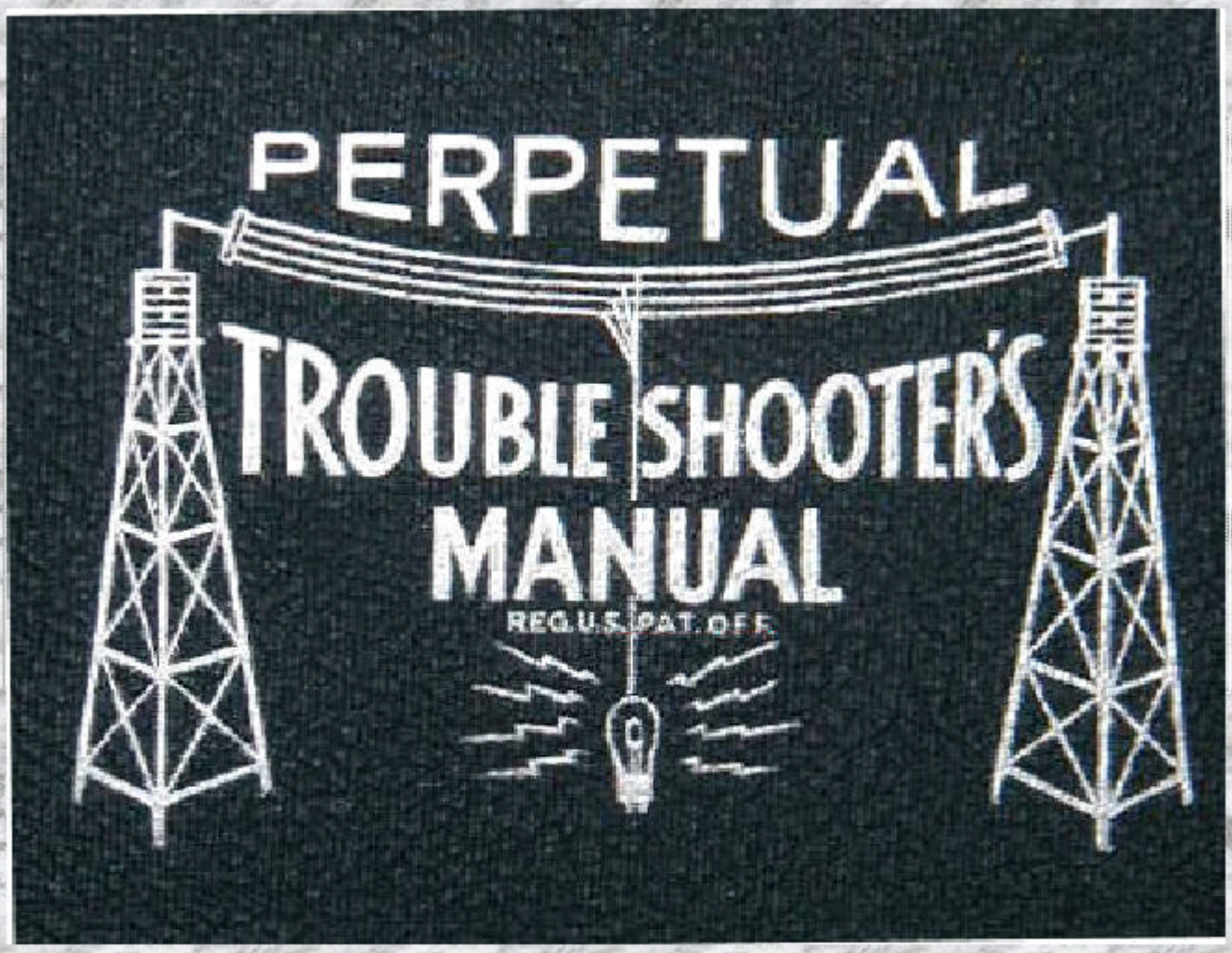
RIDER'S
VOLUME - XVIII



COVERING LATE 1947
TO EARLY 1948

CHASSIS REMOVAL (For Servicing)

Due to the type of chassis mounting used, removal of the entire tilt-out door assembly (with receiver chassis attached) simplifies removal of the receiver chassis. The receiver chassis can then be easily removed from its shock mountings. Removal is a little "tricky" but can be done most readily as described below:

Disconnect all cables and leads to the chassis.

Remove the screw and washer (#1 in figure 1) from both tilt-out spring studs (2), one on each side of the tilt-out assembly. Slip the tilt-out springs (3) off their respective studs. Unscrew the ends of the tie-bar (4). The tie-bar then hangs free on the copper braid used to bond it to the chassis.

Stand at the end of the cabinet (adjacent to the radio compartment) with left hand on the door handle at the front and with right hand in the radio compartment near the back of the chassis and grasping a long screwdriver as shown in Fig. 2.

With the left hand, pull the assembly out to **one half** of its full tilt-out position. With the screwdriver, pry both tilt-out arms (#5 in Fig. 2) off their studs (#6). **Using the screwdriver blade, push the tilt-out arms toward the front of the cabinet (against bracket #7.)** The assembly will move downward a slight amount from its original mounting position. The tilt-out assembly can now be removed from the front of the cabinet by tipping it forward and then pulling it straight out. CAUTION: In models having record storage compartments below the receiver, the record storage compartment door MUST be closed during the actual process of removing the radio tilt-out door assembly.

CHASSIS REPLACEMENT

Install chassis on the tilt-out assembly, making sure the chassis shock mounting is assembled exactly as shown in Fig. 3. Be sure that the grommets shown in Fig. 3 are in place on the chassis bracket and that the chassis bracket does not touch the tilt-out arm.

Make sure the rubber strips (#8) are in place.

To replace the assembly, grasp it with both hands and move it into place in the cabinet, in the tilted or open position.

Then continue to hold the assembly in place by grasping the door handle with the left hand. Now pull the assembly slowly toward its closed position. **At the same time** with the screwdriver in the right hand, spring the tilt-out arms (#5) inwardly until they clear the studs. The assembly will move downward and into the cabinet with the tilt-out arms in the position shown in Fig. 2.

Then lift the assembly by lifting the handle with the left hand and the tilt-out arms with the right hand. One at a time slip each tilt-out arm into place on its stud.

Replace the tie-bar (#4) and tilt-out springs (#3). Reconnect the leads and cables to the chassis.

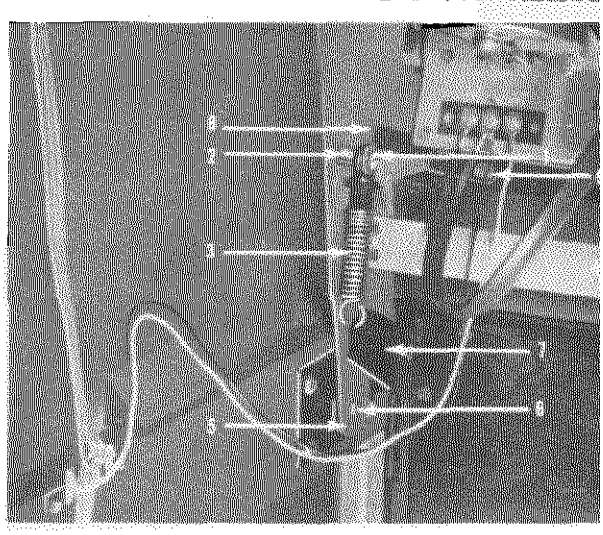


Fig. 1. Receiver Tilt-Out Mounting

Ref. No.	Description	Part I
1	#6—32 x ¼" Screw	
2	Stud	Part of
3	Spring, Adjusting (for chassis mtg.)	19A 1
4	Tie-Bar (for receiver chassis mtg.)	15B 1
5	Door Arm, left (near center of cab.)	A1440
	Door Arm, right (near center of cab.)	A1441
6	Stud	Part of
7	Door Bracket, left (near center of cab.)	A1438
	Door Bracket, right (nearest side of cab.)	A1439
8	Rubber Channel (⅜ x ⅛ x 2⅜" over-all)	12A 9
9	Bumper, Rubber—For radio chassis (some models only)	12A 3

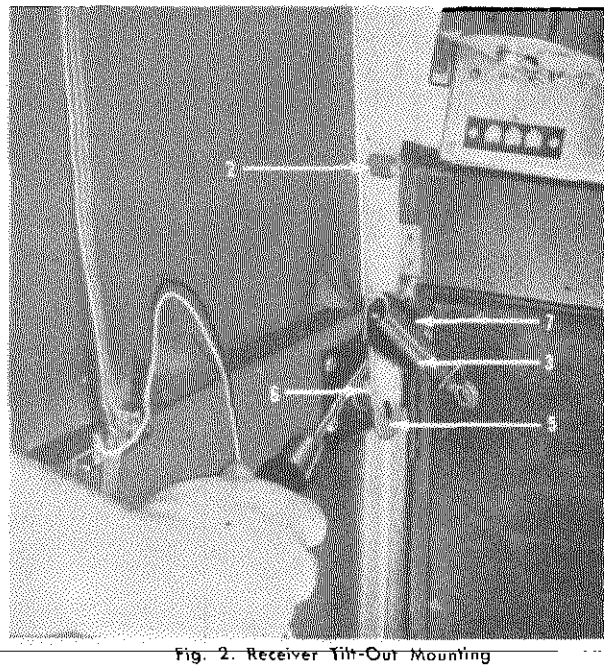


Fig. 2. Receiver Tilt-Out Mounting

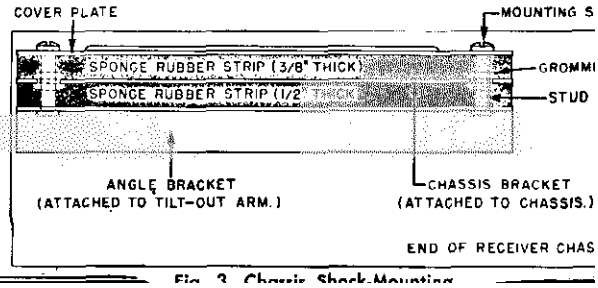
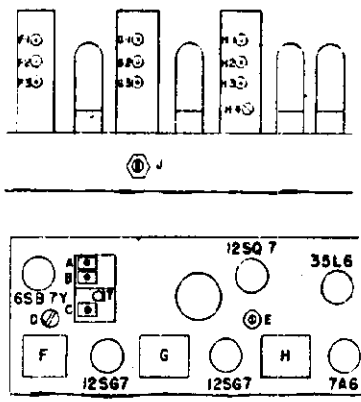


Fig. 3. Chassis Shock Mounting

ALIGNMENT PROCEDURE:



Dummy Antenna	Signal Generator Connection	Signal Generator Frequency	Band Switch Position	Radio Dial Setting	Adjust	Remarks
0.01 MFD	Terminal T	455 KC AM	Broadcast	1625 KC	E G-1 F-1	Adjust for maximum output Repeat for fine adjustment
0.01 MFD	Pin 4 of 12SG7 2nd FM-AM IF with FM Signal Gen.	10.7 MC FM	FM	108 MC	H-2	Adjust for maximum output (Broad adjustment)
0.01 MFD	"	10.7 MC FM	FM	108 MC	H-4	Adjust for maximum output
0.01 MFD	"	10.7 MC AM	FM	108 MC	H-1 or H-3	Adjust whichever is required for minimum output
						Repeat last two steps for fine adjustment until settings for maximum FM output coincide with settings for minimum AM output.
0.01 MFD	Pin 8 of 6SB7Y Converter	10.7 MC FM	FM	108 MC	G-3 — G-2	Adjust for maximum output
0.01 MFD		"	FM	108 MC	F-3 — F-2	Adjust for maximum output
						Repeat last two steps for fine adjustment
			Broadcast	535 KC	Pointer	Adjust pointer to reference mark
100 MMFD	"A" Post on Cabinet	600 KC AM	"	600 KC	J and Core on Ant. Coil in Cab.	Adjust for maximum output
"	"	1550 KC AM	"	1550 KC	B and trimmer on Ant. Coil	Adjust for maximum output
300 OHM Resistor	"	92 MC FM	FM	92 MC	D	Adjust for maximum output
"	"	106 MC FM	FM	106 MC	A and C	Adjust for maximum output

Alignment: No attempt should be made to realign this receiver until it has been determined that a poor tube or some local condition is not responsible for faulty reception. The following is a list of the minimum equipment necessary to realign this receiver.

In the following alignment procedure the high side of the signal generator is connected to the terminal indicated in the "Signal Generator Coupling" column below. The ground side of the signal generator is connected directly to the chassis. The output meter should be connected across the voice coil of the speaker for all measurements.

1—AM signal generator covering 455 KC, 600 KC, 1550 KC and 10.7 MC

2—FM signal generator covering 10.7 MC, 92 MC and 106 MC

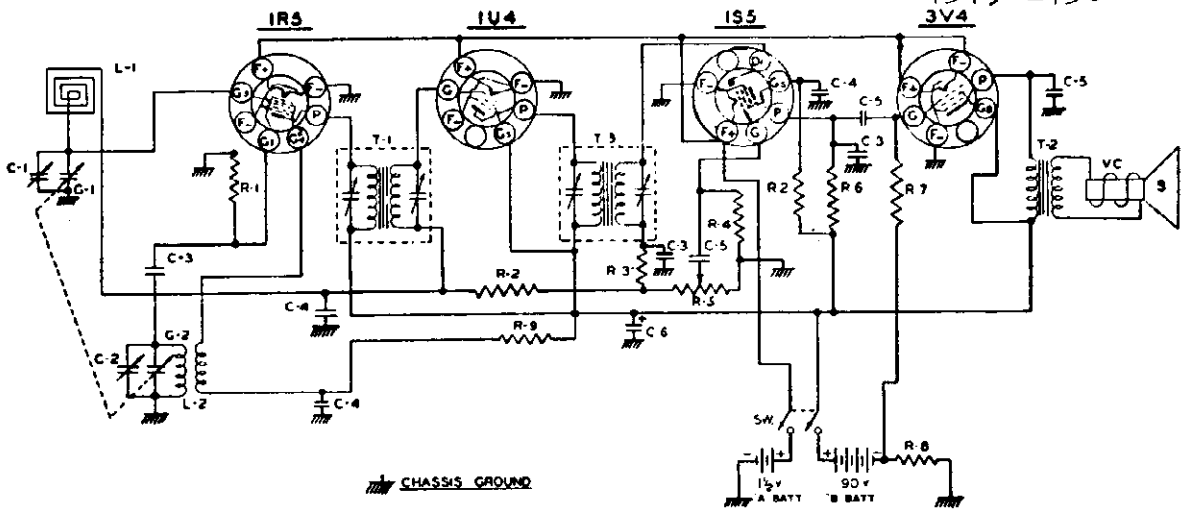
3—Output meter, rectifier type, approximately 0 to 2 volts RMS

4—Dummy antennas
100MMFD Mica Capacitor
300 Ohm Resistor
0.01 MFD Capacitor

In adjusting the radio frequency trimmers and padders it is advisable to "rock" the variable capacitor gang slightly across the signal being delivered by the signal generator until that particular signal has been accurately peaked.

ALDEN, INC.

MODELS 1755, 1756
1757, 1758



PART NO		DESCRIPTION
IR-20	R-1	220M Ω RESISTOR 1/2W 20 %
IR-23	R-2	3.3MEG RESISTOR 1/2W 20 %
IR-31	R-3	.82 M Ω RESISTOR 1/2W 10 %
IR-3	R-4	10MEG RESISTOR 1/2 W 20 %
VC-8	R-5	1MEG VOLUME CONTROL
IR-12	R-6	1MEG RESISTOR 1/2W 20 %
IR-13	R-7	2.2MEG RESISTOR 1/2W 20 %
IR-30	R-8	620 Ω RESISTOR 1/2W 5 %
IR-37	R-9	10M Ω RESISTOR 1/2W 20 %
TC-7	C-1	ANT TRIMMER
	C-2	OSC TRIMMER ON GANG
MC-2	C-3	100MMFD MICA CONDENSER
PC-7	C-4	.01 MFD 400 V CONDENSER
PC-6	C-5	.005 MFD 600 V CONDENSER
EC-7	C-6	20MFD 80WV ELECTROLYTIC
GC-5	C-1 G-2	GANG CONDENSER
LL-5	L-1	LOOP ANTENNA
LO-12	L-2	OSC COIL
LI-5	T-1	I F TRANSFORMER INPUT
	SW	DPST SWITCH ON VOLUME CONTROL
	T-2	SPEAKER TRANSFORMER
SPK-5	VC	VOICE COIL
	S	PM SPEAKER
LI-4	T-3	I F TRANSFORMER OUTPUT
TU-30		1R5 1U4 1S5 3V4

ALIGNMENT AND SERVICE DATA

Remove chassis from cabinet for alignment. A signal generator is required having the following frequencies: 455 KC and 1400 KC An output meter should be connected across the speaker.

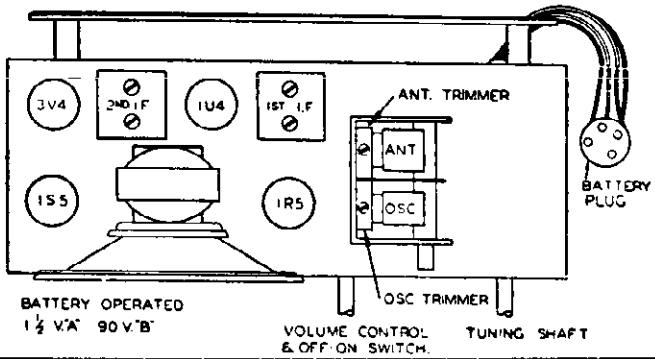
FIRST STEP: Connect the hot lead from the generator to the ANT. section of the gang condenser, through a .1 MFD. condenser. The ground lead from the generator may be connected to any spot on the metal chassis. Turn the gang condenser to complete minimum capacity. Set the generator to 455 KC. Adjust the movable trimmers in the IF cans, until a maximum reading is noted on the output meter.

The volume control of the receiver should be turned to maximum during the IF and all subsequent alignment and the generator output as low as possible to prevent the AVC from working and giving false readings.

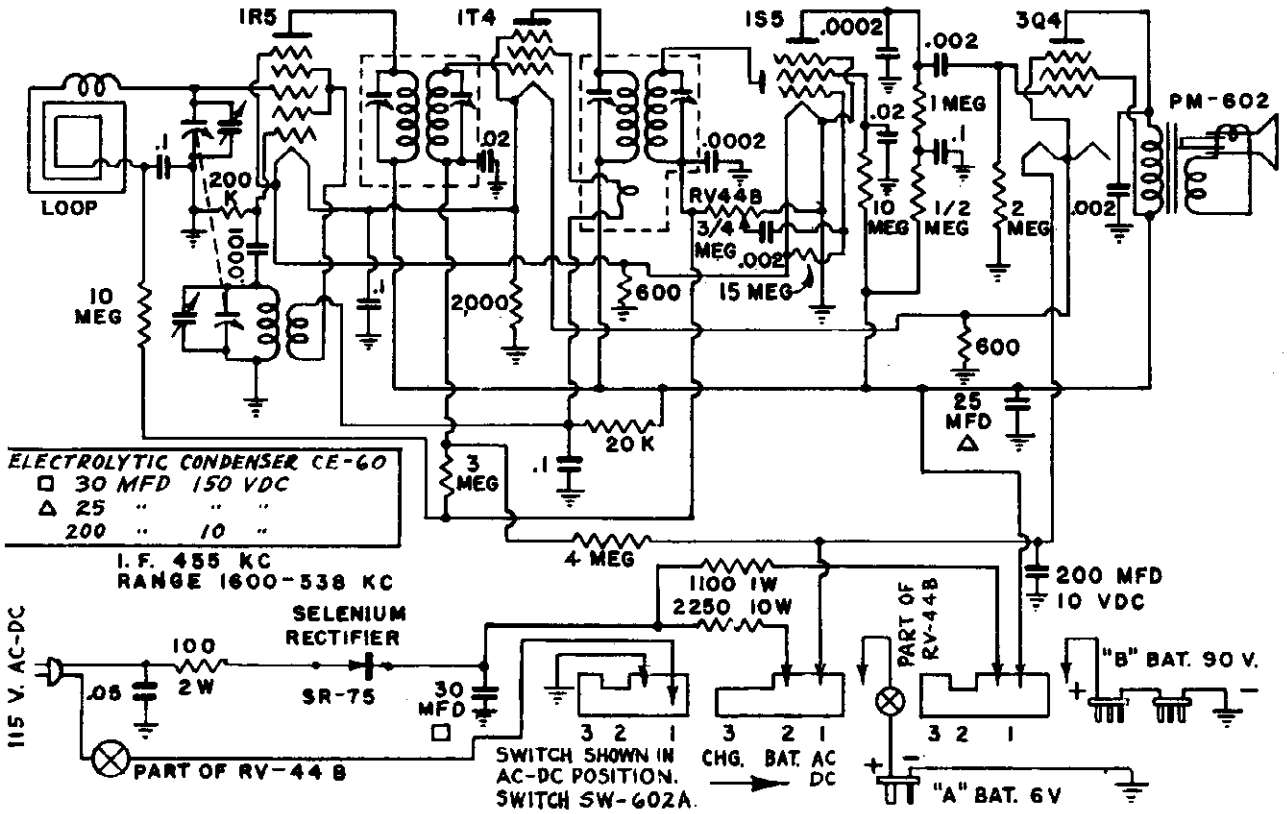
SECOND STEP: With the leads from the generator still connected as in IF alignment, adjust the generator to 400 KC. Set the dial pointer to 1400 KC on the dial scale. Adjust the oscillator trimmer until the signal is tuned in.

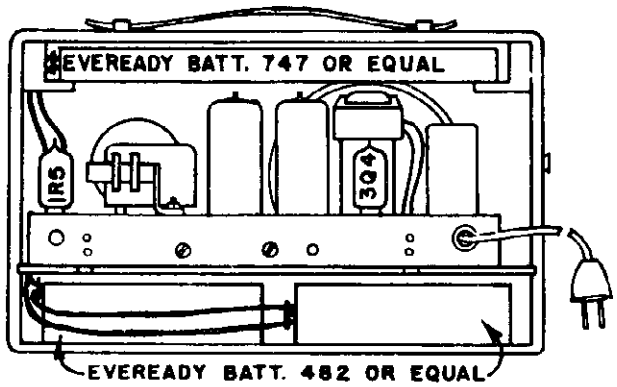
THIRD STEP: Remove the generator leads from the condenser. Connect the hot lead from the generator through a 200 MMFD. condenser to one of the leads which project from the back of the loop antenna. Connect the ground lead of the generator to the remaining lead. With the generator and the receiver still tuned to 1400 KC, adjust the antenna trimmer until a maximum reading is noted on the output meter.

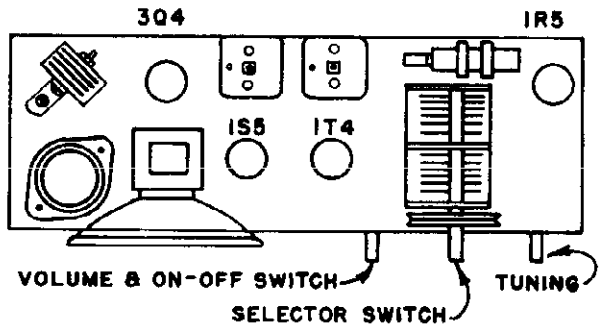
TUBE AND TRIMMER LOCATION



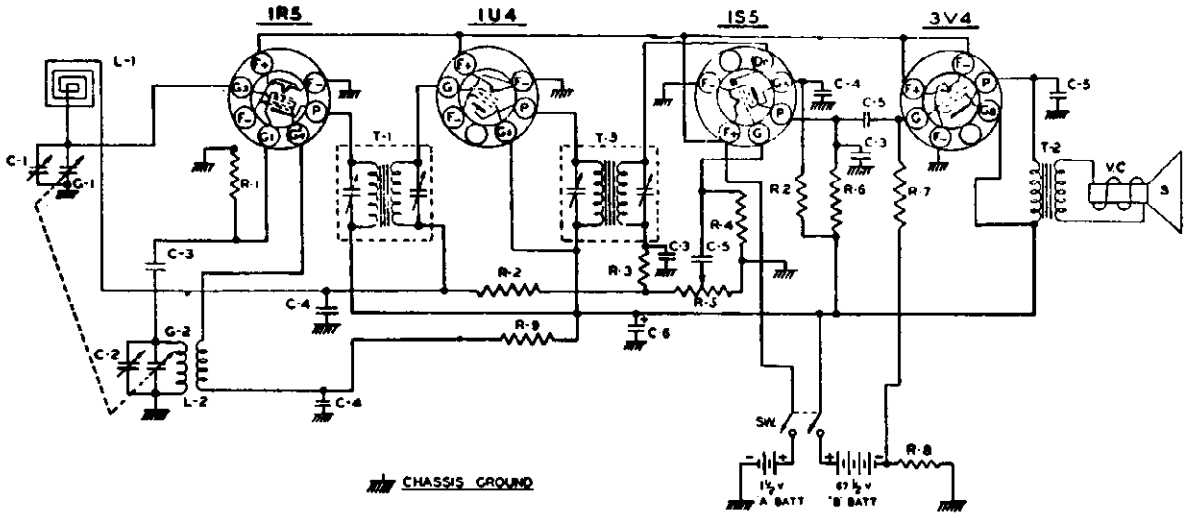
MODEL 1810 ALDEN, INC.







ALDEN, INC. MODELS 1815, 181



PART NO		DESCRIPTION
1R-20	R-1	220M Ω RESISTOR 1/2W 20 %
1R-23	R-2	3.3MEG RESISTOR 1/2W 20 %
1R-31	R-3	82M Ω RESISTOR 1/2W 10 %
1R-3	R-4	10MEG RESISTOR 1/2W 20 %
VC-8	R-5	5MEG VOLUME CONTROL
1R-12	R-6	1MEG RESISTOR 1/2W 20 %
1R-13	R-7	2.2MEG RESISTOR 1/2W 20 %
1H-39	R-8	6.20 Ω RESISTOR 1/2W 5 %
1R-37	R-9	10M Ω RESISTOR 1/2W 20 %
TC-7	C-1	ANT TRIMMER
	C-2	OSC TRIMMER ON GANG
MC-2	C-3	100MMFD MICA CONDENSER
PC-7	C-4	.01 MFD 400 V. CONDENSER
PC-6	C-5	.005MFD 600 V CONDENSER
EC-7	C-6	20MFD 80WV ELECTROLYTIC
GC-4	G-1 G-2	GANG CONDENSER
LL-18	L-1	LOOP ANTENNA
LO-16	L-2	OSC COIL
LI-3	T-1	I F TRANSFORMER INPUT
	SW	DPST SWITCH ON VOLUME CONTROL
SPK-8	T-2	SPEAKER TRANSFORMER
	VC	VOICE COIL
	S	PM SPEAKER
LI-4	T-3	IF TRANSFORMER OUTPUT
TU-30		1R5 · 1U4 · 1S5 · 3V4

ALIGNMENT AND SERVICE DATA

Remove chassis from cabinet for alignment. A signal generator is r quired having the following frequencies: 455 KC and 1400 KC. An output met should be connected across the speaker.

FIRST STEP: Connect the hot lead from the generator to the ANT. s tion of the gang condenser, through a .1 MFD. condenser. The ground le from the generator may be connected to any spot on the metal chassis. Tu the gang condenser to complete minimum capacity. Set the generator to 4 KC. Adjust the movable iron cores in the IF cans. These IF adjustments a made in the top and in the bottom of the can under the chassis. Adjust t cores until a maximum reading is noted on the output meter.

The volume control of the receiver should be turned to maximum durin the IF and all subsequent alignment and the generator output as low as po sible to prevent the AVC from working and giving false readings.

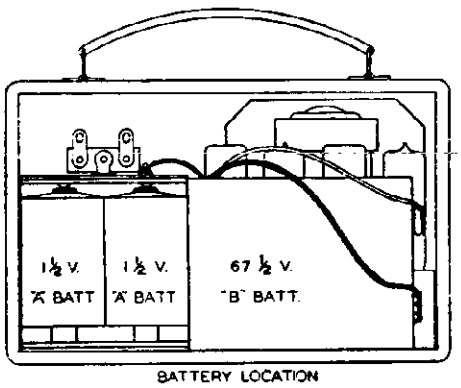
SECOND STEP: With the leads from the generator still connected as in l alignment, adjust the generator to 1400 KC. Set the dial pointer to 1400 K on the dial scale. Adjust the oscillator trimmer until the signal is tuned in

THIRD STEP: Remove the generator leads from the gang condenser.

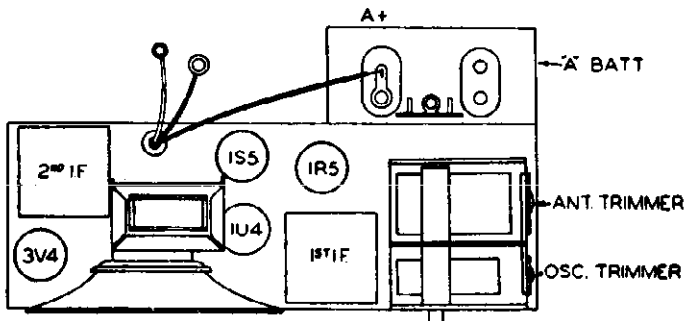
Replace the chassis in the cabinet. Loosely couple the generator to t receiver loop by making a complete turn over the outside of the cabinet. Wi the receiver and the generator still set at 1400 KC increase the generator ou put. Adjust the Antenna trimmer through the back of the chassis until maximum signal is noted on the output meter.

No further adjustment should be necessary as the coils and gang conde ser in this receiver have been specially handled at the factory to insure prop alignment at the lower frequencies.

NOTE: When the antenna trimmer is adjusted at 1400 KC., the chassis as we as the "A" and "B" batteries must be in normal position in the cabinet reflect the proper loop impedance.

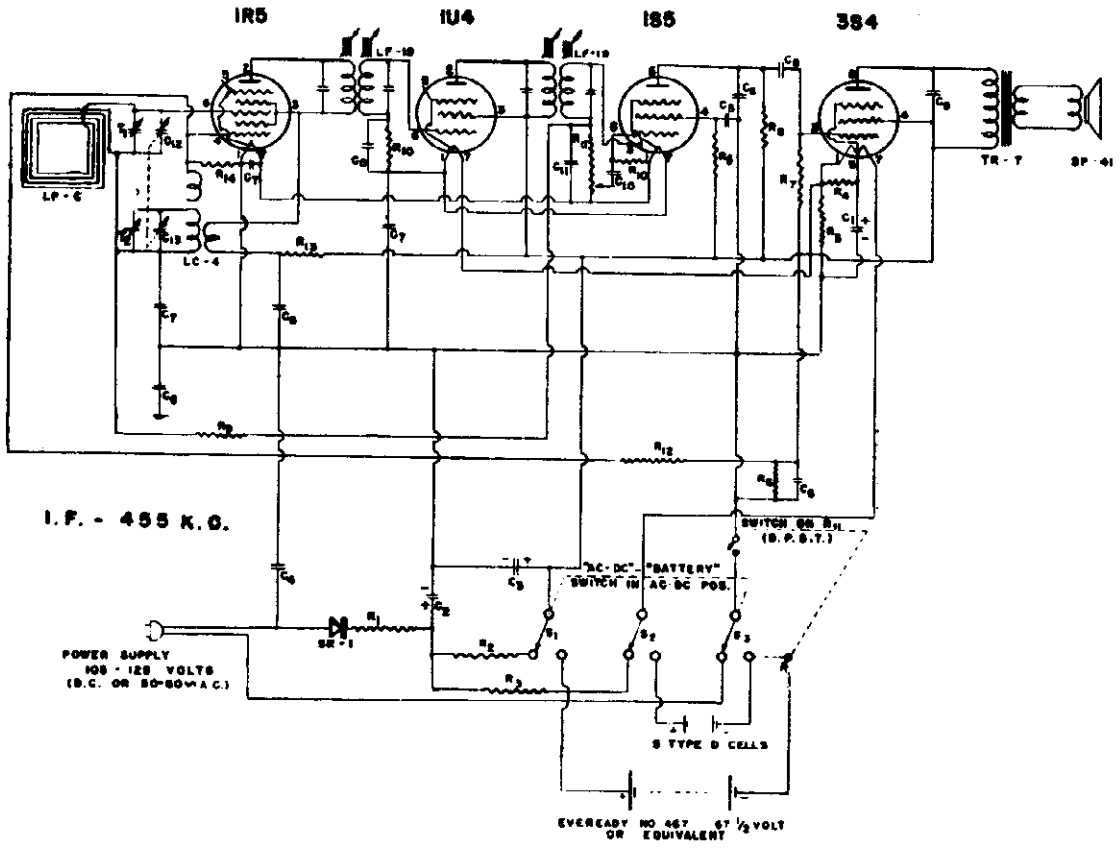


BATTERY LOCATION

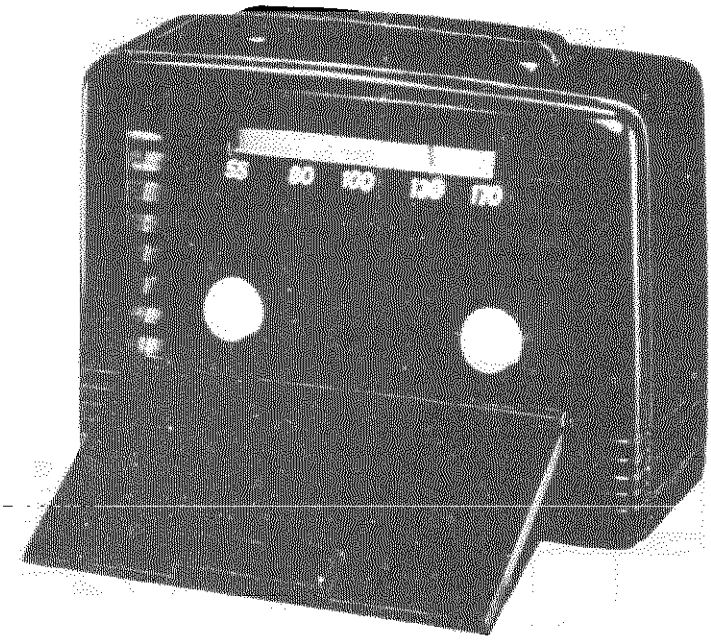


TUBE AND TRIMMER LOCATION.

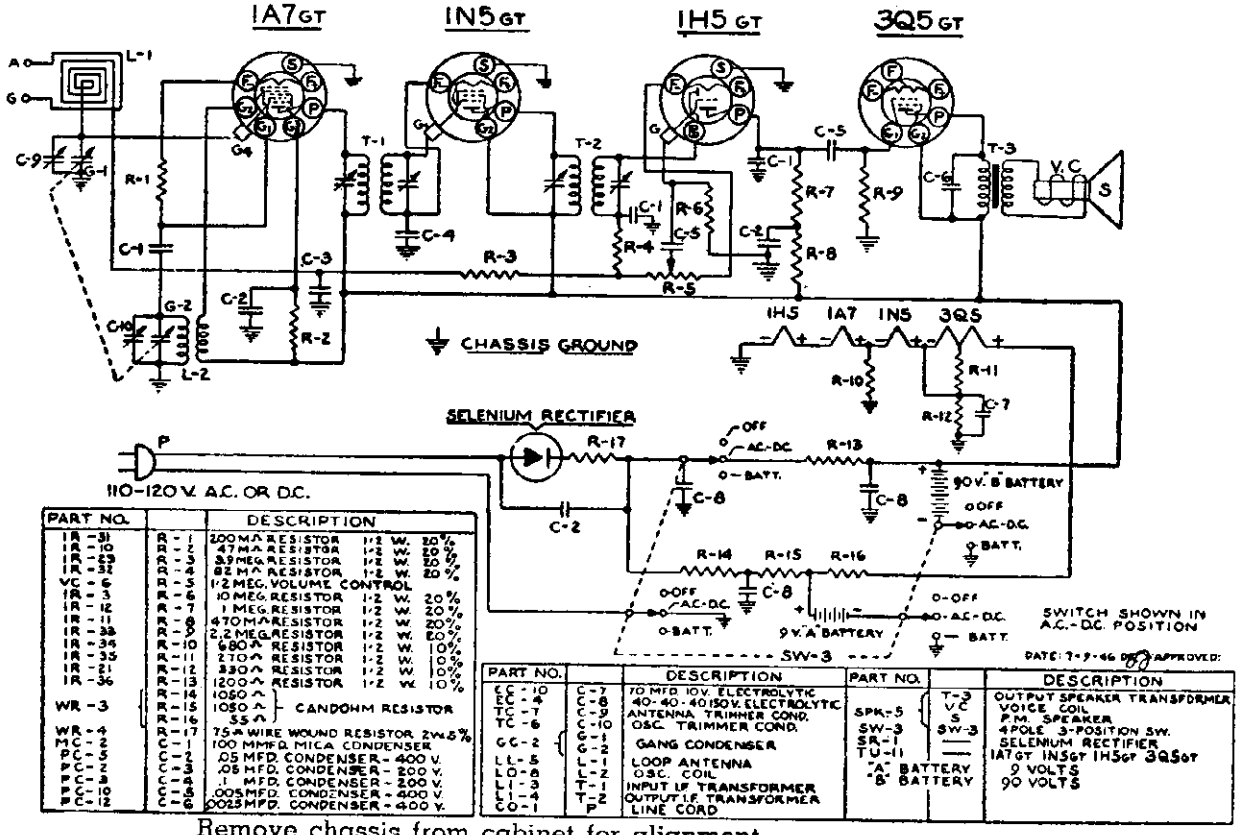
MODEL 1818 ALDEN, INC.



ITEM	DESCRIPTION	PART NUMBER
C_1	125 MFD. 10VOLT } ELECTROLYTIC	CE-12
C_2, C_3	25 MFD. 150 VOLT } CONDENSER	
C_4	.05 MFD. 400 VOLT PAPER CONDENSER	CP 503-1
C_5	.01 MFD. 150 VOLT PAPER CONDENSER	CP 103-2
C_6	.1 MFD. 200 VOLT PAPER CONDENSER	CP 104-2
C_7	.05 MFD. 150 VOLT PAPER CONDENSER	CP 503-2
C_8	.002 MFD. 120 VOLT PAPER CONDENSER	CP 202-1
C_9	.005 MFD. 400 VOLT PAPER CONDENSER	CP 502-2
C_{10}	.001 MFD. 120 VOLT PAPER CONDENSER	CP 102-1
C_{11}	.0001 MFD. 300 VOLT MICA CONDENSER	CM 101-1
C_{12}-C_{13}	VARIABLE CONDENSER	CV 10
LC-4	OSCILLATOR COIL	LC-4
LF-10	I.F. TRANSFORMER	LF-10
LP-6	ANTENNA LOOP	LP-6
R_1	56 OHM 2 WATT 10% W.W. RESISTOR	RW 560-6
R_2	7500 OHM 1 WATT 10% RESISTOR	RC 752-6
R_3	2720 OHM 10 WATT 5% RESISTOR	RP-1
R_4	470 OHM ½ WATT RESISTOR	RC 471-1
R_5	820 OHM ½ WATT 10% RESISTOR	RC 821-2
R_6	270,000 OHM ½ WATT 10% RESISTOR	RC 274-2
R_7	2.2 MEG. ½ WATT RESISTOR	RC 225-1
R_8	1 MEG. ½ WATT RESISTOR	RC 105-1
R_9	3.3 MEG. ½ WATT RESISTOR	RC 335-1
R_{10}	10 MEG. ½ WATT RESISTOR	RC 106-1
R_{11}	1 MEG POTENTIOMETER WITH SWITCH	VC-6
R_{12}	1 MEG ½ WATT 10% RESISTOR	RC 105-2
R_{13}	15,000 OHM ½ WATT RESISTOR	RC 153-1
R_{14}	100,000 OHM ½ WATT 10% RESISTOR	RC 104-2
S_1-S_2-S_3	3 POLE SINGLE THROW SWITCH	SW-3
SP-41	SPEAKER	SP-41
TR-7	OUTPUT TRANSFORMER	TR-7
SR-1	SELENIUM RECTIFIER	SR-1
T_1, T_2	TRIMMERS ON VARIABLE	



ALLIED RADIO CORP. MODEL 4B-1



PART NO.		DESCRIPTION
1A-31	R-1	200 M^ RESISTOR 1/2 W. 20%
1A-10	R-2	47 M^ RESISTOR 1/2 W. 20%
1A-29	R-3	3.9 MEG. RESISTOR 1/2 W. 20%
1A-32	R-4	82 M^ RESISTOR 1/2 W. 20%
VC-6	R-5	1/2 MEG. VOLUME CONTROL
1A-3	R-6	10 MEG. RESISTOR 1/2 W. 20%
1A-12	R-7	1 MEG. RESISTOR 1/2 W. 20%
1A-11	R-8	470 M^ RESISTOR 1/2 W. 20%
1A-38	R-9	2.2 MEG. RESISTOR 1/2 W. 20%
1A-34	R-10	680 ^ RESISTOR 1/2 W. 10%
1A-33	R-11	270 ^ RESISTOR 1/2 W. 10%
1A-21	R-12	330 ^ RESISTOR 1/2 W. 10%
1A-36	R-13	1200 ^ RESISTOR 1/2 W. 10%
	R-14	1050 ^
WR-3	R-15	1050 ^ CANDOHM RESISTOR
	R-16	55 ^
WR-4	R-17	75 ^ WIRE WOUND RESISTOR 2W 5%
MC-2	C-1	100 MMFD. MICA CONDENSER
PC-5	C-2	.05 MFD. CONDENSER - 400 V.
PC-2	C-3	.05 MFD. CONDENSER - 200 V.
PC-3	C-4	.1 MFD. CONDENSER - 200 V.
PC-10	C-5	.005 MFD. CONDENSER - 400 V.
PC-12	C-6	.0025 MFD. CONDENSER - 400 V.

PART NO.		DESCRIPTION
EC-10	C-7	70 MFD 10 V. ELECTROLYTIC
EC-4	C-8	40-40-40 150 V. ELECTROLYTIC
TC-7	C-9	ANTENNA TRIMMER COND.
TC-6	C-10	OSC. TRIMMER COND.
GC-2	G-1	GANG CONDENSER
	G-2	
LL-5	L-1	LOOP ANTENNA
LO-8	L-2	OSC. COIL
LI-3	T-1	INPUT I.F. TRANSFORMER
LI-4	T-2	OUTPUT I.F. TRANSFORMER
CO-1	P	LINE CORD

PART NO.		DESCRIPTION
SPK-5	T-3	OUTPUT SPEAKER TRANSFORMER
	VC	VOICE COIL
	S	P.M. SPEAKER
SW-3	SW-3	4 POLE 3-POSITION SW.
SR-1		SELENIUM RECTIFIER
TU-11		1A7GT 1N5GT 1H5GT 3Q5GT
"A" BATTERY		9 VOLTS
"B" BATTERY		90 VOLTS

DATE: 7-9-46 APPROVED:

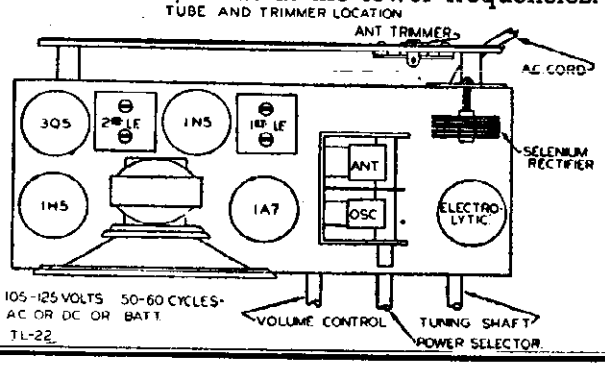
Remove chassis from cabinet for alignment.

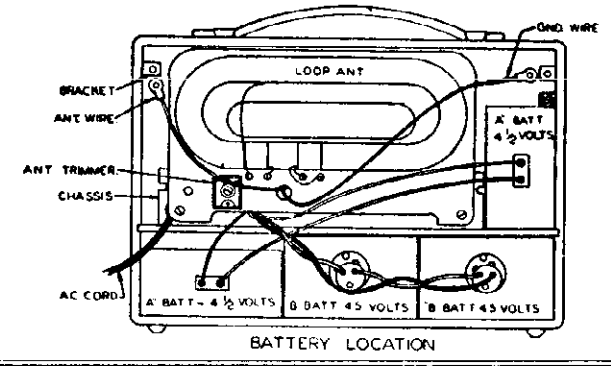
A Signal Generator is required having the following frequencies: 455 KC, 1400 KC, 1720 KC. An output meter should be connected across the speaker.

FIRST STEP: Connect the hot lead from the generator to the ANT. section of the gang condenser, through a .1 MFD condenser. The ground lead from the generator must be connected to the metal frame of the gang condenser. Turn the gang condenser to complete minimum capacity. Adjust the generator to 455KC and adjust the trimmers of the 1st and 2nd I.F. transformers until a maximum reading is noted on the output meter.

SECOND STEP: With the leads from the generator still connected in the same manner, adjust the Signal Generator to 1720 KC. The OSC. trimmer is located on the top of the oscillator section of the gang condenser. Adjust this trimmer until the 1720 KC signal is tuned in.

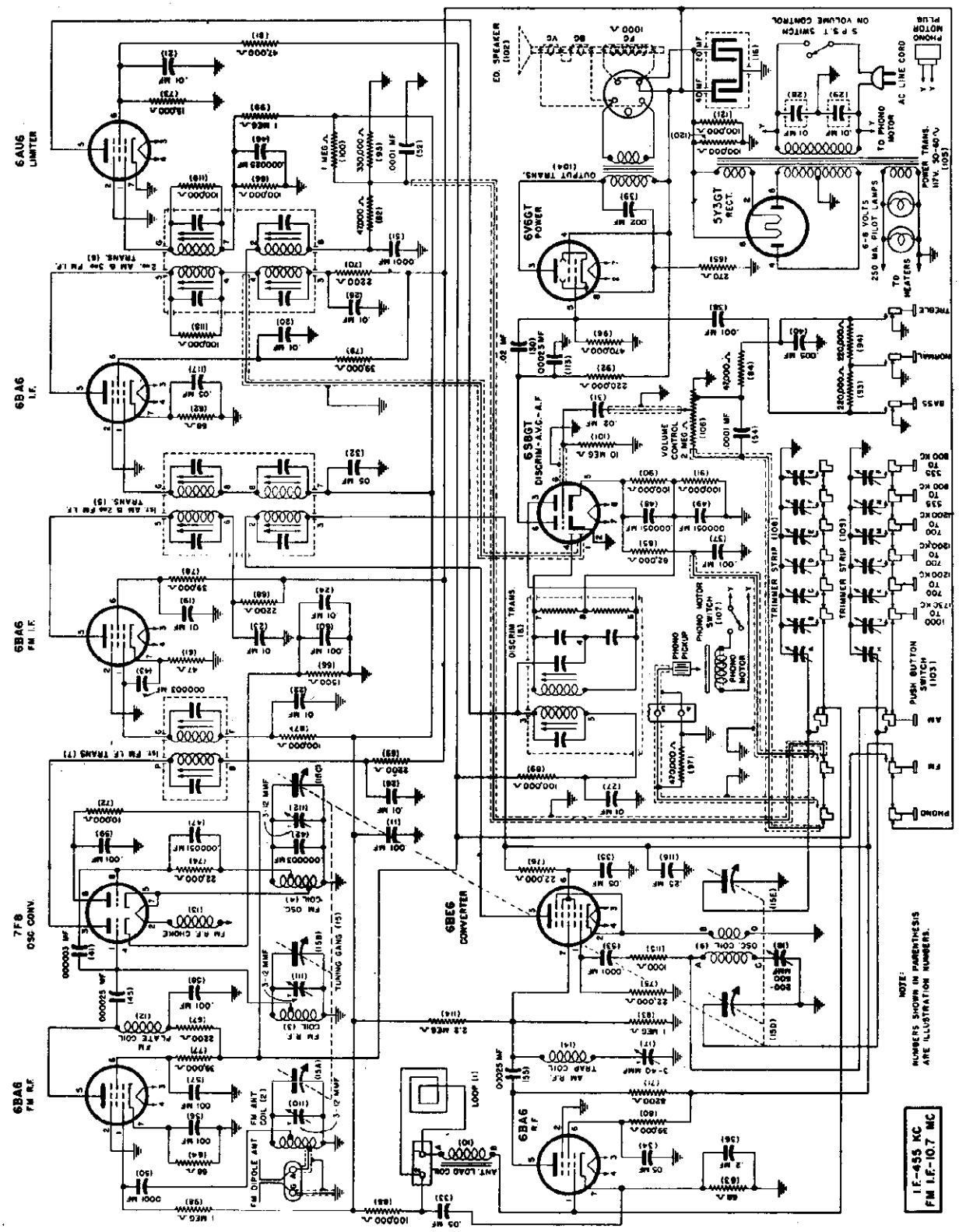
THIRD STEP: Remove the hot lead of the generator from the ANT section of the gang condenser. Connect this lead to the antenna lead wire that projects from the back of the loop antenna through a 200 MMFD condenser. Adjust the Signal Generator to 1400 KC. Rotate the tuning control until this signal is tuned in. The ANT trimmer is located on the back of the loop antenna. Adjust this trimmer until a maximum reading is noted on the output meter. No further adjustment should be necessary, unless the set has been damaged, as the coils and condenser in this receiver have been specially handled at the factory to insure proper alignment at the lower frequencies.





MODEL 10C-249

ALLIED RADIO CORP.



FM ALIGNMENT

Instructions for Alignment of the Frequency Modulation I. F. Transformers, Discriminator, Oscillator, R. F. and Antenna Circuits, with AM equipment generally available to the service man.

The equipment necessary for this procedure consists of the following:

D.C. Vacuum Tube Voltmeter of the Volt-Ohmyst Type. An AM Signal Generator that will supply:

(1) A 10.7 M.C. Signal for I F. alignment.

(2) A 105 M.C. and 109 M.C. Signal—a Signal Generator that only goes up to 30 M.C. but which has sufficient fourth harmonics present in the carrier could be used for this purpose.

THE GENERATOR USED NEED NOT BE FREQUENCY MODULATED.

IT IS ALWAYS DESIRABLE TO ALIGN THE "AM" I. F. TRANSFORMERS BEFORE MAKING ANY OF THE "FM" I. F. ADJUSTMENTS, and to RECHECK "AM" I. F. TRIMMERS AFTER COMPLETING "FM" I. F. ADJUSTMENTS.

BE SURE TO MAKE THE "FM" ADJUSTMENTS IN THE ORDER GIVEN BELOW.

(1) PROCEDURE FOR ALIGNMENT OF FM DISCRIMINATOR TRANSFORMER:

(A) Connect the Voltmeter from Pin No. 5 of the 6S8GT tube to chassis.

(B) With a .002 Mfd. Isolation Condenser in series with hot Signal Generator lead, connect generator from Pin No. 1 of the 6AU6 Limiter tube to chassis.

(C) Set Signal Generator to EXACTLY 10.7 M. C.

(D) Adjust 10.7 M. C. Discriminator Primary Trimmer for MAXIMUM reading on Voltmeter.

(E) Leave Signal Generator set at 10.7 M. C. and modulate with a 400 cycle note.

(F) Adjust 10.7 M. C. Secondary Discriminator Trimmer for MINIMUM 400 CYCLE RESPONSE IN THE SPEAKER. IMPORTANT: The reading on the Voltmeter should be ZERO. MINIMUM AUDIO RESPONSE WILL BE RATHER CRITICAL IN ADJUSTMENT.

(G) To check adjustment, swing Signal Generator to one side of 10.7 M. C. until MAXIMUM reading is obtained on Voltmeter and NOTE FREQUENCY and VOLTAGE READING. Then swing Signal Generator to the opposite side of 10.7 M. C. until MAXIMUM reading is obtained on Voltmeter and AGAIN NOTE VOLTAGE AND FREQUENCY READINGS. The two Voltmeter readings should be similar within 3 DB. and the two Signal Frequency readings should be a reasonably equal distance from 10.7 M. C. The difference in K.C. between the center frequency and one side should not exceed the difference between the center frequency and the other side by more than 50 K. C.

NOTE: If reliable FM Generator is available at 10.7 M.C., the procedure outlined in Paragraph (G) will be simplified by aligning to the proper pattern on an Oscilloscope. 100 K. C. deviation should be used.

CAUTION: Care should be taken to align the I. F. stages at the EXACT same center frequency as the Discriminator Coil. Switching from FM to AM on some generators may shift the carrier frequency somewhat.

(2) PROCEDURE FOR ALIGNMENT OF "FM" I. F. TRANSFORMERS:

(A) Connect the Voltmeter from the junction of the two 1 Megohm Resistors, (Illus. 99 and 100) to chassis.

(B) Connect Signal Generator to Input Grid (Pin No. 1) of 7F8 Converter tube.

(C) Set Signal Generator to EXACTLY 10.7 M. C.—if possible, mark the position where this occurs right on the Generator's calibrated dial because **this becomes a reference point** in checking for proper FM I. F. alignment.

(D) Adjust each of the 1st, 2nd and 3rd FM I. F. Transformers' 10.7 M. C. trimmers for MAXIMUM reading on Voltmeter. KEEP OUTPUT OF SIGNAL GENERATOR SO THAT A READING OF APPROXIMATELY 2 to 4 VOLTS IS OBTAINED ON THE VOLTMETER.

(E) After all the above FM I. F. Transformer Trimmer adjustments have been correctly completed, MAKE A NOTE OF THE READING ON THE VOLTMETER.

(F) Next, detune the signal generator to a slightly HIGHER frequency (higher than the 10.7 reference frequency), until the Voltmeter reads ONE-HALF of the figure noted in (E) above, and MAKE A NOTE OF THE GENERATOR FREQUENCY AT WHICH THIS OCCURS.

(G) Now, detune the signal generator to a LOWER frequency (lower than the 10.7 reference frequency), until the Voltmeter again reads ONE-HALF the original figure noted in (E), and AGAIN NOTE THE GENERATOR FREQUENCY AT WHICH THIS OCCURS.

The difference between the two above frequencies obtained in (F) and (G), the one lower than 10.7 M. C. reference point and the one higher, is the "Half-amplitude" Band width of the FM-I. F. system. These two frequencies (F) and (G), should be somewhat uniformly spaced on either side of the 10.7 M. C. (C) reference frequency. A SLIGHT DIFFERENCE IS NOT SERIOUS. Only when one is more than twice as far as the other from the 10.7 M. C. reference frequency, or when there is a double peak, is the discrepancy serious. Assuming the FM I. F. Transformers have been properly adjusted, a double peak, or extremely one-sided "half-amplitude" band width, is usually caused by regeneration or a defective FM I. F. Transformer.

(3) PROCEDURE FOR THE ALIGNMENT OF THE "FM" ANTENNA, R.F., AND OSCILLATOR CIRCUITS:

(A) Leave Voltmeter connected as it was for FM I. F. Alignment.

(B) Connect the hot Signal Generator lead through a 300 Ohm Resistor to the FM Antenna Post, marked "ANT" on back of chassis, and the other lead to the post marked "GND".

(C) Set Signal Generator so that it will deliver a modulated 108 M. C. signal. [illegible]

AM ALIGNMENT PROCEDURE

Be sure to follow procedure carefully and in the order given—otherwise the receiver will be insensitive and the dial calibration incorrect. For alignment procedure read tabulations from left to right. Make the adjustment marked (1) first, (2) next.

Before starting alignment:

(A) Check tuning dial adjustment by turning gang condenser until plates reach maximum capacity stop (completely in mesh) at which point the dial pointer must be exactly even with the last line at the low frequency end of the AM dial calibration. If dial pointer does not point exactly to last line move to correct position.

(B) Use an accurately calibrated test oscillator with some type of output measuring device.

(C) WHEN ADJUSTING THE 1730 KC OSCILLATOR TRIMMER, THE 455 KC TRIMMER, remove chassis from cabinet and disconnect the loop connection wires from the set. Attach a 1 megohm resistor across these connections and feed output of test oscillator across the 1 megohm resistor.

(D) THE 1400 KC LOOP ANTENNA TRIMMER and 600 KC PADDER should be adjusted only after all other adjustments have been made and with the set mounted in the cabinet, and the loop in position. When aligning the 1400 KC Antenna Trimmer and 600 KC Padder, couple test oscillator to receiver loop by: (1) make loop consisting of five to ten turns of No. 20 to No. 30 size wire, wound on a 2″ or 3″ form; (2) connect this loop across output of test oscillator; (3) place test oscillator loop near radio loop. BE SURE THAT NEITHER LOOP MOVES WHILE ALIGNING.

Steps	Place band switch for operation on:	Set receiver dial to:	TEST OSCILLATOR			Refer to parts layout diagram for location of trimmers mentioned below:
			Adjust test oscillator frequency to:	Use dummy antenna in series with output of test oscillator consisting of:	Attach output of test oscillator to:	
1	AM Band position	Any point where no interfering signal is received	Exactly 455 K. C.	0.2 Mfd. Condenser	High side to AM-Osc. stator plates of tuning condenser (15D). Low side to frame of condenser through .01 Mfd. condenser.	Adjust each of the 2nd 455 K. C. AM I. F. transformer trimmers for maximum output, then adjust each of the 1st 455 K. C. I. F. transformer trimmers for maximum output.
2	AM Band position	Rotate gang condenser to maximum capacity	Exactly 455 K. C.	.00025 Condenser	See Paragraph (C) above.	Adjust 455 K. C. trap trimmer for **MINIMUM** 455 K. C. Signal.
		Exactly 1730 K. C.	Exactly 1730 K. C.			Adjust 1730 K. C. oscillator trimmer for maximum output.
		Approx. 1400 K. C.	Approx. 1400 K. C.	See Paragraph (D) above.		Adjust 1400 K. C. AM Ant. trimmer for maximum output.
		Approx. 600 K. C.	Approx. 600 K. C.			While rocking gang condenser, adjust 600 K. C. oscillator padder for maximum output.

signed to deliver a 108 M. C. signal, use a generator covering at least to 30 M. C. and set this generator frequency to 27 M. C.—the fourth harmonic of which will be 108 M. C.

(D) Set Receiver Dial Pointer to EXACTLY 108 M. C.

(E) Adjust 108 M. C. Oscillator Trimmer for MAXIMUM reading on Voltmeter or MAXIMUM signal heard in speaker.

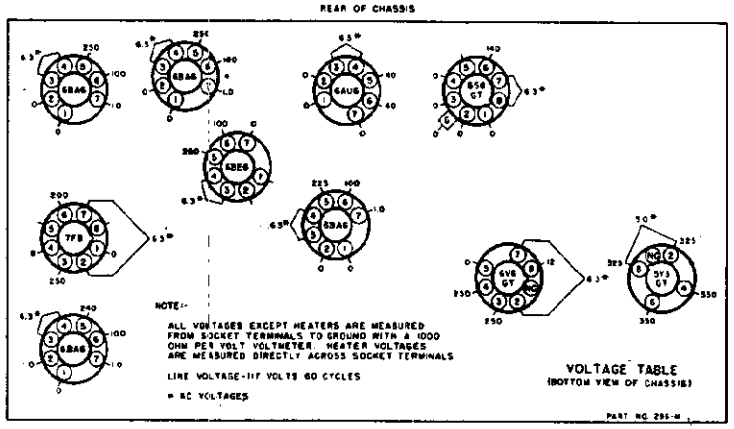
(F) Next, tune the receiver to 104 M. C.

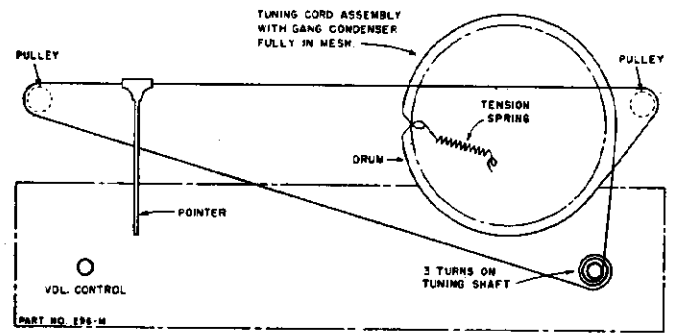
(G) Set Signal Generator to deliver a 104 M. C. modulated signal.

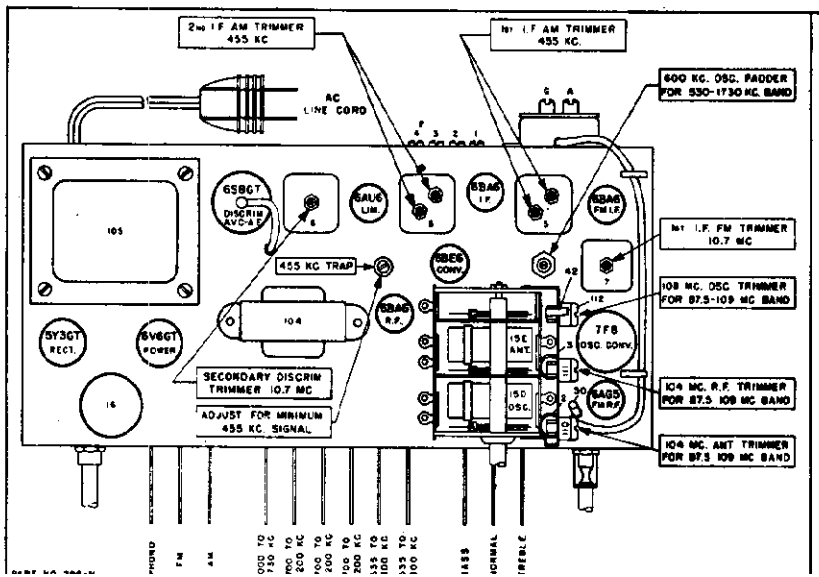
(H) Adjust 104 M. C. Antenna and R. F. Trimmers for MAXIMUM reading on Voltmeter or MAXIMUM signal heard in speaker.

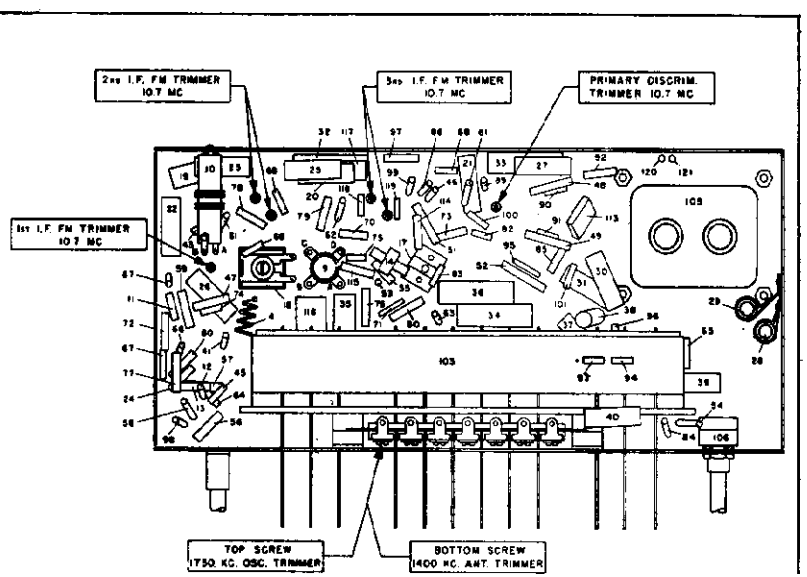
Because it is somewhat helpful to hear the signal, an AM modulation on the 108 M. C. and 104 M. C. signal frequencies may be used for alignment of the FM Oscillator, R. F. and Antenna circuits. With modulated or unmodulated signal, ALWAYS ADJUST FOR MAXIMUM READING ON VOLTMETER. (ADJUSTMENT OF "FM" GANG CONDENSER PLATES AT 98 M.C. AND 90 M. C. MAY BE NECESSARY TO INSURE PROPER TRACKING.)

A FREQUENCY MODULATED SIGNAL GENERATOR may be used instead of an AM signal generator. When a Frequency Modulated Signal Generator is used, it is recommended that an unmodulated carrier be used for all of the above adjustments EXCEPT alignment of the Discriminator Secondary Trimmer. Use a Frequency Modulated signal (100 K.C. deviation) and align Discriminator Secondary for proper pattern on an Oscilloscope.







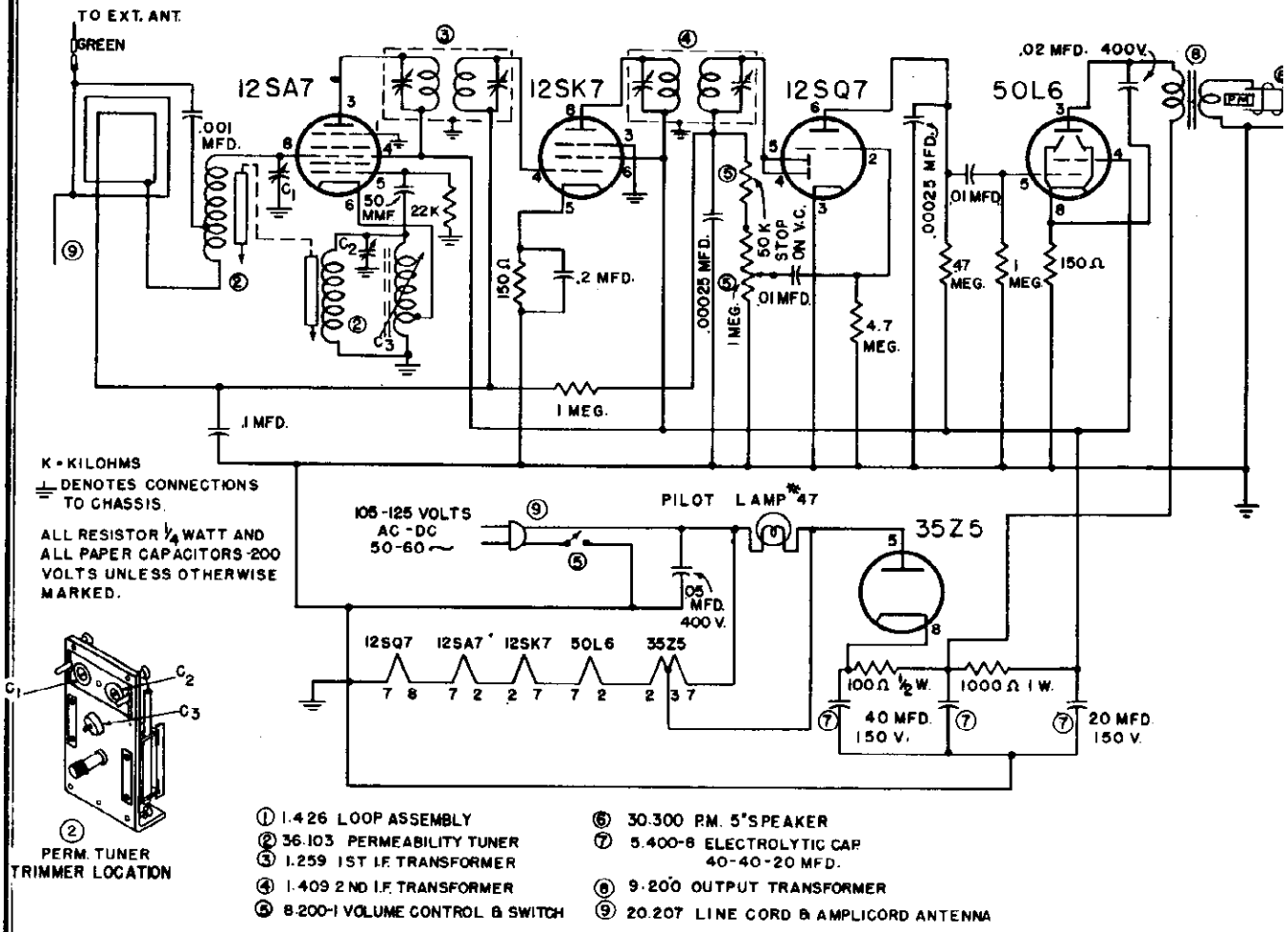


PARTS LIST

Illus. No.	Part No.	Part Name	Description
1	20E235	Antenna	Loop
2	2E48	Coil	FM Antenna
3	2E49	Coil	FM R.F.
4	2E50	Coil	FM Osc.
5	20E216	Coil	1st AM & 2nd FM I.F. Trans.
6	20E217	Coil	2nd AM & 3rd FM I.F. Trans.
7	20E218	Coil	1st FM I.F. Trans.
8	20E219	Coil	Discriminator
9	20E221	Coil	Oscillator
10	20E222	Coil	Ant. Loading
11	23E2012	Condenser	Fixed Ceramic, .001 Mfd.
12	2E52	Coil	FM Plate
13	2E47	Coil	FM R.F. Choke
14	2E19	Coil	455 KC Trap
15	24E27	Condenser	Tuning Gang
16	25E20	Condenser	Elect. Dry 20-40 Mfd. 400 V.
17	24E3	Condenser	Trimmer, 3-40 MMF
18	24E16	Condenser	Padder, 200-600 MMF
19	23E411	Condenser	Fixed Paper, .01 Mfd. 400 V.
20	23E411	Condenser	Fixed Paper, .01 Mfd. 400 V.
21	23E411	Condenser	Fixed Paper, .01 Mfd. 400 V.
22	23E411	Condenser	Fixed Paper, .01 Mfd. 400 V.
23	23E411	Condenser	Fixed Paper, .01 Mfd. 400 V.
24	23E2004-5	Condenser	Fixed Paper, .01 Mfd. 150 V.
25	23E411	Condenser	Fixed Paper, .01 Mfd. 400 V.
26	23E411	Condenser	Fixed Paper, .01 Mfd. 400 V.
27	23E411	Condenser	Fixed Paper, .01 Mfd. 400 V.
28	23E250	Condenser	.01 Mfd. 220 V. Metal Container
29	23E250	Condenser	.01 Mfd. 220 V. Metal Container
30	23E413	Condenser	Fixed Paper, .02 Mfd. 400 V.
31	23E213	Condenser	Fixed Paper, .02 Mfd. 200 V.
32	23E2014-8	Condenser	Fixed Paper, .05 Mfd. 200 V.
33	23E416	Condenser	Fixed Paper, .05 Mfd. 400 V.
34	23E416	Condenser	Fixed Paper, .05 Mfd. 400 V.
35	23E416	Condenser	Fixed Paper, .05 Mfd. 400 V.
36	23E2014-10	Condenser	Fixed Paper, .2 Mfd. 200 V.
37	23E204	Condenser	Fixed Paper, .001 Mfd. 200 V.
38	23E204	Condenser	Fixed Paper, .001 Mfd. 200 V.
39	23E605	Condenser	Fixed Paper, .002 Mfd. 500 V.
40	23E208	Condenser	Fixed Paper, .005 Mfd. 200 V.
41	23E20	Condenser	Fixed Ceramic, .000003 Mfd. 500 V.
42	23E20	Condenser	Fixed Ceramic, .000003 Mfd. 500 V.
43	23E13	Condenser	Fixed Ceramic, .000003 Mfd. 500 V.
45	23E8	Condenser	Fixed Ceramic, .000025 Mfd. 500 V.
46	23E8	Condenser	Fixed Ceramic, .000025 Mfd. 500 V.
47	23E2	Condenser	Fixed Ceramic, .000051 Mfd. 500 V.
48	23E2	Condenser	Fixed Ceramic, .000051 Mfd. 500 V.
49	23E2	Condenser	Fixed Ceramic, .000051 Mfd. 500 V.
50	23E10	Condenser	Fixed Ceramic, .0001 Mfd. 500 V.
51	23E11	Condenser	Fixed Ceramic, .0001 Mfd. 500 V.
52	23E11	Condenser	Fixed Ceramic, .0001 Mfd. 500 V.
53	23E11	Condenser	Fixed Ceramic, .0001 Mfd. 500 V.
54	23E11	Condenser	Fixed Ceramic, .0001 Mfd. 500 V.
55	23E42	Condenser	Fixed Mica, .00025 Mfd.
56	23E2012	Condenser	Fixed Ceramic, .001 Mfd. 500 V.
57	23E2012	Condenser	Fixed Ceramic, .001 Mfd. 500 V.
58	23E2012	Condenser	Fixed Ceramic, .001 Mfd. 500 V.
59	23E2012	Condenser	Fixed Ceramic, .001 Mfd. 500 V.
60	23E2012	Condenser	Fixed Ceramic, .001 Mfd. 500 V.
61	27E470-2	Resistor	Carbon, 47 Ohm 1/2 Watt
62	27E680-2	Resistor	Carbon, 68 Ohm 1/2 Watt
63	27E680-2	Resistor	Carbon, 68 Ohm 1/2 Watt
64	27E680-2	Resistor	Carbon, 68 Ohm 1/2 Watt
65	27E271-3	Resistor	Carbon, 270 Ohm 1 Watt
66	27E152-2	Resistor	Carbon, 1,500 Ohm 1/2 Watt
67	27E222-2	Resistor	Carbon, 2,200 Ohm 1/2 Watt
68	27E222-2	Resistor	Carbon, 2,200 Ohm 1/2 Watt
69	27E222-2	Resistor	Carbon, 2,200 Ohm 1/2 Watt
70	27E222-2	Resistor	Carbon, 2,200 Ohm 1/2 Watt
71	27E822-3	Resistor	Carbon, 8,200 Ohm 1 Watt
72	27E103-3	Resistor	Carbon, 10,000 Ohm 1 Watt
73	27E153-2	Resistor	Carbon, 15,000 Ohm 1/2 Watt
74	27E223-2	Resistor	Carbon, 22,000 Ohm 1/2 Watt
75	27E223-2	Resistor	Carbon, 22,000 Ohm 1/2 Watt
76	27E223-5	Resistor	Carbon, 22,000 Ohm 2 Watt
77	27E393-2	Resistor	Carbon, 39,000 Ohm 1/2 Watt
78	27E393-2	Resistor	Carbon, 39,000 Ohm 1/2 Watt
79	27E393-2	Resistor	Carbon, 39,000 Ohm 1/2 Watt
80	27E393-2	Resistor	Carbon, 39,000 Ohm 1/2 Watt
81	27E473-3	Resistor	Carbon, 47,000 Ohm 1 Watt
82	27E473-2	Resistor	Carbon, 47,000 Ohm 1/2 Watt
83	27E105-2	Resistor	Carbon, 1 Meg Ohm 1/2 Watt
84	27E473-2	Resistor	Carbon, 47,000 Ohm 1/2 Watt
85	27E823-2	Resistor	Carbon, 82,000 Ohm 1/2 Watt
86	27E104-2	Resistor	Carbon, 100,000 Ohm 1/2 Watt
87	27E104-2	Resistor	Carbon, 100,000 Ohm 1/2 Watt
88	27E104-2	Resistor	Carbon, 100,000 Ohm 1/2 Watt
89	27E104-2	Resistor	Carbon, 100,000 Ohm 1/2 Watt
90	27E104-2	Resistor	Carbon, 100,000 Ohm 1/2 Watt
91	27E104-2	Resistor	Carbon, 100,000 Ohm 1/2 Watt
92	27E224-2	Resistor	Carbon, 220,000 Ohm 1/2 Watt
93	27E224-2	Resistor	Carbon, 220,000 Ohm 1/2 Watt
94	27E224-2	Resistor	Carbon, 220,000 Ohm 1/2 Watt
95	27E334-2	Resistor	Carbon, 330,000 Ohm 1/2 Watt
96	27E474-2	Resistor	Carbon, 470,000 Ohm 1/2 Watt
97	27E474-2	Resistor	Carbon, 470,000 Ohm 1/2 Watt
98	27E105-2	Resistor	Carbon, 1 Meg Ohm 1/2 Watt
99	27E105-2	Resistor	Carbon, 1 Meg Ohm 1/2 Watt
100	27E105-2	Resistor	Carbon, 1 Meg Ohm 1/2 Watt
101	27E106-2	Resistor	Carbon, 10 Meg Ohm 1/2 Watt
102	1E24	Speaker	12" E.D.
103	29E14	Switch	Push Button
104	22E18	Transformer	Output
105	22E19	Transformer	Power
106	28E21	Volume Control	With S.P.S.T. Switch
107	11X052	Switch	Phono Motor Assembly (On Motor Panel)
108	24E25	Capacitor	Trimmer Strip (7 Section)
109	24E26	Capacitor	Trimmer Strip (7 Section)
110	24E28	Capacitor	Trimmer (3-12 MMF)
111	24E28	Capacitor	Trimmer (3-12 MMF)
112	24E28	Capacitor	Trimmer (3-12 MMF)
113	23E42	Condenser	Fixed Mica .00025 Mfd.
114	27E225-2	Resistor	Carbon, 2.2 Meg Ohm 1/2 Watt
115	27E102-2	Resistor	Carbon, 1000 Ohm 1/2 Watt
116	23E422	Capacitor	Fixed Paper, .25 Mfd. 400 V.
117	23E416	Capacitor	Fixed Paper, .05 Mfd. 400 V.
118	27E104	Resistor	Carbon, 100,000 Ohm 1/3 Watt
119	27E104	Resistor	Carbon, 100,000 Ohm 1/3 Watt
120	27E104-5	Resistor	Carbon, 100,000 Ohm 2 Watt
121	27E104-5	Resistor	Carbon, 100,000 Ohm 2 Watt

MISCELLANEOUS PARTS

Part No.	Part Name	Description
64E9	Antenna	FM Di Pole
7E116	Back	For Cabinet
53E128	Call Letters	Complete Set Station Call Letter Sheets
53E129	Call Letters	"AM-FM," "Phono," "High," "Med.," "Bass" on Sheet
36E29	Dial Scale	Calibrated Scale
20E270-6	Dial Shaft Assem.	Drive Shaft Assembly
20E253-10	Dial Cord	Drive Cord
65E2	Dial Spring	Tension Spring for Dial Cord
20E174-4	Dial Pointer	Dial Indicator
48E3	Dial Escutcheon	Fits around Dial Scale and Push Buttons for 296M
48E3-2	Dial Escutcheon	Fits around Dial Scale and Push Buttons for 296B
40E2	Dial Light	6-8 Volt .250 Amp. Mazda Type No. 44
37E27-12	Knob	Marked "Tuning" for Model 296M
37E27-14	Knob	Marked "Off-On-Vol." for Model 296M
37E27-34	Knob	Marked "Tuning" for Model 296B
37E27-35	Knob	Marked "Off-On-Vol." for Model 296B
37E46	Knob	Push Button
17E21-2	Plug	2 Prong for Phono-Motor
18E4-2	Post	4 Post Binding
18E4-3	Post	2 Post Binding
7E111	Slide Rail	For Record Changer
17E27	Socket	For Pilot Light
20E184	Socket	2 Contact, Female, for Phono Motor



MODEL 125-P SCHEMATIC DIAGRAM

LINE VOLTAGE: This receiver is designed for operation on 105-125 Volts, 50-60 Cycles, either Alternating or Direct Current (AC-DC).

POWER CONSUMPTION 30 Watts.

TUNING RANGE: Broadcast: 545 to 1620 Kilocycles (185 to 550 meters).

DIAL: The Dial Scale is calibrated in Kilocycles times 10 to correspond with newspaper or periodical listings.

TUBES: The tubes used and their functions are as follows:

12SA7 Converter	12SQ7 Detector, Avc and Audio Amp.
12SK7 I. F. Amplifier	50L6GT Beam Power Amplifier
	35Z5GT Rectifier

CAUTION: If this receiver is operated on D. C. (Direct Current), and you cannot obtain reception although the tubes are lighted, reverse the line cord plug to obtain the correct polarity. Objectionable hum or noise may also be eliminated on A. C. operation by reversing the line cord plug.

ALIGNMENT: Should it become necessary at any time to check the alignment of this receiver, proceed as follows:

(1) Set the Signal Generator to 455 KC and connect to the Antenna Trimmer (C1) of the Permeability Tuner. Connect the Signal Generator ground lead to the chassis. Connect a suitable Output Meter across the Speaker Voice Coil Connections. Turn the Volume Control to the maximum position. Turn the Permeability Tuner to the extreme clockwise position (cores out of coils).

(2) Adjust the trimmers located at the top of the first and second I. F. Transformers for maximum output as indicated on the Output Meter.

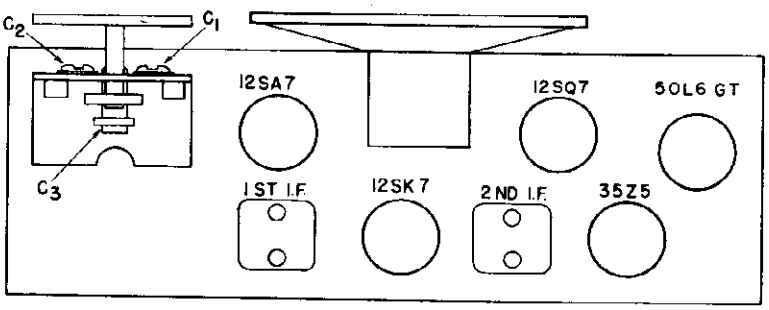
(3) Set the Signal Generator to 1620 KC and loosely couple through a 2 or 3 turn loop to the receiver loop.

(4) With the Permeability Tuner set at the extreme clockwise position (cores out of coils), tune in the 1620 KC signal by means of the Oscillator Trimmer (C2).

(5) Set the Signal Generator to 1500 KC and turn the Tuning Control so that this frequency is indicated on the dial. Adjust the Antenna Trimmer (C1) on the Permeability Tuner for maximum output.

(6) Set the Signal Generator to 600 KC and turn the Tuning Control so that this frequency is indicated on the dial. Adjust the Oscillator Shunt Coil (C3) for maximum response while "rocking" the Signal Generator. Recheck the High Frequency Oscillator Trimmer (C2) and re-peak the Antenna Trimmer (C1) for maximum response.

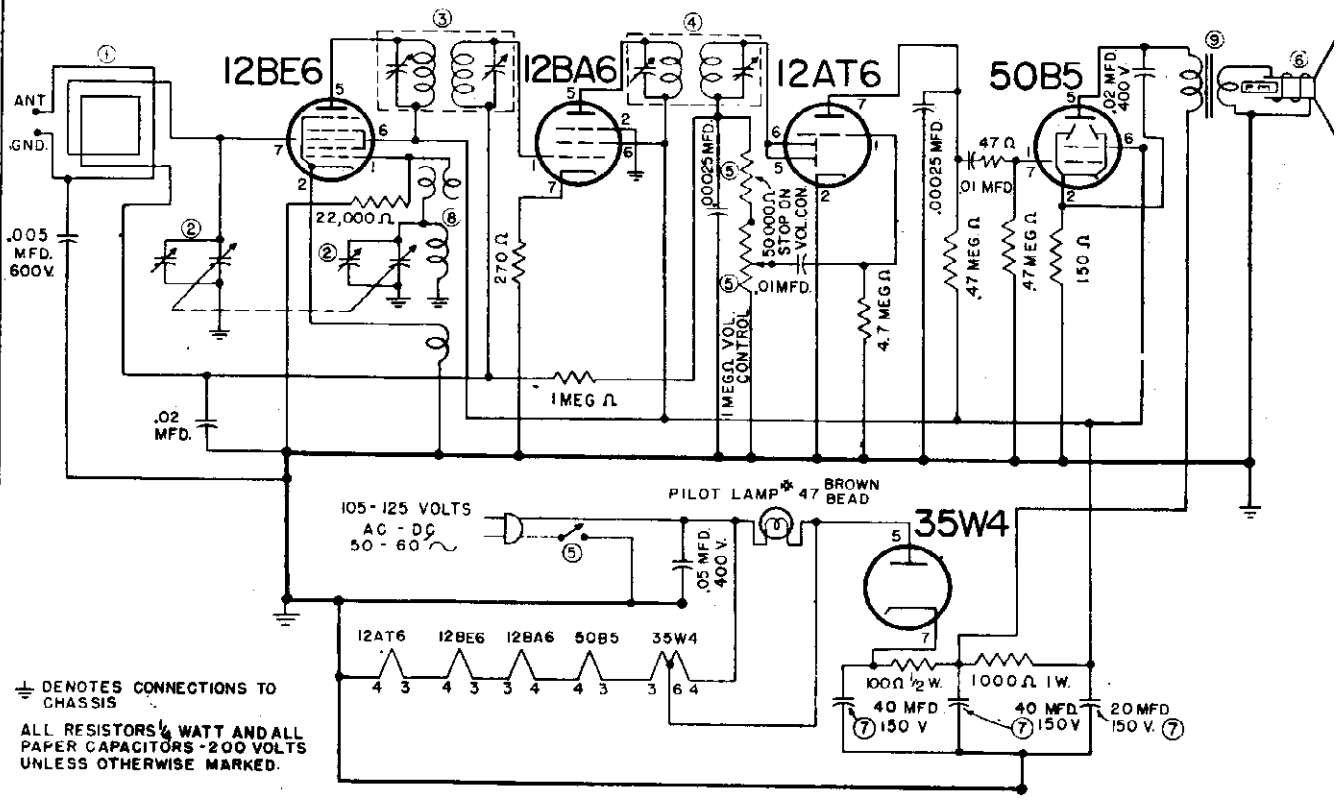
Note: Oscillator and Antenna Coil Saddles have been set and adjusted at the factory. Do not attempt to readjust the Oscillator or Antenna Coil Saddles during the above alignment procedure or serious mis-tracking will occur, resulting in loss of sensitivity at various points in the band.



TRIMMER AND TUBE LOCATION DIAGRAM

INSTALLATION: The Model 125-P is complete in every detail for efficient and immediate operation. A self-contained Loop Antenna is included, which will give excellent results in most locations. Due to the directional properties of the Loop, it may be advantageous to turn the receiver to the left or right in noisy locations for maximum signal and minimum noise. A best position for reception can always be found. The "Amplicord" Antenna which is part of the line cord should be fully extended for reception of weak stations. In unfavorable locations where distant reception is required, a well-constructed outside antenna may be used, and connected to the Green wire labeled "Ant." at the rear of the Loop.

ASSOCIATED MERCHANDISING CORP. MODEL 125



I.F. = 455 K.C.

① 1.403 LOOP ASSEMBLY
② 2.163 2GANG VARIABLE COND.
③ 1-259 1ST. I.F. TRANSFORMER
④ 1.409 2ND. I.F. TRANSFORMER
⑤ 8.200-1 VOLUME CONTROL & SWITCH
⑥ 30.300 P.M. 5" SPEAKER
⑦ 5.415 ELECTROLYTIC CAP. 40-40-20 MFD.
⑧ 1.402-1 OSCILLATOR COIL
⑨ 9-200 OUTPUT TRANSFORMER

LINE VOLTAGE: This receiver is designed for operation on 105-125 Volts, 50-60 Cycles, either Alternating or Direct Current (AC-DC).

POWER CONSUMPTION: 30 Watts.

TUNING RANGE: Broadcast: 540 to 1650 Kilocycles (180 to 555 meters).

DIAL: The Dial Scale is calibrated in Kilocycles times 10 to correspond with newspaper or periodical listings.

TUBES: The tubes used and their functions are as follows:

12BE6 Converter — 12AT6 Detector, Avc and Audio Amp.
12BA6 I. F. Amplifier — 50B5 Beam Power Amplifier
35W4 Rectifier

CAUTION: If this receiver is operated on D. C. (Direct Current), and you cannot obtain reception although the tubes are lighted, reverse the line cord plug to obtain the correct polarity. Objectionable hum or noise may also be eliminated on A. C. operation by reversing the line cord plug.

ALIGNMENT: Should it become necessary at any time to check the alignment of this receiver, proceed as follows:

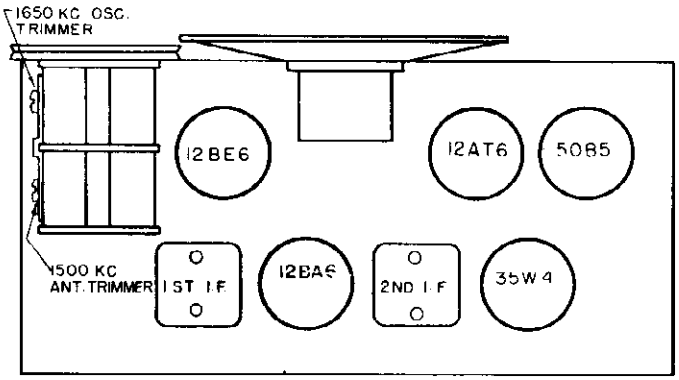
(1) Set the Signal Generator to 455 KC and connect to the Stator Lug on the rear section of the Variable Capacitor. Connect the Signal Generator ground lead to the chassis. Connect a suitable output meter across the Speaker Voice Coil Connections. Turn the Volume Control to the maximum position. Turn the Variable Capacitor to the extreme clockwise position.

(2) Adjust the trimmers located at the top of the first and second I. F. Transformers for maximum output as indicated on the output meter.

(3) Loosely couple the Signal Generator Ground Lead to the loop and set to 1650 KC.

(4) With the Variable Capacitor set at the extreme clockwise position, tune in the 1650 KC signal by means of the Oscillator Trimmer on the Variable Capacitor (front section).

(5) Set the Signal Generator to 1500 KC and turn the Tuning Control so that this frequency is indicated on the dial. Adjust the Antenna Trimmer on the Variable Capacitor (rear section) for maximum output. No other adjustments are necessary.



MODEL 125-Z

TRIMMER AND TUBE LOCATION DIAGRAM

INSTALLATION: The Model 125-Z is complete in every detail for efficient and immediate operation. A self-contained Loop Antenna is included, which will give excellent results in most locations. Due to the directional properties of the Loop, it may be advantageous to turn the receiver to the left or right in noisy locations for maximum signal and minimum noise. A best position for reception can always be found. In unfavorable locations where distant reception is required, a well-constructed outside antenna may be used, and connected to the *Green* wire labeled "Ant." at the rear of the Loop. A water or gas pipe may be used as a ground and connected to the *Black* wire labeled "Gnd." at the rear of the Loop.

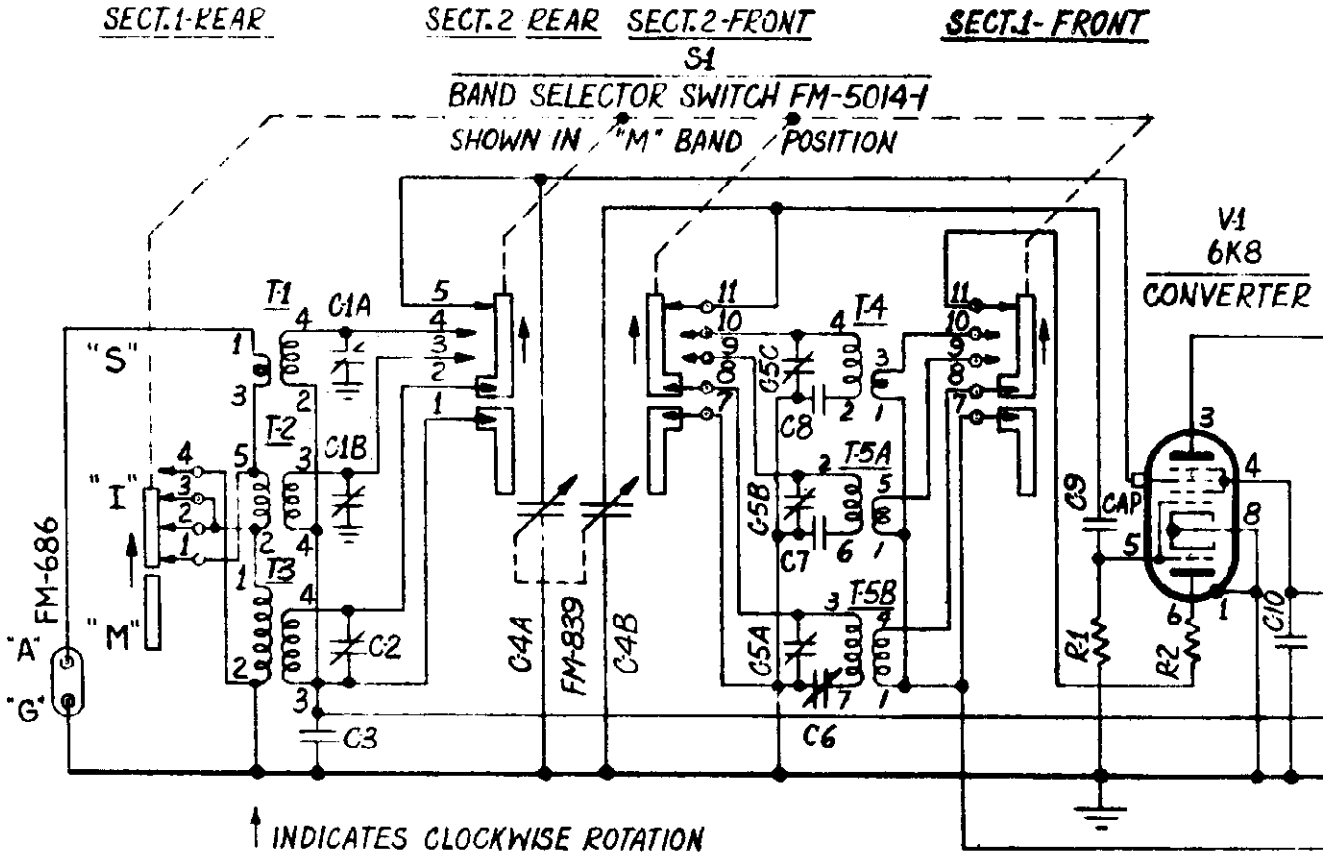
MINOR REASONS FOR FAILURE TO FUNCTION: Defective tubes, defective Volume Control and On-Off Switch, line cord reversed on D.C., defective line cord plug.

Ref. No.	Description	Part No.
C-1A	DUAL MIDGET TRIMMER. 3-30 mmfds	FM-444
C-1B		
C-2	SINGLE SECTION TRIMMER. 2-50uuf.	HCV-2109
C-3	TUB. PAPER CAP. .05 MFD 200V	HC-6
C-4A	2 SECTION GANG COND.	
C-4B		
C-5A		
C-5B	3 SECTION TRIMMER COND. 3.40 uuf.	FM-705
C-5C		
C-6	SINGLE MTG. TRIMMER. 430 uuf Oper.	FM-446
C-7	MOLDED MICA CAP. .0015 MFD. ±3%	HC-125
C-8	MOLDED MICA CAP. .005 MFD. ±3%	HC-126
C-9	MOLDED MICA CAP. .0001 MFD. ±20%	HC-93
C-10	TUB. PAPER CAP. .95 MFD. 600V	HC-92
C-11	TUB. PAPER CAP. 0.1 MFD. 200V	HC-5
C-12	TUB. PAPER CAP. 0.1 MFD. 400V	HC-4
C-13	TUB. PAPER CAP. 0.05 MFD. 200V	HC-6 HC-1004
C-14	MOLDED MICA CAP. .00025 MFD. ±20%	HC-89
C-15	TUB. PAPER CAP. .002 MFD. 600V	HC-193
C-16	TUB. PAPER CAP. .05 MFD. 200V	HC-6
C-17	TUB. PAPER CAP. .006 MFD. 600V	HC-60
C-18A	20 MFD. 25V	
C-18	ELECTROLYTIC CAP. 20 MFD. 450V	HC-196
C-18C	20 MFD. 450V	
C-19	TUB. PAPER CAP. .002 MFD. 600V	HC-193
C-20	DRY ELECTROLYTIC 20 MFD. 250V	HCE-1314
C-21	TUB. PAPER CAP. .5 MFD. 100V	HC-84
C-22	TUB. PAPER CAP. .01 MFD. 600V	HC-91
C-23	TUB. PAPER CAP. .01 MFD. 600V	HC-91
C-24	TUB. PAPER CAP. .05 MFD. 400V	HC-53
C-25	TUB. PAPER CAP. .01 MFD. 600V	HC-91
C-26	MOLDED MICA CAP .005 MFD. ±20%	HC-120
C-27	MOLDED MICA CAP .005 MFD. ±20%	HC-120
L-1	60 uh "A" F-F CHOKE	FM-571
L-2	5.5 mh "B" R-F CHOKE	SA-75
PL-1	PILOT LIGHT 6-8 V 0.15A	

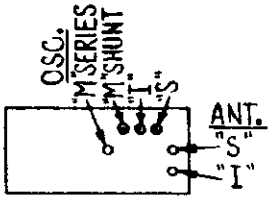
Ref. No.	Description	Part No.
	BROWN BEAD	FM-696
R-1	25,000 OHMS ±20% 1/2 W	GR-12
R-2	200 OHMS ±10% 1/2 W	GR-49
R-3	150 OHMS ±10% 1/2 W	GRC-202
R-4	22,000 OHMS ±10% 1/2 W	GRC-201
R-5	2.0 MEGOHMS ±20% 1/2 W	GR-23
R-6	VOLUME CONTROL 1/2 MEG. COMPLETE WITH S-1	FM-5015
R-7	50,000 OHMS ±20% 1/2 W	GR-44B
R-8	10 MEG. ±20% 1/2 W	GR-108
R-9	240,000 OHMS ±20% 1/2 W	GR-46
R-10	TONE CONTROL 1/4 W	FM-5016
R-11	470 OHMS ±10% 1/2 W	GRC-213
R-12	1000 OHMS ±10% 1 W	GRC-231
R-13	200 OHMS ±10% 1 W	GR-43
S-1	BAND SELECTOR SWITCH 2 SECTIONS - 3 POS.	FM-5014-1
S-2	ON-OFF SWITCH (ON REAR OF R-6)	
T-1	"S" BAND ANTENNA TRANSFORMER	SA-223
T-2	"I" BAND ANTENNA TRANSFORMER	SA-221
T-3	"M" BAND ANTENNA TRANSFORMER	SA-301
T-4	"S" BAND OSCILLATOR TRANSFORMER	SA-193
T-5A	"I" BAND OSCILLATOR TRANSFORMER	SA-222
T-5B	"M" BAND OSCILLATOR TRANSFORMER	
T-6	470 Kc. AMPLIFIER IF TRANSFORMER	SA-200A
T-7	470 Kc. DIODE IF TRANSFORMER	SA-195D
T-8	OUTPUT TRANSFORMER ON SPKR.	
T-9	VIBRATOR TRANSFORMER	FM-862
V-1	6K8	
V-2	6SK7	
V-3	6H6	
V-4	6SF5	
V-5	6K6GT	
SPKR.		FM-960
VIB.	6 V. SYNCHRONOUS VIBRATOR	FM-860

ANDREA RADIO CORP.

ANDREA RA
MODEL

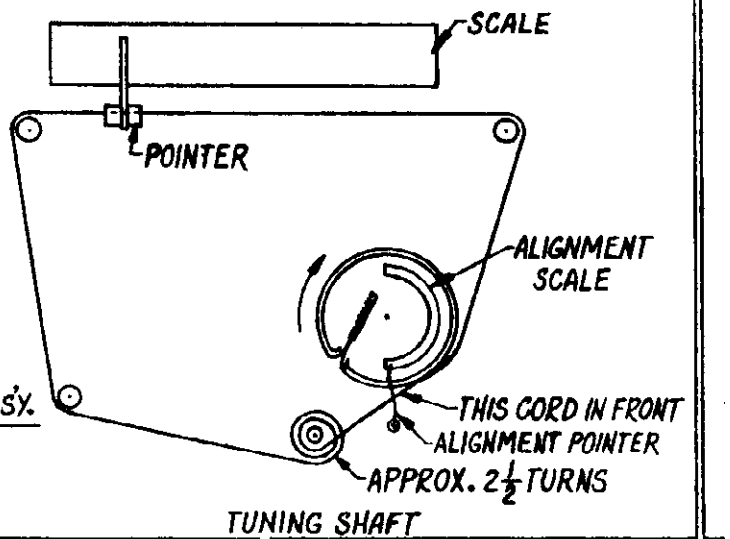


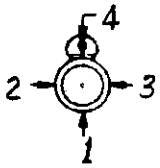
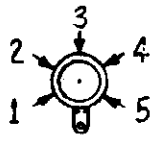
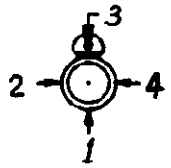
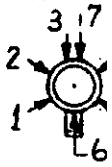
ALIGNMENT FREQUENCIES		
BAND	EXACT ALIGNMENT	CIRCULAR SCALE DIVISIONS
"M"	600Kc-500METERS 1500Kc-200METERS	15.5 88.5
"I"	6Mc - 50 METERS	80.5
"S"	22Mc - 13.6METERS	83.0

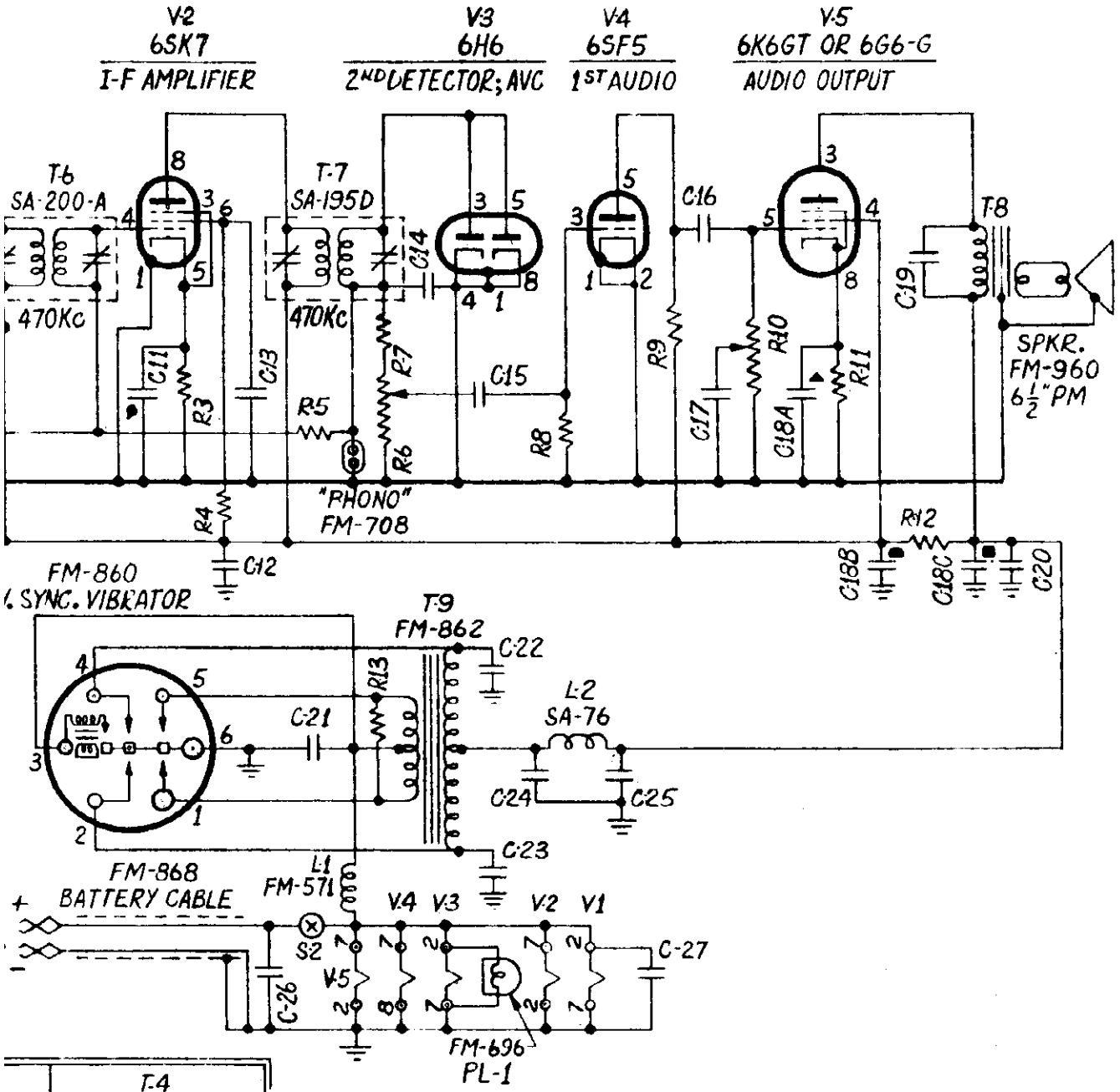


FRONT
TOP VIEW

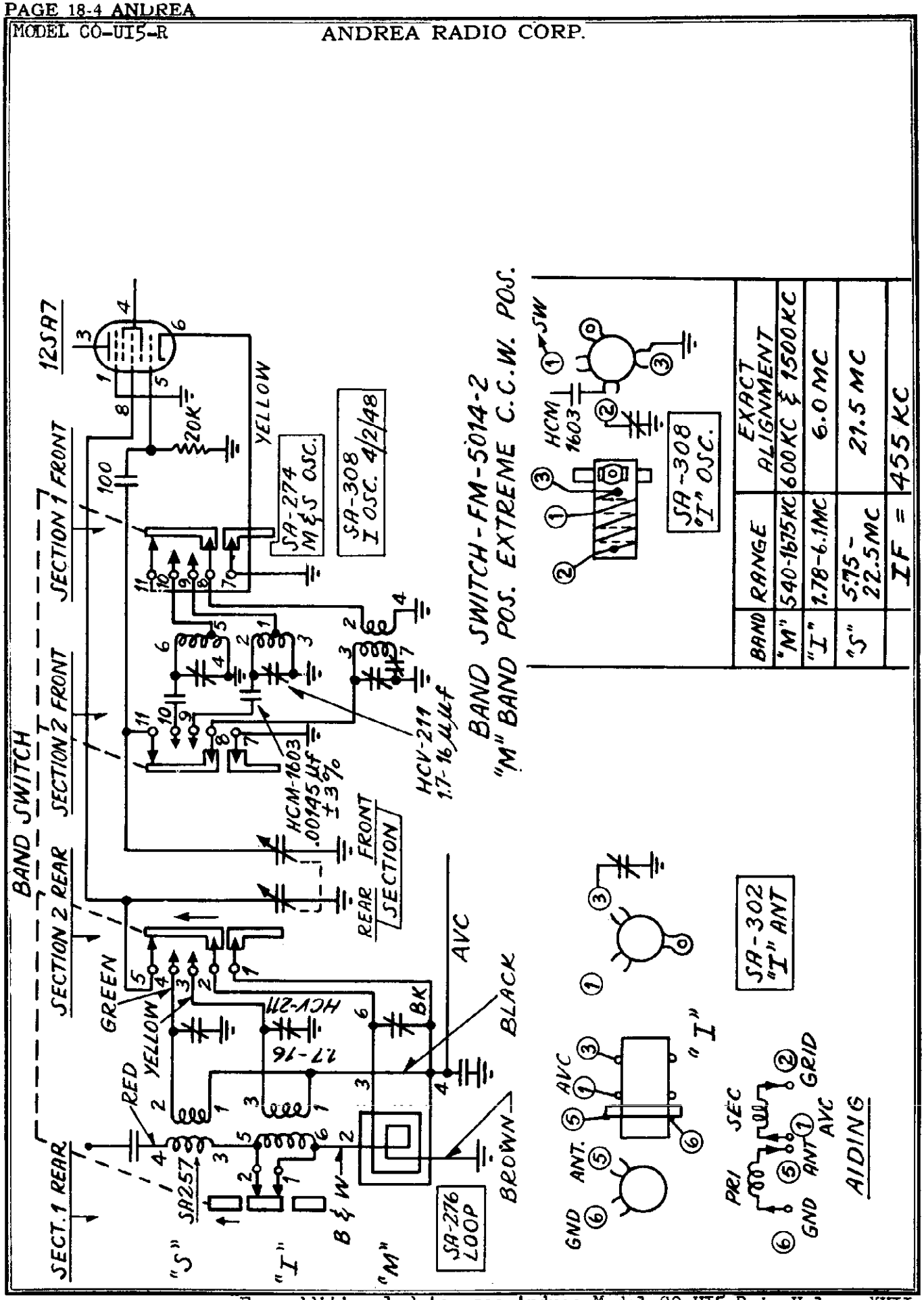
TRIMMER LOCATION
NOTE : "M" ANT. TRIMMER LOCATED ON SA-301



T-3 "M" BAND ANT. COIL SA-301	T-2 "I" BAND ANT. COIL SA-221	T-1 "S" BAND ANT. COIL SA-223	T-5 A&B "M" & "I" BAND SA-22
			
TOP VIEW	BOTTOM VIEW	TOP VIEW	FRONT VI

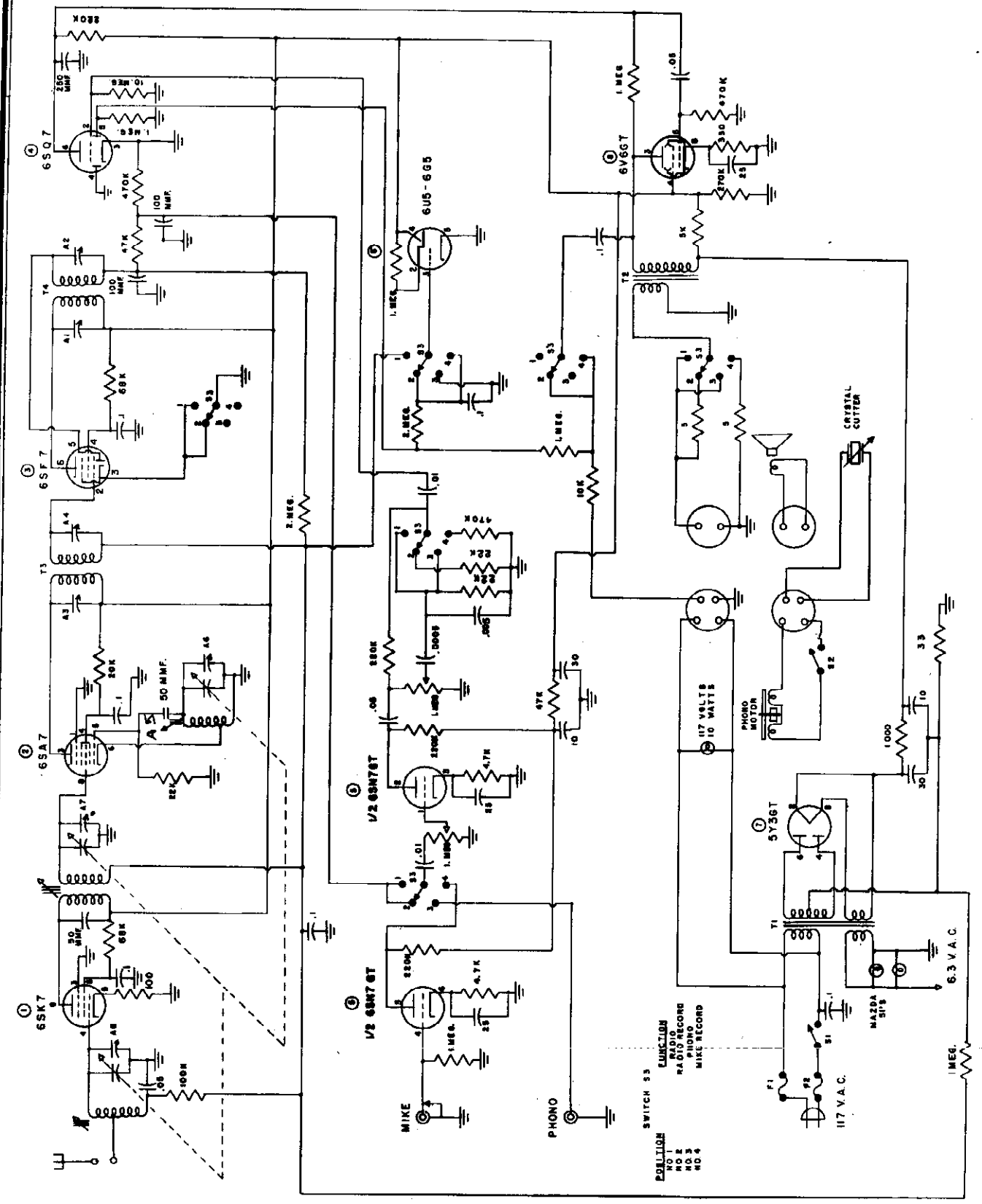

V2
6SK7
I-F AMPLIFIER
V3
6H6
2ND DETECTOR; AVC
V4
6SF5
1ST AUDIO
V5
6K6GT OR 6G6-G
AUDIO OUTPUT
T-6
SA-200-A
T-7
SA-195D
470Kc
470Kc
C11
R3
C13
C14
R7
R6
R5
C15
R8
R9
C16
C17
R10
C18A
R11
C19
T-8
SPKR.
FM-960
6½" PM
"PHONO"
FM-708
R4
C12
R12
C18B
C18C
C20
FM-860
SYNC. VIBRATOR
T-9
FM-862
C22
R13
C21
L-2
SA-76
C24
C25
C23
FM-868
BATTERY CABLE
L1
FM-571
S2
V5
V4 V3 V2 V1
C-27
C-26
FM-696
PL-1
T-4
"S" BAND OSC. COIL
SA-193
TOP VIEW

ANDREA RADIO CORP.



BAND	RANGE	EXACT ALIGNMENT
"M"	540-1675KC	600KC & 1500KC
"I"	1.78-6.1MC	6.0 MC
"S"	5.75-22.5MC	21.5 MC
	IF =	455 KC

For additional data, see Andrea Model CO-UI5-R in Volume XVII.


6SQ7
6SF7
6SA7
6SK7
6U5-6G5
6V6GT
6SN7GT
5Y3GT
CRYSTAL CUTTER
PHONO MOTOR
117 VOLTS 10 WATTS
MIKE
PHONO
SWITCH S3
FUNCTION
RADIO
RADIO RECORD
PHONO
MIKE RECORD
POSITION
NO 1
NO 2
NO 3
NO 4
6.3 V.A.C.
117 V.A.C.
MAZDA 51'S

MODEL RER-9 AUDAR INC.

SPECIFICATIONS

117 Volts 60 Cycle AC ONLY -- 130 watts.

8 Multi-Purpose Tubes Including Rectifier Giving 13 Tube Efficiency.

Built-in Antenna.

6 x 9 oval Alnico V speaker.

Broad Band Bass Boost with Treble Control.

TUBES USED

6SK7--R.F. Amplifier

6SA7--Mixer

6SF7--I.F.Amplifier, Diode Detector and Automatic Volume Control

6SQ7--Audio Amplifier and Volume Indicator Rectifier

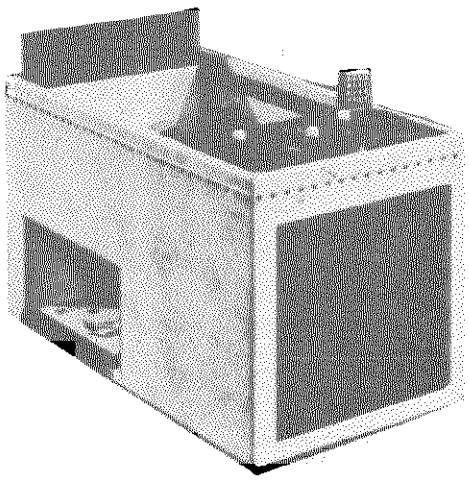
6SN7 GT -- Microphone Preamplifier and Audio Amplifier

6V6 GT -- Power Output Amplifier

5Y3 GT -- Power Rectifier

6U5/6G5 -- Tuning Eye and volume level Indicator

Changer Compartment light - 10 watt, 117 volt, double contact, candelabra, bayonet - Mazda No. 10C7-DC



TUNING EYE

The 6U5/6G5 magic eye tube located in the center of the dial is used as a tuning indicator when the selector switch is in the RADIO position. The tuning knob should be adjusted to cause the eye opening to be narrowest for perfect tuning. When the selector switch is in the RADIO RECORD or VOICE RECORD positions, this tube functions as a volume level indicator. It is not operative in the PHONO position.

Alignment Instructions

Step	Dummy Ant.	Signal Generator Coupling	Signal Generator Frequency	S3 Switch Pos.	Radio Dial Setting	Output Meter	Adjust	Remarks
1	.05mfd	High side to ant. jack low side to chassis	455 KC	Radio	Tuning Cap. fully open	Across voice coil	A1:A2	Adjust for maximum output.
2	.05mfd	"	"	"	"	"	A3:A4	"
3	See note	See note	540 KC	"	Tuning cap. fully closed	"	A5	"
4	"	"	1720 KC	"	Tuning cap. fully open	"	A6	Adjust for maximum output. Repeat steps 3 and 4 until desired range is secured.
5	"	"	1400 KC	"	Tune for maximum output	"	A7	Adjust for maximum output. Rock tuning capacitor while adjusting
6	"	"	1400 KC	"	"	"	A8	"

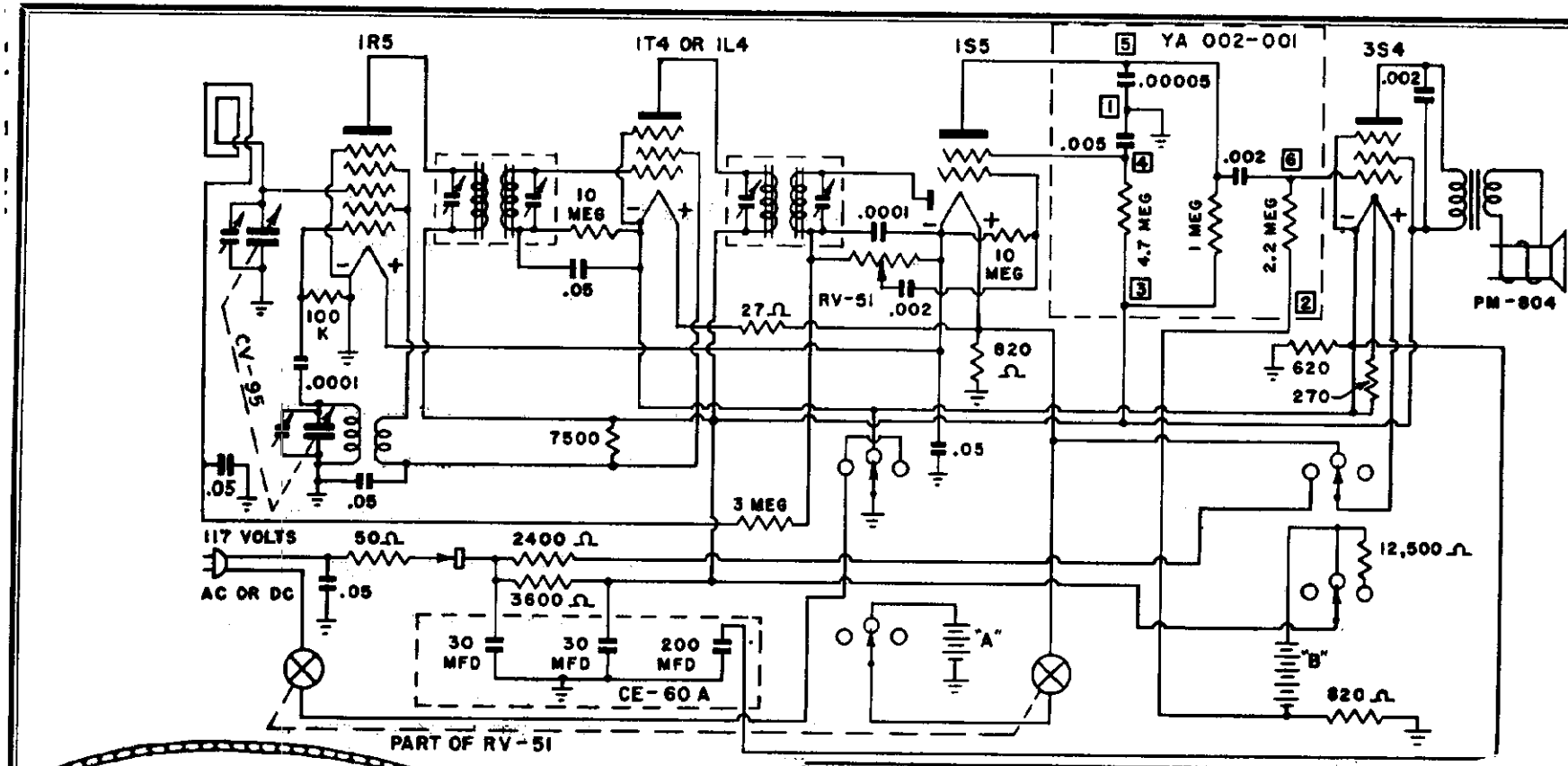
NOTE: Make all RF adjustments with a dummy antenna, which consists of a piece of wire approximately 8 feet long, connected to the antenna jack. Signal generator should be connected to a short length of wire placed several inches from the dummy antenna.

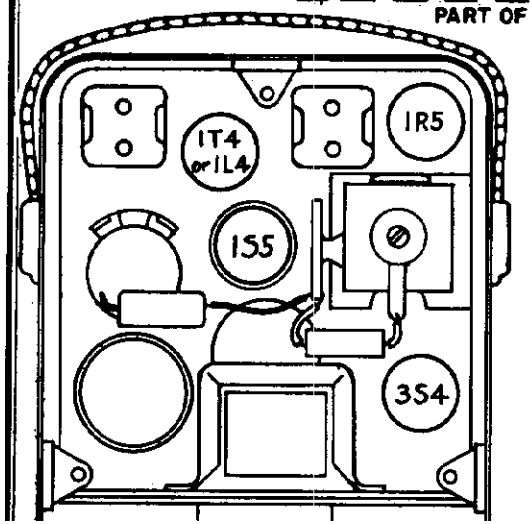
Voltage Table

No.	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
1	6SK7	0V	0V	0V	AVC	.75VDC	100VDC	6.3VAC	185VDC
2	6SA7	0V	0V	185VDC	65VDC	*-7VDC	------	6.3VAC	AVC
3	6SF7	0V	AVC	0V	90VDC	------	185VDC	6.3VAC	0V
4	6SQ7	0V	*-.8V	0V	-----	------	110VDC	6.3VAC	0V
5	6SN7GT	-----	45VDC	2.2VDC	-----	45VDC	2.2VDC	6.3VAC	0V
6	6U5	6.3VAC	35VDC	AVC	185VDC	0V	0V		
7	5Y3GT	------	370VDC	-----	350VAC	------	350VAC	------	370VDC
8	6V6GT	0V	0V	305VDC	190VDC	------	------	6.3VAC	10VDC

Conditions

1. SWITCH S3 in radio position, volume control at normal listening level, broadcast signal being received.
2. All DC voltage measurements except those marked with an asterisk are at 20,000 ohms per volt. Voltages marked with an asterisk obtained with a VTVM.
3. AVC voltage will vary with strength of received signal.
4. Voltage readings are from [illegible]





I. F. 455 KC
RANGE 540-1600 KC

Batteries Required

1 67½ Volt "B" Battery. Use one of the following types, or equivalent:
Eveready No. 467
Burgess No. XX45
Ray-O-Vac No. 4367
Winchester No. 1710

2 Flashlight Cells. Size D. Use two of the following types, or equivalent:
Eveready No. 950
Burgess No. 2
Ray-O-Vac No. 2LP

AUTOMATIC RADIO MFG. CO., INC. MODEL TOM THUMB BUDDY

MODEL TOM THUMB
BUDDY

AUTOMATIC RADIO MFG. CO., INC.

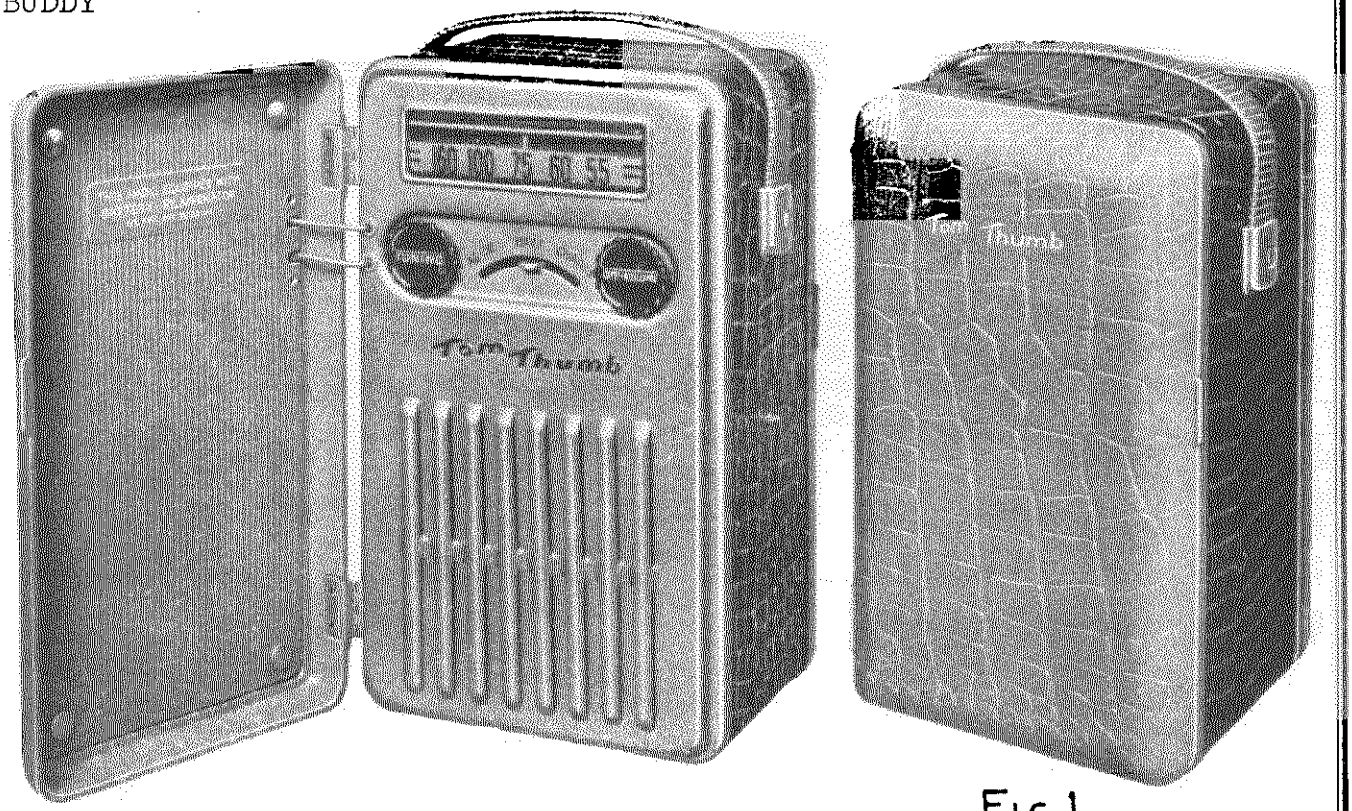


FIG. 1

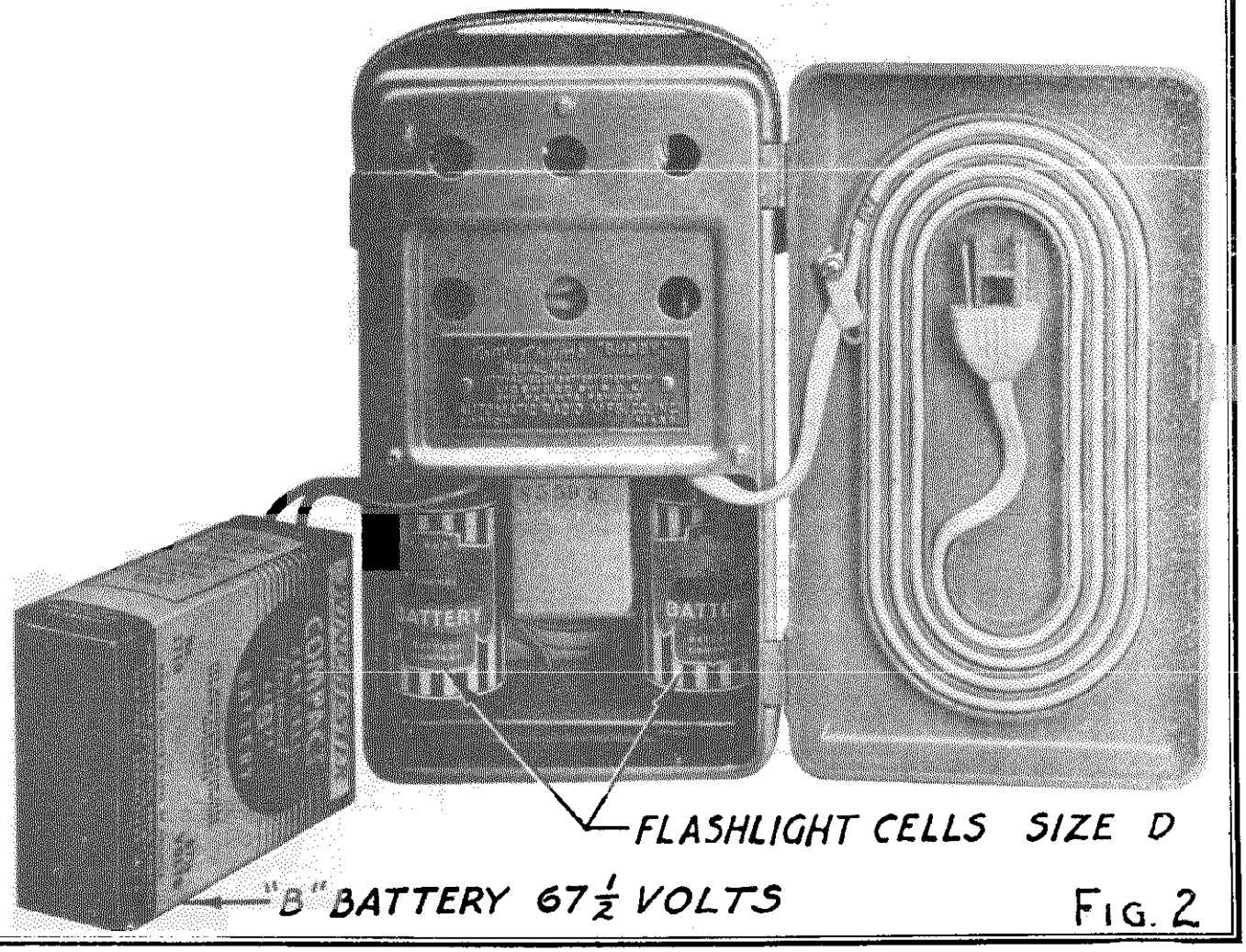


FIG. 2

BATTERY INSTALLATION INSTRUCTIONS

Flashlight Cell Installation

1.) Open Back door.
2.) Insert flashlight cells on each side of speaker frame as indicated in figure 2.

"B" Battery Installation

1.) Snap connector strip over "B" battery terminals.
2.) Insert bottom end of "B" battery to the extreme right under frame of back cover.
3.) Drop top of battery into position over flashlight cells.
4.) Slide battery slightly to the left to locate centrally under back door frame.

NOTE: "B" battery can be removed by lifting top of battery by the connector strip terminal leads a reversing the above procedure.
Batteries that have become badly swollen can be taken out by removing the back cover and dc assembly.

BATTERY CHARGING

The "Charge" feature contained in this model is only applied to the "B" battery. The inexpensi flashlight cells are not subjected to a charge.

Failure of the radio to operate on battery power will first be due to exhausted flashlight cells. T radio will operate again on battery power when these cells have been replaced.

The "B" battery under normal operating conditions without charge will last approximately three tim as long as the flashlight cells.

The normal operating life of the "B" battery can be extended from two to three times with charging outlined below.

The following procedure should be followed when a battery charge is required. (Refer to figure 1 switch detail.)

1. Plug power line cord into AC or DC 117 Volt power line.
2. Turn "Off-On" Volume knob to the right until a click is heard.
3. Slide 3-position Operation Selector Switch to "AC-DC" position. If radio operates, power outlet working satisfactorily.
4. Slide 3-position Operation Selector Switch to "Charge" position. The battery is now on charge

The best possible performance on battery operation can be realized if the battery is periodica charged for about as long a period as it has been in use, rather than wait until it has run down. F example, if the radio has been operated for four hours on battery, it should be on charge for at least fo hours afterwards. In this manner the quality and sensitivity of the radio will be at a maximum since tl fully charged "B" battery will insure "new battery" performance.

This charge can be repeated many times until finally the "B" battery is completely dissipated and w no longer respond to a charge.

DO NOT REPLACE "B" BATTERY UNTIL RADIO FAILS TO OPERATE ON BATTERY POWER WIT NEW FLASHLIGHT CELLS.

Power Line Cord

The Power line cord is contained in the spiral groove on the inside of the back cover. For "AC-DC" "Charge" operation, remove plug from post holder and unwind required length of cord necessary reach available outlet. Wind back in spiral groove when not in use. If entire length of cord has bee unwound, start rewinding from outside groove and work in towards the center. Put plug back into pc holder.

THE FOLLOWING PROCEDURE SHOULD BE FOLLOWED TO REMOVE CHASSIS FROM CABINET FOR REPAIRING

1.) Remove knobs.
2.) Remove tri-mount snap fasteners securing loop cover (contained in front door) and unsolder loc leads.
3.) Remove three screws holding back frame and cover assembly in position.
4.) Slip off back frame and cover assembly.
5.) Remove cabinet body.
6.) Remove the mounting screws that secure chassis to three mounting brackets.
7.) Slide chassis out carefully spreading mounting brackets slightly if necessary.

MODEL TOM THUMB CAMERA

AUTOMATIC RADIO MFG. CO., INC.

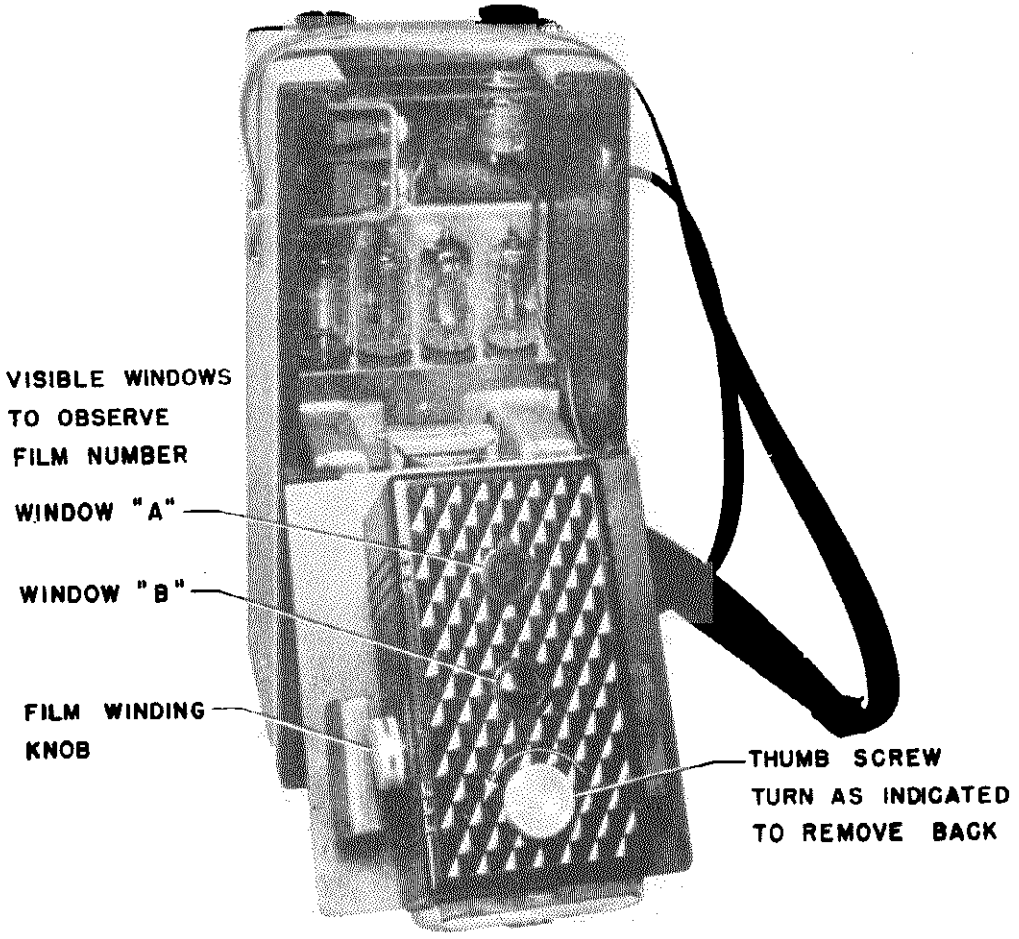
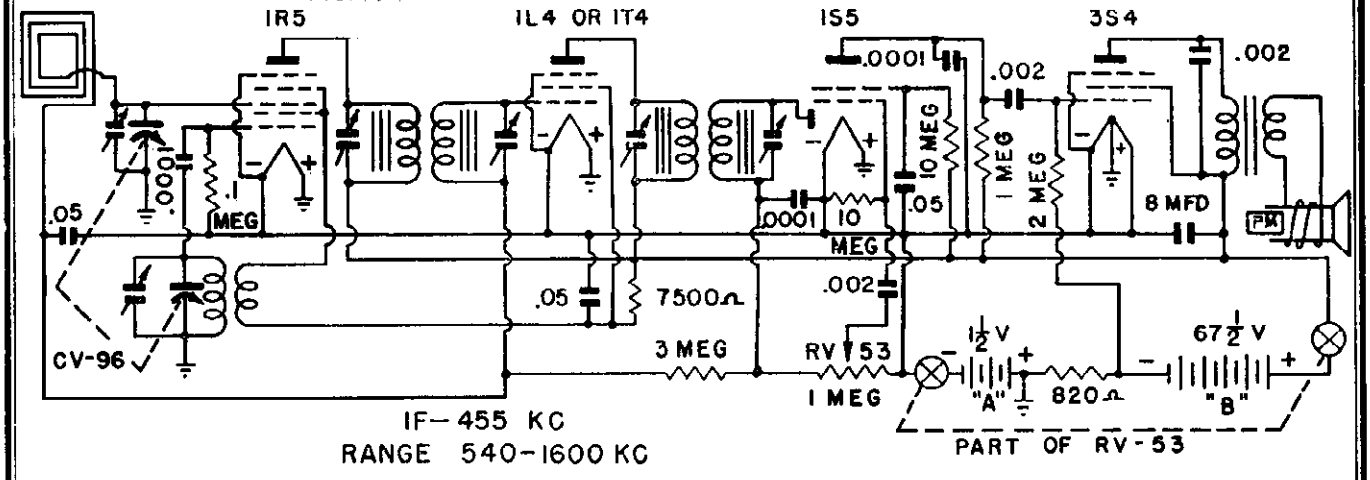


FIG. 3



THE FOLLOWING PROCEDURE SHOULD BE FOLLOWED TO REMOVE CHASSIS FROM CABINET FOR REPAIRING.

1. Remove knobs.
2. Remove bottom screw on back located below tuning dial window.
3. Remove back by dropping down slightly and lifting out.
4. Remove license label.
5. Unsolder speaker and bottom battery terminal leads.
6. Swing camera down.
7. Remove screw located in center of terminal board.
8. Drop chassis carefully so that control shafts clear inside top of cabinet and swing out.

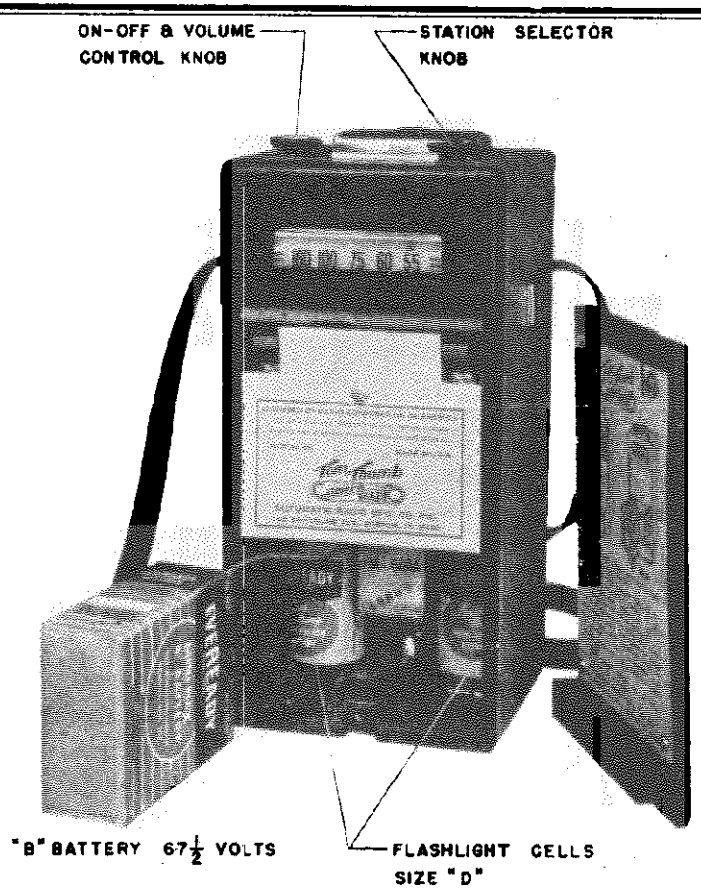


FIG. 2

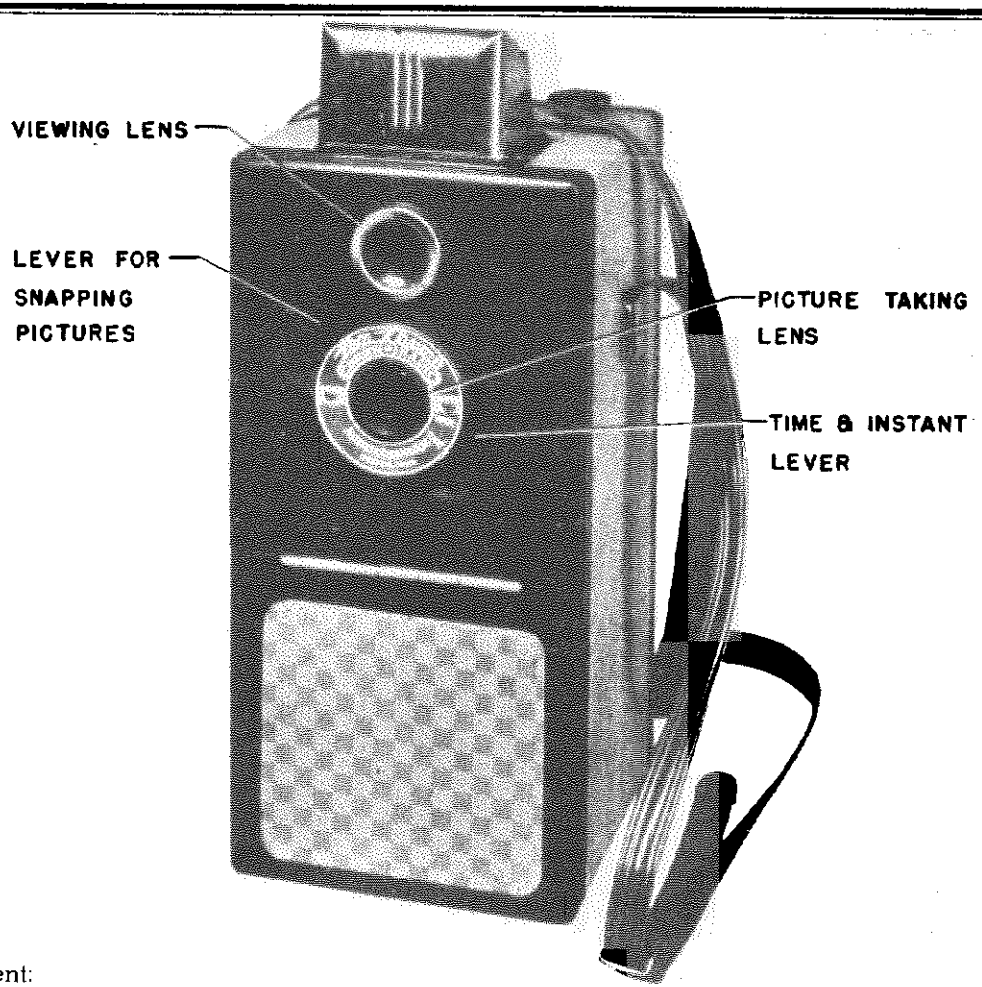


FIG. 1

Batteries Required

1 67½ Volt "B" Battery. Use one of the following types, or equivalent:
- Eveready No. 467
- Burgess No. XX45
- Ray-O-Vac No. 4367
- Winchester No. 1710

2 Flashlight Cells. Size D. Use two of the following types, or equivalent:
- Eveready No. 950
- Burgess No. 2
- Ray-O-Vac No. 2LP
- Winchester No. 1511

BATTERY INSTALLATION (See Figure 2)

1. Remove bottom screw on back located below tuning dial window.
2. Remove back by dropping down slightly and lifting out.
3. Insert flashlight cells on each side of speaker frame as indicated in Figure 2.
4. Snap connector strip over "B" Battery terminals.
5. Place "B" battery over flashlight cells (See Fig. 2).
6. Replace Back.

MODEL TOM THUMB CAMERA — AUTOMATIC RADIO MFG. CO., INC.

FILM REQUIRED FOR CAMERA:

AGFA A8 OR EASTMAN 127 OR EQUIVALENT.

TO LOAD AND UNLOAD CAMERA (See Figure 3)

Facing tuning dial, place thumb on camera top cover with other fingers on radio side and push camera away from knobs. An unlocking click will be heard as the camera hinges down and exposes all the necessary adjustments. Turn thumb screw to the left to remove back cover.

Always load and unload camera in shaded place, never in bright sunlight! Insert slotted end of spool into the winding knob at the top of camera. Then place film in empty receptacle at extreme opposite end. Fit ends of spool into the grooves (under film retainer spring). Push the roll down into the grooves which hold the roll. Then break seal on film and pull end towards empty spool. Thread end of film through widest side of slot in empty spool. Turn winding knob two or three times until paper rolls on empty spool. Replace back of camera. Be sure thumb screw is turned as far as it will go to be sure cover is on as tightly as possible.

TO WIND FILM

Suspend Camera-Radio in front of operator by means of adjustable shoulder strap so that camera lens faces subject to be photographed. Unlock camera by pushing camera top away from knobs as mentioned previously. The camera will hinge down and expose necessary controls.

Turn winding knob slowly and watch film pass red window "A". When the figure "1" appears in the center of Window "A", you are ready to take the first picture. Swing camera back into position again pressing the camera firmly towards the knobs until a slight click is heard. This indicates that the camera is properly locked in place. After taking this picture swing camera down again exposing control and wind knob slowly until figure "1" appears in red window "B". Then take second picture. After this picture is taken, turn knob until figure "2" appears in window "A". After snapping the picture, turn knob until figure "2" appears in window "B" In this manner 2 pictures are taken for each number appearing on the film roll — one in window "A", one in window "B". When number "8" appears in the center of window "B", you have taken 16 pictures. When you have taken all of the pictures, keep turning knob in same direction until the complete roll of film including the red paper is all wound on the top spool.

TO REMOVE FILM

Open back of camera as when loading Then press down on spring holding film roll and lift out spool of film. Now, seal roll with piece of gummed paper attached to end of roll so that it will not unroll.

HOW TO TAKE PICTURES

Open cover at top by placing thumb and forefinger on bottom of cover and lift upward. Look down into ground glass enclosed under cover. Point lens of camera at object you want to photograph. Object you see reflected there will appear on your finished picture. By moving camera closer or further from object, you can gauge the proportions and size desired in finished print. When ready to photograph, hold camera steady; then press lever firmly and picture has been taken. **NOTE:** Always have sun behind you with object being photographed facing sun!

SHUTTER

The shutter has been carefully adjusted to give you maximum excellent reults for all standard shots! It has also been regulated to enable you to take clear, clean photographs of landscapes, groups, portraits, and "action shots." To adjust shutter for instant or time exposure, merely move indicator at left of camera to either INST. or TIME.

FOR INSTANTANEOUS PICTURES

Move indicator to INST. Grasp Camera-Radio firmly. Sight object to be photographed in ground glass view finder. **HOLD CAMERA-RADIO STEADY.** Then press shutter lever down firmly, and the picture is taken.

TIME EXPOSURE

Move indicator to "TIME". Place Camera-Radio on a solid support (a table or bench) so that Camera-Radio will not move. (Never hold Camera-Radio in hands for time shot.) **Then press shutter lever and hold down until you have counted the required number of seconds** for exposure desired. (Five seconds usually being ample, depending upon lighting conditions.) Then picture is completed . . . If you wish to return to INST. daylight shots, push lever back to INST.

IMPORTANT: To obtain best results, subject to be photographed should be at least 8 feet away from camera.

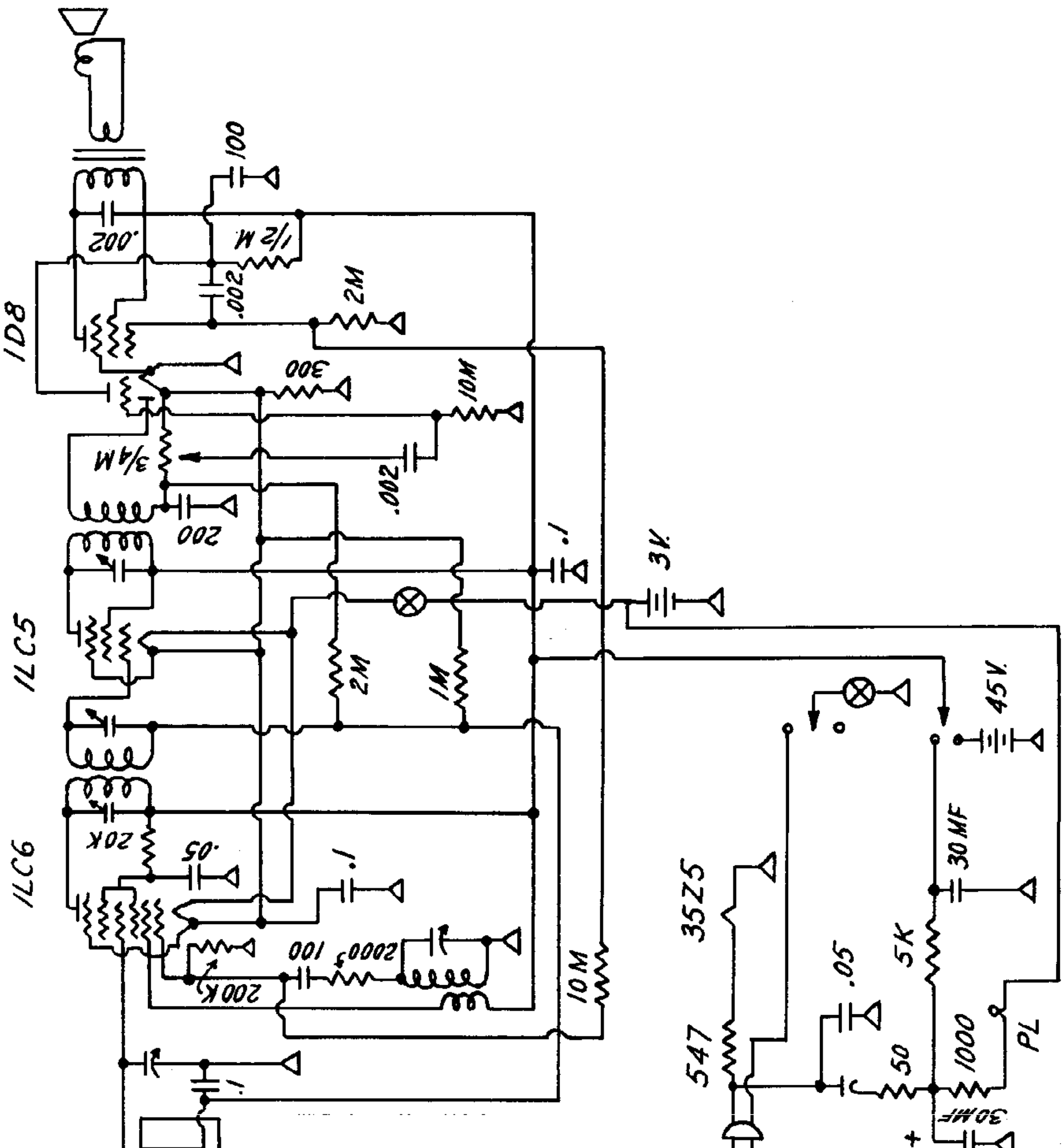
"LARGER" CONTACT PRINTS

Most photo finishers throughout the country are equipped with contact enlargement printers that produce approximately 3¼"x4" prints from the negatives you get with this camera.

Retail prices for these enlarged prints vary in different sections of the United States. However, in most cases they cost only slightly more than ordinary quality prints. See your dealer for further information.

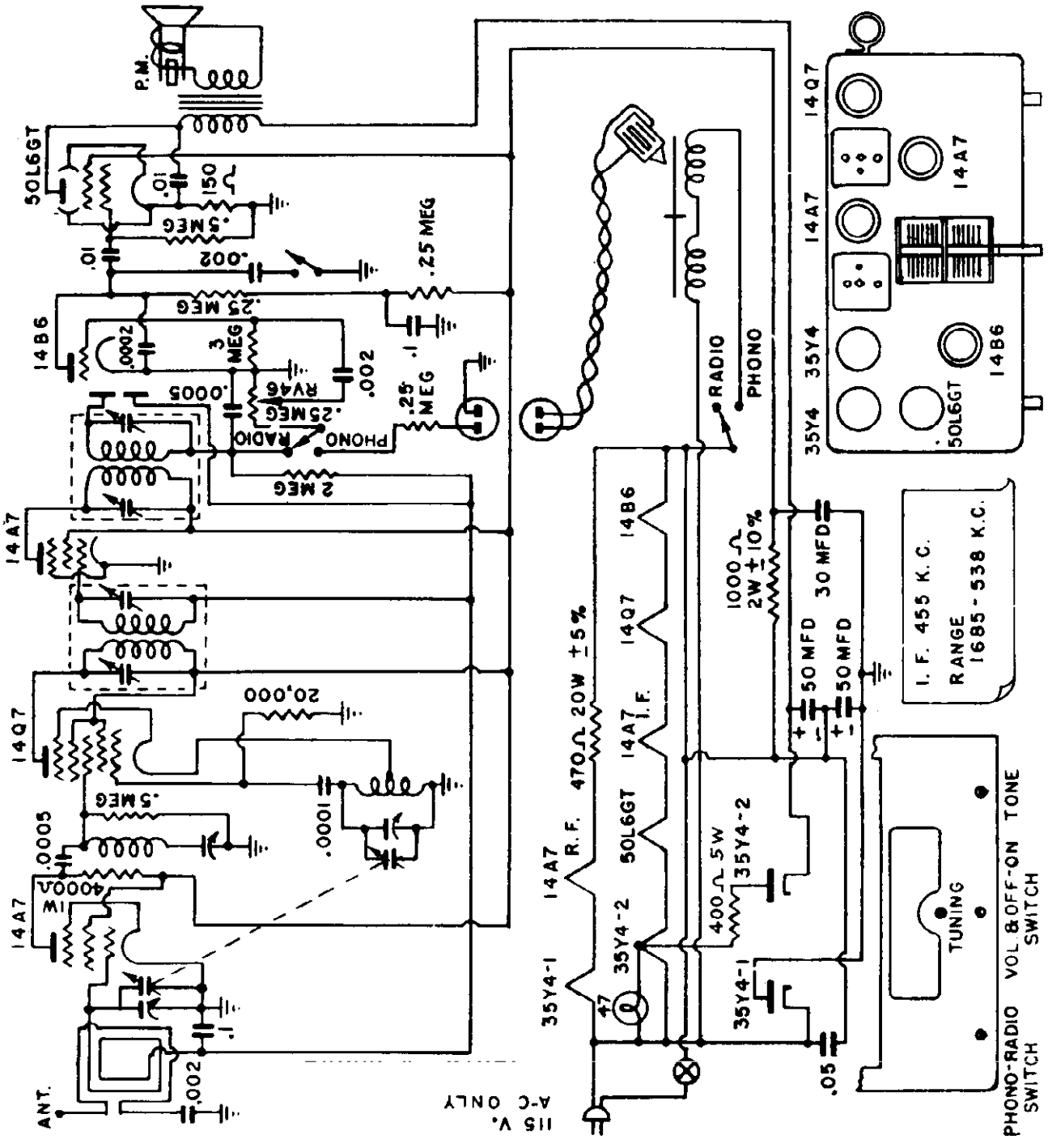
INSTRUCTIONS

- Be sure lenses are clean. Use soft, clean cloth.
- Keep interior of camera free from dust.
- Be sure cover is tightly closed before taking picture.
- Be sure film is wound as tightly as possible before opening camera to remove film.


1D8
1LC5
1LC6
35Z5
547
PL
3V
45V
30 MF
5K
1000
50
.05
10M
2M
1M
200
3/4M
.002
300
100
1/2M
20K
200K
2000
.1

MODEL 677
SERIES C

AUTOMATIC RADIO MFG. CO., INC.

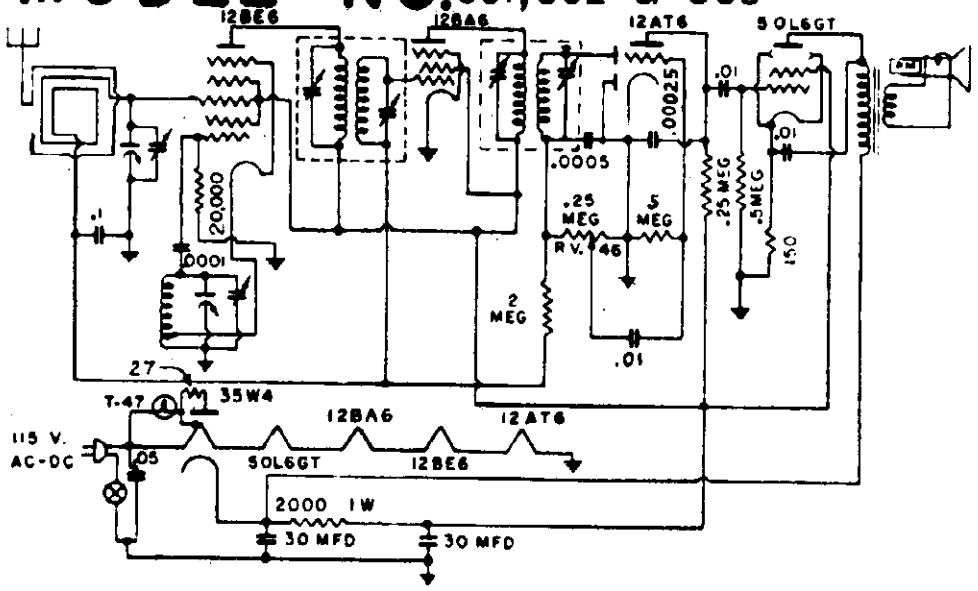


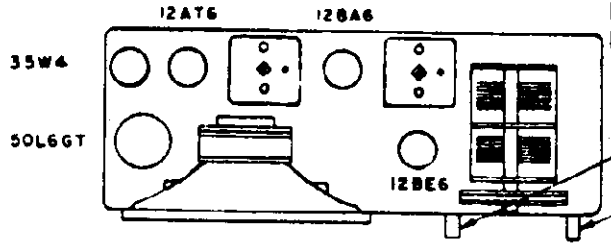
MODELS 801, 802
803, SERIES B

AUTOMATIC RADIO MFG. CO., INC.

MODELS 801
802, 803

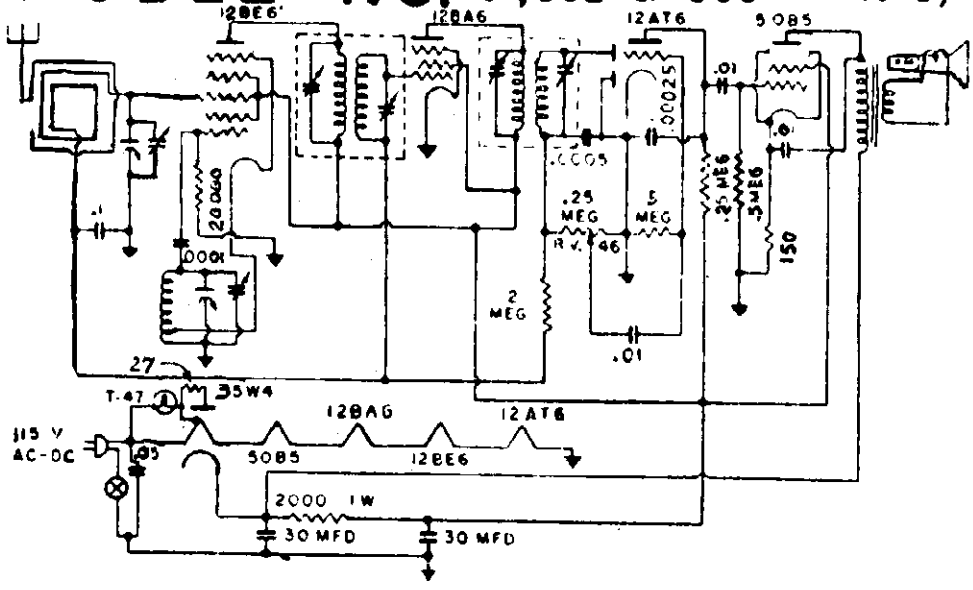
MODEL NO. 801, 802 & 803

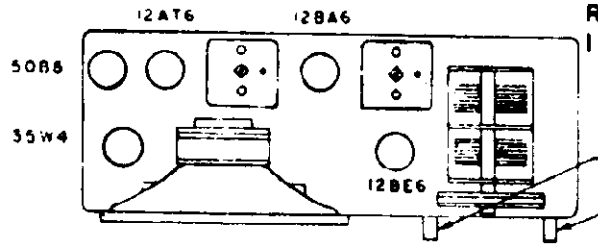




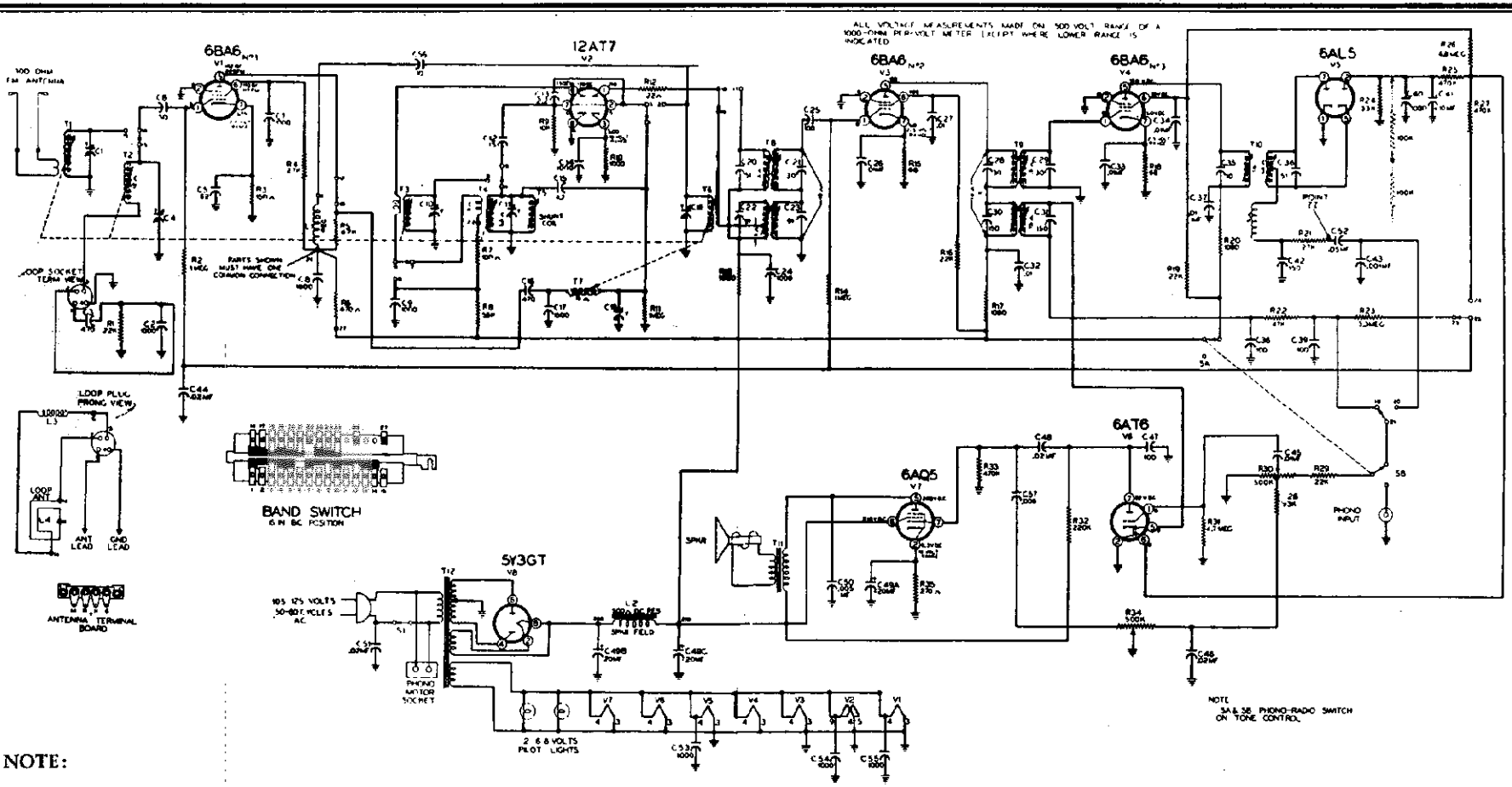
RANGE 540-1650 KC
I.F. FREQ. 455 KC

MODEL NO. 801, 802 & 803 (SERIES B)





RANGE 540-1650 KC
IF FREQ 455 KC



NOTE:

The two 100K ohm resistors in series from Pin No. 2 to ground are connected as shown only when aligning the FM - I.F. Refer to FM - I.F. alignment procedure.

On some sets R12, 22 ohms, C-9B1-42 is replaced with C-9B1-45, a 39 ohm resistor.

On some sets C24, 40, 53 Part No. C-8G-13016 (uninsulated type) is replaced with an insulated type, same value, Part No. C-8G-13201.

ELECTRICAL SPECIFICATIONS

Power Supply.....105 to 125 volts, AC, 60-cycles; Chassis only 75 watts. With phono operation 100 watts.

Frequency Ranges...Broadcast Band—535 to 1620 kc. FM Band—88 to 108 mc.

Intermediate Freq...AM - 455 kc.; FM - 10.7 mc.

Selectivity.....AM - 42 kc. broad at 1000 times signal, measured at 1000 kc. I.F. FM - 200 kc. broad at 2 times down. I.F. FM - 400 kc. broad at 10 times down.

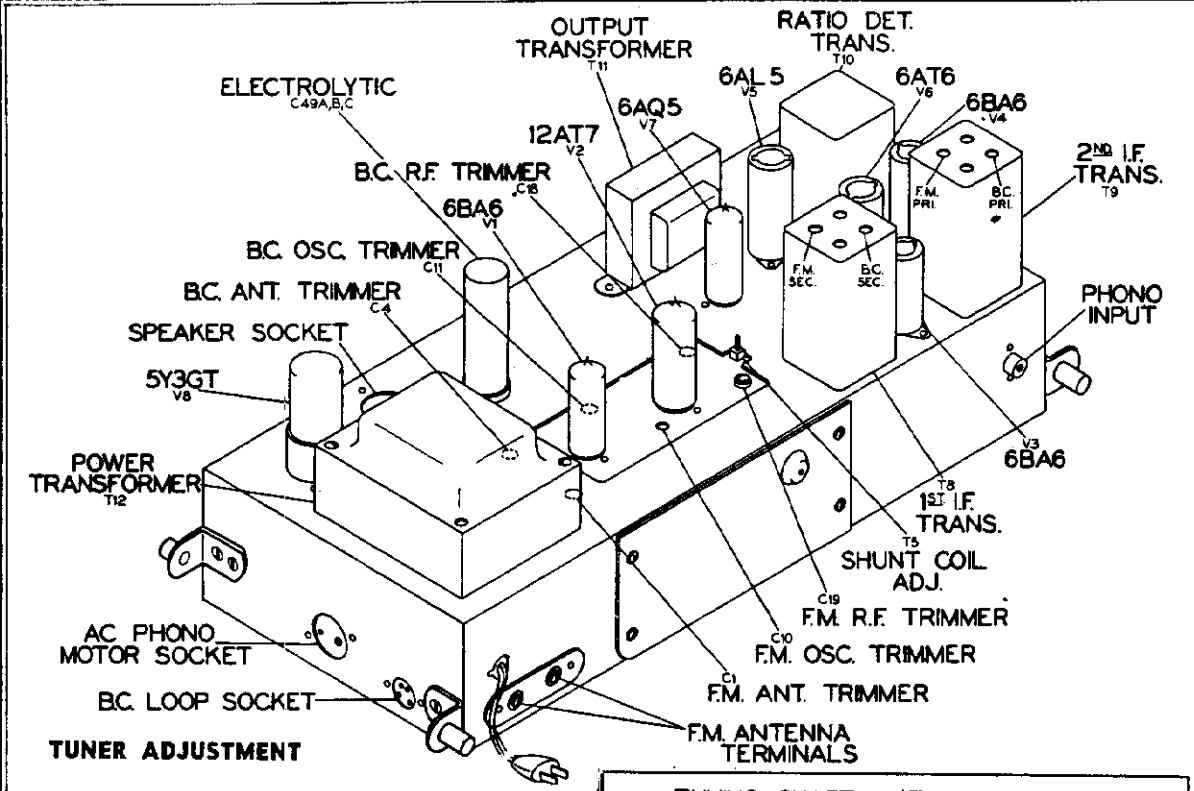
Power Output.....2 watts, 10% distortion. 4 watts maximum.

Loud Speaker.....10" electrodynamic. Voice coil impedance 3.2 ohms, 400 cycles.

AM Sensitivity.....(For .5 watt output with external antenna)—5 microvolts average.

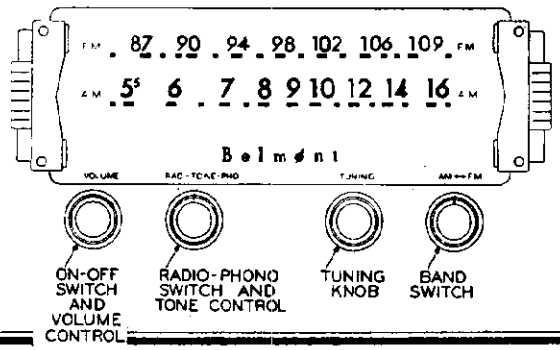
Tube and Lamp Complement

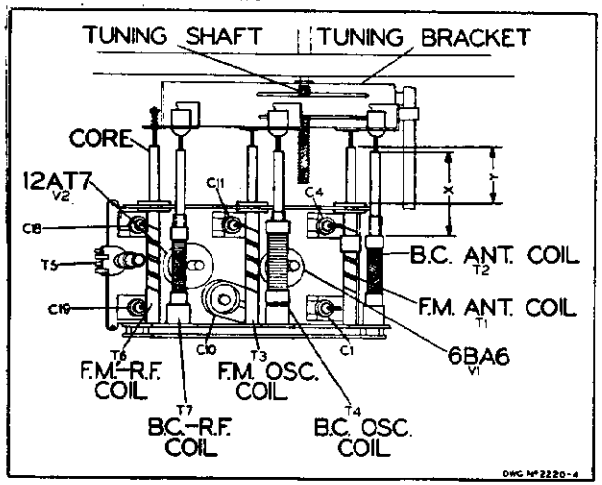
6BA6, FM—AM R.F. stage.
12AT7, FM—AM oscillator and mixer.
6BA6, FM—AM 1st I.F.
6BA6, FM—2nd I.F.
6AL5, FM ratio detector.
6AT6, AM detector. A.F. AMP. and A.V.C.
6AQ5, Audio output.
5Y3, rectifier.
T-44 dial lamp (2 used)



TUNER ADJUSTMENT

With tuner all the way out, dimension "X" should be 1½ inches. "Y" should be 1-1/16 inches. "X" is from the end of the slug to edge of the coil winding. Check these dimensions before R.F. alignment is attempted of either the AM or FM Band. No slug adjustment should be necessary since the slugs are properly set at the factory.





FM Aerial — The noise-reducing capabilities of FM are noticeably greater when strong FM signals are obtained. Therefore, we recommend, wherever possible, the use of an outside "folded dipole" aerial with a 300-ohm line lead-in. The aerial must be installed according to the directions furnished with it. The radio is shipped from the factory with the built-in FM aerial connected to the two screws labeled "F.M. Antenna Terminals", (See Chassis View). To connect the lead-in from the outside FM aerial, remove the two wires from the built-in FM antenna and connect the twin lead-in wire to the two screws. Either wire of the twin lead-in can be connected to either screw. A ground connection is not required for the FM reception, but may occasionally be helpful. The ground wire should be connected to the black lead at the rear of the chassis.

It should be remembered in conjunction with the erection of an FM folded dipole aerial that the signal strength from an FM transmitting station is less and less at greater distances from the transmitter and that FM reception is hardly ever possible beyond "line of sight" distances between transmitting and receiving aerials. This maximum limit is usually about 45 miles but consistently satisfactory reception is frequently limited to 30 miles or less depending on the height of transmitting and receiving aerials and the intervening terrain.

Broadcast Aerial — In locations remote from broadcasting stations or where receiving conditions are poor, an outside antenna, 50 to 75 feet long including lead-in, will give best results.

Connect the antenna lead-in wire to the *tan* wire extending out of the rear of the radio chassis.

If an external antenna is used, an external ground should also be used. The ground wire (*black*) should be connected with a clamp to a well-cleaned water pipe or to a metal rod driven several feet into the earth.

ALIGNMENT PROCEDURE

FM Band Section I.F. and R.F.

A non-metallic alignment tool must be used.

IMPORTANT — No alignment of the FM section of this radio should be attempted unless you are positive that the circuits are in need of adjustment and you have the necessary equipment.

All components used in this radio are extremely stable and the tuned circuits should require no adjustment over a long period of time.

NOTE — The following alignment is based on the use of the new Simpson vacuum tube volt-meter which has a "floating ground". In other words, the meter, when used as a vacuum tube volt-meter can have both the positive and negative sides connected to points above ground and still give true readings.

A standard AM signal generator is required.

FM - I. F. ALIGNMENT

Band Switch in FM Position. Dummy Antenna .1 Mfd.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	VACUUM TUBE VOLT METER CONNECTION TO RADIO	ADJUSTMENTS TO BE MADE	ADJUST FOR
10.7 Mc. Use about .1 volt	Pin No. 1 of 6BA6 No. 3 and ground	Pin No. 2 of 6AL5 and ground	Primary of T10	Resonance should be about 3 volts
10.7 Mc. Use about .1 volt	Pin No. 1 of 6BA6 No. 3 and ground	See note "A"	Secondary of T10	Zero. Use zero center scale See note "B"
10.7 Mc. Use about 3300 microvolts	Pin No. 1 of 6BA6 No. 2 and ground	Pin No. 2 of 6AL5 and ground	Primary and Secondary of T9 10.7 m.c. windings See top and bottom views.	Resonance should be about 3 volts
10.7 Mc. Use about 200 microvolts	Pin No. 2 of 12AT7 and ground	Pin No. 2 of 6AL5 and ground	Primary and Secondary of 10.7 m.c. windings of T8 See top and bottom views.	Resonance should be about 3 volts

NOTES ON FM—I.F. ALIGNMENT

NOTE "A." Connect two resistors, 100K OHMS each, from Pin No. 2 of 6AL5 to ground. These resistors must be matched within 5%. Connect as shown in dotted lines on schematic diagram. Connect vacuum tube volt-meter between the mid-point of the resistors and point zz.

NOTE "B." If T10 has been tampered with, it is possible that no crossover point will be found at first. Careful adjustment of both primary and secondary is necessary.

GENERAL: Input signals should be adjusted to give approximately 3 volts. The ratio detector is operating at a reasonable level at this point and will give the truest indication of correct alignment with the procedure specified.

FM - R. F. ALIGNMENT

Check center of pointer so that it coincides with the marker to the extreme right on the calibration strip when iron cores are all the way out. For adjustment, see dial mechanism illustration.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	DUMMY ANTENNA	ADJUST	VACUUM TUBE VOLT METER CONNECTION TO RADIO	ADJUST
100 Mc. Use about 25 microvolts	FM Antenna Terminals See note	300 ohms	C10 Osc. C19 R. F. C1 Ant.	Pin No. 2 of 6AL5 and Ground	Resonance about 3 volts

NOTE: If a signal generator with the above fundamental frequency is not available, it is sometimes possible to use harmonics. Use extreme care in picking harmonics. An alternate procedure is to use a local station carrier of known frequency to align the FM Band and to use the vacuum tube volt-meter as above for resonance indication. A weak carrier, however, will not produce 3 volts.

NOTE: Connect 300 ohms in series with hot side of generator and connect to one screw. Connect cold side of generator to other screw.

MODEL B-8AF21 BELMONT RADIO CORP.

ALIGNMENT PROCEDURE

Broadcast Band Section I.F. and R.F.

The alignment procedure below includes the sensitivities at the inputs of various stages. All signal input values are based on an output of ½ watt. This may be measured by disconnecting the speaker voice coil and substituting a 3.2-ohm resistor across the secondary winding of the output transformer. A reading of 1.3 volts AC across this resistor will be approximately equivalent to a ½-watt output with the speaker connected. The volume control must be set at maximum. The tone control must be set for maximum treble.

The signal source must be an accurately calibrated signal generator capable of supplying the frequencies designated, modulated 30% with a 400-cycle audio signal. A 400 cycle audio signal is required for the audio measurement. Variations in sensitivities of plus or minus 25% are usually permissable.

AM-I. F. ALIGNMENT

Band Switch in AM Position. Tune Set to 1400 Kc. Dummy Antenna .1 Mfd.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	ADJUSTMENTS TO BE MADE	ADJUST FOR
455 Kc. Use 2400 microvolts	Pin No. 1 of 6BA6 No. 2 and ground	Primary and Secondary of T9 AM windings. See top and bottom views.	Maximum output. Should be ½ watt.
455 Kc. Use 70 microvolts	Pin No. 2 of 12AT7 and ground	Primary and Secondary of T8 AM windings. See top and bottom views.	Maximum output. Should be ½ watt.
400 cycles. Use 60 millivolts	Hot end of volume control and ground	None	Maximum output. Should be ½ watt.

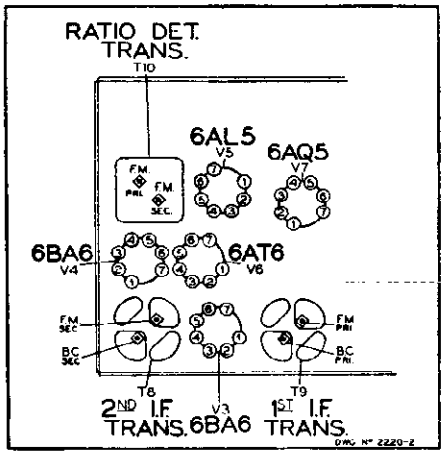
BROADCAST BAND-R. F. ALIGNMENT

Check center of pointer so that it coincides with the marker to the extreme right on the calibration strip when iron cores are all the way out. For adjustment, see dial mechanism illustration.

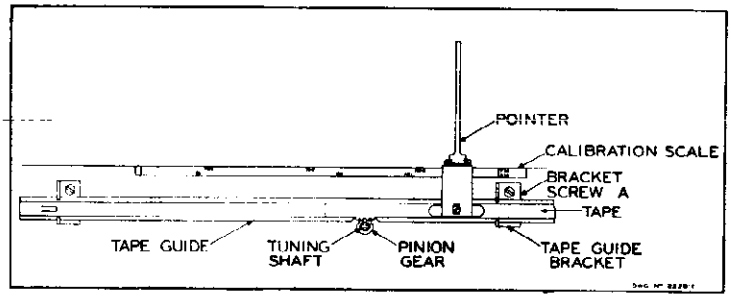
SIGNAL GENERATOR FREQ.	CONNECTION TO RADIO	DUMMY ANTENNA	ADJUST
1620 Kc.	AM Antenna and Ground	200 mmf.	C11 Osc. trimmer for maximum
535 Kc.	AM Antenna and Ground	200 mmf.	T5 for maximum ½ watt
1620 Kc. Use 5 microvolts	AM Antenna and Ground	200 mmf.	C4 and C18 for max. ½ watt. See note

NOTE: Re-check first two adjustments after this adjustment because of inter-locking effects.

Procedure for disassembly and assembly of dial mechanism.

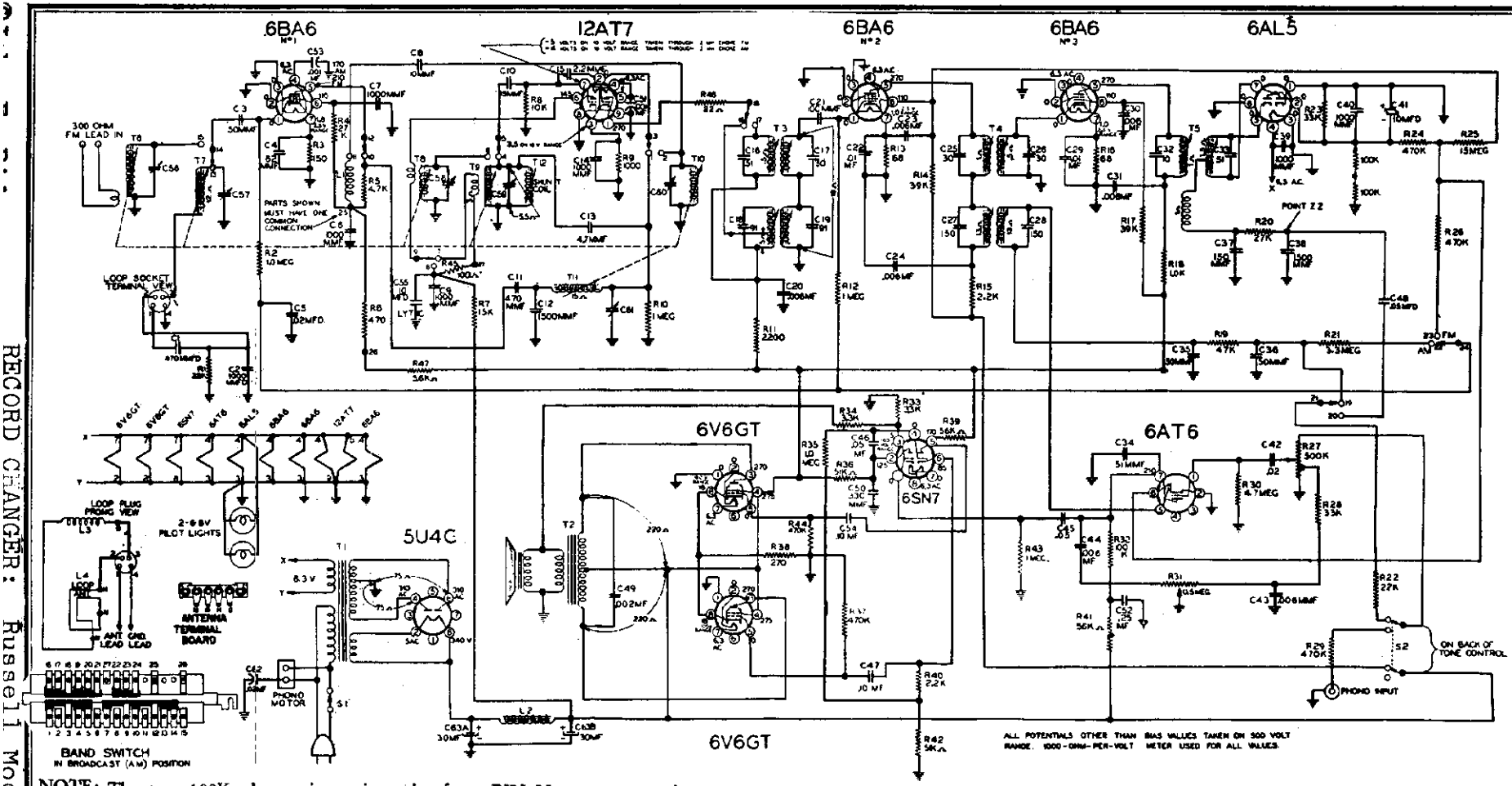


TO ALIGN POINTER—Loosen bracket screw "A". Then tape guide bracket can be moved up to allow proper meshing of tape teeth with pinion gear. Re-adjust bracket to eliminate backlash.



REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description	Qty. Used
		TUNER CHASSIS PARTS	
		Condensers	
C10	A-8E-13575	Trimmer condenser	1
C1, 4, 11, 19, 18	A-2M-12618	Trimmer cond. plate	5
C3, 16	C-8G-11732	470 mmf ±20%	2
C2	C-8G-13695	1000 mmf, ±20%	1
C8, 7, 9, 14, 54, 55	C-8G-13201	1000 mmf, +20%—10%	6
C5	C-8G-13018	62 mmf, ±10%	1
C17	C-8G-11731	1500 mmf, ±20%	1
C12	C-8G-13017	15 mmf, +10%	1
C6	C-8G-11484	50 mmf, ±10%	1
C56	C-8G-11789	10 mmf, ±10%	1
C15	A-8G-12495-6	4.7 mmf, ±20%	1
C13	A-8G-12495-4	2.2 mmf, ±20%	1
C44	C-8D-11304	.02 mfd, 200 volts, ±20%	1
		Resistors	
R4	C-9B2-79	27K ohms, 1 watt, 10%	1
R1	C-9B1-21	22K ohms, ½ watt, 20%	1
R3	C-9B1-52	150 ohms, ½ watt, 10%	1
R5	C-9B1-17	4700 ohms, ½ watt, 20%	1
R6	C-9B1-11	470 ohms, ½ watt, 20%	1
R9	C-9B1-19	10K ohms, ½ watt, 20%	1
R2, 11	C-9B1-31	1 megohm, ½ watt, 20%	2
R10	C-9B1-62	1000 ohms, ½ watt, 10%	1
R23	C-9B1-34	3.3 megohms, ½ watt, 20%	1
R7	C-9B1-50	100 ohms, ½ watt, 10%	1
R12	C-9B1-42	22 ohms, ½ watt, 10%	1
		Coils	
T3	B-13D-13027	FM oscillator coil assembly	1
T1	B-13E-13028	FM antenna coil assembly	1
T6	B-13C-13029	FM R.F. coil assembly	1
T4	B-13D-13030	AM oscillator coil assembly	1
T2	B-13E-13031	AM ant. coil assembly	1
T7	B-13C-13032	AM R.F. coil assembly	1
L1	A-16A-13033	Choke coil assembly	1
T5	B-13D-12974	AM osc. shunt coil assembly	1
		Miscellaneous	
	B-208-13553 or	Band change slide switch	1
	B-201-12967	Band change slide switch	1
	A-15B-12997	7 prong, min., tube socket	1
	A-15B-13430	9 prong, min., tube socket	1
	A-200-12912	Drive bracket assembly	1
	A-25A-13019	Core grommets, for AM band	3
	A-3M-13020	Insert for core grommet	3
	A-49A-12394	Spiral spring for FM cores	3
	B-2D-12316	Tape guide	1
	B-2J-12922	Rack tape, with teeth and pointer bracket A-2D-11194	1
	B-2G-10588	Pointer	1
	A-200-15059	Drive, pinion and lead screw assembly	1
	A-200-15004	Guide and pointer bracket	1
		MAIN CHASSIS PARTS	
		Condensers	
C49B, 49C, 49A	A-8C-13555	Electrolytic, 20—20 x 350 volts; 20 x 25 volts	1
C50	C-8D-10935	.005 mf x 600 volts	1
C26, 27, 32, 33, 34,37, 45	C-8D-10761	.01 mf x 400 volts, 20%	7
C57	C-8D-10785	.006 mf x 600 volts, 20%	1
C41	A-8C-13132	Electrolytic, 10 mf x 50 volts	1
C43	C-8D-10787	.001 x 600 volts, 20%	1
C52	C-8D-10770	.05 x 200 volts, 20%	1
C51, 46	C-8D-10774	.02 x 400 volts, 20%	2
C48	C-8J-11321	.02 x 600 volts, 20%	1
C25, 47	C-8G-13131	100 mmf, ceramic, 10%	2
C24, 40, 53	C-8G-13201	1000 mmf, ceramic, 20%	3
C42	C-8F3-229	150 mmf, mica, 5%	1
C38, 39	A-8F-13127	.0001 mf, dual mica, 20%	1
C22, 23	C-8G-12160	91 mmf, ceramic, 5%	2
C20	C-8G-13026	51 mmf, ceramic, 5%	1
C30, 31	C-8G-13025	150 mmf, ceramic, 5%	2
C21, 28, 29	C-8G-12159	30 mmf, ceramic, 5%	3
C35	C-8G-11789	10 mmf, ceramic	1
C36	C-8G-11891	51 mmf, ceramic	1
		Resistors	
R30, S1	A-10A-13114	Volume control (500K ohms) and switch	1
R34, SA, SB	A-11A-13115	Tone control (500K ohms) and radio-phono switch	1
R32	C-9B1-27	220K ohms, ½ watt, 20%	1
R15, 18	C-9B1-48	68 ohms, ½ watt, 10%	2
R14	C-9B1-31	1 megohm, ½ watt, 20%	1
R19, 16	C-9B2-78	22K ohms, 1 watt, 10%	2
R24, 28	C-9B1-80	33K ohms, ½ watt, 10%	2
R21	C-9B1-79	27K ohms, ½ watt, 10%	1
R8	C-9B2-71	5600 ohms, 1 watt, 10%	1
R22	C-9B1-23	47K ohms, ½ watt, 20%	1
R29	C-9B1-21	22K ohms, ½ watt, 20%	1
R31	C-9B1-35	4.7 megohms, ½ watt, 20%	1
R25, 27, 33	C-9B1-29	470K ohms, ½ watt, 20%	3
R35	C-9B1-55	270 ohms, ½ watt, 10%	1
R26	C-9B1-36	6.8 megohms, ½ watt, 20%	1
R13, 20, 17	C-9B1-13	1000 ohms, ½ watt, 20%	3
		Coils	
T8	C-13A-13009	Input I.F. transformer, combinatic 455 kc. and 10.7 mc.	1
T9	C-13B-13014	Second I.F. transformer, combinat 455 kc. and 10.7 mc.	1
T10	C-203-11745-1	Ratio detector coil assembly 10.7 mc.	1
L3	A-16A-13243	Loop loading coil	1
L4	B-14MA-11066-10	Loop antenna ribbon	1
		Transformers	
T12	B-12A-13120	Power transformer, primary, 50-6(cycles. 105-125 volts A.C.	1
T11	B-12C-13556	Output transformer, for speaker	1
		Speaker	
L2	B-18B-14140	Electrodynamic speaker, 10-inch, less output transformer	1
		Miscellaneous	
	C-30A-14499	Dial scale	1
	B-5B-13978-37	Knob, mahogany, "Tone and Volume"	2
	B-5B-13978-14	Knob, walnut, "Tone and Volume"	2
	B-5B-13737-37	Knob, mahogany, "Tuning and Bandswitch"	2
	B-5B-13737-14	Knob, walnut, "Tuning and Bandswitch"	2
	B-5C-15078-37	Escutcheon side pieces, mahogany	2
	B-5C-15078-14	Escutcheon side pieces, walnut	2
	B-14M-11479	Line cord and plug	1
	A-3A-12933	Band switch shaft	1
	A-55C-12935	Ball bearing	1
	B-47A-12458-2	Pilot lite and bracket assembly	1
	A-46A-11739	Pilot lite, 6-8 volts, T-44	2
	A-15C-13174	Miniature socket, 7 prong	5
	A-15B-10440	Octal socket, 8 prong	1
	A-19B-12644	Loop antenna socket	1
	B-7B-13050	FM terminal strip	1
	A-15B-11538	Speaker socket	1
	A-19B-12468	Phono motor socket	1
	A-19B-12170	Phono input socket	1
	A-25A-13818	Chassis rubber grommet	4
		RECORD CHANGER	
	B-201-14063-1	C10M Changer with Webster Retracto cartridge	1
	Webster Retracto	Crystal cartridge with needle	1



NOTE: The two 100K ohm resistors in series from PIN No. 2 to ground are connected as shown only when aligning the FM I. F. Refer to FM I. F. alignment procedure.

NOTE: On some sets R46—22 ohm resistor is replaced with a 39 ohm resistor, Part No. C-9B1-45.

ELECTRICAL SPECIFICATIONS

Power Supply.....105 to 125 volts, AC, 60-cycles; Chassis only 122 watts. With phono operation 150 watts.

Frequency Range...Broadcast Band—535 to 1620 kc.
FM—Band 88 to 108 mc.

Intermediate Freq. AM-455 kc; FM-10.7 mc.

Selectivity.....AM-48 kc. broad at 1000 times signal, measured at 1000 kc.
I.F. FM-180 kc. broad at 2 times down.
I.F. FM-320 kc. broad at 10 times down.

AM Sensitivity.....(For .5 watt output with external antenna)—3 microvolts average.

FM Sensitivity.....(For .5 watt output)—10 microvolts average.

Power Output.....8 watts, 10% distortion. 10 watts maximum.

Loud Speaker.....12" electrodynamic. Voice coil impedance 3.2 ohms, 400 cycles.

Tube and Lamp Complement.....6BA6, FM—AM R.F. stage.
12AT7, FM—AM oscillator and mixer.
6BA6, FM—AM—1st I.F.
6BA6, FM—2nd I.F.
6AL5, FM—ratio detector.
6AT6, AM detector.
A. F. AMP. and A.V.C.
6SN7, Push-Pull. Driver and phase-inverter.
5U4G, rectifier.
6V6, output.
6V6, output.
T-44 dial lamp (2 used).

Automatic changer..
Russell C-10 with P-93 Cartridge.

ALIGNMENT PROCEDURE

FM Band Section I.F. and R.F.

A non-metallic alignment tool must be used.

IMPORTANT— No alignment of the FM section of this radio should be attempted unless you are positive that the circuits are in need of adjustment and you have the necessary equipment.

All components used in this radio are extremely stable and the tuned circuits should require no adjustment over a long period of time.

NOTE— The following alignment is based on the use of the new Simpson vacuum tube voltmeter which has a "floating ground". In other words, the meter, when used as a vacuum tube volt-meter, can have both the positive and negative sides connected to points above ground and still give true readings.

A standard AM signal generator is required.

FM - I. F. ALIGNMENT

Band Switch in FM Position. Dummy Antenna .1 Mjd.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	VACUUM TUBE VOLT METER CONNECTION TO RADIO	ADJUSTMENTS TO BE MADE	ADJUST FOR
10.7 Mc. Use about .1 volt	Pin No. 1 of 6BA6 No. 3 and ground	Pin No. 2 of 6AL5 and ground	Primary of T5	Resonance should be about 3 volts
10.7 Mc. Use about .1 volt	Pin No. 1 of 6BA6 No. 3 and ground	See note "A"	Secondary of T5	Resonance should be about 3 volts
10.7 Mc. Use about 3300 microvolts	Pin No. 1 of 6BA6 No. 2 and ground	Pin No. 2 of 6AL5 and ground	Primary and Secondary of T4 10.7 m.c. windings See top and bottom views	Zero. Use zero center scale See note "B"
10.7 Mc. Use about 200 microvolts	Pin No. 2 of 12AT7 and ground	Pin No. 2 of 6AL5 and ground	Primary and Secondary of 10.7 m.c. windings of T3 See top and bottom views	Resonance should be about 3 volts

NOTES ON FM — I. F. ALIGNMENT

NOTE "A" Connect two resistors, 100K OHMS each, from Pin No. 2 of 6AL5 to ground. These resistors must be matched within 5%. Connect as shown in dotted lines on schematic diagram. Connect vacuum tube voltmeter between the mid-point of the resistors and point zz.

NOTE "B" If T5 has been tampered with, it is possible that no crossover point will be found at first. Careful adjustment of both primary and secondary is necessary.

GENERAL Input signals should be adjusted to give approximately 3 volts. The ratio detector is operating at a resonable level at this point and will give the truest indication of correct alignment with the procedure specified.

FM - R. F. ALIGNMENT

Check pointer so that the right hand edge of the pointer skirt coincides with the right hand edge of marker to the extreme right when iron cores are all the way out.

For Adjustment, see dial mechanism illustration.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	DUMMY ANTENNA	ADJUST	VACUUM TUBE VOLT METER CONNECTION TO RADIO	ADJUST TO
100 Mc. Use about 10 microvolts	FM Antenna Terminals See note	300 ohms	C58 Osc. C60 R. F. C56 Ant.	Pin No. 2 of 6AL5 and Ground	Resonance about 3 volts

NOTE: If a signal generator with the above fundamental frequency is not available, it is sometimes possible to use harmonics. Use extreme care in picking harmonics. An alternate procedure is to use a local station carrier of known frequency to align the FM Band and to use the vacuum tube volt-meter as above for resonance indication. A weak carrier, however, will not produce 3 volts.

NOTE: Connect 300 ohms in series with hot side of generator and connect to one screw. Connect cold side of generator to other screw.

ALIGNMENT PROCEDURE

Broadcast Band Section I.F. and R.F.

The alignment procedure below includes the sensitivities at the inputs of various stages. All signal input values are based on an output of ½ watt. This may be measured by disconnecting the speaker voice coil and substituting a 3.2-ohm resistor across the secondary winding of the output transformer. A reading of 1.3 volts AC across this resistor will be approximately equivalent to a ½-watt output with the speaker connected. The volume control must be set at maximum. The tone control must be set for maximum treble.

The signal source must be an accurately calibrated signal generator capable of suppling the frequencies designated, modulated 30% with a 400-cycle audio signal. A 400 cycle audio signal is required for the audio measurement. Variations in sensitivities of plus or minus 25% are usually permissable.

AM-I.F. ALIGNMENT

Band Switch in AM Position. Tune Set to 1400 *Kc. Dummy Antenna* .1 *Mfd.*

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	ADJUSTMENTS TO BE MADE	ADJUST FOR
455 Kc. Use 1000 microvolts	Pin No. 1 of 6BA6 No. 2 and ground	Primary and Secondary of T4 AM windings See top and bottom views	Maximum output Should be ½ watt
455Kc. Use 30 microvolts	Pin No. 2 of 12AT7 and ground	Primary and Secondary of T3 AM windings See top and bottom views	Maximum output Should be ½ watt
400 cycles. Use 28 millivolts	Hot end of volume control and ground	None	Maximum output Should be ½ watt

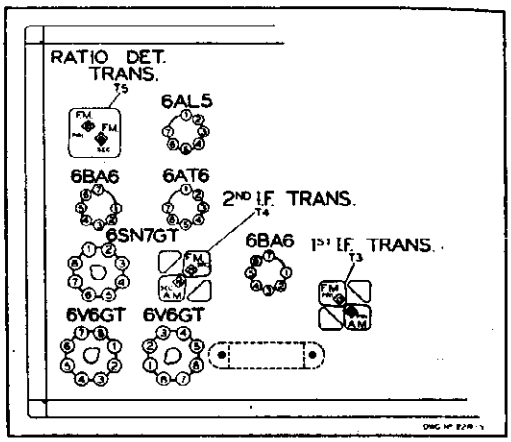
BROADCAST BAND-R.F. ALIGNMENT

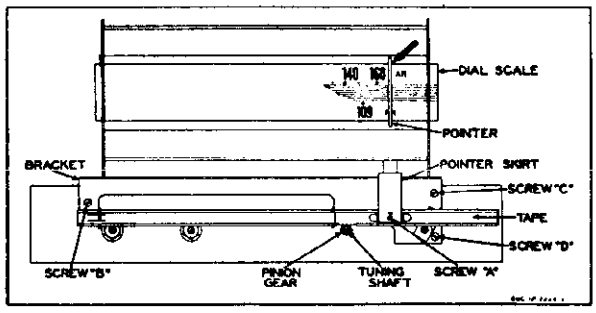
Check pointer so that the right hand edge of the pointer skirt coincides with the right hand edge of marker to the extreme right when iron cores are all the way out. For Adjustment, see dial mechanism illustration.

SIGNAL GENERATOR FREQ.	CONNECTION TO RADIO	DUMMY ANTENNA	ADJUST
1620 Kc.	AM Antenna and Ground	200 mmf.	C59 Osc. trimmer for maximum
535 Kc.	AM Antenna and Ground	200 mmf.	T12 for maximum ½ watt
1620 Kc. Use 3 microvolts	AM Antenna and Ground	200 mmf.	C57 and C61 for max. ½ watt. See note

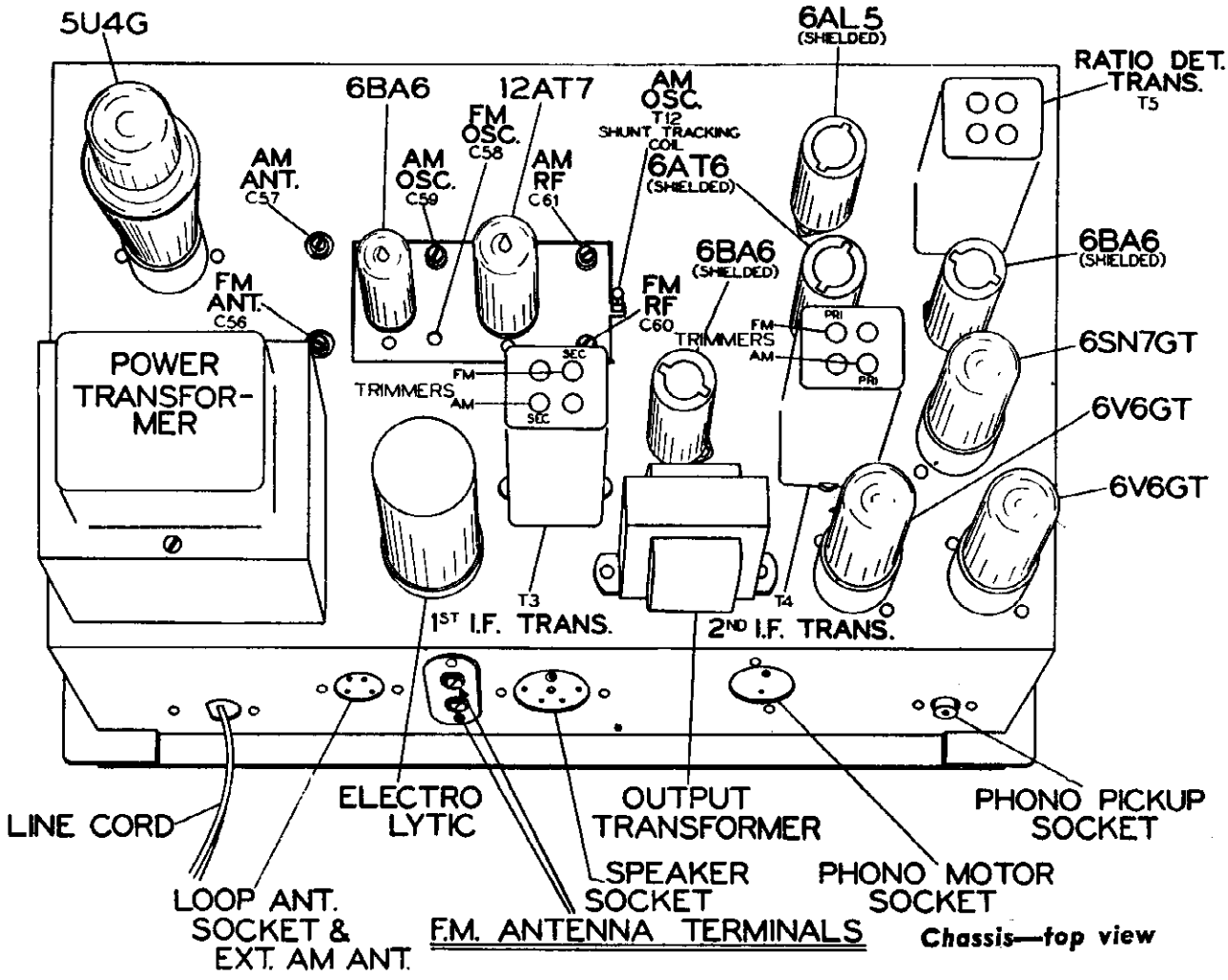
NOTE: Re-check first two adjustments after this adjustment because of inter-locking effects.

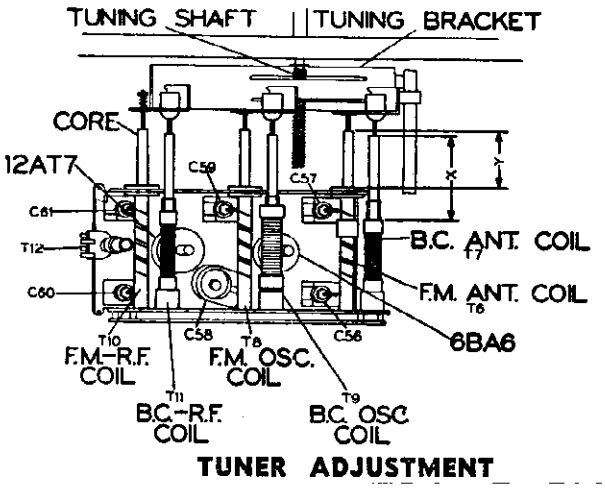
Procedure for disassembly and assembly of dial mechanism



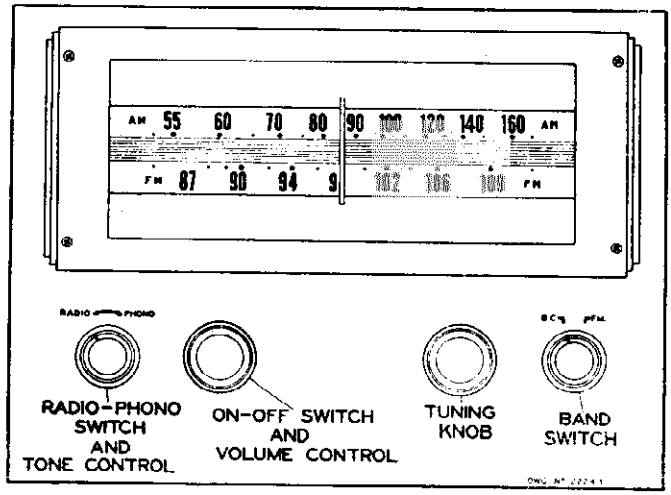


Loosen screws "C" and "D" so that teeth of tape can be properly meshed with pinion gear to give proper pointer travel.





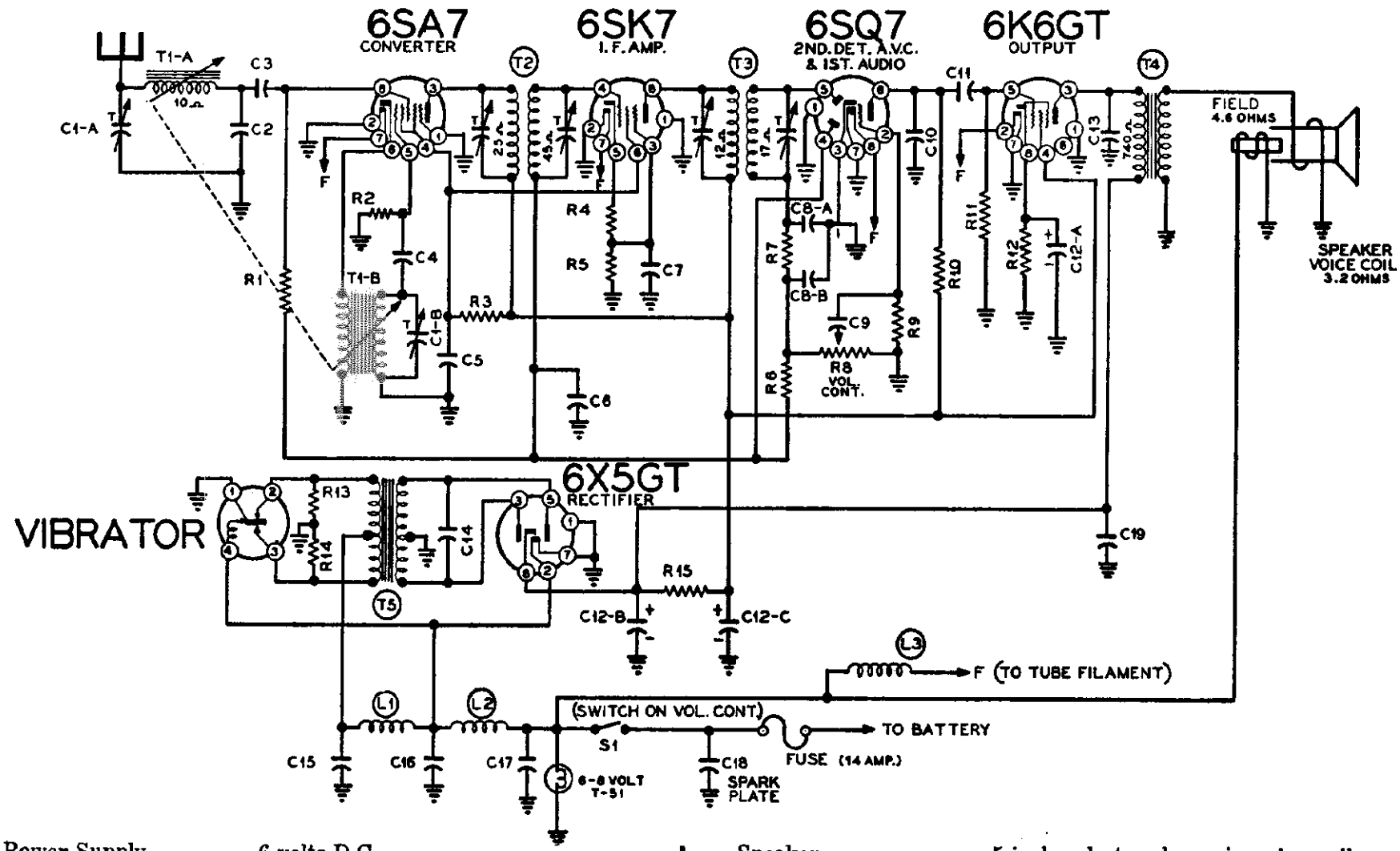
TUNER ADJUSTMENT



With tuner all the way out, dimension "X" should be 1½ inches. "Y" should be 1-1/16 inches. "X" is from the end of the slug to edge of the coil winding. Check these dimensions before R.F. alignment is attempted of either the AM or FM Band. No slug adjustment should be necessary since the slugs are properly set at the factory.

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description	Qty. Used
		TUNER PARTS	
		Condensers	
C58	A-8E-13575	Trimmer condenser	1
C56, 57, 59, 60, 61	A-2M-12618	Trimmer cond. plate	5
C1, C11	C-8G-11732	470 mmf, ±20%	2
C2	C-8G-13695	1000 mmf, ±20%	1
C6, 7, 9, 14 51, 53	C-8G-13201	1000 mmf, +20%—10%	6
C4	C-8G-13018	62 mmf, ±10%	1
C12	C-8G-11731	1500 mmf, ±20%	1
C10	C-8G-13017	15 mmf, +10%	1
C3	C-8G-11484	50 mmf, ±10%	1
C8	C-8G-11789	10 mmf, ±10%	1
C13	A-8G-12495-6	4.7 mmf, ±20%	1
C15	A-8G-12495-4	2.2 mmf, ±20%	1
C5	C-8D-11304	.02 mfd. 200 volts, ±20%	1
		Resistors	
R4	C-9B2-79	27K ohms, 1 watt, 10%	1
R1	C-9B1-21	22K ohms, ½ watt, 20%	1
R3	C-9B1-52	150 ohms, ½ watt, 10%	1
R5	C-9B1-17	4700 ohms, ½ watt, 20%	1
R6	C-9B1-11	470 ohms, ½ watt, 20%	1
R8	C-9B1-19	10K ohms, ½ watt, 20%	1
R2, R10	C-9B1-31	1 megohm, ½ watt, 20%	2
R9	C-9B1-62	1000 ohms, ½ watt, 10%	1
R21	C-9B1-34	3.3 megohms, ½ watt, 20%	1
R45	C-9B1-50	100 ohms, ½ watt, 10%	1
R46	C-9B1-42	22 ohms, ½ watt, 10%	1
		Coils	
T8	B-13D-13027	FM oscillator coil assembly	1
T6	B-13E-13028	FM antenna coil assembly	1
T10	B-13C-13029	FM R.F. coil assembly	1
T9	B-13D-13030	AM oscillator coil assembly	1
T7	B-13E-13031	AM antenna coil assembly	1
T11	B-13C-13032	AM R.F. coil assembly	1
L1	A-16A-13033	Choke coil assembly	1
T12	B-13D-12974	AM osc. shunt coil assembly	1
		Miscellaneous	
	B-208-13553 or	Band change slide switch	1
	B-201-12967	Band change slide switch	1
	A-15B-12997	7 prong, min. tube socket	1
	A-15B-13430	9 prong, min. tube socket	1
	N-200-13802	Pointer guide and bracket assembly	1
	A-3A-12308-1	Lead screw	1
	A-3J-12309	Pinion gear for lead screw	1
	A-49A-13447	Tension spring for lead screw	1
	A-25A-13019	Core grom., for AM band	3
	A-3M-13020	Insert for core grommet	3
	A-49A-12394	Spiral spring for FM cores	3
	C-2D-12990	Tape guide	1
	B-2J-13006	Rack, with teeth, with A-2D-11194 bracket	1
	A-5M-13741	Pointer	1
	32F6SE-5274	6-32x¼" screw to mount pointer	1
		MAIN CHASSIS PARTS	
		Condensers	
63A, 63B	B-8C-11629	Electrolytic condenser, dual, 30-30 x 450 volts	1
C21	C-8G-11734	100 mmf, 20%, ceramic	1
C37	C-8F3-229	150 mmf, mica	1
C38	C-8G-13059	1500 mmf, ceramic	1
C34	C-8G-13060	51 mmf, ceramic	1
C20, 23, 24, 30, 31, 43, 44	C-8D-10785	.006 mf x 600 volts, paper	7
C22, C29	C-8D-10761	.01 mf x 400 volts, paper	2
C45, 46	C-8D-10813	.05 mf x 400, paper	2
C55	A-8C-12154	Electrolytic condenser 10 mf x 450 volts	1
C49	C-8D-10789	.002 mf x 600 volts, paper	1
C39, 40	C-8G-13201	1000 mmf, ceramic	2
C41	A-8C-13132	Electrolytic condenser, 10 mf x 50 volts	1
C62	C-8J-11321	.02 mf x 600 volts	1
C48	C-8D-10770	.05 mf x 200 volts	1
C50	C-8G-11741	330 mmf, ceramic	1
C42	C-8D-11304	.02 mf x 200 volts	1
C52	C-8D-13439	.25 mf x 400 volts	1
C47, 54	C-8D-10760	.1 mf x 400 volts	2
C35, 36	A-8F-13047	50 mmf, dual, mica	1
C32	C-8G-11789	10 mmf, ceramic, 10%	1
C33	C-8G-11891	51 mmf, ceramic, 5%	1
C27, 28	C-8G-13025	150 mmf, ceramic	2
C17, 25, 26	C-8G-12159	30 mmf, ceramic	3
C18, 19	C-8G-12160	91 mmf, ceramic	2
C16	C-8G-13026	51 mmf, ceramic	1
		Resistors	
R27	A-10A-13001	Volume control (500K) and switch	1
R31	A-11A-12988	Tone control (500K) and radio-phono switch	1
R32	C-9B1-86	100K ohms, ½ watt, 10%	1
R29, 44	C-9B1-94	470K ohms, ½ watt, 10%	2
R39, 41	C-9B1-83	56K ohms, ½ watt, 10%	2
R33, 34	C-9B1-68	3300 ohms, ½ watt, 10%	2
R30	C-9B1-35	4.7 megohms, ½ watt, 20%	1
R23, 28	C-9B1-80	33K ohms, ½ watt, 10%	2
R20	C-9B1-79	27K ohms, ½ watt, 10%	1
R22	C-9B1-78	22K ohms, ½ watt, 20%	1
R13, 16	C-9B1-48	68 ohms, ½ watt, 10%	2
R14, 17	C-9B2-81	39K ohms, 1 watt, 10%	2
R24, 26, 37	C-9B1-29	470K ohms, ½ watt, 20%	3
R25	C-9B1-302	15 megohms, ½ watt, 10%	1
R19	C-9B1-23	47K ohms, ½ watt, 20%	1
R7	C-9B4-76	15K ohms, 2 watts, 10%	1
R12, 35, 43	C-9B1-31	1 megohm, ½ watt, 20%	3
R40	C-9B1-66	2200 ohms, ½ watt, 10%	1
R36, 42	C-9B1-200	51K ohms, ½ watt, 5%	2
R38	C-9B4-55	270 ohms, 2 watts, 10%	1
R47	C-9B1-71	5600 ohms, ½ watt, 10%	1
R18	C-9B1-13	1000 ohms, ½ watt, 20%	1
R15, 11	C-9B2-15	2200 ohms, 1 watt, 20%	2
		Coils	
T3	C-13A-13009-1	Input I.F. transformer, combination 455 kc. and 10.7 mc	1
T4	C-13B-13014-1	Output transformer, combination 455 kc. and 10.7 mc	1
T5	C-203-11745-1	Ratio det. coil assembly 10.7 mc	1
L3	A-16A-13243	Loop loading coil	1
L4	B-14MA-11066	Loop antenna—B.C. Band	1
		Transformers	
T2	B-12C-13042	Output trans. for speaker	1
	B-12A-13038	Power transformer, primary, 50-60 cycles, 105-125 volts, AC	1
		Speaker	
	B-18B-13043	Electrodynamic speaker, 12" less output transformer	1
		Miscellaneous	
	C-30B-13943	Dial glass	1
	B-30A-13734	Dial scale	1
	B-5B-13738-37	Knob, small, with dot, mahogany	2
	B-5B-13737-37	Knob, large, without dot, mahogany	2
	B-2G-13596	Escutcheon	1
	B-14M-11479	A.C. line cord	1
	A-3A-13003	Switch shaft	1
	A-2D-12983	Detent bracket (U shaped on front of set)	1
	A-43D-12934	"U" speed clip	1
	A-55C-12935	Ball Bearing	1
	A-2D-13004	Switch activator bracket	1
	A-47A-13801	Pilot lite assembly	1
	A-46A-11739	Pilot lite, 6-8 volts, T-44	2
	A-15C-10717	7 prong, min., tube socket	4
	A-15B-10440	8 prong, octal, socket	4
	A-19B-12644	Antenna socket	1
	A-7B-13050	FM dipole, 2-screw strip	1
	A-15B-11538	Speaker socket	1
	A-19B-12468	Phono motor socket	1
	A-19B-12170	Phono input socket	1
		RECORD CHANGER	
	B-201-14063	Record changer (Russell C-10) with P-93 cartridge	1
	P-93	Crystal cartridge	1



Power Supply	6 volts D.C.
Frequency Range	530 to 1600 kc.
Intermediate Freq.	455 kc.
Tuning	Two permeability-tuned circuits.
Antenna System	Adjustable to accommodate various car antennae capacities.
Speaker	5-inch; electro dynamic voice coil impedance 3.2 ohms.
Power Output	1 watt undistorted; 1.6 watts maximum.
Sensitivity	20 microvolts average for 500-milliwatt output.
Selectivity	50 kc broad at 1000 times signal at 1000 kc.

MODEL 5C12 BELMONT RADIO CORP.

ALIGNMENT PROCEDURE

(Refer to Chassis View)

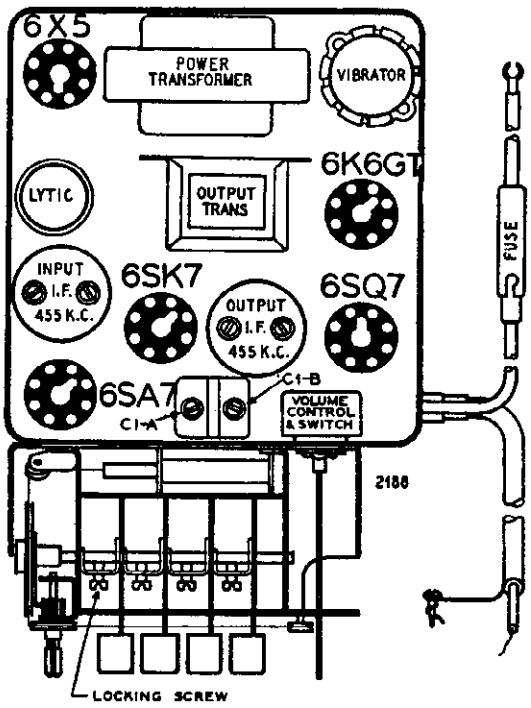
- Output meter across 3.2-ohm output load.
- Align for maximum output. Reduce input as needed to keep output near 0.4 volts.
- Volume control at maximum for all adjustments.
- Connect ground post of signal generator to radio chassis.

BAND	SIGNAL GENERATOR				ADJUSTMENT
	Frequency	Dummy Antenna	Connection to Radio	Ground Connection	Adjust for Max. Output
I.F.	455 kc	.1 mfd.	Pin #4 Grid 6SK7 Tube	Chassis	Adjust Trimmers of T3 output I.F.
I.F.	455 kc	.1 mfd.	Pin #8 Grid 6SA7 Tube	Chassis	Adjust Trimmers of T2 input I.F.
Broadcast Band	1600 kc	30 mmfd.	Antenna Lead	Chassis	Adjust Trimmers C1-B Oscillator and C1-A Antenna.
Broadcast Band	1400 kc	30 mmfd.	Antenna Lead	Chassis	*Slide Antenna Coil lengthwise for max. output by means of a screw driver.
Broadcast Band	1600 kc	30 mmfd.	Antenna Lead	Chassis	**Adjust Antenna Trimmer C1-A to maximum output.

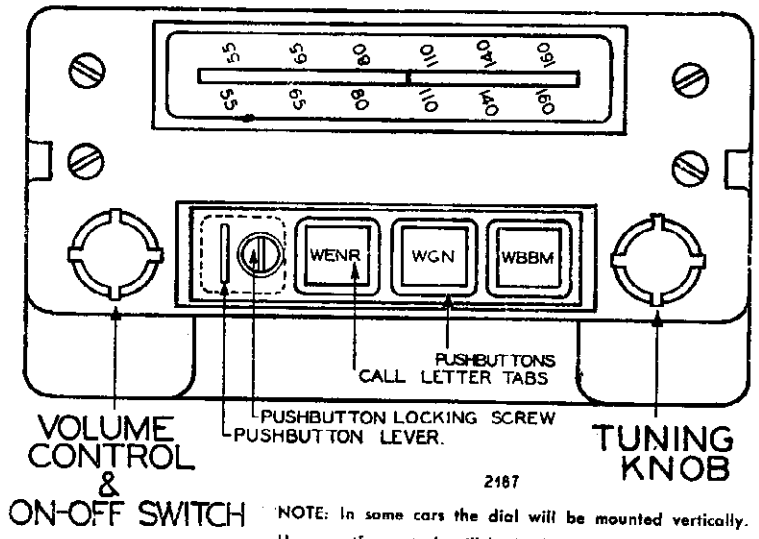
*This adjustment will seldom be necessary in service work as the Antenna Coil is adjusted and sealed in place at the factory. The necessity of this adjustment can be checked quickly by tuning set to a 1400 kc. signal and adjusting C1-A. If a large increase in output is noted the Antenna Coil should be adjusted.

**If Antenna Coil is adjusted, C1-A should be readjusted at 1600 kc.. These two adjustments (Antenna Trimmer C1-A and Antenna Coil) should be repeated until no further improvement is noted.

NOTE: At 1600 kc., the Oscillator Core should extend 31/32 inch from the edge of the Coil Form.



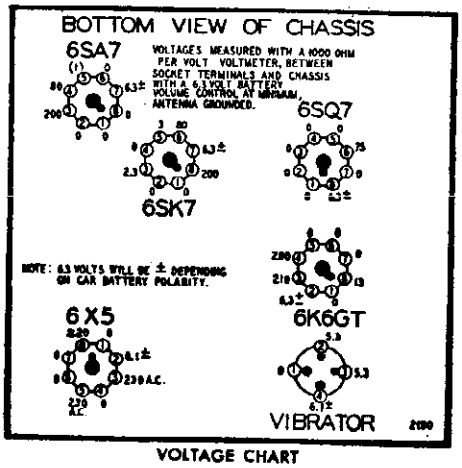
CHASSIS VIEW—Showing tube location, trimmers, and the pushbutton locking-screws.



NOTE: In some cars the dial will be mounted vertically. However the controls will be in the same relative position.

SETTING THE PUSHBUTTONS

Press the first pushbutton lever in firmly and the locking screw will show up in the hole. Unscrew the locking screw several turns to the left with a screw driver. Hold the pushbutton lever pressed in firmly and tune in the desired station. With the pushbutton lever still pressed in, tighten the pushbutton locking screw. Continue to set up the other three pushbuttons in the same manner. Replace the pushbuttons on the levers and insert the call letters. Stations may be changed whenever desired by pulling one or all of the pushbuttons off and re-setting to any desired station as outlined above.



VOLTAGE CHART

MOUNTING LOCATIONS

The chart below shows the mounting positions for cars back to 1939. Most cars previous to 1939 will require under-dash mounting.

To use the chart, note the position letters for the required car, then refer to the small drawing for the location of the letter or letters. The word dash indicates that the radio will fit the dash, similar to a custom installation. The following pages show the method of dash installation on cars requiring no dash panel kits.

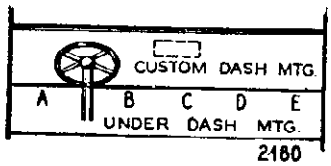
The 1941, 1942 and 1946 Ford; the 1941, 1942 and 1946 Pontiac; and the 1942 and 1946 Mercury will take a dash installation, but require panel kits for mounting and trim. Instructions for mounting the radio and panel kit are included with each panel kit, however, refer to this manual for connections and motor noise suppression.

Make of Car	1946	1942	1941	1940	1939
Buick	C	C	C	C - D	C
Cadillac			B - C		
Chevrolet	Dash - C	Dash - C	Dash - C	C - E	D - E
Chrysler	Dash	Dash	Dash	Dash	C
De Soto	Dash	Dash	Dash	Dash—B - D	C
Dodge	Dash A	Dash - A	Dash - B	Dash—B - D - E	C
Ford	*Dash	*Dash	*Dash - C	B - D	B
Hudson	D - E	C - D - E	C - D - E	C - E	B - C - D
Lincoln	B - C - D	B - C - D	None		
Mercury	*Dash	*Dash	*Dash	A - B - D	B
Nash	C	C	C	A - C	E
Oldsmobile	C - D - E	A - C - E	A - D - E -	***C - with Add. Brkt.	C
Packard	C - D	C - D	C - D	D - E	D - E
Plymouth	Dash	Dash	Dash	Dash—B - D	C
Pontiac	*Dash - D - E	*Dash - D - E	*Dash—D - E	C - D - E	C - D - E
Studebaker	C	C	C	C	C
Americar		**Dash - B - D - E	**Dash		

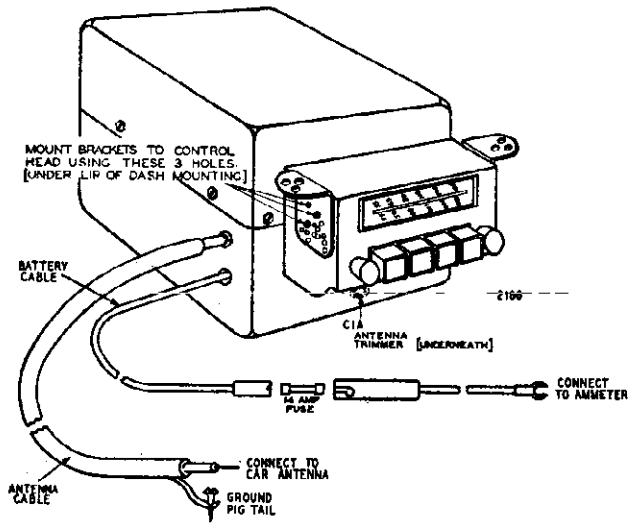
*Use special dash mounting plate.

**Cut dial opening as per dimensions shown on Willy's Americar drawing on page 4.

***Oldsmobile 1940. The radio can be mounted under the dash below the plastic portion, however, it must be supported by a metal strap. Another rear mounting strap, Part No. 115713 will be suitable. Bolt the radio to the metal strap and bolt the strap to the metal dash panel lip.



Universal Under Dash Mounting

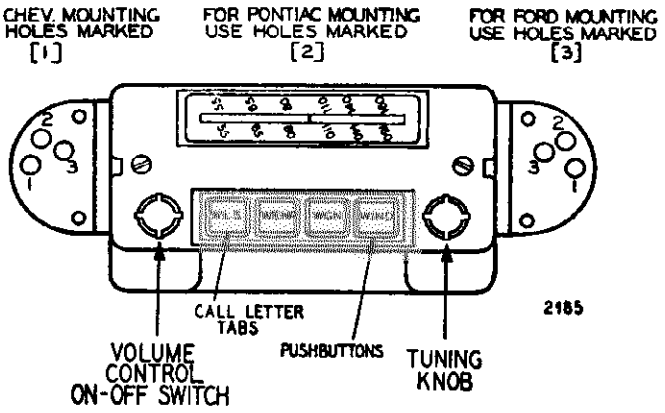


This view shows the battery cable, antenna and ground cable and the two mounting brackets at the side of the tuning dial which are used to mount the radio to the underlip of the dash. These brackets are packed with the kit of hardware and should be fastened to the chassis using the holes shown in solid black. They are then bolted to the underlip of the dash and the rear mounting strap used as shown in the Chevrolet installation. Under Dash Mounting must be used on cars not shown as Dash Mounting in the chart above.

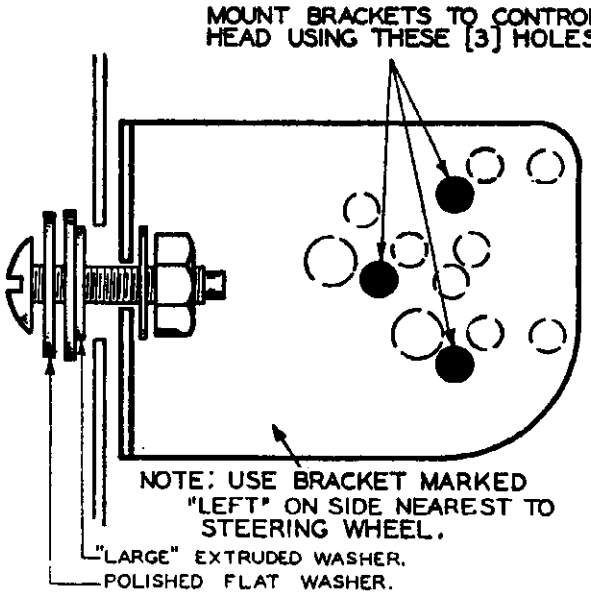
MODEL 5C12 BELMONT RADIO CORP.

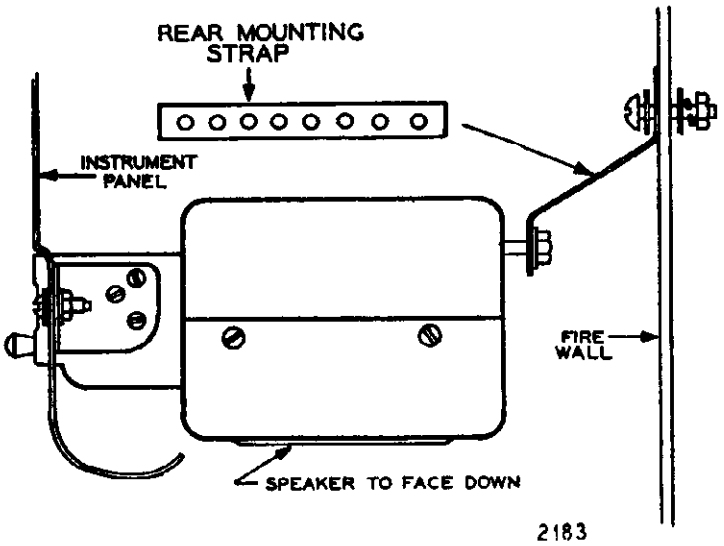
1941, 1942 and 1946 Chevrolet

This view shows how the chassis is mounted to the dash. The rear mounting strap (in the kit of hardware) should be bent as shown and used to support the chassis at the back. The two front mounting brackets should be fastened to the chassis using the solid black holes as shown. Lay the bracket on the left hand drawing and the black circles will show through the holes to be used. The two holes marked No. 1 in the front brackets, as shown in the Dial View Drawing, should be used to bolt the chassis to the dash.



DIAL VIEW WHEN MOUNTED

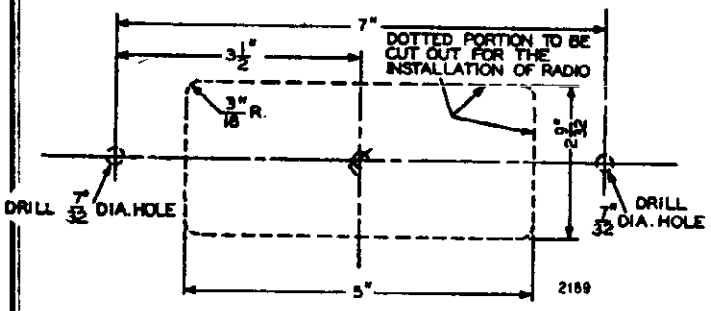




NOTE: Mount Chassis as shown with the speaker face down. Be sure to use rear mounting strap.

1941 and 1942 Americar Models (Willys)

Remove the panel from the left side of the dash and cut an opening, using the dimensions below. Mount the chassis the same as in the Chevrolet installation.



FINAL CONNECTIONS

The antenna cable should be connected and the shield grounded to the car body.

Connect the battery cable to the hot side of the ammeter behind the instrument panel and then insert the fuse in the cable receptor.

ANTENNA TRIMMER

(See Chassis View)

The input circuit has been especially designed to be used with a low capacity antenna of the fish pole or whip type.

Truetone antennas are especially designed to be used with this radio.

Tune in a station on the high frequency end of the dial and adjust the antenna trimmer for maximum volume. A weak station which does not fade is best for this adjustment.

IMPORTANT (ALL INSTALLATIONS)

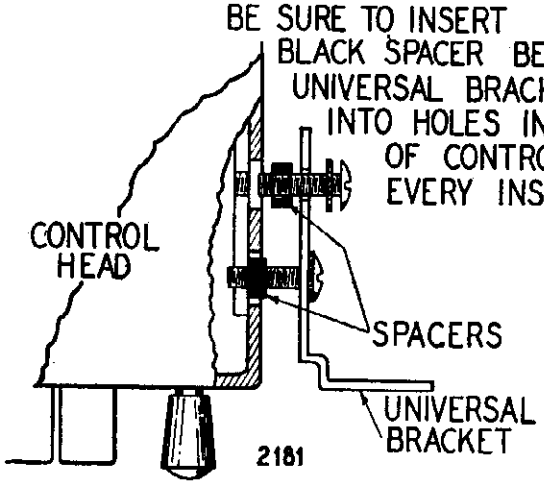
Two universal mounting brackets are supplied with the kit of hardware and are mounted in various positions on the chassis for installation in or under the dash of different cars.

In all installations it is very important that the black metal spacers be used between the front mounting brackets and the side of the chassis. The spacers must fit into the holes in the side of the chassis. They are packed in the kit of hardware.

Be sure to draw the rear mounting strap up tight so that it holds the chassis rigid.

In some installations it may be necessary to adjust the antenna trimmer before bolting the chassis to the dash.

Two pairs of extruded washers are supplied for use when bolting the chassis to the dash. Be sure the washers seat properly in the dash mounting holes and use the pair which fits the holes snugly.

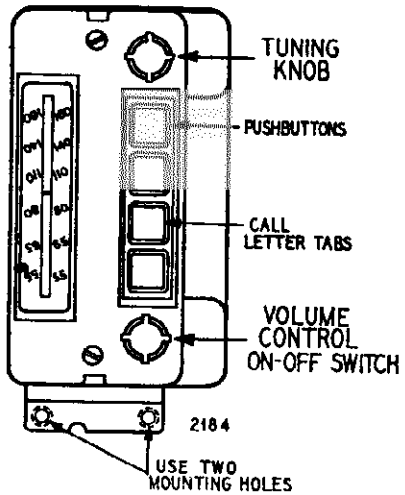


Dash Panel Mounting

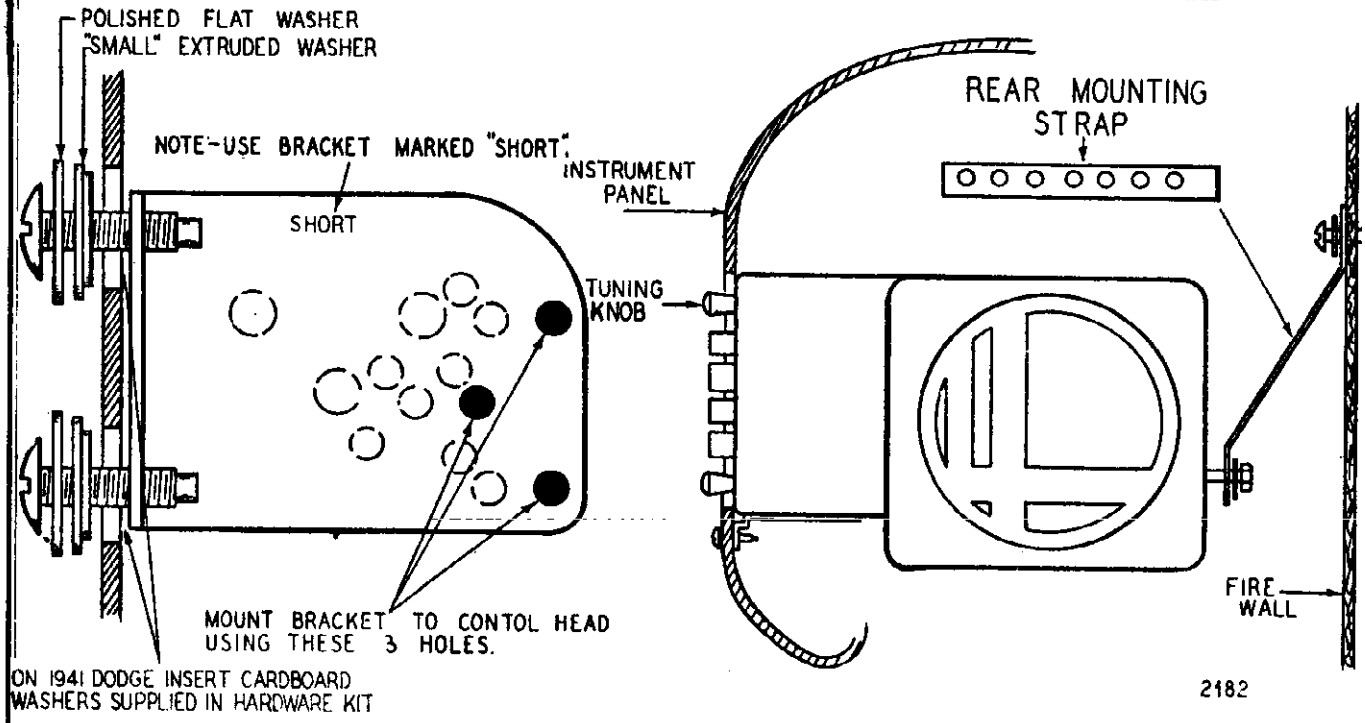
1940, 1941, 1942 and 1946 Models of Chrysler, De Soto, Dodge, Plymouth

Mount the chassis as shown with the dial vertical. A special bracket marked "short" is supplied with the kit of hardware. Mount this bracket to the chassis, using the solid black holes shown in the left hand drawing. Note that the chassis should be mounted with the tuning knob at the top. It may be necessary in some installations to reverse the bolt in the cowl lever to prevent it from hitting the speaker grill. On Plymouth cars remove Pal nut behind dash at top of dial opening so the dial will come up flush.

The call letters must be carefully trimmed to fit the push-buttons horizontally. Be sure to use the black spacers pictured above when mounting the front (short) bracket.



DIAL VIEW WHEN MOUNTED



NOTE: Lay the bracket on drawing above to identify holes. Bracket when mounted will of course be at bottom of tuner.

NOTE: Mount Chassis as shown — Be sure to use Rear Mounting Strap.

ELIMINATING MOTOR NOISE

GENERATOR CONDENSER

A Generator Condenser must be connected in all cases from the battery terminal of the generator to the Generator frame.

This condenser must not be connected across the field winding terminal on late cars which use Automatic Cutouts.

It is advisable that you find out from your local car dealers where the manufacturer recommends the condenser be connected for each make of car.

DISTRIBUTOR SUPPRESSOR

A Distributor Suppressor is required in practically all cases, except Ford V8's where none is used. The high tension lead must be removed from the distributor head and the suppressor inserted in its place. The high tension lead is then plugged into the suppressor.

AMMETER CONDENSER

A .5 Mfd. by pass condenser should be connected from one ammeter terminal to a good ground on the instrument panel. Usually this condenser plus the generator condenser and distributor suppressor will remove all objectionable ignition noise.

ELECTRICAL ACCESSORIES

If the above procedure has not reduced the noise sufficiently, it will be necessary to continue by passing sources of noise.

Accessories such as lighters, electric motor heaters, horns, light switches, automatic relays, electrical gauges such as oil, water and gas are often a source of interference. In these cases the procedure is to try a condenser from ground to various accessories until the interference is eliminated, then install the condensers in those places permanently. Spark intensifiers should not be used.

HIGH AND LOW TENSION LEADS

In many cars the low tension battery leads, etc., are grouped together with the high tension wires. These leads will very often pick up motor noise and feed it into the receiver through the battery circuit. In cases such as these it will be necessary to separate the low tension from the high tension wires and run them through another hole if they run from the engine compartment up to the instrument panel. This condition is particularly true on the V-8 Ford as the battery and primary leads run through a special tube which also houses the high tension leads. Shield and ground these leads.

IGNITION COILS

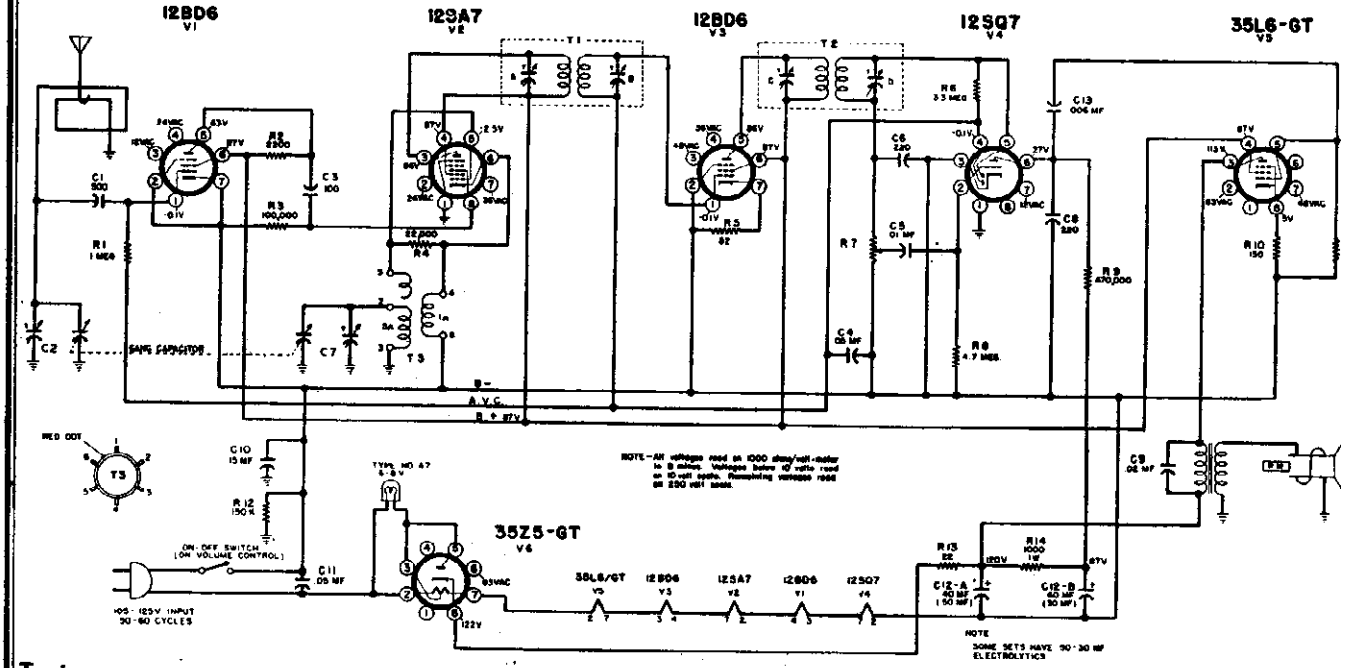
In cars where the ignition coil is located on the back side of the instrument panel it is often necessary to use an additional condenser. It must be installed from the battery side of the ignition coil to the closest ground on the instrument panel.

Short leads are very important. Where coils are mounted either on the instrument panel or in the driver's compartment, it may be necessary to shield the high tension lead from the coil to the distributor.

Part No.	Schematic Diagram Reference	Description	No. Used in Set
		CONDENSERS	
100-26	C9	.02 x 400 Volt Tubular	1
100-87	C13	.01 x 600 Volt Tubular	1
100-13	C6	.05 x 400 Volt Tubular	1
100-20	C7	.1 x 200 Volt Tubular	1
100-9	C5	.05 x 200 Volt Tubular	1
100-125	C14	.0035 x 1600 Volt Tubular	1
100-25	C11	.002 x 600 Volt Tubular	1
100-31	C15, C16, C17	.5 x 120 Volt Oval Type	3
100-81		.5 Mfd. Generator Cond.	1
100-82		.5 Mfd. Ammeter Cond.	1
119-105	C12 A-B-C	Electrolytic Filter Condenser—20 Mfd. x 25 Volt; 15 Mfd. x 350 Volt; 15 Mfd. x 350 Volt	1
124-187	C1-A-B	Ant. and Osc. Dual Trimmer	1
129-161	C8A-B	.0001 Dual Mica—10%	1
129-2	C3, C10	.0005 Mica Type—20%	2
129-188	C2	.00008 Mica Type—3%	1
129-21	C4	.0002 Mica Type—20%	1
129-12	C19	.00025 Mica Type—20%	1
11749B	C18	Spark Plate	1
		RESISTORS	
C-9B1-35	R9	4.7 Megohm, ½ Watt—20%	1
C-9B1-27	R10	220K Ohm, ½ Watt—20%	1
C-9B1-29	R11	470K Ohm, ½ Watt—20%	1
C-9B1-60	R12	680 Ohm, ½ Watt—10%	1
C-9B1-34	R6	3.3 Megohm, ½ Watt—20%	1
C-9B1-23	R7	47K Ohm, ½ Watt—20%	1
C-9B1-31	R1	1 Megohm, ½ Watt—20%	1
C-9B1-22	R2	33K Ohm, ½ Watt—20%	1
C-9B2-76	R3	15K Ohm, 1 Watt—10%	1
C-9B2-64	R15	1500 Ohm, 1 Watt—10%	1
C-9B1-50	R13, R14	100 Ohm, ½ Watt—10%	2
C-9B1-52	R4	150 Ohm, ½ Watt—10%	1
C-9B1-56	R5	330 Ohm, ½ Watt—10%	1
		COILS	
108139B	T2	Input I.F. Coil	1
108211	T3	Output I.F. Coil	1
C-211-10961 T1-A; T1-B		Permeability Tuning Unit Complete with Ant. and Osc. Coils	1
10566	L3	"A" Choke No. 16 Wire	1
10568	L1-L2	"A" Choke No. 18 Wire	2
		TRANSFORMERS	
104295	T5	Power Transformer	1
B-12C-10235	T4	Output Transformer for Speaker	1

Part No.	Schematic Diagram Reference	Description	No. Used in Set
		SPEAKER	
B-18B10236		Five Inch Electrodynamic Speaker. Less Output Transformer	1
		VIBRATOR UNIT	
12629		Plug-in Vibrator Unit	1
		DIAL AND TUNER PARTS	
A-6D-10740		Dial Scale	1
D-4B-10750		Escutcheon	1
1121029		Set of Station Call Letters	1
128773-45		Knob—For Tuning and Volume	2
115860		Shaft for Volume Control	1
128766-45		Pushbuttons	4
1121027		Pointer	1
A-53A-10989		String for Pointer	1
120442		Tension Spring for Pointer String	1
1121026		Diffuser for Dial	1
A-2M-7758		Snap-in Rivet to Fasten Diffuser	2
107400		Socket Assembly for Pilot Lite	1
10797		6-8 Volt Lite. Type T-51	1
115807		Pushrod—For Pushbuttons	4
115799		"U" Cam—With Set Screw	4
120-184		Return Springs—For Pushrods	4
117924		Tuning Shaft	1
117311		Pinion Gear—Drives Crown Gear	1
13623		Drum Assembly Complete with 115800 Crown Gear	1
120441		Tension Spring for Slug String	1
		MISCELLANEOUS	
107360B		Antenna Cable	1
107244		Ammeter Cable	1
131225		Fuse—14 Amp.—Type SFE	1
115713		Mounting Strap Bracket	1
115808		Case Mouning Bracket—Left	1
115809		Case Mounting Bracket—Right	1
115810		Case Mounting Bracket—Short Left	1
117929		Mounting Spacer	6
132293		No. 10-32 x ¾ Fancy Head Screw	2
131145		Flat Steel Washer—For Above Screw	2
131403		Extruded Washer for Chevrolet 1941-42-46	2
131397		Extruded Washer for Dodge—DeSoto—Plymouth—Chrysler 1940-41-42-46	2
13625		Complete Kit of Mounting Hardware Including Brackets, Condensers, Screws, etc.	
131-50		Buzz, Clips—for case	10

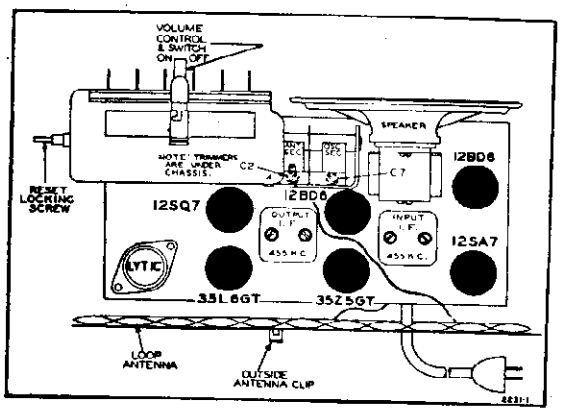
BELMONT RADIO CORP.



Tuning range	530 to 1650 Kc.
Intermediate frequency	455 Kc.
Power consumption	35 Watts
Sensitivity (for 0.05 watt output)	40 microvolts average
Selectivity	55 Kc. broad at 1000 x signal at 1000 Kc.
Power output (in voice coil)	
Undistorted	0.8 watt
Maximum	1.0 watt
Voice coil impedance	3.2 ohms

NOTE: On some sets slug tuned I. F.'s are used instead of trimmer tuned I. F.'s. 108-140Q and 108-145H are trimmer tuned. B-13A-12023-1 and B-13B-12022-1 are slug tuned. The slug tuned I. F.'s are tuned from the top and bottom (secondary on top, primary on bottom).

When trimmer tuned I. F.'s are used, R5 is 270 ohms.



Chassis View, showing tube locations

ALIGNMENT PROCEDURE

- No aligning adjustments should be attempted until all other possible causes of trouble have been checked.
- Chassis must be removed from cabinet for proper alignment. Slight adjustments of the oscillator and antenna circuits can be made, without removing the chassis, through two holes provided on the bottom of the cabinet. The two adjustment screws can be reached with a long insulated screwdriver.
- It is important that during alignment the loop antenna be maintained at the same distance from the chassis as when the chassis is installed in the cabinet.
- Turn volume control to maximum for all adjustments.
- Connect ground post of signal generator to B— of radio through a 0.1 mfd. condenser.
- Connect dummy antenna value in series with generator output lead.
- Connect output meter across primary of output transformer.

Band	Signal Generator Frequency Setting	Dummy Antenna	Connection to Radio	Tuning Condenser Setting	Adjust for Maximum Output (see chassis view)
I.F.	455 Kc.	0.1 mfd.	Grid of 12SA7	Rotor full open (plates out of mesh)	4 trimmers on input a output I.F. transforme
Broadcast	1650 Kc.	0.1 mfd.	Grid of 12SA7	Rotor full open (plates out of mesh)	Oscillator trimmer C on bottom of radio
	1400 Kc.	None	See note A	Set dial at 1400 Kc.	Antenna trimmer C2 on bottom of radio

Note A: Lay output lead of generator in back of loop antenna. Turn up generator output. Loop antenna will pick up energy.

MODEL 6D130
SERIES A

BELMONT RADIO CORP.

IMPORTANT!

This receiver, unless otherwise marked, must be operated on an AC voltage of 105 to 125 volts, 50 to 60 cycles, or on a DC voltage of 105 to 125 volts. If you are in doubt as to the voltage of your power supply, consult your local power company. DO NOT INSERT THE PLUG IN THE POWER RECEPTACLE UNLESS YOU ARE SURE THAT THE CORRECT VOLTAGE IS AVAILABLE. Receivers of this same model which are for use on voltages other than those specified above are so marked.

SETTING THE PUSHBUTTONS

The pushbuttons may be used, after proper adjustment, for the automatic tuning of any six stations which you select. They can be set up in any order.

1. Turn on the radio. Allow it to warm up for at least one minute.
2. Push out the call letters of the six stations from the call-letter sheet supplied with this manual.
3. Insert one call-letter tab in the rectangular opening in each of the pushbuttons, in any sequence. Press an acetate tab (supplied in small envelope) into each of of the pushbuttons.
4. With the screwdriver supplied, check to see that the locking screw in the center of the tuning knob (see illustration) is loose. If it is not, turn it several turns to the left (counterclockwise).
5. Press the first pushbutton down *all the way*. With one hand hold the button down *firmly* and with the other carefully tune in the desired station. Release the pushbutton.
6. Follow this procedure for each of the five other buttons, adjusting each one for a different station.
7. Rotate the tuning knob on the side of the cabinet as far to the right as it will go. Tighten the locking screw in the center of the knob. IT IS IMPORTANT THAT THIS SCREW BE TIGHTENED VERY FIRMLY.
8. The pushbuttons are now properly set for automatic tuning. Any of the six stations may now be tuned in simply by pressing the proper button down as far as it will go. If it is desired to reset any of the buttons for a new station, loosen the locking screw in the center of the tuning knob, set the pushbutton as described above, and re-tighten the locking screw.

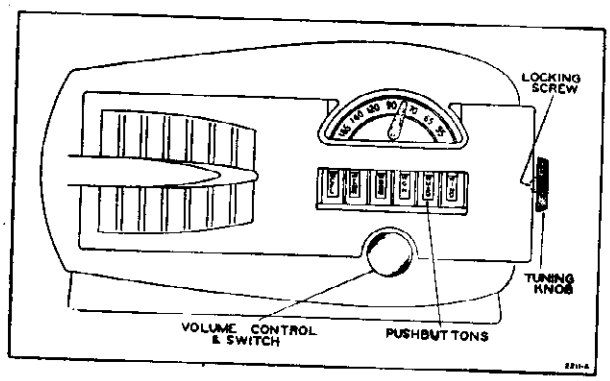
ANTENNA AND GROUND

The antenna (aerial) built into the rear of the cabinet is sufficient for receiving programs from strong local stations and from powerful nearby stations. This antenna may be somewhat directional, that is, reception is improved when the antenna is facing in certain directions. Therefore tune in a station and try the radio in several positions.

In locations remote from broadcasting stations or where receiving conditions are poor, an outside antenna, 50 to 75 feet long, will give best results. The antenna should be erected as high as possible, as far from surrounding objects as is practical, and at right angles to street car lines and power lines. Connect the antenna lead-in wire to the antenna clip at the rear of the radio

Periodic inspection of the antenna is recommended to make sure that all connections are clean and tight and that the antenna is well insulated from the ground at all points.

No ground wire is required with this radio.



1. Check the power at the receptacle by inserting the plug of a lamp cord and noticing whether the lamp lights. If the radio is being operated on direct current, try reversing the plug of the radio line cord.
2. If an outside antenna is being used, check all connections to be sure they are clean and tight. Make sure that the antenna is insulated from the ground at all points.
3. Take out the tubes and have them tested. The tubes may be removed as follows: First disconnect the line cord from the power receptacle. Then remove the four buttons which hold the back of the cabinet in place. Unclip the two leads connected to the loop antenna on the inside of the back. Remove each tube by holding it near its base, rocking it back and forth, and pulling upward. WHEN REPLACING TUBES, BE SURE THAT THE TYPE NUMBER OF EACH TUBE CORRESPONDS TO THE TYPE NUMBER STAMPED ON THE CHASSIS ALONGSIDE THE TUBE SOCKET.

If for any reason it is found necessary to remove the chassis, proceed as follows: Make sure the line cord is disconnected from the power receptacle. Remove the back as described above. Pull the volume knob off its shaft. Unscrew the locking screw in the center of the tuning knob and pull the tuning knob off its shaft. Remove the four chassis mounting screws from the bottom of the cabinet. Move the chassis toward the back of the cabinet so that the control shafts and tuner assembly clear the holes. The chassis can then be slipped out. After the chassis is replaced the automatic pushbuttons will probably have to be reset.

APPLYING POWER TO RADIO

Insert the line plug in the power receptacle. If no sound is heard after one minute, and the set is operating on direct current (DC), reverse the plug. If the set is operating on alternating current (AC), a low steady hum may be noticeable after the set warms up. Reverse the plug and notice whether or not there is any difference. Leave the plug in the position which gives less hum.

The power consumption of this radio is 35 watts, slightly less than that of a 40-watt electric light bulb.

BELMONT RADIO CORP.

MODEL 6D1
SERIES A

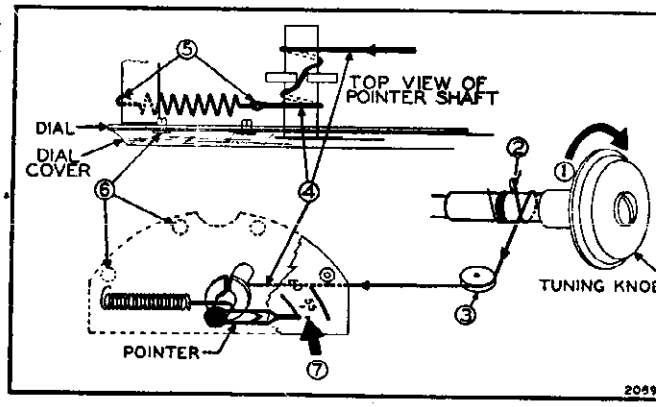
Ref. No.	Part No.	Description
		Condensers
C-12A, C-12B	A-8C-11375 or	Filter cond., 40 mfd., x 40 mfd., x 150 volts
	A-8C-15030 or	Filter cond., 40 mfd., x 40 mfd., x 150 volts
	A-8C-15262	Filter cond., 50 mfd., x 30 mfd., x 150 volts
C4	C-8D-10770	.05 x 200 volts, tubular
C9	C-8D-10774	.02 x 400 volts, tubular
C5	C-8D-11738	.01 x 200 volts, tubular
C11	C-8D-10813	.05 x 400 volts, tubular
C10	C-8D-10953	.15 x 400 volts, tubular
C13	C-8D-10785	.006 x 600 volts, tubular
C6, C8	C-8G-11733	220 mmf., ceramic
C1	C-8G-11822	500 mmf., ceramic
C3	C-8G-11734	100 mmf., ceramic
		Resistors
R14	C-9B2-62	1000 ohms, 1 watt, 10%
R9, R11	C-9B1-94	470K ohms, ½ watt, 20%
R8	C-9B1-35	4.7 megohms, ½ watt, 20%
R6	C-9B1-34	3.3 megohms, ½ watt, 20%
R4	C-9B1-78	2.2K ohms, ½ watt, 20%
R13	C-9B1-42	22 ohms, ½ watt, 10%
R3	C-9B1-25	100K ohms, ½ watt, 20%
R2	C-9B1-66	2200 ohms, ½ watt, 10%
R12	C-9B1-26	150K ohm, ½ watt, 20%
R1	C-9B1-31	1 megohm, ½ watt, 20%
R10	C-9B1-52	150 ohms, ½ watt, 10%
R5	C-9B1-49 or	82 ohms, ½ watt, 10%
	C-9B1-55	270 ohms, ½ watt, 10%
		Coils
	C-13E-15280 or C-13E-15293	Loop antenna assembly, complete on back
T3	B-13D-15277	Oscillator coil
T1	108-140Q or B-13A-12023-1	Input I. F. coil in can, 455 Kc.
T2	108-145H or B-13B-12022-1	Output I. F. coil in can, 455 Kc.
		Sockets
	A-15C-15189	7-prong, tube socket
	121171	8-prong socket, laminated
	121216	Socket base, bakelite
	A-47A-11470	Pilot light socket assembly

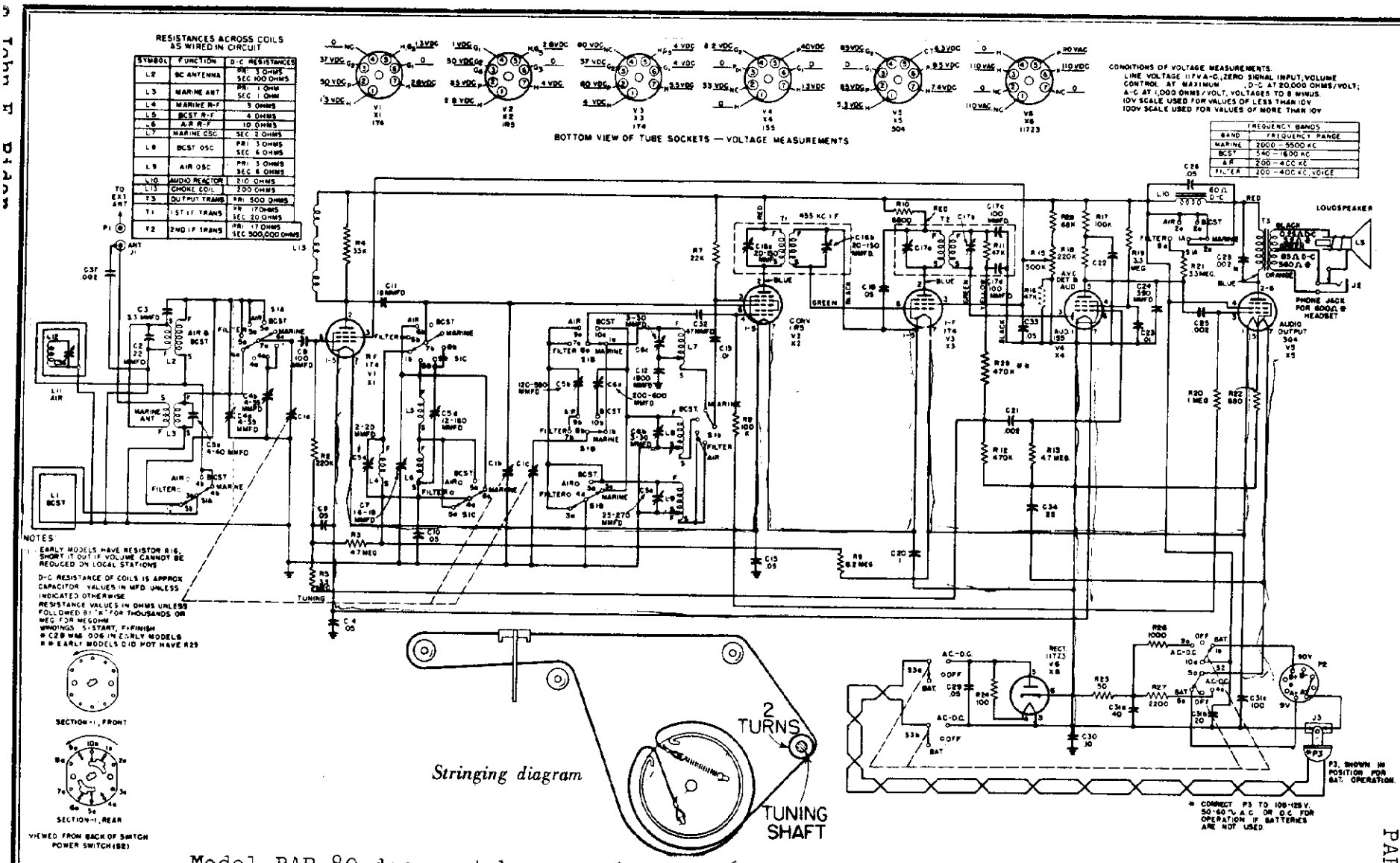
Ref. No.	Part No.	Description
		Speaker
	114197	5-inch, P.M. speaker
	B-12C-15278	Output transformer for speak
		Dial Parts
	115448	End plate (right hand bracke
	115448C	End plate (left hand bracket)
	115146	Cams
	115143	Key washer (13 used on cam shaft)
	117528	Brass spacer (1 used on cam shaft)
	117602	Brass spacer (4 used on cam shaft)
	131181	Spring washers for locking co
	117604	Locking collar
	117600	Level shaft
	115361	Lever with roller
	120283	Return spring for levers
	115449B	Dial bracket assembly
	112785	Pointer
	A-53A-10989	Drive cord, 6 inches used
	A-49A-11087	Spring on tuning shaft, for cc
	A-3N-11086	Spacer under above spring
	120143	Take-up spring for drive cord
	B-6D-10241-2	Dial scale
	112-659-1	Crystal, clear, for dial scale
	A-2M-7758	Cinch buttons for fastening sc to bracket
	117833	Brass spacer (for spacing poi from dial)
		Miscellaneous
	10798	Line cord and plug
R7	101218 or A-10A-10626	Volume control and switch, 1 megohm
C1-A, C1-B	B-8A-10211	2- gang, variable condenser
	107249	Pilot light bulb, type T-47
	134123	Rubber bumper (bottom of ca
	13141	Cinch buttons, to cover trimme holes in cabinet
	B-5B-14298-8	Pushbuttons (6 used), Ivory
	A-23L-11900	Station call letters, set
	A-6C-14299	Acetate tabs for call letters
	5C-15128-9	Cabinet, bakelite, ivory color
	128-686-8	Knob, volume, ivory color
	A-5B-10994-9	Knob, tuning, ivory color
	A-3F-10995	Locking screw for tuning knob
	120388	Locking spring for tuning kno
	A-2H-10996	Reset key
	5C-15128-36	Cabinet, walnut
	128-686-37	Knob, volume, walnut
	A-5B-10994-36	Knob, tuning, walnut
	B-5B-14298-37	Pushbuttons, walnut

REPLACING DIAL POINTER DRIVE CORD

Six inches of cord are required in the set. Use a piece slightly longer so that knots may be tied at each end. Numbers below correspond to circled numbers in diagram.

1. Rotate tuning knob to extreme clockwise position. This closes tuning condenser. Knob should remain in this position until installation is completed.
2. Tie cord to loop in spring as shown. Wind cord one turn around shaft in direction shown.
3. Pass cord over idler pulley.
4. Pass cord *over* pointer shaft; wind it one turn around shaft; pass it through key washer; wind it one more turn around shaft.
5. Hook spring over end of dial support. Tie cord to spring. IMPORTANT: Before tying knot stretch spring enough so that full contraction of spring will rotate pointer shaft at least one-half turn.
6. Remove dial crystal by removing Cinch buttons.
7. Make sure tuning knob is in extreme clockwise position. Then rotate pointer clockwise, against friction of shaft, until it is in horizontal position, as shown.



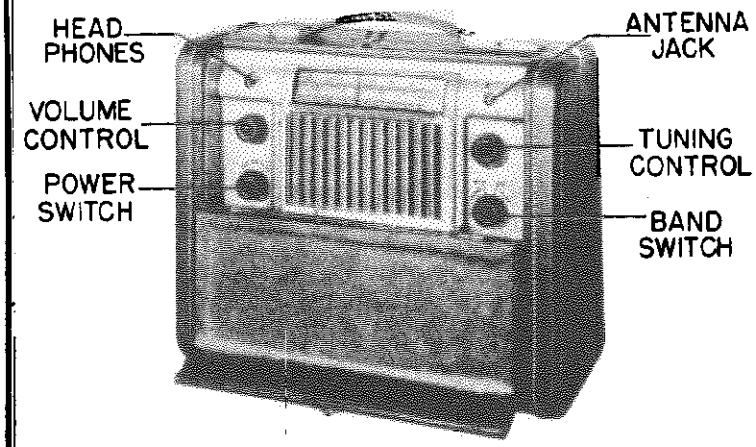


Model PAR-80 does not have resistor R16.

SELECTIVITY—**Bandwidth at 10 X down; 15 kc for 1000 kc, 22 kc for 300 kc, 19 kc for 3500 kc.**

STANDARD AUDIO OUTPUT—Approximately 150 milliwatts. Speaker integral with receiver.

TUBE COMPLEMENT—1T4 R-F, 1R5 Converter, 1T4 I-F, 1S5 Detector, AVC and First Audio, 3Q4 Audio Output, 1173 Rectifier.



Model PAR 80

SPECIFICATIONS

Power Requirements
(a) 105 - 125 DC or 60 cycle AC
(b) Bendix Battery Pack AB225
Power Consumption
19 Watts
Tuning Frequency Range
Air Band 200 - 400 KC
Broadcast Band 540 - 1600 KC
Marine Band 2000 - 5500 KC
Immediate Frequency
455 KC
Power Output
Maximum .320 Watts
Tube Complement
2-1T4, 1-1R5, 1-1S5, 1-3Q4
Total 5, Plus 117Z3 Rectifier
Loudspeaker
5" diameter PM

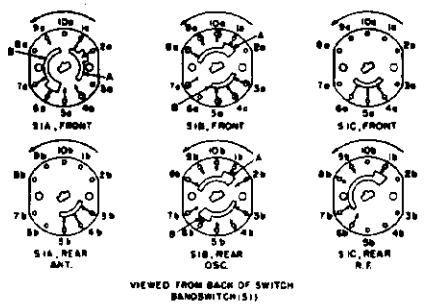
GENERAL

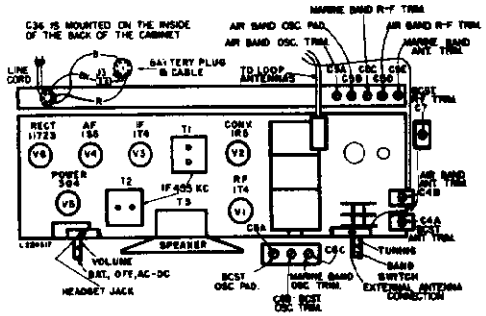
The Bendix Radio Model Par 80 provides reception of the Air, Standard Broadcast, and Marine bands. The Filter position of the band switch selects Air Band (200-400 KC) for voice reception with minimum interference from A and N code signals or the 1020 cycle tone. This receiver can be operated on AC, DC, or from a self-contained Bendix Battery Pack AB225, or equivalent. Battery must provide B supply of 90V and A supply of 9V, 8 prong plug, and dimensions not greater than 10½" x 3¼" x $4\frac{1}{16}$". Line cord must be plugged into battery switch located in cabinet rear compartment before receiver can be operated on battery power. An external antenna is required for Marine band reception, and will improve reception on other bands as well. Attach antenna to plug at upper left of front panel. Headphones with 600 ohm impedance may be used, and when plugged into jack at upper right of front panel, disconnect speaker from circuit.

SENSITIVITY measurements made for 50 mw output, using Hazeltine standard loop (24" spacing) for the broadcast and air bands and using RMA standard dummy antenna for the marine band.

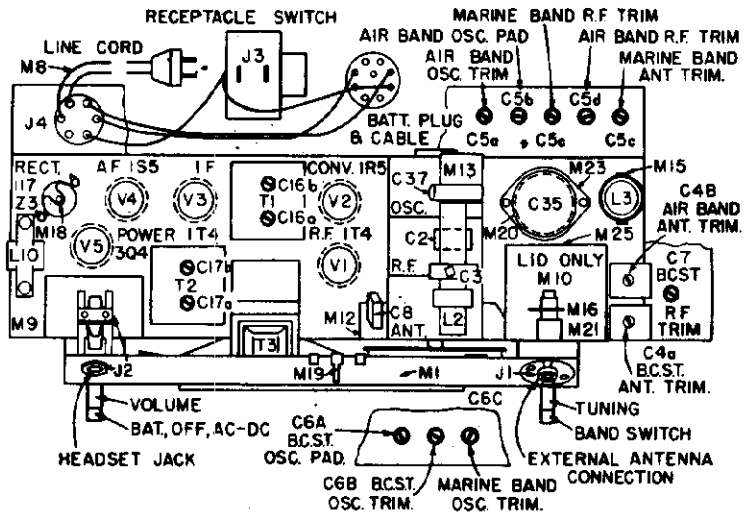
Freq.	Approx. Sens.	Freq.	Approx. Sens.
1475 KC	20 uv/M	400 KC	15 uv/M
1000 KC	25 uv/M	2000 KC	50 uv
580 KC	40 uv/M	3000 KC	25 uv
200 KC	45 uv/M	5000 KC	20 uv
300 KC	25 uv/M		

Model PAR-80A only.

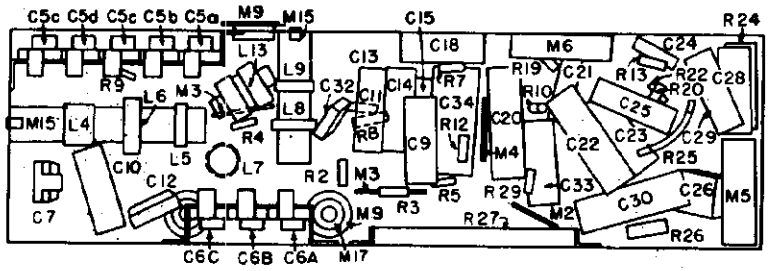




MODEL PAR-80 ONLY



Trimmer Location Diagram



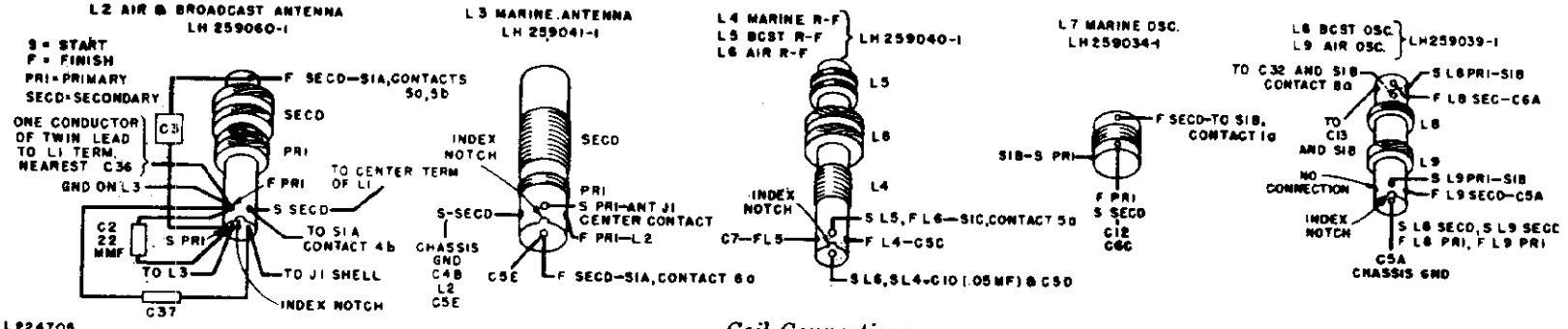
Component Diagram Bottom View

ALIGNMENT PROCEDURE

Connect line cord plug to 117V, 60 cycle AC power source. Use full volume and set signal generator to produce .05 W (9.38V, AC) or less of receiver output to prevent AVC action. Plug output meter (560-600 ohms impedance) or AC meter (shunted by 560-600 ohms) into phone jack. Use 30% modulated AM signal for RF alignment.

ALIGNMENT CHART

INPUT FREQ.	THROUGH	TO	BAND SWITCH POSITION (Circuit)	DIAL POINTER POSITION	ADJUSTMENTS	REMARKS
455 KC	.01 mf or Larger	Pin #6 V2, I8S	BCST. (IF)	High end of band	C17b, C17a C16b, C16a	Adjust for Max.
5500 KC	400 ohms	J1	Marine (RF)	5500 KC	C4, C5c C5e	Adjust for Max.
Adjustment of the BCST. Trimmers, RF and ANT., will necessitate adjustment of AIR Trimmers, RF and ANT.						
1550 KC	100 mmf	J1	BCST. (RF)	1550 KC	C4b, C7 C4a	Adjust for Max.
600 KC	100 mmf	J1	BCST. (RF)	600 KC	C4a	Rock tuning control for Max. output
1550 KC	100 mmf	J1	BCST. (RF)	1550 KC	C4b, C7 C4a	Adjust for Max.
400 KC	100 mmf	J1	Air (RF)	400 KC	C5a, C5d C4b	Adjust for Max.
200 KC	100 mmf	J1	Air (RF)	200 KC	C5b	Rock tuning control for Max. output
400 KC	.00 mmf	J1	Air (RF)	400 KC	C5a, C5d C4b	Adjust for Max.
455 KC	100 mmf	J1	Air (IF Trap)	High end of band	C34	Adjust for Minimum



Coil Connections

MODEL PAR-80

BENDIX RADIO DIV.

REPLACEMENT PARTS LIST

Stock Number	Symbol Number	Description
		ELECTRICAL COMPONENTS
CV0C07	(C1a,b,c)	CAPACITOR—Variable 3 Sections
CM5A05	(C2)	CAPACITOR—Mica 22 mmf 500V
CC9A16†	(C3)	CAPACITOR—Ceramic 3.3 mmf
CT2A16	(C4a,b)	CAPACITOR—Antenna Trimmer
CT5A01	(C5a,b,c,d,e)	CAPACITOR—Trimmer
CT3A01	(C6a,b,c)	CAPACITOR—Trimmer
CT1A19†	(C7)	CAPACITOR—Trimmer 1.6-18mmf
CM5A22†	(C8)	CAPACITOR—Mica 100 mmf 500V
CP2T40†	(C9,10,14,15, 18,29,33)	CAPACITOR—Paper .05 mfd—10% +30% 200V
CM6A16	(C11)	CAPACITOR—Mica 18 mmf ±10% 500V
CM6E64	(C12)	CAPACITOR—Mica 1800 mmf ±10% 500V
CP2T31†	(C13,23)	CAPACITOR—Paper .01 mfd —10% +20% 200V
CT2A06†	(C16a,b)	CAPACITOR—Trimmer
CT3A08†	(C17a,b,c,d)	CAPACITOR—Trimmer
CP2T51†	(C20,22,30)	CAPACITOR—Paper .1 mfd —10% +20% 200V
CP2T12†	(C21,25)	CAPACITOR—Paper .002 mfd —10% +20% 200V
CM6A48	(C24)	CAPACITOR—Mica 390 mmf ± 10% 500V
CP0M48	(C26)	CAPACITOR—Paper .05 mfd ±10% 120V
CP4T12†	(C28,37)	CAPACITOR—Paper .002 mfd—20% +40% 600V
CE3A04	(C31a,b,c)	CAPACITOR—Electrolytic (40-20 mfd) (100 mfd)
CM5A14†	(C32)	CAPACITOR—Mica 47 mmf 500V
CE1T00†	(C34)	CAPACITOR—Electrolytic 25 mfd 25 VDC
CT1A21	(C36)	CAPACITOR—Trimmer, Mica 12-160 mmf
RC22A224M†	(R2,18)	RESISTOR—Comp. 220K ¼W
RC22A475K	(R3,13)	RESISTOR—Comp. 4.7 meg ±10% ¼W
RC22A333M†	(R4)	RESISTOR—Comp. 33K ¼W
RC22A335M†	(R5,19,21)	RESISTOR—Comp. 3.3 meg ¼W
RC22A223M†	(R7)	RESISTOR—Comp. 22K ¼W
RC22A104M†	(R8,17)	RESISTOR—Comp 100K ¼W
RC22A825K	(R9)	RESISTOR—Comp. 8.2 meg ±10% ½W
RC22A682M†	(R10)	RESISTOR—Comp. 6.8K ¼W
RC22A473M†	(R11)	RESISTOR—Comp. 47K ¼W
RC22A474M†	(R12,29)	RESISTOR—Comp. 470K ¼W
RV0C09	(R15)	RESISTOR—Pot. .5 meg ±30%
RC22A105M†	(R20)	RESISTOR—Comp. 1 meg ¼W
RC22A681K	(R22)	RESISTOR—Comp. 680 ohms ±10% ¼W
RC24A101M†	(R24)	RESISTOR—Comp. 100 ohms 1W
RW1A09	(R25)	RESISTOR—Wirewound 50 ohms 1W
RC24A102M†	(R26)	RESISTOR—Comp. 1000 ohms 1W
RW0B08†	(R27)	RESISTOR—Wirewound 2.2K ±10%
RC23A683K†	(R28)	RESISTOR—Comp. 68K ±10% ½W
TI0C03†	(T1)	TRANSFORMER—IF 1st
TI0D04†	(T2)	TRANSFORMER—IF 2nd
TA0D17	(T3)	TRANSFORMER—Output
LA0S00	(L2)	COIL—Antenna (Bdct. & Air)
LA0C01	(L3)	COIL—SW Ant.
LJ0S00	(L4,5,6)	COIL—RF (Marine, Air, Bdct.)
LO6C01	(L7)	COIL—SW Oscillator
LO6S00	(L8,9)	COIL—Oscillator (Bdct. & Air)
LF0100	(L10)	COIL—Choke (Audio)
LF0A05	(L13)	COIL—Choke, RF 20mh
AL0Z17	(L1)	ANTENNA—Loop AM
AL0Z16	(L11)	ANTENNA—Loop, Long Wave
TI0W00	(L12)	TRAP—IF Wave
SP5R00†		SPEAKER—5" PM
SR4F00	(S1)	SWITCH—Band 4 Position, 3 Section
SR3B00†	(S2,3)	SWITCH—Rotary 2 Pole, 3 Position
		MECHANICAL COMPONENTS
AD0C00	(M1)	ASSEMBLY—Dial Back Plate
BT1S01†	(M2)	BOARD—Terminal (1 Lug, 1 Mtg.)
BT2S00†	(M3)	BOARD—Terminal (2 Lug, 1 Mtg.)
BT3S01†	(M4)	BOARD—Terminal (3 Lug, 1 Mtg.)
BT3S07†	(M5)	BOARD—Terminal (3 Lug, 1 Mtg.)
BT3S00	(M6)	BOARD—Terminal (3 Lug, 1 Mtg.)
CD0N02	(M7)	CABLE—Dial
CL2A07†	(M8)	CORD—Line AC
CS0M06†	(M9)	COVER—Switch Shield
CS0M07	(M10)	COVER—Bandswitch Shield
DS0E02		DIAL—Scale, Marine, Bdct. & Air
GR0S00†	(M11)	GROMMET—Rubber Shockmount
HB0M01†	(M12)	BRACKET—Variable Capacitor Mtg.
HB0M99	(M13)	BRACKET—Coil Mtg.
HC0C00†	(M14)	CLIP—Coil Mtg.
HC0C02†	(M15)	CLIP—Coil Mtg.
HC0C03†		CLAMP—Dial Cable
HC0C13†		CLIP—IF 2nd
HC0S00†	(M16)	CLIP—Spring (Tuning Shaft)
HR0S01†		RIVET—Shoulder (.171 x .118)
HS0C00†		SPRING—Coil (Dial Cable)
HS6F01†	(M17)	SPACER—Tuning Cond. Mtg.
HS0X09†	(M18)	SPRING—Tube Retainer
HZ0S00†		STUD—Trimount (Dial Scale)
ID0M26	(M19)	INDICATOR—Metal Dial (Pointer)
IM0P03		INSULATOR—Bandswitch Mtg.
IT0C02	(M20)	INSULATOR—Paper Tube (Elec. Cap)
IT0P00		INSULATOR—Flexible Tubing (Vinylite)
JR1003	(J2)	JACK—Midget, Phone 1 Contact
JP8009†	(J4)	PLUG—Bat. 8 Contact
JR2008†	(J3)	RECEPTACLE—Line Cord Switch (Bat.)
JR1S00†	(J1)	RECEPTACLE—1 Pin Single Contact Ant.
MB0B00†	(M21)	BEARING—Brass (Tuning Shaft)
MP0100†		PULLEY—Idler Fiber
MS0T12†	(M22)	SHAFT—Tuning
PI0C00†	(M23)	PLATE—Cap. Insulator Mtg.
PI0P04†	(M24)	PLATE—Line Cord
SM0B03†		SHIELD—Metal Base Tube
SM0C06	(M25)	SHIELD—Band Switch
SM0T04†	(M26)	SHIELD—Tube
SO7M11		SOCKET—Miniature, 7 Prong
WF0100†	(M27)	WASHER—Insulating Ant. Jack
XS0CT6		INSULATOR—Shield Switch
		CABINET COMPONENTS
BZ0D23†		BAFFLE—Grille
BZ0D28†		BAFFLE—Speaker Chipboard
GC0D01†		GASKET—Dial Cork
GF0S00		GASKET—Felt Speaker
GZ0C07		GRILLE—Cloth
HB0M61†		BRACKET—Mtg. Latch & Carry Strap
HC0S64†		CLIP—Spring Latch Pin
HH0S03†		HOUSING—Battery Switch
HK0R00†		RING—Knob Retainer Spring
HN9S02		NUT—Speed (On Grille)
HP0M04†		GUIDE—Top Center
HP0P12		PIN—Latch Hinge
HS0C73†		SPRING—Latch Coil
HS0F14†		SPACER—Right, Flat Strap Assy.
HS0F15†		SPACER—Left, Flat Strap Assy.
HS0S17		STUD—Latch Pin
HZ0C01†		LATCH—Right
HZ0C02†		LATCH—Left
HZ0C10		LATCH—Top Section
HZ0L03		HANDLE—Leather
IM0A00		INSULATOR—Mtg. Shelf Cover
IM0P01		INSULATOR—Paper, Battery Switch
IM0P02		INSULATOR—Paper, Battery Switch
JP1002†		PLUG—1 Contact Ant.
KB0R00		KNOB—Control, Index (Red)
KC0R01		KNOB—Control (Red)
NE0B01		NAMEPLATE—Bendix (Brass)
PI0R00		PLATE—Loop Retainer (Paper)
PI0R01		PLATE—Wave Trap Retainer (Paper)
PZ0M01		PANEL—Front
ZW6P01		CABINET—

†Used on previous models ‡Complete assembly—see separate manual for proper code.

Circuit Symbols	*Description*
	CAPACITORS
C1a, C1b, C1c	Three-sect var min 11 mmf, increment C 420 mmf for ea sect, ant sect front, osc sect rear (NH260025-1)
C2	22 mmf ±20%, 500v dcw, mica (CH267500-220)
C3	3.3 mmf ±20%, 500v dcw, ceramic, orange code band, part of L2, (CH267007-003)
C4a, C4b	4-35mmf ea sect, 2 sect (CH260039-1)
C5a, C5b, C5c, C5d, C5e	5 sect trimmer: 25-270 mmf, 120-580 mmf, 2-20 mmf, 12-160 mmf, 4-40 mmf (CH260031-1)
C6a, C6b, C6c	3 sect trimmer: 200-600 mmf, 3-30 mmf, 3-30 mmf (CH260032-1)
C7	1.6 to 18 mmf trim (AH260035-1)
C8	100 mmf ±20%, 500v dcw, mica (CH267500-101)
C9, C10, C14, C15, C18, C29, C33	.05 mmf —10% +30%, 200v dcw, paper, (CH267000-503)
C11	18 mmf ±10%, 500v dcw, mica (CH267503-180)
C12	1800 mmf ±10%, 500v dcw, mica (CH267515-182)
C13, C28	.01 mf —10% +20%, 200v dcw, paper (CH267000-103)
C16a, C16b	20-150 mmf ea of 2 sect, nonreplaceable part of T1
C17a, C17b, C17c, C17d	20-150 mmf, 25-130 mmf, 100mmf, 100 mmf, nonreplaceable part of T2
C20, C22, C30	.1 mf —10% +20%, 200v dcw, paper, (CH267000-104)
C21, C25	.002 mf —10% +20%, 200v dcw, paper, (CH267000-202)
C24	390 mmf ±10%, 500v dcw, mica, (CH267503-391)
C26	.05 mf ±10%, 120v dcw, molded paper (CH267033-503)
C28, C37	.002 mf +40% —20%, 600v dcw, paper (CH267003-202)
C31a, C31b, C31c	lub 1, 40 mf +100% —10%, 150v dcw, lug 2, 20 mf +100%, —10%, 150v dcw, lug 3, 100 mf +250% —10%, 25v dcw, can is gnd, dry electrolytic (CH267020-1)
C32	47 mmf ±20%, 500v dcw, mica, (CH267500-470)
C34	25 mf +250% —10%, 25v dcw, electrolytic, (CH267014-1)
C36	12-160 mmf, mica, trim (CH260042-4)
	CONNECTORS
J1	Ant rec, one contact (AH266005)
J2	Phone jack (AH274086)
J3	Receptacle for ac/dc plug P3 (AH258020)
	COILS
L1	Bcst. loop ant (LH254014-2)
L2	Ant coil includes C3 (LH259060-1)
L3	Ant coil (LH259041-1)
L4, L5, L6	Three windings, L5 and L6 series adding (LH259040-1)
L7	Osc coil (LH259034-1)
L8, L9	Osc coil (LH259039-1)
L10	Reactor, aud, approx. 0.49 hy at 1000 cyc (CH265031)
L11	Air band loop ant (NH 251141-1)
L12	Coil, universal winding, i-f trap (CH259068-1)
L13	Choke, 20 mh at 1000 cyc (CH259067-1)
	CONNECTORS
P1	Ant connec, one male contact (AH266032)
P2	Batt plug, 8-contact (AH266037)
P3	Two-prong plug, part of W1
	RESISTORS
R2, R18	220K ±20%, 1/4w (CH268500-224)
R3, R13	4.7 meg ±10%, 1/4w (CH268504-475)
R4	33K ±20%, 1/4w (CH268500-333)
R5, R19, R21	3.3 meg ±20%, 1/4w (CH268500-335)
R7	22K ±20%, 1/4w, (CH268500-223)
R8, R17	100K ±20%, 1/4w (CH268500-104)
R9	8.2 meg ±10%, 1/4w (CH268504-825)
R10	6800 ohms ±20%, 1/4w (CH268500-682)
R11	47K ±20%, 1/4w, part of T2 (CH268500-473)
R12, R29	470K ±20%, 1/4w (CH268500-474)
R15	500K ±20%, potentiometer (CH262010-1)
R20	1 meg ±20%, 1/4w (CH268500-105)
R22	680 ohms ±10%, 1/4w (CH268504-681)
R24	100 ohms ±20%, 1w (CH268503-101)
R25	50 ohms ±20%, 1w, ww, (CH268002-500)
R26	1000 ohms ±20%, 1w (CH268503-102)
R27	2200 ohms ±10%, 10.9 max w, ww, (CH268004-2)
R28	68K ±10%, 1/2w (CH268505-683)
	SPEAKER
LS	Speaker, 5", 3.2 ohm impedance voice coil (LH256009-2)
	SWITCHES
S1	4 position, 8 sect (LH258014)
S2, S3	Rotary switch, 3 pos. 2 pole, (CH258007-1)
	TRANSFORMERS
T1	Resonates at 455 kc, includes C16a, C16b (LH251075-2)
T2	Resonates at 455 kc, includes C17a, C17b, C17c, C17d, R11 (LH251070-1)
T3	Output, pri 10,000 ohms impedance at 400 cyc, secd 3.2/500 ohms impedance at 400 cyc (CH265024-1)
	VACUUM TUBES
V1, V3	1T4
V2	1R5
V4	1S5
V5	3Q4
V6	117Z3
	CABLES
W1	AC-DC line cord, includes P3 (CH268910-2)
W2	Batt cable, includes P2 and J3 (CH251155-1)
	SOCKETS
	Miniature socket (OCH266091)
	MECHANICAL PARTS
	Base for tube shield AH274088 (AH274137 for base)
	Cable, dial (specify 32") special thin linen (AH270001-3)
	Dial, tuning (CH257562)
	Grille cloth for speaker (AH253609)
	Knob, has color-filled index groove (LH269013-1)
	Knob, does not have index groove (LH269013-2)
	Pointer, tuning dial (CH270244-2)
	Shield, tube (AH274088)
	Strap, carrying (CH253573-1)
	Strap and latch assem, entire assem including latches, mtg bracket, and carrying strap (CH251176-1)

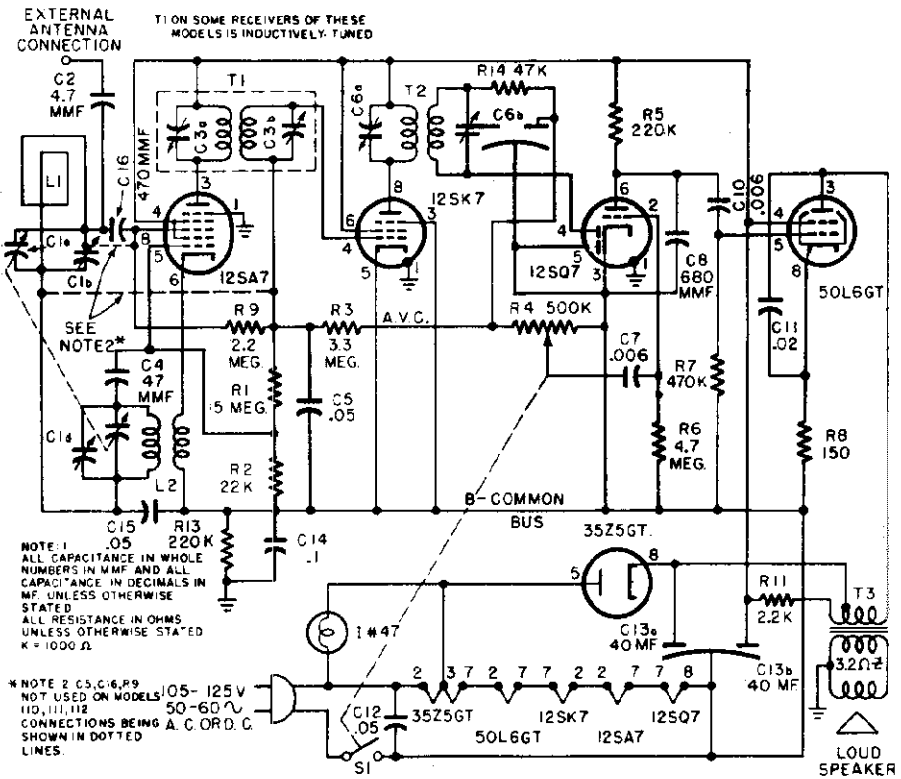
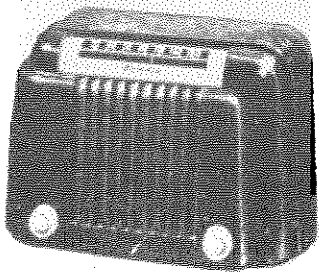
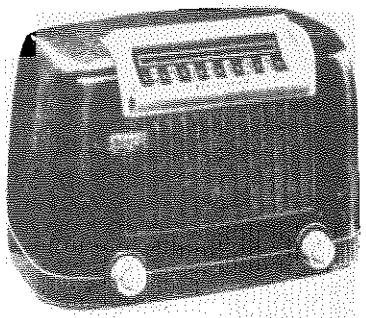


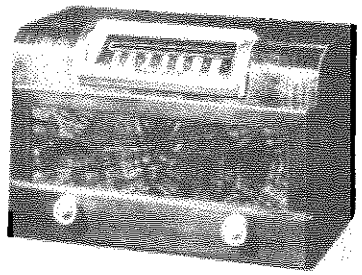
FIG. 1 - SCHEMATIC DIAGRAM MODELS 110, 110W, 111, 111W, 112, 114, 115



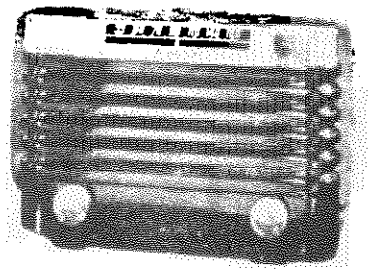
MODEL 110 - Walnut Finish Plastic
MODEL 110W - Ivory Plastic



MODEL 111 - Walnut Finish Plastic
MODEL 111W - Ivory Plastic



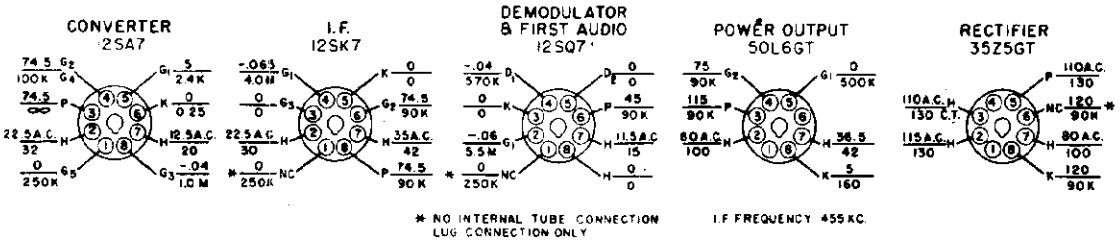
MODEL 112 - Walnut



MODEL 114 - Tan & Brown Polystrene
MODEL 115 - Ivory & Burgundy Polystrene

CONDITIONS OF MEASUREMENTS

LINE VOLTAGE 117 A-C. ZERO SIGNAL INPUT VOL CONT. MIN SOCKET VOLTAGE / RESISTANCE TO COMMON B MINUS D.C. AT 20,000 Ω/V A-C AT 1,000 Ω/V



* NO INTERNAL TUBE CONNECTION LUG CONNECTION ONLY

I.F FREQUENCY 455 KC.

SPECIFICATIONS

5 Tube AC-DC Superheterodyne

Power
Voltage.....105-125 V. A.C. or D.C.
Frequency.....50-60 Cycles per Second
Power Consumption.....30 Watts
I.F. Frequency.....455 K.C.
Tuning Range.....540-1620 K.C.
Max. Power Output.....1.8 Watts
Loud Speaker.....P.M.
Cone Diameter.....4 Inches
Voice Coil Impedance.180 Cycles, 3.2 Ohms

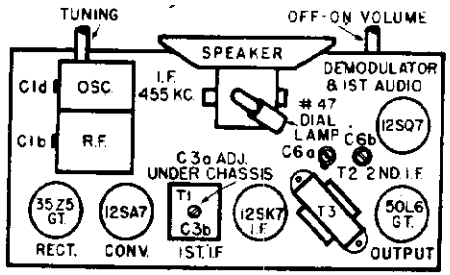


FIG. 2 - TRIMMER LOCATION

ALIGNMENT CHART

CIRCUITS ALIGNED	DIAL POINTER	INPUT FREQUENCY	APPLY THROUGH	ADJUST
I. F.	Max. to Right	+ 455 K.C.	.01 Mfd	C3a, C3b, C6a, C6b,
Broadcast	1475 Ref. Mark	1475 K.C.	50 Mmf	C1d C1b
Broadcast	965 Ref. Mark	965 K.C.	50 Mmf	Check Calibration*
Broadcast	580 Ref. Mark	580 K.C.	50 Mmf	Check Calibration*

* If calibration does not check within the frequency mark, both oscillator and antenna sections of the gang condenser must be bent to correct tracking.

\+ Signal Generator connected to external antenna connection for complete alignment.

GENERAL

Before making any alignment adjustments, turn the receiver and all power operated test equipment on and allow to warm up, if at all possible, for at least five minutes. Turn tuning gang fully closed and set dial pointer directly over Reference mark on dial. See Fig. 3.

After receiver has warmed up and dial pointer has been properly set, turn volume control full on and rotate tuning gang to full open (high frequency end of broadcast band) position. Connect low range of output meter across voice coil and refer to ALIGNMENT CHART

Signal generator to be connected to external antenna connection through an isolating capacitor as given in ALIGNMENT CHART. Keep input signal as low as practical at all times and make all adjustments for maximum output meter reading.

PRECAUTIONS

An isolating transformer should be used between the AC power line and the receiver for protection of any test equipment that must be operated from the same power line.

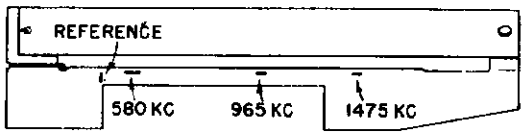


FIG. 3 - DIAL REFERENCE POINTS

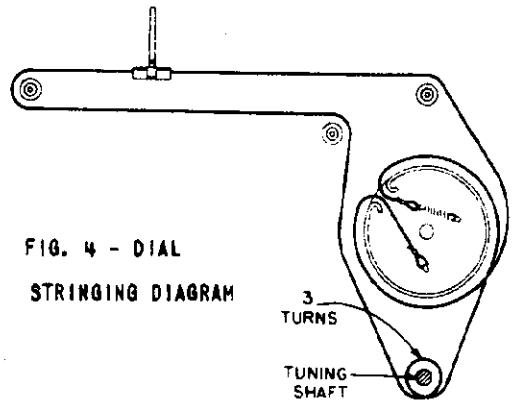


FIG. 4 - DIAL STRINGING DIAGRAM

Stock Number	Description
	ELECTRICAL COMPONENTS
CC8A30	CAPACITOR-Ceramicon 47 mmf (C4)...
CC8A18+	CAPACITOR-Ceramicon 4.7 mmf (C2)..
CC9K44	CAPACITOR-Ceramicon 680 mmf 300V (C8).....
CE2D01	CAPACITOR-40-40 mf, 150V. 2 sectio: Electrolytic (C13a, C13b).....
CP4T20+	CAPACITOR-Tubular Paper .006 mfd 400V (C7) (C10).....
CP4T34+	CAPACITOR-Tubular Paper .02 mfd 400V (C11).....
CP4T40+	CAPACITOR-Tubular Paper .05 mfd 400V (C12) (C5).....
CP4T51+	CAPACITOR-Tubular Paper .01 mfd 400V (C14).....
CT2A05	CAPACITOR-2 section Trimmer (C6a, C6b).....
CV0B05	CAPACITOR-Variable (C1).....
LO6B03	COIL-Osc. (L2).....
RC1H40+	RESISTOR-Comp. 22,000 ohms ½W (R2).
RC1H44	RESISTOR-Comp. 47,000 ohms ½W (R14).
RC1H54+	RESISTOR-Comp. 220,000 ohms ½W (R5) (R13).....
RC1H58+	RESISTOR-Comp. 470,000 ohms ½W (R7).
RC1H68+	RESISTOR-Comp. 3.3 Meg. ½W (R3).....
RC1H70+	RESISTOR-Comp. 4.7 Meg. ½W (R6)....
RC1H76+	RESISTOR-Comp. 15 Meg. ½W (R1).....
RC4H28	RESISTOR-Comp. 2200 ohms 2W (R11)..
RV0S02	POTENTIOMETER-(with switch S1) (R4).
RW1B28+	RESISTOR-Wirewound 150 ohms 1W (R8)
SP4R00	SPEAKER-4" P.M. Rd (less Trans.)..
TA0C10	TRANSFORMER-Output (T3).....
TI0C09	TRANSFORMER-1st. IF (T1).....
TI0D12	TRANSFORMER-IF Output (T2).....
#47 +	LAMP-Bayonet Base.....

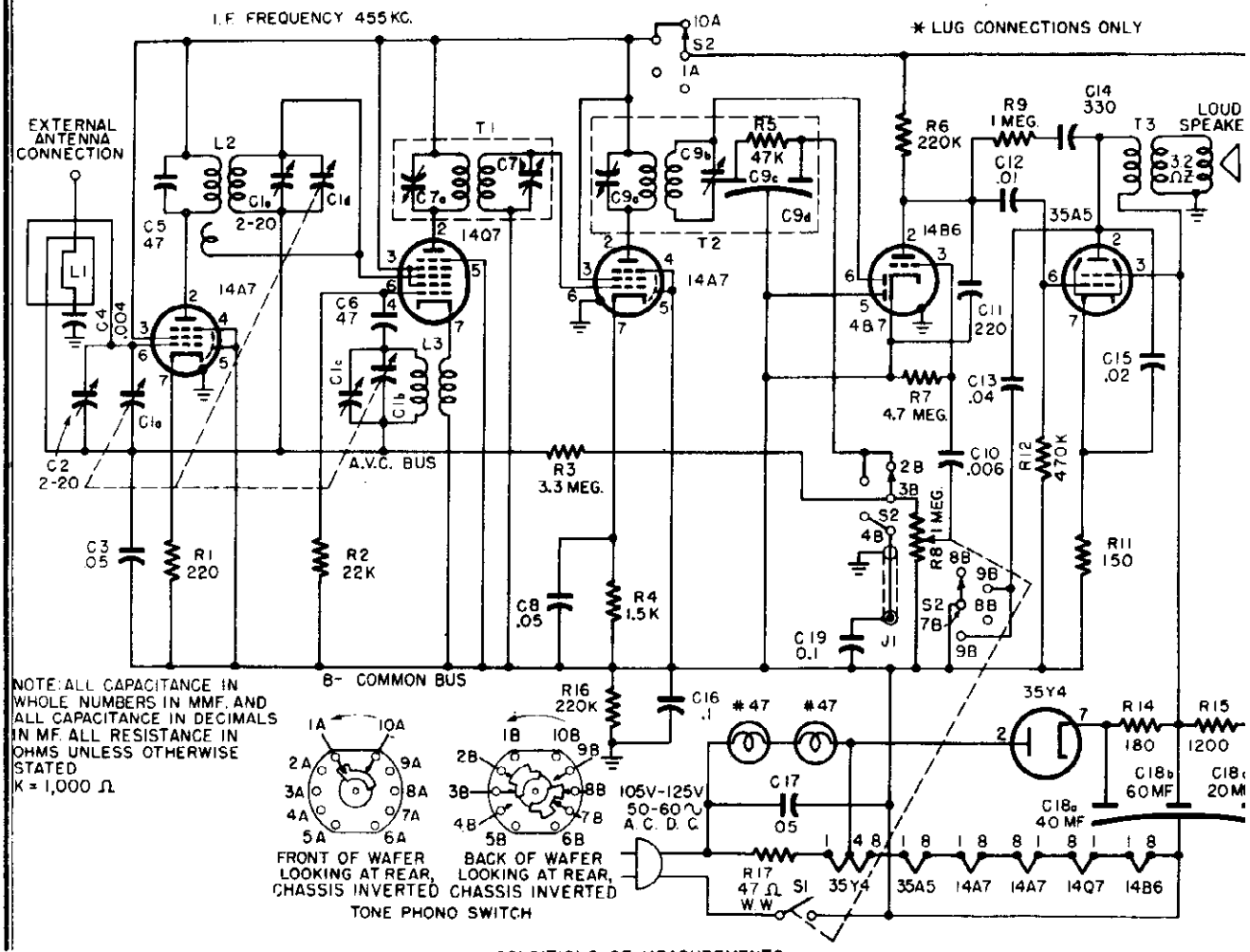
MODELS 110, 110W, 111, 111W, 112, 114, 115 — BENDIX RADIO DIV.

Stock Number	Description
	GENERAL MECHANICAL COMPONENTS
AD0B02	PLATE-Dial Back.....
BT4S04	BOARD-Terminal (4 terminal - 1 Mtg.).....
BT4S05	BOARD-Terminal (4 terminal - 1 Mtg.).....
CL2A06+	CORD-AC Power (Ivory).....
CL2A07+	CORD-A.C. Power (Brown).....
HR0S02+	RIVET-.118 x .218 Shoulder.....
HS0C00+	SPRING-Coil Dial Cable.....
HC0C03+	CLAMP-Dial Cable.....
HC0S00+	CLIP-Tuning Shaft Spring.....
HC0S60	CLIP-1st. IF Mtg.....
HC0S61	SPRING-Dial Back Plate Window.....
HZ0S08+	STUD-Trimount (Window).....
ID0M14	INDICATOR-Dial.....
MB0B00	BEARING-Tuning Shaft.....
MP0I00+	PULLEY-Dial Cord Idler.....
MS0T00+	SHAFT-Tuning.....
PI0P03	PLATE-Line Cord Insulator.....
SO0D00+	SOCKET-Dial Light.....
SO8S01+	SOCKET-Octal Tube.....
WP0D01	WINDOW-Dial.....
XS0C00+	STRIP-Dial Cable Protector.....
	CABINET COMPONENTS FOR MODEL 110
AL0Z10	ANTENNA-Loop (L1).....
BZ0D14	BAFFLE-Speaker.....
DS0A23	DIAL-Scale.....
HC0S01+	SPRING-Baffle Retainer.....
HK0R00+	RING-Control Knob Retainer.....
HP0B02	PLATE-Base.....
HZ0S00+	STUD-Trimount Dial Scale.....
KC0L00	KNOB-Beige Control.....
ZP0B01+	CABINET-Brown Plastic.....
	CABINET COMPONENTS FOR MODEL 110W
DS0A22	DIAL-Scale.....
KC0M00	KNOB-Maroon Control.....
ZP0I01+	CABINET-Ivory.....
	CABINET COMPONENTS FOR MODEL 111
BZ0D18	BAFFLE-Cloth and Speaker.....
DS0A25	DIAL-Scale.....
ED0M02	ESCUTCHEON-Dial.....
HC0D07	SPRING-Escutcheon Retainer.....
HC0S63	CLIP Spring Baffle Retainer.....
HH0D01	HOLDER-Dial & Escutcheon.....
HK0R00+	RING-Control Knob Retainer.....
HP0B02	PLATE-Base.....
KC0B12	KNOB-Control.....
PI0B01	COVER-Asbesto Base Plate.....
ZP0B03	CABINET-Brown.....

Stock Number	Description
	CABINET COMPONENTS FOR MODEL 111W
DS0A30	DIAL-Scale.....
KC0M01	KNOB-Maroon Control.....
ZP0I02	CABINET-Ivory.....
	CHASSIS COMPONENTS FOR MODEL 112
ID0M17	INDICATOR-Dial.....
WP0D05	WINDOW-Dial Back.....
	CABINET COMPONENTS FOR MODEL 112
AL0Z11	BACK-Loop and.....
BZ0D21	BAFFLE-Grille Assy. &.....
ED0M03	ESCUTCHEON-Dial.....
HH0D02	HOLDER-Dial & Escutcheon.....
HP0B03	PLATE-Base.....
KC0B01	KNOB-Control.....
ZW5A01	CABINET-Wood.....
	CHASSIS COMPONENTS FOR MODELS 114 - 115
CP4T40+	CAPACITOR-Paper .05 mfd 400V (C15).
ID0M18	INDICATOR-Dial.....
RC1E58	RESISTOR-Comp. 470,000 ohms ½W (R9).
WP0D04	WINDOW-Dial Back.....
	CABINET COMPONENTS FOR MODELS 114-115
AL0Z12	LOOP-Back and.....
DS0A28	DIAL-Scale.....
GC0D00	GASKET-Dial Mounting Cork.....
GR0D00+	GASKET-Dial Mounting Rubber.....
HK0R00+	RING-Control Knob Retainer.....
HP0B03	PLATE-Base.....
HZ0S01	STUD-Loop & Back Mtg.....
	CABINET COMPONENTS FOR MODEL 114
KC0B13	KNOB-Control (Brown).....
ZP0T01	CABINET-Plastic (Dark Brown & Light Brown).....
ZC0B05	BOTTOM & SIDE SECTIONS-(Light Brown).....
ZC0T02	TOP & SIDE SECTIONS-(Dark Brown)..
	CABINET COMPONENTS FOR MODEL 115
KC0I00	KNOB-Ivory Control.....
ZP0T00	CABINET-Plastic (Ivory & Maroon)..
ZC0B04	BOTTOM-Front Sections (Maroon)....
ZC0T01	TOP-& Side Sections Ivory.....

BENDIX RADIO DIV.

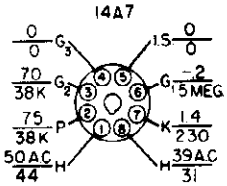
MODELS 300, 300W
301, 302



CONDITIONS OF MEASUREMENTS

LINE VOLTAGE 117 A-C. ZERO SIGNAL VOL. CONT. MIN. SOCKET VOLTAGE / RESISTANCE TO COMMON B MINUS D. C. AT 20,000Ω A. C. AT 1,000Ω / V.

R.F. 14A7



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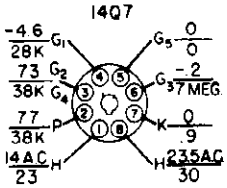
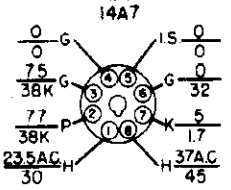
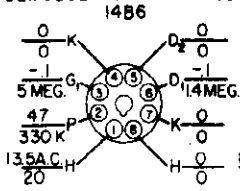


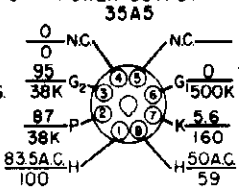
I.F. 14A7



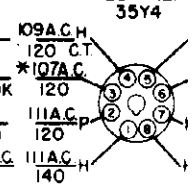
DEMODULATOR & 1ST. AUDIO 14B6

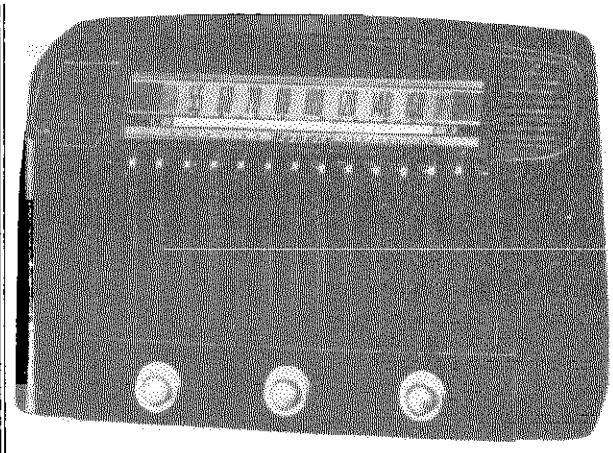


POWER OUTPUT 35A5

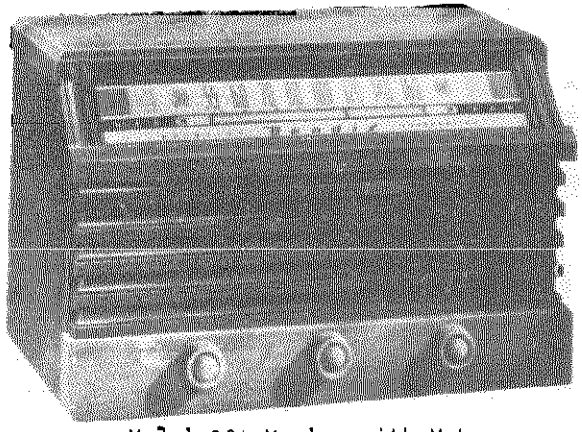


RECTIFIER 35Y4





Model 300 Brown Plastic
Model 300W Ivory Plastic



Model 301 Maple, with Mahogany finish grille
Model 302 Mahogany finish with Maple grille

MODELS 300, 300W, 301, 302

BENDIX RADIO DIV.

ALIGNMENT PROCEDURE

Connect line cord plug to 117 volt, 60 cycles AC power source. Set volume control at maximum clockwise position and tone control (S2) in counterclockwise position. Connect output meter across voice coil. Adjust dial pointer by turning tuning control fully counterclockwise and sliding dial pointer on dial cord to Reference Mark on dial back plate, (See Fig. 5). Make all adjustments in order given in ALIGNMENT CHART on opposite page and for maximum output. Keep input as low as possible at all times.

PRECAUTIONS

An isolating transformer should be used between the power supply and the receiver if any of the test equipment is AC operated. The use of isolating capacitors is not recommended as AC though the capacitor may introduce hum modulation, and if the capacitors should break down the test instruments will likely be damaged.

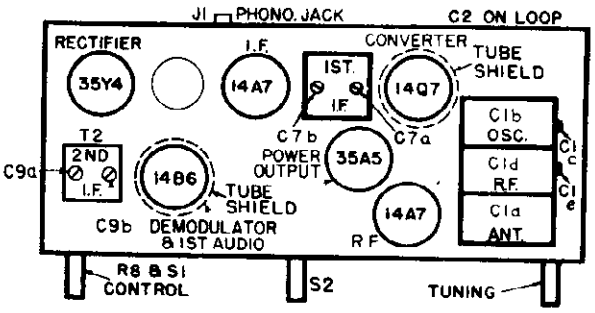
ALIGNMENT CHART

Circuit Aligned	*Input Freq.*	*Dial Pointer Position*	*Adjustments*
IF	*455 KC	Max. to right	C9b, C9a, C7b, C7a
OSC.	**1475 KC	1475 Ref. Mark	C1c
RF	**1475 KC **965 KC **580 KC	1475 965 580	C1e, C2 +Check Calibration

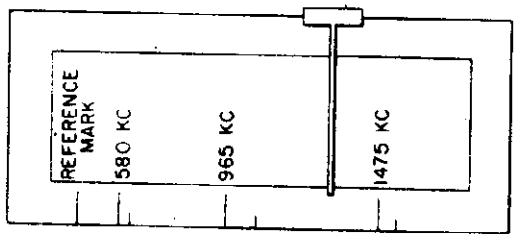
* Applied to Antenna Input through .1 mfd. or less.

** Applied to Antenna input through 50 mmf. or less.

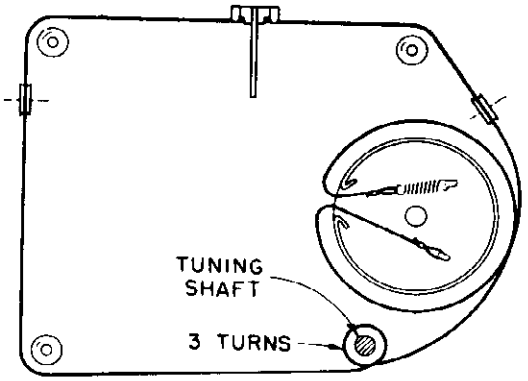
\+ If dial pointer calibration is not within plus or minus 10 KC the gang rotor plates must be bent to cause correct tracking.



Trimmer Location Diagram



Dial Reference Points



Dial Cord Stringing Diagram

SPECIFICATIONS

Model 300 Series

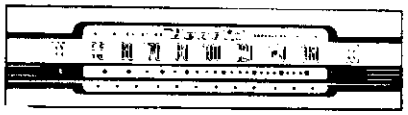
POWER

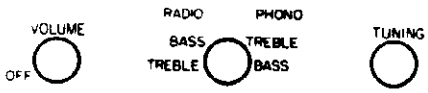
Voltage Rating, AC or DC.....105-125
Frequency-Cycles per second.....50-60
Power Consumption-Watts.....30

TUNING RANGE-FREQUENCY IN KC.....540-1620
INTERMEDIATE FREQUENCY (KC).....455
MAXIMUM POWER OUTPUT IN WATTS.....1.2
LOUD SPEAKER-PM OVAL
Cone diameter-inches.....4 x 6
Voice Coil Impedance (ohms at 400 cycles).....3.2

TUBE COMPLEMENT

2 - 14A7, 1-14Q7, 1 - 14B6, 1 - 35A5, 1 - 35Y4
Two #47 dial lamps





Control Layout

BENDIX RADIO DIV.

MODELS 300, 300W
301, 302

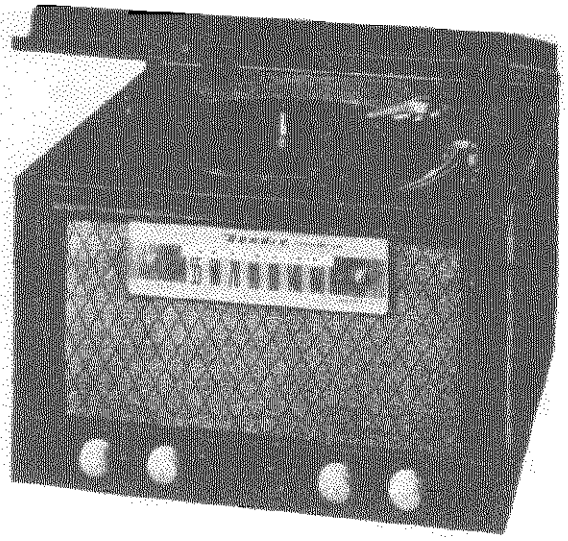
Stock Number		Description

ELECTRICAL COMPONENTS

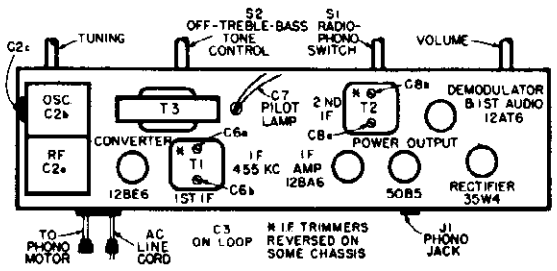
CC8F40	+	CAPACITOR-Ceramic 330 mmf (C14)..
CE3A00	+	CAPACITOR-Electrolytic, 40,60, 20 mfd. (C18A,B,C).....
CM5A14	+	CAPACITOR-Mica 47 mmf (C5(C6)....
CM5A30	+	CAPACITOR-Mica 220 mmf (C11).....
CP4T20	+	CAPACITOR-Paper .006 mfd 400V (C10).....
CP4T31	+	CAPACITOR-Paper .01 mfd 400V (C12).....
CP4T34	+	CAPACITOR-Paper .02 mfd 400V (C15).....
CP4T38	+	CAPACITOR-Paper .04 mfd 400V (C13).....
CP4T40	+	CAPACITOR-Paper .05 mfd 400V (C3) (C8) (C17).....
CP4T51	+	CAPACITOR-Paper .1 mfd 400V (C19) (C16).....
CP6T16	+	CAPACITOR-Paper .004 mfd 600V (C4).....
CT2A06		CAPACITOR-Trimmer (C7a, b).....
CT3A00		CAPACITOR-Trimmer (C9a, b).....
CV0C04	+	CAPACITOR-Variable (C1).....
LO5B01	+	COIL-Oscillator (L3).....
RC4D14	+	RESISTOR-Comp. 200 ohms 2W (R14).
RC1H16	+	RESISTOR-Comp. 220 ohms ½w (R1)..
RC1H26	+	RESISTOR-Comp. 1500 ohms ½w (R4).
RC1H40	+	RESISTOR-Comp. 22,000 ohms ½w (R2).....
RC1H44	+	RESISTOR-Comp. 47,000 ohms ½w (R5).....
RC1H54	+	RESISTOR-Comp. 220K ohms ½w (R16) (R6).....
RC1H58	+	RESISTOR-Carbon 470K ohms ½w (R12).....
RC1H62	+	RESISTOR-Comp. 1 Meg ½w (R9).....
RC1H68	+	RESISTOR-Comp 3.3 Meg. ½w (R3)...
RC1H70	+	RESISTOR-Comp. 4.7 Meg. ½w (R7)..
RC3H25	+	RESISTOR-Comp. 1200 ohms 1w (R15).
RV4S03		POTENTIOMETER-1 Meg. (with switch) (R8) (S1).....
RW1B28	+	RESISTOR-Wirewound 150 ohms 1w (R11).....
RW2S07		RESISTOR-Wirewound 47 ohms 2w ±10% (R17).....
SP4000		SPEAKER-4" x 6" P.M.....
SR4C00	+	SWITCH-3 Pole 4 Position (S2).....
TA0001		TRANSFORMER-output (T3).....
TI0C01	+	TRANSFORMER-I.F. input (T1).....
TI0D03	+	TRANSFORMER-I.F. output.....
TR6L00	+	COIL-R.F. Interstage (L2).....
#47	+*	LAMP-Bayonet Base.....

MECHANICAL COMPONENTS

AD0C07		ASSEMBLY-Dial Back Plate.....
AL0C06	+*	ANTENNA-Loop.....
BT1S00	+	BOARD-Terminal.....
BT2S00	+	BOARD-Terminal.....
BT4S01	+	BOARD-Terminal.....
BZ0R00	+	FOOT-Rubber.....
CD0C16		CABLE-Dial 46½".....
GR0S00	+	GROMMET-Capacitor Shockmount....
HB0M00	+	BRACKET-Variable Capacitor.....
HC0C00	+	CLIP-Coil Mtg.....
HC0C03	+	CLAMP-Cable.....
HC0D00	+	FASTENER-Dial (R.H.).....
HC0D01	+	FASTENER-Dial (L.H.).....
HC0S00	+	CLIP-Spring.....
HC0S01	+	CLIP-Baffle Spring Retainer.....
HC0S62		CLIP-Window Spring.....
HC0T00	+	CLIP-Tube Shield Ring.....
HK0R00		CLIP-Knob Retainer.....
HP0B01	+	PLATE-Base.....
HR0S01	+	RIVET-Shoulder.....
HS0C00	+	SPRING-Dial Cord.....
HS8F01	+	SLEEVE-Spacer.....
HZ0S08		STUD-Trimount (Dial back window mounting).....
ID0M15		INDICATOR-Dial.....
JR1S00	+	RECEPTACLE-Phono (J1).....
MB0B00	+	BEARING-Tuning Shaft.....
MP0I00	+	PULLEY-Dial Cord Idler.....
MS0T02	+	SHAFT-Tuning.....
PI0C00	+	PLATE-Filter Capacitor Mtg.....
PI0P02	+	PLATE-Line Cord Insulating.....
RD0A00		REFLECTOR-Dial (Fishpaper).....
SM0T00	+	SHIELD-Tube.....
SO0D11		SOCKET-Dial Light.....
SO8L03		SOCKET-Loktal Tube.....
WP0D02		WINDOW-Dial Back Plate.....



Model 613 Radio-Phonograph



Trimmer Location Diagram

ALIGNMENT PROCEDURE

Refer to page 1 for general instructions and precautions. The builtin loop antenna must be connected to the chassis during alignment or a 192 u.h. inductance substituted in place of the loop. During alignment of the IF channel the tuning gang should be fully open (high frequency end of band). If calibration does not check within the dial reference marks at 965 and 580 KCS the tuning gang rotor plates must be bent to obtain proper tracking. This is a difficult operation and must be attempted by experienced technicians only.

ALIGNMENT CHART

Circuit Aligned	Input Frequency	Apply Through	Adjust
IF	455 KCS	.01 mfd.	C8b, C8a C6b, C6a
Osc.	1475 KCS	50 mmf.	C2c
Antenna	1475 KCS	50 mmf.	C3
	965 KCS 580 KCS	50 mmf.	Check Calibration

The radio chassis used in the model 613A Receiver-Phonograph combination is an AC-DC superheterodyne design, using four tubes in the radio circuit and one as a vacuum tube rectifier. The chassis will operate on DC but the record changer will operate only on 105-125 volts, 60 cycles AC. All tubes are of the miniature type.

Before making any alignment adjustments, turn the receiver and all power operated test equipment on and allow to warm up, if at all possible, for at least five minutes. Turn tuning gang fully closed and set dial pointer directly over Reference Mark on dial.

After receiver has warmed up and dial pointer has been properly set, turn volume control full on and rotate tuning gang to full open (high frequency end of broadcast band) position. Connect low range of output meter across voice coil and refer to ALIGNMENT CHART on Page 3 for detailed procedure to follow in making adjustments.

Signal generator to be connected to external antenna connection through an isolating capacitor as given in ALIGNMENT CHART. Keep input signal as low as practical at all times and make all adjustments for maximum output meter reading.

PRECAUTIONS

If any test instruments used for alignment or servicing are operated from the AC power line, an isolating transformer should be used to isolate the receiver from the power source. Isolating capacitors are not recommended as hum-modulation may be introduced into the receiver.

SPECIFICATIONS

Power Requirements
105-125 volts, 60 cycles AC

Power Consumption (including phonograph)
60 watts

Speaker
6 inch P.M.

Voice coil impedance
Ohms at 400 cycles - 3.2

Record Changer
Automatic twelve 10-inch or ten 12-inch standard records

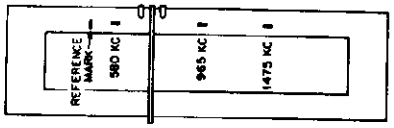
Dial Lamp
1 - No. C-7 dial lamp
110 volt, candelabra base

Tuning or Frequency Range
540-1620 KCS

IF Frequency
455 KCS

Tube Complement
1 - 12BE6, 1 - 12BA6, 1 - 12AT6, 1 - 50B5
1 - 35W4

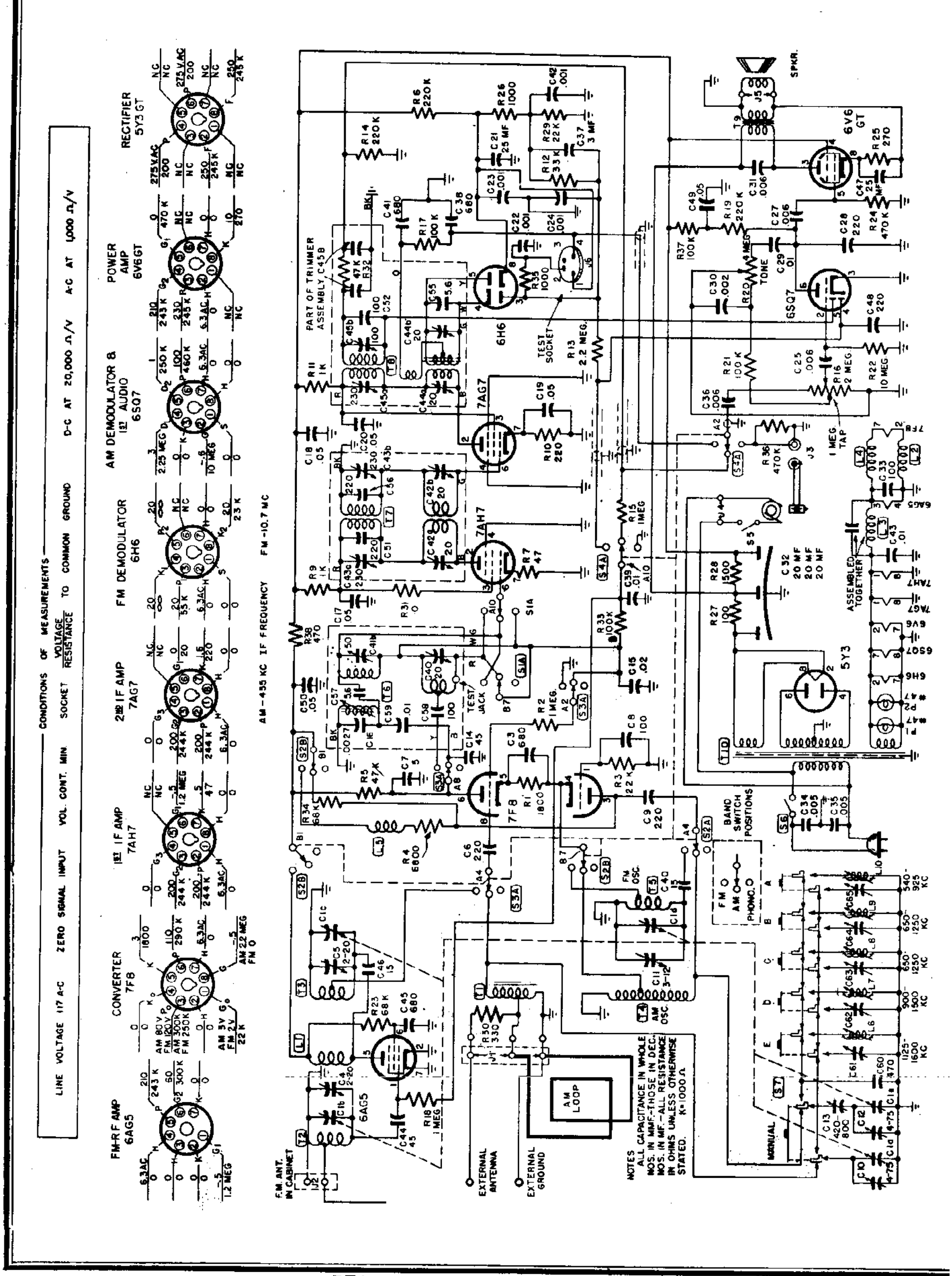
Maximum Power Output
2.0 watts



Dial Reference Marks

MODEL 613 BENDIX RADIO DIV.

Stock Number	Description
	ELECTRICAL COMPONENTS
ALOZ14 *	ANTENNA-Loop.....
CC6A30 +	CAPACITOR-Ceramicon 47 mmf (C5)
CC6A34 +	CAPACITOR-Ceramicon 100 mmf (C19).....
CC6A38	CAPACITOR-Ceramicon 220 mmf 500v (C15).....
CC9A18 +	CAPACITOR-Ceramic.....
CE3E02 +	CAPACITOR-Electrolytic 40-40-40 mfd (C17a,b,c).....
CE1T04 +	CAPACITOR-Electrolytic 25 mfd 25v (C18).....
CP4T20 +	CAPACITOR-Paper .006 mfd 400v (C10, 11).....
CP4T31 +	CAPACITOR-Paper .01 mfd 400v (C13, C14).....
CP4T34 +	CAPACITOR-Paper .02 mfd (C16) 400v.....
CP4T40 +	CAPACITOR-Paper .05 mfd 400v (C7, 12).....
CP4T51 +	CAPACITOR-Paper .1 mfd 400v (C9).....
CP4T56 +	CAPACITOR-Paper .2 mfd 400v (C4).....
CT1A18	CAPACITOR-Mica Trimmer (2-20) mmf (C3).....
CT2A06 +	CAPACITOR-Trimmer (C8a,C8b)....
CT2A12	CAPACITOR-Trimmer (C8a,C8b, C8c).....
CV0B04	CAPACITOR-Variable (C2).....
LO5B04	COIL-Oscillator (L2).....
RC3G14	RESISTOR-Comp. 150 ohms 1w (R13).....
RC4G24	RESISTOR-Comp. 1200 ohms 2w (R19).....
RC1H12 +	RESISTOR-Comp. 100 ohms ½w (R5).....
RC1H40 +	RESISTOR-Comp. 22,000 ohms ½w (R3, 8).....
RC1H44 +	RESISTOR-Comp. 47,000 ohms ½w (R6).....
RC1H54 +	RESISTOR-Comp. .22 meg ½w (R2, 12).....
RC1H58 +	RESISTOR-Comp. 470,000 ohms ½w (R14, 21).....
RC1H62 +	RESISTOR-Comp. 1 meg ½w (R1)...
RC1H68 +	RESISTOR-Comp. 3.3 meg ½w (R4).
RC1H70 +	RESISTOR-Comp. 4.7 meg ½w (R11)
RV0C02	POTENTIOMETER-500,000 (tapped at 100K) (R7).....
RW1A04	RESISTOR-Wirewound 15 ohms 1w (R9).....
RW1B28 +	RESISTOR-Wirewound 150 ohms 1w (R13, 20).....
SP6R01 *	SPEAKER-6" Rd. P.M. .....
TA0012	TRANSFORMER-Output (T3).....
TI0C08 +	TRANSFORMER-I.F. Input (T1)....
TI0D14	TRANSFORMER-I.F. Output (T2)...
C-7 *	LAMP-Dial.....
	MECHANICAL COMPONENTS
BT3S06 +	BOARD-Terminal (3 terminal)...
BT3S07	BOARD-Terminal (3 terminal single mtg.).....
BT4S05 +	BOARD-Terminal (4 terminal)...
BT4S06 +	BOARD-Terminal (4 terminal)...
CD0C19	CABLE-Dial 42½".....
CL2A08 +	CORD-A.C. Power 8 ft. Brown...
GR0S00 +	GROMMET-Tuning Gang Shockmtg..
HB0M70	BRACKET-Speaker Mtg.....
HB0M71	BRACKET-Dial Light.....
HC0C03 +	CLAMP-Dial Cable.....
HC0M01 +	CLAMP-Dial Light.....
HC0M04	CLAMP-Electrolytic Mounting...
HC0S00 +	CLIP-Tuning Shaft Spring.....
HP0B05	PLATE-Chassis Mtg.....
HR0S02 +	RIVET-Shoulder (Idler Pulley Mtg.).....
HS0C00 +	SPRING-Dial Cord.....
HS6F01 +	SPACER-Tuning Gang Mtg. Sleeve.....
ID0M19	INDICATOR-Dial.....
IW0F00 +	WASHER-Insulator.....
JR2010	RECEPTACLE-2 Contact (Phono Power).....
JR1S00 +	RECEPTACLE-Phono.....
MB0B00 +	BEARING-Shaft.....
MP0I00 +	PULLEY-Dial Cord Idler.....
MS0T14	SHAFT-Tuning.....
PB0D04	PLATE-Dial Back.....
PI0B03	COVER-Asbestos Mtg. Plate.....
PI0P01 +	PLATE-Line Cord.....
SM0T05	SHIELD-Tube (Chassis mounted)..
SO0D12	SOCKET-Dial Light (12" leads)..
SO7M07	SOCKET-Tube Octal Miniature....
SR2B02	SWITCH-Rotary Phono-Radio Double Pole - Double Throw (S1).....
SR3E04	SWITCH-Rotary with A.C. Switch Single Pole - 3 Position (S2).....
WP0D06	WINDOW-Back Plate.....


CONDITIONS OF MEASUREMENTS
LINE VOLTAGE 117 A-C
ZERO SIGNAL INPUT
VOL. CONT. MIN.
SOCKET VOLTAGE/RESISTANCE TO COMMON GROUND
D-C AT 20,000 Ω/V A-C AT 1,000 Ω/V
FM-RF AMP 6AG5
CONVERTER 7F8
1ST IF AMP 7AH7
2ND IF AMP 7AG7
FM DEMODULATOR 6H6
AM DEMODULATOR & 1ST AUDIO 6SQ7
POWER AMP 6V6GT
RECTIFIER 5Y3GT
AM-455 KC IF FREQUENCY FM-10.7 MC
PART OF TRIMMER ASSEMBLY C45B
TEST SOCKET
TEST JACK
SPKR.
TONE
1 MEG. TAP
ASSEMBLED TOGETHER
BAND SWITCH POSITIONS
FM
AM
PHONO.
MANUAL
AM LOOP
EXTERNAL ANTENNA
EXTERNAL GROUND
F.M. ANT. IN CABINET
AM OSC.
FM OSC.
NOTES CAPACITANCE IN WHOLE NOS. IN MMF.-THOSE IN DEC. NOS. IN MF.-ALL RESISTANCE IN OHMS UNLESS OTHERWISE STATED. K=1000 Ω

FM ALIGNMENT

For reference marks see Fig. 3
Rotate gang condenser fully closed and set pointer to reference mark
Trimming screwdriver must be 100% insulated

A - CW METER METHOD

Generator output - pure RF or amplitude modulated
VTVM must not be AC-DC, or with GND. connected to AC line or through resistor

Gen. Freq.	Dummy Ant.	Gen. To	Band Sw. Position	Pointer Setting	Special Conditions	VTVM Connections	Adjust	Remarks
10.7 mc.	.01 mfd	Term. #3 on gang & chassis	FM-Full counter-clock-wise	-------	Short FM osc. term. #5 to chassis	Test socket pins #1 (+) & #2 (-) Low Scale	1st IF-C40 2nd IF-C42A C42B 3rd IF-C44A for max. output on VTVM	Realign several times to assure max. output Signal may be fed into "Test Jack" in 1st IF can for prel. align. of C44A, C42A & C42B.
10.7 mc.	"	"	"	------	"	*Center of jumper resistors & test sock. Pin #4 - Fig. #2.	3rd IF-C44B To zero reading on VTVM	**Alternate step #1 (C44A for max. output) & step #2 (C44B for zero) several times to assure correct alignment
106 mc.	Std. FM Fig. #4	FM ant input term's.	"	106 mc. refer. mark	Remove short from osc. term. #5	Test socket pins #1 (+) & #2 (-) Low scale	***Osc. -C11 RF -C5 Ant -C4 for max. output on VTVM	"Rock" tuning control during alignment
97 mc.	"	"	"	Approx. 97 mc ref. mark	---------	"	----------	****Check Calibration
90 mc.	"	"	"	Approx. 90 mc. refer. mark	---------	"	----------	****Check Calibration

* See Fig. #2 "Test Circuit for FM Alignment".

** A VTVM with a zero center scale is very convenient for use in this alignment step. A50 microammeter may be used in place of the VTVM, but is not as accurate.

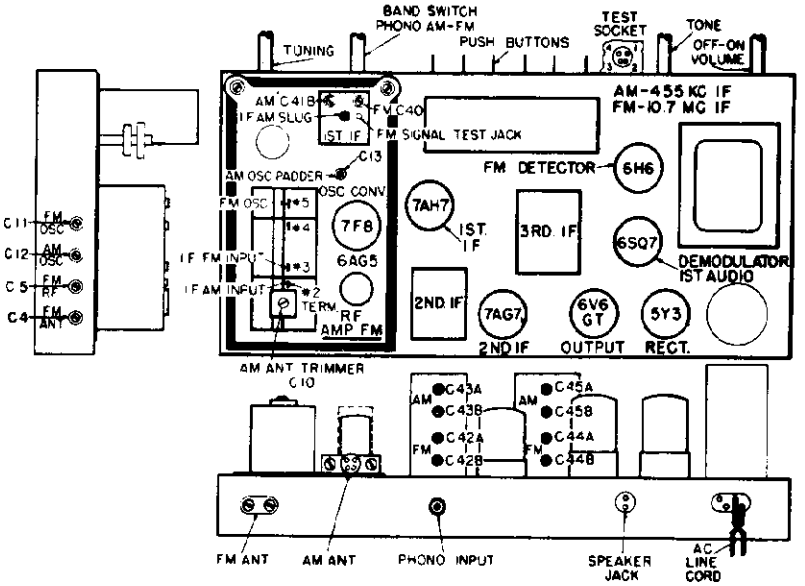
*** The oscillator circuit has been designed to operate on the high freq. side of the incoming signal. It is possible to adjust the trimmer (C11) at 106 MC such that the osc. is operating on the "image" or low freq. side of the signal. To check the osc. (C11) adjustment, set sig. gen. to 84.6 MC, freq. modulated, dial pointer at 106 MC. If signal is NOT heard, adjustment of C11 is correct, but if signal IS heard, osc. trimmer C11 has been incorrectly adjusted on the "image" frequency. Readjust C11 to other setting at 106 MC and recheck with gen. freq. at 84.6 MC. Signal MUST NOT be heard with pointer at 106 MC and sig. gen., freq. modulated, set at 84.6 MC.

**** If calibration is not within reasonable tolerance at these points, the osc. coil inductance must be adjusted. If dial pointer reading is on low freq. side, inductance is too low, and turns must be compressed slightly. If pointer reading is on high freq. side, osc. coil is too high and coil turns must be spread slightly.

To check and adjust inductance of ant. and RF coils, tune receiver to 90 MC signal and observe AVC reading. Insert iron core end of "tuning wand" into RF coil, at same time rocking tuning control to max. AVC. If reading increases as wand is inserted, RF coil inductance is too low and turns must be compressed slightly. If reading decreases, reverse wand and insert metal end into coil, again rocking tuning control to max. AVC. If reading decreases, (after iron core check), inductance is properly adjusted. If reading increases, inductance is too high and turns must be spread slightly.

Ant coil is checked and adjusted exactly like RF coil.

NOTE: THE LATTER OPERATIONS ARE VERY DELICATE AND DIFFICULT PROCEDURE AND MUST BE ATTEMPTED ONLY BY TECHNICIANS WITH CONSIDERABLE HIGH FREQUENCY EXPERIENCE.



CHASSIS TRIMMER LOCATION

HBOM17		Bracket, Tuning Shaft Bearing	SS6P00		Switch, 6 Pushbutton SW-2
HBOM18		Bracket, Antenna Plug Mtg.	TBOP00		Call Letter Tabs
HBOM19		Bracket, Shockmount	WP0B00	+	Windows, Pushbutton
HBOM20		Bracket, Terminal	WP0D00		Window, Dial
HBOM21		Bracket, Bearing Pointer Support	XS0C01		Strip, Copper .004 x 5/16 x 1-3/16
HBOM22		Bracket, Variable Condenser	XS0C02		Strip, Copper .004 x 5/16 x 1-5/8
HC0C00	+	Clip, Retainer	XS0Z01	+	Strip, Fishpaper
HC0C03	+	Clamp, Dial Cable	XS0Z02	+	Strip, Fishpaper
HC0C06	+	Clip, Coil	XS0Z09		Strip, Fishpaper
HC0S08	+	Clip, Binding Post Spring	ZL8G00		Lid, Console AM, FM
HC0S09	+	Clip, Retainer, Ring Knob	ZW8G00	*	Cabinet, Platt 0026 (Walnut)
HC0S28		Clip, Washer "C" Blued Finish			STANDARD HARDWARE
HK0R00	+	Clip, Retainer, Ring		+	Palnut (6-32)
HP8I01		Pin, Threaded 8-32		+	Nut, Hexagon 4-40
HS0C00	+	Spring		+	Nut, Hexagon 8-32 Steel
HS0P16		Sleeve, Spacer		+	Nut #8-32 N.P.
HS0P17		Spacer 3/8" OD 1/4" ID 1/2" Lg Steel		+	Nut 10-32 Hex (C.P.)
HS0S05		Spacer, Thread Shoulder		+	Lockwasher, #8
HZ0G01	+	Glides, Metal		+	Screw, Self-Tapping #8 x 1/4" Lg
HZ0H00	+	Hinges, Statuary Brze (2 Lids)		+	Screw #8 (1/2" Self Tapping)
HZ0S06		Lid Support L.H. Stat. Brze		+	Screw, 5/16 #8-32
HZ0S07		Lid Support, RH Stat. Brze		+	Screw, 1/2" #8-32
IDOW10		Indicator, Dial		+	Screw 1/2" #1/4-20
JP1002	+	Plug 1 Contact, Male		+	Screw, 3/4" #4-40
JP2004		Plug 2 Contact		+	Screw, 1" - 1/4-20
JP3000		Cable, Assy., AM Loop		+	Screw Binder Head 6-32 x 1/4
JP3002		Plug, 3 Contact	HR0P01	+	Rivet, Tubular .121 Dia. x 1/8" Lg
JR2008		Receptacle 2 Contact	HR0P00	+	Rivet, Tubular .121 Dia. x 13/64"Lg
JR3000		Receptacle 3 Contact	HR0P06	+	Rivet, Tubular .121 Dia. x 14/64"Lg
KB0P01	+	Knob, Control Indexed Push On		+	Washer, Flat
KC0H06	+	Knob, Control, Brown	WF0F14	+	Washer, Insulating
MA0T00		Adapter, Slug Adj. Screw 4-40		+	Washer, Flat
MB0P02		Bushing, Tuning Shaft	HL6804	+	Lug, Soldering
MS0T06		Shaft, Tuning		+	Screw, #6 3/8" Lg Statuary Brze
NP0N01	+	Needle, Reproducing		+	Screw, #5 Rd.Hd.Steel Bright Finish
PP0H00	+	Pads, Felt Bumper		+	Lockwasher #4
SM0B00		Shield Base Min. Tube		+	Lockwasher #6
SW0T03		Shield Miniature Tube		+	Washer, Lock
SO0D04	+	Socket, Dial Light		+	Washer, Lock
SO0D05	+	Socket, Dial Light		+	Palnut 3/8 x 32
SO7M05		Socket, Miniature Tube Zip in Type		+	Screws, Speaker
SO8L01	+	Socket, Moulded Locktal		+	Teenuts, Chassis Board
SO8S01		Socket, Octal		+	Teenuts, Motor Board
SR3G00		Switch, Rotary 3 Position 4 Wafer		+	Lockwasher

FM ALIGNMENT

B - Visual Method.

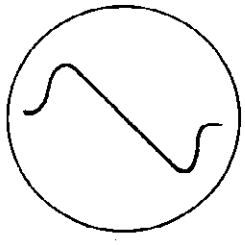
Gen. Freq.	Gen. Mod.	Dummy Ant.	Generator to	Band SW. Position	Special Conditions	Dial Setting	VTVM Conn	Oscillo-scope	Adjust	Remarks
10.7 MC	Pure RF or Amplitude	.05 mfd	High side to Term. #3 Gang Cond. Low side to chassis	FM-Max. CCW.	Short Osc. Stator-Term. #5 to Chassis Gnd.	-------	Test Socket Pins #1 (+) & #2 (-) Low Scale	No conn.	1st IF C40 2nd IF C42A, C42B 3rd IF C44A	Adjust for max-imum output on low range of VTVM - Realign each Cond. several times to assure max. out-put. Signal may be fed into "test jack" in 1st IF can for Prelim. Alignment of C44A, C42A & C42B.
Approx. 10.7 MC Adjust until Ratio Detector curve is cen-tered on Horiz Scope Sweep Line	Freq. Mod. 60 Cy-Sweep width max. possible (should be 200 KC Min)	"	"	"	"	-------	No con-nection	Connect vert. in-put to Test Socket Pins #4 & Chassis Gnd.	3rd IF C44B	*Adjust for max. symmetrical "S" curve similar to Fig. 5. Alternate adjs. of C44A & C44B to obtain Max desired curve.
106 MC	"	Std. FM Fig. 4	FM Ant. Terms's thru dummy	"	Remove short from Term #5.	106 MC ref. mark	No con-nection	"	FM Osc. C11	**Adjust until "S" curve is centered on Horiz. Sweep scope line.
106 MC	"	"	"	"	----------	"	"	"	FM RF Trimmer C5. FM Ant. Trimmer C-4.	Adj. for Max. height of "S" pattern-"rock" tuning control at same time to keep "S" curve centered on Scope.
97 MC	"	"	"	"	---------	Approx. 97 MC ref. mark	"	"	------	***Check Cal-ibration
90 MC	"	"	"	"	---------	Approx. 90 MC ref. mark	"	"	------	***Check Cal-ibration

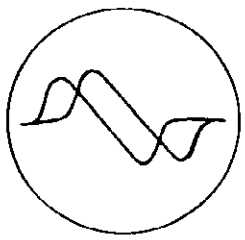
* Some phase shift between the Signal Generator and the scope horizontal sweep may be encountered, resulting in a double trace pattern, shown in Fig. 6. In some Oscilloscopes, provision is made for connecting this phase shift directly in the oscilloscope circuit. If so, rotate the "phase shift" control until the curves coincide as in Fig. 5. If no provision is made in the scope, the connection might be accomplished by inserting a condenser of suitable value in series with the signal generator "Synchronized Sweep Voltage" output. The condenser value will depend upon the amount of phase shift and the horizontal input impedance of the scope - approximate condenser range .01 to .1 mfd. See Fig. 7 for instrument connection diagram.

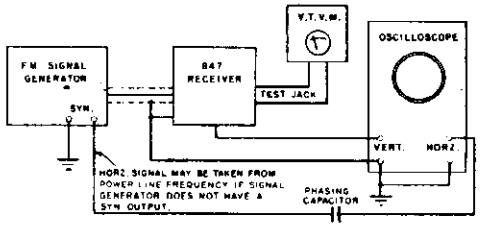
** See *** Page 5.

*** If calibration is not within tolerance at these points, the inductance of local FM oscillator coil, RF and antenna coils must be adjusted. See **** Page 5.

NOTE: The latter operation is a very delicate and difficult procedure, and must be attempted only by technicians of considerable high frequency experience.

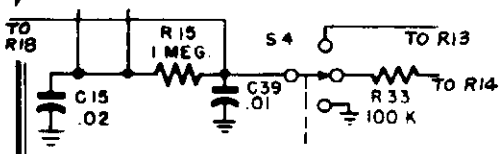




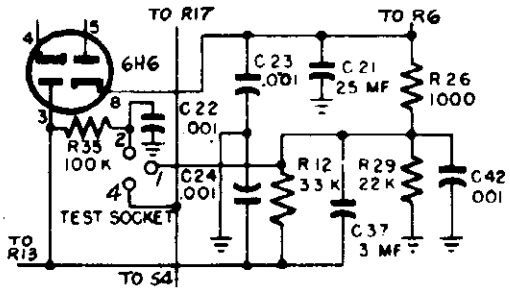


MODEL 847-B

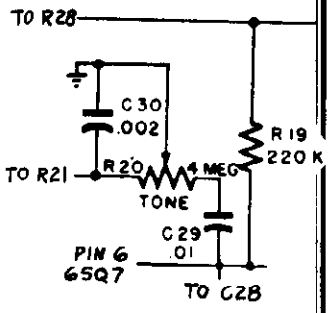
BENDIX RADIO DIV.



Values of R15 & R33 Changed

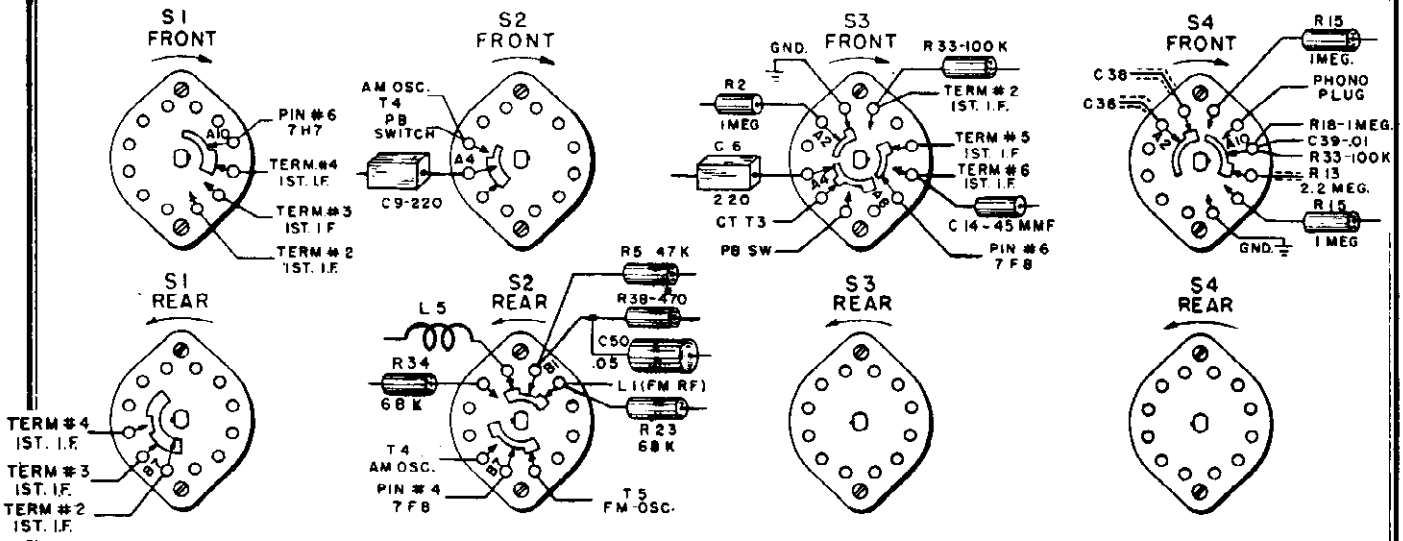


Test Socket Connection Changed



R37 Not Used

CIRCUITS USED ON EARLY MODELS



BAND SWITCH SECTIONS

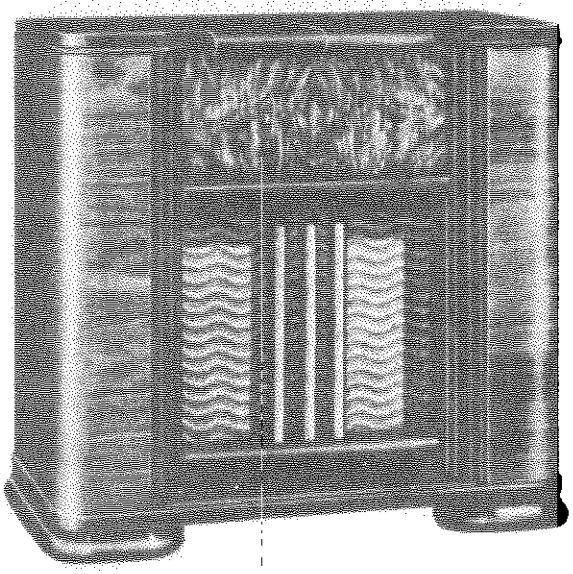
BROADCAST BAND ALIGNMENT

See Fig. 1 for trimmer locations.
Rotate gang condenser until full closed. Set pointer to reference mark. See Fig. 3.
Connect output meter across voice coil on lowest scale.
Signal Generator amplitude modulated.
Rotate volume control full ON. Keep generator output low as practical.

Apply	Thru	To	Band Switch Position	Dial Setting	Adjust
455 KC	.05 mfd.	Term. #2 gang cond. & chassis	AM-mid-position	Gang cond. full open	IF slug, C41B, C43A, C43B, C45A, C45B for max output
580 KC	Bendix dummy loop AD0L00	Dummy loop plugged in AM ant. socket on rear of chassis	"	580 KC ref. mark	C13 for max. output
1475 KC	"	"	"	1475 KC ref. mark	*C12, C10 for max. output
580 KC	"	"	"	Approx. 580 KC ref. mark	C13 for max. output "Rock" gang during adjustment
965 KC	"	"	"	Approx. 965 KC ref. mark	**Check Calibration
580 KC	"	"	"	Approx. 580 KC ref. mark	**Check Calibration

* Repeat 1475 KC and following 580 KC adjustment in rotation several times until receiver is properly aligned.

** If calibration does not check within 10 KC, "knife" oscillator and antenna gang sections. The latter operation must be attempted by experienced technicians only.



MODEL 847-B
8 Tube Phono-radio Combination

SPECIFICATIONS

POWER
Voltage.....105-125 VAC
Frequency.....60 Cycles
Consumption.....100 Watts

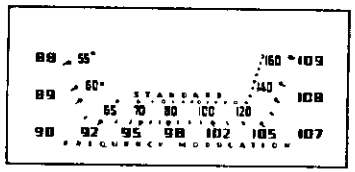
TUNING RANGE
AM.....540-1620 KC
FM.....88-108 MC

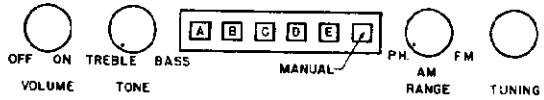
INTERMEDIATE FREQUENCY
AM.....455 KC
FM.....10.7 MC

POWER OUTPUT
Maximum.....4.2 Watts

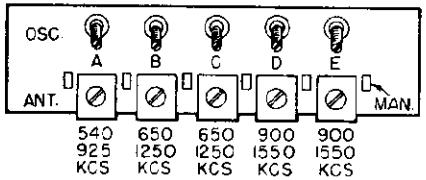
LOUDSPEAKER - PM.
Cone diameter.....10 inches
VC impedance at 400 cycle.....3.2 ohms

CABINET
33" high, 34-1/2" wide, 18-3/16" deep
Shipping Weight.....95 pounds



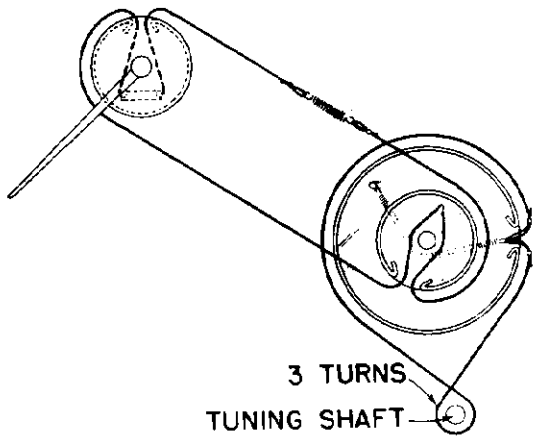


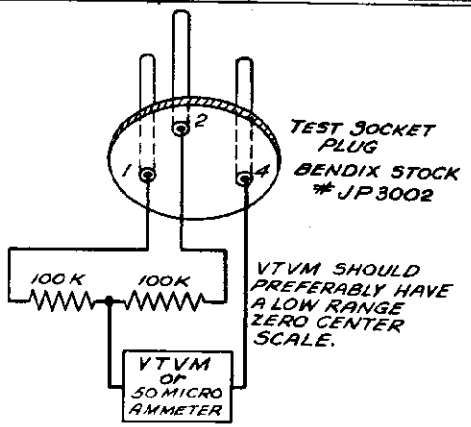
Controls--The various controls are shown in the above drawing. Controls as arranged from left to right are: Volume control, Tone control, Pushbuttons, Range control, and Tuning control. Tone Control rotates to the Bass position in a clockwise direction, to the Treble position in the counterclockwise direction. The range switch is in F.M. position at maximum CCW, broadcast position is mid-position, and phono position is maximum clockwise.



Pushbuttons--The adjustment position of the pushbutton assembly is shown below. Pushbutton operation is provided by rotating the band switch to the center position and depressing the desired Pushbutton. The extreme right hand pushbutton is depressed when MANUAL tuning operation is desired.

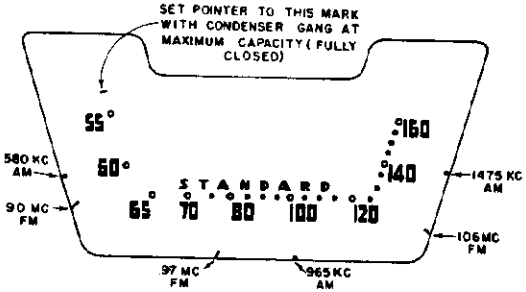
Access to the adjustment screws is obtained by pulling the Pushbuttons off the shaft vertically. The osc. and antenna adjustment screws, with the Pushbutton frequency ranges, is shown in the above diagram.



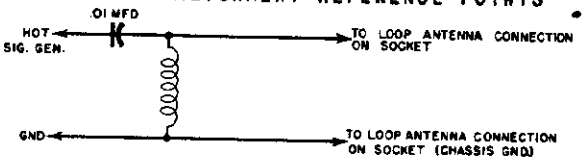


TEST CIRCUIT FOR DEMODULATOR TRANSFORMER ALIGNMENT

TEST CIRCUIT FOR FM ALIGNMENT

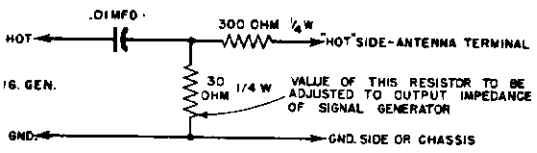


ALIGNMENT REFERENCE POINTS



A.M.

COIL FOR 847B IS 3.7 MICRO-HENRY



F.M. DUMMY ANTENNA

DUMMY ANTENNA FOR 847-B

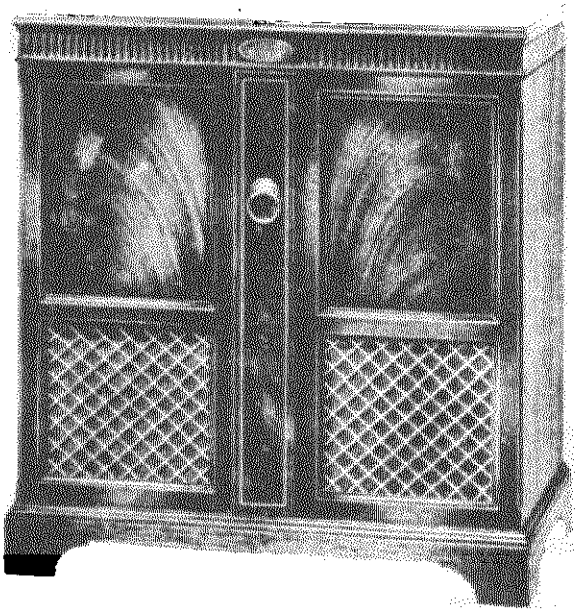
MODEL 847-B BENDIX RADIO DIV.

Stock Number	Description
AL0Z08*	Assy. Antenna FM Loop.....
AR0B00	Assy. R.F. Osc. Chassis Assy....
CC8A24	Capacitor, Ceramic 15 mmf 500V (C46).....
CC8A30	Capacitor, Ceramic 45 mmf 500V (C14, C44).....
CC0F18	Capacitor, Ceramic 4.7 mmf 500V (C7).....
CC0F19	Capacitor, Ceramic 5.6 mmf 500V (C55, C57).....
CE3A01 +	Capacitor, Electrolytic 3 x 20 mfd 450V (C32).....
CE1T00	Capacitor, Electrolytic 25 mmf 25 V.D.C. (C21, C47).....
CE1T01	Capacitor, Electrolytic 3 mfd 50V (C37).....
CL2A02 +	Cord, A C Line Brown.....
CM4A42	Capacitor, Mica 680 mmf 300V (C38, C41, C45).....
CM5A22 +	Capacitor, Mica 100 mmf 500V (C33).....
CM5A30 +	Capacitor, Mica 220 mmf 500 V.D.C. (C28, C48).....
CM6A22	Capacitor, Mica 100 mmf 500V (C52).....
CM7A30	Capacitor, Mica 220 mmf 500V (C51, C56).....
CM4L42	Capacitor, Mica (Low Loss) 680 mmf 300V (C3).....
CM5L03	Capacitor, Mica (Low Loss) 15 mmf 500V (C40).....
CM5L22	Capacitor, Mica (Low Loss) 100 mmf 500V (C8).....
CM5L30	Capacitor, Mica (Low Loss) 220 mmf 500V (C6, C9).....
CM8S50 +	Capacitor, Mica 470 mmf 500V. D.C. (C60).....
CP2M10	Capacitor, Paper .001 mfd. 200V (C22, C23, C24, C42).....
CP4M34	Capacitor, Paper .02 mfd 400V (C15).....
CP4M51	Capacitor, Paper .1 mfd 400V (C59).....
CP4T31 +	Capacitor, Tubular Paper .01 mf 400V 10% (C29).....
CP4T40 +	Capacitor, Tubular Paper .05 mf 400V (C17, 18, 19,20, 49, 50).
CP6T12 +	Capacitor, Tubular Paper .002 m 600V (C30).....
CP6T18 +	Capacitor, Paper .005 mfd 600V D.C. (C34, C35).....
CP6T20 +	Capacitor, Paper .006 mfd 600V (C25, 27, 31, 36).....
CP6T31 +	Capacitor, Paper .01 mfd 600V (C39, 43).....
CT1A03 +	Capacitor, Trimmer 12 - 160 mmf (C61, 62).....
CT1A04 +	Capacitor, Trimmer 45 - 370 mmf (C63, 64).....
CT1A05 +	Capacitor, Trimmer 120 - 580 mmf (C65).....
CT1A09	Capacitor, Trimmer 3 - 13 mmf (C11).....
CT1A10	Capacitor, Trimmer 4 - 75 mmf (C10).....
CT1A11	Capacitor, Trimmer 475-1000 mmf (C13).....
CT1C00	Capacitor, Trimmer 2 - 20 mmf (Ceramic Insulator) (C4, 5)...
CT1C01	Capacitor, Trimmer 4 - 75 mmf (Ceramic Insulator) (C12)....
CV0D00	Capacitor, Variable (2 Section AM - 3 Section FM) (C1).....
LF0A00	Coil RF Choke (T11, T12).....
LF0A01	Coil, Choke R.F. (L1, L5).....
LF0C00	Coil, Filament Choke Assy (L3).
LO8B00	Coil, Oscillator A.M. (T-4).....
LO8F00	Coil, Oscillator F.M. (T-5).....
LT0A03	Coil, Pushbutton Osc. Assy. Col Code Yellow (L-10).....
LT0A04	Coil, Pushbutton, Osc. Assy. Cc Code Green (L8, L9).....
LT0805	Coil, Pushbutton Osc. Assy. Co Code Black (L6, L7).....
RC4D26	Resistor, Comp. 1500 Ohm, 2W (R-28).....
RC2G16	Resistor, Comp. 220 Ohms 1/2W.....
RC2G27	Resistor, Comp. 1800 Ohms 1/2W (R1).....
RC1H18	Resistor, Comp. 330 Ohms 1/4W (R30).....
RC1H20 +	Resistor, Comp. 470 Ohms 1/4W (R38).....
RC1H24 +	Resistor, Comp. 1000 Ohms 1/4W (R35).....
RC1H40 +	Resistor, Comp. 22,000 Ohms 1/4W (R3, R29).....
RC1H42 +	Resistor, Comp. 33,000 Ohms 1/4W (R12).....
RC1H44	Resistor, Comp. 47,000 Ohms 1/4W (R32).....
RC1H51 +	Resistor, Comp. 100,000 Ohms 1/4W (R17, 21, 33, 37).....
RC1H54 +	Resistor, Comp. 220,000 Ohms 1/4W (R6, 14, 19).....
RC1H58 +	Resistor, Comp. 470,000 Ohms 1/4W (R24, 36).....
RC1H62 +	Resistor, Comp. 1 Meg 1/4W (R2, 15, 18).....
RC1H66 +	Resistor, Comp. 2.2 Meg. 1/4W (R13).....
RC1H74 +	Resistor, Comp. 10 Meg. 1/4W (R22).....
RC2H00	Resistor, Comp. 10 Ohms 1/2W (R31).....
RC2H08	Resistor, Comp.47 Ohms 1/2W (R7).
RC2H16	Resistor, Comp. 220 Ohms 1/2W (R10).....
RC2H24	Resistor, Comp. 1,000 Ohms 1/2W (R9, 11, 26).....
RC2H34	Resistor, Comp. 6,800 Ohms 1/2W (R4).....
RC2H44	Resistor, Comp. 47,000 Ohms 1/2W (R5).....
RC2H46	Resistor, Comp. 68,000 Ohms 1/2W (R23, 34).....
RV4C00	Potentiometer, Tone 4 Meg. (R20)..
RV4S10	Potentiometer, 2 Meg. (R16).....
RW2A12	Resistor, Wirewound 100 Ohms 2W (R27).....
RW1B34	Resistor, Wirewound 270 Ohms 1W (R25).....
SP0R00*	Speaker, PM 10" Round.....
ST0100	Core, Iron.....
TA0007	Transformer, Audio Output (T9)....
TI0C06	Transformer, I.F. 1st T6.....
TI0D08	Transformer, I.F. 3rd T8.....
TI0100	Transformer, I.F. 2nd T7.....
TP0J00	Transformer, Power T10.....
TR8B00	Transformer, Ant. Coil T1.....
TR8F00	Transformer, Ant. R.F. (FM).....
TR8P00	Transformer Interstage FM Mixer Coil T3.....
#44 +	Lamp, Pilot.....

MECHANICAL COMPONENTS

AB0C01	Assy. Pushbutton Switch.....
AD0E00	Assy. Dial Back Plate.....
AS0P00	Assy. Shaft & Pulley.....
BP0B00	Pushbutton.....
BT1S00 +	Strip Terminal (1 Terminal).....
BT1S01 +	Strip Terminal.....
BT1S03	Strip Terminal (1) Mtg. 1 Lug.....
BT2S00 +	Strip Terminal.....
BT3S00 +	Strip Terminal.....
BZ0D08	Baffle & Cloth Assy.....
CD0C09	Dial, Cord (Indicator).....
CD0C10	Dial, Cord (Tuning).....
DS0A19	Dial, Scale (88-109 MC) Paper.....
DS0A20	Dial, Standard Broadcast.....
DZ0F08	Decal, Nameplate.....
DZ0F09	Decal, Volume.....
DZ0F10	Decal, Tone.....
DZ0F11	Decal, Range.....
DZ0F12	Decal, Tuning.....
EB0M02	Escutcheon 6 Pushbutton.....
ED0M01	Escutcheon, Dial.....
GR0100	Grommet, Rubber Insulating.....
GR0101	Grommet, (Color Code Black).....
GR0S09	Grommet, Shockmount.....
GR0S10	Grommet, Rubber Shockmount.....
HB0M15	Bracket, Pointer Bearing Mtg.....
HB0M16	Bracket, Pushbutton Mtg.....

BENDIX RADIO DIV. MODELS 1518, 15
1524, 1525

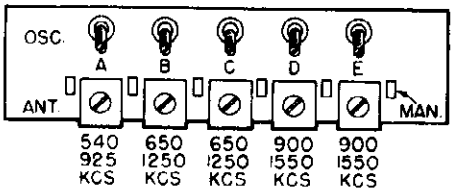


Models 1518 & 1524 Mahogany
Models 1519 & 1525 Walnut

GENERAL

The Bendix models 1518 and 1519 are sever tube (plus vacuum tube rectifier) superheterodyn radio-phonograph combinations designed to re ceive the Standard AM Broadcast Band (540 1620 KC) and the 88 - 108 MC FM Band. The onl difference between the chassis used in the 151 and 1519 and the 1524 and 1525 models is in th phono-input circuit used in the 1524 and 152 models. These two later models incorporate tw additional miniature tubes in a dynamic nois reduction circuit designed to reduce to a min imum all noise originating from needle-scratc or from old and worn records. This circui functions only on phonograph operation and i completely out of the radio circuit.

The schematic diagram shown in Fig. 3 i basically that of models 1524 and 1525, bu since this circuit is identically the same a the circuit used in models 1518 and 1519, plu the Hush-O-Matic feature, the one schemati contains all the circuits found in any one o the four models. If either the 1518 or 151 chassis is being considered then the Hush-O Matic circuit contained within the dotted line at the lower-right hand corner of Fig. 3 shoul be disregarded, together with the power cor and jack J8 connected to the main chassis.

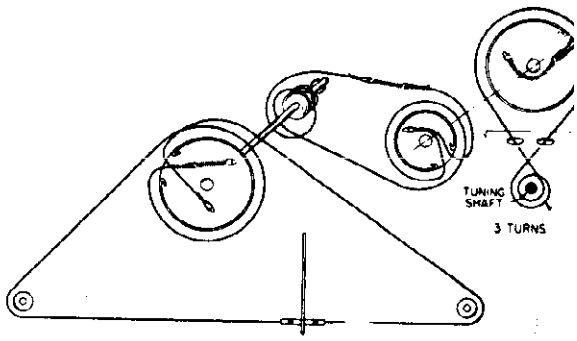


Pushbutton Frequencies

PUSHBUTTON ADJUSTMENT

The pushbuttons may be adjusted as follows:

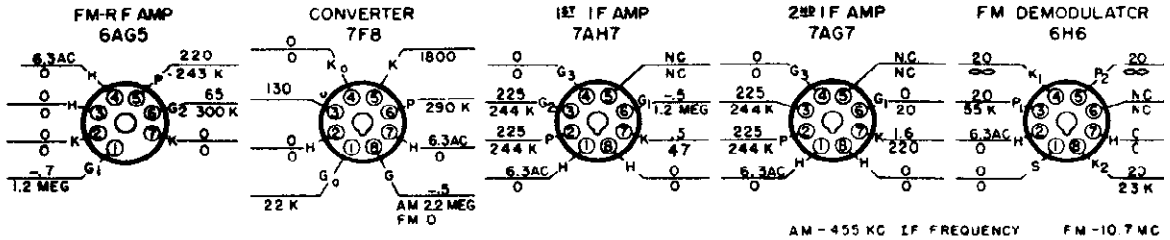
1. Place the receiver in operation on the Standard Broadcast Band (AM) and tune in manually one of the stations to be selected by pushbuttons and whose carrier frequency is between 540 and 925 KCS. (The MANUAL pushbutton must be depressed when tuning manually. See Fig. 9)
2. Remove all the pushbuttons by pulling them straight up from the panel.
3. Depress the shank for pushbutton "A" and increase the volume slightly.
4. Using a small screwdriver, tune in the desired station by adjusting the long brass screw located above pushbutton "A". It can be reached through the opening in the panel after the pushbuttons have been removed. This screw adjusts the oscillator coil and is marked "OSC" in Fig. 9. Now press the shank for the MANUAL pushbutton and check to make certain the correct station has been tuned in.
5. With pushbutton "A" again depressed and OSC screw adjusted for maximum signal, similarly adjust the screw located just below push-button "A". This screw tunes the antenna is marked ANT in Fig. 9.
6. Repeat steps 4 and 5 to obtain the best bined adjustments.
7. Pushbuttons B, C, D, and E may be adjuste exactly the same manner as pushbutton except that the same carrier frequency of station selected must be within the speci range as given in Fig. 9.
8. Select from the call letter tabs enclosed station call letters to which the pushbut have been tuned and insert through the s in the side of the pushbuttons. The cellu protector tabs provided are to be placed the call letter tabs by the same proced followed in inserting the call lette
9. Replace the pushbuttons on the receiver g ing proper attention to the location of call letters.

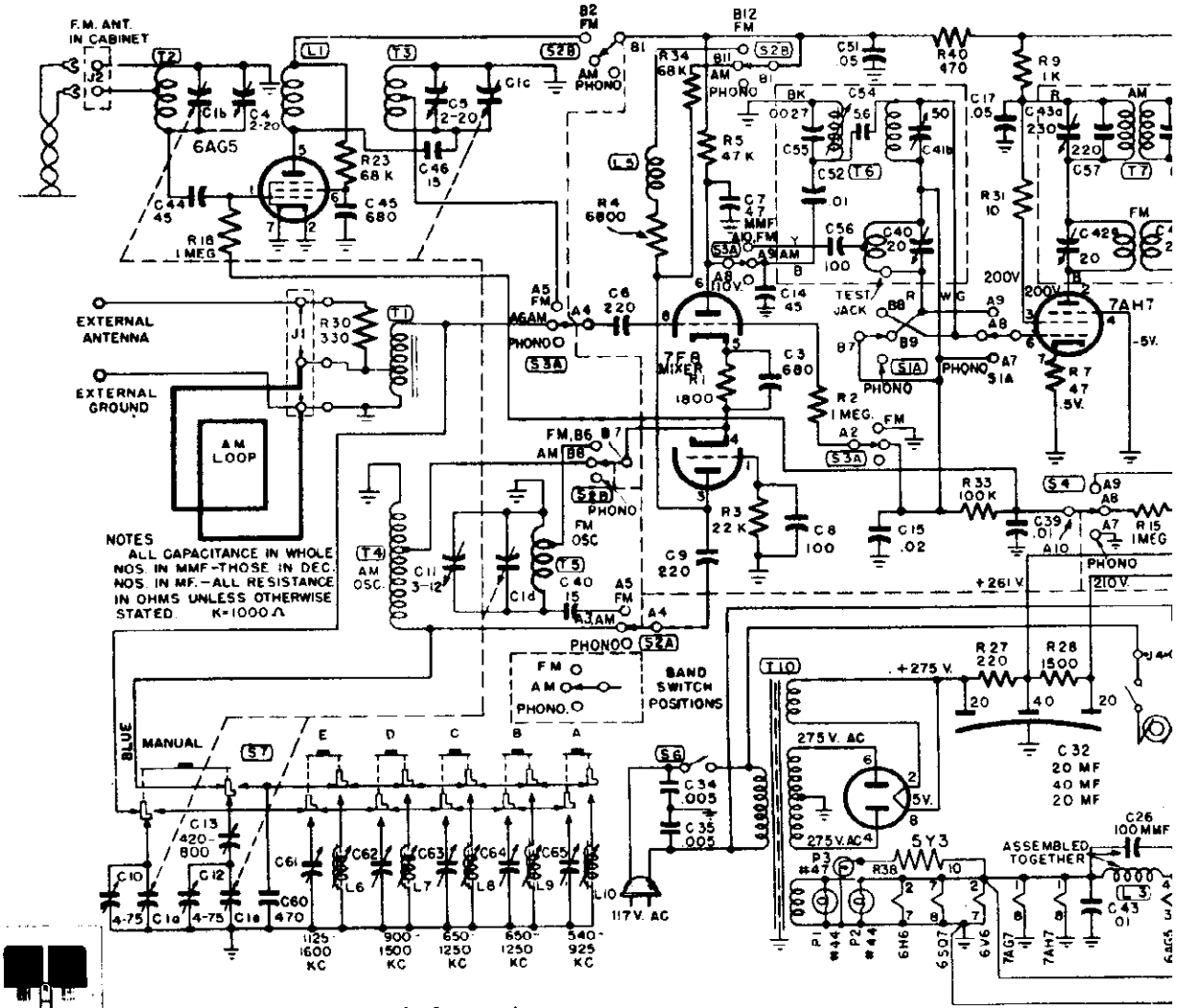


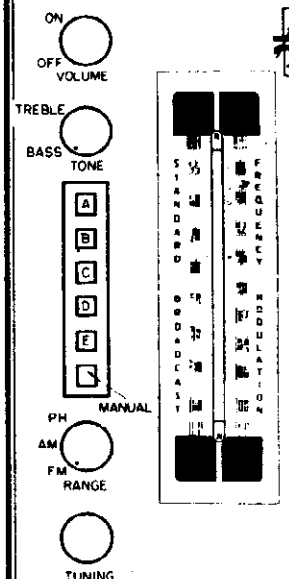
Dial Stringing Diagram

CONDITIONS OF MEASUREMENTS

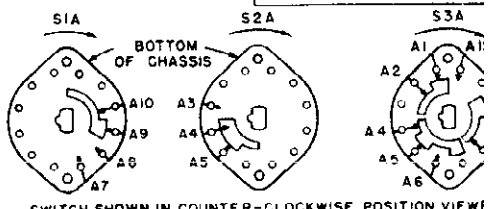
LINE VOLTAGE 117 A-C ZERO SIGNAL INPUT VOL. CONT. MIN. SOCKET VOLTAGE / RESISTANCE TO COMMON GROUN







Control Layout
Models 1524 & 1525



SWITCH SHOWN IN COUNTER-CLOCKWISE POSITION VIEWE
END. FRONT OR "A" SECTIONS VIEWED FROM FRO

SPECIFICATIONS

POWER

Voltage.....105-125V AC
Frequency.....60 Cycles
Power Consumption.....95 Watts

TUNING RANGE

AM.....540-1620 KC
FM.....88-108 MC

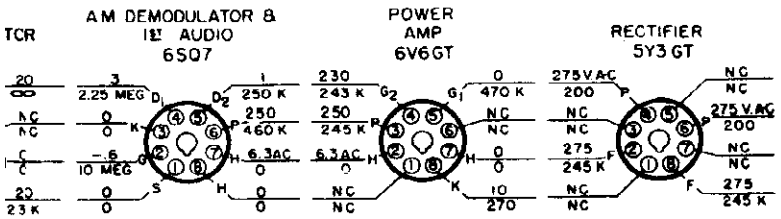
INTERMEDIATE FREQUENCY

AM.....
FM.....

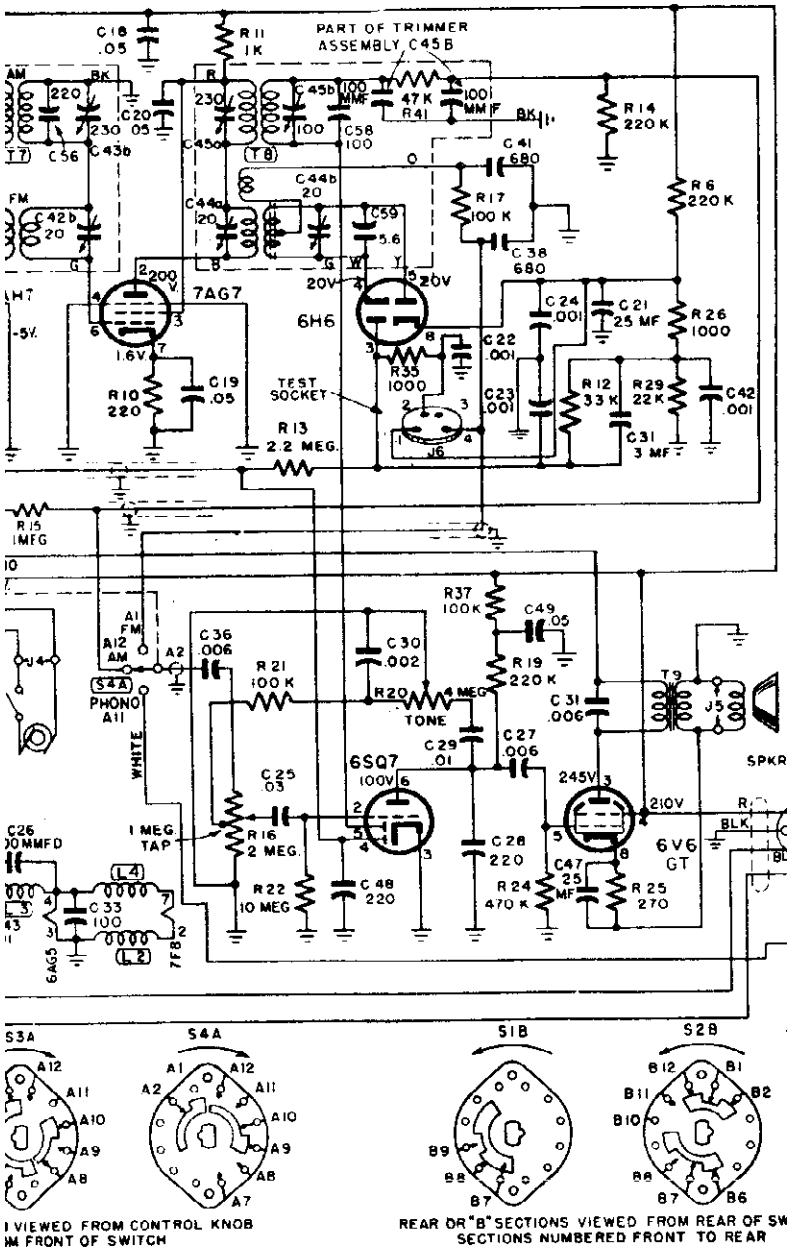
POWER OUTPUT

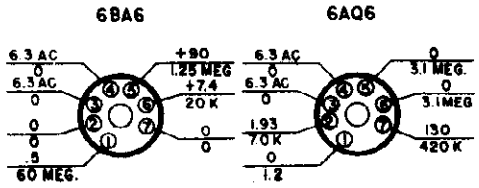
Maximum.....

GROUND D-C AT 20,000 Ω/V A-C AT 1,000 Ω/V

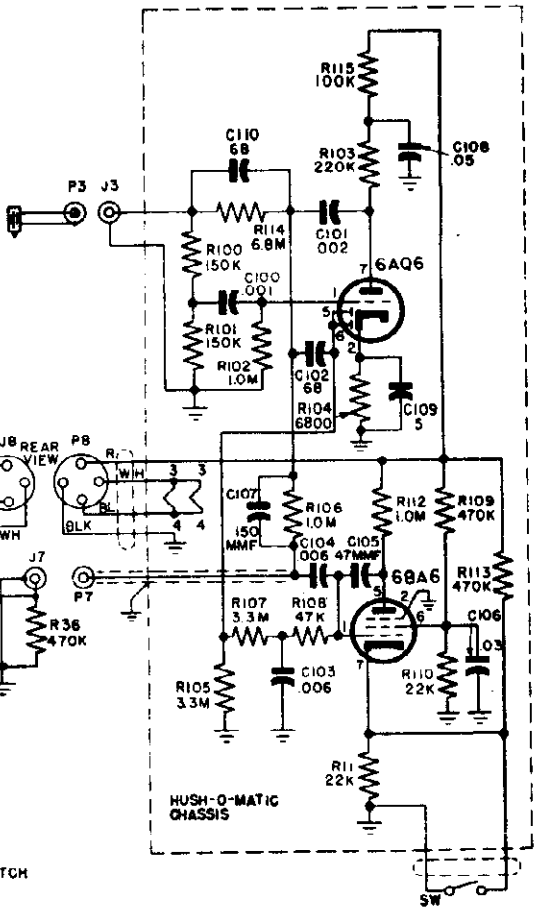


NOTE: Models 1518 and 1519 chassis are identical to this schematic except that Hush-O-Matic circuit (tubes 6BA6 and 6AQ6) is not used.





NOTE-ALL READINGS WITH HUSH-O-MATIC SWITCH ON.



VIEWED FROM CONTROL KNOB
M FRONT OF SWITCH

REAR OR "B" SECTIONS VIEWED FROM REAR OF SWITCH
SECTIONS NUMBERED FRONT TO REAR

.....455 KC

.....10.7 MC

.....4.2 Watts

LOUDSPEAKER - PM

Cone diameter.....12 inches

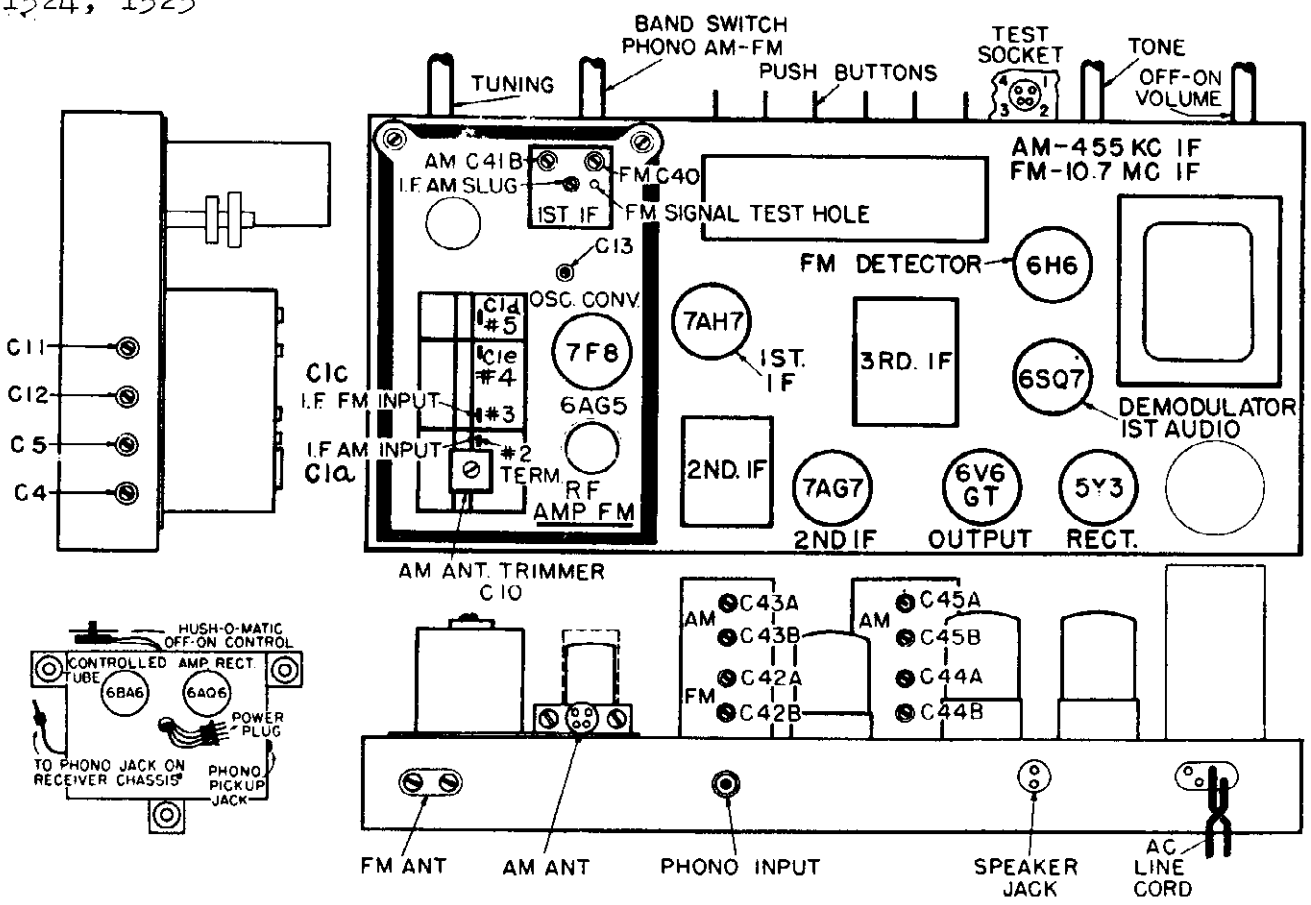
VC impedance at 400 cycles.....3.2 ohms

CABINET

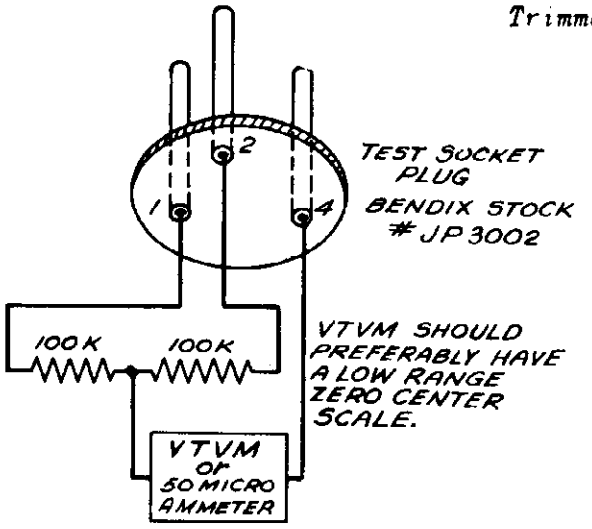
34" high, 31" wide, 17-1/4" deep

MODELS 1518, 1519, 1524, 1525

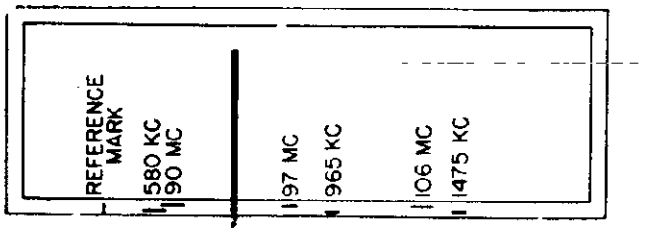
BENDIX RADIO DIV.



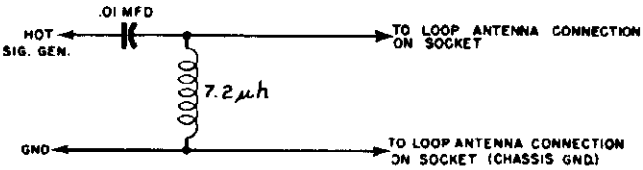
Trimmer Location Diagram



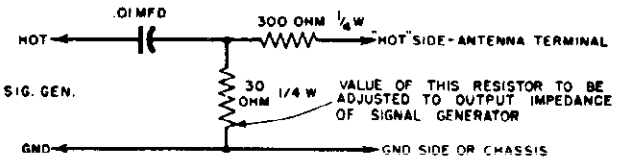
Test Circuit Plug



Alignment Reference Marks



AM DUMMY Antenna
Bendix Part No. AD0L01



FM DUMMY Antenna

The chassis must be removed from the cabinet in order to align the FM channels. If only the AM channels are to be aligned this is not necessary but will be found to be much more convenient if it is removed. However, if the chassis is removed a dummy antenna, described in detail later in the text, must be used when aligning the antenna circuits, unless these circuits are adjusted after the chassis is again installed in the cabinet.

Unless the various circuits of each channel are much out of alignment, adjustments made on the FM circuits will not appreciably affect the adjustments previously made on the AM circuits. However, if the FM circuits are badly out of alignment, necessitating considerable adjustment, it is best after these adjustments have been made, to go back and check the AM alignment.

An amplitude modulated (AM) signal of the proper frequency may be used for aligning both the AM and FM channels. However- if convenient, an oscilloscope and frequency-modulated signal may be used for aligning the FM channel.

Before making any adjustments, turn "on" the receiver and all AC operated test equipment and allow to warm up for at least five minutes. IMPORTANT: All adjustments must be made in the order in which they are given; i.e., the AM band must be completely aligned before aligning the FM band. The manual push-button must be pressed before the AM oscillator and RF circuits can be aligned.

EQUIPMENT REQUIRED

Signal Generator
  AM, 455 KC to 106 MC
Vacuum Tube Voltmeter
  DC ranges up to approximately 20 Volts. Ground, or minus, lead must be isolated from the power line.
Low Range Output Meter
Capacitors
  One .01 mfd. and one 50 mmf.
Dummy Antennas
  FM Dummy Antenna (See Fig. 8)
  AM Dummy Antenna, Bendix Part No. AD0L01, (See Fig. 7).
Test Circuit Plug
  See Fig. 5 and text for details.
Alignment Screwdrivers
  Must be 100% non-metallic.
Tuning Wand
  May be made from a 1/4" x 8" polystyrene rod with a small brass slug attached to one end and a powdered iron core attached to the other end.
Miscellaneous Hand Tools

AM ALIGNMENT

After the set has warmed up proceed with the alignment in steps as follows:

1. Rotate gang condenser all the way closed and set dial pointer to reference mark. See Fig. 6.
2. Short AM oscillator terminal #4 to chassis. (C1e).
3. Rotate band switch to AM - midposition and press manual push-button.
4. Rotate volume control full on (Clockwise).
5. Set output meter on low range and connect across voice coil.
6. Signal generator adjusted to 455 kc AM.
7. Connect 455 KC signal to terminal #2 (7F8 grid input) through a .01 mfd. capacitor, generator shield lead to receiver chassis and ground. See Fig. 4 for diagram.
8. Align IF AM slug, (center of T6), C41B, C43A, C43B, C45A and C45B for maximum reading on output meter. Keep generator output as low as practical. Refer to Fig. 4 for trimmer location diagram.
9. Rotate tuning control until pointer is at 580 KC reference mark.
10. Set generator to 580 KC, amplitude modulated.
11. Connect signal generator through AM Dummy Antenna to AM antenna terminal,
12. Remove short from gang terminal #4 to chassis.
13. Adjust oscillator padder C13 for maximum output.
14. Turn dial pointer to 1475 KC reference mark.
15. Set Signal Generator at 1475 KC amplitude modulated.
16. Adjust oscillator trimmer C12 and antenna trimmer C10 for maximum output.
17. Turn pointer to 580 KC reference mark.
18. Set generator at 580 KC amplitude modulated.
19. Again adjust oscillator padder C13 to maximum, at same time "rock" gang condenser to obtain maximum output.
20. Repeat steps 13 through 19 several times, until it is apparent receiver is properly aligned.
21. Check calibration at 965 KC and 580 KC reference points.
22. If 965 and 580 calibration do not check within 10 KC, oscillator and antenna sections of gang condenser must be bent to obtain proper tracking.

CAUTION: This last operation must be attempted by experienced technicians only.

MODELS 1518, 1519, 1524, 1525 BENDIX RADIO DIV.

FM ALIGNMENT

1. Preliminary:
   a. Rotate gang condenser until fully closed. Set pointer to Reference Mark.
   b. Rotate band selector to FM band - Maximum counterclockwise position.
   c. Short stator FM oscillator gang (C1d) to chassis - #5 terminal.

I.F. ALIGNMENT

2. Adjust Signal Generator to 10.7 mc, either CW or AM.
3. Connect generator output lead through .01 Mfd. capacitor to terminal #3 (C1c) of tuning gang.
4. Connect D.C. Vacuum Tube Voltmeter to test socket pins #1 (+) and #2 (-) using low scale.
5. Align 1st, 2nd and 3rd IF trimmers fo maximum AVC voltage, C40 on 1st IF, C42A and C42B on 2nd, C44A on 3rd. Reduce signal generator output as alignment proceeds, such that reasonable reading is obtained on low scale of D.C. VTVM. If no indication is obtained with maximum signal applied, apply signal to test jack in 1st IF can and tune C42A, C42B, and C44A to approximate peak before moving generator lead to #3 terminal.

   Realign IF trimmers (C40, C42A, C42B, and C44A) carefully several times for absolute maximum AVC voltage.
6. Insert test circuit plug in test socket and reconnect DC VTVM between center tap of shunt test resistors and test socket pin #4. See Fig. 5 for details.
7. Remove IF Signal input from receiver.
8. Set DC VTVM to zero reading.
9. Inject 10.7 MC signal to terminal #3, as in Step 3.
10. Adjust secondary of 3rd IF, C44B, to absolute zero reading on VTVM.
11. Alternate adjustments in steps 5 and 10 several times until correct adjustment is obtained.
    a. Correct adjustment is obtained when Step 5 produces no increase in AVC reading, and Step 10 remains at zero reading.
12. Remove short from terminal #5 to chassis.

R.F. AND OSCILLATOR ALIGNMENT

13. Reconnect VTVM to test socket terminals #1 (+) and #2 (-).
14. Adjust signal generator to 106 MC either CW or AM.
15. Connect generator output to receiver FM antenna posts through standard FM dummy antenna. See Fig. 8.
16. Set dial pointer to 106 MC reference mark - Fig. 6.
17. Adjust FM oscillator C11, RF - C5 and Ant. - C4 to maximum AVC reading.
    a. Tuning control must be "rocked" while adjusting C5 and C4 due to reaction on C11.
    b. The oscillator circuit has been designed to operate on the high frequency side of the incoming signal. It is possible to adjust the trimmer (C11) at 106 MC such that the oscillator is operating on the "image" or low frequency side of the signal. To check the oscillator (C11) adjustment, set signal generator to 84.6 AM, dial pointer still at 106 MC. If signal is NOT heard, adjustment of C11 is correct, but if signal IS heard, oscillator trimmer C11 has been incorrectly set on the "image" frequency. Readjust C11 to other setting at 106 MC and recheck with generator at 84.6 MC. SIGNAL MUST NOT be heard with pointer at 106 MC, and signal generator set at 84.6 MC.
18. Check calibration at 97 MC and 90 MC.
    a. If calibration is not within reasonable tolerance at these points, the inductance of the FM oscillator coil must be adjusted. If dial pointer reading is on low frequency side, inductance of oscillator coil is too low and turns must be compressed slightly. If pointer reading is on high frequency side, oscillator coil inductance is too high and coil turns must be spread slightly. Alternate Steps 17 and 18 until correct calibration is obtained.
19. Check and adjust inductance of RF coil.
    a. Tune receiver to 90 MC signal. Observe AVC reading. Insert iron core end of "tuning wand"* into RF coil, at same time rocking tuning control to maximum reading. If reading increases as wand is inserted, RF coil inductance is too low and turns must be compressed slightly. If reading decreases, reverse wand and insert brass end into coil, again rocking gang to maximum reading. If reading increases, inductance is too high and turns must be separated slightly. If reading decreases (after iron core check) inductance is properly adjusted.
20. Check and adjust inductance of antenna coil.
    a. Use exactly same procedure on antenna coil as in Step 19.

NOTE: Operations 18, 19 and 20 are very difficult and should be attempted only by technicians having had considerable high frequency experience.

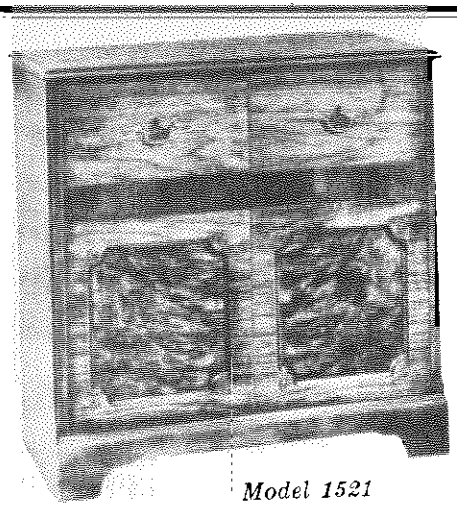
* A round rod of insulating material, approximately 8" in length, with an iron core slug on one end, and a non-ferrous metallic slug on the opposite end.

RC1H20	+	RESISTOR-Comp 470 ohms ¼w ±20% R40.	
RC1H24	+	RESISTOR-Comp 1000 ohms ¼w ±20% R35.	
RC1H40	+	RESISTOR-Comp 22000 ohms ¼w ±20% (R3, R29)	
RC1H42	+	RESISTOR-Comp 3300 ohms ¼w ±20% R12.	
RC1H51	+	RESISTOR-Comp 100,000 ohms ¼w ±20% (R33,37,17,21)	
RC1H54	+	RESISTOR-Comp 220,000 ohms ¼w ±20% (R19,R6,R14)	
RC1H58	+	RESISTOR-Comp 470,000 ohms ¼w ±20% R24	
RC1H62	+	RESISTOR-Comp 1 meg ¼w ±20% (R2, 15,18,36)	
RC1H66	+	RESISTOR-Comp 2.2 meg ¼w ±20% (R13)(R39)	
RC1H74	+	RESISTOR-Comp 10 meg ¼w ±20% R22	
RC2H00	+	RESISTOR-Comp 10 ohms ½w ±20% (R31)(R38)	
RC2H08	+	RESISTOR-Comp 47 ohms ½w ±20% (R7).	
RC2H16	+	RESISTOR-Comp 220 ohms ½w ±20% R10.	
RC2H24	+	RESISTOR-Comp 1000 ohms ½w ±20% (R9,11,26)	
RC2H34	+	RESISTOR-Comp 6800 ohms ½w ±20% (R4)	
RC2H44	+	RESISTOR-Comp 47,000 ohms ½w ±20% (R5)	
RC2H46	+	RESISTOR-Comp 68,000 ohms ½w ±20% (R34)(R23)	
RC4D26	+	RESISTOR-Comp 1500 ohms 2w ±20% (R28)	
RV4C00	+	POTENTIOMETER-Tone R20	
RV4S10	+	POTENTIOMETER-(with switch)(R-16)	
SP1R00	*	SPEAKER-12" PM Round	
TA0009		TRANSFORMER-Output (T-9)	
TI0C06		TRANSFORMER-1st IF Input (T6)	
TI0D08	+	TRANSFORMER-3rd IF Assy (T8)	
TI0I00		TRANSFORMER-2nd IF (T7)	
TP0J00	+	TRANSFORMER-Power (T10)	
TR8B02		TRANSFORMER-Ant. (T1)	
#44	+*	LAMP-Bayonet Base 6.3v	
#47	+*	LAMP-Bayonet Base	
		MECHANICAL COMPONENTS	
AB0C02		ASSY-6 Pushbutton	
BP0B02		PUSHBUTTON-Brown	
BP0R00	+	BUMPER	
BT1S00	+	STRIP-Terminal (1 soldering lug - 1 mtg. lug)	
BT1S01	+	STRIP-Terminal (1 soldering lug - 1 mtg. lug)	
BT2S00	+	STRIP-Terminal (2 soldering lug - 1 mtg. lug)	
BT2S04	+	STRIP-Terminal (2 soldering lug - 1 mtg. lug)	
BT3S00	+	STRIP-Terminal (3 soldering lug - 1 mtg. lug)	
BT5S02	+	STRIP-Terminal (5 soldering lug - 2 mtg. lug)	
DS0C05		DIAL-Scale (55-160 KC)(88-108 MC)	
DZ0F12	+	DECAL-Tuning	
DZ0N00	+	DECAL-Swing-a-Door	
GR0I00	+	GROMMET-Insulating	
GR0I01	+	GROMMET-Shockmount Insulating	
GR0I03		GROMMET-Shockmount Insulating	
GR0S09	+	GROMMET-Shockmount	
GR0S10	+	GROMMET-Shockmount	
GZ0M05	+	GRILLE-Metal (Eng Ant)	
HB0M16	+	BRACKET-Pushbutton Mtg	
HB0M19	+	BRACKET-Shockmount	
HC0C00	+	CLIP-Coil Mtg	
HC0C03	+	CLAMP-Dial Cable	
HC0C06	+	CLIP-Coil Fastener	
HC0C07	+	CLIP-Cable	
HC0D03	+	CLIP-Retainer Spring	
HC0R00	+	STOP-Runner	
HC0S09	+	CLIP-Retainer Ring	
HC0S28	+	CLIP-Washer "C"	
HC0T03		CLAMP-Tube	
HK0H04	+	PULL Door	
HK0R00	+	CLIP-Retainer Ring	
HN0R00	+	BUSHING-Threaded	
HR0P01	+	RIVET-Tubular 1/8 x .121	
HR0P02	+	RIVET-Tubular 11/64 x .121	
HR0S01	+	RIVET-Shoulder .171 x .118	
HR0S07	+	RIVET-Shoulder .190 x .185	
HS0C00	+	SPRING-Dial Cord (Pulley)	
HS0C68		SPRING-Dial Cord (Idler)	
HS0P16	+	SLEEVE-Spacer	
HS0P17	+	SPACER-3/8 x 1/2 x .058	
HS0S05	+	SPACER-Threaded	
HT0T00	+	TRACK-Record Changer	
HZ0C00	+	CATCH-Bullet (Eng Ant)	
HZ0G01	+	GLIDE-Metal	
HZ0H00	+	HINGE-Lid	
HZ0H04	+	HINGE-Door (Stat Brze.)	
HZ0S02	+	SUPPORT-Lid (Stat Brze.)	
ID0M13		INDICATOR-Dial	
JI0A00	+	JEWEL-Pilot Light	
JP1002	+	PLUG-1 contact male	
JP2004	+	PLUG-2 contact	
JP3002	+	PLUG-3 contact	
JR2006	+	RECEPTACLE-2 contact	
JR3000	+	RECEPTACLE-3 contact	
JR1S00	+	RECEPTACLE-Phono	
KC0B10		KNOB-Control (Index)	
KC0B11		KNOB-Control (Plain)	
MA0T00		ADAPTER-Slug Adj. Screw	
MC0C01	+	CAM & BUMPER	
MP0I00	+	PULLEY-Idler	
MS0F00	+	RUNNER-Plain	
MS0G00	+	RUNNER-Guide	
MS0T08	+	SHAFT-Tuning	
NE0M00	+	EMBLEM-Nameplate	
NP0S00	+	NEEDLE	
PB0D01		PLATE-Back	
PI0P01	+	PLATE-Line Cord Insulator	
PF0B00	+	PADS-Felt Brown	
SM0B00	+	BASE-Min Tube	
SM0T03	+	SHIELD-Min Tube	
SO0D04	+	SOCKET-Dial Light	
SO0D05	+	SOCKET-Dial Light	
SO0D10		SOCKET-Dial Light	
SO7M05	+	SOCKET-Min Tube	
SR3G00	+	SWITCH-Rotary	
SS6P01		SWITCH-6 Pushbutton	
ST0I00		SLUG-Iron Pushbutton Tuning	
WF0F14	+	WASHER-Insulating (Trimmer Mtg.)	
WP0B00	+	WINDOWS-Pushbutton	
XS0Z02	+	STRIP-Fishpaper	
XZ0R00	+	STOP-Rail	
		CABINET COMPONENTS - MODEL 1519 & 1525	
BZ0D15		Cardboard Baffle and Cloth (without cutout)	
BZ0D16		Cardboard Baffle and Cloth (with cutout)	
ZD8G02		DOOR-Walnut (pair)	
ZL8G02		LID-Walnut (pair)	
ZW8G02	*	CABINET-Walnut (Model 1519)	
ZW8G05	*	CABINET-Walnut (Model 1525)	
		CABINET COMPONENTS - MODEL 1518 & 1524	
BZ0D09	+	Cardboard Baffle and Cloth (without cutout)	
BZ0D10	+	Cardboard Baffle and Cloth (with cutout)	
ZF8G01		DOOR-BW71	
ZL8G01		LID-BW71 Mahogany Complete top (Permanent & Adjustable)	
ZW8G01	*	CABINET-Assy BW71 Mahogany (1518)	
ZW8G04	*	CABINET-Assy Mahogany (1524)	
		HUSH-O-MATIC ELECTRICAL COMPONENTS FOR 1524-1525	
CC9K50		CAPACITOR-Ceramic 1000 mmf (C100)	
CE1T03		CAPACITOR-Electrolytic 5 mfd (C109)	
CM4A18		CAPACITOR-Mica 68 mmf (C110)(C102)	
CM5A14		CAPACITOR-Mica 47 mmf (C105)	
CM5A26		CAPACITOR-Mica 150 mmf (C107)	
CP4T20		CAPACITOR-Paper .006 mfd 400v (C103)(C104)	
CP4T36		CAPACITOR-Paper .03 mfd 400v (C106)	
CP4T40		CAPACITOR-Tub Paper .05 mfd 400v (C108)	
CP6T12		CAPACITOR-Paper .002 mfd 600v (C101)	
RC1H34		RESISTOR-Comp 6800 ohms ¼w (R104)	
RC1H40		RESISTOR-Comp 22K ohms ¼w (R110) (R111)	
RC1H44		RESISTOR-Comp 47K ohms ¼w (R108)	
RC1H51		RESISTOR-Comp 100K ohms ¼w (R115)	
RC1H53		RESISTOR-Comp 150K ohms ¼w (R100) (R101)	
RC1H54		RESISTOR-Comp 220K ohms ¼w (R103)	
RC1H58		RESISTOR-Comp 470K ohms ¼w (R109) (R113)	
RC1H68		RESISTOR-Comp 3.3 meg. ¼w (R105) (R107)	
RC1H62		RESISTOR-Comp 1 meg. ¼w (R102) (R106)(R112)	
RC1H72		RESISTOR-Comp 6.8 meg ¼w (R114)	
		HUSH-O-MATIC MECHANICAL COMPONENTS 1524-1525	
BT3S06		BOARD-Terminal 3 terminal 1 mtg	
BT7S01		BOARD-Terminal 7 terminal 2 mtg	
EC0M00		ESCUTCHEON-Control Hush-O-Matic	
GR0S15		GROMMET-Shockmount Chassis	
MP0M03		PLATE-Mtg	
JP1O02		JACK-Phono	
JR1S00		RECEPTACLE-Phono	
KS0B02		KNOB-Control (Set Type)	
SM0B03		BASE-Tube Shield	
SM0T04		SHIELD-Tube	
SO7M06		SOCKET-Miniature	
SR2A01		SWITCH-S.P.S.T	
XS0C06		STRIP-Fishpaper .015 x 1-1/4" x 1-1/2"	
		GENERAL HARDWARE	
		PALNUT-3/8 - 32	
		SCREW-Oval Head Phillips 4-40 x 5/8"	

CP4T31 + CAPACITOR-Tub Paper .01 mfd 400v (C89)
CP4T40 + CAPACITOR-Paper .05 mfd 400v (C17,18,19,20,48,61)
CP6T12 + CAPACITOR-Paper Tubular .002 mfd 600v (C30)
CP6T19 + CAPACITOR-Paper .009 mfd 600v C34, C36
CP6T20 + CAPACITOR-Tubular Paper .006 mfd 600v (C27,31,36)
CP6T31 + CAPACITOR-Paper .01 mfd 600v (C33,C43)
CTA003 + CAPACITOR-Trimmer (C31,69)
CTA004 + CAPACITOR-Trimmer (C53,86)
CTA005 + CAPACITOR-Trimmer C85
CTA009 + CAPACITOR-Trimmer 3-13 mmf (C11)
CTA010 + CAPACITOR-Trimmer 4-75 mmf C10
CTA011 + CAPACITOR-Mica 420-800 mmf (C13)
CTC000 + CAPACITOR-Trimmer (2-20 mmf) (C4, C5)
CTC001 + CAPACITOR-Trimmer 4-75 mmf (C12)
CV0D00 + CAPACITOR-Variable (C1)
LF0A00 + CHOKE-R.F. (T11, T12)
LF0A01 + CHOKE-R.F. (L1, L2)
LT0A03 + COIL-Pushbutton (L10)
LT0A04 COIL-Pushbutton (L8,9)
LT0A05 COIL-Pushbutton (L6,7)
RC2G27 + RESISTOR-Comp 1800 ohms ½w ±10% R1
RC1H19 + RESISTOR-Comp 330 ohms ½w ±20% (R30)

ELECTRICAL COMPONENTS

CC0A34 + CAPACITOR-Ceramic 15 mmf 500v (C46)
CC0A30 + CAPACITOR-Ceramic 45 mmf 500v (C14 - 44)
CC0F18 + CAPACITOR-Ceramic 4.7 mmf (C7)
CE3A03 + CAPACITOR-Electrolytic 20-20-40 mfd 450v C38
CE1T00 + CAPACITOR-Electrolytic 20 mfd 25v (C21,C47)
CE1T01 + CAPACITOR-Electrolytic 3 mfd (C37)
CL2A10 COIL-Phono Power
CM4A28 + CAPACITOR-Mica 680 mmf 300v C41, C38, C45
CM5A22 + CAPACITOR-Mica 100 mmf 500v (C39)
CM5A30 + CAPACITOR-Mica 220 mmf 500v (C28, 48)
CM4L42 + CAPACITOR-Mica 680 mmf 300v (C3)
CM5L03 + CAPACITOR-Mica 15 mmf 500v (C40)
CM5L22 + CAPACITOR-Mica 100 mmf 500v (C8)
CM5L30 + CAPACITOR-Mica 220 mmf 500v (C6, C9, C50)
CM6S50 + CAPACITOR-Mica 470 mmf
CP2H10 + CAPACITOR Paper .001 mfd 200v C23, C24, 29, 42
CP4M34 + CAPACITOR-Paper .02 mfd 400v C15
CP2T3u + CAPACITOR-Paper Tub .03 mfd 200v (C25)



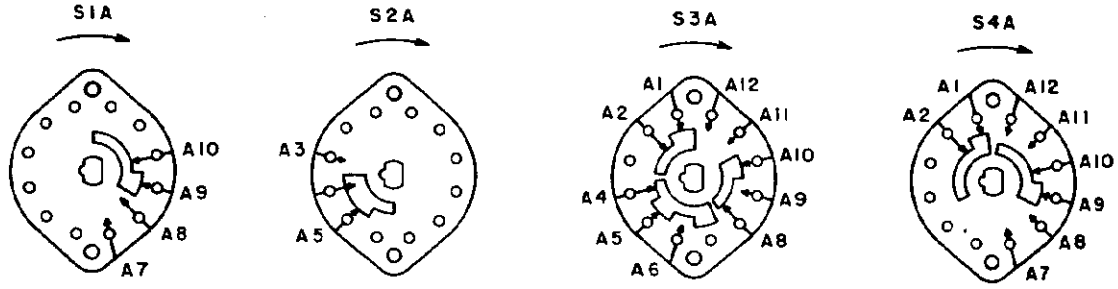
Model 1521
Walnut

GENERAL

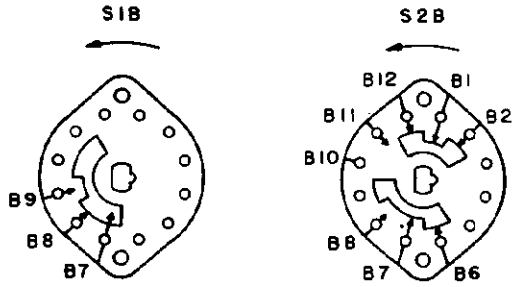
The Bendix Model 1521 is an eight tube AM-FM superheterodyne receiver providing AM reception from 540 KC to 1620 KC and FM reception from 88 MC to 108 MC. A jack on the radio chassis provides 110 volts AC to the record changer motor only when the radio OFF-ON switch is in the ON position. The output of the phonograph is injected into the audio amplifier of the main chassis through a high impedance phono jack also mounted on the rear of the main chassis.

The standard superheterodyne circuit is used, with one stage of tuned Radio Frequency on the FM band; an AM signal is fed directly into the Converter Stage. A low impedance AM Loop Antenna is located on the rear cover of the cabinet as well as the built-in FM Dipole Antenna. AM or FM external antennas may be used with this receiver. When making use of an external FM antenna, *disconnect* the internal FM antenna at the chassis and replace with the external antenna lead-in. The proper external antenna to be used for FM is a 300 ohm Dipole Antenna such as the Bendix AD1F00.

The 7F8 dual triode is used as a mixer and oscillator for both FM and AM. One diode of the 6SQ7 is used for DAVC in the FM circuit; the remaining diode and triode are the AM detector and 1st audio circuits respectively.

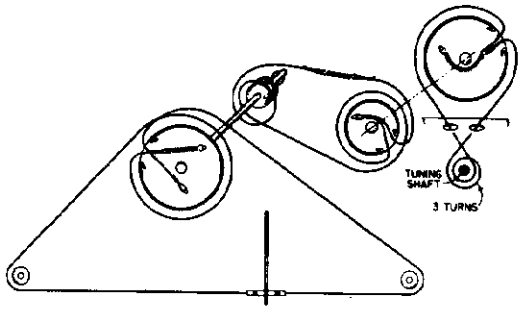


SECTIONS VIEWED FROM FRONT OF CHASSIS
SECTIONS NUMBERED FRONT TO REAR



SECTIONS VIEWED FROM REAR OF CHASSIS
SECTIONS NUMBERED FROM FRONT TO REAR

Wafer Connections

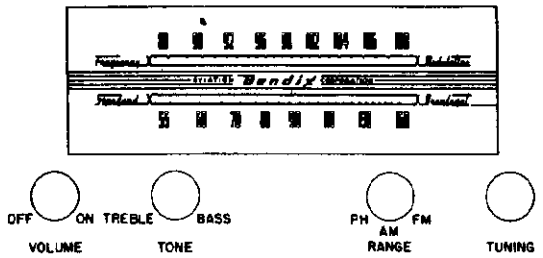


Dial Stringing Diagram

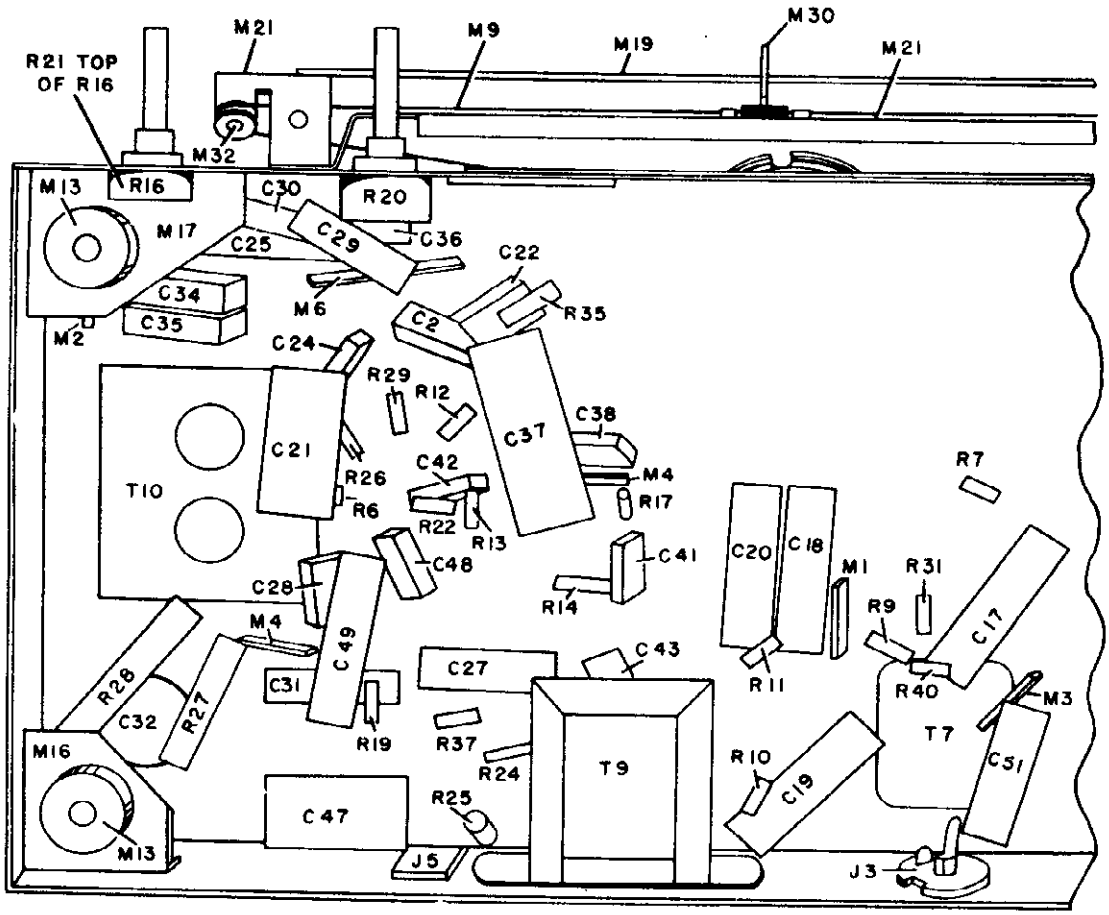
SPECIFICATIONS

Power Requirements
105 - 125 volts, 60 cycles AC
Power Consumption
Radio - 60 watts; Phono-turntable - 25 watts.
Tuning Frequency Range
AM 540 - 1620 KC
FM 88 - 108 MC
Intermediate Frequency
AM 455 KC
FM 10.7 MC
Power Output
Maximum — 4 Watts
Tube Complement
1-6AG5, 1-7F8, 1-7AH7, 1-7AG7, 1-6H6, 1-6SQ7, 1-6V6GT, 1-5Y3GT. Total 8
Loudspeaker
12-inch diameter PM

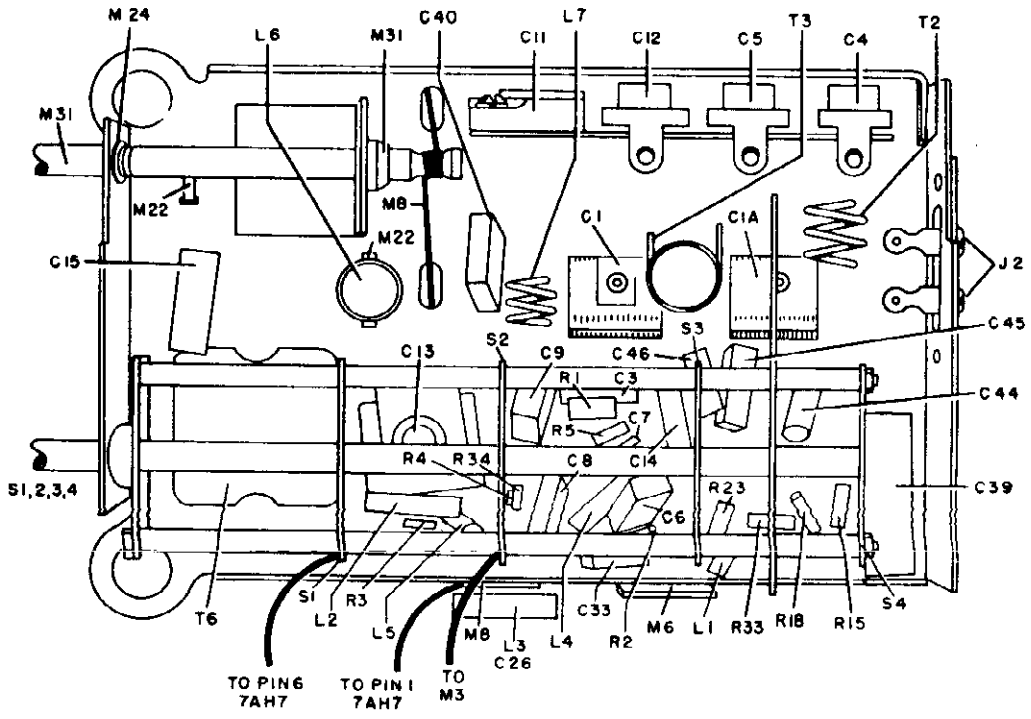
Record Changer
Automatic - twelve 10-inch or ten 12-inch standard lateral cut records.



Control Layout



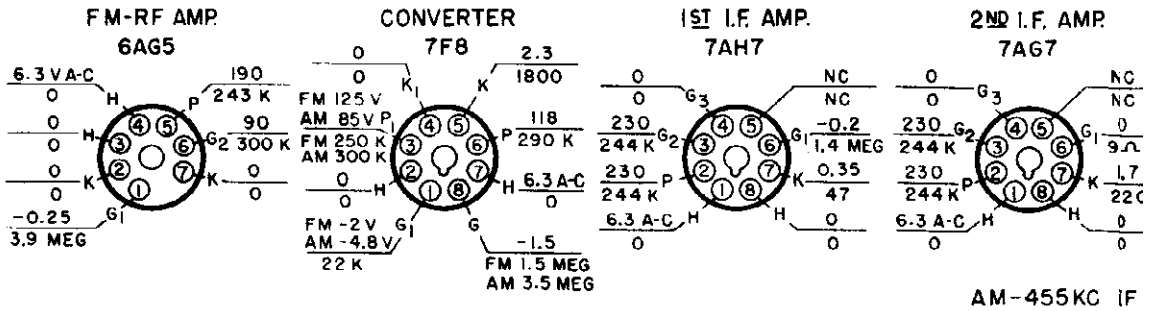
Main Chassis Component Diagram
Bottom View



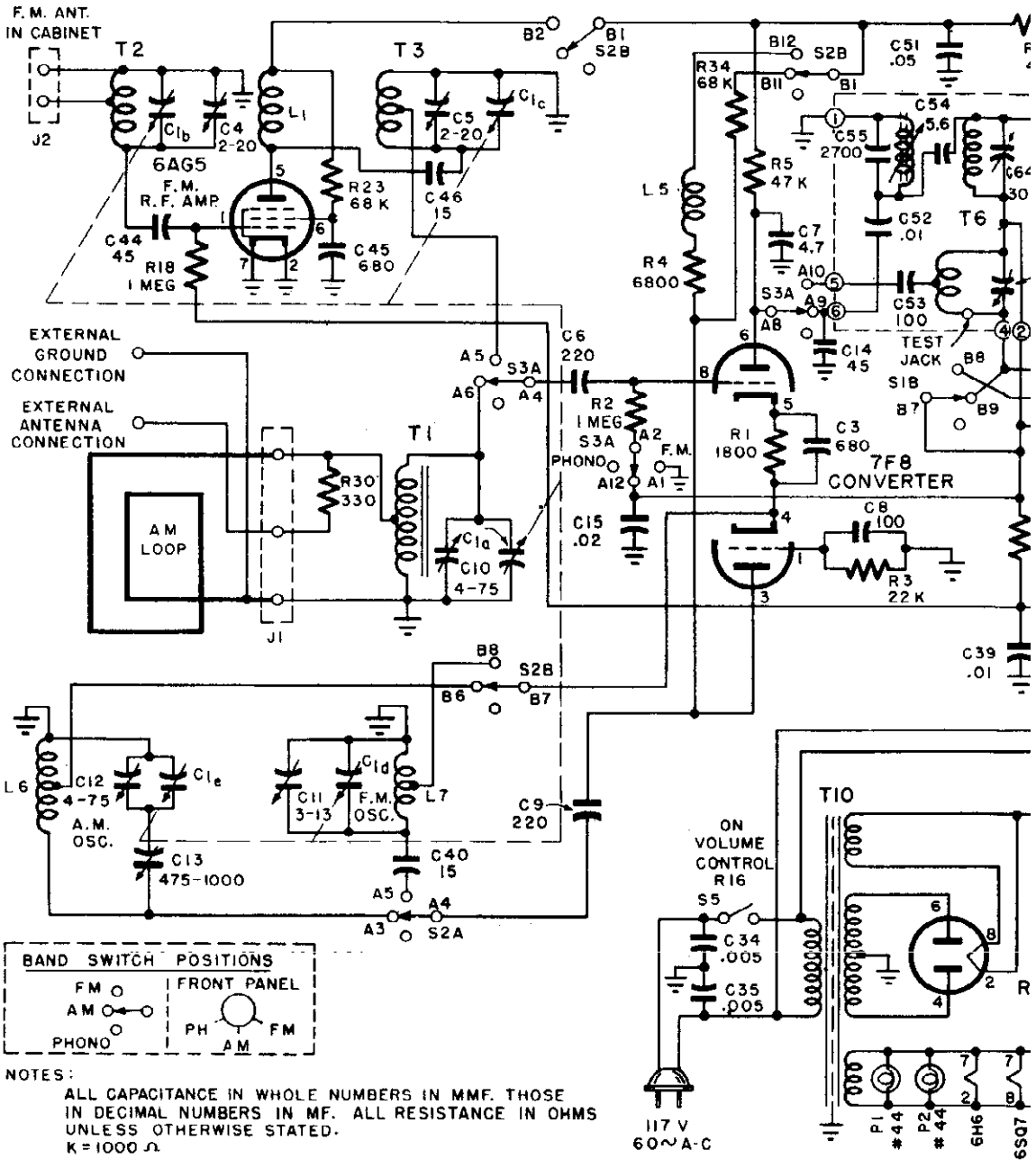
RF Chassis Component Diagram
Bottom View

CONDITIONS OF

LINE VOLTAGE 117 A-C	ZERO SIGNAL INPUT	VOL. CONT. MIN.	SOCKET	VOLT / RESST



AM-455KC IF



NOTES:

ALL CAPACITANCE IN WHOLE NUMBERS IN MMF. THOSE IN DECIMAL NUMBERS IN MF. ALL RESISTANCE IN OHMS UNLESS OTHERWISE STATED.
K = 1000 Ω

SUREMENTS

E TO COMMON GROUND D-C AT 20,000 Ω/V A-C AT 1,000 Ω/V

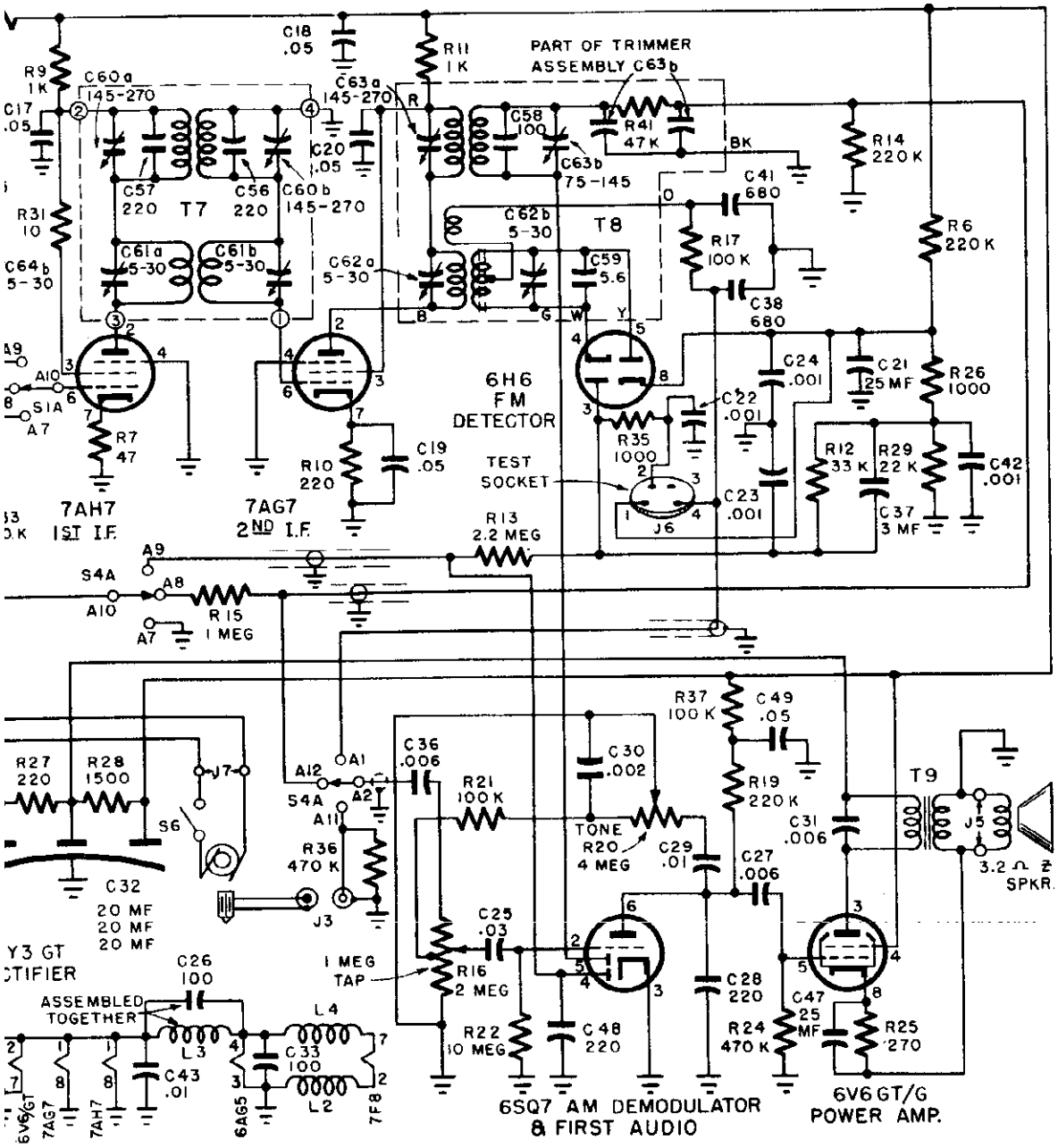
FM DETECTOR 6H6

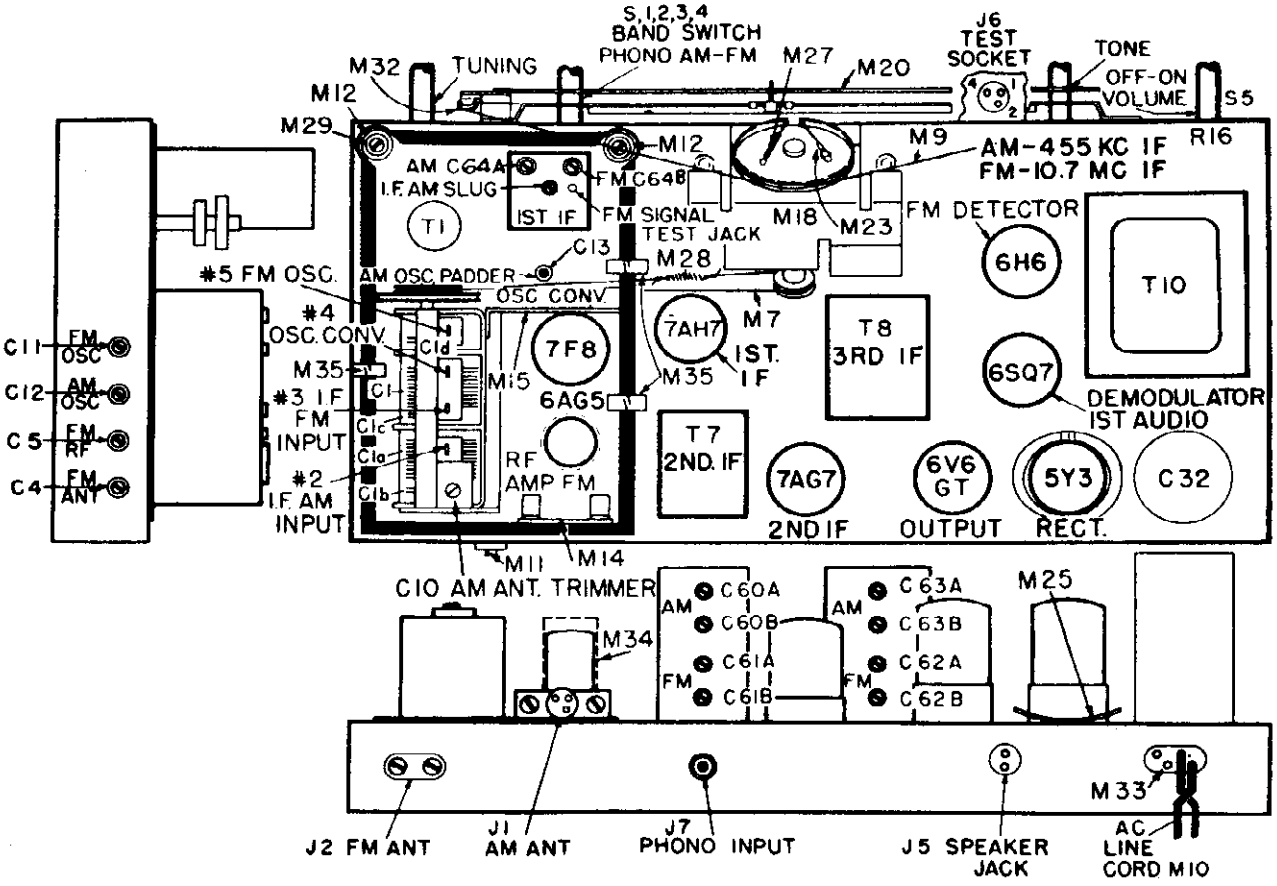
AM DEMODULATOR & 1ST AUDIO 6SQ7

POWER AMP 6V6 GT/G

RECTIFIER 5Y3 GT

EQUENCY FM-10.7 MC

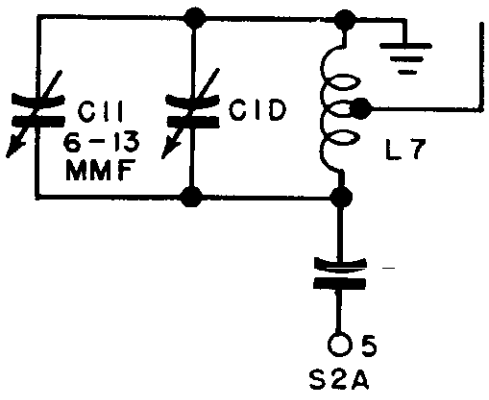




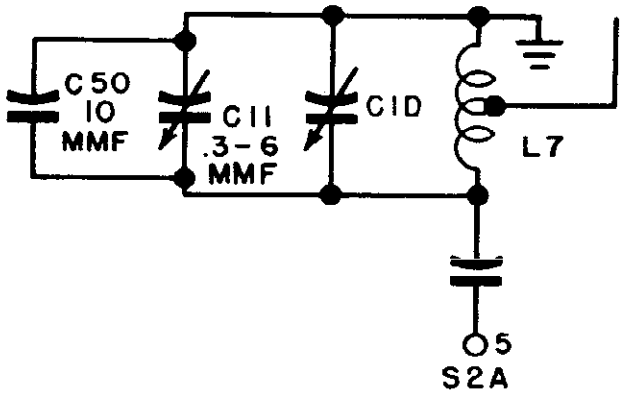
Trimmer Location Diagram

CIRCUIT CHANGES

Some sets of this model, capacitor CT1A09 (C11) has been replaced by two capacitors CT2A14 (C11) and CC5A22 (C50). The FM oscillator is changed as shown



Circuit using 6 - 13 mmf for C11



Circuit using 10 mmf in parallel with .3 - 6 mmf C11.

ALIGNMENT PROCEDURE

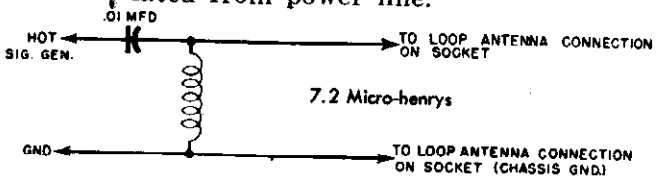
Remove chassis from cabinet and, if possible, have a speaker connected while alignment procedure is carried out. By using an amplitude modulated (30%) test signal whenever possible, weak signals in a detuned receiver may readily be identified. Plug the line cord into 117 volts, 60 cycle A.C. power source and turn the set on. Allow the set and test equipment to "warm up" for five minutes before beginning alignment procedures.

The AM channel is aligned first since the FM alignment will be affected if the AM section is not tuned properly. Refer to Figs. 3, 8, 9, 10 and 11 for trimmer locations, dial reference points, etc.

To set dial pointer, rotate gang condenser until fully closed and set pointer to reference mark at left of scale. See Fig. 10.

TEST EQUIPMENT REQUIRED

Standard AM Signal Generator
FM Signal Generator with range to approximately 108 MC. (For visual alignment.)
Bendix AM Dummy Antenna (See Fig. 3)
FM Dummy Antenna (See Fig. 9)
.01 mfd Capacitor
Alignment Screwdriver
Special Test Circuit Plug (See Fig. 11)
Standard Output Meter
Vacuum Tube Voltmeter - Preferable with a zero center scale.
a. Minus or "ground" lead must be isolated from power line.



A M Dummy Antenna
Bendix No. AD0L01

AM ALIGNMENT

PRELIMINARY:
Connect the output meter across voice coil. Set meter on lowest A C Range.
Signal Generator Amplitude Modulated (Approx. 30% modulation)
Rotate Volume Control full on. Keep Generator output low as possible.

	Generator Freq.	Dummy Antenna	Generator Coupling	Band Position	Special Conditions	Dial Setting	Adjust	Remarks
1)	455 KC	.05 mfd	High Side—Term. #2 of gang Cond. Low Side—Chassis Gnd.	AM—Mid-Position	Short AM Osc.—Term. #4 to Chassis	Gang Closed	IF Slug; C64A, C60A, C60B, C63A, C63B.	Adjust for Max. Outpu
2)	580 KC	Bendix Dummy Antenna AD0L01	Dummy Antenna Plugged in AM Ant. Socket on Rear of Chassis See Fig. 8	AM—Mid-Position	Remove short from Term. #4	580 KC Ref. Mark	AM Osc. Padder C13	"
3)	1475 KC	"	"	"	———	1475 KC Ref. Mark	AM Osc. Trimmer C12, AM Ant. Trimmer C10	"
4)	580 KC	"	"	"	———	580 KC Ref. Mark	C13	Rock Gang Cond. Adjust for Max. Outpu
5)	REPEAT STEPS 3 & 4 UNTIL RECEIVER IS PROPERLY ALIGNED							
6)	965 KC	Bendix Dummy Antenna AD0L01	Dummy Antenna Plugged in AM Ant. Socket on Rear of Chassis, See Fig. 8	AM—Mid-Position	———	965 KC Ref. Mark	———	*Check Calibration
7)	580 KC	"	"	"	———	580 KC Ref. Mark	———	Check Calibration

*If calibration is not within 10 KC in steps 6 & 7, oscillator & antenna gang rotor sections must be bent. This operation should be attempted by experienced technicians only.

FM ALIGNMENT

CW METER METHOD

BE CERTAIN "AM" CHANNEL IS ALIGNED BEFORE BEGINNING "FM" ALIGNMENT.

The CW Meter Method has proved to be very satisfactory for aligning the FM section of a correctly operating Bendix Model 1521 receiver. The advantage of this method over the Visual Alignment procedure is that the equipment required is generally associated with AM receiver alignment. A check by use of the Visual method will reveal any distortion in the output, which is difficult to locate using only the CW Meter Method.

1. Preliminary
   a. Rotate band selector to FM band - Max. counter-clockwise
   b. Short stator of FM oscillator gang to chassis - #5 terminal. See Fig. 8.
2. Signal Generator Setting
   a. Power "ON"
   b. Frequency - 10.7 MC
   c. Modulation - pure RF or, preferably, amplitude modulated.
3. Connect generator lead through .01 mfd capacitor to terminal #3 (C1d) of gang condenser.
4. Connect DC Vacuum Tube Voltmeter to test socket pins #1 (+) and #2 (-) using low scale.
5. Align 1st, 2nd, and 3rd IF trimmers for maximum AVC voltage - C64B on 1st IF, C61A and C61B on 2nd, C62A on 3rd. As alignment proceeds, reduce signal generator output, such that reasonable reading is obtained on lowest scale of DC vacuum tube voltmeter. If no indication is obtained with maximum signal applied, apply signal to test jack in 1st IF can and tune C61A, C61B, and C62A to approximate peak before moving generator lead to #3 terminal. Realign all IF trimmers (C64B, C61A, C61B, and C62A) carefully several time for *absolute maximum* AVC voltage.
6. Insert test circuit plug in test socket and connect DC Vacuum Tube Voltmeter between center tap of shunt test resistors and test socket pin #4. See Sketch, Fig. 11.
7. Remove IF signal input from receiver. (Vacuum Tube Voltmeter remains connected to test socket and receiver is still "ON".)
8. Adjust DC Vacuum Tube Voltmeter to zero reading under conditions stated in Step 7.
9. Re-connect Signal Generator to terminal #3 as in Step 2, using the same 10.7 MC signal.
10. Adjust secondary of 3rd IF (C62B) to absolute zero reading on Vacuum Tube Voltmeter. (Same "zero reading" as in Step 8.)
11. Alternate adjustments in Steps 5 and 10 several times until correct adjustment is obtained.
    a. Correct adjustment is obtained when Step 5 produces no increase in AVC reading, and Step 10 remains at zero reading.
    (Note: When changing from Step 5 to Step 10, Vacuum Tube Voltmeter is adjusted for zero with Signal Generator output removed from chassis. *Do not remove* Vacuum Tube Voltmeter leads from chassis and adjust for zero.)
12. Remove short from terminal #5 to chassis.
13. Reconnect Vacuum Tube Voltmeter to test socket terminals #1 (+) and #2 (-).
14. Reset Signal Generator
    a. Frequency - 106 MC
    b. Output - pure RF or amplitude modulated.
15. Connect generator output to receiver FM antenna posts through standard FM dummy antenna. See Fig. 9.
16. Set pointer to 106 MC Reference Mark - Fig. 10.
17. Adjust FM oscillator C11, RF - C5, and antenna - C4, to obtain maximum AVC reading. Repeat several times to insure maximum reading.
    a. Tuning control must be rocked while adjusting C5 and C4 due to reaction on C11.
18. Check calibration by setting dial pointer on 97 MC Reference Mark (See Fig. 10) and change Signal Generator to 97 MC pure RF or amplitude modulated.
19. Repeat Step 18 for a signal of 90 MC. If calibration in Steps 18 and 19 is off, it will be necessary to readjust inductance of oscillator coil, (RF and antenna coils also, if needed). See Text "FM Alignment - Visual Method" - Paragraph 17.
    NOTE: *This operation should be attempted by well experienced technicians ONLY.*

VISUAL ALIGNMENT

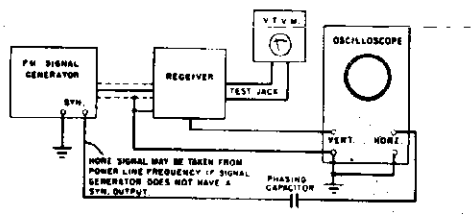
The Bendix Radio Model 1521 receiver uses the ratio detector type of demodulator. Since the limiter stage is omitted, a direct visual alignment of the IF stages by means of an oscilloscope is impractical. However, the ratio detector may readily be aligned visually, and upon completion of the entire alignment procedure, a visual alignment analysis of a signal from antenna to discriminator load will indirectly determine whether the IF transformers are symmetrically aligned.

The general method of alignment, hereafter described, is to first align the IF transformers and the primary of the detector at 10.7 MC by means of a pure RF signal and a Vacuum Tube Voltmeter. After this preliminary alignment, the secondary of the IF detector is aligned visually by means of a frequency modulated RF signal at 10.7 MC and an Oscilloscope across the ratio detector output. It is a definite advantage to use 60 cycle modulation with the frequency modulated RF signal, since no syn-

chronization is needed between the horizontal and vertical signals to keep the scope pattern stationary.

Connect the test instruments as diagramed in Fig. 4 and as directed in the procedure hereafter. The connections for the Vacuum Tube Voltmeter and vertical input to the oscilloscope are changed to different test jack terminals as different steps in the alignment procedure are completed.

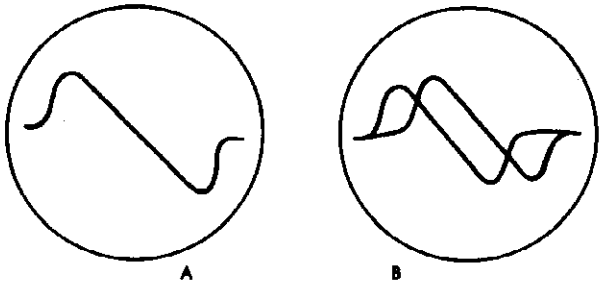
1. Signal Generator Setting
   a. Power - "ON"
   b. Frequency setting - 10.7 MC
   c. Modulation - pure RF or amplitude modulated.
   d. Output controls - set for workable receiver output.
2. Receiver Settings
   a. Rotate band selector to FM band - Maximum counter-clockwise.
   b. Short stator of local FM oscillator to ground.
   This connection is #5 terminal on the gang condenser, easily accessible from the top of the chassis. See Fig. 8.
3. Connect generator lead to terminal #3 of gang condenser using .01 mfd coupling capacitor and ground shield to receiver chassis.
4. Connect Vacuum Tube Voltmeter to test socket pins #1 (+) and #2 (-). See Figs. 8 and 11.
5. Align 1st and 2nd IF transformers for maximum AVC voltage, - trimmer C64B on 1st IF, trimmers C61A, C61B on 2nd. As alignment proceeds, reduce signal generator output such that reasonable reading is obtained on lowest scale of DC Vacuum Tube Voltmeter. If no indication is obtained with maximum signal applied, apply signal to test jack in 1st IF can and tune 2nd IF transformer to approximate peak before moving generator input back to #3 terminal. Adjust primary of detector transformer (trimmer C62A) for maximum AVC voltage. Carefully realign all IF trimmers (C64B, C61A, C61B, C62A) several times for absolute maximum AVC voltage.
6. Reset Signal Generator
   a. Frequency 10.7 MC
   b. Modulation - 60 cycle FM
   c. Sweep width - maximum possible (should be a minimum of 200 KC).
7. Connect vertical input of scope to test socket pin #4 and ground as shown in Figs. 4, 8, and 11 and connect a 60 cycle sine wave signal to horizontal input.



Connections for Visual Alignment

A suitable 60 cycle signal may be obtained by removing one of the dial lamp sockets from its bracket and connecting the horizontal input lead directly to the socket or through a small capacitor if required for proper phasing. The sweep circuit in the scope is not used.

8. Adjust Signal Generator frequency until ratio detector curve is centered on the horizontal scope sweep - (This may deviate slightly from 10.7 MC.)
9. Adjust secondary of detector transformer (C62B) for a maximum "S" curve similar to Fig. 5a - (the "S" curve may be reversed depending on the internal circuit of the scope used.) Alternate adjustment of primary (C62A) and secondary (C62B) to obtain maximum desired curve. Some phase shift between the Signal Generator and scope horizontal sweep may be encountered, resulting in a double trace pattern, shown in Fig. 5b. In some oscilloscopes, provision is made for correcting this phase shift directly in the oscilloscope circuit. If so, rotate the "phase shift" control until the curves coincide as in Fig. 5a. If no provision is made in the 'scope, the correction might be accomplished by inserting a capacitor of suitable value in series with the 60 cycle signal and the horizontal input to the scope. The capacitor value will depend upon the amount of phase shift and the horizontal input impedance of the scope. Approximate capacitors range from .01 to 0.1 mfd. When aligning the secondary of the detector transformer visually, it is advantageous to leave the Vacuum Tube Voltmeter connected to test socket pins #1 (+) and #2 (-) as in Step 4. This will facilitate the adjustment for maximum "S" curve since the meter will indicate the maximum AVC voltage and the scope will indicate the most linear "S" curve. Maximum meter reading obtained at same time best linearity is obtained, indicates correct alignment.
10. Rotate gang condenser such that the pointer is resting on 106 MC reference mark on dial face. Remove short from FM oscillator terminal #5 to ground.
11. Reset Generator
    a. Frequency - 106 MC
    b. Modulation - 60 cycle FM
    c. Sweep - maximum width (should be between 200 KC and 450 KC).
12. Connect Signal Generator lead to receiver antenna post through standard FM dummy antenna (See Fig. 9).
13. Oscilloscope should be connected as in Step #7.
14. Adjust C11, local oscillator trimmer, until "S" curve is centered on scope.
    The Oscillator has been designed to operate on the high side of the incoming signal. It is possible to adjust the trimmer (C11) at 106 MC so that the oscillator is operating on the "image" or low frequency side



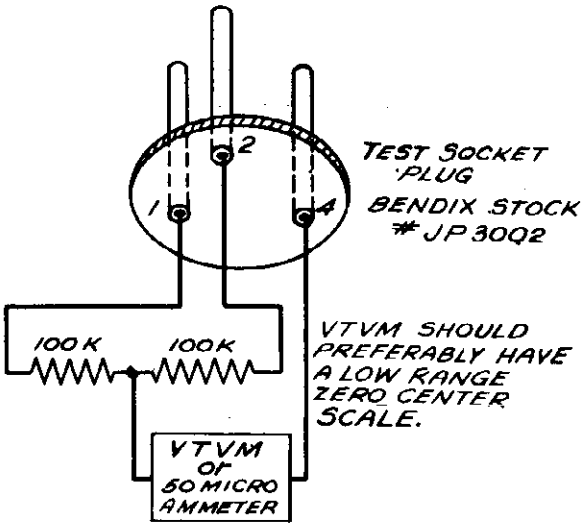
"S" Curves

of the signal. To check the oscillator (C11) adjustment, set Signal Generator to 84.6 MC, frequency modulated, dial pointer still at 106 MC. If signal is NOT heard, adjustment of C11 is correct, but if signal is heard, oscillator trimmer C11 has been incorrectly set on the "image" frequency. Readjust C11 to other setting at 106 MC and recheck with generator at 84.6 MC. Signal MUST NOT be heard with pointer at 106 MC, and Signal Generator, frequency modulated, set at 84.6 MC.

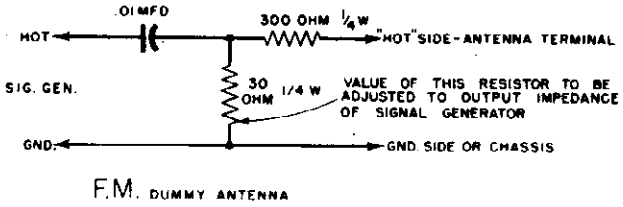
15. Adjust C5, at same time "rocking" receiver tuning control to keep "S" curve centered on horizontal sweep line on scope, for maximum height of the "S" pattern.
16. Adjust C4 for maximum height of the "S" pattern.
17. Check calibration of 97 MC and 90 MC.
    a. If calibration is not within reasonable tolerance at these points, the inductance of the FM oscillator coil must be adjusted. If dial pointer reading is on low frequency side, inductance of oscillator coil is too low and turns must be compressed slightly. If pointer reading is on high frequency side, oscillator coil inductance is too high and coil turns must be spread slightly. Repeat Steps 14 to 17 until correct calibration is obtained.
18. Check and adjust inductance of RF coil.
    a. Tune receiver at 90 MC signal. Observe AVC reading. Insert iron core end of "tuning wand" * into RF coil at same time "rocking" tuning control to maximum reading. If reading increases as wand is inserted, RF coil inductance is too low and turns must be compressed slightly. If reading decreases, reverse wand and insert brass end into coil, again "rocking" gang to maximum reading. If reading increases, inductance is too high and turns must be separated slightly. Insertion of either end of tuning wand should cause meter reading to decrease.
19. Check and adjust inductance of antenna coil.
    a. Use exactly same procedure on antenna coil as in Step 18.

    NOTE. Operations 17, 18 and 19 are very difficult and should be attempted only by technicians who have had more than average high frequency experience.

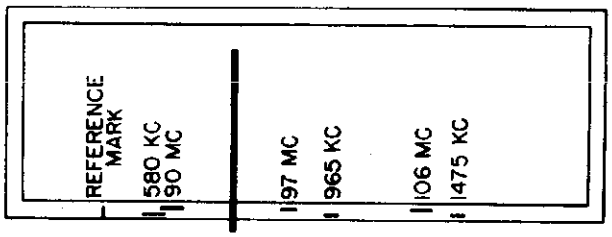
* A round rod of insulating material, approximately 6" in length, with an iron core slug on one end, and a non-ferrous metallic slug on the opposite end.



Test Circuit for Demodulator Transformer Alignment



FM Dummy Antenna



Dial Reference Points

ELECTRICAL COMPONENTS

CC5A22	CAPACITOR—Ceramic 10 mmf 500V (C50)
CC8A24†	CAPACITOR—Ceramic 15 mmf 500V (C46)
CC8A30†	CAPACITOR—Ceramic 45 mmf 500V (C14, 44)
CC0F18†	CAPACITOR—Ceramic 4.7 mmf (C7)
CC0F19†	CAPACITOR—Ceramic 5.6 mmf (C54) (C59)
CE3A03†	CAPACITOR—Electrolytic 20 x 20 x 40mfd (450 DC) (C32)
CE1T00†	CAPACITOR—Electrolytic 25 mfd 25VDC (C21, 47)
CE1T01†	CAPACITOR—Electrolytic 3 mfd (C37)
CM4A42†	CAPACITOR—Mica 680 mmf 300V (C41, 38, 45)
CM5A22	CAPACITOR—Mica 100 mmf 500V (C33) (C53)
CM5A30	CAPACITOR—Mica 220 mmf 500V (C28) (48)
CM6A22	CAPACITOR—Mica 100 mmf (C58)
CM7A30	CAPACITOR—Mica 220 mmf (C56, 57)
CM4L42	CAPACITOR—Mica 680 mmf 300V (C3)
CM5L03	CAPACITOR—Mica 15 mmf 500V (C40)
CM5L22	CAPACITOR—Mica 100 mmf 500V (C8)
CM5L30	CAPACITOR—Mica 220 mmf 500V (C6, 9)
CM8S70	CAPACITOR—Mica 2700 mmf 500V (C55)
CP2M10	CAPACITOR—Paper .001 mfd 200V (C23, 24, 22, 42)
CP4M34	CAPACITOR—Paper .02 mfd 400V (C15)
CP4M51	CAPACITOR—.01 mfd (C52)
CP2T36	CAPACITOR—Paper .03 mfd 20V (C25)
CP4T31	CAPACITOR—Tub Paper .01 mfd 400V (C29)
CP4T40	CAPACITOR—Paper .05 mfd 400V (C17, 18, 19, 20, 49, 51)
CP6T12	CAPACITOR—Paper .002 mfd 600V (C30)
CP6T18	CAPACITOR—Paper .005 mfd 600V (C34, C35)
CP6T20	CAPACITOR—Paper .006 mfd 600V (C31, 36, 27)
CP6T31	CAPACITOR—Paper .01 mfd 600V (C39, C43)
CT1A09	CAPACITOR—Trimmer (C11)
CT1A10	CAPACITOR—Trimmer Mica (C10) (4-75 mmf)
CT1A11	CAPACITOR—Trimmer (C13) (475-1000 mmf)
CT2A09	CAPACITOR—Trimmer (5-30 mmf) (5-30 mmf) (C15a, C16b, C62a, C62b)
CT2A10	CAPACITOR—Trimmer (145-270 mmf) (C63a) (75-145 mmf)-(C63b)
CT2A11	CAPACITOR—Trimmer (145-270 mmf) (145-270 mmf) (C60a, C60b)
CT2A14	CAPACITOR—Trimmer (5-30 mmf-C61) (30-75 mmf-C64a)
CT1B01	CAPACITOR—Midget Trimmer .3-6 mmf (C11 on models using C50)
CT1C00	CAPACITOR—Trimmer (C4, C5) (0.2-20 mmf)
CT1C01	CAPACITOR—Trimmer (C12) (4-75 mmf)
CV0D00	CAPACITOR—Variable C1
LF0A00	COIL—RF Choke (L4) (L2)
LF0A01†	COIL—RF Choke (L1) (L5)
LF0C00†	COIL—Filament Choke (L3)
LO8B00†	COIL—AM Oscillator (L6)
LO8F00†	COIL—FM Oscillator (L7)
RC4D26†	RESISTOR—Comp 1500 ohm 2W (R28)
RC2G27†	RESISTOR—Comp 1800 ohms ½ W (R1)
RC1H18†	RESISTOR—Comp 330 ohms ¼ W (R30)
RC1H20†	RESISTOR—Comp 470 ohms ¼ W (R10)
RC1H24†	RESISTOR—Comp 1000 ohms ¼ W (R35)
RC1H40†	RESISTOR—Comp 22,000 ohms ¼ W (R3 29)
RC1H42†	RESISTOR—Comp 33,000 ohms ¼ W (R12)
RC1H44†	RESISTOR—Comp 47,000 ohms (R41)
RC1H51†	RESISTOR—Comp 100,000 ohms ¼ W (R17, 21, 33, 37)
RC1H54†	RESISTOR—Comp 220,000 ohms ¼ W (R19, 6, 14)
RC1H58†	RESISTOR—Comp 470,000 ohms ¼ W R24, 36)
RC1H62†	RESISTOR—Comp 1 meg ¼ W (R2, R15, R18)
RC1H66†	RESISTOR—Comp 2.2 meg ¼ W (R13)
RC1H74†	RESISTOR—Comp 10 meg ¼ W (R22)
RC2H00†	RESISTOR—Comp 10 ohms ½ W (R31)
RC2H08†	RESISTOR—Comp 47 ohms ½ W (R7)
RC2H16†	RESISTOR—Comp 220 ohms ½ W (R10)
RC2H24†	RESISTOR—Comp 1,000 ohms ½ W (R9, 11, 26)
RC2H34†	RESISTOR—Comp 6,800 ohms ½ W (R4)
RC2H44†	RESISTOR—Comp 47,000 ohms ½ W (R5)
RC2H46†	RESISTOR—Comp 68,000 ohms ½ W (R34, 23)
RV4C00†	POTENTIOMETER—Tone (R20)
RV4S10†	POTENTIOMETER—(with S.P.S.T. Switch) (R16)
RW2A16†	RESISTOR—Wirewound 220 ohms 2W (R27)
RW1B34†	RESISTOR—Wirewound 270 ohms 1W (R25)
TA0O09	TRANSFORMER—Output (T9)
T10C06†	TRANSFORMER—1st IF Input (T6)
T10D08†	TRANSFORMER—Assy. 3rd IF (T8)
T10I00†	TRANSFORMER—Assy. 2nd IF (T7)
TP0J00†	TRANSFORMER—Power (T10)
TR8B02†	TRANSFORMER—Ant. (T1)
TR8F00†	TRANSFORMER—FM Ant. (T2)
TR8P00†	TRANSFORMER—FM Mixer (T3)
#44†*	LAMP—Bayonet Base 6.3V

MECHANICAL COMPONENTS

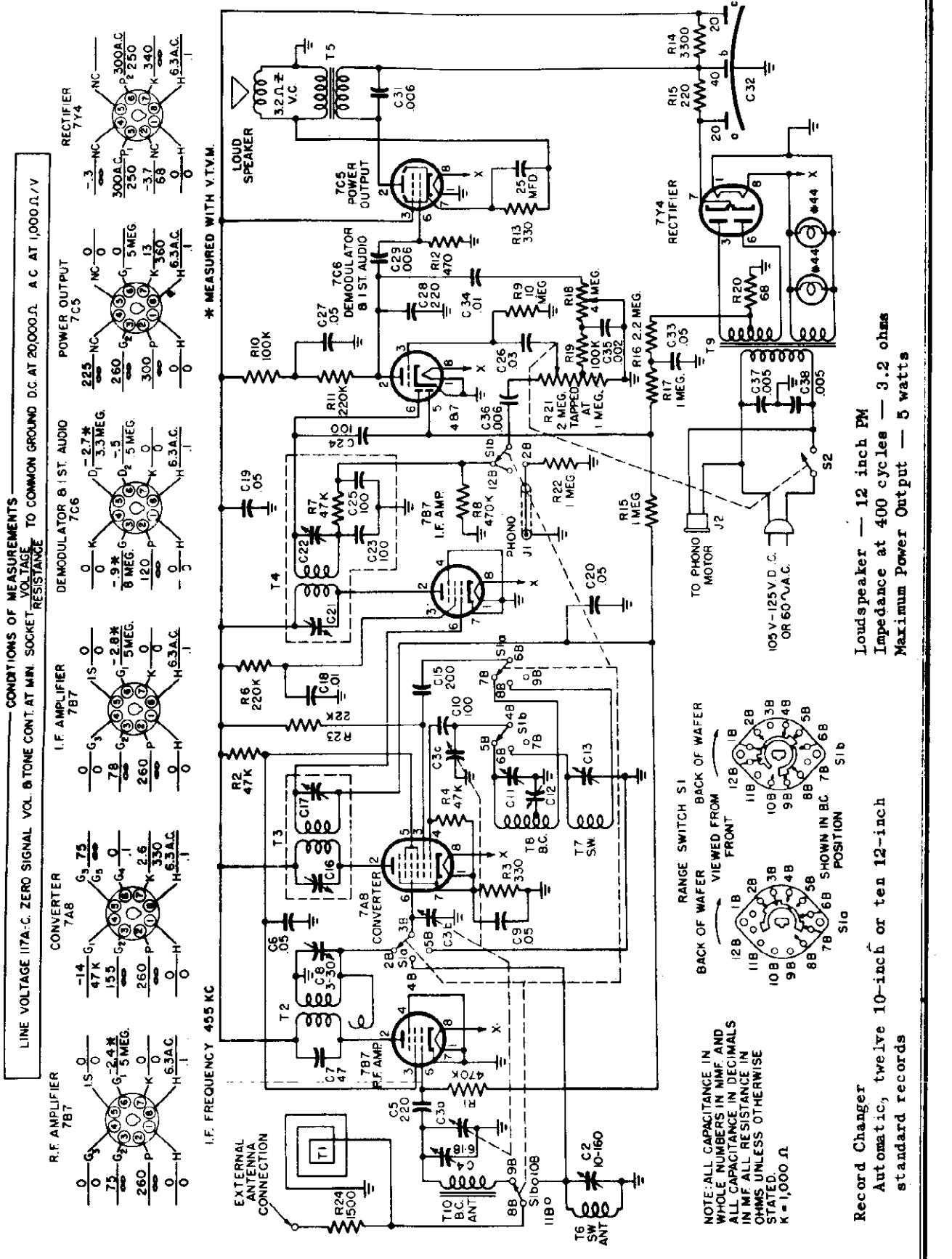
BT1S00†	BOARD—Terminal (1 Soldering Lug 1 RT. Angle Mtg. Lug) (M1)
BT1S01†	BOARD—Terminal (1 Soldering Lug 1 Rt. Angle Mtg. Lug.) (M2)
BT1S04†	BOARD—Terminal (2 Soldering Lugs 1 Vert. Angle Mtg. Lug) (M3)
BT2S00†	BOARD—Terminal (2 Soldering Lugs 1 Rt. Angle Mtg. Lug) (M4)
BT2S04†	BOARD—Terminal (1 Soldering Lug 1 Vert. Mtg. Lug) (M5)
BT2T00	BINDING POST—2 Term. (FM Ant.) (J2)
BT3S00†	BOARD—Terminal (3 Soldering Lugs 1 Rt. Angle Mtg. Lug) (M6)
CD0C13†	CABLE—Dial Indicator (M7)
CD0C14†	CABLE—Dial Tuning (M8)
CD0C22	CABLE—Dial Tuning Idler (M9)
CL2A08†	CORD—AC Line (M10)
GR0S09†	GROMMET—Shock Mtg. (Rear, RF Chassis) (M11)
GR0S10†	GROMMET—Shock Mtg. (Top, RF Chassis) (M12)
GR0S17	GROMMET—Shock Mtg. Chassis Main Chassis to Cabinet (M13)
HB0M18	BRACKET—Ant. Plug (M14)
HB0M22	BRACKET—Capacitor Support (M15)
HB0M45†	BRACKET—Chassis Shock Mtg. (M16)
HB0M46†	BRACKET—Chassis Shock Mtg. (M17)
HB0M52†	BRACKET—Pulley & Shaft Center, Top Chassis (M18)
HB0M54†	FRAME—Dial Back Plate (Bottom) (M19)
HB0M55†	FRAME—Dial Back Plate (Top) (M20)
HB0M68	BRACKET—Slide Pointer Support (M21)
HC0C00†	CLIP—Coil Mtg. (for T1 and L6 (M22)
HC0C03†	CLAMP—Dial Cable (M23)
HC0S28†	CLIP—Tuning Shaft "C" Washer (M24)
HC0T01	CLAMP—Tube (M25)
HP8T01	PIN—8-32 Threaded (M26)
HR0P02	RIVET—Tubular 11/64 x .121
HR0S01†	RIVET—Shoulder .171 x .118
HS0C00†	SPRING—Dial Cord (Tuning & Idler) (M27)
HS0C68†	SPRING—Dial Cord (Indicator Pulley) (M28)
HS0P16	SPACER—Plain Sleeve (RF Shock Mtg.) (M29)
ID0M13†	INDICATOR—Dial (M30)
JR2O06†	RECEPTACLE—2 Contact Speaker (J-5)
JR3O00†	RECEPTACLE—3 Contact—Test Socket (J6) (J1)
JR1S00†	RECEPTACLE—Phono (J7)
MS0T08†	SHAFT—Tuning (M31)
MP0I00†	PULLEY—Dial Cable Idler (M32)
PB0D02†	PLATE—Dial Back
PI0P01†	PLATE—Line Cord Insulator (M33)
SM0B00†	BASE—Min. Tube
SM0T03†	SHIELD—Min. Tube (M34)
SO9D04†	SOCKET—Dial Light (P1) (12" lead)
SO0D05†	SOCKET—Dial Light (P2) (9 1/2" lead)
SO8L03	SOCKET—Loktal Black Bakelite
SO8L04	SOCKET—Loktal (Mica Filled)
SO7M05†	SOCKET—Miniature "Zip In" Type
SO8S01†	SOCKET—Octal
SR3G00†	SWITCH—Rotary (S1, 2, 3, 4)
XS0C01†	STRIP—Copper (.004 x 5/16 x 1 1/8) (M35)

CABINET COMPONENTS

BZ0B10*	BACK & LOOP—Cabinet
BZ0D25	BAFFLE—Board (1/8" Chipboard)
DS0C07	DIAL—Scale AM - FM Bands (SS-160KC) (88-108 MC)
DZ0F09†	DECAL—Volume
DZ0F10†	DECAL—Tone
DZ0F11†	DECAL—Range
DZ0F12†	DECAL—Tuning
ED0M01	ESCUTCHEON—Dial
GZ0M08	GRILLE—Perforated Metal
HC0D08†	RETAINER—Spring (Dial Glass)
HK0R00†	CLIP—Ring Retainer (Control Knobs)
HK0R06	PULL—(Door Handle)
HW8C02†	WASHER—Finishing (Back Cabinet)
HZ0C04†	CATCH & STRIKE—Bullet
HZ0G01	GLIDES—Metal
HZ0H00†	HINGES—Lid
HZ0H01†	HINGES—Door
HZ0S07†	SUPPORT—Lid
JP2O01	PLUG—(2 Contact) Speaker
JP3O02†	PLUG—(3 Contact) Antenna
KC0B10†	KNOB—Control (Index) Dark Brown
KC0B11†	KNOB—Control (Plain) Dark Brown
PF0B00†	PADS—Felt
PZ0D01	PANEL—Di Noc
SP1R01†*	SPEAKER—12" Rd P M
WF0Z03†	WASHER—Felt
XS0Z02†	STRIP—Fishpaper (Line & Audio Cords) 2" x 1 1/2" x .015"
ZW8G03*	CABINET—Assy. (Bendix 66)

MODELS 1531, 1533

BENDIX RADIO DIV.



ALIGNMENT PROCEDURE

Connect line cord plug to 117 volt, 60 cycles AC power source. Set volume control at maximum clockwise position and tone control (R18) in counterclockwise position. Connect output meter across voice coil. Adjust dial pointer by turning tuning control fully counterclockwise and sliding dial pointer on dial cord until it is exactly over Reference Mark on dial back plate. (See Fig. 7.) Make all adjustments in order given in table and for maximum output. Keep input as low as possible at all times. Range switch in ST'D position except as noted in table. The dial back plate is marked as shown in Fig. 7 giving the tolerance at all alignment points called for in the ALIGNMENT CHART. Tuning gang to be fully open during alignment of I.F.

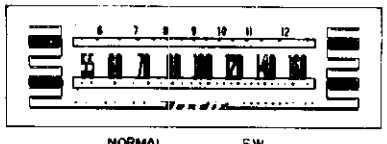
The builtin loop consists of approximately 4-3/4 turns of polyethylene covered wire, close wound, on a 14-5/16" x 22-5/16" frame. If loop is detached during alignment a 43 uh inductance must be connected across the loop terminals when adjusting the antenna trimmers on either the Standard Broadcast or Shortwave Band. If such an inductance is not connected across the loop terminals, C4 (Broadcast Antenna Trimmer) and C2 (Shortwave Antenna Trimmer) must be adjusted after the chassis is installed in the cabinet and the builtin loop attached.

ALIGNMENT CHART

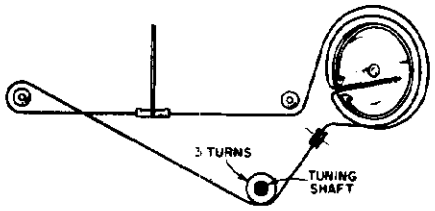
Circuit Aligned	Input Frequency	Adjustments
IF	*455 KCS	C22, C21, C17, C16
OSC Broadcast	**580 KCS	C12
	**1475 KCS	C11
RF, Broadcast	**1475 KCS	C8, C4
	965 KCS 580 KCS	Check Calibration
+OSC Shortwave	**11 MCS	C13
+RF Shortwave	**11 MCS	C2

NOTE: Repeat above procedure until no further improvement can be made on any adjustments. Tuning gang rotor plates must be bent if tracking is not correct at 965 and 580 KCS check points.

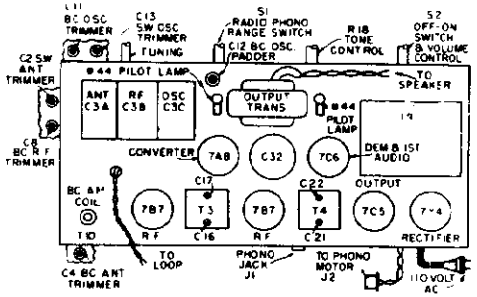
*Applied to antenna through .1 mfd. or less.
**Applied to antenna through 50 mmf. or less.
+Range switch in SW position.



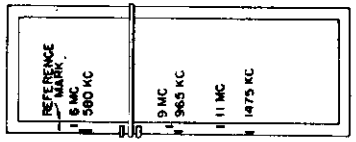
Control Layout



Dial Stringing Diagram

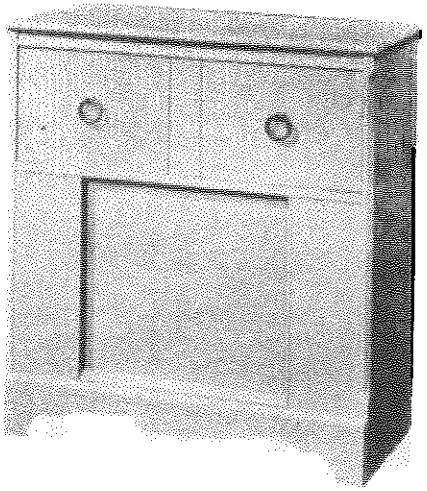


Trimmer Location Diagram



Dial Reference Marks

Model 1531 Mahogany



Model 1533 Wheat Mahogany

MODELS 1531, 1533 BENDIX RADIO DIV.

Stock Number		Description
		ELECTRICAL COMPONENTS
CC6A34		CAPACITOR-Ceramic 100 mfd 500v (C24).....
CE3A03	+	CAPACITOR-Electrolytic 20-20-40 mfd (C32).....
CE1T00	+	CAPACITOR-Electrolytic 25 mfd 25v (C30).....
CM5A14	+	CAPACITOR-Mica 47 mmf (C7).....
CM5A22	+	CAPACITOR-Mica 100 mmf (C10).....
CM5A30	+	CAPACITOR-Mica 220 mmf (C5, 15, 28).....
CP2T40	+	CAPACITOR-Paper .05 mfd 200v (C9, 20, 33).....
CP4T31	+	CAPACITOR-Paper .01 mfd 400v (C18, 34).....
CP4T36	+	CAPACITOR-Paper .03 mfd 400v (C26).....
CP4T40	+	CAPACITOR-Paper .05 mfd 400v (C6, 19, 27).....
CP6T12	+	CAPACITOR-Paper .002 mfd 600v (C35).....
CP6T18	+	CAPACITOR-Paper .005 mfd 600v (C37, 38).....
CP6T20	+	CAPACITOR-Paper .006 mfd 600v (C29, 31, 36).....
CT1A11	+	CAPACITOR-Trimmer 420-800 mmf (C12).....
CT1A16		CAPACITOR-Trimmer (1.6-18 mmf) (C4).
CT2A06		CAPACITOR-Trimmer (C16, 17).....
CT2A07		CAPACITOR-Trimmer (4-70 mmf), (10-160 mmf) (C11, 13).....
CT2A08		CAPACITOR-Trimmer (10-160 mmf) (3-30 mmf) (C2 & C8).....
CT3A00		CAPACITOR-Trimmer (20-150 mmf) (25-130 mmf) (C21, 22).....
CV0C06		CAPACITOR-Variable gang (C3).....
LA0B00	+	COIL-BC Ant. (T10).....
LA0C00	+	COIL-SW Ant. (T6).....
LO6B03		COIL-AM Oscillator (T8).....
LO6C00		COIL-SW Oscillator (T7).....
RC4D16		RESISTOR-Comp. 22 ohms 2w (R15)..
RC4G30		RESISTOR-Comp. 3300 ohms 2w (R14)
RC1H18	+	RESISTOR-Comp. 330 ohms ½w (R3)..
RC1H26	+	RESISTOR-Comp. ½w (R24).....
RC1H44	+	RESISTOR-Comp. 47K ½w (R4).....
RC1H51	+	RESISTOR-Comp. 100K ½w (R10,19)..
RC1H54	+	RESISTOR-Comp. 220K ½w (R6,11)...
RC1H58	+	RESISTOR-Comp. 470K ½w (R1,8,12)..
RC1H62	+	RESISTOR-Comp. 1 Meg ½w (R5,17,22)
RC1H66	+	RESISTOR-Comp. 2.2 Meg ½w (R16)..
RC1H74	+	RESISTOR-Comp. 10 Meg ½w (R9)....
RC3H10		RESISTOR-Comp. 68 ohms 1w (R20)..
RC3H18		RESISTOR-Comp. 330 ohms 1w (R13).
RC3H80		RESISTOR-Comp. 22K, 1w (R23).....
RC3H88		RESISTOR-Comp. 47K, 1w (R2).....
RV4C00	+	POTENTIOMETER-Tone (R18).....
RV4S10	+	POTENTIOMETER-Volume (R21 & S2)..
SP1R01	*	SPEAKER-12" Rd. P.M.....
SR3E01		SWITCH-Rotary 2 Pole - 3 Position (S-1).....
TA0011		TRANSFORMER-Output (T5).....
TI0C02		TRANSFORMER-IF Input (T3).....
TI0D13		TRANSFORMER-IF Output (T4).....
TP0F02		TRANSFORMER-Power (T9).....
TRGL07		TRANSFORMER-R.F. Interstage (T2).
#44	+*	LAMP-Bayonet Base.....

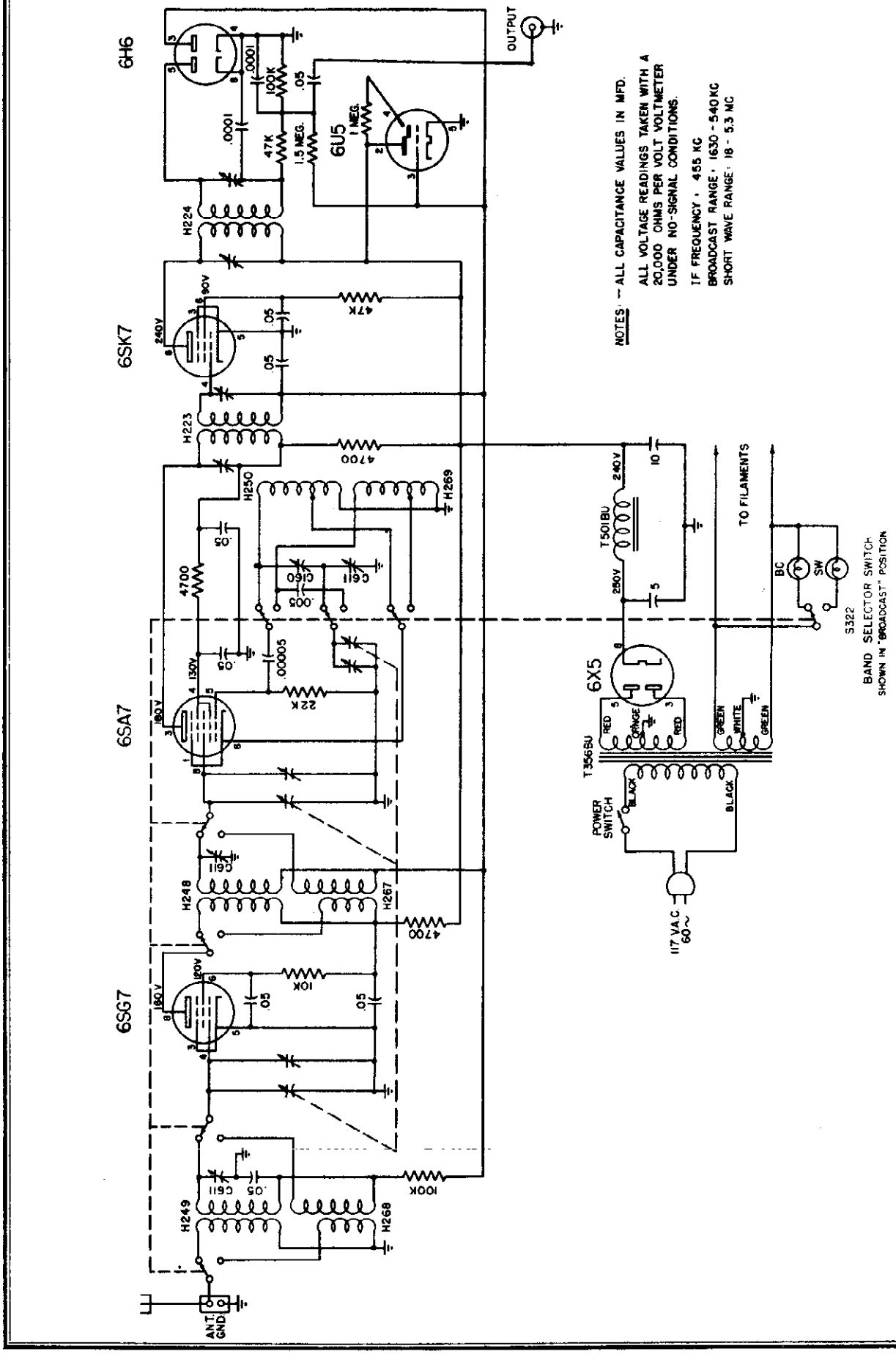
Stock Number		Description
		MECHANICAL COMPONENTS
BT2S05	+	BOARD-2 Terminal.....
BT3S06	+	BOARD-3 Terminal.....
BT4S06		BOARD-4 Terminal.....
CD0C18		CABLE-Dial 52½".....
CL2A08	+	CORD-A.C. Power.....
GR0S00	+	GROMMET-Tuning Gang Shockmtg.....
GR0S16		GROMMET-Chassis Shockmount.....
HB0M55		FRAME-Back Plate Top.....
HB0M63		BRACKET-Variable Capacitor Mtg...
HB0M64		BRACKET-Chassis Shockmount.....
HB0M65		BRACKET-Pointer Slide.....
HB0M66		BRACKET-Lamp (L.H.).....
HB0M67		BRACKET-Lamp (R.H.).....
HC0C00		CLIP-Coil Mtg.....
HC0S00	+	CLIP-Hairpin Spring.....
HR0S01	+	RIVET-.171 x .083 Shoulder.....
HS0C00	+	SPRING-Dial Cord.....
HS0F16		SPACER-Transformer Flat.....
HS6F00	+	SPACER-Flared Sleeve (Gang Mtg.).
ID0M13	+	INDICATOR-Dial.....
JR2009		RECEPTACLE-2 Contact Phono Power.
JR1S00	+	RECEPTACLE-Single Control Phono..
MB0B00	+	BEARING-Tuning Shaft.....
MP0I00	+	PULLEY-Dial Cord Idler.....
MS0T13		SHAFT-Tuning.....
PB0D02		PLATE-Dial Back.....
PB0D05	+	FRAME-Back Plate Bottom.....
PI0P01	+	PLATE-Line Cord Insulating.....
SO0D02	+	SOCKET-Dial Light.....
SO8L03	+	SOCKET-Loktal Tube.....
XS0C08		STRIP-Copper .025 x ¼ x 1-3/16..
XS0Z02	+	STRIP-Fishpaper (line & audio)...

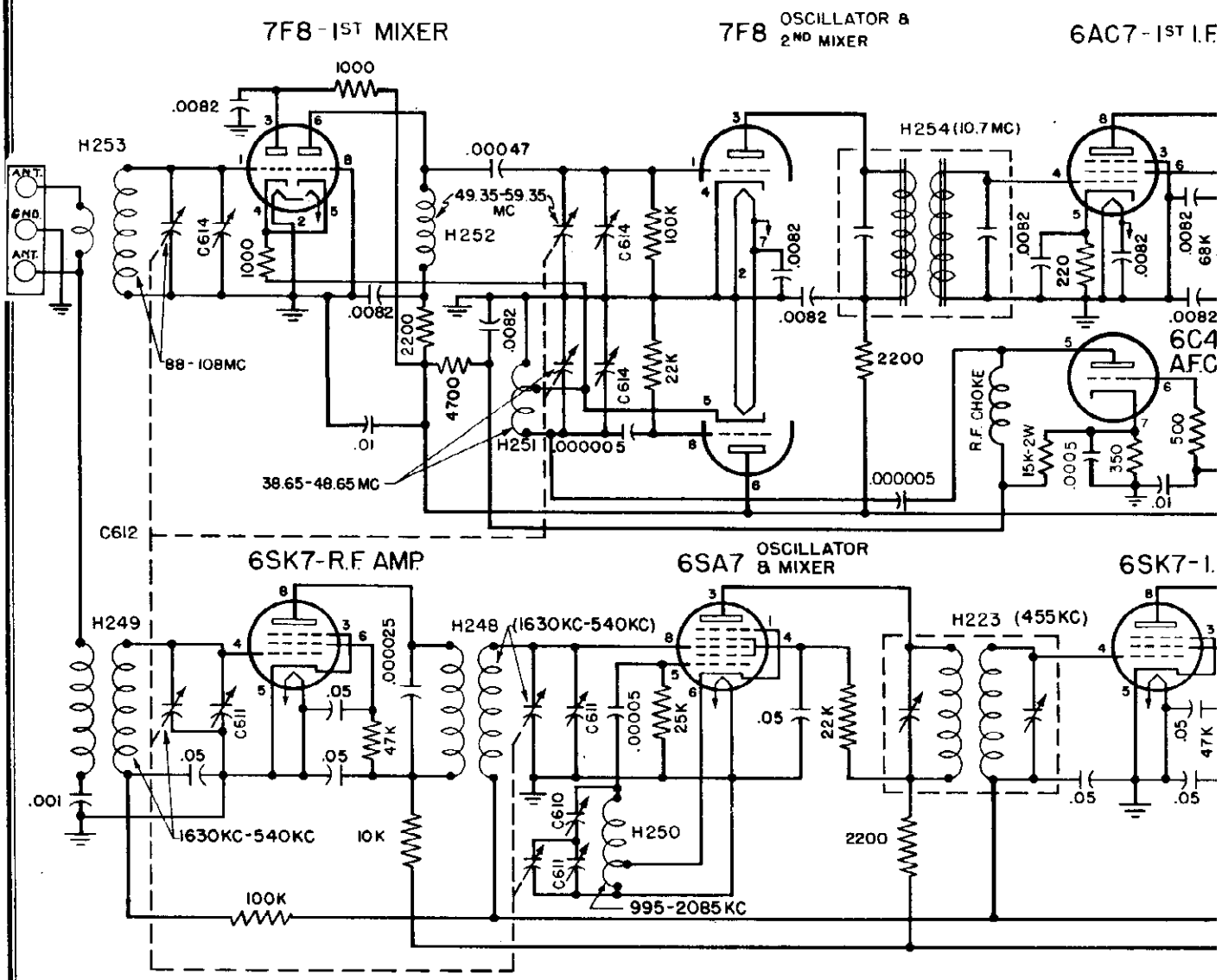
The Bendix models 1531 & 1533 radios incorporate the same model chassis. It is a six tube superheterodyne, two-band circuit, providing radio reception on the Standard AM Broadcast Band (540 to 1620 KC) and the 6 to 12 MC Shortwave Band. A high-impedance phono input jack is provided. The continually variable tone control is of the high frequency cut, bass boost, feed-back type. All six tubes are of the locktal type. One stage of tuned RF is provided on the Standard Broadcast Band. The builtin low-impedance loop antenna functions on both the Broadcast and Shortwave Bands. Better shortwave reception will of course be obtained by using a good outside antenna. A suitable binding screw for attaching such an antenna is provided on the rear of the cabinet.

SPECIFICATIONS

Power Requirements
105-125 volts, 60 cycles AC
Power Consumption (including record changer)
75 watts
Tuning Frequency Range
Broadcast Band 540-1620 KCS
Shortwave Band 6-12 MCS
Intermediate Frequency — 455 KCS
Tube Complement
2-7B7, 1-7A8, 1-7C6, 1-7C5, 1-7Y4
Two No. 44 dial lamps are used

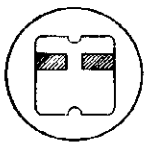
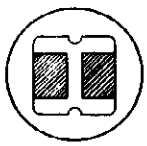
DAVID BOGEN CO., INC. MODEL

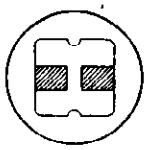
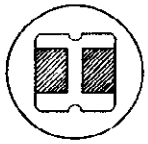




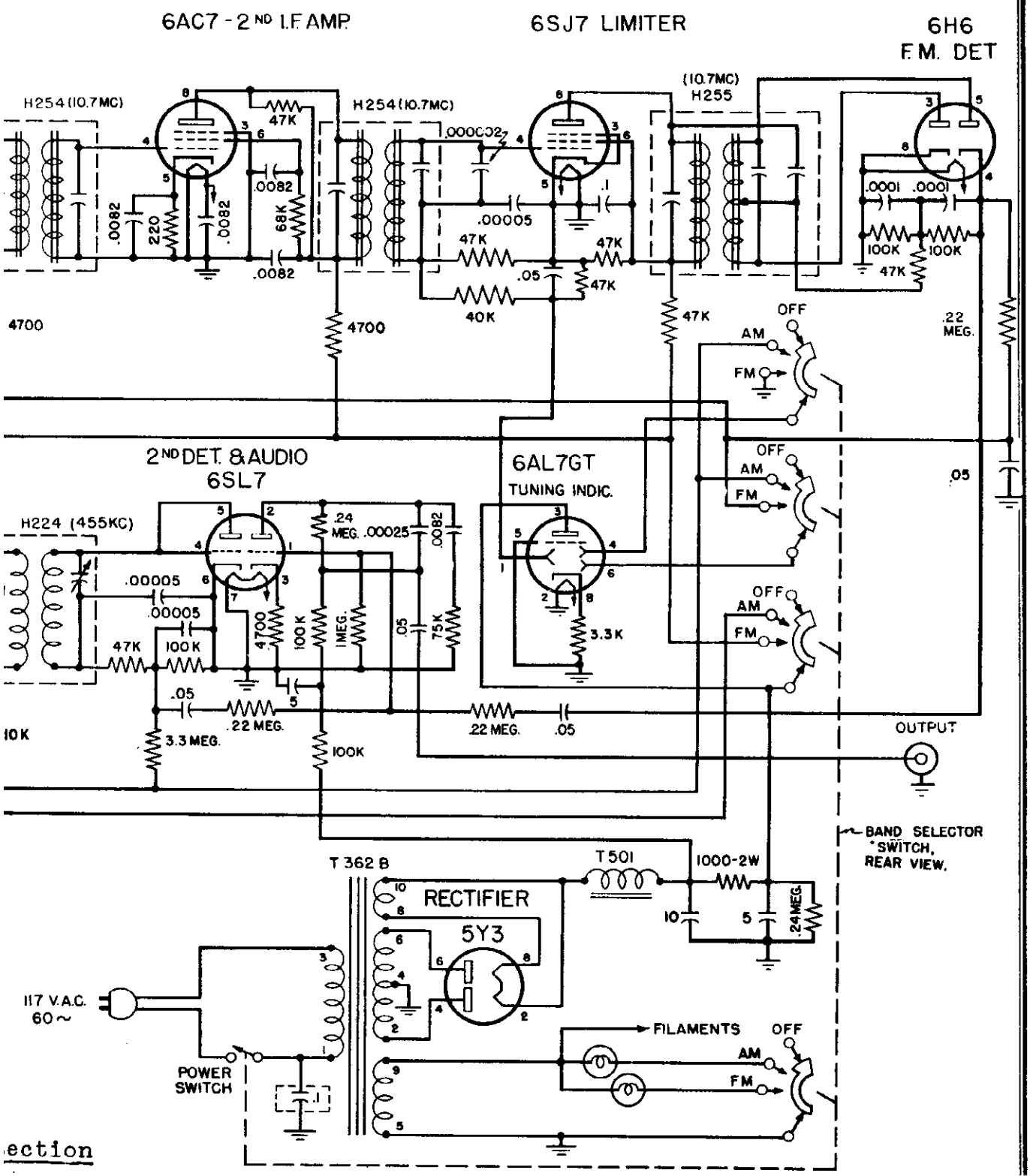
6AL7GT PATTERN SEQUENCE DURING TUNING

NOTE: SHADED AREA INDICATES GREEN LIGHTED AREA ON FACE OF INDICATOR.

	OFF TUNE (-)	ON TUNE	OFF TUNE (+)	
				AM
	FIG. 1	FIG. 2	FIG. 3	

OFF CHANNEL (-)	ON CHANNEL OFF TUNE (-)	ON TUNE	ON CHANNEL OFF TUNE (+)	OFF CHANNEL (+)	
					FM
FIG. 4	FIG. 5	FIG. 6	FIG. 7	FIG. 8	

CO., INC. MODEL R601



ection

Range: 540 to 1630 KC
I.F. Frequency: 455 KC

Power Requirements: 117 volts - 60 cps - 80 watts

ection

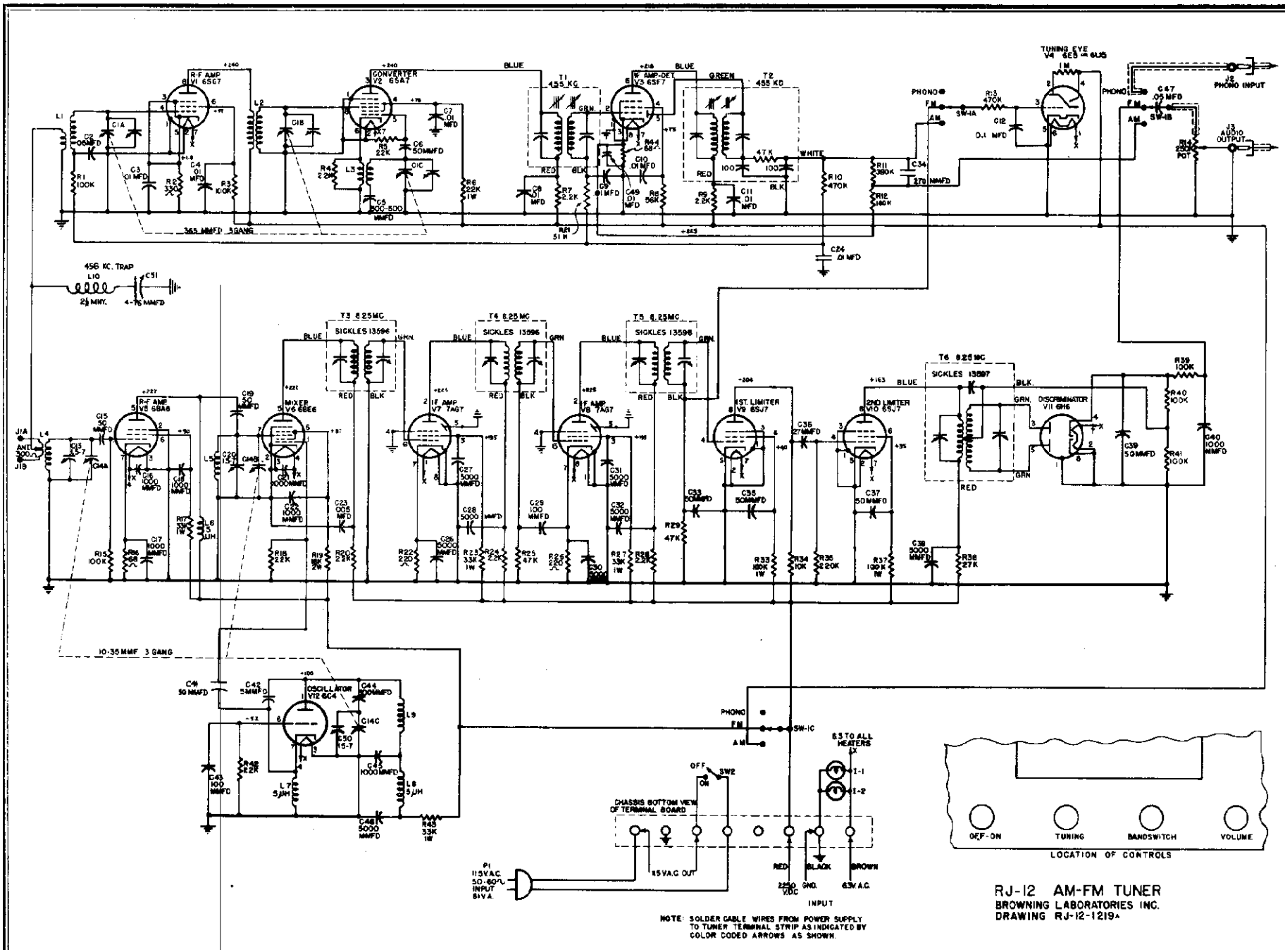
Range: 88 to 108 MC
I.F. Frequency: 10.7 MC

Input Voltage: 117 volts
Power Frequency: 60 cycles
Range: 540 KC to 1630 KC and 5.3 MC to 18 MC.
Intermediate Frequency: 455 KC
Tubes: Total, 6: 1-6SG7, 1-6SA7, 1-6SK7, 1-6H6, 1-6U5, 1-6X5
Output: The output matches a high impedance phonograph line.
Installation: Connect an antenna and ground to the terminals marked "ANT" and "GND". From the audio output jack, connect with a single conductor shielded wire (to reduce the possibility of hum pickup) to the amplifiers.
Aligning Instructions: Allow tuner to warm up for 10 minutes before aligning.
I.F. Alignment:
1- Connect the test oscillator output to R.F. section of variable condenser.
2- With "Band Selector Switch" in "Broadcast" position turn station selector to 540 KC.
3- Tune test oscillator to 455KC and adjust its output so that the tuning indicator tube starts to close.
4- Adjust the I.F. trimmers for the narrowest shadow in the tuning eye, readjusting the oscillator output as necessary.

Short Wave Band Alignment:

1- Connect the test oscillator output to the "ANT" and "GND" terminals of the tuner.
2- Set both the test oscillator and tuner dials to 18 MC.
3- Make certain that the tuner's variable condenser plates are fully open when the dial pointer is at 18 MC.
4- Adjust trimmer on the oscillator section of the variable condenser for minimum shadow in tuning indicator.
5- Set both test oscillator and tuner dials to 16 MC.
6- Adjust trimmers on the Antenna and R.F. sections of the variable condenser for minimum shadow in tuning indicator.

Broadcast Band Alignment:
1- Put "Band Selector Switch" in the "Broadcast" position.
2- Set both the test oscillator and tuner dials to 540 KC.
3- Adjust padder condenser for minimum shadow in indicator tube.
4- Set both the test oscillator and tuner dials to 1630 KC.
5- Make certain that the tuner's variable condenser plates are fully open when the dial pointer is at 1630 KC.
6- Adjust "broadcast" trimmer of oscillator for minimum shadow in tuning indicator.
7- Set both test oscillator and tuner dials to 1400 KC.
8- Adjust "Broadcast" trimmers of antenna and R.F. circuit for minimum shadow in indicator tube.
9- Set both the test oscillator and tuner dials to 600 KC.
10- Readjust padder condenser for minimum shadow in indicator tube
11- Set both the test oscillator and tuner dials to 1400 KC.
12- Readjust "broadcast" trimmers of antenna and R.F. circuit for minimum shadow in indicator tube.



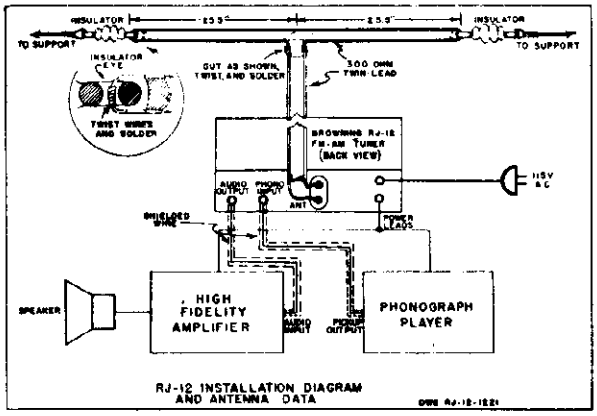
NOTE: SOLDER CABLE WIRES FROM POWER SUPPLY TO TUNER TERMINAL STRIP AS INDICATED BY COLOR CODED ARROWS AS SHOWN.

RJ-12 AM-FM TUNER

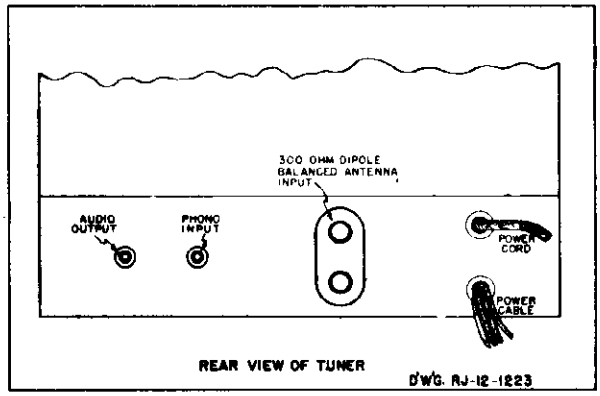
BROWNING LABORATORIES INC.
DRAWING RJ-12-1219-A

MODELS RJ-12, RJ-14

BROWNING LABORATORIES, INC.

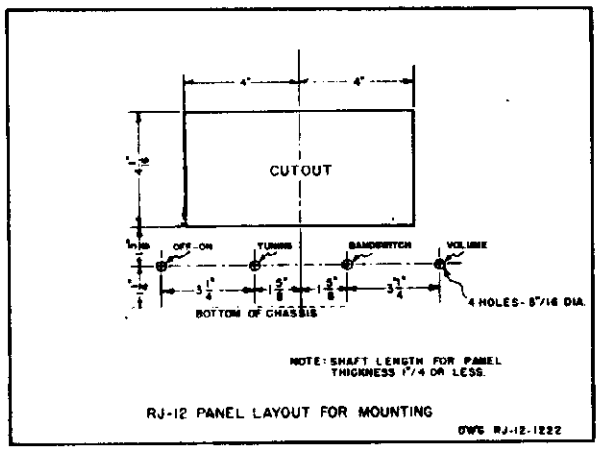


RJ-12 INSTALLATION DIAGRAM AND ANTENNA DATA



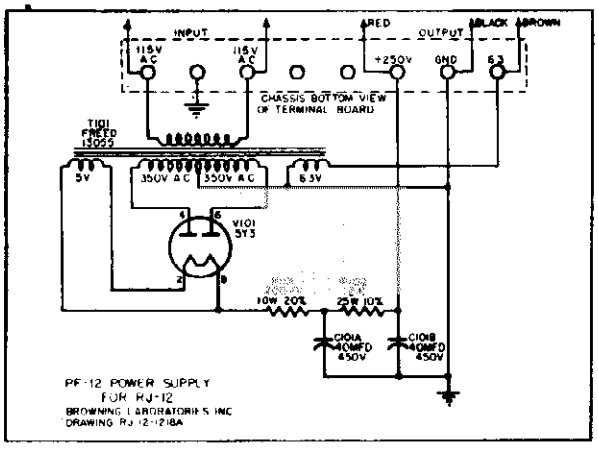
REAR VIEW OF TUNER

DWG. RJ-12-1223



RJ-12 PANEL LAYOUT FOR MOUNTING

DWG RJ-12-1222



PF-12 POWER SUPPLY FOR RJ-12
BROWNING LABORATORIES INC
DRAWING RJ-12-1218A

F-M CHANNEL NUMBERS

The table below gives the frequencies for the even-numbered F-M channels. The intervening ones can be obtained by adding or subtracting 0.2 MC., which is the spacing between channels.

No.	MC.	No.	MC.	No.	MC.	No.	MC.
201	88.1	226	93.1	250	97.9	276	103.1
202	88.3	228	93.5	252	98.3	278	103.5
204	88.7	230	93.9	254	98.7	280	103.9
206	89.1	232	94.3	256	99.1	282	104.3
208	89.5	234	94.7	258	99.5	284	104.7
210	89.9	236	95.1	260	99.9	286	105.1
212	90.3	238	95.5	262	100.3	288	105.5
214	90.7	240	95.9	264	100.7	290	105.9
216	91.1	242	96.3	266	101.1	292	106.3
218	91.5	244	96.7	268	101.5	294	106.7
220	91.9	246	97.1	270	101.9	296	107.1
222	92.3	248	97.5	272	102.3	298	107.5
224	92.7	250	97.9	274	102.7	300	107.9
226	93.1			276	103.1		

BROWNING LABORATORIES, INC.

MODELS RJ-12
RJ-14

Designed for high-fidelity reception in the new high frequency FM band as well as quality reception in the standard AM broadcast band, the Browning Universal FM-AM Tuner Model RJ-12 is primarily intended for those who wish to build radio sets into bookcases, drawers, shelves, walls, or cabinets. Its extreme sensitivity and high fidelity are not exceeded in the most expensive of commercial home radios. The Model RJ-14 is the RJ-12 mounted on a rack panel for laboratory and special uses. Employs Major Armstrong's circuit on FM.

INSTALLATION:

In mounting the unit, due consideration must be given to ventilation. Approximately 65 watts of heat must be dissipated. Position of mounting of the unit is unimportant.

The loudspeaker used should, for best results, be located a few feet from the RJ-12 and the audio amplifier. If the speaker is in the same cabinet with the tuner and audio amplifier, placing these latter two units on felt or rubber padding may improve the quality of reception.

The following components are necessary to complete a radio receiving system with the RJ-12: a high-fidelity audio amplifier, loudspeaker, antenna, and a power supply. The power supply may be omitted if the audio amplifier can provide the proper voltages and currents.

Any high quality audio amplifier and loudspeaker should work satisfactorily with the RJ-12 tuner. The audio gain should be such that an input voltage of 0.1 volt will provide ample volume.

The tuner is designed for maximum performance when used with a 300 ohm FM antenna. Most any commercial FM antenna having this impedance should work satisfactorily. It is important that no part of the antenna system be grounded, because of the balanced feed required on FM operation. On AM operation the entire antenna and feeder system act as the antenna. The antenna system should be located as high as possible. For those who wish to build their own, a drawing has been provided to furnish the necessary information.

Shielded leads from the tuner to the amplifier and also from the phonograph pickup to the female connectors in the rear of the RJ-12 chassis are essential. The two male connectors will be found plugged into the female connectors in the RJ-12 and several feet of shielded wire is packed with each tuner. Since individual installations will vary, this wire is uncut and not attached to the male connectors.

When making up the cables, the center conductor should be stripped and tinned, inserted in the center sleeve of the male connector, and heated until the solder flows making a good joint. Bring the braid up on the outside shell of the plug and solder all the way around.

There are some cases where the shield on the lead between the audio output of the RJ-12 and the amplifier employed may not be a sufficient ground bond between the two. In cases where there is any hum (not present in the audio amplifier itself), try bonding the RJ-12 chassis to the audio amplifier with copper braid or number 16 or larger wire.

Power requirements for the RJ-12 tuner are 250 volts DC at 65 milliamperes and 6.3 volts AC or DC at 4 amperes. Often times these voltages can be made available from the audio amplifier. If these voltages are not available, a separate power supply should be provided such as the Browning Model PF-12, a schematic diagram of which is shown.

OPERATION:

After proper installation, the set may be put into operation by turning the ON-OFF switch clockwise; the dial should be immediately illuminated. Within a minute of warming up, the tuning eye should emit a bright green glow. The set is ready for operation on AM. Allow a 10 minute warm-up period for FM.

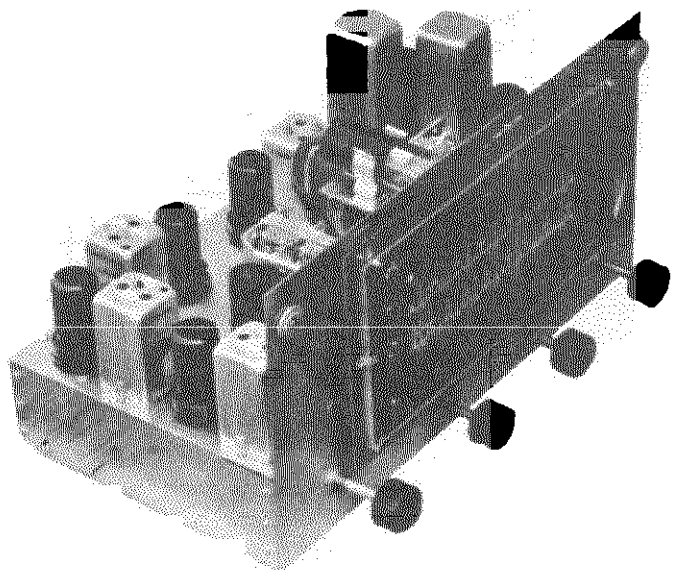
AM or FM reception can be selected by the AM-FM-PHONO switch. Starting with the band switch knob in the farthest counter-clockwise position and rotating clockwise gives AM-FM-PHONO reception. Rotate the TUNING knob to select the desired station. As the tuning approaches the station, the tuning eye will gradually close. Correct tuning is indicated by maximum eye closing. Increase the volume to the desired level by rotating the VOLUME knob clockwise. In tuning in FM stations, always tune for the complete elimination of noise. In cases where the signal strength of the FM station is too low to saturate the dual limiter, some background noise may be expected.

For those who wish to incorporate phonograph connections to the tuner, a phono input connector is provided at the rear of the chassis. By turning the selector switch to the PHONO position, the phonograph input is connected to the amplifier through the VOLUME control; thus eliminating a separate volume control for phonograph operation.

It should be noted that while tuning between stations, both on FM and AM, the rushing noise is normal for the tuner. The extreme high sensitivity is responsible for picking up random atmospherics, but this will be eliminated when a station is tuned in unless the signal strength of the station is of the same order of magnitude as that of the atmospheric noise.

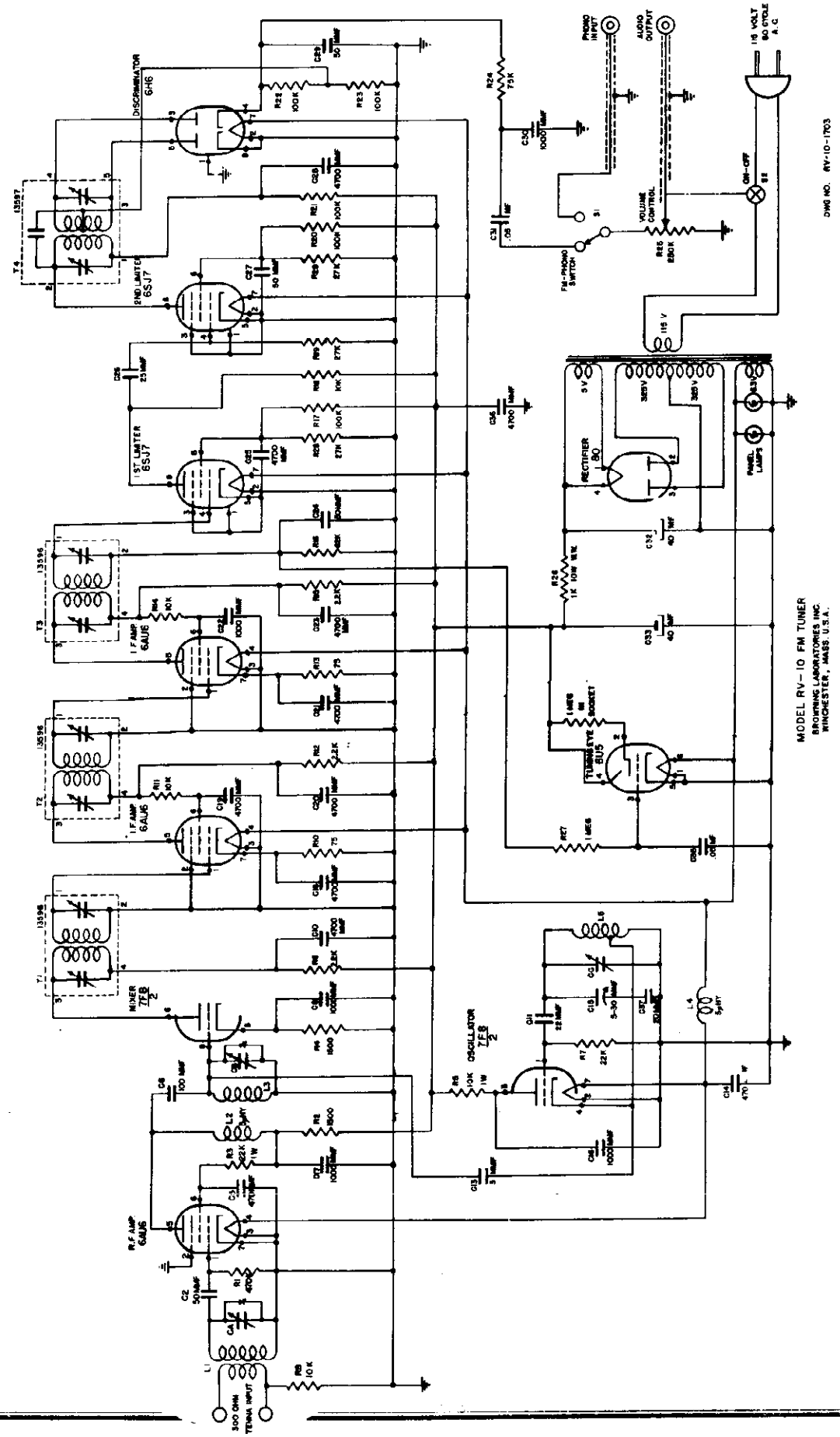
ADJUSTMENT:

No adjustment should be made on the tuner aside from the panel controls. Adjustments and alignment on the FM portion should only be made by experienced personnel with the proper visual alignment equipment. Ordinary meters or aural methods are in general unsatisfactory for alignment. Replacement of tubes can usually be made without realignment.



MODELS RV-10, RV-11

BROWNING LABORATORIES, INC.



ALIGNMENT PROCEDURE:

The following equipment is recommended for alignment of these models:

1. Standard signal generator.
2. FM signal generator capable of sweeping at least 200 kc. at 8.25 mc.
3. Oscilloscope.
4. Voltmeter of 20,000 ohm/volt or better.

RV-10 IF ALIGNMENT:

Visual Method: To align the IF section of the tuner using the visual method, connect the sweep voltage output of the frequency-modulated signal generator to the horizontal deflection input of the oscilloscope, and adjust the controls until the horizontal sweep nearly fills the screen. Adjust the FM signal generator to sweep from about 8.0 to 8.4 mc., and apply the output to the grid of the second IF stage. Connect the vertical deflection input of the oscilloscope across C24 in the grid circuit of the first limiter. The rectifying action of the grid circuit of this stage will provide a signal corresponding to the amplitude response of the preceding circuits. Adjusting the controls of the scope should produce a picture of the response curve. Always use as small a signal from the generator as possible consistent with a good image. In order to provide a frequency marker for alignment, apply a signal of exactly 8.25 mc. from the AM signal generator to the same grid where the FM signal is applied. This is best done by using a small mica isolation condenser in series with the 8.25 mc. source. Adjust the amplitude of the 8.25 mc. AM signal until a small marker pip appears on the response pattern, as shown in Fig. 7. Use only enough marker voltage in all cases so that the pip is just discernible. The location of this marker pip on the curve indicates the center alignment frequency of the amplifier. The adjustment screws of T3 should now be set for the desired characteristic. In all cases, the marker pip should be left at the center or axis of symmetry of the curve. Adjustment of the screws will produce varied patterns. For guidance, the curves of typical misalignment and proper alignment are shown in Fig. 7. Greater amplitude of the pattern indicates higher gain, so adjustments should be made not only for best symmetry but for optimum gain as well. Having adjusted T3 in this fashion, the output from the signal generators must now be applied to the grid of the first IF amplifier. Next, T2 should be adjusted in the same manner. Signal generator outputs should be reduced as a stage of gain has been added. When T2 is aligned satisfactorily, apply the signal

generators to the grid of the mixer tube. Align T2 for the best possible response curve. The pattern appearing on the screen at this point is the overall response of the whole IF amplifier and should be similar to that shown in Fig. 7 for proper alignment before going on to align the discriminator.

Meter Method: Satisfactory alignment can be made using only an AM signal generator and a high impedance DC voltmeter by the following method, although it is considerably more time-consuming than the visual procedure. The meter should have an impedance of at least 20,000 ohms per volt, and be capable of reading negative DC voltage of approximately 3 volts. Connect this meter across C24 in the grid circuit of the first limiter, with the ground side of the meter going to the grounded side of the condenser. The tuning eye employed in the tuner can be used for indicating maximum response. However, this is not as satisfactory as a meter. Apply the output of the AM signal generator to the control grid of the second IF amplifier tube. Set the signal generator to 8.25 mc. When making these adjustments, always use an input signal level which results in meter readings of from 1 to 2 volts.

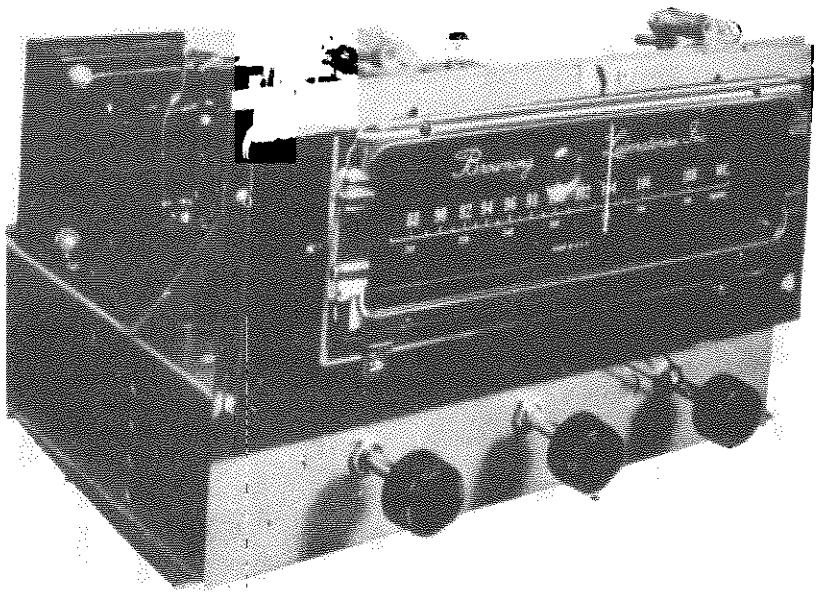
Adjust the screws on T3 for maximum meter reading. The frequency of the signal generator should be changed in steps of 20 or 30 kc. above and below 8.25 mc., and the readings noted in order to determine if the curve is symmetrical about the 8.25 mc. center frequency. If the results show that the curve is not symmetrical, further adjustments must be made and rechecked until a well-balanced curve results. When checks show the desired result, apply the signal to the grid of the first IF stage. Tune transformer T2 in the manner prescribed for T3. When this has been accomplished, transfer the AM signal generator to the grid of the mixer.

FM DISCRIMINATOR ALIGNMENT:

Visual Method: Alignment of the discriminator is easy with the visual method. Apply the output of the frequency-modulated generator to the grid of the first limiter. Apply a signal from the AM generator at 8.25 mc. to the same point. Connect the vertical input of the oscilloscope across C29 in the output of the discriminator. Make certain that the ground of the oscilloscope goes to the ground side of this condenser. Adjust the controls for the best image, using as small RF signals from both generators as practical. Alignment must be made for symmetry about the 8.25 mc. marker pip, and linearity above and below this point as shown in Fig. 8.

Meter Method: When only a meter and AM signal generator are available, connect the output of the generator to the grid of the first limiter, and a vacuum tube voltmeter, reading plus or minus DC voltage of about 2.0 volts, across C29 in the discriminator output. Set the frequency of the signal generator to exactly 8.25 mc. Adjust the secondary of the discriminator until the meter reads zero. Change the frequency of the generator in 20 kc. steps above and below 8.25 mc., and note the voltage generated at each step. Readings should increase linearly each side of center frequency out to 75 kc. Should more voltage be generated on one side than the other, adjust the primary of this transformer and recheck. A number of trials and checks should result in a curve very similar to that shown in Fig. 8.

FM RF ALIGNMENT: To align the RF portion of the tuner, a signal generator covering 88 to 108 mc. and a DC meter having an impedance of at least 20,000 ohms per volt and capable of reading 3.0 volts are required. Apply the signal generator to the antenna terminals and connect the meter across C24 in the first limiter. Set the signal generator at 108 mc. and set the tuner dial to the same frequency. Adjust the HF Osc. Trimmer (on top of chassis at rear of variable condenser) until the signal is heard or the meter indicates maximum voltage. Set the tuner dial at 90 mc., and the signal generator to correspond. With a non-conducting rod, compress or expand the oscillator inductance as needed to tune in the signal. Return the generator and dial to the high-frequency end and recheck. Readjust the trimmer if necessary. Adjustments of the inductance and trimmer are interacting, and several adjustments of each may be required for exact alignment. Reset the signal generator and tuner dial to 108 mc. Rock the tuning for maximum voltage indication on the meter. Adjust the signal level as necessary to maintain the voltage at less than 2.0 volts. Adjust the "RF Trimmer" (trimmer on the center section of variable) for highest meter reading. Set the generator and dial to 90 mc. and rock the tuning for highest meter reading. Adjust the RF coil inductance with the non-conducting rod for best gain. Here again, several adjustments at both ends of the band will be necessary for the best alignment since adjustment at the one end will affect tuning at the other. The antenna circuit can simply be trimmed at the high frequency end of the band and left, since the application of antenna or signal generator to the antenna terminals severely damps this circuit and the tuning is not critical. When this adjustment has been made, the tuner is completely aligned.



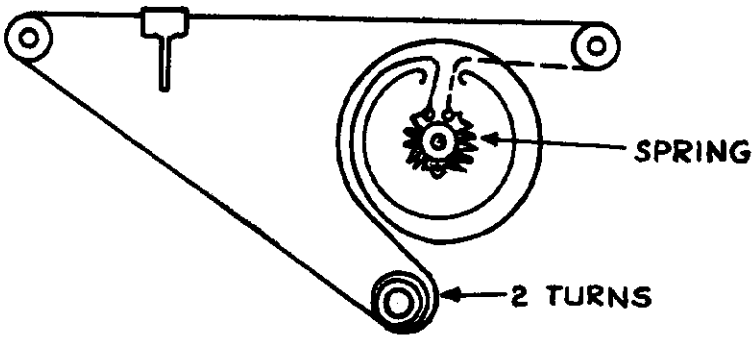
The tuner is designed for best performance with a 300 ohm FM antenna. Many such antennae are commercially available and should produce good results. Signal strength increases as the height of the antenna is increased, therefore, the antenna should be erected in the highest possible location. Losses in lead-in up to 75 ft. in length are unimportant. For those who wish to build their own antenna, dimensions are given on the drawing. The folded dipole shown gives good results over the entire band. It possesses a directional pickup pattern and should be oriented broadside toward the station of most interest or most difficult to receive.

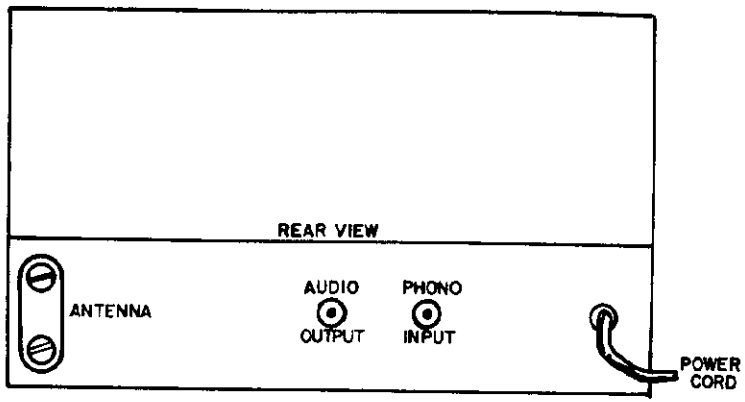
Shielded leads from tuner to amplifier and from phono pickup to tuner are essential. Two male connectors will be found plugged into the female connectors in the RV-10 and eight feet of shielded wire is packed with each unit. Since individual requirements vary, this wire is supplied uncut and not attached to the male connectors.

When making up the cables, the center conductor should be stripped of insulation and tinned, inserted in the center sleeve of the male connector, and heated until the solder flows making a good joint. Bring the braid up on the outside shell of the plug and solder all the way around.

DIAL STRINGING CHART:

NOTE: Remove dial plate to make pulleys and drum accessible.

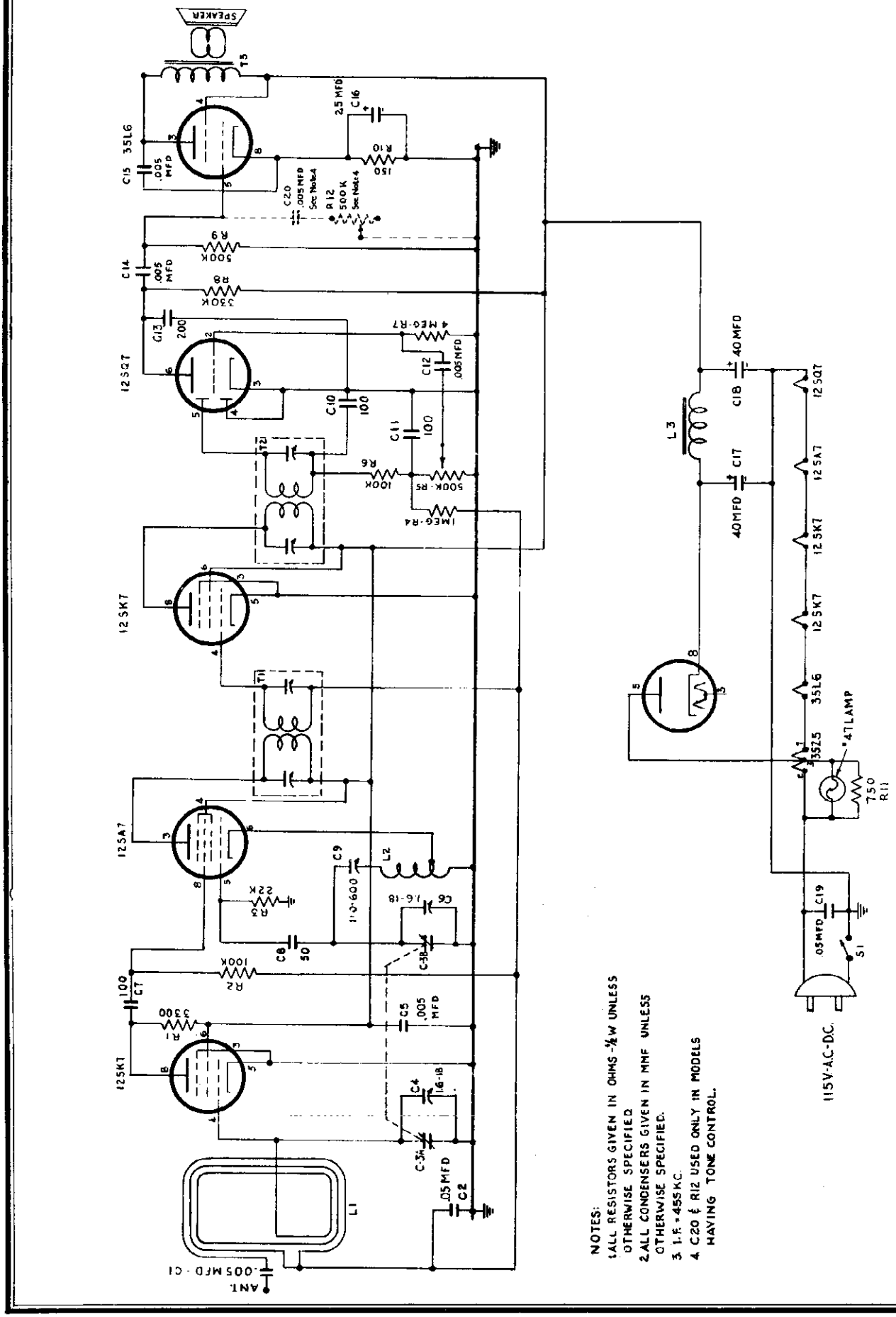




In most cases, the shield braid will provide sufficient ground between tuner and amplifier. In infrequent cases, some hum may be encountered which can be cured by connecting the amplifier chassis to the tuner chassis with a piece of heavy copper braid. The hum level out of the tuner is very low and the hum experienced will generally be found in the amplifier used or in the method of connection to the tuner.

CAPITOL RADIO CORPORATION

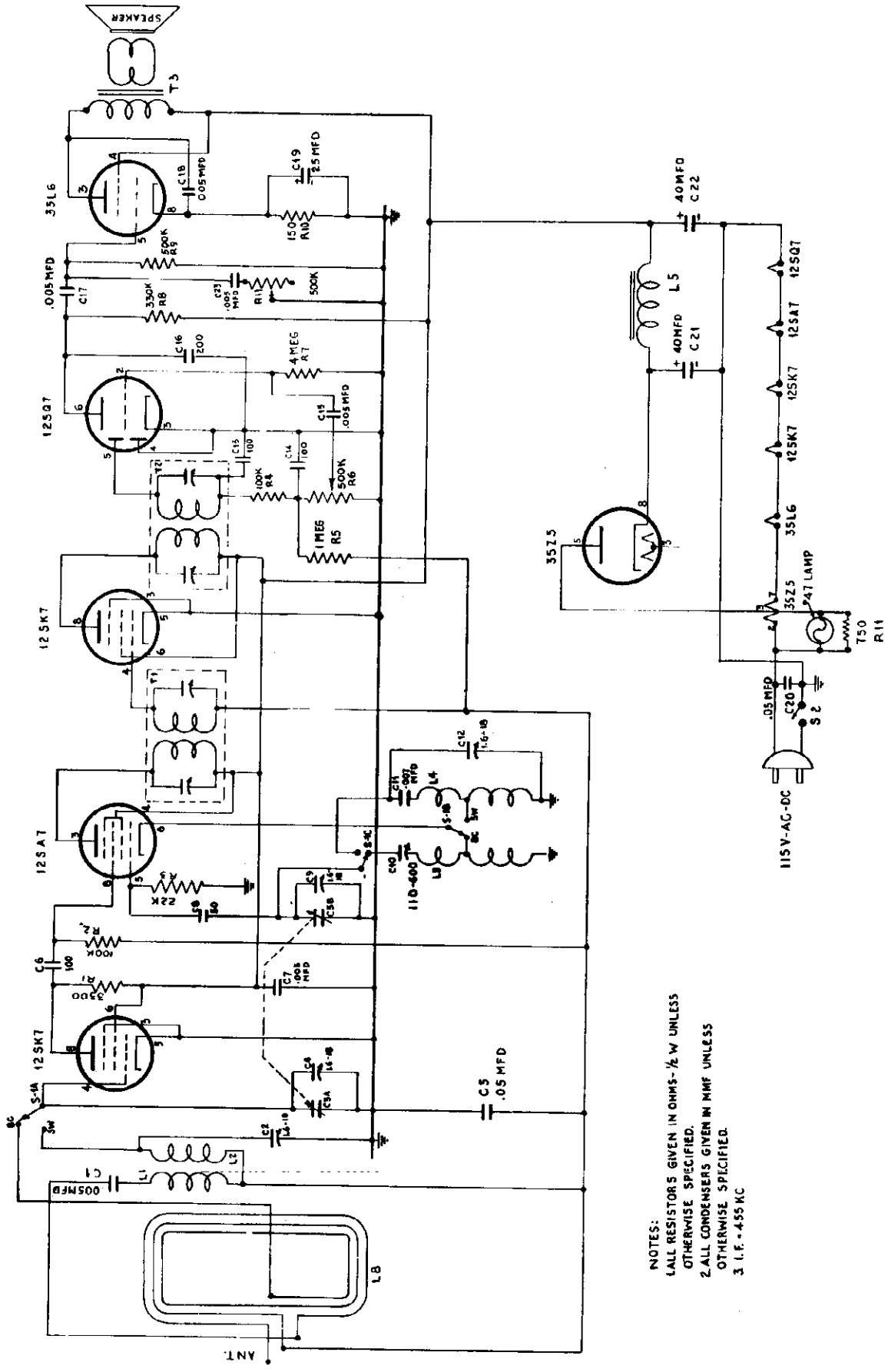
MODEL



NOTES:
1. ALL RESISTORS GIVEN IN OHMS - ½ W UNLESS OTHERWISE SPECIFIED.
2. ALL CONDENSERS GIVEN IN MMF UNLESS OTHERWISE SPECIFIED.
3. I.F. = 455 K.C.
4. C20 & R12 USED ONLY IN MODELS HAVING TONE CONTROL.

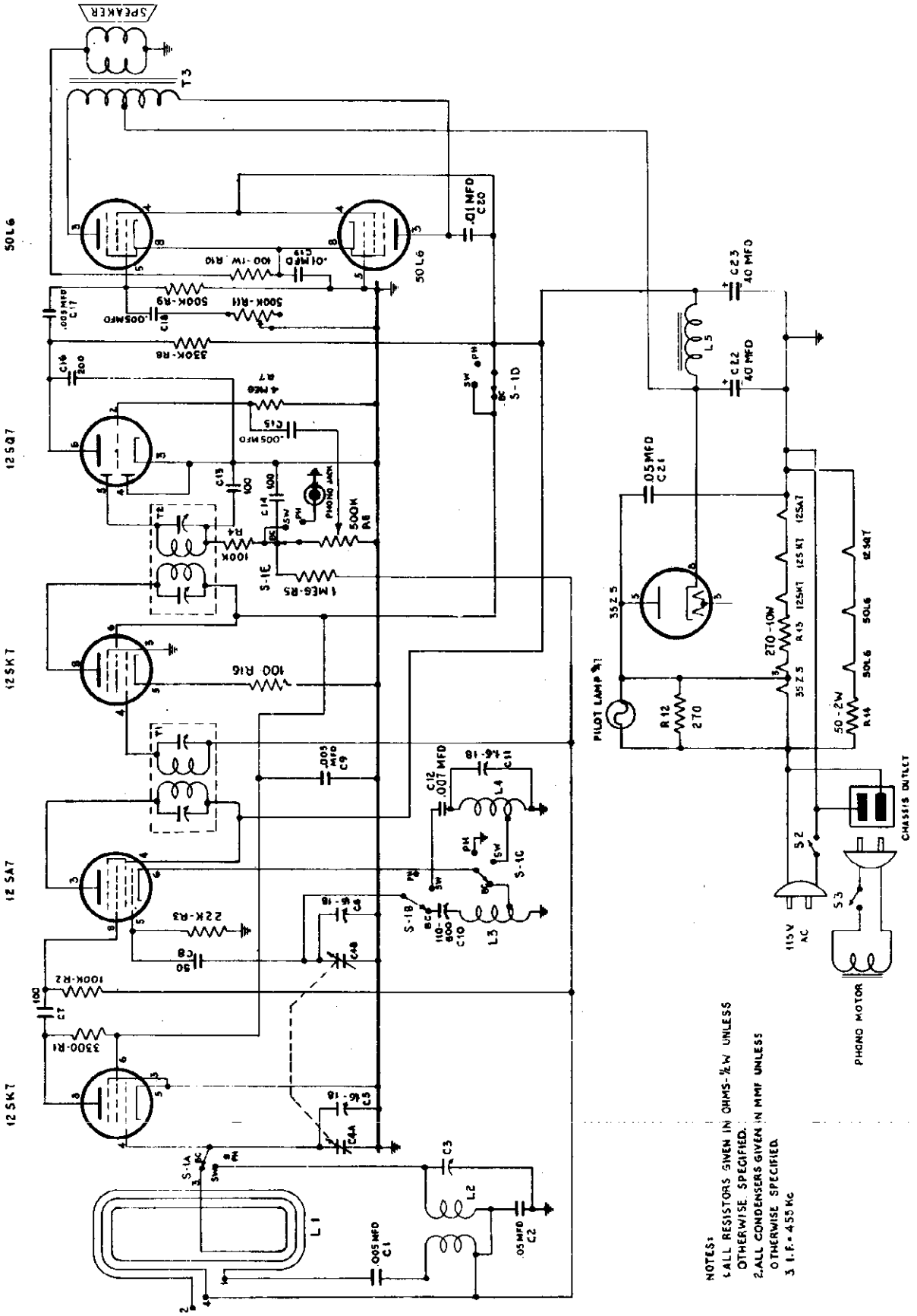
MODEL UN62

CAPITOL RADIO CORPORATION



CAPITOL RADIO CORPORATION

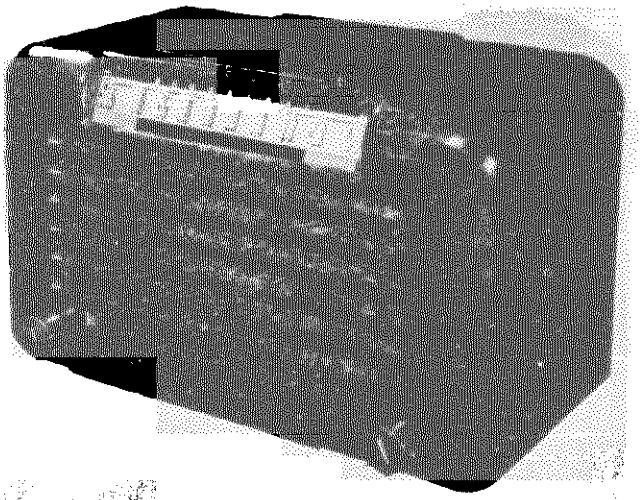
MODELS UN72, UN72PC



NOTES:
1. ALL RESISTORS GIVEN IN OHMS-½W UNLESS OTHERWISE SPECIFIED.
2. ALL CONDENSERS GIVEN IN MMF UNLESS OTHERWISE SPECIFIED.
3. I.F. = 455 Kc

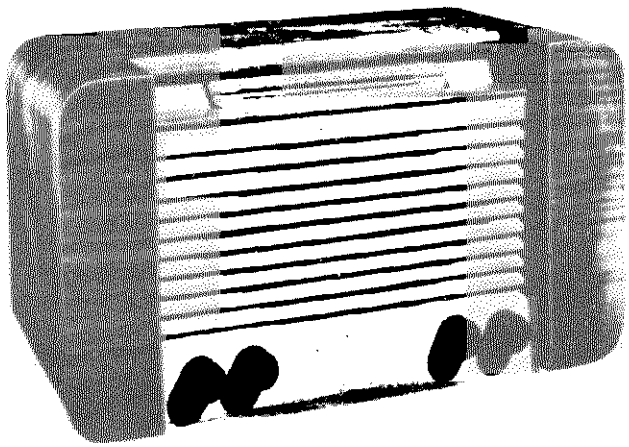
MODELS UN61, UN72, UN72PC

CAPITOL RADIO CORPORATION



MODEL UN-61 "MUSIC MASTER"

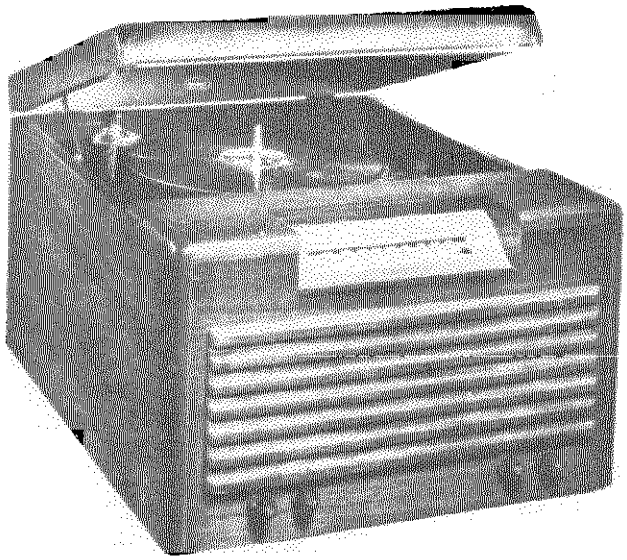
6 tube AC-DC broadcast band, R.F. stage, Iron core I.F. coils, High Q. shielded loop, 1.47oz. Alnico 5 permanent magnet, 5" speaker, A.V.C.



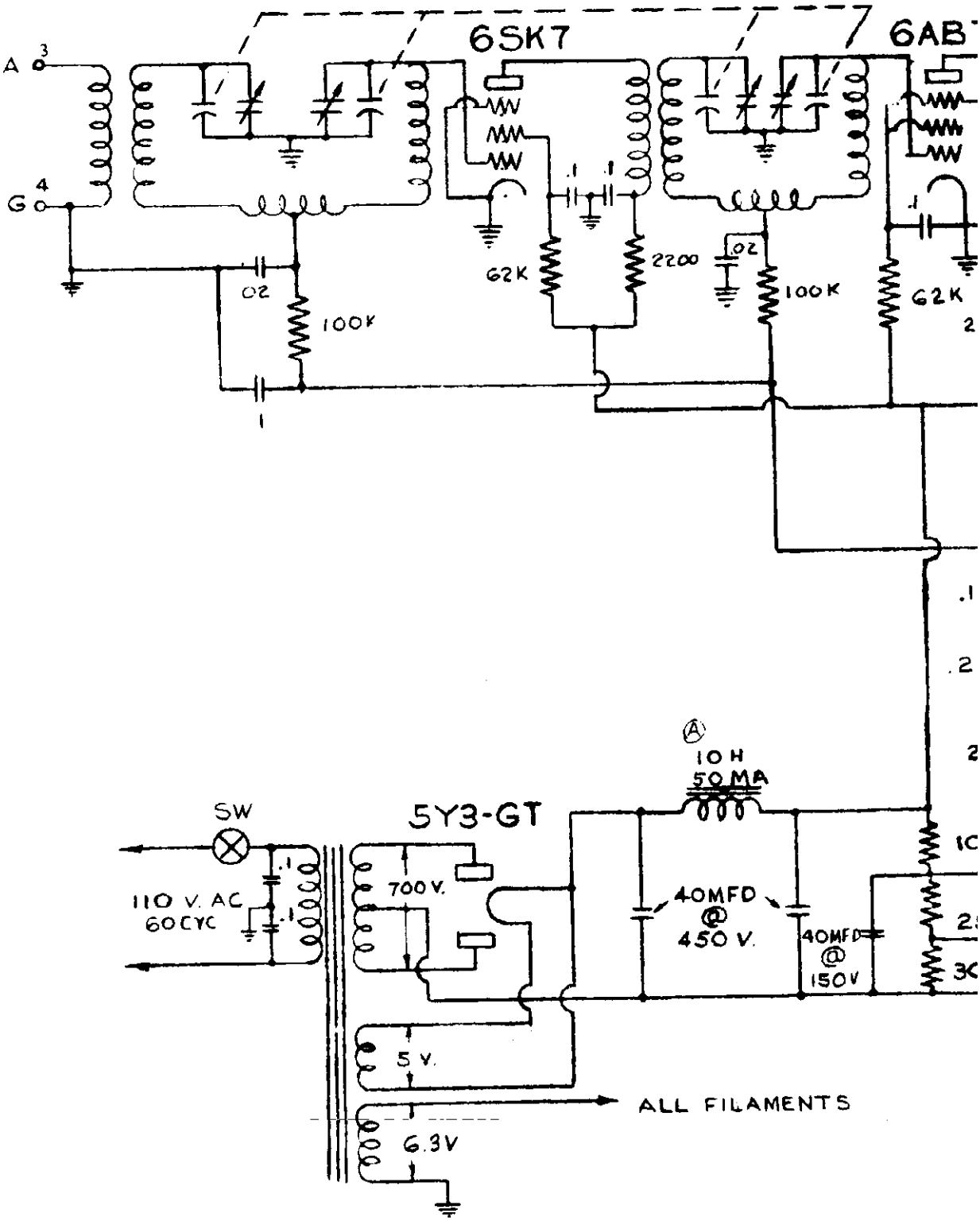
MODEL UN-72

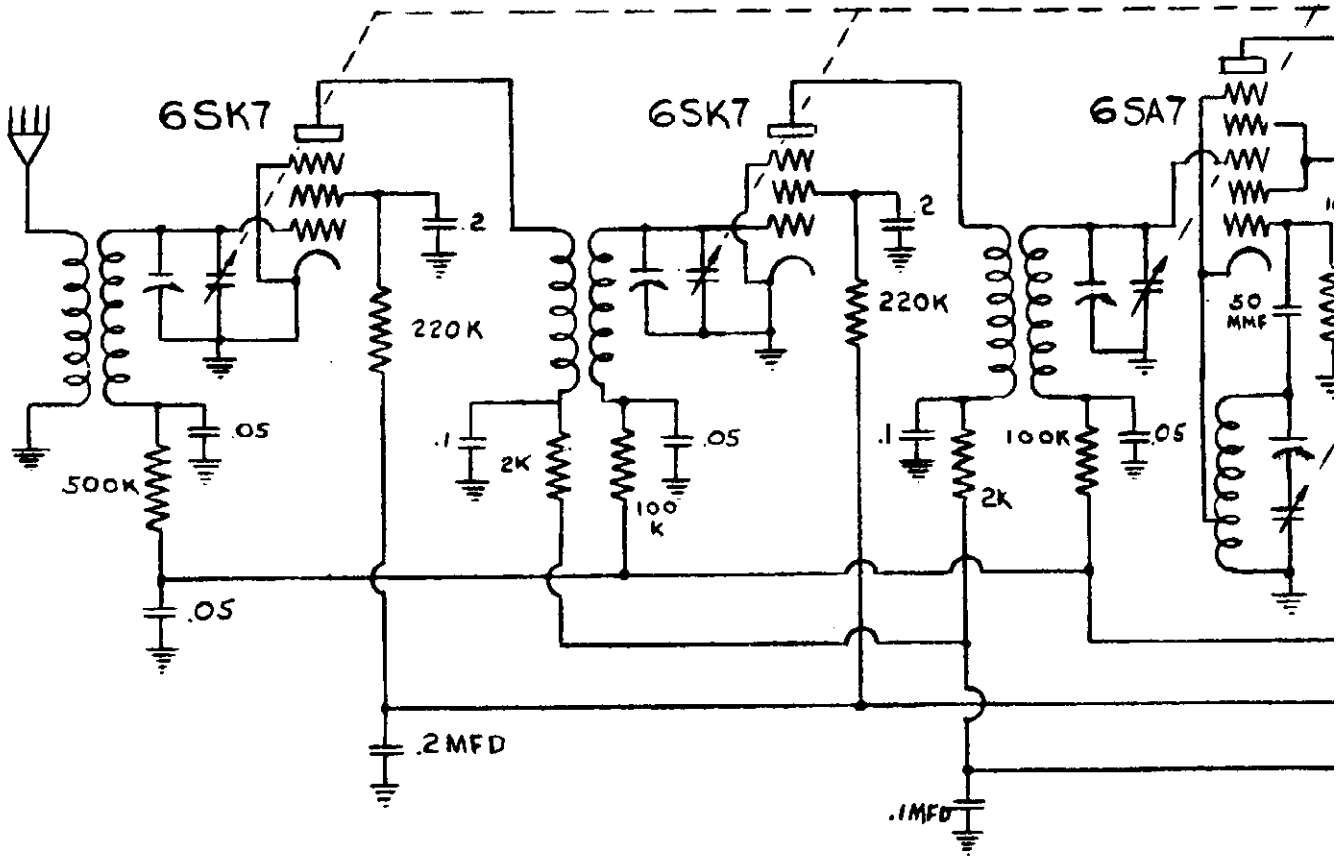
"HIGH FIDELITY SYMPHONIC"

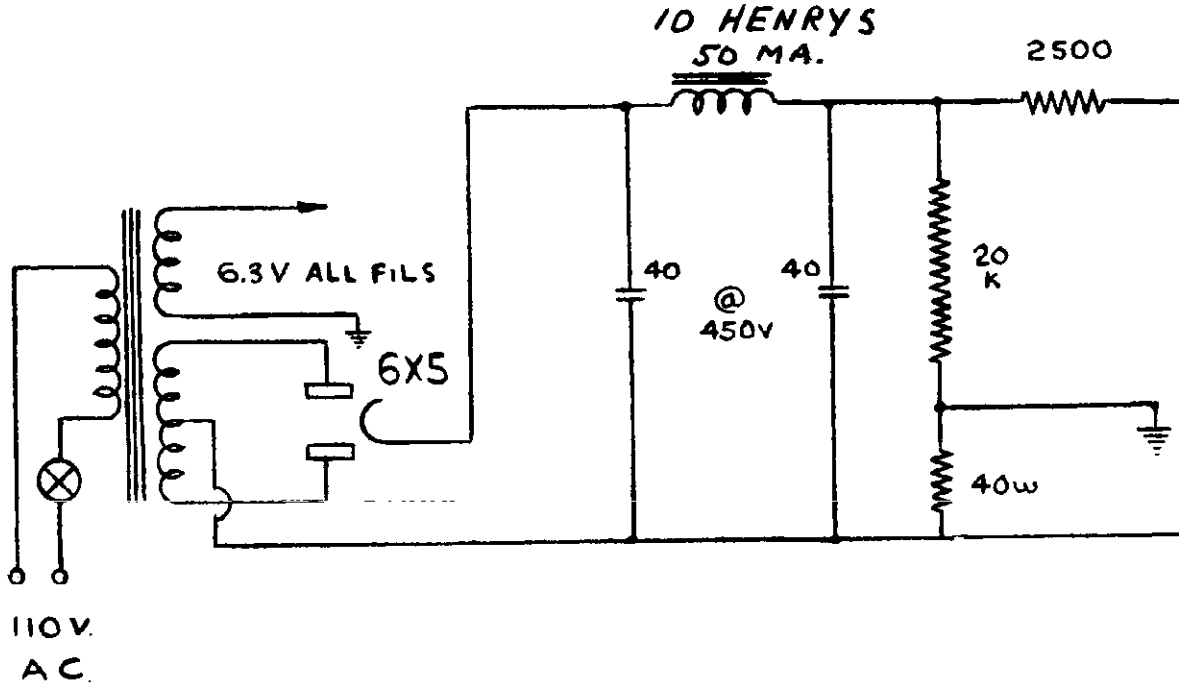
7 tube broadcast and short wave bands, R.F. stage, I.F. coils, high Q. shielded loop, Alnico 5, 3.16oz. magnet, 6" speaker, A.V.C.



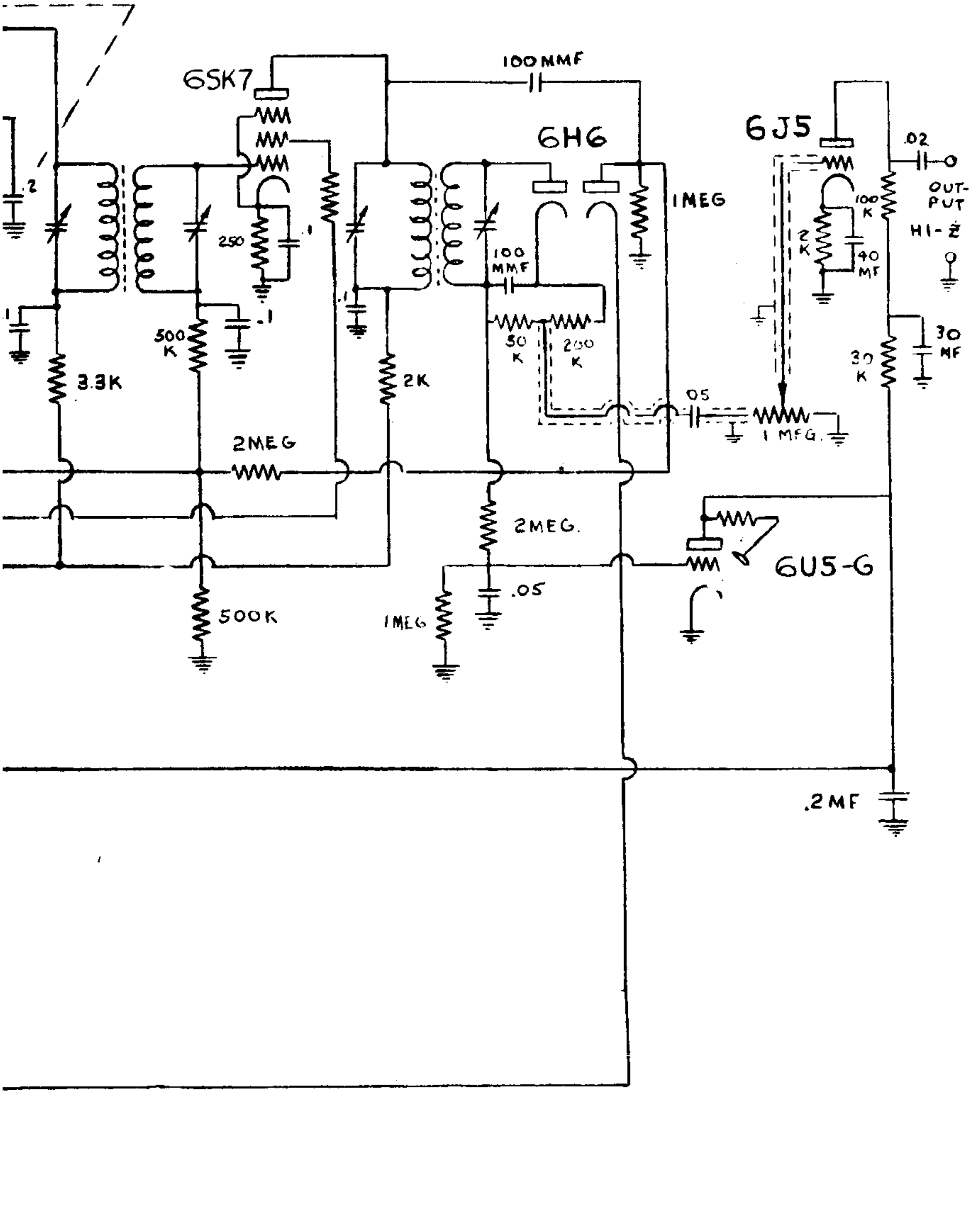
MODEL UN-72P

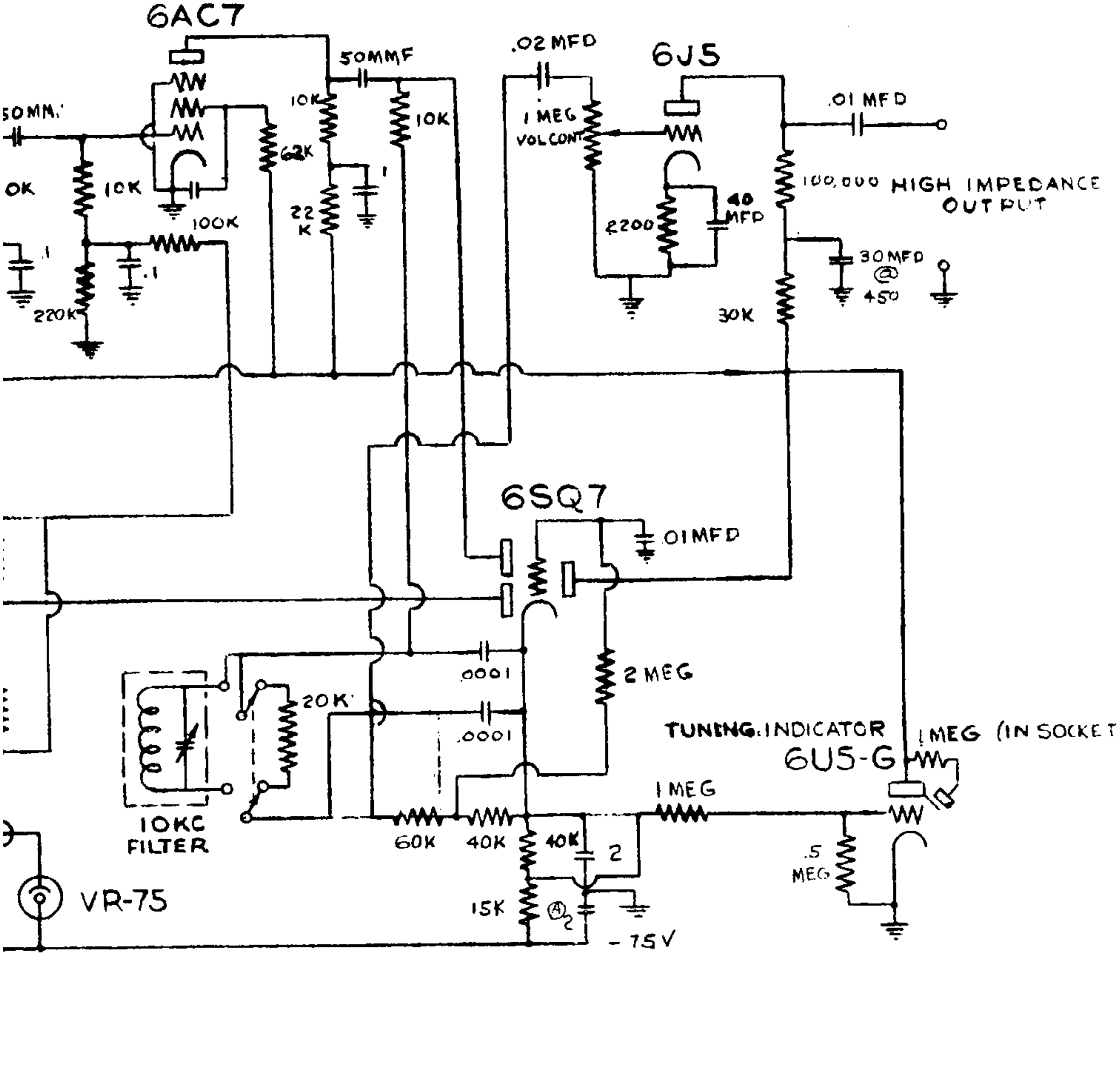

6SK7
6AB
A
3
G
4
.02
100K
1
62K
2200
.1
.1
.02
100K
62K
2
.1
.2
2
Ⓐ
10 H
50 MA
SW
5Y3-GT
110 V. AC
60 CYC
.1
.1
700 V.
40MFD
@
450 V.
40MFD
@
150V
1C
2
3C
5 V.
ALL FILAMENTS
6.3V


6SK7
6SK7
6SA7
.2
220K
.05
500K
.05
.1
2K
100K
.05
.2
220K
.1
2K
100K
.05
50 MMF
.2MFD
.1MFD


10 HENRYS
50 MA.
2500
6.3V ALL FILS
6X5
40
@
450V
40
20
K
40w
110V.
AC.

DUCTS CO.

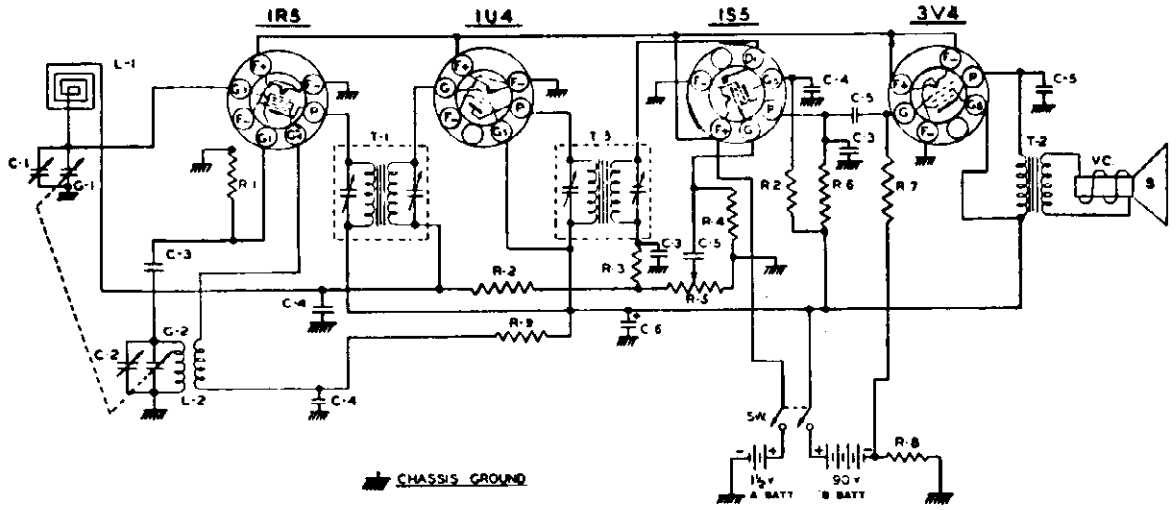

6SK7
100MMF
6H6
6J5
.02
.2
OUT-PUT
HI-Z
1MEG
100 K
2 K
40 MF
250
.1
.1
500 K
.1
100 MMF
50 K
200 K
30 MF
30 K
3.3K
2K
.05
1 MEG.
2MEG
2MEG.
6U5-G
.05
1MEG
500K
.2MF



6AC7
50MMF
10K
10K
62K
1
22 K
50MM.
0K
10K
100K
.1
.1
220K
.02 MFD
1 MEG VOL CONT
6J5
.01 MFD
100,000
HIGH IMPEDANCE OUTPUT
2200
40 MFD
30 MFD @ 450
30K
6SQ7
.01MFD
2 MEG
.0001
.0001
20K
10KC FILTER
TUNING INDICATOR
6U5-G
1 MEG (IN SOCKET)
1 MEG
.5 MEG
60K
40K
40K
2
15K
4 2
-75V
VR-75

CONCORD RADIO CORP.

MODELS 1-40
1-405



ALIGNMENT AND SERVICE DATA

PART NO		DESCRIPTION	
IR-20	R-1	220M Ω RESISTOR	1/2W 20 %
IR-23	R-2	3.3MEG RESISTOR	1/2W 20 %
IR-31	R-3	82M Ω RESISTOR	1/2W 10 %
IR-3	R-4	10MEG RESISTOR	1/2W 20 %
VC-8	R-5	5MEG VOLUME CONTROL	
IR-15	R-6	1MEG RESISTOR	1/2W 20 %
IR-13	R-7	2.2MEG RESISTOR	1/2W 20 %
IR-39	R-8	620 Ω RESISTOR	1/2W 20 %
IR-37	R-9	10M Ω RESISTOR	1/2W 20 %
TC-7	C-1	ANT TRIMMER	
	C-2	OSC TRIMMER ON GANG	
MC-2	C-3	100MMFD MICA CONDENSER	
PC-7	C-4	.01 MFD 400 V CONDENSER	
PC-6	C-5	.005MFD 600 V CONDENSER	
EC-7	C-6	20MFD 80WV ELECTROLYTIC	
GC-5	G-1	GANG CONDENSER	
	G-2		
LL-5	L-1	LOOP ANTENNA	
LO-12	L-2	OSC COIL	
LI-3	T-1	I.F. TRANSFORMER INPUT	
	SW	DPST SWITCH ON VOLUME CONTROL	
	T-2	SPEAKER TRANSFORMER	
SPK-5	VC	VOICE COIL	
	S	PM SPEAKER	
LI-4	T-3	I.F. TRANSFORMER OUTPUT	
TU-30		1R5 1U4 1S5 3V4	

Remove chassis from cabinet for alignment. A signal generato is required having the following frequencies: 455 KC and 1400 KC An output meter should be connected across the speaker.

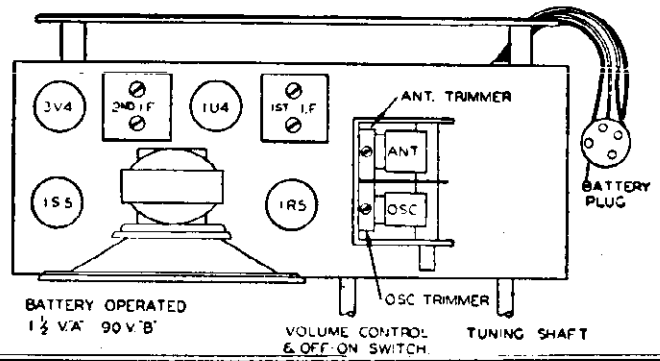
FIRST STEP: Connect the hot lead from the generator to the ANT section of the gang condenser, through a .1 MFD. condenser. Th ground lead from the generator may be connected to any spot on th metal chassis. Turn the gang condenser to complete minimum ca pacity. Set the generator to 455 KC. Adjust the movable trimmers in th IF cans, until a maximum reading is noted on the output meter.

The volume control of the receiver should be turned to maximun during the IF and all subsequent alignment and the generator outpu as low as possible to prevent the AVC from working and giving fals readings.

SECOND STEP: With the leads from the generator still connected a in IF alignment, adjust the generator to 400 KC. Set the dial pointe to 1400 KC on the dial scale. Adjust the oscillator trimmer until th signal is tuned in.

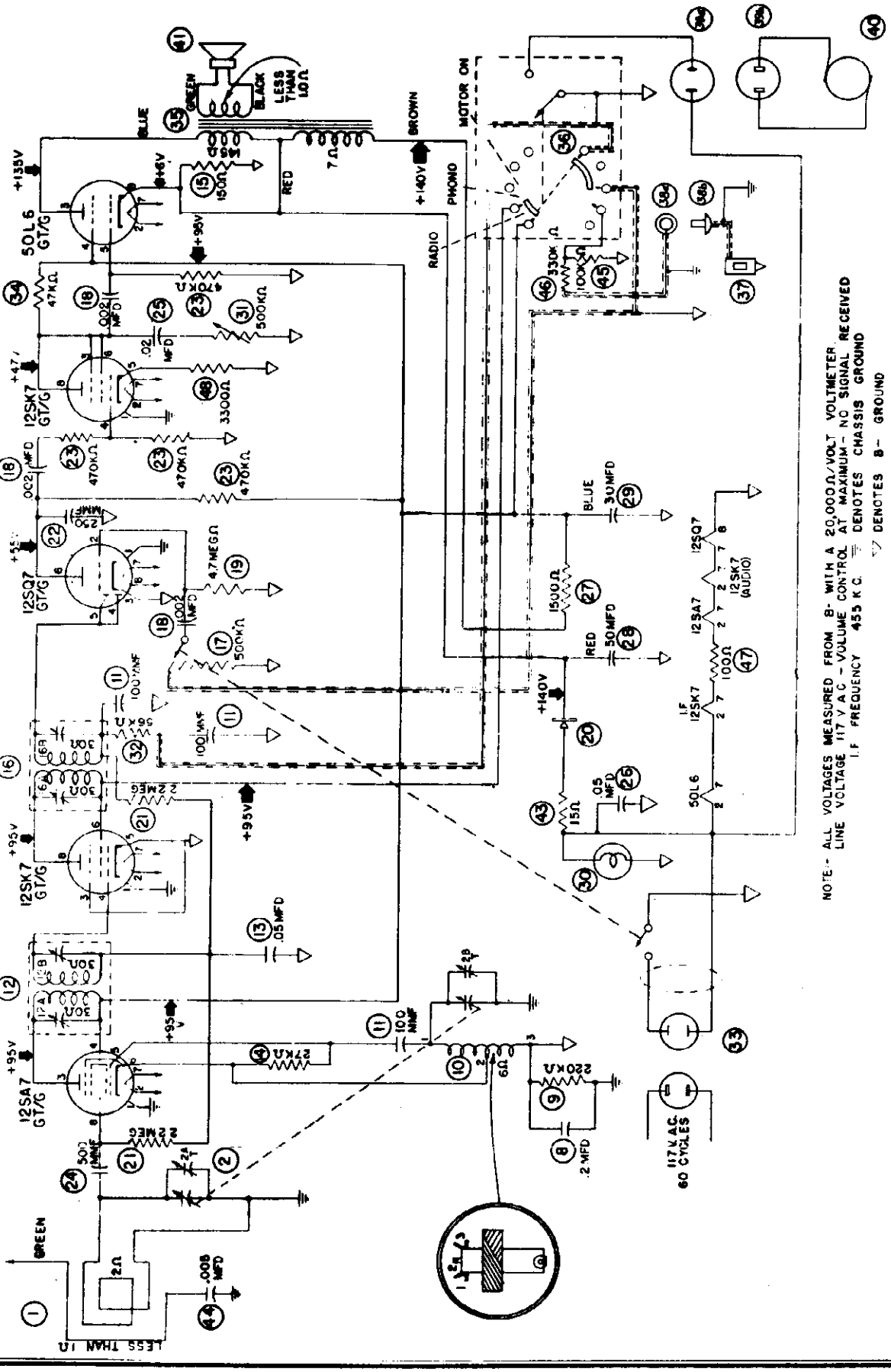
THIRD STEP: Remove the generator leads from the condenser. Connec the hot lead from the generator through a 200 MMFD. condenser t one of the leads which project from the back of the loop antenna Connect the ground lead of the generator to the remaining lead. Wit the generator and the receiver still tuned to 1400 KC, adjust the antenn trimmer until a maximum reading is noted on the output meter.

TUBE AND TRIMMER LOCATION

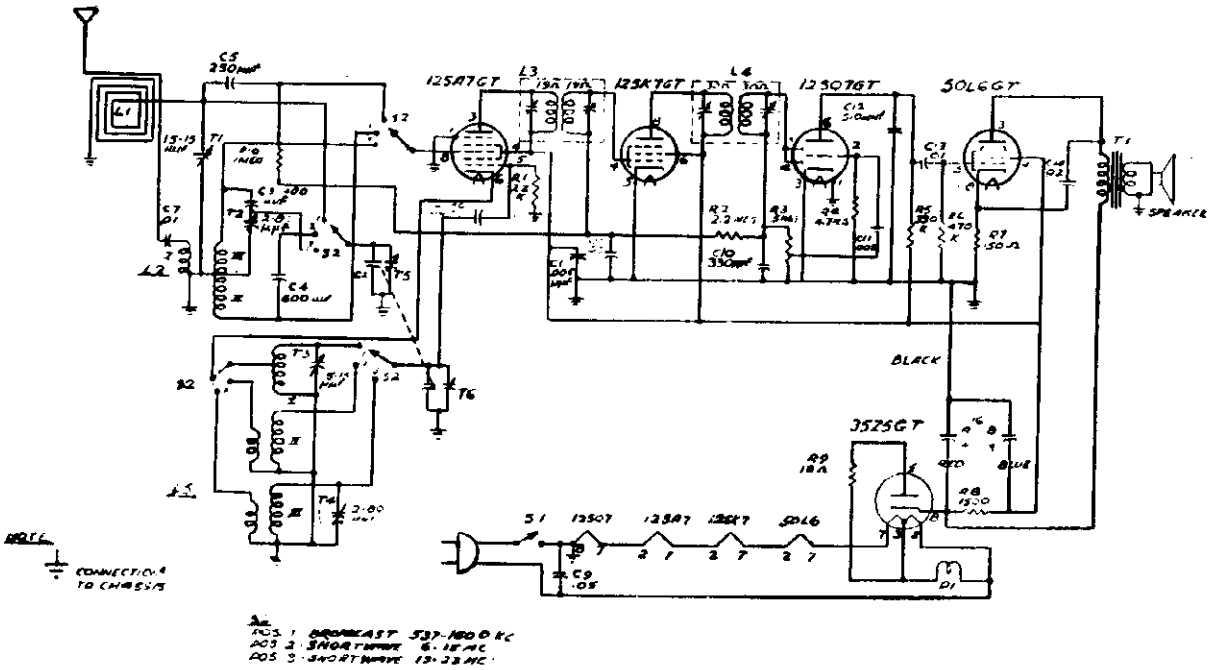


MODEL 1-506

CONCORD RADIO CORP.



NOTE- ALL VOLTAGES MEASURED FROM B- WITH A 20,000Ω/VOLT VOLTMETER
LINE VOLTAGE 117 V A.C. - VOLUME CONTROL AT MAXIMUM - NO SIGNAL RECEIVED
I.F. FREQUENCY 455 K.C. ⏚ DENOTES CHASSIS GROUND
▽ DENOTES B- GROUND



ALIGNMENT PROCEDURE

Output meter connection.....Across voice coil

Output meter reading ½ watt .....1.25V for 3.2 Ohm voice coil

Connection of generator ground.....Receiver chassis

Generator modulation.....Approximately 30% @ 400 cycles

Position of volume control.....Fully clockwise

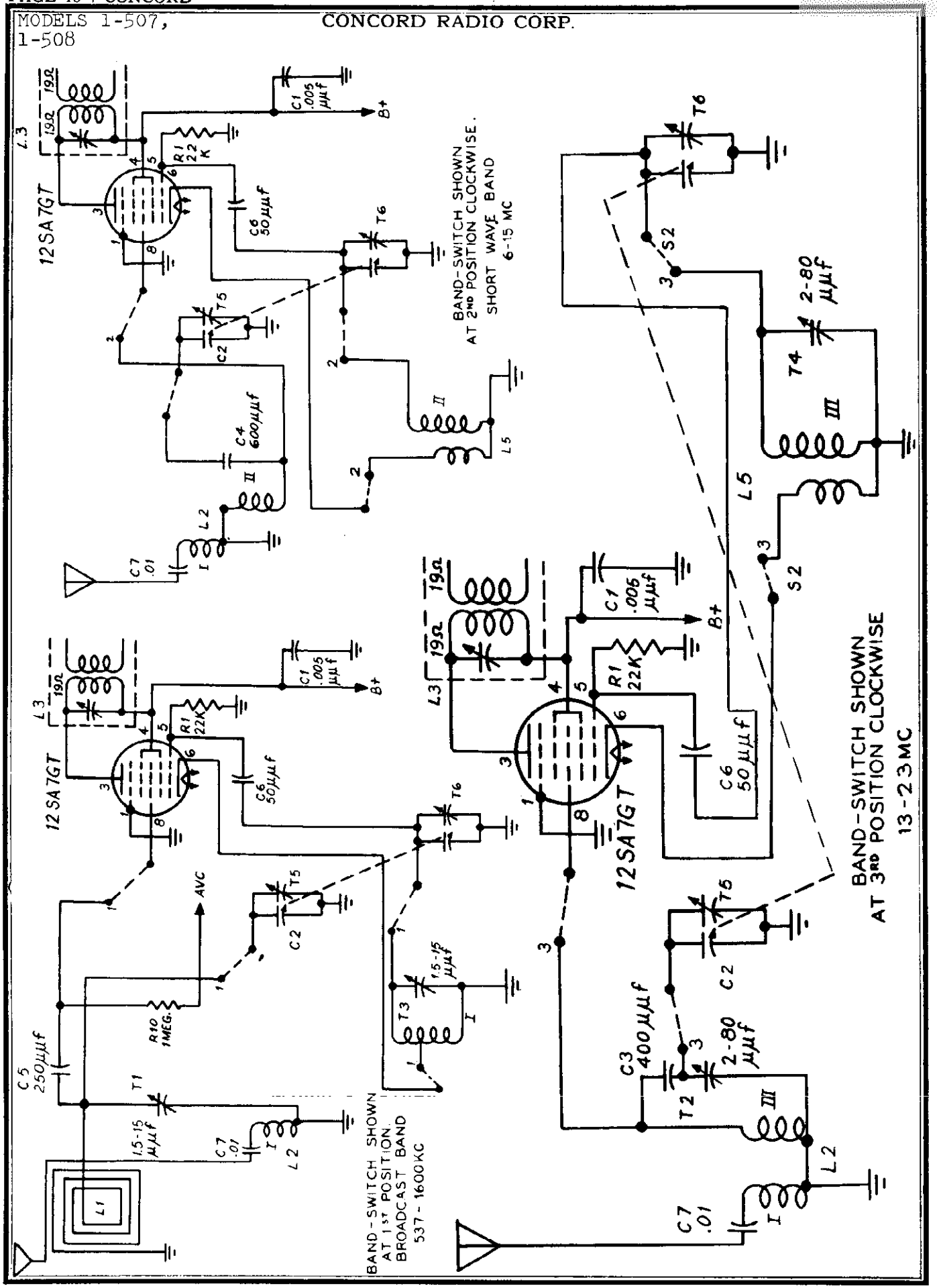
WAVE BAND SW.	POSITION OF DIAL POINTER	GEN. FREQ.	GEN. CONN.	DUMMY ANT.	TRIMMERS ADJ. IN ORDER	TRIMMER FUNCTION
B. C.	550	455	12SA7 Grid	1 mfd.	I. F. Trimmers	I. F.
S. W. 1	14	14	Ant. Post	R.M.A. Std.	T6*	Osc.
	14	14	Ant. Post	R.M.A. Std.	T5	Osc.
S. W. 2	23	23	Ant. Post	R.M.A. Std.	T4*	Osc.
	23	23	Ant. Post	R.M.A. Std.	T2	R. F.
B. C.	1500	1500	Ant. Post	R.M.A. Std.	T3	R. F.
	1500	1500	Ant. Post	R.M.A. Std.	T1	R. F.

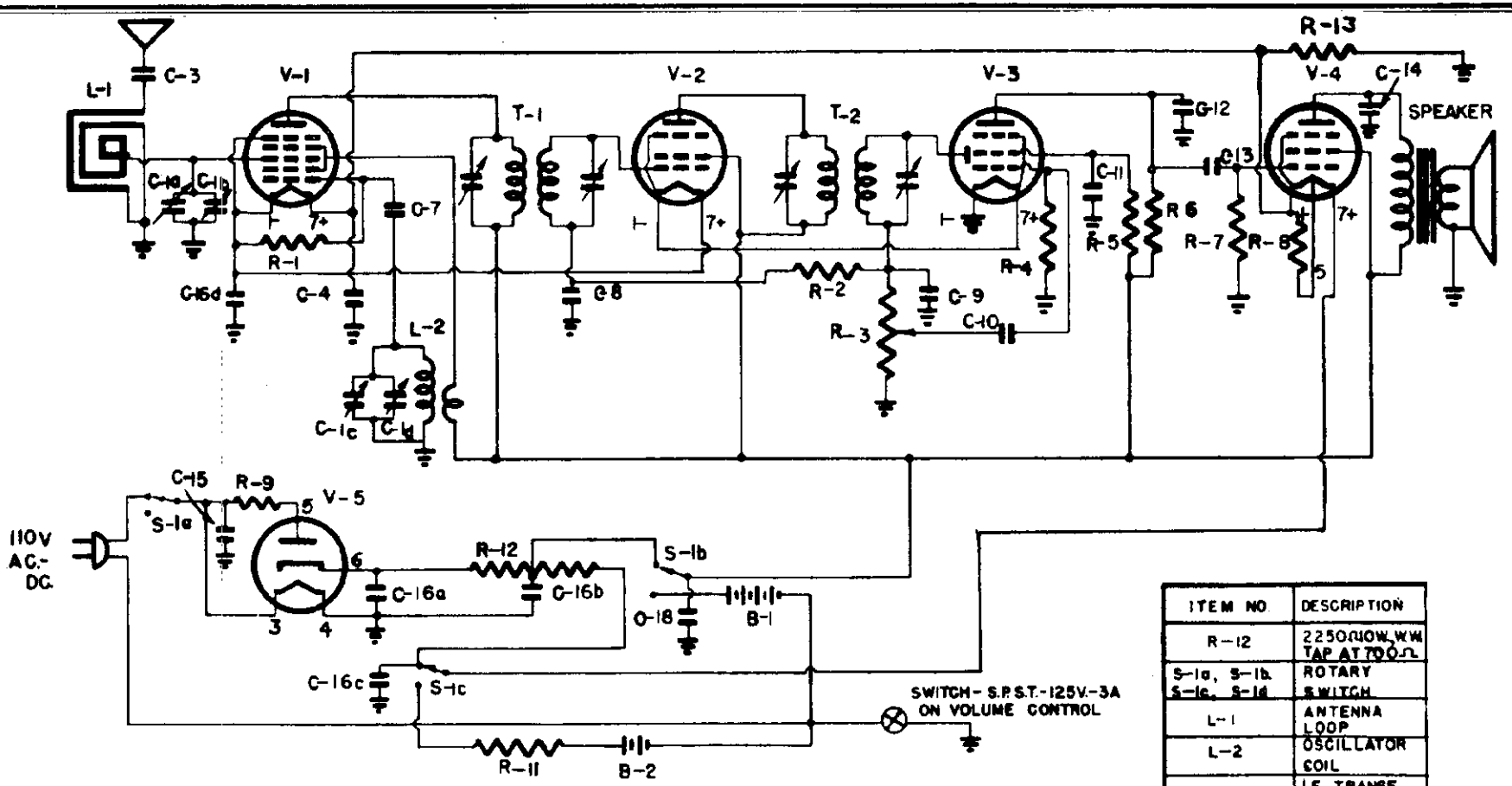
NOTE:

* If two peaks can be had the correct one is with the trimmer screw further out, the other peak is the image. Align set in order shown.

MODELS 1-507, 1-508

CONCORD RADIO CORP.





ITEM NO.	DESCRIPTION
C-1a, C-1b C-1c, C-1d	2 GANG VAR. CAPACITOR
C-3	.01 MFD. 200V PAP. TUB. CAP.
C-4	.1 MFD. 200V. PAP. TUB. CAP.
C-7	50 MMFD. MICA CAPACITOR
C-8	.05 MFD. 200V PAP. TUB. CAP.
C-9	200, MMFD. MIC. CAPACITOR
C-10	.01 MFD. 200V. PAP. TUB. CAP.
C-11	.1 MFD. 200 V.

ITEM NO.	DESCRIPTION
C-12	200 MMFD. MICA CAPACITOR
C-13	.01 MFD. 200 V. PAP. TUB. CAP.
C-14	.005 MFD. 200V PAP. TUB. CAP.
C-15	.05 MFD. 200 V. PAP. TUB. CAP.
C-16a C-16b C-16c, C-16d	40 MFD. 150 V. 100 MFD. 25 V.
C-18	.1 MFD. 200 V. PAP. TUB. CAP.
R-1	100 K, 1/2 W. CARBON RES.
R-2	2.2 M. 1/2 W.

ITEM NO	DESCRIPTION
R-3	.5 M CARBON POT. VOLUME
R-4	10 M 1/2 W. CARBON RES.
R-5	3 M. 1/2 W. CARBON RES.
R-6	1 M. 1/2 W. CARBON RES.
R-7	470 K 1/2 W. CARBON RES.
R-8	270 Ω 1/2 W. CARBON RES.
R-9	33 Ω 1/2 W. CARBON RES.
R-11	33 Ω 1/2 W.

ITEM NO	DESCRIPTION
R-12	2250 Ω LOW, W.W. TAP AT 700 Ω
S-1a, S-1b S-1c, S-1d	ROTARY SWITCH
L-1	ANTENNA LOOP
L-2	OSCILLATOR COIL
T-1	I.F. TRANSF. INPUT
T-2	I.F. TRANSF OUTPUT
V-1	1R5
V-2	1T4
V-3	1S5
V-4	3Q4
V-5	117Z3
B-1	45V BATTERY
B-2	4 1/2 VOLT BATTERY.

CONCORD RADIO CORP.

CONCORD PAGE 1
MODEL 1-

MODEL 1-513

CONCORD RADIO CORP.

VOLTAGE MEASUREMENT

All reading in AC-DC position of power selector switch with 20,000 ohms per meter. Readings taken are referred to ground.

11Z3

PIN	AC	DC	RESISTANCE IN OHMS
1	117V	—	540
2	—	120V	2000
3	117V	—	500
4	—	—	—
5	117V	—	500
6	120V	—	2000
7	—	—	—

3Q4

PIN	DC	RESISTANCE IN OHMS
1	4.8V	50
2	86V	2000
3	—	500,000
4	88V	1500
5	6V	50
6	86V	2000
7	7.6V	70

1S5

PIN	DC	RESISTANCE IN OHMS
1	—	—
2	—	—
3	—	400,000
4	19V	3,000,000
5	7.8V	1,500,000
6	—	10,000,000
7	1.5V	260

1T4

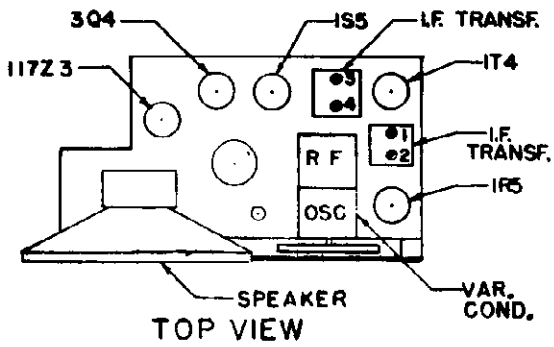
PIN	DC	RESISTANCE IN OHMS
1	1.5V	260
2	88V	1500
3	80V	1500
4	—	2,000,000
5	1.6V	45
6	—	2,200,000
7	3.3V	45

1R5

PIN	DC	RESISTANCE IN OHMS
1	3.3V	45
2	88V	1500
3	80V	1500
4	—	85
5	1.6V	45
6	—	—
7	2.3V	50

CORRECTIONS

1. Servicing Notes Section:	2. Voltage Measurements Section:	3. Schematic Diagram Section:
Stator large section gang open to read: Stator large section gang closed.	20,000 ohms per meter to read: 20,000 ohms per volt D. C. 1,000 ohms per volt A. C. meter 11Z3 to read: 117Z3	No 8-Id C 18: .1 mfd, 200 volts to read: .1 mfd, 400 volts 1000 mfd - 6v D.C. Pin # 1 of V2 to ground.



Generator Connection	Dummy Ant.	Freq.	Adj. Trimmers	Output	Sensitivity uv.
Stator large section gang open	.1 MFD cond.	455 KC	1, 2, 3, 4	Max.	120
Antenna loop wire	200 mmf cond.	1400 KC	5 & 6	Max.	50
Antenna loop wire	200 mmf	600 KC	Variable Plates	Max.	150

SPECIFICATIONS

ELECTRICAL CHARACTERISTICS

Tuning Range: Standard Broadcast 540-1640 KCS

Power Supply: Direct Current 105-125 volts or alternating current 105-125 volts, 50-60 Cycle or Batteries.

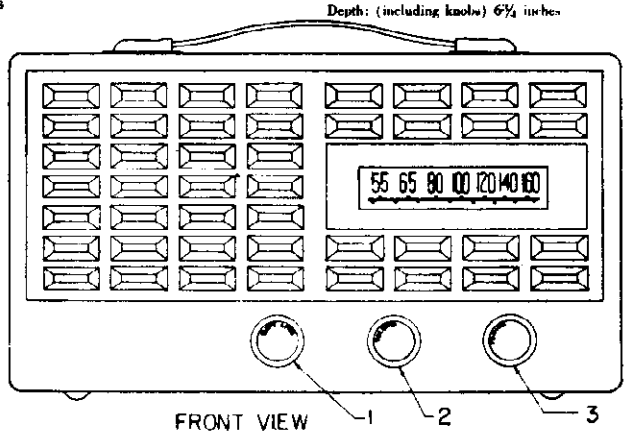
Power Consumption: AC or DC 12 watts

Battery Complement: 2—4½ Volt "A" Batteries
Eveready No. 746 or equivalent.

2—45 Volt "B" Batteries
Eveready No. 482 or equivalent.

Tube Complement: 1R5—Converter
1T4—1. F. Amplifier
1S5—2nd Det.—AVC—1st Audio
3Q4—Power Amplifier
117Z3—Rectifier

Mechanical Characteristics: Dimensions — Height: (including feet) 7⅛ inches
Width: 13 inches
Depth: (including knobs) 6¾ inches



SERVICING NOTES

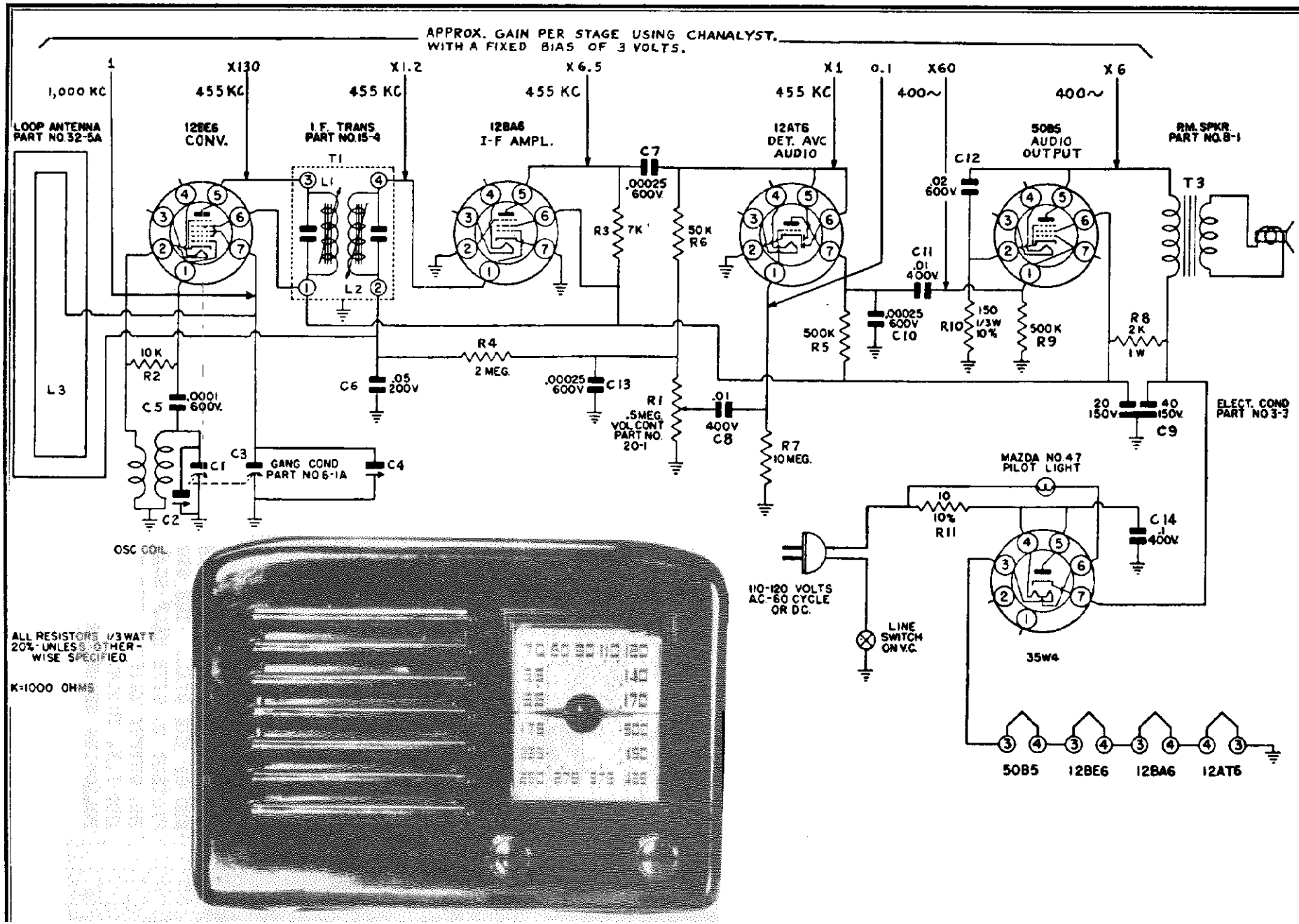
All specifications and measurements based on 117 Volts, 60 Cycles, and all readings based on a 20,000 ohms per volt meter. All readings are taken with volume control (switch No. 2) in maximum clockwise position. Apply the lowest signallevel from the signal generator.

Output: 50 mw into a 3.2 ohm voice coil impedance.

Approximate reading 0.4 Volt.

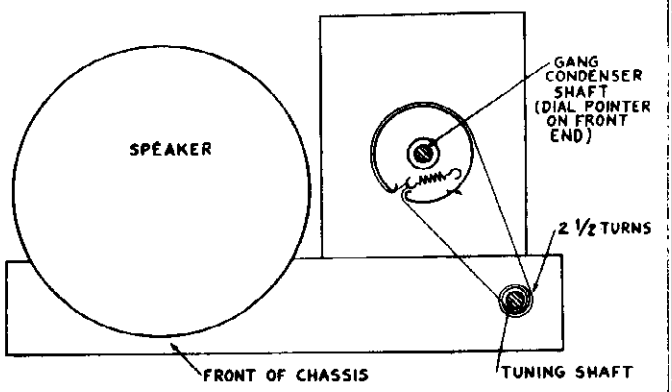
I. F. ALIGNMENT: With signal generator, set a 455 KC, apply signal through a .1 MFD condenser dummy to R.F. grid of convertor (1R5) or the stator of RF section of the variable condenser (condenser must be fully meshed). Peak I.F. trimmers 1, 2, 3, 4 (top view diagram) to give maximum reading on output meter connected across voice coil. (Note: If for any possible reason the signal does not come through indicating the receiver is way out of alignment, apply the signal to the grid of the I.F. Amplifier (1T4) and tune signal in by trimmers 3, 4 of second I.F. Transformer. Peak for maximum and once this stage is tuned, repeat above procedure.)

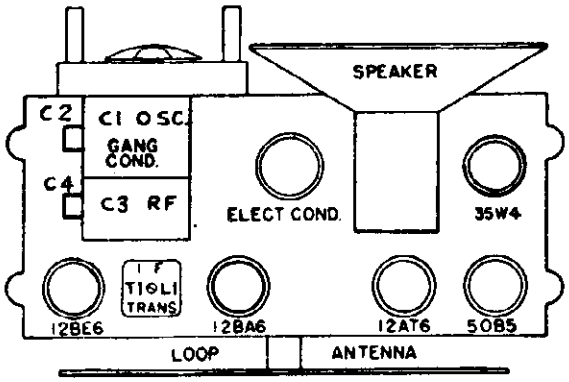
R.F. Alignment: With signal generator, set at 1400 KC, apply signal through a dummy antenna (200 mmf condenser) to the antenna loop wire. Set dial of receiver to 1400 KC and peak trimmers 5 & 6 to give maximum reading of output meter. Then set signal generator at 600 KC and tune receiver to 600 KC mark on dial. This setting should fall on calibrated point.


APPROX. GAIN PER STAGE USING CHANALYST.
WITH A FIXED BIAS OF 3 VOLTS.
1
X130
X1.2
X6.5
X1
0.1
X60
X6
1,000 KC
455 KC
455 KC
455 KC
455 KC
400~
400~
LOOP ANTENNA
PART NO.32-5A
12BE6
CONV.
I.F. TRANS
PART NO.15-4
12BA6
I-F AMPL.
12AT6
DET. AVC
AUDIO
5085
AUDIO
OUTPUT
RM. SPKR.
PART NO.8-1
T1
L1
L2
L3
C7
.00025
600V.
R3
7K
50K
R6
C12
.02
600V
T3
C11
.01
400V
.00025
600V
C10
500K
R5
150
1/3W
10%
R10
500K
R9
R8
2K
1W
10K
R2
R4
2 MEG.
C6
.05
200V
.00025
600V
C13
C5
.0001
600V.
R1
.5MEG.
VOL CONT
PART NO.
20-1
.01
400V
C8
20
150V
40
150V
C9
ELECT. COND
PART NO 3-3
R7
10MEG.
C1
C3
GANG COND
PART NO 6-1A
C4
C2
OSC COIL
MAZDA NO.47
PILOT LIGHT
10
10%
R11
C14
.1
400V
110-120 VOLTS
AC-60 CYCLE
OR DC.
LINE
SWITCH
ON V.C.
35W4
5085
12BE6
12BA6
12AT6
ALL RESISTORS 1/3 WATT
20% UNLESS OTHER-
WISE SPECIFIED.
K=1000 OHMS

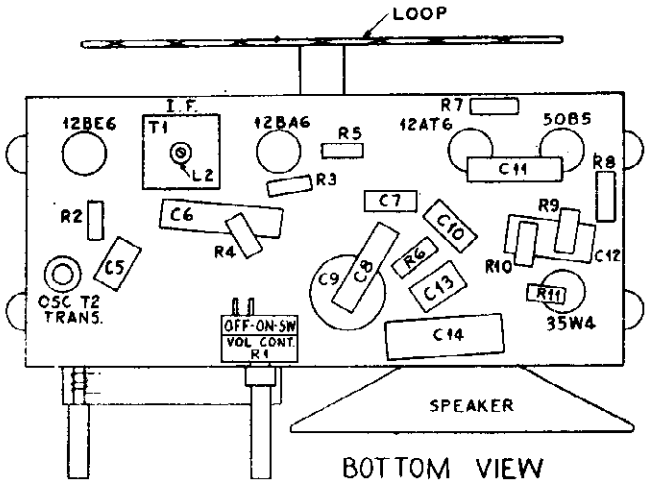
MODEL 1-514 CONCORD RADIO CORP.

DIAL CORD DRIVE





TUBE LAYOUT



BOTTOM VIEW

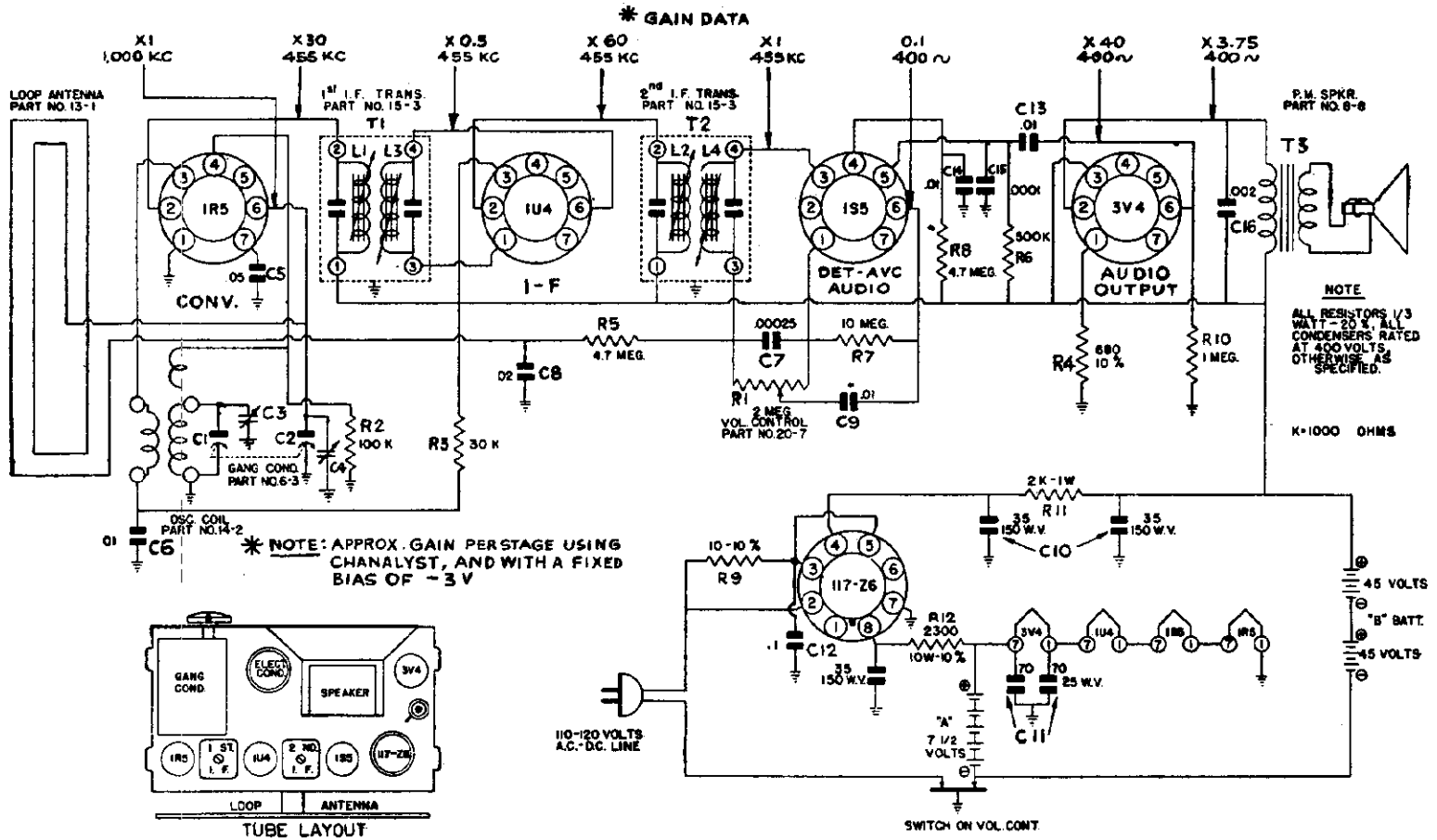
SOCKET	PIN	VTVM	20,000Ω/P.V.	1,000Ω/P.V.	RESISTANCE
12BE6	1	-6	-6	-6 ON 100V SCALE	10K
CONV.				-3.5 ON 10V SCALE	
	2	0	0	0	0
	3	AC	AC	AC	45 Ω
	4	AC	AC	AC	30 Ω
	5	+82	+82	+82	OVER 5 MEGS
	6	+82	+82	+82	OVER 5 MEGS
	7	-1.0	-0.6	-0.2	3 MEGS
12BA6	1	-1.0	-0.6	-0.2	3 MEGS
I.F. AMPL.	2	0	0	0	0
	3	AC	AC	AC	25 Ω
	4	AC	AC	AC	15 Ω
	5	+25	+24	+22	OVER 5 MEGS
	6	+82	+82	+82	OVER 5 MEGS
	7	0	0	0	0
12AT6	1	-0.6	-0.2	0	10 MEGS
DET. AVC	2	0	0	0	0
AUDIO	3	0	0	0	0
	4	AC	AC	AC	15 Ω
	5	-0.5	-0.2	0	500K
	6	-0.5	-0.2	0	500K
	7	+40	+38	+15	OVER 5 MEGS
50B5	1	0	0	0	500K
AUDIO	2	+5	+5	+5	150 Ω
OUTPUT	3	AC	AC	AC	85 Ω
	4	AC	AC	AC	35 Ω
	5	+120	+120	+120	OVER 5 MEGS
	6	+82	+82	+82	OVER 5 MEGS
	7	--	--	--	--
35W4	1	AC	AC	AC	110 Ω
RECT	2	--	--	--	--
	3	AC	AC	AC	85 Ω
	4	AC	AC	AC	115 Ω
	5	AC	AC	AC	116 Ω
	6	AC	AC	AC	110 Ω
	7	+125	+125	+125	OVER 5 MEGS

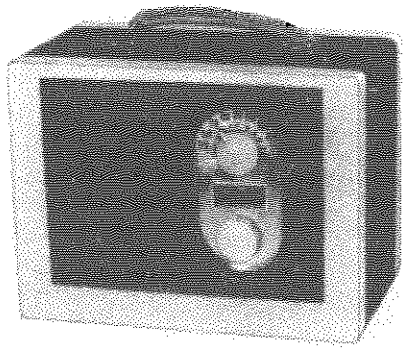
ALL VOLTAGE AND RESISTANCE MEASUREMENT MADE WITH RESPECT TO CHASSIS GROUND AND WITH A LINE VOLTAGE OF 116 V. A. C.

A L I G N M E N T

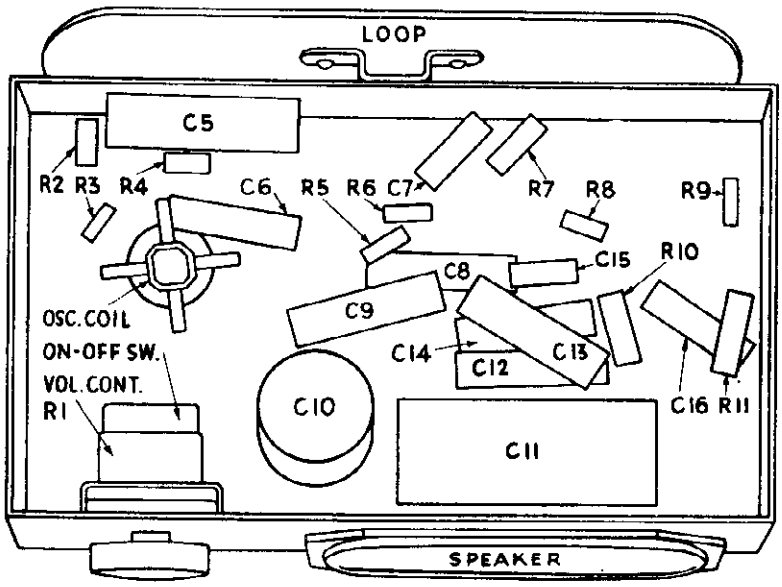
THE CHASSIS MUST BE REMOVED FROM THE CABINET IN ORDER TO ALIGN THE RECEIVER. CONNECT THE OUTPUT METER ACROSS THE VOICE COIL. CONNECT THE SIGNAL GENERATOR TO THE STANDARD HAZELTINE MODEL 1150 LOOP, AND COUPLE LOOSELY TO THE RECEIVER LOOP. SET THE RECEIVER VOLUME CONTROL AT MAXIMUM.

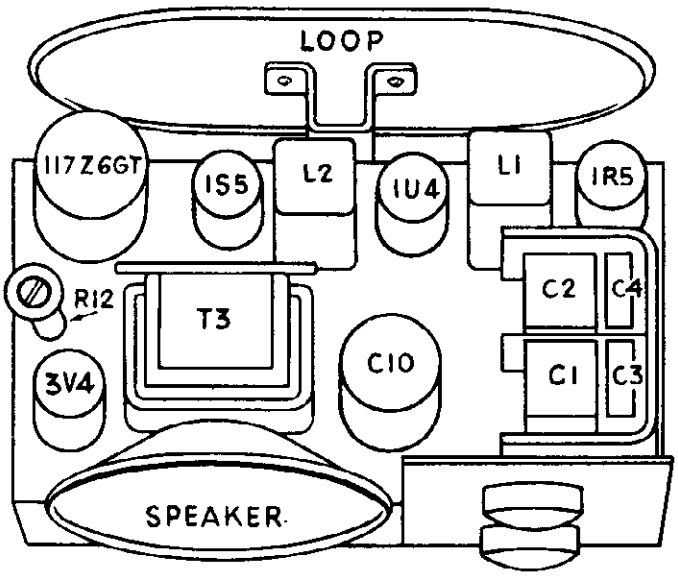
THE TUNING CONDENSER PLATES SHOULD BE FULLY MESHED WHEN THE DIAL POINTER IS AT THE INDEX MARK AT THE LOW FREQUENCY END OF THE DIAL. THE SIGNAL GENERATOR OUTPUT SHOULD BE SUFFICIENT TO GIVE HALF SCALE DEFLECTION ON THE LOWEST SCALE OF THE OUTPUT METER. SET THE SIGNAL GENERATOR TO 455 KC. ADJUST THE I.F. TUNING SLUGS FOR MAXIMUM METER DEFLECTION IN THE FOLLOWING SEQUENCE: L2, L1. SET THE GENERATOR AND RECEIVER TO 700 KC AND ADJUST OSCILLATOR TRIMMER C2 FOR MAXIMUM OUTPUT. SET THE GENERATOR AND RECEIVER TO 1400 KC AND ADJUST LOOP TRIMMER C4 FOR MAXIMUM OUTPUT.


* GAIN DATA
X1 1,000 KC
X30 455 KC
X 0.5 455 KC
X 60 455 KC
X1 455 KC
0.1 400 ~
X 40 400 ~
X 3.75 400 ~
LOOP ANTENNA PART NO. 13-1
1st I.F. TRANS. PART NO. 15-3
T1
2nd I.F. TRANS. PART NO. 15-3
T2
P.M. SPKR. PART NO. 6-8
T3
1R5
1U4
1S5
3V4
CONV.
I-F
DET-AVC AUDIO
AUDIO OUTPUT
C13 .01
C14 .01
C15 .0001
C16 .002
R8 4.7 MEG.
R6 500K
C5 .05
R5 4.7 MEG.
.00025 C7
10 MEG. R7
R4 680 10%
R10 1 MEG.
C8 .02
R1 2 MEG. VOL. CONTROL PART NO. 20-7
C9 .01
C1
C3
C2
R2 100 K
C4 GANG COND. PART NO. 6-3
R5 30 K
OSC. COIL PART NO. 14-2
C6 .01
NOTE
ALL RESISTORS 1/3 WATT - 20 %, ALL CONDENSERS RATED AT 400 VOLTS OTHERWISE AS SPECIFIED.
K=1000 OHMS
* NOTE: APPROX. GAIN PER STAGE USING CHANALYST, AND WITH A FIXED BIAS OF -3 V
2K-1W R11
35 150 W.V. C10
35 150 W.V.
10-10 % R9
117-Z6
R12 2300 10W-10 %
.1 C12
35 150 W.V.
70 70 25 W.V. C11
"A" 7 1/2 VOLTS
45 VOLTS "B" BATT. 45 VOLTS
110-120 VOLTS A.C.-D.C. LINE
SWITCH ON VOL. CONT.
GANG COND.
ELECT. COND.
SPEAKER
3V4
1R5
1 ST I.F.
1U4
2 ND I.F.
1S5
117-Z6
LOOP
ANTENNA
TUBE LAYOUT



MODEL 1-518 CONCORD RADIO CORP.





ALIGNMENT

The chassis is removed from the cabinet in order to align this receiver.

Connect the output meter across the voice coil. Connect the signal generator to the standard Hazeltine loop, Model 1150, and couple loosely to the receiver loop. Set the receiver volume control to maximum. The tuning condenser plates should be fully meshed when the dial pointer is at the index mark at the low frequency end of the dial. The signal generator output should be sufficient to give a readable deflection on the output meter.

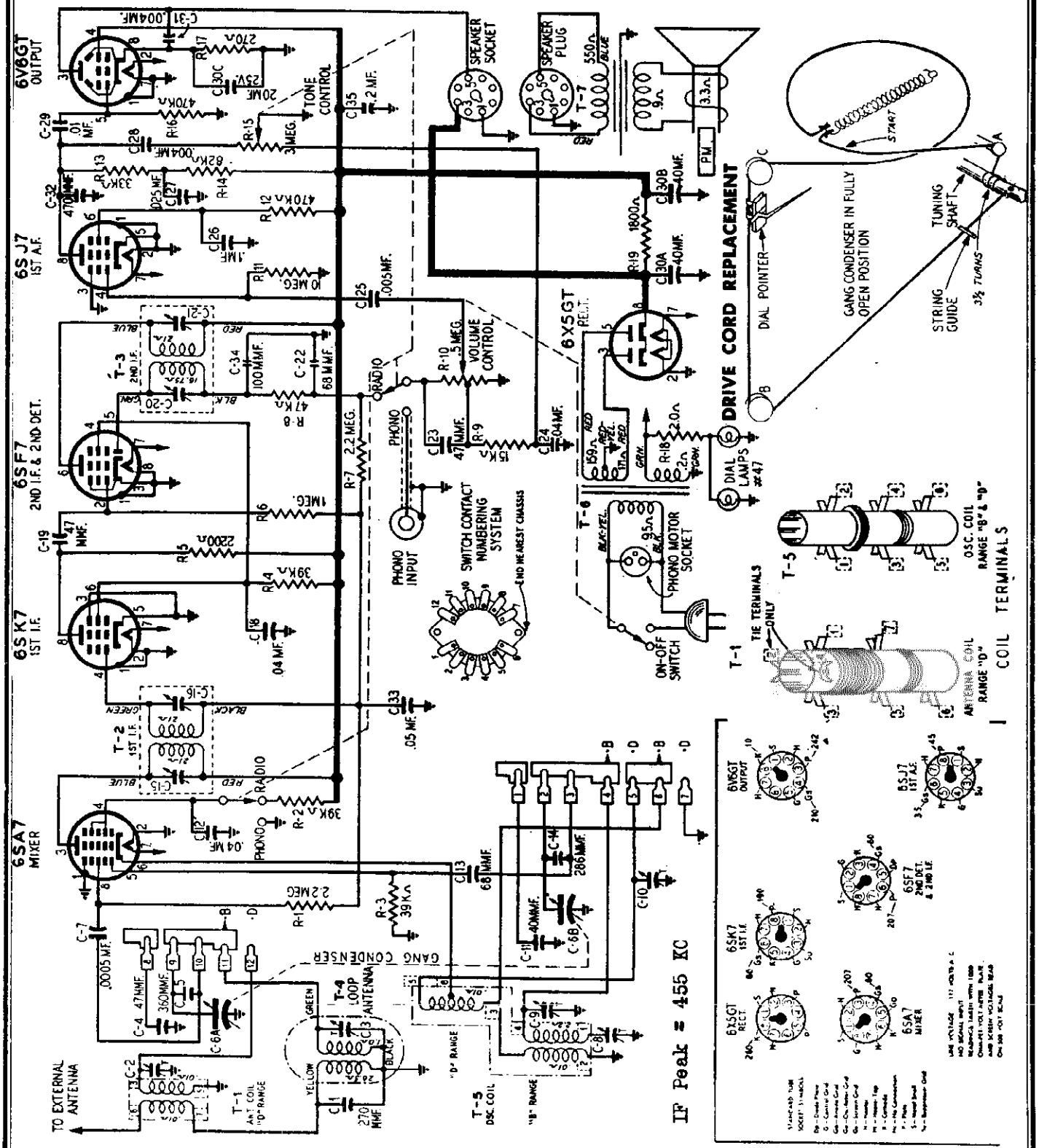
Set the signal generator to 455 kc. Adjust the I.F. tuning slugs, L4, L3, L2, L1, for maximum output on the output meter. Set the signal generator and receiver to 1600 kc and adjust the oscillator trimmer C4 for maximum output. Set the signal generator and receiver to 1400 kc and adjust R.F. trimmer C3 for maximum output.

TUBE	PIN	VTVM	20,000 P.V.	1,000 P.V.	RESISTANCE
IR5	1	0	0	0	0
Conv	2	105	105	105	Over 5 megs
	3	44	44	42	Over 5 megs
	4	-5	-2.6	0	100 K
	5	0	0	0	0
	6	0	0	0	5.5 megs
	7	1.7	1.7	1.7	12 Ω
IU4					
I.F. Ampl	1	3.3	3.3	3.3	22 Ω
	2	105	105	105	Over 5 megs
	3	105	105	105	Over 5 megs
	4	0.6	0.1	0	5.5 megs
	5	3.6	3.6	3.6	22 Ω
	6	3.3	3.3	3.3	34 Ω
	7	5	5	5	34 Ω
IS5	1	1.7	1.7	1.7	12 Ω
Det. AVC	2	0	0	0	0
Audio Amp	3	1.2	0.2	0	1.7 megs
	4	23	20	3	5.5 megs
	5	46	42	12	Over 5 megs
	6	1.1	0	0	8 megs
	7	3.3	3.3	3.3	22 Ω
3V4	1	5	5	5	32 Ω
Audio	2	100	100	100	Over 5 megs
Output	3	105	105	105	Over 5 megs
	4	105	105	105	Over 5 megs
	5	-	-	-	-
	6	0	0	0	1 meg
	7	8	8	8	52 Ω
117Z6	1	0	0	0	0
Rect	2	AC	AC	AC	235 Ω
	3	AC	AC	AC	240 Ω
	4	135	135	135	Over 5 megs
	5	AC	AC	AC	240 Ω
	6	105	105	105	Over 5 megs
	7	0	0	0	0
	8	120	120	120	Over 5 megs

All values are positive unless indicated otherwise.

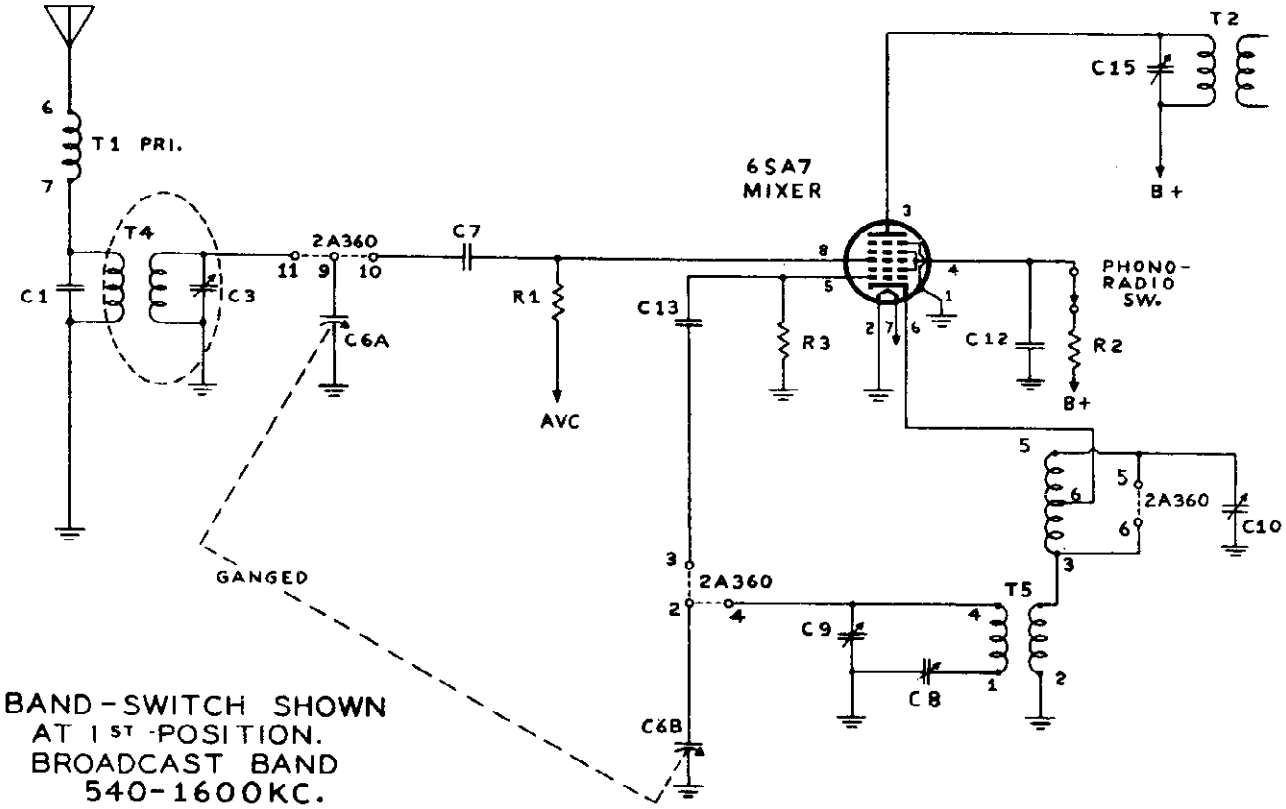
MODELS 1-601,
1-602, 1-603

CONCORD RADIO CORP.

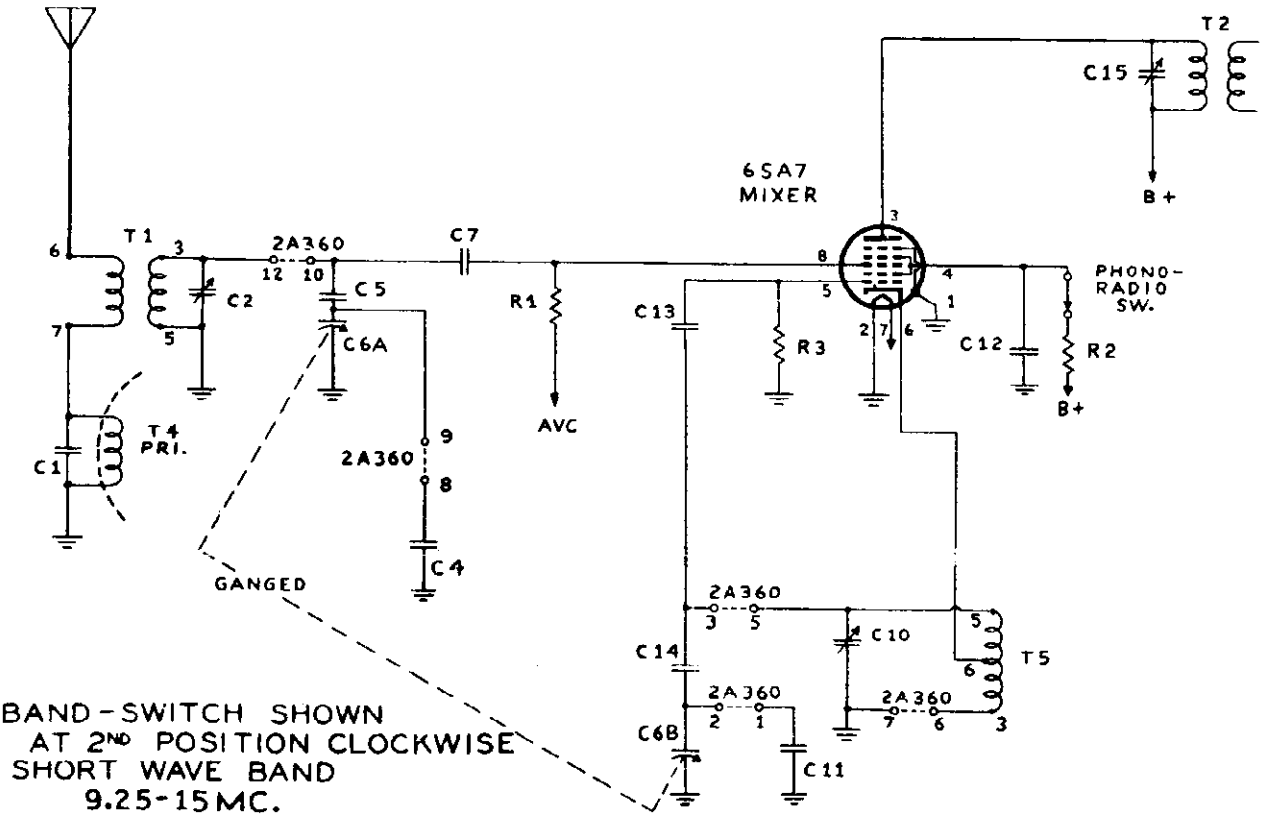


CONCORD RADIO CORP.

MODELS 1-601
1-602, 1-603



BAND-SWITCH SHOWN
AT 1ST POSITION.
BROADCAST BAND
540-1600KC.



BAND-SWITCH SHOWN
AT 2ND POSITION CLOCKWISE
SHORT WAVE BAND
9.25-15MC.

ALIGNMENT PROCEDURE

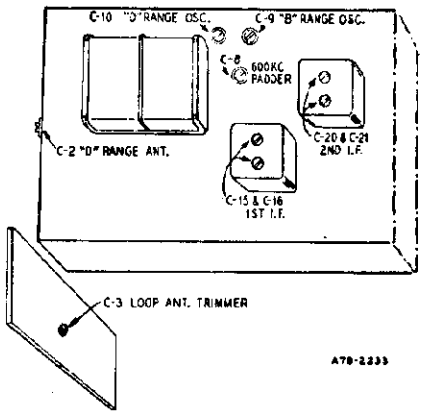
Volume Control—Maximum All Adjustments.

Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.

Allow Chassis and Signal Generator to "Heat Up" for several minutes.

The following equipment is required for aligning: An All Wave Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.
Output Indicating Meter—Non-Metallic Screwdriver.
Dummy Antennas—.1 mf., 100 mmf., and 400 ohms.

	SIGNAL GENERATOR FREQUENCY SETTING	CONNECTION AT RADIO	DUMMY ANTENNA	BAND SWITCH SETTING	CONDENSER SETTING	ADJUST TRIMMERS TO MAXIMUM
I.F.	455 KC	Grid of 6SA7 Pin 8	.1 mf.	B Range	Turn Rotor to Full Open	1st I.F. (C15) & (C16) 2nd I.F. (C20) & (C21)
RANGE B	1620 KC	Antenna Lead	100 mmf.	B Range	Turn Rotor to Full Open	Oscillator Range B (C9)
	1400 KC	Antenna Lead	100 mmf.	B Range	Tune Rotor to Max. Output See Note A	Ant. Range B (C3)
	600 KC	Antenna Lead	100 mmf.	B Range	Tune Rotor to Max. Output	Oscillator (C8) See Note B
	Repeat above steps at 1620 and 600 KC until readjusting the oscillator Range B Trimmer (C9) causes no further improvement of output.					
RANGE D	15.6 MC	Antenna Lead	400 Ohm	D Range	Turn Rotor to Full Open	Oscillator Range D (C10)
	14 MC	Antenna Lead	400 Ohm	D Range	Tune Rotor to Max. Output	Ant. Range D (C2)
LOOP RANGE B	Reassemble chassis in cabinet. 1400 KC	Antenna Lead	100 mmf.	B Range	Tune Rotor to Max. Output	Ant. Range B (C3)

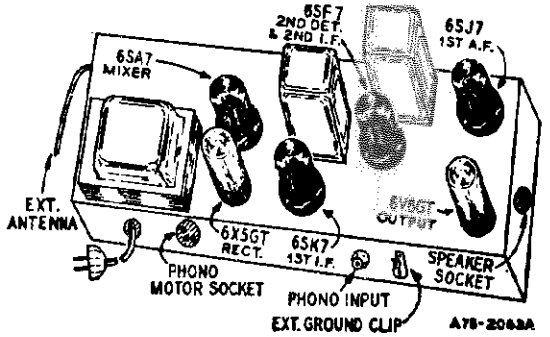


NOTE A—Set pointer at the 1400 KC mark on the dial scale. Attach pointer to drive cord.

NOTE B—Turn rotor back and forth and adjust the trimmer until peak of greatest intensity is obtained.

REMOVAL OF CHASSIS FROM CABINET

Before the chassis may be taken from the cabinet, it is necessary to pull off the 4 control knobs, remove the 4 chassis mounting bolts, disconnect the leads running to the loop antenna, record changer and speaker and loosen the screw and remove the black lead fastened to the lower left corner of the chassis.



SPECIFICATIONS

Power Consumption (at 117 Volts AC) ..... 40 Watts (normal) 58 Watts (phono operating)

Power Output ..... 4 Watts, Maximum 2.3 Watts, 10% Distortion

Tuning Frequency Range
- B Range ..... 540-1600 Kilocycles
- D Range ..... 9.25-15 Megacycles

Intermediate Frequency ..... 455 KC

Selectivity ..... 40 KC Broad at 1000 Times Signal

Sensitivity (For 0.5 Watt Output, with External Antenna)
- B Range ..... 9 Microvolts Average
- D Range ..... 20 Microvolts Average

CONCORD RADIO CORP.

MODELS 1-60
1-602, 1-60

REPLACEMENT PARTS LIST

NOTICE: There is a Model Number label on the chassis. This label identifies the radio as to chassis, dial and issue letter. When ordering parts or writing, give ALL information appearing on this label.

MISCELLANEOUS

PART NO.	DESCRIPTION
12A442	6" P.M. Speaker complete with Output Transformer
12A436	8" P.M. Speaker complete with Output Transformer
	Cone and Voice Coil Assembly (Specify part number and letters stamped on speaker)
	Output Transformer (Specify part number and letters stamped on speaker)
3A303	Tube Socket—Octal (8 prong) Molded
3A304	Phono Motor Socket
3A305	Phono Socket—Single Pin Tip
2A360	Band Change Switch
13X328	Line Cord and Plug Assembly
10A614	Knob (Tuning)
10A615	Knob (Volume)
10A616	Knob (Tone—R.P.)
10A617	Knob (SW-BC)

CAPACITORS

C-1	47X445	270 mmf		Molded
C-2	17A164	5-50 mmf		Trimmer
C-3	17A235	2-12 mmf		Trimmer
C-4	47X473	47 mmf		Silvered Mica
C-5	47X474	360 mmf		Silvered Mica
C-6A, C-6B	14A184	Gang Condenser		
C-7	B66501	.0005 mf	200 V	Tubular
C-8	17A155	350-430 mmf		Trimmer
C-9, C-10	17A109	2.5-35 mmf		Dual Trimmer
C-11	47X472	40 mmf		Silvered Mica
C-12, C-18	D66403	.04 mf	400 V	Tubular
C-13	47X466	68 mmf		Molded
C-14	47X481	286 mmf		Silvered Mica
C-15, C-16	Part of T-2 (1st I-F Coil Assem.)			
C-19, C-23	47X463	47 mmf		Molded
C-20, C-21	Part of T-3 (2nd I-F Coil Assem.)			
C-22	47X471	68 mmf		Molded
C-24	D64403	.04 mf	400 V	Tubular
C-25	D66502	.005 mf	400 V	Tubular
C-26	D67104	.10 mf	400 V	Tubular
C-27	D64253	.025 mf	400 V	Tubular
C-28	D66402	.004 mf	400 V	Tubular
C-29	D66103	.01 mf	400 V	Tubular
C-30A	45X346	40 mf	450 V	Three Section Electrolytic
C-30B		40 mf	450 V	
C-30C		20 mf	25 V	
C-31	F66402	.004 mf	600 V	Tubular
C-32	47X505	470 mmf		Molded
C-33	B66503	.05 mf	200 V	Tubular
C-34	47X476	100 mmf		Molded
C-35	D67204	.2 mf	400 V	Tubular

RESISTORS

		OHMS	WATTS	
R-1, R-7	B85225	2.2 meg.	0.5	Carbon
R-2, R-4	C84393	39 K	1.0	Carbon
R-3	B84393	39 K	0.5	Carbon
R-5	B84222	2200	0.5	Carbon
R-6	B85105	1 meg.	0.5	Carbon
R-8	B85473	47 K	0.5	Carbon
R-9	B84153	15 K	0.5	Carbon
R-10	36X357	.5 meg.		Volume Control & Swi
R-11	B85106	10 meg.	0.5	Carbon
R-12, R-16	B85474	470 K	0.5	Carbon
R-13	B84333	33 K	0.5	Carbon
R-14	B84823	82 K	0.5	Carbon
*R-15	40X277	3 meg.		Tone Control & Radio Phono Swit
R-17	C84271	270	1.0	Carbon
R-18	43X213	2.0	0.5	Wire-wound
R-19	D84182	1800	2.0	Carbon

DIAL AND DRIVE ASSEMBLY

6X21, 20X329	Rubber Grommet, Cond. Cushion Stud — Mtg. Gang Condenser
26A443	Dial Bracket Assembly complete with Spacers, Pulley Diffusers and Dial Background less Dial Glass
58X676	Dial Glass
26A444	Idler Bracket Assembly
26X486	Drive Shaft
19X192	"C" Washer (for drive shaft)
15X163	Pointer
10X38	Drive Cord Assembly or 50" Cord
28X113	Drive Cord Tension Spring
7X199	Pilot Light Socket Assembly
	No. 47 Pilot Light
4X353	Escutcheon

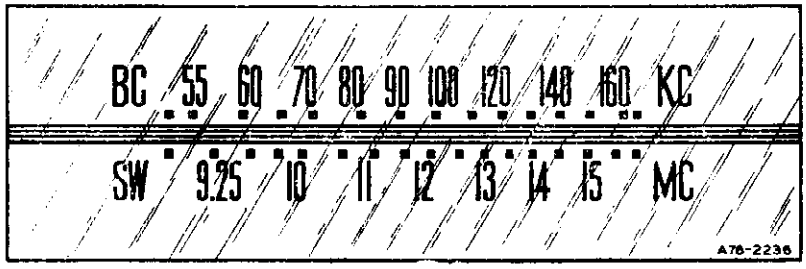
TRANSFORMERS AND COILS

T-1	9A1812	"D" Range Antenna Coil Assembly
T-2	9A1814	1st I-F Coil Assembly
T-3	9A1815	2nd I-F Coil Assembly
T-4	26A449	"B" Range Loop Antenna Assembly
T-5	9A1813	"B" and "D" Range Oscillator Coil Assembly
T-6	53X282	117 Volt, 60 Cycle, Standard Power Transformer
T-7		Output Transformer (See Miscellaneous)

SUBSTITUTE PARTS

The following parts are used in some receivers only. Check part numbe on old part before ordering and order part originally used in receive

*40X282	Tone Control (Substitute for 40X277)
*25X1539	Radio Phono Switch Lever (Use with 40X282)
*2A161	D.P.D.T. Switch (Use with 40X282)



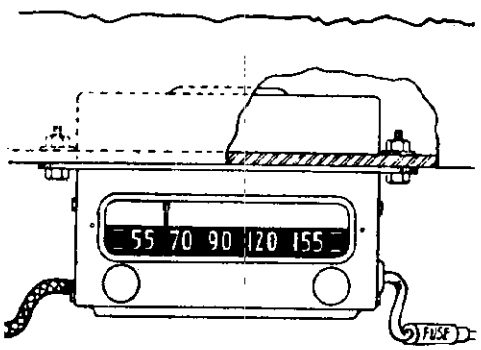
ON-OFF SWITCH AND VOLUME CONTROL

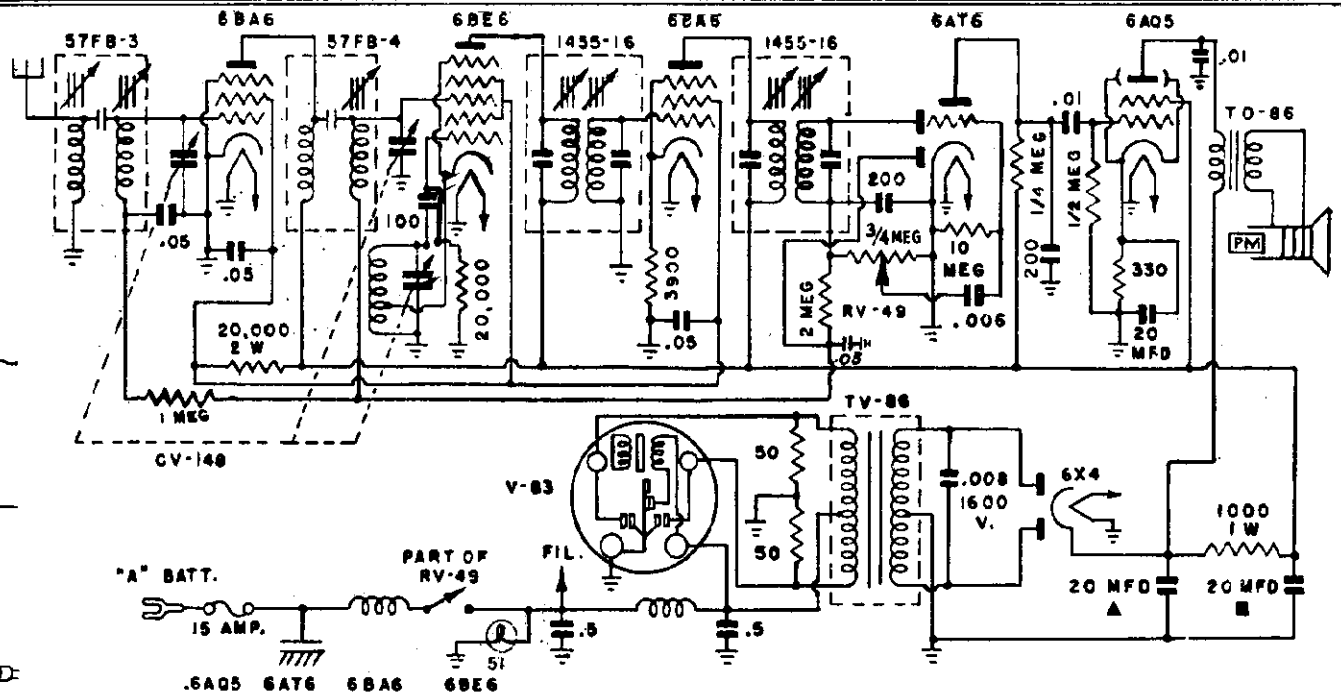
BAND SWITCH

TUNING KNOB

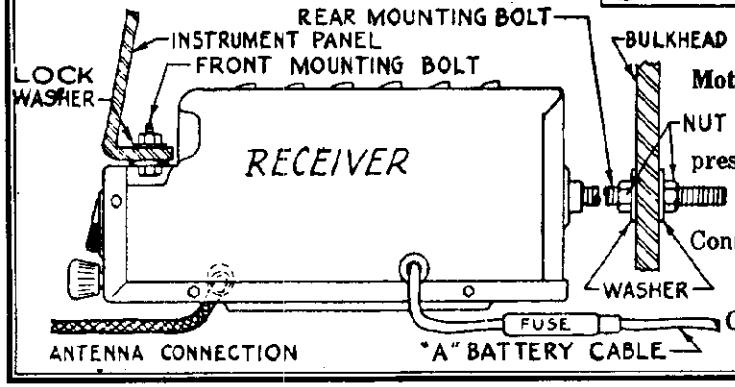
TONE CONTROL AND PHONO-RADIO SWITCH

RECEIVER MOUNTING DIAGRAM





ELECTROLYTIC CONDENSER CE-86
■ 20 MFD 350 VDC
▲ 20 MFD 350 VDC
20 MFD 25 VDC
I.F. 455 KC
RANGE 540 TO 1560 KC

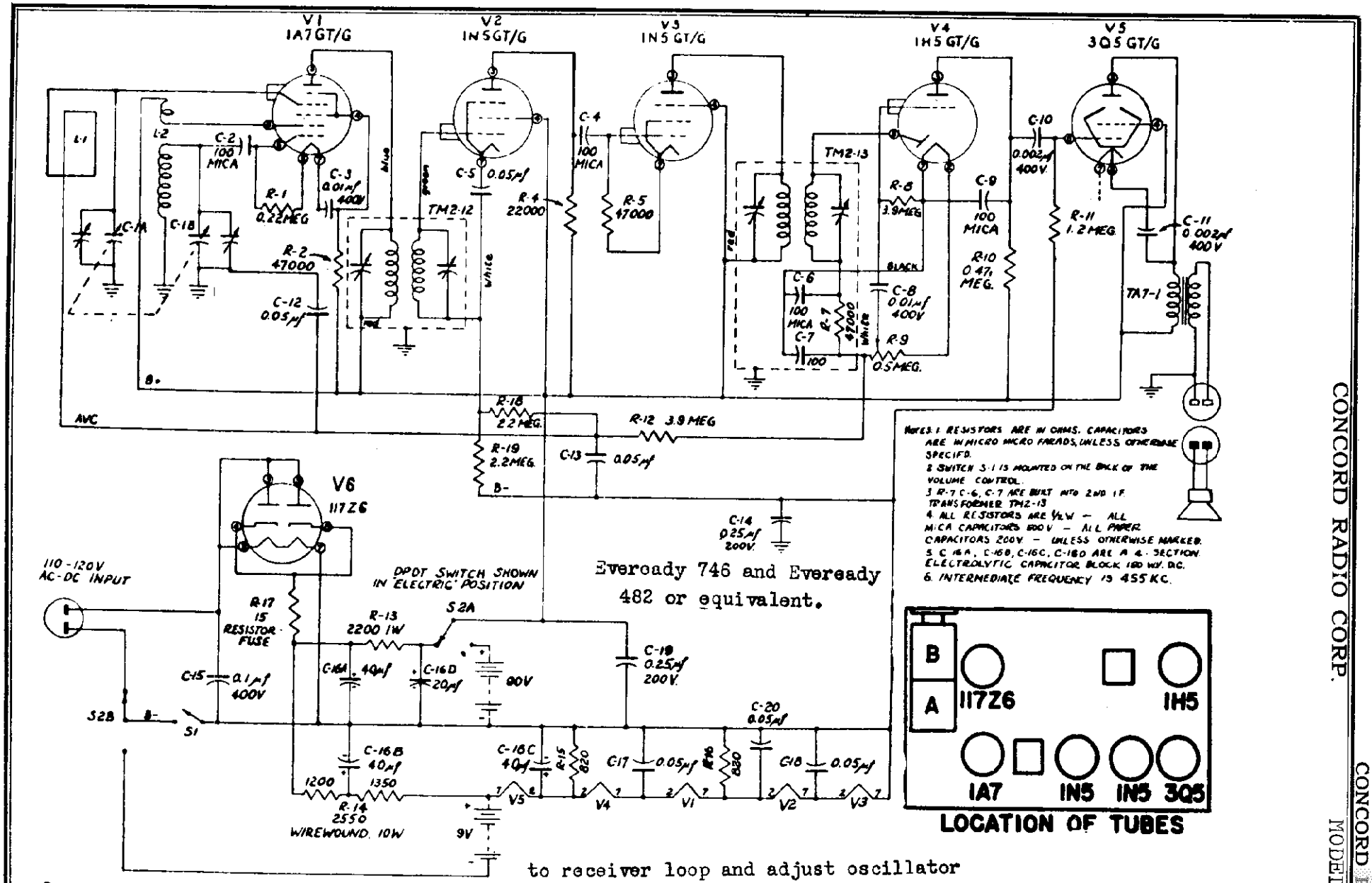


Motor Noise Elimination

1. Disconnect the center lead in the distributor head of the motor and insert a "distributor suppressor" in the cavity and then place the lead in the top receptacle of the suppressor.

2. Clamp a "generator condenser" under the screw which mounts the cut-out on the generator. Connect the flexible terminal of the condenser to the lead on the cut-out.

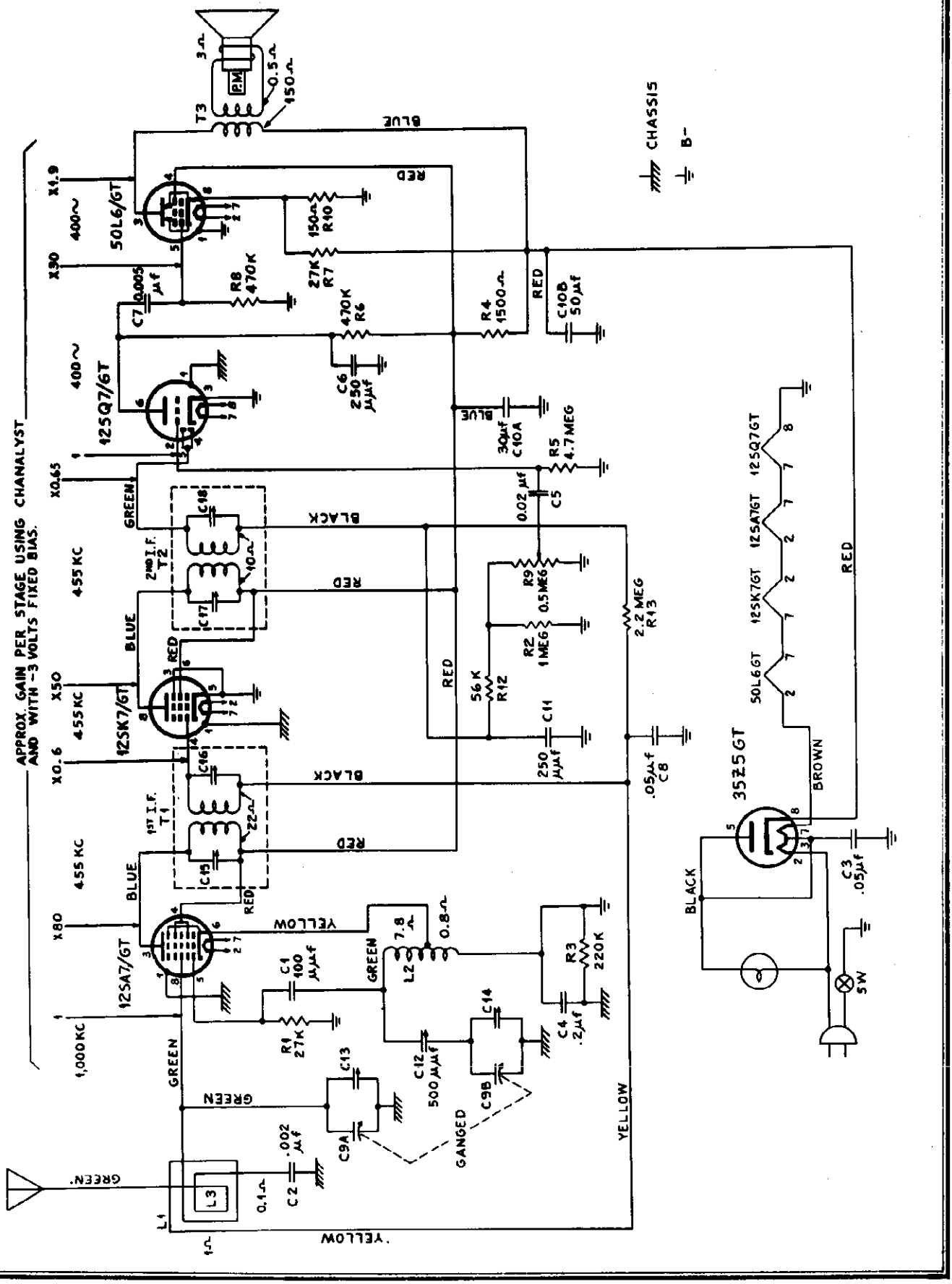
Caution: Do not screw stud in case beyond point necessary to insure support, otherwise, it may penetrate rear wall of case and cause damage to the instrument.



1. Using .01 mfd. capacitor, align i-f trimmers to 455 kc with smallest input.
2. With capacitor plates out of mesh, to receiver loop and adjust oscillator trimmer B to 1700 kc.
3. Adjust r-f trimmer A to 1550 kc for maximum response.

MODEL 6E51B

CONCORD RADIO CORP.



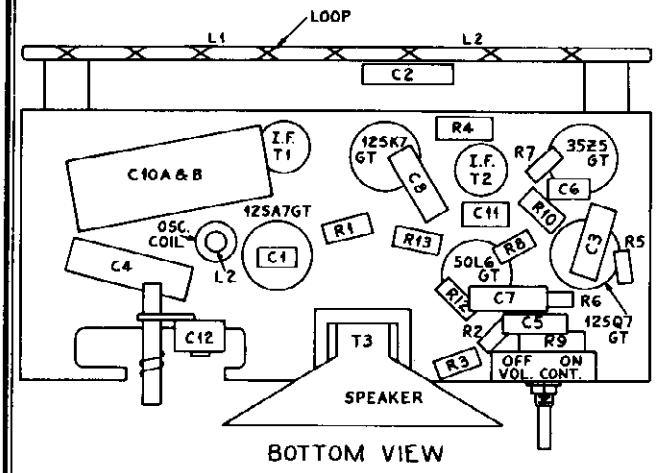
ALIGNMENT

Remove the chassis from the cabinet. Connect the output meter across the voice coil. Connect the signal generator to the Standard Hazeltine Model 1150 loop and couple loosely to the receiver loop. Set the receiver volume control at maximum.

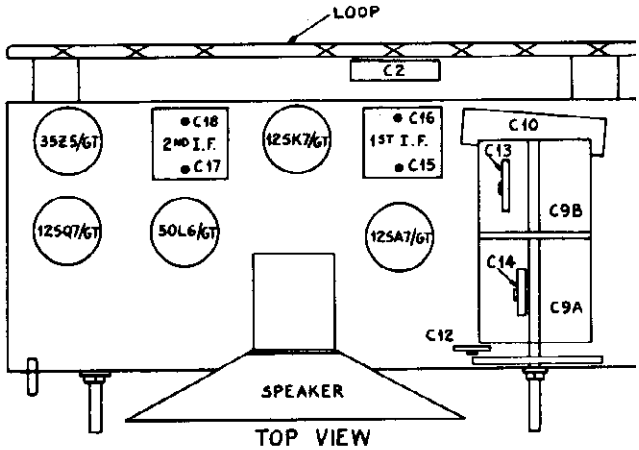
The tuning condenser plates should be fully meshed when the dial pointer is at the low-frequency index. The signal generator output should be just sufficient to obtain a small deflection on the output meter.

Short the oscillator grid (12SA) pin 5 to B-). Set the signal generator to 455 KC. Adjust the IF trimmers in the following order: C18, C17, C16, C15. Set the generator and receiver at 1600 KC and remove the short from the oscillator and adjust oscillator trimmer C14 for maximum output. Set the signal generator and receiver at 600 KC and adjust oscillator padder C 12 for maximum output.

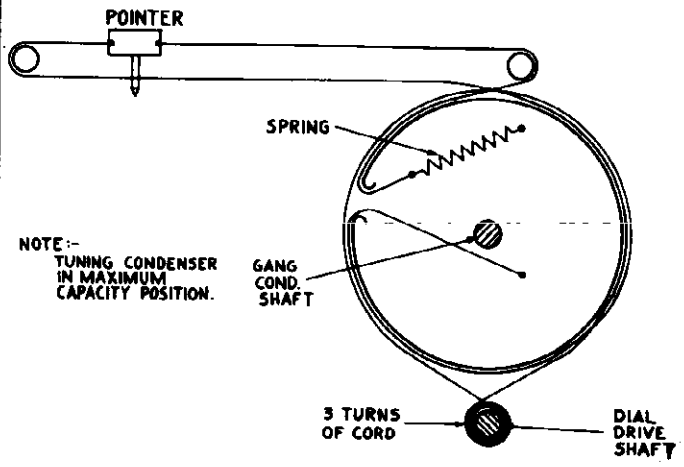
Go back to 1600 KC and adjust oscillator trimmer C 14 for maximum output. Return to 600 KC and readjust oscillator padder C 12 for maximum output, rocking the main tuning condenser during this adjustment for maximum output. Set the receiver and signal generator at 1400 KC and adjust the RF trimmer for maximum output. This completes the alignment.

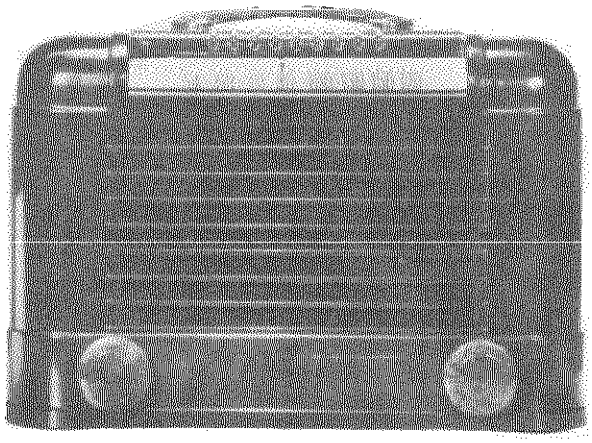


BOTTOM VIEW



TOP VIEW



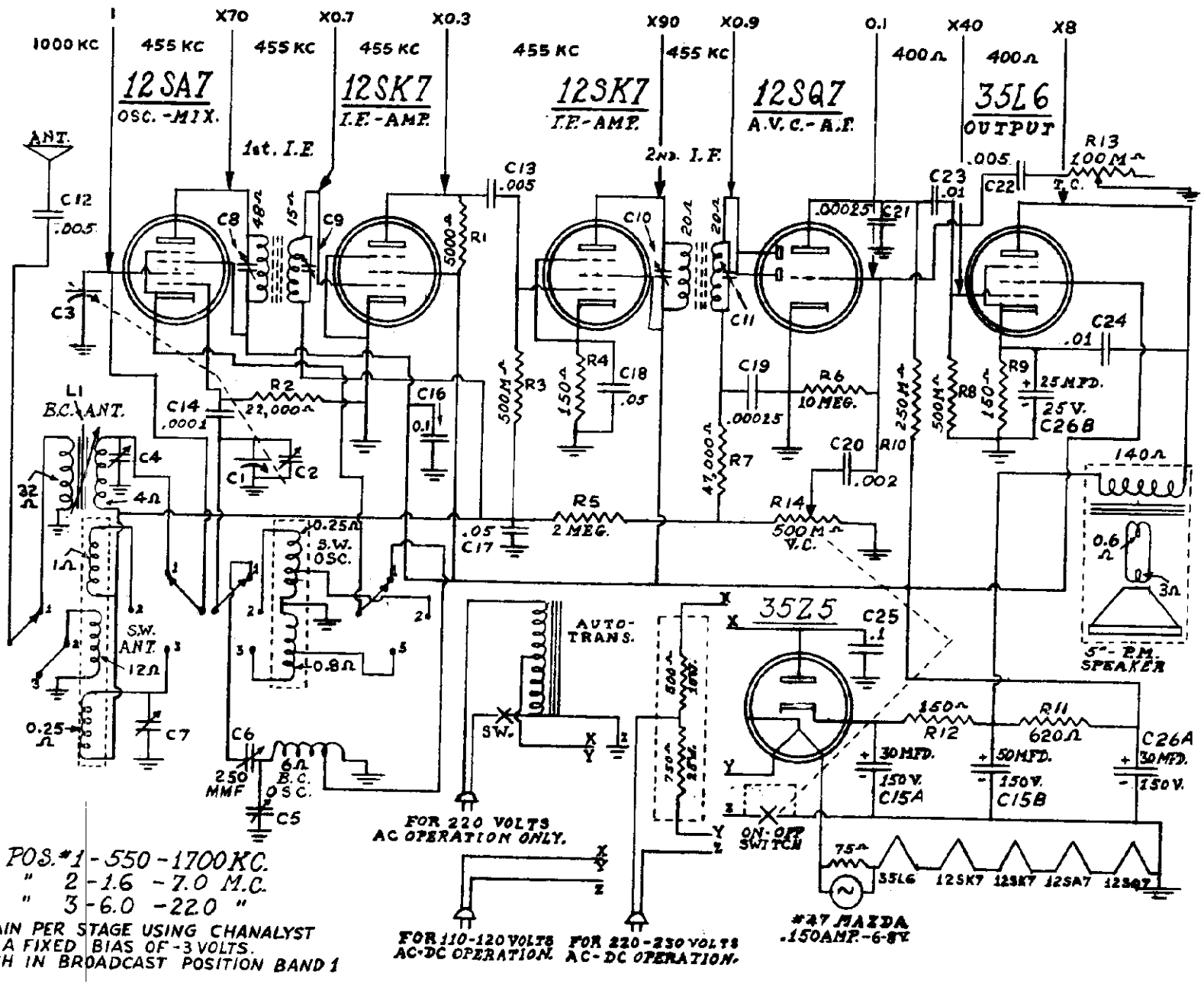


MODEL 6E51B — CONCORD RADIO CORP.

SOCKET	PIN	VTVM	20,000Ω P.V.	1,000Ω P.V.	RESISTANCE
12SA7GT	1	0	0	0	240K
CONV.	2	AC	AC	AC	35Ω
	3	+86	+86	+86	30K
	4	+86	+86	+86	30K
	5	-7.6	-6.2	-3	27K
	6	0	0	0	1Ω
	7	AC	AC	AC	15Ω
	8	-0.7	-0.4	-0.2	2MEGS.
12SK7GT	1	0	0	0	240K
1-F AMPL.	2	AC	AC	AC	30Ω
	3	0	0	0	0
	4	-0.7	-0.4	-0.2	2MEGS.
	5	0	0	0	0
	6	+86	+86	+86	30K
	7	AC	AC	AC	40Ω
	8	+86	+86	+86	30K
12SQ7GT	1	0	0	0	240K
	2	-0.9	-0.6	-0.3	5MEGS.
	3	0	0	0	0
	4	-0.7	-0.5	-0.2	650K
	5	-0.7	-0.5	-0.2	650K
	6	+44	+42	+15	500K
	7	AC	AC	AC	15Ω
	8	0	0	0	0
50L6GT	1	0	0	0	0
AUDIO	2	AC	AC	AC	90Ω
OUTPUT	3	+115	+115	+115	28K
	4	+86	+86	+86	30K
	5	0	0	0	450K
	6	-0.7	-0.5	-0.2	650K
	7	AC	AC	AC	40Ω
	8	+6	+6	+6	150Ω
35Z5GT	1	-	-	-	-
	2	AC	AC	AC	120Ω
	3	AC	AC	AC	115Ω
	4	-	-	-	-
	5	AC	AC	AC	115Ω
	6	-	-	-	-
	7	AC	AC	AC	90Ω
	8	+120	+120	+120	28K

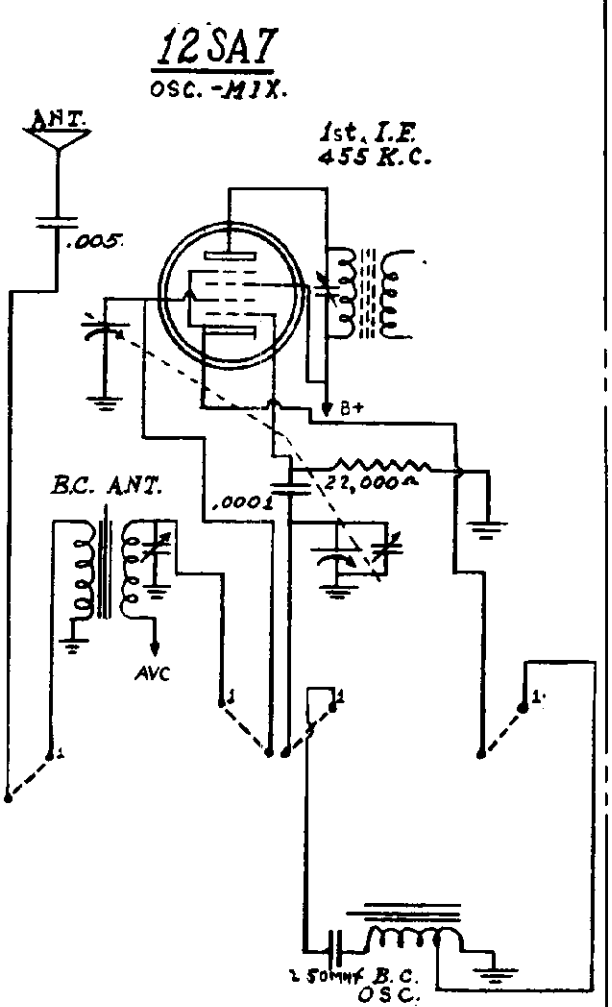
All voltage and resistance measurements were made with respect to B-
With a line voltage of 116 V. A.C.

Resistance from B- to chassis ground=240K

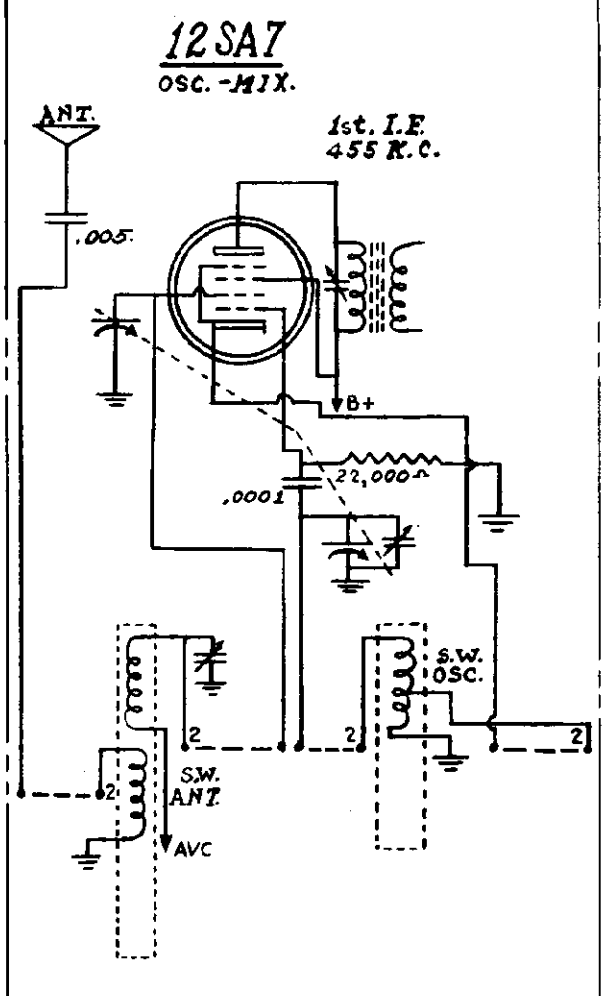


CORONET RADIO AND TELEV.

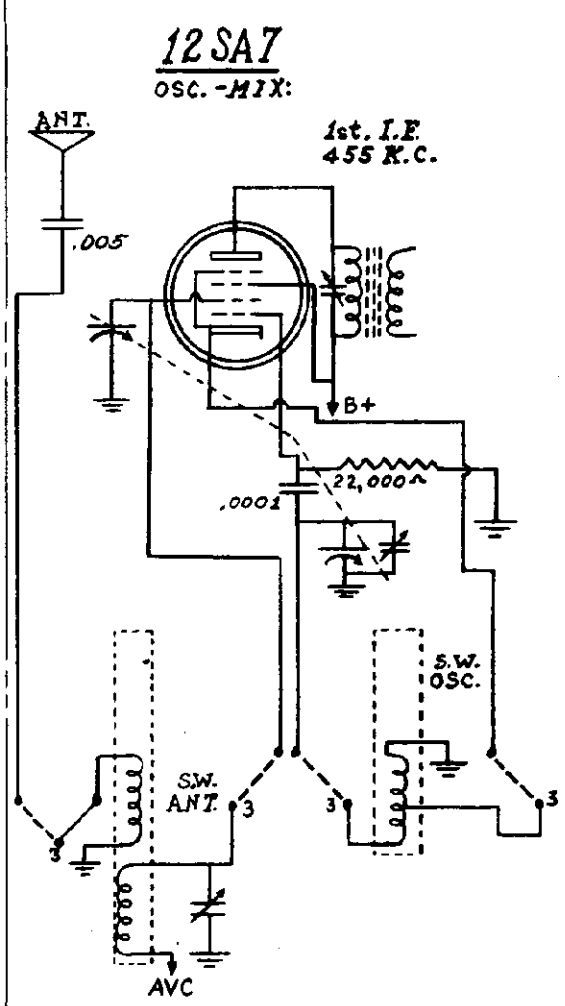
CORONET PAGE 1
MODEL 1701
ARISTA



BAND-SWITCH SHOWN
AT 1ST POSITION.
BROADCAST BAND
540-1700 KC



BAND-SWITCH SHOWN
AT 2ND POSITION.
SHORT WAVE BAND
1.7-7.0 MC



BAND-SWITCH SHOWN
AT 3RD POSITION.
SHORT WAVE BAND
6.0-21.0 MC

CORONET RADIO AND TELEV. MODEL 1701
ARISTA

ALIGNMENT OF CORONET MODEL 1701X
I.F. ALIGNMENT

Connect on output meter across the voice coil.

Connect the signal generator to pin 8 of the 12SA7GT, through a 0.01 mf capacitor. Tune the signal generator to 455 KC, and fully mesh the main tuning capacitor of the receiver.

Keep the receiver volume control at maximum and the output of the signal generator sufficient to give a readable deflection on the output meter.

Adjust for maximum IF Trimmers C11, C10, C9, and C8.

R.F. - Osc. Adjustments.

The short wave band 3 should be tuned first, short wave band 2, second, and Broadcast band 1 last.

Turn the band switch clockwise to position 3.

Keep the same setup used for I.F. alignment, and apply a 16 mc. signal to antenna coupling capacitor C12, located on top rear of chassis. Tune the receiver to 16 mc. and adjust for maximum oscillator trimmer C2.

Adjust antenna trimmer C7 for maximum ouptut at 16 mc.

Turn the band switch counter clockwise to position 2.

This band has no trimmer for the antenna coil, and since Oscillator trimmer C2 is used for both band 3 and 2, the calibration of band 2 is dependent on the calibration of band 3; And vice versa.

Tune the signal generator and receiver to 5 mc., and check the calibration of band 2. It should be fairly accurate. If it is off to any great extent, Oscillator trimmer C2 can be used to balance the descrepancy in frequency between band 3 and 2.

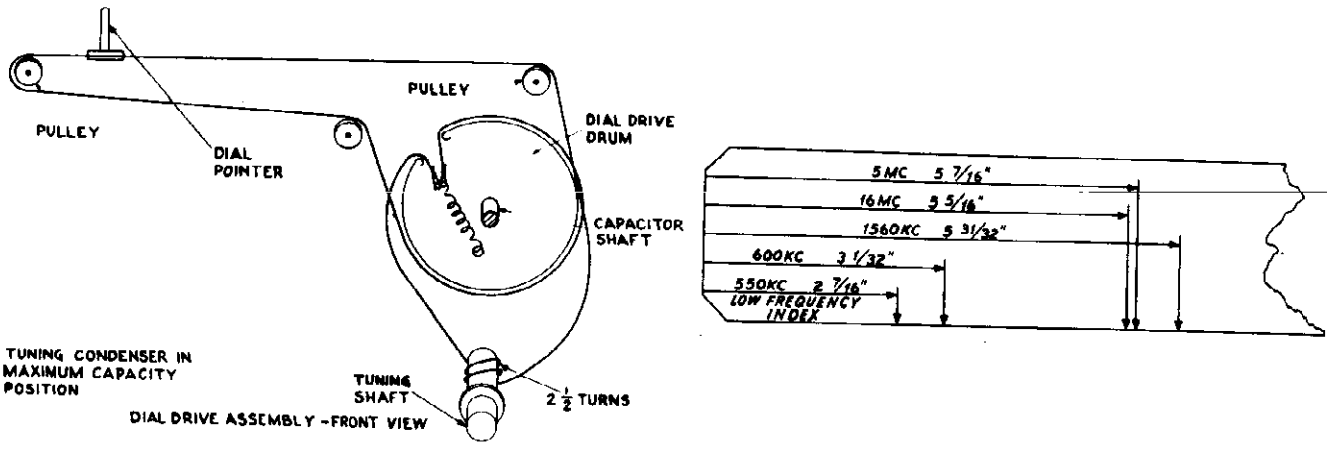
Turn the band switch counter clockwise to position 1 broadcast band.

Tune the signal generator and receiver to 1560 KC. Adjust oscillator trimmer C5 for maximum.

Tune the signal gnnerator and receiver to 600 KC and adjust low frequency padder C6 for maximum while rocking the main tuning capacitor.

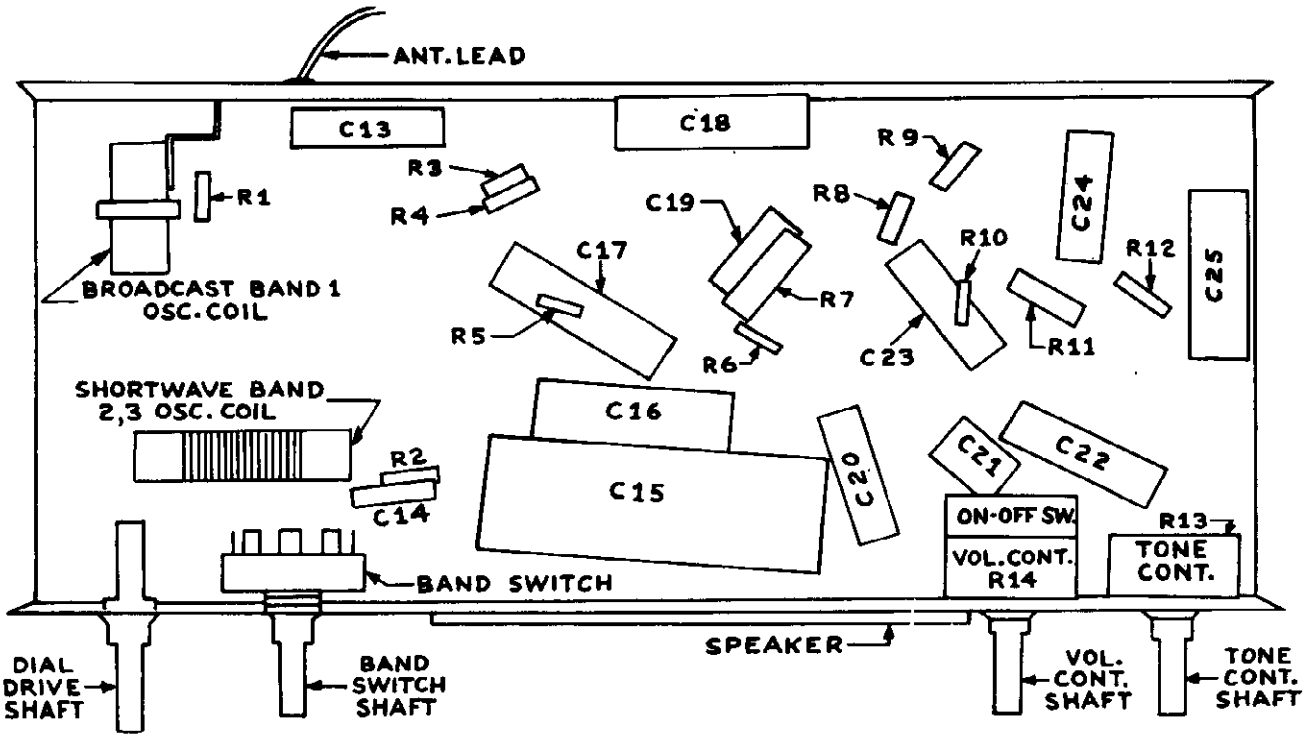
Tune the signal generator and receiver to 1560 KC and adjust antenna trimmer C4 for maximum output. Then tune the signal generator and receiver to 600 KC and adjust tuning slug L1 for maximum output.

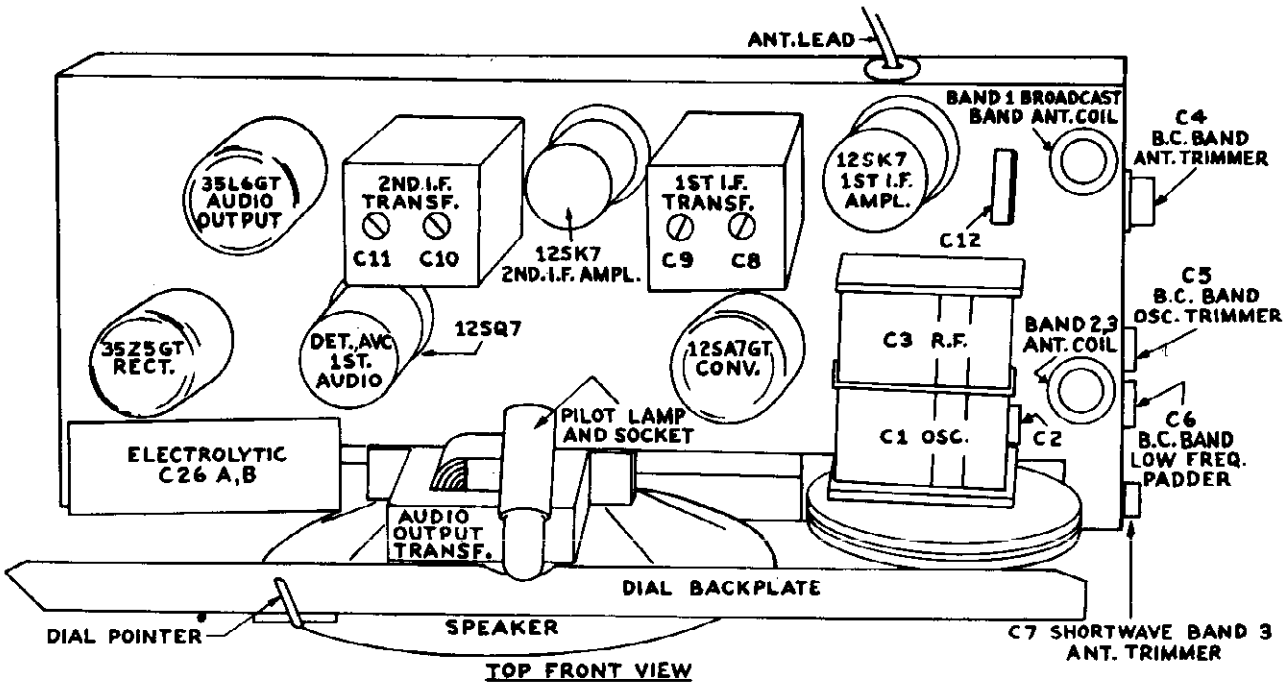
The entire prceedure for the broadcast band should be repeated for best results.



MODEL 1701X
ARISTA

CORONET RADIO AND TELEV





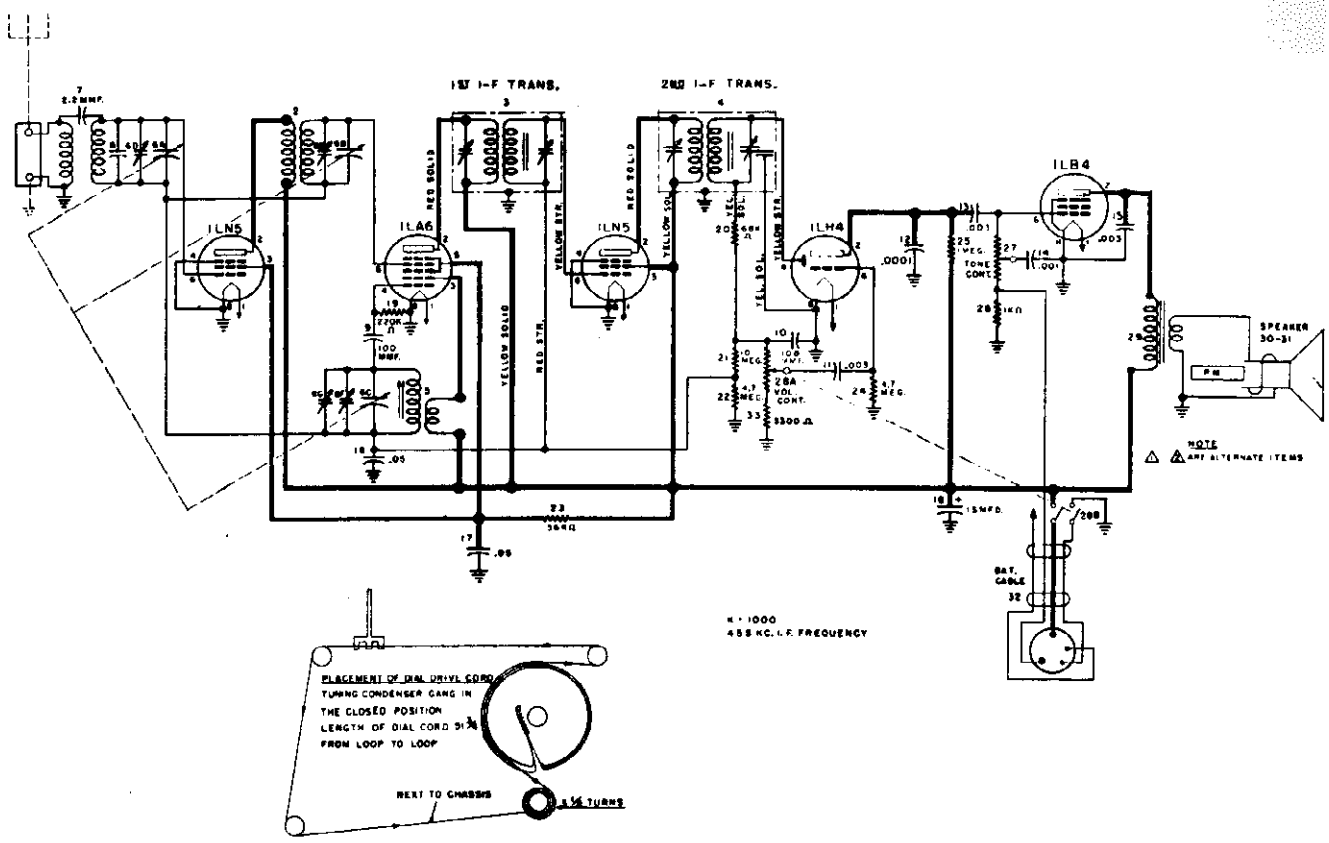
CORONET RADIO AND TELEV. MODEL 1701
ARISTA

TUBE	PIN	VTVM	20,000 OHM P.V.	1,000 OHM P.V.	RESISTANCE
12SA7GT	1	0	0	0	0
CONV.	2	AC	AC	AC	12 OHM
	3	+90	+90	+90	OVER 1 MEG
	4	+90	+90	+90	OVER 1 MEG
	5				
	BAND,1, 550 KC.	-7	-5	-3.5	20K
	BAND,1, 1500 KC.	-9.5	-9	-5	20K
	BAND,2, 1600 KC.	-4	-3	-1.5	20K
	BAND,2, 7 mc.	-7	-5	-2.5	20K
	BAND 3, 6 mc.	-3	-1	-0.2	20K
	BAND 3, 22 mc.	-7.5	-2.5	-0.2	20K
	6	0	0	0	0.6 OHM
	7	0	0	0	24 OHM
	8	-0.5	-0.3	-0.1	2.6 MEG.
12SK7	1	0	0	0	0
1st I.F. Ampl.	2	AC	AC	AC	38 OHM
	3	0	0	0	0
	4	-0.5	-0.3	-0.1	2.6 MEG.
	5	0	0	0	0
	6	+90	+90	+90	OVER 1 MEG.
	7	AC	AC	AC	24 OHM
	8	+30	+30	+30	OVER 1 MEG.
12SK7	1	0	0	0	0
2nd I.F. Ampl.	2	AC	AC	AC	38 OHM
	3	+1.5	+1.5	+1.5	145 OHM
	4	-0.5	-0.3	-0.1	3 MEG.
	5	+1.5	+1.5	+1.5	145 OHM
	6	+90	+90	+90	OVER 1 MEG.
	7	AC	AC	AC	50 OHM
	8	+90	+90	+90	OVER 1 MEG.
12SQ7	1	0	0	0	0
DET. A.V.C.	2	-0.8	-0.5	-0.2	10 MEG.
1st AUDIO	3	0	0	0	0
	4	-0.5	-0.3	-0.1	500K
	5	-0.5	-0.3	-0.1	500K
	6	+60	+58	+24	OVER 1 MEG.
	7	AC	AC	AC	12 OHM
	8	0	0	0	0
35L6GT	1	+5	+5	+5	180 OHM
AUDIO	2	AC	AC	AC	85 OHM
OUTPUT	3	+105	+105	+105	OVER 1 MEG.
	4	+112	+112	+112	OVER 1 MEG.
	5	0	0	0	575 K
	6	0	0	0	0
	7	AC	AC	AC	50 OHM
	8	+5	+5	+5	180 OHM
35Z5	1	+110	+110	+110	OVER 1 MEG.
RECT	2	AC	AC	AC	115 OHM
	3	AC	AC	AC	112 OHM
	4	--	--	--	--
	5	AC	AC	AC	112 OHM
	6	--	--	--	--
	7	AC	AC	AC	85 OHM
	8	+120	+120	+120	OVER 1 MEG.

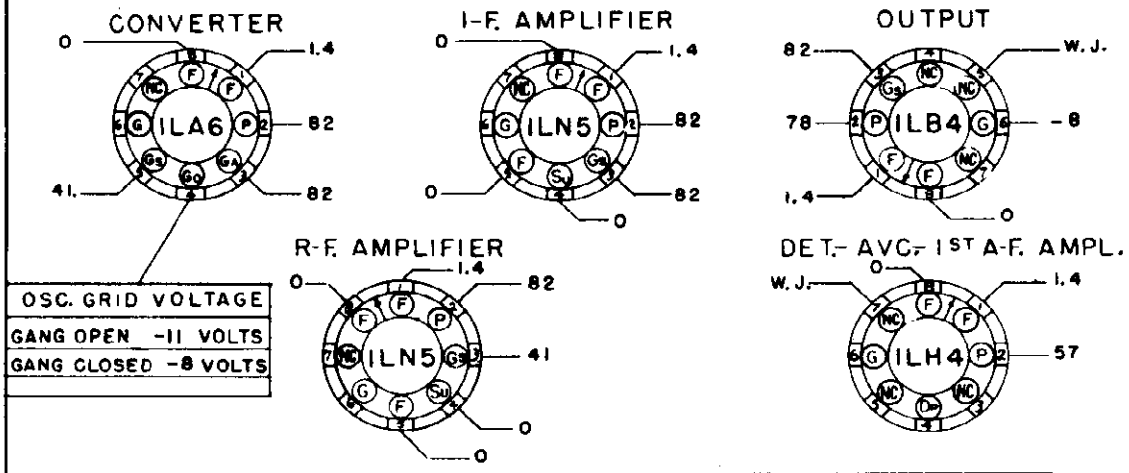
All voltage and resistance measurements made with respect to chassis ground and with a line voltage of 116 V.A.C. Band switch in broadcast position.

CROSLEY DIV.
AVCO MFG. CORP.

MODEL 9-101



SCHEMATIC DIAGRAM



NOTES:
1. BOTTOM VIEW OF TUBE SOCKETS
2. VOLTAGES MEASURED FROM SOCKET LUG TO CHASSIS WITH AN ELECTRONIC VOLTMETER
3. W.J.= WIRING JUNCTION
4. N.C.= NO CONNECTION
5. BATTERY PACK VOLTAGE "A" =1.4VOLTS, "B"=90 VOLTS
6. SOCKET VOLTAGE TOLERANCE 10 %

SOCKET VOLTAGE CHART

MODEL 9-101

CROSLEY DIV.
AVCO MFG. CORP.

ALIGNMENT PROCEDURE

1. Turn the tuning condenser to the completely closed position against the stop and set the dial pointer to the reference line at the end of the dial scale.
2. Connect the output meter across the speaker voice coil.
3. The r.f. signal input from the signal generator should be fed to the receiver as indicated in the alignment chart. Connect the low side (ground) of the signal generator to the chassis.
4. Turn the tone control to its treble position.
5. Turn the volume control on full and adjust the signal generator output to produce approximately mid-scale deflection of the output meter, but maintain signal generator output as low as possible to prevent AVC action in the receiver.

ALIGNMENT CHART

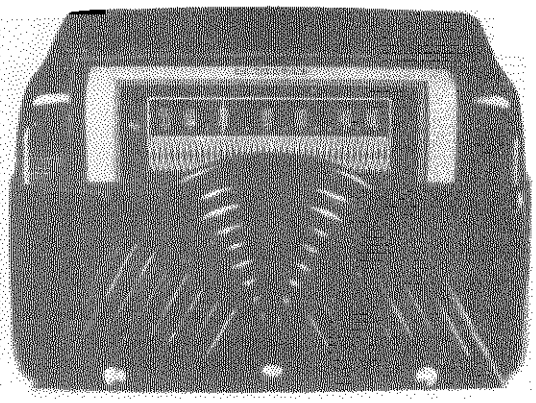
Alignment adjustment locations are shown on page 1, Chassis, Rear View.

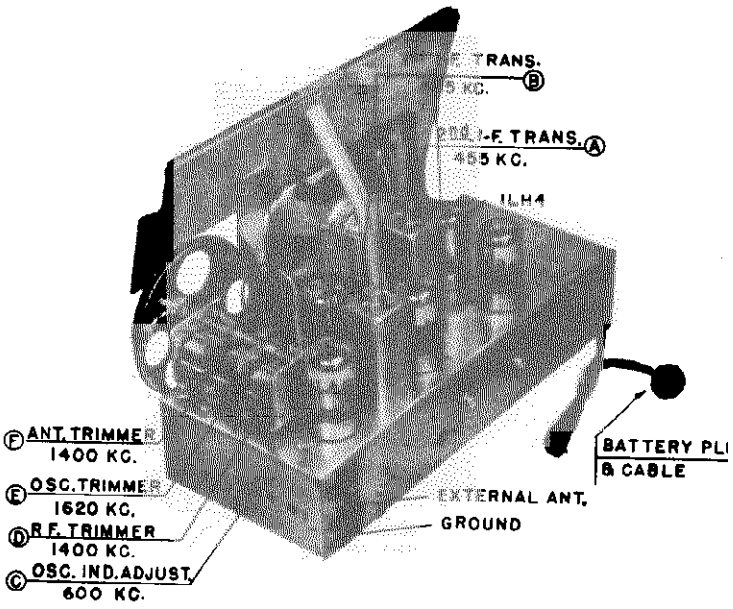
Alignment Sequence	Signal Generator Output			Position of Dial Pointer or Var. Cond.	Adjust for Maximum Output	Remarks
	Frequency in kc.	In Series With	To			
1	455	.01 mfd.	R.F. Grid	Closed	A & B	
2	600	.01 mfd.	R.F. Grid	600 kc.	C	Preset "G" to ¼ turn from the closed position and "E" to ½ turn from its closed position.
3	1620	.01 mfd.	Ant.	Open	E	
4	1400	200 mmf.	Ant.	Tune to Signal	D & F	
5	600	200 mmf.	Ant.	Tune to Signal	C	Rock Gang.
6	Repeat steps 3, 4, and 5 until circuits align and dial tracks.					
7	Conclude alignment by repeating step 4.					

TUBE COMPLEMENT:,

Type	Function
1LA6	Mixer
1LN5	I. F. Amplifier,
1LN5	R. F. Amplifier
1LH4	Detector, AVC 1st A. F. Amplifier
1LB4	A. F. Power Output

CROSLEY DIV.
AVCO MFG. CORP.





FREQUENCY RANGE: 540 to 1600 kc.

INTERMEDIATE FREQUENCY: 455 kc.

POWER SUPPLY: Crosley "A-B" Battery Pack, CR69.

VOLTAGE RATING: 1½ v. "A"; 90 v. "B".

POWER OUTPUT: 175 mw. maximum.

CHASSIS REAR VIEW

TYPE: Five-tube, single-band superheterodyn

For satisfactory operation it is necessary that a antenna and ground be connected to this receive

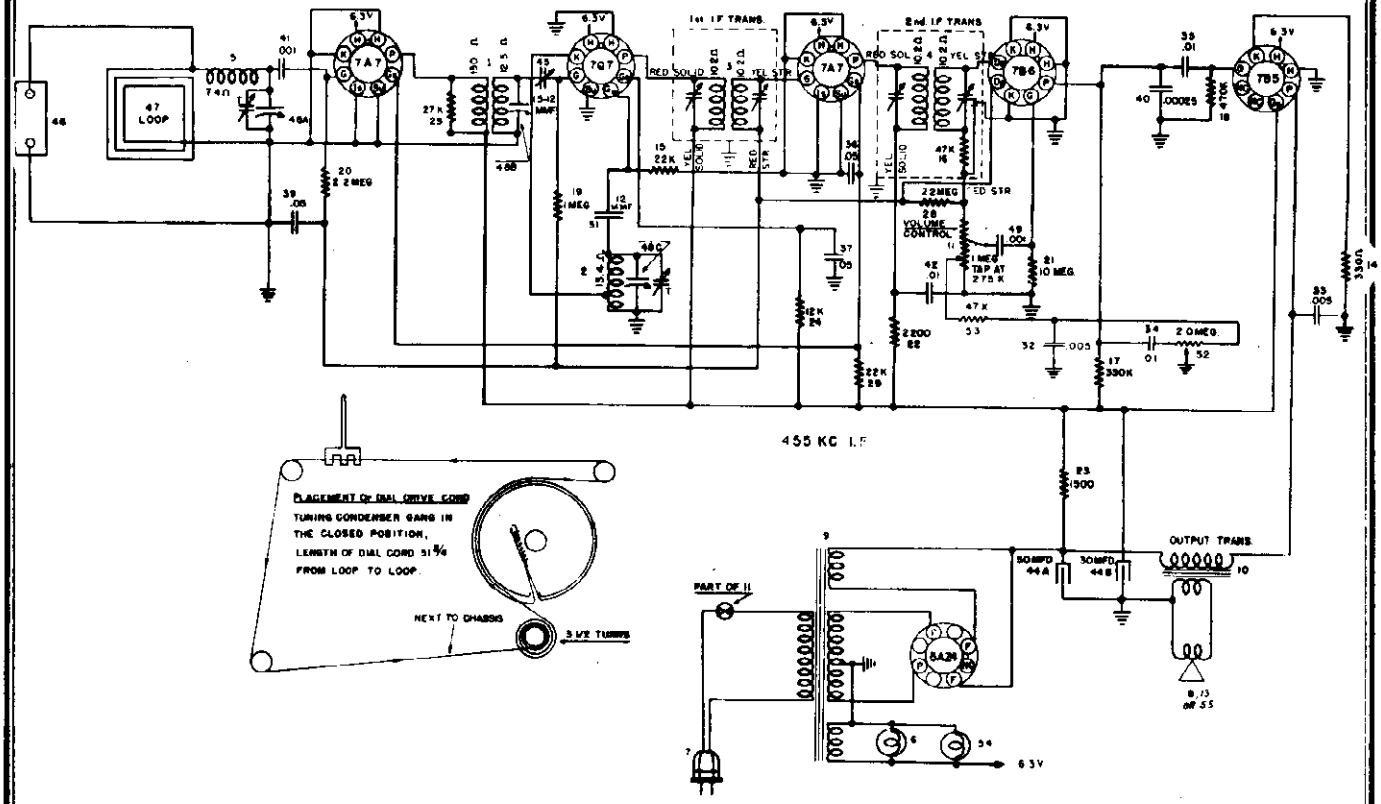
REPLACEMENT PARTS LIST—MODEL 9-101

Figures in first column correspond to figures in Schematic Diagram.

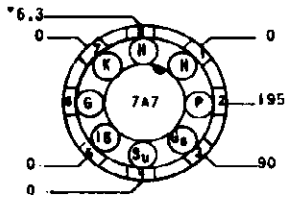
Item No.	Part No.	Description
1	AW-142997	Coil, Antenna
2	AW-142993	Coil, R.F.
3	AC-143013	Transformer, 1st I.F.
4	AC-143034	Transformer, 2nd I.F.
5	AW-142975	Coil, Oscillator
6A	AC-137073-20	Condenser, Variable } Three section
6B		Condenser, Variable } and Pulley
6C		Condenser, Variable } Assembly
6D	Part of Item 6A	Condenser, Trimmer
6E	Part of Item 6B	Condenser, Trimmer
6F	Part of Item 6C	Condenser, Trimmer
6G	Part of Item 6C	Condenser, Trimmer
7	W-137398-4	Condenser, 2.2 mmf., 500 v.
8	C-137727-47	Condenser, 10 mmf., 500 v., ceramic
9	C-137727-1	Condenser, 100 mmf., 300 v., ceramic
10	C-137727-1	Condenser, 100 mmf., 300 v., ceramic
11	39001-76	Condenser, .003 mfd., 600 v., paper
12	39001-1	Condenser, .0001 mfd., 600 v., paper
13	39001-76	Condenser, .003 mfd., 600 v., paper
14	39001-7	Condenser, .001 mfd., 600 v., paper
15	39001-76	Condenser, .003 mfd., 600 v., paper
16	39001-17	Condenser, .05 mfd., 600 v., paper
17	39001-17	Condenser, .05 mfd., 600 v., paper
18	39358-13	Condenser, 16 mfd., 150 v., Elect.
19	39373-80	Resistor, 220,000 ohm, ½ w.
20	39373-71	Resistor, 68,000 ohm, ½ w.
21	39373-107	Resistor, 10 megohm, ½ w.
22	39373-102	Resistor, 4.7 megohm, ½ w.
23	39373-69	Resistor, 56,000 ohm, ½ w.
24	39373-102	Resistor, 4.7 megohm, ½ w.
25	39373-92	Resistor, 1 megohm, ½ w.
26	39373-33	Resistor, 1000 ohm, ½ w.
27	39368-11	Control, Tone (2 megohm)
28A	39368-14	Control, Volume (1 megohm)
28B	39369-2	Switch, Power
29	B-143018	Transformer, Output
31	143688	Speaker
32	B-130493	Cable and Plug Assy., Battery
33	39373-44	Resistor, 3300 ohm, ½ w.
	R-138573-5	Cabinet
	C-143245	Dial Glass
	W-134055	Grommet, Var. Cond. Mtg.
	W-143041	Grommet, Battery Cable
	C-39012-81	Iron Core, Osc. Coil
	B-138574-4	Knob
	W-46065	Mounting (Rubber), Speaker
	W-132366-2	Nut, Locking (Osc. Iron Core)
	B-143115	Pointer, Dial
	W-137939-1	Pulley, Drive Cord Idler
	W-51071	Ring, Retaining (Drive Shaft)
	B-135075-5	Shaft, Dial Drive
	39441	Socket, Tube
	W-51752	Spring, Dial Drive Cord
	B-138649	Strip, Dial Glass
	W-138568	Strip, Dial Pointer
	AC-138443-3	Support and Pulley Assy., Dial
	W-134916	Washer, Spring (Drive Shaft)

MODELS 9-102,
9-118W

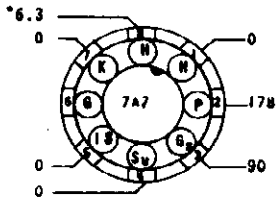
CROSLEY DIV.
AVCO MFG. CORP.



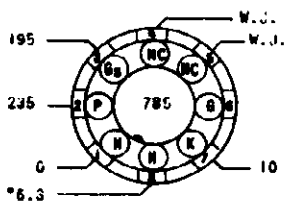
R. F. AMPLIFIER



I. F. AMPLIFIER

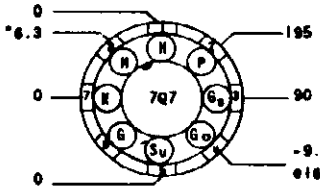


POWER OUTPUT

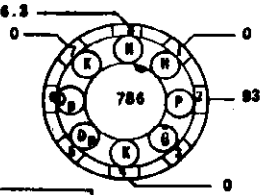


POWER TRANSFORMER

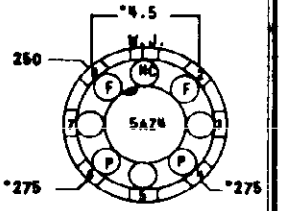
CONVERTER



DET.-AVC.-1st. A.F.AMPL.



RECTIFIER



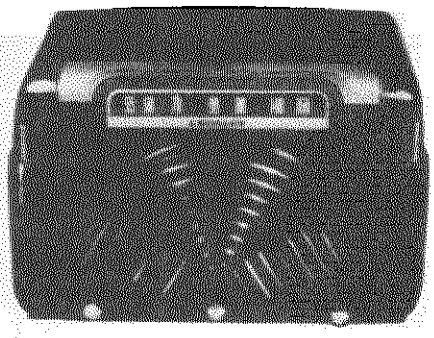
NOTES:
1. Bottom View of Sockets
2. Measure Voltage From Socket Lug To -B(Chassis)
3. Voltages Measured With An Electronic Voltmeter
4. W.J. = Wiring Junction.
5. N.C. = No Connection.
6. * = A.C. Voltage.
7. Voltage Tolerance, 10%
8. Line Voltage 117 V, 60 ~ A.C.

SOCKET VOLTAGE CHART

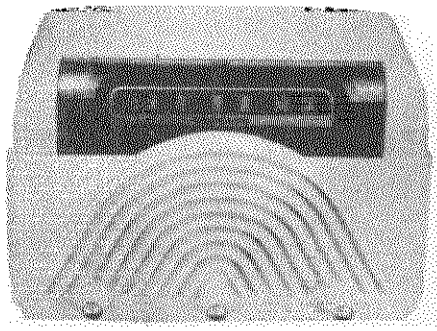
CROSLEY DIV.
AVCO MFG. CORP.

MODELS 9-102, 9-118W

9-102,



9-118W



ALIGNMENT PROCEDURE

1. Turn the tuning condenser to the completely closed position against the stop and set the dial pointer to the reference line at the low frequency end of the dial scale.
2. Turn the tone control to the treble (clockwise) position.
3. Connect the output meter across the speaker voice coil.
4. The r. f. signal input from the signal generator should be connected through a condenser as indicated in the alignment chart. Connect the signal generator ground to the receiver chassis.
5. Turn the volume control on full and adjust the signal generator output to produce approximately normal scale deflection of the output meter, but maintain signal generator output as low as possible to prevent AVC action in the receiver.
6. Loop antenna must remain connected at all times.

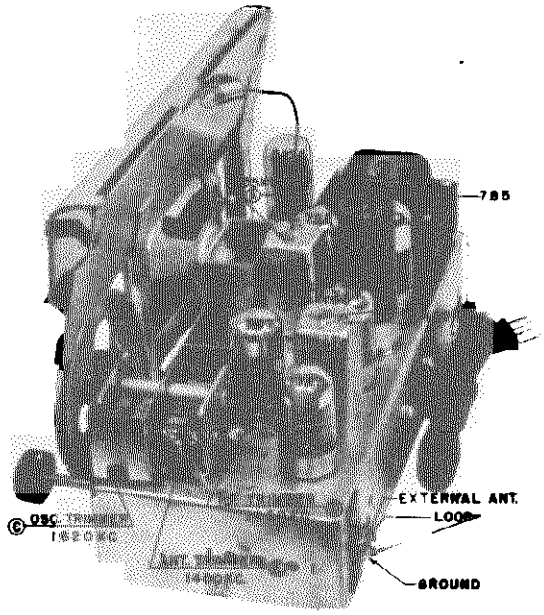
ALIGNMENT CHART

Alignment adjustments are shown in "CHASSIS, SIDE VIEW,"

Alignment Sequence	Signal Generator Output			Position of Tuning Dial or Var. Cond.	Adjust for Maximum Output
	Frequency in KC	In Series with	To		
1	455	.05 mfd.	Pin 6 7Q7	open	A & B
2	1620	4 mmf.	Top Ant. Clip	open 1620	C
3	1400	4 mmf.	Top Ant. Clip	1400	D
4	1400	4 mmf.	Top Ant. Clip	1400	E
5	1400	4mmf.	Top Ant. Clip	1400	Rock var. cond. and repeat 3 & 4

MODELS 9-102, 9-118W

CROSLEY DIV. AVCO MFG. CORP.



CHASSIS, SIDE VIEW

TYPE: Six-tube, single band, superheterodyne.

FREQUENCY RANGE: 540 to 1600 kc.

INTERMEDIATE FREQUENCY: 455 kc.

POWER SUPPLY: 60 cycle a. c. only

VOLTAGE RATING: 105-125 volts.

POWER CONSUMPTION: 50 watts maximum

POWER OUTPUT: 2.5 watts maximum

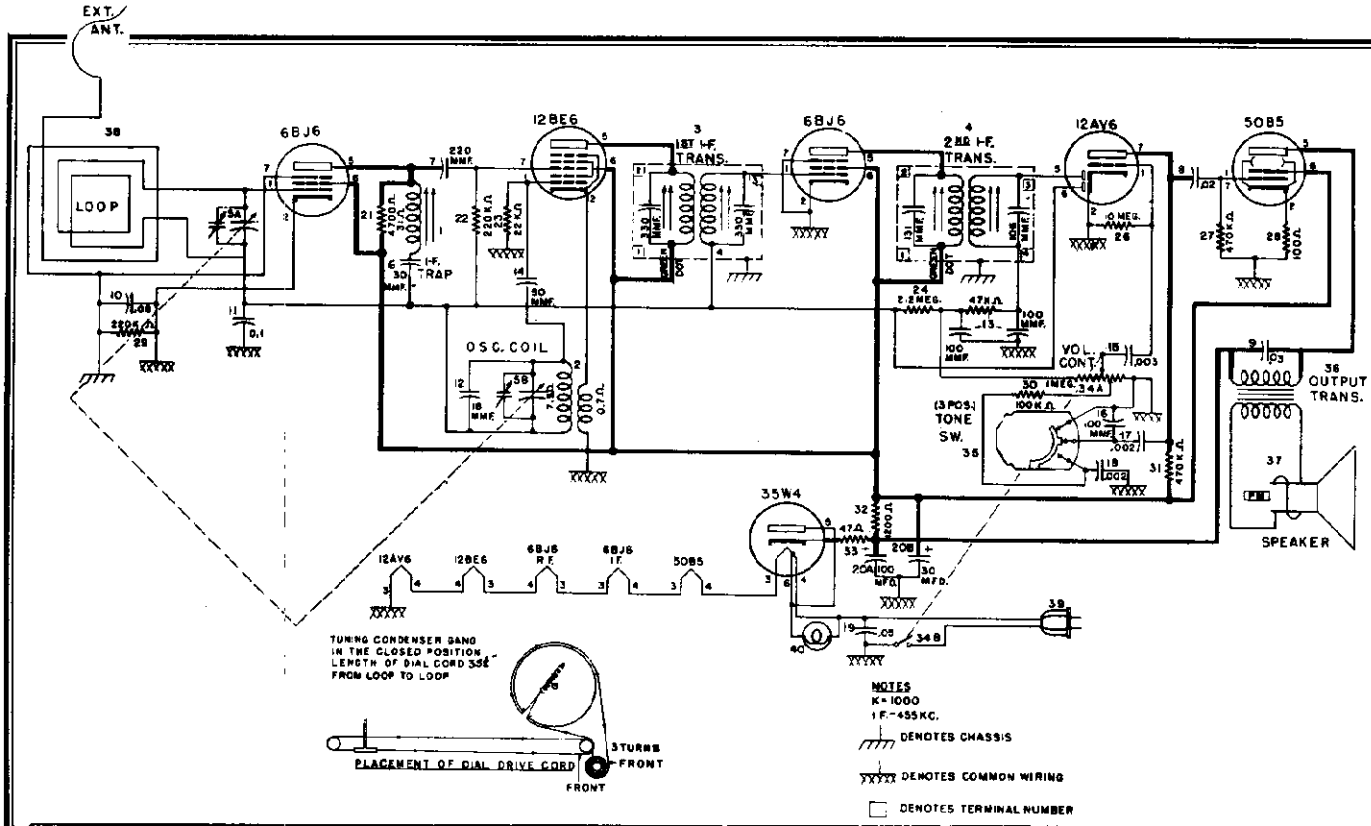
TUBE COMPLEMENT:

TYPE	FUNCTION
7A7	R. F. Amplifier
7Q7	Converter
7A7	I. F. Amplifier
7B6	Detector, AVC, 1st A. F. Amplifier
7B5	A. F. Power Output
5AZ4	Rectifier

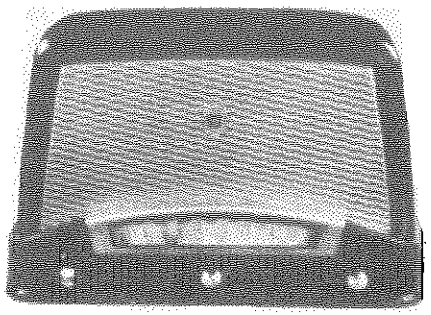
REPLACEMENT PARTS LIST—MODELS: 9-102, 9-118W

Figures in first column correspond to figures in Schematic Diagram

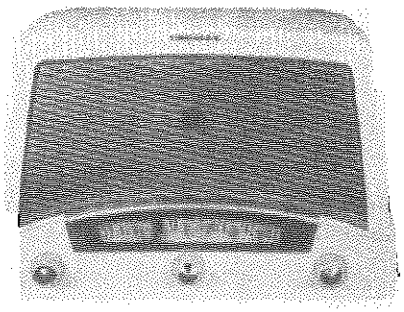
Item No.	Part No.	Description
1	AW-137800	Coil, R. F.
2	AW-137724	Coil, Osc.
3	AC-137933	Transformer, 1st I. F.
4	AC-137934	Transformer, 2nd I. F.
5	AW-138546	Coil, Antenna Loading
6	W-48858	Bulb (Dial), Type 47, 6.3 v., .15 amp.
7	C-132300-1	Cable & Plug Assy., Power
9	B-135102	Transformer, Power
10	B-138131-4	Transformer, Output
11	39368-18	Control, Volume
	39370-2	Shaft, Volume Control (Knurled)
	39369-1	Switch, Power
13	C-138246	Speaker
14	39373-23	Resistor, 330 ohm, ½ w.
15	39373-60	Resistor, 22,000 ohms, ½ w.
16	39373-67	Resistor, 47,000 ohms, ½ w.
17	39373-84	Resistor, 330,000 ohms, ½ w.
18	39373-87	Resistor, 470,000 ohms, ½ w.
19	39373-92	Resistor, 1.0 megohm, ½ w.
20	39373-97	Resistor, 2.2 megohms, ½ w.
21	39373-107	Resistor, 10 megohms, ½ w.
22	39373-40	Resistor, 2,200 ohms, ½ w.
23	39372-7	Resistor, 1,500 ohms, 10 w.
24	39373-165	Resistor, 12,000 ohms, 1 w.
25	39373-62	Resistor, 27,000 ohms, ½ w.
27	39373-97	Resistor. 2.2 megohm, ½ w.
28	39373-97	Resistor, 2.2 megohm, ½ w.
29	39373-60	Resistor, 22,000 ohms, ½ w.
32	39001-11	Condenser, .005 mfd., 600 v., paper
33	39001-11	Condenser, .005 mfd., 600 v., paper
34	39001-13	Condenser, .01 mfd., 600 v., paper
35	39001-13	Condenser, .01 mfd., 600 v., paper
36	39001-17	Condenser, .05 mfd., 600 v., paper
37	39001-17	Condenser, .05 mfd., 600 v., paper
39	39001-17	Condenser, .05 mfd., 600 v., paper
40	39001-73	Condenser, .00025 mfd., 600 v., paper
41	39001-7	Condenser .001 mfd., 600 v., paper
42	39001-13	Condenser, .01 mfd., 600 v., paper
44A	B-136596	Condenser, 50 mfd., 300 v. } Two Sect.
44B		Condenser, 30 mfd., 300 v. } elect.filter
45	W-132267-1	Condenser, Trimmer
46	AB-138584	Terminal Board
47	AC-138464	Loop Antenna Assy.
48A	AC-138595-2	Condenser, Variable }
48B		Condenser, Variable } Three Sect.
48C		Condenser, Variable }
49	39001-7	Condenser, .001 mfd., 600 v., paper
51	C-137727-52	Condenser, 12 mmf., 500 v., ceramic
52	39368-11	Control, Tone
53	39373-67	Resistor, 47,000 ohms, ½ w.
54	W-48858	Bulb (Dial), Type 47, 6.3 v., .15 amp.
	C-137750	Back, Cabinet
	R-138573-1	Cabinet (9-102)
	R-138573-2	Cabinet (9-118W)
	D-143931	Dial
	AC-143143	Dial Plate Assy.
	W-134055	Grommet, Variable Condenser
	B-138574-5	Knob (9-102)
	B-138574-2	Knob (9-118W)
	B-143115	Pointer, Dial
	W-137939-1	Pulley, Idler
	W-51071	Ring, Retaining (Dial Drive Shaft)
	39220-36CP	Screw, Chassis Mtg.
	B-135075-5	Shaft, Drive
	W-46065	Shock Mount, Speaker
	D-136565-16	Socket, Dial Light
	39441	Socket, Tube
	W-51752	Spring, Dial Drive
	W-138568	Strip, Pointer
	W-132124-5	Trimount Stud, Cabinet Back
	W-134916	Washer, Spring (Dial Drive Shaft)



9-103

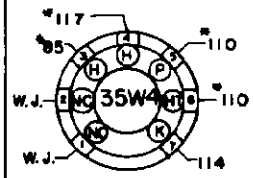


9-104W

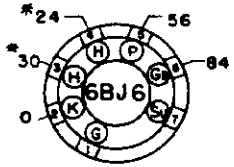


SOCKET VOLTAGE CHART

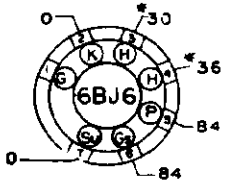
RECTIFIER



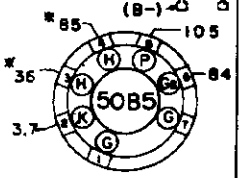
R.F. AMPLIFIER



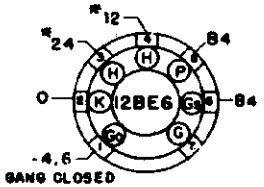
I.F. AMPLIFIER



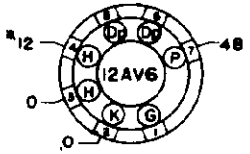
OUTPUT (B-)



CONVERTER



DET. AVC. & 1ST AUDIO AMPLIFIER



NOTES:

1. BOTTOM VIEW OF TUBE SOCKETS.
2. VOLTAGE MEASURED WITH AN ELECTRONIC VOLTMETER FROM SOCKET LUG TO B-.
3. LINE VOLTAGE 117 V. 60 CYCLE.
4. NC = NO CONNECTION.
5. W.J. = WIRING JUNCTION.
6. * = AC. VOLTAGE.
7. SOCKET VOLTAGE TOLERANCE ±10%.

MODELS 9-103, 9-104W

CROSLEY DIV.
AVCO MFG. CORP.

ALIGNMENT PROCEDURE

1. Turn the tuning condenser to the completely closed position against the stop and set the dial pointer to the reference notch at the low frequency end of the dial background.
2. Turn the tone control to the treble (clockwise) position.
3. Connect the output meter across the speaker voice coil.
4. The r. f. signal input from the signal generator should be connected through a condenser as indicated in the alignment chart. Connect the signal generator ground through a 0.1 mfd. condenser to B— (pin 2 on 6BJ6 tube socket).
5. Turn the volume control on full and adjust the signal generator output to produce approximately mid-scale deflection of the output meter, but maintain signal generator output as low as possible to prevent AVC action in the receiver.
6. Loop antenna must remain connected at all times.

ALIGNMENT NOTES

1. Turn I. F. trap core "A" counter-clockwise to stop.
2. To perform step 5 and 6, attach the chassis bottom to chassis and move loop antenna as far away from chassis as the loop brackets will permit.
3. Adjust for maximum output.

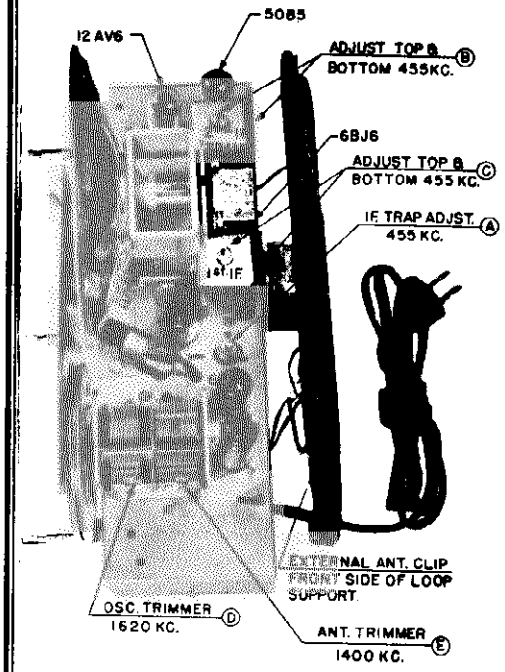
ALIGNMENT CHART

Alignment adjustments are shown in "CHASSIS VIEW,"

Alignment Sequence	Signal Generator Output			Position of Tuning Dial or Var. Cond.	Adjust	Remarks
	Frequency in KC	In Series with	To			
1					A	See Note 1
2	455	200 mmf.	Ant. Clip	open	B	See Note 3
3	455	200 mmf.	Ant. Clip	open	C	See Note 3
4	455	200 mmf.	Ant. Clip	open	A	Adj. for min. signal
5	1620	200 mmf.	Ant. Clip	open	D	See Note 2 and 3
6	1400	200 mmf.	Ant. Clip	Tune in Signal	E	See Note 2 and 3

CROSLEY DIV.
AVCO MFG. CORP.

MODELS 9-103
9-104W



CHASSIS, VIEW

TYPE: Six-tube, single band, superheterodyne.

FREQUENCY RANGE: 540 to 1600 kc.

INTERMEDIATE FREQUENCY: 455 kc.

POWER SUPPLY: a.c.—d.c.

VOLTAGE RATING: 105-125 volts.

POWER CONSUMPTION: 30 watts nominal.

POWER OUTPUT: 1.5 watts maximum.

TUBE COMPLEMENT:

TYPE	FUNCTION
6BJ6	R. F. Amplifier
12BE6	Converter
6BJ6	I. F. Amplifier
12AV6	Detector, AVC 1st A. F. Amplifier
50B5	A. F. Power Output
35W4	Rectifier

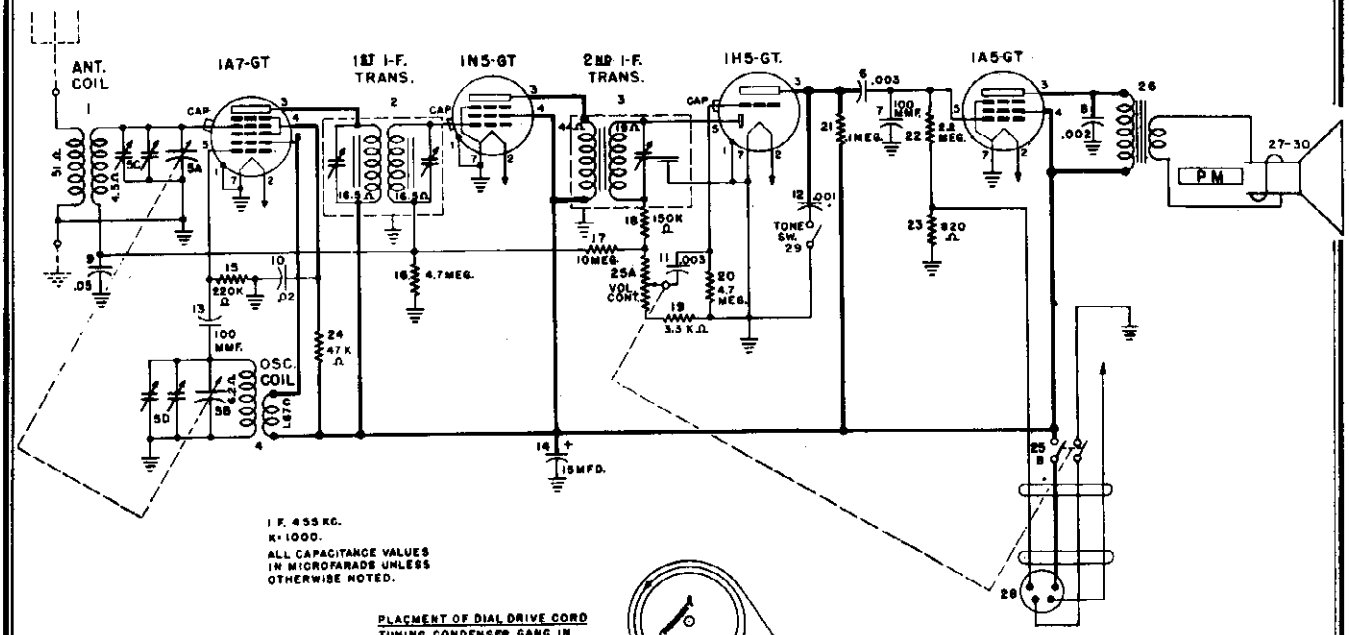
REPLACEMENT PARTS LIST

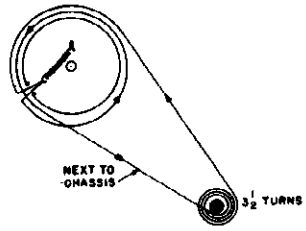
Figures in first column correspond to figures in Schematic Diagram

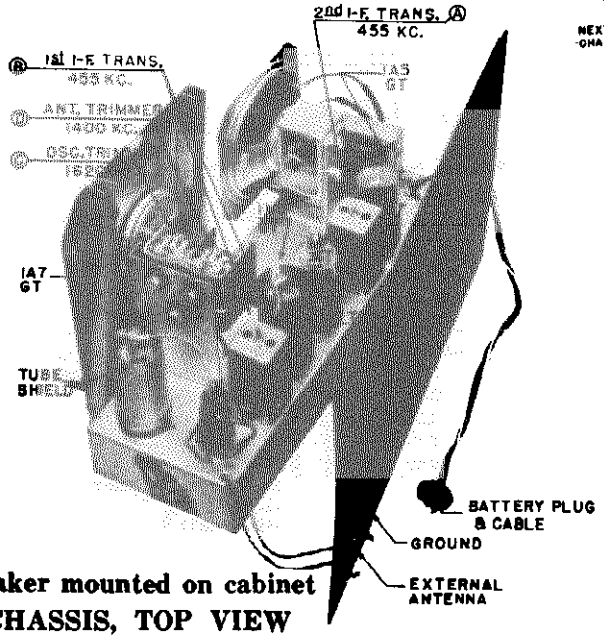
Item No.	Part No.	Description
1	AW-143474	Coil, I.F. Trap
2	AW-144325	Coil, Osc.
3	AB-143678	Transformer, 1st I.F.
4	AB-143679	Transformer, 2nd I.F.
5A	AC-137073-24	Condenser, Variable } Two
5B		Condenser, Variable } Sect.
	Part of Item 5	Pulley
6	B-137498-12	Condenser, 30 mmf., 500 v., mica
7	B-137498-38	Condenser, 220 mmf., 500 v., mica
8	39001-80	Condenser, .02 mfd., 600 v., paper
9	39001-17	Condenser, .05 mfd., 600 v., paper
10	39001-19	Condenser, .1 mfd., 600 v., paper
11	39001-19	Condenser, .1 mfd., 600 v., paper
12	C-137727-66	Condenser, 18 mmf., 500 v., ceramic
13	B-142951-2	Filter Assy., Diode
14	C-137727-21	Condenser, 50 mmf., 500 v., ceramic
15	39001-76	Condenser, .003 mfd., 600 v., paper
16	B-143686-3	Condenser, 100 mmf., 500 v., ceramic
17	39001-74	Condenser, .002 mfd., 600 v., paper
18	39001-74	Condenser, .002 mfd., 600 v., paper
19	39001-17	Condenser, .05 mfd., 600 v., paper
20A	B-143680	Condenser, 100 mfd., 150 v. } Two Sect.
20B		Condenser, 30 mfd., 150 v. } Elect. Fil.
21	39373-47	Resistor, 4,700 ohms, ½ w.
22	39373-80	Resistor, 220,000 ohms, ½ w.
23	39373-60	Resistor, 22,000 ohms, ½ w.
24	39373-97	Resistor, 2.2 megohms, ½ w.
26	39373-107	Resistor, 10 megohms, ½ w.
27	39373-87	Resisor, 470,000 ohms, ½ w.
28	39373-14	Resistor, 100 ohms, ½ w.
29	39373-80	Resistor, 220,000 ohms, ½ w.
30	39373-74	Resistor, 100,000 ohms, ½ w.
31	39373-87	Resistor, 470,000 ohms, ½ w.
32	39373-144	Resistor, 1,200 ohms, 1 w.
33	39373-119	Resistor, 47 ohms, ½ w.
34	39368-14	Control, Volume, 1.0 meg.
	39369-1	Switch, Power
35	B-143494	Switch, Tone
36	B-137723	Transformer, Audio
37	136420	Speaker
38	AC-143698	Loop Antenna Assy.
39	C-132300-1	Cable & Plug Assy., Power
40	W-48858	Bulb (Dial) Type 47, 6.3 v., .15 amp
	R-143113-1	Cabinet (9-103)
	R-143113-2	Cabinet (9-104W)
	W-131154-1	Cotter, External
	C-143884	Dial
	B-143907	Escutcheon
	W-143514	Foot, Rubber
	AW-143791	Grille Cloth & Baffle Assy.
	39012-87	Iron Core, I.F. Trap
	39012-89	Iron Core, 1st I.F.
	39012-89	Iron Core, 2nd I.F.
	B-138576-8	Knob (9-103)
	B-138576-7	Knob (9-104W)
	143289	Pointer, Dial
	W-137939-2	Pulley, Idler
	39156-49CP	Screw, Chassis Mtg.
	B-135075-2	Shaft, Drive
	W-46065	Shock Mount, Variable Cond.
	D-136565-25	Socket, Dial Light
	W-51752	Spring, Dial Drive
	C-135038-12	Terminal Strip, Two Lug
	C-135038-15	Terminal Strip, Three Lug
	W-134916	Washer, Dial Drive

MODEL 9-117

CROSLEY DIV.
AVCO MFG. CORP.

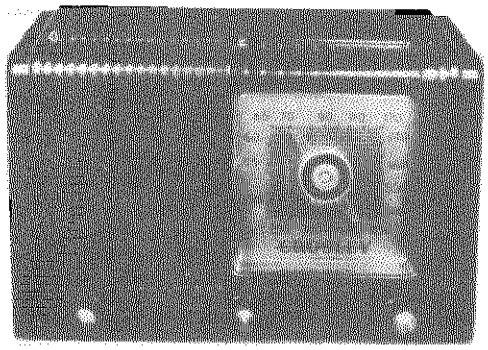






Speaker mounted on cabinet
CHASSIS, TOP VIEW

MODEL 9-117

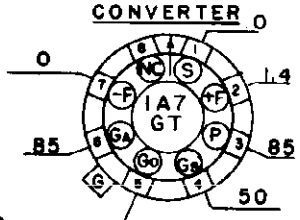


SOCKET VOLTAGE CHART

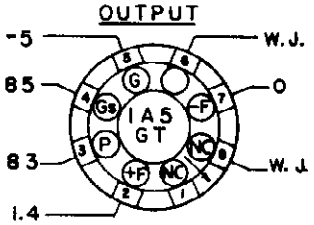
NOTES:

1. BOTTOM VIEW OF TUBE SOCKETS.
2. VOLTAGES MEASURED FROM SOCKET LUG TO CHASSIS WITH AN ELECTRONIC VOLTMETER.
3. W. J.= WIRING JUNCTION.
4. N.C.= NO CONNECTION.
5. BATTERY PACK VOLTAGE "A"=1.4V. "B"=90 V.
6. SOCKET VOLTAGE TOLERANCE 10 %.

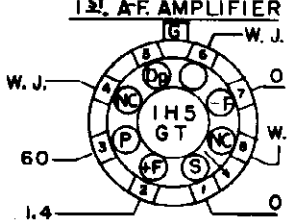
CONVERTER



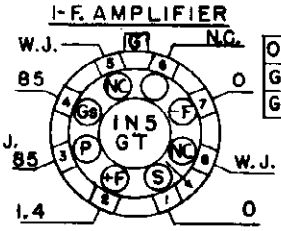
OUTPUT



DET.-AVC.& 1st. A.F. AMPLIFIER



I-F. AMPLIFIER



OSCILLATOR GRID VOLTS
GANG OPEN -9 VOLTS
GANG CLOSED-5VOLTS

CROSLEY DIV.
AVCO MFG. CORP.
ALIGNMENT PROCEDURE

1. Turn the tuning condenser to the completely closed position against the stop and set the dial pointer in a horizontal position.
2. Connect the output meter across the speaker voice coil.
3. The r.f. signal input from the signal generator should be connected to the antenna terminal as indicated in the alignment chart. Connect the low side (ground) of the signal generator to the chassis.
4. Turn the volume control on full and the tone control to treble. Adjust the signal generator output to produce approximately mid-scale deflection of the output meter, but maintain signal generator output as low as possible to prevent AVC action in the receiver.

ALIGNMENT CHART

Alignment Sequence	Signal Generator Output			Position of	Adjust for Maximum Output
	Frequency in kc.	In Series with	To	Tuning Dial	
1	455	200 mmf.	Ant.	540	A & B
2	1620	200 mmf.	Ant.	1620	C
3	1400	200 mmf.	Ant.	1400	D

TYPE: Four-tube, single-band superheterodyne.

FREQUENCY RANGE: 540 to 1600 kc.

INTERMEDIATE FREQUENCY: 455 kc.

POWER SUPPLY: Crosley "A-B" Battery Pack, CR69.

VOLTAGE RATING: 1½ v. "A"; 90 v. "B".

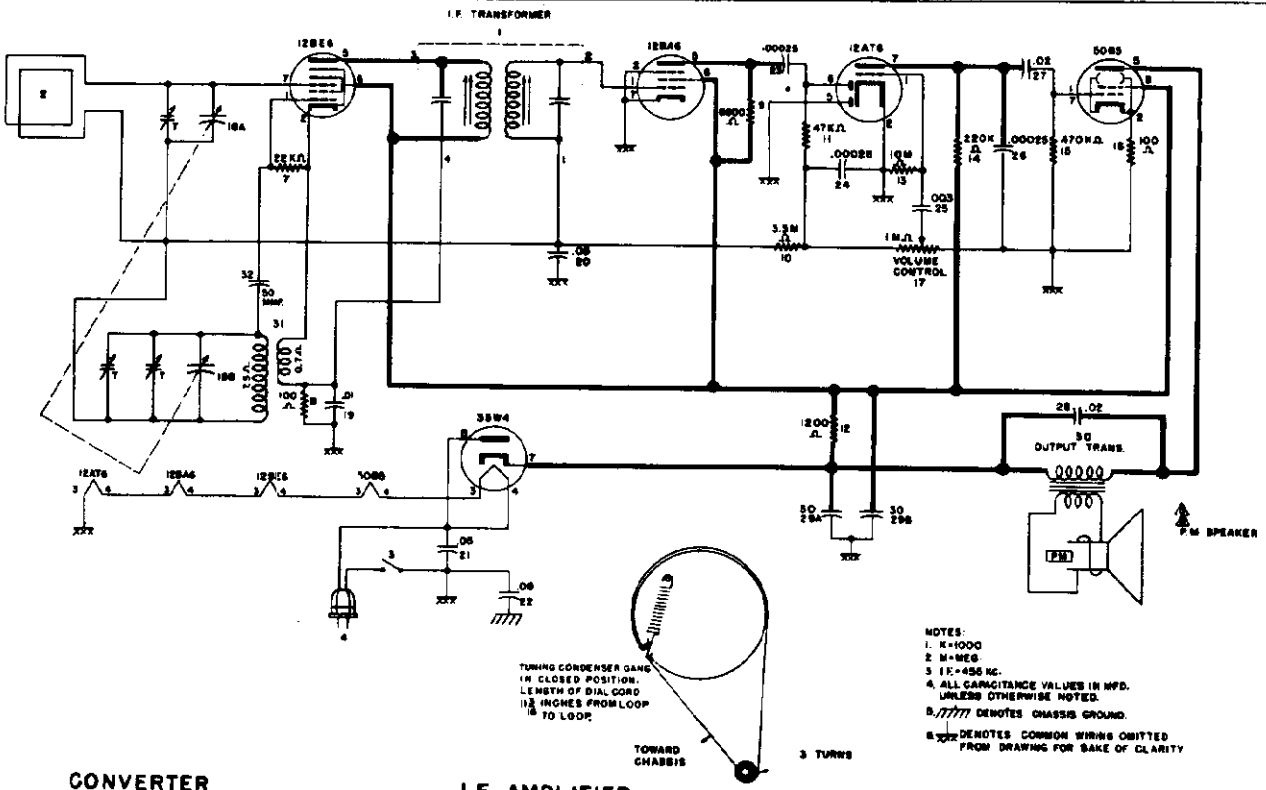
POWER OUTPUT: 150 mw. maximum.

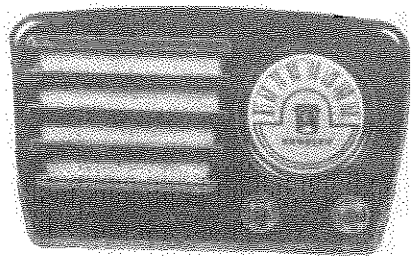
TUBE COMPLEMENT:

TYPE	FUNCTION
1A7GT/G	Mixer
1N5GT/G	I.F. Amplifier
1H5GT/G	Detector, AVC, 1st A.F. Amplifier
1A5GT/G	A.F. Power Output

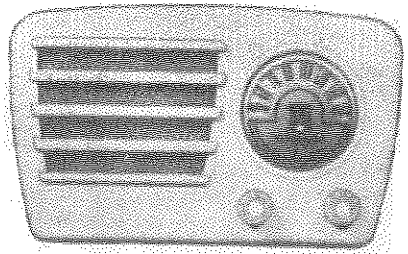
For satisfactory operation it is necessary that an antenna and ground be connected to this receiver.

Item No.	Part No.	Description
1	AW-142997	Coil, Antenna
2	AW-134348	Transformer, 1st I.F.
3	AW-134349	Transformer, 2nd I.F.
4	AW-143261	Coil, Oscillator
5A	B-143204	Condenser, Variable } Two Section
5B		Condenser, Variable }
5C	Part of Item 5A	Condenser, Trimmer
5D	Part of Item 5B	Condenser, Trimmer
6	39001-76	Condenser, .003 mfd., 600 v., Paper
7	C-137727-1	Condenser, 100 mmf., 300 v., Ceramic
8	39001-74	Condenser, .002 mfd., 600 v., Paper
9	39001-17	Condenser, .05 mfd., 600 v., Paper
10	39001-80	Condenser, .02 mfd., 600 v., Paper
11	39001-76	Condenser, .003 mfd., 600 v., Paper
12	39001-7	Condenser, .001 mfd., 600 v., Paper
13	137727-1	Condenser, 100 mmf., 300 v., Ceramic
14	B-143027	Condenser, 15 mfd., 100 v., Elect. Filter
15	39373-80	Resistor, 220,000 ohms, ½ w.
16	39373-102	Resistor, 4.7 megohm, ½ w.
17	39373-107	Resistor, 10.0 megohm, ½ w.
18	39373-77	Resistor, 150,000 ohm, ½ w.
19	39373-44	Resistor, 3300 ohm, ½ w.
20	39373-102	Resistor, 4.7 megohm, ½ w.
21	39373-92	Resistor, 1.0 megohm, ½ w.
22	39373-97	Resistor, 2.2 megohm, ½ w.
23	39373-32	Resistor, 820 ohm, ½ w.
24	39373-67	Resistor, 47,000 ohm, ½ w.
25A	39368-14	Control, Volume (1.0 megohm)
25B	39369-2	Switch, Power
26	B-138131-6	Transformer, Output
27	AD-139631	Speaker
28	B-130493	Cable & Plug Assy., Battery
29	W-143207	Switch, Tone
	AC-143274	Back Assy., Cabinet
	R-143226	Cabinet
	W-134667	Clip, Dial Pointer
	AB-143234	Dial & Support Assy.
	W-143290	Grille Cloth
	B-138576-4B	Knob
	B-132258	Lens, Dial
	W-45580	Mounting Rubber, Var. Cond. Mtg.
	B-143252	Pointer, Dial
	W-51071	Ring, Retaining (Dial Drive Shaft)
	39296-29CP	Screw, Chassis Mtg.
	W-143206	Shaft, Dial Drive
	G-39204	Socket, Tube
	W-51752	Spring, Dial Drive Cord
	W-136630	Stud, Trimount (Dial Lens Mtg.)
	W-132124	Stud, Trimount (Cabinet Back)
	W-134916	Washer, Spring (Dial Drive Shaft)
	CR-69	"A-B" Battery Pack





9-120W

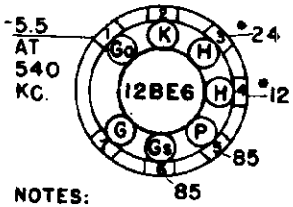


TUBE COMPLEMENT

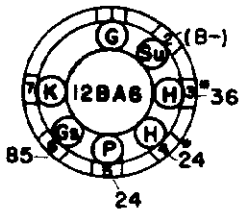
Type	Function
12BE6	Converter
12BA6	I. F. Amplifier
12AT6	Detector, AVC, 1st A.F. Amplifier
50B5	A.F. Power Output
35W4	Rectifier

NOTES:
1. K=1000
2. M=MEG
3. I.F.=456 KC.
4. ALL CAPACITANCE VALUES IN MFD. UNLESS OTHERWISE NOTED.
5. ⏚ DENOTES CHASSIS GROUND.
6. ✕ DENOTES COMMON WIRING OMITTED FROM DRAWING FOR SAKE OF CLARITY

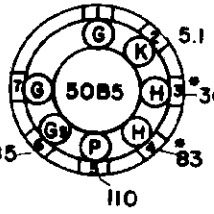
CONVERTER



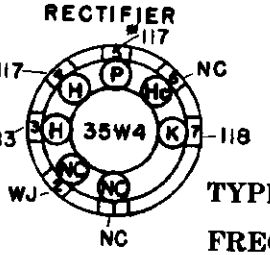
I.F. AMPLIFIER



OUTPUT



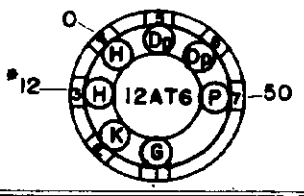
RECTIFIER



NOTES:
1. BOTTOM VIEW OF TUBE SOCKETS.
2. MEASURE VOLTAGE WITH AN ELECTRONIC VOLTMETER FROM SOCKET LUG TO 8-PIN 2 ON THE 12BA6.
3. LINE VOLTAGE 117V 60 ~
4. NC=NO CONNECTION
5. WJ=WIRING JUNCTION
6. * =AC. VOLTAGE
7. SOCKET VOLTAGE TOLERANCE ± 10%

SOCKET VOLTAGE CHART

DET., AVC., 1st A.F. AMPL.



TYPE: Five-tube, single band, Superheterodyne.

FREQUENCY RANGE: 540 to 1600 kc.

INTERMEDIATE FREQUENCY: 455 kc.

POWER SUPPLY: a.c.-d.c.

VOLTAGE RATING: 105-125 volts.

POWER CONSUMPTION: 30 watts.

POWER OUTPUT: 1.5 watts maximum.

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MODELS 9-11
9-120W

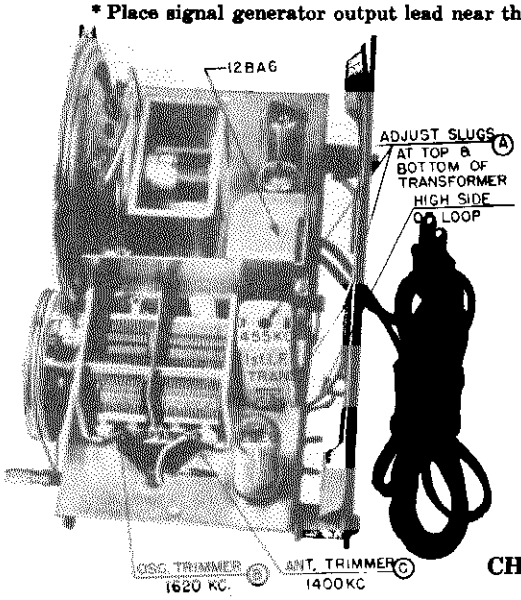
ALIGNMENT PROCEDURE

1. Connect an output meter across the speaker voice coil.
2. The r.f. signal input from the signal generator should be connected to the high side of loop antenna. Connect the signal generator ground through a 0.1 mfd. condenser to B— (pin 2 on 12BA6 tube socket).
3. Turn the volume control on full and adjust the signal generator output to produce approximately midscale deflection of the output meter, but maintain signal generator output as low as possible to prevent AVC action in the receiver.

ALIGNMENT CHART

Alignment Sequence	Signal Generator Output			Position of Dial Pointer	Adjust for Maximum Output
	Frequency in kc.	In Series with	To		
1	455	200 mmf.	High Side of Loop	1620	A
2	1620	*Radiated to Loop		1620	B
3	1400	*Radiated to Loop		1400	C

* Place signal generator output lead near the loop antenna.



When using direct current it may be necessary to reverse the position of the power plug in the electric outlet for correct polarity.

Reversing the position of the power plug when alternating current is used may reduce hum.

Under no circumstances should a ground be connected to this receiver.

CHASSIS, TOP VIEW

1	139919	Transformer, I.F.	24	39001-73	Condenser, 250 mmf., 600 v., paper
2	139873	Antenna Loop and Back Assy.	25	39001-76	Condenser, .003 mfd., 600 v., paper
3	39369-1	Switch, Power	26	39001-73	Condenser, 250 mmf., 600 v., paper
4	142769	Cable and Plug Assy., Power	27	39001-80	Condenser, .02 mfd., 600 v., paper
5	138459	Speaker (Less Transformer)	28	39001-80	Condenser, .02 mfd., 600 v., paper
7	39373-60	Resistor, 22,000 ohm, ½ w.	29A	136770	Condenser, 50 mfd., 150 v. ⎫ Two Sect.
8	39373-14	Resistor, 100 ohm, ½ w.	29B		Condenser, 30 mfd., 150 v. ⎭ Elec. Filt.
9	39373-161	Resistor, 6,800 ohm, 1 w.	30	138131-1	Transformer, Output
10	39373-100	Resistor, 3.3 megohm, ½ w.	31	144325	Coil Assy., Oscillator
11	39373-67	Resistor, 47,000 ohm, ½ w.	32	137727-21	Condenser, 50 mmf., 500 v., ceramic
12	39373-144	Resistor, 1,200 ohm, 1 w.		144244-1	Cabinet (9-119)
13	39373-107	Resistor, 10 megohm, ½ w.		144242	Cabinet (9-120W)
14	39373-80	Resistor, 220,000 ohm, ½ w.		144243	Dial
15	39373-87	Resistor, 470,000 ohm, ½ w.		144240	Grill Cloth
16	39373-14	Resistor, 100 ohm, ½ w.		139925-1	Knob (9-119)
17	39368-14	Control, Volume (1 megohm)		139925-2	Knob (9-120W)
18A	137073-17	Condenser, Variable ⎫ Two		144239	Pointer Disc, Dial
18B		Condenser, Variable ⎭ Section		144224	Ring, Calibrated Dial
19	39001-13	Condenser, .01 mfd., 600 v., paper		51071	Ring, Retaining
20	39001-17	Condenser, .05 mfd., 600 v., paper		135075-4	Shaft, Drive
21	39001-17	Condenser, .05 mfd., 600 v., paper		39462-1	Socket, Tube
22	39001-19	Condenser, .1 mfd., 600 v., paper		51752	Spring, Dial Drive Cord
23	39001-73	Condenser, 250 mmf., 600 v., paper		132124	Stud, Trimount
				134916	Washer, Spring

MODELS 9-201,
9-202M, 9-203B

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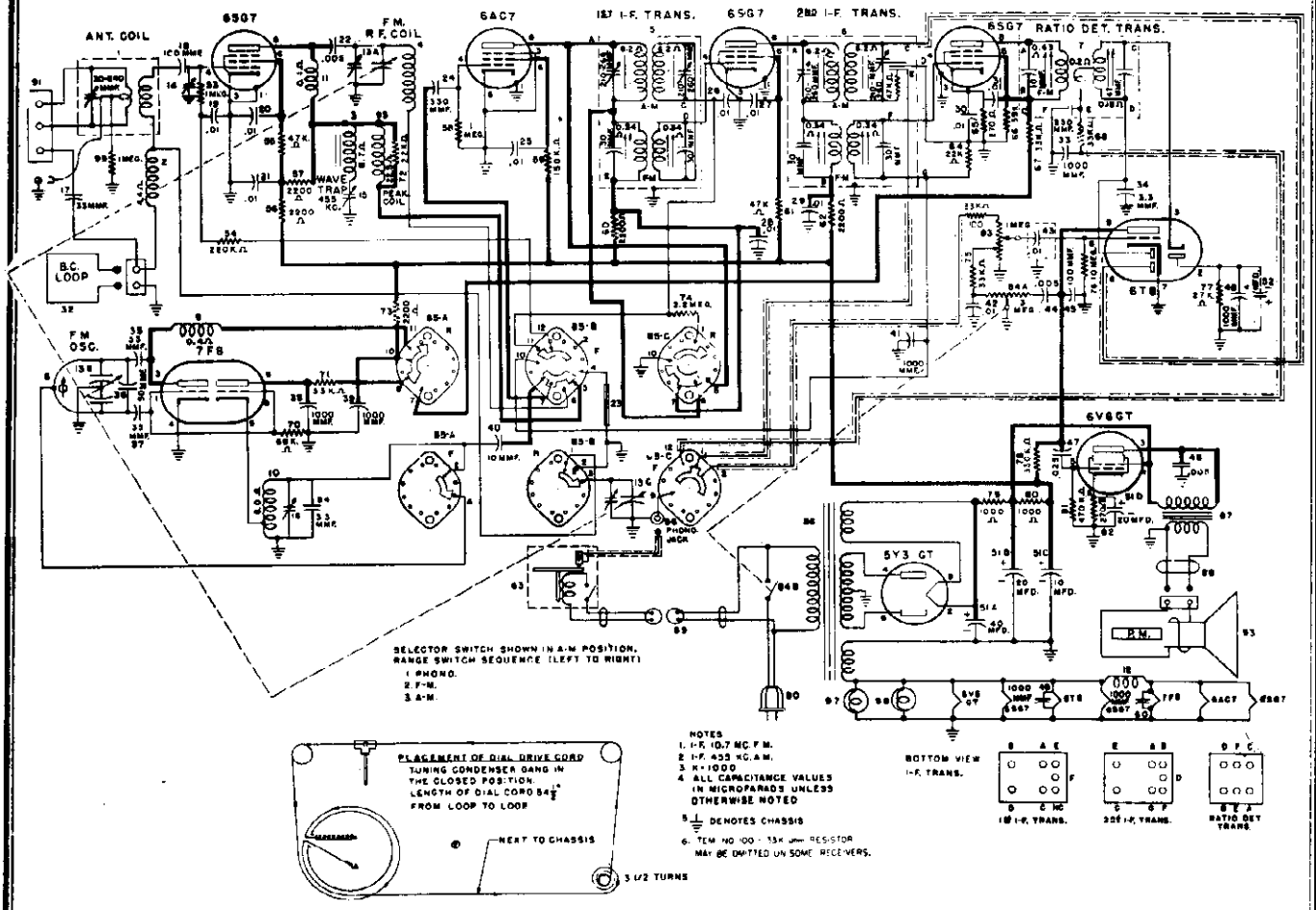
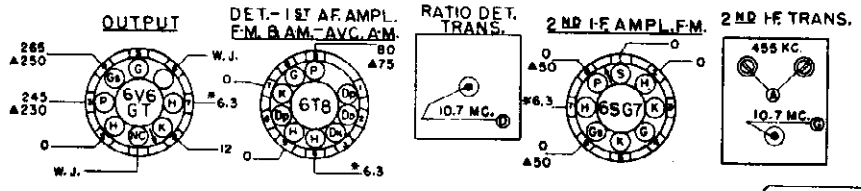
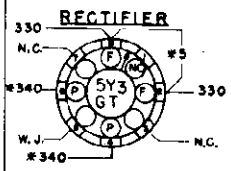
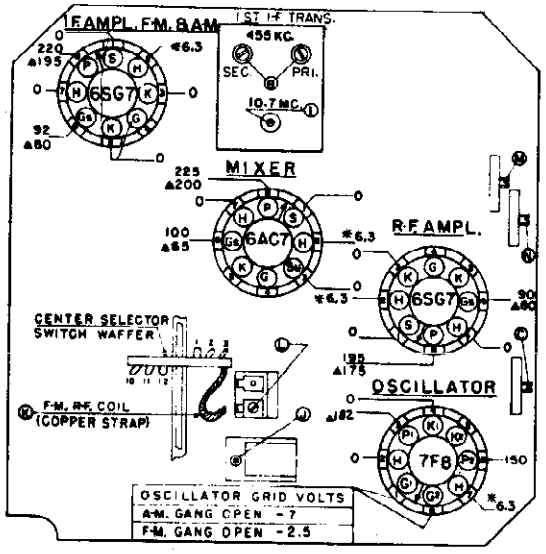




NOTES:

1. BOTTOM VIEW OF SOCKETS.
2. VOLTAGE MEASURED FROM SOCKET LUG TO CHASSIS WITH AN ELECTRONIC VOLTMETER.
3. VOLTAGE MEASURED WITH SWITCH IN A-M. POSITION EXCEPT WHERE MARKED WITH DELTA (▲).
4. ▲ SELECTOR SWITCH IN F-M. POSITION.
5. W.J. - WIRING JUNCTION. N.C. - NO CONNECTION. * - A.C. VOLTAGE.
6. ALL VOLTAGES TAKEN AT NOMINAL OPERATING VOLTAGE, 117 V., 60 ~
7. SOCKET VOLTAGE TOLERANCE 10%





SOCKET VOLTAGE CHART

SOCKET VOLTAGE TOLERANCE 10%

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MODELS 9-201, 9-202M, 9-203

REPLACEMENT CABINET PARTS—MODEL 9-201

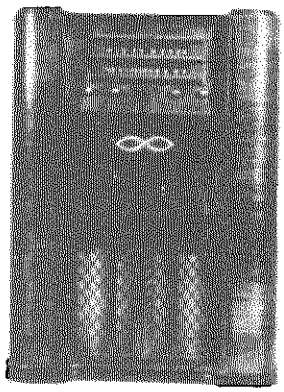
Item No.	Part No.	Description	Item No.	Part No.	Description
	144113	Baffle, Speaker		143734	Pull, Record Changer Drawer
	143403	Cabinet		143485	Rubber Bumper
	143733	Drawer, Panel, Record Changer		143478	Slides, Record Changer Drawer
	143735	Grille Cloth			

REPLACEMENT CABINET PARTS—MODEL 9-202M

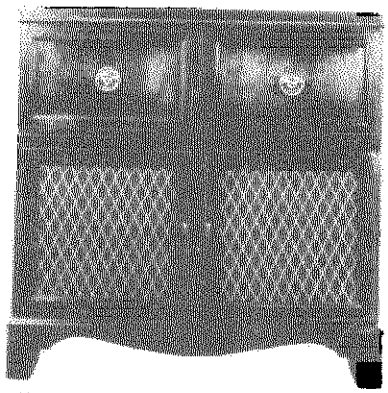
Item No.	Part No.	Description	Item No.	Part No.	Description
	143957	Baffle, Speaker		143510	Leg and Base Assy.(Side)
	143458	Cabinet		143491	Pull, Drawer and Radio Compartment
	139319-SB	Catch and Strike Assy.		142912-EA	Pull Record Compartment Door
	143504	Drawer Panel and Radio Compartment Door		143504	Radio Dial Panel
				143490	Record Changer Drawer Frame Assy.
	143956	Grille Cloth		143953	Record Compartment Door
	137266-SB	Hinge, Door		143485	Rubber Bumper, Doors
	143958	Leg and Base Assy. (Front)		143478	Slides, Record Changer Drawer

REPLACEMENT CABINET PARTS—MODEL 9-203B

Item No.	Part No.	Description	Item No.	Part No.	Description
	143485	Bumper, Rubber, Compt. Door		143480-BR	Pull, Door, Radio and Record Changer
	143409	Cabinet		143487-BR	Pull, Door, Record Storage Compt.
	139319-BR	Catch and Strike Assy.		143431-BR	Screw, Door Pull, Radio and Record Changer Compartment
	143488	Doors, Compartment, Record Storage			
	143483	Door and Record Changer Drawer Front		39176-78-BR	Screw, Door Pull, Record Storage Compartment
	143484	Grille Cloth		143479	Shelf Assy., Record Changer
	144505-BR	Hinge, Door		143478	Slides, Record Changer Drawer
	143489	Leg and Base Assembly		139319-BR	Strike and Catch Assembly
	143482	Panel, Radio Dial			



9-201



9-202M

9-203B

TYPE: Eight-tube, two-band, superheterodyne.

FREQUENCY RANGE: American Broadcast Band, 540 to 1600 kc. (Selector Switch at AM.)

FM Band, 88 to 108 MC; Channels 201 to 300. (Selector Switch at FM.)

INTERMEDIATE FREQUENCY: Broadcast Band 455 kc. Frequency Modulated Band 10.7 mc.

POWER SUPPLY: 60 cycle a. c. only.

VOLTAGE RATING: 105-125 volts.

POWER CONSUMPTION: 80 watts maximum. 20 watts additional for record changer.

POWER OUTPUT: 4.5 watts maximum.

TUBE COMPLEMENT:

Type	FUNCTION
6SG7	R. F. Amplifier
7F8	Oscillator
6AC7	Mixer
6SG7	I. F. Amplifier AM and FM
6SG7	2nd I. F. Amplifier FM
6T8	Det. 1st Audio Amplifier AM and FM, A.V.C., AM
6V6GT	Output
5Y3GT	Rectifier

MODELS 9-201, 9-202M, 9-203B

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ALIGNMENT PROCEDURE NOTES

1. Shunt a 1000 ohm resistor across the primary (A to E) on the first I.F. transformer (5) and adjust transformer secondary trimmer for maximum output. Remove shunt and transfer it to transformer secondary (C to D) and adjust transformer primary trimmer for maximum output.
2. Connect the two 100,000 ohm resistors in series and connect these resistors from the No. 2 lug of the 6T8 to the chassis. Connect an electronic voltmeter from the center of these resistors to the shielded lead junction of the 33,000 ohm resistor (68) and the 1000 mmf. condenser, (33). Adjust the ratio detector transformer secondary (D) for zero volts on the electronic voltmeter. Remove the two 100,000 ohm resistors.
3. Connect the electronic voltmeter across the 27,000 ohm load resistor (77) and adjust primary of core (A) of the ratio detector transformer (7) for maximum DC output.
4. Connect output of marker generator across sweep generator output. Connect CRO across the 22,000 ohm resistor (64) in the grid circuit of the second I.F. amplifier.
5. CRO connections same as note 4.
6. For dummy antenna see figure 1.

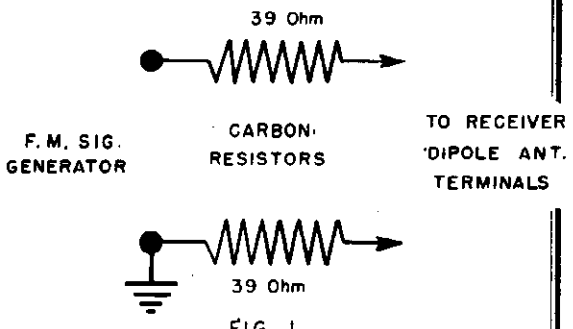
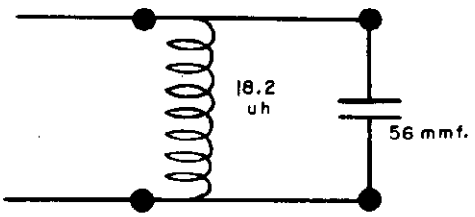


FIG. 1



7. Tune in signal and adjust for maximum sensitivity by a slight movement in either direction from the hairpin loop.
8. Tune in signal and adjust for greatest sensitivity.
9. Connect CRO in series with 100,000 ohm resistor to grid of R.F. amplifier and chassis. Connect output of marker generator across output of sweep generator. Adjust (M-N) until pattern and markers approximate figure in alignment chart.

9a. Shunt primary of FM antenna transformer with a 10 ohm carbon resistor and adjust (M) for maximum output. Remove shunt and place it across FM antenna transformer secondary and adjust (N) for maximum output. Remove shunt.

10. Connect BC. dummy loop (Fig. 2) across loop terminals on rear of chassis.

MEGACYCLES TO CHANNEL NUMBERS

Cross index between frequency calibrations in megacycles on the dial and channel numbers follow:

Frequency in Megacycles	Channel No.	Frequency in Megacycles	Channel No.
87.9	200	98.9	255
88.9	205	99.9	260
89.9	210	100.9	265
90.9	215	101.9	270
91.9	220	102.9	275
92.9	225	103.9	280
93.9	230	104.9	285
94.9	235	105.9	290
95.9	240	106.9	295
96.9	245	107.9	300
97.9	250		

To find the frequency in megacycles for CHANNEL NUMBERS between those given above, add .2 megacycle for every whole number added to the CHANNEL NUMBER; for example Channel 204 would be 88.7 megacycles and 251 would be 98.1 megacycles.

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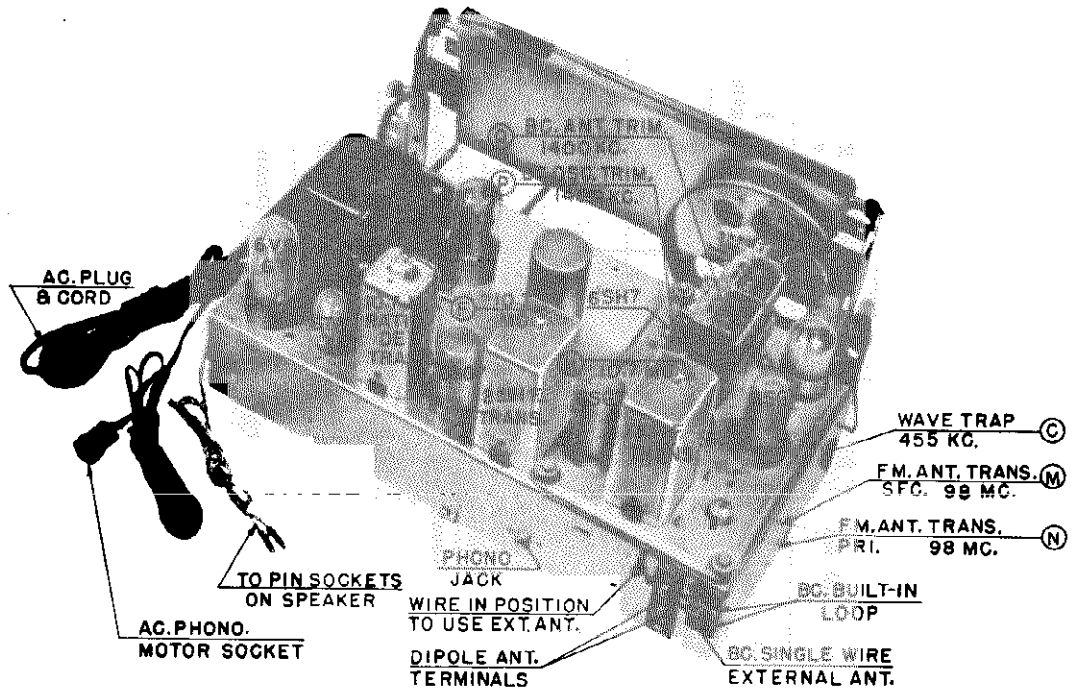
MODELS 9-201,
9-202M, 9-203

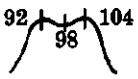
ALIGNMENT PROCEDURE

1. This receiver has been aligned at the factory for best performance, and no attempt should be made realign it unless the proper test equipment is available.
2. Turn the tuning condenser to full mesh against stop and position the pointer 2-3/8 inches from l side of dial background. In the FM band, the pointer is 5-7/16" from the left side at 98 mc. and in t AM band 8-13/32" from the left side for 1400 kc.
3. Connect the output meter across the speaker voice coil (3.2 ohms). Connect the CRO as indicated the alignment procedure notes.
4. Feed an R.F. amplitude modulated signal, modulated 30% at 400 cycles to the receiver as indicat in the alignment chart. When the FM signal generator is used, connect as indicated in the alignme chart. A 30% modulated signal is equal to a deviation of 22.5 kc.
5. Turn the volume control knob to maximum clockwise position and adjust the signal generator o put to produce a noticeable output meter reading. Keep the signal generator output as low as possi to prevent excessive AVC action in the receiver.
6. Set the tone control to treble position.
7. The broadcast band must be aligned with the built-in loop antenna connected. If the chassis is moved from the cabinet, a suitable dummy antenna consisting of a coil of 18.2 uh. inductance parallel with a 56 mmf. capacitor must be used. (See circuit)
8. The short lead wire with the spade lug on the rear of the chassis should be removed from the upp screw on the antenna terminal strip, if it is connected.
9. For complete receiver alignment, see the alignment procedure chart ------- and alignment pro dure notes.
10. For position of trimmers, refer to chassis rear view -------and socket voltage chart. — — (S schematic diagram - - - - for item No's.)



CHASSIS, REAR VIEW

ALIGNMENT PROCEDURE CHART

Step No.	Signal Generator Output			Position Of		Adjust	Type of Selectivity Curve	Output Meter	Remarks
	Frequency	In Series With	To	Band Switch	Tuning Dial or Tuning Cap.				
1	455 kc.	.01 mfd.	1st I. F. Grid	AM	Gang open	A		Max. Output	
2	455 kc.	.01 mfd.	Stator, 21 Plate Section of gang	AM	Gang open	B		Max. Output	See Note 1
3	455 kc.	.01 mfd.	Stator, 21 Plate Section of gang	AM	Gang open	C		Null	Adjust for Minimum Output
4	10.7 MC Unmodulated	1000 mmf.	Grid 2nd I. F.	FM	Gang closed	D			See Note 2
5	10.7 MC Unmodulated	1000 mmf.	Grid 2nd I. F.	FM	Gang closed	E			See Note 3
6	RF Sweep 450 kc. Marker 10.7 MC	1000 mmf.	Grid 1st I. F.	FM	Gang closed	F & G			See Note 4
7	RF Sweep 450 kc. Marker 10.7 MC	1000 mmf.	Stator, 3 Plate Section of gang	FM	Gang closed	H & I			See Note 5
8	FM; RF Gen. 98 MC	FM Dummy Ant.	Dipole ant. Terminals	FM	98 MC	J			See Note 6
9	FM; RF Gen. 92 MC	FM Dummy Ant.	Dipole ant. Terminals	FM	92 MC	K			See Note 7
10	FM; RF Gen. 104 MC	FM Dummy Ant.	Dipole ant. Terminals	FM	104 MC	L			See Note 8
11	FM Sweep Gen. 30 MC Marker Gen. 92-98-104 MC	FM Dummy Ant.	Dipole ant. Terminals	FM	Gang closed	M-N		Max. Output	See Notes 9
12	AM; RF Gen. 1400 kc.	200 mmf.	AM ant. Terminals	AM	1400 kc.	P		Max. Output	See Note 10
13	AM; RF Gen. 1400 kc.	200 mmf.	AM ant. Terminals	AM	1400 kc.	Q		Max. Output	

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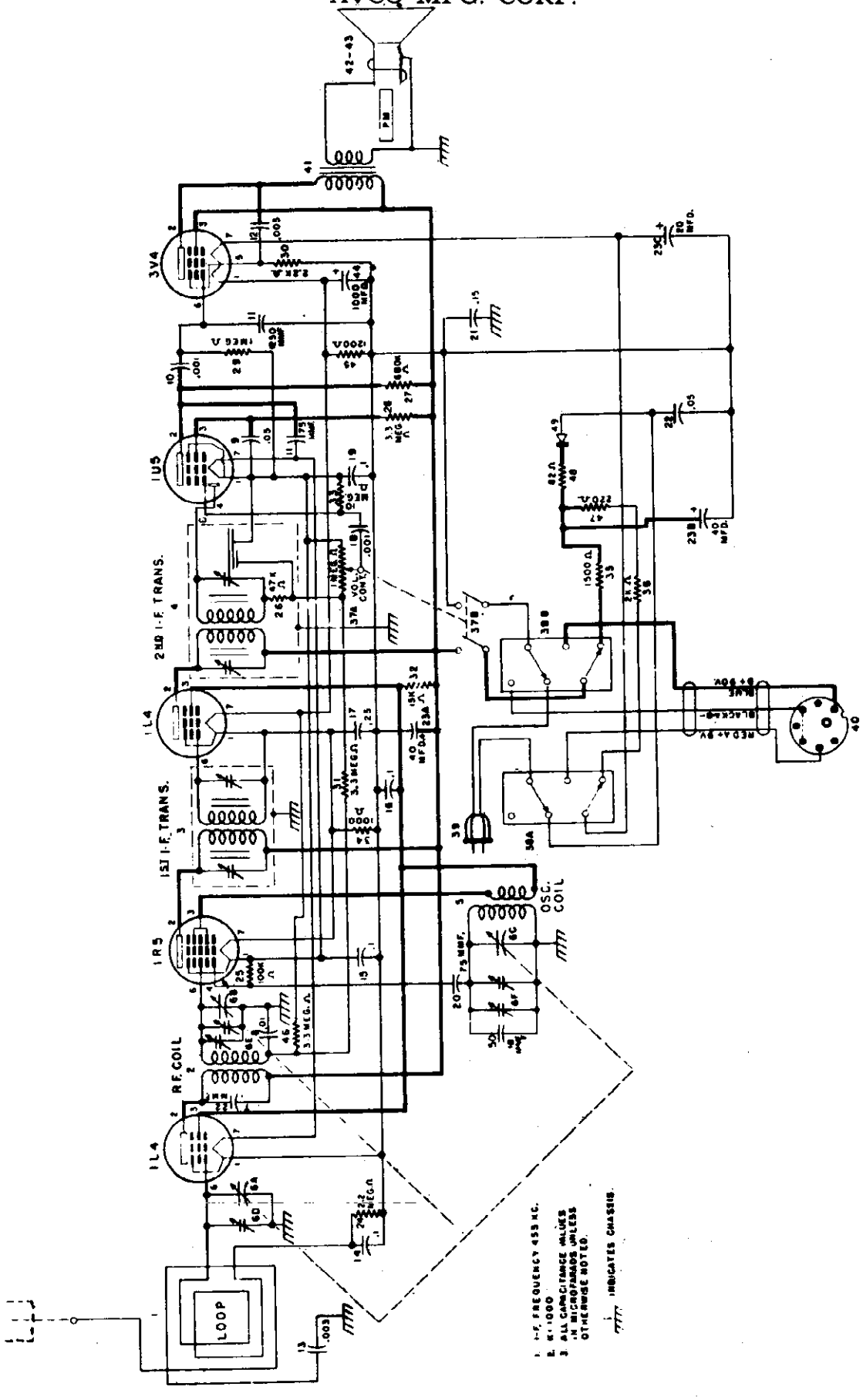
MODELS 9-201,
9-202M, 9-203I

Figures in First Column Correspond to Figures in Schematic Diagram

Item No.	Part No.	Description
1	143650	Coil, Antenna (F.M.)
2	144010	Coil, Antenna (B.C.)
3	143179	Coil, Wave Trap, 455 Kc.
4	143502	Coil, R.F. (F.M.)
5	143090	Transformer, 1st I.F.
6	143105	Transformer, 2nd I.F.
7	143378	Transformer, Ratio Det.
8	143305	Coil Assy., Oscillator (F.M.)
9	143752	Coil, Choke
10	143180	Coil, Osc. (B.C.)
11	143752	Coil, Choke
12	136720	Coil, Choke (Heater)
13A	142775	Condenser, Variable }
13B		Condenser, Variable } Three Section
13C		Condenser, Variable }
14	137219-4	Condenser, Trimmer
15	137219-5	Condenser, Trimmer
16	143014	Condenser, Trimmer
17	143686-2	Condenser, 33 mmf., 500 v., ceramic
18	137727-1	Condenser, 100 mmf., 300 v., ceramic
19	39001-13	Condenser, .01 mfd., 600 v., paper
20	39001-13	Condenser, .01 mfd., 600 v., paper
21	39001-13	Condenser, .01 mfd., 600 v., paper
22	137727-48	Condenser, .005 mfd., 500v., ceramic
23	139115-5	Strip, Copper
24	143223-10	Condenser, 330 mmf., 500 v., mica
25	39001-13	Condenser, .01 mfd., 600 v., paper
26	39001-13	Condenser, .01 mfd., 600 v., paper
27	39001-13	Condenser, .01 mfd., 600 v., paper
28	39001-13	Condenser, .01 mfd., 600 v., paper
29	39001-13	Condenser, .01 mfd., 600 v., paper
30	39001-13	Condenser, .01 mfd., 600 v., paper
31	39001-13	Condenser, .01 mfd., 600 v., paper
32	139692	Loop Ant. (Transmission Line)
33	137727-8	Condenser, 1000 mmf., 300 v., ceramic
34	137398-5	Condenser, 3.3 mmf., 500 v., ceramic
35	137727-53	Condenser, 33 mmf., 500 v., ceramic
36	143112	Condenser, 50 mmf., ceramic
37	137727-53	Condenser, 33 mmf., 500 v., ceramic
38	137727-8	Condenser, 1000 mmf., 300 v., ceramic
39	137727-8	Condenser, 1000 mmf., 300 v., ceramic
40	137727-44	Condenser, 10 mmf., 500 v., ceramic
41	137727-8	Condenser, 1000 mmf., 300 v., ceramic
42	39001-13	Condenser, .01 mfd., 600 v., paper
43	39001-13	Condenser, .01 mfd., 600 v., paper
44	39001-11	Condenser, .005 mfd., 600 v.,paper
45	39001-1	Condenser, 100 mmf., 600 v., paper
46	137727-8	Condenser, 1000 mmf., 500 v., ceramic
47	39001-80	Condenser, .02 mfd., 600 v., paper
48	39001-11	Condenser, .005 mfd., 600 v., paper
49	137727-8	Condenser, 1000 mmf., 300 v., ceramic
50	137727-8	Condenser, 1000 mmf., 300 v., ceramic
51A	143089	Condenser, 40 mfd., 450 v. } Four
51B		Condenser, 20 mfd., 450 v. } Section
51C		Condenser, 10 mfd., 450 v. } Elect.
51D		Condenser, 20 mfd., 25 v. } Filter
52	142958	Condenser, 4 mfd., 50 v., Elect.
53	39373-92	Resistor, 1.0 megohm, ½ w.
54	39373-80	Resistor, 220,000 ohms, ½ w.
55	39373-67	Resistor, 47,000 ohms, ½ w.
56	39373-40	Resistor, 2,200 ohms, ½ w.
57	39373-40	Resistor, 2,200 ohms, ½ w.
58	39373-92	Resistor, 1.0 megohm, ½ w.
59	39373-77	Resistor, 150,000 ohms, ½ w.
60	39373-40	Resistor, 2,200 ohms, ½ w.
61	39373-67	Resistor, 47,000 ohms, ½ w.
62	39373-40	Resistor, 2,200 ohms, ½ w.
63	143513	Record Changer (W-148)
64	39373-60	Resistor, 22,000 ohms, ½ w.
65	39373-21	Resistor, 270 ohms, ½ w.
66	39373-65	Resistor, 39,000 ohms, ½ w.
67	39373-174	Resistor, 33,000 ohms, 1 w.
68	39373-64	Resistor, 33,000 ohms, ½ w.
70	39373-71	Resistor, 68,000 ohms, ½ w.
71	39373-64	Resistor, 33,000 ohms, ½ w.
72	39373-60	Resistor, 22,000 ohms, ½ w.
73	39373-40	Resistor, 2,200 ohms, ½ w.
74	39373-97	Resistor, 2.2 megohm, ½ w.
75	39373-64	Resistor, 33,000 ohms, ½ w.
76	39373-107	Resistor, 10 megohm, ½ w.
77	39373-62	Resistor, 27,000 ohms, ½ w.
78	39373-84	Resistor, 330,000 ohms, ½ w.
79	39371-5	Resistor, 1,000 ohms, 10 w.
80	39373-253	Resistor, 1,000 ohms, 2 w.
81	39373-87	Resistor, 470,000 ohms, ½ w.
82	39373-131	Resistor, 270 ohms, 1 w.
83	39368-14	Control, Volume, (1 megohm), Kn
84A	39368-22	Control, Tone (3 megohm)
	39370-2	Shaft, Tone Control (Knurled)
84B	39369-1	Switch, Power
85A	142968	Switch, Band }
85B		Switch, Band } Three Section
85C		Switch, Band }
86	135105	Transformer, Power
87	138131-2	Transformer, Output
88	144068	Cable and Pin Assy., Speaker
89	139727-5	Cable, Phono Motor
90	132300-2	Cable and Plug Assy., Power
91	39019-3	Terminal Board, Antenna
92	143404	Terminal Board, Loop antenna
93	138762-5	Speaker
94	137398-5	Condenser, 3.3 mmf., 500 v.
95	143606	Coil, Band Pass (B.C.)
96	136998	Phono Jack
97	138437-1	Bulb (Dial), Type 47, 6-8 v., .15 an
98	138437-1	Bulb (Dial), Type 47, 6-8 v., .15 an
99	39373-92	Resistor, 1 megohm, ½ w.
100	39373-64	Resistor, 33,000 ohms, ½ w.
	143397	Background Assy., Dial
	41405-2CP	Bushing, Sub-Chassis Mtg.
	139477-1	Button, Loop (with shoulder)
	139477-2	Button, Loop (without shoulder)
	136853	Cushion, Rubber (Dial Mtg.)
	143413	Dial Glass
	143700	Escutcheon, Dial
	46065	Grommet, Rubber, Sub-Chassis M
	45056	Grommet, Chassis Support Bracke
	39012-84	Iron Core, 1st I.F.
	39012-84	Iron Core, 2nd I.F.
	138576-6	Knob
	143778	Knob (Band Switch)
	45580	Mounting, Rubber (Speaker)
	143414	Pointer, Dial
	143453	Pulley and Hub Assy. (Variable Condenser)
	136979	Pulley, Dial Drive Idler
	143513	Record Changer (W-148)
	51071	Ring, Retaining (Dial Drive Shaft
	39220-40CP	Screw, Chassis Mtg. (9-202M)
	39220-38CP	Screw, Chassis Mtg. (9-201)
	39220-30CP	Screw, Chassis Mtg.
	136565-24	Socket, Dial Light
	39232-1	Socket, Tube, Octal
	136470	Socket, Loctal
	143114	Socket, 9 prong
	143398	Shaft, Drive Dial
	137148	Spacer
	51752	Spring, Dial Drive Cord
	143552	Strip, Dial Pointer
	135038-51	Terminal Strip, Six Lug
	135038-4	Terminal Strip, One Lug
	135038-56	Terminal Strip, Two Lug
	135038-57	Terminal Strip, Seven Lug
	142756	Tuning Blade, F.M. Osc.
	134916	Washer, Spring (Dial Drive Shaft

MODEL 9-302

CROSLEY DIV.
AVCO MFG. CORP.



CROSLEY DIV.
AVCO MFG. CORP.
MODEL 9-302

ALIGNMENT PROCEDURE

1. Turn the tuning condenser to the completely closed position against the stop and set the dial poin to the reference line at the 550 kilocycle end of the scale.
2. Connect the output meter across the speaker voice coil.
3. Connect a 47,000 ohm resistor from the antenna trimmer lug on the tuning condenser to the lug the terminal board next to the tuning condenser.
4. Connect the high side of the signal generator, through a 200 mmf. condenser, to the antenna trimm lug. Connect the signal generator ground through a 0.1 mmf. condenser to B—(Black wire or El trolytic Filter Condenser.)
5. Turn the volume control on full and adjust the signal generator output to produce approximately mi scale deflection of the output meter, but maintain signal generator output as low as possible to pr vent AVC action in the receiver.

ALIGNMENT CHART

Alignment adjustment locations are shown on Chassis View—Model 9-302

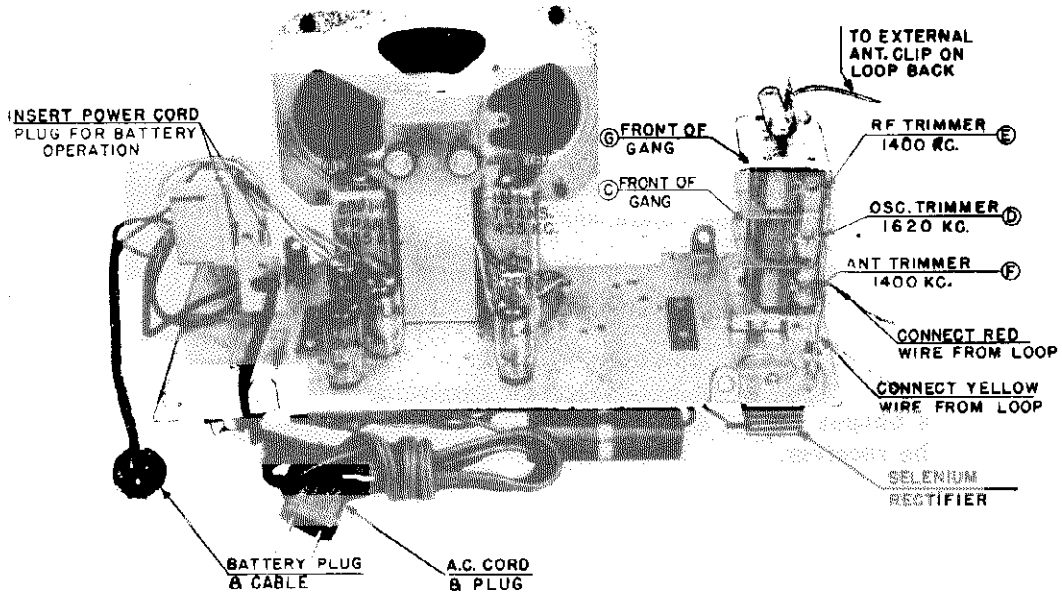
Alignment Sequence	Signal Generator Output			Position of Dial pointer or Var. Cond.	Adjust for Maximum Output	Remarks
	Frequency in KC	In Series with	To			
1	455	200 mmf.	Antenna Trimmer Lug	Closed	A & B	See steps 3 & 4 of Alignment procedure
2	1620	200 mmf.	Antenna Trimmer Lug	Open	D	See note 1 of Alignment notes
3	1400	200 mmf.	Antenna Trimmer Lug	1400 kc	E	See note 2 of Alignment notes
4	1400	200 mmf.	Antenna Clip	1400 kc	F	See note 3 of Alignment notes

ALIGNMENT NOTES

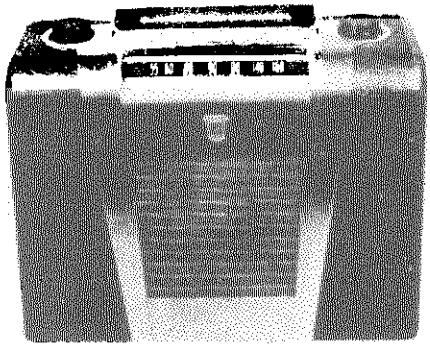
1. Preset "C" to ⅛ turn from its closed position before adjusting "D".
2. Preset "G" to ¼ turn from its closed position before adjusting "E".
3. Remove the 47,000 ohm resistor from the antenna trimmer lug and the Terminal board lug. Repla the chassis in the cabinet, install the battery pack in the cabinet under the chassis and close the cab net back panel. Remove the hole plug from the cabinet back and adjust trimmer "F". Replace ho plug.

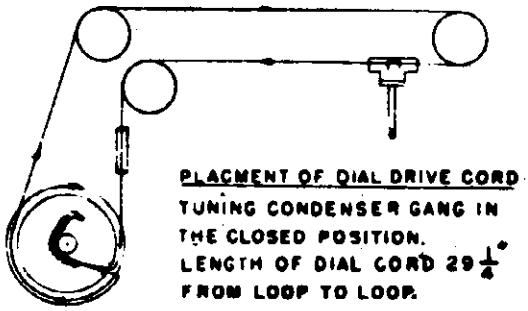
MODEL 9-302

CROSLEY DIV.
AVCO MFG. CORP.

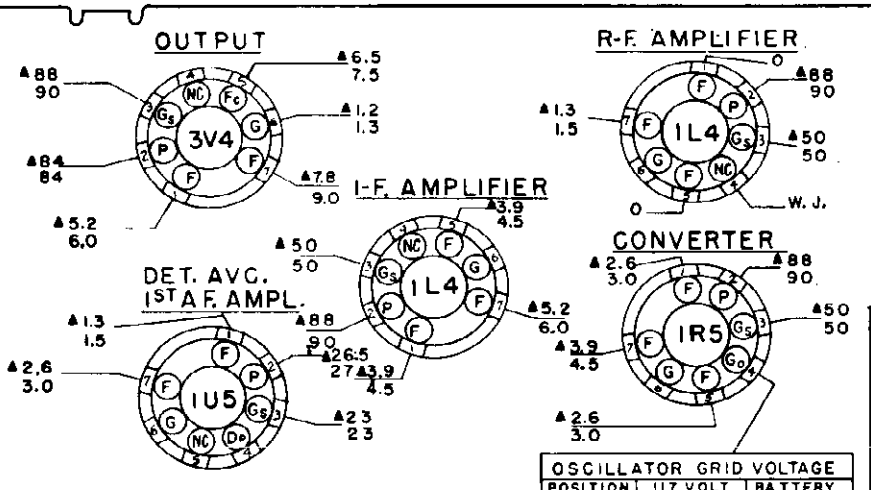


CHASSIS, TOP VIEW





PLACMENT OF DIAL DRIVE CORD
TUNING CONDENSER GANG IN THE CLOSED POSITION.
LENGTH OF DIAL CORD 29 1/4"
FROM LOOP TO LOOP.



OSCILLATOR GRID VOLTAGE		
POSITION OF GANG	117 VOLT OPERATION	BATTERY OPERATION
CLOSED	▲ −4	−3.8
OPEN	▲ −8.6	−8.2

NOTES:
1. BOTTOM VIEW OF TUBE SOCKETS.
2. VOLTAGES MEASURED WITH AN ELECTRONIC VOLTMETER FROM SOCKET LUG TO B−.
3. W. J. = WIRING JUNCTION.
4. N.C. = NO CONNECTION.
5. ▲ = VOLTAGES MEASURED WITH RADIO PLUGED INTO 117 VOLT, 60 CYCLE LINE.
6. ✱ = 60 CYCLE VOLTAGE.
7. ALL OTHER VOLTAGES MEASURED IN BATTERY OPERATION POSITION WITH "A" = 9 VOLTS, "B" = 90 VOLTS.
8. SOCKET VOLTAGE TOLERANCE 10%.

SOCKET VOLTAGE CHART

CROSLEY DIV.
AVCO MFG. CORP.

DESCRIPTION

TYPE: Five-tube, combination, battery Portable and AC-DC Superheterodyne with Selenium Rectifier.

FREQUENCY RANGE: 540 to 1600 kilocycles.

INTERMEDIATE FREQUENCY: 455 kc.

POWER SUPPLY: AC-DC or Battery.

VOLTAGE RATING: AC-DC, 110 to 120 volts. Battery "A" 7½ volts, "B" 90 volts.

POWER OUTPUT: 200 M.W. maximum

POWER CONSUMPTION: 15 watts at 125 volts, 60 cycle.

"A-B" BATTERY PACK: one Crosley CR68, 7.5 "A" volts—90 "B" volts.

TUBE COMPLEMENT:

Type	Function
1L4	R.F. Amplifier
1R5	Mixer
1L4	I.F. Amplifier
1U5	Detector, AVC, 1st A.F. Amplifier
3V4	A.F. Power Output

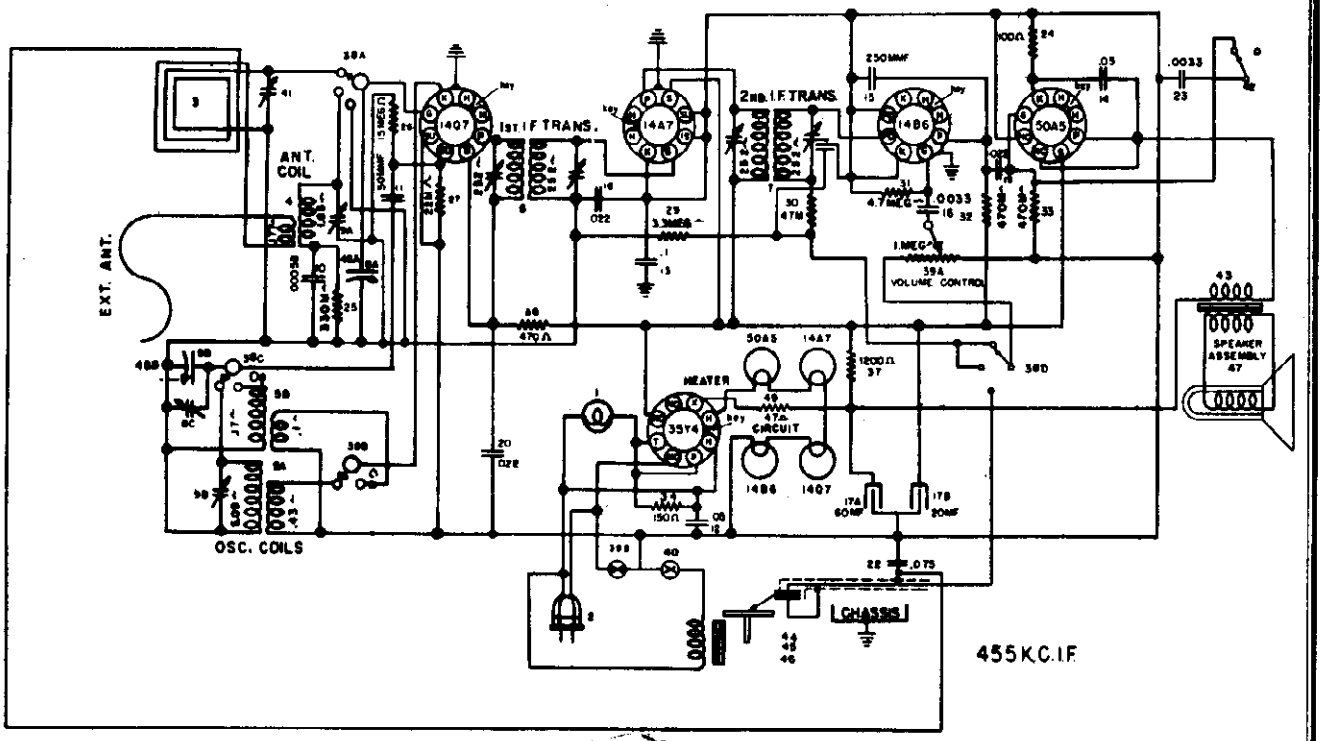
REPLACEMENT PARTS LIST—MODEL 9-302

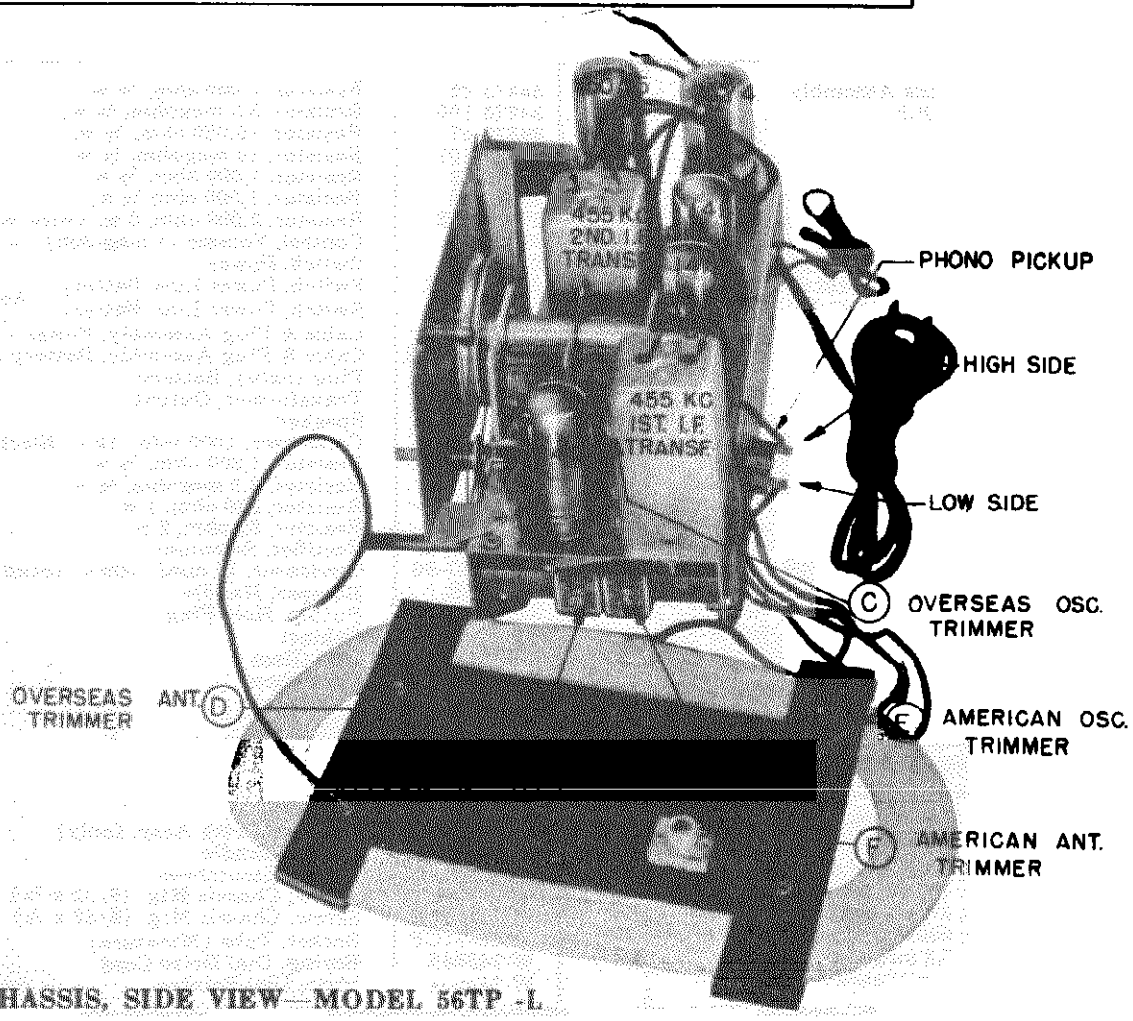
Figures in the first column correspond to figures in Schematic Diagram.

Item No.	Part No.	Description
1	AC-143080	Loop Antenna Assembly
2	AW-136966	Coil Assy., R.F.
3	AW-136288	Transformer, 1st I.F.
4	AW-136289	Transformer, 2nd I.F.
5	AW-144209	Coil Assy. Oscillator
6A	AB-143151	Condenser, Variable } Three Section Assy.
6B		Condenser, Variable } Includes Pulley and
6C		Condenser, Variable } Pinion Drive Assy. AB-143140
	AB-143140	Pulley & Pinion Drive Assy. only. (Var. Cond.)
6D	Part of Item 6A	Condenser, Trimmer
6E	Part of Item 6B	Condenser, Trimmer
6F	Part of Item 6C	Condenser, Trimmer
7	C-137727-58	Condenser, 22 mmf., 300 v., ceramic
8	39001-13	Condenser, .01 mfd., 600 v., paper
9	39001-17	Condenser, .05 mfd., 600 v., paper
10	39001-7	Condenser, .001 mfd., 600 v., paper
11	C-137727-22	Condenser, 75 mmf., 500 v., ceramic
12	39001-76	Condenser, .003 mfd., 600 v., paper
13	39001-76	Condenser, .003 mfd., 600 v., paper
14	39001-19	Condenser, .1 mfd., 600 v., paper
15	39001-19	Condenser, .1 mfd., 600 v., paper
16	39001-19	Condenser, .1 mfd., 600 v., paper
17	39001-87	Condenser, .25 mfd., 600 v., paper
18	39001-7	Condenser, .001 mfd., 600 v., paper
19	39001-19	Condenser, .1 mfd., 600 v., paper
20	C-137727-22	Condenser, 75 mmf., 500 v., ceramic
21	39001-19	Condenser, .1 mfd., 600 v., paper
22	39001-17	Condenser, .05 mfd., 600 v., paper
23A	B-136294	Condenser, 40 mfd., 100 v. } Three Section Electric Filter
23B		Condenser, 40 mfd., 150 v. }
23C		Condenser, 20 mfd., 10 v. }
24	39373-97	Resistor, 2.2 megohm, ½ w.
25	39373-74	Resistor, 100,000 ohm, ½ w.
26	39373-67	Resistor, 47,000 ohm, ½ w.
27	39373-90	Resistor, 680,000 ohm, ½ w.
28	39373-100	Resistor, 3.3 megohm, ½ w.
29	39373-92	Resistor, 1. megohm, ½ w.
30	39373-40	Resistor, 2,200 ohm, ½ w.
31	39373-100	Resistor, 3.3 megohm, ½ w.
32	39373-57	Resistor, 15,000 ohm, ½ w.
33	39373-107	Resistor, 10 megohm, ½ w.
34	39373-33	Resistor, 1,000 ohm, ½ w.
35	39373-36	Resistor, 1,500 ohm ½ w.
36	W-143123	Resistor, 2,000 ohm, 6 w. (wire-wou
37A	39368-14	Control, Volume (1 megohm)
37B	39369-2	Switch, Power
38A	AB-143068	Switch, Power Line-Battery } Assy.
38B		Switch, Power Line-Battery }
39	C-132300-3	Cable & Plug Assembly, Power
40	AB-139513-2	Cable & Plug Assembly, Battery
	W-134126	Plug (only), Battery
41	B-135878	Transformer, Output
42	138246	Speaker
44	B-135459	Condenser, 1000 mfd., 10 v., Elect.
45	39373-34	Resistor, 1,200 ohm, ½ w.
46	39373-100	Resistor, 3.3 megohm, ½ w.
47	39373-129	Resistor, 220 ohm, 1 w.
48	39373-233	Resistor, 82 ohm, 2 w.
49	B-143883-2	Rectifier, Selenium
50	C-137727-66	Condenser, 18 mmf., 500 v., ceramic
	39354-23	Bumper, Handle
	39176-72CP	Button, Hole Plug
	R-143031	Cabinet
	C-143121	Dial Glass
	D-143124	Escutcheon
	AB-139484-2	Handle
	W-135590-3	Knob
	C-143139	Plate, Dial Background
	B-139482	Pointer, Dial
	AW-139424	Pulley & Bracket Assy., Idler (Dial Drive)
	AB-143140	Pulley & Drive Assy. (only)
	W-143146	Screw, Handle
	W-51752	Screw, Escutcheon
	W-138171	Screw, Chassis Mtg. (8/32 x ⅜)
	39458-42	Screw, Chassis Mtg. (8/32 x ⅝)
	39176-71CP	Socket, Tube (Minature)
	W-143846	Spring, Dial Drive Cord
	W-143054	Strip, Dial Pointer

MODEL 56TP-L

CROSLEY DIV.
AVCO MFG. CORP.





CHASSIS, SIDE VIEW—MODEL 56TP-L

CROSLEY DIV.
AVCO MFG. CORP.

ALIGNMENT PROCEDURE

1. Turn the tuning condenser to the completely closed position against the stop and set the dial pointer to the reference line at the end of the dial scale.
2. Connect the output meter across the speaker voice coil.
3. The r.f. signal input from the signal generator should be connected to the external antenna lead. Connect the signal generator ground through a 0.1 mfd. condenser to —B (pin 3 on 12SK7 tube socket).
4. Turn the volume control on full and adjust the signal generator output to produce approximately mid-scale deflection of the output meter, but maintain signal generator output as low as possible to prevent AVC action in the receiver.

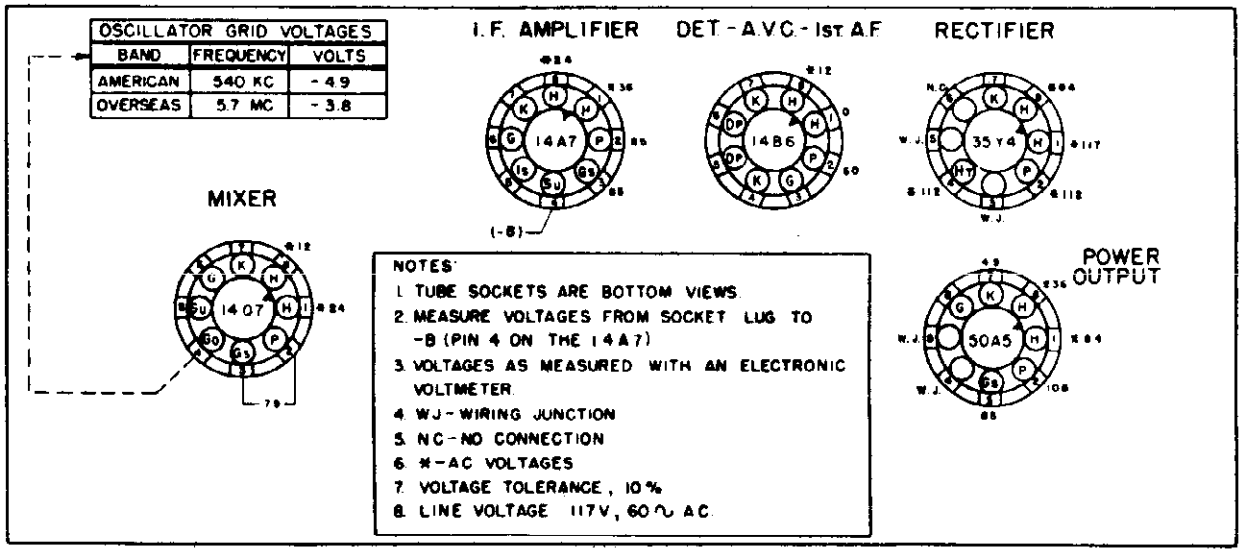
ALIGNMENT CHART

Alignment adjustment locations are shown on Chassis, Side View—Model 56TP -L

Alignment Sequence	Signal Generator Output			Position of		Adjust for Maximum Output
	Frequency in kc.	In Series with	To	Band Switch	Tuning Dial	
1	455	200 mmf.	Ant.	Left	1,620	A & B
2	15,300	400 ohms	Ant.	Right	15,300	C
3	15,000	400 ohms	Ant.	Right	15,000	D
4	1,620	200 mmf.	Ant.	A	1,620	E
5	1,400	200 mmf.	Ant.	A	1,400	F

NOTE: When aligning the short-wave oscillator trimmer (C), be sure that the circuit is aligned at the correct frequency and not at the image frequency which is 910 kilocycles lower as indicated by the receiver dial. To check: Tune in the generator frequency, then increase the generator output and tune in the image frequency. The image frequency should be weaker than the fundamental and audible 910 kilocycles lower on the receiver dial. If the image cannot be tuned in, the oscillator trimmer is adjusted to the wrong peak; i.e., the oscillator trimmer may be adjusted to the image or one of the harmonics instead of the fundamental frequency. The correct peak is the second one heard as the trimmer adjustment screw is opened from the completely closed position.

SOCKET VOLTAGE CHART



MODEL 56TP-L

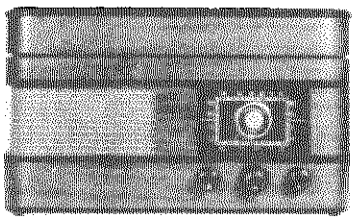
CROSLEY DIV.
AVCO MFG. CORP.

Figures in first column correspond to figures in schematic diagram.

Item No.	Part No.	Description
1	W-48858	Bulb (Dial Light, Type 47, 6.3 v., .15 amp)
2	C-132300-1	Cable and Plug (Power)
3	AC-134605	Antenna Loop Assembly
4	AW-134994	Antenna Coil Assembly
5A	AW-134993	Coil (B. C. Oscillator) } Two
5B		Coil (H. F. Oscillator) } Section
6	AW-134065	Transformer (1st I. F.)
7	AW-134158	Transformer (2nd I. F.)
8A	B-134995	Condenser (Variable) } Two
8B		Condenser (Variable) } Section
8C	Part of Item #8B	Condenser (Trimmer)
9A	AB-134982	Condenser (Trimmer) } Two
9B		Condenser (Trimmer) } Section
10	GC-210685-143	Condenser, 580 mmf., 300 v., Mica
11	B-226638-53	Condenser, 50 mmf., 500 v., Mica
12	39001-65	Condenser, .05 mfd., 200 v., Paper
13	39001-67	Condenser, .1 mfd., 200 v., Paper
14	39001-65	Condenser, .05 mfd., 200 v., Paper
15	39001-73	Condenser, 250 mmf., 500 v., Mica
16	39001-10	Condenser, 3300 mmf., 600 v., Paper
17A	W-134988	Condenser, 60 mfd., 150 w.v. } Two Section Elect. Filter
17B		Condenser, 20 mfd., 100 w.v. }
18	39001-63	Condenser, .022 mfd., 200 v., Paper
19	39001-63	Condenser, .022 mfd., 200 v., Paper
20	39001-63	Condenser, .022 mfd., 200 v., Paper
22	39001-66	Condenser, .075 mfd., 200 v., Paper
23	39001-10	Condenser, 3300 mmf., 600 v., Paper
24	39281-7	Resistor, 100 ohm, ½ w.
25	39281-28	Resistor, 330,000 ohm, ½ w.
26	39281-38	Resistor, 15 megohm, ½ w.
27	39281-21	Resistor, 22,000 ohm, ½ w.
29	39281-34	Resistor, 3.3 megohm, ½ w.
30	39281-23	Resistor, 47,000 ohm, ½ w.
31	39281-35	Resistor, 4.7 megohm, ½ w.
32	39281-29	Resistor, 470,000 ohm, ½ w.
33	39281-29	Resistor, 470 000 ohm, ½ w.
34	39281-8	Resistor, 150 ohm, ½ w.
36	39281-11	Resistor, 470 ohm, ½ w.
37	39015-26	Resistor, 1200 ohm, 1 w.
38A	B-134720	Switch (Band Change) } Four Section
38B		Switch (Band Change) }
38C		Switch (Band Change) }
38D		Switch (Band Change) }
39A	C-46846-6	Control, Volume (1 megohm) } Assembly
39B		Switch (Power) }
41	Part of Item #3	Condenser (Antenna Trimmer)
42	W-134939	Switch (Tone Control)
43	B-134940	Transformer (Output)
44	C-134724	Phono. Motor and Spindle Assembly
46	B-134245	Tone Arm and Cartridge Assembly
47	B-135023	Speaker
49	W-137367	Resistor, 47 ohm, 1 w.

Item No.	Part No.	Description
	W-134939	Switch, S. P. S. T. (Slide Type)
	W-135371	Socket (Tube)
	39017-4	Socket (Dial Light) Assembly
	C-134869	Face (Dial)
	B-134952	Pointer (Dial)
	W-134667	Clip (Dial Pointer)
	W-134917	Shaft (Drive)
	AB-134697	Toggle Link Assembly
	W-51071	Ring (Retaining)
	W-134916	Washer (Spring)
	W-49829	Spring (Lock)
	W-51752	Spring (Dial Cord)
	W-49770	Stud, Trimount (Dial Face and Chassis Bottom)
	W-136630	Stud, Trimount (Toggle Link)
	W-134055	Grommet
	R-135021	Cabinet
	B-134931	Lens (Dial)
	W-134882	Knob (Volume or Dial)
	W-134742	Knob (Tone)
	W-134924	Knob (Band Change)
	AB-134935	Floating Jewel Needle Assembly
	W-131126	Spring, Ratio Change
	136774-68	Pickup Cartridge
	136774-129	Phono Motor (only)
	131104	Turntable
	131098	Grommet (Motor Mounting)
	131101	Bushing (Motor Mounting)
	131102	Idler Wheel
	131207	Spindle (Turntable)
	131097	Phono Mounting Plate
	131103	Spring (Idler Wheel)

MODEL: 56TP-L



Reversing the position of the power plug when alternating current is used may reduce power hum. *Under no circumstances should a ground be connected to this receiver.*

TYPE: Five-tube, two-band, superheterodyne.

FREQUENCY RANGE: American Broadcast Band: 540 to 1600 kc. (Selector switch at A.)

Overseas Short-wave Band: 5.8 to 15 mc. (Selector switch at 0.)

INTERMEDIATE FREQUENCY: 455 kc.

POWER SUPPLY: 60 cycle a.c. only.

VOLTAGE RATING: 105-125 volts.

POWER CONSUMPTION: 35 watts nominal.

POWER OUTPUT: 1.5 watts minimum.

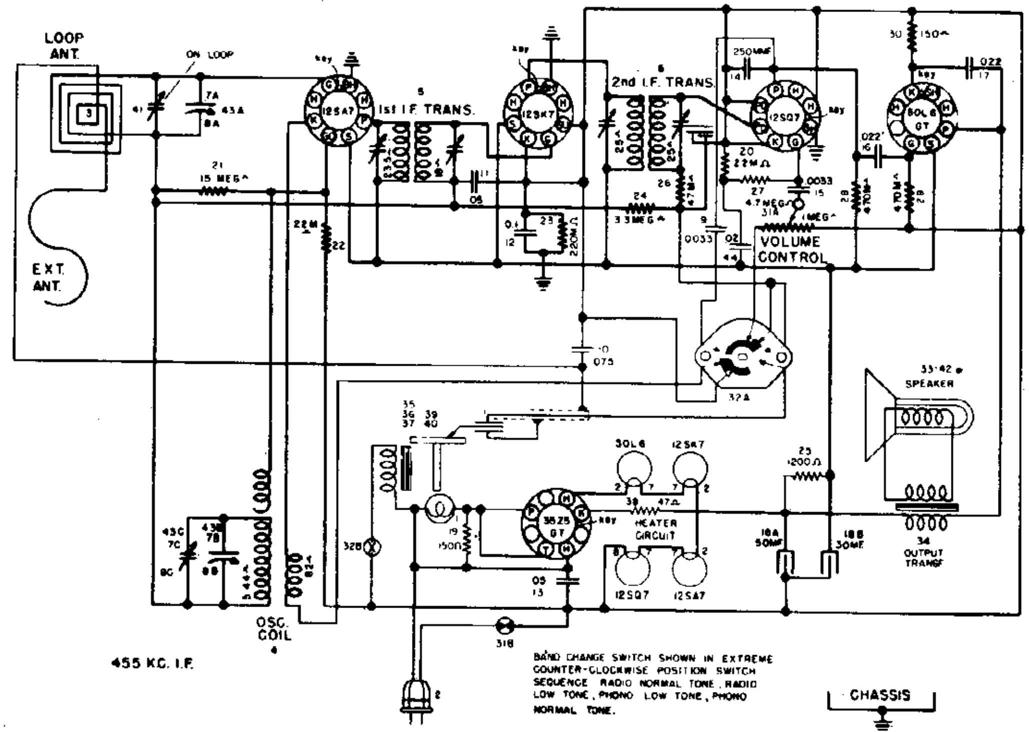
TUBE COMPLEMENT:

Type	Function
14Q7	Mixer
14A7	I. F. Amplifier
14B6	Detector, AVC, 1st A.F. Amplifier
50A5	A.F. Power Output
35Y4	Rectifier

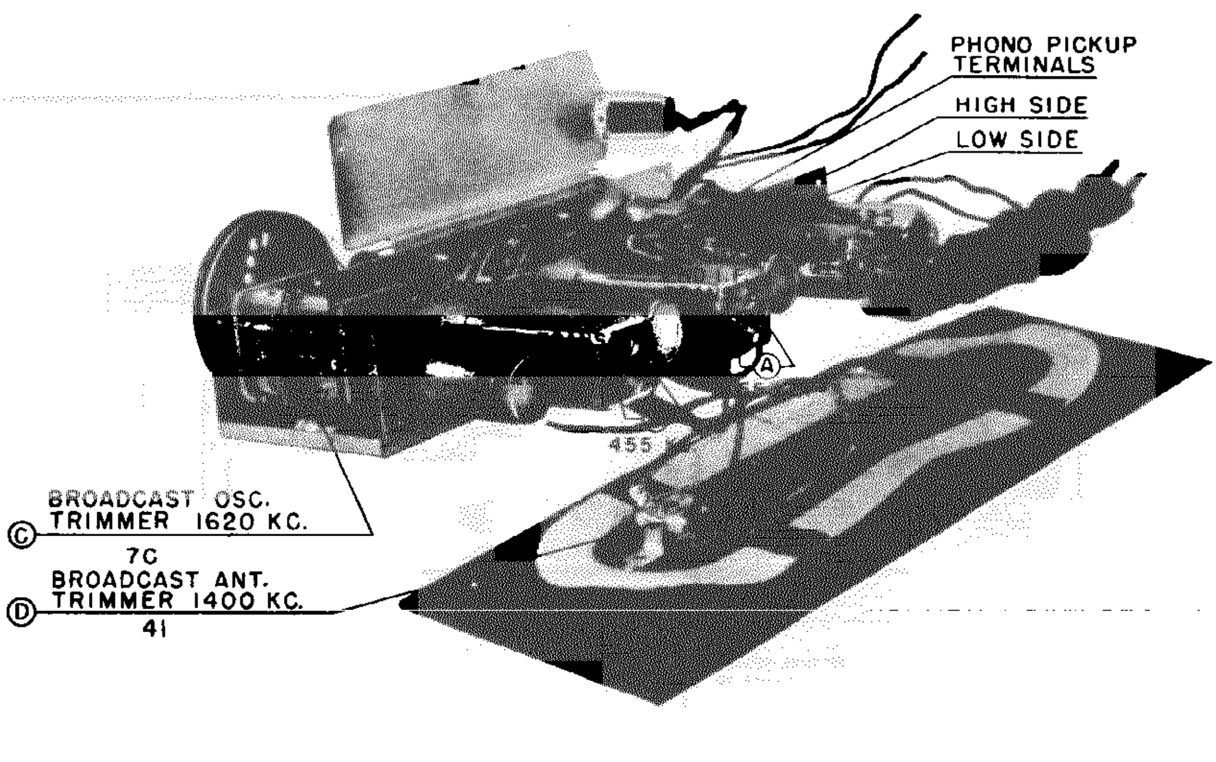
DIAL BULB: Type 47, 6.3 volts, .15 amp.

CROSLEY DIV.
AVCO MFG. CORP.

MODELS 56TR
56TS



Reversing the position of the power plug may reduce power hum.
Under no circumstances should a ground be connected to this receiver.



CHASSIS, SIDE VIEW—MODELS: 56TR, 56TS

MODELS 56TR, 56TS

CROSLEY DIV.
AVCO MFG. CORP.

ALIGNMENT PROCEDURE

1. Turn the tuning condenser to the completely closed position against the stop and set the dial pointer to the reference line at the end of the dial scale.
2. Turn tone control switch to normal tone position.
3. Connect the output meter across the speaker voice coil.
4. The r.f. signal input from the signal generator should be connected to the external antenna clip. Connect the signal generator ground through a 0.1 mfd. condenser to—B (pin 3 on 12SK7 tube socket).
5. Turn the volume control on full and adjust the signal generator output to produce approximately mid-scale deflection of the output meter, but maintain signal generator output as low as possible to prevent AVC action in the receiver.

ALIGNMENT CHART

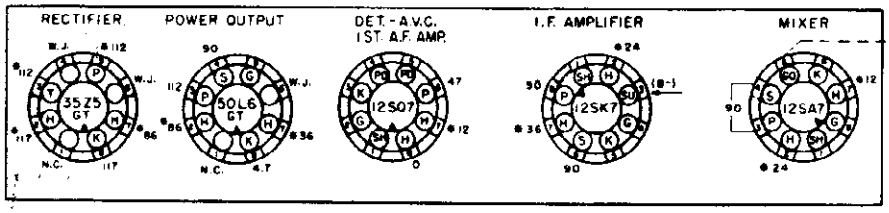
Alignment adjustment locations are shown on Chassis, Side View—Models 56TR, 56TS

Alignment Sequence	Signal Generator Output			Position of		Adjust for Maximum Output
	Frequency in kc.	In Series with	To	Band Switch	Tuning Dial	
1	455	200 mmf.	Ant.	Right	1620	A & B
2	1620	200 mmf	Ant.	Right	1620	C
3	1400	200 mmf	Ant.	Right	1400	D

Note: Model 56TS uses the Model G-5 (Part No. D-134921) automatic record changer. and parts list.

SOCKET VOLTAGE CHART

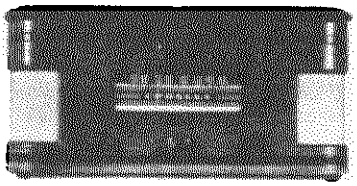
OSCILLATOR GRID VOLTAGE		
BAND	FREQUENCY	VOLTS
AMERICAN	540 KC	-5.5



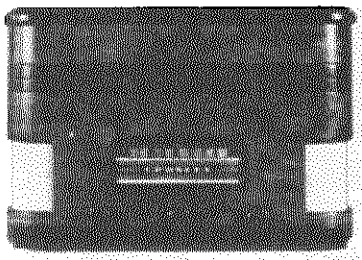
NOTES:
1. THESE ARE BOTTOM VIEWS OF TUBE SOCKETS.
2. MEASURE VOLTAGES FROM SOCKET LUGS TO "B-" (PIN 3 ON THE 12SK7).
3. THESE VOLTAGES WERE MEASURED USING AN ELECTRONIC VOLTMETER.
4. W.J. — WIRING JUNCTION.
5. N.C. — NO CONNECTION.
6. @ — 60 CYCLE A.C. VOLTAGES.
7. SOCKET VOLTAGE TOLERANCE, 10%.
8. LINE VOLTAGE 117 V, 60~ A.C.

CROSLEY DIV.
AVCO MFG. CORP.

MODELS 56TR, 56TS



56TR



56TS

TYPE: Five-tube superheterodyne.

FREQUENCY RANGE: 540 to 1600 kc.

INTERMEDIATE FREQUENCY: 455 kc.

POWER SUPPLY: 60 cycle a.c. only.

VOLTAGE RATING: 105-125 volts.

POWER CONSUMPTION:
Radio position—30 watts.
Phono position—45 watts.

POWER OUTPUT: 1.5 watts minimum.

TUBE COMPLEMENT:

Type	Function
12SA7	Converter
12SK7	I.F. Amplifier
12SQ7	Detector, AVC, 1st I.F. Amplifier
50L6GT	A.F. Power Output
35Z5GT	Rectifier

DIAL BULB: Type 47, 6.3 volts, .15 amp.

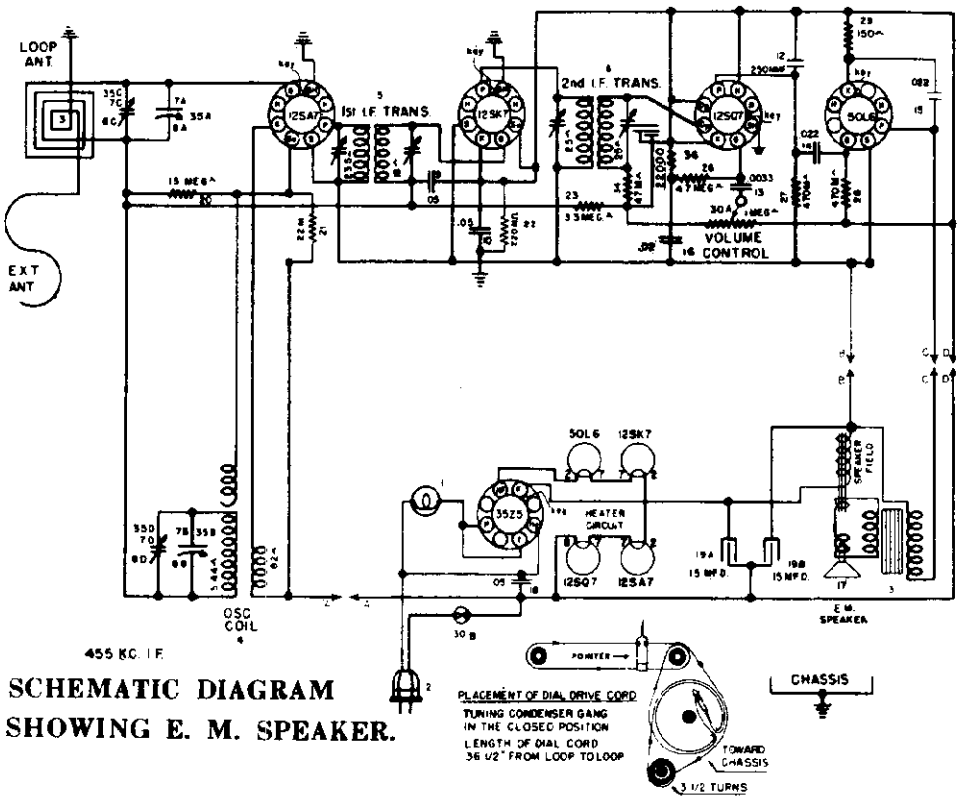
Figures in first column correspond to figures in schematic diagram.

Item No.	Part Number	Description
1	W-48858	Bulb (Dial), Type 47, 6.3 v., .15 amp.
2	C-132300-1	Cable & Plug (Power)
3	AC-135840	Ant. Loop & Back Assy.
4	AW-135730	Coil Assy., Oscillator
5	AW-135729	Transformer, 1st I. F.
6	AW-135731	Transformer, 2nd I. F.
7A	B-135570	Condenser, Variable (Two
7B		Condenser, Variable Section
7C	Part of Item #7B	Condenser, Trimmer
9	39001-76	Condenser, .003 mfd., 600 v., Paper
10	39001-17	Condenser, .05 mfd., 600 v., Paper
11	39001-17	Condenser, .05 mfd., 600 v., Paper
12	39001-19	Condenser, .1 mfd., 600 v., Paper
13	39001-17	Condenser, .05 mfd., 600 v., Paper
14	39001-73	Condenser, 250 mmf., 600 v., Paper
15	39001-76	Condenser, .003 mfd., 600 v., Paper
16	39001-80	Condenser, .02 mfd., 600 v., Paper
17	39001-80	Condenser, .02 mfd., 600 v., Paper
**18A	B-136770	Condenser, 50 mfd., 150 w.v. (Two
**18B		Condenser, 30 mfd., 150 w.v. Section
19	39294-8	Resistor, 150 ohm, ½ w.
**20	39294-21	Resistor, 22,000 ohm, ½ w.
21	39294-38	Resistor, 15.0 megohm, ½ w.
22	39294-21	Resistor, 22,000 ohm, ½ w.
23	39294-27	Resistor, 220,000 ohm, ½ w.
24	39294-34	Resistor, 3.3 megohm, ½ w.
25	39015-26	Resistor, 1200 ohm, 1 w.
26	Part of Item #6	Resistor, 47,000 ohm, ½ w.
27	39294-35	Resistor, 4.7 megohm, ½ w.
28	39294-29	Resistor, 470,000 ohm, ½ w.
29	39294-29	Resistor, 470,000 ohm, ½ w.
30	39294-8	Resistor, 150 ohm, ½ w.
31A	B-135692	Control, Volume (1.0 megohm) Assy.
31B		Switch, Power (Radio) Assy.
*	39368-14	Control, Volume
*	39369-1	Switch, Power (Radio)
32A	B-135641	Switch (Radio, Phono, Tone) Assy.
32B		Switch, Power (Phono.) Assy.
33	C-135633	Speaker (Less Transformer)
34	B-137723	Transformer, Output
36	D-134921	Record Changer, G5 (56TS)
37	C-134724	Phono Motor & Turntable Assy. (56TR)
38	W-137367	Resistor, 47 ohm. 1 w.
39	B-134245	Tone Arm & Cartridge Assy. (56TR)
41	Part of Item #3	Condenser, Trimmer
**44	39001-80	Condenser, .02 mfd., 600 v. Paper

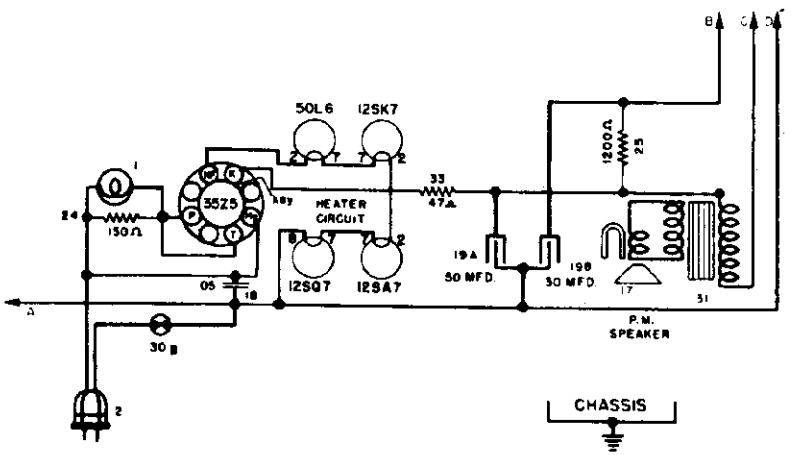
Item No.	Part Number	Description
	G-39204	Socket, Tube
	D-136565-15	Socket, Dial Light
	AB-135575	Plate & Stud Assy., Dial
	W-135074	Pulley, Idler (Wood)
	W-131154-1	Cotter, External (Idler Pulley)
	W-51752	Spring, Dial Drive Cord
	B-135460	Pointer, Dial
	B-135568	Shaft, Drive
	W-51071	Ring, Retaining (Drive Shaft)
	W-134916	Washer, Spring (Drive Shaft)
	W-134055	Grommet
	W-135164	Bumper
	R-137483	Cabinet (56TR)
	R-137982	Cabinet (56TS)
	B-135751	Dial Glass
	W-137200	Spring, Retaining (Dial Glass)
	W-135929	Knob (Dial or Volume)
	W-135930	Knob (Radio-Phono)
	AB-134935	Floating Jewel Needle Assy.
	136774-68	Cartridge, Pickup
	W-131126	Spring, Ratio Change (56TR)
	W-138271	Motor & Spindle Assy. (Less Turntable),56TR
	131104	Turntable (56TR)
	131098	Grommet, Motor Mtg. (56TR)
	131101	Bushing, Motor Mtg. (56TR)
	131102	Idler Wheel, Phono (56TR)
	131103	Spring, Idler Wheel (56TR)
	131207	Spindle, Turntable (56TR)
	131097	Plate, Phono Mtg. (56TR)
	W-134247	Rest, Tone Arm (56TR)
	W-134246	Spacer, Tone Arm (56TR)
	W-134955	Bumper (56TS)
	W-45056	Grommet (56TS)
	AB-137859	Support, Lid (56TS)
	AB-137884	Support, Lid (56TR)

*These parts will replace the original equipment parts.

**Early models used a three section Filter Condenser, Part No. B-135732. Item No. 20 and No. 44 were not used.



SCHEMATIC DIAGRAM SHOWING E. M. SPEAKER.



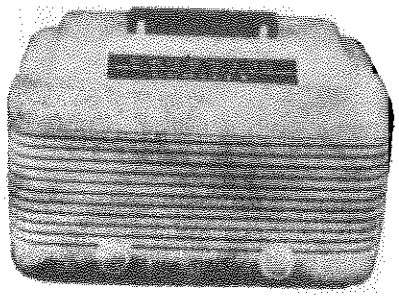
ALTERNATE WIRING WHEN P. M. SPEAKER IS USED.

RESISTANCE OF SPEAKER FIELD: 450 ohms.
SPEAKER FIELD CURRENT: 60 ma.
TUBE COMPLEMENT:

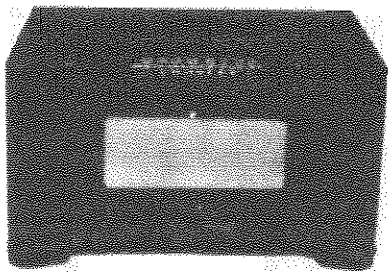
Type	Function
12SA7 (or GT/G)	Mixer
12SK7 (or GT/G)	I.F. Amplifier
12SQ7 (or GT/G)	Detector, AVC, 1st A.F. Amplifier
50L6GT	A.F. Power Output
35Z5GT/G	Rectifier

DIAL BULB: Type 47, 6.3 volts, .15 amp.

56TU-O



56TV-O



CROSLEY DIV.
AVCO MFG. CORP.

MODELS 56TU-O
56TV-O

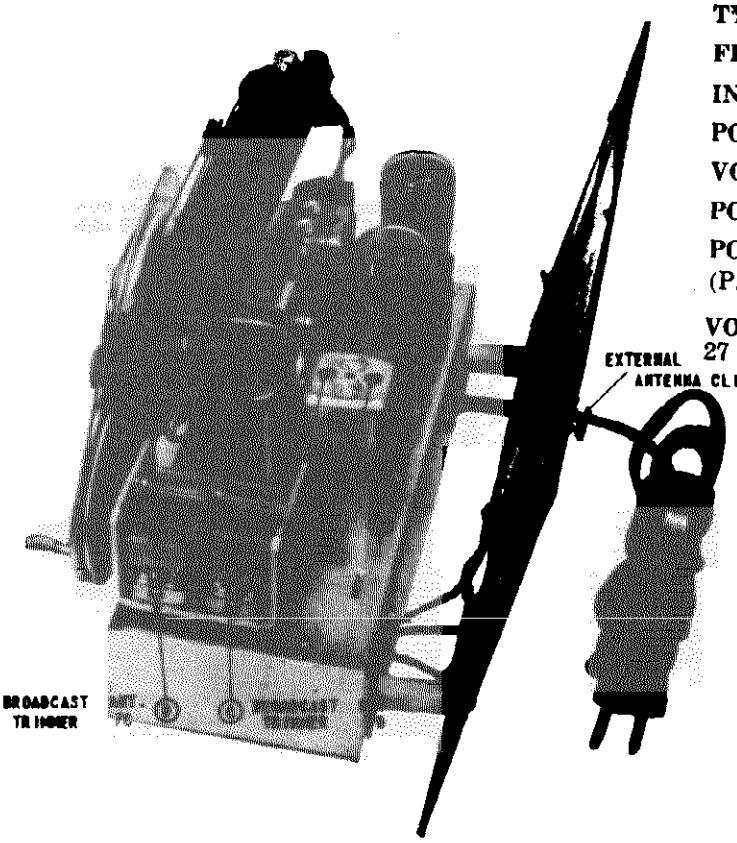
ALIGNMENT PROCEDURE

1. Turn the tuning condenser to the completely closed position against the stop and set the dial pointer to the reference line at the end of the dial scale.
2. Connect the output meter across the speaker voice coil.
3. The r.f. signal input from the signal generator should be connected to the external antenna lead. Connect the signal generator ground through a 0.1 mfd. condenser to —B (pin 3 on 12SK7 tube socket).
4. Turn the volume control on full and adjust the signal generator output to produce approximately mid-scale deflection of the output meter, but maintain signal generator output as low as possible to prevent AVC action in the receiver.

ALIGNMENT CHART

Alignment adjustment locations are shown on Chassis, Side View—Models 56TU-O, 56TV-O

Alignment Sequence	Signal Generator Output		To	Position of Tuning Dial	Adjust for Maximum Output
	Frequency in kc.	In Series with			
1	455	200 mmf.	Ant.	1,620	A & B
2	1,620	200 mmf.	Ant.	1,620	C
3	1,400	200 mmf.	Ant.	1,400	D



CHASSIS, SIDE VIEW

TYPE: Five-tube, single band, superheterodyne.

FREQUENCY RANGE: 540 to 1600 kc.

INTERMEDIATE FREQUENCY: 455 kc.

POWER SUPPLY: a.c—d.c.

VOLTAGE RATING: 105-125 volts.

POWER CONSUMPTION: 35 watts nominal.

POWER OUTPUT: (E.M. Speaker) 1 watt maximum (P.M. Speaker) 1.75 watts maximum

VOLTAGE DROP ACROSS SPEAKER FIELD: 27 volts.

When using direct current it may be necessary to reverse the position of the power plug in the electric outlet for correct polarity.

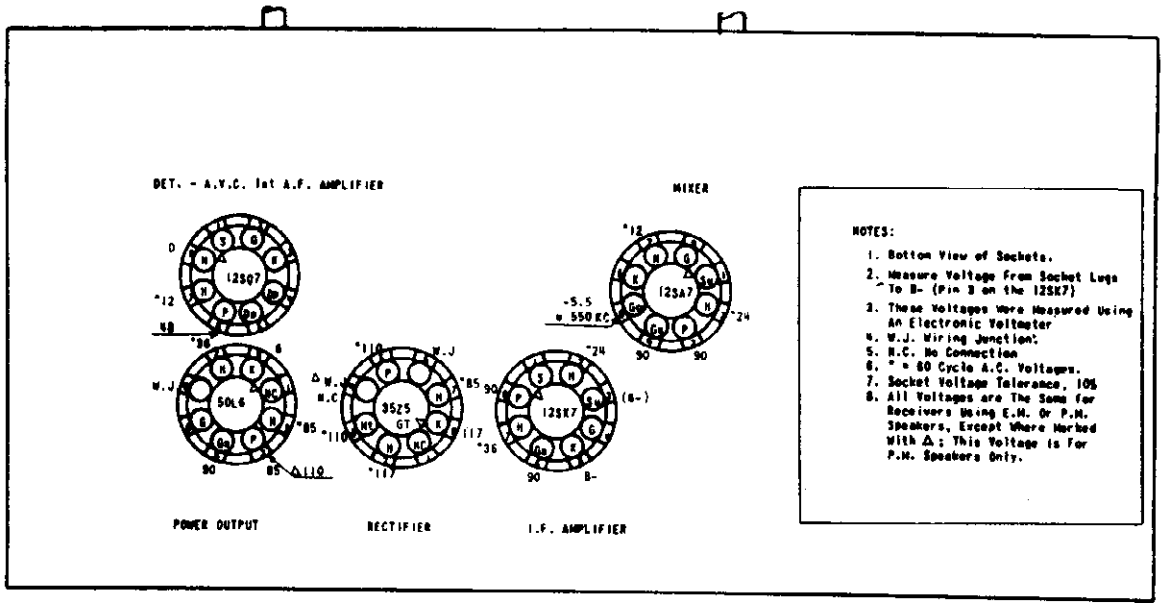
Reversing the position of the power plug when alternating current is used may reduce power hum.

Under no circumstances should a ground be connected to this receiver.

MODELS 56TU-O,
56TV-O

CROSLEY DIV.
AVCO MFG. CORP.

SOCKET VOLTAGE CHART



Figures in first column correspond to figures in Schematic Diagram

Item No.	Part No.	Description
1	W-48858	Bulb (Dial), Type 47, 6.3 v., .15 amp.
2	C-132300-1	Cable and Plug (Power)
3	AC-135506	Antenna Loop & Back Assy. (56TU-O)
3	AC-137489	Antenna Loop & Back Assy. (56TV-O)
4	AW-135195	Coil Assembly (Oscillator)
5	AW-137665	Transformer (1st. I. F.)
6	AW-137667	Transformer (2nd. I. F.)
7A	B-135202	Condenser (Variable) } Two
7B		Condenser (Variable) } Section
7C	Part of Item #7A	Condenser (Trimmer)
7D	Part of Item #7B	Condenser (Trimmer)
9	39001-17	Condenser, .05 mfd., 600 v., Paper
10	39001-17	Condenser, .05 mfd., 600 v., Paper
12	39001-73	Condenser, 250 mmf., 600 v., Paper
13	39001-76	Condenser, .003 mfd., 600 v., Paper
14	39001-80	Condenser, .02 mfd., 600 v., Paper
15	39001-80	Condenser, .02 mfd., 600 v., Paper
**16	39001-80	Condenser, .02 mfd., 600 v., Paper
**17	B-136768	Speaker, P. M.
*17	AD-135632	Speaker, E. M.
18	39001-17	Condenser. .05 mfd., 600 v., Paper
** 19A	B-136770	Condenser, 50 mfd., 150 w.v. } Two Section
** 19B		Condenser, 30 mfd., 150 w.v. } Elect. Filter
*19A	B-135073	Condenser, 15 mfd., 150 w.v. } Two Section
*19B		Condenser, 15 mfd., 150 w.v. } Elect. Filter
20	39294-38	Resistor, 15 megohm, ½ w.
21	39294-21	Resistor, 22,000 ohm, ½ w.
22	39294-27	Resistor, 220,000 ohm, ½ w.
23	39294-34	Resistor, 3.3 megohm, ½ w.
**24	39294-8	Resistor, 150 ohm, ½ w.
**25	39015-26	Resistor, 1200 ohm, 1 w.
26	39294-35	Resistor, 4.7 megohm, ½ w.
27	39294-29	Resistor, 470,000 ohm, ½ w.
28	39294-29	Resistor, 470,000 ohm, ½ w.
29	39294-8	Resistor, 150 ohm, ½ w.
30A	B-135127	Control, Volume (1 megohm) } Assy.
30B		Switch (Power) } Assy.
‡	39368-14	Control (Volume)
‡	39369-1	Switch (Power)
31	B-135077	Transformer (Output)
**33	W-137367	Resistor, 47 ohm, 1 w.
34	Part of Item #6	Resistor, 47,000 ohm, ½ w.
**36	39294-21	Resistor, 22,000 ohm, ½ w.
	G-39204	Socket, Tube
	39017-5	Socket (Dial Light)
	AB-135135	Plate Assembly (Dial)
	W-135074	Pulley (Idler)
	B-135094	Pointer (Dial)
	B-135075	Shaft (Drive)
	W-134916	Washer (Spring)
	W-51071	Ring (Retaining)
	W-131154-1	Cotter (External)
	W-51752	Spring (Drive Cord)
	W-134055	Grommet
	W-49770	Stud (Trimount)
	D-137324	Cabinet (56TV-O)
	R-135446	Cabinet & Handle Assy. (56TU-O)
	R-135444	Cabinet, Only (56TU-O)
	B-135403	Handle (56TU-O)
	W-137511	Spring, Handle (56TU-O)
	W-50325	Clip (56TU-O)
	B-135713	Dial Glass
	W-135455	Knob (56TV-O)
	W-135454	Knob (56TU-O)
	W-132124	Stud, Trimount (56TU-O)
	136571	Support, Dial

*These parts are used only on the above models which are equipped with E. M. speakers.
**These parts are used only on the above models which are equipped with P. M. speakers.
‡These parts will replace the original equipment parts.

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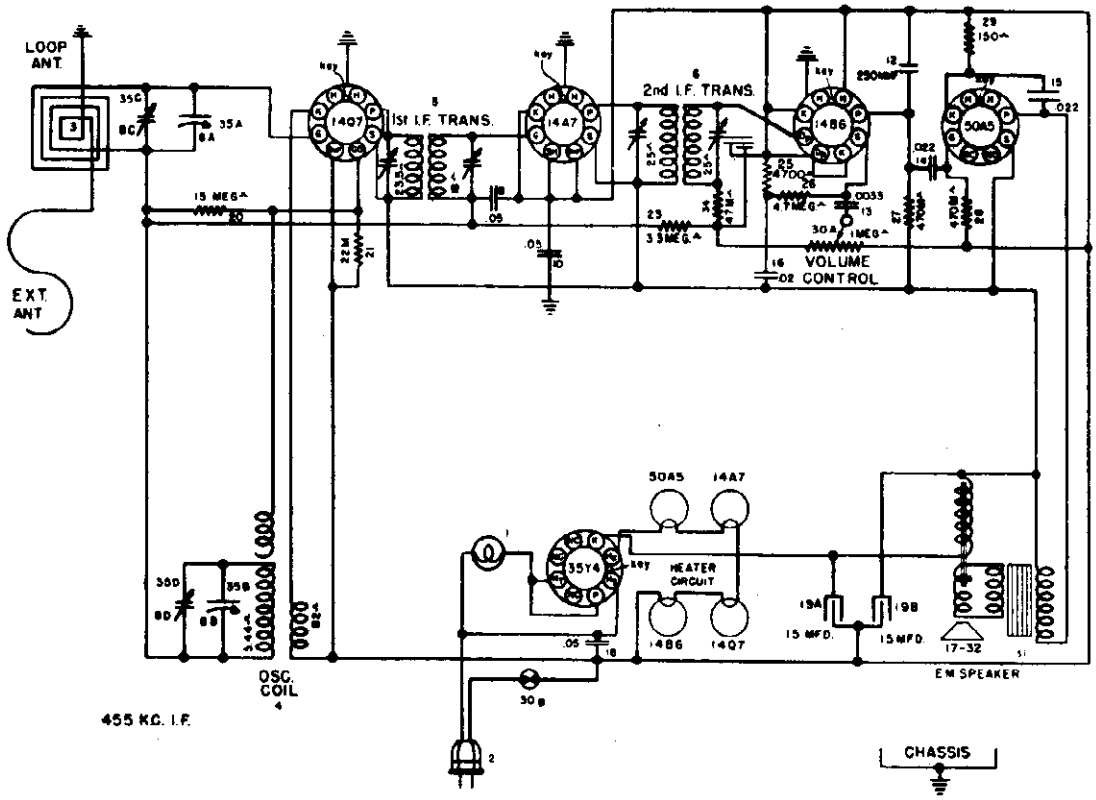
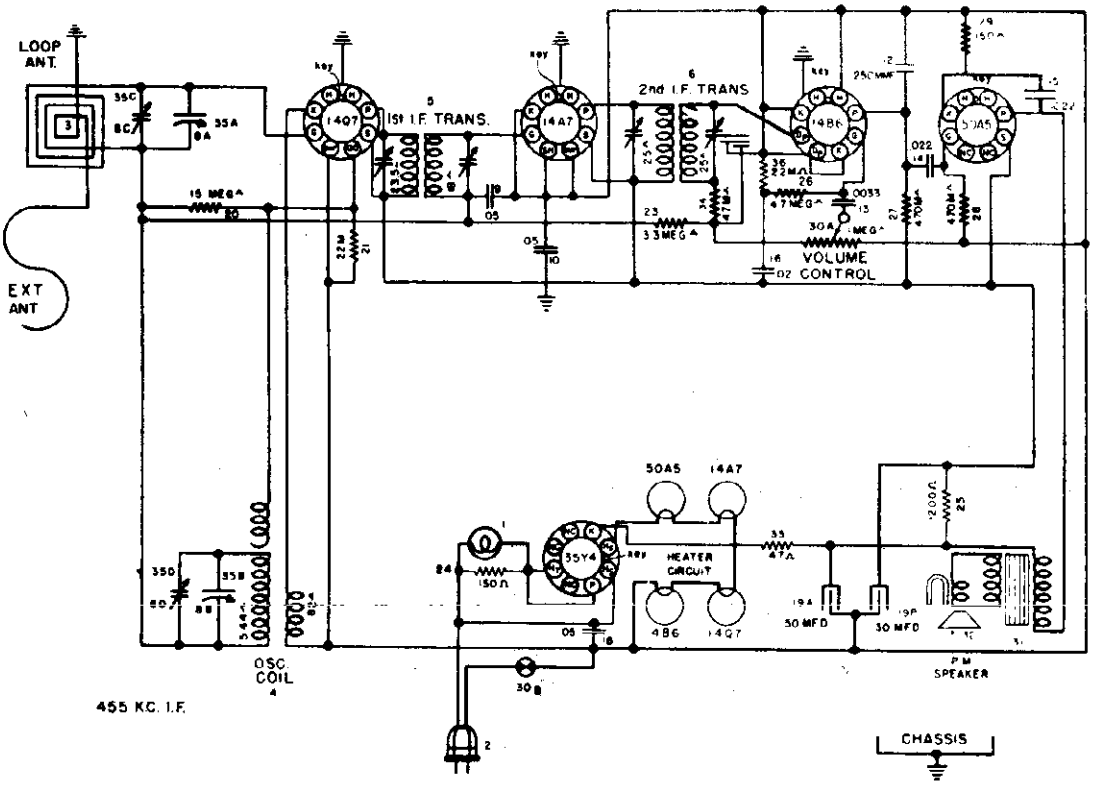
AVCO MFG. CORP.



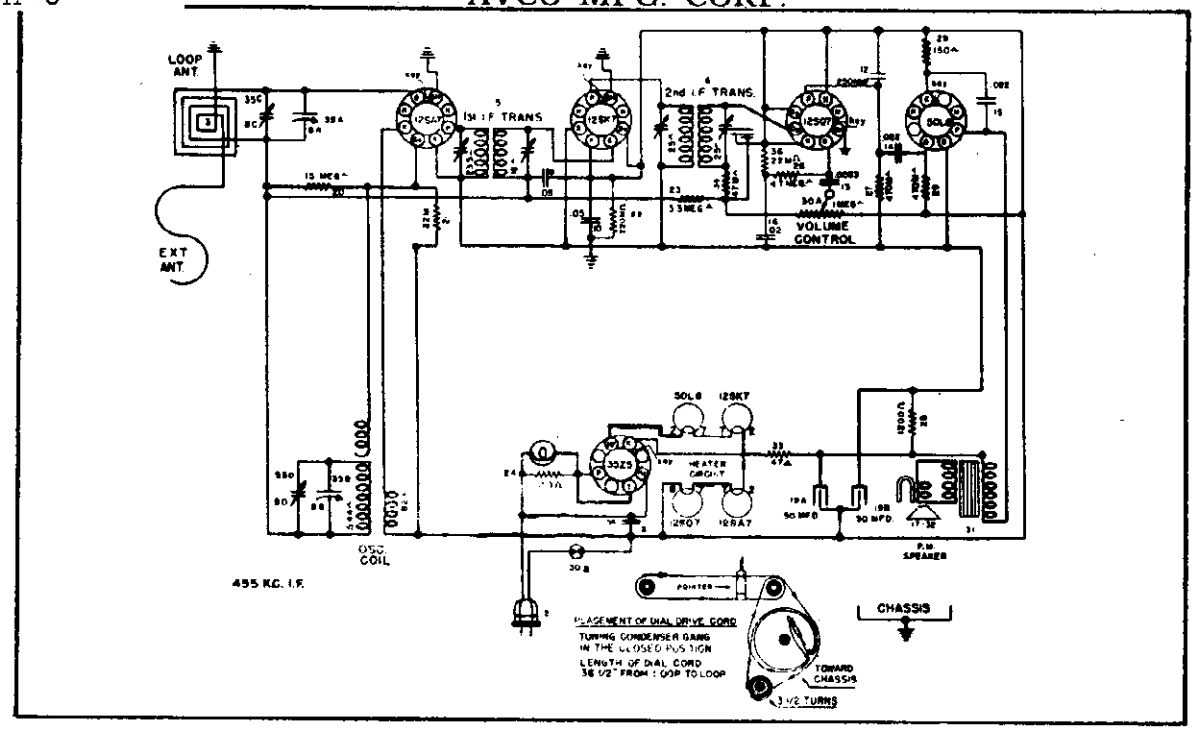
SCHEMATIC DIAGRAM - MODEL 58TH (E. M. SPEAKER)



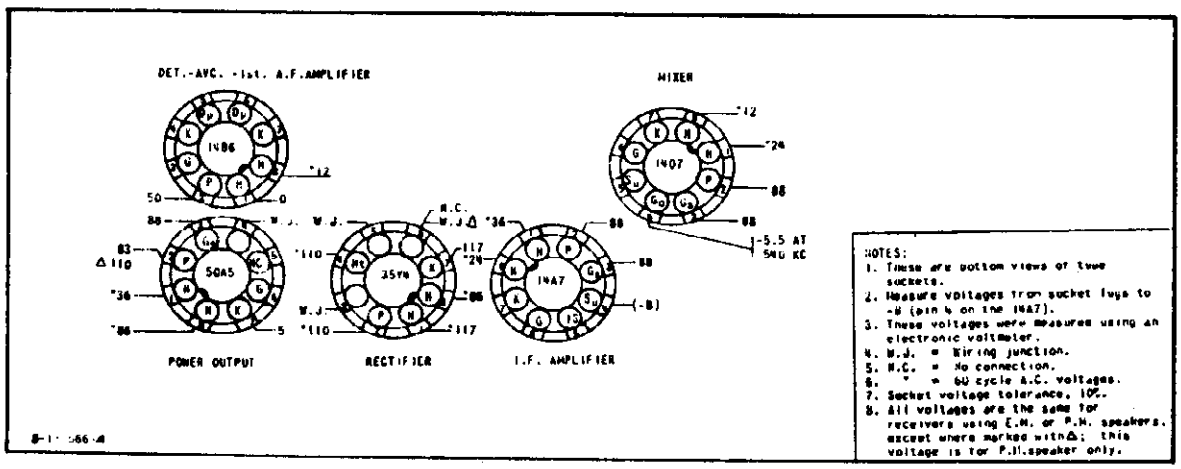
SCHEMATIC DIAGRAM—MODEL 58TH (P. M. SPEAKER)

MODELS 58TH,
58TH-O

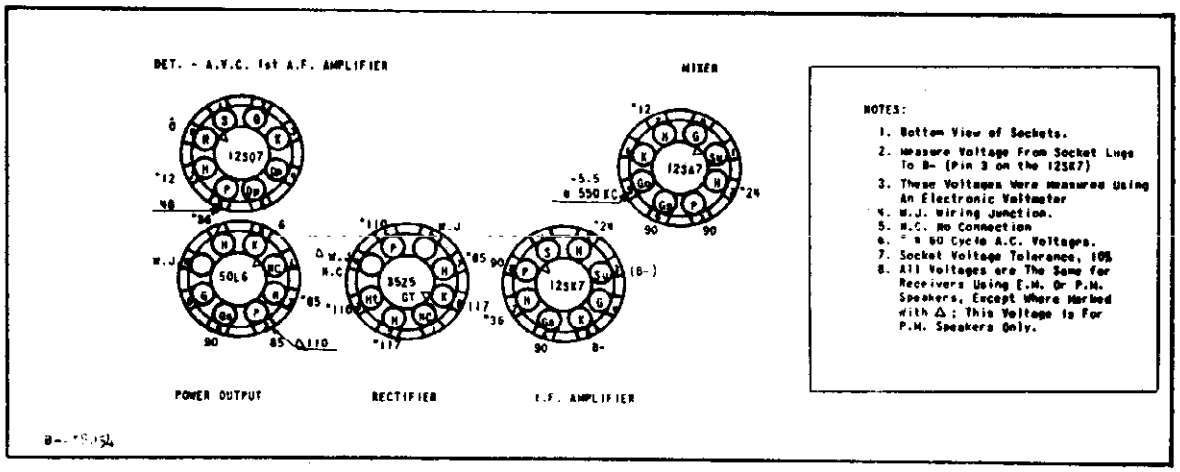
CROSLEY DIV.
AVCO MFG. CORP.



SCHEMATIC DIAGRAM – MODEL 58TH-O



SOCKET VOLTAGE CHART – MODEL 58TH



SOCKET VOLTAGE CHART – MODEL 58TH-O

CROSLEY DIV.
AVCO MFG. CORP.

MODELS 58TH,
58TH-O

ALIGNMENT PROCEDURE

1. Turn the tuning condenser to the completely closed position against the stop and set the dial pointer the reference line at the end of the dial scale.
2. Connect the output meter across the speaker voice coil.
3. The r.f. input from the signal generator should be connected to the external antenna lead. Connect signal generator ground through a 0.1 mfd. condenser to —B (See Socket Voltage Chart).
4. Turn the volume control on full and adjust the signal generator output to produce approximately m scale deflection of the output meter, but maintain signal generator output as low as possible to prev AVC action in the receiver.

ALIGNMENT CHART

Alignment adjustment locations are shown on Chassis, Side View—Models 58TH, 58TH-O

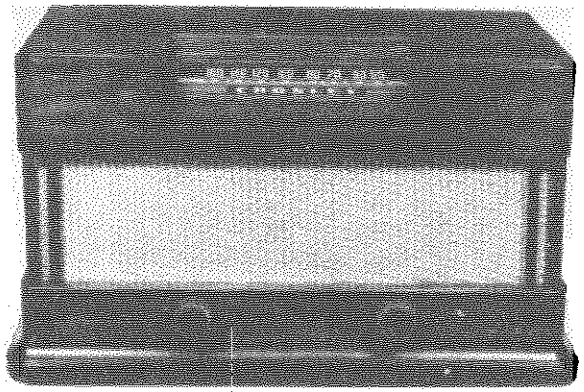
Alignment Sequence	Signal Generator Output		To	Position of Tuning Dial	Adjust for Maximum Output
	Frequency in kc.	In Series with			
1	455	200 mmf.	Ant.	1,620	A & B
2	1,620	200 mmf.	Ant.	1,620	C
3	1,400	200 mmf.	Ant.	1,400	D

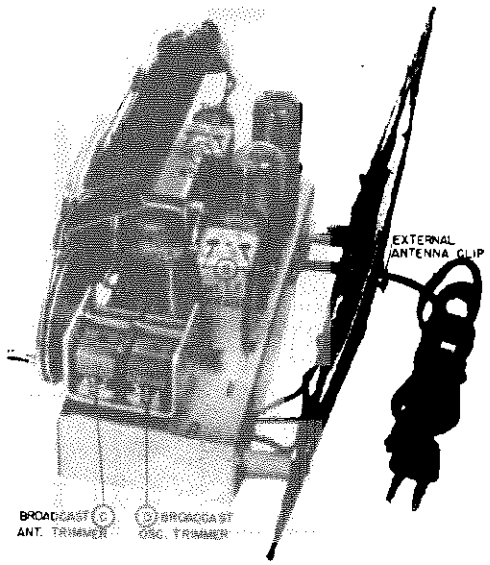
REPLACEMENT PARTS LIST—MODELS 58TH, 58TH-O

Figures in first column correspond to figures in Schematic Diagram.

Item No.	Part No.	Description
1	W-48858	Bulb (Dial), Type 47, 6.3 v., .15 amp.
2	C-132300-2	Cable and Plug Assy., Power
3	AC-135253	Antenna Loop and Back Assy.
4	AW-135195	Coil Assy., Oscillator
5	AW-137665	Transformer, 1st I. F.
6	AW-137667	Transformer, 2nd I. F.
8 A	B-135056	Condenser, Variable } Two
8 B		Condenser, Variable } Section
8 C	Part of Item 8A	Condenser, Trimmer
8 D	Part of Item 8B	Condenser, Trimmer
9	39001-17	Condenser, .05 mfd., 600 v., paper
10	39001-17	Condenser, .05 mfd., 600 v., paper
12	39001-73	Condenser, 250 mmf., 600 v., paper
13	39001-76	Condenser, .003 mfd., 600 v., paper
14	39001-80	Condenser, .02 mfd., 600 v., paper
15	39001-80	Condenser, .02 mfd., 600 v., paper
16	39001-80	Condenser, .02 mfd., 600 v., paper
**17	B-136768	Speaker (P. M.)
‡17	B-135082	Speaker (E. M.)
18	39001-17	Condenser, .05 mfd., 600 v., paper
**19 A	B-136770	Condenser, 50 mfd., 150 v. } Two Section
**19 B		Condenser, 30 mfd., 150 v. } Elect. Filter
‡19 A	B-135073	Condenser, 15 mfd., 150 v. } Two Section
‡19 B		Condenser, 15 mfd., 150 v. } Elect. Filter
20	39373-109	Resistor, 15 megohm, ½ w.
21	39373-60	Resistor, 22,000 ohm, ½ w.
22	39373-80	Resistor, 220,000 ohm, ½ w. (58TH-O)
23	39373-100	Resistor, 3.3 megohm, ½ w.
**24	39373-16	Resistor, 150 ohm, ½ w. (58TH-O)
**25	39373-144	Resistor, 1200 ohm, 1 w.
‡25	39373-47	Resistor, 4700 ohm, ½ w.
26	39373-102	Resistor, 4.7 megohm, ½ w.
27	39373-87	Resistor, 470,000 ohm, ½ w.
28	39373-87	Resistor, 470,000 ohm, ½ w.
29	39373-16	Resistor, 150 ohm, ½ w.
30 A	C-135127	Control, Volume (1 megohm) } Assy
30 B		Switch, Power } Assy
*	39368-14	Control, Volume
*	39369-1	Switch, Power
31	B-137723	Transformer, Output
**33	W-137367	Resistor, 47 ohm, 1 w.
34	Part of Item 6	Resistor, 47,000 ohm, ½ w.
**36	39373-60	Resistor, 22,000 ohm, ½ w.
	W-135164	Bumper
	R-135236	Cabinet
	W-131154-1	Cotter, External
	B-135713	Dial Glass
	W-134055	Grommet
	W-135391	Knob
	AB-135135	Plate, Dial
	B-135094	Pointer, Dial
	W-135074	Pulley, Idler
	W-51071	Ring, Retaining
	W-135603	Screw, Back Mtg.
	B-135075-1	Shaft, Drive
	W-46447-1	Shield, Tube
	39017-5	Socket, Dial Light
	39441	Socket, Tube (58TH)
	39232-1	Socket, Tube (58TH-O)
	W-51752	Spring, Dial Drive Cord
	W-49770	Trimount Stud (Bottom Mtg.)
	W-134916	Washer, Spring

*These parts will replace the original equipment parts.
**Used only on models equipped with P. M. speakers.
‡Used only on models equipped with E. M. speakers.





CHASSIS SIDE VIEW

TYPE: Five-tube, single-band, superheterodyne.

FREQUENCY RANGE: 540 to 1600 kc.

INTERMEDIATE FREQUENCY: 455 kc.

POWER SUPPLY: a.c.-d.c.

VOLTAGE RATING: 105-125 volts.

POWER CONSUMPTION: 35 watts nominal.

POWER OUTPUT: (E. M. Speaker) 1 watt maximum. (P. M. Speaker) 1.75 watts maximum.

VOLTAGE DROP ACROSS SPEAKER FIELD: 27 volts.

SPEAKER FIELD RESISTANCE: 450 ohms.

SPEAKER FIELD CURRENT: 60 ma.

TUBE COMPLEMENT (Model 58TH)

Tube No.	Type	Function
5	14Q7	Mixer
4	14A7	I. F. Amplifier
3	14B6	Detector, AVC, 1st A. F. Ampl.
1	50A5	A. F. Power Output
2	35Y4	Rectifier

TUBE COMPLEMENT (Model 58TH-O)

Tube No.	Type	Function
5	12SA7 (or GT/G)	Mixer
4	12SK7 (or GT/G)	I. F. Amplifier
3	12SQ7 (or GT/G)	Detector, AVC, 1st A. F. Ampl.
1	50L6GT	A. F. Powef Output
2	35Z5GT/G)	Rectifier

DIAL BULB: Type 47, 6.3 volts, .15 amp.

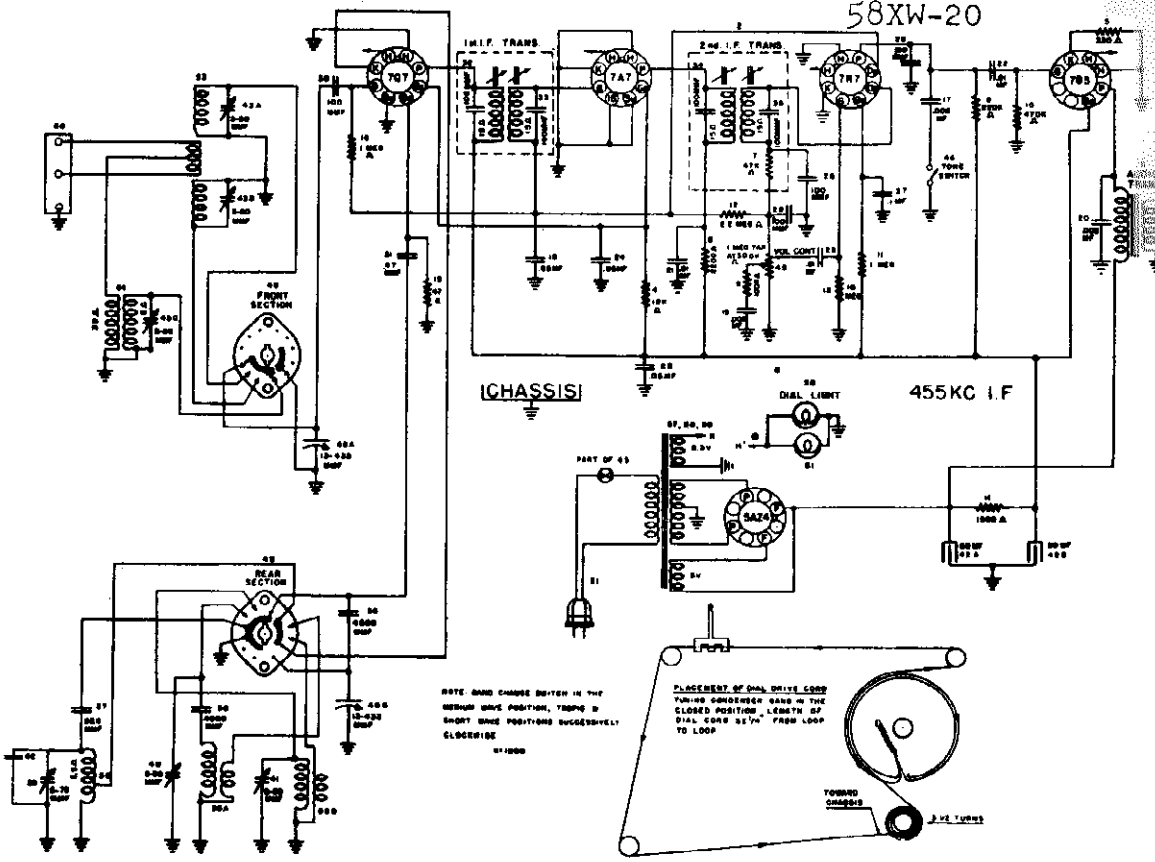
When using direct current it may be necessary to reverse the position of the power plug in the electric outlet for correct polarity.

Reversing the position of the power plug when alternating current is used may reduce power hum.

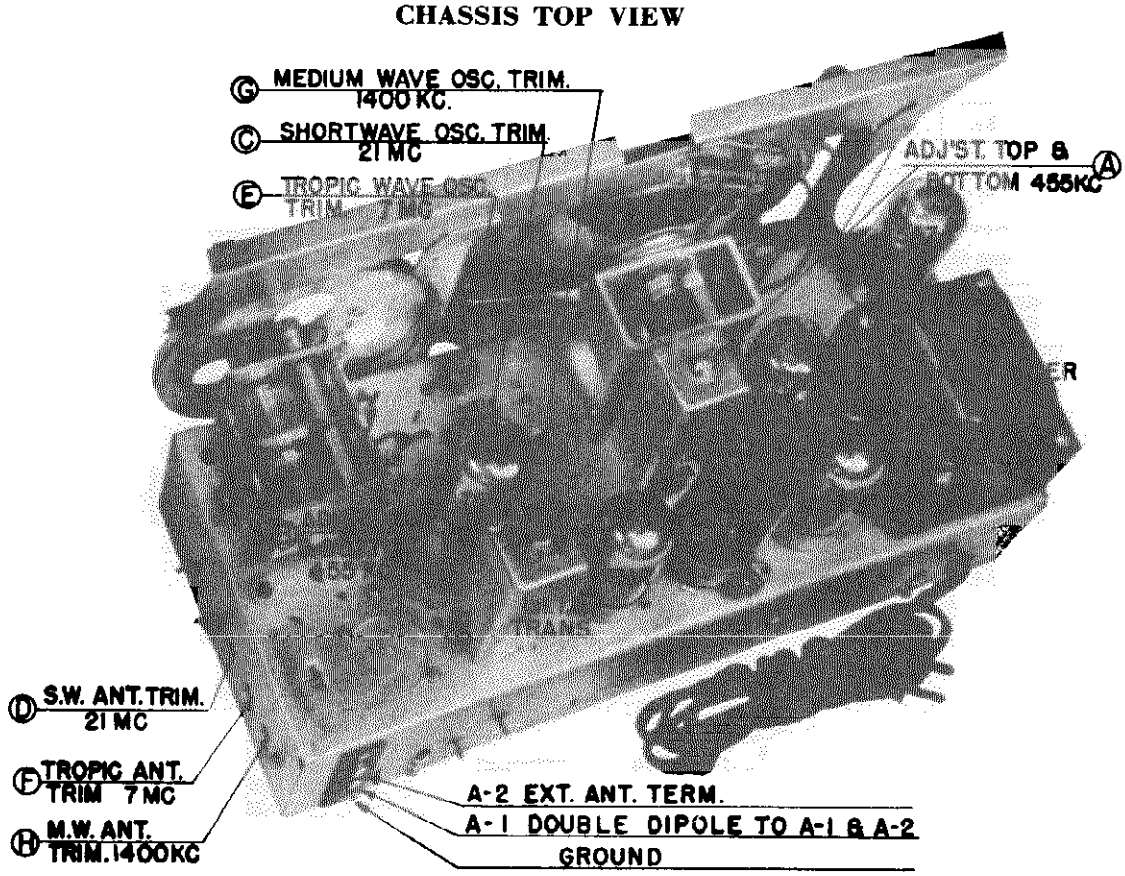
Under no circumstances should a ground be connected to this receiver.

CROSLEY DIV.
AVCO MFG. CORP.

MODELS 58XA, 58XA-10, 58XA-20, 58XW, 58XW-10, 58XW-20



SCHEMATIC DIAGRAM
CHASSIS TOP VIEW



MODELS 58XA, 58XA-10, 58XA-20, 58XW

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MODELS 58XW-10, 58XW-20

ALIGNMENT PROCEDURE

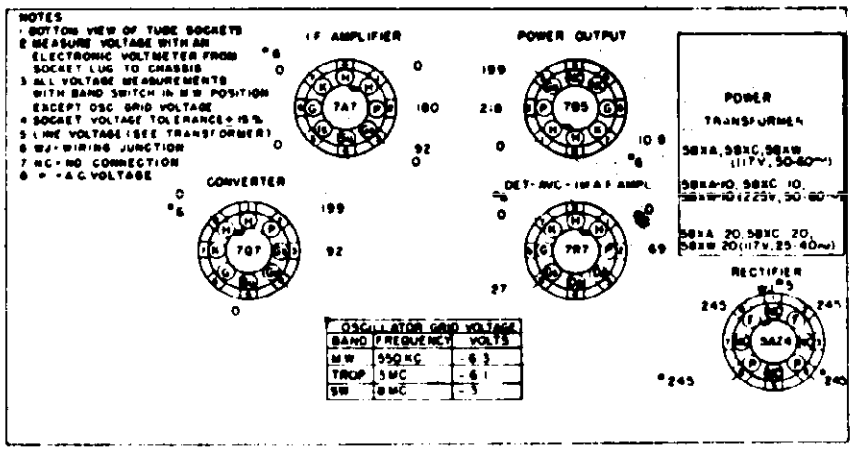
1. Turn the tuning condenser to the completely closed position against the stop, and set the dial pointer to the reference line at the low frequency end of the dial scale.
2. Turn the tone control to the high or treble position.
3. Connect the output meter across the speaker voice coil.
4. The r. f. signal input from the signal generator should be connected to the external antenna terminal (A-2), as indicated in the alignment chart. Connect the signal generator ground to the chassis.
5. Turn the volume control on full, and adjust the signal generator output to produce approximately mid-scale deflection of the output meter, but maintain signal generator output as low as possible to prevent AVC action in the receiver.

ALIGNMENT CHART

Alignment Sequence	SIGNAL GENERATOR OUTPUT			POSITION OF		Adjust for Maximum	Osc. Frequency	Remarks
	Frequency	In Series with	To	Band Switch Knob to	Dial Pointer			
1	455 kc.	200 mmf.	Ant. (A-2)	Left	1650 kc.	A & B	.....	
2	21.0 mc.	70 ohm Resistor	Ant. (A-2)	Right	21.0 mc.	C	Above	Ground Ant. (A-1).
3	21.0 mc.	70 ohm Resistor	Ant. (A-2)	Right	21.0 mc.	D	Above	Rock gang as trimmer is aligned.
4	7.0 mc.	70 ohm Resistor	Ant. (A-2)	Midway	7.0 mc.	E	Above	Ground Ant. (A-1)
5	7.0 mc.	70 ohm Resistor	Ant. (A-2)	Midway	7.0 mc.	F	Above	Rock gang as trimmer is aligned.
6	1400 kc.	200 mmf.	Ant. (A-2)	Left	1400 kc.	G	Above	Remove ground from Ant. (A-1).
7	1400 kc.	200 mmf.	Ant. (A-2)	Left	1400 kc.	H	Above	

NOTE: When aligning the short-wave oscillator trimmer (C), be sure that the circuit is aligned at the correct frequency and not at the image frequency which is 910 kilocycles lower as indicated by the receiver dial. To check: Tune in the generator frequency, then increase the generator output and tune in the image frequency. The image frequency should be weaker than the fundamental and audible 910 kilocycles lower on the receiver dial. If the image cannot be tuned in, the oscillator trimmer is adjusted to the wrong peak. The correct peak is the second one heard as the trimmer adjustment screw is opened from the completely closed position.

SOCKET VOLTAGE CHART



MODELS 58XW-10, 58XW-20

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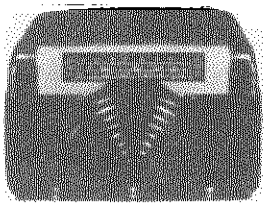
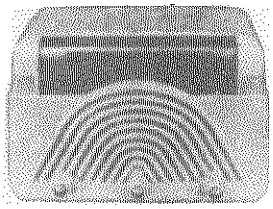
MODELS 58XA, 58XA-1(
58XA-20, 58XW



MODELS 58XA, (-10) (-20)



MODELS 58XW, (-10) (-20)

DESCRIPTION

TYPE: Five-tube, three-band superheterodyne.

FREQUENCY RANGE: Medium Wave Band: 540 to 1600 kc. (555 to 188 meters), Band Switch to left. Tropical Wave Band: 3.0 to 8.0 mc. (100 to 37.5 meters), Band Switch to midway position. Short Wave Band: 8.0 to 22.0 mc. (37.5 to 13.7 meters), Band Switch to right.

INTERMEDIATE FREQUENCY: 455 kc.

POWER SUPPLY: Models 58XA, 58XA-10, 58XW, 58XW-10, 50-60 cycle a. c. only. Model 58XA-20, 58XW-20, 25-40 cycles a. c. only.

VOLTAGE RATING: Models 58XA, 58XA-20, 58XW, 58XW-20, 105-130 volts. Models 58XA-10, 58XW-10, 210-260 volts.

POWER CONSUMPTION: 50 watts maximum.

POWER OUTPUT: 2.5 watts maximum.

TUBE COMPLEMENT

Type	Function
7Q7	Mixer
7A7	I. F. Amplifier
7R7	Detector, AVC, 1st A. F. Amplifier
7B5	Power Amplifier
5AZ4	Rectifier

DIAL BULB: Type 47, 6.3 volts, .15 amp.

REPLACEMENT PARTS LIST—

Figures in first column correspond to figures in Schematic Diagram

Item No.	Part No.	Description
1	AB-138744	Transformer, 1st I. F.
2	AB-138745	Transformer, 2nd I. F.
3	B-138692	Transformer, Output
4	39373-275	Resistor, 12,000 ohm, 2 w.
5	39373-23	Resistor, 330 ohm, ½ w.
6	39373-40	Resistor, 2200 ohm, ½ w.
7	39373-67	Resistor, 47,000 ohm, ½ w.
8	39373-80	Resistor, 220,000 ohm, ½ w.
9	39373-74	Resistor, 100,000 ohm, ½ w.
10	39373-87	Resistor, 470,000 ohm, ½ w.
11	39373-92	Resistor, 1 megohm, ½ w.
12	39373-97	Resistor, 2.2 megohm, ½ w.
13	39373-107	Resistor, 10 megohm, ½ w.
14	39372-7	Resistor, 1500 ohm, 3 w.
15	39373-67	Resistor, 47,000 ohm, ½ w.
16	39373-92	Resistor, 1 megohm, ½ w.
17	39001-74	Condenser, .002 mfd., 600 v., paper
18	39001-17	Condenser, .05 mfd., 600 v., paper
19	39001-11	Condenser, .005 mfd., 600 v., paper
20	39001-11	Condenser, .005 mfd., 600 v., paper
21	39001-13	Condenser, .01 mfd., 600 v., paper
22	39001-13	Condenser, .01 mfd., 600 v., paper
23	39001-13	Condenser, .01 mfd., 600 v., paper
24	39001-17	Condenser, .05 mfd., 600 v., paper
25	39001-17	Condenser, .05 mfd., 600 v., paper
26	39001-1	Condenser, .0001 mfd., 600 v., paper
27	39001-19	Condenser, .1 mfd., 600 v., paper
28	137727-25	Condenser, 100 mmf., 500 v., ceramic
29	137727-25	Condenser, 100 mmf., 500 v., ceramic
30	137727-25	Condenser, 100 mmf., 500 v., ceramic
31	137727-31	Condenser, 47 mmf., 300 v., ceramic
32	137727-25	Condenser, 100 mmf., 500 v., ceramic
33	137727-25	Condenser, 100 mmf., 500 v., ceramic
34	137727-25	Condenser, 100 mmf., 500 v., ceramic
35	137727-25	Condenser, 100 mmf., 500 v., ceramic
36	137498-18	Condenser, 4500 mmf., 300 v., mica
37	137498-21	Condenser, 526 mmf., 300 v., mica
38	137498-20	Condenser, 4000 mmf., 300 v., mica
39	W-142439	Condenser, Trimmer
40	W-138820	Condenser, Trimmer
41	W-138820	Condenser, Trimmer
42 A	B-139726	Condenser, 50 mfd., 400 v. — Two Sec. Elec. — 58XA-20
42 B		Condenser, 30 mfd., 350 v. — 58XW-20
42 A	B-138693	Condenser, 50 mfd., 400 v. — Two Sec. Elec. — 58XA, 58XW.
42 B		Condenser, 30 mfd., 350 v. — 58XA-10 — 58XW-10
43 A	B-132386-7	Condenser, Trimmer — Three Section
43 B		Condenser, Trimmer — Assembly
43 C		Condenser, Trimmer

Item No.	Part No.	Description
44	138246	Speaker (Less Transformer)
45	39368-18	Control, Volume (1 meg., Tap 300,000 ohm.)
	39370-2	Shaft, Volume Control
	39369-1	Switch, Power
46	W-138775	Switch, Tone
48 A	AC-137073-10	Condenser, Variable — Two Section
48 B		Condenser, Variable
49	B-138691	Switch, Band Change
50	W-48858	Bulb (Dial), Type 47, 6.3 v., .15 amp.
51	C-132300-1	Cable & Plug Assy., Power
53	AW-138746	Coil, Antenna
54	AW-138743	Coil, Antenna (Med. Wave)
55 A	AW-138747	Coil, Oscillator (Trop. & S.W.) — Two
55 B		Coil, Oscillator (Trop. & S.W.) — Section
56	AW-138689	Coil, Oscillator (Med. Wave)
57	B-138076	Transformer, Power (58XA) (58XW)
58	B-138844	Transformer, Power (58XA-20) (58XW-20)
59	B-138845	Transformer, Power (58XA-10) (58XW-10)
60	39439-3	Terminal Board
61	W-48858	Bulb (Dial), Type 47, 6.3 v., .15 amp.
62	C-137727-52	Condenser, 12 mmf., 500 v., ceramic
	AB-138766	Arm & Link Assy., Toggle
	C-137750	Back, Cabinet
	R-138573-1	Cabinet (58XA, 58XA-10, 58XA-20)
	AW-138663	Cabinet (58XW, 58XW-10, 58XW-20)
	D-143173	Dial Glass
	W-134055	Grommet, Var. Cond. Mtg.
	B-138574-5	Knob (Volume & Tuning) — 58XA,
	B-138575-5	Knob (Band Change) — 58XA-10,
	B-138576-5	Knob (Tone) — 58XA-20
	B-138574-2	Knob (Volume & Tuning — 58XW,
	B-138575-2	Knob (Band Change) — 58XW-10,
	B-138576-2	Knob (Tone) — 58XW-20
	W-49829	Lock Spring, Dial Drive Bearing
	W-46065	Mounting Rubber, Speaker Bracket
	B-143142	Pointer, Dial
	W-137939-1	Pulley, Dial Drive Idler
	W-51071-CP	Ring (Retaining), Dial Drive Shaft
	W-136613-3CP	Screw, Dial Glass Strip
	39220-36CP	Screw, Chassis Mtg.
	B-135075-5	Shaft, Dial Drive
	39440	Socket, Tube
	D-136565-16	Socket, Dial Light
	W-51752	Spring, Dial Drive Cord
	W-138568	Strip, Pointer
	B-138649	Strip, Dial Glass
	AC-138443-1	Support & Pulley Assy., Dial
	W-132124-SB	Trimount Stud
	W-134916	Washer (Spring), Dial Drive Shaft

MODEL 660S(0)

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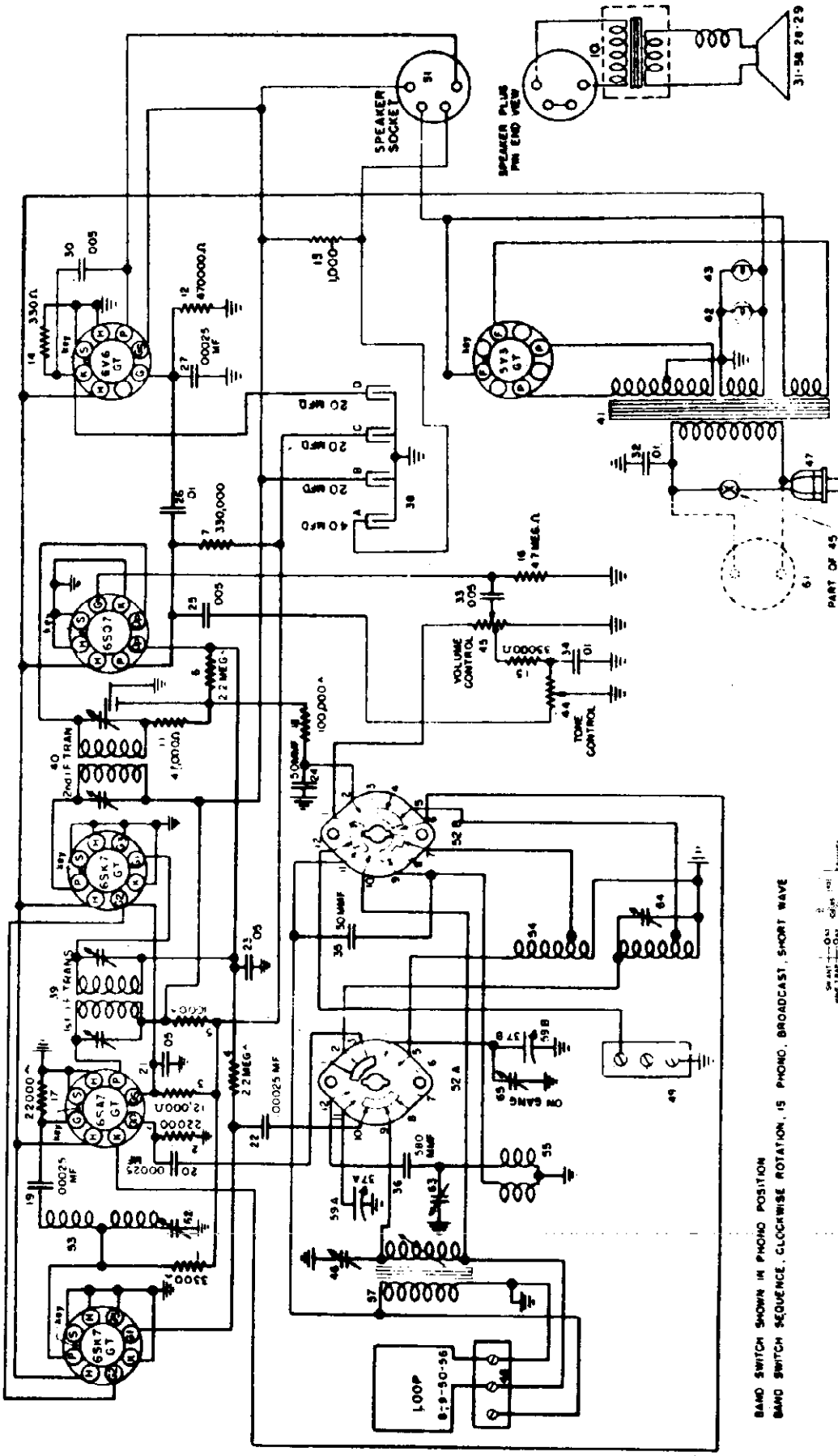

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ALIGNMENT PROCEDURE

1. Turn the tuning condenser to the completely closed position against the stop and set the dial pointer to the reference line at the end of the dial scale.
2. Connect the output meter across the speaker voice coil.
3. The r. f. signal input from the signal generator should be connected to the external antenna post as indicated in the alignment chart. Connect the low side (ground) of the signal generator to the chassis.
4. Turn the volume control on full and adjust the signal generator output to produce approximately mid-scale deflection of the output meter, but maintain the signal generator output as low as possible to prevent AVC action in the receiver.

NOTE: The Signal Web antenna must remain connected, or if the chassis is removed from cabinet, a suitable dummy loop antenna should be connected in its place.

ALIGNMENT CHART

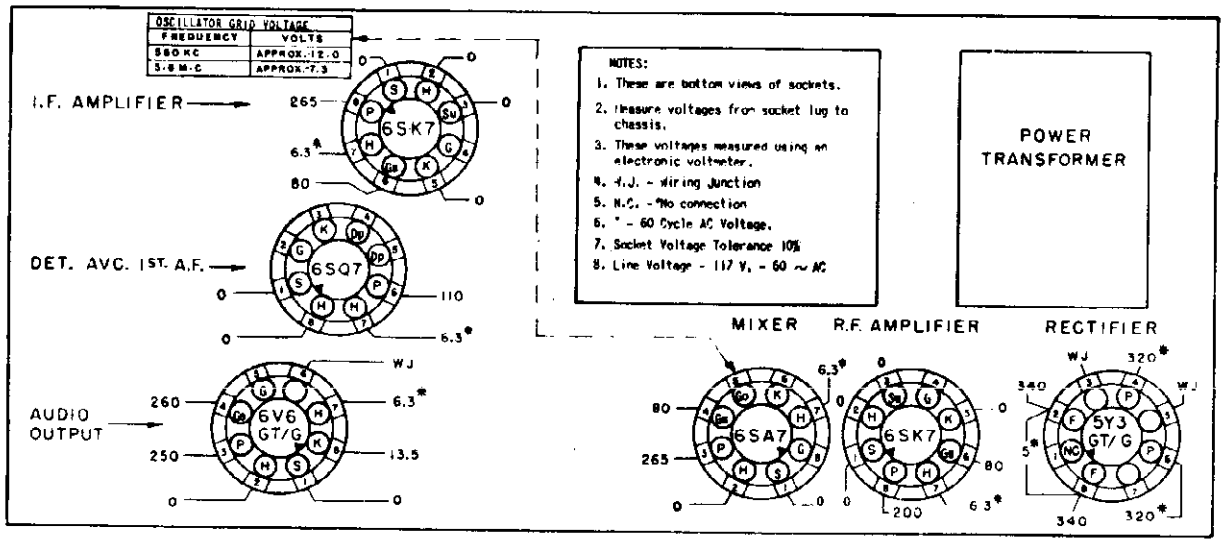
Alignment adjustment locations are shown on Chassis, Rear View—Model 66CS(O)

Alignment Sequence	Signal Generator Output			Position of		Adjust for Maximum Output
	Frequency in kc.	In Series With	To	Band Switch	Tuning Dial	
1	455	200 mmf.	Ant.	A	1620	A & B
2	455	200 mmf.	Ant.	A	1620	C*
3	15,300	400 ohms	Ant.	O	15.3	D
4	15,000	400 ohms	Ant.	O	15.0	E
5	1620	200 mmf.	Ant.	A	1620	F
6	1400	200 mmf.	Ant.	A	1400	G
7	600	200 mmf.	Ant.	A	600	H
8	1400	200 mmf.	Ant.	A	1400	Recheck G

*Adjust for Minimum Output (Wave Trap).

NOTE: When aligning the "Overseas" oscillator (D), be sure that the circuit is aligned at the correct frequency and not at the image frequency which is 910 kilocycles lower in frequency as indicated on the dial. To check: tune in signal generator frequency, then increase the generator output and tune in the image frequency which should be audible, but weaker than the fundamental frequency. If the image cannot be tuned in, the oscillator trimmer is adjusted to the wrong peak. The correct peak is the second peak of the trimmer from the closed position.

SOCKET VOLTAGE CHART



SOCKET VOLTAGE TOLERANCE: 10%

MODEL 66CS(O)

CROSLEY DIV.
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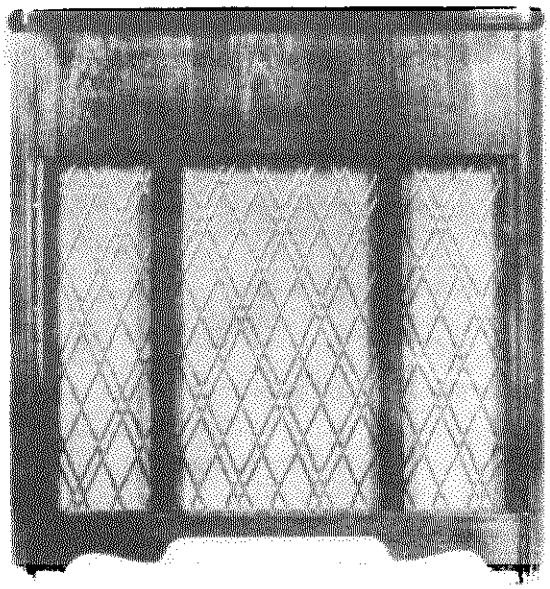


TUBE COMPLEMENT:

Type	Function
6SA7 (GT/G)	Mixer
6SK7 (GT/G)	R. F. Amplifier
6SK7 (GT/G)	I. F. Amplifier
6SQ7 (GT/G)	Detector, AVC, 1st A.F. Amplifier
6V6 (GT/G)	A. F. Power Output
5Y3 (GT/G)	Rectifier

DIAL BULB: Type 51, 7.5 volts, .25 amp.

TYPE: Six-tube, two-band, superheterodyne.

FREQUENCY RANGE: American Broadcast Band, 540 to 1600 kc. (Selector Switch at A.)

Overseas Short-wave Band, 5.8 to 15 mc. (Selector Switch at O.)

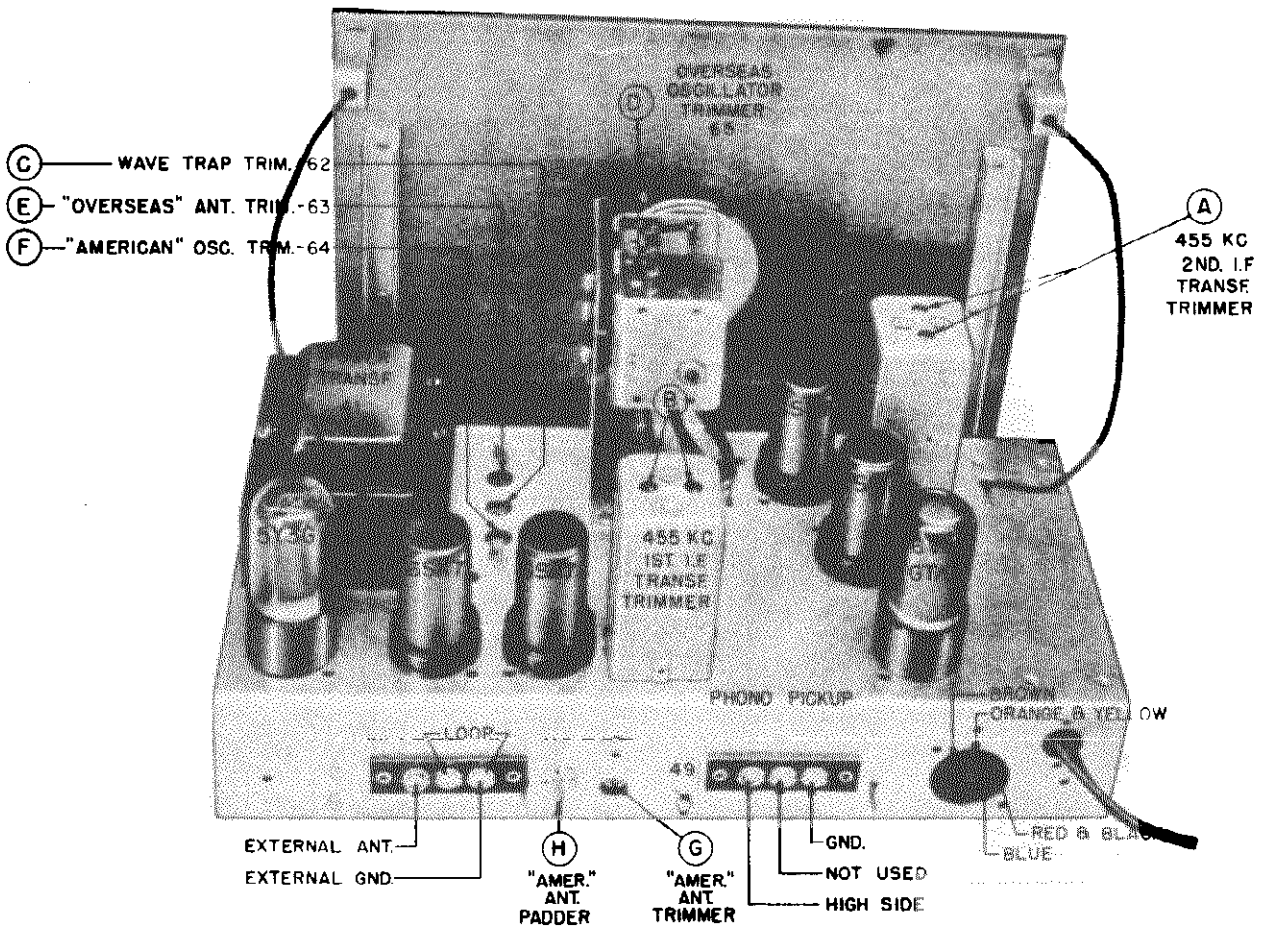
INTERMEDIATE FREQUENCY: 455 kc.

POWER SUPPLY: 60 cycle a. c. only.

VOLTAGE RATING: 105-125 volts.

POWER CONSUMPTION: 65 watts maximum, 20 watts additional for record changer.

POWER OUTPUT: 4.5 watts maximum.



CHASSIS, REAR VIEW—MODEL 66CS(O)

CROSLEY DIV.
AVCO MFG. CORP.

MODEL 66CS(O

REPLACEMENT PARTS LIST—MODEL 66CS(O)

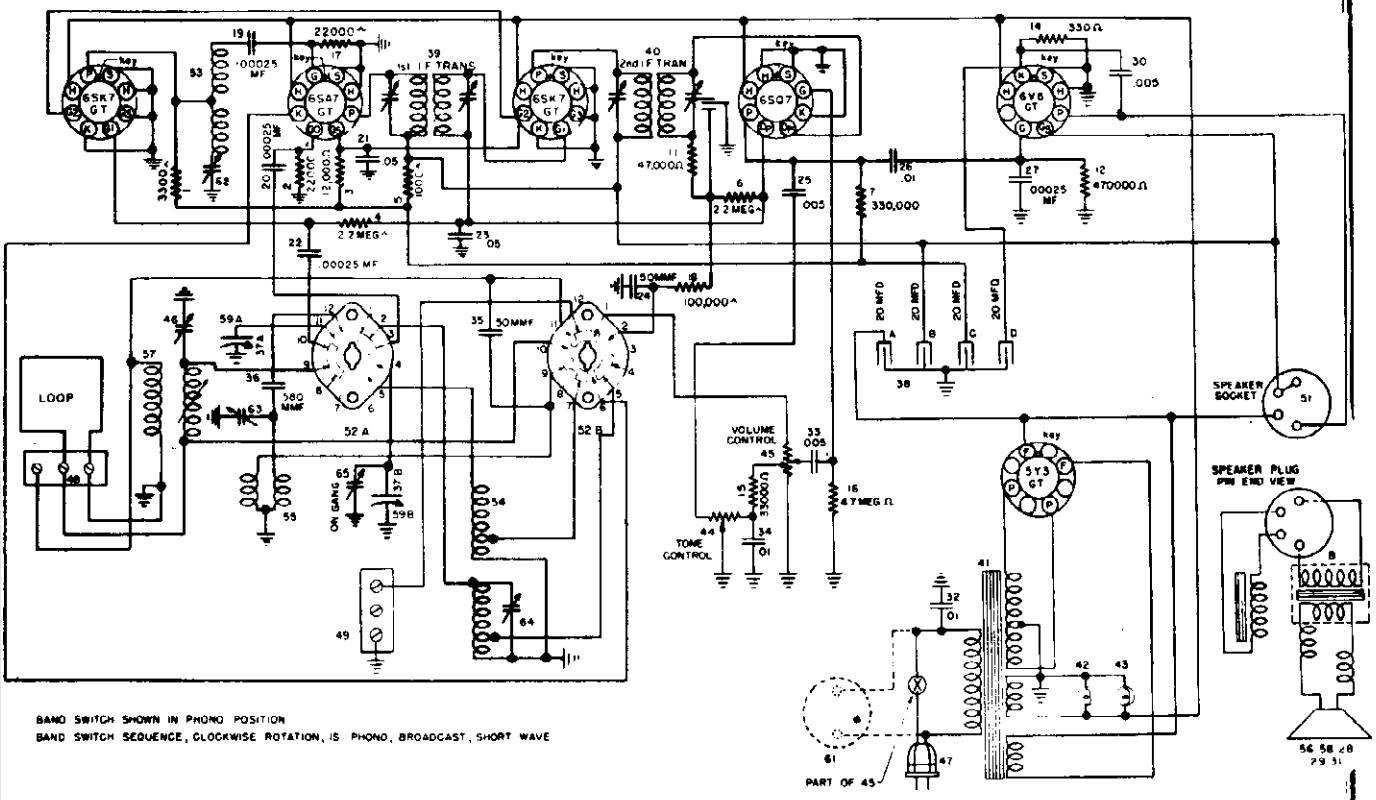
Figures in first column correspond to figures in Schematic Diagram.

Item No.	Part Number	Description	Item No.	Part Number	Description
1	39373-44	Resistor, 3,300 ohm, ½ w.		39368-18	Control, Volume
2	39373-60	Resistor, 22,000 ohm, ½ w.	*	39369-1	Switch, Power
3	39373-275	Resistor, 12,000 ohm, 2 w.		39370-1	Shaft, Plug-in
4	39373-97	Resistor, 2.2 megohm, ½ w.	46	W-132267-1	Condenser, Trimmer
5	39373-143	Resistor, 1,000 ohm, 1 w.	47	B-132300-1	Cable & Plug Assy., Power
6	39373-97	Resistor, 2.2 megohm, ½ w.	48	39019-3	Terminal Board Assy.
7	39373-84	Resistor, 330,000 ohm, ½ w.	49	39019-3	Terminal Board Assy.
8	W-137143	Antenna (Transmission Line)	51	W-134968-1	Socket, Speaker
10	B-138131-2	Transformer, Output	52A	B-134639	Switch, Band Change (Two
11	39373-67	Resistor, 47,000 ohm, ½ w.	52B		Switch, Band Change \ Section
12	39373-87	Resistor, 470,000 ohm, ½ w.	53	AW-135907	Coil Assy., R. F.
13	39371-5	Resistor, 1,000 ohm, 5 w.	54	AW-135908	Coil Assy., Osc.
14	39373-133	Resistor, 330 ohm, 1 w.	55	AW-135909	Coil Assy., Ant.
15	39373-64	Resistor, 33,000 ohm, ½ w.	57	AW-135910	Coil Assy., Ant. Loading
16	39373-102	Resistor, 4.7 megohm, ½ w.	58	B-137082	Speaker & Transformer Assy.
17	39373-60	Resistor, 22,000 ohm, ½ w.	62	B-132386-7	Condenser, Trimmer) Three
18	39373-74	Resistor, 100,000 ohm, ½ w.	63		Condenser, Trimmer } Section
19	39001-73	Condenser, .00025 mfd., 600 v., paper	64		Condenser, Trimmer) Assy.
20	39001-73	Condenser, .00025 mfd., 600 v., paper		G-39012-8	Core, Iron
21	39001-17	Condenser, .05 mfd., 600 v., paper		G-39204	Socket, Tube
22	39001-73	Condenser, .00025 mfd., 600 v., paper		39017-3	Socket, Dial Light
23	39001-17	Condenser, .05 mfd., 600 v., paper		AW-134793	Face Assy., Dial
24	39004-5	Condenser, 50 mmf., 500 v., mica		B-134571	Pointer, Dial
25	39001-11	Condenser, .005 mfd., 600 v., paper		W-134667	Clip, Dial Pointer
26	39001-13	Condenser, .01 mfd., 600 v., paper		W-51752	Spring, Dial Cord
27	39001-73	Condenser, .00025 mfd., 600 v., paper		W-134917	Shaft, Drive
30	39001-11	Condenser, .005 mfd., 600 v., paper		W-51071	Ring, Retaining
32	W-30805	Condenser, .01 mfd., 400 v., paper		W-134916	Washer, Spring
33	39001-11	Condenser, .005 mfd., 600 v., paper		W-132366-2	Nut, Iron Core Locking
34	39001-13	Condenser, .01 mfd., 600 v., paper		39196-29	Screw, Dial Mtg.
35	B-226638-53	Condenser, 50 mmf., 500 v., ceramic		W-134055	Grommet, Variable Condenser Mt
36	210685-143	Condenser, 580 mmf., 300 v., mica		R-139206	Cabinet
37A	134995	Condenser, Variable (Two		C-134773	Lens, Dial
37B		Condenser, Variable \ Section		D-137057	Record Changer (Model "O D")
38A	137076	Condenser, 40 mfd., 450 w. v. Four		AB-134935	Floating Jewel Needle Assy.
38B		Condenser, 20 mfd., 450 w. v. } Section		W-134959	Cable, Phono
38C		Condenser, 20 mfd., 450 w. v. } Elect.		W-135248	Knob
38D		Condenser, 20 mfd., 25 w. v. } Filter		W-45580	Rubber Mounting., Speaker
39	AW-134065	Transformer, 1st I. F.		W-45580	Rubber Mtg., Chassis
40	AW-134158	Transformer, 2nd I. F.		W-23880	Thumbscrew, Chassis Mtg.
41	B-134625	Transformer, Power		W-134966	Nut, Spring Lock (Record Changer Mtg.)
42	W-43567	Bulb (Dial), Type 51, 7.5 v., .25 amp.			
43	W-43567	Bulb (Dial), Type 51, 7.5 v., .25 amp.		AW-134961	Lead Assy., Shielded (Record Changer)
44	B-135651	Control, Tone (3 megohm)			
*	39368-10	Control, Tone		AC-137885	Lid Support, Cabinet
45	B-135859	Control, Volume (1 megohm) & Switch		W-138330	Hinge, Cabinet Lid

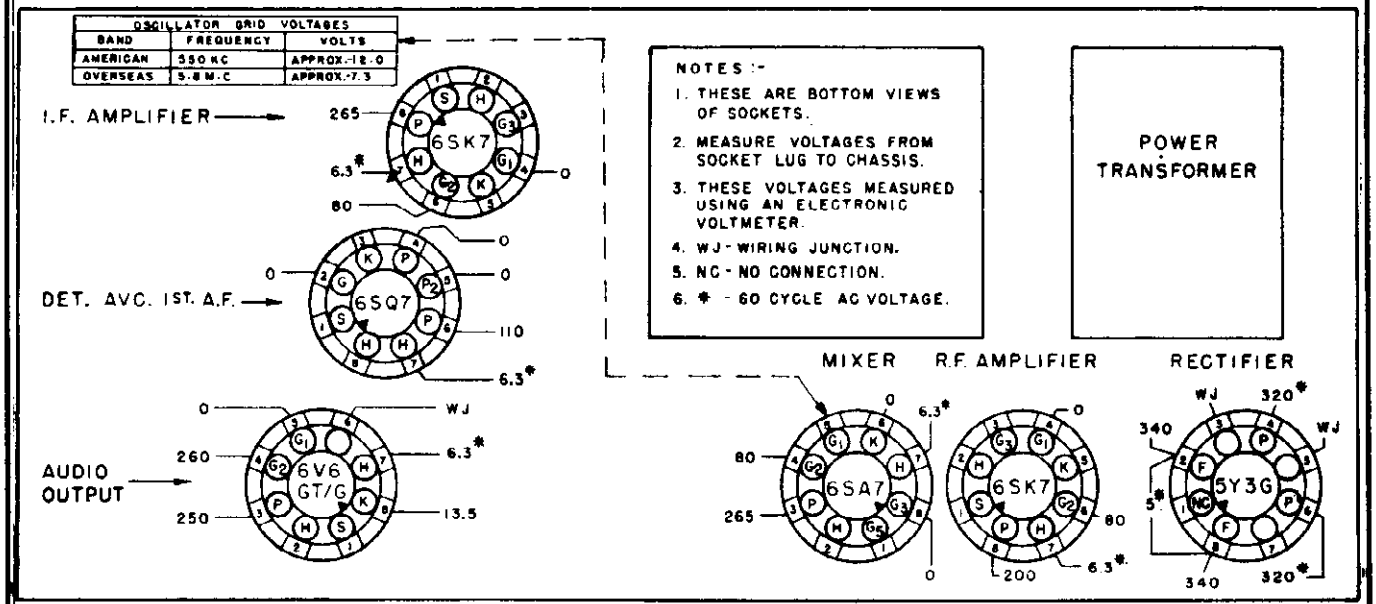
*These parts will replace the original equipment parts.

MODEL 66CT

CROSLEY DIV.
AVCO MFG. CORP.



SOCKET VOLTAGE CHART



SOCKET VOLTAGE TOLERANCE: 10%

TYPE: Six-tube, two-band, superheterodyne.

FREQUENCY RANGE: American Broadcast Band, 540 to 1600 kc. (Selector Switch at A.)

Overseas Short-wave Band, 5.8 to 15 mc. (Selector Switch at 0.)

INTERMEDIATE FREQUENCY: 455 kc.

POWER SUPPLY: 60 cycle a. c. only.

VOLTAGE RATING: 105-125 volts.

POWER CONSUMPTION: 60 watts maximum.

POWER OUPUT: 4.5 watts minimum.

VOLTAGE DROP ACROSS SPEAKER FIELD: 76 volts.

RESISTANCE OF SPEAKER FIELD: 900 ohms.

RECORD CHANGER: Seeburg Model K, RCD.CH. 15-2

CROSLEY DIV.
AVCO MFG. CORP.
MODEL CO(

ALIGNMENT PROCEDURE

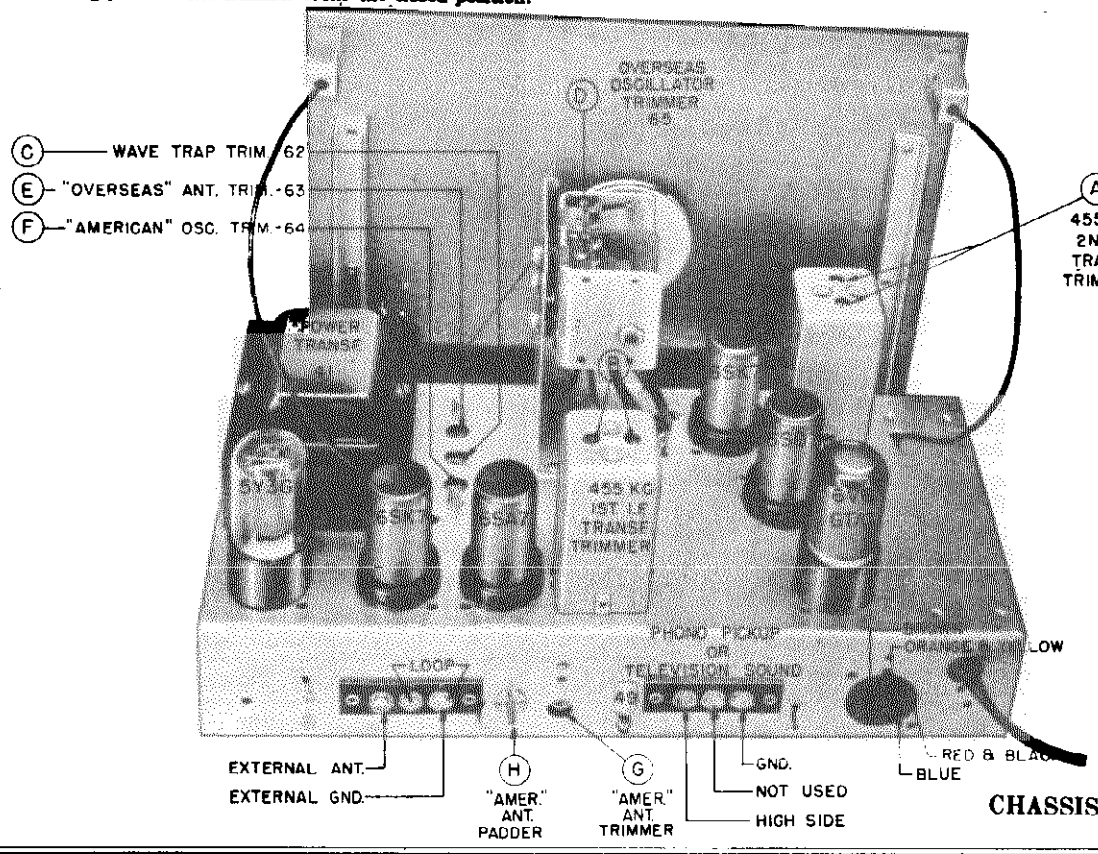
1. Turn the tuning condenser to the completely closed position against the stop and set the dial pointer to the reference line at the end of the dial scale.
2. Connect the output meter across the speaker voice coil.
3. The r. f. signal input from the signal generator should be connected to the external antenna post as indicated in the alignment chart. Connect the low side (ground) of the signal generator to the chassis.
4. Turn the volume control on full and adjust the signal generator output to produce approximately mid-scale deflection of the output meter, but maintain the signal generator output as low as possible to prevent AVC action in the receiver.

Alignment adjustment locations are shown on Chassis, Rear View-

Alignment Sequence	Signal Generator Output			Position of		Adjust for Maximum Output
	Frequency in kc.	In Series With	To	Band Switch	Tuning Dial	
1	455	200 mmf.	Ant.	A	1620	A & B
2	455	200 mmf.	Ant.	A	1620	C*
3	15,300	400 ohms	Ant.	O	15,300	D
4	15,000	400 ohms	Ant.	O	15,000	E
5	1620	200 mmf.	Ant.	A	1620	F
6	1400	200 mmf.	Ant.	A	1400	G
7	600	200 mmf.	Ant.	A	600	H
8	1400	200 mmf.	Ant.	A	1400	Recheck G

*Adjust for Minimum Output (Wave Trap).

NOTE: When aligning the "Overseas" oscillator trimmer (D), be sure that the circuit is aligned at the correct frequency and not at the image frequency which is 910 kilocycles lower as indicated by the receiver dial. To check: tune in the generator frequency, then increase the generator output and tune in the image frequency. The image frequency should be weaker than the fundamental and audible 910 kilocycles lower on the receiver dial. If the image cannot be tuned in, the oscillator trimmer is adjusted to the wrong peak of the trimmer from the closed position.



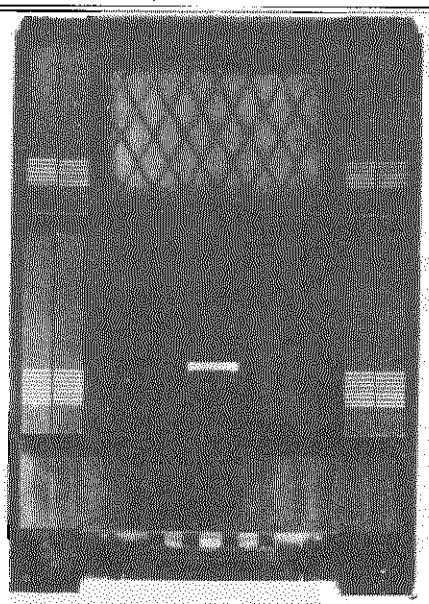
CHASSIS, REAR VIEW

MODEL 66CT

CROSLEY DIV.
AVCO MFG. CORP.
PARTS LIST—MODEL 66CT

Item No.	Part Number	Description
1	39294-16	Resistor, 3300 ohm, ½ w.
2	39294-21	Resistor, 22,000 ohm, ½ w.
3	39016-38	Resistor, 12,000 ohm, 2 w.
4	39294-33	Resistor, 2.2 megohm, ½ w.
5	39040-13	Resistor, 1,000 ohm, 1 w.
6	39294-33	Resistor, 2.2 megohm, ½ w.
7	39294-28	Resistor, 330,000 ohm, ½ w.
8	B-138131-2	Transformer, Output
11	39294-23	Resistor, 47,000 ohm, ½ w.
12	39294-29	Resistor, 470,000 ohm, ½ w.
14	39015-19	Resistor, 330 ohm, 1 w.
15	39294-22	Resistor, 33,000 ohm, ½ w.
16	39294-35	Resistor, 4.7 megohm, ½ w.
17	39294-21	Resistor, 22,000 ohm, ½ w.
18	39294-25	Resistor, 100,000 ohm, ½ w.
19	39001-73	Condenser, 250 mmf., 600 v., Paper
20	39001-73	Condenser, 250 mmf., 600 v., Paper
21	39001-17	Condenser, .05 mfd., 600 v., Paper
22	39001-73	Condenser, 250 mmf., 600 v., Paper
23	39001-17	Condenser, .05 mfd., 600 v., Paper
24	39004-5	Condenser, 50 mmf., 500 v., Mica
25	39001-11	Condenser, .005 mfd., 600 v., Paper
26	39001-13	Condenser, .01 mfd., 600 v., Paper
27	39001-73	Condenser, 250 mmf., 600 v., Paper
30	39001-11	Condenser, .005 mfd., 600 v., Paper
32	W-30805	Condenser, .01 mfd., 400 v., Paper
33	39001-11	Condenser, .005 mfd., 600 v., Paper
34	39001-13	Condenser, .01 mfd., 600 v., Paper
35	B-226638-53	Condenser, 50 mmf., 500 v., Ceramic
36	GC-210685-143	Condenser, 580 mmf., 300 v., Mica
37A	B-134995	Condenser, Variable (Two
37B		Condenser, Variable (Section
38A	B-132807	Condenser, 20 mfd., 360 w.v. (Four
38B		Condenser, 20 mfd., 275 w.v. (Section
38C		Condenser, 20 mfd., 245 w.v. (Elect.
38D		Condenser, 20 mfd., 25 w.v. (Filter
39	AW-137495	Coil Assy., 1st. I.F.
40	AW-134158	Coil Assy., 2nd. I. F.
41	B-134625	Transformer, Power
42	W-43567	Bulb (Dial), Type 51, 7.5 v., 0.2 amp.
43	W-43567	Bulb (Dial), Type 51, 7.5 v., 0.2 amp.
44	B-135651	Control, Tone (3 megohm)
*	39368-10	Control, Tone*
45	B-135859	Control, Volume (1 meg.) & Switch Assy.
*	39368-18	Control, Volume
*	39369-1	Switch, Power
	39370-1	Shaft, Volume (Plug in)
46	W-132267-1	Condenser, Trimmer
47	B-132300-1	Cable & Plug Assy. (Power)
48	39019-3	Terminal Board Assy.
49	39019-3	Terminal Board Assy.
51	W-134968-1	Socket, Speaker
52A	B-134639	Switch, Band Change (Two
52B		Switch, Band Change (Section
53	AW-135907	Coil Assy., R. F.
54	AW-135908	Coil Assy., Oscillator
55	AW-135909	Coil Assy., Antenna
56	B-134700	Speaker & Transformer Assy.
57	AW-135910	Coil Assy., Antenna Loading

Item No.	Part Number	Description
62	B-132386-7	Condenser, Trimmer (Three
63		Condenser, Trimmer Section
64		Condenser, Trimmer (Assembly
65	Part of Item # 37B	Condenser, Trimmer
	G-39204	Socket, Tube
	39017-4	Socket, Dial Light
	G-39012-8	Iron Core
	W-132366-2	Nut, Locking (Iron Core)
	AW-134793	Face Assy., Dial
	B-134571	Pointer, Dial
	W-134667	Clip, Dial Pointer
	W-51752	Spring, Dial Drive Cord
	W-134917	Shaft, Drive
	W-51071	Ring, Retaining (Drive Shaft)
	W-134916	Washer, Spring (Drive Shaft)
	W-134055	Grommet (Var. Cond. Mtg.)
	39196-29	Screw (Dial Mtg.)
	39172-200	Screw, Chassis Mtg. (Front)
	W-45580	Grommet, Chassis Mtg.
	W-137199	Nut, Tee (Chassis Mtg)
	R-138151	Cabinet
	C-134773	Lens, Dial
	W-137201	Pull, Drawer
	W-135248	Knob
	D-134945-1	Record Changer (Model "K")
	AW-138145	Shielded Wire Assy.
61	W-137213	Cable & Plug Assy. (Phono.)
	W-134956	Nut, Tee (Record Changer Mtg.)
	W-134966	Nut, Spring Lock (Record Changer Mtg.)
	AW-137232	Screw & Washer Assy. (Record Changer Mtg.)
	C-137173	Album (12" Record)
	C-137236	Album (10" Record)
	AB-134935	Needle, Floating Jewel Assy.



*These parts will replace the original equipment parts.

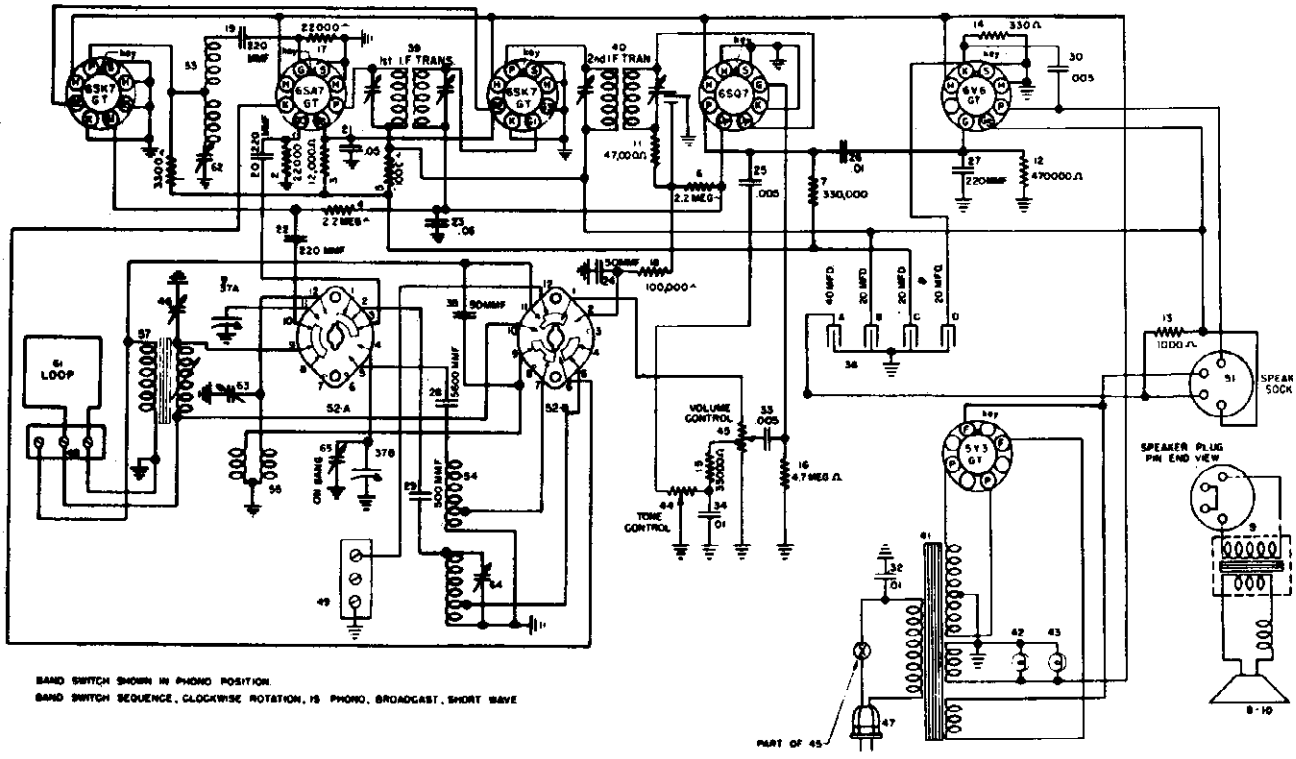
TUBE COMPLEMENT:

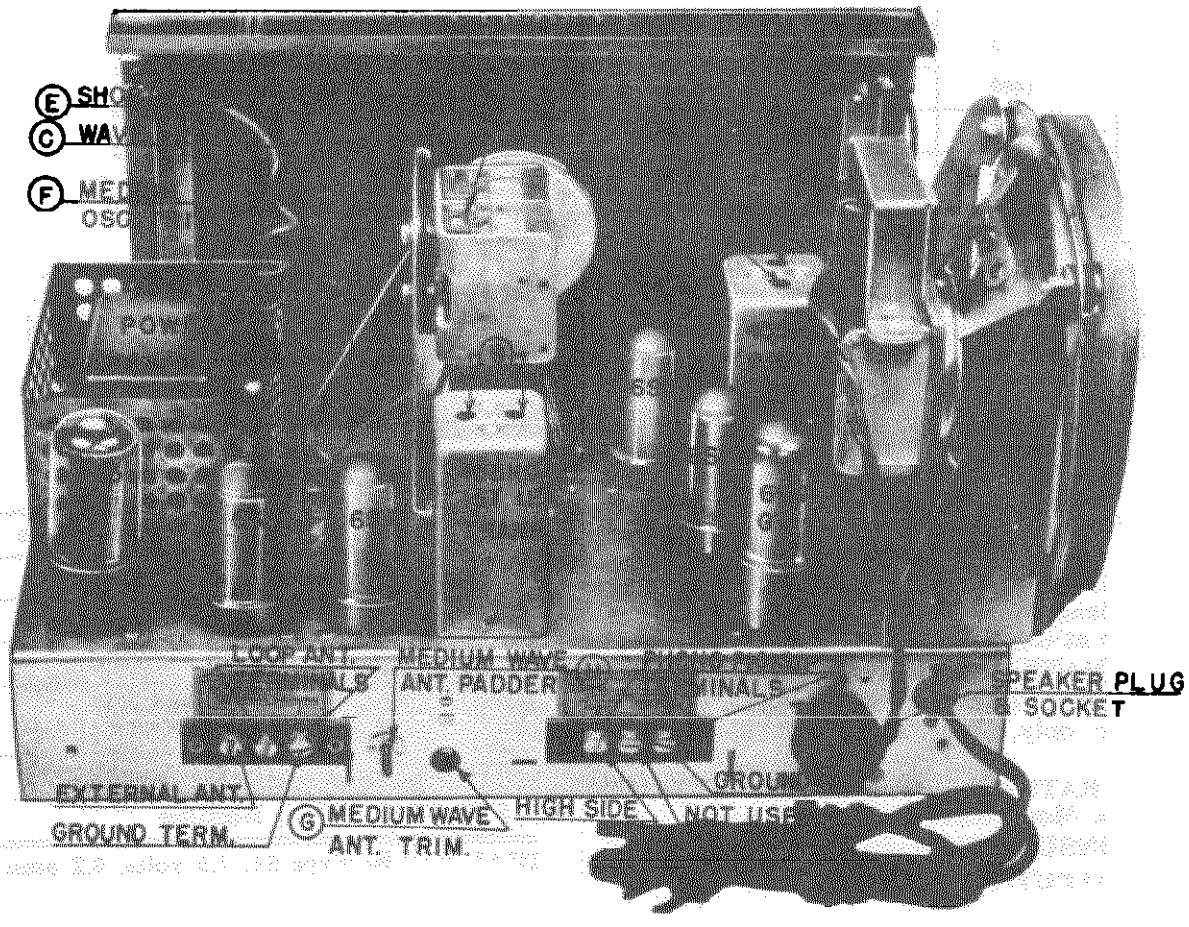
Type	Function
6SA7 (or GT/G)	Mixer
6SK7 (or GT/G)	R. F. Amplifier
6SK7 (or GT/G)	I. F. Amplifier
6SQ7 (or GT/G)	Detector, AVC, 1st A.F. Amplifier
6V6 GT	A. F. Power Output
5Y3 G	Rectifier

DIAL BULB: Type 51, 7.5 volts, .25 amp.

CROSLEY DIV.
AVCO MFG. CORP.

MODELS 66XTA,
66XTA-10, 66XTA-2





CHASSIS, REAR VIEW

MODELS 66XTA,
66XTA-10, 66XTA-20

CROSLEY DIV.
AVCO MFG. CORP.

ALIGNMENT PROCEDURE

1. Turn the tuning capacitor to the completely closed position against the stop, and set the dial pointer to the reference line at the end of the dial scale.
2. Turn the tone control to the high or treble position.
3. Connect the output meter across the speaker voice coil.
4. The r. f. signal input from the signal generator should be connected to the external antenna post. Connect the signal generator ground to the chassis.
5. Turn the volume control on full, and adjust the signal generator output to produce approximately mid-scale deflection of the output meter, but maintain signal generator output as low as possible to prevent AVC action in the receiver.
6. Loop antenna must be connected when making alignments.

ALIGNMENT CHART

Alignment Sequence	Signal Generator Output			Position of		Adjust for Maximum Output
	Frequency in k c.	In Series with	To	Band Switch	Tuning Dial	
1	455	200 mmf.	Ant.	M	1650 KC	A & B
2	455	200 mmf.	Ant.	M	1650 KC	C*
3	15,500	400 ohms	Ant.	S	15.5 MC	D
4	15,000	400 ohms	Ant.	S	20 M	E
5	1650	200 mmf.	Ant.	M	1650 KC	F
6	1400	200 mmf.	Ant.	M	1400 KC	G
7	600	200 mmf.	Ant.	M	500 M	H
8	1400	200 mmf.	Ant.	M	1400 KC	Recheck G

*Adjust for minimum output (wavetrap).

NOTE: When aligning the short-wave oscillator trimmer (D), be sure that the circuit is aligned at the correct frequency and not at the image frequency which is 910 kilocycles lower as indicated by the receiver dial. To check: Tune in the generator frequency, then increase the generator output and tune in the image frequency. The image frequency should be weaker than the fundamental and audible 910 kilocycles lower on the receiver dial. If the image cannot be tuned in, the oscillator trimmer is adjusted to the wrong peak. The correct peak is the second one heard as the trimmer adjustment screw is opened from the completely closed position.

TYPE: Six-tube, two band superheterodyne with ter minals provided for record player.

FREQUENCY RANGE: Medium wave band: 540 to 1650 kc. (555 to 182 meters), Band Switch at (M). Shortwave Band: 4.7 to 15.5 mc. (63 to 19.35 meters), Band Switch at (S).

INTERMEDIATE FREQUENCY: 455 kc.

POWER SUPPLY: Models 66XTA, 66XTA-10, 50-60 cycle a. c. only. Model 66XTA-20, 25-40 cycles a. c. only.

VOLTAGE RATING: Models 66XTA, 66XTA-20, 105-125 volts. Model 66XTA-10, 210-250 volts.

POWER CONSUMPTION: 60 watts maximum.

POWER OUTPUT: 4.5 watts maximum.

TUBE COMPLEMENT

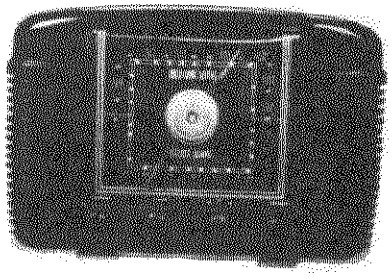
Type	Function
6SK7	R. F. Amplifier
6SA7	Mixer
6SK7	I. F. Amplifier
6SQ7	Detector, AVC, 1st A. F. Amplifier
6V6 GT/G	Power Amplifier
5Y3 GT/G	Rectifier

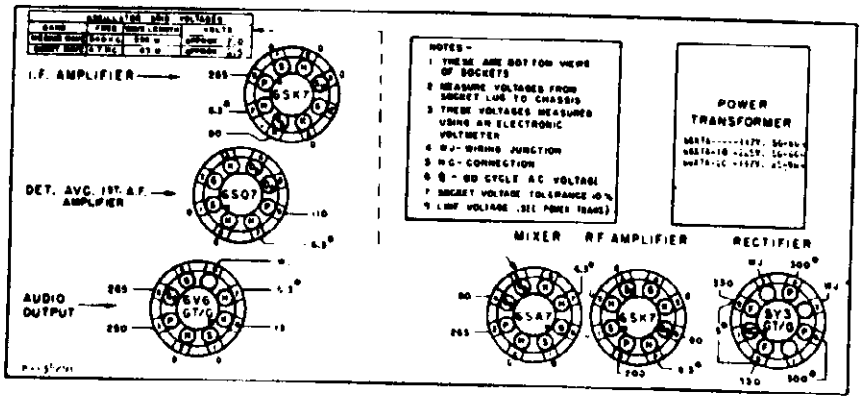
DIAL BULB: Type 51, 7.5 volts, 0.2 amp.

CROSLEY DIV.
AVCO MFG. CORP.

MODELS 66XTA,
66XTA-10, 66XTA-2(

SOCKET VOLTAGE CHART





Figures in first column correspond to figures in Schematic Diagram

Item No.	Part No.	Description
1	39373-38	Resistor, 3300 ohm, ½ w.
2	39373-60	Resistor, 22,000 ohm, ½ w.
3	39373-275	Resistor, 12,000 ohm, 2 w.
4	39373-97	Resistor, 2.2 megohm, ½w.
5	39373-143	Resistor, 1,000 ohm, 1 w.
6	39373-97	Resistor, 2.2 megohm, ½ w.
7	39373-84	Resistor, 330,000 ohm, ½ w.
9	B-138131-2	Transformer, output
10	C-135933	Speaker and Transformer Assy.
11	39373-67	Resistor, 47,000 ohm, ½ w.
12	39373-87	Resistor, 470,000 ohm, ½ w.
13	39371-5	Resistor, 1,000 ohm, 10 w.
14	39373-133	Resistor, 330 ohm, 1 w.
15	39373-64	Resistor, 33,000 ohm, ½ w.
16	39373-102	Resistor, 4.7 megohm, ½ w.
17	39373-60	Resistor, 22,000 ohm, ½ w.
18	39373-74	Resistor, 100,000 ohm, ½ w.
19	39004-9	Condenser, 220 mmf., 500 v., mica
20	39004-9	Condenser, 220 mmf., 500 v., mica
21	39001-17	Condenser, .05 mfd., 600 v., paper
22	39004-9	Condenser, 220 mmf., 500 v., mica
23	39001-17	Condenser, .05 mfd., 600 v., paper
24	39004-5	Condenser, 50 mmf., 500 v., mica
25	39001-11	Condenser, .005 mfd., 600 v., paper
26	39001-13	Condenser, .01 mfd., 600 v., paper
27	39004-9	Condenser, 220 mmf., 500 v., mica
28	210685-188	Condenser, 5600 mmf., 500 v., mica
29	210685-165	Condenser, 500 mmf., 500 v., mica
30	39001-11	Condenser, .005 mfd., 600 v., paper
32	W-30805	Condenser, .01 mfd., 400 v., paper
33	39001-11	Condenser, .005 mfd., 600 v., paper
34	39001-13	Condenser, .01 mfd., 600 v., paper
35	39004-5	Condenser, 50 mmf., 500 v., mica
37A	B-136207	Condenser, Variable (Two
37B		Condenser, Variable (Section
38A	B-135934	Condenser, 40 mfd., 360 w.v. (Four Section Elec. Filter used on Models 66XTA, 66XTA-10
38B		Condenser, 20 mfd., 275 w.v.
38C		Condenser, 20 mfd., 245 w.v.
38D		Condenser, 20 mfd., 22 w.v.
38A	B-137372	Condenser, 40 mfd., 360 w.v. (Four Section Elec. Filter used on Model 66XTA-20
38B		Condenser, 20 mfd., 275 w.v.
38C		Condenser, 20 mfd., 245 w.v.
38D		Condenser, 20 mfd., 22 w.v.
39	AW-137495	Transformer, Assy., 1st I. F.
40	AW-134158	Transformer Assy., 2nd I. F.
41	B-135937	Transformer, Power (66XTA)
41	B-136132	Transformer, Power (66XTA-10)
41	B-136131	Transformer, Power (66XTA-20)
42	W-43567	Bulb (dial), Type 51, 7.5 v., 0.2 a
43	W-43567	Bulb (dial), Type 51, 7.5 v., 0.2 a
44	B-135651	Control, Tone (3 megohm)
*	39368-10	Control, Tone
45	B-135859	Control, Volume (1 megohm) and Switch Assy.
*	39368-18	Control, Volume
*	39370-1	Shaft, Volume (Plug in)
*	39369-1	Switch, Power
46	W-132267-1	Condenser, Trimmer
47	C-132300-2	Cable and Plug, Power
48	W-135479	Terminal Board Assy.
49	W-135479	Terminal Board Assy.
51	W-134968-2	Socket, Speaker
52A	B-135936	Switch, Band Change (Two
52B		Switch, Band Change (Section
53	AW-135907	Coil Assy., R. F.
54	AW-136360	Coil Assy., Osc.
55	AW-136361	Coil Assy., Ant.
57	AW-135954	Coil Assy., Ant. Loading
61	AC-138210	Antenna Loop and Back Assy.
62	B-132386-7	Condenser Trimmer (Three
63		Condenser Trimmer (Section
64		Condenser Trimmer (Assy.
65	Part of Item #37B	Condenser Trimmer
	39388	Socket, Tube
	39017-3	Socket, Dial Light
	G-39012-8	Iron Core
	W-132366-2	Nut, Iron Core Locking
	AW-137205	Dial Face Assy.
	B-134571	Pointer, Dial
	W-134667	Clip, Dial Pointer
	W-51752	Spring, Dial Drive Cord
	W-134917	Shaft, Drive
	W-51071	Ring, Retaining
	W-134916	Washer, Spring
	W-135164	Bumper
	W-134055	Grommet, Variable Cond. Mtg.
	R-134592	Cabinet
	C-132688	Lens, Dial
	W-130197	Knob
	W-132709	Grille Cloth
	W-45580	Grommet
	B-134660	Gasket, Speaker
	W-132124	Stud, Trimount
	W-136584	Washer, Rubber

*These parts will replace the original equipment parts.

MODELS 88TA,
88TC

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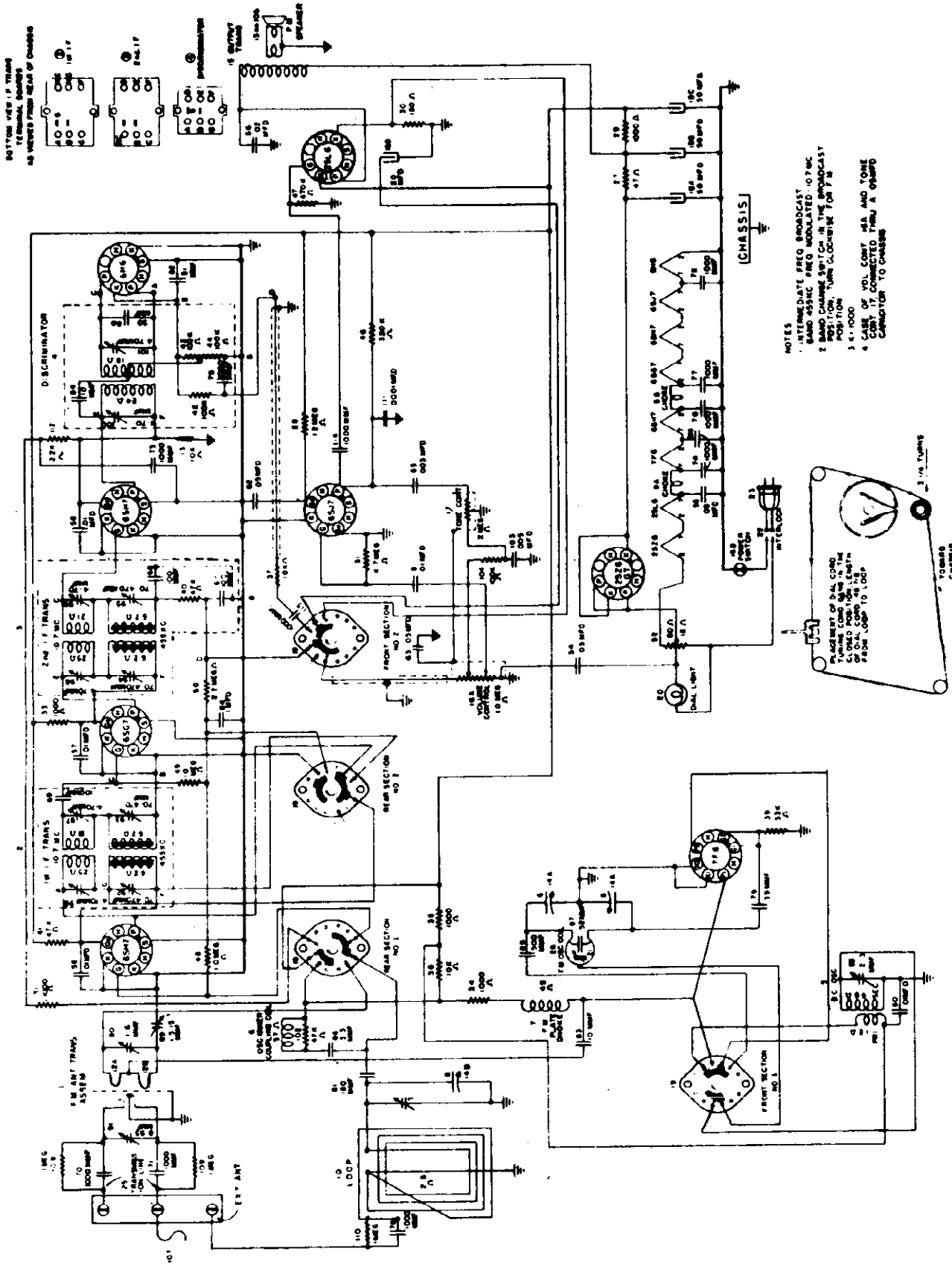
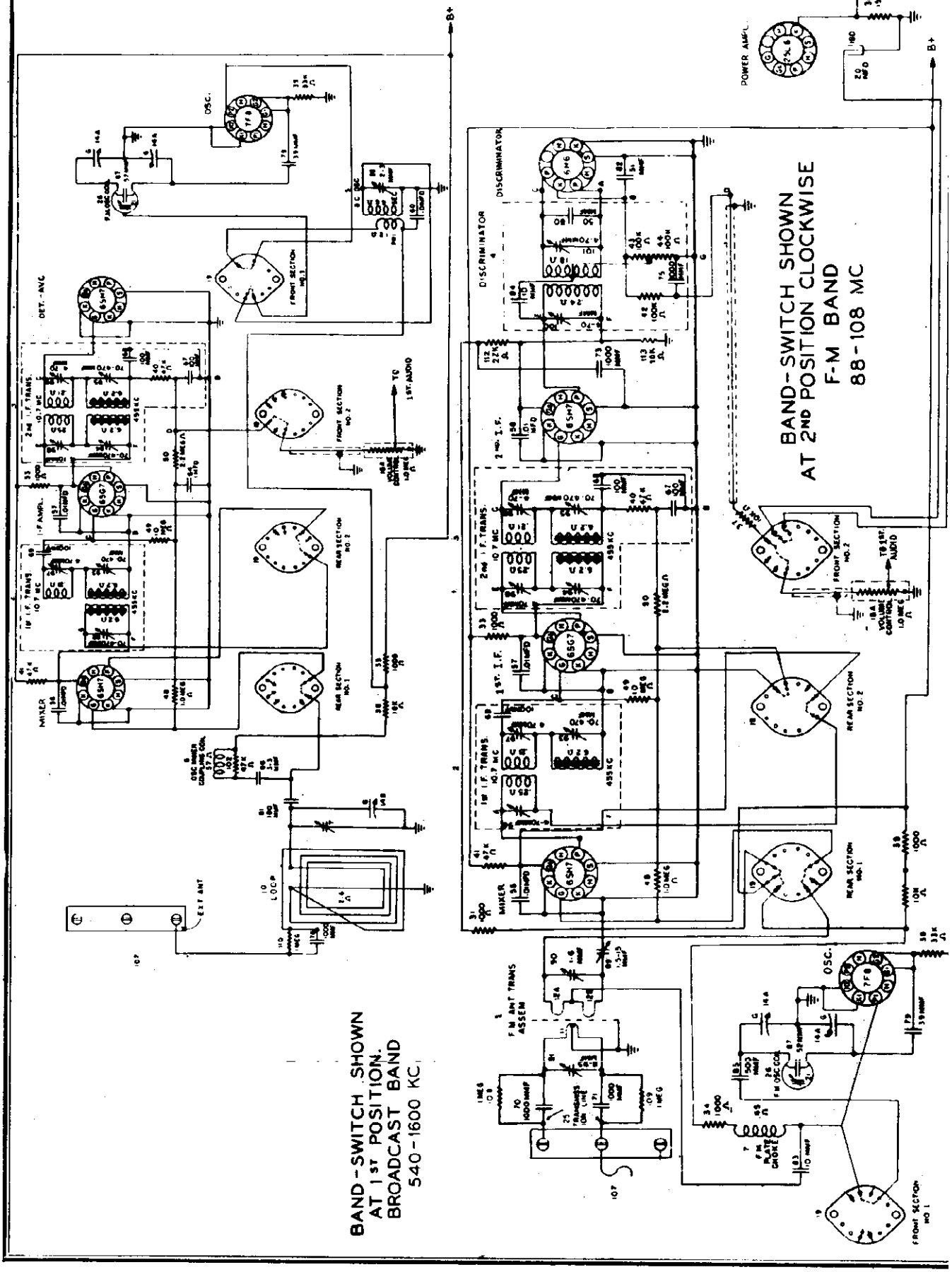
AVCO MFG. CORP.



December, 1947

CROSLEY DIV.
AVCO MFG. CORP.

MODELS 88TA
88TC



MODELS 88TA, 88TC

CROSLEY DIV.
AVCO MFG. CORP.

Under no circumstances should a ground be connected to this receiver. Never place the receiver chassis on a metal bench or grounded object when the power plug is connected to the electric outlet. To avoid shock, when making repairs or adjustments, do not permit any part of the body to contact grounded metal objects.

ALIGNMENT EQUIPMENT

The following equipment is used as indicated in the alignment chart and alignment notes:

SIGNAL GENERATORS:

1. Amplitude Modulated Signal Generator with 400 cycle modulated signal to cover 455 to 1600 kc.
2. Frequency Modulated Signal Generator to cover 10.7 to 108 mc., with sweep to cover 450 kc. for the 10.7 mc. alignment.

CATHODE RAY OSCILLOGRAPH:

METERS:

1. Suitable Output Meter.
2. Field Strength Meter (Fig. 1). This meter may consist of a D.C.100 microampere (full scale) meter, shunted by a 1000 mmf. mica by-pass condenser; a germanium crystal rectifier connected in series with the meter and a five foot, 75 ohm twisted, pair of leads. Shunt the meter end of the leads with a 75 ohm carbon resistor. The open ends of the leads are connected to the F.M. dipole antenna terminals. *Connect the condenser directly across meter terminals, and the crystal directly to one terminal of meter. Keep connecting leads as short as possible*

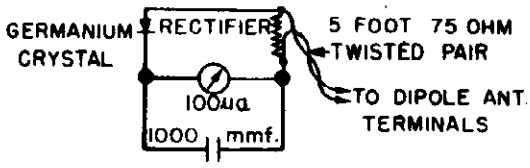


FIGURE 1

DUMMY ANTENNA:

1. 78 ohm Dummy Antenna (Fig. 2).

CONDENSERS:

1. 0.1 mfd. Condenser.
2. 100 mmf. Condenser.
3. 220 mmf. Condenser.
4. 30 mmf. Condenser.

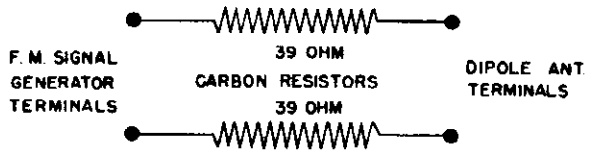


FIGURE 2

SHUNT:

1. 10 ohm carbon Resistor.

ALIGNMENT PROCEDURE

This receiver has been aligned at the factory for best performance and no attempt should be made to realign it unless the proper test equipment is available.

1. Turn the tuning condenser to full mesh, against stop, and set the dial pointer to the reference point at the left end of the dial.
2. Set the tone control knob to the full treble position (extreme right).
3. For Amplitude Modulated signal readings, connect output meter across voice coil (3.2 ohms).
4. All Amplitude Modulated input signals are modulated 30% at 400 cycles with the High side of the signal generator connected to receiver as indicated in the alignment chart. Connect the low side of signal generator thru a 0.1 mfd condenser to the receiver chassis. If hum is encountered, use a 1 to 1 isolating transformer between the power line outlet and the receiver power line cord. Then connect the low side of the signal generator directly to the receiver chassis.
5. All Frequency Modulated signals are modulated 30% at 400 cycles. 30% modulation is equal to a deviation of 22.5 kilocycles.
6. Turn the volume control to maximum clockwise position and adjust signal generator output to produce a noticeable output meter reading. Keep signal generator output as low as possible to prevent AVC action in the receiver.

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MODELS 88TA
88TC

ALIGNMENT CHART

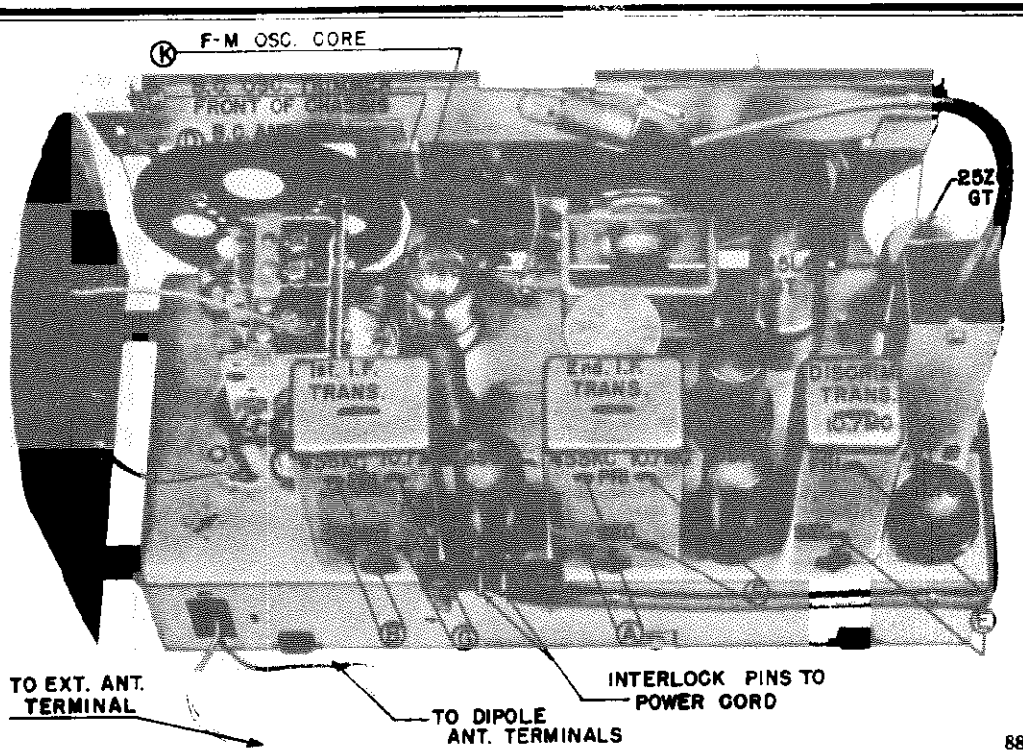
Alignment adjustment locations are shown on pages 1 and 2

Alignment Sequence	Type Generator	Signal Generator Output: Frequency	Signal Generator Output: In Series with	Signal Generator Output: To	Position of: Range Switch	Position of: Dial Pointer or Var. Cond.	Adjust	Type of Selectivity Curve	Osc. Frequency	Remarks
1	AM	455 kc	100 mmf.	Mixer Grid 6SH7	AM	Open	A & B	Single Peak	.....	See Note 1
2	AM	1400 kc.	100 mmf.	Stator Plates, Ant. Section of Var. Cond.	AM	1400 kc.	C	.....	Above	See Notes 1 and 2
3	AM	1400 kc.	220 mmf.	Loop Primary	AM	1400 kc.	D	.....	Above	See Note 1.
4	FM	10.7 mc.	30 mmf.	2nd I.F. Grid 6SH7	FM	Closed	E	~	.....	See Notes 1, 3, 4, 5 & 6.
5	FM	10.7 mc.	30 mmf.	1st I.F. Grid 6SG7	FM	Closed	F	~	.....	See Notes 3, 5 & 6.
6	FM	10.7 mc.	30 mmf.	F.M. Ant. Terminals	FM	Closed	G	~	.....	See Notes 3, 5 & 6.
7	FM	98.0 mc.	*78 ohm Dummy	F.M. Ant. Terminals	FM	98 mc.	H & I	Single Peak	.....	See Notes 7 & 9
8	Disconnect Generator. Connect Field Strength Meter.*				FM	92 mc.	J	.....	.....	Adjust for null point. See Note 8.
9	If Trimmer (J) in Step 8 is turned more than ¼ turn, repeat Step 7.									
10	Repeat Step 8 if Step 9 was necessary.									
11	FM	98.0 mc.	*78 ohm Dummy	F.M. Ant. Terminals	FM	98 mc.	K	.....	.....	Adjust for maximum output.

*See Circuit.

ALIGNMENT NOTES

1. Connect low side of signal generator as explained in "Alignment Procedure".
2. Receiver should tune thru peaks at 540 and 1600 kc.
3. Sweep generator alignment. (For 10.7 mc. I.F. alignment use approximately 450 kc. sweep width).
4. Sweep generator output 0.1 to 1 volt R. M. S.
5. Connect high side of scope to discriminator transformer terminal at shielded lead wire junction. Connect low side of scope to the receiver chassis.
6. Align for maximum peak amplitude. Peak separations should be 150 to 170 kc.
7. Disconnect scope. Connect output meter to voice coil (3.2 ohms).
8. It is important that the radiation balance trimmer be adjusted to the null point for proper operation of the Frequency Modulation band. To check the null point, connect a Field Strength Meter across the F.M. antenna primary trimmer.
9. Align F.M. Antenna band pass circuit as follows:
   (a) With the F.M. signal generator set to 98.0 megacycles, feed a signal, modulated with 400 cycles at 30% to the receiver as indicated in the alignment chart. Shunt the antenna primary trimmer with a 10 ohm carbon resistor and adjust trimmer (H) for maximum output.
   (b) Place the 10 ohm carbon resistor across the F.M. antenna secondary trimmer and adjust trimmer (I) for maximum output. Remove 10 ohm carbon resistor from secondary trimmer.



DESCRIPTION

TYPE: Eight-tube, two-band, superheterodyne.

FREQUENCY RANGE: Standard American Broadcast Band; 540 to 1600 kc. (Selector Switch to left).

Frequency Modulation Band; 88 to 108 megacycles (Selector Switch to right).

INTERMEDIATE FREQUENCY: Standard American Broadcast Band; 455 kc.

Frequency Modulation Band; 10.7 mc.

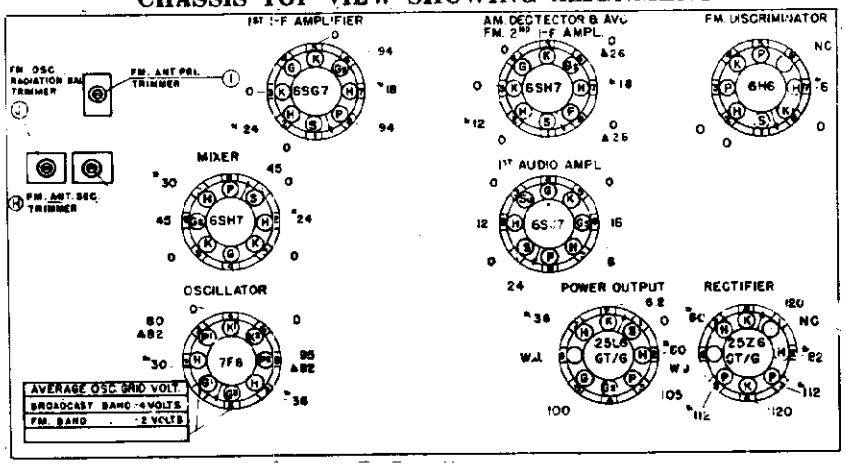
POWER SUPPLY: a.c.—d.c.

VOLTAGE RATING: 105-125 volts.

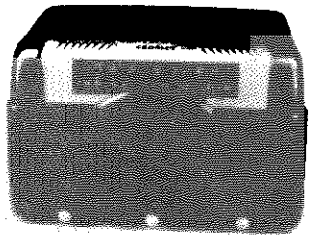
POWER CONSUMPTION: 45 watts at normal power supply voltage (117 volts).

POWER OUTPUT: 1.5 watts maximum.

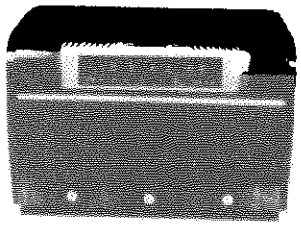
CHASSIS TOP VIEW SHOWING ALIGNMENT ADJUSTMENTS



88TA



88TC



TUBE COMPLEMENT

Type	Function
6SH7	Mixer
7F8	Oscillator
6SG7	1st I. F. Amp. (F. M. and A. M.)
6SH7	2nd F. M. I. F. Ampl. and A. M. Det.
6H6	F. M. Det. (Discriminator)
6SJ7	1st Audio Ampl.
25L6GT	Output
25Z6GT	Rectifier

DIAL BULB: Type 47, 6.3 v., .15 amp.

SOCKET VOLTAGE CHART

NOTES:
1 BOTTOM VIEW OF TUBE SOCKETS
2 MEASURE VOLTAGE WITH AN ELECTRONIC VOLTMETER FROM SOCKET LUG TO CHASSIS
3 ALL VOLTAGES ARE THE SAME FOR BC & FM EXCEPT WHERE MARKED WITH DELTA (Δ) THIS IS THE VOLTAGE WITH BAND SWITCH IN THE FM. POSITION
4 LINE VOLTAGE 117 V. 60 ~
5 NC = NO CONNECTION
6 WJ = WIRING JUNCTION
7 ~ = A.C. VOLTAGE
8 SOCKET VOLTAGE TOLERANCE 10%

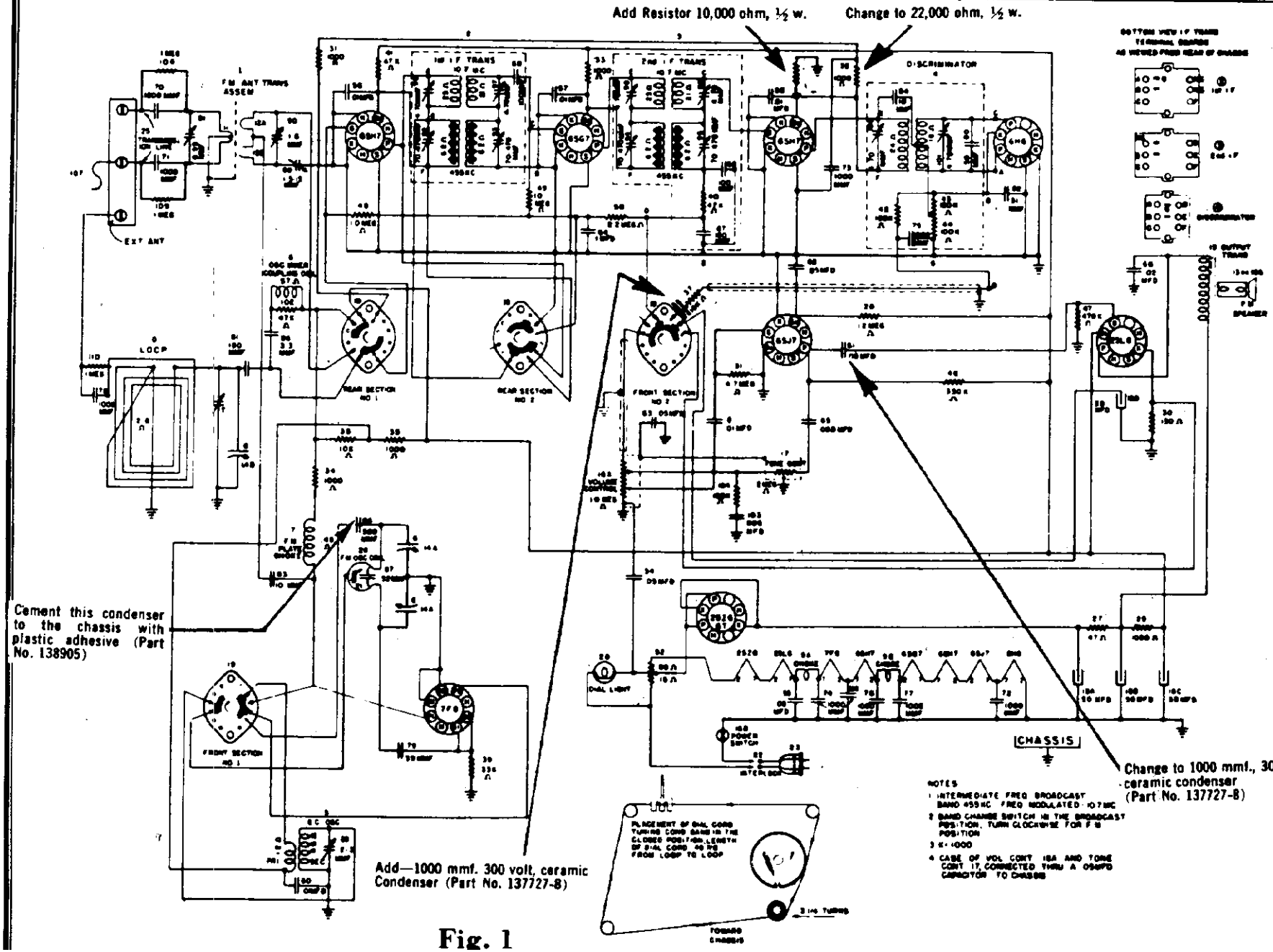

Add Resistor 10,000 ohm, ½ w.
Change to 22,000 ohm, ½ w.
Cement this condenser to the chassis with plastic adhesive (Part No. 138905)
Add—1000 mmf. 300 volt, ceramic Condenser (Part No. 137727-8)
Change to 1000 mmf., 300 volt, ceramic condenser (Part No. 137727-8)
CHASSIS
NOTES

Fig. 1

MODELS 88TA, 88TC

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A kit of materials (part No. 143964) will be forwarded, free of charge, upon receipt of a request and the serial number of the radio for which it is required.

1. Change the resistor (item No. 32) to a 22,000 ohm, ½ watt, resistor (part No. 39373-60) as shown in Fig. 1.
2. Add one 10,000 ohm ½ watt, resistor (part No. 39373-54) as shown in Fig. 1. (88TC only)
3. Add one 1,000 mmf., 300 volt ceramic condenser (part No. 137727-8) as shown in Fig. 1.
4. Change the condenser (item No. 61) to a 1000 mmf., 300 volt ceramic condenser (part No. 137727-8) as shown in Fig. 1. (88TC only)
5. Replace the two lower screws, that fasten the speaker brackets to the front of the chassis, with two No. 8 x 1" hex. headed self threading screws (part No. 39220-36 CP). Add one headed bushing (part No.41405-3) to each of these screws, and add one rubber bumper (part No. 135164) to the head of each of these screws. (88TC only)
6. Add one Shock mount (part No. 46065) in the upper right hole of speaker mounting bracket. Do not fasten the speaker to this shock mount.
7. Cement condenser (item No. 85 in schematic wiring diagram) to the chassis with Plastic adhesive (part No. 138905).
8. Apply a heavy coat of plastic adhesive (part No. 138905) to the original variable condenser as shown in Fig. 2. Care must be taken so that the adhesive does not interfere with the mechanical operation of the condenser.

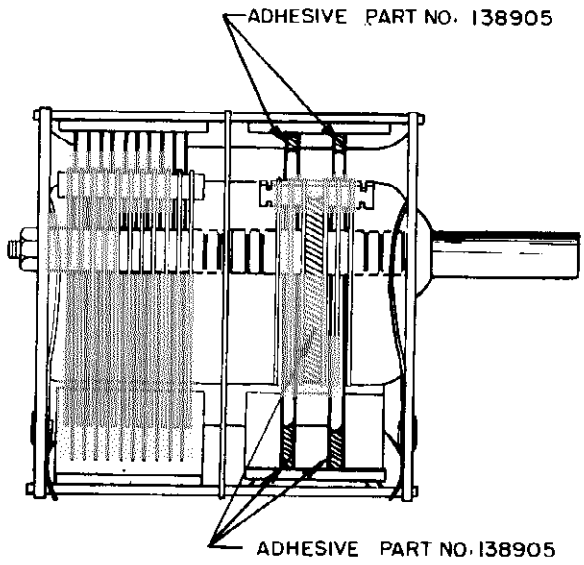

FIG. 2

9. Secure the insulator at the top of the 1st I.F., 2nd I.F., and discriminator transformers to the transformer shields with a heavy coat of adhesive (part No. 86646).
10. Add one rubber washer (part No. 136584) between the underneath side of the cabinet and each large metal washer used on the chassis mounting screws. (88TC only)

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MODELS 88TA, 88TC, LONG DISTANCE SWITCH INSTALL

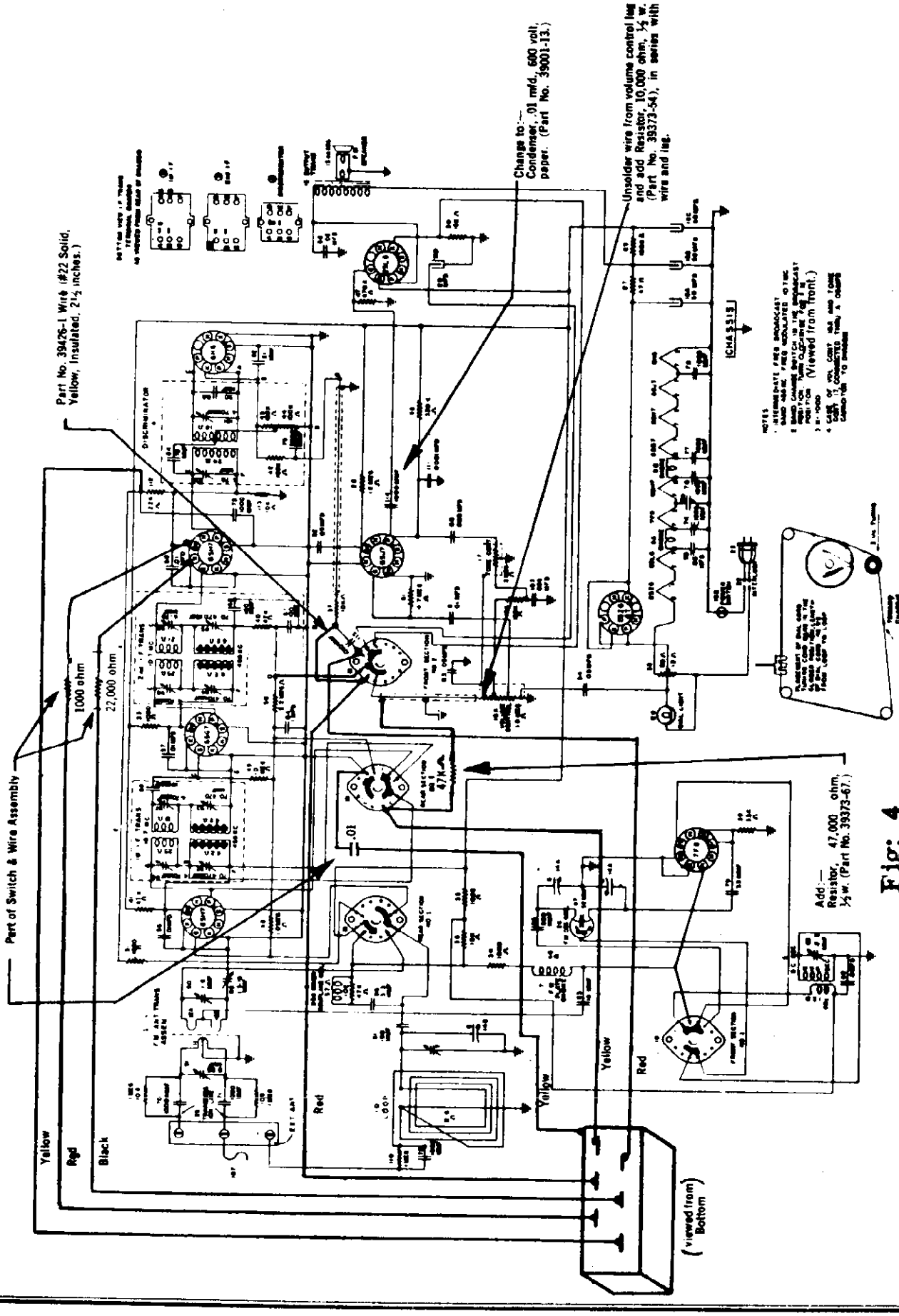


Fig: 4

INSTALLATION OF KIT (PART NO. AW-144330) - To install this kit, proceed as follows:

1. **Mounting The Switch** - The switch is mounted to the inside of the cabinet back in the following manner:

(a) Mark dimensions on cabinet back as shown in Fig. 3.

(b) Drill the two small holes "A" and "B" with a 1/8 drill.

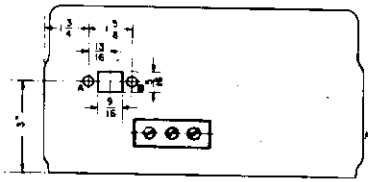


Fig. 3

(c) The large hole may be started by drilling a hole 9/32 of an inch in diameter and then enlarge it with a small hole saw or file to the illustrated dimensions.

(d) With the two small screws (part No. 39170-31CP), washers (part No. 39027-2CP), and nuts (part No. 39033-6CP), secure the switch to the inside of the cabinet back, in a position so that the side of the switch case with the yellow wire soldered to it is toward the top of the cabinet back.

(e) The gummed local-distance label (part No. W-144338) should be fastened on the outside of the cabinet back at approximately 1/8" directly above the switch.

2. Placement of the Switch Wires and Their Connection to the Chassis Circuits - With the chassis and cabinet back turned upside down proceed as explained in the following:

(a) Place the red wire, black wire, and yellow wire, from the three lugs at the left of the switch, (looking down on switch from rear) through the large hole located in the rear of the receiver chassis, near the

(b) Tie an overhand knot in the wires, making certain that no surplus wire remains inside the chassis. These three wires must be placed against the inside of the chassis and dressed under the shield, which is located near the 6SH7 tube socket. (2nd F.M. I.F. Amplifier and A.M. Detector tube).

(c) If a 1000 ohm resistor is connected from lug 5 to lug 6 of this socket, remove and discard the resistor.

(d) With reference to Fig. 4, solder the 22,000 ohm resistor, from the black wire, to lug 5 and the 1000 ohm resistor, from the red wire, to lug 6 of this 6SH7 socket. Be sure to slide the two pieces of tubing over the resistors, permitting it to cover the soldered connections to the wires.

(e) The yellow wire must be soldered to the junction of the 22,000 ohm resistor (item 112, Fig. 4) and 1000 mmf., condenser (item 73, Fig.4), which is secured to the center lug (viewed in chassis) of the discriminator transformer.

(f) The twisted pair of wires (red wire and yellow wire), which has the yellow wire soldered to the switch case, must be placed through the middle hole in the insulating strip located at the right rear of chassis. Tie an overhand knot in these wires, making certain that no surplus wire remains inside the chassis.

(g) With the chassis upside down and viewing it from the front, solder the red wire to the first lug of the front portion of band switch section No. 2 (to locate lugs, count clockwise from the band switch section spacer that is uninsulated).

(h) Slip the short piece of tubing (part No. 39431-16) over the yellow wire which is soldered to the local-distance switch case. Solder a .01 mfd. condenser (part No. 39001-13) to this wire and slide the tubing over the connection. Solder the other end of this condenser to the first lug of the rear portion of band switch section No. 2.

(i) Place the remaining pair of twisted wires (red wire and yellow wire) through the remaining hole in the insulating strip and tie an overhand knot in the wires, being careful that no surplus wire remains inside the chassis.

(j) Solder the yellow wire to the sixth lug of the rear portion of band switch section no. 2. Also solder one end of the 47,000 ohm resistor (part No 39373-67) to this lug.

(k) Unsolder the shielded wire from both the band switch spacer and the fourth lug of the front portion of band switch section No. 2. Slip the 3 inch length of tubing (part No. 39431-14) over the shielded wire so that the braided shield protrudes slightly from the end of the tubing. Resolder the shielded wire to the fourth lug. The loose end of the 47,000 ohm resistor should be soldered to the protruding end of the wire's braided shield. Do not resolder braided shield to the band switch spacer.

(l) Unsolder the other end of the shielded wire from the volume control lug and solder the 10,000 ohm resistor (part No. 39373-54) in series with the wire and lug. Push the tubing over the resistor and dress the shielded wire against the inside of the chassis front over the volume control.

(m) Remove the condenser (item 114, Fig. 4) and replace it with a .01 mfd. condenser (part No. 39001-13).

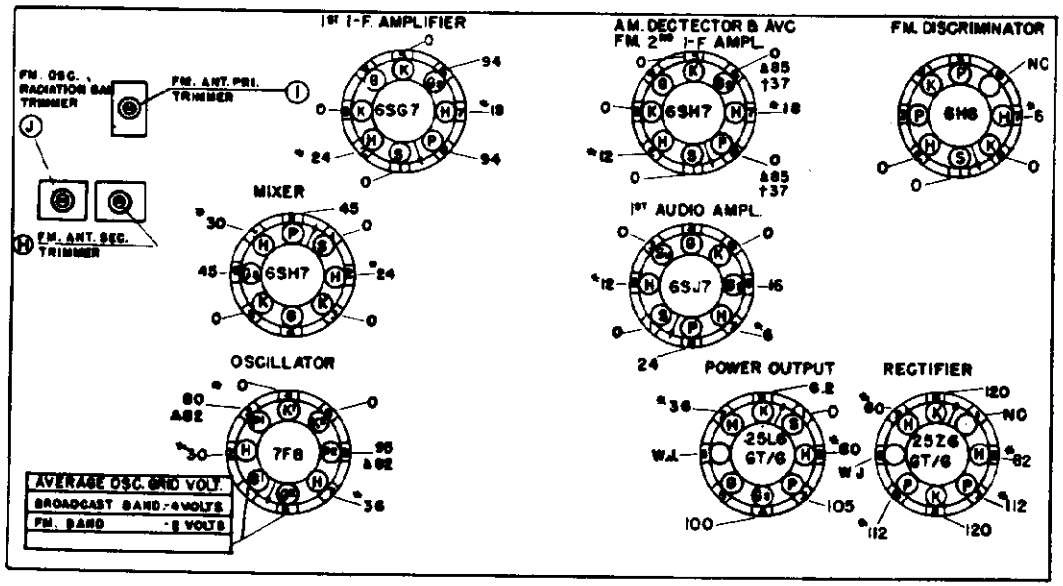
(n) The remaining red wire from the local-distance switch and one end of the $2\frac{1}{2}$ inch piece of yellow insulated wire (Part No. 39426-1) should be soldered to the fifth lug of the front portion of band switch section No. 2. The other end of the $2\frac{1}{2}$ inch piece of wire must be soldered to the junction of resistor (item 37, Fig. 4) and condenser (item 115, Fig. 4).

(o) The four wires placed through the insulated strip must be twisted together inside the chassis and dressed in a direct line to their place of connection on the band switch. Solder the $1\frac{1}{2}$ inch piece of bare wire (part No. 39209-22) to the pressed out grounding loop, which is located inside the rear of chassis, near the insulating strip. Then wrap this wire around the four wires so that the four wires are held toward the rear of chassis.

The following socket voltage chart shows the proper voltages of a receiver that incorporates a local distance switch.

SOCKET VOLTAGE NOTES:

1. BOTTOM VIEW OF TUBE SOCKETS.
2. MEASURE VOLTAGE WITH AN ELECTRONIC VOLTMETER FROM SOCKET LUG TO CHASSIS.
3. ALL VOLTAGES ARE THE SAME FOR BC. & FM. EXCEPT WHERE MARKED WITH DELTA (▲), THIS IS THE VOLTAGE WITH BAND SWITCH IN THE FM. POSITION.
4. LINE VOLTAGE 117V 60~
5. NC = NO CONNECTION.
6. WJ = WIRING JUNCTION.
7. * = AC. VOLTAGE.
8. SOCKET VOLTAGE TOLERANCE 10%
9. † LOCAL - DISTANCE SWITCH IN LOCAL POSITION



SOCKET VOLTAGE CHART

KIT (PART NO. AW-143964)

QTY.	PART NO.	DESCRIPTION
(1)	39373-60	Resistor 22,000 ohm ½W
(1)	137727-8	Condenser 1000 mmf. 300 volt, ceramic
(2)	39220-36CP	Screw #8 x 1" hex hd. self threading
(2)	41405-3	Bushing-Headed
(2)	135164	Bumper-Rubber
(1)	46065	Shock Mount
(X)	138905	Plastic Adhesive (in an oil can - Part No. 448931)
(X)	86648	Adhesive (in an oil can - Part No. 448931)
(3)	136584	Washer-Rubber
(1)	144407	Packing List

LOCAL-DISTANCE SWITCH KIT (Part No. AW-144330
MODELS 88TA, 88TC

QTY.	PART NO.	DESCRIPTION
1	AB-144339	Switch & Twisted Wire Assy.
1	W-144338	Label (Gummed), Local-Distance
1	39431-14	Tubing (3 Inches In Length)
1	39431-16	Tubing (1 Inch In Length)
2	39001-13	Condensers, .01 mfd., 600v., paper
1	39373-54	Resistor, 10,000 ohm, ½W. (Brown, Black, Orange)
1	39373-67	Resistor, 47,000 ohm, ½W. (Yellow, Violet, Orange)
1	39426-1	Wire (#22 Solid, Yellow Insulated, 2½ Inches In Length)
1	39209-22	Wire (#22 Solid, Bare, 1½ Inches In Length)
2	39170-31CP	Screw (#4-40 x 5/16), C. R. Machine)
2	39033-6CP	Nut (#4-40, Hex.)
2	39027-2CP	Washer (#4 Internal Shakeproof)
1	W-144331	Packing List
1	91995	Carton

MODELS 88TA, 88TC

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REPLACEMENT PARTS LIST—MODELS 88TA, 88TC

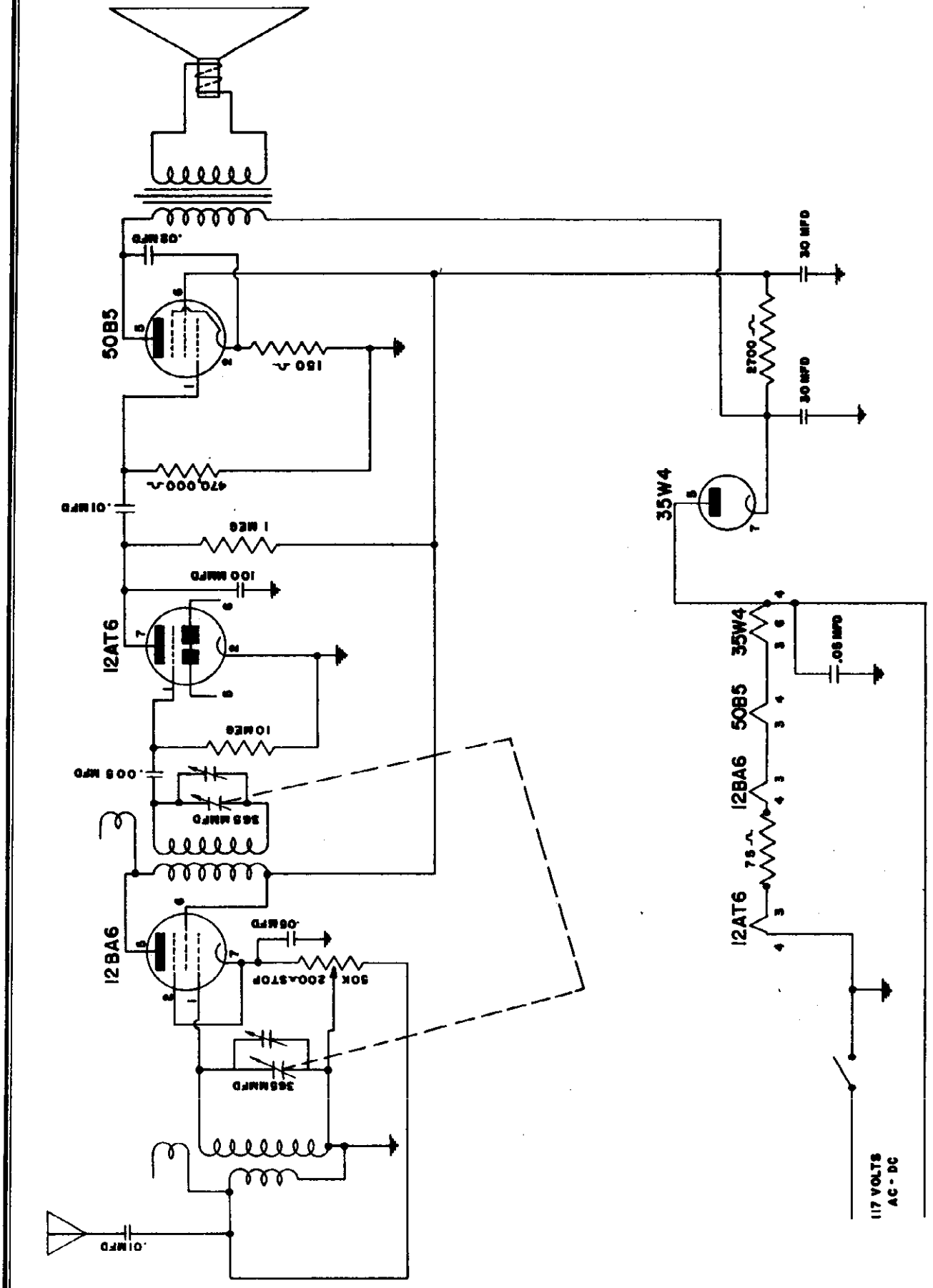
Figures in first column correspond to figures in Schematic Diagram

Item No.	Part No.	Description
1	AC-137783	Transformer Assy., Antenna (F.M.)
2	AC-138819-B	Transformer Assy., 1st I.F.
3	AC-139094-C	Transformer Assy., 2nd I.F.
4	AC-139077-B	Transformer Assy., Discriminator
5	AW-138924	Coil Assy., Oscillator (Broadcast)
6	AW-138950	Coil Assy., Oscillator Mixer Coupling
7	AW-138978	Choke Assy., Plate (F.M. Osc.)
8	AW-139056	Condenser Assy., .01 mfd., 200 v., (shielded)
9A	AW-136720	Choke, R.F. Heater } Assy.
9B		Choke, R.F. Heater }
10	AB-139118	Loop and Support Assy., Antenna
11	Part of Item 1	Coil Assy.
12A	Part of Item 1	Coil } Two Section Assy.
12B		Coil }
13	AD-138246	Speaker
14A	C-139028	Condenser, Variable } Two
14B		Condenser, Variable } Section
15	B-137364	Transformer, Output
16A	B-137781	Control, Volume (1 megohm) } Assy.
16B		Switch, Power }
*	39368-18	Control, Volume
*	39370-2	Shaft, Plug, in
*	39369-1	Switch, Power
17	B-137782	Control, Tone (2 megohm)
*	39368-11	Control, Tone
18A	B-137976	Condenser, 50 mfd., 200 v. } Four
18B		Condenser, 50 mfd., 200 v. } Section
18C		Condenser, 50 mfd., 150 v. } Elect.
18D		Condenser, 20 mfd., 25 v. } Filter
19	B-137986	Switch, Band Change
20	W-48858	Bulb (Dial), Type 47, 6.3 v., .15 amp.
21	39012-70	Iron Core, F.M. Oscillator Coil
22	AB-138971	Interlock Assy.
23	C-132300-6	Cable and Plug Assy., Power
25	W-137143	Transmission Line, 75 ohm
26	W-139286	Coil, Oscillator (F.M.)
27	39373-9	Resistor, 47 ohm, ½ w.
28	39373-93	Resistor, 1.2 megohm, ½ w.
29	39373-143	Resistor, 1000 ohm, 1 w.
30	39373-16	Resistor, 150 ohm, ½ w.
31	39373-33	Resistor, 1000 ohm, ½ w.
33	39373-33	Resistor, 1000 ohm, ½ w.
34	39373-33	Resistor, 1000 ohm, ½ w.
35	39373-33	Resistor, 1000 ohm, ½ w.
37	39373-54	Resistor, 10,000 ohm, ½ w.
38	39373-54	Resistor, 10,000 ohm, ½ w.
39	39373-64	Resistor, 33,000 ohm, ½ w.
40	Part of Item 3	Resistor, 47,000 ohm, ½ w.
41	39373-67	Resistor, 47,000 ohm, ½ w.
42	Part of Item 4	Resistor, 100,000 ohm, ½ w.
43	Part of Item 4	Resistor, 100,000 ohm, ½ w.
44	Part of Item 4	Resistor, 100,000 ohm, ½ w.
46	39373-84	Resistor, 330,000 ohm, ½ w.
47	39373-87	Resistor, 470,000 ohm, ½ w.
48	39373-92	Resistor, 1 megohm, ½ w.
49	39373-92	Resistor, 1 megohm, ½ w.
50	39373-97	Resistor, 2.2 megohm, ½ w.
51	39373-102	Resistor, 4.7 megohm, ½ w.
52	W-139035	Resistor, 80 ohm (Wire Wound) } Two
		Resistor, 18 ohm (Wire Wound) } Section
54	39001-17	Condenser, .05 mfd., 600 v., paper
55	39001-17	Condenser, .05 mfd., 600 v., paper
56	39001-13	Condenser, .01 mfd., 600 v., paper
57	39001-13	Condenser, .01 mfd., 600 v., paper
58	39001-13	Condenser, .01 mfd., 600 v., paper
60	39001-13	Condenser, .01 mfd., 600 v., paper
62	39001-17	Condenser, .05 mfd., 600 v., paper
63	39001-17	Condenser, .05 mfd., 600 v., paper
64	39001-19	Condenser, .1 mfd., 600 v., paper
65	39001-76	Condenser, .003 mfd., 600 v., paper
66	39001-80	Condenser, .02 mfd., 600 v., paper
67	Part of Item 3	Condenser, 100 mmf., 300 v., ceramic
68	Part of Item 3	Condenser, 100 mmf., 300 v., ceramic
69	Part of Item 2	Condenser, 100 mmf., 300 v., ceramic
70	C-137727-8	Condenser, 1000 mmf., 300 v., ceramic
71	C-137727-8	Condenser, 1000 mmf., 300 v., ceramic
72	C-137727-8	Condenser, 1000 mmf., 300 v., ceramic
73	C-137727-8	Condenser, 1000 mmf., 300 v., ceramic
74	C-137727-8	Condenser, 1000 mmf., 300 v., ceramic
75	Part of Item 4	Condenser, 1000 mmf., 300 v., ceramic
76	C-137727-8	Condenser, 1000 mmf., 300 v., ceramic
77	C-137727-8	Condenser, 1000 mmf., 300 v., ceramic
78	Part of Item 10	Condenser, 1000 mmf., 300 v., ceramic
79	C-137727-19	Condenser, 39 mmf., 300 v., ceramic
80	Part of Item 4	Condenser, 50 mmf., 500 v., ceramic
81	C-137727-24	Condenser, 180 mmf., 500 v., ceramic
82	C-137727-28	Condenser, 51 mmf., 500 v., ceramic
83	C-137727-37	Condenser, 10 mmf., 300 v., ceramic
84	Part of Item 4	Condenser, 10 mmf., 300 v., ceramic
85	B-137499-5	Condenser, 500 mmf., 300 v., silver mica
86	Part of Item 6	Condenser, 3.3 mmf., 500 v.
87	W-139285	Condenser, 52 mmf., ceramic
88	W-138268	Condenser, Trimmer
89	C-136327-29	Condenser, Trimmer
90	Part of Item 1	Condenser, Trimmer
91	Part of Item 1	Condenser, Trimmer
92	Part of Item 2	Condenser, Trimmer
93	Part of Item 2	Condenser, Trimmer
94	Part of Item 3	Condenser, Trimmer
95	Part of Item 3	Condenser, Trimmer
96	Part of Item 2	Condenser, Trimmer
97	Part of Item 2	Condenser, Trimmer
98	Part of Item 3	Condenser, Trimmer
99	Part of Item 3	Condenser, Trimmer
100	Part of Item 4	Condenser, Trimmer
101	Part of Item 4	Condenser, Trimmer
102	Part of Item 6	Resistor, 47,000 ohm, ½ w.
103	39001-11	Condenser, .005 mfd., 600 v., paper
104	39373-74	Resistor, 100,000 ohm, ½ w.
105	C-137727-8	Condenser, 1000 mmf., 300 v., ceramic
108	39373-92	Resistor, 1 megohm, ½ w.
109	39373-92	Resistor, 1 megohm, ½ w.
110	Part of Item 10	Resistor, 1 megohm, ½ w.
111	39001-1	Condenser, .0001 mfd., 600 v., paper
112	39373-60	Resistor, 22,000 ohm, ½ w.
113	39373-54	Resistor, 10,000 ohm, ½ w.
114	C-137727-8	Condenser, 1000 mmf., 300 v., ceramic
115	C-137727-8	Condenser, 1000 mmf., 300 v., ceramic
	AB-138910	Back & Power Cable Assy. (88TA)
	AB-139643	Back & Power Cable Assy. (88TC)
	W-135164	Bumper, Rubber (Chassis, Front)
	R-138573-3	Cabinet (88TA)
	R-139647	Cabinet (88TC)
	AB-139105	Dial Assy.
	AW-139148	Dipole Antenna Kit
	W-138660	Foot, Rubber (88TA)
	W-134055	Grommet (Var. Cond. Mtg.)
	B-138574-3	Knob, Volume or Tuning (88TA)
	B-138575-3	Knob, Band Change (88TA)
	B-138576-3	Knob, Tone (88TA)
	B-138574-1	Knob, Volume or Tuning (88TC)
	B-138575-1	Knob, Band Change (88TC)
	B-138576-6	Knob, Tone (88TC)
	W-132366-1	Nut, Locking (Trimmer)
	W-132366-2	Nut, Locking (Osc. Coil)
	W-137460	Pointer, Dial
	W-51071	Ring, Retaining
	W-211101	Ring, Socket Retaining
	39311-60	Screw, Set (Toggle Arm)
	W-137751-2	Shaft, Drive
	W-46065	Shock Mount, Rubber (speaker)
	39232-1	Socket, Tube (25Z6)
	39232-2	Socket, Tube (25L6)
	39232-7	Socket, Tube (6H6)
	39232-10	Socket, Tube (6SH7)
	39232-10	Socket, Tube (6SG7)
	39232-10	Socket, Tube (6SJ7)
	W-136470	Socket, Tube (7F8)
	D-136565-17	Socket, Dial Light
	W-138656	Spring, Dial
	W-51752	Spring, Dial Drive Cord
	W-49829	Spring, Lock
	W-138568	Strip, Dial Pointer
	C-139844	Strip, Dial Trim
	B-138649	Strip, Dial Window
	AB-139099	Toggle Arm & Link Assy.
	W-132124-58	Trimount Stud, Back (88TA)
	W-136584	Washer, Rubber (Chassis Mtg.)
	W-134916	Washer, Spring
	C-139037	Window, Dial

*These parts will replace the original equipment parts.

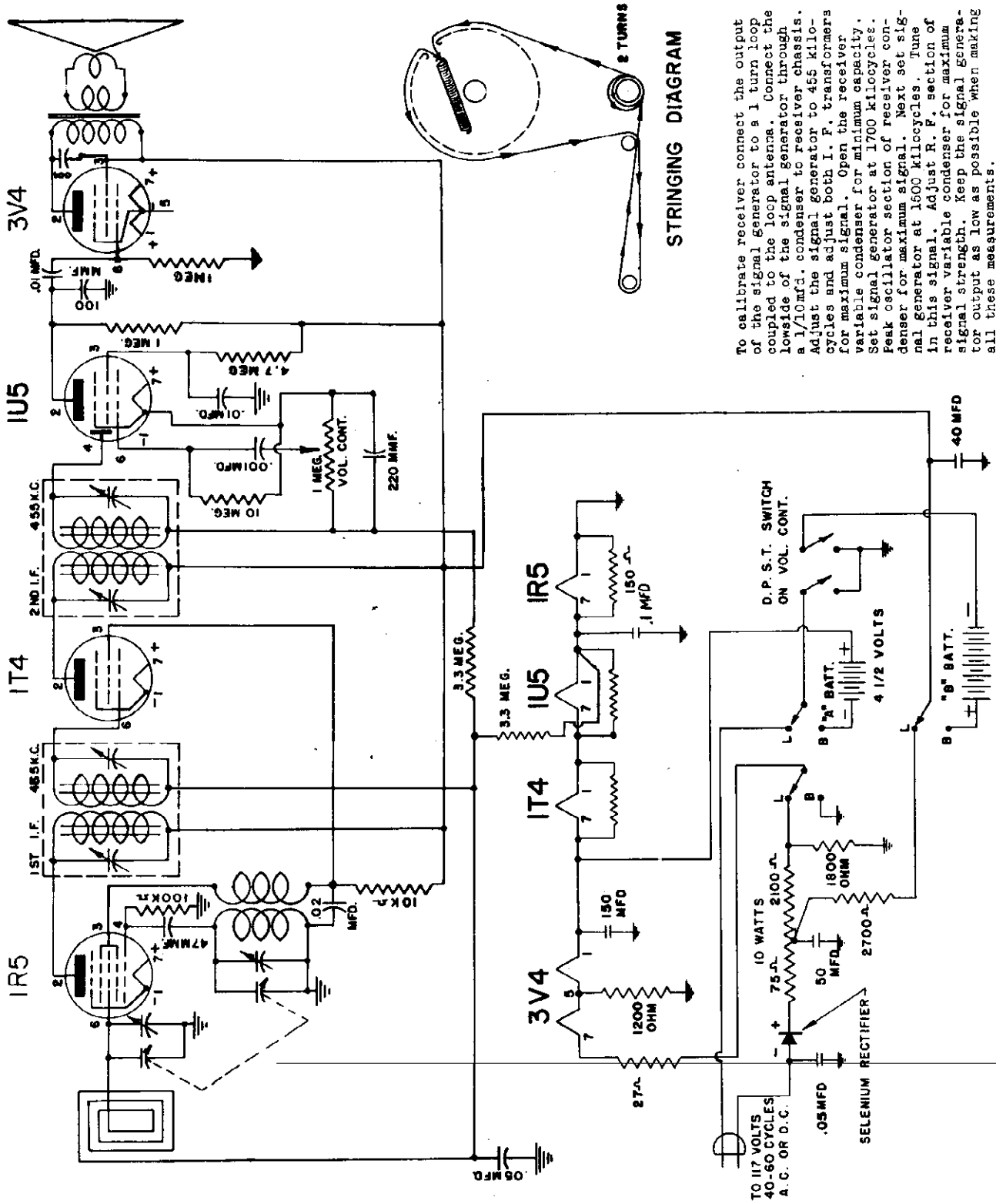
DEWALD RADIO

MODEL B-40



MODEL B-504

DEWALD RADIO



DEWALD RADIO

MODEL B-50

The DeWald model B-504 is a combination portable battery receiver. This receiver uses the latest type tubes for best performance. The circuit used is designed for excellent reception and long battery lif

The receiver uses an "A" supply of 4½ volts and a "B" supply of 67½ volts.

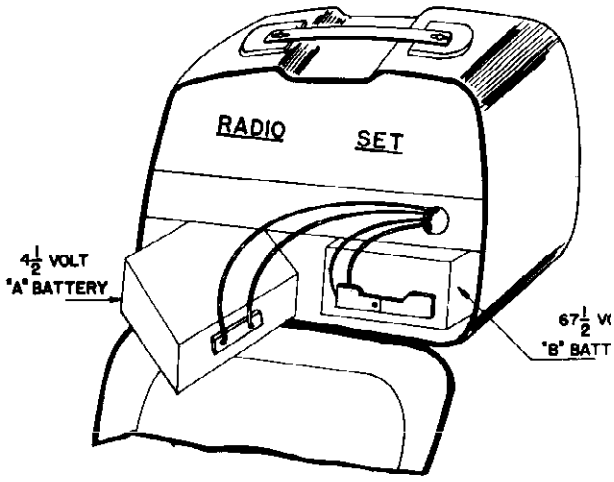
For good reception the life of the batteries is from 70 to 80 hours when the receiver is used abo two hours per day.

The following or similar batteries may be used with this receiver:

	"A" BATTERY 4½ V	"B" BATTERY 67½ V
Eveready	#746	#467
General	#3H3	#W45A
Ray O Vac	#P83A	#P4367
Burgess	#G3	#XX45

To install the batteries in the receiver, proceed as follows:

1. Open back by inserting fingers in slots provided on top of cabinet and pull back open.
2. Connect battery clips to batteries.
3. Put batteries in set as shown in sketch. BE CAREFUL NOT TO BREAK WIRES CONNECTED TO LOOPTENNA.

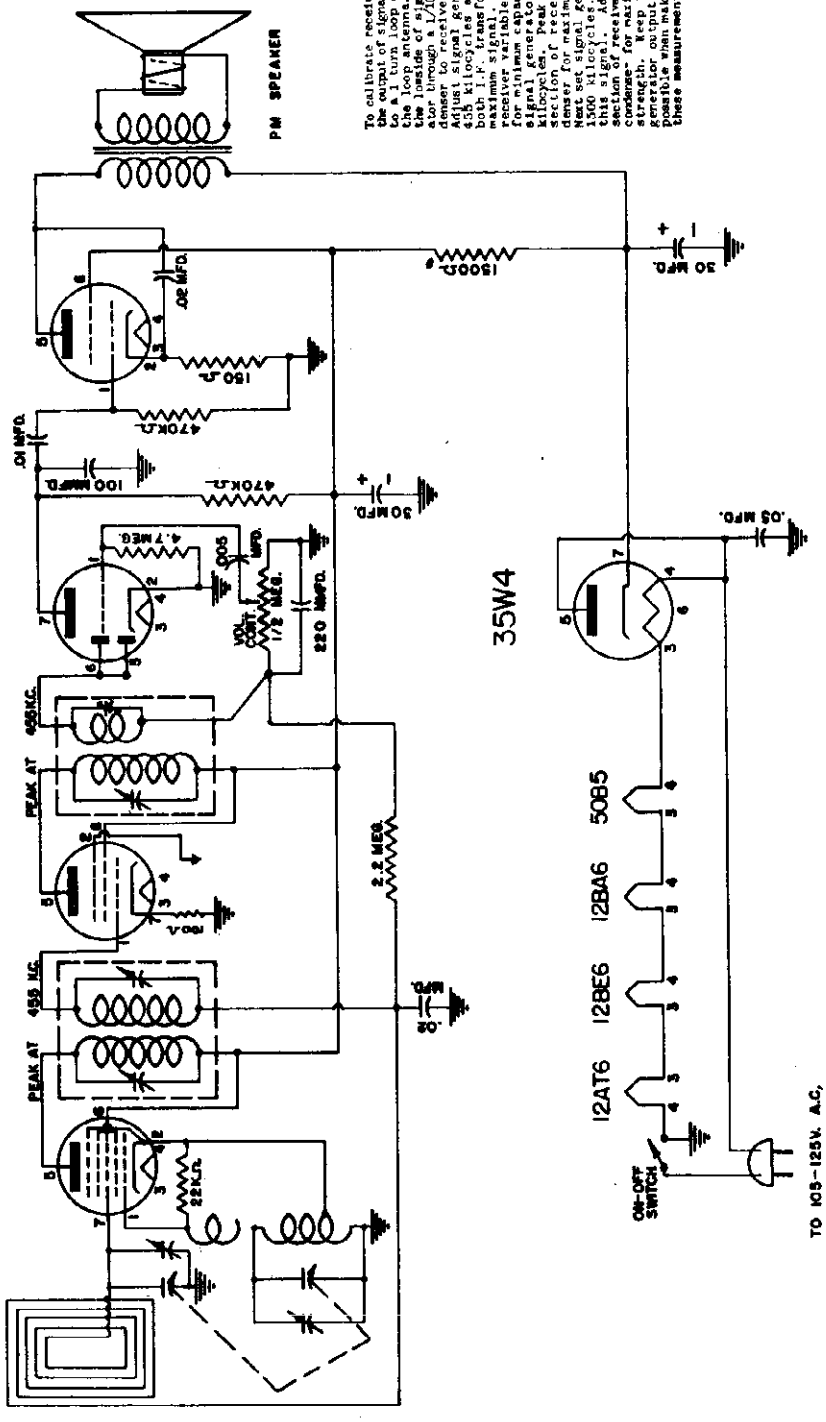


LIST OF REPLACEMENT PARTS

1st I.F.	1027C-4	Variable Cond.	2017B
2nd I.F.	1027-1	Electrolytic Cond.	2020B
Osc. Coil	1034	Volume Control	3012
Ant. Loop	1037	Cabinet	4064
Batt. Cable	5005	Speaker	7003B3
Knobs	4055A	Sel. Rect.	8018A

MODEL B-506

DEWALD RADIO



To calibrate receiver connect the output of signal generator to a 1 turn loop coupled to the loop antenna. Connect the loopside of signal generator through a 1/10 mfd. condenser to receiver chassis. Adjust signal generator to 455 kilocycles and adjust both I.F. trimmer screws for maximum signal. Open the receiver variable condenser for minimum capacity. Set signal generator at 1720 kilocycles. Peak oscillator section of receiver condenser for maximum signal. Next set signal generator at 1500 kilocycles. Tune in this signal. Adjust R.F. section of receiver variable condenser for maximum signal strength. Keep the signal generator output as low as possible when making all of these measurements.

REPLACEMENT PARTS

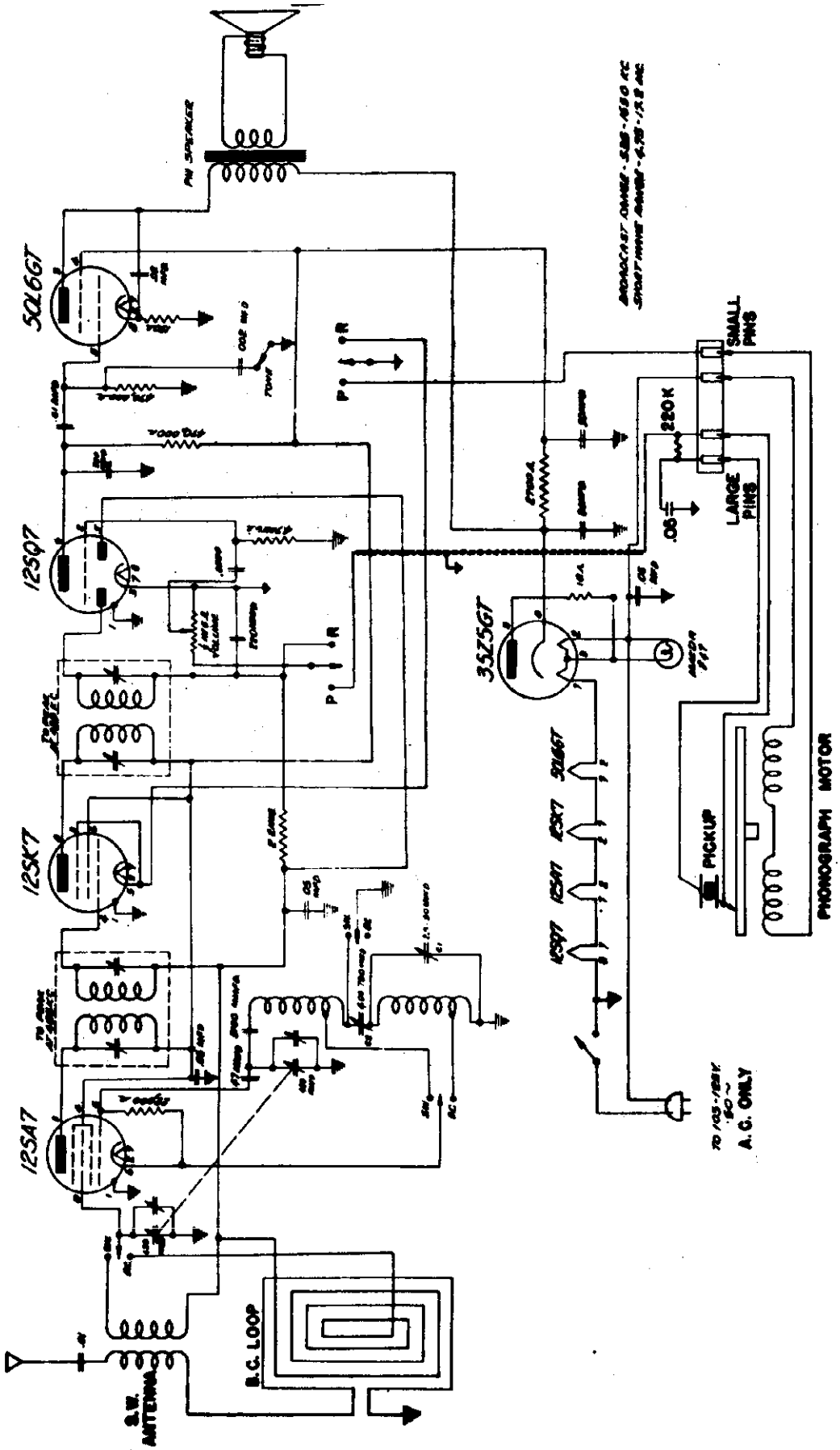
1016	Looptenna	3000	¼ W. resistors
1028	oscillator coil	3001	2 W. resistors
1027-1	1st I.F. coil	3002	vol. cont. and switch
1002-3	2nd detector coil	5000	line cord
2000	paper condensers	7003	speaker
2012	mica condensers	9050	shaft
2002	comb. electrolytic	9818	bushing
2003	var. condenser	9762	drive spring
		#20	dial cord

TUBES

1	35W4	CABINET	4053
1	50B5	KNOB	4055
1	12AT6	BACK	4059
1	12BA6		
1	12BE6		

DEWALD RADIO

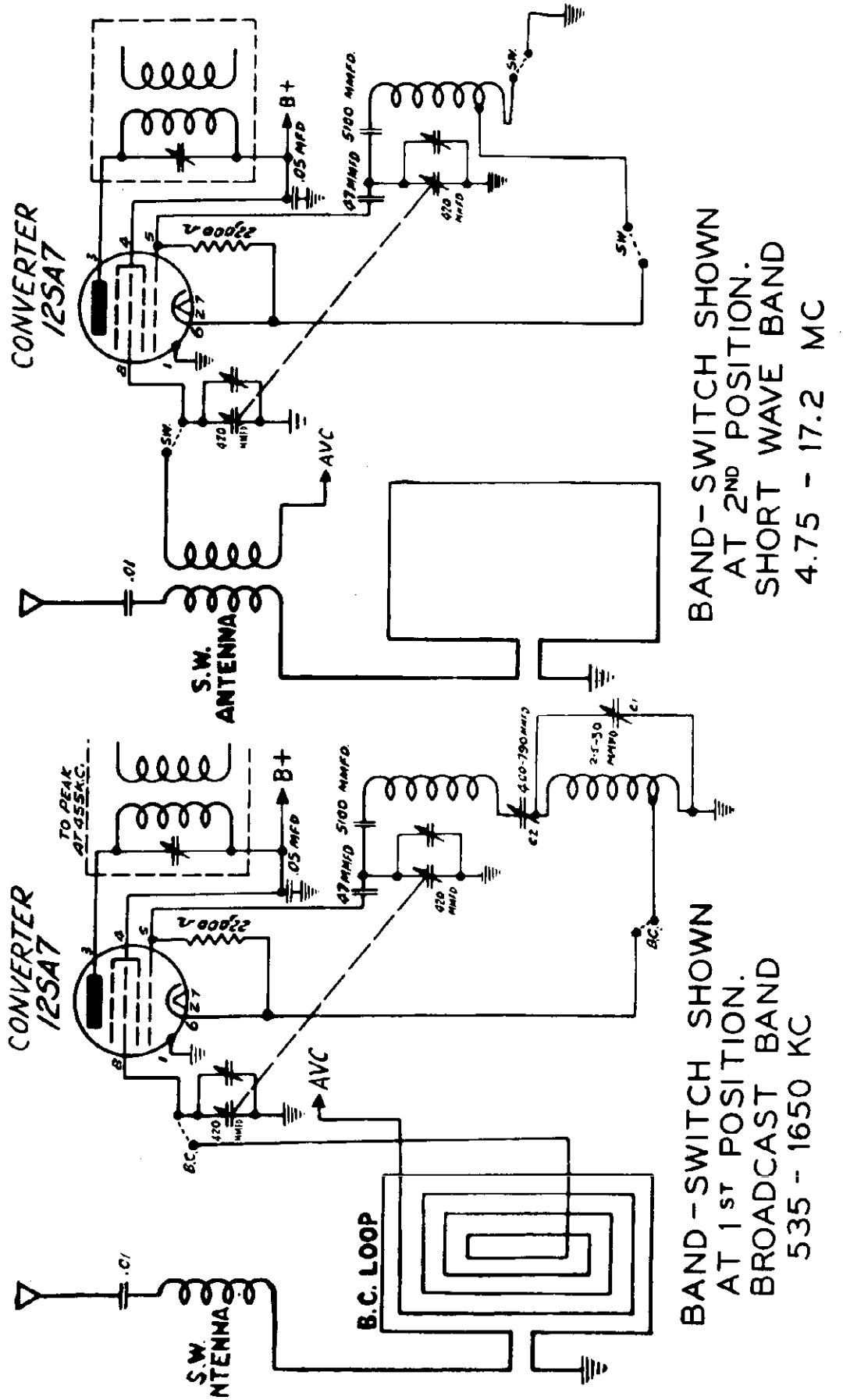
MODEL B-51



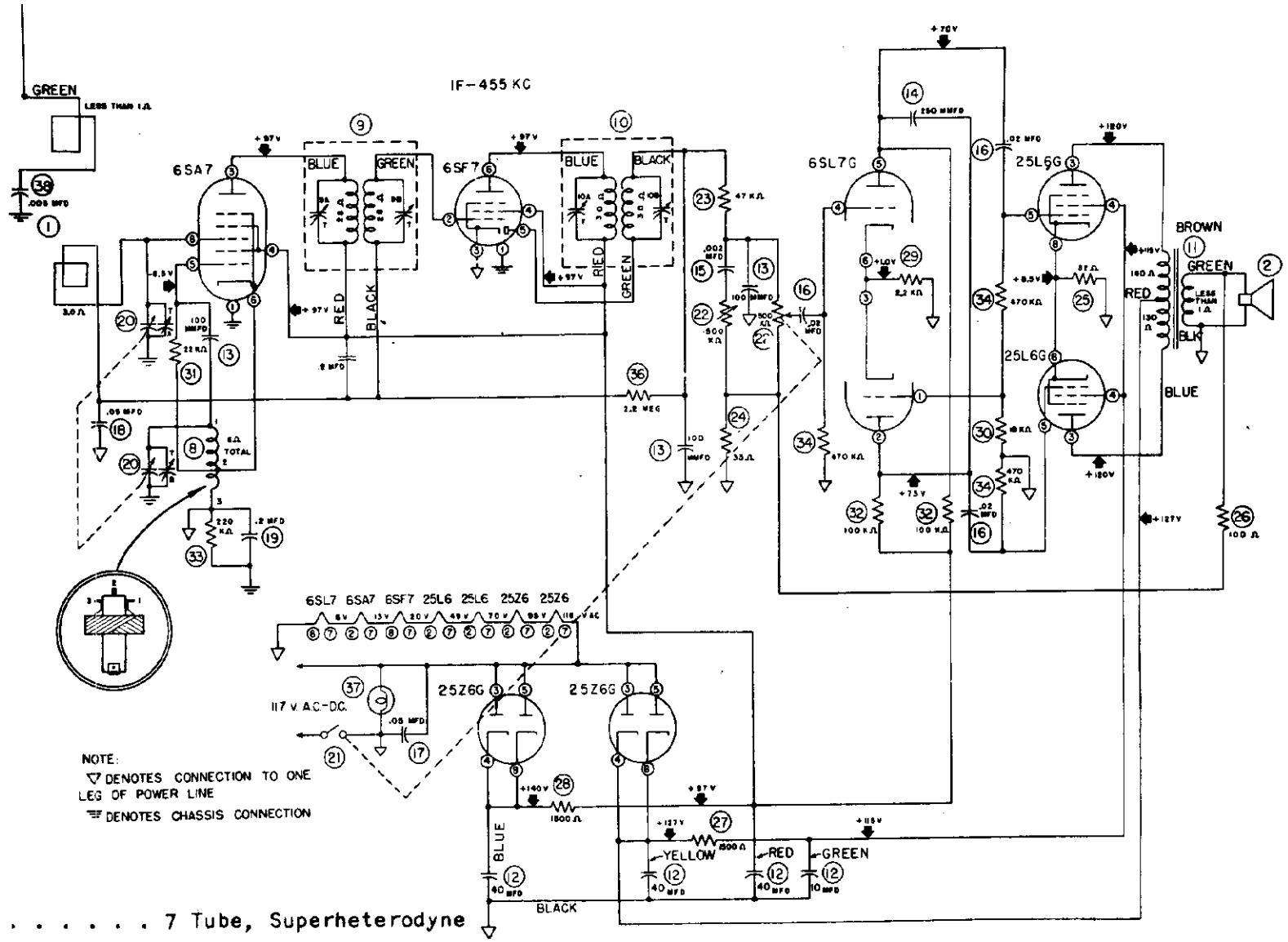
CLARI-SKEMATIX
Registered Trademark

MODEL B-511

DEWALD RADIO



ELECTRONIC CORP. OF AMERICA



CIRCUIT . . . . . 7 Tube, Superheterodyne
FREQUENCY RANGE . . . 540 to 1720 KC
INTERMEDIATE FREQ. . 455 KC
POWER INPUT . . . . . 110 to 125 V. AC-DC
POWER CONSUMPTION . . . 60 Watts

ANTENNA . . . . . Built-in Loop
SPEAKER . . . . . Alnico V PM Dynamic 6"
V.C. IMPEDANCE . . . . 3.2 ohms at 400 Cycles
POWER OUTPUT . . . . . 3 Watts Undistorted

With the receiver on and the volume control at maximum, connect the signal generator to the coupling loop and bring the loop close to the receiver chassis. Adjust the signal generator output to minimum necessary to give a suitable indication on the output meter, which should be connected from B minus to the plate of one output tube. CAUTION: Make sure the output meter is isolated from DC by a series blocking condenser.

With the gang condenser fully meshed, adjust the pointer so that the left hand edge of the pointer saddle is one inch from the end of the dial frame. *(See Dial Installation drawing)* Using the dial scale contained in this Service Bulletin, align the pointer to the indicated reference mark with the pointer set as above. Then proceed with the alignment in accordance with the chart below:

SET SIGNAL GENERATOR AT	SET GANG	LOOP DISTANCE	ADJUST TRIMMER	TUNE FOR	OPERATION
455 KC	Meshed	Close	9a 9b 10a 10b	Max.	Align - I.F.
1720 KC	Fully Open	Close	20a	Max.	Align Oscillator
1400 KC	1400 KC	Close	20b	Max.	Align - R.F.

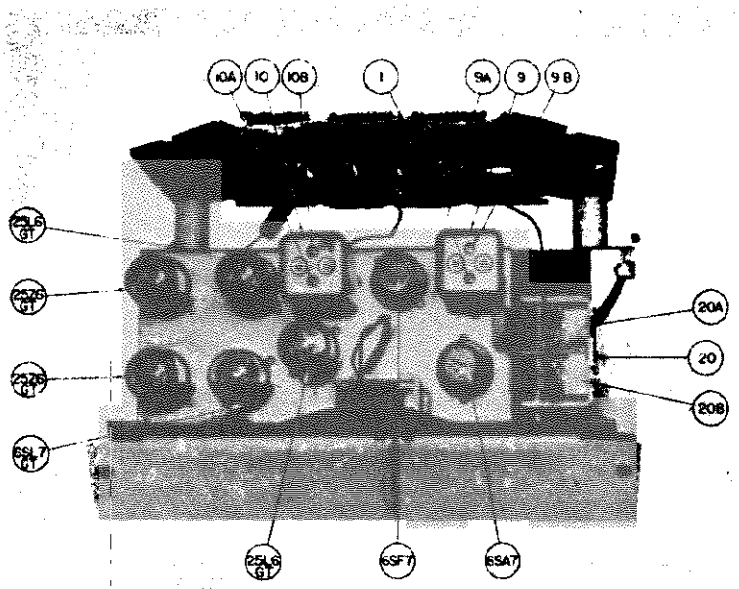
All DC voltage measurements in this Service Bulletin have been made with a 20,000 ohms per volt voltmeter, using B minus as a common reference point. All AC voltage measurements are with 1000 ohms per volt voltmeter. Line voltage was maintained at 117 volts for all voltage measurements. The condenser gang should be fully meshed and the volume control at its minimum point. Voltages may vary ±10% from the indicated nominal value.

Measurements of oscillator grid bias voltage should be made with a 50,000 ohm resistor in series with the negative probe of the meter, and the positive prod connected to B minus. Rotate the tuning condenser throughout its complete range with the meter connected. Absence of bias voltage at any point is an indication that the oscillator is not functioning.

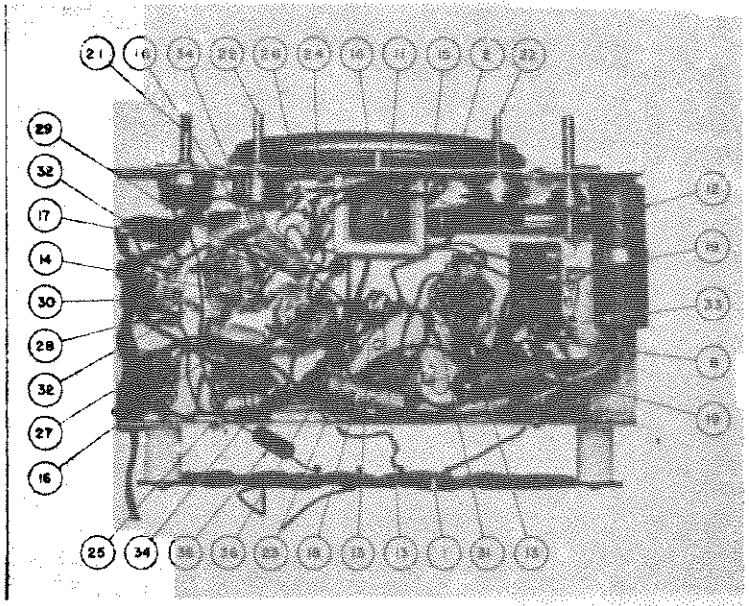
Alignment Procedure

In order to make a proper alignment, the following equipment is required:

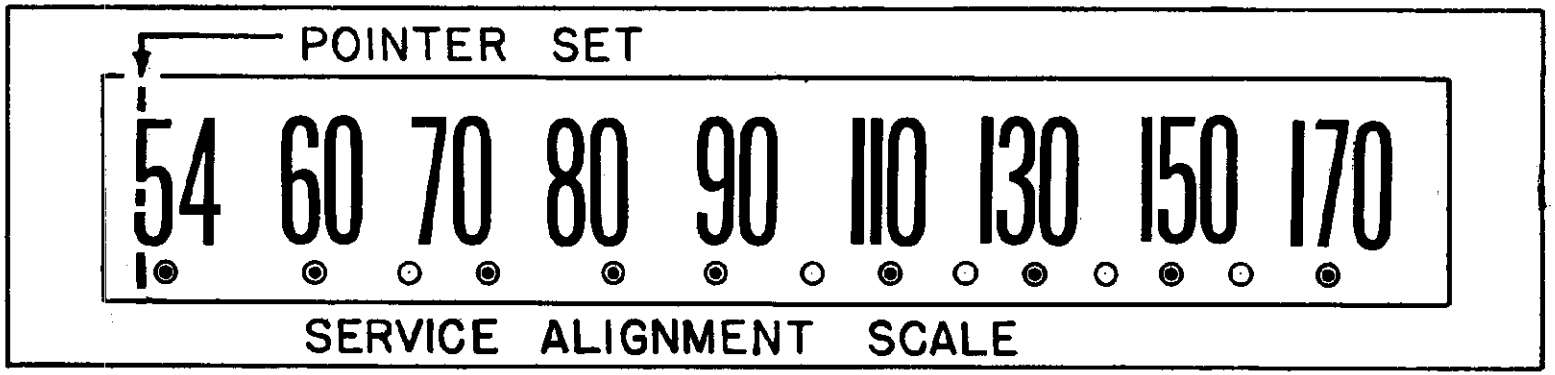
1. A signal generator capable of providing a modulated radio frequency output over the frequencies required.
2. A suitable output meter or sensitive AC voltmeter with a .1 mfd series blocking condenser.
3. A coupling loop, made of three turns of stiff hookup wire, 4 inches in diameter, mounted on a suitable block of wood or stand.
4. A non-metallic screwdriver.



Chassis Top View



Chassis Underside View



Replacement of I.F. Transformers

When replacing intermediate frequency transformers, either input or output, use caution to observe original lead dress.

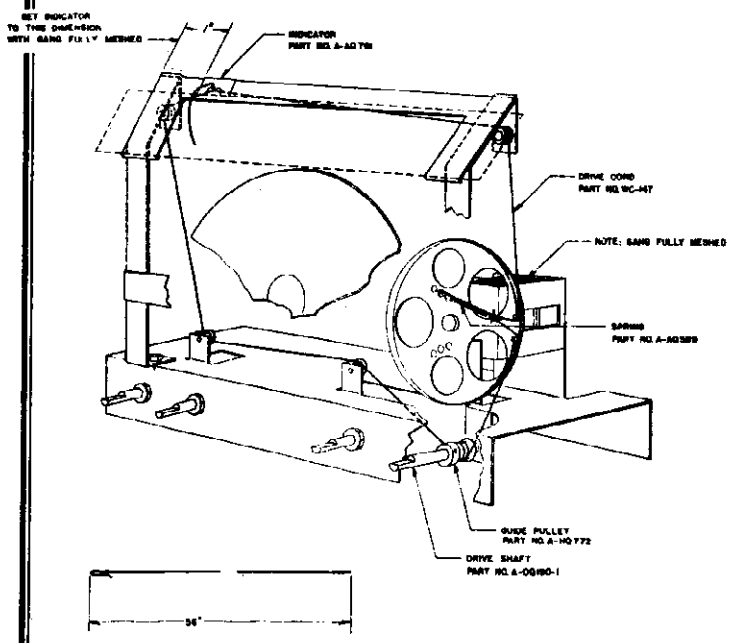
MODEL 132

ELECTRONIC CORP. OF AMERICA

Replacement of Dial Drive Cord

Completely remove remainder of defective dial cord. Inspect all pulleys and make sure they revolve freely. Determine that no grease or oil is present on any pulley surface. Attach the cord spring, part #A-AQ589, to one end of the drive cord. Fully mesh the gang condenser and hook the spring to the hole closest to the cord cutout on the dial drum. Proceed to string dial cord in accordance with the detail drawing. Take two full turns around the drive drum, part #A-HQ772. Pull the cord snug at this point. Wrap one complete turn around gang drum and pull cord snug. Securely tie free end of cord to the cord spring. Next, adjust spring tension by moving the hook end of the spring into the next spring hole.

Clip the pointer on to the dial cord with sufficient tension so as to prevent slippage and adjust pointer position, so that with fully meshed gang, the left edge of the pointer saddle is one inch from the edge of the dial support frame. Insert chassis in cabinet and check pointer and scale agreement. Then make final adjustment of pointer position. Remove the chassis and firmly crimp the pointer prongs on the dial cord, and secure with a small drop of speaker cement.



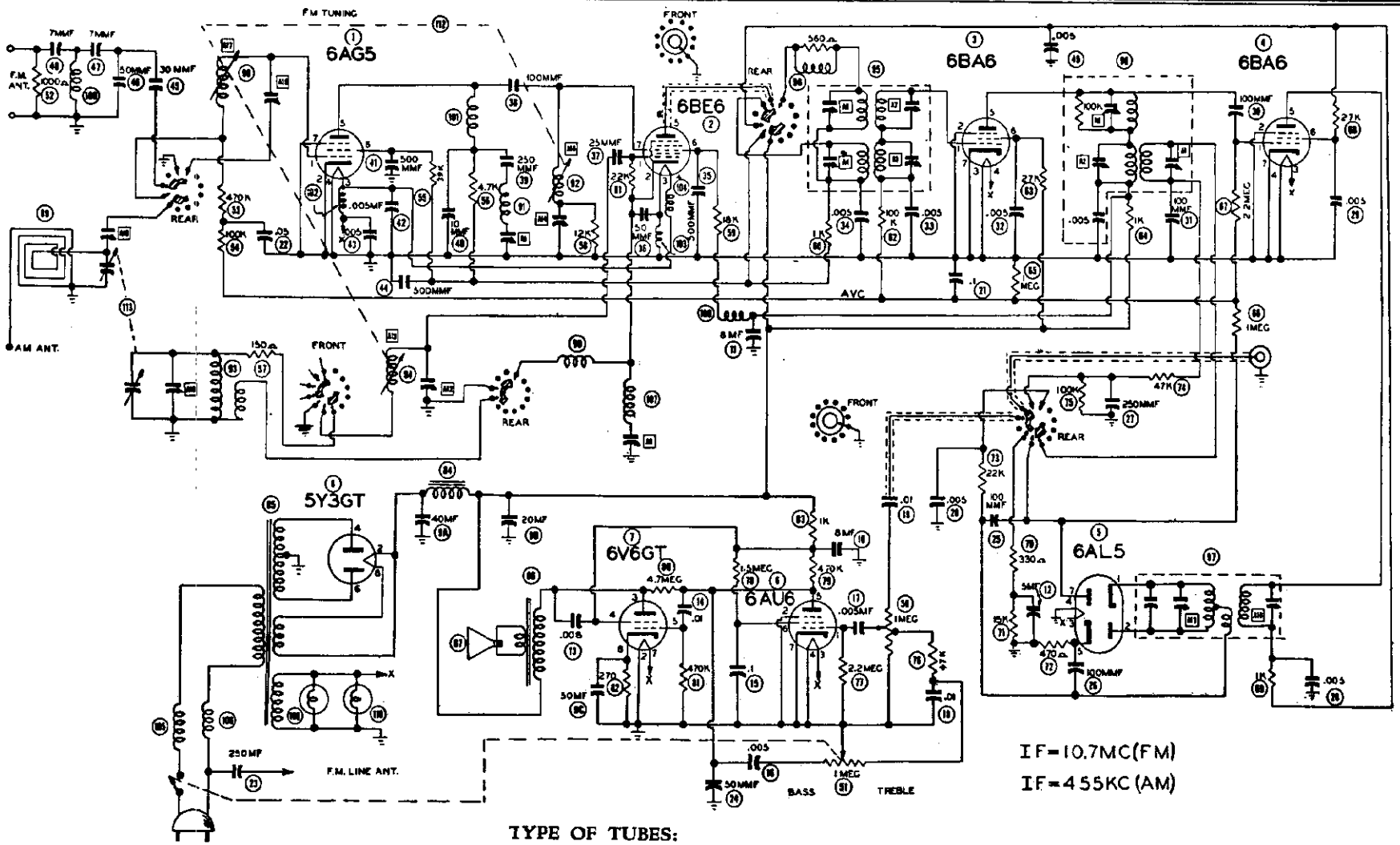
Replacement of Audio Output Transformers

When replacing the audio output transformer, original lead dress must be maintained. If either primary or secondary windings are reversed, the set will have a a severe audio oscillation, due to the inverse feedback network.

Service Parts List

No.	PART NAME	PART NO.
1	Loop Antenna	C-ZQ-522*
2	Speaker	S-QL-105E*
8	Oscillator Coil	S-LR-120*
9	Input I.F. Transformer	S-LR-127*
10	Output I.F. Transformer	S-LR-128*
11	Output Transformer	S-TA-116*
12	Electrolytic Condenser	S-CE-126M*
13	Condenser, Mica, 100 mmf.	CM-103E
14	" " 250 mmf.	CM-112E
15	" Paper, .002 mf., 400 v.	CP-122E
16	" " .02 mf.	CP-104E
17	" " .05 mf.	CP-105E
18	" " .05 mf., 200 v.	CP-105D
19	" " .2 mf., 200 V.	CP-133D
20	Variable Capacitor and Drum	S-ZQ-500*
21	On-off Switch	S-SR-137*
22	Vol.Control, Tone Control, 500K ohms	S-RV-174-1*
23	Resistor, Fixed, 47K ohm, 1/4 w.	RS-186B
24	" " 33 " 1/4 w.	RS-220B
25	" " 82 " 1 w., 10%	RS-221D
26	" " 100 " 1/4 w.	RS-114B
27	" " 1500 " 1/2 w.,10%	RS-195C
28	" " 1500 " 2 w., 10%	RS-195E
29	" " 2.2K " 1/4 w.	RS-185B
30	Resistor,Fixed, 18K ohm, 1/4 w.,10%	RS-222B
31	" " 22K " 1/4 w.	RS-197B
32	" " 100K " 1/4 w.,10%	RS-120B
33	" " 220K " 1/4 w.	RS-190B
34	" " 470K " 1/4 w.,10%	RS-189B
36	" " 2.2 meg.	RS-223B
37	Pilot Bulb, G.E., 3 w., 110 v.	IP-115
38	Condenser, Paper, .005 mf., 200 v.	CP-116D
	Cabinet, Bakelite	E-AQ-640*
	Knob Assembly	A-ZQ-577*
	Dial Scale	C-NP-157-3*
	Pointer	A-AQ-761*
	Dial Cord Spring	A-AQ-589*
	Tuning Shaft	A-OQ-190-1*
	"C" Washer	HN-405*
	Dial Cord Bushing	A-HQ-772*
	Pilot Light Socket	S-XQ-164*
	Dial Background Plate	B-AQ-758*
	Loop Spacer Block	A-AQ-637*
	Felt Knob Washers	HN-365*
	Dial and Speaker Support	C-ZQ-619*
	5 Lug Terminal Panel	EQ-380*
	Line Cord and Plug	WC-148*

Note: All items followed by an asterisk (*) will be stocked by the Electronic Corporation of America. All unmarked items may be replaced by any high quality component of equal electrical value.



DESCRIPTION

TYPE: Amplitude modulation (AM) and frequency modulation (FM) superheterodyne.

FREQUENCY RANGE:

Broadcast band (AM)—530-1620 kilocycles
Frequency modulation band (FM)—87.75-108.5

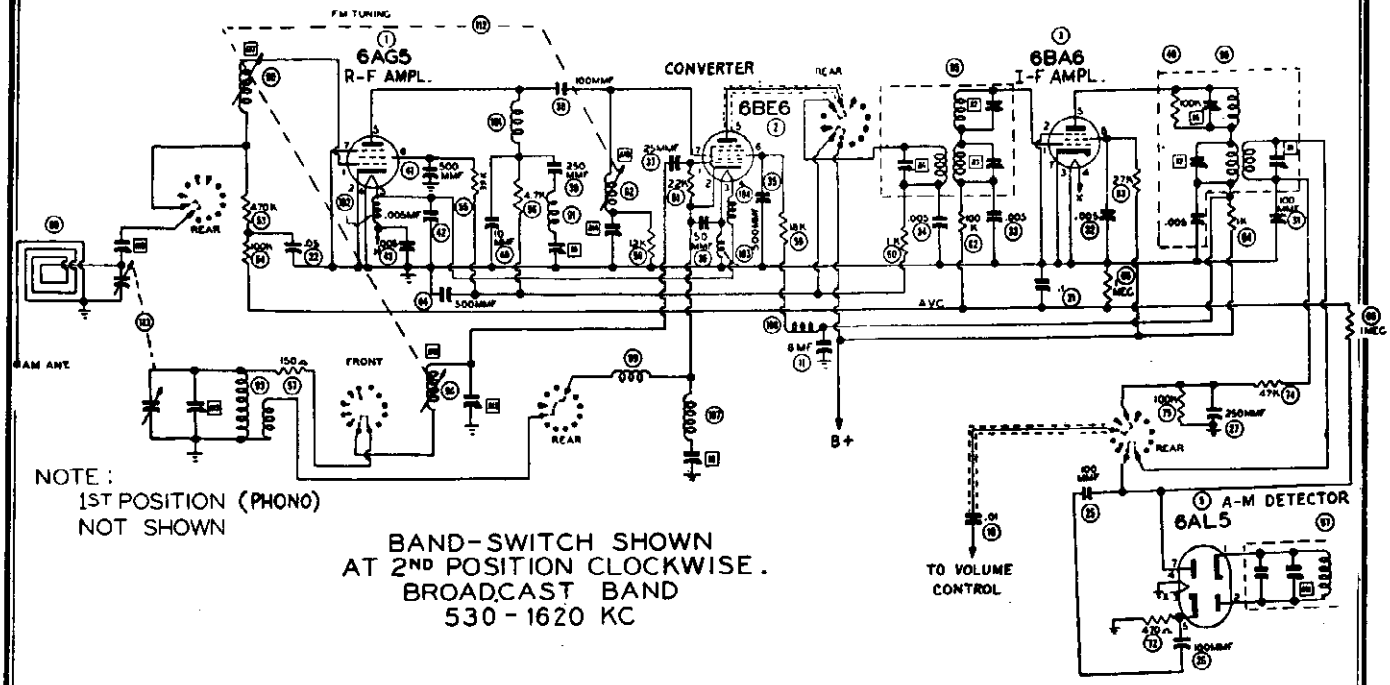
TYPE OF TUBES:

1—6AG5, r-f amplifier
1—6BE6, converter
2—6BA6, first i-f amplifier and FM second i-f amplifier
1—6AL5, FM-AM detector, a.v.c.
1—6AU6, a-f amplifier
1—6V6GT, power output

POWER SUPPLY: 60-cycle a.c.
VOLTAGE RATING: 105-125 volts.
POWER CONSUMPTION: 80 watts.

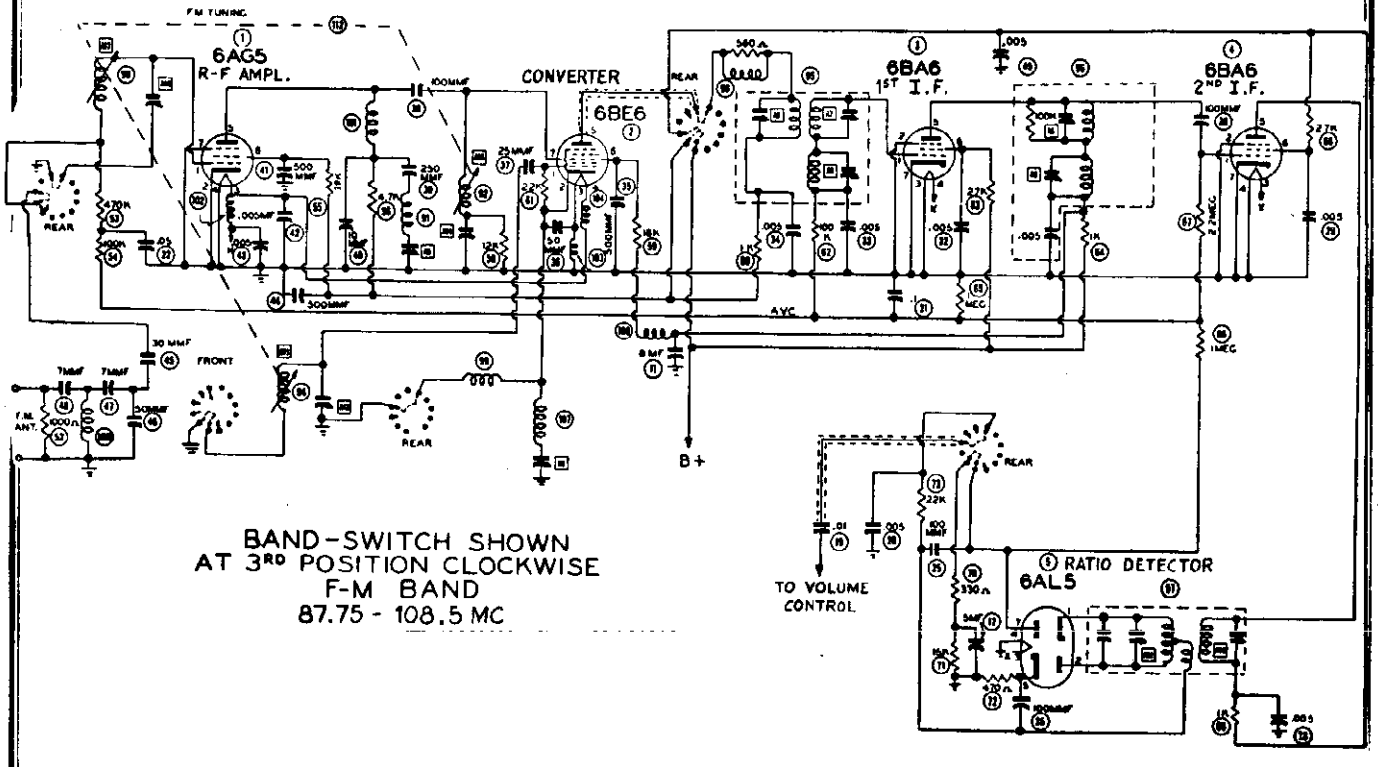
MODEL 528

EMERSON RADIO AND PHONO. CORP.



BAND-SWITCH SHOWN
AT 2ND POSITION CLOCKWISE.
BROADCAST BAND
530 - 1620 KC

IF=455KC



BAND-SWITCH SHOWN
AT 3RD POSITION CLOCKWISE
F-M BAND
87.75 - 108.5 MC

IF=10.7MC

EMERSON RADIO AND PHONO. CORP. MODEL 528, CHASSIS 1200

ALIGNMENT

To set pointer turn variable condenser fully closed and set pointer to last reference mark at low-frequency end of dial. To inject signal in Steps 4, 5 and 6, remove tube and connect wire to pin 1. Replace tube, making certain that wire does not short to shield base. For Step 8, connect two 100,000 ohm resistors in series from pin 7 of 6AL5 to chassis. After Step 8, turn variable condenser fully counterclockwise and check adjustment of FM tuning unit per dial cord drawing. Volume control should be at maximum position; output of signal generator should be no higher than necessary to obtain an output reading. Use an alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1	0.1 mfd.	High side to stator of front section of the variable condenser. Low side to chassis.	455 kc	BC (center position)	High frequency end of dial.	Across voice coil.	A1, A2, A3, A4	Adjust for maximum output.
2	0.1 mfd.	High side to stator of front section of the variable condenser. Low side to chassis.	455 kc	BC (center position)	Low frequency end of dial.	Across voice coil.	A5	Adjust for minimum output.
3	0.05 mfd.	High side to pin 1 (grid) of 6BA6, 1st i-f tube (3). Low side to chassis.	10.7 mc (unmodulated)	FM (fully clockwise)	High frequency end of dial.	VTVM connected to pin 7 of 6AL5 and chassis.	A6	Adjust for maximum deflection.
4	0.05 mfd.	High side to pin 1 (grid) of 6BE6. Low side to chassis.	10.6 mc (unmodulated)	FM (fully clockwise)	High frequency end of dial.	VTVM connected to pin 7 of 6AL5 and chassis.	A7	Adjust for maximum deflection.
5	0.05 mfd.	High side to pin 1 (grid) of 6BE6. Low side to chassis.	10.8 mc (unmodulated)	FM (fully clockwise)	High frequency end of dial.	VTVM connected to pin 7 of 6AL5 and chassis.	A8	Adjust for maximum deflection.
6	0.05 mfd.	High side to pin 1 (grid) of 6BE6. Low side to chassis.	10.7 mc (unmodulated)	FM (fully clockwise)	High frequency end of dial.	VTVM connected to pin 7 of 6AL5 and chassis.	A9	Adjust for maximum deflection.
7	0.05 mfd.	High side to pin 1 (grid) of 6BA6, 2nd i-f tube (4). Low side to chassis.	10.7 mc (unmodulated)	FM (fully clockwise)	High frequency end of dial.	VTVM connected to pin 7 of 6AL5 and chassis.	A10	Adjust for maximum deflection.
8	0.05 mfd.	High side to pin 1 (grid) of 6BA6, 2nd i-f tube (4). Low side to chassis.	10.7 mc (unmodulated)	FM (fully clockwise)	High frequency end of dial.	VTVM connected from junction of two 100,000 ohm resistors and junction of condensers 25 and 26. (See preliminary alignment notes.)	A11	Adjust for zero deflection.
9	150 ohms in series with each lead.	High side to "A," low side to "G" on FM antenna terminals. Disconnect internal antenna.	108 mc (unmodulated)	FM (fully clockwise)	108 mc	VTVM connected to pin 7 of 6AL5 and chassis.	A 12	Adjust for maximum deflection.
10	150 ohms in series with each lead.	High side to "A," low side to "G" on FM antenna terminals. Disconnect internal antenna.	88 mc (unmodulated)	FM (fully clockwise)	88 mc	VTVM connected to pin 7 of 6AL5 and chassis.	A 13	Adjust iron core (ho brass in position) for maximum deflection.
11	150 ohms in series with each lead.	High side to "A," low side to "G" on FM antenna terminals. Disconnect internal antenna.	98 mc	FM (fully clockwise)	98 mc	VTVM connected to pin 7 of 6AL5 and chassis.	A 13	Adjust brass and iro cores (one screw) fo maximum deflection. R peat steps 9, 10 and until no further impro ment can be made.
12	150 ohms in series with each lead.	High side to "A," low side to "G" on FM antenna terminals. Disconnect internal antenna.	106 mc	FM (fully clockwise)	Tune for maximum deflection.	VTVM connected to pin 7 of 6AL5 and chassis.	A 14, A 15	Adjust for maximum deflection.
13	150 ohms in series with each lead.	High side to "A," low side to "G" on FM antenna terminals. Disconnect internal antenna.	90 mc	FM (fully clockwise)	Tune for maximum deflection.	VTVM connected to pin 7 of 6AL5 and chassis.	A 16, A 17	Adjust iron cores (ho brass in place) for maximum deflection.
14	150 ohms in series with each lead.	High side to "A," low side to "G" on FM antenna terminals. Disconnect internal antenna.	100 mc	FM (fully clockwise)	Tune for maximum deflection.	VTVM connected to pin 7 of 6AL5 and chassis.	A16, A17	Adjust both iron an brass cores for maxim deflection. Repeat ste 12, 13, and 14 until n further improvement can be made.
15	200 mmfd.	High side to "A," low side to "G" terminals of AM antenna terminals.	1600 kc	BC	1600 kc	Across voice coil.	A18	Adjust for maximum output.
16	20 mmfd.	High side to "A," low side to "G" terminals of AM antenna terminals.	1400 kc	BC	Tune for maximum output.	Across voice coil.	A19	Adjust for maximum output.

INSTRUCTIONS FOR VOLTAGE AND RESISTANCE READINGS

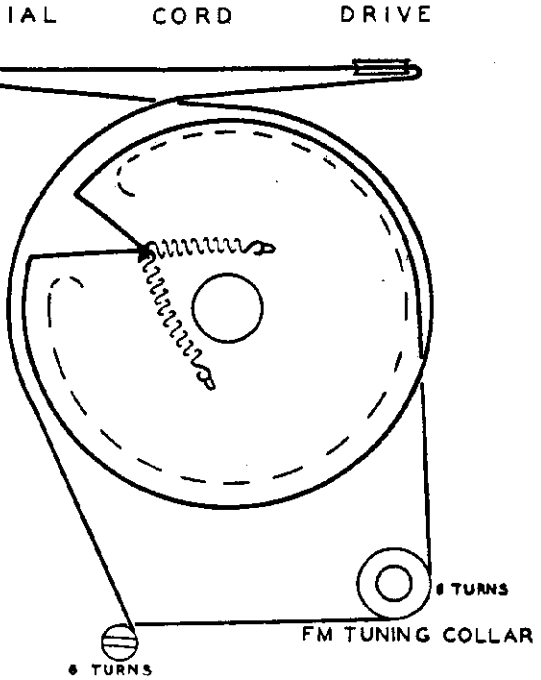
1. All readings taken in broadcast position except those for item 4A, 6BA6 tube, which should be taken in FM position.
2. Voltage readings are in volts and resistance readings in ohms unless otherwise specified.
3. D-C voltage measurements are at 20,000 ohms per volt; a-c voltages measured at 1,000 ohms.
4. Socket connections are shown as bottom views.
5. Measured values are from socket pin to common negative.
6. Line voltage maintained at 117 volts for voltage readings.
7. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
8. Volume control at maximum, no signal applied for voltage measurements.
9. Resistance readings in the B+ circuits may vary widely according td the condition of the filter capacitors.

VOLTAGE READINGS

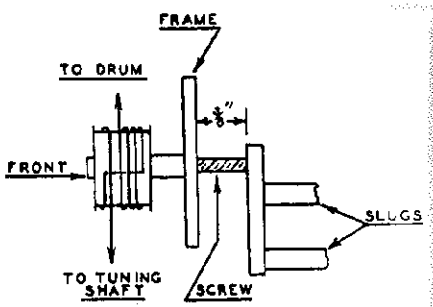
SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
1	6AG5	-0.5 DC	0	6.5 AC	0	225 DC	137 DC	0	
2	6BE6	-0.3 DC	0	0	6.5 AC	270 DC	100 DC	0	
3	6BA6	-0.1 DC	0	0	6.5 AC	260 DC	115 DC	0	
4	6BA6	-0.4 DC	0	6.5 AC	0	0	0	0	
4A	6BA6	-0.3 DC	0	6.5 AC	0	250 DC	110 DC	0	
5	6AL5	0	0	6.5 AC	0	0	0	-0.8 DC	
6	6AU6	-0.8 DC	0	6.5 AC	0	105 DC	32 DC	0	
7	6V6GT	0	0	260 DC	270 DC	0	105 DC	6.5 AC	13.5 DC
8	5Y3GT	0	300 DC	0	300 AC	0	300 AC	0	300 DC

RESISTANCE READINGS

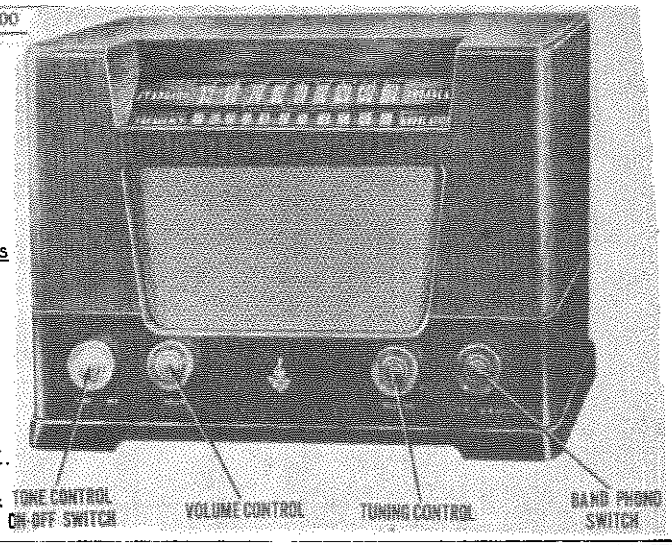
SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
1	6AG5	1.5 meg.	0	0.2	0	55,000	90,000	0	
2	6BE6	20,000	1	0.2	0.5	50,000	68,000	12,000	
3	6BA6	680,000	0	0	0.1	50,000	77,000	0	
4	6BA6	3 meg.	0	0.1	0	inf.	inf.	0	
4A	6BA6	3 meg.	0	0.1	0	50,000	77,000	0	
5	6AL5	inf.	inf.	0.1	0	520	0	135,000	
6	6AU6	2.5 meg.	0	0.1	0	520,000	1.5 meg.	0	
7	6V6GT	0	0	50,000	50,000	470,000	520,000	0.1	250
8	5Y3GT	inf.	50,000	inf.	130	inf.	125	inf.	50,000



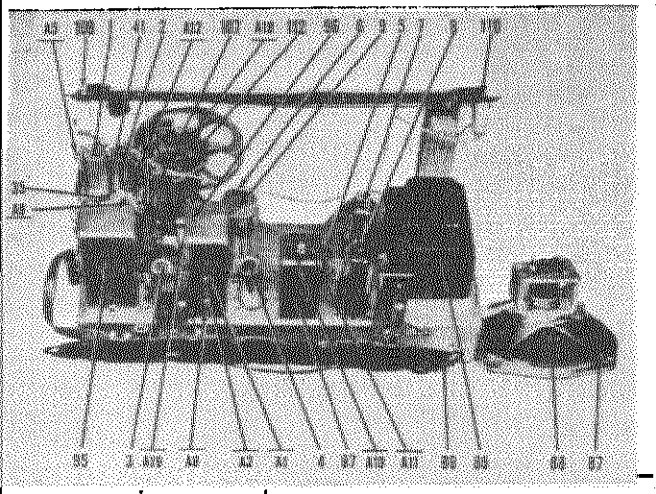
1. If replacements are made or the wiring disturbed in the r-f section of the circuit, the receiver should be carefully realigned.
2. The color coding of the i-f transformer leads is as follows: Grid—green Plate—blue
3. A self-contained loop antenna is provided for broadcast band reception. For permanent home installation, however, if it is desired to improve reception of weak stations, an additional outdoor antenna may be used. Connect the outdoor antenna to the single screw terminal on the loop terminal marked BCST. ANT. The loop antenna operates at maximum efficiency when its position is at right angles to the broadcasting source. Once the station is tuned in, rotate the cabinet back and forth through a quarter of a circle, leaving it in the position where the station is received with maximum volume.
4. An internal power line antenna is provided for FM operation in relatively strong signal areas. An external dipole antenna is recommended for maximum FM operation. To connect the dipole, remove the wire from the FM ANT. screw terminal "A" and connect the dipole leads to "A" and "G."
5. A ground connection is not required for AM or FM operation.
6. An external phonograph can be connected to the jack provided at the rear of the chassis base.

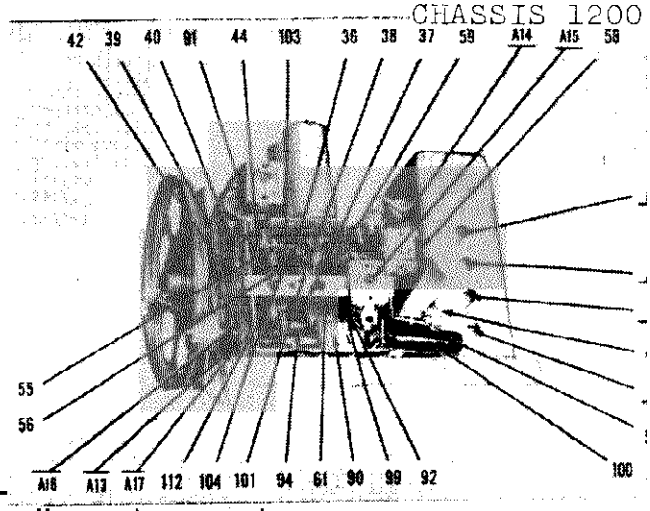


DETAIL OF FM COLLAR STRINGING AND CORRECT SETTING OF SLUG TUNER WITH TUNING CONTROL FULLY COUNTER—CLOCKWISE.



EMERSON RADIO AND PHONO. CORP. MODEL 528, CHASSIS 1200



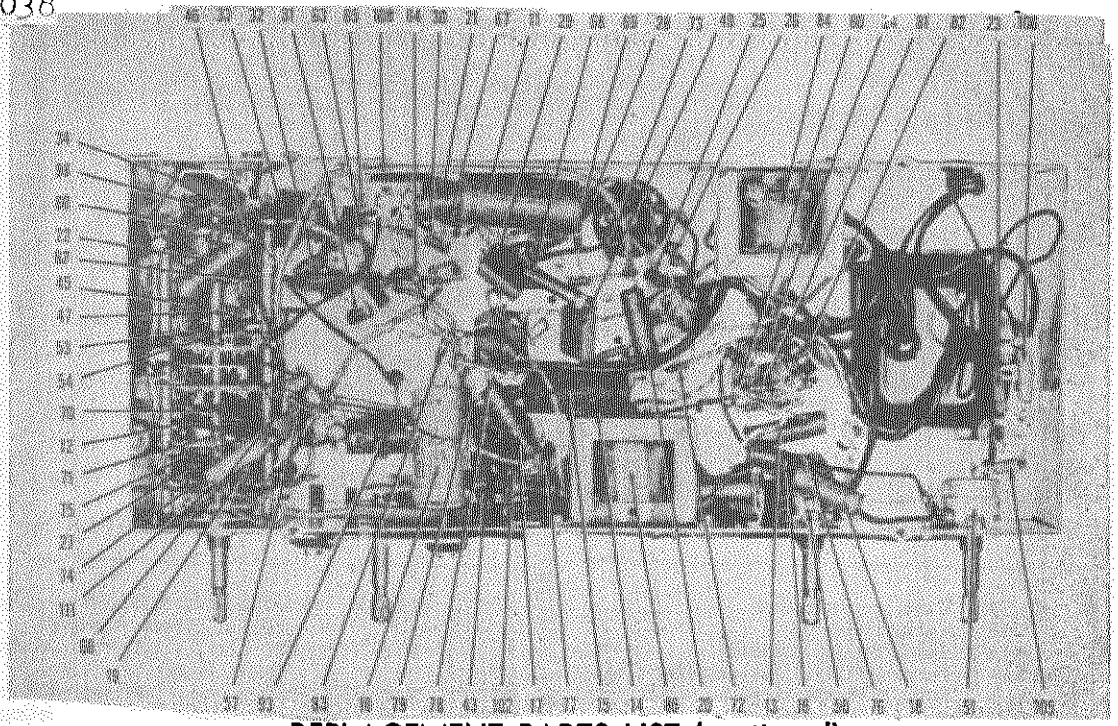


Symbol	†Part No.	DESCRIPTION
1	6AG5	Tube, r-f amplifier
2	6BE6	Tube, converter
3	6BA6	Tube, 1st i-f amplifier
4	6BA6	Tube, FM 2nd i-f amplifier
5	6AL5	Tube, FM-AM detector, a.v.c.
6	6AU6	Tube, a-f amplifier
7	6V6GT	Tube, power output
8	5Y3GT	Tube, rectifier
9A, B, C	925268	40-20-50 mfd., 400-400-25 volt electrolytic condenser (filter)
10	925190	8 mfd., 450 volt electrolytic condenser (filter)
11	925190	8 mfd., 450 volt electrolytic condenser (filter)
12	925005	5 mfd., 50 volt condenser (ratio detector bias)
13	920512	0.008 mfd., 400 volt condenser (output plate bypass)
14	920090	0.01 mfd., 400 volt condenser (audio coupling)
15	920250	0.1 mfd., 400 volt condenser (audio screen bypass)
16	920180	0.005 mfd., 400 volt condenser (tone compensation)
17	920180	0.005 mfd., 400 volt condenser (audio coupling)
18	920090	0.01 mfd., 400 volt condenser (tone compensation)
19	920090	0.01 mfd., 400 volt condenser (audio coupling)
20	920180	0.005 mfd., 400 volt condenser (deemphasis)
21	920040	0.1 mfd., 200 volt condenser (a.v.c. filter)
22	920060	0.05 mfd., 200 volt condenser (a.v.c. filter)
23	910320	250 mmfd., 500 volt mica condenser (FM antenna coupling)
24	928102	50 mmfd., 300 volt ceramic condenser (audio plate bypass)
25	910100	100 mmfd., 500 volt mica condenser (ratio detector load)
26	910100	100 mmfd., 500 volt mica condenser (ratio detector load)
27	910320	250 mmfd., 500 volt mica condenser (diode filter)
28	910356	5000 mmfd., 500 volt mica condenser (2nd i-f plate decoupling)
29	910356	5000 mmfd., 500 volt mica condenser (2nd i-f screen bypass)
30	910100	100 mmfd., 500 volt mica condenser (i-f coupling)
31	910100	100 mmfd., 500 volt mica condenser (diode filter)
32	910356	5000 mmfd., 500 volt condenser (1st i-f screen bypass)
33	910356	5000 mmfd., 500 volt condenser (a.v.c. filter)
34	910356	5000 mmfd., 500 volt condenser (converter plate decoupling)
35	915003	500 mmfd., 300 volt button mica condenser (converter screen bypas
36	928102	50 mmfd., 300 volt ceramic condenser (converter cathode bypas
37	928101	25 mmfd., 300 volt ceramic condenser (oscillator grid)
38	928106	100 mmfd., 300 volt ceramic condenser (r-f coupling)
39	910320	250 mmfd., 300 volt mica condens (wave trap)
40	928002	10 mmfd., 300 volt ceramic condenser (r-f plate decoupling)
41	915003	500 mmfd., 300 volt button mica condenser (r-f screen bypass)
42	910356	5000 mmfd., 500 volt mica condens (r-f filament bypass)
43	910356	5000 mmfd., 500 volt mica condens (r-f filament bypass)
44	915003	500 mmfd., 300 volt button mica condenser (r-f bypass power suppl
45	928107	30 mmfd., 300 volt ceramic conde ser (FM r-f coupling)
46	928102	50 mmfd., 300 volt ceramic condenser (FM r-f coupling)
47	928105	7 mmfd., 300 volt ceramic condens (FM r-f coupling)
48	928105	7 mmfd., 300 volt ceramic condens (FM r-f coupling)
49	910356	5000 mmfd., 500 volt condenser (r-f bypass power supply)
50	390378	Volume control, 1 meg.
51	390379	Tone control and switch, 1 meg.
52	320490	1000 ohms, ¼ watt resistor (anten loading)
53	321130	470,000 ohms, ¼ watt resistor (r-f grid)
54	310970	100,000 ohms, ¼ watt resistor (a.v.c. network)
55	370872	39,000 ohms, 1 watt resistor (r-f screen dropping)
56	310650	4,700 ohms, ¼ watt resistor (r-f plate decoupling)
57	320290	150 ohms, ¼ watt resistor (parasi suppressor)
58	310750	12,000 ohms, ¼ watt resistor (cor verter grid)

* Not supplied separately.

† Specify part numbers when ordering.

MODEL 528, CHASSIS 120038 EMERSON RADIO AND PHONO. CORP.



REPLACEMENT PARTS LIST (continued)

Symbol	†Part No.	DESCRIPTION
59	397070	18,000 ohms, 2 watt resistor (converter screen dropping)
60	340370	1,000 ohms, ¼ watt resistor (converter plate decoupling)
61	310810	22,000 ohms, ¼ watt resistor (oscillator grid)
62	310970	100,000 ohms, ¼ watt resistor (a.v.c. network)
63	370830	27,000 ohms, 1 watt resistor (1st i-f screen dropping)
64	320490	1,000 ohms, ¼ watt resistor (1st i-f plate decoupling)
65	321210	1 meg., ¼ watt resistor (a.v.c. network)
66	321210	1 meg., ¼ watt resistor (a.v.c. network)
67	321290	2.2 meg., ¼ watt resistor (2nd i-f grid)
68	370830	27,000 ohms, 1 watt resistor (2nd i-f screen dropping)
69	320490	1,000 ohms, ¼ watt resistor (2nd i-f plate decoupling)
70	340370	330 ohms, ½ watt resistor (ratio detector bias)
71	310771	15,000 ohms, ¼ watt resistor (ratio detector bias)
72	340410	470 ohms, ½ watt resistor (ratio detector bias)
73	350810	22,000 ohms, ½ watt resistor (deemphasis)
74	310890	47,000 ohms, ¼ watt resistor (diode r-f filter)
75	310970	100,000 ohms, ¼ watt resistor (diode load)
76	310890	47,000 ohms ¼ watt resistor (tone compensation)
77	321290	2.2 meg., ¼ watt resistor (a-f grid)
78	311250	1.5 meg., ¼ watt resistor (a-f screen dropping)
79	321130	47,000 ohms, ¼ watt resistor (a-f plate load)
80	351270	4.7 meg., ½ watt resistor (feedback)
81	321130	470,000 ohms, ¼ watt resistor (output grid)
82	370350	270 ohms, 1 watt resistor (output cathode)
83	351370	1,000 ohms, ¼ watt resistor (filter)
84	737068	Filter choke, 210 ohms d-c resistance
85	730067	Power transformer
86	734202	Output transformer
87	180017	Speaker, 6-inch P.M.
*88		Speaker cone (part of 180017)
89	700234	AM loop antenna
90	710014	FM antenna coil
91	708001	AM wave trap
92	714003	FM r-f coil
93	708001	AM oscillator coil
94	716112	FM oscillator coil
95	720523	1st i-f transformer
96	720524	2nd i-f transformer
97	708145	FM ratio and AM detector and transformer
98	705005	Plate r-f choke
99	705007	R-F choke
100	705003	R-F choke
101	705000	R-F choke
102	705002	R-F choke
103	705002	R-F choke
104	705002	R-F choke
105	705002	R-F choke
106	705002	R-F choke
107	705002	R-F choke
108	705002	R-F choke
109	807020	Dial light
110	807020	Dial light
111	510400	Band-phono switch
112		FM tuning unit
113	900312	Two-gang variable condenser
	508010	Phono input receptacle
	503150	Line cord and plug
	507040	Dial light socket assembly, left
	507050	Dial light socket assembly, right
	280501	Drive shaft, dial assembly
	280505	Drive shaft, FM tuner
	520506	Dial backplate
	520508	Dial glass
	525206	Pointer
	140056	Cabinet
	620012	Knob, with indicator dot
	620030	Knob

*Not supplied separately.

† Specify part numbers when ordering.

EMERSON RADIO AND PHONO. CORP. MODELS 540, 56
572 CHASSIS 120042
120027, 12006

MODELS 540, 564, 572

EMERSON RADIO AND PHONO. CORP.

ALIGNMENT

To set pointer on Models 540 and 564, turn tuning slugs completely in and set pointer to top reference dot on right side of dial backplate. On Model 572 set pointer in extreme clockwise position. Use isolation transformer if available. If not, connect a condenser in series with low side of signal generator and chassis. Volume control should be at maximum position; output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1	0.1 mfd.	High side to pin 7 (grid) of 12BE6. Low side to B—.	455 kc	Tuning slugs completely out.	Across voice coil.	A1, A2, A3, A4	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to 0.001 mfd. to reduce hum modulation.
2	200 mmfd.	High side to external antenna lead. Low side to chassis.	1600 kc for Models 540 and 564. 1620 kc for Model 572	Bottom reference dot at right side of dial backplate for Models 540 and 564. Tuning slugs completely out on Model 572.	Across voice coil.	A5,. A6	Adjust for maximum output.
3	200 mmfd.	High side to external antenna lead. Low side to chassis.	1400 kc	Tune for maximum output.	Across voice coil.	Antenna coil (34)	Loosen screws on bracket of antenna coil (34). Adjust position of coil for maximum output. Tighten screws.

VOLTAGE READINGS

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7
1	12BE6	-4.3 DC	0	12 AC	24 AC	100 DC	77 DC	-0.1 DC
2	12BA6	-0.1 DC	0	24 AC	35 AC	100 DC	100 DC	1.3 DC
3	12AT6	-0.7 DC	0	0	12 AC	-0.5 DC	0	57 DC
4	50B5	0	6.2 DC	35 AC	85 AC	115 DC	100 DC	0
5	35W4	122 DC	115 AC	85 AC	117 AC	110 DC	110 AC	122 DC

RESISTANCE READINGS

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7
1	12BE6	20,000	0	11	22	40,000	45,000	3.5 meg.
2	12BA6	3.5 meg.	0	22	32	40,000	40,000	100
3	12AT6	15 meg.	0	0	11	500,000	0	500,000
4	50B5	450,000	125,000	32	75	40,000	40,000	450,000
5	35W4	40,000	100,000	75	102	110	97	40,000

VOLTAGE AND RESISTANCE READING INSTRUCTIONS

1. Voltage readings are in volts and resistance readings in ohms unless otherwise specified.
2. D-C voltage measurements are at 20,000 ohms per volt; a-c voltages measured at 1,000 ohms per volt.
3. Socket connections are shown as bottom views.
4. Measured values are from socket pin to common negative.
5. Line voltage maintained at 117 volts for voltage readings.
6. Nominal tolerance on component values makes possible a variation of ± 10% in voltage and resistance readings.
7. Volume control at maximum, no signal applied for voltage measurements.

DESCRIPTION

TYPE: Single-band superheterodyne.

FREQUENCY RANGE: 540-1620 kc.

TYPE OF TUBES:

1—12BE6, pentagrid oscillator-modulator
1—12BA6, first i-f amplifier
1—12AT6, diode detector, a-f amplifier, a.v.c.
1—50B5, beam power output
1—35W4, half-wave rectifier

POWER SUPPLY: A.C. or D.C.

VOLTAGE RATING: 105-125 volts.

POWER CONSUMPTION: 30 watts.

CURRENT DRAIN: 0.24 amp. at 117 volts a.c.

GENERAL NOTES

1. If replacements are made or the wiring disturbed in the r-f section of the circuit, the receiver should be carefully realigned.
2. In operating the receiver on d.c., it may be necessary to reverse the line plug for correct polarity.
3. The color coding of the i-f transformer leads is as follows:

Grid—green	Plate—blue
Grid return—black	B+—red

EMERSON RADIO AND PHONO. CORP.

MODELS 54
564, 572

REPLACEMENT PARTS LIST

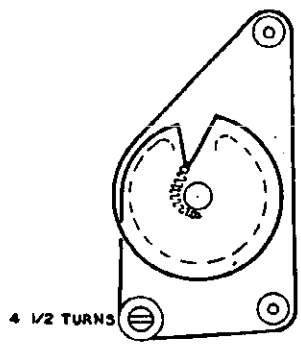
Symbol	†Part No.	DESCRIPTION
1	12BE6	Tube, converter
2	12BA6	Tube, i-f amplifier
3	12AT6	Tube, detector, a-f amplifier, a.v.c.
4	50B5	Tube, power output
5	35W4	Tube, rectifier
6A, 6B	925068	30-50 mfd., 150 volt electrolytic condenser (filter)
7	920030	0.05 mfd., 400 volt condenser (line bypass) (alternate part 920539)
8	920020	0.02 mfd., 400 volt condenser (output plate bypass) (alternate part 920540)
9	920180	0.005 mfd., 400 volt condenser audio coupling) (alternate part 920536)
10	920240	0.0005 mfd., 600 volt condenser (audio plate bypass)
11	920010	0.002 mfd., 600 volt condenser (audio coupling) (alternate part 920537)
12	920040	0.1 mfd., 200 volt condenser (a.v.c. filter) (alternate part 920538)
13	910000	220 mmfd., 500 volt mica condenser (diode filter)
14	910010	110 mmfd., 500 volt mica condenser (oscillator grid coupling)
15	910007	300 mmfd., 500 volt mica condenser fixed trimmer) (alternate part 910015)
16	910180	1000 mmfd., 300 volt mica condenser (oscillator feedback)
17	910008	80 mmfd., 500 volt mica condenser (fixed trimmer) (alternate ceramic condenser 928005)
18	390381	Volume control and line switch, 0.5 meg. (Model 540)
18	390029	Volume control and line switch, 0.5 meg. (Models 564, 572)
19	340810	22,000 ohms, ½ watt resistor (oscillator grid)
20	340650	4,700 ohms, ½ watt resistor (converter screen dropping)
21	351330	3.3 meg., ½ watt resistor (a.v.c. network)
22	340250	100 ohms, ½ watt resistor (i-f cathode bias)
23	397000	15 meg., ½ watt resistor (a-f grid load)
24	351130	470,000 ohms, ½ watt resistor (a-f plate load)
25	351130	470,000 ohms, ½ watt resistor (output grid load)
26	340290	150 ohms, ½ watt resistor (output cathode bias)
27	370490	1000 ohms, 1 watt resistor (filter)
28	340050	15 ohms, ½ watt resistor (rectifier ballast)
29	340010	10 ohms, ½ watt resistor (series pilot light)
30	734006	Output transformer
31	180018	Speaker, 4" P.M. (alternate part 180036)
*32		Speaker cone, part of speaker
33	700235	Loop antenna and rear cover (Model 540)
33	700013	Loop antenna and rear cover (Model 564)
33	700022	Loop antenna and rear cover (Model 572)
*34		Antenna coil, part of tuner assembly
*35		Oscillator coil, part of tuner assembly
36	720527	First i-f transformer (455 kc) (Model 540), or
36	720033	First i-f transformer (Models 564, 572), or
36	720053	First i-f transformer (Models 540, 564, 572)
37	720527	Second i-f transformer (455 kc) (Model 540), or
37	720033	Second i-f transformer (Models 564, 572), or
37	720053	Second i-f transformer (Models 540, 564, 572)
38	807000	Dial light, type 47
39	708147	Complete tuner assembly, includes items 34 and 35
	507214	Pilot light socket (Models 540, 564)
	507007	Pilot light socket (Model 572)
	583090	Line cord

CABINET AND DIAL PARTS

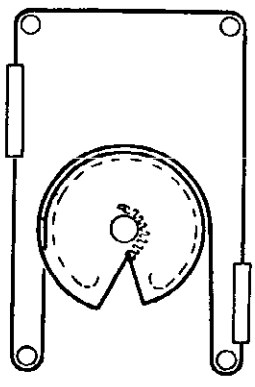
140078	Cabinet, walnut (Model 540)	
140075	Cabinet, ivory (Model 540)	
140076	Cabinet, red (Model 540)	
140077	Cabinet, green (Model 540)	
140115	Cabinet, black (Model 540)	
140121	Cabinet, green onyx (Model 564)	
140139	Cabinet, red mottled (Model 564)	
140140	Cabinet, ebony (Model 564)	
140123	Cabinet, ivory (Model 572)	
140158	Cabinet, ebony (Model 572)	
140169	Cabinet, black and white mottled (Model 572)	
520004	Dial crystal (Model 540)	
520051	Dial crystal (Model 564 green onyx)	
520055	Dial crystal (Model 564 red and ebony)	
525207	Dial pointer (Models 540, 564)	
525026	Dial Pointer (Model 572)	
470319	Pointer shaft and pulley assembly (Model 572)	
520053	Dial backplate (Model 564 green onyx)	
520511	Dial backplate (Model 540 and Model 564 red and ebony)	
280509	Drive shaft	
460001	Knob, black (Models 540, 572)	
450015	Knob, brown (Model 564)	
450016	Knob, red (Model 564)	
450017	Knob, black (Model 564)	
410268	Metal grille, gold (Model 572)	
635001	Jewel indicator (Model 572)	

† Specify part numbers when ordering.

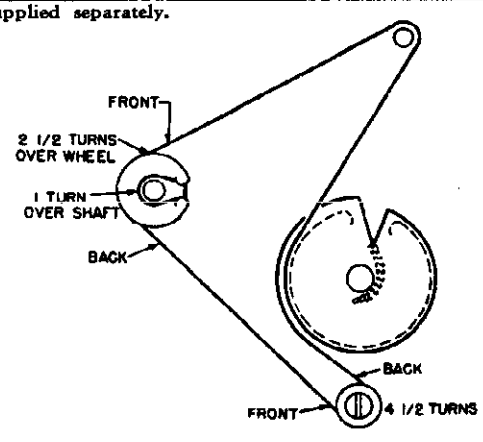
* Not supplied separately.



SLIDE RULE TYPE DIAL DRIVE



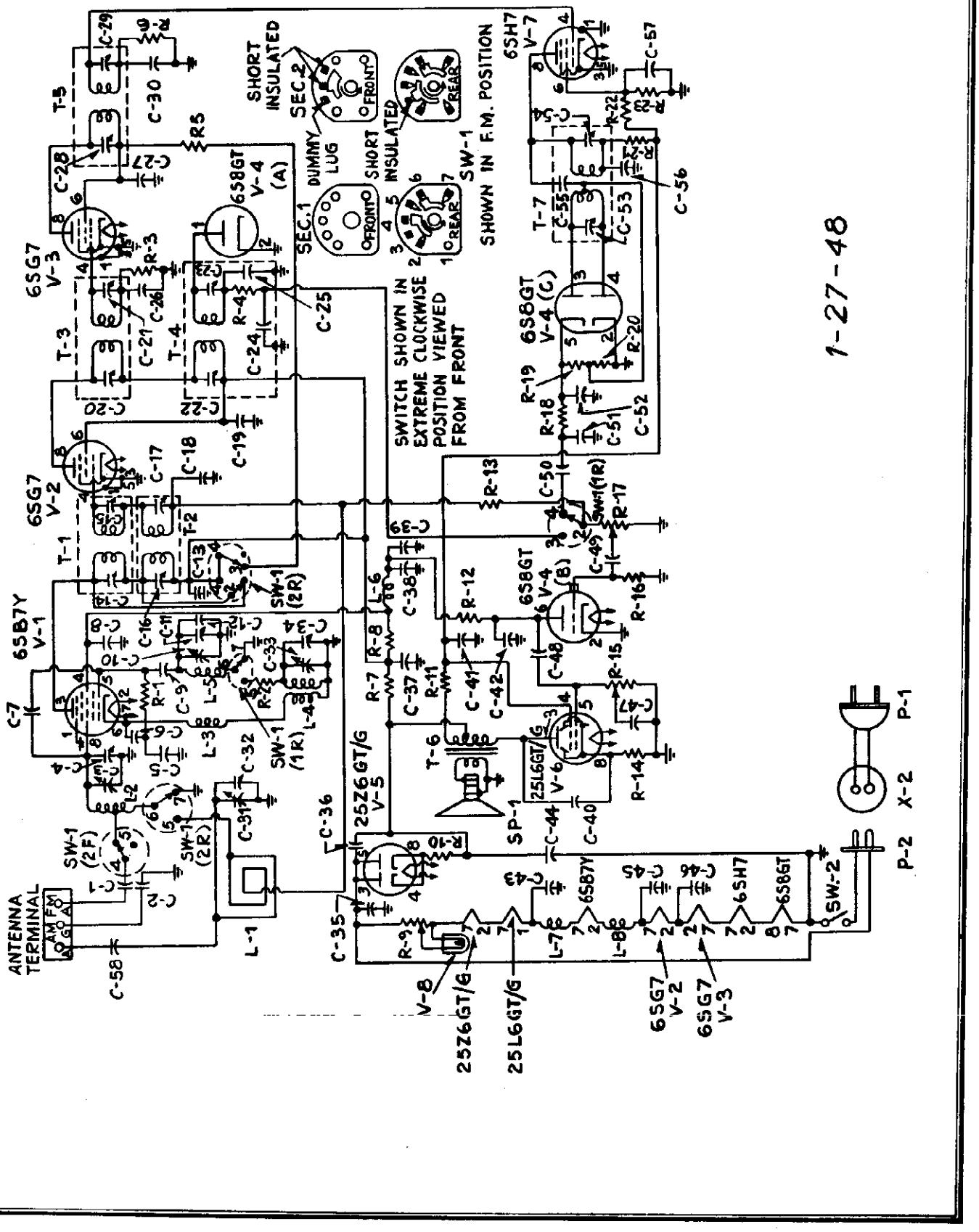
TUNING ASSEMBLY DRIVE



CLOCK FACE TYPE DIAL DRIVE

MODEL 557,
CHASSIS 120048B

EMERSON RADIO AND PHONO. CORP.



Item	Part No.	Description		
C-1	928003	1000MMF CERAMIC	±20%	
C-2	928003	1000MMF CERAMIC	±20%	
C-3	900400	VARIABLE CONDENSER (FM)		
C-4	PT. OF C3	TRIMMER		
C-5	928016	15 mmf CERAMIC	±10%	
C-6	928014	50 mmf CERAMIC	±20%	
C-7	915005	2.2 mmf STACKPOLE GA-4	±20%	500V
C-8	928109	5000 mmf CERAMIC CIRCULAR C.T.S.		
C-9	928015	75 mmf CERAMIC	±10%	
C-10	PT. of C-3	Variable Condenser (FM)		
C-11	PT of C-10	TRIMMER		
C-12	928017	5 mmf CERAMIC	±10%	
C-13	920092	.01 MF Paper		200V
C-14	PT. of T-1	TRIMMER		
C-15	PT. of T-1	TRIMMER		
C-16	PT. of T-2	TRIMMER		
C-17	PT. of T-2	TRIMMER		
C-18	920060	.05 MF Paper		200V
C-19	920092	.01 MF Paper		200V
C-20	PT. of T-3	TRIMMER		
C-21	PT. of T-3	TRIMMER		
C-22	PT. of T-4	TRIMMER		
C-23	PT. of T-4	TRIMMER		
C-24	PT. of T-4	TRIMMER		
C-25	PT. of T-4	TRIMMER		
C-26	920092	.01 MF Paper		200V
C-27	920092	.01 MF Paper		200V
C-28	PT. of T-5	TRIMMER		
C-29	PT. of T-5	TRIMMER		
C-30	928102	50 MMF CERAMIC		300V
C-31	PT. of C-3	VARIABLE CONDENSER (AM)		
C-32	PT. of C-31	TRIMMER		
C-33	PT. of C-3	VARIABLE CONDENSER (AM)		
C-34	PT. of C-33	TRIMMER		
C-35	920030	.05 MF Paper		400V
C-36	920180	.005 MF Paper		400V
C-37	925067	50 MF. ELECTROLYTIC		150V
C-38		50 MF ELECTROLYTIC		150V
C-39	910014	470 MMF MICA	±20%	
C-40	92002C	.01 MF Paper		400V
C-41	925084	50 MF ELECTROLYTIC		150V
C-42	910014	470 MMF MICA	±20%	
C-43	920090	.01 MF Paper		400V
C-44	PT. of C-41	.50 MF Paper		150V
C-45	920090	.01 MF Paper		400V
C-46	920090	.01 MF Paper		400V
C-47	920515	.002 MF Paper	±20%	400V
C-48	920090	.01 MF Paper		400V
C-49	920090	.01 MF Paper		400V
C-50	920092	.01 MF Paper		200V
C-51	920514	.001 MF Paper	±20%	400V
C-52	910010	110 MF MICA	±20%	
C-53	PT. of T-7	TRIMMER		
C-54	PT. of T-7	TRIMMER		
C-55	PT. of T-7	50 MMF		
C-56	920092	.01 MF Paper		200V
C-57	920092	.01 MF Paper		200V
C-58	915995	2.2 MMF (PT of L-1) STACKPOLE GA-4	±20%	500V
C-58	P T of PT.No 700011	33 MMF	±20%	300V

Item	Part No.	Description
L-1	700011 or 700021	ANTENNA LOOP
L-2	713009	R.F. TUNING COIL -FM
L-3	715002	OSCILLATOR CHOKE -FM
L-4	716015	OSCILLATOR COIL -AM
L-5	716013	OSCILLATOR COIL -FM
L-6		R.F. CHOKE - #22 WIRE - 35 TURNS
L-7	705011	R.F. CHOKE
L-8	705011	R.F. CHOKE
SP-1	180031P	P.M. SPEAKER
SW-1	510009	BAND SWITCH
SW-2	PT. of R-17	ON-OFF SWITCH
P-1	583202	LINE CORD AND PLUG
P-2	505007	PLUG - AC (interlock)

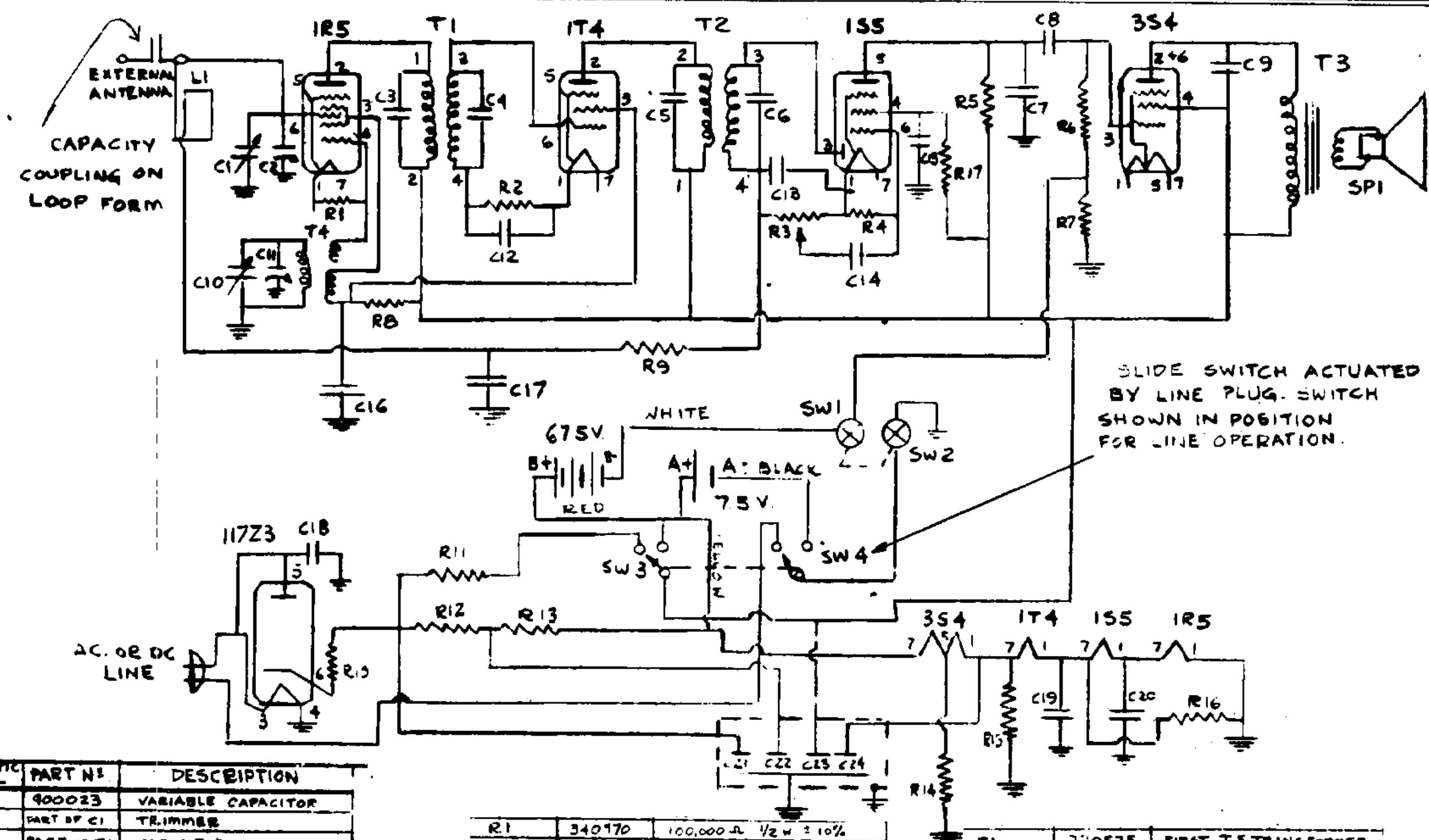
R-1	340810	22000 OHM	1/2 WATT	±10%
R-2	350290	150 OHM	1/2 WATT	±20%
R-3	351290	2.2 Megohm	1/2 WATT	
R-4	PT. of T-4	27000 OHM	1/2 WATT	±20%
R-5	350450	680 OHM	1/2 WATT	±10%
R-6	340890	47000 OHM	1/2 WATT	±10%
R-7	370450	680 OHM	1 WATT	±10%
R-8	340450	680 OHM	1/2 WATT	±10%
R-9	394012	108 OHM TAP at 17 OHMS	10 W	±5%
R-10	380050	15 OHM	1 WATT	±20%
R-11	340490	1000 OHM	1/2 WATT	±10%
R-12	351130	470000 OHM	1/2 WATT	±20%
R-13	351330	3.3 MEGOHM	1/2 WATT	±20%
R-14	370290	150 OHM	1 WATT	± 10%
R-15	390028	.5 MEGOHM	TONE CONTROL	
R-16	397000	15 MEGOHM	1/2 WATT	±50% -30%
R-17	390027	.5 MEGOHM	VOLUME CONTROL	
R-18	350930	68000 OHM	1/2 WATT	±20%
R-19	340970	100000 OHM	1/2 WATT	±10%
R-20	340970	100000 OHM	1/2 WATT	±10%
R-21	350890	47000 OHM	1/2 WATT	±20%
R-22	340810	22000 OHM	1/2 WATT	±10%
R-23	340690	6800 OHM	1/2 WATT	±10%

T-1	720024	1st I.F. TRANSFORMER -FM
T-2	720031	1st I.F. TRANSFORMER -AM
T-3	720025	2nd I.F. TRANSFORMER -FM
T-4	720032	2nd I.F. TRANSFORMER -AM
T-5	720026	3rd I.F. TRANSFORMER -FM
T-6	734015	OUTPUT TRANSFORMER
T-7	708005	DISCRIMINATOR COIL

140113	CABINET
360041	CABINET BACK
520046	DIAL DRYSTAL
610177	DIAL BACKPLATE
280039	DRIVE SHAFT
525017	POINTER
507004	DIAL LIGHT SOCKET ASS'Y

MODEL 559,
CHASSIS 120059A

EMERSON RADIO AND PHONO. CORP.

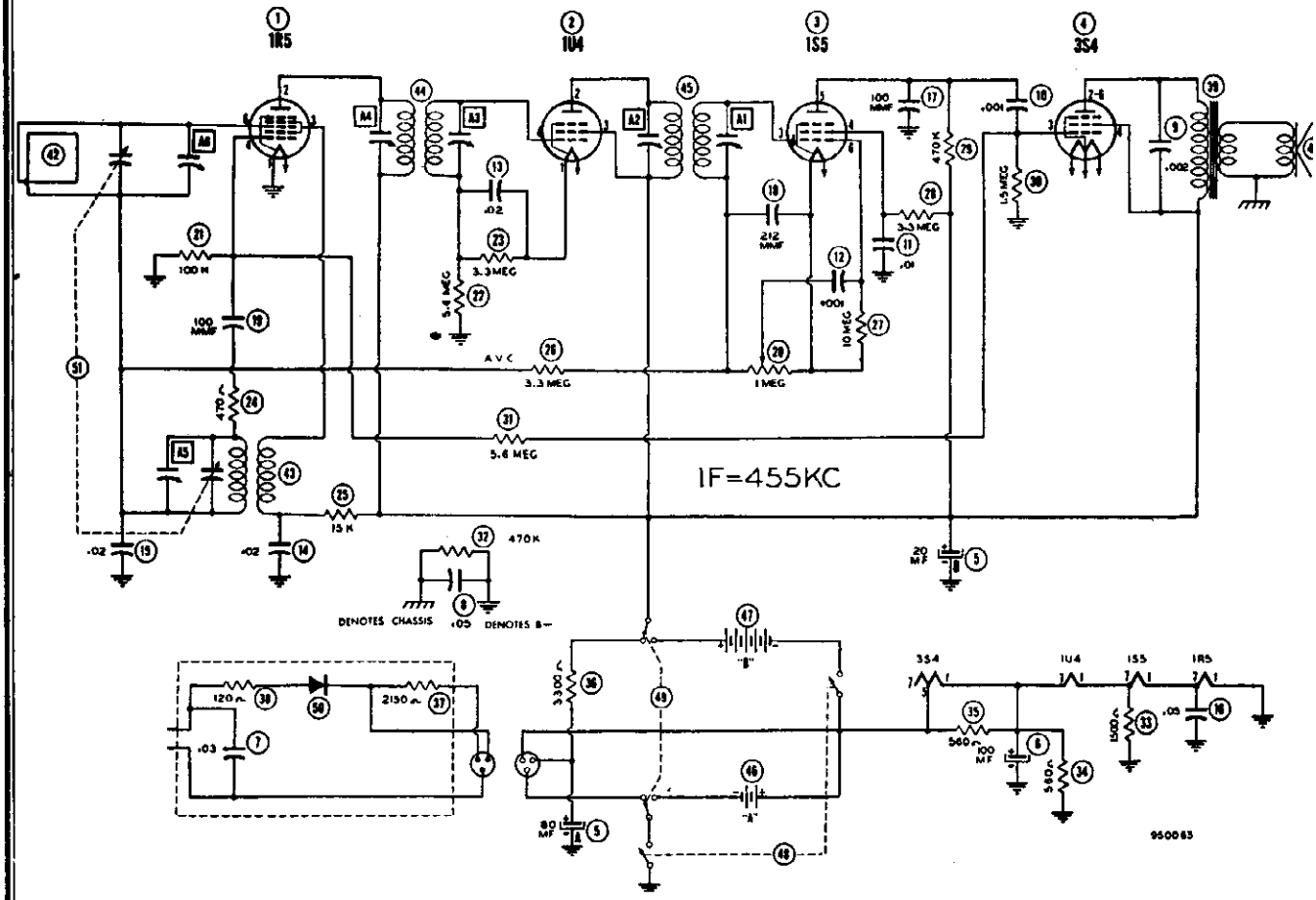


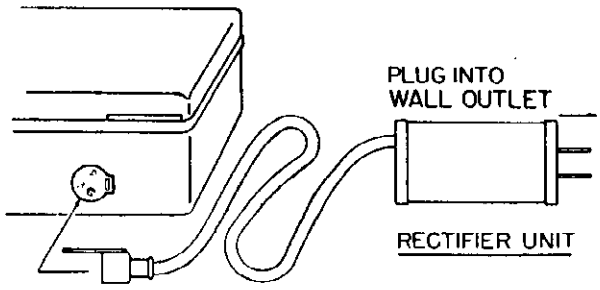
SCHEMATIC SYMBOL	PART N°	DESCRIPTION
C1, C10	900023	VARIABLE CAPACITOR
C2	PART OF C1	TRIMMER
C3, C4	PART OF T1	CAPACITOR
C5, C6	PART OF T2	CAPACITOR
C7, C13 } or	910000	220 MMF ± 20% MICA
C7, C13	928011	220 MMF 300V. ± 20% CERAMIC
C8	920180	.005 MFD 400V
C9, C14	920515	.002 MFD 400V.
C11	PART OF C10	TRIMMER
C12, C15	920092	.01 MFD 200V.
C16, C17, C20	920060	.05 MFD 200V
C18	922102	.05 MFD 400V.
C19	920040	.1 MFD 200V.
C21	925059	80 MFD. 150V. +100 −10 %
C22		30 MFD. 150V. +100 −10 %
C23		40 MFD 150V. +100 −10 %
C24		100 MFD 25V. +250 −0 %
L1	700009	LOOP ANTENNA

R1	340970	100,000 Ω ½W ± 10%
R2, R17	351330	3.3 MEG Ω ½W ± 20%
R3	390026	VOLUME CONTROL
R4	351450	10 MEG Ω ½W ± 20%
R5	351130	470,000 Ω ½W ± 20%
R6	351250	1.5 MEG Ω ½W ± 20%
R7	340330	220 Ω ½W ± 10%
R8	340710	8200 Ω ½W ± 10%
R9	351290	2.2 MEG Ω ½W ± 20%
R10	370170	47 Ω 1W. ± 10%
R11	340610	3300 Ω ½W. ± 10%
R12, R13	394008	2200 Ω 8W ± 5%
R14, R15, R16	340490	1000 Ω ½W ± 10%
SP1 } or	180030	SPEAKER
SP1	180034	SPEAKER
SW1, SW2	PART OF R3	D.P.S.T. SWITCH
SW3, SW4	510008	D.P.D.T. SLIDE SWITCH

T1	720525	FIRST I.F. TRANSFORMER
T2	720525	SECOND I.F. TRANSFORMER
T3	734015	OUTPUT TRANSFORMER
T4	716017	OSCILLATOR COIL
	140117	CABINET - ALLIGATOR
	140118	CABINET BACK - ALLIGATOR
	595005	BLACK HANDLE WITH RINGS
	450115	KNOB - BLACK
	585009	"B" BATTERY CABLE
	580038	PIN TERMINAL LEAD - AVC
	580039	PIN TERMINAL LEAD - GRID
	583012P	LINE CORD
	280037	DRIVE SHAFT
	530002	DRIVE CORD
	587040	SPRING - DRIVE CORD
	410124	DIAL BACK PLATE
	525019	DIAL POINTER - RED

EMERSON RADIO AND PHONO. CORP. MODEL 569, CHASSIS 120062





POWER SUPPLY PLUG

PLUG INTO RECEPTACLE IN RECEIVER. INSERT PLUG ALL THE WAY. FOR BATTERY OPERATION REMOVE PLUG.

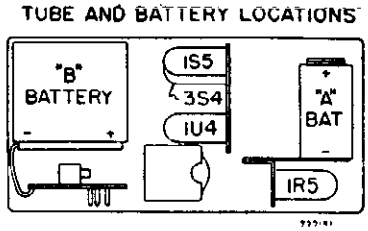
BATTERIES USED IN THIS RECEIVER		
TYPE	MANUFACTURER'S NUMBER	
6 Volt "A"	Olin No. 4919	Eveready No. 724
67½ Volt "B"	Olin No. 1712	Eveready No. 457

A.C.-D.C. OPERATION—Insert three-prong plug into socket on side of receiver. Plug Rectifier Unit into 105-125 volt wall outlet. Rectifier Unit will normally operate warm. Keep unit free from dust and in a well ventilated location. *OPERATE RECTIFIER UNIT IN HORIZONTAL POSITION ONLY.* If set is inoperative on D.C., reverse plug in wall outlet.

BATTERY OPERATION — Remove the three-prong plug from the receiver; the self-contained batteries will then supply power. Removal of Rectifier Unit from wall outlet is desirable.

BATTERY REPLACEMENT

TUBE AND BATTERY LOCATIONS



1. Remove power supply plug from set.
2. Slide the button on the release catch near the handle in the direction of the arrow. This loosens the bottom shell and permits it to be swung open on the hinge, making the batteries accessible.
3. Insert the batteries as shown in the diagram.
4. To reassemble, hold the chassis face down with the batteries in place. Close the bottom shell over the chassis and press the handle end of the shell so that it snaps into place.

MODEL 569 EMERSON RADIO AND PHONO. CORP.

INSTRUCTIONS FOR VOLTAGE AND RESISTANCE READINGS

1—DC Voltage measurements are at 20,000 ohms per volt; AC voltages measured at 1,000 ohms.
2—Socket connections are shown as bottom views.
3—Measured values are from socket pin to common negative.
4—Line voltage maintained at 117 volts for voltage readings.
5—Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6—Volume control at maximum; no signal applied for voltage measurements

VOLTAGE READINGS

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7
1	1R5	OV	78VDC	50VDC	†-3.2VDC	OV	OV	1.3VDC
2	1U4	2.5VDC	78VDC	78VDC	50VDC	2.5VDC	OV	3.8VDC
3	1S5	1.3VDC	78VDC	.2VDC	17VDC	26VDC	OV	2.5VDC
4	3S4	3.8VDC	75VDC	OV	78VDC	5.2VDC	75VDC	5.2VDC

† Taken with vacuum tube voltmeter.
NOTE: OV equivalent to zero volts.

RESISTANCE READINGS

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7
1	1R5	0 ohm	5400 ohm	20K ohm	100K ohm	0 ohm	4.3 meg.	*
2	1U4	*	5400 ohm	5400 ohm	20K ohm	*	2 meg.	*
3	1S5	*	5400 ohm	1 meg.	3.3 meg.	470K ohm	10 meg.	*
4	3S4	*	6000 ohm	1.5 meg.	5400 ohm	*	6000 ohm	*

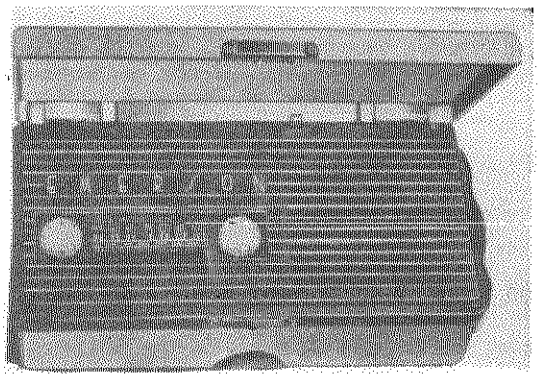
* Do not use ohmeter to measure filament resistance.

ALIGNMENT INSTRUCTIONS

Use battery power when available. If AC power is used, use an isolation transformer when available. If not, connect a .1 mfd. capacitor in series with low side of the signal generator and B—.

Volume control should be at maximum position; output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1	.1 mfd.	High side to Pin 6 (grid) of 1R5. Low side to B—.	455KC	Tuning cap. fully open.	Across voice coil.	A1, A2, A3, A4	Adjust for maximum output. If AC power is used without an isolation transformer reduce dummy ant. to 200 mmf. to reduce hum modulation.
2		Loop	1620KC	"	"	A5	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
3		"	600KC	Tune for maximum output.	"	A6	Rock tuning cap. and adjust for maximum output. Repeat Steps 2 and 3 until no further improvement can be made.



DESCRIPTION

TYPE: Three-way pocket portable superheterodyne.

FREQUENCY RANGE: 540-1600 kc.

TYPE OF TUBES:
1—1R5, oscillator-modulator
1—1U4, i-f amplifier
1—1S5, 2nd detector, a.v.c., a-f amplifier
1—3S4, pentode output

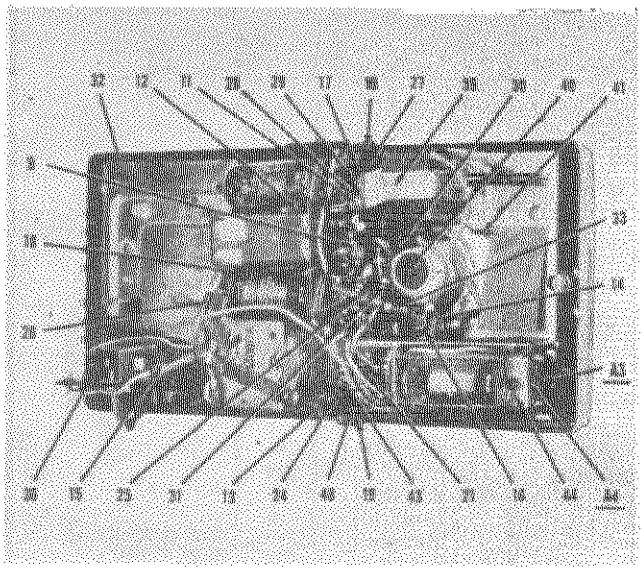
POWER SUPPLY: A.C.-D.C. (105-125 volts) or self-contained batteries

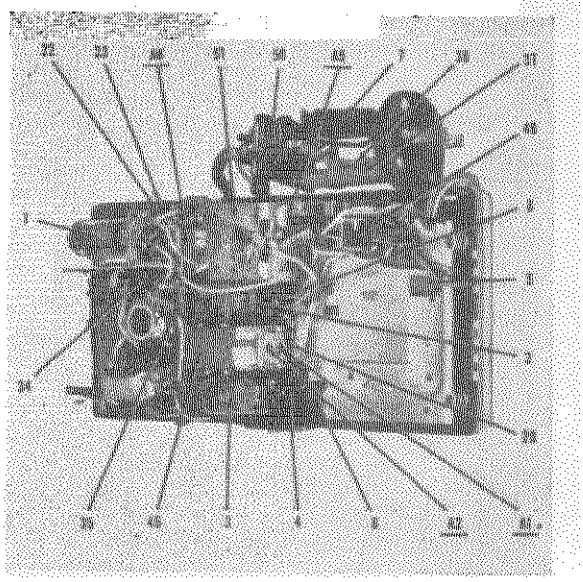
VOLTAGE RATING:
"A" Battery—6 volts
"B" Battery—67.5 volts

POWER CONSUMPTION: 11 watts

CURRENT DRAIN:
"A" Battery—60 ma.
"B" Battery—8 ma.

EMERSON RADIO AND PHONO. CORP. MODEL 5



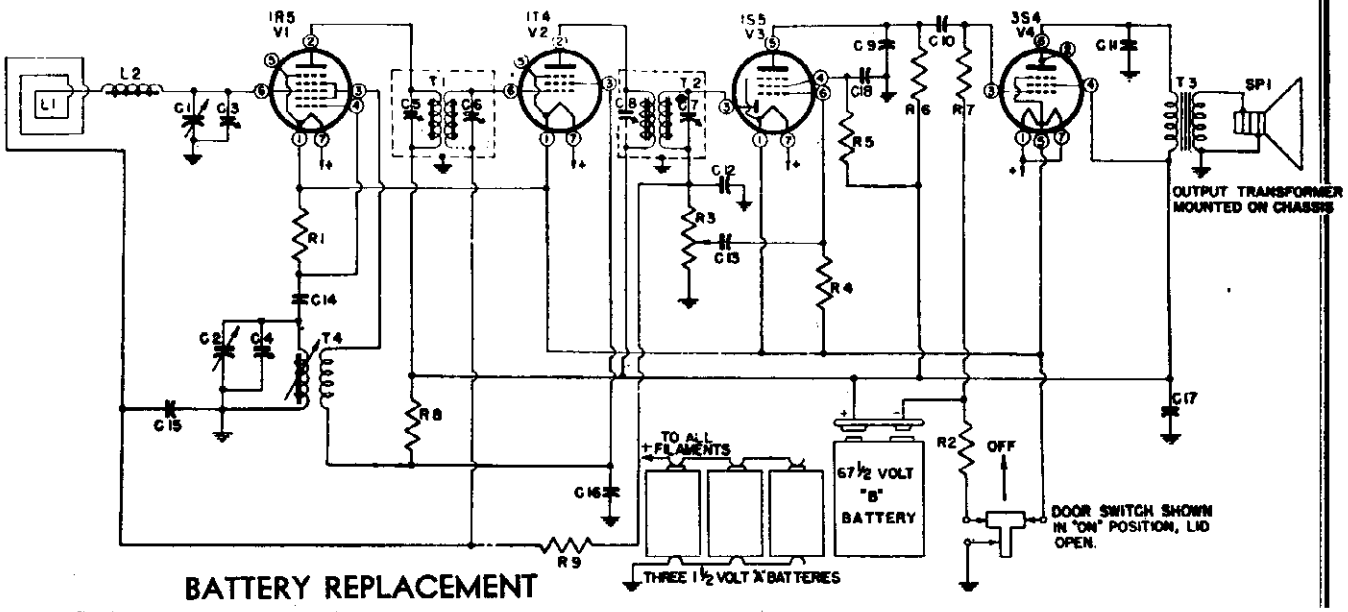


REPLACEMENT PARTS LIST

Symbol	†Part No.	DESCRIPTION
1	1R5	Converter
2	1U4	IF amplifier
3	1S5	Det.—AVC—audio amplifier
4	3S4	Power output
5A	925082	Filter (electrolytic), 80 mfd., 150 volt condenser
B		Filter (electrolytic), 20 mfd., 150 volt condenser
6	925083	Filament bypass (elect.), 100 mfd., 25 volt condenser
7	923006	Line filter, .03 mfd., 600 volt condenser
8	920494	Line isolation, .05 mfd., 200 volt condenser
9	920550	Output plate bypass, .002 mfd., 200 volt condenser
10	920497	Audio coupling, .001 mfd., 200 volt condenser
11	920499	AF screen bypass, .01 mfd., 100 volt condenser
12	920497	Audio coupling, .001 mfd.. 200 volt condenser
13	920498	IF grid filter, .02 mfd., 100 volt condenser
14	920498	Converter screen decoupling, .02 mfd., 100 volt condenser
15	920498	AVC filter, .02 mfd., 100 volt condenser
16	920494	Filament bypass, .05 mfd., 200 volt condenser
17	928013	AF plate bypass, 100 mmf., 300 volt condenser
18	928104	Diode RF filter, 212 mmf., 300 volt condenser
19	928013	Oscillator grid capacitor, 100 mmf., 300 volt condenser
20	390025	Volume control, 1 megohm, resistor
21	340970	Oscillator grid, 100K ohm, ½ watt resistor
22	341390	IF grid, 5.6 megohm, ½ watt resistor
23	351330	IF grid, 3.3 megohm, ½ watt resistor
24	340410	Parasitic suppressor, 470 ohm, ½ watt resistor
25	340770	Converter screen dropping, 15K ohm, ½ watt resistor
26	351330	AVC network, 3.3 megohm, ½ watt resistor
27	351450	AF grid, 10.0 megohm, ½ watt resistor
28	351330	AF screen, 3.3 megohm, ½ watt resistor
29	351130	AF plate, 470K ohm, ½ watt resistor
30	341250	Output grid, 1.5 megohm, ½ watt resistor
31	341390	Bias, 5.6 megohm, ½ watt resistor
32	351130	Line isolation, 470K ohm, ½ watt resistor
33	340530	Filament string, 1500 ohm, ½ watt resistor
34	370432	Filament string, 560 ohm, 1 watt resistor
35	370432	Filament string, 560 ohm, 1 watt resistor
36	340610	Filter string, 3300 ohm, ½ watt resistor
37	394019	Filament dropping, 2150 ohm, 10 watt resistor
38	394018	Rectifier ballast, 120 ohm, 3 watt resistor
39	734019	Output transformer
40	180029	3″ PM speaker
41		Cone—part of 180029
42	700008	Loop antenna
43	716021	Oscillator coil
44	720028	Input IF transformer
45	720028	Output IF transformer
46	Olin 4919	6-volt "A" battery
47	Olin 1712	67½" "B" battery
48	510019	On-off switch
49	510008	Change-over switch
50	817001	Dry disc rectifier
51	920029	2-gang tuning capacitor
	470330	Power supply unit
	585013	Plug and cable assembly
	585014	"B" battery cable
	460064	Plastic bottom shell, black
	460066	Plastic bottom shell, ivory
	460067	Plastic bottom shell, green
	460028	Plastic lid, black
	460038	Plastic lid, ivory
	460068	Plastic lid, green
	630058	Plastic loop cover, black
	410254	Metal front
	460031	Knob, black
	460037	Knob, ivory
	460061	Knob, green
	541170	Knob retaining clip
	460089	Handle, extruded plastic
	410519	Handle ring
	410298	Release catch, male
	410299	Release catch, female
	411055	Reenforcing plate, cover release catch
	410143	Lid hinge, spring loaded
	410144	Lid hinge stop
	470259	Hinge assembly, shell to metal front
	520038	Dial crystal
	520041	Dial backplate
	525016	Dial pointer
	280038	Drive shaft
	587326	Dial drive spring
	410150	"A" battery contact spring
	555000	"A" Battery contact assembly

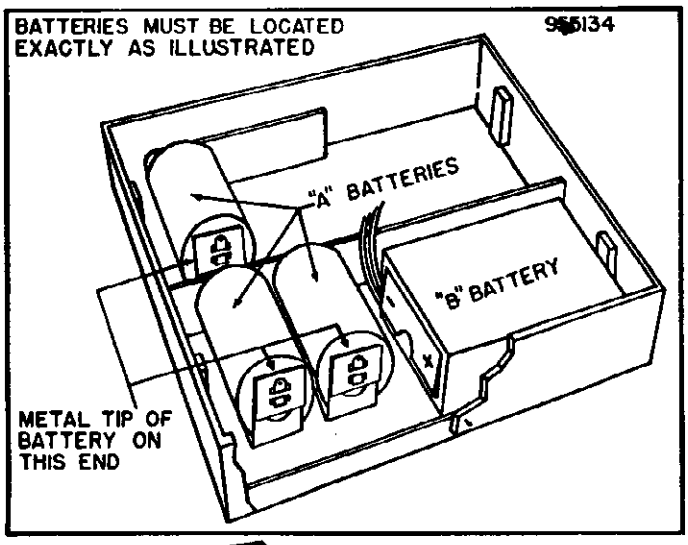
MODELS 570, 574, 580, CHASSIS 120064

EMERSON RADIO AND PHONO. CORP.



BATTERY REPLACEMENT

TO REPLACE BATTERIES: Close cover and turn set over. Unscrew large screw in center of base and remove bottom panel. This makes batteries accessible. Replace batteries as shown in illustration. Replace bottom panel and tighten screw.



DESCRIPTION

DESIGNATION: "Memento."

TYPE: Battery-operated superheterodyne.

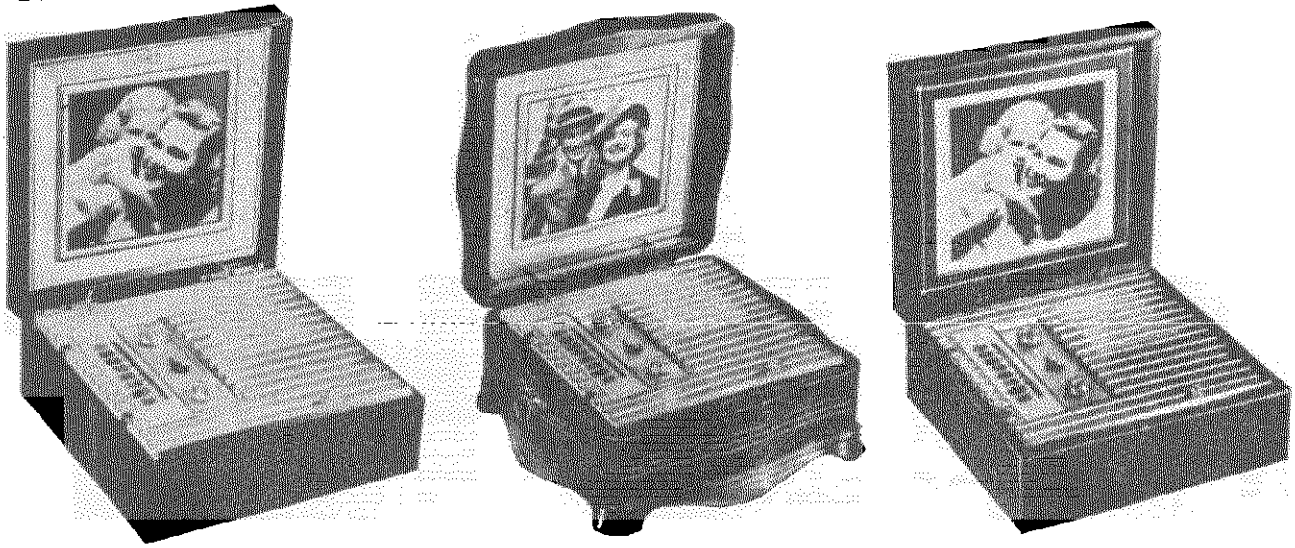
FREQUENCY RANGE: 540-1600 kc.

TYPE OF TUBES:
1—1S5, 2nd detector, a.v.c, a-f amplifier
1—1R5, oscillator-modulator
1—1T4, i-f amplifier
1—3S4, pentode output

POWER SUPPLY: "A" and "B" batteries.

VOLTAGE RATING:
"A" Battery—1.5 volts
"B" Battery—67.5 volts

CURRENT DRAIN:
"A" Battery—0.25 amp.
"B" Battery—0.0075 amp.



MODEL 570 MODEL 574 MODEL 580

ADJUSTMENTS

An oscillator with frequencies of 455, 600, 1420, and 1620 kc is required.

An output meter should be connected across the primary or secondary of the output transformer for observing maximum response.

Always use as weak a test signal as possible, turning down the output of the test oscillator as the alignment of the receiver progresses.

Turn the volume control on full.

Location of Coils and Trimmer Adjustments

The first i-f transformer is located next to the 1R5 tube. The trimmers are accessible through holes in the top of the can.

The second i-f transformer is located between the 1T4 and 1S5 tubes. Trimmers are accessible through holes in the top of the can.

The oscillator coil is located behind the on-off switch. The trimmer for the oscillator is located on the smaller variable condenser section. The 600 kc oscillator core adjustment is the brass screw protruding from the end of the oscillator coil.

The loop antenna acts as the antenna coil. The trimmer for the loop is located on the larger section of the variable condenser.

I-f Alignment

1. Rotate the variable condenser to the minimum capacity position.
2. Feed 455 kc to the grid (pin 6) of the 1R5 tube through a 0.01 mfd. condenser.
3. Adjust the four i-f trimmer screws for maximum response. (Clip the test signal lead to the stator of the larger capacity section of the variable condenser.)

R-f Alignment

1. Connect the test oscillator to a coil composed of three or four turns of wire wound in a circle approximately 12 inches in diameter. This coil should be placed parallel to and in line with the receiver loop at a distance of approximately 15 to 20 inches.
2. Radiate a signal at 1620 kc, rotate the variable condenser to minimum capacity, and adjust the oscillator trimmer, on the smaller section of the variable condenser, for maximum response.
3. Radiate a signal at 1420 kc, tune in the 1420 kc signal, and adjust the antenna trimmer, on the larger section of the variable condenser, for maximum response.
4. Radiate a signal at 600 kc, set the dial indicator to 60, and adjust the oscillator coil core trimmer while rocking the variable condenser for maximum response.
5. Return to 1620 kc and check alignment. If readjustment is necessary, repeat Steps 2 to 4 until no further improvement is noted.

VOLTAGE ANALYSIS

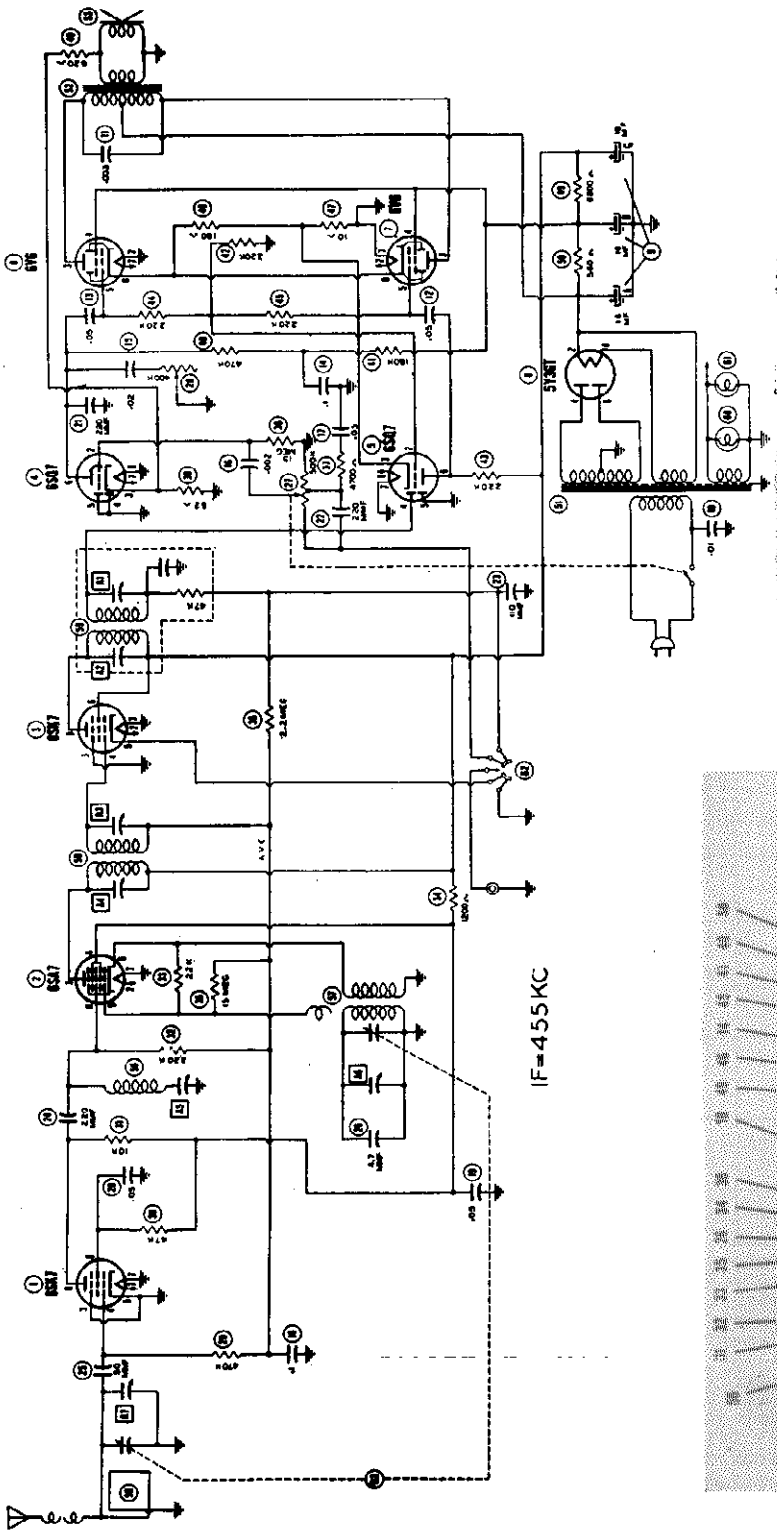
The following voltage readings are d-c measurements taken from B— (chassis) to the indicated tube-socket pin. A 1000 ohms-per-volt meter should be used for all readings except those indicated by an asterisk (*), which should be taken with a d-c vacuum-tube voltmeter. Take readings with the volume control set at minimum and the variable condenser closed. Use fresh batteries.

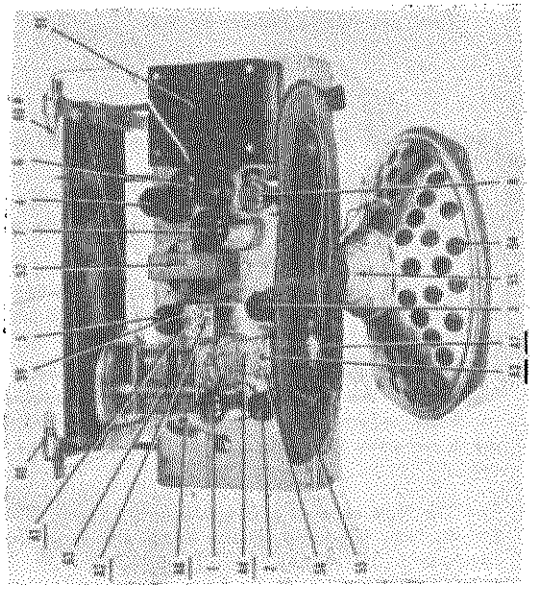
	PIN NUMBER						
TUBE	1	2	3	4	5	6	7
1R5		60	35	*-8		*-0.2	1.5
1T4		60	35			*-0.2	1.5
1S5			*-0.2	*17	*25	*-0.1	1.5
3S4	1.5	59	*-6.5	60		59	1.5

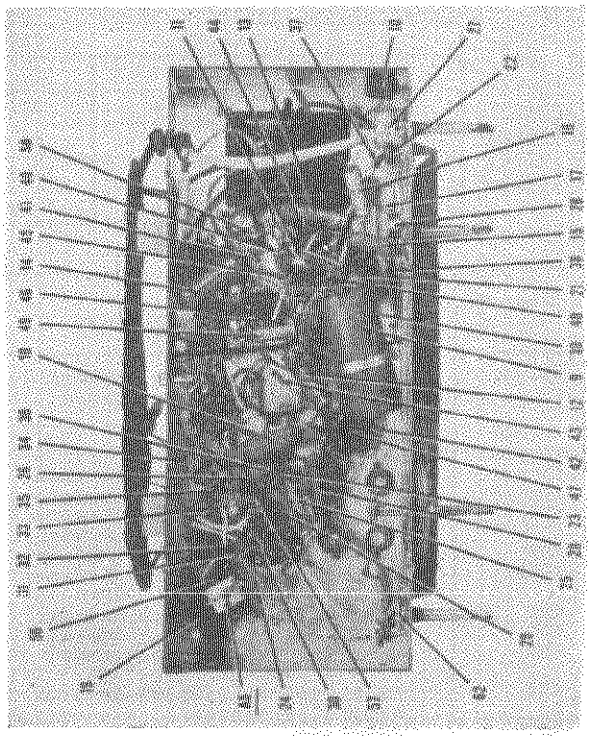
Schematic Symbol	†Part No.	DESCRIPTION
C1, C2	900022	Two-gang variable condenser
*C3	Part of C1	Trimmer
*C4	Part of C2	Trimmer
*C5, C6	Part of T1	Trimmer
*C7, C8	Part of T2	Trimmer
C9	928013	0.0001 mfd. ceramic condenser
C10	920497	0.001 mfd., 200 volt condenser
C11	920496	0.005 mfd., 200 volt condenser
C12	928104	212 mmfd., ceramic condenser
C13	920497	0.001 mfd., 200 volt condenser
C14	928010	0.0001 mfd., ceramic condenser (Alternate part 928013)
C15	920494	0.05 mfd., 200 volt condenser
C16	920120	0.02 mfd., 100 volt condenser
C17	925063	16 mfd., 100 volt electrolytic condenser
C18	920485	0.01 mfd., 100 volt condenser
L1	700019	Loop antenna
L2	708007	Loading coil
R1	340970	100,00 ohms, ½ watt resistor
R2	340470	820 ohms, ½ watt resistor
R3	390025	1 meg., volume control
R4	351450	10 meg., ½ watt resistor
R5	351330	3.3 meg., ½ watt resistor
R6	351130	470,000 ohms, ½ watt resistor
R7	351250	1.5 meg., ½ watt resistor
R8	340730	10,000 ohms, ½ watt resistor
R9	351330	3.3 meg., ½ watt resistor
SP1	180029	3-inch P.M. dynamic speaker
T1	720028	First i-f transformer
T2	720028	Second i-f transformer (alternate part 720035)
T3	734011	Output transformer
T4	716011	Oscillator coil
	510017	Lid switch
	585007	"B" battery cable

MODEL 577,
CHASSIS 120012B

EMERSON RADIO AND PHONO. CORP.







EMERSON RADIO AND PHONO. CORP.

MODEL 577,
CHASSIS 12001

ALIGNMENT

Volume control should be at maximum position; output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1	.1 mfd.	High side to Pin 8 (grid) of 6SA7. Low side to chassis.	455KC	Tuning cap. fully open.	Across voice coil.	A1, A2, A3, A4	Adjust for maximum output.
2	200 mmf.	High side to ext. ant. lead. Low side to chassis.	"	Tuning cap. fully closed.	"	A5	Adjust for minimum output.
3	200 mmf.	"	1620KC	Tuning cap. fully open.	"	A6	Adjust for maximum output
4	200 mmf.	"	1400KC	Tune for maximum output.	"	A7	" " "
5	200 mmf.	"	600KC	"	"		Adjust outside turn of loo for maximum output.

INSTRUCTIONS FOR VOLTAGE AND RESISTANCE READINGS

1—D.C. Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1,000 ohms per volt.

2—Socket connections are shown as bottom views.

3—Measured values are from socket pin to common negative.

4—Line voltage maintained at 117 volts for voltage readings.

5—Nominal tolerance on component values makes possible a variation of ± 10% in voltage and resistance readings.

6—Volume control at maximum, no signal applied for voltage measurements.

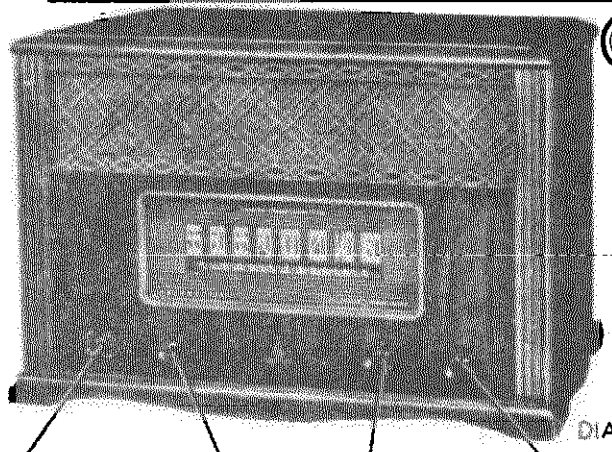
VOLTAGE READINGS

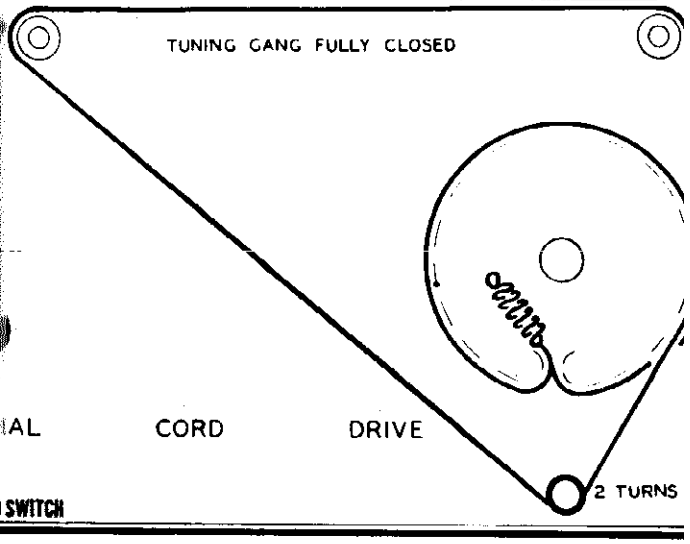
SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
1	6SK7	0	0	0	-.6V DC	0	45V DC	6.4V AC	60V DC
2	6SA7	0	6.4V AC	100V DC	85V DC	-11V DC	0	0	-.3V DC
3	6SK7	0	6.4V AC	0	-.5V DC	0	100V DC	0	100V DC
4	6SQ7	0	-.5V AC	0	0	0	85V DC	6.4V AC	0
5	6SQ7	0	0	.9V DC	-.1V DC	0	60V DC	0	6.4V AC
6	6V6GT	0	0	290V DC	280V DC	0	0	6.4V AC	16V DC
7	6V6GT	0	6.4V AC	290V DC	280V DC	0	100V DC	0	16V DC
8	5Y3GT	0	300V DC	220V DC	300V AC	.9V DC	300V AC	75V AC	300V DC

Taken with vacuum tube voltmeter, Radio-Phono switch in radio position.

RESISTANCE READINGS

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
1	6SK7	0 ohm	0 ohm	0 ohm	3.1 meg.	0 ohm	200K ohm	.1 ohm	170K ohm
2	6SA7	0 ohm	.1 ohm	160K ohm	160K ohm	22K ohm	1 ohm	0 ohm	2.7 meg.
3	6SK7	0 ohm	.1 ohm	0 ohm	2.5 meg.	0 ohm	160K ohm	0 ohm	160K ohm
4	6SQ7	0 ohm	15 meg.	82 ohm	0 ohm	0 ohm	800K ohm	.1 ohm	0 ohm
5	6SQ7	0 ohm	220K ohm	10 ohm	550K ohm	0 ohm	370K ohm	0 ohm	.1 ohm
6	6V6GT	0 ohm	0 ohm	150K ohm	150K ohm	440K ohm	220K ohm	.1 ohm	180 ohm
7	6V6GT	0 ohm	.1 ohm	150K ohm	150K ohm	440K ohm	160K ohm	0 ohm	180 ohm
8	5Y3GT	inf.	150K ohm	350K ohm	87 ohm	10 ohm	80 ohm	inf.	150K ohm





MODEL 577,
CHASSIS 120012B

EMERSON RADIO AND PHONO. CORP.

TYPE OF TUBES:

1—6SK7 r-f amplifier
1—6SA7 converter
1—6SK7 i-f amplifier
1—6SQ7 a-f amplifier
1—6SQ7 detector—a.v.c. phase inverter
2—6V6GT power output
1—5Y3GT rectifier

TYPE: A.C. Superheterodyne.

FREQUENCY RANGE: 540-1620 kc.

POWER SUPPLY: 60 cycle a.c.

VOLTAGE RATING: 105-125 volts a.c., 60 cycles

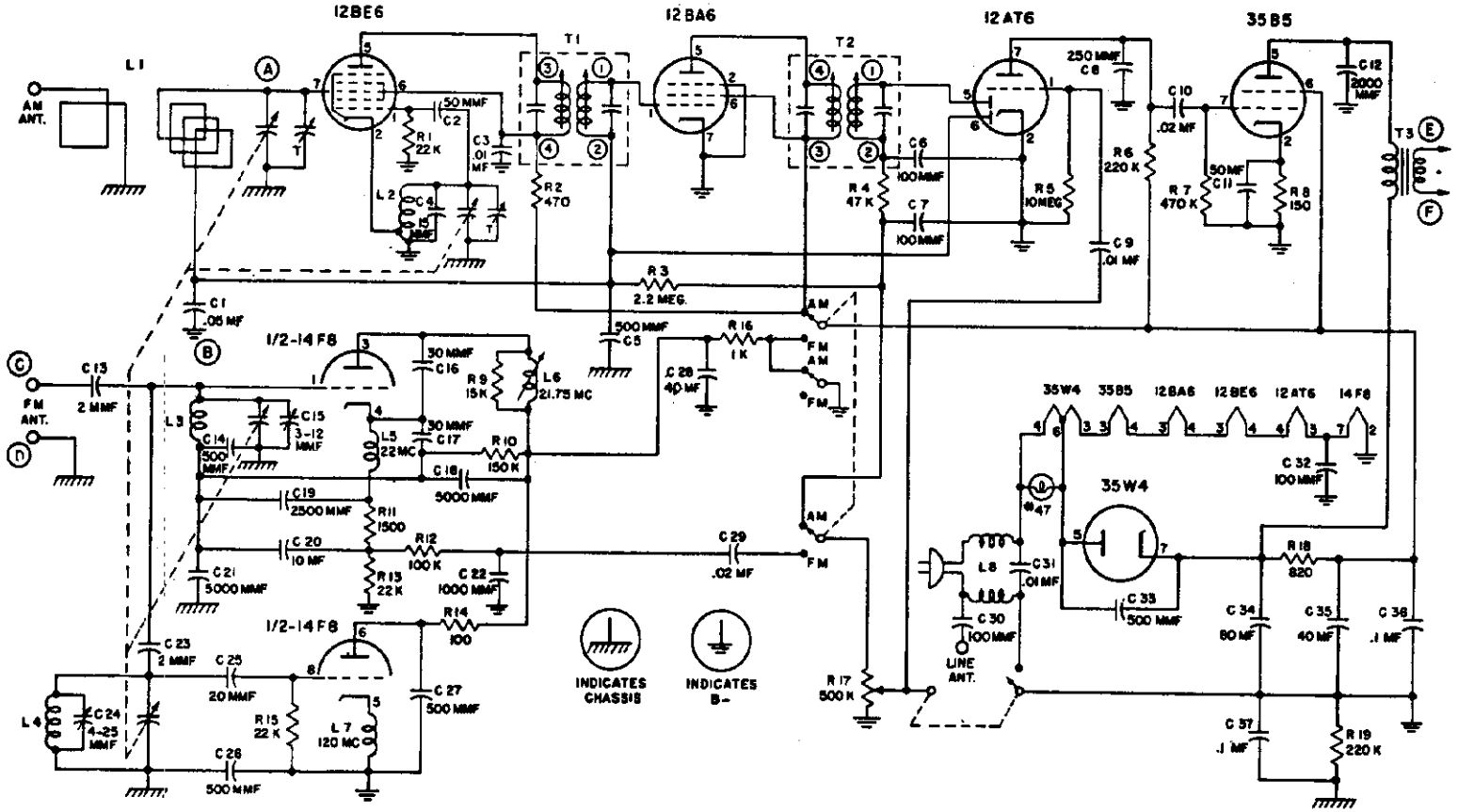
POWER CONSUMPTION: 90 watts

CURRENT DRAIN: .75 amp. at 117 volts a.c.

Symbol	†Part No.	DESCRIPTION
1	6SK7	RF amplifier
2	6SA7	Converter
3	6SK7	IF amplifier
4	6SQ7	Audio amplifier
5	6SQ7	Det. a.v.c. phase inverter
6	6V6GT	Power output
7	6V6GT	Power output
8	5Y3GT	Rectifier
9A	925007	Filter (Elect.) 16 mfd., 450 volt condenser
B		Filter (Elect.) 16 mfd., 450 volt condenser
C		Filter (Elect.) 16 mfd., 450 volt condenser
10	922020	Line filter, .01 mfd., 400 volt condenser
11	920542	Output plate bypass, .003 mfd., 600 volt condenser
12	920539	Audio coupling, .05 mfd., 400 volt condenser
13	920539	Audio coupling, .05 mfd., 400 volt condenser
14	920250	Audio plate decoupling, .1 mfd., 400 volt condenser
15	920020	Tone compensation, .02 mfd., 400 volt condenser
16	920010	Audio coupling, .002 mfd., 600 volt condenser
17	920539	Tone compensation, .05 mfd., 400 volt condenser
18	920040	AVC filter, .1 mfd., 200 volt condenser
19	920539	Decoupling, .05 mfd., 400 volt condenser
20	920539	RF screen bypass, .05 mfd., 400 volt condenser
21	910000	AF plate bypass, 220 mmf., 300 volt condenser
22	910000	Tone compensation, 220 mmf., 300 volt condenser
23	910010	Diode RF filter, 110 mmf., 500 volt condenser
24	910000	RF coupling, 220 mmf., 300 volt condenser
25	910250	RF coupling, 50 mmfd., 500 volt condenser
26	923004	Fixed trimmer, 4.7 mmfd., 500 volt condenser
27	390006	Volume control with switch, 500K ohms, resistor
28	390007	Tone control, 400K ohms, resistor
29	351130	RF grid, 470K ohms, ½ watt resistor
30	340890	RF screen, 47K ohms, ½ watt resistor
31	340730	RF plate load, 10K ohms, ½ watt resistor
32	351050	Converter grid, 220K ohms, ½ watt resistor
33	340810	Oscillator grid, 22K ohms, ½ watt resistor
34	340510	Decoupling, 1200 ohms, ½ watt resistor
35	397000	AVC network, 15 meg., ½ watt resistor
36	351290	AVC network, 3.2 meg., ½ watt resistor
37	350650	Tone compensation, 4700 ohms, ½ watt resistor
38	397000	AF grid, 15 meg., ½ watt resistor
39	340230	AF cathode, 82 ohms, ½ watt resistor
40	351130	AF plate load, 470K ohms, ½ watt resistor
41		AF plate decoupling, 180K ohms, ½ watt resistor
42	351050	Phase inverter grid, 220K ohms, ½ watt resistor
43	351050	Phase inverter plate load, 220K ohms, ½ watt resistor
44	351050	Output grid, 220K ohms, ½ watt resistor
45	351050	Output grid, 220K ohms, ½ watt resistor
46	394140	Output Cathode, 180 ohms, 2 watt resistor
47	340010	Output cathode, 10 ohms, ½ watt resistor
48	340470	Feedback, 820 ohms, ½ watt resistor
49	394002	Filter, 6800 ohms, 5 watt resistor
50	397001	Filter, 560 ohms, 2 watt resistor
51	730008	Power transformer
52	734005	Output transformer
53	180037	6" x 9" oval speaker
54		Cone (part of 180037)
55	700026	Loop antenna
56	708060	Wave trap
57	716050	Oscillator coil
58	720532	1st i-f transformer
59	720533	2nd i-f transformer
60	807020	Type 44 pilot lamp
61	807020	Type 44 pilot lamp
62	510002	Radio-Phono-switch
63	900008	2-gang variable capacitor
	520066	Dial scale—glass
	525027	Dial pointer
	460470	Knob, plastic
	140148	Cabinet, walnut
	507001	Pilot lamp socket
	583010	Line cord
	555004	Speaker terminal strip
	520065	Dial escutcheon
	520130	Dial backplate
	280004	Dial drive shaft
	587070	Drive cord spring

* Not supplied separately.

† Specify part numbers when ordering.



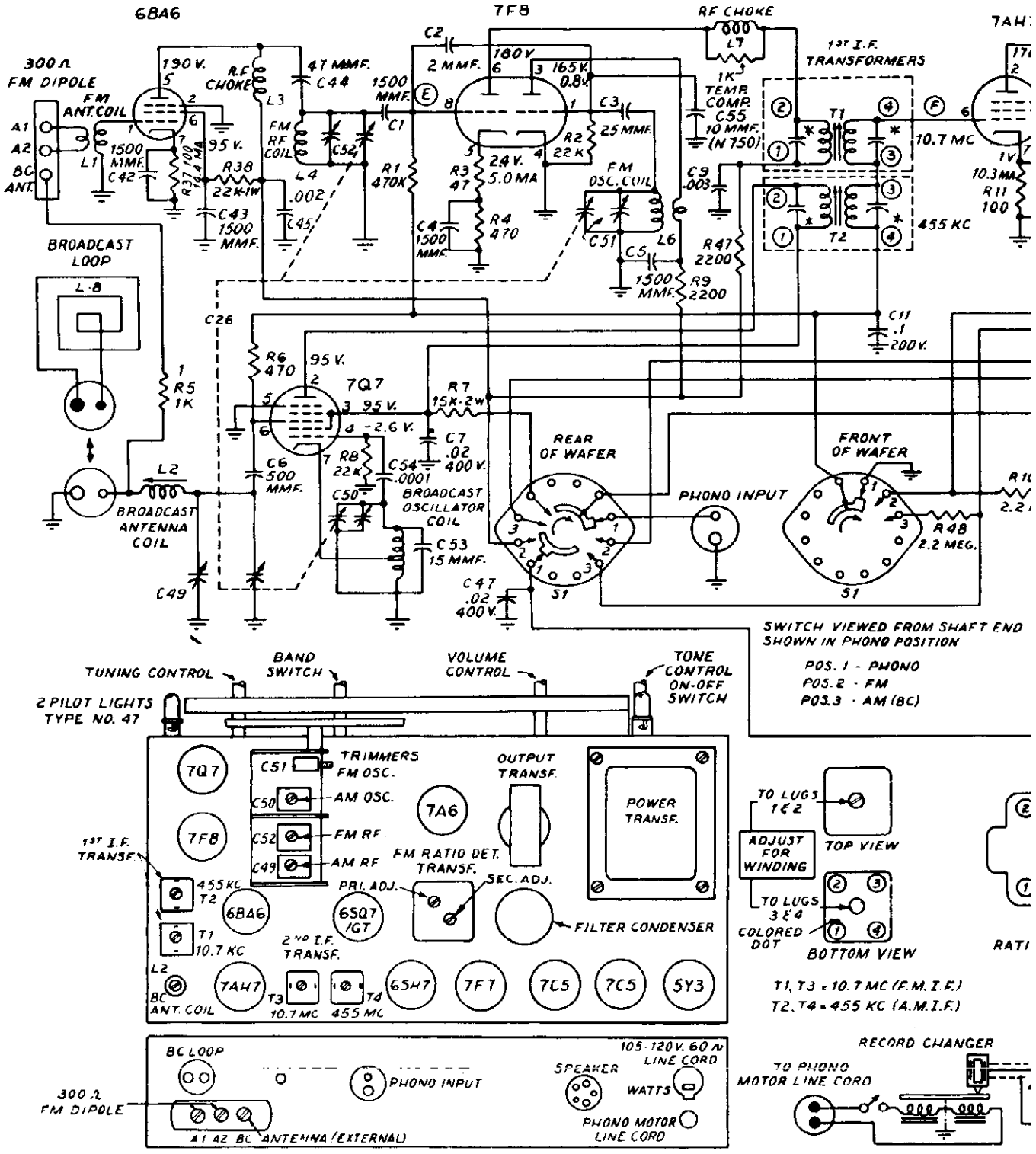
4. Connect the "high" side of the Generator to the antenna terminal with a 200 mmf condenser inserted in series. Connect the "ground" side of the Generator to point "B".
5. Tune receiver to 150 on the dial. Adjust Signal Generator to 1500 kc. Adjust BC oscillator and BC antenna trimmers for maximum output. Use a weak signal for final adjustment.

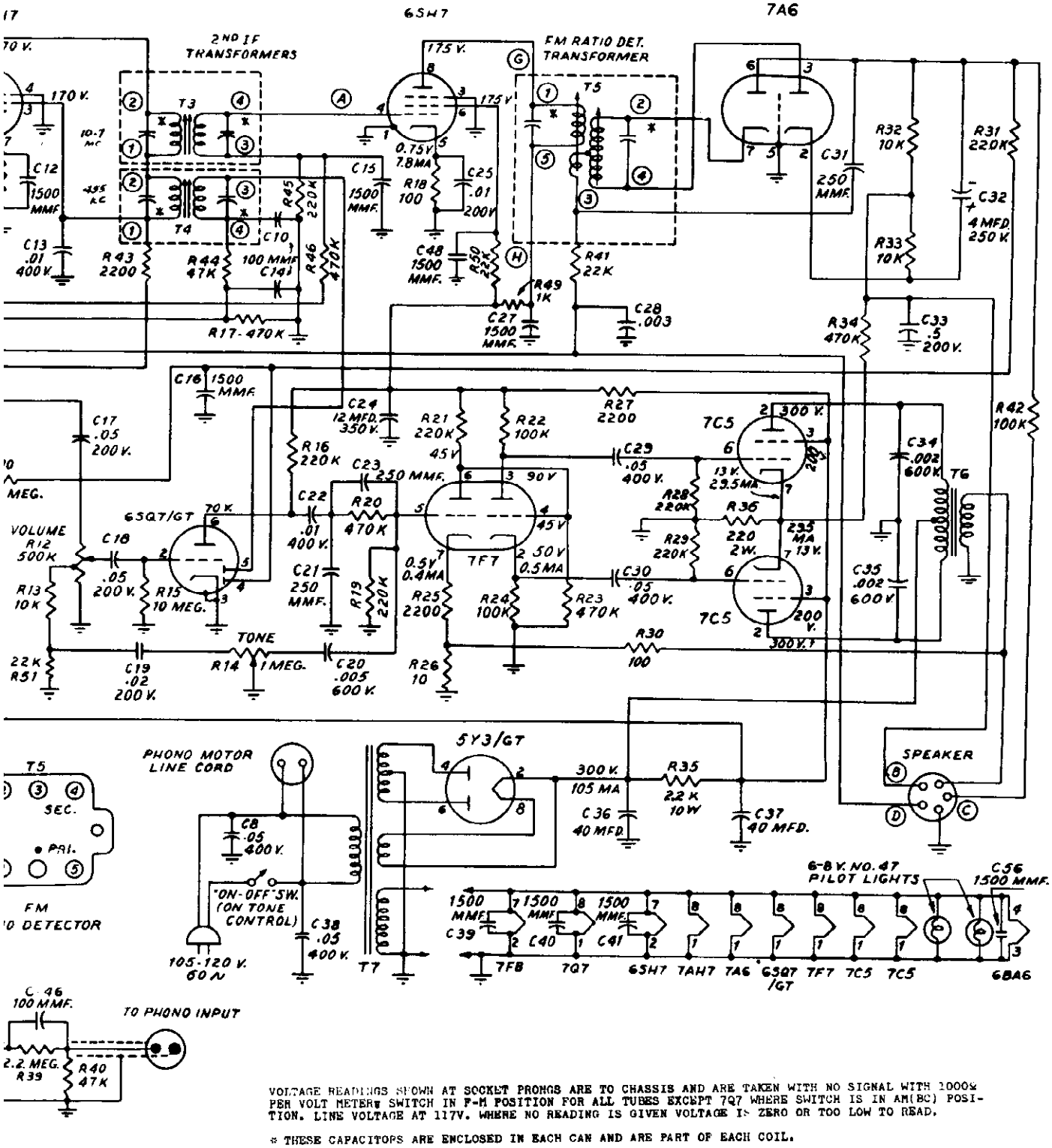
FM Equipment:

Equipment Required:

a) 21.75 kc oscillator.
b) FM Signal Generator for 88 to 108 megacycle range.
c) Output meter.

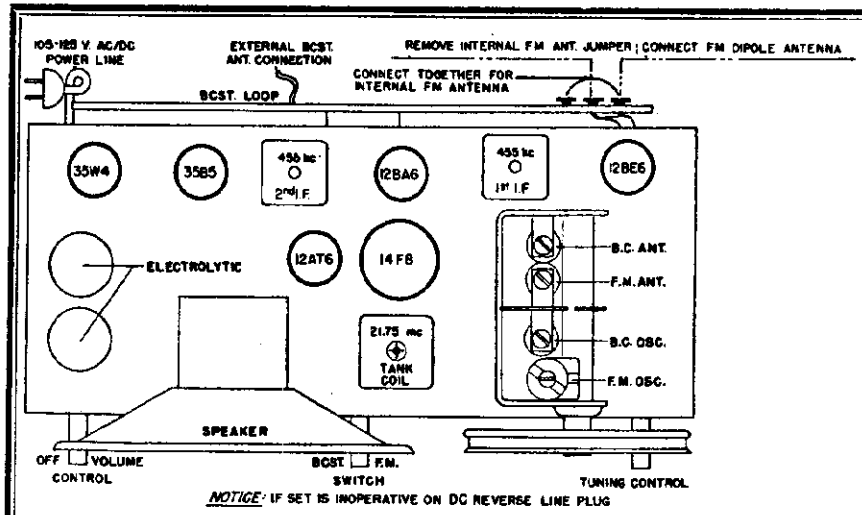
1. Connect output meter across points "E" and "F".
3. Adjust tank coil for maximum response on output meter.
4. Disconnect 21.75 kc oscillator and connect FM signal generator to points "C" and "D".
5. Set receiver dial to 88 megacycles and adjust Signal Generator for same frequency. Adjust spacing of FM oscillator coil for maximum signal response.
6. Tune receiver to 108 megacycles and adjust Signal Generator to same frequency. Adjust FM oscillator trimmer for maximum signal response.
7. Repeat operation 5 and 6.
8. Tune receiver to 90 megacycles and adjust Signal Generator for same frequency. Adjust spacing of the FM antenna coil for maximum signal response with minimum background noise. Slowly rock tuning control while performing this adjustment.


6BA6
7F8
RF CHOKE
7AH
300Ω FM DIPOLE
FM ANT. COIL
190 V.
R.F. CHOKE
47 MMF. C44
1500 MMF. C1
C2 2 MMF.
180 V.
165 V. 0.8 MA
1K TEMP. COMP. C55 10 MMF. (N750)
1ST I.F. TRANSFORMERS
10.7 MC
455 KC
T1
T2
A1
A2
BC ANT.
1500 MMF. C42
R37 100
95 V. 14 MA
R38 22K-1W
C43 1500 MMF.
.002 C45
FM RF COIL L3
L4
C52
R1 470K
R3 47
24 V. 5.0 MA
R2 22K
25 MMF. C3
C4 1500 MMF.
R4 470
FM OSC. COIL
C51
L6
C5 1500 MMF.
R9 2200
C9 .003
R47 2200
BROADCAST LOOP
L-8
C26
R6 470
95 V.
7Q7
R7 15K-2W
R5 1K
C7 .02 400 V.
C6 500 MMF.
R8 22K
C54 .0001
C50
BROADCAST OSCILLATOR COIL
C53 15 MMF.
BROADCAST ANTENNA COIL
L2
C49
C47 .02 400 V.
REAR OF WAFER
FRONT OF WAFER
PHONO INPUT
R48 2.2 MEG.
S1
C11 .1 200 V.
SWITCH VIEWED FROM SHAFT END SHOWN IN PHONO POSITION
POS. 1 - PHONO
POS. 2 - FM
POS. 3 - AM (BC)
TUNING CONTROL
BAND SWITCH
VOLUME CONTROL
TONE CONTROL ON-OFF SWITCH
2 PILOT LIGHTS TYPE NO. 47
TRIMMERS
C51 FM OSC.
C50 AM OSC.
C52 FM RF
C49 AM RF
OUTPUT TRANSF.
POWER TRANSF.
7A6
FM RATIO DET. TRANSF.
PRI. ADJ.
SEC. ADJ.
FILTER CONDENSER
1ST I.F. TRANSF.
455 KC T2
T1 10.7 KC
6BA6
6SQ7/GT
2ND I.F. TRANSF.
7AH7
T3 10.7 MC
T4 455 MC
6SH7
7F7
7C5
7C5
5Y3
L2 BC ANT. COIL
TO LUGS 1 & 2
ADJUST FOR WINDING
TOP VIEW
TO LUGS 3 & 4
COLORED DOT
BOTTOM VIEW
T1, T3 = 10.7 MC (F.M.I.F.)
T2, T4 = 455 KC (A.M.I.F.)
BC LOOP
PHONO INPUT
105-120 V. 60 ~ LINE CORD
SPEAKER
WATTS
300Ω FM DIPOLE
A1 A2 BC ANTENNA (EXTERNAL)
PHONO MOTOR LINE CORD
RECORD CHANGER
TO PHONO MOTOR LINE CORD



VOLTAGE READINGS SHOWN AT SOCKET PRONGS ARE TO CHASSIS AND ARE TAKEN WITH NO SIGNAL WITH 1000Ω PER VOLT METER⁄ SWITCH IN F-M POSITION FOR ALL TUBES EXCEPT 7Q7 WHERE SWITCH IS IN AM(BC) POSITION. LINE VOLTAGE AT 117V. WHERE NO READING IS GIVEN VOLTAGE IS ZERO OR TOO LOW TO READ.

* THESE CAPACITORS ARE ENCLOSED IN EACH CAN AND ARE PART OF EACH COIL.



NOTICE: IF SET IS INOPERATIVE ON DC REVERSE LINE PLUG

POWER SOURCE:

This receiver may be operated from either an AC or DC line, between 105 and 125 volts. On AC lines the frequency must be 50 to 60 cycles.

TUBE COMPLEMENT:

1 12BE6 — AM converter.
1 12BA6 — AM intermediate frequency amplifier.
1 12AT6 — AM demodulator and AVC; AM-FM 1st audio amplifier.
1 14F8 — FM oscillator-mixer-Super Regenerative I.F. amp.
1 35B5 — Audio output amplifier.
1 35W4 — Power rectifier.

INSTALLATION:

1. Antenna Connection.

AM—A self contained loop antenna is provided, which will give satisfactory reception on the standard broadcast band without requiring any additional external antenna. However, if stronger signals are desired from weak or distant stations an external antenna may be connected to the wire extending from the loop.

FM—A self contained line antenna system is provided for reception of stations appearing in the FM band. To use this line antenna a short wire jumper should be connected between the two outside screw terminals of the FM antenna panel, which is mounted on the broadcast loop antenna form. Should poor reception conditions make it necessary, an FM dipole antenna may be connected to the left hand and center screw terminals of the FM antenna panel. In such a case, the line antenna link should be disconnected.

2. Ground.

This set has been designed to operate without an external ground, and the use of any ground connection is not recommended.

3. Power Connection.

After making certain that the power circuit is rated between 105 and 125 volts extend the line cord to its full length and insert the plug into the nearest convenient outlet. If the supply is DC, and the set fails to operate, it may be necessary to reverse the plug connection to secure operation of the set.

OPERATION:

The left hand knob controls the ON-OFF power switch and volume level. To turn receiver on, rotate this knob in a clockwise direction. Within a few degrees of rotation an audible click will be heard, and the dial will become luminous. After a half minute of warm up the receiver will be in an operating condition. Further advance of this control in a clockwise direction will provide an increase in volume level.

The center knob controls the selection of AM or FM stations. When rotated to the counterclockwise position, operation in the AM (standard broadcast) band is provided. When this control is rotated to the clockwise position, FM stations may be tuned in.

The right hand or tuning knob enables the selection of any desired station as indicated on the calibrated dial. The upper row of numbers is calibrated directly in megacycles and covers the FM band. The lower scale is used to tune in stations in the standard broadcast band. Add one zero to the numbers on this scale to obtain the station frequency in kilocycles.

VI. SERVICE ADJUSTMENTS:

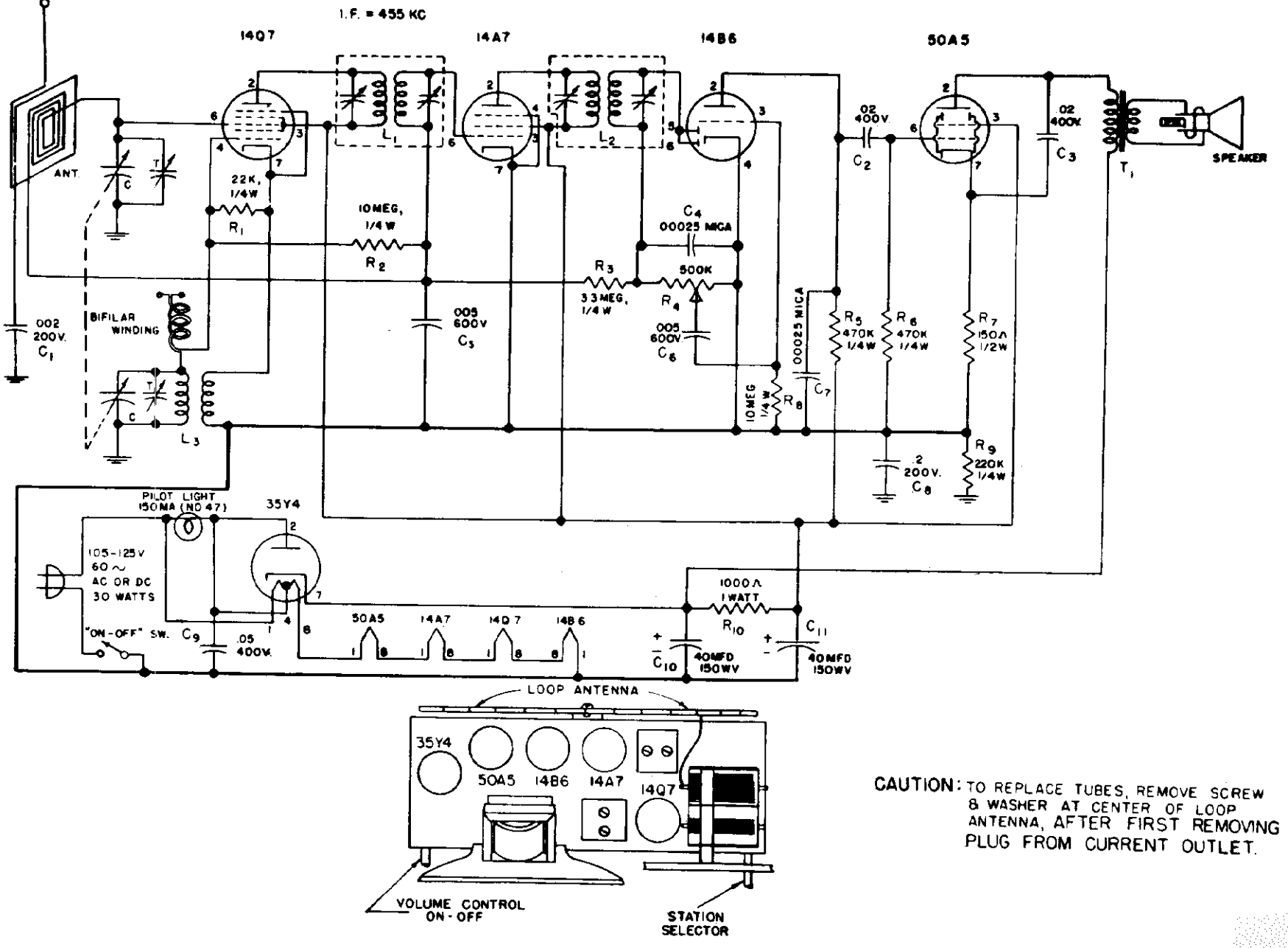
Alignment or adjustment of the various circuits of this receiver can only be made by a skilled radio technician with the proper equipment.

NOTE: Points A, B, C, D, E, and F are noted on the circuit diagram.

AM Equipment:

Equipment Required:
a) Broadcast Band Signal Generator.
b) Output Meter.

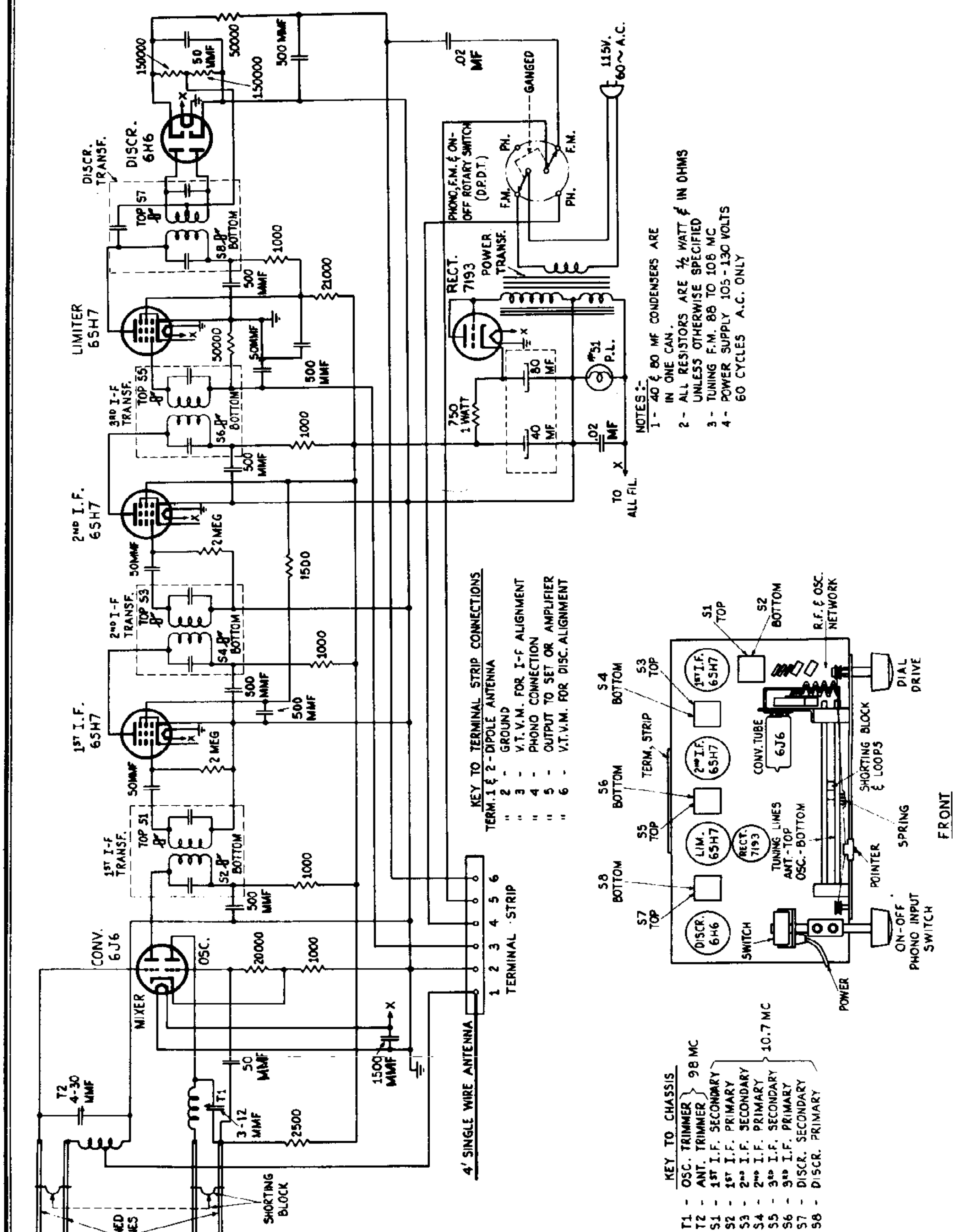
1. Set band switch at AM. Advance volume control to full volume setting.
2. Connect output meter across voice control at points "E" and "F".
3. Connect the "high" side of the Signal Generator to point "A" through a .01 mfd condenser. Connect the "ground" side to point "B". Adjust the Signal Generator to 455 kc and with the receiver switched on, adjust the first and second I.F. transformers for peak output as shown on the output meter. The signal injected into the receiver should be as small in magnitude as possible, consistent with a useful deflection on the output meter.



CAUTION: TO REPLACE TUBES, REMOVE SCREW & WASHER AT CENTER OF LOOP ANTENNA, AFTER FIRST REMOVING PLUG FROM CURRENT OUTLET.

F.M. SPECIALTIES, INC.

MODEL FIDELOTUNE
REVISED



MODEL FIDELOTUNER
REVISED

F.M. SPECIALTIES, INC.

ALIGNMENT PROCEDURE

GENERAL NOTES

THE FIDELOTUNER SHOULD HAVE A WARMUP PERIOD OF ABOUT 30 MINUTES BEFORE ALIGNMENT PROCEDURE IS TO BE CARRIED OUT. IN ALL ADJUSTMENTS AN INSULATED ALIGNMENT TOOL IS TO BE USED. IF THE SIGNAL GENERATOR (USED IN EITHER THE METER OR VISUAL ALIGNMENT PROCEDURE) DOES NOT HAVE SUFFICIENT OUTPUT FOR AN INDICATION ON THE METER OR OSCILLOSCOPE WHEN THE OUTPUT OF THE GENERATOR IS FED INTO THE LIMITER OR THE LAST I-F AMPLIFIER THEN IT IS SUGGESTED THAT THE OUTPUT BE PLACED AT THE GRID INPUT TO THE R-F SECTION OF THE 6J6 CONVERTER AND THE REST OF THE ALIGNMENT PROCEDURE FOLLOWED AS IS. HOWEVER IF THE SIGNAL GENERATORS ARE CAPABLE OF STRONG SIGNAL OUTPUTS, THIS OUTPUT SHOULD BE JUST HIGH ENOUGH TO PRODUCE A DEFINITE INDICATION ON THE METER OR OSCILLOSCOPE.

I. METER METHOD OF ALIGNMENT

EQUIPMENT: A STANDARD SIGNAL GENERATOR CAPABLE OF FREQUENCIES ILLUSTRATED BELOW AND A VACUUM TUBE VOLTMETER (VTVM) AS AN OUTPUT INDICATOR. IF NO VTVM IS AVAILABLE USE AS HIGH A RESISTANCE PER VOLT DC VOLTMETER (PREFERABLY 20,000 OHMS PER VOLT METER). THE LOW SIDE OF THE SIGNAL GENERATOR AND METER SHOULD BE CONNECTED FOR ALL ALIGNMENTS TO CHASSIS GROUND OR PIN 2 OF THE TERMINAL STRIP.

STEPS	TUNER DIAL SETTING	SIGNAL GENERATOR FREQUENCY	CONNECT SIGNAL GENERATOR TO	DUMMY ANTENNA	METER CONNECTION	ADJUST TRIMMERS OR COILS IN ORDER SHOWN	REMARKS
A	HIGH FREQ. END OF BAND	10.7 MC UNMODULATED	PIN 4 GRID OF 6SH7 2ND IF AMPLIFIER	0.02 MF	TO PIN 3 OF TERMINAL STRIP	S5, S6	MAXIMUM DEFLECTION ON METER
B	"	"	PIN 4 GRID OF 6SH7 1ST IF	"	"	S3, S4	" " " "
C	"	"	PIN 6 RF GRID OF 6J6 CONVERTER TUBE	"	"	S1, S2	" " " "
D	98 MC	98MC UNMODULATED	PIN 1 OF TERMINAL STRIP	500 OHM CARBON RESISTOR	"	T1, T2	MAXIMUM DEFLECTION ON METER ROCK DIAL WHILE TUNING T2 FOR MAXIMUM
E	105 MC	105 MC UNMODULATED	"	"	"	T1	MAXIMUM DEFLECTION ON METER
F	TUNE DIAL FOR MAXIMUM METER DEFLECTION	90 MC UNMODULATED	"	"	"	OSCILLATOR COIL	IF DIAL READING IS TOO LOW ACCORDING TO THE FREQUENCY OF THE GENERATOR EXPAND OSCILLATOR COIL SLIGHTLY; IF DIAL READING IS HIGH, THEN COMPRESS COIL. IN EITHER CASE IT IS FOR MAXIMUM DEFLECTION. REPEAT STEPS E AND F FOR BEST POSSIBLE INDICATION.
G	REPEAT STEP D FOR FINAL ADJUSTMENTS OF R-F AND OSCILLATOR SECTIONS						
H	HIGH FREQ. END OF BAND	10.7 MC UNMODULATED	PIN 4 GRID OF 6SH7 LIMITER	0.02 MF	TO JUNCTION OF R11 AND R12 DISCRIMINATOR LOAD RESISTORS	S8	MAXIMUM DEFLECTION ON METER
I	"	"	"	"	TO PIN 6 OF TERMINAL STRIP	S7	ZERO DEFLECTION (ZERO READING)* ON METER

*VARY SIGNAL GENERATOR BY A SIMILAR AMOUNT ON EITHER SIDE OF THE 10.7 MC SIGNAL AND OBSERVE METER. THE READINGS SHOULD BE THE SAME BUT OF OPPOSITE POLARITY. IF THEY ARE NOT, REPEAT STEPS H AND I IN THE ORDER INDICATED.

II. VISUAL METHOD OF ALIGNMENT

EQUIPMENT: OSCILLOSCOPE AND ANY GOOD STANDARD FM SIGNAL GENERATOR CAPABLE OF FREQUENCIES AND DEVIATIONS LISTED BELOW. THE OUTPUT FREQUENCY OF THE SIGNAL GENERATOR WILL ALWAYS BE FREQUENCY MODULATED. THE LOW SIDE OF THE SIGNAL GENERATOR AND OSCILLOSCOPE HORIZONTAL AND VERTICAL TERMINALS SHOULD BE CONNECTED FOR ALL ALIGNMENTS TO CHASSIS GROUND OR PIN 2 OF THE TERMINAL STRIP. THE MODULATING SIGNAL FROM THE F-M SIGNAL GENERATOR SHOULD, FOR ALL ALIGNMENTS BE ATTACHED TO THE HORIZONTAL TERMINALS OF THE OSCILLOSCOPE.

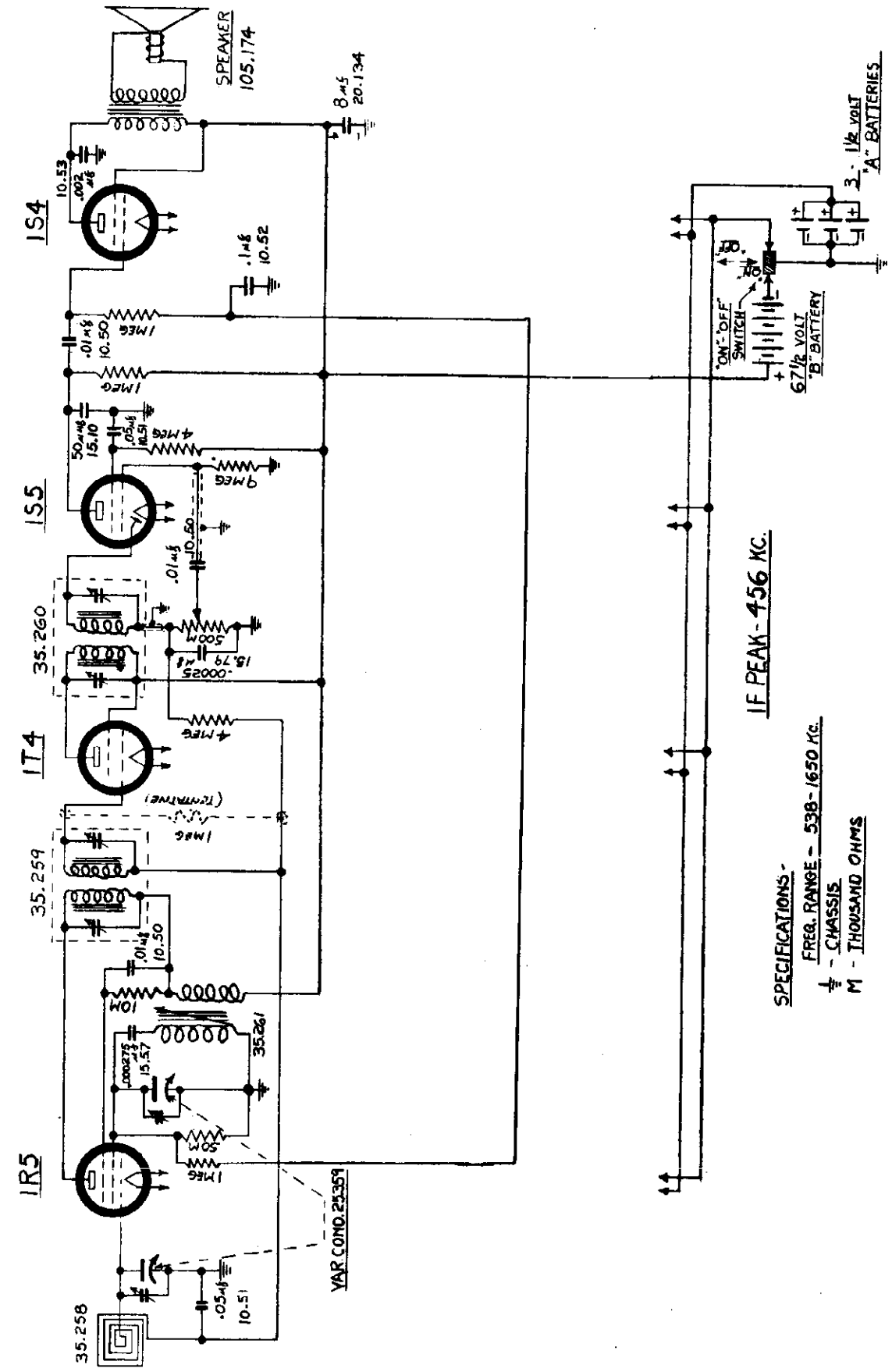
PATTERN A

PATTERN B

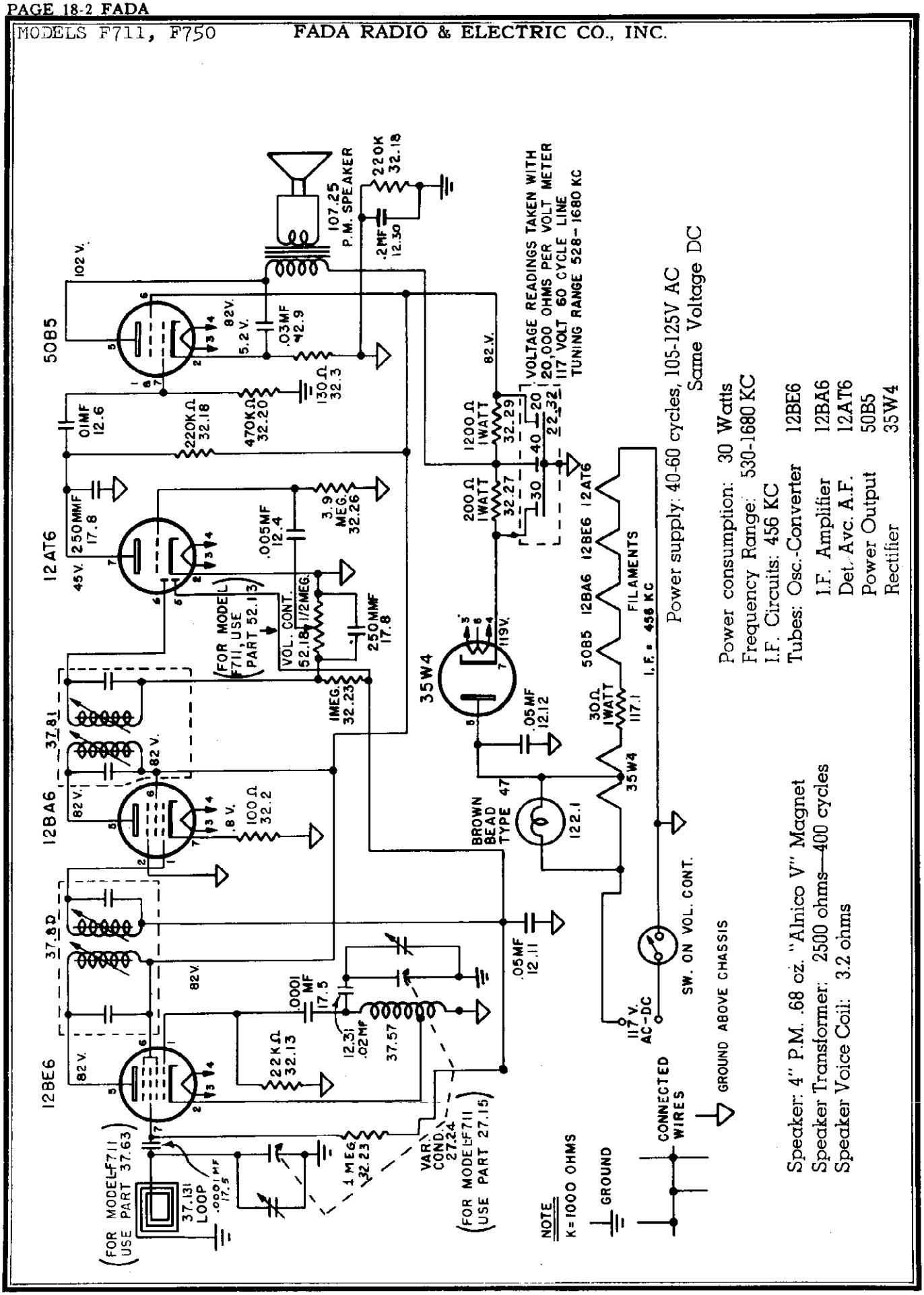
STEPS	TUNER DIAL SETTING	SIGNAL* GENERATOR FREQUENCY AND DEVIATION SETTING	CONNECT SIGNAL GENERATOR TO	DUMMY ANTENNA	METER CONNECTION	ADJUST TRIMMERS ON COILS IN ORDER SHOWN	REMARKS
A	HIGH FREQ. END OF BAND	10.7 MC (FREQ. MOD) WITH ABOUT 500 KC FREQ. DEVIATION	PIN 4 GRID OF 6SH7 2ND IF AMPLIFIER	0.02 MF	VERTICAL TERMINAL TO PIN 3 ON TERMINAL STRIP	S5, S6	ADJUST FOR SYMMETRY AND MAXIMUM AMPLITUDE AS INDICATED IN PATTERN (A) ABOVE
B	"	"	PIN 4 GRID OF 6SH7 1ST IF	"	"	S3, S4	SAME AS ABOVE
C	"	"	PIN 6 RF GRID OF 6J6 CONVERTER TUBE	"	"	S1, S2	SAME AS ABOVE
D	98 MC	98 MC (FREQ. MODULATED) WITH ABOUT 500 KC DEVIATION	PIN 1 OF TERMINAL STRIP	500 OHM CARBON RESISTOR	"	T1, T2	SAME AS ABOVE ALSO ROCK DIAL WHILE TUNING T2 FOR MAXIMUM RESPONSE OF PATTERN (A) ABOVE
E	105 MC	105 MC (FREQ. MODULATED) WITH ABOUT 500 KC DEVIATION	"	"	"	T1	SAME AS REMARKS FOR STEP A
F	TUNE DIAL FOR MAXIMUM AND SYMMETRICAL RESPONSE	90 MC (FREQ. MODULATED) WITH ABOUT 500 KC DEVIATION	"	"	"	OSCILLATOR COIL	IF DIAL READING IS TOO LOW ACCORDING TO THE FREQUENCY OF THE GENERATOR, EXPAND OSCILLATOR COIL SLIGHTLY; IF DIAL READING IS HIGH THEN COMPRESS COIL. IN EITHER CASE THE ADJUSTMENT IS FOR MAXIMUM AND SYMMETRICAL RESPONSE AS SHOWN IN PATTERN (A) ABOVE
G	REPEAT STEP D FOR FINAL ADJUSTMENTS OF R-F AND OSCILLATOR SECTION						
H	HIGH FREQ. END OF BAND	10.7 MC (FREQ. MOD) WITH ABOUT 300 KC FREQ. DEVIATION	PIN 4 GRID OF 6SH7 LIMITER	0.02 MF	PIN 6 OF TERMINAL STRIP	S8	ADJUST S8 FOR GOOD LINEARITY AND MAXIMUM AMPLITUDE AS INDICATED IN PATTERN (B) ABOVE
I	"	"	"	"	"	S7	ADJUST S7 FOR CORRECT SYMMETRY OF THE MID POINT OF THE CURVE.

*IF THE F-M SIGNAL GENERATOR CANNOT PRODUCE THE FREQUENCY DEVIATION (i.e.)SWEEP FREQUENCY) INDICATED THEN THE LARGEST FREQUENCY DEVIATION THAT THE GENERATOR CAN PRODUCE SHOULD BE USED.

FADA RADIO & ELECTRIC CO., INC. MODEL C



MODELS F711, F750 FADA RADIO & ELECTRIC CO., INC.



ALIGNMENT PROCEDURE

No attempt should be made to realign the various circuits until all other causes have been checked, unless the condition is so obvious as to indicate that realignment is necessary. Then proceed as follows:

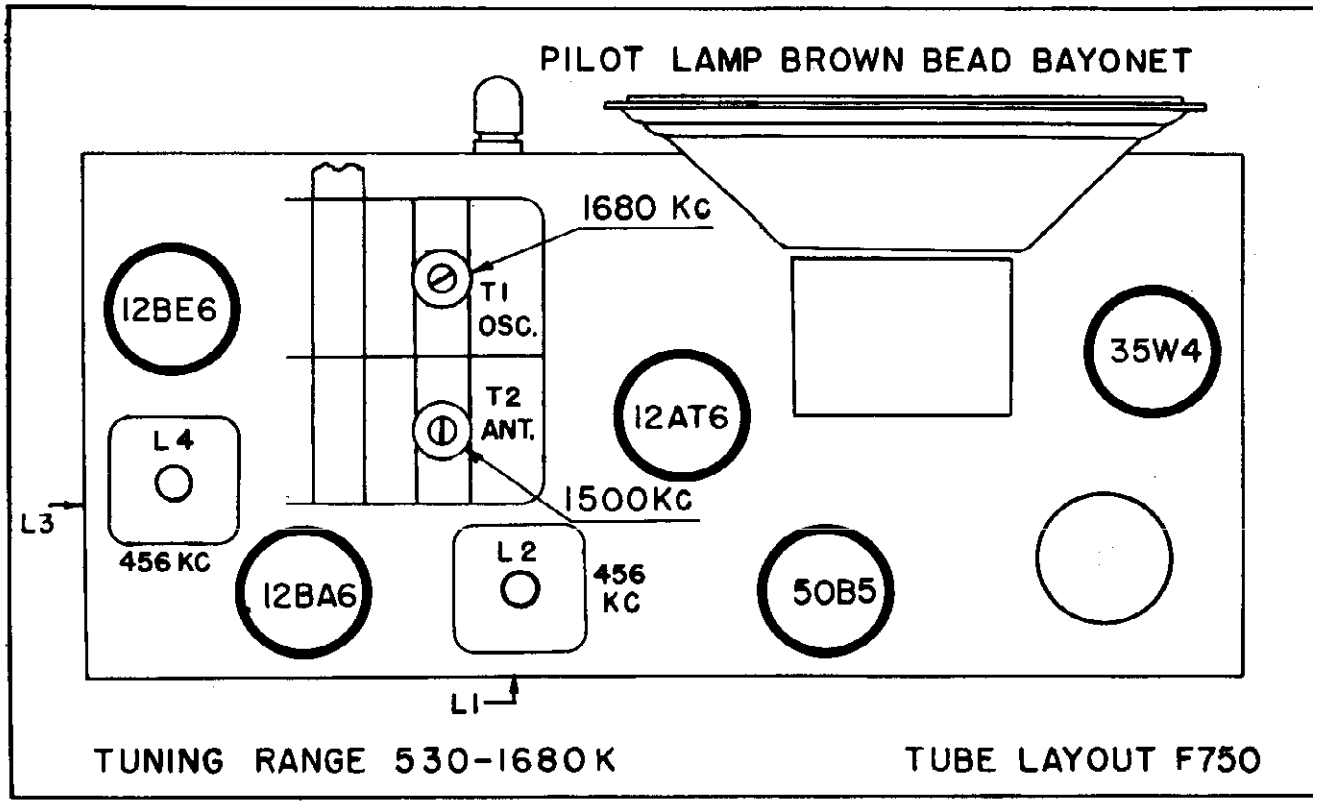
Volume Control full on.

Low range A.C. meter connected across voice coil to indicate output.

Keep signal generator attenuated so as to maintain 1/2 scale reading on output meter.

Make certain that dial pointer is exactly horizontal when variable condenser is fully meshed.

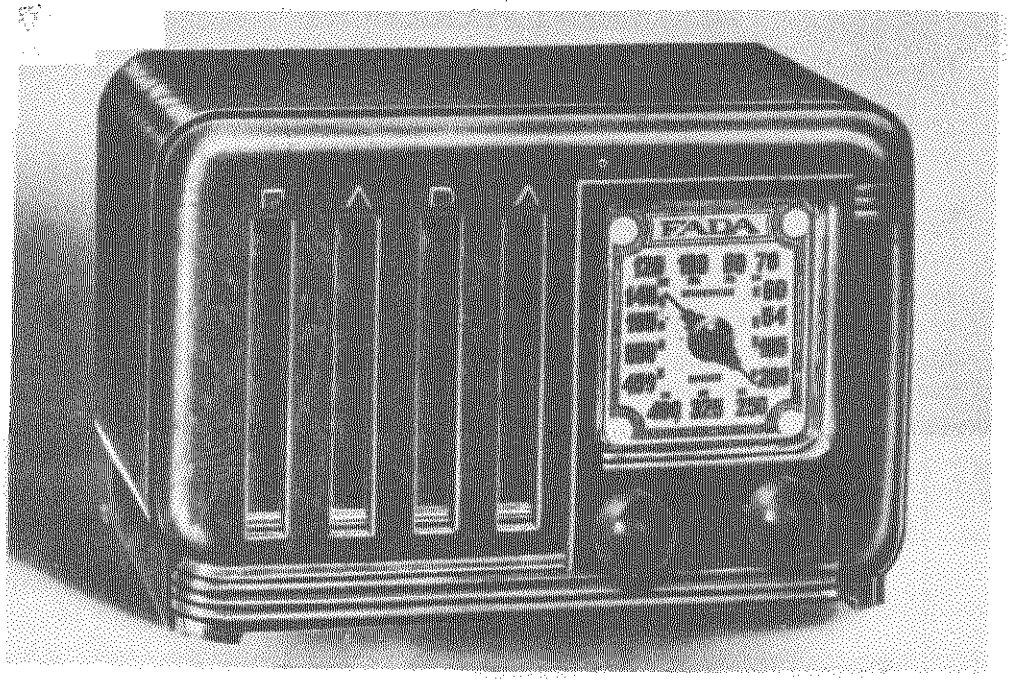
Receiver Dial at:	Signal Generator	Dummy Antenna	Connect Signal Generator to:	Refer to Chassis Layout for Location of Trimmers
1 Full Open	Exactly 456 KC	.1 MF	Control Grid 12BE6 Tube (Top) Rear Section Variable Condenser	Adjust for Maximum Output L1, L2, L3 & L4
2 Full Open	Exactly 1680 KC		Radiating Loop (1/2 meter) 20" from Receiver Loop	Adjust for Maximum Output T1
3 Approx. 1500 KC	Approx. 1500 KC		Radiating Loop (1/2 meter) 20" from Receiver Loop	Adjust for Maximum Output T2
4 Approx. 600 KC	Approx. 600 KC		Radiating Loop (1/2 meter) 20" from Receiver Loop	Check tracking and bend slotted end plate (rear section) of variable, if necessary.
5				



TUNING RANGE 530-1680K

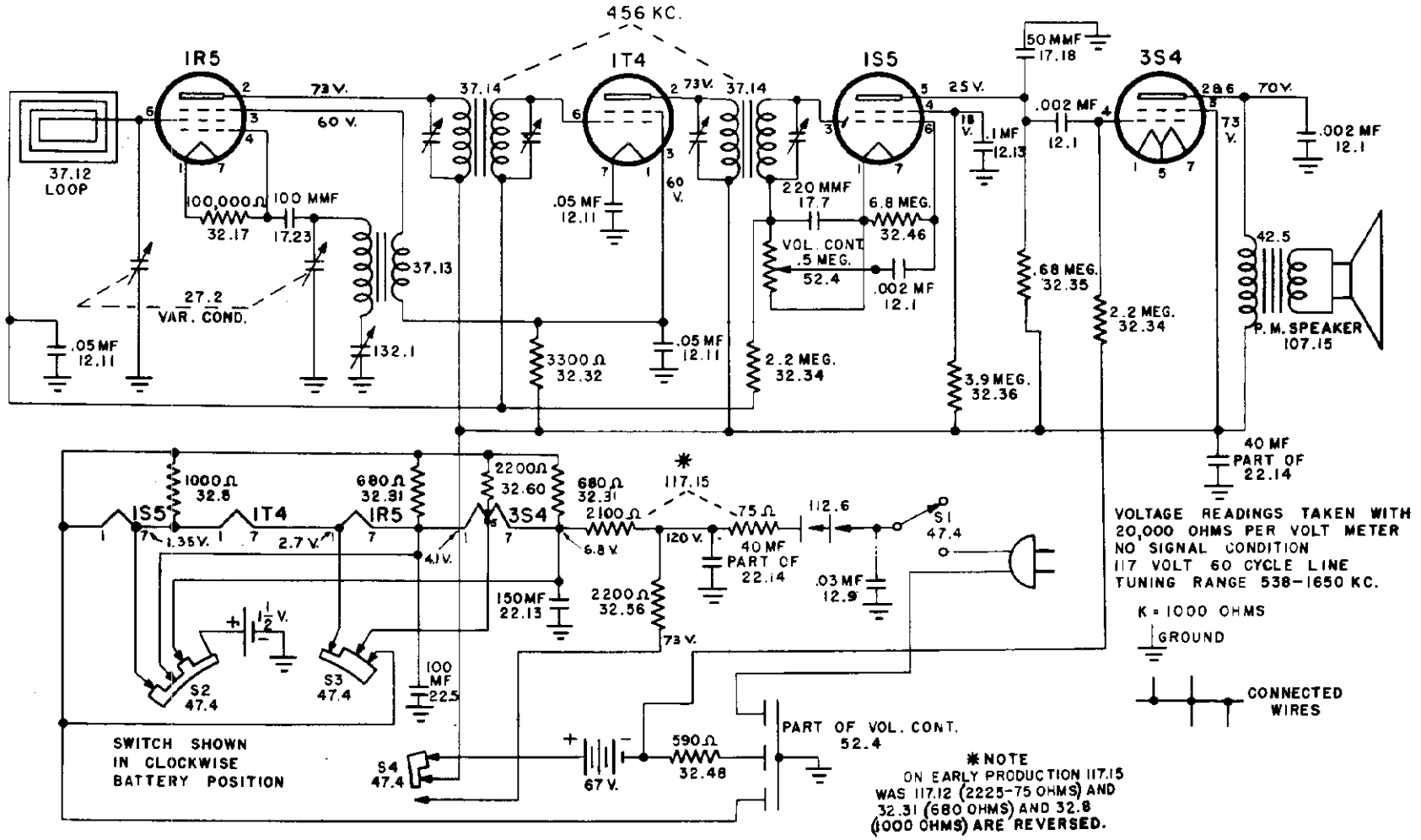
TUBE LAYOUT F750

MODELS F711, F750 FADA RADIO & ELECTRIC CO., INC.



PARTS LIST

Part No.	Description
12.4	Tubular Condenser, .005 mf, 600 V
12.6	Tubular Condenser, .01 mf, 400 V
12.9	Tubular Condenser, .03 mf, 400 V
12.11	Tubular Condenser, .05 mf, 200 V
12.12	Tubular Condenser, .05 mf, 400 V
17.21	Mica Condenser, 100 mmf, ± 20%
17.22	Mica Condenser, 220 mmf, ± 20%
22.32	3 Section Electrolytic Condenser, 30-40-20 mf, 150 W.V.
27.24	Variable Condenser
37.37	Oscillator Coil
37.131	Loop Antenna & Back
37.80	Input I.F. Transformer, complete
37.81	Output I.F. Transformer, complete
52.18	Volume Control with Switch
72.1	Power Cord (Approved)
77.106	Dial Scale (Calibrated)
77.108	Dial Pointer
77.7	Dial Crystal
97.123W	Cabinet, Bakelite-Walnut
97.123V	Cabinet, Bakelite-Ivory
142.32W	Cabinet Knobs—Walnut
142.32V	Cabinet Knobs—Ivory
107.25T	4" P.M. Speaker with Transformer
107.25	4" P.M. Speaker less Transformer
42.25	Speaker Transformer for above U.L. approved
117.1	30 ohm 1 W. Resistor
12.30	.2 mf, 400 V.
12.31	.02 mf, 200 V.



Power Supply: 105-125 V., 40-60 cycles AC
Same Voltage DC—Power Consumption 10 Watts
Battery Operation: 1—67½ V B — 2—1½ V D Cells in parallel
Frequency Range: 1640 — 530 KC
I.F. Circuits: 456 KC

Tubes: 1R5 Osc. Converter
1T4 I.F. Amplifier
1S5 Det. AVC A.F.
3S4 Power Output

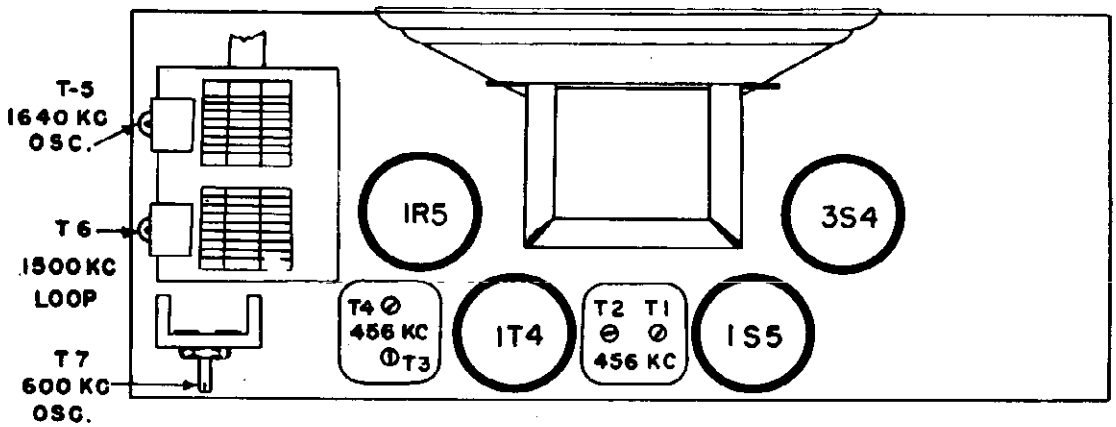
Rectifier, Selinium
Speaker 4" P.M. 1 oz. Alnico V Magnet.
Speaker Transformer 5500 ohms - 400 cycles
Speaker Voice Coil 3.2 ohms.

ALIGNMENT PROCEDURE

No attempt should be made to realign the various circuits until all other causes have been checked, unless the condition is so obvious as to indicate that realignment is necessary. Then proceed as follows:

Disconnect Loop leads—Remove Chassis from Cabinet.
Volume Control full on.
Low range A.C. meter connected across voice coil to indicate output.
Keep signal generator attenuated so as to maintain ½ scale reading on output meter.
Use battery power when available.

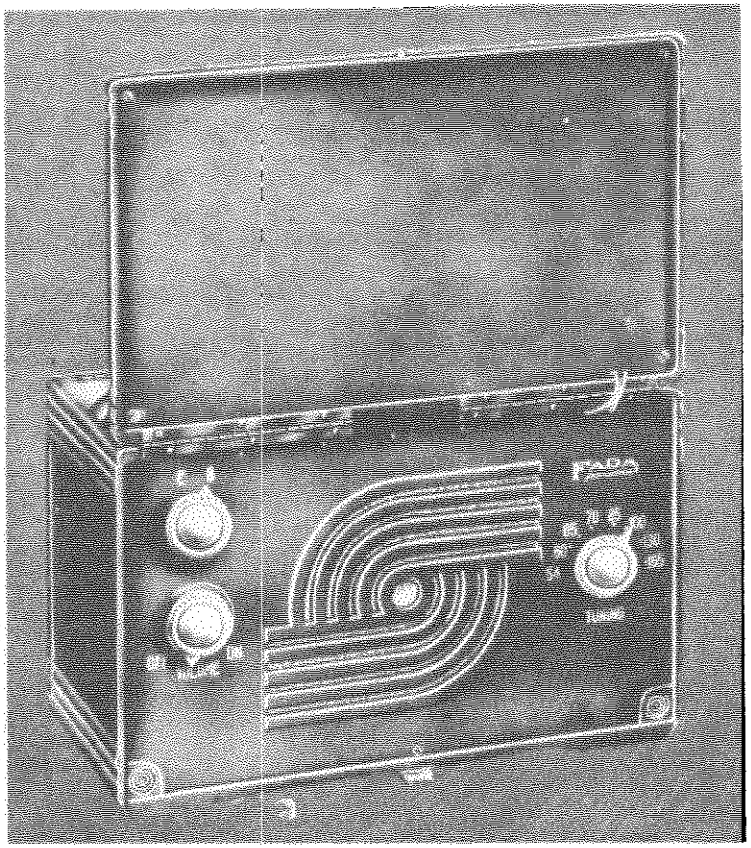
Receiver Condenser at:	Signal Generator	Dummy Antenna	Connect Signal Generator to:	Refer to Chassis Layout for Location of Trimmers
1 Fully closed	Exactly 456 KC	.1 MF	Chassis Ground and Control Grid 1R5 Rear Section Var. Cond.	Adjust for maximum output T1, T2, T3, and T4.
2 Fully closed	Approx. 538 KC	.1 MF	"	Adjust for maximum output T7
3 Fully open	Exactly 1640 KC	.1 MF	"	Adjust for maximum output T5
Repeat Operations 2 and 3. The next two operations are performed with the chassis in the cabinet, the loop connected and tuning indicator in position.				
4 Approx. 1500 KC	Approx. 1500 KC		Radiating Loop 20" from Receiver	Adjust T6 for maximum output.
5 Approx. 600 KC	Approx. 600 KC		Radiating Loop 20" from Receiver	Adjust T7 for max. while rocking variable cond.



TUNING RANGE 538—1640 Kc TUBE LAYOUT P 80

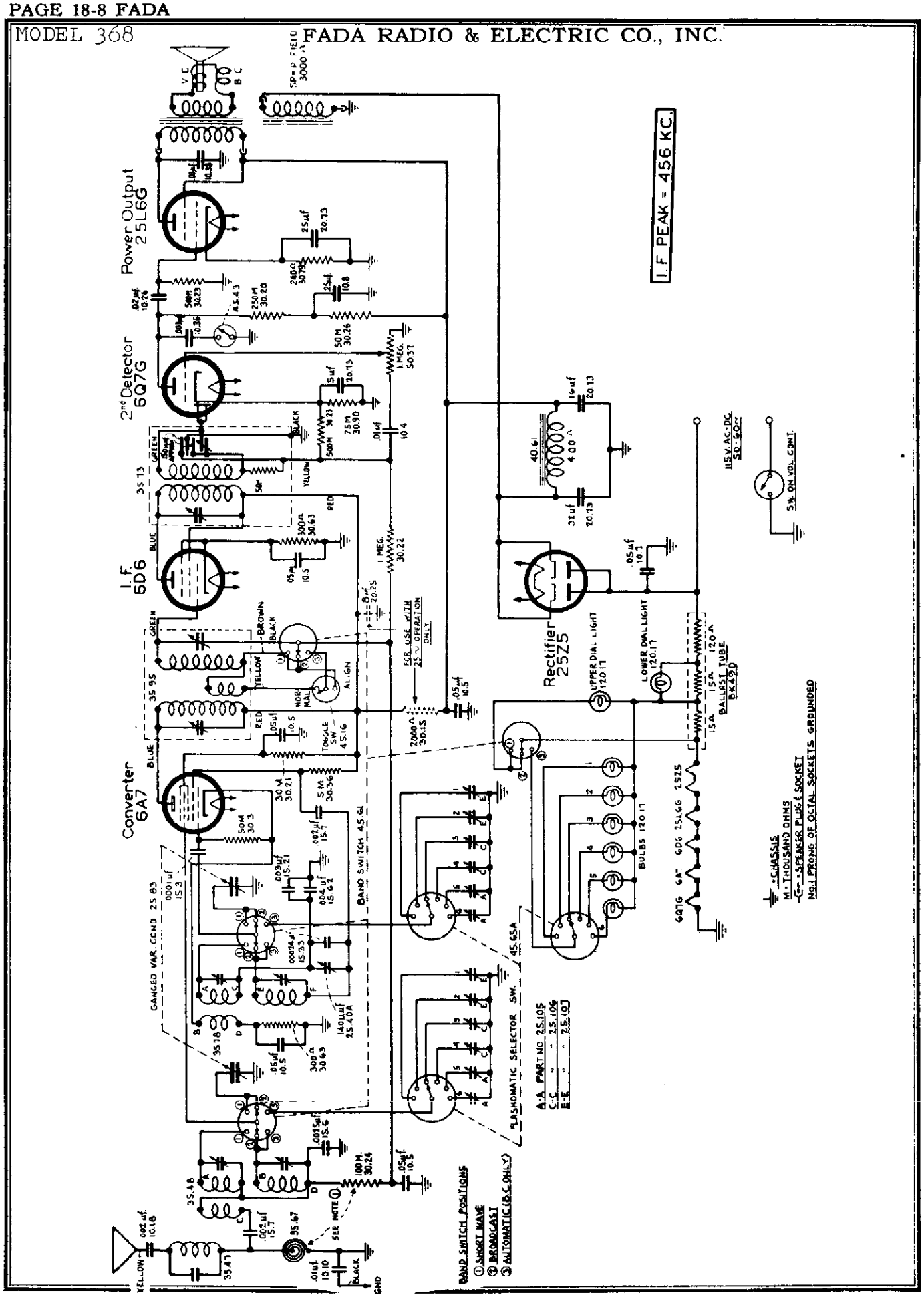
De Luxe Portable Tri-Power

SUPERHETERODYNE RECEIVER

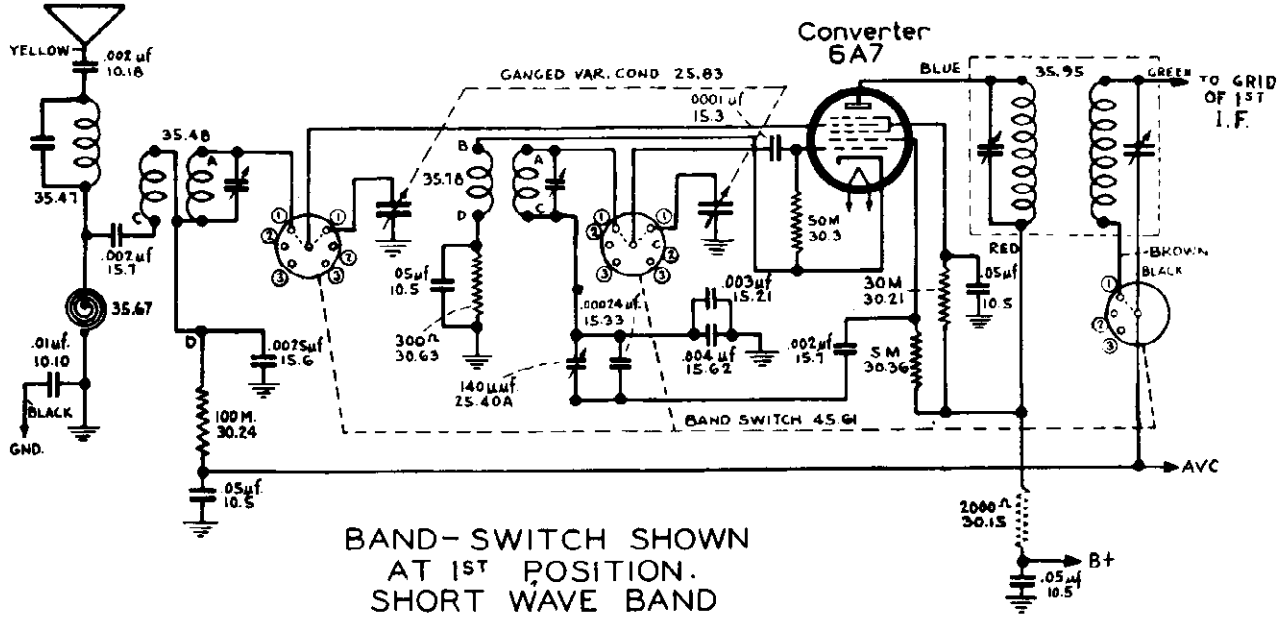


PARTS LIST

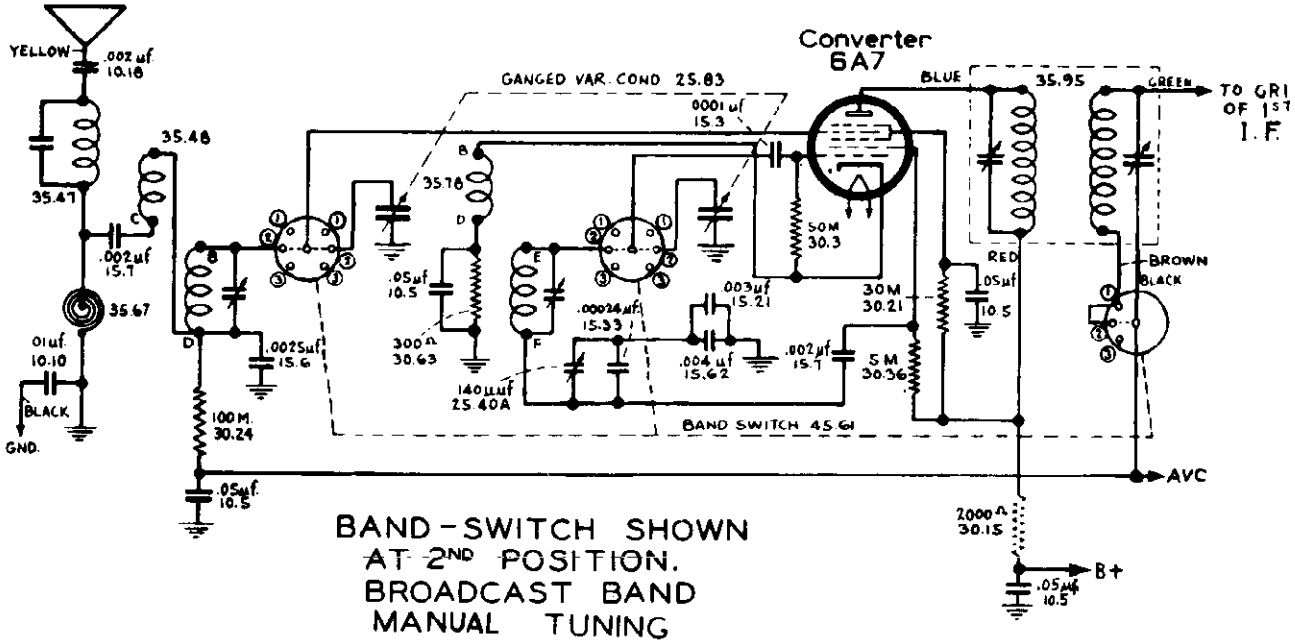
Part No.	Description
12.1	Tubular Condenser .002 mf 200 V
12.9	Tubular Condenser .03 mf 400 V
12.11	Tubular Condenser .05 mf 200 V
12.13	Tubular Condenser .1 mf 100 V
12.14	Tubular Condenser .1 mf 200 V
17.7	Ceramic Condenser 200 mmf ± 20%
17.18	Ceramic Condenser 50 mmf ± 20%
17.21	Ceramic Condenser 100 mmf ± 20%
22.5	Electrolytic Condenser 100 mf 15 V
22.13	Electrolytic Condenser 150 mf 15 V
22.14	Electrolytic Condenser 40-40 mf 150 V
27.2	Variable Condenser 2 gang
37.13	Oscillator Coil
37.14	Input & Diode I.F. Transformer
42.5	Speaker Transformer
47.4	Changeover Switch
52.4	Volume Control w/on-off switch
72.35	Power Cord
112.6	Rectifier Selinium
117.15	W. W. Resistor
132.1	Padder Condenser
142.6	Knob-Tuning — Ivory only
142.7	Knob-Pointer — Ivory only
142.8	Knob-Volume or Changeover — Ivory only
157.3	Loop & Cover Assembly
157.4	A. Battery Contact Assembly
92.25	B. Battery Connector
92.80	Spring Clip Phospher Bronze
92.81	Ball Knob
157.5	Cabinet Assembly — complete w/front & rear lid & hinges less loop & spring catch (Specify color)
107.15	4" Speaker 1 oz. less transformer
107.15T	4" Speaker 1 oz. with transformer


MODEL 368
FADA RADIO & ELECTRIC CO., INC.
I.F PEAK = 456 KC.
Converter 6A7
I.F 6D6
2nd Detector 6Q7G
Power Output 25L6G
Rectifier 2525
GANGED VAR. COND. 25-83
BAND SWITCH 45-64
PUSHOMATIC SELECTOR SW. 45-65A
A-A PART NO. 25-105
C-C " " 25-106
E-E " " 25-107
BAND SWITCH POSITIONS
① SHORT WAVE
② BROADCAST
③ AUTOMATIC (D.C. ONLY)
SEE NOTE ①
FOR USE WITH 25 ~ OPERATION ONLY
TOGGLE SW. 45-16
SW. ON VOL. CONT.
UPPER DIAL LIGHT 12-0-17
LOWER DIAL LIGHT 12-0-17
BULBS 12-0-17
BALLAST TUBE BK492
115 V. AC-DC 50-60~
6Q7G 6A7 6D6 25L6G 2525
CHASSIS
M = THOUSAND OHMS
= SPEAKER PLUG & SOCKET
NO. 1 PRONG OF OCTAL SOCKETS GROUNDED
YELLOW
BLACK
GND

FADA RADIO & ELECTRIC CO., INC. MODEL 36



BAND-SWITCH SHOWN
AT 1ST POSITION.
SHORT WAVE BAND

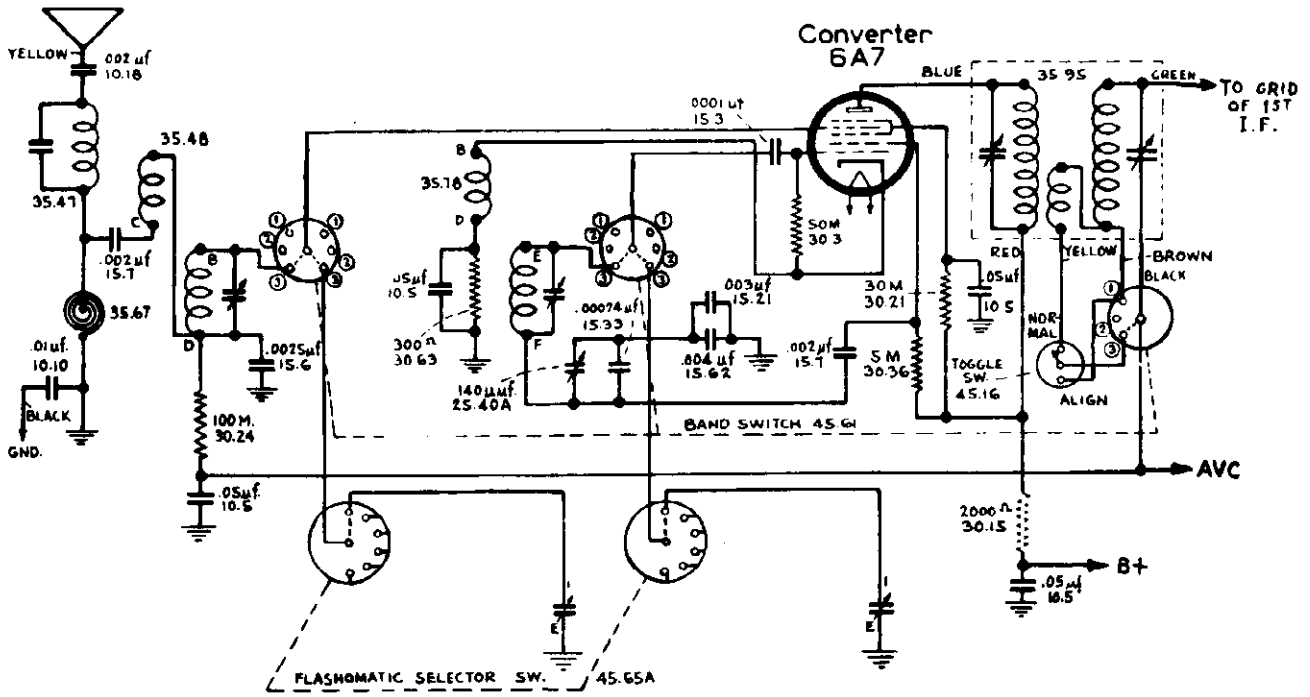


BAND-SWITCH SHOWN
AT 2ND POSITION.
BROADCAST BAND
MANUAL TUNING

CLARI-SKEMATIX
Registered Trademark

MODEL 368

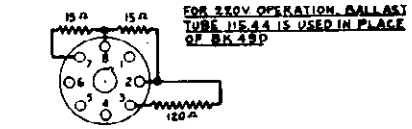
FADA RADIO & ELECTRIC CO., INC.



BAND-SWITCH SHOWN AT 3RD POSITION.
BROADCAST BAND (AUTOMATIC)
#1 "E" BUTTON DEPRESSED

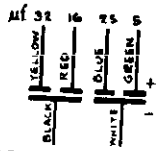
Ant. Coil 35.48	Osc. Coil 35.78
A-D = .02Ω B-D = 6.6Ω C-D = .28Ω	A-C = .02Ω B-D = 33Ω E-F = 5.15Ω
1ST I.F. 35.95 PRI = BLUE-RED = 25Ω SEC. = GREEN-BROWN = 23Ω EXP. WINDING = YELLOW-BROWN = 75Ω	2ND I.F. 35.73 PRI = BLUE-RED = 28Ω SEC = 28Ω

NOTE ① ON EARLY MODELS 10 M. RESISTOR PART NO. 30.31 IS USED IN PLACE OF 35.67 & R.F. CHOKE 35.67 IS USED IN PLACE OF 100 M - 30.24



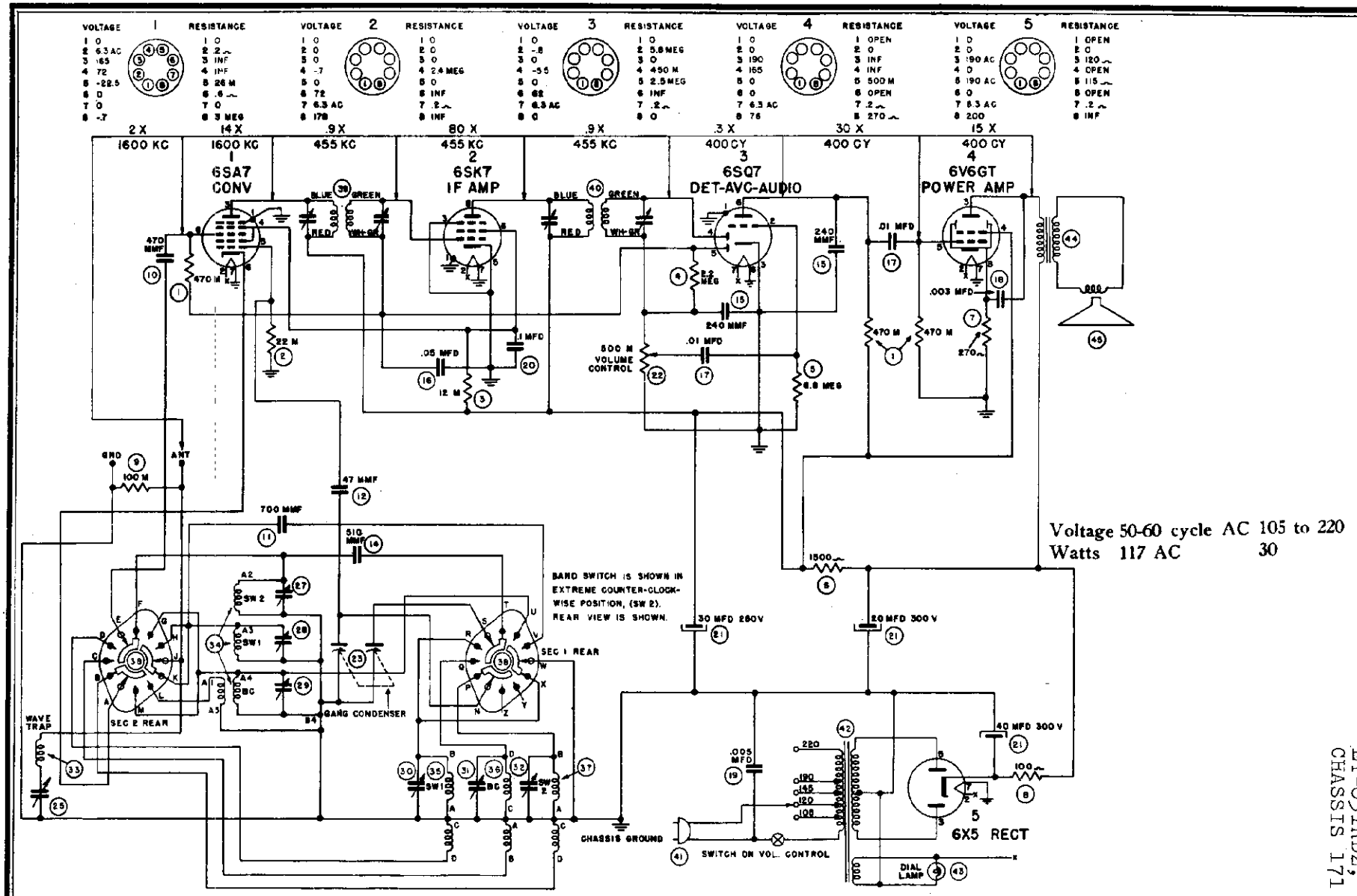
FOR 220V OPERATION, BALLAST TUBE 115.44 IS USED IN PLACE OF BK49D

BK49D
BALLAST TUBE
(BOTTOM VIEW OF SOCKET VIEWED FROM INSIDE OF RECEIVER)



ELECTRO COND. BLOCK.
20.73

FARNSWORTH TELEV. & RADIO CORP. MODELS ET-650BRZ, ET-651BKZ, ET-651BUZ, ET-651RDZ, CHASSIS 171



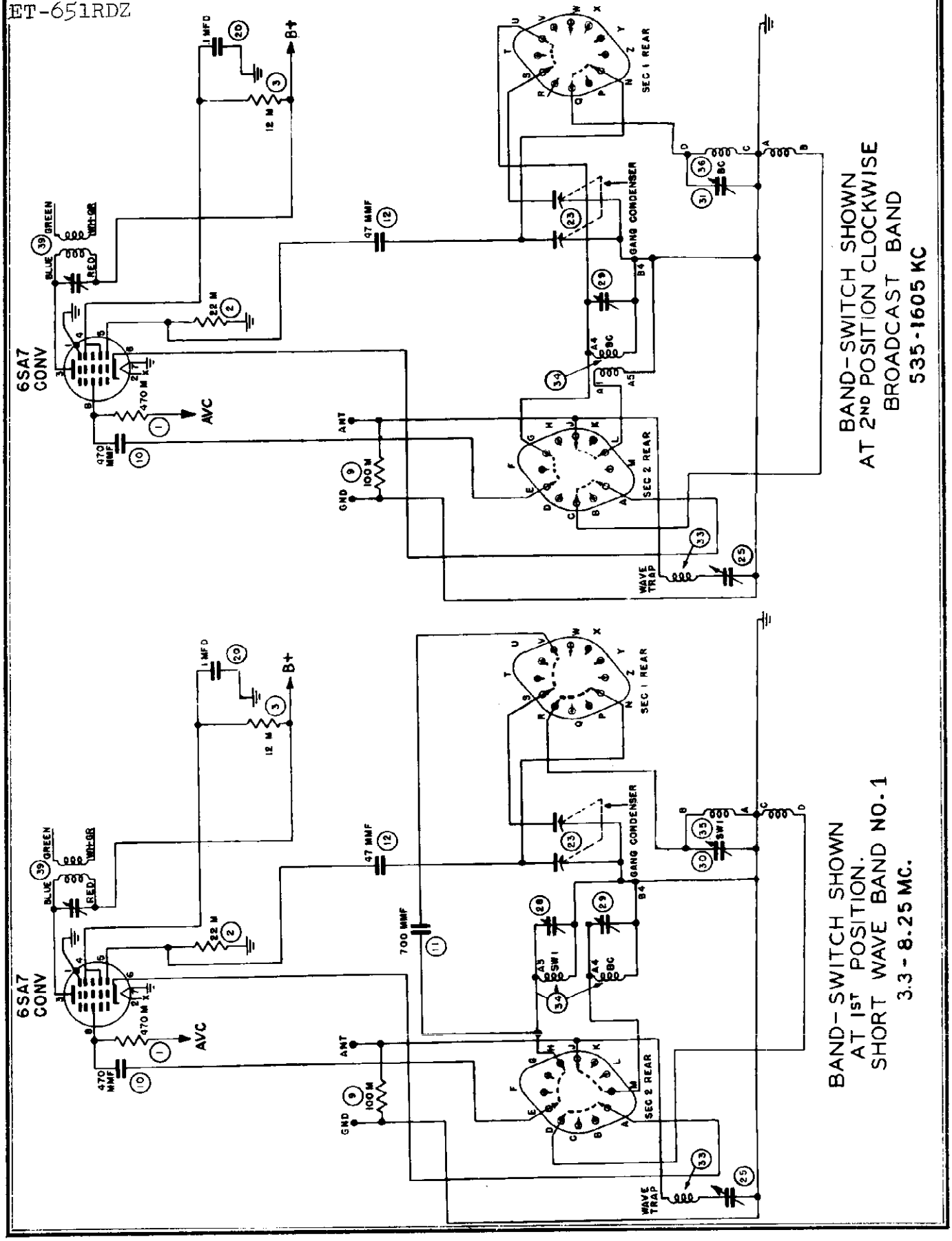
Voltage 50-60 cycle AC 105 to 220
Watts 117 AC 30

Five Tube AC operated Three Band Superheterodyne

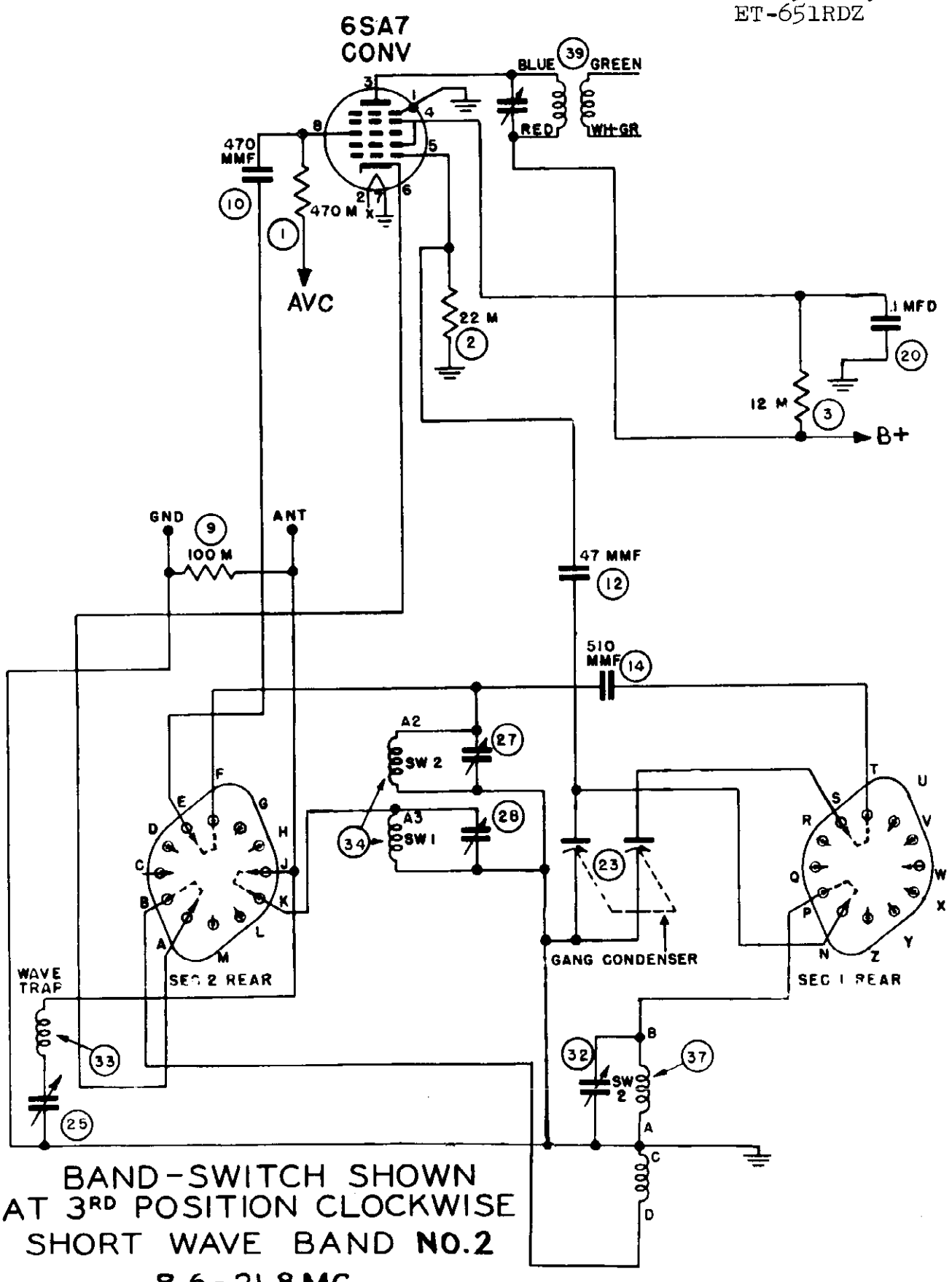
Broadcast Band	535 Kc. — 1605 Kc.
Short Wave Band No. 1	3.3 Mc. — 8.25 Mc.
Short Wave Band No. 2	8.6 Mc. — 21.8 Mc.

To set transformer tap switch: Remove line cord plug from power outlet. Loosen the lock screw above the window. The switch knob should now be turned until the figures appearing in the center of the window area corresponds to, or are greater than the voltage of the power supply. The setting is locked by tightening the lock screw.

MODELS ET-650BRZ, FARNSWORTH TELEV. & RADIO CORP.
ET-651BKZ,
ET-651BUZ,
ET-651RDZ



FARNSWORTH TELEV. & RADIO CORP MODELS ET-650BR
ET-651BKZ,
ET-651BUZ,
ET-651RDZ



EQUIPMENT AND PROCEDURE FOR ALIGNMENT

An output meter and a signal generator are required for proper alignment of these sets. The signal generator should be calibrated at the following points: 455 Kc., 600 Kc., 1000 Kc., 1500 Kc., 3.5 Mc., 7.5 Mc., 9.5 Mc. and 20 Mc. All adjustments should be made with the volume control set for maximum, keeping the signal generator output as low as possible to prevent AVC action and incorrect settings.

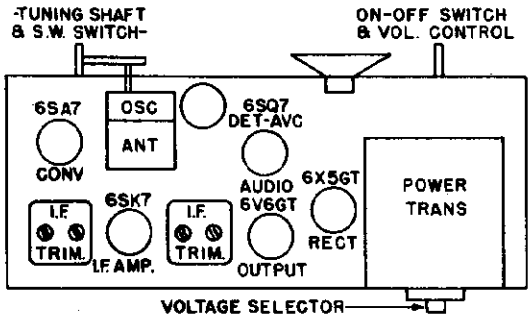
Connect the low side of the signal generator to the ground terminal on the chassis. Connect the high side of generator to antenna terminal through dummy load of 200 MMF for broadcast band and a dummy load of 400 ohms for shortwave.

STEPS	DUMMY ANTENNA	SET GENERATOR AT	SET GANG AT	ADJUST	LOCATED	TO OBTAIN
1	SET VOLUME CONTROL AT MAXIMUM					Maximum Output
2	.1 Mfd.	455 Kc.	Minimum	2nd. I.F. Trimmers	Top of I.F. Trans.	
3				1st. I.F. Trimmers		
4	Broadcast 200 MMF		1000 Kc.	Wave Trap Trimmer	See Illustration on page one	Minimum Output
5		1500 Kc.	1500 Kc.	B.C. Osc. Trimmer		MAXIMUM OUTPUT
6		1500 Kc.	1500 Kc.	B.C. RF Trimmer		
7		CHECK POINTER CALIBRATION AT 1000 Kc. & 600 Kc.				
8	S.W. 1 400 ohms	7.5 Mc.	7.5 Mc.	S.W. 1 Osc. Trimmer *	See Illustration on page one	
9		7.5 Mc.	7.5 Mc.	S.W. 1 RF Trimmer **		
10		CHECK 3.5 Mc.				
11	S.W. 2 400 ohms	20 Mc.	20 Mc.	S.W. 2 Osc. Trimmer *		
12		20 Mc.	20 Mc.	S.W. 2 RF Trimmer **		
13		CHECK 9.5 Mc.				

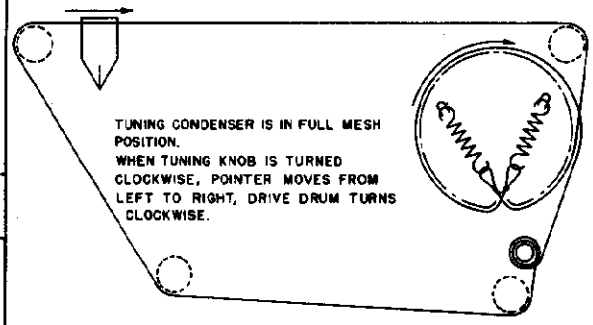
*When aligning the Shortwave oscillators use the peak found farthest out from maximum capacity on the oscillator trimmers.

**Use the peak nearest maximum capacity on the R.F. trimmers and rock gang for maximum output.

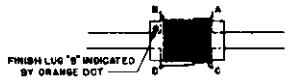
CHASSIS LAYOUT



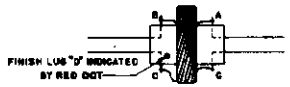
DIAL STRINGING



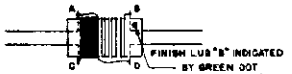
ANTENNA AND OSCILLATOR COILS



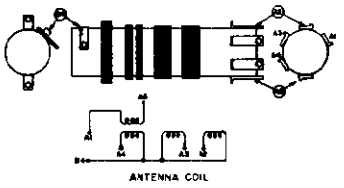
SHORT WAVE 1 OSCILLATOR COIL



BROADCAST OSCILLATOR COIL



SHORT WAVE 2 OSCILLATOR COIL



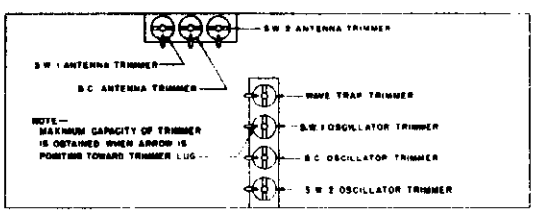
ANTENNA COIL

MODELS ET-651BUZ, FARNSWORTH TELEV. & RADIO CORP. MODELS ET-650BI
ET-651RDZ ET-651BKZ

Ref. No.	Part No.	DESCRIPTION
1	77217	470M Ohms
2	77266	22M Ohms
3	77155	12M Ohms 2 watt
4	77270	2.2 Megohms
5	77273	6.8 Megohms
6	77342	1500 Ohms 1 watt
7	77174	270 Ohms 1 watt
8	77258	100 Ohms
9	77214	100M Ohms
10	25285	470 Mmf. Mica Capacitor
11	25418	700 Mmf. Mica Capacitor
12	25193	47 Mmf. Mica Capacitor
14	25417	510 Mmf. Mica Capacitor
15	25187	240 Mmf. Mica Capacitor
16	25080	.05 Mfd. 200 V. Export
17	25365	.01 Mfd. 600 V. Molded Oil Paper
18	25077	.003 Mfd. 600 V. Export
19	25323	.005 Mfd. Line Buffer 800 V.
20	25361	.1 Mfd. 400 V. Molded Oil Paper
21	25330	Electrolytic Capacitor 40 Mfd. 20 Mfd. 300 V., 30 Mfd. 250 V.
22	78070	Volume Control
23	26227	Gang Condenser
25	26229	Wave Trap Trimmer
27	26228	SW2 Antenna Trimmer
28	26228	SW1 Antenna Trimmer
29	26228	BC Antenna Trimmer
30	26228	SW1 Oscillator Trimmer
31	26228	BC Oscillator Trimmer
32	26229	SW2 Oscillator Trimmer
33	38650	Wave Trap Coil
34	38747	Antenna Coil
35	38730	SW1 Oscillator Coil
36	38729	BC Oscillator Coil
37	38731	SW2 Oscillator Coil
38	90198	Band Switch
39	36898	1st. I.F. Transformer
40	36899	2nd I.F. Transformer
41	27118	Line Cord
42	94207	Power Transformer
43	42186	Dial Lamp
44	94208	Output Transformer
45	81146	Speaker, 6"
	80139	Molded Octal Tube Socket
	80033	Antenna and Ground Terminal Strip
	31275	Dial Window
	31330	Dial Scale
	31329	Dial Background
	11299	Dial Pointer
	41106	Drive Cord (Approx. 38" long) and springs
	56994	Drive Drum
	09195	Knob and Set Screw ET-650BRZ
	09196	Knob and Set Screw ET-651RDZ
	09224	Knob and Set Screw ET-651BUZ
	09225	Knob and Set Screw ET-651BKZ
	54091	Band Switch Lever ET-650BRZ
	54118	Band Switch Lever ET-651 Series
	59168	Grille ET-650BRZ
	59190	Grille for ET-651RDZ
	59247	Grille for ET-651BUZ
	59248	Grille for ET-651BKZ
	H-268	Cabinet and Packing 650BRZ
	H-269	Cabinet and Packing 651 Series

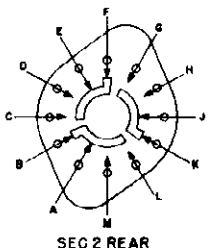
The Service Department policy is to furnish ½ Watt 5% Carbon Resistors and 600 Volt Tubular Condenser unless otherwise specified.

BOTTOM VIEW OF CHASSIS

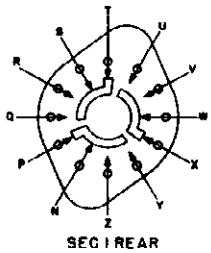


(FRONT OF CHASSIS)

BAND SWITCH



SEG 2 REAR

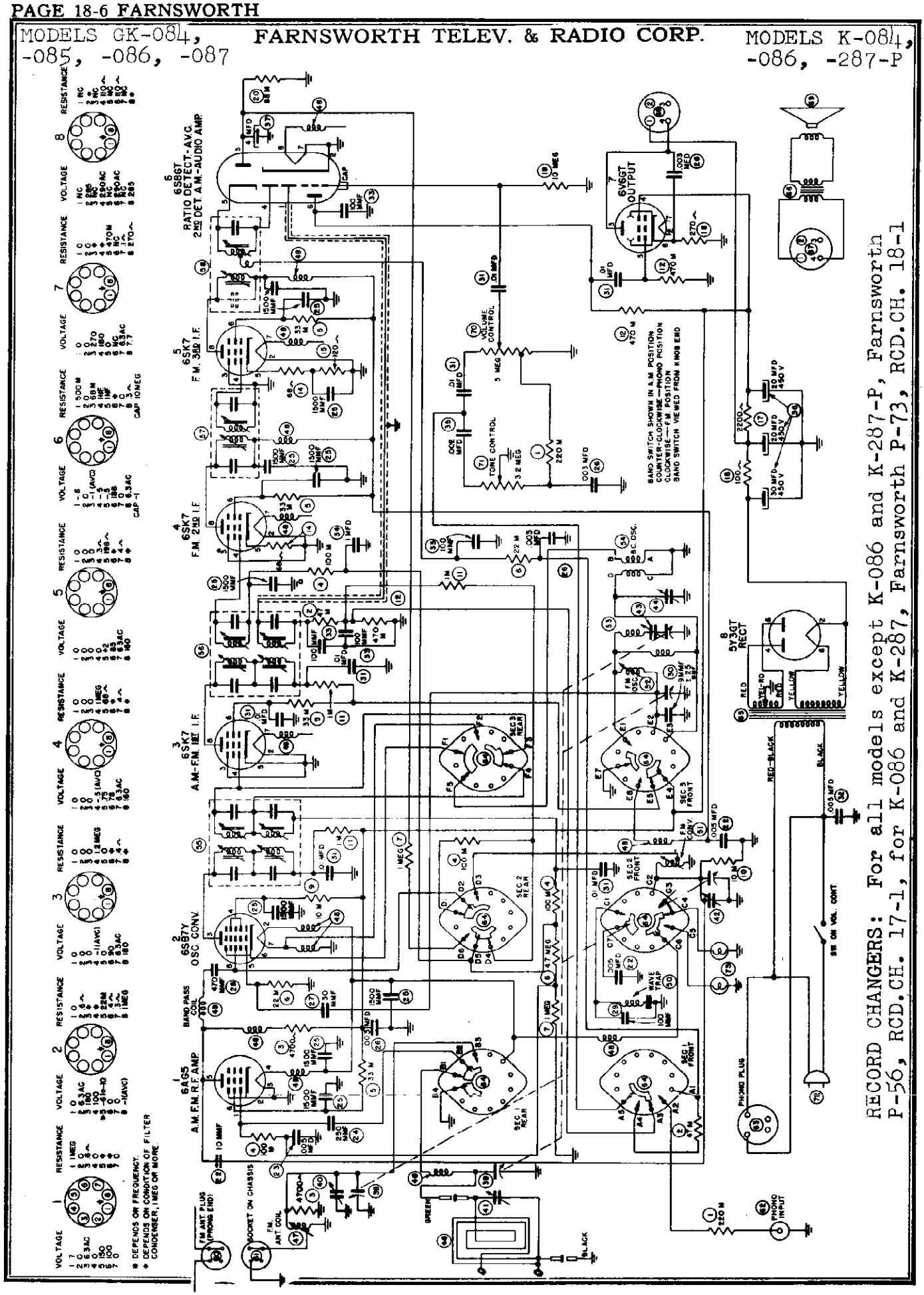


SEG 1 REAR

MODELS GK-084, -085, -086, -087

FARNSWORTH TELEV. & RADIO CORP.

MODELS K-084, -086, -287-P

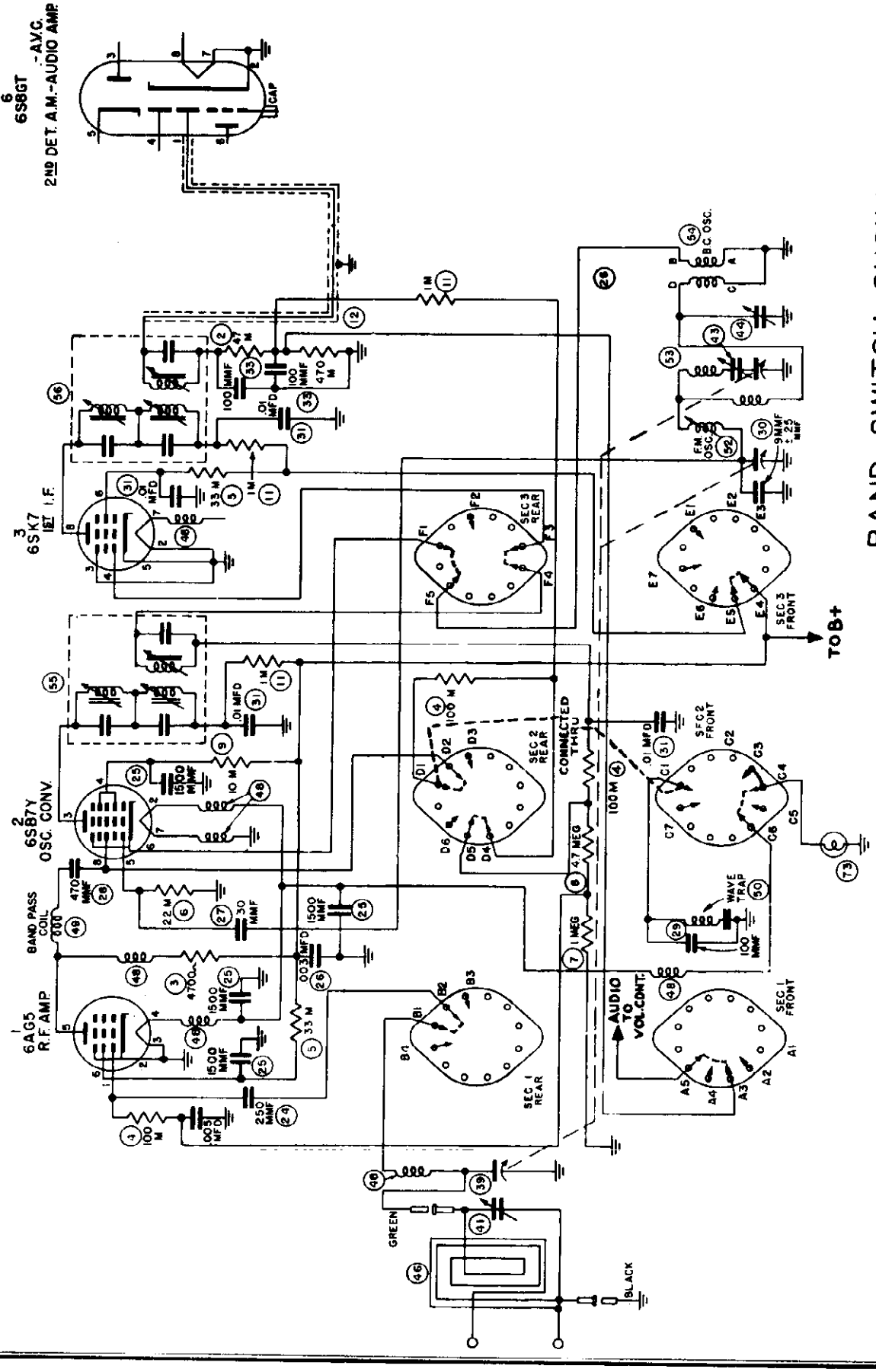


RECORD CHANGERS: For all models except K-086 and K-287-P, Farnsworth P-56, RCD.CH. 17-1, for K-086 and K-287, Farnsworth P-73, RCD.CH. 18-1

MODELS K-084, -086, -287-P

FARNSWORTH TELEV. & RADIO CORP.

MODELS GK-084, -085, -086, -0



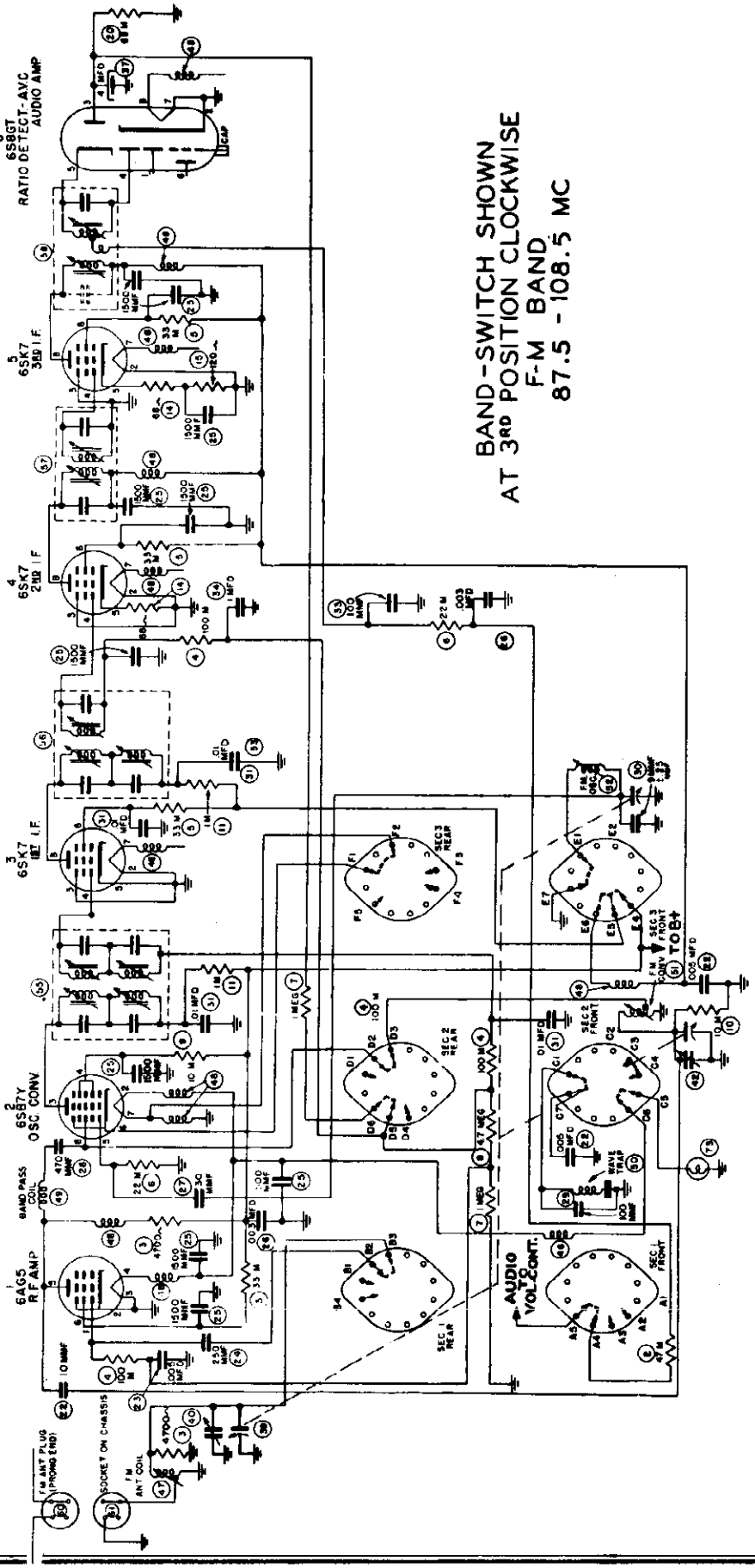
CLARI-SKEMATIX

Registered Trademark

MODELS GK-084, -085, -086, -087

FARNSWORTH TELEV. & RADIO CORP.

MODELS K-084, -086, -287-P



SPECIFICATIONS

RECEIVER FREQUENCIES

Broadcast Band	537 Kc. to 1620 Kc.	IF AM Band	455 Kc.
FM Band	87.5 Mc. to 108.5 Mc.	IF FM Band	10.7 Mc.

TUBE COMPLEMENT

Application	Type	Application	Type
AM, FM RF Amplifier	6AG5	FM 3rd. IF Amplifier	6SK7
Oscillator, Converter	6SB7Y	FM, AM Det, AVC, 1st Audio	6S8GT
AM, FM 1st IF Amplifier	6SK7	Output	6V6GT
FM 2nd. IF Amplifier	6SK7	Rectifier	5Y3GT

POWER AND VOLTAGE REQUIREMENTS

Voltage ..... 105 to 125 volts at 50-60 cycles per second
Power Consumption, 117 volts, 60 cycles ..... 88 watts
50 Cycle operation of changer requires modification

INSTRUCTIONS FOR ALIGNMENT OF FM BAND

1. *Necessary Equipment:*

RF Signal Generator, Vacuum Tube Voltmeter, Insulated Screw Driver.

NOTE—All alignment should be done with only sufficient signal amplitude to provide satisfactory signal to noise ratio, and readable output on output meter. The use of excessively strong signal is almost certain to produce misalignment.

2. *Procedure for IF Alignment, FM Band*

a. Connect V.T.V.M. from ground to audio lead of ratio detector (discriminator). Connect generator tuned to 10.7 mc. to grid of third FM IF tube through 0.1 MFD capacitor.

b. Turn secondary slug of ratio detector transformer (bottom) out as far as it will turn.

c. Tune primary for maximum output.

d. Connect generator to grid of second FM IF tube.

e. Turn bottom slug of third FM IF transformer out as far as possible. Tune primary for maximum output. Secondary may now be tuned for maximum.

f. Connect generator to the grid of first FM IF tube.

g. Turn bottom slug on second FM IF transformer out as far as possible. Using slug number 2, tune primary for maximum out. Tune secondary for maximum, using slug number 4 (bottom).

h. Connect generator to converter grid through 10,000 ohm resistor and 0.1 Mfd capacitor.

i. Follow same procedure given in paragraph (g), substituting first FM IF transformer in lieu of second IF transformer.

j. Tune secondary (bottom) of ratio detector transformer *for zero or minimum* output.

k. The FM IF system should be aligned if instructions have been carefully pursued.

3. *Instructions for Aligning FM RF Channel*

a. Equipment required: RF Signal Generator, Range 88 to 106 Mc., Output Meter, Insulated Screw Driver.

b. Connect RF signal generator in series with 300 ohm carbon or metalized resistor to "high" side of FM antenna socket. Connect output meter across voice coil of speaker.

c. Set tuning control for pointer to calibrate at the equivalent of half way between channels 280 and 300.

d. Apply 106 Mc. signal.

e. Set converter and antenna trimmers at minimum capacity.

f. Adjust oscillator by changing physical location of 9 mmf ceramic capacitor until signal is heard at maximum output.

g. Adjust antenna and converter trimmers for maximum output.

h. Set tuning controls so that dial pointer calibrates at the pointer's width higher than channel 220.

i. Apply 92 Mc. signal.

j. Adjust oscillator slug until signal is heard. Adjust converter and antenna slugs to maximum output.

k. Repeat operations c to j inclusive.

NOTE—The degree of adjustment required in the tuning of the oscillator slug will determine the number of times operations c to j must be repeated *until no further gain in sensitivity is obtained.*

l. Carefully tune across the entire FM band for the observance of dead or weak spots that may be a result of improper alignment or defective components. This can be determined by carefully noting the degree of receiver hiss in the absence of a received signal.

MODELS GK-084, -085, -086, -087 — FARNSWORTH TELEV. & RADIO CORP. — MODELS K-084, K-086, -287-P

ALIGNMENT INSTRUCTIONS FOR AM BAND

EQUIPMENT REQUIRED

For proper alignment, a calibrated signal generator having fundamental frequencies from 455 Kc to 1500 Kc should be provided.

The indicating device for showing correct alignment may be a high resistance AC voltmeter or a vacuum tube voltmeter.

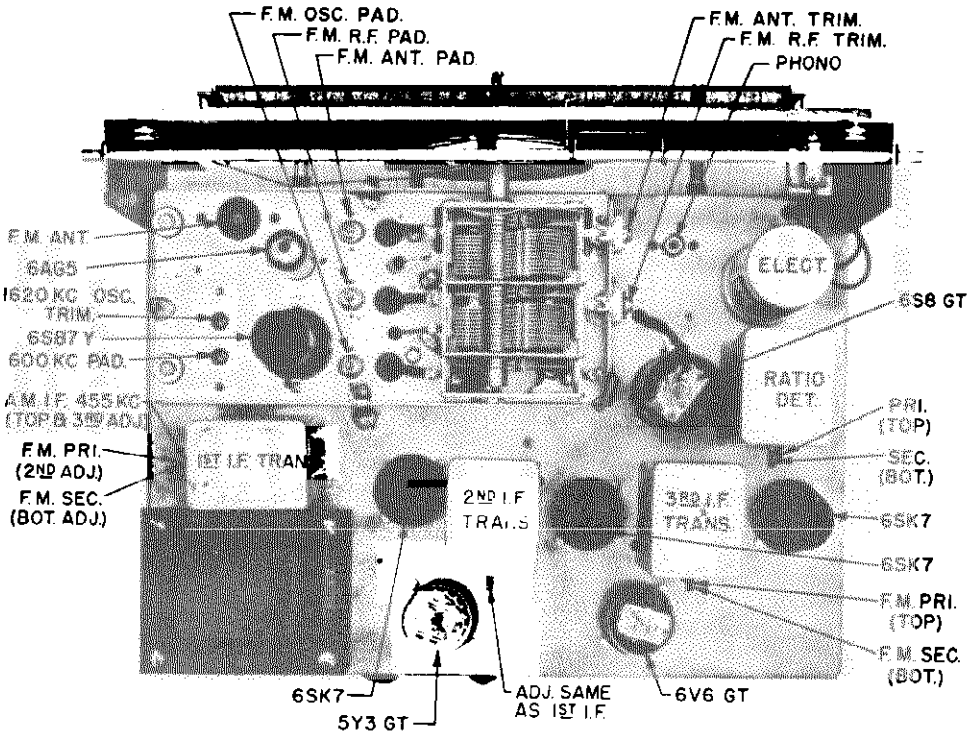
Connect the AC voltmeter either across the voice coil of the loud speaker, or if the meter range is high enough, to the plate in the output stage (through a condenser [0.1 Mfd.] to keep the DC out of the meter).

Maintain the output of the signal generator as low as possible to prevent AVC action and false settings.

TABULATION FOR AM ALIGNMENT

STEPS		CONNECT GENERATOR	SET GENERATOR AT	SET GANG AT	ADJUST	TO OBTAIN
1			Set tone and volume controls at maximum			MAXIMUM OUTPUT
2	Through 1 Mfd.	Sig. Grid (pin 8) Conv. Tube	455 Kc	Quiet Point	2nd IF Slugs #1 and 3	
3					1st IF Slugs #1 and 3	
4	Through 200 mmf	External Antenna Post on Loop	1500 Kc	1500 Kc	BC Osc. Trimmer	
5			600 Kc	600 Kc	Osc. Padder*	
6		Check dial calibration at several frequencies. If not reasonably correct, adjust oscillator padder. See note 1.				
7		Ext. Ant. Binding Post	1500 Kc	1500 Kc	Loop Trimmer	

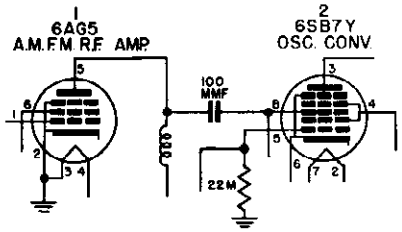
Through RMA dummy antenna.
*This adjustment should be made while gang is rocked.
Note 1. After any adjustment of oscillator padder, repeat steps 4 and 5.

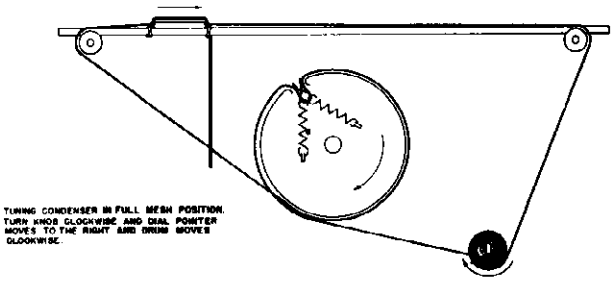


MODELS K-084, K-086, -287-P — FARNSWORTH TELEV. & RADIO CORP. — MODELS GK-084, -085, -086, -08

CIRCUIT MODIFICATION

Early sets did not incorporate the coil-condenser combination connecting between the plate of the RF amplifier and the grid of the converter. Below is an excerpt indicating that portion of the schematic of the early-production receiver.





Dial Stringing Diagram

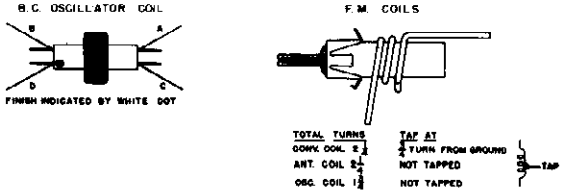
The GK-080 series instruments incorporate two internal antennas; a loop antenna used in broadcast band reception and a folded-dipole antenna used for FM reception.

These internal antennas are intended for use only in the presence of adequate field strength, as in large metropolitan areas where local stations supply the majority of desired programs. Neither a loop nor a dipole element which is within the confines of the cabinet can be considered as efficient signal pickup devices and, should field strength requirements be not fulfilled, it will be necessary, for satisfactory reception, to install an efficient outside folded dipole antenna which feeds the receiver through a 300 ohm transmission line.

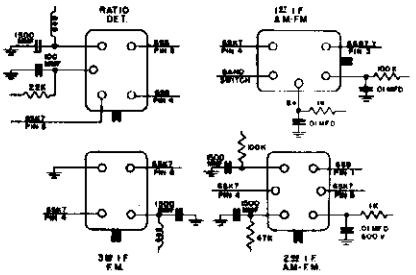
Both the loop and the dipole (internal or external) antennas exhibit certain characteristics of directivity, with which the experienced serviceman is familiar, which should be borne in mind when locating the receiver (or external antenna) in the home. Slight orientation of the receiver may effect more satisfactory reception of desired weak signals.

MULTIPLE RESPONSE AND WHISTLES

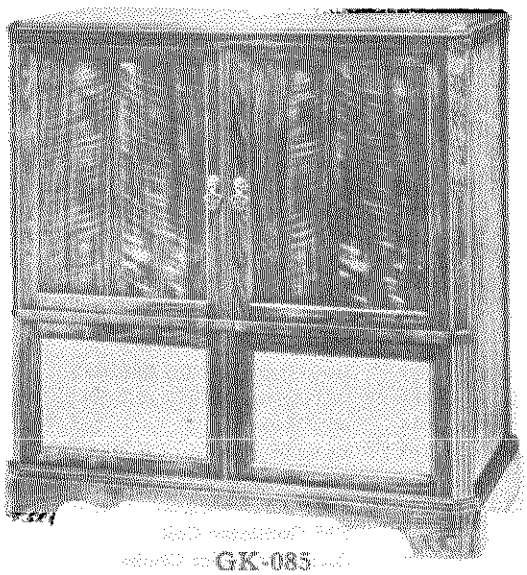
In metropolitan areas with close proximity t several strong transmitting stations, it may b necessary, on early production receivers, to co nect a 200 mmf mica capacitor across the wa trap. This must be placed on the band switch s it is switched out on FM. Should oscillation c low end of the band be experienced in the GK-08 (chairside) instrument, it is recommended that modified wave trap (part No. 38930) be subst tuted for wave trap connected between ground an terminal C1 of Section 2, front, of band switc



Oscillator Coil Assemblies



Bottom View of IF Cans



GK-085

MODELS GK-084, -085, -086, -087

FARNSWORTH TELEV. & RADIO CORP.

MODELS K-084, K-086, -287-P

PARTS LIST

Ref. No.	Part Number	Description
1	77216	220M Ohm Resistor
2	77213	47M Ohm Resistor
3	77211	4700 Ohm Resistor
4	77214	100M Ohm Resistor
5	77267	33M Ohm Resistor
6	77266	22M Ohm Resistor
7	77218	1 Megohm Resistor
8	77272	4.7 Megohm Resistor
9	77013	10M Ohm Resistor, 2 Watt
10	77212	10M Ohm Resistor
11	77262	1000 Ohm Resistor
12	77217	470M Ohm Resistor
14	77269	68 Ohm Resistor
15	77450	120 Ohm Resistor
16	77258	100 Ohm Resistor
17	77449	200 Ohm Molded Resistor, 8 Watt
18	77174	270 Ohm Resistor, 1 Watt
19	77274	10 Megohm Resistor
20	77305	68M Ohm Resistor
22	25425	10 Mmf Ceramic Capacitor
23	25183	.005 Mfd ,Tubular Capacitor, 600 Volts
24	25380	250 Mmf Ceramic Capacitor Hi "K"
25	25273	1500 Mmf Ceramic Hi "K"
26	25184	.003 Mfd Tubular Capacitor, 600 Volts
27	25439	30 Mmf N-1400
28	25189	470 Mmf Mica Capacitor
29	25435	100 Mmf Ceramic Capacitor
30	25440	9 Mmf Ceramic Capacitor
31	25194	.01 Mfd Tubular Capacitor, 600 Volts
32	25031	.005 Mfd Buffer Capacitor, 600 Volts
33	25188	100 Mmf Mica Capacitor
34	25215	.1 Mfd Tubular Capacitor, 600 Volts
35	25185	.002 Mfd Tubular Capacitor, 600 Volts
36	25424	30 Mfd, 20 Mfd, 20 Mfd, 450 Volt Electrolytic
37	25270	4 Mfd Electrolytic
39	17196	Gang Capacitor and Drum
40	26269	FM Antenna Trimmer
41	26032	AM Loop Trimmer
42	26269	FM Converter Trimmer
43	26267	AM Padder
44	26267	AM Oscillator Trimmer
46	13766	Loop Antenna GK-084, 088
46	13789	Loop Antenna GK-085
46	13784	Loop Antenna GK-086, 087
47	38880	FM Antenna Coil
48	38884	RF Choke
49	38915	Band Pass Coil
50	38484	Wave Trap
51	38881	FM Converter Coil
52	38882	FM Oscillator Coil
53	38898	Oscillator Series Choke

Ref. No.	Part Number	Description
54	38883	B.C. Oscillator Coil
55	38876	1st AM FM IF Transformer
56	38877	2nd AM FM IF Transformer
57	38878	3rd AM FM IF Transformer
58	38879	4th AM FM IF Transformer
60	80440	FM Antenna Plug
61	80439	FM Antenna Socket
62	80030	Phono Input Socket
63	11274	Phono AC Plug and Cable
64	90240	Band Switch
65	94204	Power Transformer
66	94325	Output Transformer
67	80444	Speaker Plug
68	80385	Speaker Socket
69	81175	Speaker GK-084, 085, 086
69	81169	Speaker GK-087, 088
70	78150	Volume Control
71	78071	Tone Control
72	27118	Line Cord
73	42185	Pilot Lamp, 250 Ma.
	13871	Dial Pointer and Tubing Assy.
	22147	Pickup Cable (GK-084-88)
	22150	Pickup Cable (GK-085-86-87)
	31421	AM Dial Glass
	31422	FM Dial Glass
	31423	Dial Escutcheon (Old Type)
	31431	Dial Escutcheon (New Type)
	31432	Dial Escutcheon (Used on GK-088 Only)
	37498	#3 x 5/8" Brass Finish Wood Screw (For Mtg Dial Escutcheon)
	41106	Dial Tuning Cord (45 in.)
	55392	Ornamental Washer (For Mtg Dial Escutcheon)
	54091	Band Switch Lever
	59134	Volume and Tuning Knob (Wal.)
	59193	Volume and Tuning Knob (Blonde)
	60588	Dial Background (Used in Conjunction With #31423)
	71223	Phono Needle
	H-283-1	Cabinet and Carton for GK-084 (Wa.)
	H-283-2	Cabinet and Carton for GK-084 (Bl.)
	H-290	Cabinet and Carton for GK-085 (Wa.)
	H-285-1	Cabinet and Carton for GK-086 (Wa.)
	H-285-2	Cabinet and Carton for GK-086 (Bl.)
	H-287	Cabinet and Carton for GK-087 (Mah.)
	H-301	Cabinet and Carton for GK-088 (Mah.)

FARNSWORTH TELEV. & RADIO CORP.

MODELS GK-1
GK-141, GK-
GK-144

Ref. No.	Part No.	DESCRIPTION
1	77323	270 Ohm Resistors
2	77214	100 M Ohm
3	77262	1000 Ohm
4	77258	100 Ohm
5	77305	68 M Ohm
6	77216	220 M Ohm
7	77266	22 M Ohm
8	77261	470 Ohm
9	77324	56 M Ohm
10	77429	4700 Ohm 1 Watt
11	77270	2.2 Megohms
12	77322	39 M Ohm 1 Watt
13	77217	470 M Ohm
14	77325	15 M Ohm 2 Watt
15	77213	47 M Ohm
16	77218	1 Megohm
17	77269	68 Ohm
18	77274	10 Megohms
19	77339	4.7 Ohms 2 Watt Wire Wound
20	77209	220 Ohm
21	77338	230 Ohms 5 Watt Wire Wound
22	77337	500 Ohms 5 Watt Wire Wound
23	77428	27 Ohm 1 Watt
24	77268	330 M Ohm
25	25196	.05 Mfd. Tubular Capacitor
26	25183	.005 Mfd. Tubular
27	25215	.1 Mfd. Tubular
28	25185	.002 Mfd. Tubular
29	25195	.02 Mfd. Tubular
30	25194	.01 Mfd. Tubular
31	25184	.003 Mfd. Tubular
32	25031	.005 Mfd. Buffer
33	25277	20 Mfd., 30 Mfd., 40 Mfd., 450 Volt Electrolytic
34	25269	50 Mfd., 250 V. Electrolytic
35	25270	4 Mfd., 100 V. Electrolytic
36	25347	90 Mmf. Ceramic N-470
37	25273	1500 Mmf. Ceramic HiK "L"
38	25274	600 Mmf. Ceramic HiK "K"
39	25143	50 Mmf. Ceramic Zero Temp.
40	25275	2 Mmf. Ceramic Zero Temp.
41	25272	.002 Mfd. Molded Mica
42	25346	55 Mmf. Ceramic N-330
43	25193	47 Mmf. Molded Mica
44	25188	100 Mmf. Molded Mica
45	25318	200 Mmf. Molded Mica
46	25141	.005 Mfd. Molded Mica
47	26222	Gang Capacitor and Push Button Ass'y
48	26221	Ceramic Trimmer 1.5-7 Mmf.
49	26031	Antenna Trimmer
50	26226	No. 4 Trimmer Strip
51	26223	No. 1 Trimmer Strip
52	26224	No. 2 Trimmer Strip
53	26225	No. 3 Trimmer Strip
54	38671	FM R.F. Coil Assy.
55	80439	FM Antenna Socket
56	38679	Loop Antenna
57	80439	AM Antenna Socket
58		
59		
60		
61		
62		
63		
64	80440	AM Antenna Plug
65	38678	S.W. Antenna Coil
66	90246	Band Switch Wafer #1
67	90247	Band Switch Wafer #2
68	90248	Band Switch Wafer #3
69	90249	Band Switch Wafer #4
70	90250	Band Switch Wafer #5
72	38661	RF Choke
73	38672	FM Mixer Coil
74	38673	FM Osc. Coil
76	38676	SW Mixer Coil
77	38675	BC & SW Osc. Coil
78	38677	BC Mixer Coil
79	38621	1st. IF Transformer
80	38622	2nd. IF Transformer
81	38623	3rd. IF Transformer
82	38624	Discriminator Transformer
83	80030	Phono Input Socket
84	78103	1 Megohm Treble Control
85	78057	3 Megohm Volume Control
86	78101	2.2 Megohm Bass Control
87	42185	Dial Light
88	11274	Phono Motor Lead & Socket
89	94170	Power Transformer
90	81145	Speaker
91	94257	Output Transformer
92	80444	Speaker Plug
93	80244	Speaker Socket
94	27118	Line Cord
95	90244	Phono Switch
	90192	Band Switch
	13585	Compartment Light Assy. for GK 140
	42191	Compartment Lamp for GK 140
	09260	Segment Gear Assy.
	09262	Drive Gear Assy.
	09263	Pointer Drive Drum Assy.
	59254	Pointer
	31334	Dial Glass
	31327	S.W. Dial Glass
	55006	Dial Pointer Slider Bar
	22150	P.U. Cable
	31411	Volume Decal
	31412	Tuning Range & Switch Decal
	31413	Treble Decal
	41137	Push Button Spring Kit
	71223	Phono Needle
	59257	Push Button
	57134	Tuning Knob
	59111	Tone Control Knob
	92201	Felt Washer
	58046	Push Button Escutcheon
	H-242	Cabinet and Carton for GK 140
	H-275	Cabinet and Carton for GK 141 (Mah.)
	H-276-1	Cabinet and Carton for GK 143 (Mah.)
	H-276-2	Cabinet and Carton for GK 143 (Walnut)
	80370	Pilot Lamp Socket Assy.
	80139	Molded Octal Socket
	80239	Molded Octal Socket for Rectifier
	80319	Miniature Tube Socket
	80318	Molded Octal Socket (Loctal)

For schematic see pages 1

VOLTAGE 1		RESISTANCE 1		VOLTAGE 2		RESISTANCE 2	
1	0	1	0	1	2.9	1	50 Ω
2	78	2	1500 Ω	2	78	2	1500 Ω
3	64	3	6000 Ω	3	64	3	6000 Ω
4	-15	4	100 M	4	NC	4	NC
5	0	5	0	5	2.9	5	50 Ω
6	.9	6	4 MEG	6	2.1	6	4 MEG
7	1.5	7	30 Ω	7	4.3	7	70 Ω

VOLTAGE MEASUREMENTS TAKEN A.C. POWER ON AND WITH LOOP DISCONNECTED.

RESISTANCE MEASUREMENTS TAKEN WITH "ON-OFF" SWITCH "ON", A.C. POWER DISCONNECTED, BAKELITE PRONG REMOVED FROM SLOT AND LOOP BEING CONNECTED.

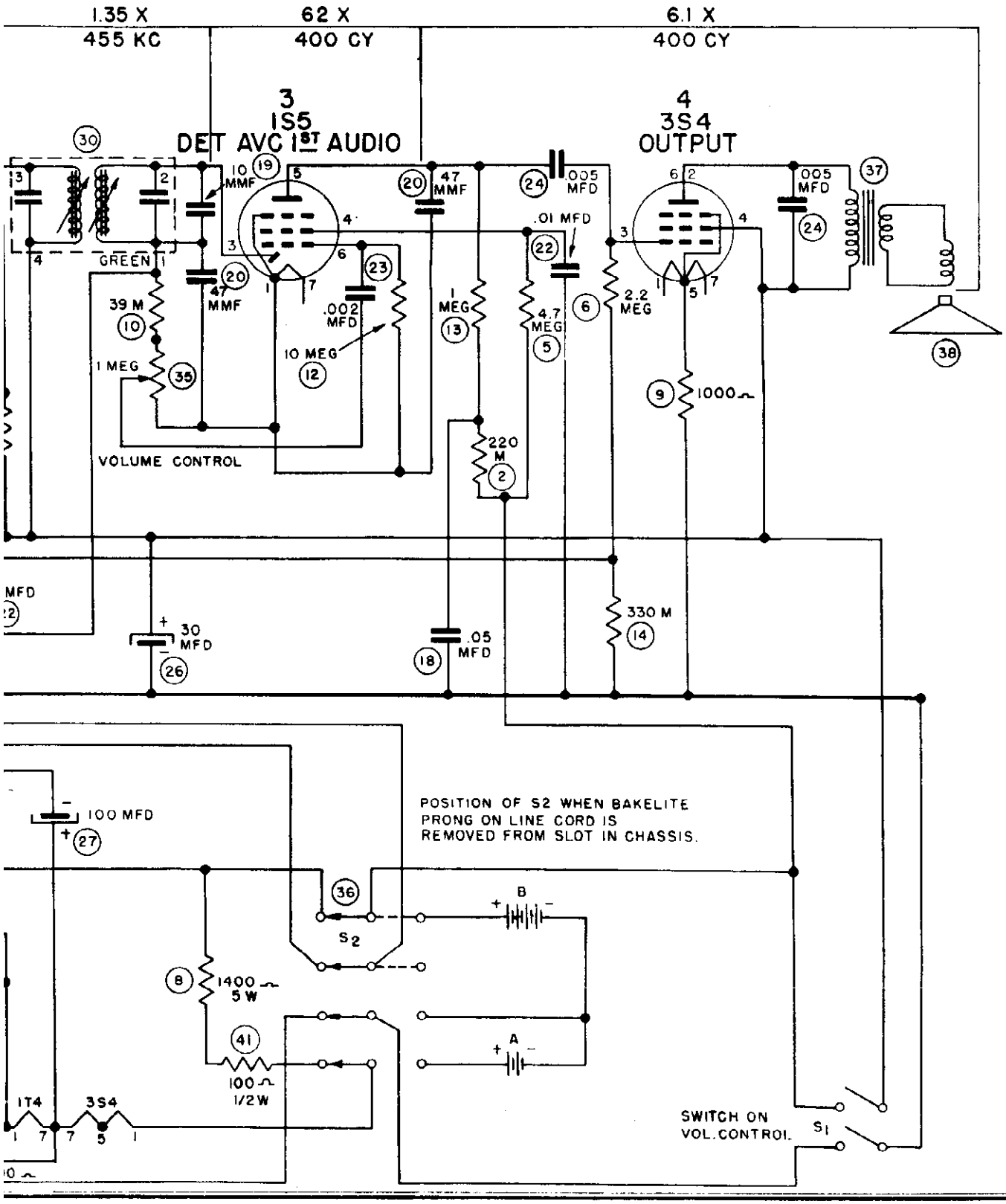
GAIN MEASUREMENTS TAKEN WITH A.V.C. DISCONNECTED AND WITH 1.5 VOLT BIAS.

VOLTAGE MEASUREMENTS MADE USING ELECTRONIC VOLT-OHM-METER AND SET USING 117 VOLTS A.C.

RADIO CORP.

MODEL P-860

VOLTAGE 3		RESISTANCE	VOLTAGE 4		RESISTANCE
1	1.4	1 30Ω	1	7.3	1 105Ω
2	NC	2 NC	2	72	2 2000Ω
3	.9	3 1 MEG	3	-1.9	3 2.5 MEG
4	25	4 4.7 MEG	4	76	4 1500Ω
5	20	5 1.2 MEG	5	5.8	5 85Ω
6	.8	6 10 MEG	6	72	6 2000Ω
7	2.9	7 50Ω	7	4.3	7 70Ω



MODELS CAPEHART 400N, 100N SERIES

FARNSWORTH TELEV. & RADIO CORP.

MODELS PANAMUSE 19N3, 21N2, 25N2, 26N2

SECTION 1

RECEIVER FREQUENCIES

Broadcast Band	540 to 1600 K.C.
Short-Wave Band	9.4 to 15.4 M.C.
Frequency Modulation Band	88 to 108 M.C.
Intermediate Frequency—AM Bands	455 K.C.
FM Band	10.7 M.C.

TUBE COMPLEMENT

Application	Type		Type	Application
FM RF Amp.	6AG5		6SK7	3rd FM IF Amp
FM Converter	6AG5	TUNER	6H6	FM 2nd Detector
FM Oscillator	6C4	(100N and 400N	6SK7	1st AM IF Amp.
AM RF Amp.	6SK7	Models)	6SK7	2nd AM IF Amp.
AM Converter	6SA7		6H6	AM 2nd Detector
AM Oscillator	6J5	Total 15	6SN7	Audio Amplifier
1st FM IF Amp.	6SK7		6J7	Phono Preamplifier
2nd FM IF Amp.	6SK7			

N-1 AMPLIFIER (400N Models)						N-2 AMPLIFIER (100N Models)
	1	6J5	Audio Amplifier	6J5	1	
	1	6J5	Inverter	6J5	1	
	2	6J5	Drivers	6J5	2	
	4	2A3	Power Output	6L6G	2	
	2	5U4G	Rectifiers	5U4G	2	
	1	5Y3	Bias Rectifier		—	
	11		Total		8	

AMPLIFIER

30 Watts	Undistorted	Power Output 18 Watts
4 Ohms	Voice Coil	Impedance 8 Ohms
	Frequency	Response

Linear from 50 to 12000 C.P.S.

RECORD CHANGER

Type	41E
Speed	78 RPM
Record Capacity	16 10" or 12" Records
Phonograph Pickup	Capehart "True Timbre"

POWER AND VOLTAGE REQUIREMENTS

Power Consumption—245 Watts at 117 Volts, 60 Cycles

Voltage—105-125 Volts at 60 Cycles per Second

50 Cycle Operation With Modification

FARNSWORTH TELEV. & RADIO CORP.

MODELS 19N3
21N2, 25N2,
26N2

RECEIVER FREQUENCIES

Broadcast Band	540 to 1600 K.C.
Short-Wave Band	9.4 to 15.4 M.C.
Frequency Modulation Band	88 to 108 M.C.
Intermediate Frequency—AM Bands	455 K.C.
FM Band	10.7 M.C.

TUBE COMPLEMENT

TUNER

Application	Type
FM RF Amp.	6AG5
FM Converter	6AG5
FM Oscillator	6C4
AM RF Amp.	6SK7
AM Converter	6SA7
AM Oscillator	6J5
1st FM IF Amp.	6SK7
2nd FM IF Amp.	6SK7
3rd FM IF Amp.	6SK7
FM 2nd Detector	6H6
1st AM IF Amp.	6SK7
2nd AM IF Amp.	6SK7
AM 2nd Detector	6H6
Audio Amplifier	6SN7
Phono Preamplifier	6J7

AMPLIFIER

Application	Type
Audio Amplifier	6J5
Inverter	6J5
Drivers	(2) 6J5
Power Output	(2) 6V6G
Rectifier	5V4G

Total 22 Tubes

AMPLIFIER SPEAKER SYSTEM

Undistorted Power Output	12 Watts
Voice Coil Impedance	8 Ohms
Uniform Frequency Response	50 to 12000 C.P.S.

AUTOMATIC RECORD CHANGER

Type	P-63
Speed	78 RPM
Record Capacity	10 12" or 12 10" Records
Phonograph Pickup	Capehart "True Timbre"

POWER AND VOLTAGE REQUIREMENTS

Power Consumption—195 Watts at 117 Volts, 60 Cycles

Voltage—105-125 Volts at 60 Cycles per Second

50 Cycle Operation With Modification

RECORD CHANGER: Farnsworth Model Capehart P(

MODELS CAPEHART, FARNSWORTH TELEV. & RADIO CORP.
PANAMUSE N SERIES

GENERAL DESCRIPTION

SECTION 2

This Maintenance Manual is intended to assist the serviceman in understanding and adjusting for proper operation of the Capehart, Panamuse ... N series instruments. No attempt has been made toward a theoretical analysis of the various electrical and mechanical functional parts, for it is assumed that none but qualified technicians shall attempt adjustments.

An entirely new instrument, in most respects, is this first post-war product of Capehart. Cabinets remain the authentic styling that was offered pre-war and basic principles of the 16-E changer are yet unique but otherwise, little semblance is seen to the previous De-Luxe Capehart. This change has been brought about largely by new standards of dependability and excellence, particularly as concerns the tuner-amplifier-speaker combination, established in the many military applications of communications equipment.

In specifically enumerating these outstanding features and advancements, the several portions of the instrument shall be considered individually.

SECTION 3

THE RADIO TUNER

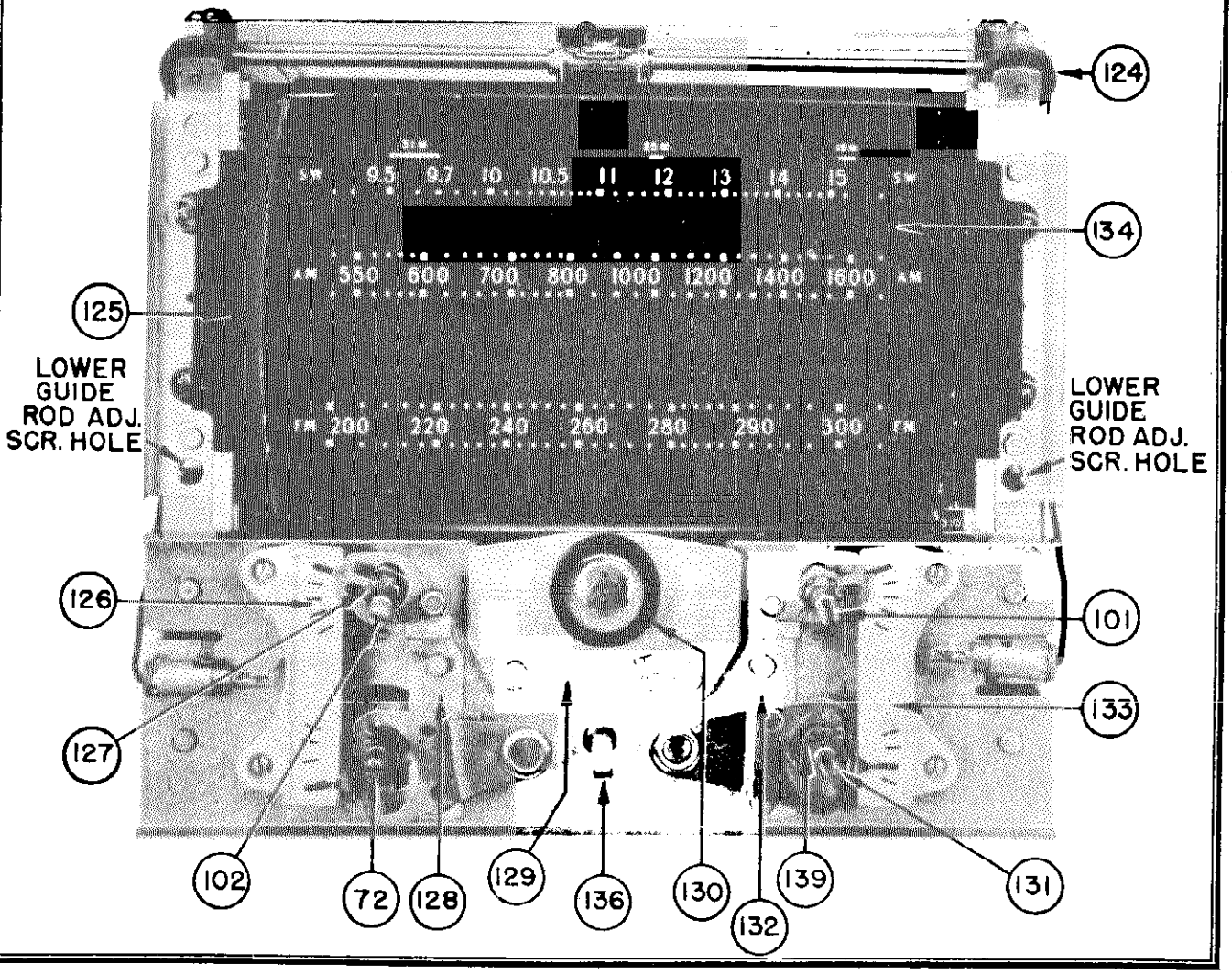
Those servicemen who dealt with the war-time application of communications equipment will readily recognize "the military" in the radio tuner. Paint over the cadmium chassis plating, bathtub-type oil-filled condensers, strip-mounting of small parts and extensive cabling are all new innovations which were basic to the armed forces' equipment. Other features also contribute to make this chassis, we believe, electrically and mechanically a masterworks:

A. Completely separate FM-AM circuits up to entry into the audio system, leading to maximum efficiency in each circuit.

B. Copper FM tuning condenser plates, rubber-mounting of R-F assembly reduce microphonics.

C. R-F sub-assembly at the rear of chassis, easily removable for service.

D. Miniature tubes are employed in the FM R-F section for optimum performance in the 100 mc. range of FM.



E. Negligible thermal effects in high frequency circuits. Low-drift ceramic condensers, temperature-compensation condensers, silver-plated invar wire to form the oscillator coil and polystyrene coil forms all contribute to frequency stability.

F. Adjustments for accurate tracking calibration. Adjustments are made to inductance, as well as capacity of tracking circuits—a feature usually to be had only in high-grade communications-type equipment.

G. Separate AM antenna coil and selector switch for use of either a loop or an external antenna.

H. Slug-tuned IF transformers and large capacity across tube input afford a high degree of stability. Changing of tubes and the "Miller effect" (a change of tuning under varying AVC potential) produce no detuning.

I. Quarter-wave resonant lines for FM RF circuit elements, accomplish image rejection of 100 decibels—a phenomenally high figure.

J. Cathode degeneration in IF stages enhances stability.

K. Ratio FM detector discriminates against AM (noise), particularly at low signal levels where the discriminator-limiter combination fail. Increased output also allows less gain in IF amplifier, effecting greater stability.

L. No critical wire placement. Detuning is practically impossible as a result of wire misplacement.

M. Improved tuning-eye circuit, showing proper tuning of FM, as well as AM.

N. Low impedance output stage. A cathode-follower provides an output of less than 500 ohms impedance. High frequencies are therefore not attenuated in the inter-chassis connecting line.

O. Reduced potential on those pilot lamps which necessitate chassis-removal for replacement. Lamp life-expectancy in excess of 10,000 hours--probably the life of the instrument.

P. Travel-light dial. By optically projecting a line of light upon the glass face, parallax is wholly eliminated. Positive band-indication is also thereby had.

These enumerate but major features of the tuner. Others, such as separate decoupling R-C networks for each stage, separate bass and treble controls, FM calibration to the new FCC channel assignments are apparant from inspection of the set and schematic. Neither esthetic appeal nor electrical efficiency have been neglected or compromised.

SECTION 4 AUDIO AMPLIFIERS

A portion of the audio system is incorporated in the tuner chassis. This is a 6SN7 tube, one section of which serves as an amplifier, the second section being used as a cathode-follower for low-impedance output. In addition, a 6J7 (triode-connected) gives added amplification in the "phono" position only.

Outstanding features of the amplifier chassis are:

A. *N-1 amplifier:* Individual output tube bias and hum-bucking adjustment. *N-2 amplifier:* Inverse feedback affords low distortion at high power levels.

N-1 and N-2 amplifiers:

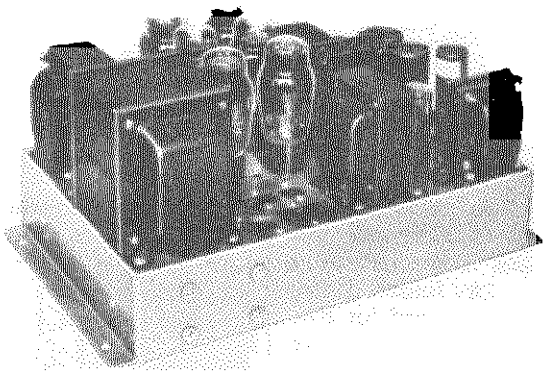
B. Very low inter-modulation distortion. Compensation of deficiencies in one amplifie stage may be made in another stage. Such a prac tice however, gives rise to intermodulation or "cross talk," resulting in the production of new and ur wanted frequencies. This effect, often overlooke in amplifier design, has here been given particula attention, such distortion being held to less tha one-half of one per cent.

C. Frequency response uniform from 50 cycle to 12,000 cycles per record.

D. Gain control in amplifier permits any "refe ence level" setting of the tuner-chassis contro

E. Auxiliary input provides for the use of wi recorder or other signal source.

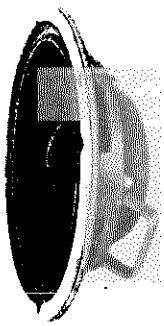
F. Fuses in both primary of transformer an output of rectifier, affording complete transforme rectifier protection.



G. Resistor in —B lead to avoid shock. T prevent hum pickup in the power cable, groundir between the two chassis is made through the aud cable. Should this cable be removed, there r mains 33 ohms between chassis, maintaining co tinuity and preventing high electrical potential b tween chassis.

SECTION 5 SPEAKERS

400N Series Instruments. The single speake in the 400N Series instruments results from military-sponsored design to produce the finest of sound-reproducing units. This speaker, exclusively used for home-reproduction in The Capehart, is in reality a 2-cone unit for high-fidelity response to both high and low frequencies. Both cones are driven by a 4-inch voice coil of 4 ohms impedance, a helix of spirally-wound copper ribbon, operating in the intense magnetic field produced by 5 pounds of alnico metal. Its power capacity is in excess of the thirty watts delivered b the N-1 amplifier.



For proper frequency response, the speaker mus be contained within a full enclosure of volume no less than 2½ nor more than 4 cubic feet, havin firmly attached a lining of suitable absorbent ma terial such as hair-felt.

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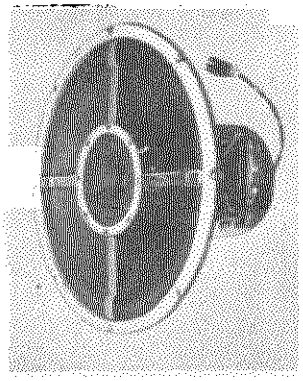
PANAMUSE N SERIES

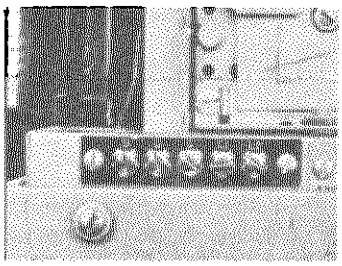
N Series Instruments. Although but a single mounting is required for the reproducing unit of the 100-Series instrument, it consists of 2 speakers coaxially-mounted. One, with 15-inch cone, is responsive to low frequencies while the other, a 5-inch unit, acts as high-frequency reproducer. Both are field-excited by heavy alnico permanent magnets. Such a "woofer-tweeter" combination has long been accepted in high-fidelity sound reproduction since but a single cone is incapable of proper response to both low and high-frequency electrical impulses.



The combined voice-coil impedance of the 2 units is 8 ohms.

SECTION 7 ANTENNAS

Capehart N-series instruments incoprorate 2 internal antennas; a loop antenna used in broadcast-band reception only and a folded-dipole antenna used for FM reception. The latter is also, as a straight-wire antenna, employed in short-wave reception, and, if desired, in broadcast reception. This latter function is accomplished by a switch at the rear of the chassis.



These internal antennas are intended for use only in the presence of adequate field strength, as in large metropolitan areas where local stations supply the majority of desired programs. Neither a loop nor a dipole element which is within the confines of the cabinet can be considered as efficient signal pickup devices and, should field strength requirements be not fulfilled, it will be necessary, for satisfactory reception, to install an efficient outside folded dipole antenna which feeds the receiver through a 300 ohm transmission line.

Both the loop and the dipole (internal or external) antennas exhibit certain characteristics of directivity, with which the experienced serviceman is familiar, which should be borne in mind when locating the receiver (or external antenna) in the home. Slight orientation of the receiver may effect more satisfactory reception of desired weak signals.

An external folded-dipole antenna will, of course, afford optimum signal pickup on FM or short-wave AM and, when the rear-chassis switch is at the "antenna" position, it will provide a good external "flat-top" for broadcast-band reception.

The internal loop antenna connects to terminals L1, L2 of the rear-chassis terminal strip; the internal or external folded-dipole antenna connects to terminals D, D on the same strip—both without regard to polarity. Terminal "G" is the connection to an earth ground.

SECTION 8

SETTING UP FOR OPERATION

We cannot overemphasize the necessity for more than a perfunctory check of the instrument prior to demonstration on the dealer's floor or to installation in the home. Improperly installed or improperly operating when installed, extra service costs and customer dissatisfaction rise rapidly, overshadowing the short added time necessary to a thorough checking routine. At least the following items should be covered and if you are thorough in your work, you undoubtedly will make additions to the list.

SUGGESTED INSPECTION ROUTINE FOR THE CAPEHART INSTRUMENTS

1. Unpacking. Carefully remove the instrument from its shipping case.

2. Inspect condition of cabinet. Packing case should be scrutinized. If panel is broken, look for concealed damage—if cabinet is damaged by rough handling in transit, concealed damaged claim should be filed with the "carrier."

3. See that all shipping tie-downs are removed from back of magazine, reverse-arm guide, tone-changer-arm and swing lever and that the cardboard block is removed from under the reverse arm lock. It is important that the reverse-arm lock be checked to see that it is not caught behind the stop, which would cause the changer to jam when started. To release such a jam, remove screws 55010 (see 41-E changer instruction manual). Set selector lever in one side position and run through 1 cycle. Although changer is shipped in 1 side position to prevent jam, main cam switch 57155 (see 41-E manual) may shift in transit, resulting in a jam.

4. The record changer must be free-floating and all 4 cushion supports in proper position. If changer is not free-floating, its position should be shifted slightly until there is no tendency to touch against any part of the mounting frame.

5. Level the cabinet with adjustable glides which are contained in a separate bag attached to the inside of shipping case. This is important for proper automatic phonograph operation.

6. Check level of changer mechanism in cabinet.

7. Determine whether the power-line voltage and frequency agree with the electrical specifications on plate on rear of the instrument.

8. Read carefully operating instructions accompanying the instrument.

9. Place a phonograph record on the turntable. Place "on-off" switch on changer to "on" position. Set all controls; volume, bass, treble, in wide-open position for acoustic feedback test. RCA record No. 49196 is good for this purpose. This test will indicate any excessive noise or rumble. Shifting the changer to a free-floating position while this record is playing should clear up any rumble which may be present.

10. Operate volume, bass, and treble controls to observe proper action.

11. Check for reproduction quality. To do this, use a good record, of quality and type of reproduction with which you are familiar. Check record reproduction at both high and low volume levels.

12. Examine antenna connections. Check reception and calibration of radio tuner on all bands.

13. Observe action of the "Electric Eye" tube and position so that tuning segments are horizontal.

14. Tap tubes in tuner to locate any excessively microphonic tubes.

15. Affix station call letter tabs on the dial, following procedure in operating instructions. The knobs must be removed before the escutcheon can be replaced. The escutcheon is wrapped in the cardboard screwed to the inside of the cabinet near the base. After the escutcheon is attached, replace the knobs.

16. Effect a complete check of the record changer

17. Carefully clean cabinet to remove finger marks. A piece of cheesecloth folded into a pad and moistened with water to which a few drops of vinegar have been added is recommended. The use of furniture polish on Capehart cabinets is not recommended.

18. Instruct customer on all phases of operation of the machine. Personally place in the customer's hands the operation manual which accompanies the instrument.

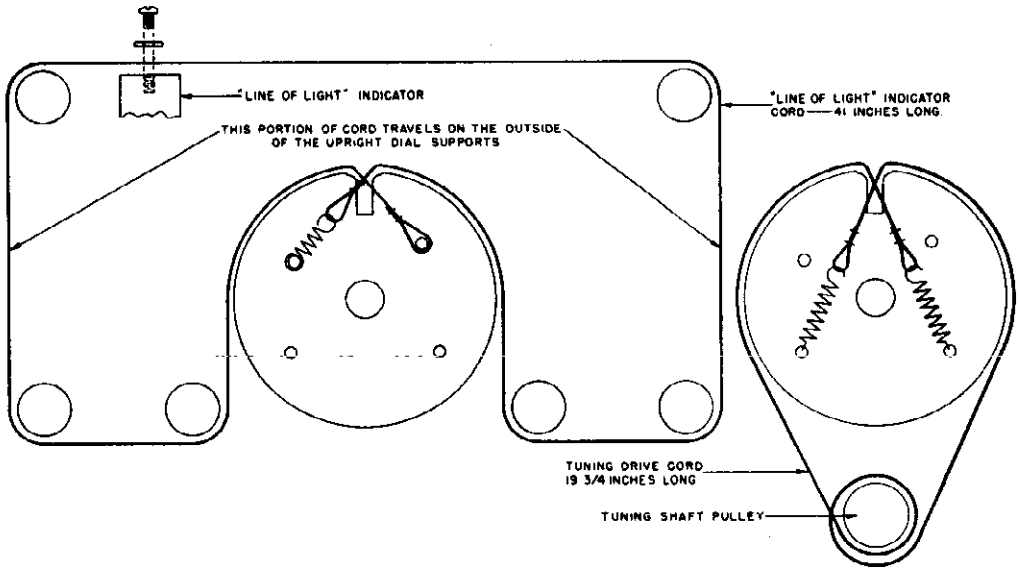
DRIVE CORD ASSEMBLIES

SECTION 9

The dial cord assemblies are 2 in number; the main drive cord which causes rotation of the drum, and a second cord which operates the traveling-light dial scale indicator. As an aid in stringin these cords, the schematics of both the vertical an horizontal type dials are shown below:

"LINE OF LIGHT" AND PULLEY STRINGING DIAGRAM
(REAR VIEW)
DIAL DRUM IS SHOWN IN THIS POSITION FOR CLARITY ONLY. AFTER BOTH DRIVE CORDS ARE INSTALLED, TURN TUNING KNOB COUNTER-CLOCKWISE UNTIL DRUM STRIKES STOP.

SET "LINE OF LIGHT" INDICATOR ON MARKS ON EXTREME LEFT END OF DIAL GLASS, TURN VARIABLE CONDENSER TO FULL MESH POSITION AND TIGHTEN SET SCREWS IN FLEXIBLE COUPLING.



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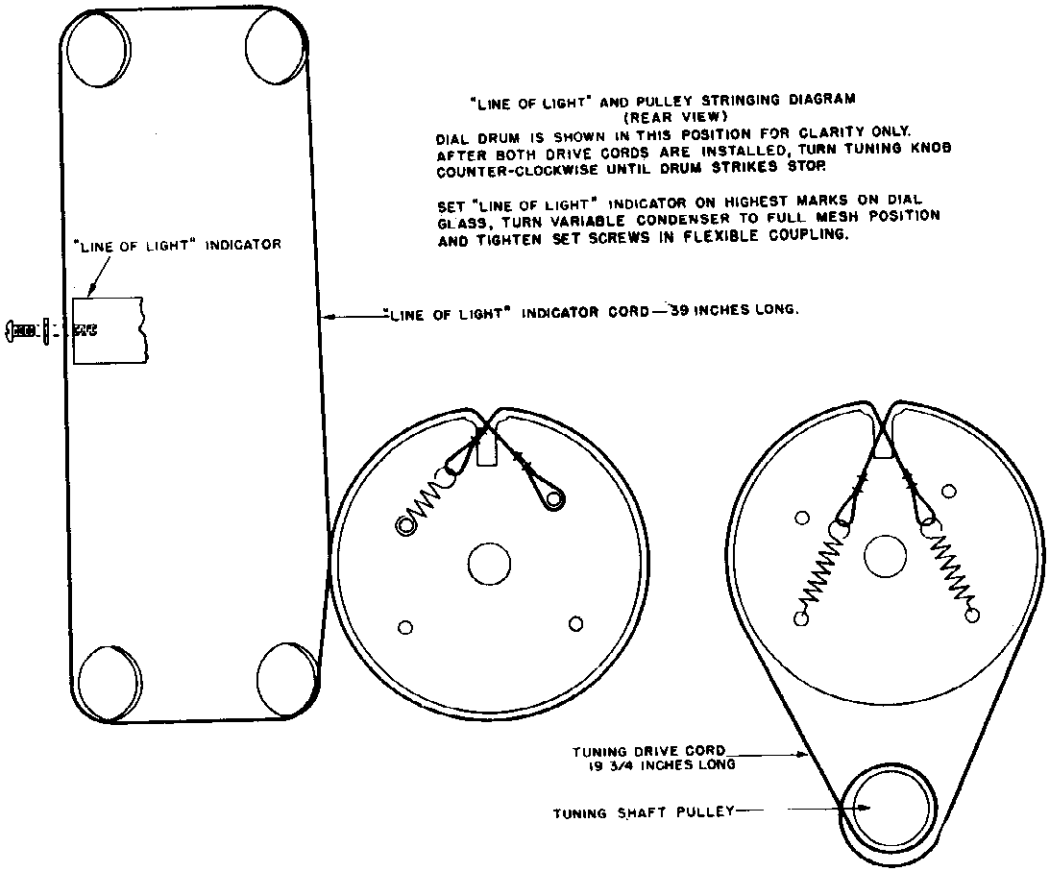
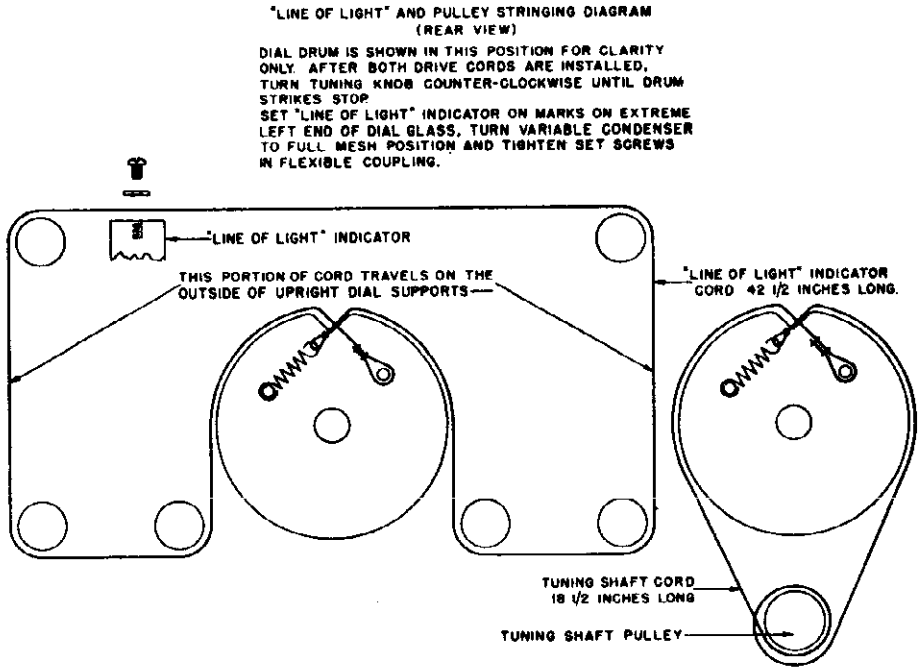


MODELS
19N3 25N2
21N2 26N2

Drive cord assembly, current-production instruments



Drive cord assembly, earlier-production instruments, spring at one end of the cord

FARNSWORTH TELEV. & RADIO CORP. MODELS CAPEHART, PANAMUSE N SERIES

RECEIVER ALIGNMENT

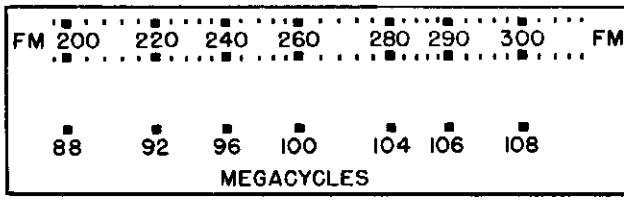
SECTION 10

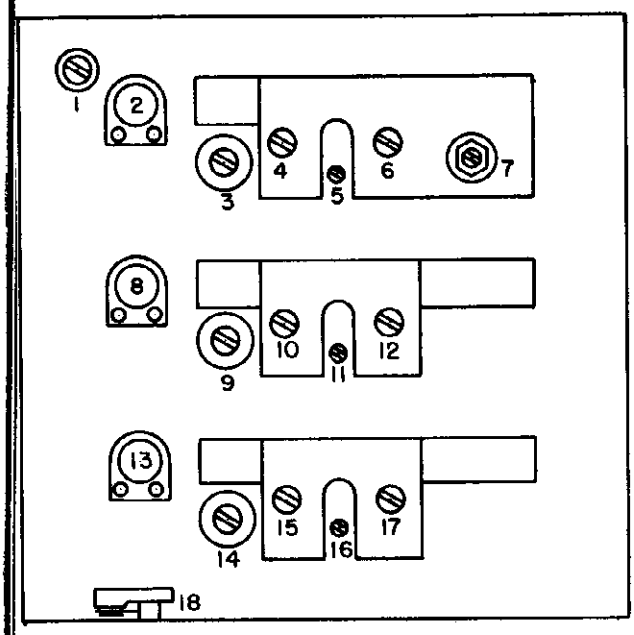
Herewith are presented two methods of alignment of the Capehart receivers. Those service shops possessing a suitable sweep generator and oscillograph will effect considerable saving of time, as well as assuring more precise alignment, by using the first method, Section 1.00 through Section 7.08. This method is employed in factory alignment.

An alternative method, using the amplitude-modulated signal generator, is presented in the second portion of the papers which covers alignment of the FM-IF stages (Section 10.00 through Section 13.00) and of the AM portion of receiver (the chart showing Steps 1-22 which should be followed in sequence).

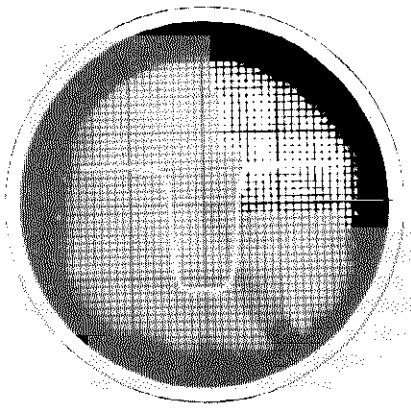
By following these detailed procedures, the original factory alignment of the receiver may be duplicated.

The conversion of FM dial scale readings to frequency may be made from the following analysis: The FM band extends from 88 to 108 mc., each station channel 200 kc. in width. Channel 201, that lowest in frequency, has center frequency at 88.1 mc. Each succeeding channel is successively 200 kc. higher, so channel 202 is centered at 88.3 (200 kc. higher), channel 203 is centered at 88.5 mc., 206 at 89.1 mc., etc.

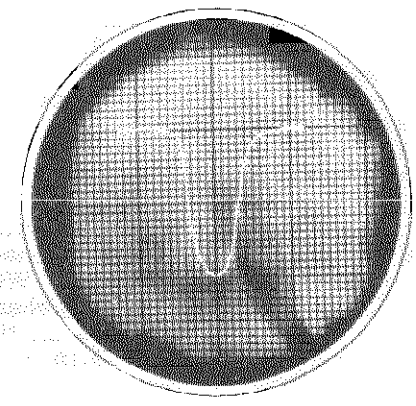




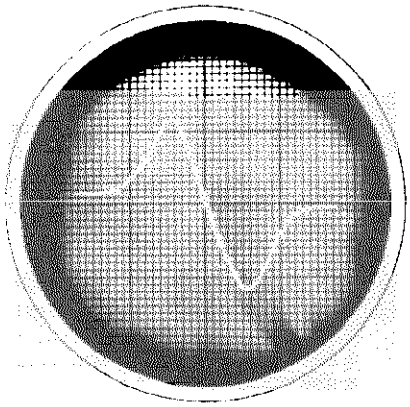
1. FM oscillator padder
2. FM oscillator trimmer
3. SW oscillator padder
4. SW oscillator trimmer
5. BC oscillator inductance slug (do not adjust in alignment procedure)
6. BC oscillator trimmer
7. BC oscillator padder
8. FM mixer trimmer
9. SW mixer inductance slug
10. SW mixer trimmer
11. BC mixer inductance slug
12. BC mixer trimmer
13. FM R-F trimmer
14. SW R-F inductance slug
15. SW R-F trimmer
16. BC R-F inductance slug
17. BC R-F trimmer
18. Loop antenna peaking condenser



Normal IF response curve



IF response curve, resistance loading



Alignment of the discriminator

MODELS CAPEHART, FARNSWORTH TELEV. & RADIO CORP.
PANAMUSE N SERIES

ALIGNMENT OF THE RECEIVER, SWEEP GENERATOR METHOD

1.00 GENERAL INSTRUCTIONS

1.01 *Adjustments of Dial Pointer*

a. Tune receiver to extreme low frequency end of dial and set pointer to index at the last calibration mark.

b. Carefully determine that the gang condenser plates are completely meshed with the pointer in this position.

WARNING: This adjustment is extremely important if subsequent alignment is to provide accurate calibration.

c. With the pointer at the extreme low end of the range, rotate band switch through all positions and note that the pointer line is accurately indexed on all three bands, and that the pointer is illuminated for the proper band in respect to the position of the band switch.

Note: The pointer remains dark when the band switch is in the phonograph position.

d. Tune the dial across the entire range and observe that the pointer line is a single sharply defined line of uniform brilliance. If this is not obtained, it indicates that mechanical adjustment of the spacing of the light box from the dial glass is necessary. Do not proceed with alignment until all mechanical adjustments have been made.

1.02 TUNING EYE BALANCE ADJUSTMENT

Remove last FM IF tube from its socket. Turn band switch to FM position, and adjust tuning eye balance control (located on top of the chassis between the 6H6 discriminator tube and discriminator transformer) for balance of the 2 sections of the eye. No further adjustment of this control is necessary or should be attempted. The IF tube is then replaced. If, after alignment has been completed the tuning eye does not assume this same degree of balance, it is an indication the FM IF alignment is incorrect and should be reworked. This observation must be made with no signal input to receiver. After electrical balance has been obtained, the tuning eye must be rotated in its mounting such that the 2 wedge shaped dark areas will be in horizontal alignment to the chassis.

1.03 SETTING OF RECEIVER CONTROLS

Unless otherwise indicated, the receiver controls shall be set as follows during all alignment operations:

a. Set treble tone control to maximum treble position (pointer up).

b. Set bass tone control to maximum bass position (pointer up).

c. Set volume control to maximum.

1.04 TEST SIGNAL CONDITIONS

All alignment shall be done with only sufficient signal amplitude to provide satisfactory, signal to noise ratio, and acceptable pattern size on oscilloscope or readable output on output meter. *The use of excessively strong signal is almost certain to produce misalignment.*

2.00 *Equipment Required*

2.01 455 KC IF sweep generator.

2.02 10.7 MC IF sweep generator.

2.03 5" cathode ray oscilloscope.

2.04 RF signal generator, range 400 KC to 18 MC.

2.05 RF signal generator (frequency modulation desirable). Range 88 to 108 MC.

2.06 Output meter.

2.07 Insulated screw driver.

2.08 Voltohmyst.

3.00 FM IF ALIGNMENT

3.01 Equipment required: From Section 2.00 use items numbers 2.02, 2.03, and 2.08.

3.02 Set band switch in FM position and other controls as in Section 1.03.

3.03 Make connection from vertical deflection amplifier of oscilloscope to pin #3 of 6H6 discriminator tube. Make certain that the 4 MFD electrolytic condenser is disconnected from this same circuit. It is necessary that the lead to the oscilloscope be shielded, of low total capacity, and connection to receiver isolated by means of a 1 meg. resistor.

3.04 Connect sweep generator to last FM IF grid (Pin 4) through a .1 MFD coupling capacitor.

3.05 Align discriminator to obtain a picture similar to an over coupled IF transformer.

3.06 Place 10K resistor across primary of discriminator transformer and retouch alignment to obtain symmetrical pattern. It will be noted that the pattern is now single peaked but rather broad. This does NOT constitute a final alignment of discriminator, but is a convenient expedient to assist in the alignment of the IF stages.

3.07 Shift connection of sweep signal generator the grid of the second FM IF tube (Pin 4).

3.08 Align third FM IF transformer for a symmetrical flat top pattern.

3.09 Shift signal generator to the grid of the first IF tube (Pin 4).

3.10 Align second IF transformer in same manner as described in Section 3.07. NOTE: The width of the nose of the curve is the same as before, but the sides have become steeper.

3.11 Connect the signal generator to the grid of the converter tube grid (Pin 1) in series with 10,000 ohm resistor and a .1 MFD capacitor, or loosely couple by stray capacity of an insulated wire.

3.12 Align first FM IF transformer in the same manner as in Section 3.07. NOTE: The sides of the curve have further steepened, but that the nose of the curve has retained approximately the same width.

3.13 Remove load resistor from primary of discriminator transformer and connect 4 MFD electrolytic capacitor that was previously disconnected.

3.14 Connect oscilloscope to audio output terminal of the discriminator. There are several points where this contact can be made and can be identified as the circuit connected to the terminal of the discriminator transformer to which a shielded lead is connected.

3.15 With sweep signal input to converter grid, (Pin 1) align discriminator transformer for conventional discriminator pattern.

3.16 Connect signal generator to converter tube grid (Pin 1) in series with a 10,000 ohm resistor and a .1 MFD condenser capacitor. A signal input of 4,000 uV at 10.7 MC shall develop 3 volts AVC as measured with a voltohmyst.

4.00 FM RF ALIGNMENT

4.01 Equipment required: From Section 2.00 use items 2.05, 2.06, 2.07, and 2.08.

4.02 Connect RF signal generator in series with 400 ohm carbon or metalited resistor to terminal "D" of RF unit nearest the side of the tuner (extreme left hand terminal viewing rear of chassis).

4.03 Set tuning control for pointer to calibrate at the equivalent of half way between channels 300 and 301.

4.04 Apply 108 MC signal.

4.05 Set converter and antenna trimmers at minimum capacity.

4.06 Adjust oscillator trimmer by tuning from maximum capacity to first signal that is heard, and peak for maximum output.

4.07 Adjust antenna and converter trimmers from maximum output.

4.08 Set tuning controls so dial pointer calibrates at the equivalent of half way between channels 200 and 201.

4.09 Apply 88 MC signal.

4.10 Adjust oscillator slug to maximum output.

4.11 Repeat operations 4.03 to 4.10 inclusive.

NOTE: The degree of adjustment required in the tuning of the oscillator slug will determine the number of times operations 4.03 to 4.10 must be repeated until no further gain in sensitivity is obtained.

4.12 Carefully tune across the entire FM band for the observance of dead or weak spots that may be a function of improper alignment or defective compoents. This can be determined by carefully noting the degree of receiver noise, that is, high noise generally is accompanied by good sensitivity.

4.13 Signal input of 18 uV should produce approximately 3 volts AVC as measured with a voltohmyst.

4.14 With no signal input to antenna the tuning eye should have the same balanced appearance as it had following operation 1.02. If this is not the case, it usually indicates inaccurate alignment of IF system.

5.00 AM IF ALIGNMENT

5.01 Equipment required: From Section 2.00 use items 2.01, 2.03, and 2.08.

5.02 Set band switch in broadcast position and other controls as in Section 1.03.

5.03 Connect oscilloscope to high potential side of volume control.

5.04 Connect 455 KC sweep generator to the grid of the second AM IF tube through a .1 MFD condenser.

5.05 Align diode transformer for symmetrical conventional IF pattern.

5.06 Connect signal generator to grid of first IF tube.

5.07 Align second IF transformer.

5.08 Connect signal generator to converter grid.

5.09 Align first IF transformer.

NOTE: The resulting overall pattern shall be symmetrical and slightly flat topped.

5.10 Signal input of 2700 uV should produce approximately 3 volts AVC as measured with a voltohmyst.

6.00 BROADCAST BAND RF ALIGNMENT

6.01 Equipment required: From Section 2.00 use items 2.04, 2.06, 2.07, and 2.08.

6.02 Place antenna loop switch in antenna position.

6.03 Connect RF signal generator to either terminal "D" through 200 MF mica capacitor.

6.04 Set dial pointer to 1500 KC.

6.05 With 1500 KC signal align oscillator, converter, and antenna trimmers for maximum output.

6.06 Set dial pointer at 600 KC.

6.07 Align oscillator padder, converter and antenna slugs for maximum output. Do not adjust the coil slug in broadcast oscillator coil.

6.08 Repeat operations 6.04 to 6.07 inclusive until no further increase in sensitivity is obtained.

6.09 Check dial calibration at several frequencies. If calibration is not reasonably accurate it will be necessary to make an adjustment of the inductance slug.

WARNING: After any adjustment of the oscillator inductance slug it will be necessary to repeat operations 6.04 to 6.07 inclusive.

6.10 Signal input of 35 uV at 1000 KC should produce approximately 3 volts AVC as measured with a voltohmyst.

6.11 Switch antenna loop switch to loop position.

6.12 Connect dummy loop to terminal L-1 and L-2, and signal generator to antenna connection of dummy loop.

6.13 Set dial pointer to 1500 KC.

6.14 With 1500 KC signal align the loop trimmer for maximum output.

6.15 Check sensitivity at 600 and 1500 KC.

7.00 SHORT WAVE RF ALIGNMENT

7.01 Equipment required: From Section 2.00 use items 2.04, 2.06, 2.07, and 2.08.

7.02 Set band switch in short wave position and other controls as in Section 1.03.

7.03 Connect RF signal generator to either terminal "D" through a 400 ohm resistor.

7.04 Set dial pointer to 15 MC. Adjust oscillator, converter, and antenna trimmers for maximum output.

WARNING: On the short wave band the oscillator is operating on the low frequency side of the RF signal. Therefore, to avoid error in setting oscillator frequency, first set oscillator trimmer to maximum capacity, then slowly turn trimmer until first signal is heard.

7.05 Set dial pointer to 9.5 MC.

7.06 Adjust oscillator, converter, and antenna slugs for maximum output.

7.07 Repeat Sections 7.04 to 7.06 inclusive, until no further gain in sensitivity is obtained.

7.08 With signal input of 90 microvolts at 15 MC should produce approximately 3 volts AVC as measured with voltohmyst.

Upon completion of all alignment the oscillator padder should be sealed with a touch of glyptal on the adjustment screw and Ambroid or similar cement applied to all coil slugs to prevent their changing adjustment.

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PANAMUSE N SERIES

TABULATION FOR AM ALIGNMENT

10.00-10.04 Same as 1.00-1.04.

11.00 EQUIPMENT REQUIRED

11.01 Voltohmyst.

11.02 R.F signal generator range 450 KC to 108 mc.

11.03 Insulated screw-driver.

12.00 FM IF ALIGNMENT

12.01 Equipment required: From Section 11.00 use items numbers 11.01, 11.02, and 11.03.

12.02 Set bandswitch in FM position and other controls as in section 10.03.

12.03 Connect voltohmyst from ground to pin #3 on 6H6 ratio detector.

12.04 Connect signal generator in series with a .1 MFD capacitor between grid and ground of 3rd. FM IF tube (Pin 4) and set generator to 10.7.

12.05 Disconnect 4 mfd. condenser (1 lead is sufficienct from detector circuit and place 10,000 ohm resistor across primary of the fourth or discriminator transformer. Resistor shall be left connected until operation calling for its removal.

12.06 Tune secondary and primary slugs for maximum voltage.

12.07 Connect generator in series with a .1 mfd. capacitor to grid of 2nd FM IF tube.

12.08 Place a 2200 ohm resistor across secondary of 3rd FM IF transformer.

12.09 Tune primary slug for maximum voltage.

12.10 Remove 2200 ohm resistor from secondary (and place across primary of same transformer).

12.11 Tune secondary slug for maximum output.

12.12 Remove 2200 ohm resistor from primary of 3rd FM IF transformer and place across secondary of 2nd FM IF transformer.

12.13 Connect generator, in series with a .1 mfd. capacitor to grid of 1st FM IF tube.

12.14 Tune primary slug for maximum voltage.

12.15 Remove resistor from 2nd IF transformer secondary and place across primary.

12.16 Tune secondary for maximum voltage.

12.17 Connect generator to grid of FM converter tube through a 10,000 ohm resistor and .1 mfd. condenser in series or loosely couple to the grid by placing the generator lead near the grid lead.

12.18 Remove resistor from 2nd IF transformer primary and place it across secondary of 1st IF transformer.

12.19 Tune primary slug for maximum voltage.

12.20 Remove resistor from secondary and place it across the primary.

12.21 Tune secondary for maximum voltage.

12.22 Move voltmeter to audio output lead on 4th FM IF transformer. This is a shielded lead.

12.23 Remove the 10,000 ohm resistor from the discriminator primary that was installed in item 12.05. Tune secondary of 4th FM IF transformer for zero voltage. Slight returning of the primary may be necessary after the secondary is tuned.

12.24 Tuning of the primary is done by slightly detuning signal generator to obtain a readable output then tuning slug for maximum. This operation and that of 12.23 must be repeated several times to obtain final accurate alignment.

12.25 The FM IF system is now aligned. Detuning the signal generator equal amounts each side of 10.7 mc should produce equal deflections of opposite polarity on the voltmeter. If the deflections are not equal (+10% or less) the alignment is not correct and the discriminator requires re-alignment.

13.00 FM RF ALIGNMENT

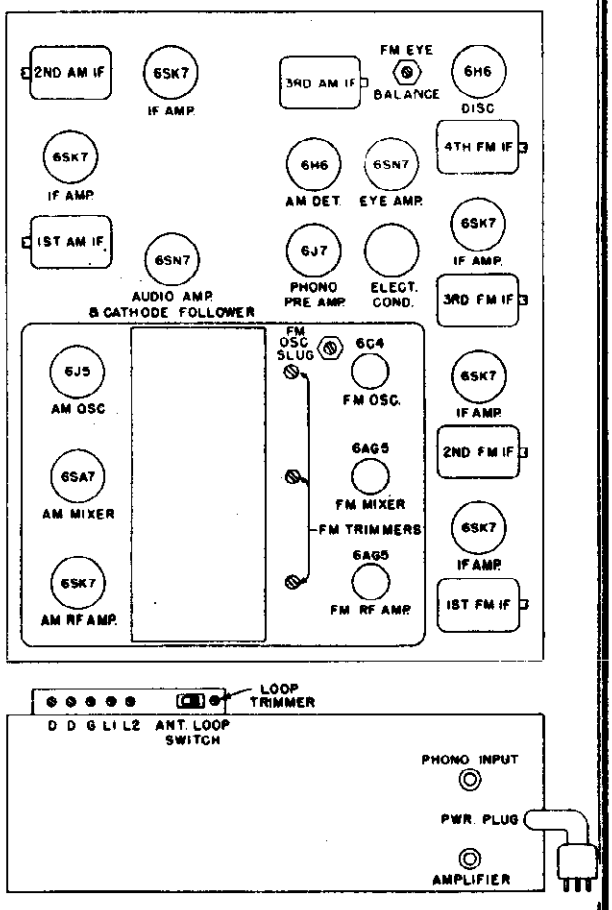
Follows exactly that given in sections 4.01 to 4.14.

14.00 ALIGNMENT OF THE A-M BANDS

Equipment required: Same as section 11.

CAUTION: Care must be taken when aligning the short wave band, for the adjustment of the shunt trimmer affects the adjustment of the oscillator coil slug.

At the high frequency end of the band it is possible to peak the oscillator trimmer, and to peak the slug at the low frequency end at the image; so in the alignment instructions we have indicated the fundamental frequency and the correct oscillator setting for the image so that by resetting the signal generator it is possible to see if the alignment is correctly made. In each case the image is found at a frequency 910 Kc. higher than the fundamental.



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TABULATION FOR AM ALIGNMENT

STEPS		CONNECT GENERATOR	SET GENERATOR AT	SET GANG AT	ADJUST AND SEE FIG.	TO OBTAIN
1			Set Tone and Volume Controls at Maximum			
2	Through .1 Mfd.	Grid 2nd IF tube	455 KC	Quiet Point	3rd IF Slugs	MAXIMUM OUTPUT
3		Grid 1st IF tube			2nd IF Slugs	
4		Grid Conv. tube			1st IF Slugs	
5		Place Antenna loop switch in Antenna Position				
6	Through 200 MMF Mica	Either "D" Terminal	1500 KC	1500 KC	BC Osc. Trimmer	
7					BC Ant. Trimmer	
8					BC RF Trimmer	
9			600 KC	600 KC	Osc. Padder	
10					Converter Slug	
11					Antenna Slug	
12		Check dial calibration at several frequencies. If not reasonably correct, adjust oscillator slug. See Note 1*.				
13		Connect dummy loop to terminals L1 and L2, then place Antenna Loop Switch in Loop Position.				
14		Antenna of dummy loop.	1500 KC	1500 KC	Loop Trimmer	
SHORT WAVE RF						
15		Place Ant-Loop switch in "Ant." position and Band Switch in Short Wave position.				
16	Through 400 ohm resistor	Either "D" Terminal	15 MC	15 MC Image At 14.09 MC	See Note 2 SW Osc. Trimmer	MAXIMUM OUTPUT
17					SW Conv. Trimmer	
18					SW Ant. Trimmer	
19			9.5 MC	9.5 MC Image At 8.59 MC	SW Osc. Slug	
20					SW Conv. Slug	
21					SW Ant. Slug	
22		Recheck Steps 16 to 21 inclusive.				

NOTE 1—After any adjustment of oscillator slug, repeat steps 6 to 11 inclusive.

NOTE 2—Set oscillator trimmer to maximum capacity, then slowly loosen trimmer until first signal is heard.

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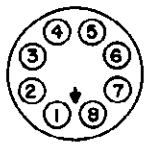
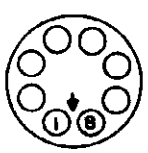
VOLTAGES AND RESISTANCES

Measurements taken from pins to chassis.

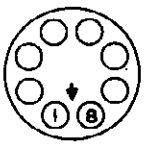
N TUNER



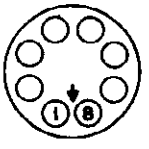
	VOLTAGE 1	RESISTANCE	VOLTAGE 2	RESISTANCE	VOLTAGE 3	RESISTANCE	VOLTAGE 4	RESISTANCE
1	0	0	0	0	0	0	0	0
2	6.3AC	.2	0	0	3.1AC	-.5	3.1AC	18
3	0	0	0	0	-.5	0	86	3.5MEG
4	-2.7	5MEG	.1	1MEG	0	0	86	4.5MEG
5	3.3	250	7	220	-.65	1M	86	5.5MEG
6	160	.5MEG	240	.5MEG	NC	NC	NC	NC
7	0	0	6.3 AC	2.2	3.1 AC	18	3.1AC	18
8	340	.5 MEG	350	.5MEG	0	0	0	0
						CAP -3		CAP 1.1 MEG



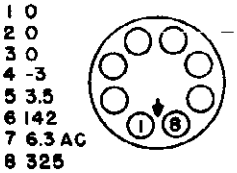
	VOLTAGE 5	RESISTANCE	VOLTAGE 6	RESISTANCE	VOLTAGE 7	RESISTANCE	VOLTAGE 8	RESISTANCE
1	48	.5MEG	0	0	0	0	0	0
2	340	.5MEG	0	0	6.3 AC	.2	0	0
3	60	10M	0	0	310	.5MEG	170	.5 MEG
4	0	1MEG	0	4MEG	130	.5 MEG	NC	NC
5	48	.5MEG	4.6	360	24	22M	24	22 M
6	1.8	1500	125	.5MEG	2.4	220	NC	NC
7	3.1AC	18	6.3 AC	.2	0	0	6.3AC	.2
8	3.1AC	18	310	.5MEG	-1.6	4 MEG	0	0



	FM VOLTAGE 9	RESISTANCE	AM VOLTAGE 9	RESISTANCE	FM VOLTAGE 10	RESISTANCE	AM VOLTAGE 10	RESISTANCE
1	9	470	-.8	2.5MEG	NC	NC	NC	NC
2	66	3.5MEG	26.5	3.5MEG	0	0	0	0
3	11.5	15M	0	0	49	2.7MEG	22	2.7 MEG
4	0	INF	-.8	2.5 MEG	66	3.5MEG	26.5	3.5 MEG
5	49	2.7MEG	22	2.7MEG	175	3.3MEG	185	3.3 MEG
6	6.9	∓	0	0	NC	NC	NC	NC
7	6.3AC	0	6.3 AC	0	6.3AC	.2	6.3 AC	.2
8	0	.2	0	0	0	0	0	0



	VOLTAGE 11	RESISTANCE	VOLTAGE 12	RESISTANCE	VOLTAGE 13	RESISTANCE	VOLTAGE 14	RESISTANCE
1	0	0	-1.8	1MEG	NC	NC	0	0
2	1.9	220	0	0	NC	NC	0	0
3	6.3AC	0	0	0	6.3AC	4	0	0
4	0	4	6.3AC	4	0	0	-3	2.4 MEG
5	300	.5MEG	320	.5MEG	190	.5MEG	3.7	290
6	130	.5MEG	85	.5MEG	-9.5	33M	135	.5 MEG
7	1.9	220	0	0	0	0	6.3AC	.4
8							325	



	VOLTAGE 15	RESISTANCE	VOLTAGE 16	RESISTANCE	VOLTAGE 17	RESISTANCE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	-.3	33M
4	-3	2.4MEG	0	0	0	INF
5	3.5	290	3	220	0	INF
6	142	.5MEG	105	.5MEG	NC	NC
7	6.3AC	.4	6.3AC	.4	6.3AC	.4
8	325	.5MEG	325	.5MEG	.3	33M

∓-DEPENDS ON EYE ALIGNMENT 0—10M.
DC VOLTS MEASURED WITH VACUUM TUBE VOLTMETER.
AC VOLTS MEASURED WITH METER HAVING 1000 OHMS PER VOLT.
AVC INOPERATIVE—3 VOLT BIAS SUBSTITUTED—NO SIGNAL.

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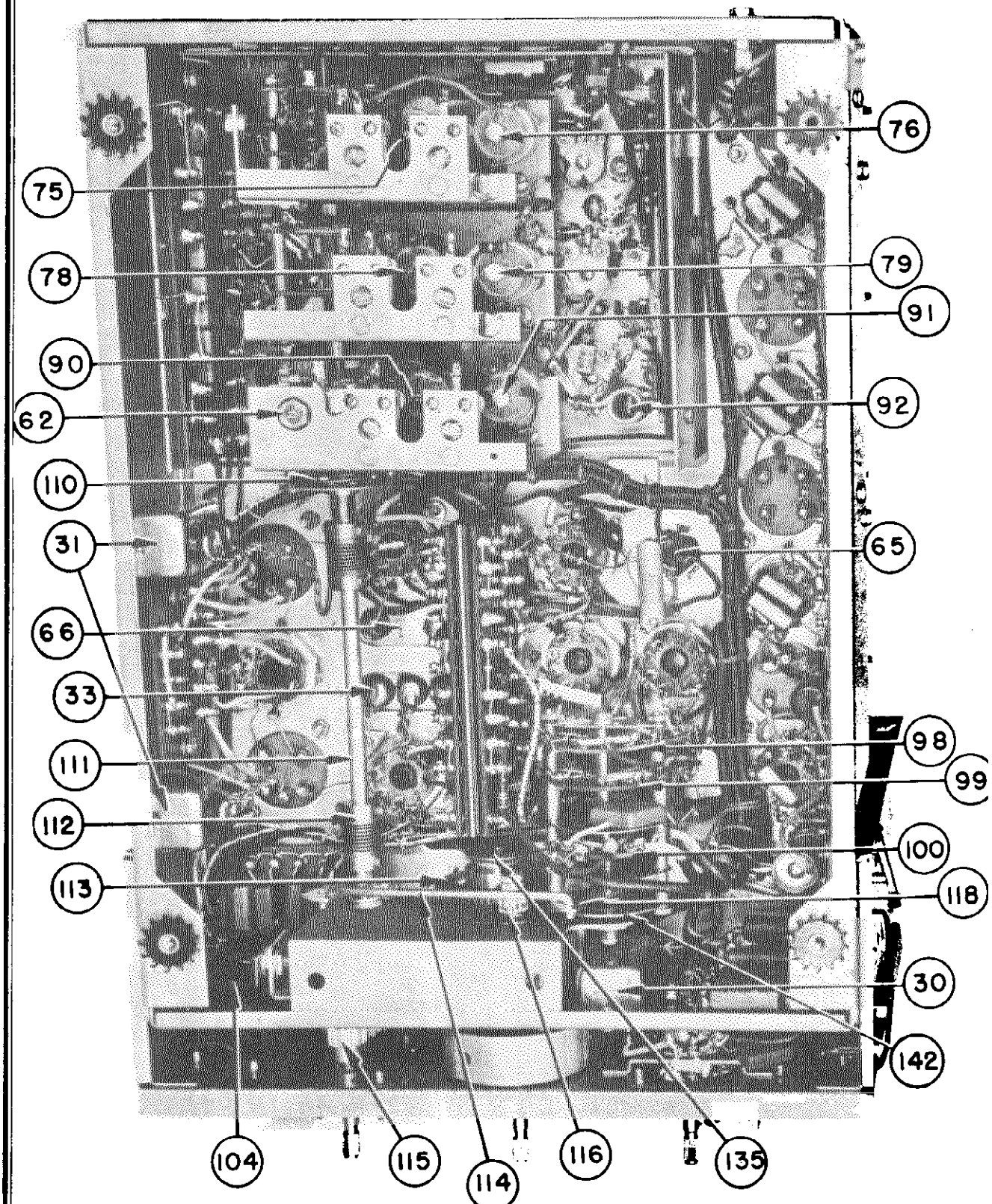
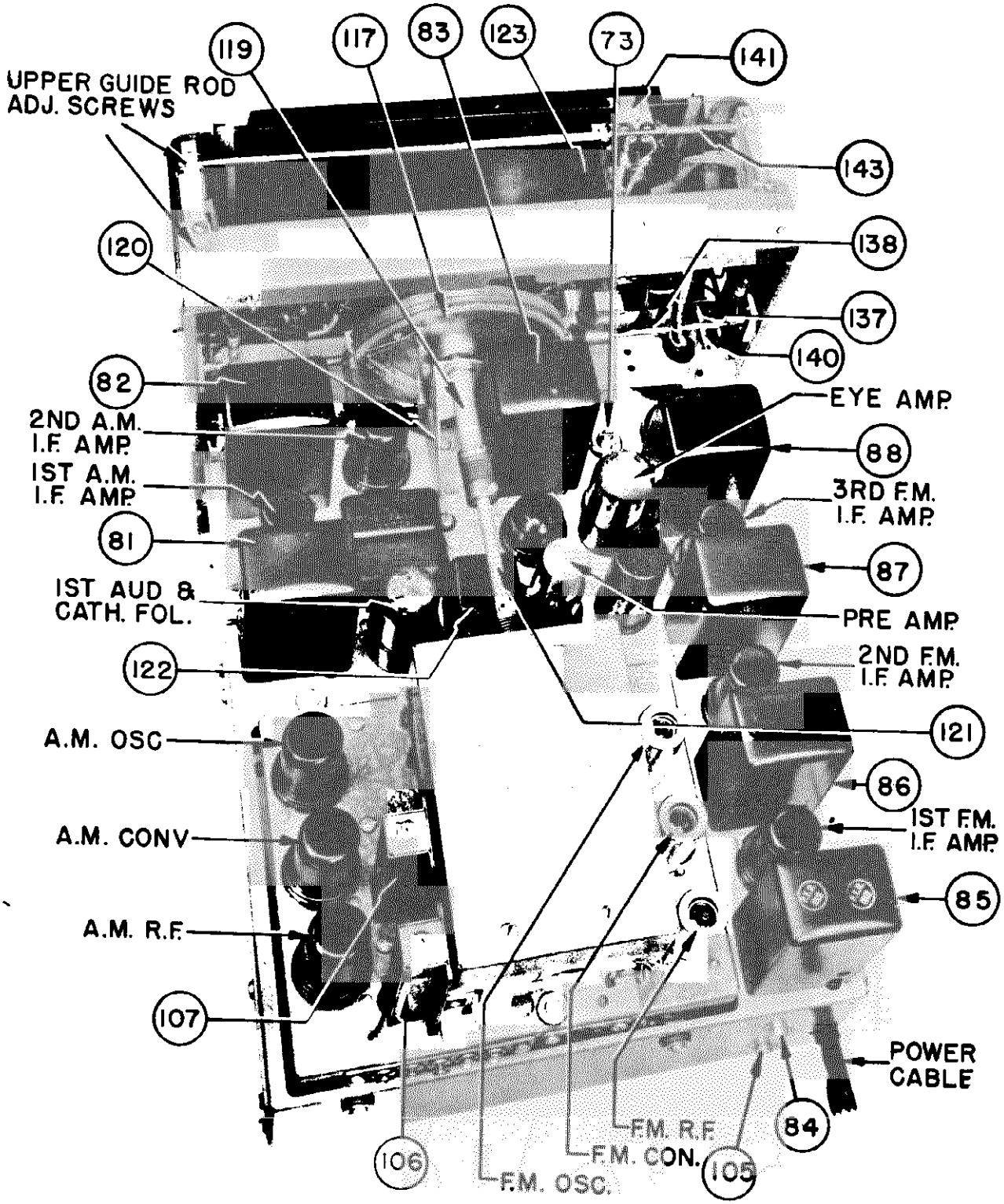


MODELS CAPEHART, PANAMUSE N SERIES

FARNSWORTH TELEV. & RADIO CORP.



MAINTENANCE OF THE TUNER

SECTION 11

This section of the Maintenance Manual is purposed, in part, to acquaint the service man with the chronological status of the tuner. The automobile industry effects certain minor modifications to their product from time to time. In like manner, circuit developments, the result of a continuous program of searching for means of improving the instrument, lead to the incorporation of modifications as enumerated below.

In addition, herein are presented the solutions to maintenance problems which the service man may encounter, which solutions will assist him in the efficient servicing of the N-series tuner. The material is listed by subject headings which will quickly permit access to the information:

1. Capehart N-series tuner code markings.
2. High hum level.
3. Tone reproduction
   a. Increasing the high frequency response.
   b. Increasing the bass response.
   c. Increasing the range of the treble control.
   d. Tone reproduction—model 413N and NC
3. Tone reproduction—general.
   a. Increasing the high frequency response.
   b. Increasing the bass response.
   c. Increasing the range of the treble control.
   d. Tone reproduction—model 413N and NC instruments.
4. Dial drive adjustments.
5. Control knobs; eccentric, loose, how to remove.
6. Dial-glass plate.
7. Microphonics.

1. CAPEHART N SERIES TUNER CODE MARKINGS

Certain "N" series receivers are coded by "circle markings" to indicate electrical circuit modifications. These markings are located on top of the first FM IF transformer (BLACK PAINTED CAN ON REAR OF CHASSIS TO THE EXTREME RIGHT WHEN VIEWING REAR OF CHASSIS) and are in the form of red circles approximately one-half inch in diameter enclosing the initials F.T.R. and tester's number.

Following is a listing of the significance of these markings, whereby you may identify any chassis:

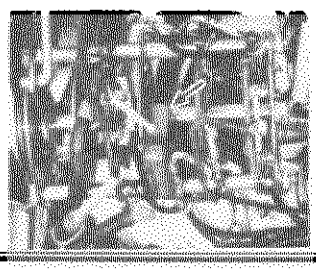
A. NO CODE MARKS

These tuners do not incorporate any of the modifications which are below-listed.

B. ONE CIRCLE

Indicates the change to a modified discriminator transformer in production which increases sensitivity and noise reduction.

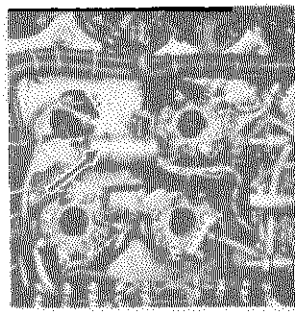
(a) *De-Emphasis Condenser*



For tuners coming under classifications (A) and (B) above, we recommend the addition of a .001 mfd. de-emphasis condenser. In FM transmission, the high modulation frequencies are pre-emphasized (their amplitude made greater). Heretofore, non-uniformity between stations caused some to evidence, in the receiver, apparent distortion—too much high-frequency response. Now, with greater uniformity in pre-emphasis, we can arrive at a more suitable overall amount of de-emphasis.

The de-emphasis condenser should be connected from the band switch side of the 47,000 ohm resistor which connects from the output of the discriminator to the auxiliary band switch, being mounted on the front wafer of the auxiliary band switch. Connection is made from the above-mentioned point to ground.

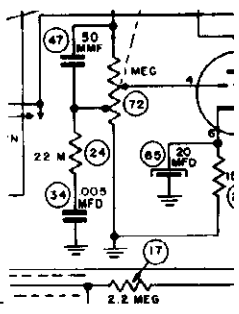
(b) *Tuning Eye Time Constant*



The action of the "eye" may be slowed-down by a longer time constant in its control circuit. This is accomplished by substituting a .1 mfd. condenser for the .01 mfd. unit connecting from pin # 4 of the eye amplifier to ground. A 200 volt condenser is satisfactory.

(a) and (b) are not essential unless the customer desires a change but if the tuner is being serviced, it is suggested that these easily-performed modifications be made.

C. TWO OR THREE CIRCLES



(a) These chassis may have resistor-capacitor values, from volume control tap to ground, of 220,000 ohms and .003 mfd., in which case the bass-boosting effects (at low volume levels) of the tap are not great. A .005 condenser and 22,000 ohm resistor will increase the bass-boost effects.

(b) These circles also indicate a change in the connection of the 50 mfd condenser associated with the single volume control circuit. Connection is changed from (1) between top of control and moving arm to (2) between top of control and fixed tap. This increases the bass response of the tuner at low volume levels.

D. FOUR CIRCLES—Tuners with 4 circles contain the above modifications.

E. ONE SQUARE—This signifies the tuner which incorporates a dual volume control as shown on the schematic, page 12. It also embodies all of the modifications listed in this portion of the manual.

2. HIGH HUM LEVEL

a. With external jumper, connect the 2 chassis together to check the ground connection in the audio cable.

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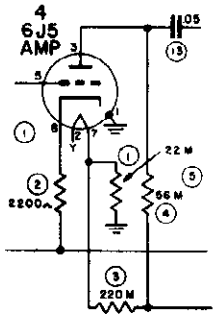
PANAMUSE N SERIES

b. Many tubes recently produced have heaters contaminated with the Barium-Strongium oxide emissive material, causing emission from heater to cathode if the cathode is positive with respect to the heater. This is a condition over which we have no control and we may only

(a) Substitute 6J5 or/and 6L6 tubes until those which have no such contamination are found or (b) Place the heaters at a positive potential with respect to cathode by:



1. Remove 6J5 (also 6L6 in N-2) heaters from ground. Also remove power transformer heater winding from ground.

2. Re-wire that side of the heater supply, using pin #6 (which is empty) as tie-down points, leaving both sides of the heater off ground.

3. Connect a 220,000 ohm and a 22,000 ohm resistor, in series, from +B to ground, the 22,000 ohm unit being placed at the ground end of the combination.

4. Connect the junction of the resistors to whichever side of the heaters results in the least hum.

This divider network places an approximate positive 30 volt potential upon the heaters.

All tuners in current production incorporate this feature.

3. TONE REPRODUCTION

The tonal reproduction of radio-combination instruments is occasionally commented upon by customers to be not in agreement with their personal preferences.

The human ear and the appreciation of musical rendition is a variable requiring some lee-way in tonal reproduction—thus tone-control adjustments, "treble" and "bass."

Should the customer desire a modification of the characteristics of his instrument, certain circuit re-arrangements may be made to effect the desired change. It is not recommended that such changes be done to sets whose tonal characteristics fulfill the individual's personal preferences.

Below are listed means of effecting a change in the receiver to accomplish increased high or low-frequency response and greater control-range of the treble control.

A. *Increasing the high-frequency response.*

If the instrument appears to lack high-frequency response

(a) Check the value of the capacitor in the pick up equalizer circuit. This component is mounted in the small shield can directly under the coupling shaft to the variable condenser. It should have a value of .0001 mfd. shunted with a 1.5 megohm resistor.

B. *Increasing the Bass Response*

(a) The resistor-capacitor combinations of part 1C should be checked.

C. *Increasing Range of Treble Control*

If comments are received regarding insufficient maximum treble control, the effect of this control may be increased as follows:

(a) Remove the shielded lead from terminal # 5, also remove bus wire jumper between terminals 1 and 5 of the 6SN7GT first audio tube.

(b) Connect the shielded lead to pin # 1 and install a 22,000 ohm half-watt resistor between pins 1 and 5. This makes each step of the treble control more pronounced and aids in minimizing record surface noise.

NOTE: Tuners "code marked" 3 or 4 circles incorporate this modification.

D. *Tone Reproduction Model 413N and NC Instruments*

The changes listed below are for purposes of rendering the reproduction more in keeping with the average ear and the personal preference of the listener. They are over-and-above the previous modifications and should be applied, if the 413N instrument is to be modified, after the pertinent previous changes have been made.

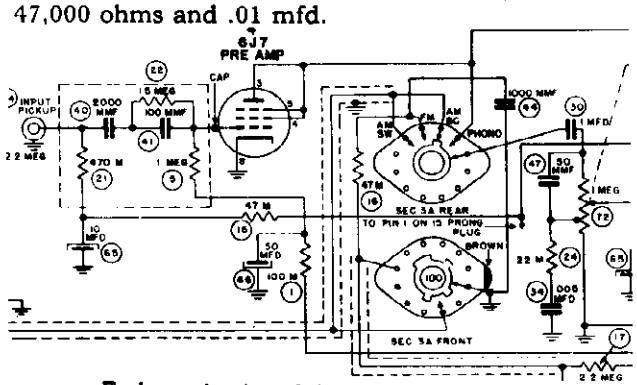
This applies to chassis with a 2, 3 or 4 code mark now in the field.

1. Change the grid resistor of the 6J7 phono preamp tube from 1 megohm to 470,000 ohms.

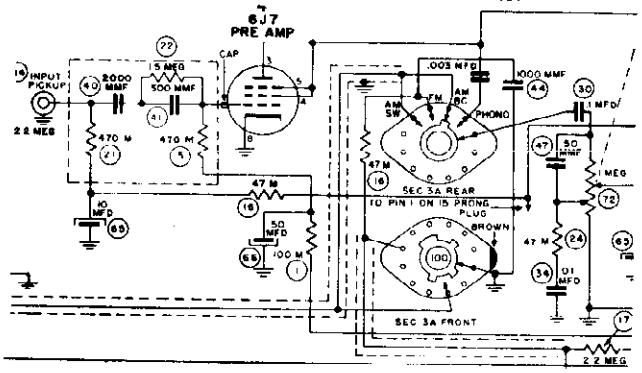
2. Change the condenser in series with the 6J7 preamp tube grid from 100 mfd. to 500 mfd. This is the condenser which has a 1.5 megohm resistor in shunt with it. This resistor should remain in the circuit.

3. Insert a .003 mfd. mica condenser in the connection between the plate of the 6J7 preamp tube and the band switch.

4. Change the series resistor-condenser connected from volume control tap to ground, to 47,000 ohms and .01 mfd.



Early production of the "N" Series tuner



Modifications of Section D, above (413N and NC instruments only)

We pass on to you below the solution to several service problems which have been experienced in the field, anticipating that they may effect a saving of time and more efficient servicing on your part.

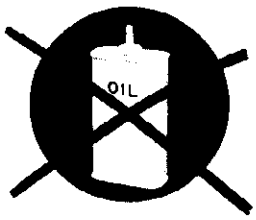
4. "N" TUNER—DIAL DRIVE ADJUSTMENTS

If dial slippage is experienced:

A. Clutch slipping. Tighten the drive clutch as tight as possible.

B. "Sticking" light boxes. The traveling light box may be sticking, causing dial slippage. This may be due to (a) lubricant on rods, (b) bent rods, (c) rough rods, (d) misalignment of rods.

(a) *The rods must be free of all lubricants.* Lubrication, momentarily helpful, causes gum to form at the light-box mounting, resulting in "sticking." Clean well with carbon tetrachloride.



(b) Bent rods must be accurately straightened or replaced.

(c) Rough portions of the rod surface should be cleaned with crocus cloth until perfectly smooth.

C. Old type of endless belt. If this belt has stretched, the newer-type may be installed by:

(a) Remove the center mounting bolt for the center resistor strip toward the FM IF section of the receiver.

(b) Remove band switch rod. Remove the program switch and lay back out of the way. (No wires need be disconnected.)

(c) Remove all parts of the idler pulley assembly and discard.

(d) Replace the drive pulley and split-gear assembly with the later type which is similar to the old type but has wider belt groove. Be sure that there is some tension on the split gear springs to avoid backlash.

(e) Remove the upper dial bracket to allow free access to the drive down.

(f) With a small rat tail file, file down the square shoulder on the drive drum at the cable cross over point. This is done to allow more space for the 2 ends of the drive cable to cross without binding. Also, dress down the ends of the drive cable channels.

(g) Install new drive cable, winding 1½ turns about the drive pulley.

(h) In reinstalling program switch, be sure that it is properly indexed with band switch.

5. DIAL GLASS PLATE

Paint scratched. This is due to the light-box assembly contacting the painted surface. Adjust the horizontal positioning of the light box for optical focus of the projected line of light, so that (1) focus is maintained throughout the entire path of travel, (2) front of light-box assembly does not at any point touch the scale. The clamps which hold the glass rod in place may be clipped back necessary.

Touch-up paint may be obtained at automobil service stations.

6. CONTROL KNOBS—ECCENTRIC—LOOSE—HOW TO REMOVE

A. *Knobs eccentric (wobbly motion) o loose.*

This is caused by pinching together the 2 halve of the split-shaft end. One half-section become bent toward the axis of the shaft to a greater de gree than does the other. Re-form the split por tions of the shaft so that they are symmetrical wit respect to the axis of the shaft.

B. *To Remove Control Knobs*

Loop a heavy cord behind the knob, bringin out the two ends at opposite sides of the knot Pull both ends firmly. If the cord (both ends) i brought out on one side only, there will be a tend ency to cause the difficulty of 6A, above.

7. MICROPHONICS AND FEEDBACK

A. Microphonic tubes.

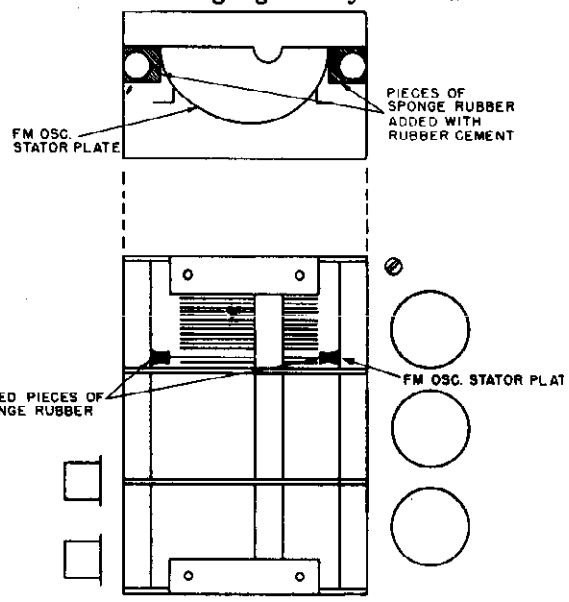
B. Check the variable condenser stator plate to ascertain whether they are loose. If so, apply collodial cement to the clamp which holds th stator plates to the insulating material.

C. "Twin lead" to antenna binding posts ma stapled to cabinet in taunt condition, whereby feed back is introduced mechanically. Re-staple the twin lead, leaving somewhat free and loose.

D. On FM microphonics and howl may b caused by the lead from stator plate to sub-chassi assembly being taunt. Re-solder with less tensio in the flat ribbon lead.

NOTE: Oscillator trimmer may have to be re adjusted.

E. If howl on the FM position persists, th following may alleviate the condition: Sponge rub ber bits added as shown in sketch. Rubbers mus be trimmed so that they will not touch rotor plate when the condenser gang is fully-meshed.



MODELS CAPEHART, FARNSWORTH TELEV. & RADIO CORP.
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REMOTE SPEAKER INSTALLATIONS

SECTION 12

No provision has been made, in the design of the instrument, for the use of one or more extension speakers.

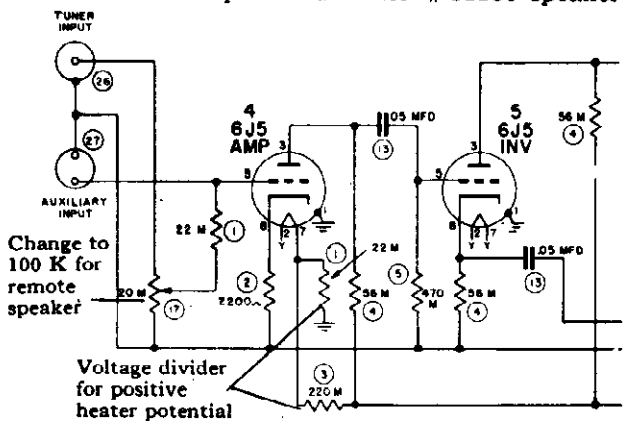
In the event that a customer desires a remote-speaker installation, we do not recommend that another speaker be connected either in series or in parallel with the cabinet speaker unit. Such an installation may be had by the use of an added amplifier unit which may be connected, in parallel with the cabinet amplifier, across the output of the tuner.

The added amplifier must have its original gain control, a 20,000 ohm unit, replaced by a control of 100,000 ohms. Connection may then be made, through a shielded lead of the low-capacity type, into the extra input jack on the cabinet amplifier chassis. Should it be so desired, the 100,000 ohm auxiliary amplifier gain control may be remotely-connected, for ready accessibility, to its amplifier circuit by individually-shielded leads of the low-capacity type. No shielding is necessary over the wires which connect amplifier to speaker.

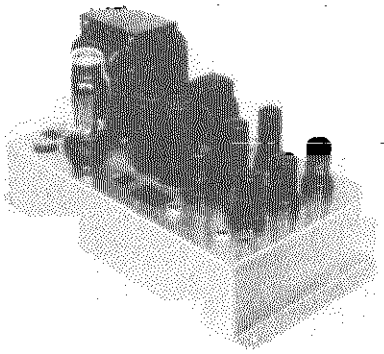
If the remotely-located speaker installation is to display characteristics identical to those of the cabinet speaker-amplifier, the remote components must be identical to those of the cabinet; an N-1 amplifier and #81143 speaker for 400N-series instruments, an N-2 amplifier and #81152 speaker for 100N-series instruments. Proper speaker enclosures must be provided. The #81166 speaker housing should be constructed of at least 1-inch plywood, wholly enclosed, lined with an acoustic absorbent such as hair-felt. Its volume is not less than $2\frac{1}{2}$, nor more than 4 cubic feet.

Should slightly lesser fidelity be permissable in the remote speaker at reduced cost, an N-3 amplifier may be employed as driver unit for the remote speaker. This amplifier provides an output power of 12 watts in an impedance of 8 ohms for driving the #81152 or #81149 speaker.

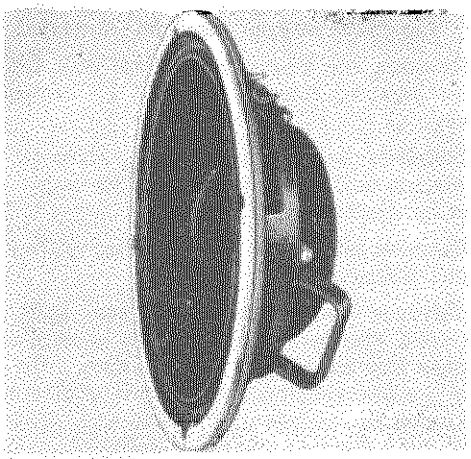
Enclosure for the 12" and 15" speakers, #81149 and 81152 respectively is after the usual fashion for cone-type speakers—it is not to be fully enclosed as is the #81143 unit.



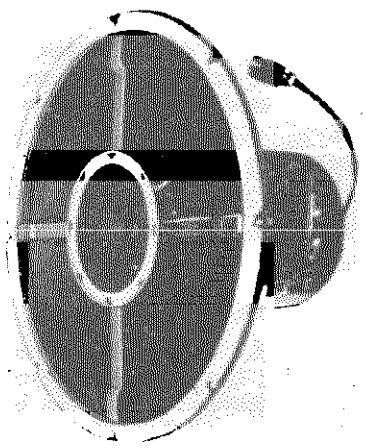
Circuit change necessary to the remote-speaker amplifier.



N3 amplifier giving 12 watts power output in 8 ohms.

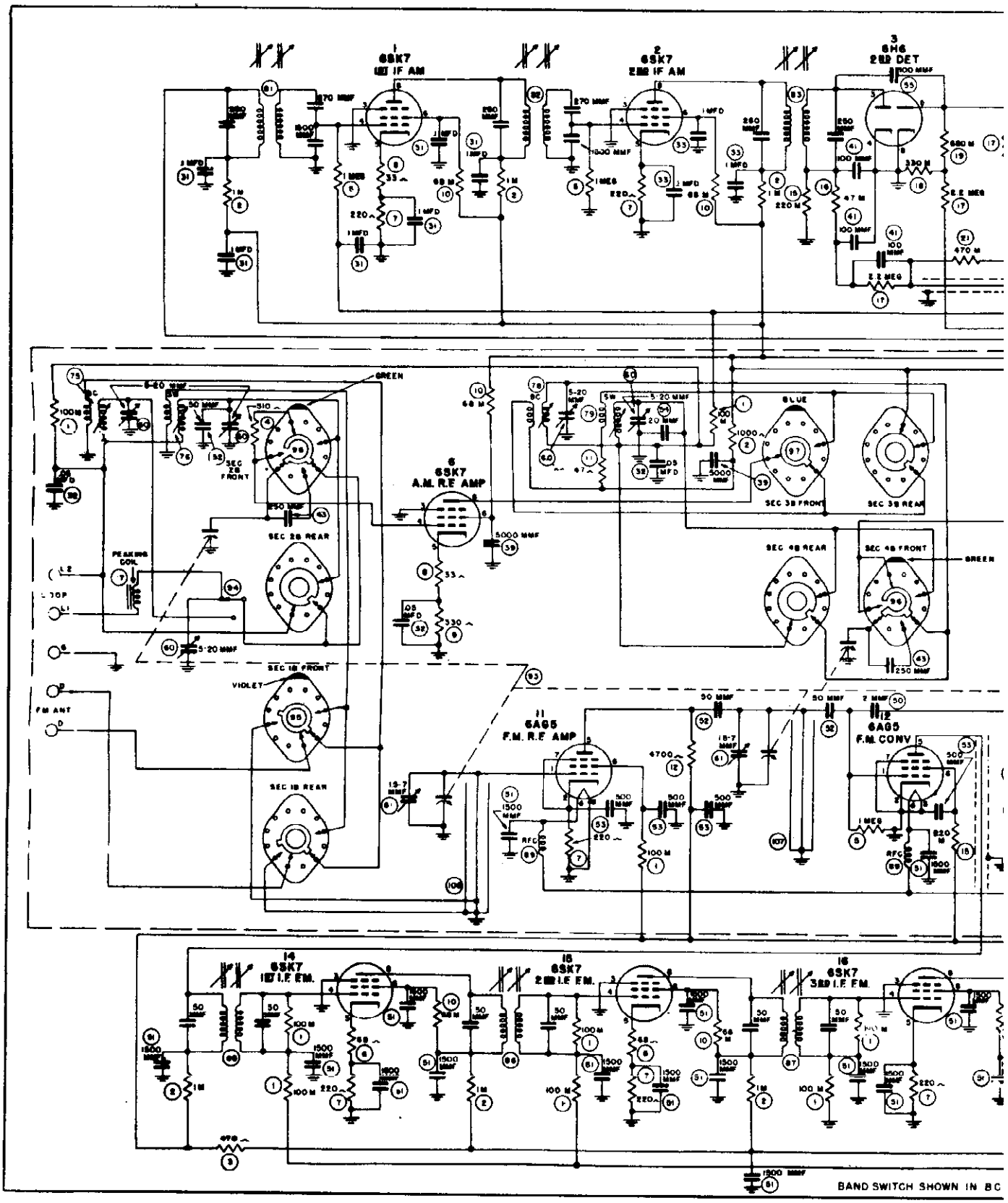


No. 81166 speaker used in 400N model instruments, to be used with the N1 amplifiers. 4 ohms impedance.



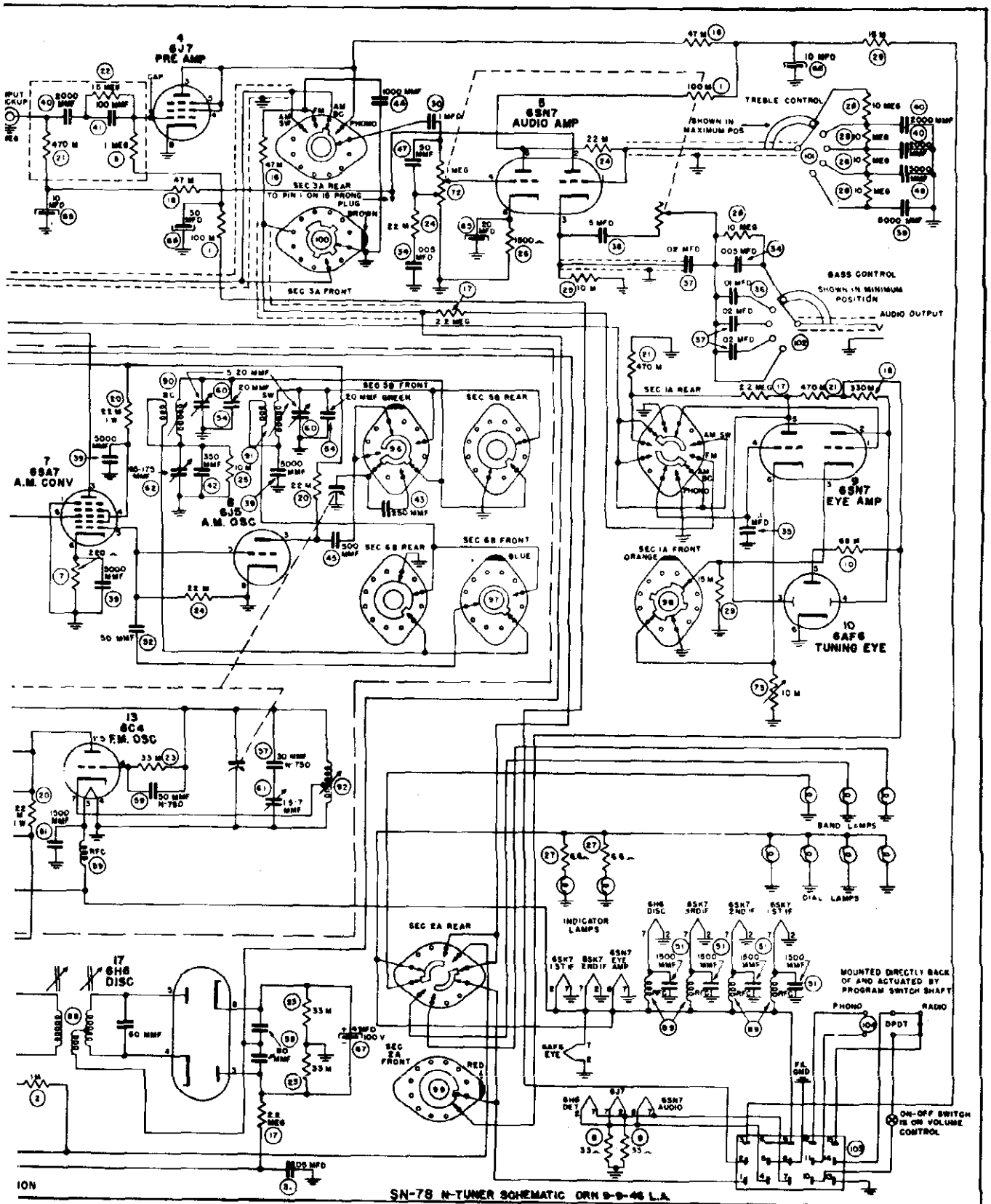
No. 81152 (15"), No. 81149 (12") speakers for use with N2 or N3 amplifiers. 8 ohms impedance.

FARNSWORTH TELEV. & RADIO CORP. MODELS CAPEH
PANAMUSE N S



Stage	Frequency	Gain
Ant to Grid RF tube	600 KC	2.5X
Grid RF tube to grid conv. tube	600 KC	11.5X
Grid conv. tube to grid 1st IF tube	455 KC	4.8X
Grid 1st IF tube to grid 2nd IF tube	455 KC	18X

SCHEMATIC

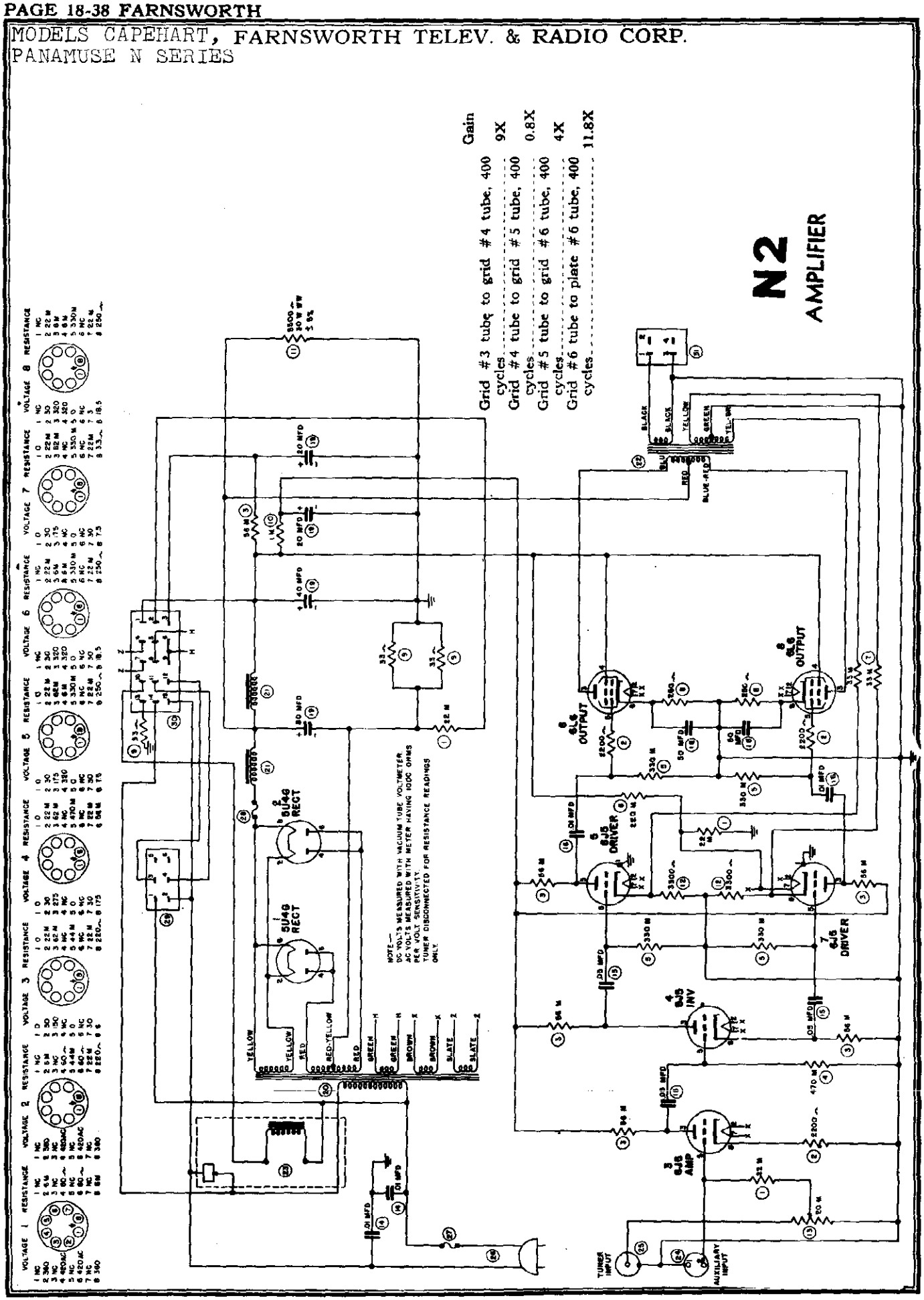


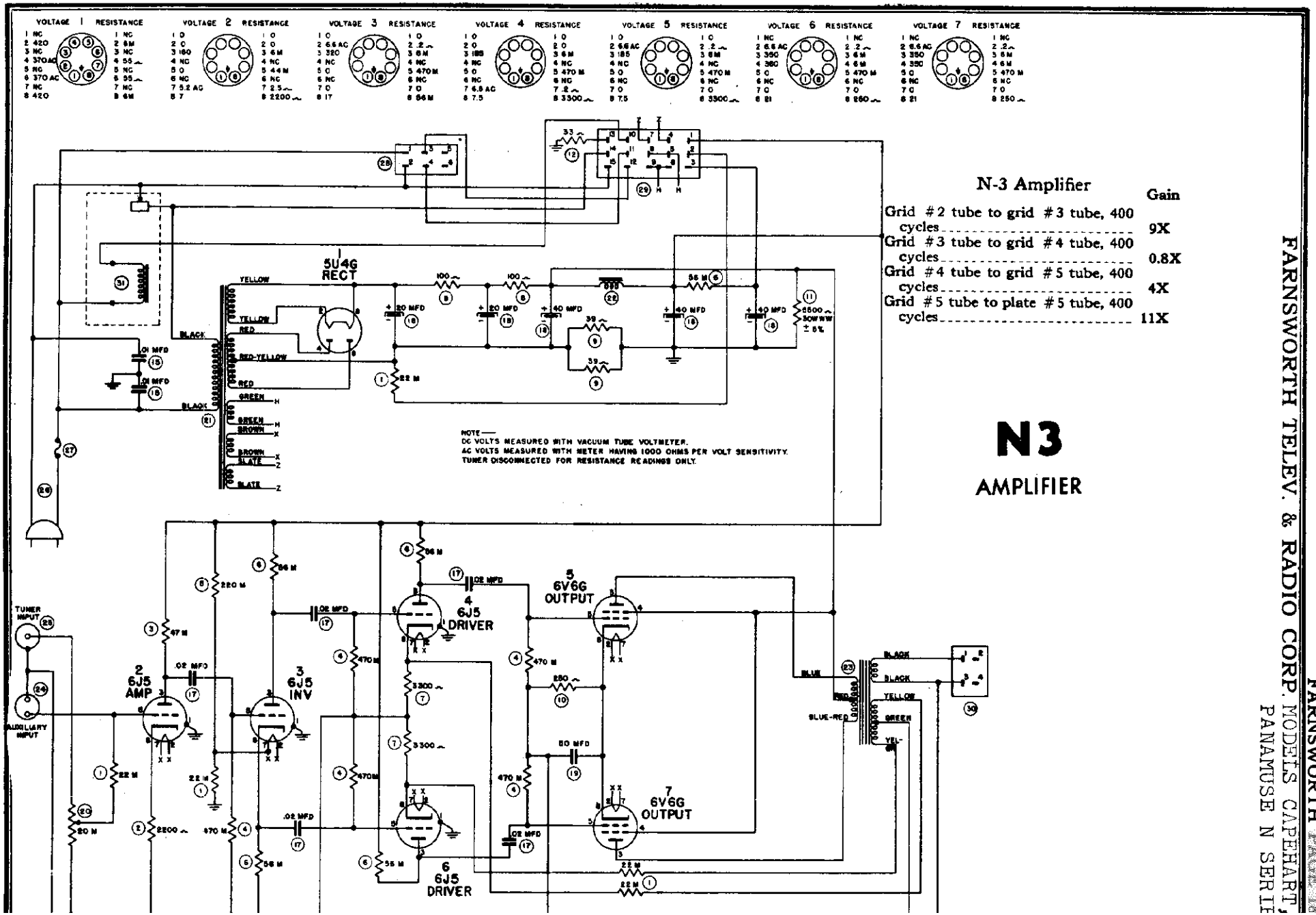
SN-78 N-TUNER SCHEMATIC DRN 9-9-46 L.A.

N TUNER

Stage	Frequency	Gain
Grid 2nd IF tube to Det. plate	455 KC	55X
Det. plate to grid 1st audio	400 cycles	0.385X
Grid 1st audio to tuner output jack	400 cycles	13X

MODELS CAPEHART, FARNSWORTH TELEV. & RADIO CORP.
PANAMUSE N SERIES





N-3 Amplifier

	Gain
Grid #2 tube to grid #3 tube, 400 cycles	9X
Grid #3 tube to grid #4 tube, 400 cycles	0.8X
Grid #4 tube to grid #5 tube, 400 cycles	4X
Grid #5 tube to plate #5 tube, 400 cycles	11X

N3

AMPLIFIER

MODELS CAPEHART, FARNSWORTH TELEV. & RADIO CORP.
PANAMUSE N SERIES

PARTS LIST—400N, 100N SERIES INSTRUMENTS

MODEL N TUNER AND AMPLIFIER PARTS AND PRICE LIST

SECTION 14

Ref. No.	Part No.	Description
1	77214	100M Ohms
2	77262	1000 Ohms
3	77333	470 Ohms, 1 Watt
4	77353	510 Ohms
5	77218	1 Megohm
6	77269	68 Ohms
7	77209	220 Ohms
8	77257	33 Ohms
9	77260	330 Ohms
10	77305	68M Ohms
11	77208	47 Ohms
12	77211	4700 Ohms
15	77216	220M Ohms
16	77213	47M Ohms
17	77270	2.2 Megohms
18	77268	330M Ohms
19	77335	680M Ohms
20	77069	22M Ohms, 1 Watt
21	77217	470M Ohms
22	77351	1.5 Megohm
23	77267	33M Ohms
24	77266	22M Ohms
25	77212	10M Ohms
26	77263	1500 Ohms
27	77095	6.8 Ohms
28	77274	10 Megohms
29	77265	15M Ohms
30	25309	.1 Mfd. Oil Paper Capacitor, 600 Vclt
31	25287	Capacitor 3 x .1 Mfd., 600 Volt
32	25080	.05 Mfd. Tubular Capacitor, 200 Volt
33	25286	3 x .1 Capacitor, 600 Volt
34	25306	.005 Tubular Capacitor, 100 Volt
35	25182	.1 Tubular Capacitor, 200 Volt
36	25305	.01 Tubular Capacitor, 100 Volt
37	25304	.02 Tubular Capacitor, 100 Volt
38	25118	.5 Mfd., 100 Volts
39	25298	5000 mmf. Silver Mica
40	25295	2000 mmf. Mica
41	25188	100 mmf. Mica
42	25331	350 mmf. Silver Mica
43	25069	250 mmf. Silver Mica
44	25053	1000 mmf. Mica
45	25307	500 mmf. Silver Mica
47	25290	50 mmf. Ceramic
48	25051	3000 mmf. Mica
50	25289	2 mmf. Ceramic
51	25273	1500 mmf. Hi-"K" Ceramic
52	25290	50 mmf. Ceramic
53	25293	500 mmf. Silver Button Mica Capacitor
54	25303	20 mmf. Ceramic
55	25145	100 mmf. Ceramic
57	25329	30 mmf. Ceramic
58	25406	80 mmf. Ceramic
59	25375	50 mmf. Ceramic N750
60	26231	5-20 mmf. Ceramic Trimmer
61	25221	1.5-7 mmf. Ceramic Trimmer
62	26111	65-175 mmf. Padder
65	25050	10 Mfd., 10 Mfd. 450 Volts; 20 Mfd. 25 Volts Electrolytic
66	25313	50 Mfd. 25 Volt Electrolytic
67	25270	4 Mfd. 100 Volt Electrolytic
72	78147	Dual Volume Control
73	78111	10M Ohm Potentiometer (tuning eye balance)
75	09308	BC Antenna Coil
76	09309	SW Antenna Coil
77	38705	Loop Loading Coil
78	09306	BC Converter Coil
79	09307	SW Converter Coil
81	38653	1st AM IF Transformer
82	38653	2nd AM IF Transformer
83	38654	3rd AM IF Transformer
84	80030	Phono Input Jack
85	38655	1st FM IF Transformer
86	38655	2nd FM IF Transformer
87	38655	3rd FM IF Transformer
88	38803	4th FM IF Transformer
89	38661	R. F. Choke
90	09304	BC Oscillator Coil
91	09305	SW Oscillator Coil
92	38752	FM Oscillator Coil
93	26230	Gang Condenser
94	90201	Antenna Loop Selector Switch
95	90206	Antenna Band Switch Wafer
96	90203	Band Switch Wafer (Osc., Conv. and R. F. Grid)
97	90204	Band Switch Wafer (Osc. and R. F. Plate)
98	90208	Aux. Band Switch Tuning Eye Wafer
99	90210	Aux. Band Switch B-plus Wafer
100	90209	Aux. Band Switch Audio Wafer
101	78114	Treble Control
102	78114	Bass Control
103	22149	Tuner and Amplifier Connecting Cable and Connector
104	90219	Phono-radio Switch
105	80030	Audio Output Jack
106		FM Antenna R. L. Line (for reference only, not stocked)
107		FM Converter R. F. Line (for reference only, not stocked)
	78112	Single Element Volume Control
110	90211	Band Switch Shaft and Detent assembly
111	55192	Band Switch Connecting Shaft
112	11277	Flexible Coupling Assembly
113	07455	Split Gear and Pulley Assembly
114	55183	Aux. Band Switch Connecting Rod
115	55158	Small Pinion Gear (Band Switch Drive)
116	55159	Pinion Gear, Tuning Shaft
117	15159	Tuning Drum, and Shaft Assembly
118	58348	Arm for Aux. Band Switch
119	55174	Tuning Drive Bushing
120	58326	Mtg. Bracket for Tuning Drum
121	55191	Connecting Shaft (tuning drive)
122	13565	Pre Amplifier Phono Input Assembly (100N and 413N)
123	13732	Dial Light Box Assembly (100N and 413N)
124	59332	Dial Cord Pulley
125	04026	Dial Light Shield Finishing Assembly (100N and 413N)
126	59439	Plastic Background (left)
127	13730	Plastic Pointer Crank and Clip Assembly
128	07453	Bass and Volume Control Pointer Assembly
129	58350	Eye Tube Support Plate (100N)
130	62134	Rubber Tube for Eye Tube
131	15168	Phono Switch Shaft and Lever Assembly
132	07450	Treble and Band Switch Pointer Assembly
133	59438	Plastic Background (right)
134	31326	Dial Scale (100N and 413N)
135	36501	"C" Washer (order #41089 "C" washer kit of 12 washers @ .40)
136	55160	Tuning Shaft
137	64382	Compression Spring
138	55118	Bottom Guide Bar (100N and 413N)
139	13731	Plastic Pointer Pinion and Clip Assembly
140	2000-071	#3-48 x 1" lg. R.H.M.S. (lower guide rod adj. screw)
141	2012-101	Dial Pointer Calibration Adj. Screw

FARNSWORTH TELEV. & RADIO CORP. MODELS CAPEHART, PANAMUSE N SERIE

Ref. No.	Part No.	Description
142	90207	Aux. Band Switch Frame
143	55119	Upper Guide Rod
	07456	Dial Drive Cord
	07629	Drive Cord Assembly
	07623	Light Box Roller Bracket Assembly
	55190	Stud for Dial Drive Cord Pulley
	54141	Glass Rod Station Pointer
	54161	Spacer, Ceramic Trimmer Mtg.
	58282	Mtg. Bracket for Glass Rod
	58335	Miniature Tube Shield
	64392	Hair Pin Retainer Spring, Cord Pulley
	80319	Miniature Tube Socket
	2000-115	#4-40 x 5/8 lg. R.H.M.S.
	2022-023	Pin for Pinion Gear

Part No.	Ref. No.	Description
	2041-141	#8-32 x 1/8" lg. Allen Cup Pt. Set Screw
	2041-143	#8-32 x 1/4" lg. Allen Cup Pt. Set Screw
	2041-147	#8-32 x 1/2" lg. Allen Cup Pt. Set Screw
	04027	Dial Light Shield Finishing Assembly
	07481	Dial Drive Cord
	13733	Dial Light Box Assembly
	13734	Preamplifier phono input assembly
	31331	Dial Scale
	55119	Guide Rod
	55228	Adjustable Guide Bar
	58282	Glass Rod Station Pointer Strap
	58441	Eye Tube Support

N1 AMPLIFIER PARTS

1	77266	22M Ohms
2	77264	2200 Ohms
3	77216	220M Ohms
4	77329	56M Ohms
5	77217	470M Ohms
6	77210	3300 Ohms
7	77263	1500 Ohms
8	77213	47M Ohms
9	77353	510 Ohms
10	77257	33 Ohms
11	77336	680 Ohms
12	25209	.01 Mfd., 600 Volt
13	25134	.05 Mfd., 600 Volt
14	25315	20 Mfd., 20 Mfd., 20 Mfd., 250 Volts
15	25297	20 Mfd., 20 Mfd., 20 Mfd., 20 Mfd., 450 Volts
17	78122	20M Ohm Potentiometer
18	78117	20 Ohm Potentiometer
19	78116	5M Ohm Potentiometer
20	94203	Bias Power Transformer
21	94124	Power Transformer
22	94202	Audio Drive Transformer
23	94157	Output Transformer
24	94161	Filter Choke
25	90215	Relay (power line control)
26	80334	Tuner Input Connector
27	80364	Auxiliary Input Connector
28	80331	6-pin Jones Connector
29	80089	15-pin Jones Connector
30	80332	4-pin Jones Connector
31	48006	5 Ampere Fuse
32	48015	1 Ampere Delayed Action Fuse
33	80336	Male Connector (A.C. line)
	80335	Fuse Receptacle
	80081	Molded Octal Socket
	80300	Molded Octal Socket (4-prong)

N2 AMPLIFIER PARTS

1	77266	22M Ohms
2	77264	2200 Ohms
3	77329	56M Ohms
4	77217	470M Ohms
5	77268	330M Ohms
6	77216	220M Ohms
7	77267	33M Ohms
8	77334	250 Ohms, Wire Wound, 5 Watt
9	77257	33 Ohms
10	77262	1000 Ohms
11	77350	5500 Ohms, Wire Wound, 30 Watts
12	77210	3300 Ohms
13	78122	20M Ohms Potentiometer
14	25209	.01 Mfd. (metal cased)
15	25314	.05 Mfd.
16	25083	.01 Mfd., 600 Volt
18	25269	50 Mfd., 25 Volt Electrolytic
19	25297	20 Mfd., 20 Mfd., 20 Mfd., 20 Mfd. 450 Volt
20	94125	Power Transformer
21	94161	Filter Choke
22	94158	Output Transformer
23	90215	Relay (power line control)
24	80334	Tuner Input Connector
25	80364	Auxiliary Input Connector
26	80336	A. C. Male Connector
27	48006	5 Amp. Fuse
28	48015	1 Amp. Delayed Action Fuse
29	80331	6-pin Jones Connector
30	80089	15-pin Jones Connector
31	80332	4-pin Jones Connector
	80081	Octal Socket
	80335	Fuse Receptacle

N3 AMPLIFIER PARTS

Ref. No.	Part No.	Description
1	77266	22M Ohms
2	77264	2200 Ohms
3	77213	47M Ohms
4	77217	470M Ohms
5	77216	220M Ohms
6	77239	56M Ohms
7	77210	3300 Ohms
8	77341	100 Ohms 10 Watt Wire Wound
9	77347	39 Ohms
10	77334	250 Ohms 5 Watt, Wire Wound
11	77350	5500 Ohms, 30 Watt Wire Wound
12	77257	33 Ohms
15	25209	.01 Mfd. Capacitor 600 Volt (metal cased)
17	25079	.02 Mfd. Capacitor 600 Volt
18	25297	20 Mfd., 20 Mfd., 20 Mfd., 20 Mfd., 450 Volt Electrolytic

Ref. No.	Part No.	Description
19	25269	50 Mfd. 25 Volt Electrolytic
20	78122	20M Ohm Potentiometer
21	94126	Power Transformer
22	94201	Filter Choke
23	94159	Output Transformer
24	80364	Auxiliary Input Connector
25	80334	Tuner Input Connector
26	80336	Male Connector (A.C.)
27	48006	5 Amp. Fuse
28	80331	6-Pin Jones Plug
29	80089	15 Pin Jones Plug
30	80332	4-Pin Jones Plug
31	90215	Relay (Power Line Control)
	80335	Fuse Receptacle
	80081	Octal Socket

MODELS CAPEHART, PANAMUSE N SERIES

FARNSWORTH TELEV. & RADIO CORP.

CAPEHART CABINET SPECIFICATIONS

SECTION 15

Model No.	Cabinet	Crated Dimensions	Shipping Weight
414N	Chippendale	45¼ x 44½ x 24½	330 lb.
413N	Chippendale	39⅜ x 45½ x 24½	330 lb.
406N	Adam	26¾ x 46 x 47	331 lb.

Model No.	Cabinet	Dimensions Crated	Shipping Weight
114N2	Early Georgian	42½ x 25½ x 42¼	298 lb.
112N2	George II	42½ x 25½ x 41¾	286 lb.

Subtract 1¾" for cabinet dimensions.

PANAMUSE CABINET SPECIFICATIONS

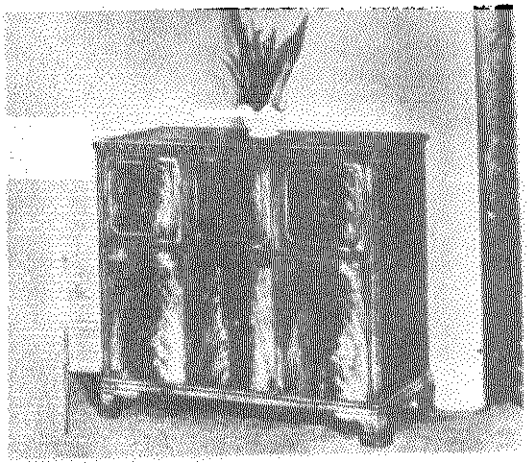
SECTION 15

Model	Cabinet	Crated Dimensions	Shipping Weight
19N3	Sheraton	37½ x 38½ x 23¾	197 lb.
21N2	Chippendale	43⅓ x 24¼ x 39¾	300 lb.

Model	Cabinet	Crated Dimensions	Shipping Weight
25N2	Sheraton Upright	40¼ x 37¾ x 24¼	219 lb.
26N2	Modern	40½ x 24 x 37¾	236 lbs.

Subtract 1¾" for cabinet dimensions.

"Sheraton Upright" 25N2



"Chippendale" 21N2

PANAMUSE "N" SERIES CABINET PARTS LIST AND CORRECTION SHEET

26N2

Delete the following parts:

13219 Basic glides
56538 Hinge (Soss type)
37376 Lid lift and stay arm mechanism R.H.
37374 Lid lift and stay arm mechanism L.H.

Change part number 67485 Hinge concealed type, etc., to part number 37485 Hinge concealed type, etc.

Add the following parts:

H-255-1 Cabinet and packing (Bisque)
H-255-2 Cabinet and packing (Cordovan)
67459 Bisque phono lid } Order in matched
67460 Bisque radio lid } sets only
67501 Bisque R.H. speaker door } Order in matched
67502 Bisque L.H. speaker door } sets only
67553 Cordovan phono lid } Order in matched
67554 Cordovan radio lid } sets only
67499 Cord. R.H. speaker door } Order in matched
67500 Cord. L.H. speaker door } sets only
37479 Cabinet glides ¾" nickel plated (4 req.)
37438 Stay arm 13¾" phono compartment
13188 Lid lift mechanism radio side
13189 Lid lift mechanism phono side

25N2

Add:

37479 Cabinet glides ¾" nickel plated (4 req.)
37475 Door catch, bullet type (3 req.)

CLARIFICATION OF TUNER PARTS LIST

Part number 07456 Dial drive cord is the pointer drive cord.

Part number 07629 Drive cord assy. is the variable condenser drive cord assy.

Part number 07481 Dial drive cord should be deleted from the Panamuse tuner parts list as it is the Pointer drive cord for the vertical dial 400 series tuner.

Part number 13733 Dial light box assy. should be deleted as this is used only on the vertical dial 400 series tuner.

21N2

Delete the following parts:

H-255-1 Cabinet and packing (Bisque)
H-255-2 Cabinet and packing (Cordovan)
37374 Stay arm and lid lift mechanism L.H.

Add the following:

13189 Lid lift mechanism phono compartment
37438 Stay arm 13¾" phono compartment
37479 Cabinet glides, ¾" nickel plated (4 req.)

The radio door and speaker doors are grain matched to the stationary front panels of the cabinet and are therefore not supplied separately.

19N3

Delete:

37497 Cabinet glides ¾" nickel plated (4 req.)

Add:

37479 Cabinet glides ¾" nickel plated (4 req.)

All parts on the "N3 Panamuse cabinet parts list—miscellaneous" are common to the N2 Panamuse cabinet except part number 81149 speaker for N3 series Panamuse.

NOTE: 81149 consists of 12" bass speaker and 6" treble speaker assembly for N3 Panamuse.

Add to this list:

81150 12" bass speaker only for N3 Panamuse
81151 6" treble speaker only for N2 and N3 Panamuse
81152 Bass and treble speaker assembly for N2 Panamuse
81182 15" bass speaker only for N2 Panamuse

Part number 13734 preamplifier phono input assy., should be deleted as it is used only on 400 series tuners.

Part number 31331 Dial Scale should be deleted as this is the dial scale for the vertical dial 400 series only tuner.

Part number 55119 Guide rod should be deleted as it is used only on vertical Dial 400 series tuner.

Part number 55228 Adjustable guide bar should be deleted as it is used only on vertical dial 400 series tuner.

SECTION 16

Part No.	Description
MODEL 410N	
67518	Mahogany Complete Top—2 Pieces—Matched
56538	Hinge (Soss Type) To Mount Lid 2 Req., pr.
67519	Mah. Radio Comp. Door
67520	Wal. Radio Comp. Door
67521	Wal. Speaker Doors—Matched Sets
67522	Mah. Speaker Doors—Matched Sets
67523	Wal. Phono Comp. Doors—Matched Sets
67524	Mah. Phono Comp. Doors—Matched Sets
56116	Hinge, Butt Type, 10 Req. to Mount 5 Doors
37487	Door Knobs, 6 Req.
13219	Basic Cabinet Glides, 4 Req.
92264	Felt Pads ½" x ⅛", 2 Req.
37475	Door Catch, Bullet Type, 5 Req.
92301	Grille Silk-Wal.
92302	Grille Silk-Mah.
41130	Escutcheon Mtg. Kit
59258	Glass Dial Escutcheon
MODEL 406N	
67525	Complete Cabinet Top—2 Pieces—Matched Wal.
67526	Complete Cabinet Top—2 Pieces—Matched Mah.
67527	Phono Comp. Doors, Wal., 2 Pieces, Matched Sets
67528	Phono Comp. Doors, Mah., 2 Pieces, Matched Sets
56768	Door Pulls, 6 Req.
37381	Hinge, Butt Type, 10 Req.
37482	Hinge, Soss Type (large size) 2 Req.
92303	Grille Cloth 22" x 20" Wal.
92304	Grille Cloth 22" x 20" Mah.
13219	Basic Cabinet Glides, 4 Req.
67529	Radio Door, Wal., 7¾" x 13¾"
67530	Radio Door, Mah., 7¾" x 13¾"
67531	Speaker Doors, Wal., 2 Pieces, Matched Sets
67532	Speaker Doors, Mah., 2 Pieces, Matched Sets
37475	Door Catch, Bullet Type, 5 Req.
41130	Escutcheon Mtg. Kit
59258	Glass Dial Escutcheon
MODEL 413N	
67533	Complete Cabinet Top, Wal., 2 Pieces Matched
67471	Complete Cabinet Top, Mah., 2 Pieces Matched
56538	Hinge, Soss Type, 2 Req., pair
67534	Radio Comp. Door, Wal.
67535	Radio Comp. Door, Mah.
67536	Speaker Comp. Door, Wal.
67537	Speaker Comp. Door, Mah.
37488	Door Knobs, 00 Req.
37381	Hinge, Butt Type, 4 Req.
13219	Basic Cabinet Glides
37475	Door Catch, Bullet Type, 2 Req.
92264	Felt Pads, ½" x ½", 2 Req.
92305	Grille Cloth, Wal.
92306	Grille Cloth, Mah.
41130	Escutcheon Mtg. Kit
59255	Glass Dial Escutcheon
Model 112N2	
67490	Complete Top, Wal., 3 Pieces, Matched
67491	Complete Top, Mah., 3 Pieces, Matched
67492	Complete Top, Bisque, 3 Pieces Matched
67538	Speaker Doors, Wal., 4 Pieces, Matched Sets

Part No.	Description
MODEL 112N2	
67539	Speaker Doors, Mah., 4 Pieces, Matched Sets
67540	Speaker Doors, Bisque, 4 Pieces, Matched Set
56542	Door Pulls, 2 Req. (Speaker Doors)
37476	Tandem Door Control 5⅜", Left Hand
37477	Tandem Door Control, 5⅜", Right Hand
37374	Lid Lift and Stay Arm Mech. Assy., Left Han
37376	Lid Lift and Stay Arm Mech. Assy., Right Han
59462	Stay Arm Escutcheon (Clear Plastic)
92264	Felt Pads ½" x ⅛"
13219	Basic Cabinet Glides, 4 Req.
37475	Door Catch, Bullet Type, 2 Req.
37476	Tandem Door Control 5⅜" L. H., Oxidized
37477	Tandem Door Control, 5⅜" R. H., Oxidized
41130	Escutcheon Mtg. Kit
59255	Glass Dial Escutcheon
MODEL 114N2	
67488	Complete Cabinet Top, Wal., 3 Pieces, Matche
67489	Complete Cabinet Top, Mah., 3 Pieces, Matched
67541	Speaker Doors, Wal., 2 Pieces, Matched Sets
67542	Speaker Doors, Mah., 2 Pieces, Matched Sets
37381	Hinges, Butt Type, 4 Req., To Mount Speake Doors
56539	Door Pulls (Speaker Doors), 2 Req.
59462	Stay Arm Escutcheon, 1 Req.
37374	Lid Lift and Stay Arm Mech. Assy., Left Han
37376	Lid Lift and Stay Arm Mech. Assy., Right Han
13219	Basic Cabinet Glides, 4 Req.
56538	Hinge, Soss Type, 4 Req.
92264	Felt Pads, ½" x ⅛", 4 Req.
92307	Grille Cloth, 18" x 19", Wal.
92308	Grille Cloth, 18" x 19", Mah.
37475	Door Catch, Bullet Type, 2 Req.
59255	Glass Dial Escutcheon
Misc.	**Description**
11301	AC Power Cord Assembly
22145	15 Wire Extension Patch Cord and Plug Ass'r
22151	Amplifier Input Cable Assembly
22152	Pickup Cable Assembly
22167	Record Changer AC Cable Assembly
42190	7½ Watt Light Bulb
59044	Stay Arm Escutcheon, Wal.
59255	Glass Dial Escutcheon (100 Series and 413)
80365	Male Connector, 6 Prong, for Record Changer AC Cable
80366	Female Connector, Round, for Record Changer AC Cable
80368	Female Connector, Round, for Record Changer AC Cable
80371	Speaker Connector Plug to Amplifier
80373	Male Connector Plug for Reject Button
80358	Light Socket and Switch Assembly
90194	Reject Switch
59316	Lucite Tuning Knob for 100N and 400N Serie
59373	Control Knobs (Lucite) for 100N and 400N Series
58460	Escutcheon Mtg. Plate for 100N and 413N Series
58473	Escutcheon Mtg. Plate for 406-410-414
53461	Special Tapped Brkt. to Mount Escutcheon Mtg. Frame (4 required) each
36478	#3—48 x ½" L. Phil F.H.M.S. to Mtg. Escutcheon Mtg. Frame (4 required) each

MODELS CAPEHART, FARNSWORTH TELEV. & RADIO CORP.
PANAMUSE N SERIES

PANAMUSE CABINET PARTS LIST

SECTION 16

26-N2

37431	Hinge—Piano Type—16"-2 Req. to Mount Lids
37484	Hinge—Concealed Type—(For Speaker Doors) 2 Req. Upper Left Lower Right
67485	Hinge—Concealed Type—(For Speaker Doors) 2 Req. Upper Right Lower Left
37493	Door Knobs—Burnished Brass—2 Req. For Speaker Doors
37374	Stay Arm & Lid Lift Mech. Assy. L.H.
13188	Lid Lift Mech. R.H.
92264	Felt Pads ½" x ⅛", 4 Req.
37494	Stay Arm Assy. 9"
59462	Stay Arm Escutcheon (Clear Plastic)
92313	Bisque Grille Cloth
92314	Cordovan Grille Cloth
37376	Lid Lift and Stay Arm Mech. R.H.
13219	Basic Cabinet Glides (4 Req.)
56538	Hinge—SOSS Type (4 Req.)
37475	Door Catch—Bullet Type

21-N2

H-255-1	Cabinet and Packing—Bisque
H-255-2	Cabinet and Packing—Cordovan
67543	Walnut Complete Cabinet Top 2 Pieces, Matched
67544	Mahogany Complete Cabinet Top 2 Pieces, Matched
92309	Walnut Grille Cloth
92310	Mahogany Grille Cloth
37489	Door Knobs for Speaker Doors (2 Req.)
37490	Door Pulls (2 Req.)
37381	Hinge—Butt Type (6 Req.)
37506	Hinge—Piano Type (1 Req.)
37374	Stay Arm and Lid Lift Mech. Assy., L.H. (1 Req.)
37479	Cabinet Glides ¾" Nickel Plated (4 Req.)
H-258-1	Walnut Cabinet and Packing
H-258-2	Mahogany Cabinet and Packing

25-N2

92311	Walnut Grille Cloth
92312	Mahogany Grille Cloth
59462	Stay Arm Escutcheon

25-N2 (Continued)

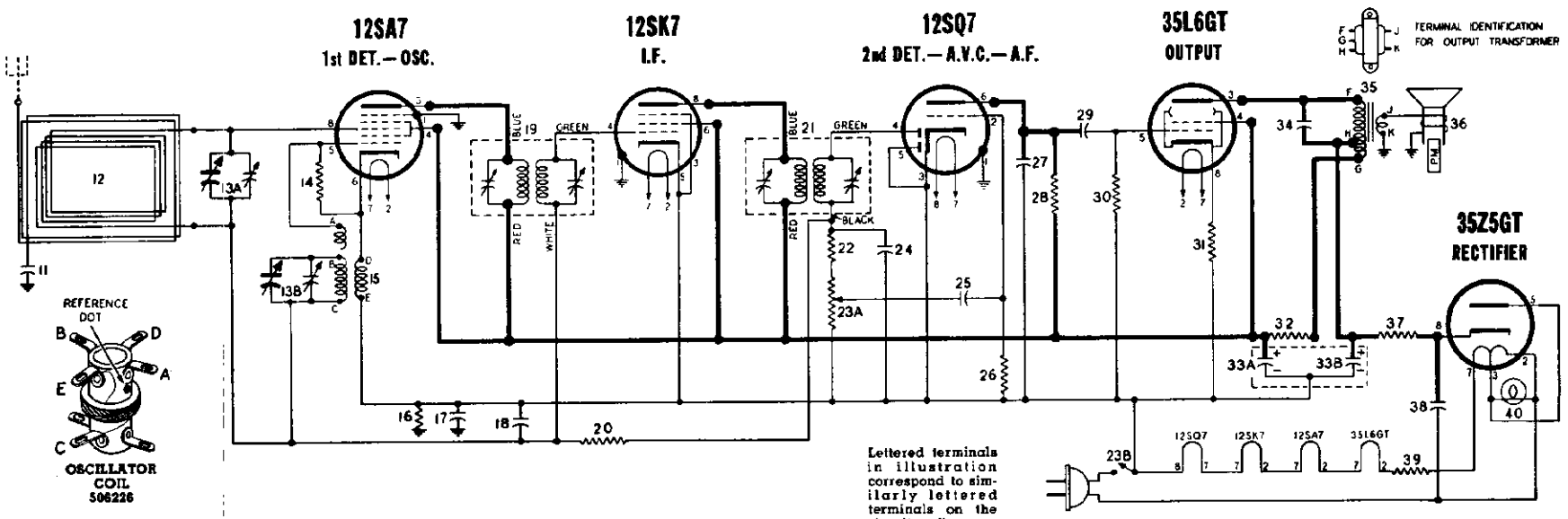
67469	Complete Top, Wal. 2 Pieces, 1 Phono Lid and 1 Top Matched
67470	Complete Top, Mah. 2 Pieces, 1 Phono Lid and 1 Top Matched
67549	Speaker Doors, Wal., 2 Pieces, Matched Sets
67550	Speaker Doors, Mah., 2 Pieces, Matched Sets
37483	Hinge—Split or Concealed Type, 4 Req. (For Speaker Doors)
37381	Hinge—Butt Type, 2 Req. (For Radio Door)
———	Door Catch—Bullet Type, 3 Req.
37491	Door Pulls, 2 Req. (Radio Door and Corresponding Panel)
37492	Door Knob, 1 Req. (For Speaker Door)
92264	Felt Pads, ½" x ⅛", 2 Req.
37497	Cabinet Glides, ¾" Nickle Plated, 4 Req.
37374	Stay Arm and Lid Lift Mech. Assy., Left Hand
37507	Hinge—Piano Type (To Mount Phono Lid)
25N2	Cabinet and Packing—Wal. H-253-1
25N2	Cabinet and Packing—Mah. H-253-2

19-N3

67474	Walnut Phono Lid L.H. Matched to R.H. Lid
67472	Mahogany Phono Lid L.H. Matched to R.H. Lid
67475	Walnut Radio Lid R.H. Matched to L.H. Lid
67473	Mahogany Radio Lid R.H. Matched to L.H. Lid
67555	Walnut Speaker Doors Two Pieces—Matched sets
67556	Mahogany Speaker Doors Two Pieces—Matched-Sets
56523	Door Pull (4 Req.)
37495	Door Knob (2 Req.)
37475	Door Catch—Bullet Type (2 Req.)
37381	Hinge—Butt Type (4 Req.)
37440	Hinge—Piano Type 18" (1 Req.) Phono Lid
37497	Cabinet Glides ¾" Nickel Plated (4 Req.)
37374	Stay Arm and Lid Lift Mech. Assy. L.H.
37376	Stay Arm and Lid Lift Mech. Assy. R.H.
37486	Hinge—Piano Type 12½" (1 Req.) Radio Lid
59044	Stay Arm Escutcheon (2 Req.)
92264	Felt Pads ½" x ⅛" (4 Req.)
92315	Walnut Grille Cloth
92316	Mahogany Grille Cloth
H-243-1	Walnut Cabinet and Packing
H-243-2	Mahogany Cabinet and Packing

N3 PANAMUSE CABINET PARTS LIST—MISCELLANEOUS

Part No.	Description
09271	Record changer mtg. spring assy. (4 req.)
11301	A. C. Power cord assy.
22144	Record changer A. C. cable
22145	15 wire extension patch cord
22151	Amplifier input cable
22152	Pickup cable assy.
36478	#3-48 x ½" long Phil. F.H.M.S. to mount escutcheon mtg. frame (4 req.)
37475	Door catch (Bullet type)
41130	Escutcheon mtg. screw kit
58460	Escutcheon mtg. frame
58461	Special tapped brkt. to mount escutcheon mtg. frame (4 req.)
59044	Plastic stay arm escutcheon
59256	Glass dial escutcheon
59316	Lucite tuning knob (large)
59373	Lucite knob (small)
80365	Male connector, 6 prong, for record changer A.C. cable
80371	Speaker connector plug to amplifier (male)
81149	Speaker for N3 series Panamuse

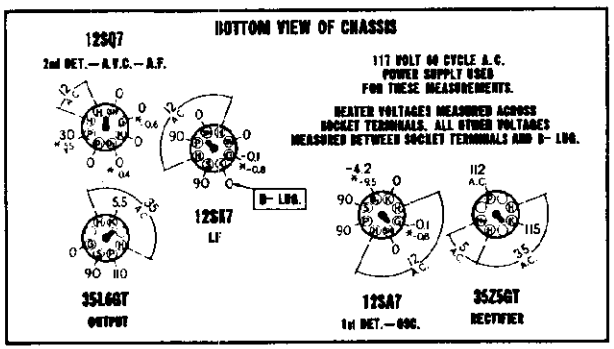


I.F. 455 KC.

SOCKET VOLTAGES

Measured with voltmeter having sensitivity of 1000 ohms per volt except where indicated by (*). The (*) symbol designates a vacuum tube voltmeter measurement.

VOLUME ON FULL WITH NO SIGNAL — DIAL TUNED TO 540 KC.



PARTS LIST

DIAGRAM NO.	PART NO.	DESCRIPTION
CONDENSERS		
11	512002	Condenser—.002 Mfd. 600 volt
13-A, B	506219	Condenser—variable gang (with drum)
17, 18	502153	Condenser—.05 Mfd. 200 volt
24	502931	Condenser—ceramic 100 Mmfd. 500 volt
25	502479	Condenser—.006 Mfd. 600 volt
27	504727	Condenser—mica 500 Mmfd. 500 volt
29	502151	Condenser—.01 Mfd. 400 volt
33-A, B	506222	Condenser—electrolytic A—30 Mfd. 150 volt; B—35 Mfd. 150 volt
34	502152	Condenser—.02 Mfd. 400 volt
38	502157	Condenser—.05 Mfd. 400 volt
RESISTORS		
14	510061	Resistor—carbon 22,000 Ohms ¼ watt
16	510079	Resistor—carbon 220,000 Ohms ¼ watt
20	510091	Resistor—carbon 1 Meg. ¼ watt
22	510067	Resistor—carbon 47,000 Ohms ¼ watt
23-A, B	506206	Volume control 500,000 Ohms (with switch)
26	510096	Resistor—carbon 6.8 Meg. ¼ watt
28	510079	Resistor—carbon 220,000 Ohms ¼ watt
30	510085	Resistor—carbon 470,000 Ohms ¼ watt
31	510123	Resistor—carbon 180 Ohms ½ watt ± 10%
32	510137	Resistor—carbon 1000 Ohms ½ watt
37	510210	Resistor—carbon 33 Ohms 1 watt
39	510617	Resistor—wire wound 82 Ohms 2 watt ± 10%

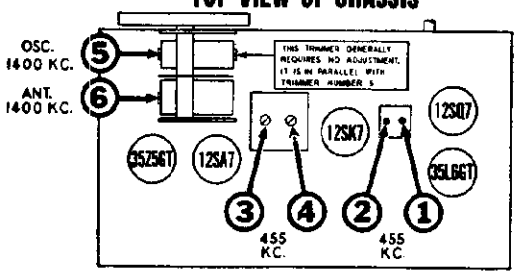
DIAGRAM NO.	PART NO.	DESCRIPTION
COILS & TRANSFORMERS		
12	506208	Loop antenna
15	506226	Coil—oscillator
19	506209	Transformer—1st I.F.
21	506210	Transformer—2nd I.F.
35	506221	Transformer—output
OTHER ELECTRICAL PARTS		
36	506212	Speaker—P.M. dynamic (4")
40	118921	Lamp dial (Mazda No. 47) 6-8 V. 150 Ma.
MISCELLANEOUS PARTS		
	505165	"C" washer—for tuning shaft
	506228	Cabinet
	114955	Clip—retainer on end of dial cord
	506230	Clip—retains cabinet back to chassis
	500497	Clip—retains cabinet back to cabinet
	117057	Cord—dial drive (4 ft. required)
	506216	Dial scale
	506218	Diffuser—light
	506215	Knob
	506217	Pointer
	119087	Ring for dial cord
	170162	Screw—#8-32 x ⅜" retains chassis
	506207	Shaft—tuning
	506211	Socket—dial light (with leads)
	116990	Socket—octal base
	506220	Socket—octal (rectifier)

ALIGNMENT PROCEDURE

1. Remove chassis and loop antenna (on cabinet back) from cabinet—allow loop to remain attached to chassis.
2. With the gang condenser fully meshed, dial pointer should be in the position indicated by the last division below 55 on the dial. If it is incorrectly, release pointer clip on dial cord and reposition pointer.
3. Couple the signal generator to the receiver by connecting its output to several turns of wire formed in a circular shape so that it may be placed adjacent and parallel to the receiver loop antenna.
4. Connect an output meter across the speaker voice coil or from the plate of the 35L6GT tube to B— through a 0.1 Mfd. condenser.
5. Set volume control at maximum volume position and use a weak signal from the signal generator.

DUMMY ANT. IN SERIES WITH SIGNAL GENERATOR	SIGNAL GENERATOR CONNECTION	SIGNAL GENERATOR FREQUENCY	RECEIVER DIAL SETTING	TRIMMER OR SLUG NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT
None	Connect directly to coupling turn as instructed in Step 3 above.	455 KC	Any point where it does not affect the signal.	1-2	2nd I.F.	Adjust for maximum output. Then repeat adjustment.
				3-4	1st I.F.	
None	Connect directly to coupling turn as instructed in Step 3 above.	1400 KC	1400 KC	5	Broadcast Oscillator	Adjust for maximum output.
None	Connect directly to coupling turn as instructed in Step 3 above.	1400 KC	Tune to 1400 KC generator signal	6	Broadcast Antenna	Adjust for maximum output.

TOP VIEW OF CHASSIS

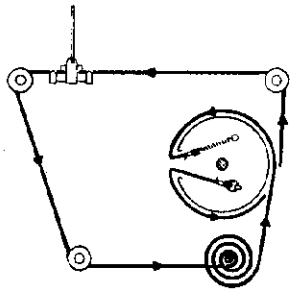


TRIMMER LOCATIONS

DIAL AND POINTER DRIVE CORD ARRANGEMENT

To string dial cord, turn the main drive drum to maximum counter - clockwise position and use following parts:

114955 Clip on end of cord
117057 Cord (4 feet)
119087 Ring for dial cord
161384 Tension Spring

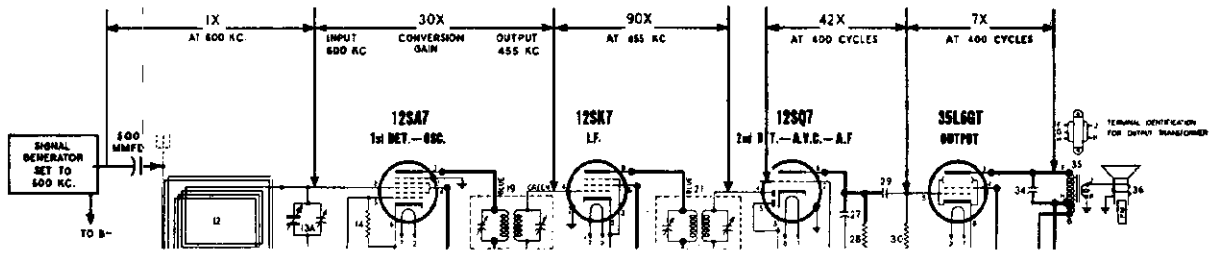


STAGE GAIN MEASUREMENT PROCEDURE

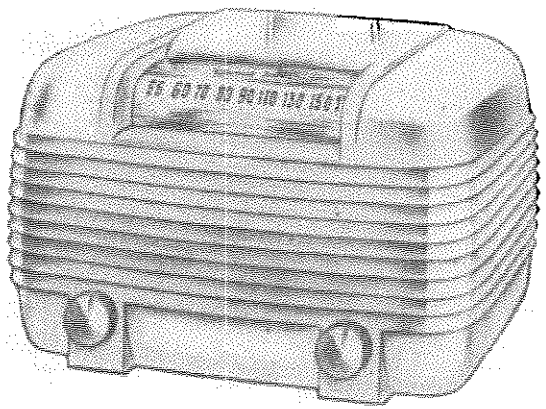
REQUIRED INSTRUMENTS: The amount of amplification or "gain" of each of the stages of this receiver may be measured with an A.C. Vacuum Tube Voltmeter or a "channel" type instrument containing a tuned and calibrated amplifier.

PROCEDURE: It is exceedingly important to adhere to the procedure outlined below since the accuracy of these measurements will be affected to a considerable extent by the failure to establish proper operating conditions.

1. Be sure that R.F. and I.F. stages are carefully and accurately aligned by utilizing the alignment procedure given above.
2. Connect Signal Generator as shown below.
3. The values of stage gain which are given here were measured with a fixed bias of 3 volts on the control grids of all R.F. and I.F. tubes which are connected to the A.V.C. circuit. Therefore, these values are not intended to indicate the full capability of a stage but they will serve as a convenient basis for determining proper operation. In order to duplicate the fixed bias voltage, connect the negative terminal of a 3 volt battery to A.V.C. at terminal "C" of the oscillator coil and connect the positive battery lead to B— in receiver chassis.
4. Set Signal Generator for operation at 600 Kc with 400 cycle modulation and carefully tune radio receiver to this signal by using an output meter to indicate peak output. If a local station interferes, set generator to a nearby frequency and re-tune the receiver.
5. R.F. and I.F. circuits are slightly de-tuned when contact is made with an instrument probe and this action, which is indicated by a change in the output meter reading, may seriously affect the gain measurement. Therefore, it is important to adjust the associated circuit trimmer for a maximum output meter reading and to set the input signal level to a convenient reference point on the gain measuring instrument while the probe is making contact. After removing the probe it is again necessary to adjust the trimmer so as to obtain the same output meter reading and thereby assure that the signal voltage at the specified point has not changed as a result of circuit de-tuning.
6. When using a "channel" type instrument carefully tune it for maximum output at desired frequency before making measurements.



DIFFERENCES in tube characteristics, torelance of parts, adjustment of tuned circuits and variations in line voltage will influence stage gain. These factors should be given due attention in event the gain of a stage varies extensively from the values shown above.

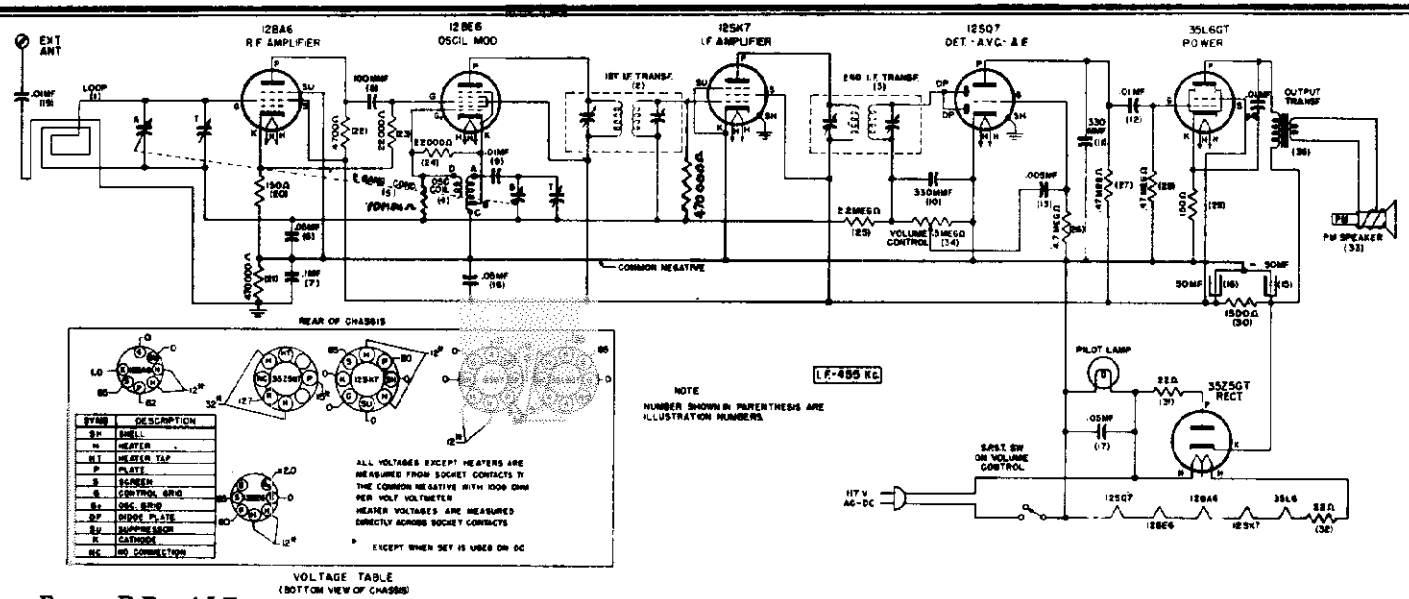


SPECIFICATIONS

CABINET DIMENSIONS	10-5/8" x 7-1/16" x 6-21/32"
WEIGHT	6 pounds 8 ounces
POWER SUPPLY	105 to 125 volts AC-DC
FREQUENCY RANGE	540 to 1600 KC.
I. F. FREQUENCY	455 KC.
SPEAKER	4 inch P-M Dynamic
VOICE COIL IMPEDANCE	3.2 ohms
POWER OUTPUT	Undistorted — 0.8 watts Maximum — 1.2 watts

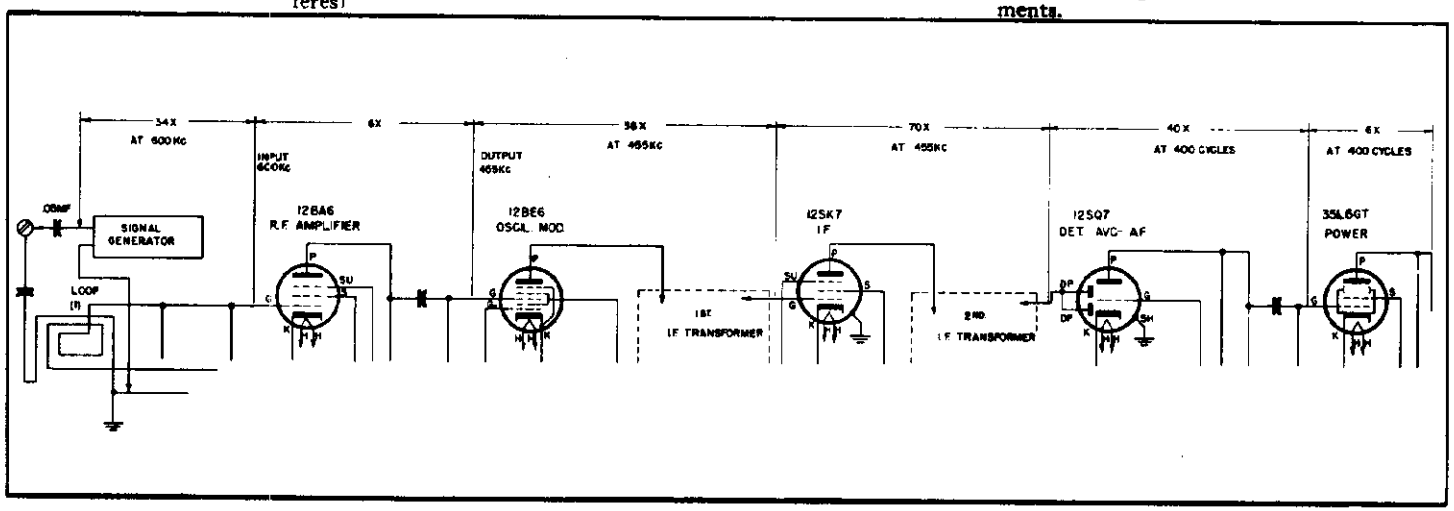
TUBE COMPLEMENT

12SA7	1st Det. — Osc.
12SK7	I. F. Amplifier
12SQ7	2nd Det. — A.V.C. — 1st A.F.
35L6GT	Power output



Be sure R-F and I-F stages are accurately aligned before measuring gain. R-F gains can be measured with a "channel" type instrument containing a tuned and calibrated R-F amplifier. A vacuum tube voltmeter may be used for audio gain measurements. Observe following precautions:

1. For all gain measurements connect signal generator as shown. Use 600 KC signal with 400 cycle modulation (use nearby frequency if local station interferes)
2. Be sure radio is carefully tuned to generator signal (use weak signal for sharp tuning).
3. When using a "channel" type instrument carefully tune it for maximum output at desired frequency before making measurements.



Differences in tube characteristics, tolerance of parts, adjustment of tuned circuits, and variations of line voltage will influence stage gain. Accuracy of measurements is dependent upon careful tuning of receiver to generator signal and experience in using your test equipment. These factors may create considerable variation in gain measurements.

ALIGNMENT PROCEDURE

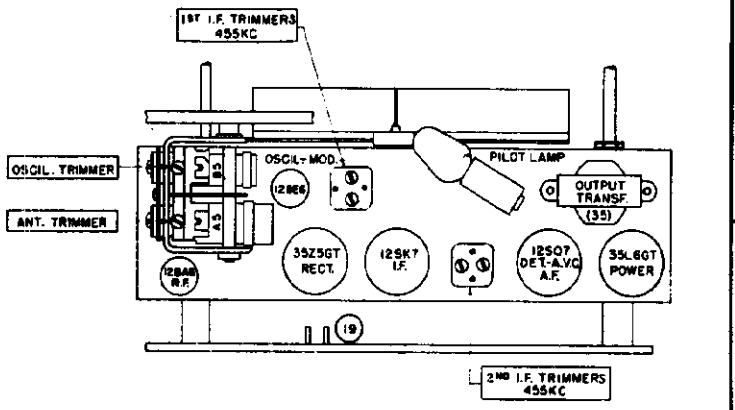
For alignment procedure read tabulations from left to right, and make the adjustment marked (1) first, (2) next, (3) third.

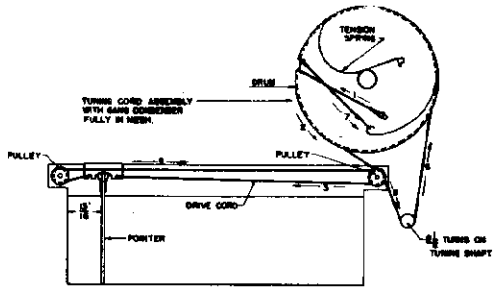
Before starting alignment:

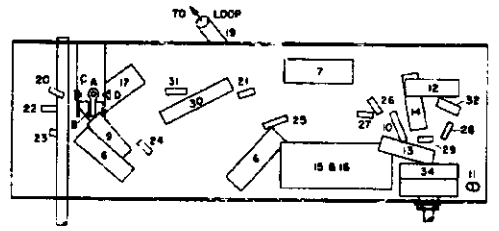
(a) Check tuning dial adjustment by tuning gang condenser until plates touch maximum capacity stop (completely in mesh) at which point the dial needle must be exactly $\frac{1}{16}$" from edge of dial plate. If dial needle does not have this position, move to correct one.

(b) Use an accurately calibrated test oscillator with some type of output measuring device.

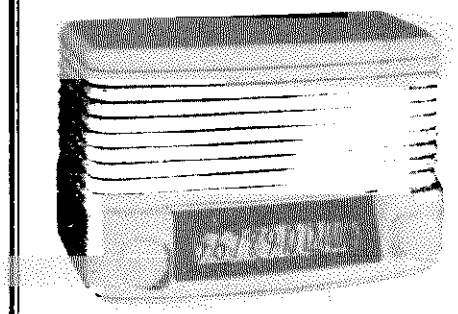
Steps	Set receiver dial to:	TEST OSCILLATOR			Refer to parts layout diagram for location of trimmers mentioned below:
		Adjust test oscillator frequency to:	Use dummy antenna in series with output of test oscillator consisting of:	Attach output of test oscillator to:	
1	Any point where no interfering signal is received.	455 K. C.	.02 MFD condenser	High side to rear stator plates of tuning condenser. Low side to B minus.	Adjust each of the second I-F transformer trimmers for maximum output—then adjust each of the first I-F trimmers for maximum output.
2	Minimum Capacity	Exactly 1620 K. C.	.00025 MFD condenser	Antenna terminal. Receiver chassis.	Adjust 1620 K. C. oscillator trimmer for maximum output.
3	Approx. 1400 K. C.	Approx. 1400 K. C.	.00025 MFD. condenser	Antenna terminal. Receiver chassis.	While rocking gang condenser adjust 1400 K. C. antenna trimmer for maximum output.







MODEL 4-A-11 THE FIRESTONE TIRE & RUBBER CO.



POWER SUPPLY.....105 to 125 Volt AC-DC
TUNING RANGE.....540 to 1600 KC
INTERMEDIATE FREQ.....455 KC
LOUDSPEAKER.....4 Inch P.M.
VOICE COIL IMPEDANCE.....3.2 Ohm at 400 Cycles

TUBE COMPLEMENT.....12BA6 R-F Amplifier
12BE6 Oscillator Modulator
12SK7 IF, 12SQ7 Det. AVC.,
35L6GT Power Output
35Z5GT Rectifier

POWER OUTPUT.....Undistorted - 0.8 Watts
Maximum - - 1.25 Watts

PARTS LIST

Ill. No.	Part No.	Part Name	Description
1	RAB-064	Antenna	Loop and back of cabinet.
2	RTL-075	Coil	1st I-F transformer
3	RTL-051	Coil	2nd I-F transformer
4	RLC-058	Coil	Oscillator coil
5	RCT-027	Condenser	Tuning, two gang
6, 18	UCC-028	Condenser	Tubular, .05 Mfd. 400V.
7	UCC-030	Condenser	Tubular, .1 Mfd. 400V.
8	UCU-028	Condenser	Tubular, .0001 Mfd. 500V.
9, 12, 19	UCC-025	Condenser	Tubular, .01 Mfd. 400V.
10, 11	UCU-040	Condenser	Mica, .00033 Mfd.
13	UCC-022	Condenser	Tubular, .005 Mfd. 400V.
14	UCC-040	Condenser	Tubular, .01 Mfd. 600V.
15, 16	RCE-050	Condenser	Dry Elec. 2 x 50 Mfd. 150V.
17	UCC-045	Condenser	Tubular, .05 Mfd. 600V.

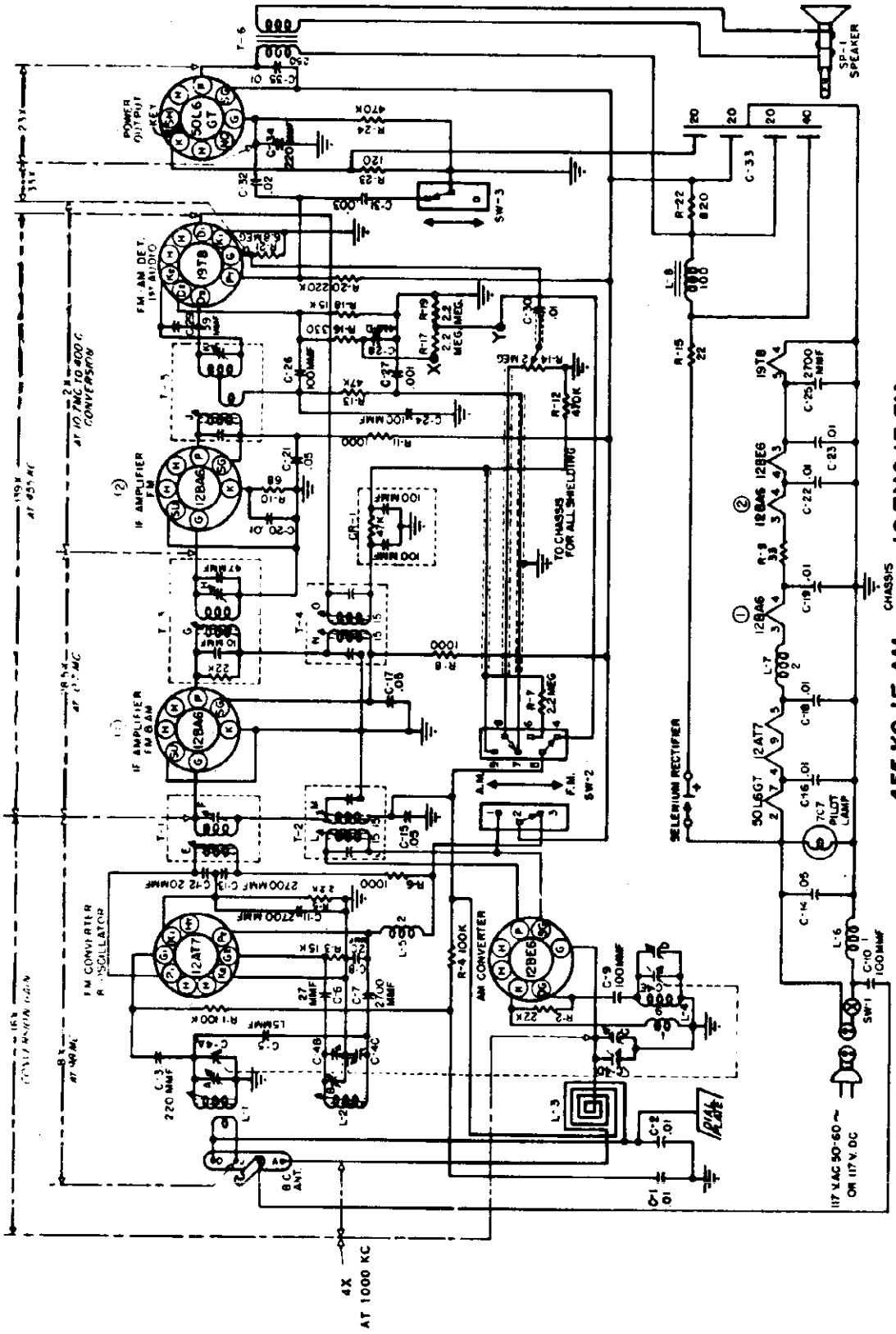
Ill. No.	Part No.	Part Name	Description
20, 29	URD-029	Resistor	Carbon, 150 Ohm ½W.
21, 27, 28	URD-113	Resistor	Carbon, 470000 Ohm ½W.
22	URD-065	Resistor	Carbon, 4700 Ohm ½W.
23, 24	URD-081	Resistor	Carbon, 22000 Ohm ½W.
25	URD-129	Resistor	Carbon, 2.2 Megohm ½W.
26	URD-137	Resistor	Carbon, 4.7 Megohm ½W.
30	URF-053	Resistor	Carbon, 1500 Ohm 2W.
31	URD-089	Resistor	Carbon, 22 Ohm ½W.
32	URE-009	Resistor	Carbon, 22 Ohm 1W.
33	UOP-420	Speaker	4 inch speaker
34	RRC-063	Volume Control	With S.P.S.T. Switch.
35	RTO-039	Transformer	Output Transformer for speaker
	URD-145	Resistor	Carbon, 10 Megohm ½W
	URD-113	Resistor	Carbon, 470000 Ohm ½W

MISCELLANEOUS PARTS

RAU-027 CABINET—Plastic cabinet.
RDC-032 CORD—Dial cord.
RAX-022 DIAL PLATE ASSEMBLY—Dial back plate assembly.
RDS-057 DIAL SCALE—Calibrated scale.
RMU-038 DIAL SHAFT—Drive shaft.
RDP-037 DIAL POINTER—Dial indicator.
RMS-119 DIAL SPRING—Tension spring for drive cord
RDK-115 KNOB.
RJS-001 PILOT LAMP SOCKET.
RMW-015 PULLEY—Dial drive pulley.
RWL-017 POWER CORD.
RJS-006 TUBE SOCKET.
RJS-100 TUBE SOCKET—Miniature.

THE FIRESTONE TIRE & RUBBER CO.

MODEL 4-A-12
THE NARRATOR



MODEL 4-A-12, THE NARRATOR

THE FIRESTONE TIRE & RUBBER CO.

ALIGNMENT PROCEDURE

The chassis and loop should remain in their normal position in the cabinet when making loop adjustment. With the gang condenser fully meshed, the dial pointer should be in the position indicated by the last division below 55 on the dial. If it is set incorrectly, slide the pointer along the dial cord to correct position.

Connect an output meter across the speaker voice coil. Connect the ground side of signal generator to B—. Set the volume control at maximum volume position and use a weak signal from the signal generator.

CAUTION: The chassis of this receiver is connected directly to one side of the line. Use an isolation transformer between the 117-volt AC line and AC input to the radio to avoid shock.

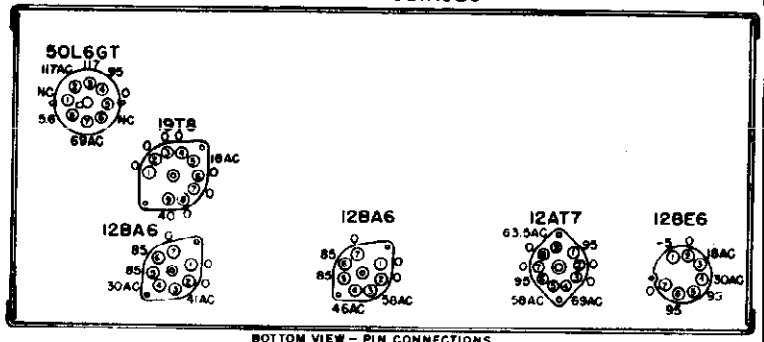
Step No.	Band Switch Position	SIGNAL GENERATOR Frequency	SIGNAL GENERATOR Type of Modulation	Dummy Antenna	Connect High Side of Signal Generator to	Radio Dial Setting	Trimmer Letter	Trimmer Description	Type of Adjustment
1	AM	455 kc	30% AM	0.1 mfd. Condenser	12BE6 Grid Pin No. 7	Any position where it does not affect the signal.	N - O L - M	2nd IF 1st IF	Adjust for maximum output, then repeat adjustment.
2	AM	1620 kc	30% AM	0.1 mfd. Condenser	12BE6 Grid Pin No. 7	Gang condenser completely out of mesh.	D	Oscillator	Adjust for maximum output.
3	AM	1400 kc	30% AM	RMA Loop		Tuned to 1400 kc generator signal.	C	Loop Antenna	Adjust for maximum output.
4	FM	10.7 mc	CW	0.1 mfd. Condenser	12BA6 Driver Grid Pin No. 1	High frequency end.	J	Ratio Detector Primary	Adjust for maximum AVC between Point X on wiring diagram and chassis, using Electronic Voltmeter. (See Note 1.)
5	FM	10.7 mc	CW	0.1 mfd. Condenser	12BA6 Driver Grid Pin No. 1	High frequency end.	K	Ratio Detector Secondary	See Note 1. Adjust for zero position (using Electronic Voltmeter) from point "Y" on the wiring diagram to the top of the volume control.
6	FM	10.7 mc	CW	0.1 mfd.	12AT7 Grid Pin No. 7	High frequency end.	G - H E - F	2nd IF 1st IF	Adjust for maximum AVC. (See Note 1.)
7	FM	108.5 mc	30% FM	300 ohm Carbon resistor	Antenna Terminal J with jumper disconnected.	High frequency end.	B	FM Oscillator	Adjust for maximum output. (See Note 2.)
8	FM	87.5 mc	30% FM	300 ohm Carbon resistor	Antenna Terminal J with jumper disconnected.	Low frequency end.	L_2	FM Oscillator	Adjust for maximum output. (See Note 2.)
9	FM	108 mc	30% FM	300 ohm Carbon resistor	Antenna Terminal J with jumper disconnected.	Tuned to 108 mc generator signal.	A	FM Antenna	Adjust for maximum output. (See Note 2.)
10	FM	87 mc	30% FM	300 ohm Carbon resistor	Antenna Terminal J with jumper disconnected.	Tune to 87 mc generator signal.	L_1	FM Antenna	Adjust for maximum output. (See Note 2.)
11	Repeat operations 9 and 10 if an appreciable change is made in the adjustment of L_1.								

NOTE 1—Adjust input voltage to give approximately 4 volts AVC before final adjustment is made. For steps 4 and 6—Voltmeter common lead to chassis. For step 5—Voltmeter common lead to point "Y" on wiring diagram. The desired zero position is at the point where the meter indicates a polarity change from plus to minus or vice versa.

NOTE 2—For all tests requiring an FM signal, the generator output (22.5 kc deviation, 400 cycles) must be adjusted to give approximately 50 milliwatts receiver output before final adjustments are made.

SOCKET VOLTAGES: Measured with voltmeter having sensitivity of 1000 ohms per volt. Tone control in treble position. Volume on full with no signal. 117 volt, 60 cycle AC power input. All voltages measured from chassis (B-) to points indicated. Voltage measurements are positive DC unless otherwise indicated.

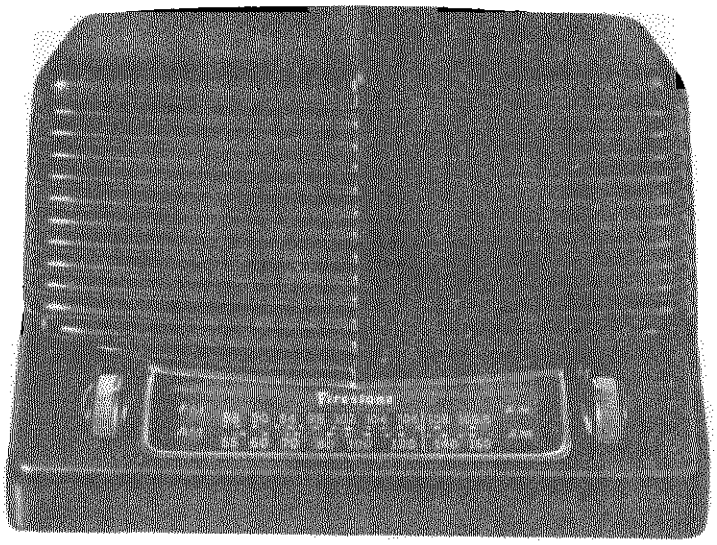
SOCKET VOLTAGES

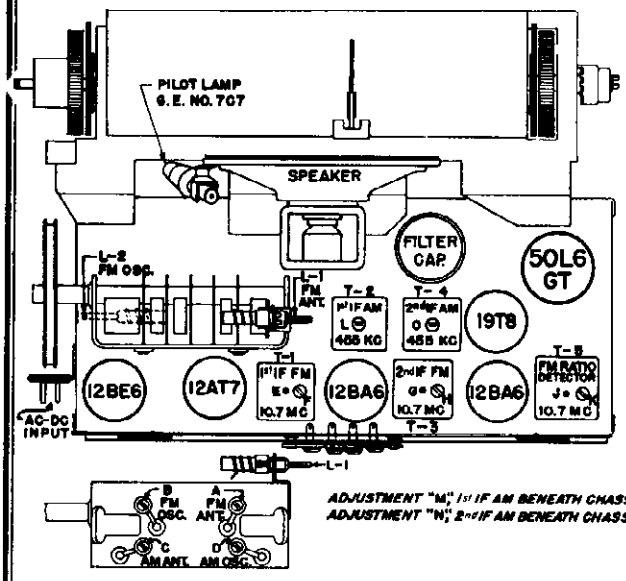


BOTTOM VIEW — PIN CONNECTIONS

ALL VOLTAGES MEASURED FROM CHASSIS (B-) TO POINT INDICATED.
ALL VOLTAGES ARE POSITIVE DC UNLESS OTHERWISE INDICATED.
MEASUREMENTS TAKEN WITH A 1,000 OHM/VOLT METER

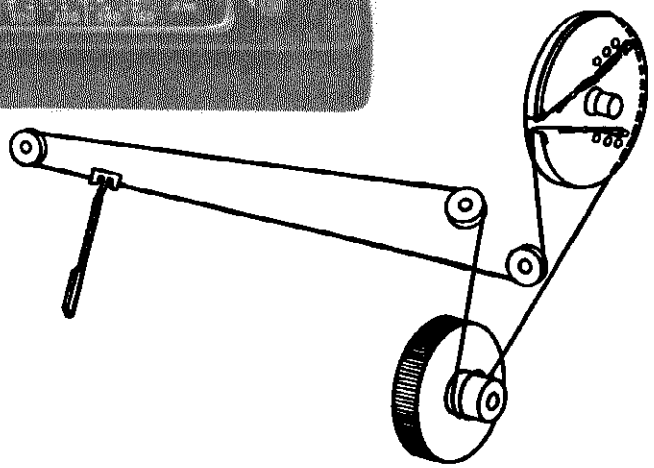
THE FIRESTONE TIRE & RUBBER CO. MODEL 4-A-12
THE NARRATOR





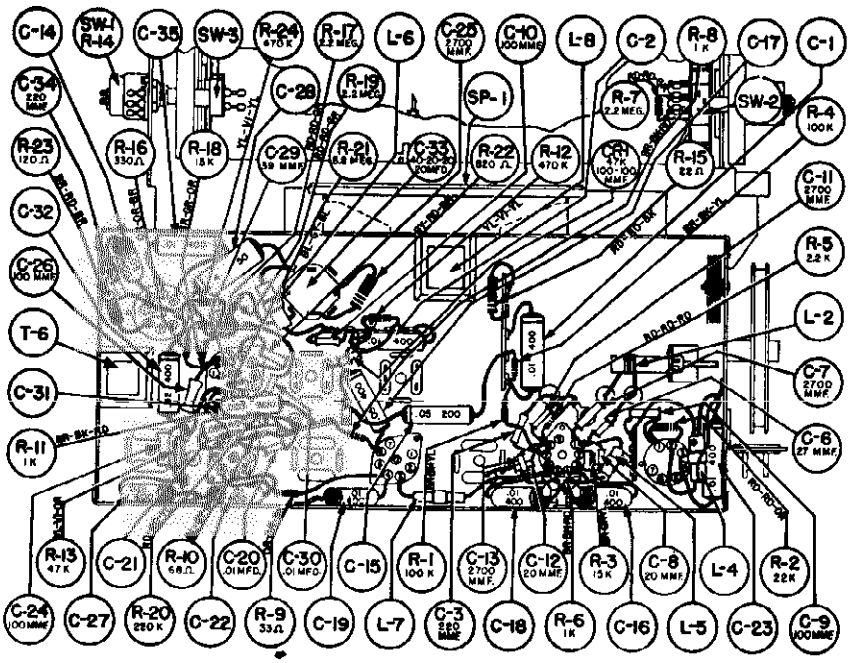
ADJUSTMENT "M" 1st IF AM BENEATH CHASSIS
ADJUSTMENT "N" 2nd IF AM BENEATH CHASSIS

SIDE VIEW OF VARIABLE CAPACITOR



DRIVE CABLE ARRANGEMENT: To string dial cable, set the gang condenser to fully meshed position. Use the following parts for assembly:

B-55402-2	Cable Assembly
A-51787	Spring, Cable
B-59580	Pointer Assembly



MODEL 4-A-12 THE FIRESTONE TIRE & RUBBER CO.

STAGE GAIN DATA

Be sure RF and IF stages are accurately aligned before measuring gain. RF gains can be measured with a "channel" type instrument containing a tuned and calibrated RF amplifier. A vacuum tube voltmeter may be used for audio gain measurements. Observe the following precautions:

1. For all gain measurements, use 1000 KC signal with 400 cycle modulation (use nearby frequency if local station interferes).
2. Be sure radio is carefully tuned to generator signal. (Use weak signal for sharp tuning.)
3. When using a "channel" type instrument, carefully tune it for maximum output at the desired frequency before making measurements.

Differences in tube characteristics, tolerance of parts, adjustment of tuned circuits, and variations of line voltage will influence stage gain. Accuracy of measurements is dependent upon careful tuning of receiver to generator signal and experience in using your test equipment. These factors may create considerable variation in gain masurements.

FREQUENCY RANGE:

540-1600 KC (AM)
88-108 MC (FM)

POWER SUPPLY:

105-125 volts
50-60 cycles AC or
105-125 volts DC
38 watts

SPEAKER:

5-inch PM
Voice coil impedance—
3.2 ohms at 400 cycles

TUNING CONDENSER:

5-section gang

POWER OUTPUT:

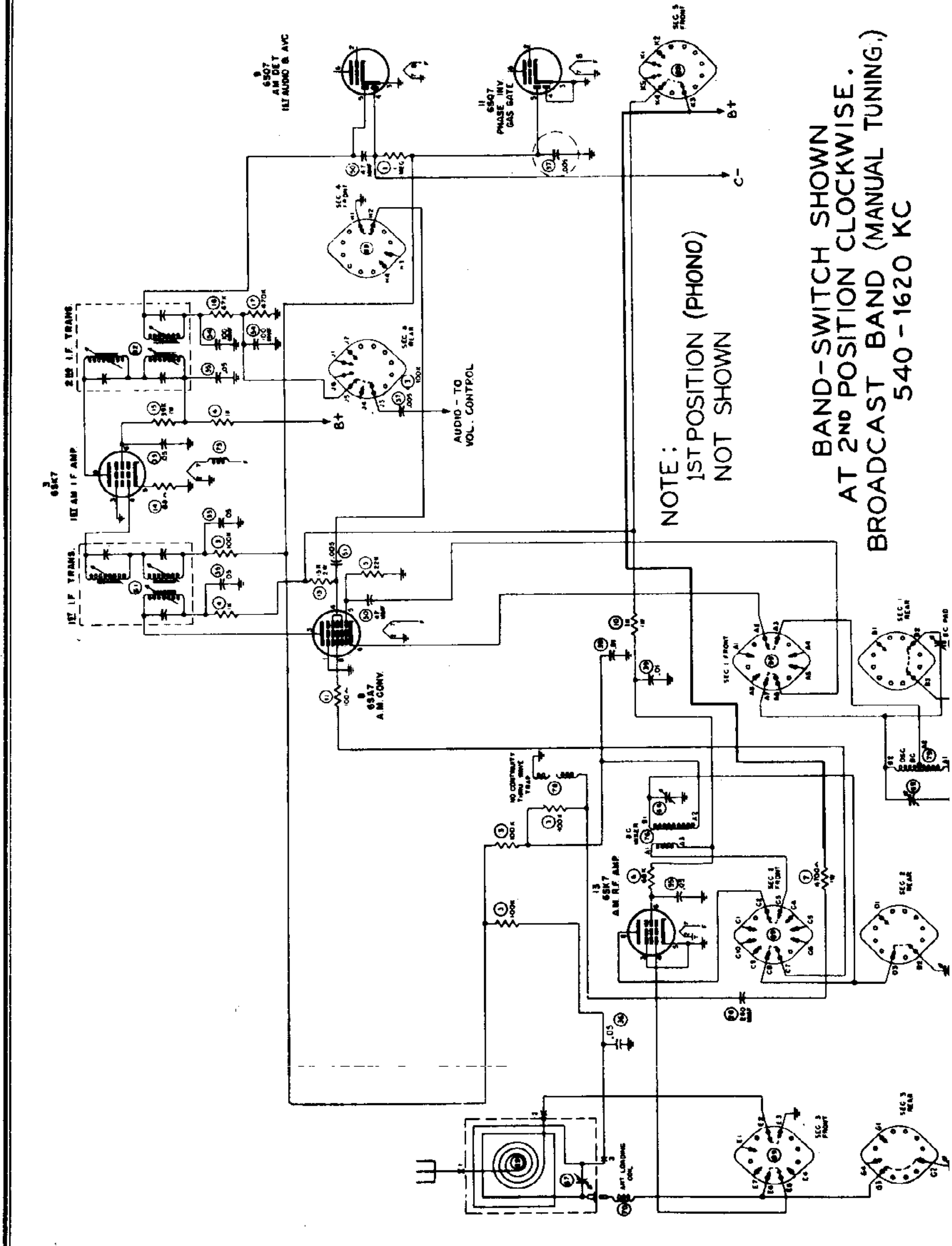
Undistorted—1.0 watt
Maximum—2.0 watts

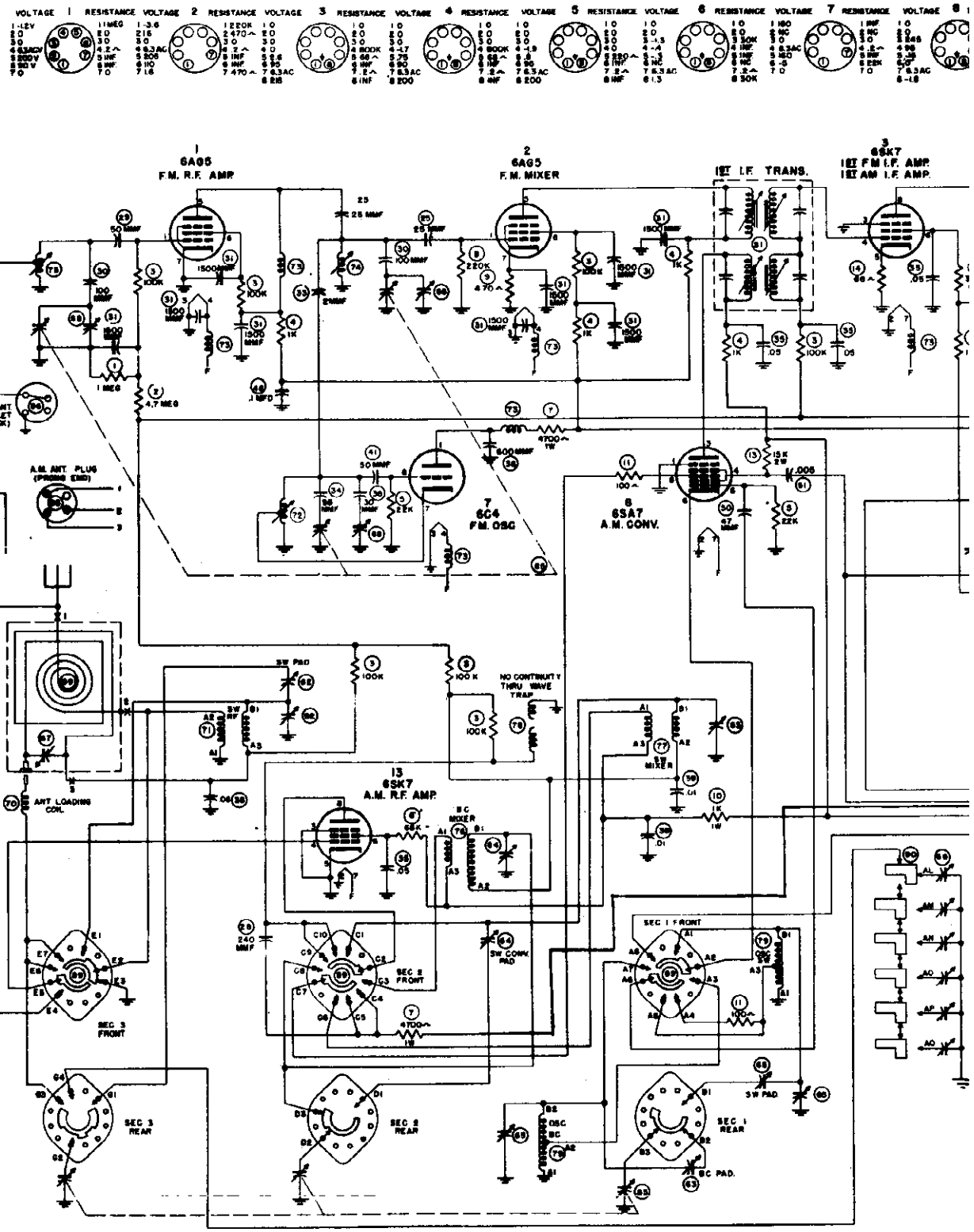
TUBE COMPLEMENT:

12AT7—FM Conv. and Osc.
12BE6—AM Converter
12BA6—I. F. Amplifier (FM-AM)
12BA6—I. F. Amplifier (FM)
19T8—Detector—1st Audio
50L6GT—Power Output

Symbol	Part No.	DESCRIPTION
		CAPACITORS
C-1, 2, 16, 18, 19, 22, 23, 35	BD410103	Capacitor, Paper, .01 Mfd., 400 volt
C-3	B-58810-8	Capacitor, Ceramic 220 mmf., ±20%
C-4A, B, C, D, E	C-59663-1	Capacitor, Variable (5-Section)
C-5	B-51839-3	Capacitor, 1.5 mmf., ±20%
C-6	B-58808-2	Capacitor, Ceramic 27 mmf., ±20%
C-7, 11, 13, 25	B-58815-6	Capacitor, Ceramic 2700 mmf., ±20%
C-8	B-58807-12	Capacitor, Ceramic 20 mmf., ±10%
C-9	B-58809-16	Capacitor, Ceramic 100 mmf., ±20%
C-10	B-58804-18	Capacitor, Ceramic 100 mmf., ±20%
C-12		Capacitor, 20 mmf. (Part of T-11)
C-14, 17, 21	BD410503	Capacitor, Paper .05 Mfd., 400 volt
C-15	BD210503	Capacitor, Paper .05 Mfd., 200 volt
C-20, 30	B-58814-2	Capacitor, Ceramic .01 Mfd., ±20%
C-24, 26	B-58813-18	Capacitor, Ceramic 100 mmf., ±10%
C-27	BD610102	Capacitor, Paper .001 Mfd., 600 volt
C-28	B-55520-5	Capacitor, Electro., 4 Mfd., 50 volt
C-29	B-58805-6	Capacitor, Ceramic 39 mmf., ±10%
C-31	BD610302	Capacitor, Paper .003 Mfd., 600 volt
C-32	BD410203	Capacitor, Paper .02 Mfd., 400 volt
C-33	A-55521	Capacitor, Electro., 40-20-20 Mfd, 150 volt, 20 Mfd., 25 volt
C-34	B-58812-5	Capacitor, Ceramic 220 mmf., ±20%
CR-1	B-58852-1	Capristor. 100-100 mmf., 47K ohms ½ watt
		RESISTORS
R-1, 4	BR17B104	Resistor, 100K ohms, ±20% ½ watt
R-2	BR17B223	Resistor, 22K ohms, ±20% ½ watt
R-3	BR17B153	Resistor, 15K ohms, ±20% ½ watt
R-5	BR17B222	Resistor, 2.2K ohms, ±20% ½ watt
R-6, 8, 11	BR17B102	Resistor, 1000 ohms, ±20% ½ watt
R-7, 17, 19	BR17B225	Resistor, 2.2 meg., ±20% ½ watt
R-9	BR17E330	Resistor, 33 ohms, ±20% 1 watt
R-10	BR17B680	Resistor, 68 ohms, ±20% ½ watt
R-12, 24	BR17B474	Resistor, 470K ohms, ±20% ½ watt
R-13	BR17B473	Resistor, 47K ohms, ±20% ½ watt
R-14	B-55585-1	Control, 2 meg. (Vol. & Sw.)
R-15	BR17E220	Resistor, 22 ohms, ±20% 1 watt
R-16	BR16B331	Resistor, 330 ohms, ±10% ½ watt
R-18	BR16B153	Resistor, 15K ohms, ±10% ½ watt
R-20	BR17B224	Resistor, 220K ohms, ±20% ½ watt
R-21	BR17B685	Resistor, 6.8 meg., ±20% ½ watt
R-22	BR16E821	Resistor, 820 ohms, ±10% 1 watt
R-23	BR16E121	Resistor, 120 ohms, ±10% 1 watt

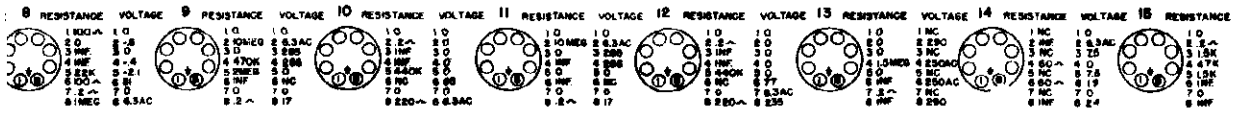
Symbol	Part No.	DESCRIPTION
		COILS AND TRANSFORMERS
L-1	B-59692	Coil Assy., FM Ant.
L-2	B-59693	Coil Assy., FM Osc.
L-3	D-59681	Coil Assy., Loop
L-4	B-57842	Coil Assy., AM Osc.
L-5	B-59572	Coil Assy., RF Choke
L-6	B-57931	Coil Assy., RF Choke
L-7	B-57931	Coil Assy., RF Choke
L-8	B-51726-1	Choke, Filter
T-1	B-59665-1	Trans. Assy., 1st I.F. FM
T-2	C-59694	Trans. Assy., 1st I.F. AM
T-3	B-59680-1	Trans. Assy., 2nd I.F. FM
T-4	C-59564	Trans. Assy., 2nd IF. AM
T-5	B-59695-1	Trans. Assy., Ratio Det.
T-6	C-59563-1	Transformer, Output
		MISCELLANEOUS PARTS
	C-59560	Back-Cabinet Assembly
	C-59688	Back
	D-58069-1	Cord Assembly
	B-59561	Insulator
	B-59559-1	Pin, Guide
	A-5243	Socket, 2-Prong
	A-55447	Socket, Shell and Bracket Assembly
	E-59660-1	Cabinet, Plastic
	A-55451-1	Clip, Tube Hold-Down
	B-55380-2	Clip, Tuning Knob Retainer
	A-51163	Clip, Tuning Shaft Retainer
	D-59671-1	Dial, Crystal Plastic
	B-55121-2	Fastener, for Loop Back
	A-59672	Insulator, Chassis Mounting
	C-59658-1	Knob, Tuning Control
	C-59659-1	Knob, Volume Control
	A-55431	Lamp, Pilot G.E. No. 7C7
	B-59580	Pointer Assembly Dial
	B-58069-1	Power Cord
	A-58612	Rectifier, Selenium
	B-55440-2	Socket, Dial Lamp (with Leads)
SP-1	D-59657	Speaker, 5-inch P.M.
	A-51787	Spring, Dial Cable Tension
	B-55122-1	Stud, Cabinet Back Mounting
SW-1		Switch (Part of R-14)
SW-2	A-55506	Switch, Band (2-Position)
	A-55507	Switch, Tone Control

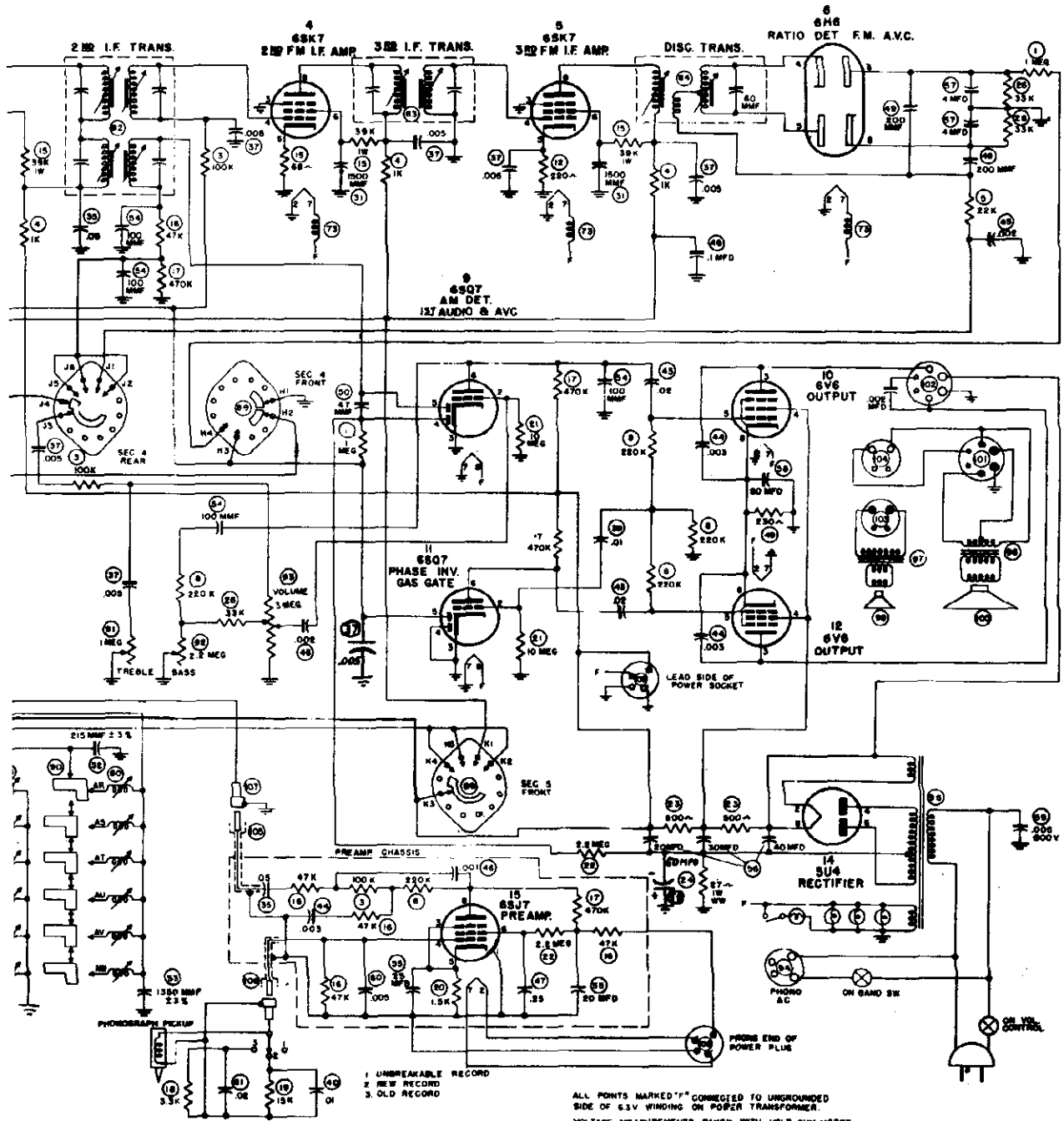

BAND-SWITCH SHOWN
AT 2ND POSITION CLOCKWISE.
BROADCAST BAND (MANUAL TUNING.)
540 - 1620 KC
NOTE:
1ST POSITION (PHONO)
NOT SHOWN
AUDIO - TO VOL. CONTROL
B+
C-


VOLTAGE 1 RESISTANCE VOLTAGE 2 RESISTANCE VOLTAGE 3 RESISTANCE VOLTAGE 4 RESISTANCE VOLTAGE 5 RESISTANCE VOLTAGE 6 RESISTANCE VOLTAGE 7 RESISTANCE VOLTAGE 8
1 6AQ5 F.M. R.F. AMP
2 6AG5 F.M. MIXER
1ST I.F. TRANS.
3 6SK7 1ST FM I.F. AMP. 1ST AM I.F. AMP.
7 6C4 F.M. OSC
8 6SA7 A.M. CONV.
13 6SK7 A.M. R.F. AMP
F.M. ANT SOCKET (BACK)
A.M. ANT. SOCKET
A.M. ANT. PLUG (PHONO END)
ANT. LOADING COIL
SW PAD
NO CONTINUITY THRU WAVE TRAP
SW MIXER
BC MIXER
SW CONV. PAD
BC PAD
SEC 3 FRONT
SEC 2 FRONT
SEC 1 FRONT
SEC 3 REAR
SEC 2 REAR
SEC 1 REAR
OSC BC

TONE TIRE & RUBBER CO.

MODEL 4-A-15



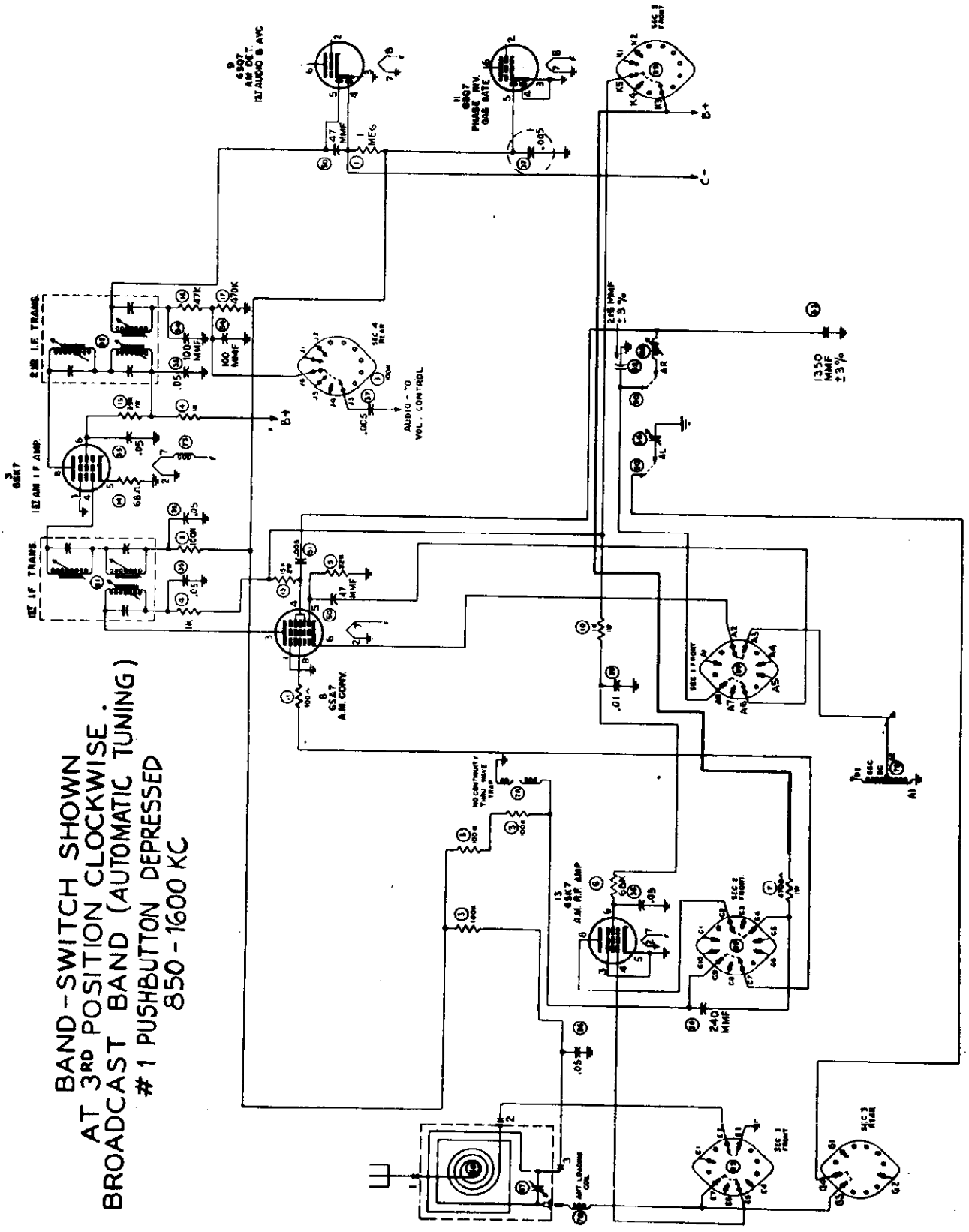


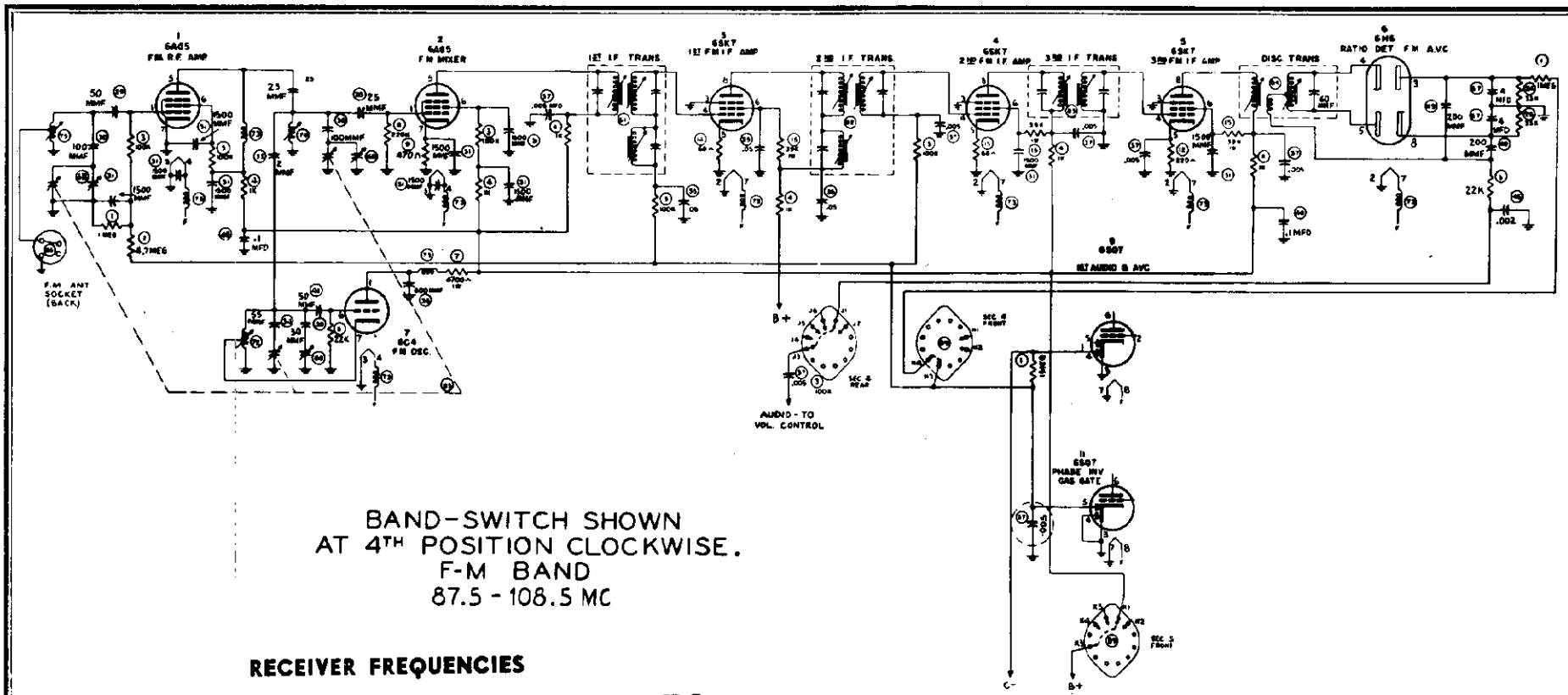
ALL POINTS MARKED "F" CONNECTED TO UNGROUNDED SIDE OF 6.3 V WINDING ON POWER TRANSFORMER.

VOLTAGE MEASUREMENTS TAKEN WITH VOLT-OHM-METER, NO SIGNAL, A.V.C. INOPERATIVE.

BAND SWITCH SHOWN IN EXTREME COUNTER-CLOCKWISE (PHONO) POSITION. 1 PHONO, 2 AM MANUAL, 3 AM PUSH BUTTON, 4 FM, 5 SHORT WAVE

MODEL 4-A-15 THE FIRESTONE TIRE & RUBBER CO.





BAND-SWITCH SHOWN
AT 4TH POSITION CLOCKWISE.
F-M BAND
87.5 - 108.5 MC

RECEIVER FREQUENCIES

Broadcast Band	540 to 1620 K.C.
Short-Wave Band	9.4 to 15.4 M.C.
Frequency Modulation Band	87.5 to 108.5 M.C.
Intermediate Frequency—AM Bands	455 K.C.
FM Bands	10.7 M.C.

POWER AND VOLTAGE REQUIREMENTS

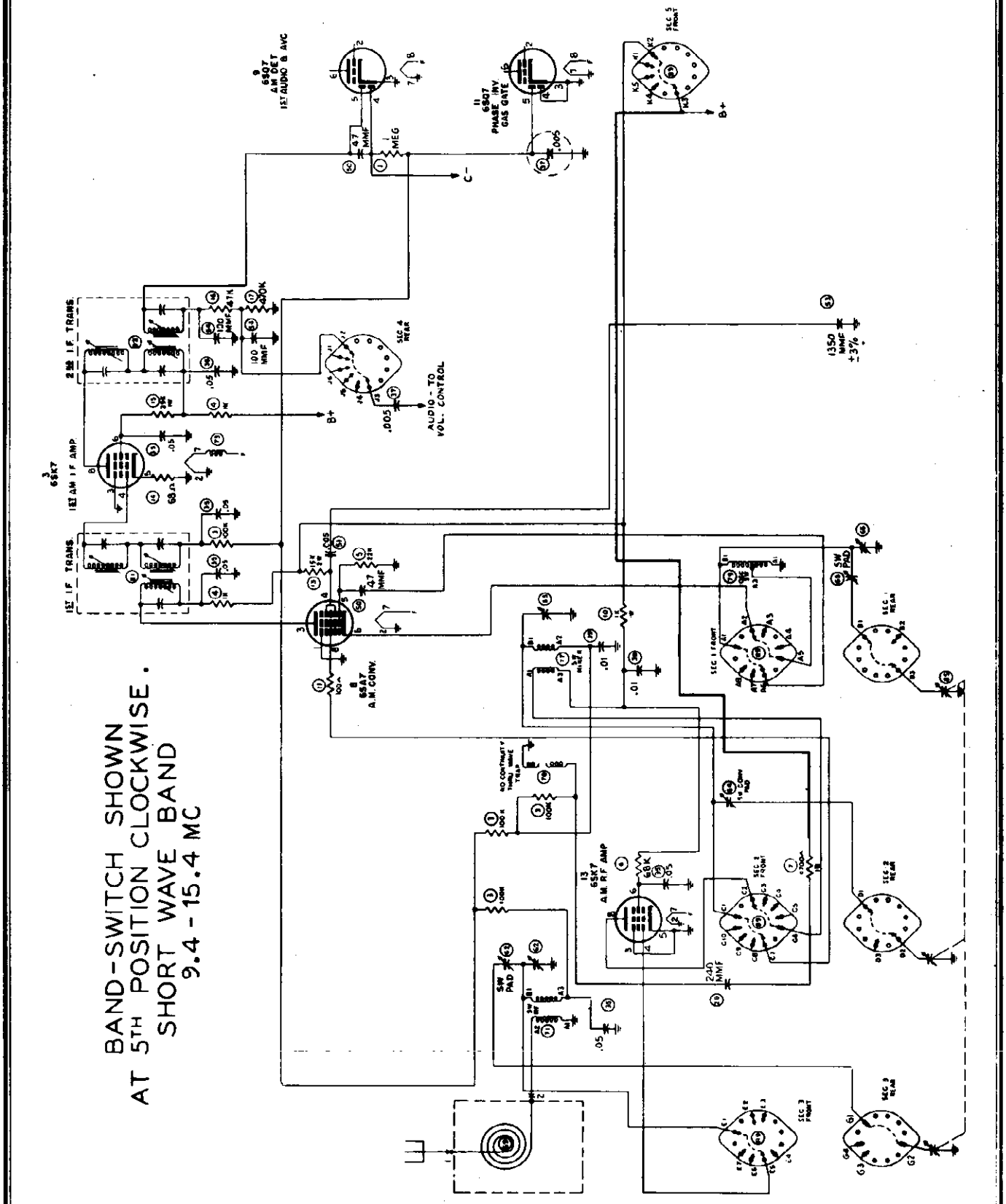
Power Consumption—120 Watts at 117 Volts, 60 Cycles
Voltage—105-125 Volts at 60 Cycles per Second
50 Cycle Operation With Modification
To The Record Changer

AMPLIFIER SPEAKER SYSTEM

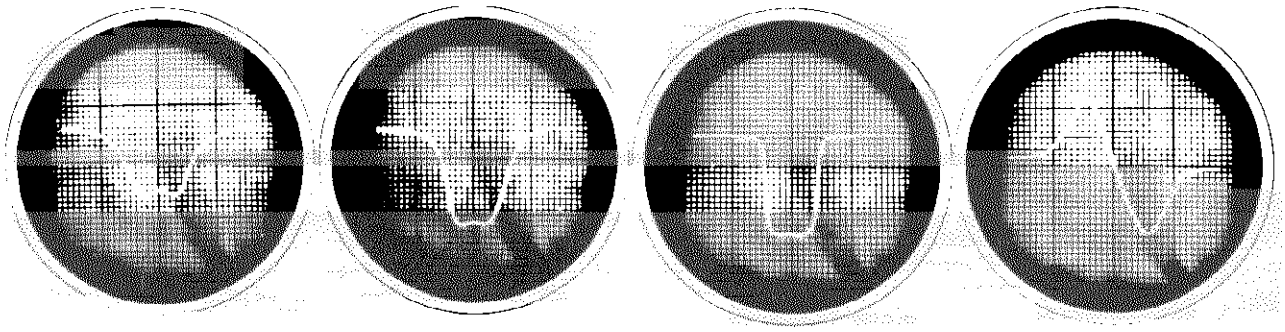
Power Output	15 Watts
Voice Coil Impedance, each speaker	3.2 Ohms
Speakers	12 inch and 6 inch

MODEL 4-A-15

THE FIRESTONE TIRE & RUBBER CO.



Oscilloscope Alignment—FM Band



(1) (2) (3) (4)

These curves were obtained under ideal conditions and show curves to be expected. They should be duplicated as nearly as practicable.

FM IF ALIGNMENT

1. Equipment required: Oscilloscope, 10.7 MC sweep generator, voltomyst, and RF signal generator.
2. Set band switch in FM position.
3. Make connection from vertical deflection amplifier of oscilloscope to pin #3 of 6H6 discriminator tube. Make certain that the 4MFD electrolytic condenser is disconnected from this same circuit. It is necessary that the lead to the oscilloscope be shielded, of low total capacity, and connection to receiver isolated by means of a 1 meg. resistor.
4. Connect sweep generator to last FM IF grid through a .1 MFD coupling capacitor.
5. Load primary of discriminator transformer with resistor of approximately 3900 ohms. Back out secondary slug (top slug) as far as it will turn. Align primary (bottom slug) to obtain curve similar to figure 1. This does not constitute a final alignment of discriminator, but is a convenient expedient to assist in IF alignment.
6. Shift connection of sweep signal generator to the grid of the second FM IF tube.
   NOTE: As alignment moves from stage to stage, reduce input instead of reducing oscilloscope gain.
7. Align third FM IF transformer for a symmetrical flat top pattern. (Fig. 2).
8. Shift signal generator to the grid of the first IF tube.
9. Align second IF transformer in same manner as described in Section 7.
   Note that the width of the nose of the curve is the same as before, but the sides have become steeper, as in Fig. 3.
10. Connect the signal generator to the grid of the converter tube grid in series with 10,000 ohm resistor and a .1MFD capacitor, or loosely couple by stray capacity of an insulated wire.
11. Align first FM IF transformer in the same manner as in Section 7.
    Note that the sides of the curve have further steepened, but that the nose of the curve has retained approximately the same width as in Fig. 3.
12. Connect 4 MFD electrolytic capacitor that was previously disconnected, and take off load resistor on discriminator primary.
13. Connect oscilloscope to audio output terminal of discriminator. There are several points where contact can be made and can be identified as the circuit connected to the terminal on the terminal board (nearest the discriminator transformer) to which the shielded lead is connected.
14. With sweep signal input to converter grid, align discriminator transformer for conventional discriminator pattern, as in Fig. 4.
15. Connect signal generator to converter tube grid through .1MFD capacitor. An unmodulated signal input of 65 microvolts at 10.7 MC should develop .55 volt rise on the AVC line with voltohmyst connected to AVC line through 1 megohm resistor.

Alternate FM IF Alignment Procedure

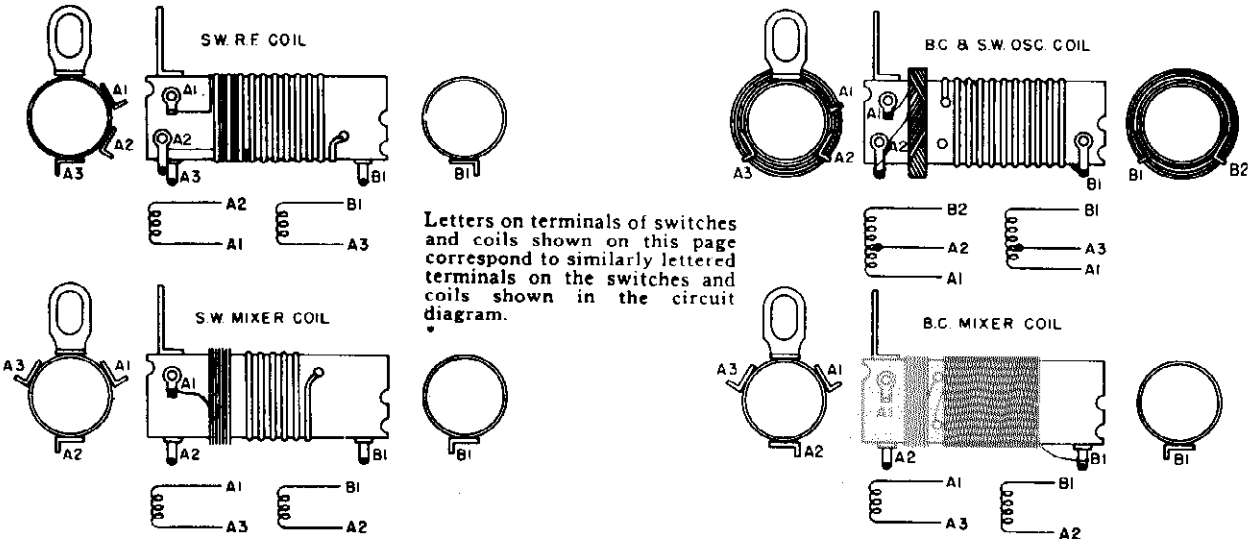
1. Connect voltohmyst or high resistance voltmeter on AVC line (Pin 3 on 6H6 socket) through 1 meg. resistor. Connect AM signal generator, set at 10.7 MC, to grid on 6SK7 which feeds diode transformer. Connect output meter on voice coil of speaker.
2. Turn bottom slug (nearest the chassis) of disc. transformer out as far as possible.
3. Tune top slug of disc. transformer for maximum output (negative voltage) on the volt meter.
4. Connect generator to grid of second IF amplifier.
5. Detune slug of 3rd IF transformer under chassis by turning out as far as possible
6. Tune top slug for maximum voltage, next tune bottom slug for maximum voltage. In each step do not use an input greater than necessary to give three volts AVC.
7. Connect signal generator to grid of first IF amplifier.
8. Detune bottom FM slug (nearest corner of can) by turning out as far as possible.

9. Tune top slug (nearest corner of can) for maximum voltage, next tune bottom slug for maximum voltage.
10. Connect signal generator to 6AG5 converter grid and tune first IF transformer as above.
11. With generator still hooked to 6AG5 grid and modulated with 400 cycles, about 200 microvolts input, adjust slug next to chassis on disc. transformer for minimum output voltage on output meter which is on voice coil.

FM RF Alignment

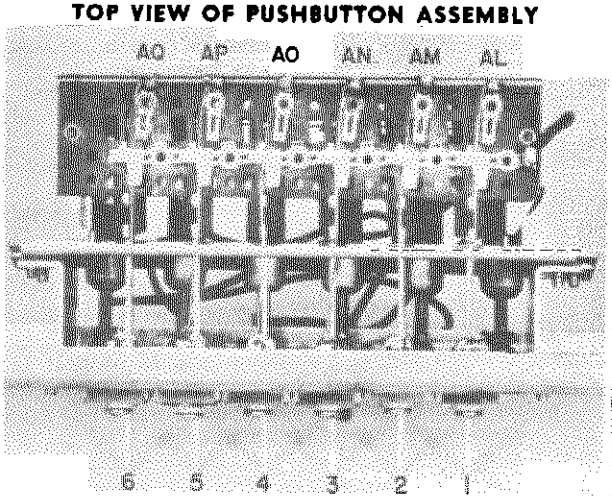
1. Equipment Required:
   a. RF Signal Generator. Range 88 to 108 MC.
   b. Output Meter.
   c. Insulated Screw Driver.
2. Connect RF signal generator in series with 330 ohm carbon resistor to "high" side of FM antenna socket. Connect output meter across voice coil of speaker.
3. Set tuning control for pointer to calibrate at 108.
4. Apply 108 MC Signal.
5. Set converter and antenna trimmers at minimum capacity.
6. Adjust oscillator trimmer by tuning from maximum capacity to first signal that is heard, and peak for maximum output.
7. Adjust antenna and converter trimmers for maximum output.
8. Set tuning controls so dial pointer calibrates at 88 MC.
9. Apply 88 MC signal.
10. Adjust oscillator, converter, and antenna slugs to maximum output.
11. Repeat operations 3 to 10 inclusive.
    NOTE: The degree of adjustment required in the tuning of the oscillator slug will determine the number of times operations 3 to 10 must be repeated until no further gain in sensivity is obtained.
12. Carefully tune across the entire FM band for the observance of the dead or weak spots that may be a resultant of improper alignment or defective components. This can be determined by carefully noting the degree of receiver noise, that is, high noise generally is accompanied by good sensitivity.

RF, OSCILLATOR AND MIXER COILS

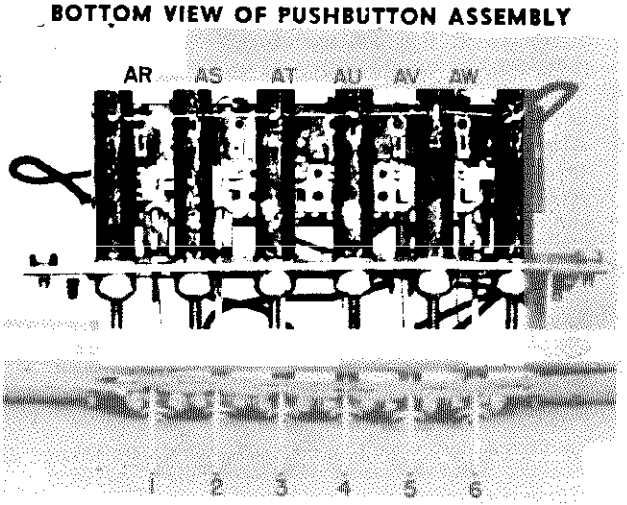


Letters on terminals of switches and coils shown on this page correspond to similarly lettered terminals on the switches and coils shown in the circuit diagram.

TOP VIEW OF PUSHBUTTON ASSEMBLY



BOTTOM VIEW OF PUSHBUTTON ASSEMBLY



Alignment of AM Bands

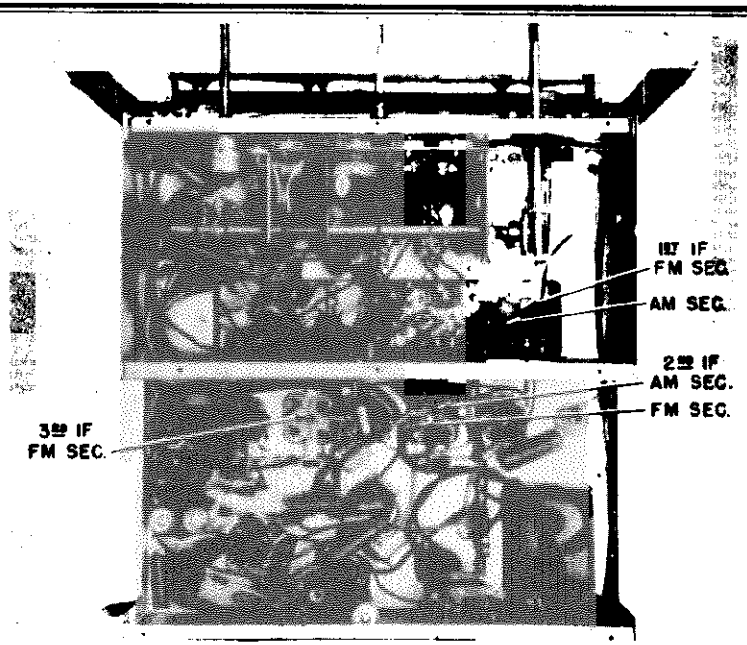
EQUIPMENT REQUIRED

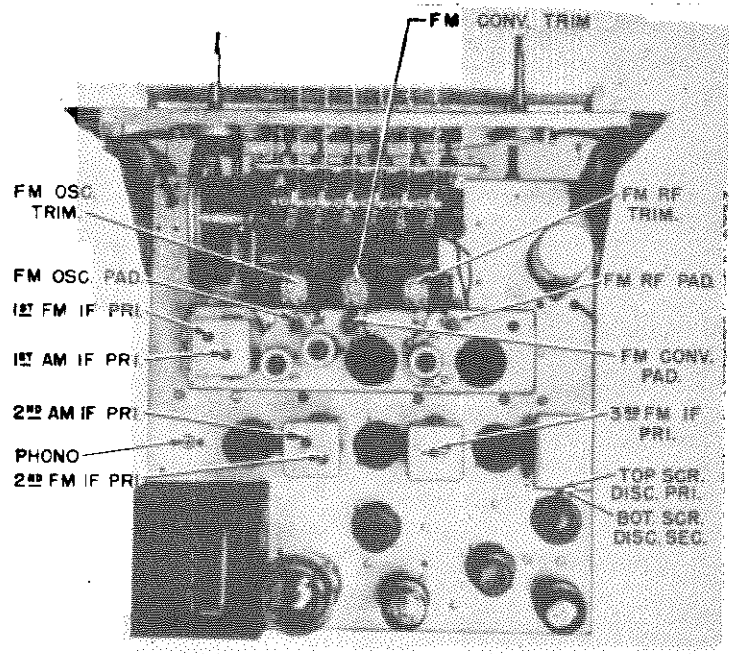
A calibrated signal generator having fundamental frequencies from 455 Kc to 16 MC. In addition to the signal generator a crystal calibrator is a great convenience.

The indicating device for showing correct alignment may be a high resistance A.C. voltmeter, a vacuum tube voltmeter or a Cathode Ray oscilloscope.

The A.C. voltmeter can be used either across the voice coil of the loud speaker or if the meter range is high enough, from the plate to plate in the output stage (don't forget a condenser (O.1 Mfd.) to keep the D.C. out of the meter).

Special care must be employed when aligning the short wave band, for the adjustment of the shunt trimmer affects the adjustment of the series pad. At the high frequency end of the band it is possible to peak the oscillator trimmer (and the pad at the low frequency end) at the image so in the alignment instructions we have indicated the fundamental frequency and the correct oscillator setting for the image so by resetting the signal generator it is possible to see if the alignment is correctly made. In each case, the image is found at a frequency 910 Kc. higher than the fundamental.





Trimmers are accessible by removing top radio panel, eliminating necessity of chassis removal from cabinet

MODEL 4-A-15 THE FIRESTONE TIRE & RUBBER CO.

TABULATION FOR AM ALIGNMENT

STEPS	CONNECT GENERATOR		SET GENERATOR AT	SET GANG AT	ADJUST	TO OBTAIN
1	Set Tone and Volume Controls at Maximum					
2	Through .1 Mfd.	Grid Conv. tube	455 Kc	Quiet Point	2nd. I.F. A.M. Slugs	MAXIMUM OUTPUT
3					1st. I.F. A.M. Slugs	
4	Through .1 Mfd.	RF of GANG	1500 Kc	1500 Kc	BC Osc. Trimmer	
5					BC R.F. Trimmer	
6			600 Kc	600 Kc	Osc. Padder *	
7		Check dial calibration at several frequencies. If not reasonably correct, adjust oscillator padder. See Note †				
8	#	Ext. Ant. Binding Post	1500 Kc	1500 Kc	Loop Trimmer	

#Through RMA dummy antenna.
* This adjustment should be made while gang is rocked.

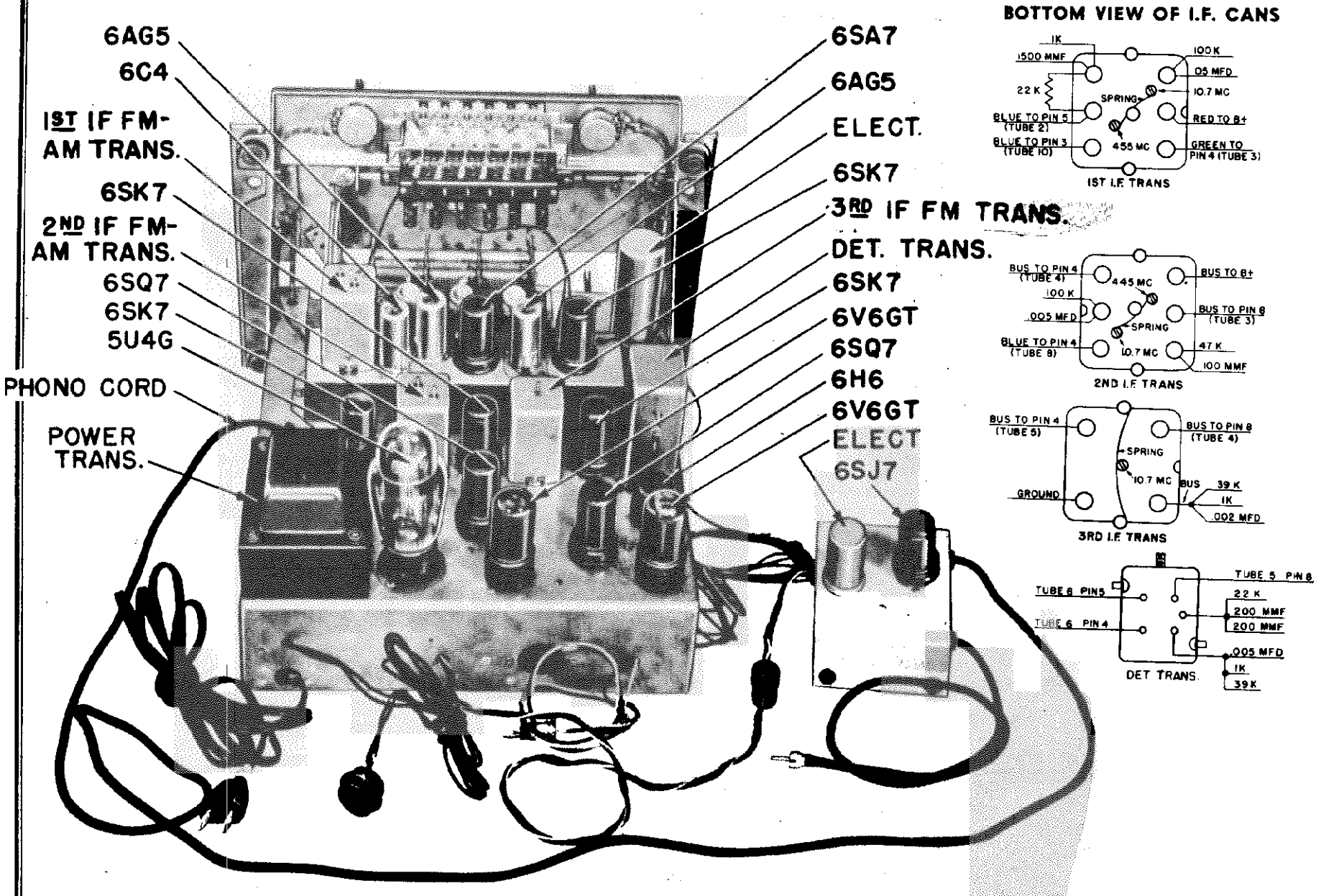
SHORT WAVE RF

9	Place Band Switch in Short Wave position.					
10	Through 400 ohm resistor	External Antenna	15 MC	15 MC	SW Osc. * Trimmer	MAXIMUM OUTPUT
11					SW R.F. Trimmer	
12					SW Ant. Trimmer	
13			9.4 MC	9.4 MC	SW Osc. † Padder	
14					SW R.F. Padder	
15					SW Ant. Padder	
16	Recheck Steps 10 to 15 inclusive.					

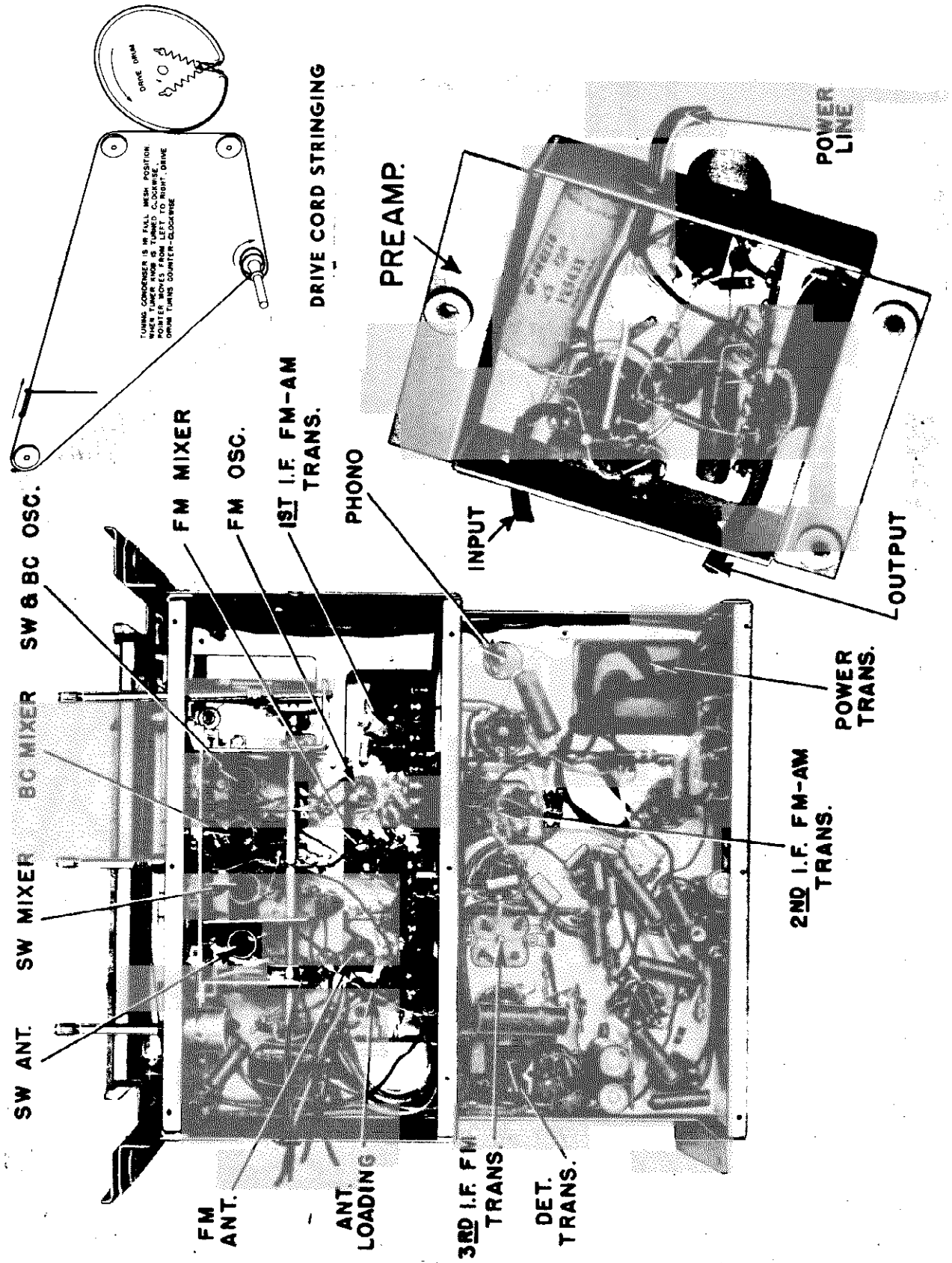
* Set oscillator trimmer to maximum capacity, then slowly loosen trimmer until 2nd signal is heard. Check for proper alignment of OSC trimmer by tuning set to approximately 14.1 MC at which point or image signal should appear.
† After any adjustment of oscillator padder, repeat steps 4, 5 and 6.

ANTENNAS

Broadcast Band ..... Firestone "Powerscope" Shielded rotatable loop
Shortwave Band.... BC loop shield acting as a capacity antenna
FM Band..... Folded dipole with 300 ohm cable

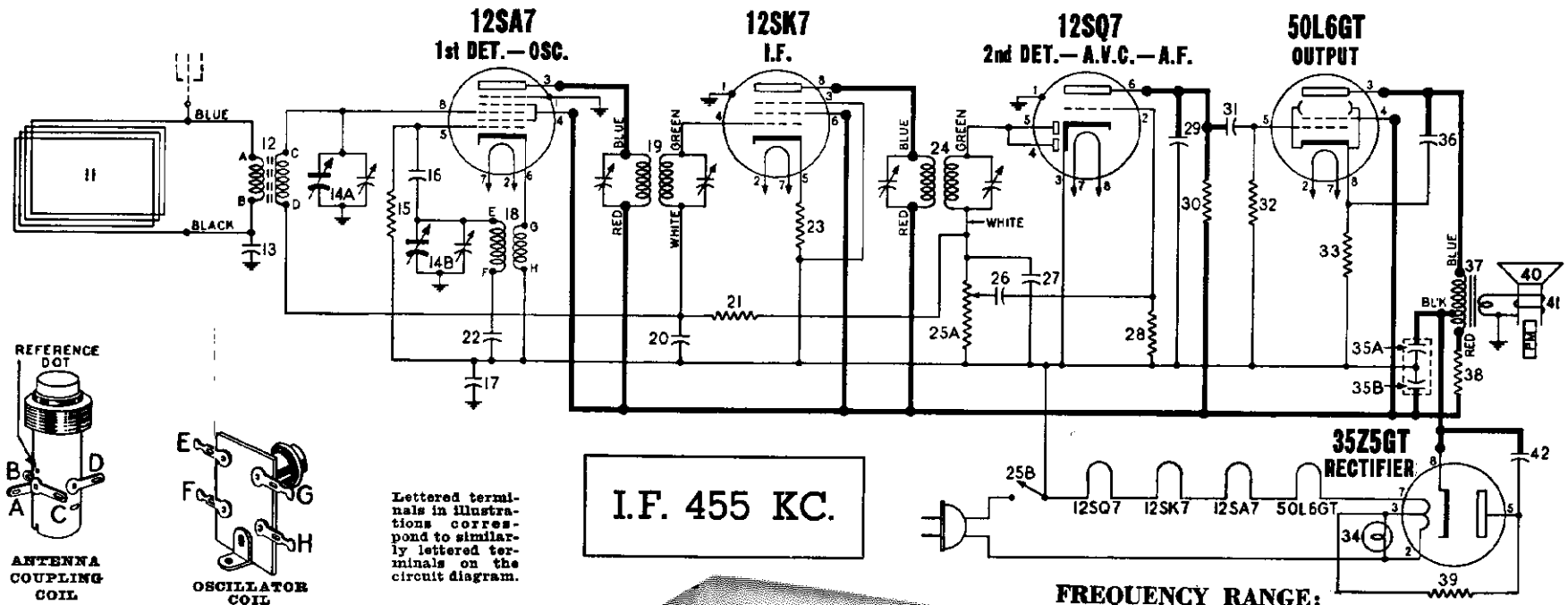

6AG5
6C4
1ST IF FM-AM TRANS.
6SK7
2ND IF FM-AM TRANS.
6SQ7
6SK7
5U4G
PHONO CORD
POWER TRANS.
6SA7
6AG5
ELECT.
6SK7
3RD IF FM TRANS.
DET. TRANS.
6SK7
6V6GT
6SQ7
6H6
6V6GT
ELECT
6SJ7
BOTTOM VIEW OF I.F. CANS
1K
1500 MMF
22 K
BLUE TO PIN 5 (TUBE 2)
BLUE TO PIN 3 (TUBE 10)
SPRING
455 MC
100 K
05 MFD
10.7 MC
RED TO B+
GREEN TO PIN 4 (TUBE 3)
1ST I.F. TRANS
BUS TO PIN 4 (TUBE 4)
100 K
005 MFD
BLUE TO PIN 4 (TUBE 8)
445 MC
SPRING
10.7 MC
BUS TO B+
BUS TO PIN 8 (TUBE 3)
47 K
100 MMF
2ND I.F. TRANS
BUS TO PIN 4 (TUBE 5)
SPRING
10.7 MC
GROUND
BUS
BUS TO PIN 8 (TUBE 4)
39 K
1K
002 MFD
3RD I.F. TRANS
TUBE 6 PIN 5
TUBE 6 PIN 4
TUBE 5 PIN 8
22 K
200 MMF
200 MMF
005 MFD
1K
39K
DET. TRANS.

MODEL 4-A-15 THE FIRESTONE TIRE & RUBBER CO.



THE FIRESTONE TIRE & RUBBER CO. MODEL 4-A-1

Ref. No.	Part No.	Description
1	77218	1 Megohm Resistor
2	77272	4.7 Megohm Resistor
3	77214	100K Ohm Resistor
4	77262	1000 Ohm Resistor
5	77266	22K Ohm Resistor
6	77305	68K Ohm Resistor
7	77429	4700 Ohm Resistor 1 Watt
8	77216	220K Ohm Resistor
9	77261	470 Ohm Resistor
10	77106	1000 Ohm Resistor 1 Watt
11	77258	100 Ohm Resistor
12	77209	220 Ohm Resistor
13	77325	15K Ohm Resistor 2 Watt
14	77269	68 Ohm Resistor
15	77322	39K Ohm Resistor 1 Watt
16	77213	47K Ohm Resistor
17	77217	470K Ohm Resistor
18	77210	3300 Ohm Resistor
19	77265	15K Ohm Resistor
20	77263	1.5K Ohm Resistor
21	77274	10 Megohm Resistor
22	77270	2.2 Megohm Resistor
23	77337	500 Ohm Resistor Wire Wound 5 Watt
24	77428	27 Ohm Resistor 1 Watt
25	77338	230 Ohm Wire Wound 5 Watt
26	77267	33K Ohm Resistor
27	77268	330K Ohm Resistor
28	25349	240 Mmf Mica Capacitor
29	25143	50 Mmf Ceramic Capacitor, Zero Temp.
30	25447	100 Mmf Ceramic Capacitor, N-470
31	25273	1500 Mmf Ceramic Capacitor
32	25159	25 Mmf Ceramic Capacitor, Zero Temp.
33	25275	2 Mmf Ceramic Capacitor, Zero Temp.
34	25346	55 Mmf Ceramic Capacitor, N-330
35	25196	.05 Mfd Tubular Capacitor 600 Volts
36	25274	600 Mmf Ceramic Capacitor Hi-K
37	25141	.005 Mfd Mica Capacitor
38	25329	30 Mmf Ceramic Capacitor
39	25194	.01 Tubular Capacitor 600 Volts
40	25112	.01 Tubular Capacitor 200 Volts
41	25375	50 Mmf Ceramic Capacitor
43	25195	.02 Mfd Tubular Capacitor 600 Volts
44	25184	.003 Mfd Tubular Capacitor 600 Volts
45	25185	.002 Mfd Tubular Capacitor 600 Volts
46	25432	.001 Mfd Tubular Capacitor 200 Volts
47	25433	.25 Mfd Tubular Capacitor 600 Volts
48	25215	.1 Mfd Tubular Capacitor 600 Volts
49	25318	200 Mmf Molded Mica Capacitor
50	25193	47 Mmf Molded Mica Capacator
51	25183	.005 Mfd Tubular Capacitor
52	25212	215 Mmf Silver Mica Capacitor
53	25213	1350 Mmf Silver Mica Capacitor
54	25188	100 Mmf Molded Mica Capacitor
55	25431	20 Mfd, 450 Volts, 25 Mfd, 25 Volt Electrolytic Capacitor
56	25277	20 Mfd, 30 Mfd, 40 Mfd, 450 Volt Electrolytic Capacitor
57	25270	4 Mfd, Electrolytic Capacitor
58	25269	50 Mfd, 25 Volts Electrolytic Capacitor
59	25031	.005 Mfd Buffer Capacitor 600 Volts
60	25126	.005 Mfd Tubular Capacitor 200 Volts
61	25276	.02 Mfd Tubular Capacitor 200 Volts
62	26273	#4 Trimmer Strip
63	26272	#3 Trimmer Strip
64	26271	#2 Trimmer Strip
65	26270	#1 Trimmer Strip
66	26274	Push Button Switch Trimmer Strip
67	26031	Antenna Trimmer
68	26221	Ceramic Trimmer 1.5-7 Mmf
69	38896	Loop Antenna Assembly
70	38845	Loop Loading Coil
71	38905	S W. Antenna Coil
72	38673	FM Oscillator Coil
73	38661	R.F. Choke
74	38672	FM Converter Coil
75	38673	FM R.F. Coil Assembly
76	38904	BC Converter Coil
77	38903	S.W. Converter Coil
78	38484	Wave Trap
79	38902	B.C. & S.W. Oscillator Coil
80	38906	P.B. Coil Assembly
81	38621	1st I.F. Transformer
82	38622	2nd I.F. Transformer
83	38623	3rd. I.F. Transformer
84	38879	Discriminator Transformer
85	26230	Gang Capacitor
86	80439	FM Antenna Socket
87	80439	AM Antenna Socket
88	80440	AM Antenna Plug
89	90263	Band Switch
90	90264	P.B. Switch
91	78103	Treble Control
92	78102	Bass Control
93	78101	Volume Control
94	11274	Phono Motor Lead & Socket
95	27118	Line Cord
96	94170	Power Transformer
97	94258	Output Transformer for 81178
98	94259	Output Transformer for 81179
99	81178	Speaker (6 inch)
100	81179	Speaker (12 inch)
101	80465	Speaker Plug for 81179
102	80245	Speaker Socket for 81179, 6 Prong, Wafer Type
103	80468	Speaker Plug for 81178
104	80236	Speaker Socket for 81178
105	22170	Output Cable
106	22169	Pick-up Cable
107	80030	Phono Jack
108	22171	Power Adapter Cable (male)
109	22173	Power Adapter Cable (female)
	05141	Drive Cord (46")
	11431	Dipole Antenna Assembly
	11441	On-Off Indicator Light Assembly
	13801	Flexible Shaft Assembly
	13806	Pointer Assembly
	17199	Miniature Tube Socket & Shield Assembly
	31424	Dial Glass
	59435	Push Button
	59436	Push Button Escutcheon
	64305	Push Button Retainer
	67512	Knob (Volume)
	67513	Knob (Tuning)
	67514	Knob (Bandswitch)
	67515	Knob (Bass Tone)
	67516	Knob (Treble)
	67517	Knob (Powerscope)
	92228	Felt Washer
	11412	Compartment Light Assy
	37530	Lid Support R.H.
	37531	Door Pull
	37532	Drawer Slides (Set)
	37533	Cabinet Knob
	37534	Door Catch—Bullet Type
	37535	Hinge—Piano Type 17¼"
	37536	Hinge RH
	37537	Hinge LH
	37538	1 Prong Glides (Set of 4)



ANTENNA COUPLING COIL
504899

OSCILLATOR COIL
502934

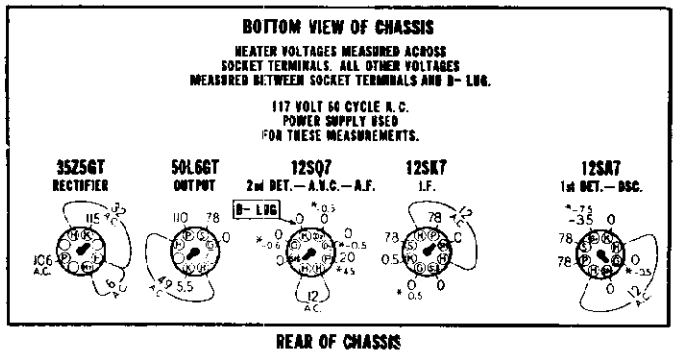
Lettered terminals in illustrations correspond to similarly lettered terminals on the circuit diagram.

I.F. 455 KC.

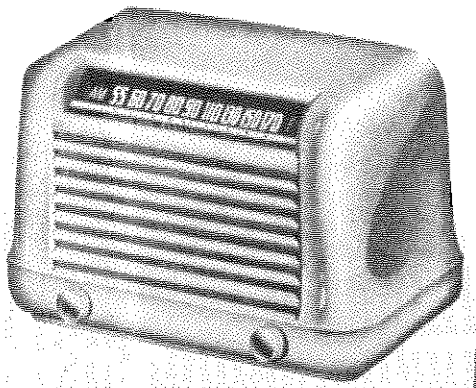
SOCKET VOLTAGES

Measured with voltmeter having sensitivity of 1000 ohms per volt except where indicated by (*). The (*) symbol designates a vacuum tube voltmeter measurement.

VOLUME ON FULL WITH NO SIGNAL — DIAL TUNED TO 540 KC.



REAR OF CHASSIS



POWER SUPPLY:

117 volts
50-60 cycles A.C. or D.C.
30 watts

POWER OUTPUT:

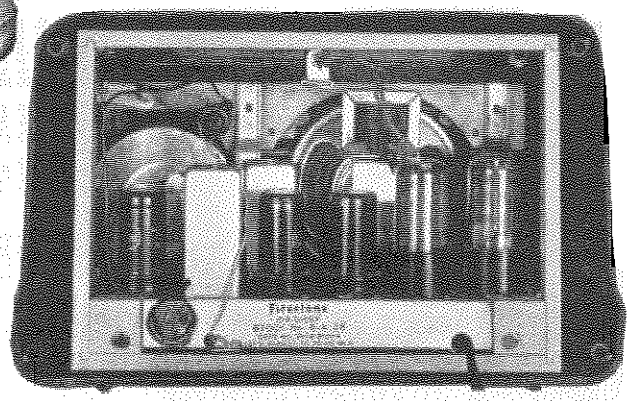
Undistorted — 1.0 watts
Maximum — 1.9 watts

FREQUENCY RANGE:

Standard Broadcast Band } 540-1725 KC.

SPEAKER:

4 inch P-M Dynamic
Voice coil impedance—3.2 ohms



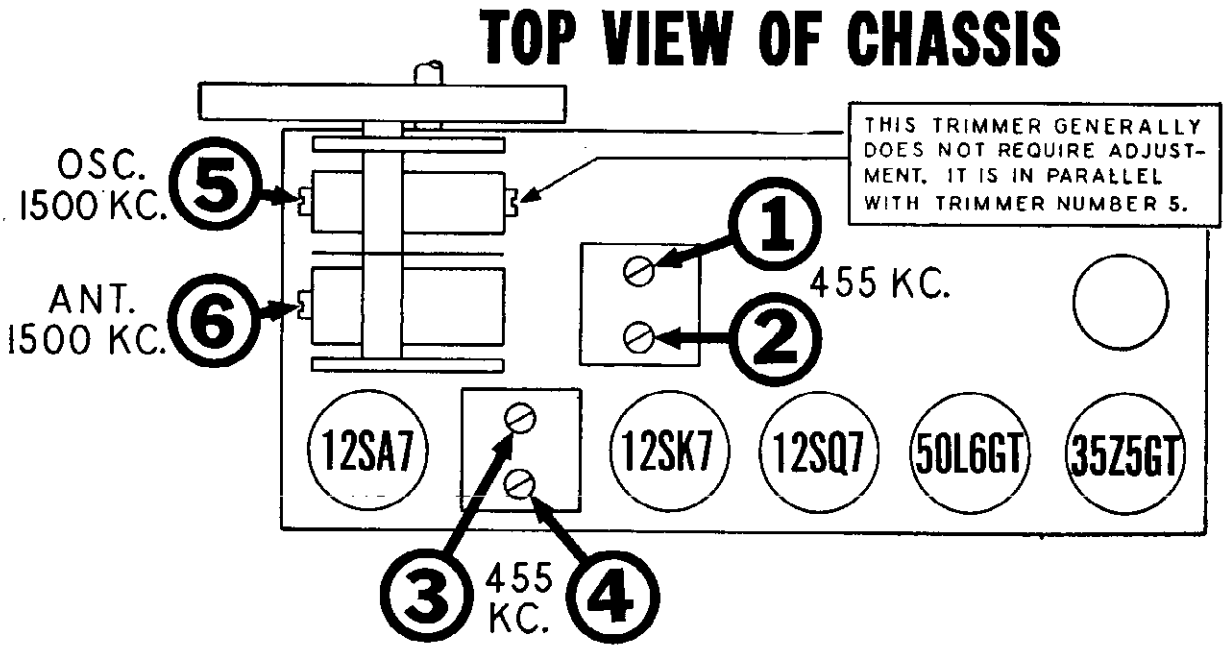
THE FIRESTONE TIRE & RUBBER CO.

MODEL 4-A-26
THE NEWSCASTI

ALIGNMENT PROCEDURE

1. With the gang condenser fully meshed, the dial pointer should be in the position indicated by the last mark below 55 on the dial. If it is set incorrectly, release the pointer clip on dial cord and reposition pointer.
2. Remove chassis from cabinet by taking out two screws which hold chassis to bottom of cabinet. Solder approximately 8" of insulated wire to any B— connection (see voltage chart on Page 6 for convenient B— location).
3. Connect ground lead of signal generator to B— through a 0.25 Mfd. condenser.
4. Connect output meter across speaker voice coil (terminals at back of speaker) or from plate of type 50L6GT tube to B— through a 0.1 Mfd. condenser.
5. Set volume control at maximum volume position and use a weak signal from the signal generator.

DUMMY ANT. IN SERIES WITH SIGNAL GENERATOR	CONNECT HIGH SIDE OF GENERATOR TO	SIGNAL GENERATOR FREQUENCY	RECEIVER DIAL SETTING	TRIMMER NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT
200 MMFD. Mica Condenser	Lug on trimmer No. 6 on rear section of gang (see figure below for location of trimmer.)	455 KC	Any point where it does not affect the signal.	1-2	2nd I.F.	Adjust for maximum output. Then repeat adjustment.
				3-4	1st I.F.	
200 MMFD. Mica Condenser	External Antenna Clip on Loop Antenna	1500 KC	1500 KC	5	Broadcast Oscillator	Adjust for maximum output.
200 MMFD. Mica Condenser	External Antenna Clip on Loop Antenna	1500 KC	Tune to 1500 KC generator signal.	6	Broadcast Antenna	Adjust for maximum output.



TRIMMER LOCATIONS

MODEL 4-A-26,
THE NEWSCASTER

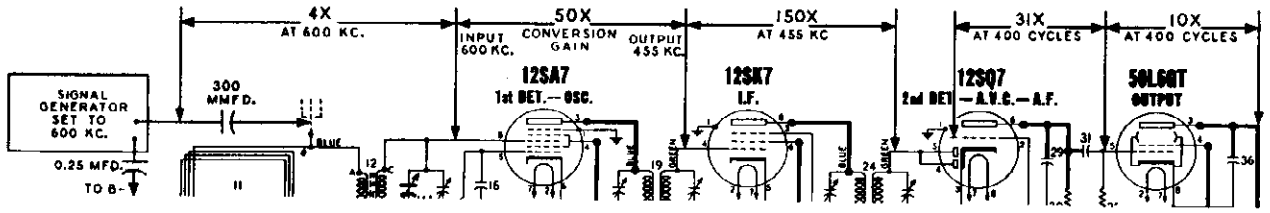
THE FIRESTONE TIRE & RUBBER CO.

STAGE GAIN MEASUREMENT PROCEDURE

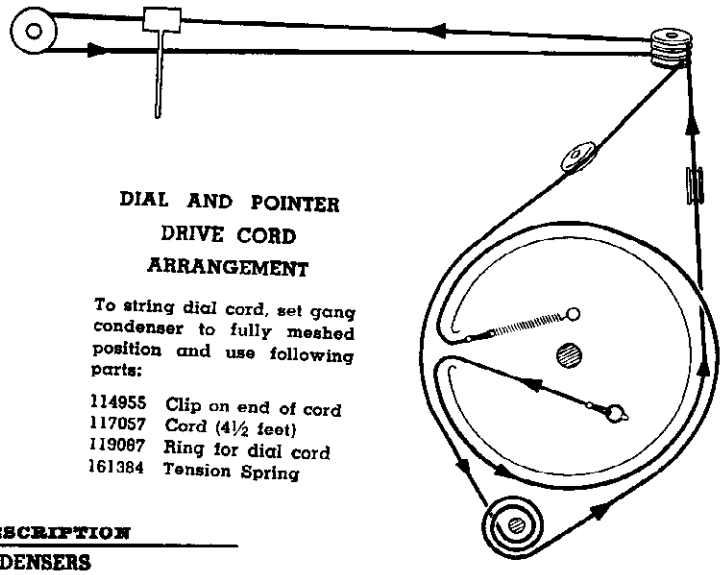
REQUIRED INSTRUMENTS: The amount of amplification or "gain" of each of the stages of this receiver may be measured with an A.C. Vacuum Tube Voltmeter or a "channel" type instrument containing a tuned and calibrated amplifier.

PROCEDURE: It is exceedingly important to adhere to the procedure outlined below since the accuracy of these measurements will be affected to a considerable extent by the failure to establish proper operating conditions.

1. Be sure that R.F. and I.F. stages are carefully and accurately aligned by utilizing the alignment procedure given on page 4.
2. Connect Signal Generator as shown below.
3. The values of stage gain which are given here were measured with a fixed bias of 3 volts on the control grids of all R.F. and I.F. tubes which are connected to the A.V.C. circuit. Therefore, these values are not intended to indicate the full capability of a stage but they will serve as a convenient basis for determining proper operation. In order to duplicate the fixed bias voltage, connect the negative terminal of a 3 volt battery to the A.V.C. lead at terminal "D" of antenna coil and then connect positive battery lead to B— in the receiver chassis.
4. Set Signal Generator for operation at 600 Kc with 400 cycle modulation and carefully tune radio receiver to this signal by using an output meter to indicate peak output. If a local station interferes, set generator to a nearby frequency and re-tune the receiver.
5. R.F. and I.F. circuits are slightly de-tuned when contact is made with an instrument probe and this action, which is indicated by a change in the output meter reading, may seriously affect the gain measurement. Therefore, it is important to adjust the associated circuit trimmer for a maximum output meter reading and to set the input signal level to a convenient reference point on the gain measuring instrument while the probe is making contact. After removing the probe it is again necessary to adjust the trimmer so as to obtain the same output meter reading and thereby assure that the signal voltage at the specified point has not changed as a result of circuit de-tuning.
6. When using a "channel" type instrument, carefully tune it for maximum output at desired frequency before making measurements.



DIFFERENCES in tube characteristics, tolerance of parts, adjustment of tuned circuits and variations in line voltage will influence stage gain. These factors should be given due attention in event the gain of a stage varies extensively from the values shown above.



DIAL AND POINTER DRIVE CORD ARRANGEMENT

To string dial cord, set gang condenser to fully meshed position and use following parts:

114955 Clip on end of cord
117057 Cord (4½ feet)
119087 Ring for dial cord
161384 Tension Spring

DIAGRAM NO.	PART NO.	DESCRIPTION
		CONDENSERS
13	502156	Condenser—.004 Mfd. 400 volt
14-A, B	502925	Condenser—variable gang (with drum)
16	502929	Condenser—47 Mmfd. 500 volt
17	502158	Condenser—.2 Mfd. 400 volt
20	502153	Condenser—.05 Mfd. 200 volt
22	502410	Condenser—.1 Mfd. 400 volt
26	502156	Condenser—.004 Mfd. 400 volt
27	502882	Condenser—220 Mmfd. 500 volt
29	502470	Condenser—.0008 Mfd. 400 volt
31	502156	Condenser—.004 Mfd. 400 volt
35-A, B	500256	Condenser—electrolytic A—40 Mfd. 150 volt B—20 Mfd. 150 volt
36	502152	Condenser—.02 Mfd. 400 volt
42	502157	Condenser—.05 Mfd. 400 volt
		RESISTORS
15	502130	Resistor—carbon 22,000 ohms ¼ watt
21	502135	Resistor—carbon 2.2 Meg. ¼ watt
23	502264	Resistor—carbon 47 ohms ¼ watt
25-A, B	502928	Volume control—with switch; 1 Meg.
28	502136	Resistor—carbon 10 Meg. ¼ watt
30	502134	Resistor—carbon 470,000 ohms ¼ watt
32	502134	Resistor—carbon 470,000 ohms ¼ watt

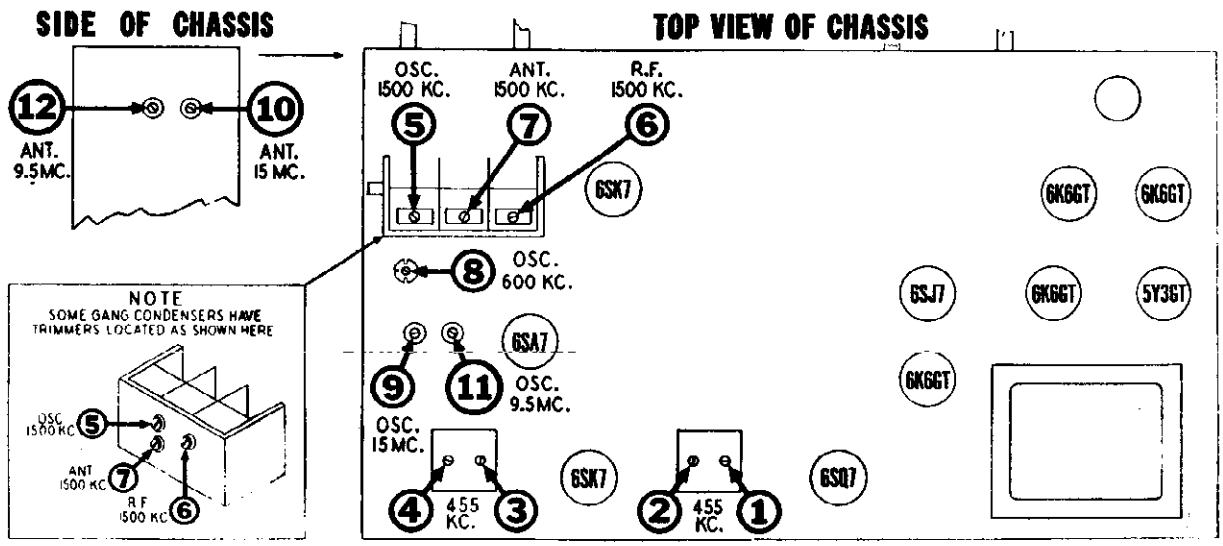
DIAGRAM NO.	PART NO.	DESCRIPTION
33	502932	Resistor—carbon 150 ohms 1 watt
38	502933	Resistor—carbon 1,500 ohms 1 watt
39	502574	Resistor—carbon 33 ohms ½ watt
		COILS AND TRANSFORMERS
11	504348	Loop antenna
12	504899	Coil—antenna
18	502934	Coil—oscillator
19	502926	Transformer—1st I.F.
24	505040	Transformer—2nd I.F.
37	502817	Transformer—output for C-502816 speaker
	504583	Transformer—output for W-502816 speaker
		OTHER ELECTRICAL PARTS
34	118921	Lamp—dial (Mazda 47) 6-8V. 150 Ma.
40	502818	Cone and voice coil for C-502816 speaker
	504584	Cone and voice coil for W-502816 speaker
41	502816	Speaker—P.M. dynamic (4 inch)

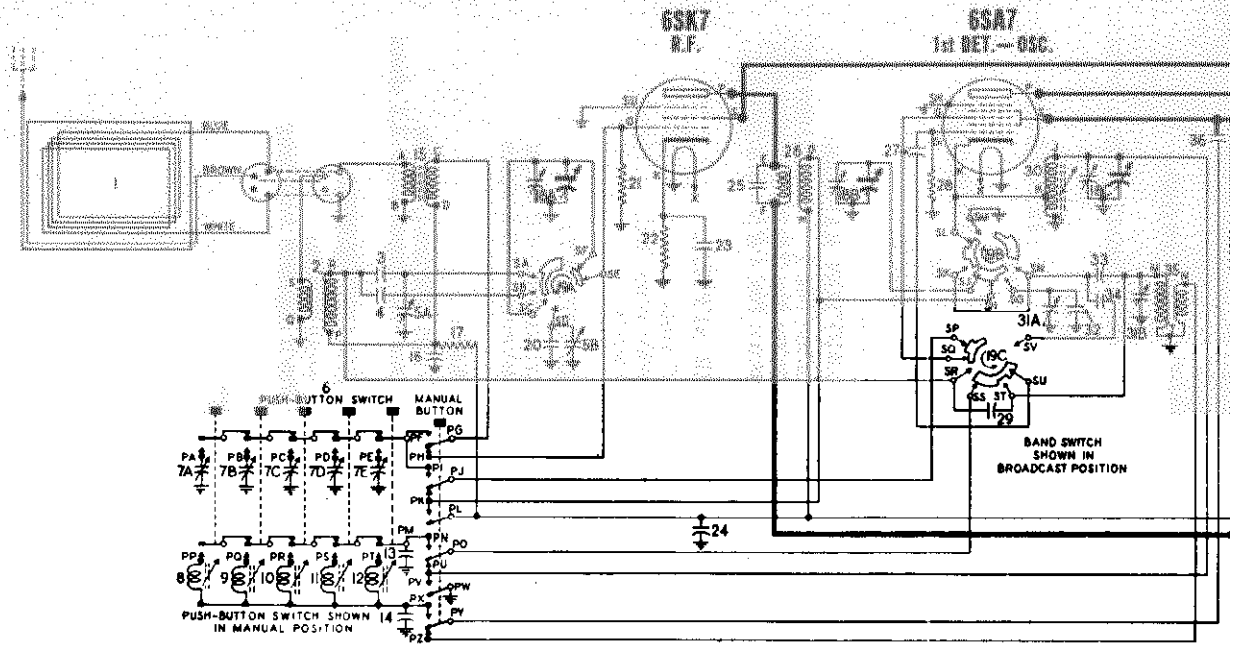
ALIGNMENT PROCEDURE

1. Remove chassis and loop antenna from cabinet (do not remove loop of wire stapled to cabinet). Wind one turn of insulated wire around frame of antenna so as to provide a means of coupling it to the signal generator. Space chassis approximately same distance from loop as when installed in cabinet. Connect plug on loop antenna cable to socket at rear of chassis. Brown lead in antenna cable (which was connected to loop of wire stapled to cabinet) should now be connected to one end of new coupling turn on frame of loop.
2. With the gang condenser fully meshed, dial pointer should be in the position indicated by the last division below 55 on the dial. If it is set incorrectly, release pointer clip on dial cord and reposition pointer.
3. Connect output meter across speaker voice coil.
4. Connect the ground lead of the signal generator to the receiver chassis.
5. Set volume control at maximum volume position and use a weak signal from the signal generator.
6. Push in the manual button and leave it in that position throughout the alignment procedure.

IMPORTANT:—Align this receiver in exactly the order shown below. Broadcast band must be aligned before short wave bands.

DUMMY ANT. IN SERIES WITH SIGNAL GENERATOR	CONNECT HIGH SIDE OF SIGNAL GENERATOR TO	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RECEIVER DIAL SETTING	TRIMMER NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT
.1 MFD. Condenser	Trimmer on rear section of gang	455 KC	"A" Broadcast (counter-clockwise)	Any point where it does not affect the signal.	1-2	2nd I.F.	Adjust for maximum output. Then repeat adjustment.
					3-4	1st I.F.	
500 MMFD. Condenser	Coupling turn on Loop Frame	1500 KC	"A" Broadcast (counter-clockwise)	1500 KC	5	Broadcast Oscillator (Shunt)	Adjust for maximum output
500 MMFD. Condenser	Coupling turn on Loop Frame	1500 KC	"A" Broadcast (counter-clockwise)	Tune to 1500 KC Generator Signal	6	Broadcast R.F.	Adjust for maximum output
500 MMFD. Condenser	Coupling turn on Loop Frame	1500 KC	"A" Broadcast (counter-clockwise)	Tune to 1500 KC Generator Signal	7	Broadcast Antenna	Adjust for maximum output
500 MMFD. Condenser	Coupling turn on Loop Frame	600 KC	"A" Broadcast (counter-clockwise)	Tune to 600 KC Generator Signal	8	Adjustable core of Broadcast Oscillator Coil.	Adjust for maximum output. Try to increase output by rotating core in and out and retuning receiver dial until maximum output is obtained.
500 MMFD. Condenser	Coupling turn on Loop Frame	Repeat adjustments of trimmers 5, 6 and 7 at 1500 Kc. Then re-check adjustment of trimmer 8 at 600 Kc.					
400 OHM Carbon Resistor	Coupling turn on Loop Frame	15.5 MC	"B" Short wave (center)	15.5 MC	9	S.W. ("B") Oscillator	Adjust for maximum output. Check to see if proper peak was obtained by tuning in image at approx. 14.6 MC. If image does not appear, realign at 15.5 MC. with trimmer screw farther out. Recheck image.
400 OHM Carbon Resistor	Coupling turn on Loop Frame	15.5 MC	"B" Short wave (center)	Tune to 15.5 MC Generator Signal	10	S.W. ("B") Antenna	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.
100 OHM Carbon Resistor	Coupling turn on Loop Frame	9.5 MC	"C" Short wave (clockwise)	9.5 MC	11	S.W. ("C") Oscillator	Adjust for maximum output. Check to see if proper peak was obtained by tuning in image at approx. 8.6 MC. If image does not appear, realign at 9.5 MC. with trimmer screw farther out. Recheck image.
400 OHM Carbon Resistor	Coupling turn on Loop Frame	9.5 MC	"C" Short wave (clockwise)	Tune to 9.5 MC Generator Signal	12	S.W. ("C") Antenna	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.





SOCKET VOLTAGES

Measured with voltmeter having sensitivity of 1000 ohms per volt except where indicated by (*). The (*) symbol designates a vacuum tube voltmeter measurement.

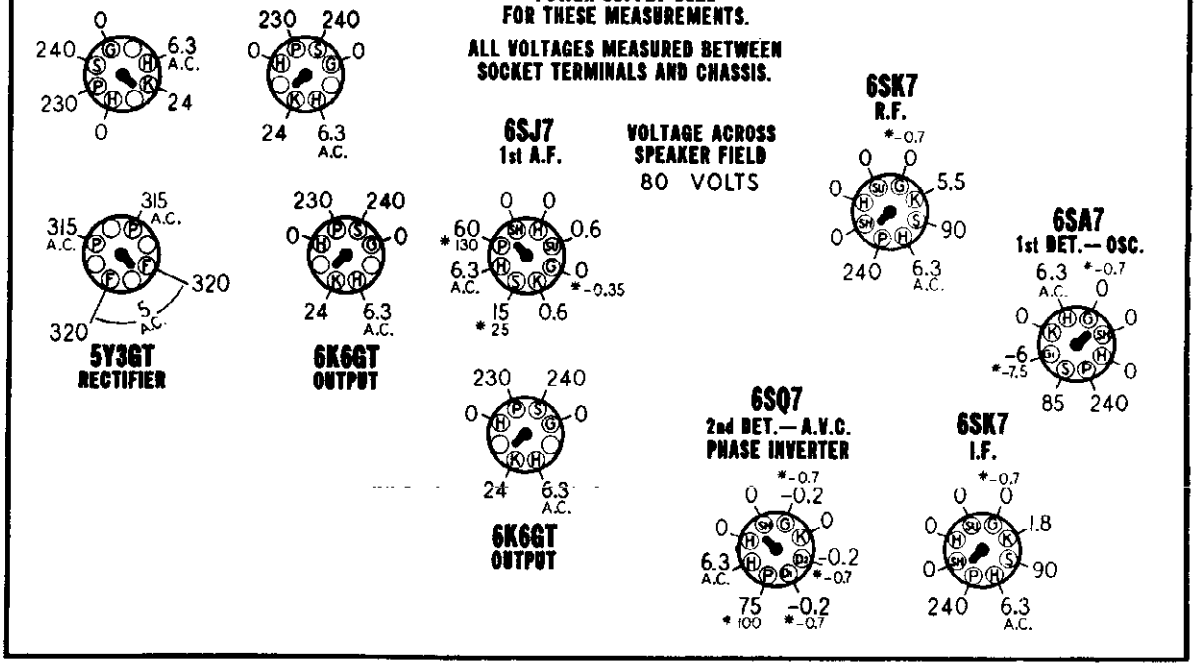
VOLUME ON FULL WITH NO SIGNAL
RANGE SWITCH IN BROADCAST ("A") POSITION

DIAL TUNED TO 540 KC.
MANUAL BUTTON PUSHED IN

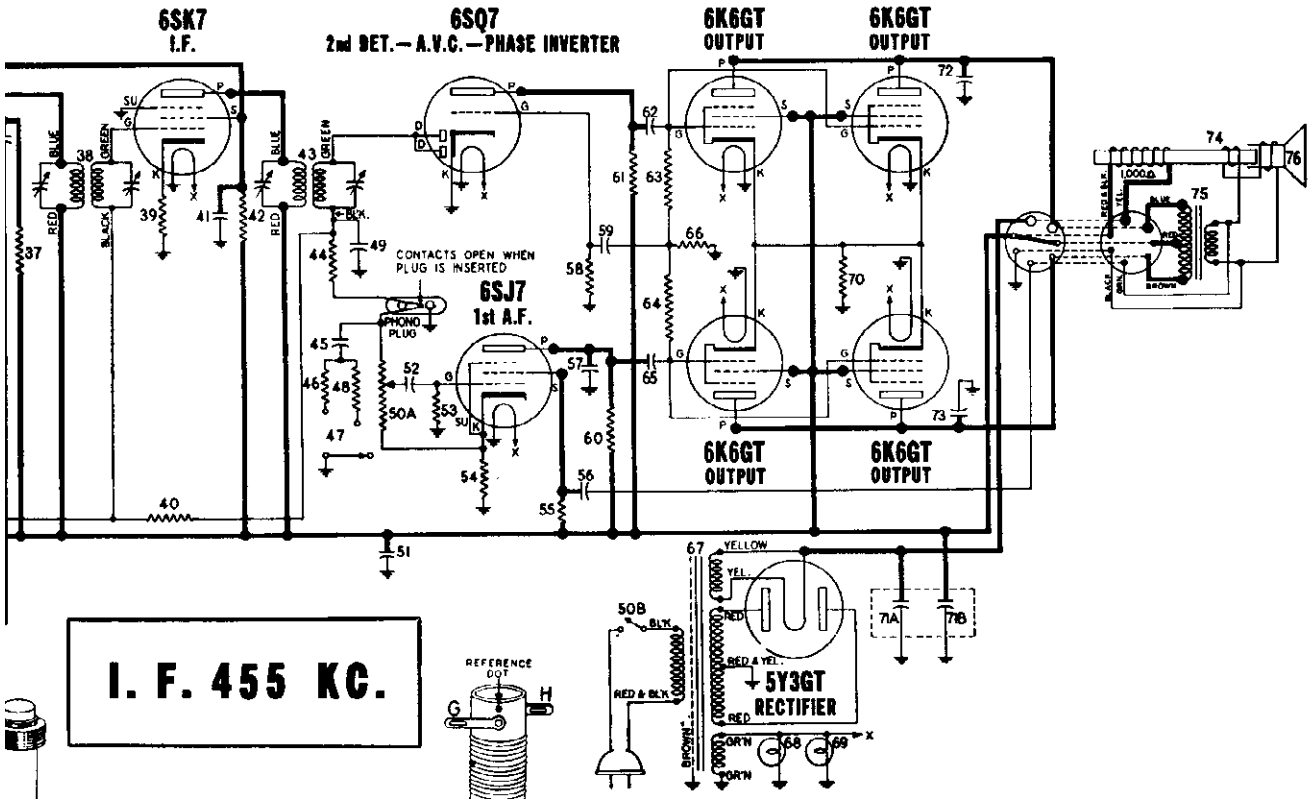
BOTTOM VIEW OF CHASSIS

117 VOLT 60 CYCLE A.C. POWER SUPPLY USED FOR THESE MEASUREMENTS.

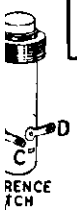
ALL VOLTAGES MEASURED BETWEEN SOCKET TERMINALS AND CHASSIS.



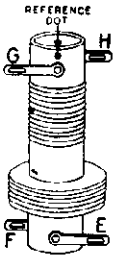
REAR OF CHASSIS



I. F. 455 KC.

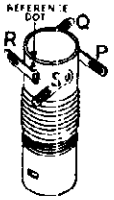


NTENNA
PLING
502112



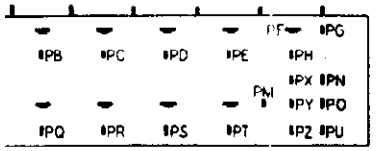
R.F. COIL
502113

ILLATOR
OIL
2114

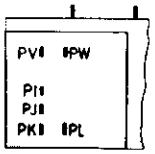


S.W. ANTENNA
COIL
502116

S.W. OSCILLATOR
COIL
502111

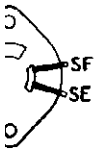


TOP
VIEW

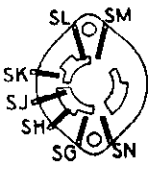


BOTTOM
VIEW

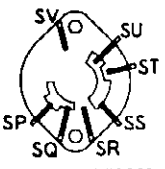
PUSH-BUTTON SWITCH 502276



SECTION
VIEW

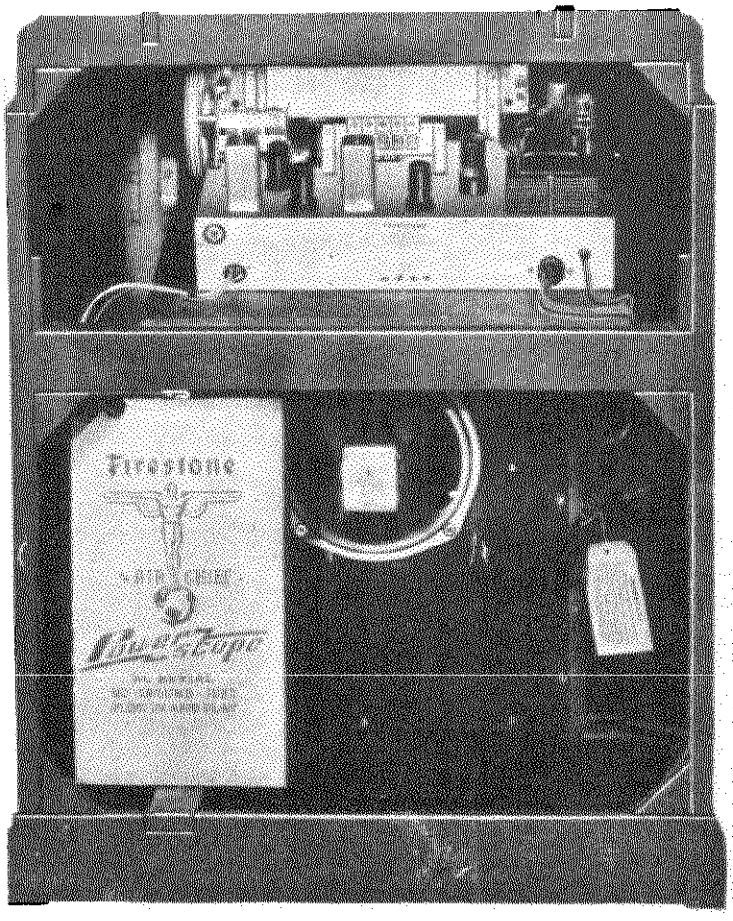


REAR SECTION
FRONT VIEW



REAR SECTION
REAR VIEW

BAND SWITCH 502275



SETTING-UP THE PUSH BUTTONS

1. Set Band Switch to "A" position and allow set to operate 15 minutes before making any adjustments.
2. Note two rows of adjusting screws on back of radio chassis which are visible and accessible through top opening in cabinet back (entire cabinet back may be removed if desired by taking out screws around the sides). Each vertical pair of adjusting screws is used to tune-in a station for one of the push-buttons. A label under the row of screws specifies the frequency or tuning range that each screw will cover.
3. Select five powerful nearby stations and obtain their frequencies from your local newspaper. Be sure that the frequency of each station falls within the frequency range of the adjusting screw which will be used to tune-in that station.
4. Before disturbing adjusting screws, return to front of radio and push in "MANUAL" button. Then tune-in the lowest frequency station in the group of 5 that you selected. Listen to the program so that you can identify it later.
5. Now push in the first button **on the left.** Return to rear of radio and use vertical pair of adjusting screws **on extreme right** to tune-in the same station. Adjust bottom screw first until desired station is heard. If station is not heard, change setting of top screw to a position where the slight static noise or rushing sound is the loudest. Then try adjusting bottom screw again; repeat this procedure until desired station is found. After locating station, carefully set bottom screw for deepest tone and top screw for maximum volume.
6. The set-up of the first push-button is now complete. Proceed to set-up remaining buttons by first tuning-in station manually to identify program, then push in desired button and use appropriate pair of adjusting screws to tune-in the same station. The pair of adjusting screws associated with a particular button are located directly behind that button.
7. A set of station call-letter tabs will be found in the envelope containing the operating instructions. Use these tabs to label the push-buttons.

FREQUENCY RANGES:

Standard Broadcast Band	540-1725 KC.
Band "B" (Short Wave)	11.4-15.5 MC.
Band "C" (Short Wave)	5.9-10.0 MC.

I.F. FREQUENCY:

455 KC.

PUSH-BUTTON RANGES:

Button No. 1 —540-1000 KC.
Button No. 2 & 3—650-1300 KC.
Button No. 4 & 5—975-1600 KC.

POWER SUPPLY:

117 volts
50-60 cycles A.C.
80 watts

POWER OUTPUT:

Undistorted—4.0 watts
Maximum —6.5 watts

SPEAKER:

10 inch Electro-Dynamic
Voice coil impedance—3.2 ohms

TUNING CONDENSER:

3 section gang;
shock resistant mounting

PARTS LIST

DIA-GRAM No.	PART No.	DESCRIPTION
		CONDENSERS
3	502166	Condenser—ceramic 82 Mmfd. 500 volt
4	502164	Condenser—mica 670 Mmfd. 500 volt
5A, B	502109	Condenser—trimmer assembly { Section A 2 to 15 Mmfd. / Section B 10 to 40 Mmfd. }
7A to E	502910	Condenser—trimmer assem. for P-B tuner
13	502161	Condenser—mica 270 Mmfd. 500 volt
14	502165	Condenser—mica 1,000 Mmfd. 500 volt
16	502153	Condenser—.05 Mfd. 200 volt
18A, B, C	502122	Condenser—variable gang
20	502182	Condenser—ceramic 39 Mmfd. 500 volt
23	502155	Condenser—.1 Mfd. 200 volt
24	502153	Condenser—.05 Mfd. 200 volt
25	502295	Condenser—ceramic 10 Mmfd. 500 volt
27	502159	Condenser—mica 50 Mmfd. 500 volt
29	502411	Condenser—2 Mmfd. 500 volt
31A, B	502108	Condenser—trimmer assembly { Section A 2 to 15 Mmfd. / Section B 2 to 15 Mmfd. }
32	502182	Condenser—ceramic 39 Mmfd. 500 volt
33	502167	Condenser—ceramic 68 Mmfd. 500 volt
34	502163	Condenser—mica 430 Mmfd. 500 volt
36	502151	Condenser—.01 Mfd. 400 volt
41	502154	Condenser—.05 Mfd. 600 volt
45	502453	Condenser—.002 Mfd. 400 volt
49	502160	Condenser—mica 110 Mmfd. 500 volt
51	502154	Condenser—.05 Mfd. 600 volt
52	502150	Condenser—.004 Mfd. 600 volt
56	502405	Condenser—.25 Mfd. 400 volt
57	502271	Condenser—mica 260 Mmfd. 500 volt
59	502151	Condenser—.01 Mfd. 400 volt
62	502151	Condenser—.01 Mfd. 400 volt
65	502151	Condenser—.01 Mfd. 400 volt
71A, B	502274	Condenser—electrolytic { A—20 Mfd. 400 volt / B—15 Mfd. 400 volt }
72, 73	502150	Condenser—.004 Mfd. 600 volt

DIA-GRAM No.	PART No.	DESCRIPTION
		RESISTORS
17	502134	Resistor-carbon 470,000 ohms ¼ watt
21	502468	Resistor-carbon 4.7 Meg. ¼ watt
22	502406	Resistor-carbon 1,500 ohms ¼ watt
28	502130	Resistor-carbon 22,000 ohms ¼ watt
37	602129	Resistor-carbon 18,000 ohms 1 watt
39	502125	Resistor-carbon 220 ohms ¼ watt
40	502135	Resistor-carbon 2.2 Meg. ¼ watt
42	502288	Resistor-carbon 47,000 ohms 1 watt
44	502131	Resistor-carbon 47,000 ohms ¼ watt
46	502407	Resistor-carbon 10,000 ohms ¼ watt
48	502132	Resistor-carbon 100,000 ohms ¼ watt
50A, B	502385	Volume control 500,000 ohms (with switch)
53	502468	Resistor-carbon 4.7 meg. ¼ watt
54	502406	Resistor-carbon 1,500 ohms ¼ watt
55	502135	Resistor-carbon 2.2 meg. ¼ watt
58	502136	Resistor-carbon 10 meg. ¼ watt
60, 61	502133	Resistor-carbon 220,000 ohms ¼ watt
63, 64	502133	Resistor-carbon 220,000 ohms ¼ watt
66	502133	Resistor-carbon 220,000 ohms ¼ watt
70	502289	Resistor-wire wound 430 ohms 2 watt
		COILS & TRANSFORMERS
1	502282	Loop antenna
2	502110	Coil—S.W. antenna
	502025	Complete coil—trimmer assem. for push button tuner
8	502907	Coil less slug (540-1000 Kc.)
9, 10	502908	Coil less slug (650-1300 Kc.)
11, 12	502909	Coil less slug (975-1600 Kc.)
	502911	Slug for coils 502907, 502908, 502909
15	502112	Coil—BC antenna
26	502113	Coil—BC. R.F.
30	502114	Coil—BC. oscillator
35	502111	Coil—S.W. oscillator
38	502102	Transformer—1st I.F.
43	502103	Transformer—2nd I.F.
67	502175	Transformer—power
75	502996	Transformer—output for M-502305 spkr.

DIA-GRAM No.	PART No.	DESCRIPTION
		OTHER ELECTRICAL PARTS
6	502276	Switch—push button
19A, B, G	502275	Switch—band
47	502299	Switch—tone control
68, 69	110629	Lamp-dial (Mazda 44) 6.3 V. 0.25 amps.
74	502305	Speaker—electro-dynamic (10 inch)
76	502997	Cone & Voice coil for M-502305 speaker

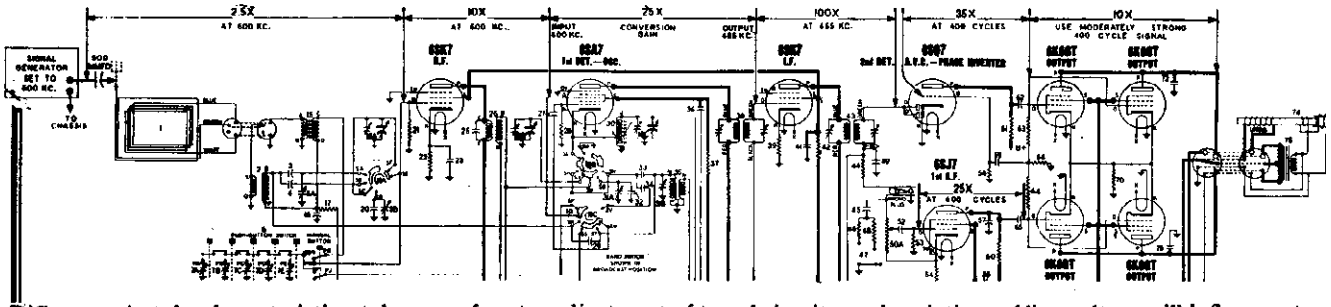
THE FIRESTONE TIRE & RUBBER CO. MODEL 4-A-3

APPROXIMATE STAGE GAIN DATA

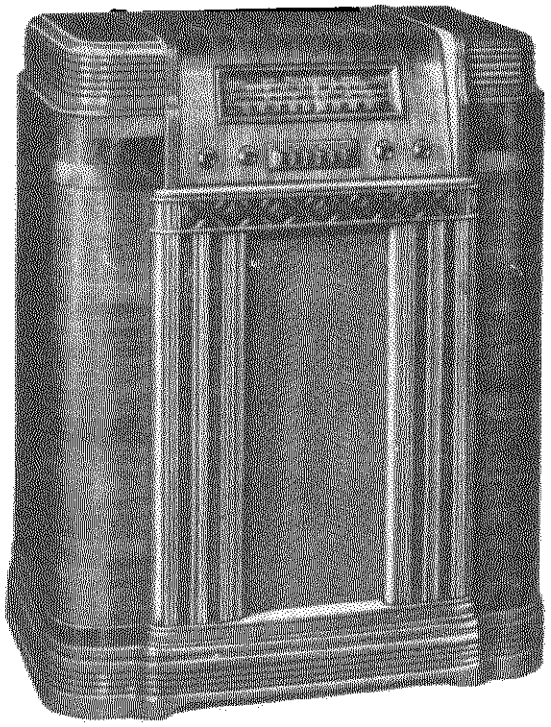
Be sure R.F. and I.F. stages are accurately aligned before measuring gain. R.F. gains can be measured with a "channel" type instru ment containing a tuned and calibrated R.F. amplifier. A vacuum tube voltmeter may be used for audio gain measurements. Observ following precautions:

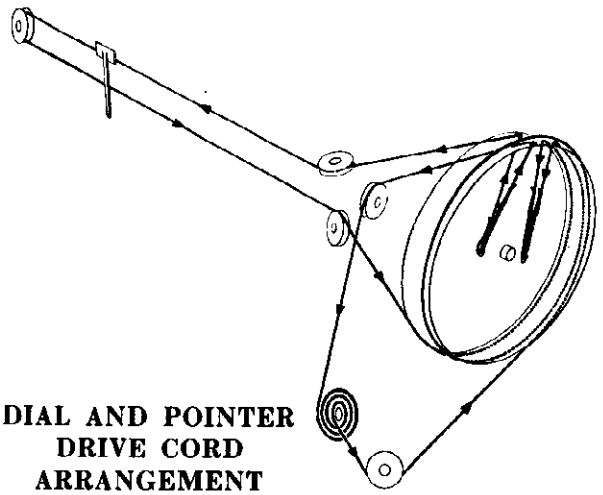
1. For all gain measurements connect signal generator as shown. Use 600 KC. signal with 400 cycle modulation (use nearby frequency if local station interferes.)
2. For R.F. and I.F. measurements connect negative terminal of a 3 volt battery (two 1½ volt cells in series) to A.V.C. lead at lug "P" of S.W. Antenna Coil and positive terminal to chassis. This provides a definite operating point. IMPORTANT: Disconnect battery when measuring audio stage gains.
3. Be sure radio is carefully tuned to generator signal (use weak signal for sharp tuning.)
4. When using "channel" type in strument carefull tune it for maxi mum output at de sired frequenc before makin measurements.

The R.F. and I.F. stage gains shown below are less than under normal operating conditions due to the use of 3 volts fixed bias i order to establish a definite operating point. Therefore, these values are not intended to indicate the full capability of a stage.



Differences in tube characteristics, tolerance of parts, adjustment of tuned circuits, and variations of line voltage will influence stag gain. Accuracy of measurements is dependent upon careful tuning of receiver to generator signal and experience in using your tes equipment. These factors may create considerable variation in gain measurements.





DIAL AND POINTER DRIVE CORD ARRANGEMENT

To string dial cord, set gang condenser to fully meshed position and use following parts:

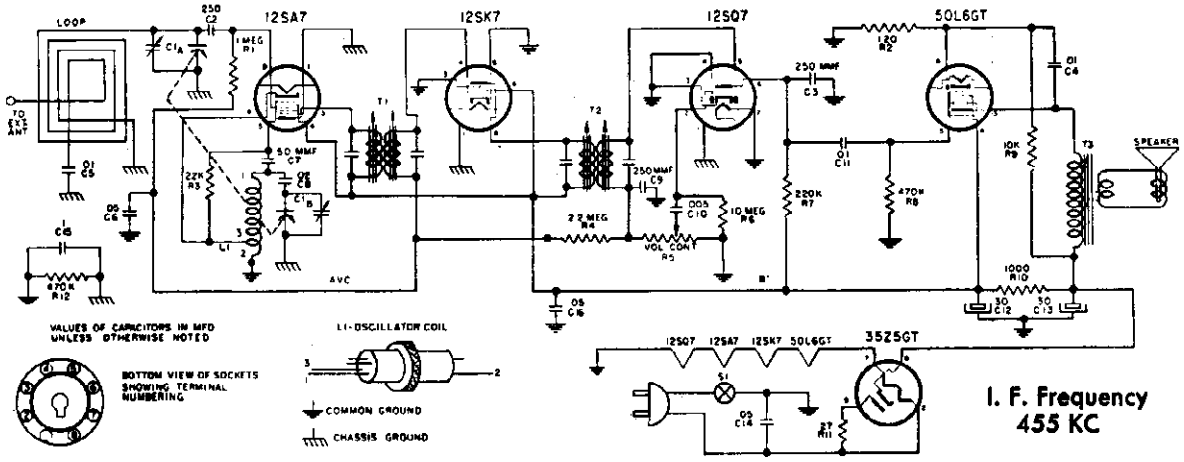
113177	Tension Spring
114955	Clip on end of cord
119087	Ring for dial cord
117057	Cord (9 feet)
	Pointer drive 5 feet
	Gang drive 4 feet

AUDIO OSCILLATION

The audio system of this receiver utilizes a two stage type of inverse feed-back arrangement and, should it ever be necessary to repl the speaker or output transformer, it is important to maintain a definite phase relationship in this feedback circuit. If the connections the output transformer are reversed or if the feed-back connection is made to the wrong side of the output transformer secondary, system will become regenerative instead of degenerative. Under such conditions audio oscillation may result. If that occurs, oscillat may be prevented by reversing the connections to the primary of the output transformer.

MODEL 4-A-61,
THE CAMEO

THE FIRESTONE TIRE & RUBBER CO.

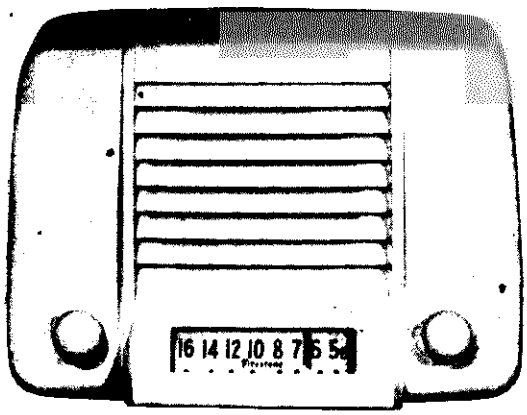


I. F. Frequency
455 KC

Code No.	Part No.	Description
C1A, C1B	19-173	Variable condenser
C2, C3, C9	A15-176	250 MMF mica condenser
C4, C5, C11	A16-156	.01 MFD 400 volt condenser
C6, C16	A16-152	.05 MFD 200 volt condenser
C7	A15-175	50 MMF mica condenser
C8	A16-150	.02 MFD 400 volt condenser
C10	A16-153	.005 MFD 600 volt condenser
C12, C13	B18-283	30 X 30 MFD 150 volt electrolytic condenser
C14	A16-158	.05 MFD 400 volt condenser
C15	A16-160	.1 MFD 400 volt condenser
R1	A60-668	1 megohm ½ watt resistor
R2	A60-702	120 ohm ½ watt resistor
R3	A60-659	22K ohm ½ watt resistor
R4	A60-684	2.2 megohm ½ watt resistor
R5	24-157	Volume control and switch, 1 megohm
R6	A60-663	10 megohm ½ watt resistor
R7	A60-667	220K ohm ½ watt resistor
R8, R12	A60-662	470K ohm ½ watt resistor
R9	A60-698	10K ohm 1 watt resistor
R10	A60-732	1000 ohm 1 watt resistor
R11	A60-690	27 ohm ½ watt resistor
T1	C10-475	1st I. F. Transformer
T2	A10-479	2nd I. F. Transformer
T3		Output transformer (part of speaker)
L1	B10-480	Oscillator coil

Tube Complement

12SA7	— Oscillator Converter
12SK7	— I. F. Amplifier
12SQ7	— AVC, Detector, 1st Audio
50L6GT	— Power Output
35Z5GT	— Rectifier



Power Supply
105-125 volt AC-DC

Tuning Range
540 to 1630 KC

Loud Speaker
4 inch P. M.

Voice Coil Impedance
3.2 ohms at 400 cycles

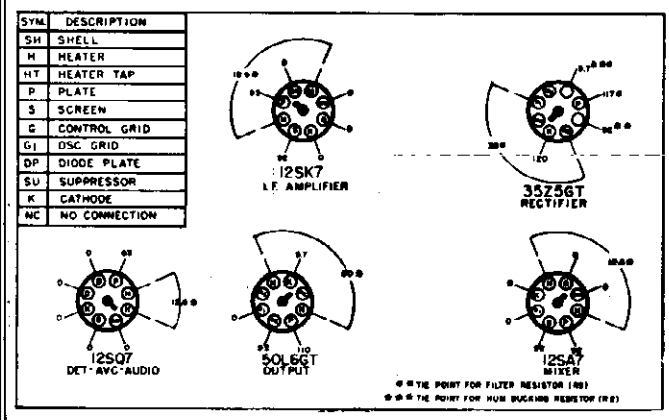
Power Output
Maximum 1.65 watts

REAR OF CHASSIS

VOLTAGE TABLE

(BOTTOM OF CHASSIS)

SYM.	DESCRIPTION
SH	SHELL
H	HEATER
HT	HEATER TAP
P	PLATE
S	SCREEN
C	CONTROL GRID
G1	OSC. GRID
DP	DIODE PLATE
SU	SUPPRESSOR
K	CATHODE
NC	NO CONNECTION



All voltages except heaters are measured from socket contacts to "common negative." Heater voltages are measured across socket contacts. All voltages measured with a 1000 ohms per volt meter.

*AC except when used on DC.

THE FIRESTONE TIRE & RUBBER CO.

MODEL 4-A-61
THE CAMEO

ALIGNMENT PROCEDURE

The alignment should be made with volume control fully on, and the output from the signal generator as low as possible, to prevent A.V.C. action from interfering with correct alignment.

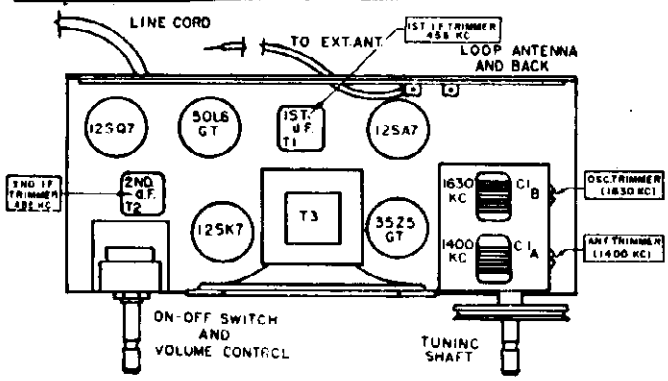
For alignment procedure read tabulations from left to right, and make the adjustment marked (1) first, (2) next, (3) third. Before starting alignment:

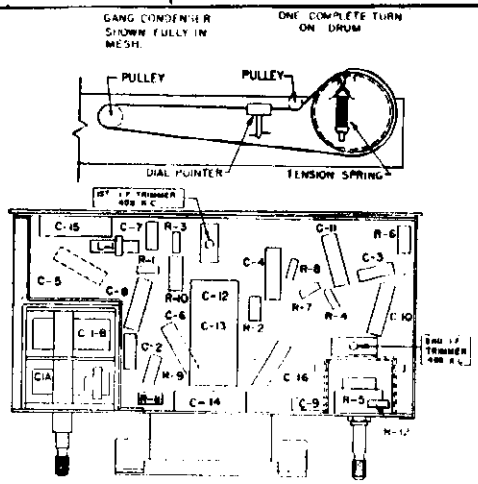
(a) Check tuning dial adjustment by tuning gang condenser until plates touch maximum capacity stop (completely in mesh at which point the dial pointer must be exactly even with the last mark at the low frequency end of the dial calibration If dial pointer is incorrectly set, release pointer clip on dial cord and reposition pointer.

(b) Use an accurately calibrated test oscillator with some type of output measuring device.

(c) PLACE LOOP ANTENNA IN THE SAME POSITION IT WILL BE IN WHEN THE SET IS IN THE CABINET.

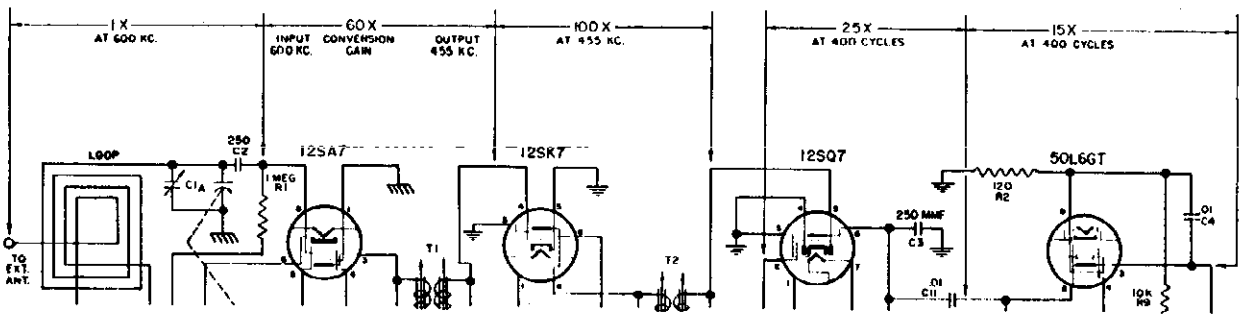
Steps	Set receiver dial to:	TEST OSCILLATOR: Adjust test oscillator frequency to:	TEST OSCILLATOR: Use dummy antenna in series with output of test oscillator consisting of:	TEST OSCILLATOR: Attach output of test oscillator to:	Refer to parts layout diagram for location of trimmers mentioned below:
1	Minimum capacity (fully open)	455 K.C.	.1 MFD. condenser	High side to grid of tuning condenser. Low side to common negative. (through .25 MFD. Cond.)	Adjust each trimmer on the second I. F. transformer for maximum output—then adjust each trimmer on the first I. F. transformer for maximum output.
2	Minimum capacity (fully open)	Exactly 1630 K.C.	.00025 MFD. condenser	Receiver antenna lead. common negative	Adjust 1630 K.C. oscillator trimmer for maximum output.
3	Approx. 1400 K.C.	Approx. 1400 K.C.	.00025 MFD. condenser	Receiver antenna lead. common negative	While rocking gang condenser adjust 1400 K.C. antenna trimmer for maximum output.





Before proceeding with stage measurements be sure the receiver is properly aligned. R.F. gains can be measured by a "channel" type instrument containing a tuned and calibrated R.F. amplifier. A vacuum tube voltmeter may be used for audio gain measurements. Observe the following precautions:

1. For all gain measurements connect the "high" side of a signal generator to the antenna lead through a .00025 mica condenser. The ground side of the signal generator should be connected to common negative. Use a 600 KC signal with 400 cycle modulation (use nearby frequency if local station interferes).
2. Be sure radio is carefully tuned to generator signal (use weak signal for sharp tuning.)
3. When using a "channel" type instrument carefully tune it for maximum output at desired frequency before making measurements.



Stage gain measurements can be influenced by the normal manufacturers tolerances allowed in parts, differences in individual tube characteristics, the adjustment of the tuned circuits and variations in line voltage. Careful tuning of the receiver as well as experience in using your test equipment will determine the accuracy of the measurements taken. Due to all of these factors, the stage gains shown in the above diagram are approximate values rather than absolute as it is possible to introduce many variations in these measurements.

MODELS 4-A-62, 4-A-63

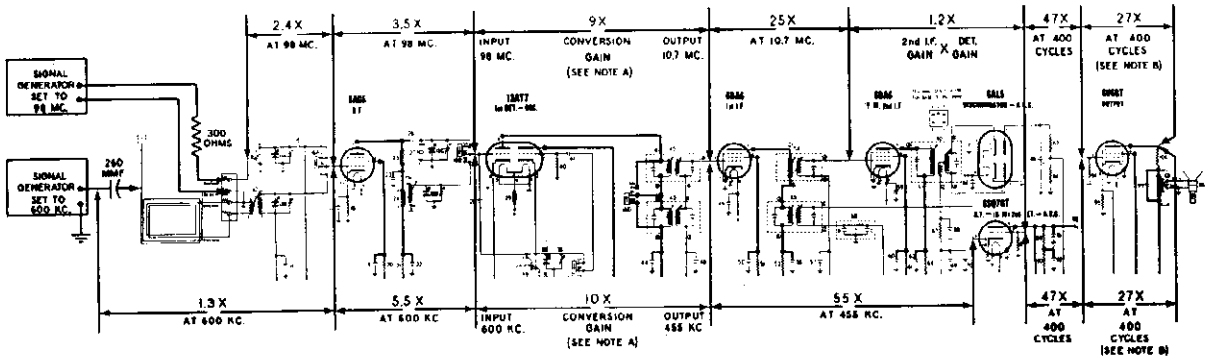
THE FIRESTONE TIRE & RUBBER CO.

STAGE GAIN MEASUREMENT PROCEDURE

REQUIRED INSTRUMENTS: The amount of amplification or "gain" of most of the stages of this receiver can be measured with an A.C. Vacuum Tube Voltmeter of the high frequency type. An AM (600 KC.) as well as an FM (98 MC.) signal source is required. For gain measurements in the FM antenna—FM converter—FM 1st I.F. stages, a microvolt calibrated FM signal generator should preferably be used.

PROCEDURE: It is exceedingly important to adhere to the procedure outlined below since the accuracy of these measurements will be affected to a considerable extent by the failure to establish proper operating conditions.

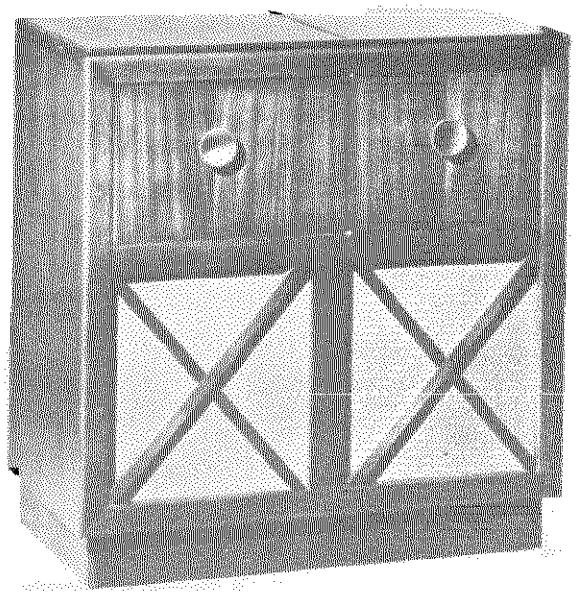
1. Be sure that R.F., I.F. and Discriminator stages are carefully and accurately aligned by utilizing the alignment procedure given in this manual.
2. Connect Signal Generator as shown below. Note that generator connections differ for "AM" and "FM" measurements.
3. For "AM" measurements, set signal generator to 600 KC. (400 cycle modulation) and then carefully tune radio receiver to this signal by using an output meter to indicate peak output. If a local station interferes, set generator to a nearby frequency and re-tune the receiver.
4. For "FM" measurements, set signal generator to 98 MC. (400 cycle modulation with 22½ KC. deviation) and then carefully tune radio receiver to this signal by using a D.C. Vacuum Tube Voltmeter as an output indicator—meter must be connected between pin No. 7 of 6AL5 tube and chassis. If a local station interferes, set generator to a nearby frequency and re-tune the receiver.
5. The values of stage gain which are given here were measured with a fixed bias of —3 volts on the control grids of all R.F. and I.F. tubes which are connected to the A.V.C. system. Therefore, these values are not intended to indicate the full capability of a stage but they will serve as a convenient basis for determining proper operation. In order to duplicate the fixed bias voltage, connect the negative terminal of a 3 volt battery to both A.V.C. supply lines by effecting a common connection to terminal 4 of 2nd FM-I.F. transformer and terminal 2 of 1st AM-I.F. transformer. Then connect the positive battery lead to the receiver chassis.
6. R.F. and I.F. circuits are slightly de-tuned when contact is made with an instrument probe and this action, which is indicated by a change in the output meter reading, may seriously affect the gain measurement. Therefore, it is important to adjust the associated circuit trimmer for a maximum output meter reading and to set the input signal level to a convenient reference point on the gain measuring instrument while the probe is making contact. After removing the probe it is again necessary to adjust the trimmer so as to obtain the same output meter reading and thereby assure that the signal voltage at the specified point has not changed as a result of circuit de-tuning.

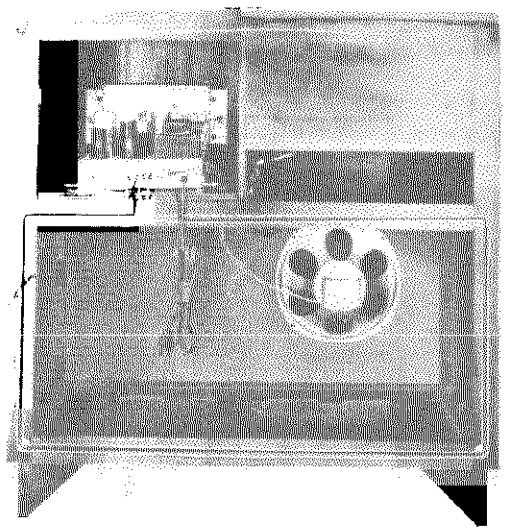


NOTE A: Short oscillator grid (pin 2 of 12AT7) to ground when measuring input voltage at signal grid (pin 7) of 12AT7 tube.

NOTE B: Measured with input voltage of 0.3.

DIFFERENCES in tube characteristics, tolerance of parts, adjustment of tuned circuits and variations in line voltage will influence stage gain. These factors should be given due attention in event the gain of a stage varies extensively from the values shown above.





THE FIRESTONE TIRE & RUBBER CO.

MODELS 4-A-
4-A-63

BROADCAST BAND —"AM"—ALIGNMENT PROCEDURE

1. Disconnect leads from FM-AM aerial terminal strip (labeled FM-FM-AM-AM) at back of chassis; also disconnect speaker leads and phono plugs. Remove chassis and speaker. If desired, allow speaker to remain in cabinet and connect to receiver by extension leads.

2. Stand chassis on one edge so that all trimmers are accessible.

3. Loop aerial leads (on cabinet) do not have to be connected to terminal strip on chassis while I. F. stages are being aligned. Before starting alignment of Ant., R.F., and Osc. stages, reconnect all four aerial leads to chassis—do not attempt to use extension leads; place chassis as close as required to cabinet so that connections may be made dire aerial terminal strip at back.

4. With the gang condenser fully meshed, dial pointer sh be in the position indicated by the last division below 5 the dial. If it is set incorrectly, hold tuning shaft steady reposition pointer.

5. Connect an output meter across speaker voice coil, or plate of 6V6GT tube to chassis through a 0.1 Mfd. conde

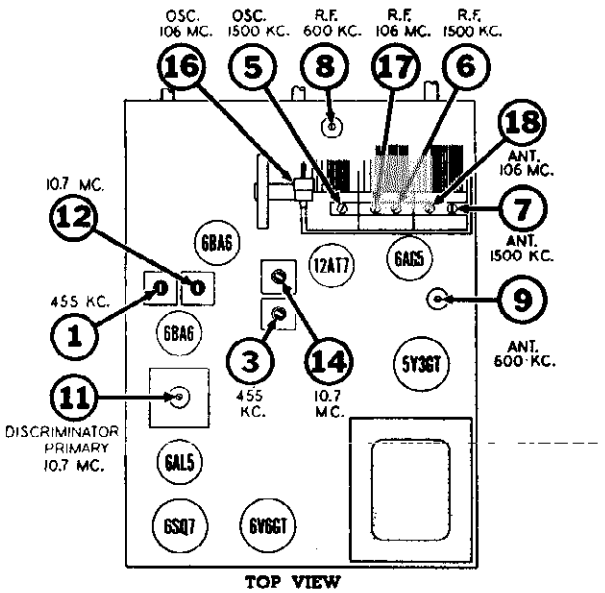
6. Connect ground lead of signal generator to the rec chassis.

7. Set volume control at maximum volume position and u weak signal from the signal generator.

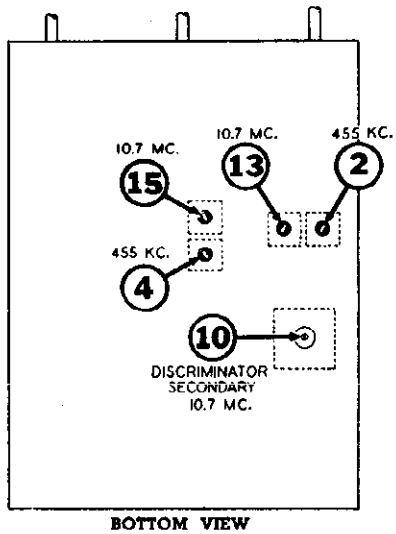
DUMMY ANT. IN SERIES WITH SIGNAL GENERATOR	CONNECT HIGH SIDE OF SIGNAL GENERATOR TO	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RECEIVER DIAL SETTING	TRIMMER OR SLUG NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMEN
.1 MFD. Condenser	Lug on trimmer No. 6 at top of gang (see figure below for location of trimmer).	455 KC	AM Broadcast (Middle)	Any point where it does not affect the signal.	1-2	2nd I.F.	Adjust for maximum out Then repeat adjustment.
					3-4	1st I.F.	
260 MMFD. Mica Condenser	External Aerial Clip on Cabinet	1500 KC	AM Broadcast (Middle)	1500 KC	5	Broadcast Oscillator	Adjust for maximum out
260 MMFD. Mica Condenser	External Aerial Clip on Cabinet	1500 KC	AM Broadcast (Middle)	Tune to 1500 Kc. generator signal.	6	Broadcast R.F.	Adjust for maximum out
					7	Broadcast Antenna	Adjust for maximum ou
260 MMFD. Mica Condenser	External Aerial Clip on Cabinet	600 KC	AM Broadcast (Middle)	Tune to 600 Kc. generator signal.	8	Adjustable core of Broadcast R.F. Coil.	Adjust for maximum out
					9	Adjustable core of Broadcast Antenna Coil.	Adjust for maximum out

Repeat adjustment of trimmers 6 & 7 and slugs 8 & 9 until one no longer detunes the other.

NOTE: It is preferable to check the alignment of the I.F. stages in the FM channel after completing AM alignment.



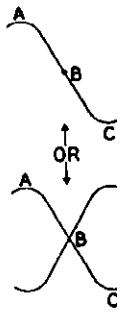
TOP VIEW



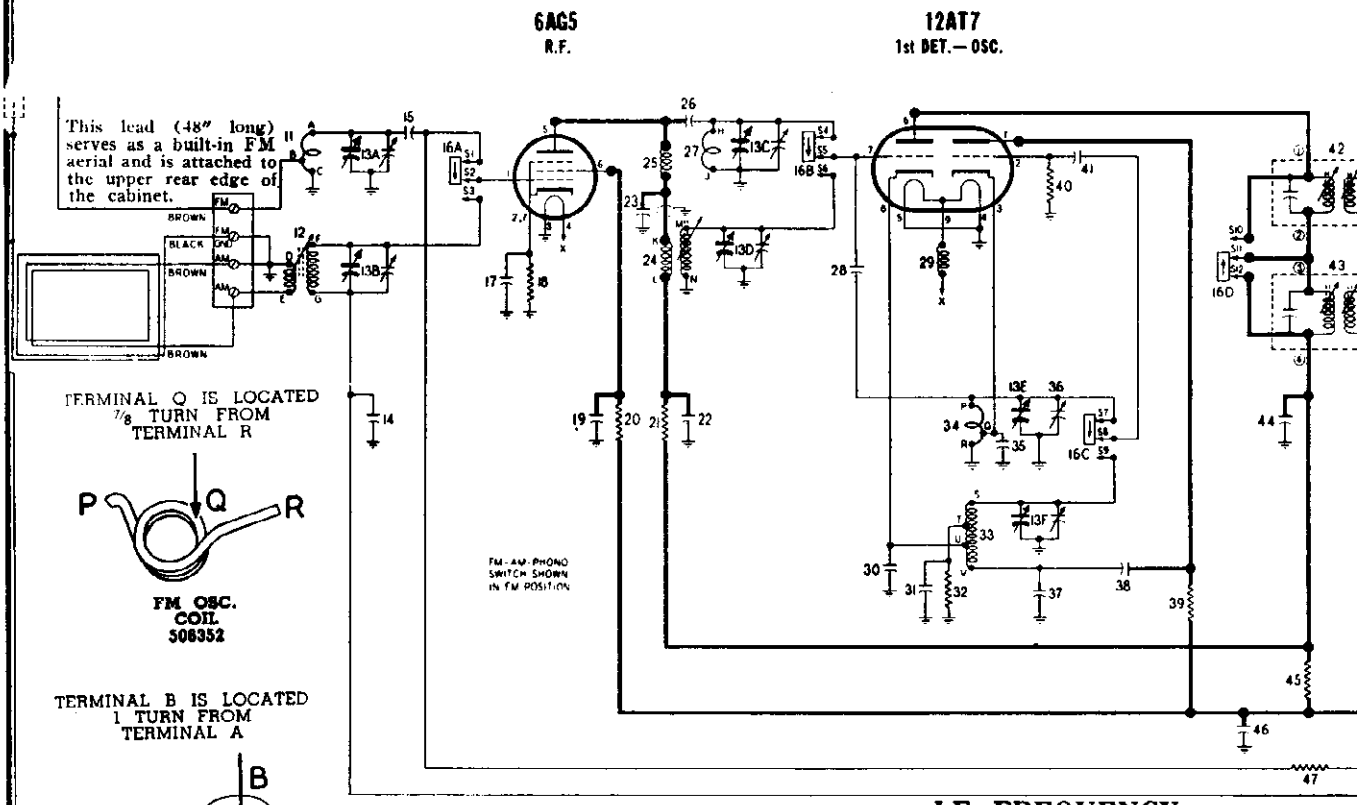
BOTTOM VIEW

TRIMMER LOCATION CHART

This single "S" c pattern results scope uses pro phased "sine w horizontal defle voltage.



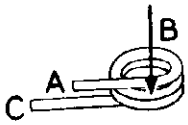
This double "S" c pattern results scope uses pro phased "Sawtc horizontal defle voltage whose quency is twice modulation frequ of signal gener



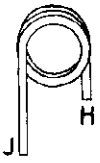
TERMINAL Q IS LOCATED 7/8 TURN FROM TERMINAL R

FM OSC. COIL 506352

TERMINAL B IS LOCATED 1 TURN FROM TERMINAL A

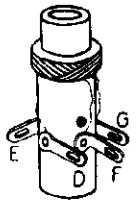


FM ANT. COIL 506353



FM R.F. COIL 506351

BC. OSC. COIL 506335



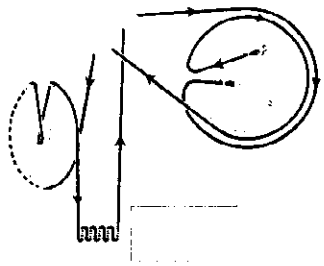
BC. ANT. COIL 506354

BC. R.F. COIL 506345

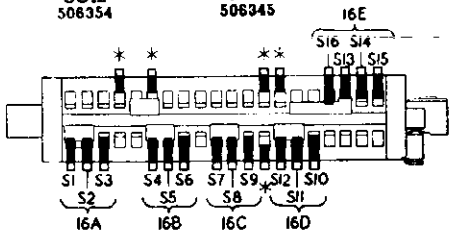
Lettered terminals in illustrations correspond to similarly lettered terminals on the circuit diagram.

DIAL AND POINTER DRIVE CORD ARRANGEMENT

SIDE VIEW

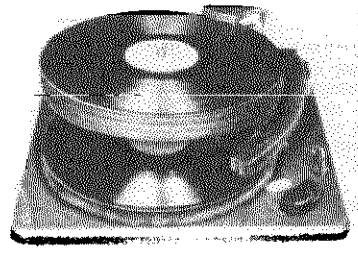


To string dial cord, set gang condenser to fully open position and use the following parts:
114955 Clip on end of cord
117057 Cord (3 feet)
119087 Ring for dial cord
505161 Tension spring



★ Not used; may serve as wiring junction point.

BAND SWITCH 506347



W-506373 RECORD CHANGER

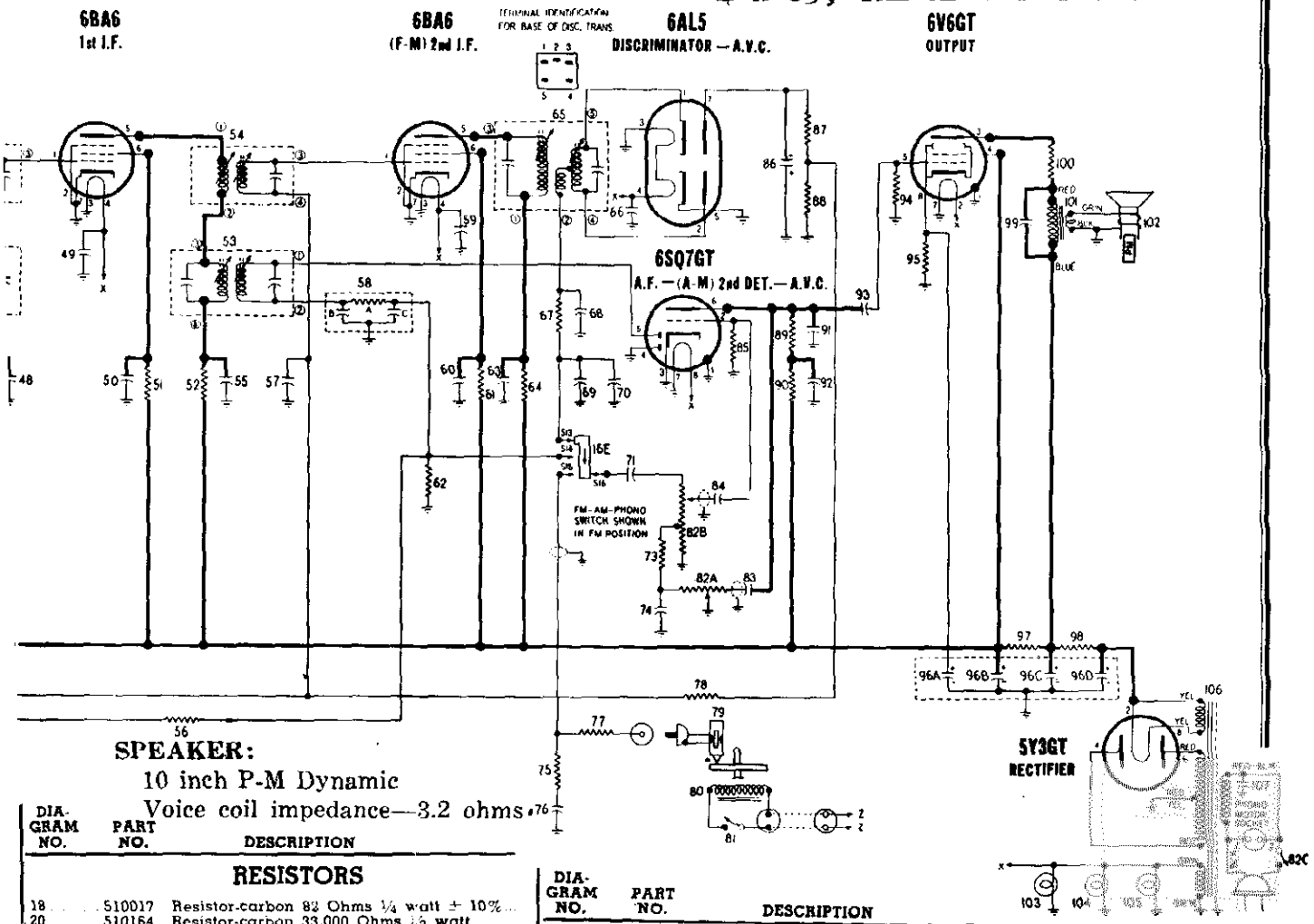
I.F. FREQUENCY:

AM — 455 KC.
FM — 10.7 MC.

DIA-GRAM NO.	PART NO.	DESCRIPTION
		CONDENSERS
13-A to F.	506348	Condenser-variable gang (with drum)
14	512026	Condenser-.05 Mfd. 200 volt
15	504973	Condenser-ceramic 22 Mmfd. 500 volt
17	504974	Condenser-ceramic 47 Mmfd. 500 volt
19	505873	Condenser-ceramic .005 Mfd. 450 volt
22	505873	Condenser-ceramic .005 Mfd. 450 volt
23	504974	Condenser-ceramic 47 Mmfd. 500 volt
26	504905	Condenser-ceramic 5 Mmfd. 500 volt ±
28	504983	Condenser-ceramic 1.0 Mmfd. 500 volt
30	506341	Condenser-ceramic 330 Mmfd. 500 volt
31	505873	Condenser-ceramic .005 Mfd. 450 volt
35	513429	Condenser-ceramic 10 Mmfd. 500 volt ±
36	506336	Condenser-trimmer; 3 to 30 Mmfd.
37	506544	Condenser-ceramic 10 Mmfd. 500 volt
38	505873	Condenser-ceramic .005 Mfd. 450 volt
41	504974	Condenser-ceramic 47 Mmfd. 500 volt
44	505873	Condenser-ceramic .005 Mfd. 450 volt
46	505873	Condenser-ceramic .005 Mfd. 450 volt
48, 49, 50	505873	Condenser-ceramic .005 Mfd. 450 volt
55	505873	Condenser-ceramic .005 Mfd. 450 volt
57	505873	Condenser-ceramic .005 Mfd. 450 volt
58-B, C	506338	Condenser-ceramic 100 Mmfd. 400 volt (of diode filter unit)
59, 60	505873	Condenser-ceramic .005 Mfd. 450 volt
63	505873	Condenser-ceramic .005 Mfd. 450 volt
66	505873	Condenser-ceramic .005 Mfd. 450 volt
68	506341	Condenser-ceramic 330 Mmfd. 500 volt
69	506340	Condenser-ceramic 100 Mmfd. 500 volt
70	512004	Condenser-.003 Mfd. 600 volt
71	512006	Condenser-.005 Mfd. 600 volt
74	512006	Condenser-.005 Mfd. 600 volt
75	505873	Condenser-ceramic .005 Mfd. 450 volt
93, 94	512006	Condenser-.005 Mmfd. 600 volt
86	504937	Condenser-electrolytic 5 Mfd. 50 volt
81	506340	Condenser-ceramic 100 Mmfd. 500 volt
92	512034	Condenser-.1 Mfd. 400 volt
93	512016	Condenser-.02 Mfd. 400 volt
95-A to D	505908	Condenser-electrolytic A-20 Mfd. 25 volt; B-10 Mfd. 450 volt; C-30 Mfd. 450 volt; D-40 Mfd. 450 volt
99	512006	Condenser-.005 Mfd. 600 volt
107	512256	Condenser-.01 Mfd. 600 volt

)NE TIRE & RUBBER CO.

MODELS 4-A-62, THE MARLBOROUGH,
4-A-63, THE METROPOLITAN



SPEAKER:

10 inch P-M Dynamic
Voice coil impedance—3.2 ohms

DIA-GRAM NO.	PART NO.	DESCRIPTION
		RESISTORS
18	510017	Resistor-carbon 82 Ohms ¼ watt ± 10%
20	510164	Resistor-carbon 33,000 Ohms ½ watt
21	510137	Resistor-carbon 1000 Ohms ½ watt
32	510041	Resistor-carbon 1800 Ohms ½ watt
39	510137	Resistor-carbon 1000 Ohms ½ watt
40	510055	Resistor-carbon 10,000 Ohms ¼ watt
45	510137	Resistor-carbon 1000 Ohms ½ watt
47	510067	Resistor-carbon 47,000 Ohms ¼ watt
51	510165	Resistor-carbon 39,000 Ohms ½ watt
52	510137	Resistor-carbon 1000 Ohms ½ watt
56	510093	Resistor-carbon 2.2 Meg. ¼ watt
58-A	506338	Resistor-carbon 47,000 Ohms 1/5 watt. (Part of diode filter unit)
61	510165	Resistor-carbon 39,000 Ohms ½ watt
62	510085	Resistor-carbon 470,000 Ohms ¼ watt
64	510137	Resistor-carbon 1000 Ohms ½ watt
67	510059	Resistor-carbon 18,000 Ohms ¼ watt
73	510070	Resistor-carbon 68,000 Ohms ¼ watt
75	510070	Resistor-carbon 68,000 Ohms ¼ watt
77	510079	Resistor-carbon 220,000 Ohms ¼ watt
78	510093	Resistor-carbon 2.2 Meg. ¼ watt
82-A, B, C	505911	Volume and tone control A-2 Megohms B-2 Megohms C-"ON-OFF" switch
85	510098	Resistor-carbon 15 Meg. ¼ watt
87, 88	510053	Resistor-carbon 8200 Ohms ¼ watt ± 10%
89	510093	Resistor-carbon 2.2 Meg. ¼ watt
90	510079	Resistor-carbon 220,000 Ohms ¼ watt
94	510085	Resistor-carbon 470,000 Ohms ¼ watt
95	510128	Resistor-carbon 330 Ohms ½ watt
97, 98	510709	Resistor-wire wound 600 Ohms 5 watt
100	510013	Resistor-carbon 47 Ohms ¼ watt
		COILS AND TRANSFORMERS
11	506353	Coil—F. M. antenna
12	506354	Coil—Antenna (AM)
	506349	Slug core for AM antenna coil
24	506345	Coil—R. F. (AM)
	506344	Slug core for AM R. F. coil
25	506337	Coil—R. F. choke (FM)
27	506351	Coil—F. M. R. F.
29	505075	Coil—R. F. choke (FM)
33	506335	Coil—Oscillator (AM)

DIA-GRAM NO.	PART NO.	DESCRIPTION
34	506352	Coil—F. M. Osc.
42	506080	Transformer-1st I. F. (FM)
43	506333	Transformer-1st I. F. (AM)
53	505797	Transformer-2nd I. F. (AM)
54	505905	Transformer-2nd I. F. (FM)
65	506332	Transformer-discriminator
101	505912	Transformer-output
106	506709	Transformer-Power
		OTHER ELECTRICAL PARTS
16-A to E	506347	Switch—FM-AM-Phono
58-A, B, C	506338	Diode filter unit A-Resistor-carbon 47,000 Ohms 1/5 watt B-Condenser-ceramic 100 Mmfd. 400 volt C-Condenser-ceramic 100 Mmfd. 400 volt
79	505100	Crystal cartridge
80	506705	Motor—for type "W"—506373 Record changer 115 volt 60 cycle
81	506704	Switch—"ON-OFF" for type "W"—506373 Record Changer
102	506374	Speaker—P.M. (10 inch)
103 to 105	118921	Lamp dial (Mazda No. 47) 6-8V, 150 Ma.

FREQUENCY RANGES:

STANDARD BROADCAST —540-1700 KC.
FM — 88-108 MC.

MANUAL TUNING DEVICE:

3 section gang condenser;
shock resistant mounting.

BUILT-IN AERIALS:

AM — High efficiency loop.
FM — Single ended half-wave aerial.

POWER SUPPLY:

117 volts
60 cycles A.C.
85 watts (radio)
20 watts (phono)

POWER OUTPUT:

Undistorted — 2.8 watts
Maximum — 5.4 watts

MODELS 4-A-62, 4-A-63

THE FIRESTONE TIRE & RUBBER CO.

FREQUENCY MODULATION—"FM"—ALIGNMENT PROCEDURE
(USING A VACUUM TUBE VOLTMETER AND AM SIGNAL GENERATOR)

INSTRUMENTS: Although it is preferable to use an FM generator and an oscilloscope, reasonably accurate alignment is obtainable when using a conventional AM generator and vacuum tube voltmeter providing proper care is exercised in adjusting the discriminator circuit trimmer.

IMPORTANT: When using an AM signal generator, it should be capable of producing fundamental frequencies of 10.7 MC and 88 to 108 MC — avoid using an AM generator which produces signals in the 88 to 108 MC range by using harmonics higher than the second. Generators which are dependent upon third, fourth or fifth harmonics for output frequencies of 88 to 108 MC will generally produce undesirable spurious beat signals with the local oscillator in the receiver and alignment will be exceedingly difficult.

1. If alignment of both AM and FM channels is required it is necessary to align the AM channel first, then align the FM channel as instructed in chart below (AM alignment procedure is given on the preceding page).
2. Disconnect leads from FM-AM aerial terminal strip (labelled FM-FM-AM-AM) at back of chassis; also disconnect speaker leads and phono plugs. Remove chassis and speaker. If desired, allow speaker to remain in cabinet and connect to receiver by extension leads.
3. With the gang condenser fully meshed, dial pointer should be in the position indicated by the last division below 88 on the dial. If it is set incorrectly, hold tuning shaft steady and reposition pointer.
4. A specific setting of the receiver volume control is not required. However, it will be found convenient to leave it in the maximum volume position so that alignment signals will be audible even though the output indication is obtained by a V-T voltmeter connected to points in the discriminator circuit.
5. Dress FM circuit leads as short and straight as possible, particularly those in the oscillator circuit. I.F. plate and grid leads should also be kept short and straight.
6. Set band switch to the FM (extreme counter-clockwise) position.

SIGNAL GENERATOR CONNECTIONS	FREQUENCY & TYPE OF MODULATION	VACUUM TUBE VOLTMETER CONNECTIONS	RECEIVER DIAL SETTING	TRIMMER OR SLUG NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT AND OUTPUT INDICATION
Connect high side in series with an .01 Mfd condenser to lug on trimmer No. 17 at top of gang see illustration on page 9 for location of trimmer). Connect ground lead to receiver chassis in vicinity of 12AT7 tube.	**10.7 MC** AM signal may be 400 cycle modulated.	Connect common (or ground) terminal of meter to receiver chassis. D.C. probe lead of meter is then connected to pin No. 7 of the 6AL5 tube.	Any position where it does not affect the signal.	11	Discriminator Primary	Adjust these trimmers for maximum meter reading the output voltage will be of negative polarity.
				12 and 13	2nd I.F.	
				14 and 15	1st I.F.	
Same as above	Same as above	Connect common (or ground) terminal of V-T voltmeter to the junction of resistors 87 and 88 in the discriminator circuit. D.C. probe lead of meter is then connected to junction of resistor No. 67 (18,000 ohms) and condenser No. 70 (.003 MFD.) which are in the discriminator output circuit. ——— Set meter for operation on its lowest D.C. voltage range.	Same as above	10	Discriminator Secondary	Note that as trimmer No. 10 is rotated a point will be found where voltmeter will swing from a positive to a negative reading or vice versa. Correct setting of trimmer No. 10 is obtained when meter reads zero as trimmer is moved through this point. The adjustment is somewhat critical and considerable care must be exercised to set the trimmer for a zero meter indication.
Recheck adjustment of trimmers No. 10 and No. 11 to be sure that both are set as accurately as possible to obtain the specified output indication.						
Connect generator "high" side in series with a 300 ohm carbon resistor to end terminal marked "FM" on strip at back of chassis. Generator ground lead must connect to next terminal marked "GND".	**106 MC** AM signal may be 400 cycle modulated.	Connect common (or ground) terminal of meter to receiver chassis. D.C. probe lead of meter is then connected to Pin No. 7 of the 6AL5 tube.	106 MC	16	Oscillator Trimmer	Set trimmer No. 16 to receive 106 MC. signal as indicated by maximum meter reading. **IMPORTANT:** It will be noted that there are two different settings of trimmer No. 16 at which the 106 MC. signal will be received always select the trimmer setting which is nearest to the low capacity end of its range.
Same as above	Same as above	Same as above	Tune to 106 MC. generator signal.	17	R.F. Trimmer	Adjust trimmer No. 17 for maximum meter reading.
				18	Antenna Trimmer	Adjust trimmer No. 18 for maximum meter reading.
				14 and 15	1st I.F.	Recheck adjustment of these trimmers for maximum meter reading.

Check calibration and tracking of receiver with input signals of 90 and 98 MC. If difference between dial pointer setting and 90 or 98 MC. calibration mark does not exceed ± 0.3 MC. and antenna and R.F. circuits are tracking properly, then alignment may be considered satisfactory and no further adjustment is necessary.

Where the calibration error is greater than ± 0.3 MC. it is advisable to make the following adjustments:

1. If pointer falls above the 90 MC. calibration point, it will be necessary to slightly spread the windings of the FM oscillator coil. Then repeat the two preceding adjustments of trimmers 16, 17 and 18 at 106 MC. Should it be found impossible to obtain the 106 MC. signal at the proper point on the dial by adjustment of the trimmers it will then be necessary to adjust the spacing of the gang condenser plates.
2. If pointer falls below the 90 MC. calibration point, it will be necessary to push the windings together on the FM oscillator coil. Then repeat the two preceding adjustments of trimmers 16, 17 and 18 at 106 MC. Should it be found impossible to obtain the 106 MC. signal at the proper point on the dial by adjustment of the trimmers it will then be necessary to adjust the spacing of the gang condsenser plates.
3. Correction for mistracking of antenna and R.F. may be accomplished by adjusting coil turns and gang plate spacing in the same manner as outlined above for the oscillator stage.

THE FIRESTONE TIRE & RUBBER CO.

MODELS 4-A-6
4-A-63

FREQUENCY MODULATION—"FM"—ALIGNMENT PROCEDURE
(USING AN OSCILLOSCOPE AND FM "SWEEP" GENERATOR)

INSTRUMENTS: Alignment of the FM circuits in this receiver can be most conveniently accomplished with an FM signal generator. When using this type generator, the output indicator must be an oscilloscope.

1. If alignment of both AM and FM channels is required it is necessary to align the AM channel first, then align the FM channel as instructed in chart below (AM alignment procedure is given on page 8).
2. Disconnect leads from FM-AM aerial terminal strip (labelled FM-FM-AM-AM) at back of chassis; also disconnect speaker leads and phono plugs. Remove chassis and speaker. (If desired, allow speaker to remain in cabinet and connect to receiver by extension leads.)
3. With the gang condenser fully meshed, dial pointer should be in the position indicated by the last division below 88 on the dial. If it is set incorrectly, hold tuning shaft steady and reposition pointer.
4. A specific setting of the receiver volume control is not required, however, it will be found convenient to leave it in the maximum volume position so that alignment signals will be audible even though the output indication is obtained by an oscilloscope connected to points in the discriminator circuit.
5. Dress FM circuit leads as short and straight as possible, particularly those in the oscillator circuit. I.F. plate and grid leads should also be kept short and straight.
6. **Set band switch to the FM (extreme counter-clockwise) position.**
7. Set tone control to fully counter-clockwise position.

SIGNAL GENERATOR CONNECTIONS	FREQUENCY & TYPE OF MODULATION	OSCILLOSCOPE CONNECTIONS	RECEIVER DIAL SETTING	TRIMMER OR SLUG NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT AND OUTPUT INDICATION
Connect high side in series with an .01 Mfd condenser to lug on trimmer No. 17 at top of gang (see illustration on page 8 for location of trimmer). Connect ground lead to receiver chassis in vicinity of 12AT7 tube.	**10.7 MC** FM signal should preferably be modulated ±400 KC.	Connect vertical amplifier "high" lead to function of resistor No. 67 (18000 ohms) and condenser No. 70 (.003 Mfd.) which are in discriminator output circuit. Connect scope ground lead to receiver chassis. Set vertical amplifier of scope for maximum amplification. Where FM signal generator provides an output voltage for synchronization, connect this voltage to "sync" terminals of the scope.	Any position where it does not affect the signal.	10	Discriminator Secondary	Before attempting to adjust trimmer No. 10, se trimmers No. 11, 12, 13, 14 and No. 15 for approx mately maximum sound output from the speake (output meter not required). This is done t obtain sufficient signal for an oscilloscope pa tern of desirable amplitude when making th following discriminator trimmer adjustment. Adjust setting of trimmer No. 10 until a patter similar to that shown in Fig. 2 appears on th screen. If pattern does not remain stationary ope ate sweep frequency control on 'scope and als "sync" control until desired result is obtainec Correct setting of trimmer No. 10 is obtained whe crossover point "B" (Fig. 2) is centrally locate in both the horizontal and vertical directions; i addition that portion of the curve between "A and "C" should be as linear (straight) as possible
Same as above	Same as above	Same as above	Same as above	11	Discriminator Primary	Adjust these trimmers for maximum amplitud and steepness of that portion of the pattern be tween "A" and "C" (see Fig. 2).
				12 and 13	2nd I.F.	
				14 and 15	1st I.F.	
Recheck adjustments of trimmers No. 10 and No. 11 to be sure that both are set as accurately as possible to obtain correct cross-over point or symmetry of pattern.						
Connect generator "high" side in series with a 300 ohm carbon resistor to end terminal marked "FM" on strip at back of chassis. **Generator ground lead** must connect to next terminal marked "GND".	**106 MC** FM signal should preferably be modulated ±400 KC.	Same as above	**106 MC**	16	Oscillator Trimmer	Adjust trimmer No. 16 to obtain the symmetrica pattern shown in Fig. 2. Correct setting of trim mer No. 16 is obtained when cross-over point i pattern is centrally located. **IMPORTANT:** It will be noted that there are tw different settings of trimmer No. 16 at which th desired 'scope pattern can be obtained—alway select the trimmer setting which is nearest to th low capacity end of its range.
Same as above	Same as above	Same as above	Tune to 106 MC. generator signal.	17	R.F. Trimmer	Adjust trimmer No. 17 for maximum amplitude o pattern.
				18	Antenna Trimmer	Adjust trimmer No. 18 for maximum amplitude o pattern.
				14 and 15	1st I.F.	Recheck adjustment of these trimmers for maxi mum amplitude of pattern.

Check calibration and tracking of receiver with input signals of 90 and 98 MC. If difference between dial pointer setting and 90 or 98 MC. calibration mark does not exceed ± 0.3 MC. and antenna and R.F. circuits are tracking properly, then alignment may be considered satisfactory and no further adjustment is necessary.

Where the calibration error is greater than ± 0.3 MC. it is advisable to make the following adjustments:

1. If pointer falls above the 90 MC. calibration point, it will be necessary to slightly spread the windings of the FM oscillator coil. Then repeat the two preceding adjustments of trimmers 16, 17 and 18 at 106 MC. Should it be found impossible to obtain the 106 MC. signal at the proper point on the dial by adjustment of the trimmers it will then be necessary to adjust the spacing of the gang condenser plates.
2. If pointer falls below the 90 MC. calibration point, it will be necessary to push the windings together on the FM oscillator coil. Then repeat the two preceding adjustments of trimmers 16, 17 and 18 at 106 MC. Should it be found impossible to obtain the 106 MC. signal at the proper point on the dial by adjustment of the trimmers it will then be necessary to adjust the spacing of the gang condenser plates.
3. Correction for mistracking of antenna and R.F. may be accomplished by adjusting coil turns and gang plate spacing in the same manner.

MODELS 4-A-62, 4-A-63

THE FIRESTONE TIRE & RUBBER CO.

SOCKET VOLTAGES

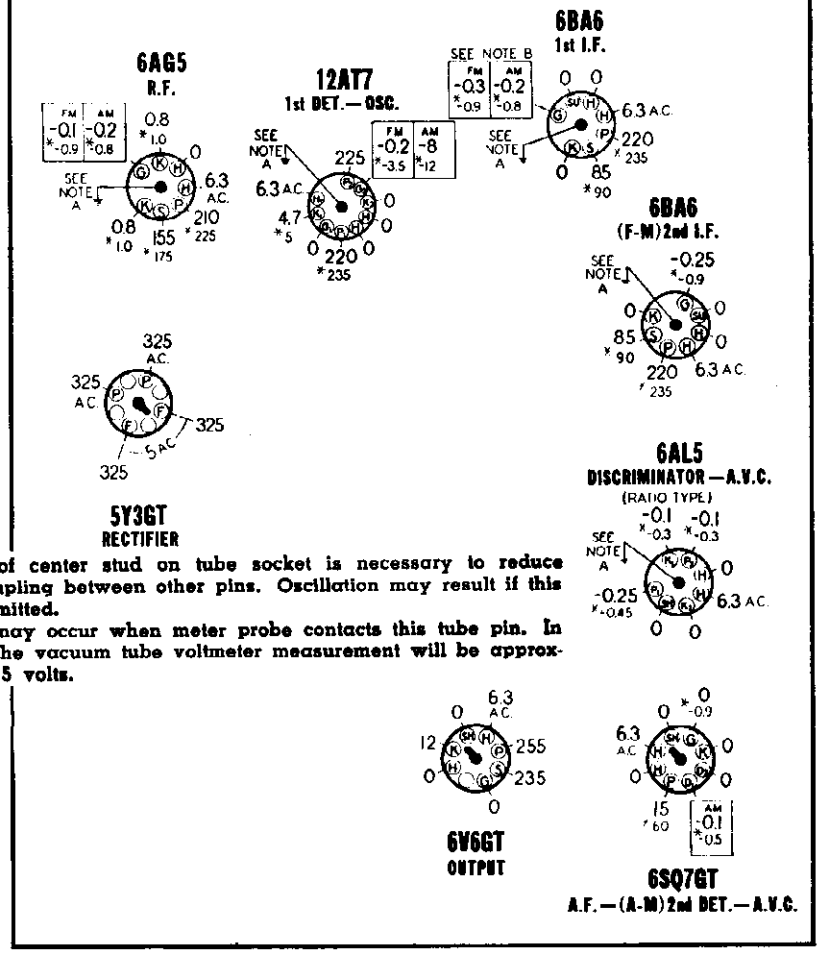
Measured with voltmeter having sensitivity of 1000 ohms per volt except where indicated by (*). The (*) symbol designates a vacuum tube voltmeter measurement.

ALL MEASUREMENTS MADE WITH BAND SWITCH IN "FM" POSITION UNLESS OTHERWISE INDICATED
DIAL TUNED TO 88MC. FOR "FM" MEASUREMENTS
DIAL TUNED TO 540KC. FOR "AM" MEASUREMENTS
VOLUME CONTROL SET TO MINIMUM WITH NO SIGNAL
GROUND ALL ANTENNA TERMINALS

BOTTOM VIEW OF CHASSIS

117 VOLT 60 CYCLE A.C. POWER SUPPLY USED FOR THESE MEASUREMENTS.

ALL VOLTAGES MEASURED BETWEEN SOCKET TERMINALS AND CHASSIS.



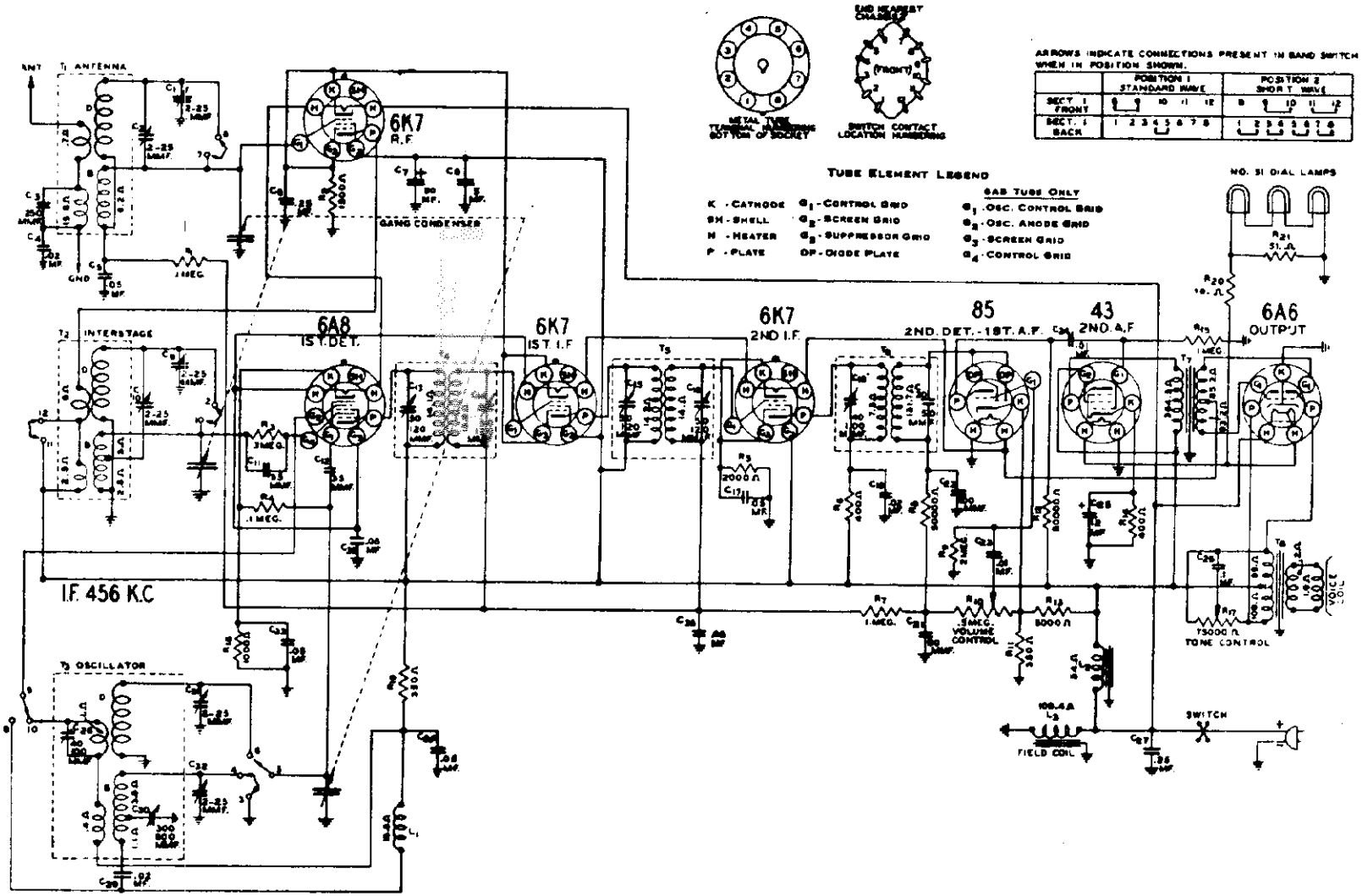
NOTE A: Grounding of center stud on tube socket is necessary to reduce capacity coupling between other pins. Oscillation may result if this ground is omitted.

NOTE B: Oscillation may occur when meter probe contacts this tube pin. In that event, the vacuum tube voltmeter measurement will be approximately —4.5 volts.

REAR OF CHASSIS

TUBE COMPLEMENT:

FM FUNCTION	TYPE	AM FUNCTION
R.F. Amplifier	6AG5	R.F. Amplifier
1st Detector and Oscillator	12AT7	1st Detector and Oscillator
1st I.F. Amplifier	6BA6	1st I.F. Amplifier
2nd I.F. Amplifier	6BA6	———
Discriminator (Ratio Type)	6AL5	———
Audio Amplifier	6SQ7	2nd Det., A.V.C.; A.F. Amp.
Power Output	6V6GT	Power Output
Rectifier	5Y3GT	Rectifier

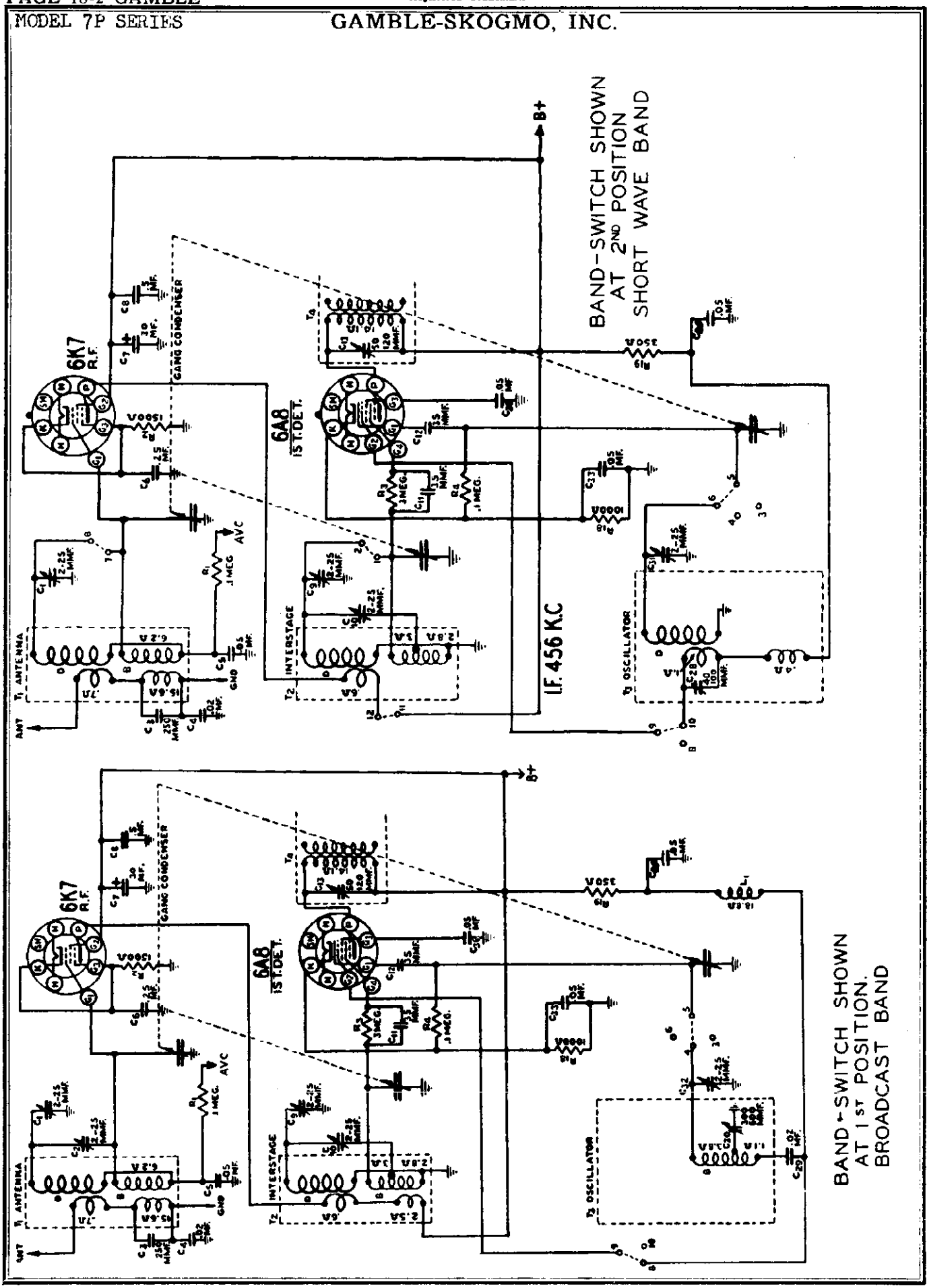

ANT
T1 ANTENNA
6K7
R.F.
GANG CONDENSER
GND
T2 INTERSTAGE
6A8
1ST. DET.
6K7
1ST. I.F.
T5
6K7
2ND I.F.
85
2ND. DET. - 1ST. A.F.
43
2ND. A.F.
6A6
OUTPUT
NO. 51 DIAL LAMPS
I.F. 456 K.C.
T3 OSCILLATOR
1 MEG.
VOLUME CONTROL
TONE CONTROL
FIELD COIL
SWITCH
METAL TUBE TERMINAL NUMBERING (BOTTOM OF SOCKET)
SWITCH CONTACT LOCATION NUMBERING
ARROWS INDICATE CONNECTIONS PRESENT IN BAND SWITCH WHEN IN POSITION SHOWN.
POSITION 1 STANDARD WAVE
POSITION 2 SHORT WAVE
SECT. 1 FRONT
SECT. 1 BACK
TUBE ELEMENT LEGEND
K - CATHODE
SH - SHELL
H - HEATER
P - PLATE
G1 - CONTROL GRID
G2 - SCREEN GRID
G3 - SUPPRESSOR GRID
DP - DIODE PLATE
6A8 TUBE ONLY
G1 - OSC. CONTROL GRID
G2 - OSC. ANODE GRID
G3 - SCREEN GRID
G4 - CONTROL GRID

CLARI-SKEMATIX

Registered Trademark

MODEL 7P SERIES

GAMBLE-SKOGMO, INC.



Series 7P – Replacement Parts

NOTICE—There is a large letter on the chassis which identifies the set as to major part changes. When ordering parts, please be sure to mention the series number and this large letter.

MISCELLANEOUS

SOCKETS

Part No.	Description
P-3A245	6A8 Tube Socket
P-3A242	6K7 Tube Socket
P-3A247	85 Tube Socket
P-3A247	43 Tube Socket
P-3A246	6A6 Tube Socket
P-3A58	5 Prong Speaker Socket

SPEAKERS

P-12A237	8" Dynamic Speaker Complete with Output Transformer T8

KNOBS

Specify Name of Knob and Name and Model of Radio	Tuning Control—Spring Type Band Switch—Set Screw Type Volume Control—Spring Type Tone Control—Spring Type

GENERAL

P-2X38	Felt Washers (Used behind knobs)
P-8X23	Rubber Chassis Mounting Cushions
P-8X42	Rubber Mounting Cushions (Front) For Gang Condenser
P-8X44	Rubber Mounting Cushion (Rear) for Gang Condenser
P-8X45	Rubber Mounting Cushion (Rear—under Chassis) for Gang Condenser
P-4A18	Terminal Strip (2 lugs, Insulated—Mounting foot center)
P-30X14	Grid Clip Only (Glass Tube)
P-30X44	Grid Clip Only (Metal Tube)
P-13X229	Line Cord and Plug
P-13X214	Antenna and Ground Lead Assembly
P-32X30	Tube Shield Base
P-32X32	Tube Shield
P-25X221	Mounting Feet for Chassis (Front)
P-25X231	Mounting Feet for Chassis (Rear)
P-2A59	1 Section, 2 Position Band Change Switch

TRANSFORMERS AND COILS

Part No.	Code	Description
P-9A696	T1	Antenna Transformer and Can Assembly
P-9A697	T2	R. F. Interstage Transformer and Can Assembly
P-9A698	T3	Oscillator Coil and Can Assembly
P-9A699	T4	1st I. F. Transformer and Can Assembly
P-9A700	T5	2nd I. F. Transformer and Can Assembly
P-9A701	T6	3rd I. F. Transformer and Can Assembly
P-50X22	T7	Input Transformer
P-51X45	T8	Output Transformer (Part of Speaker Assembly)
P-9A555	L1	"B" Reactor
P-52X33	L2	"B" Choke (Iron Core)

CONDENSERS

TUBULAR

Part No.	Code	Capacitance		Voltage	
P-46X187	C4	.02	mf.	180	
P-46X80	C5	.05	mf.	180	
P-46X117	C6	.25	mf.	180	
P-46X123	C8	.5	mf.	180	
P-46X80	C17	.05	mf.	180	
P-46X187	C19	.02	mf.	180	
P-46X124	C23	.01	mf.	180	
P-46X124	C24	.01	mf.	180	
P-46X98	C26	.1	mf.	180	
P-46X117	C27	.25	mf.	180	
P-46X187	C29	.02	mf.	180	
P-46X80	C33	.05	mf.	180	
P-46X80	C34	.05	mf.	180	
P-46X80	C35	.05	mf.	180	
P-46X80	C36	.05	mf.	180	

ELECTROLYTIC

P-48X217	C7	30	mf.	50	Dry	
	C25	12	mf.	25	Dry	

MOLDED

P-47X59	C3	250	mmf.	
P-47X47	C11	35	mmf.	
P-47X53	C12	35	mmf.	
P-47X56	C20	50	mmf.	
P-47X56	C21	50	mmf.	
P-47X57	C22	100	mmf.	

TRIMMER

P-17A35 Trimmer Strip	C1	2-25	mmf.	Range "D" Antenna Trimmer
	C2	2-25	mmf.	Range "B" Antenna Trimmer
	C9	2-25	mmf.	Range "D" Interstage Trimmer
	C10	2-25	mmf.	Range "B" Interstage Trimmer
	C31	2-25	mmf.	Range "D" Oscillator Trimmer
	C32	2-25	mmf.	Range "B" Oscillator Trimmer

See Part Number P-17A36 for replacement of any one section

CONDENSERS (Continued)

Part No.	Code	Capacitance		Voltage	
P-17A37	C13	50-120	mmf.		1st I.F. Trimmers
	C14	50-120	mmf.		
P-17A37	C15	50-120	mmf.		2nd I.F. Trimmers
	C16	50-120	mmf.		
P-17A38	C18	40-100	mmf.		3rd I.F. Trimmer
P-17A35	C28	40-100	mmf.		Oscillator Padding Condensers
	C30	300-600	mmf.		
P-17A36		2-25	mmf.		(To be used for replacement of any one section of Trimmer Strip P-17A35)

MISCELLANEOUS

P-14A58	3 Gang Condenser less Dial and Drive Assembly

RESISTORS

CARBON

Part No.	Code	Resistance		Wattage	
P-A95104	R1	100,000	Ohm	0.2	
P-A94152	R2	1500	Ohm	0.2	
P-A95305	R3	3	Megohm	0.2	
P-A94104	R4	100,000	Ohm	0.2	
P-A94202	R5	2000	Ohm	0.2	
P-A95401	R6	400	Ohm	0.2	
P-A95105	R7	1	Megohm	0.2	
P-A95503	R8	50,000	Ohm	0.2	
P-A95205	R9	2	Megohm	0.2	
P-A94351	R11	350	Ohm	0.2	
P-A95803	R12	80,000	Ohm	0.2	
P-A94602	R13	6000	Ohm	0.2	
P-A94401	R14	400	Ohm	0.2	
P-A95105	R15	1	Megohm	0.2	
P-A94102	R16	1000	Ohm	0.2	
P-A95351	R17	350	Ohm	0.2	

WIRE WOUND

P-43X73	R20	18	Ohm	4.0	
	R21	51	Ohm	6.0	

VARIABLE

P-36X213	R10	500,000	Ohm	Volume Control and On-Off Switch
P-40X209	R17	75,000	Ohm	Tone Control

INTERFERENCE ELIMINATION PARTS

Part No.	Description
P-21A7	Spark Plug Suppressor
P-48X34	Dual .5 mf. Generator Condenser

DIAL AND DRIVE ASSEMBLY

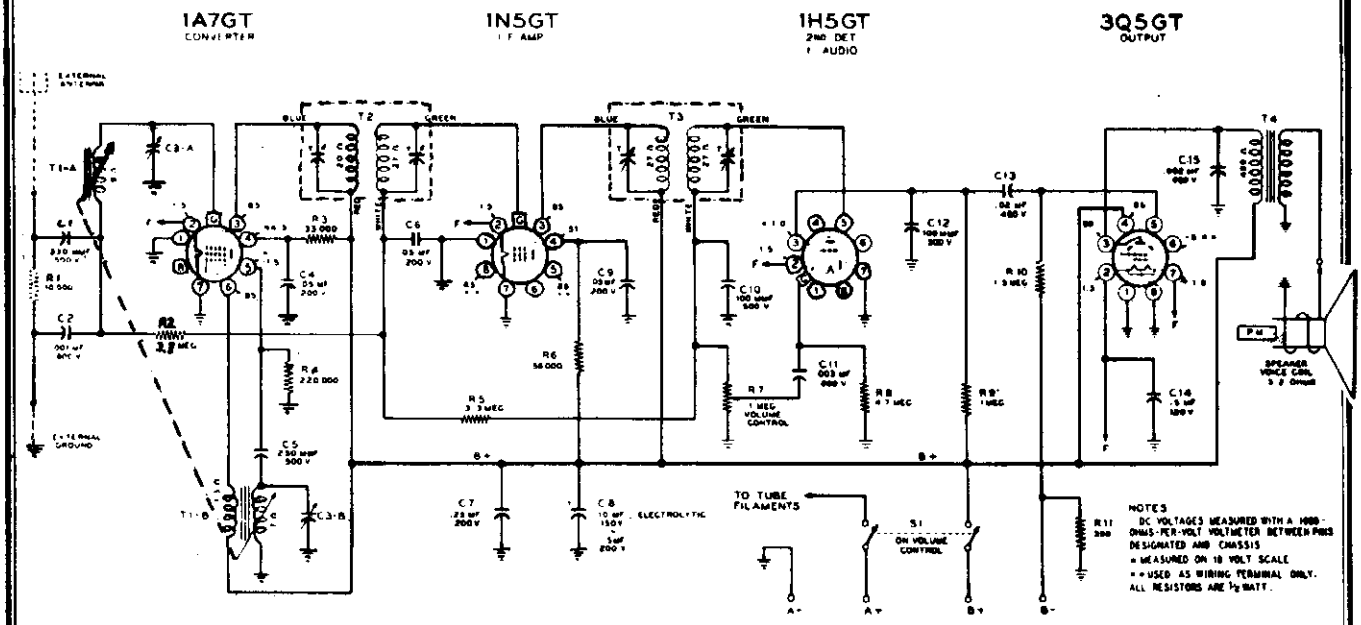
DIAL ASSEMBLY

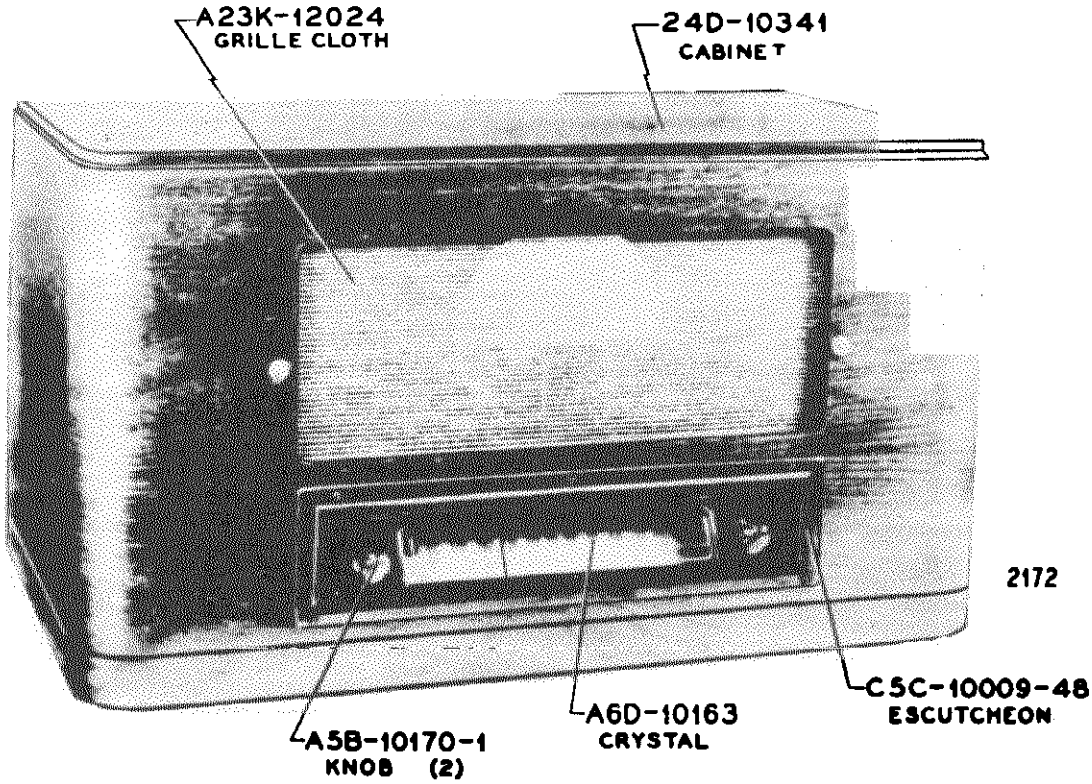
Part No.	Description
Specify Name and Model of Radio	Dial Assembly Complete with Dial Glass; Dial Plate; Dial Cardboard; Small Pointers; Reflectors; Small Pointer Cords, Springs, Pulleys and Collars; and Band Indicator Assembly less Large Station Pointer and Micrometer Pointer.
See above	Dial Glass Only
P-25A125	Dial Assembly Mounting Plate, Includes Small Pointer Shafts and Pulleys, and Band Indicator Assembly
P-25X297	Dial Assembly Support Brackets (Attached to Gang Condenser)
P-15X59	Large Station Pointer
P-15X60	Micrometer Pointer
P-16X57	Small Volume or Tone Control Pointer
P-9X16	Dial Cardboard
P-11X41	Fibre Strip (At Bottom of Dial Glass)
P-41X12	Dial Lamp Reflectors (At each side of Dial Plate)
P-7A37	Dial Lamp Sockets and Clips
P-7A32	Dial Lamps
P-29X20	10" Black Cord for Small Pointers Brass Collars with Set Screws for Securing Small Pointer Cords to Shafts
P-28X44	Tension Springs for Small Pointer Cords
P-26X229	Small Pointer Shafts and Pulleys
P-17X15	Glass Crystal (Mounted in Escutcheon Plate)
P-28X58	Crystal Retaining Ring

DRIVE ASSEMBLY

P-5A34	Planetary Assembly Complete with Hex Nut and Lockwasher (This is the unit mounted at the front of the chassis base. It is integral with the tuning shaft)
P-10X14	Black Tuning Drive Cord Only
P-28X49	Tension Spring for Tuning Drive Cord
P-25X269	Drive Assembly Bracket Only (Mounted on Gang Condenser)
P-25X283	Rear Mounting Foot for Gang Condenser
P-24X239	Drive Drum Assembly Complete with Gears, Micrometer and Main Pointer Shaft
P-28X84	Spreader Spring for Rotary Gear (Part of Above Assembly)
P-28X83	Spreader Spring for Stationary Gear (Part of Above Assembly)

MODEL 43-6321 GAMBLE-SKOGMO, INC.





GAMBLE-SKOGMO, INC. MODEL 43-632

ALIGNMENT PROCEDURE

Output meter across 3.2-ohm output load.

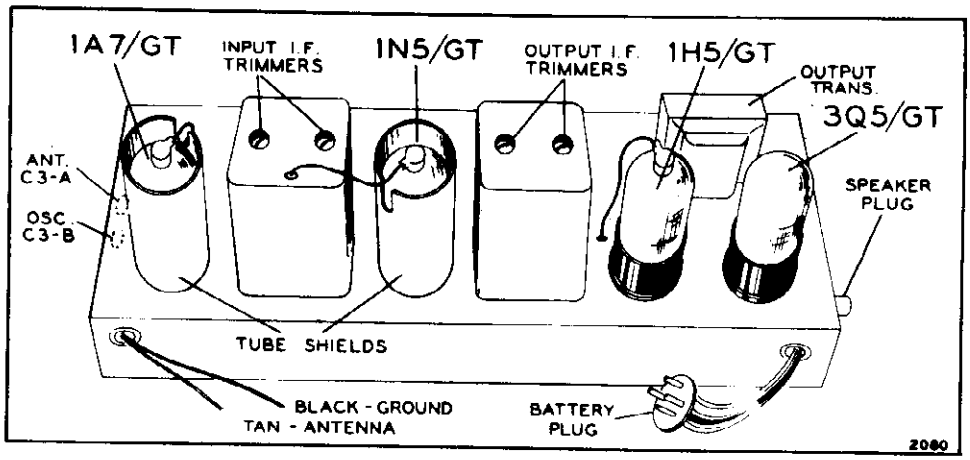
Align for maximum output. Reduce input as needed to keep output near 0.4 volts.

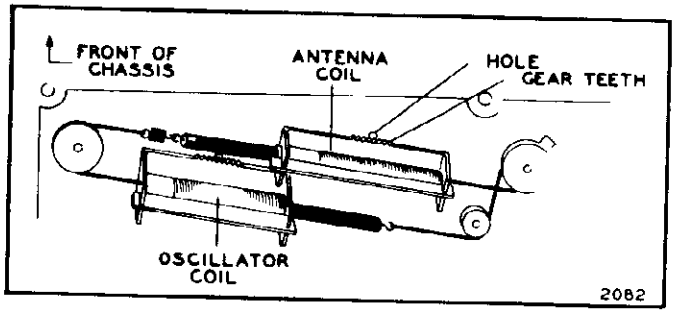
Volume control at maximum for all adjustments.

Connect ground post of signal generator to radio chassis.

FREQUENCY	SIGNAL GENERATOR DUMMY ANTENNA	CONNECTION TO RADIO	TUNER SETTING	ADJUST FOR MAXIMUM OUTPUT (in order shown)
455 kc	.1 mf	Grid (top cap) of 1A7GT	Iron cores all the way out	Trimmers on output and input I.F.
1720 kc	.1 mf	Grid (top cap) of 1A7GT	Iron cores all the way out	Oscillator trimmer C3-B
1720 kc	200 mmf	Antenna lead	Iron cores all the way out	Antenna trimmer C3-A
1400 kc	200 mmf	Antenna lead	Turn dial to 1400 kc	Adjust position of antenna coil (see coil view)

This adjustment and the previous adjustment are interlocking: therefore repeat the two adjustments alternately for best results.



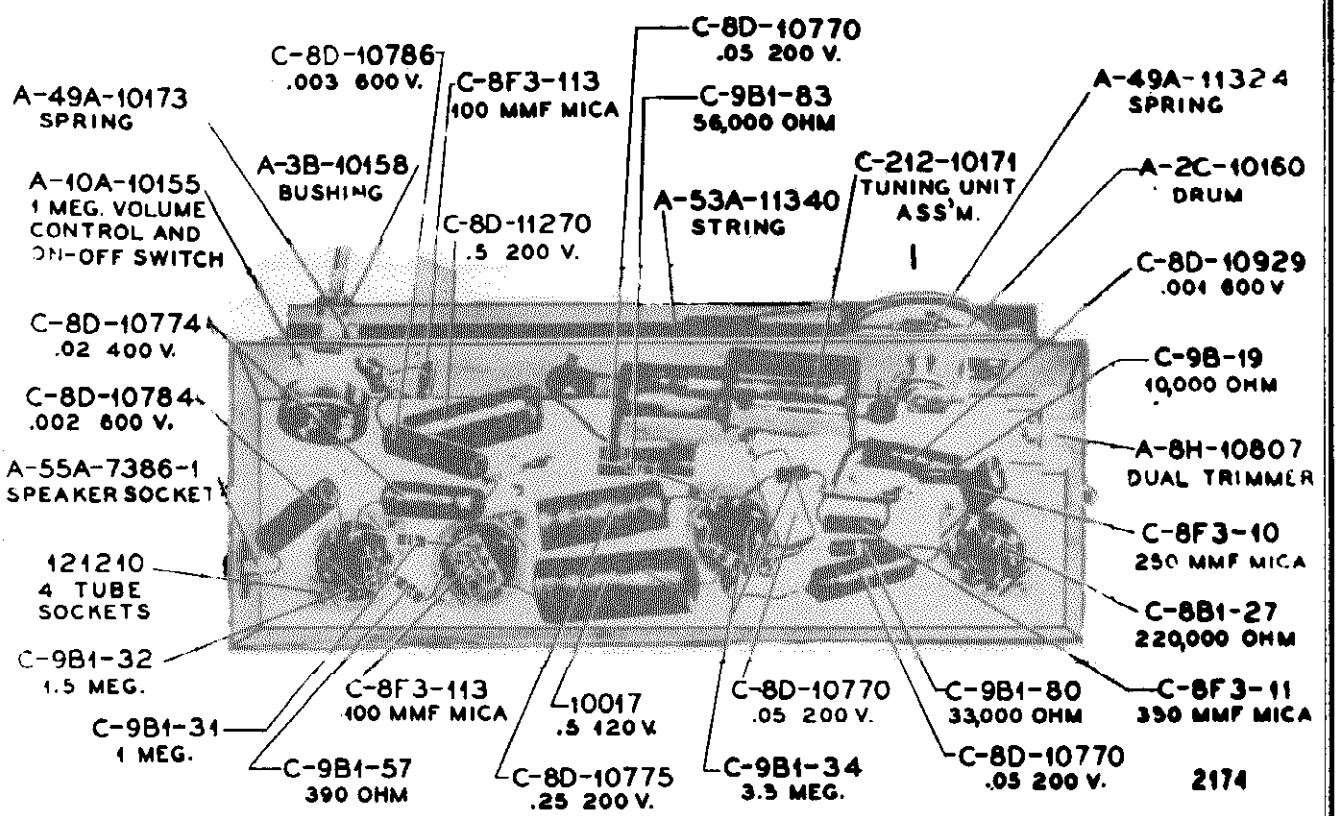


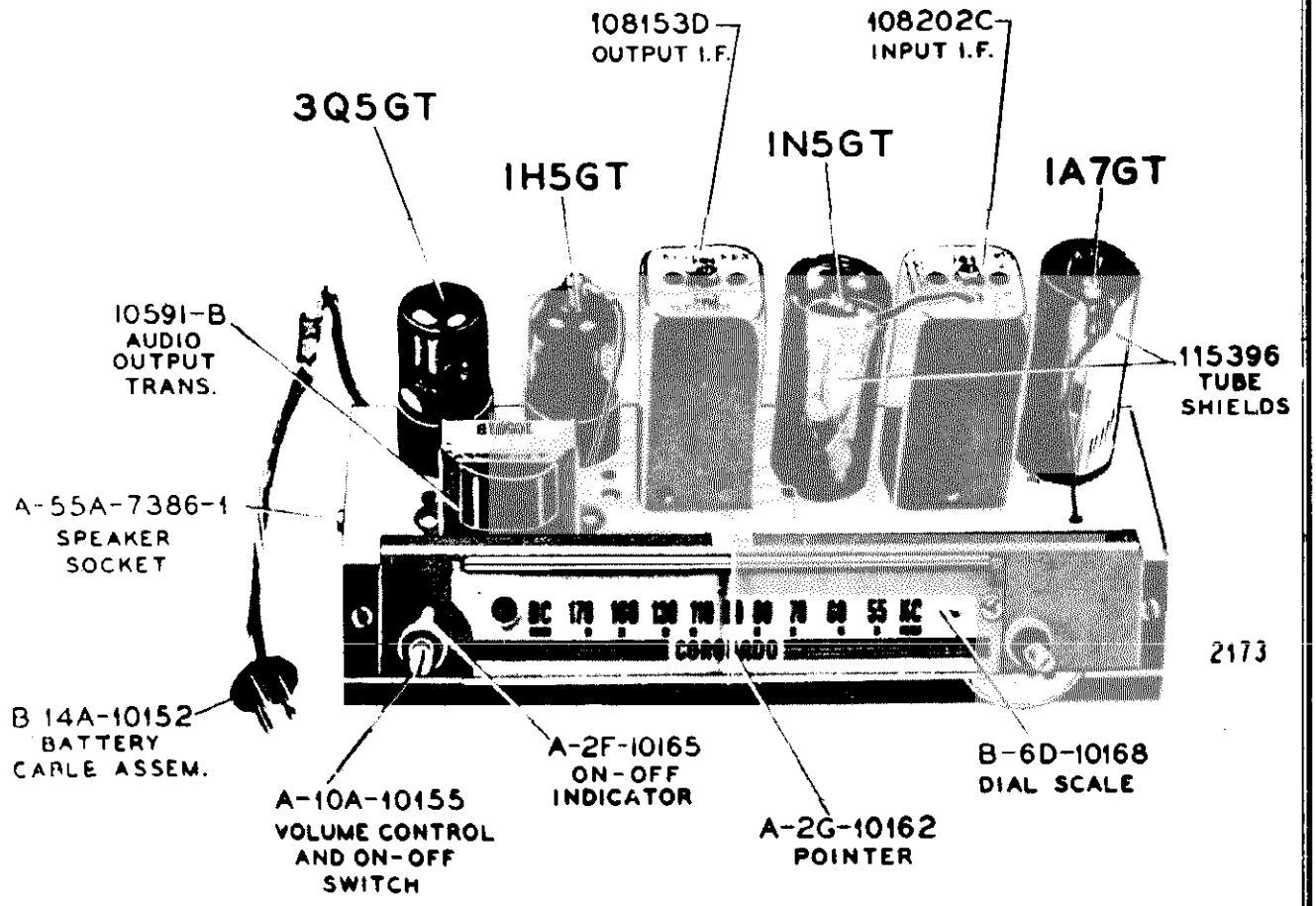
SPECIFICATIONS

4 Tube Superheterodyne

Power Output.....160 mw. undistorted, 250 mw. maximum
Selectivity.....48 kc. broad at 1,000 times signal at 1,000 kc.
Antenna.....External only. Also external ground.
Intermediate Frequency.....455 kc.
Speaker.....5 in. P.M., 1.5 oz., magnet, voice coil imp. 3.2 ohr
Tuning.....Two permeability-tuned circui
Sensitivity.....20 mv. avg. for 50 mw. outp
Frequency Range.....535 to 1,720 k
Power Supply.....A battery 1.5 v. 250 ma., B battery 90 v. 14 m

MODEL 43-6321 GAMBLE-SKOGMO, INC.

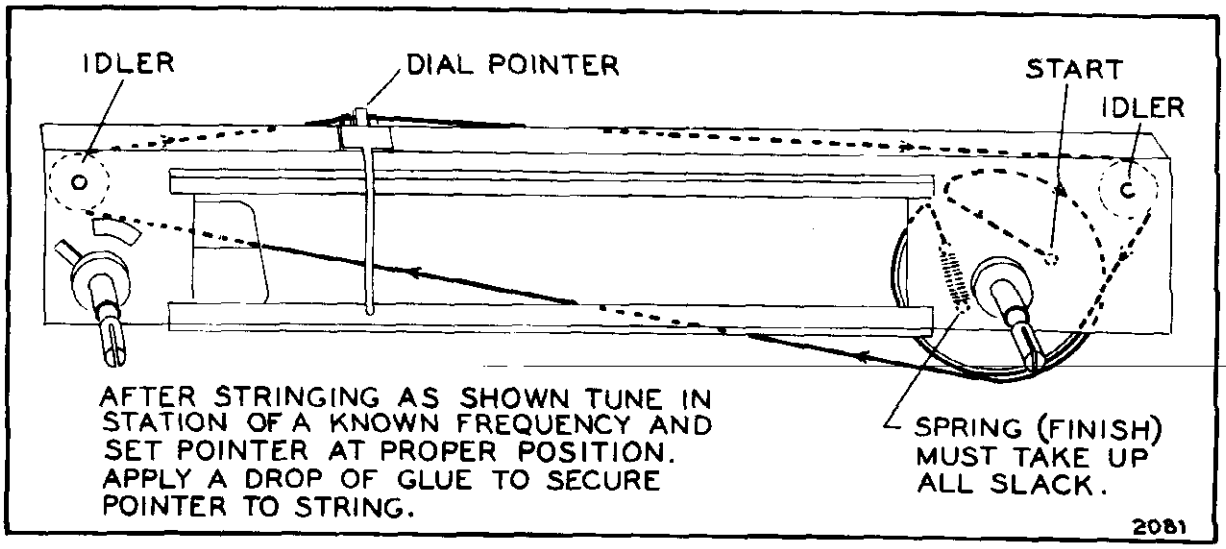




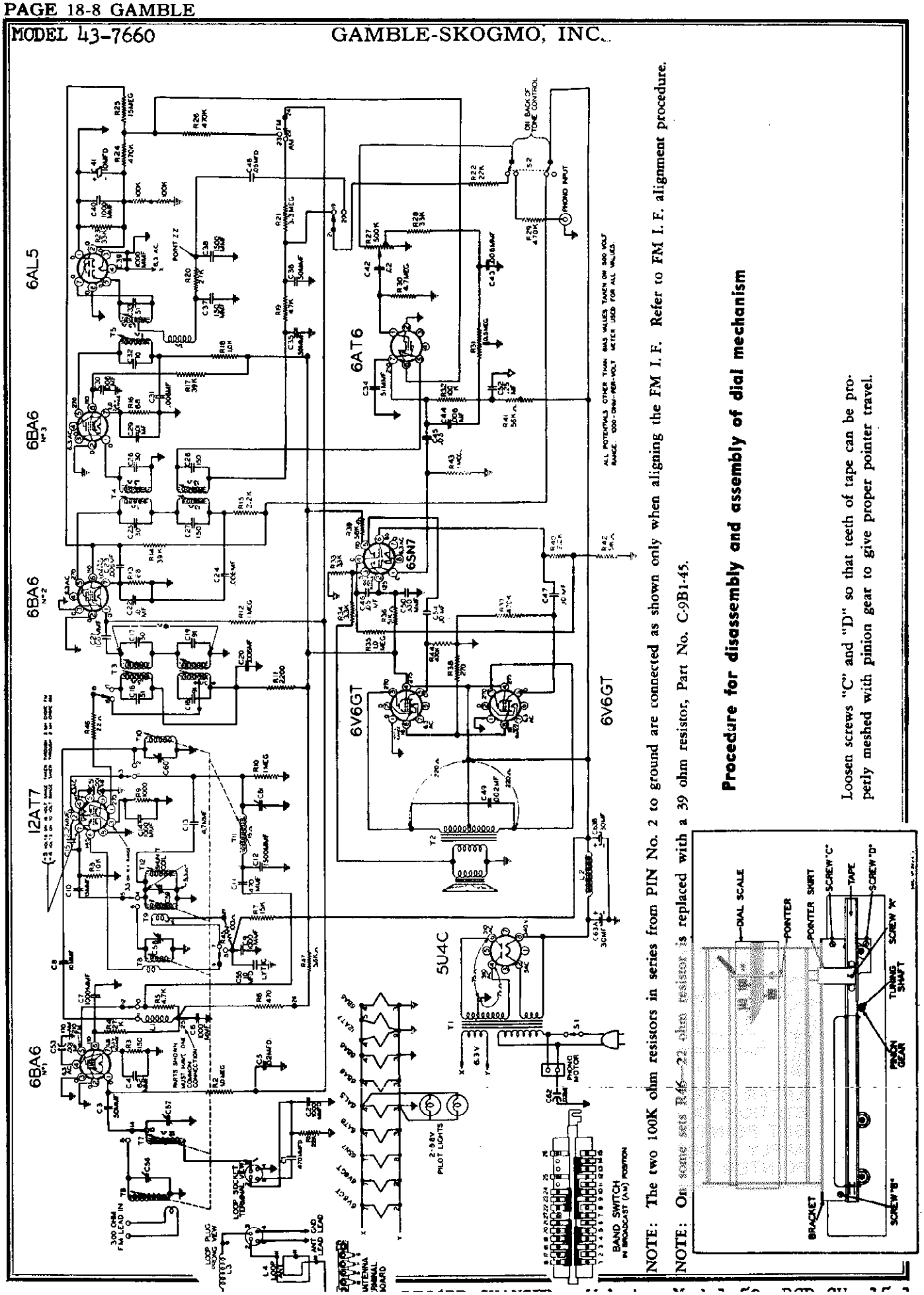
Ref. No.	Part No.	Description
CAPACITORS *		
C1	C-8F3-11	330 mmf, 20%, mica
C2	C-8D-10929	.001 mf, 600 volts, 10%
C3-A,-B	A-8H-10807	Dual trimmer; antenna (42-78 mmf) and oscillator (84-156 mmf)
C4,C6, C9	C-8D-10770	.05 mf, 200 volts, 20%
C5	C-8F3-10	220 mmf, 20%, mica
C7	C-8D-10775	.25 mf, 200 volts, +20%—10%
C8	C-8D-11270 or 119117	.5 mf, 200 volts, +20%—10% 10 mf, 150 volts, electrolytic
C10,C12	C-8F3-113	100 mmf, 10%, mica
C11	C-8D-10786	.003 mf, 600 volts, 20%
C13	C-8D-10774	.02 mf, 400 volts, 20%
C14	10017	.5 mf, 120 volts, +50%—10%
C15	C-8D-10784	.002 mf, 600 volts, 25%
RESISTORS *		
R1	C-9B1-19	10,000 ohms, ½ watt, 20%
R2,R5	C-9B1-34	3.3 megohms, ½ watt, 20%
R3	C-9B1-80	33,000 ohms, ½ watt, 10%
R4	C-9B1-27	220,000 ohms, ½ watt, 20%
R6	C-9B1-83	56,000 ohms, ½ watt, 10%
R7,S1	A-10A-10155	Volume control (1 megohm) and on-off switch
R8	C-9B1-35	4.7 megohms, ½ watt, 20%
R9	C-9B1-31	1 megohm, ½ watt, 20%
R10	C-9B1-32	1.5 megohms, ½ watt, 20%
R11	C-9B1-57	390 ohms, ½ watt, 10%

Ref. No.	Part No.	Description
TRANSFORMERS AND COILS		
T1-A,-B	C-211-10171	Tuning assembly complete, includ antenna and oscillator coils
T2	108202C	Input I.F. coil, complete in (range of trimmers: pri. 60-1 mmf, sec. 40-70 mmf)
T3	108153D	Output I.F. coil, complete in (range of trimmers: 40-70 m each)
T4	10591B	Output transformer
MISCELLANEOUS		
	B-18A-10164	Speaker, 5", P.M.
	121210	Socket, for tubes (4 used)
	A-55A-7386-1	Connector, for speaker plug
	10724	Plug, on speaker leads
	B-14A-10152	Battery cable assembly
	A-2G-10162	Pointer, for dial
	115396	Tube shield (for 1N5GT, 1A7G
	A-5B-10170-1	Knob (volume control, tuning)
	B-6D-10618	Dial scale
	B-2M-7758	Snap-in rivet for dial scale
	A-6D-10163	Crystal for dial
	A-2F-10165	On-off indicator
	A-49A-10173	Spring for on-off indicator
	A-3A-10156	Tuning shaft
	A-53A-10576	Cord, for dial pointer drive (32
	A-49A-11324	Spring for dial pointer drive cord

DRIVE CORD REPLACEMENT



MODEL 43-7660 GAMBLE-SKOGMO, INC.



NOTE: The two 100K ohm resistors in series from PIN No. 2 to ground are connected as shown only when aligning the FM I. F. Refer to FM I. F. alignment procedure.

NOTE: On some sets R46 22 ohm resistor is replaced with a 39 ohm resistor, Part No. C-9B1-45.

Procedure for disassembly and assembly of dial mechanism

Loosen screws "C" and "D" so that teeth of tape can be properly meshed with pinion gear to give proper pointer travel.

ALIGNMENT PROCEDURE

FM Band Section I.F. and R.F.

A non-metallic alignment tool must be used.

IMPORTANT— No alignment of the FM section of this radio should be attempted unless you are positive that the circuits are in need of adjustment and you have the necessary equipment.

All components used in this radio are extremely stable and the tuned circuits should require no adjustment over a long period of time.

NOTE—The following alignment is based on the use of the new Simpson vacuum tube voltmeter which has a "floating ground". In other words, the meter, when used as a vacuum tube volt-meter, can have both the positive and negative sides connected to points above ground and still give true readings.

A standard AM signal generator is required.

FM - I. F. ALIGNMENT

Band Switch in FM Position. Dummy Antenna .1 Mfd.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	VACUUM TUBE VOLT METER CONNECTION TO RADIO	ADJUSTMENTS TO BE MADE	ADJUST FOR
10.7 Mc. Use about .1 volt	Pin No. 1 of 6BA6 No. 3 and ground	Pin No. 2 of 6AL5 and ground	Primary of T5	Resonance should be about 3 volts
10.7 Mc. Use about .1 volt	Pin No. 1 of 6BA6 No. 3 and ground	See note "A"	Secondary of T5	Resonance should be about 3 volts
10.7 Mc. Use about 3300 microvolts	Pin No. 1 of 6BA6 No. 2 and ground	Pin No. 2 of 6AL5 and ground	Primary and Secondary of T4 10.7 m.c. windings See top and bottom views	Zero. Use zero center scale See note "B"
10.7 Mc. Use about 200 microvolts	Pin No. 2 of 12AT7 and ground	Pin No. 2 of 6AL5 and ground	Primary and Secondary of 10.7 m.c. windings of T3 See top and bottom views	Resonance should be about 3 volts

NOTES ON FM — I. F. ALIGNMENT

NOTE "A" Connect two resistors, 100K OHMS each, from Pin No. 2 of 6AL5 to ground. These resistors must be matched within 5%. Connect as shown in dotted lines on schematic diagram. Connect vacuum tube voltmeter between the mid-point of the resistors and point zz.

NOTE "B" If T5 has been tampered with, it is possible that no crossover point will be found at first. Careful adjustment of both primary and secondary is necessary.

GENERAL Input signals should b adjusted to give approximately volts. The ratio detector is oper ating at a resonable level at thi point and will give the truest in dication of correct alignment wit the procedure specified.

FM - R. F. ALIGNMENT

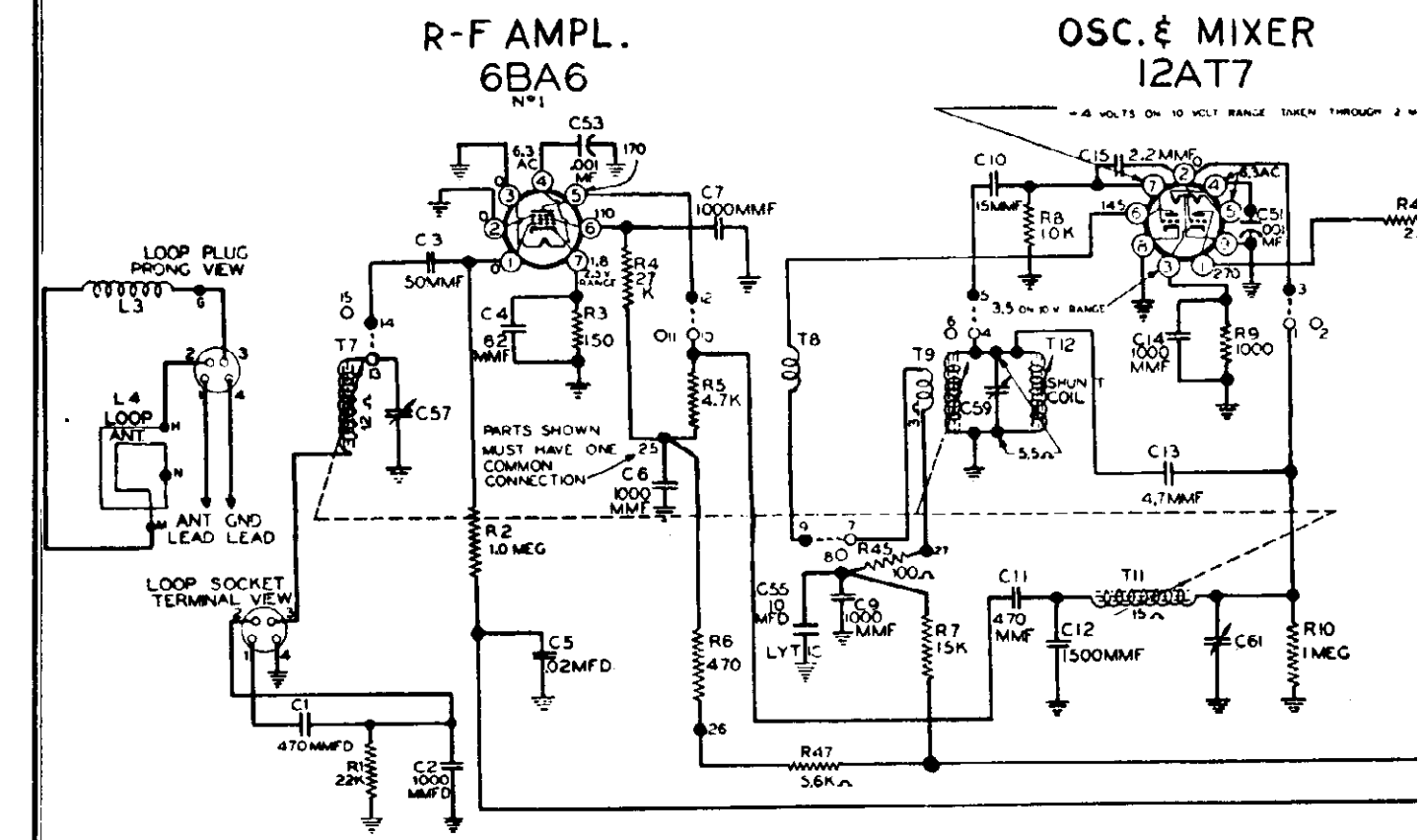
Check pointer so that the right hand edge of the pointer skirt coincides with the right hand edge of marker to the extreme right when iron cores are all the way out.

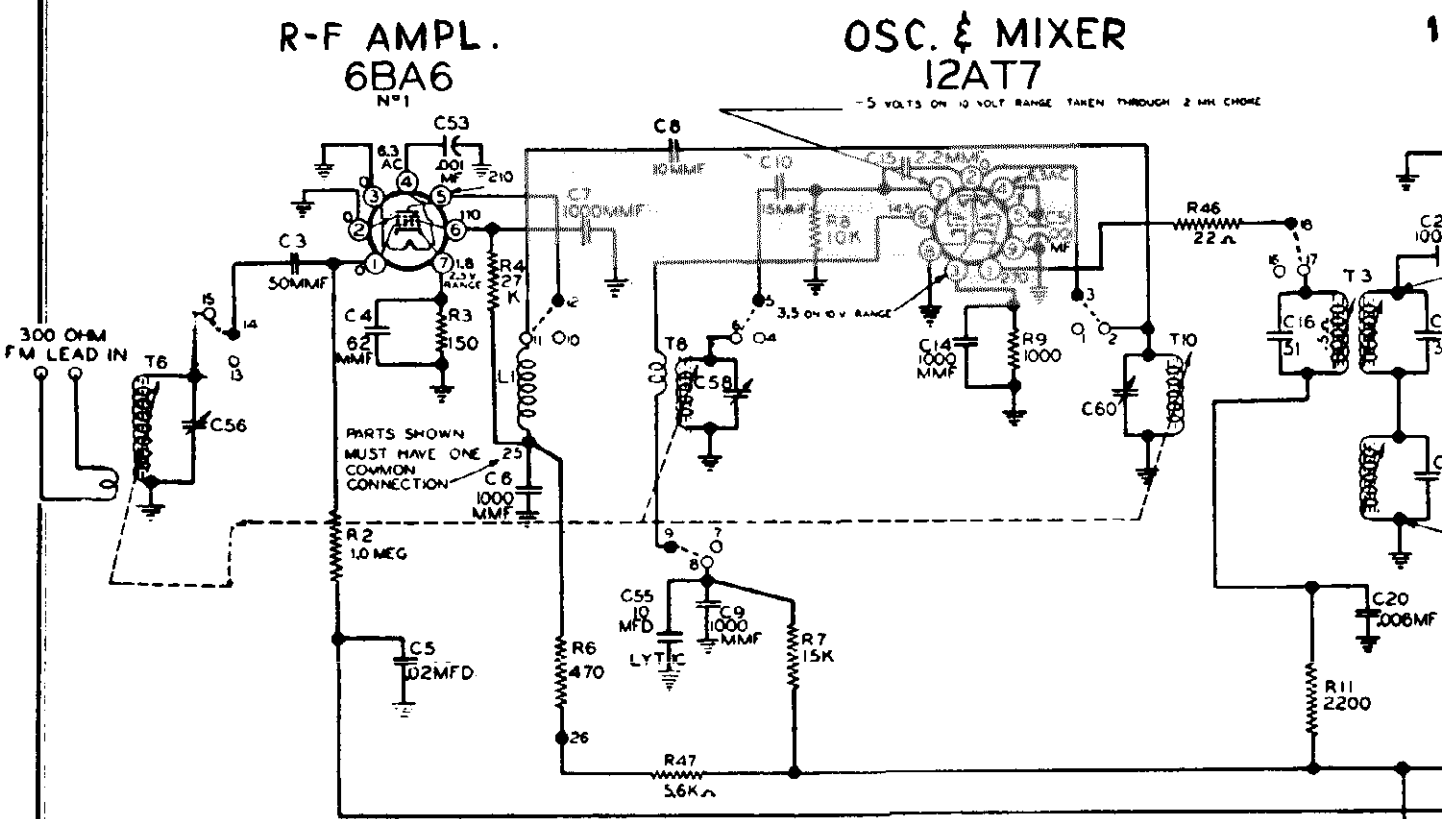
For Adjustment, see dial mechanism illustration.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	DUMMY ANTENNA	ADJUST	VACUUM TUBE VOLT METER CONNECTION TO RADIO	ADJUST TO
100 Mc. Use about 10 microvolts	FM Antenna Terminals See note	300 ohms	C58 Osc. C60 R. F. C56 Ant.	Pin No. 2 of 6AL5 and Ground	Resonance about 3 volts

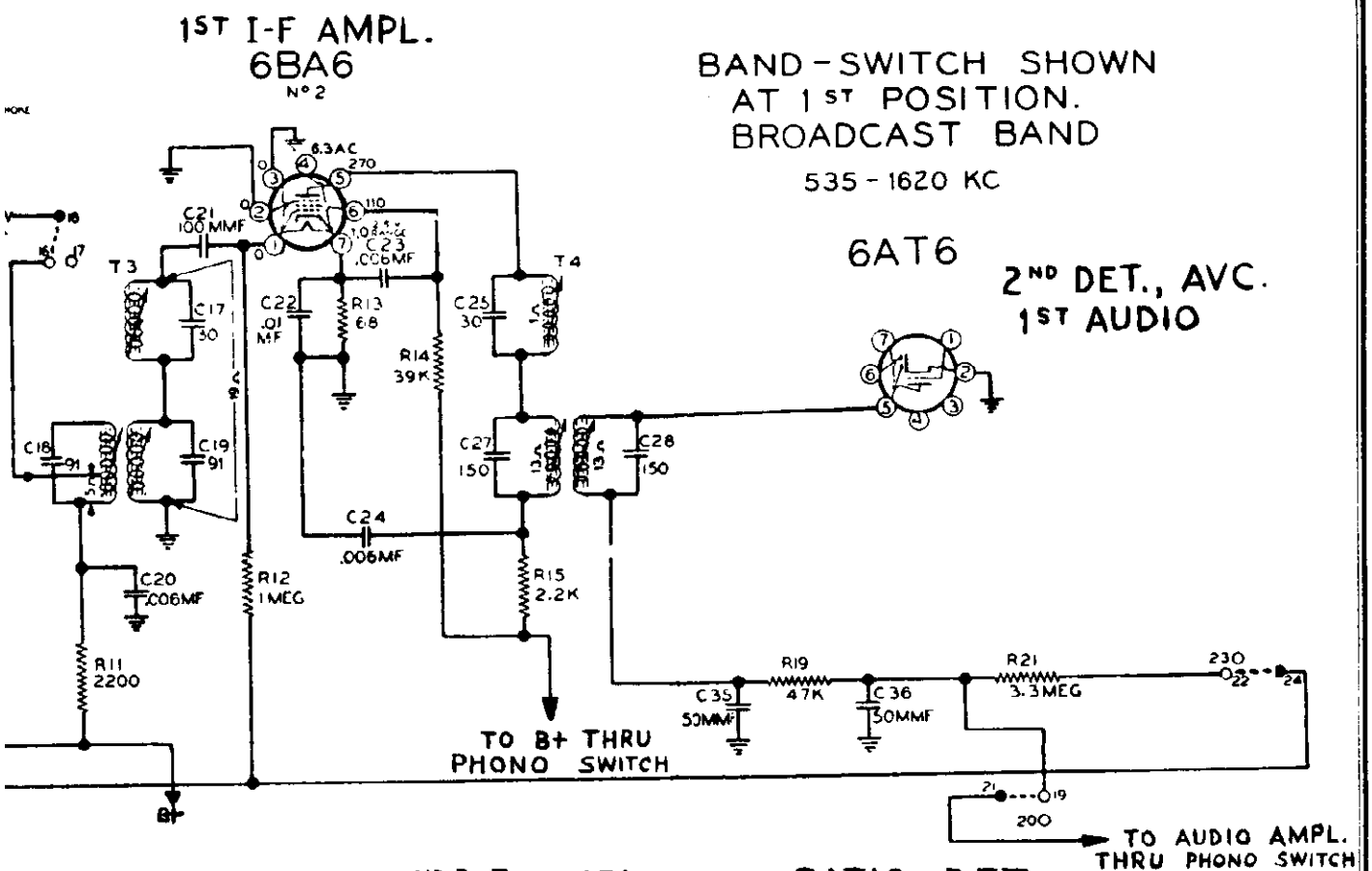
NOTE: If a signal generator with the above fundamental frequency is not available, it is sometimes possible to use harmonics. Use extreme care in picking harmonics. An alternate procedure is to use a local station carrier of known frequency to align the FM Band and to use the vacuum tube volt-meter as above for resonance indication. A weak carrier, howeve will not produce 3 volts.

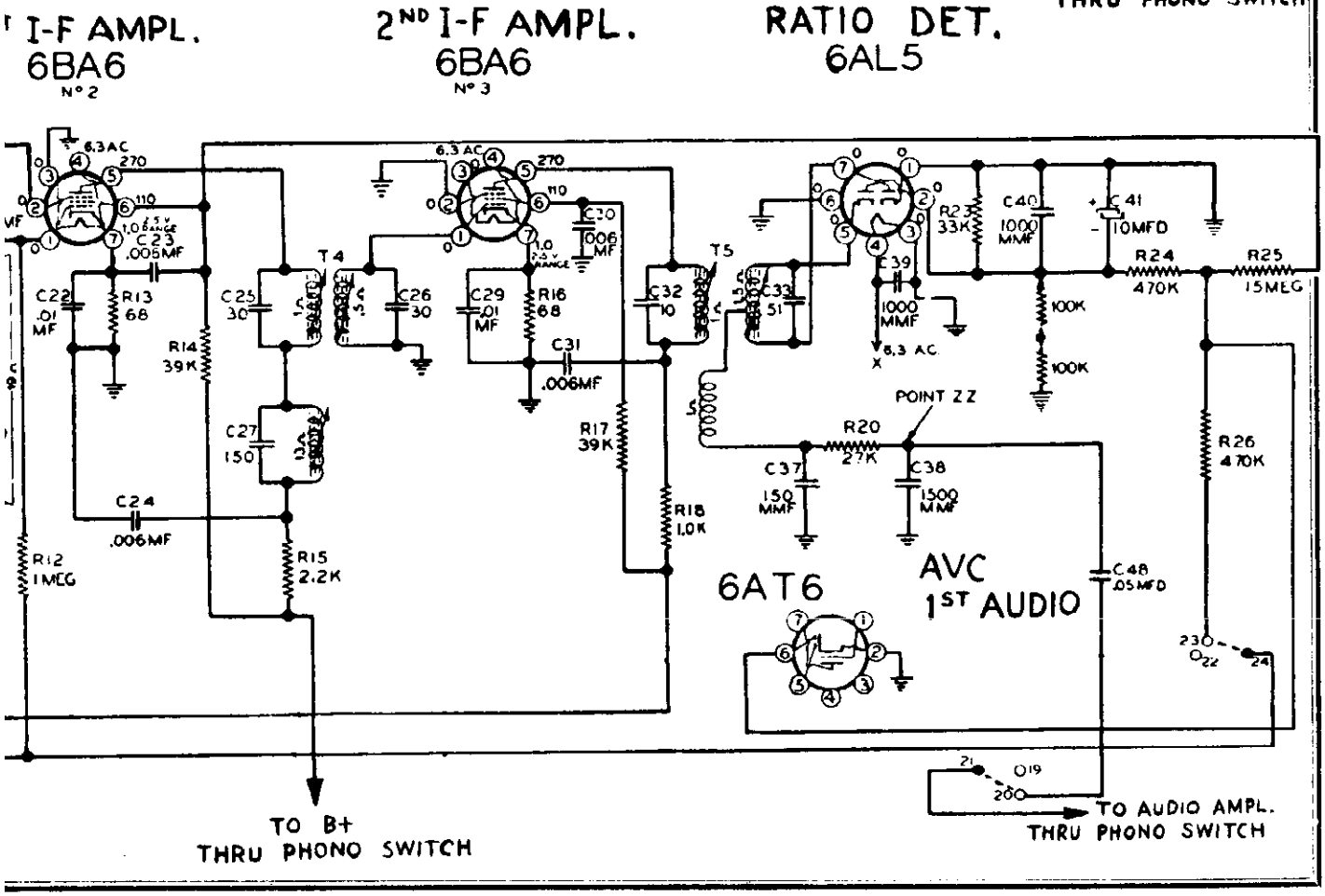
NOTE: Connect 300 ohms in series with hot side of generat and connect to one screw. Connect cold side of generator other screw.





BAND-SWITCH SHOWN
AT 2ND POSITION COUNTERCLOCKWISE.
F M BAND 88-108 MC


1ST I-F AMPL.
6BA6
N° 2
BAND-SWITCH SHOWN
AT 1 ST POSITION.
BROADCAST BAND
535 - 1620 KC
6AT6
2ND DET., AVC.
1ST AUDIO
6.3AC
270
110
C21
100 MMF
C23
.006MF
T3
T4
C17
30
C18
91
C19
91
C22
.01
MF
R13
68
R14
39K
C25
30
C27
150
C28
150
C24
.006MF
C20
.006MF
R12
1MEG
R11
2200
R15
2.2K
TO B+ THRU
PHONO SWITCH
C35
50MMF
R19
47K
C36
50MMF
R21
3.3MEG
230
22
24
21
19
200
TO AUDIO AMPL.
THRU PHONO SWITCH


I-F AMPL.
6BA6
N° 2
2ND I-F AMPL.
6BA6
N° 3
RATIO DET.
6AL5
6.3AC
270
110
C23
.005MF
C22
.01
MF
R13
68
R14
39K
C24
.006MF
R12
1MEG
T4
C25
30
C26
30
C27
150
C29
.01
MF
R16
68
C30
.006
MF
C31
.006MF
R15
2.2K
T5
C32
10
C33
51
R17
39K
R18
1.0K
R23
33K
C40
1000
MMF
C41
10MFD
C39
1000
MMF
6.3 AC
X
R24
470K
R25
15MEG
100K
100K
POINT ZZ
R20
27K
C37
150
MMF
C38
1500
MMF
R26
470K
C48
.05MFD
6AT6
AVC
1ST AUDIO
230
22
24
21
19
200
TO B+
THRU PHONO SWITCH
TO AUDIO AMPL.
THRU PHONO SWITCH

MODEL 43-7660

GAMBLE-SKOGMO, INC.

ALIGNMENT PROCEDURE

Broadcast Band Section I.F. and R.F.

The alignment procedure below includes the sensitivities at the inputs of various stages. All signal input values are based on an output of ½ watt. This may be measured by disconnecting the speaker voice coil and substituting a 3.2-ohm resistor across the secondary winding of the output transformer. A reading of 1.3 volts AC across this resistor will be approximately equivalent to a ½-watt output with the speaker connected. The volume control must be set at maximum. The tone control must be set for maximum treble.

The signal source must be an accurately calibrated signal generator capable of suppling the frequencies designated, modulated 30% with a 400-cycle audio signal. A 400 cycle audio signal is required for the audio measurement. Variations in sensitivities of plus or minus 25% are usually permissable.

AM-I.F. ALIGNMENT

Band Switch in AM Position. Tune Set to 1400 Kc. Dummy Antenna .1 Mfd.

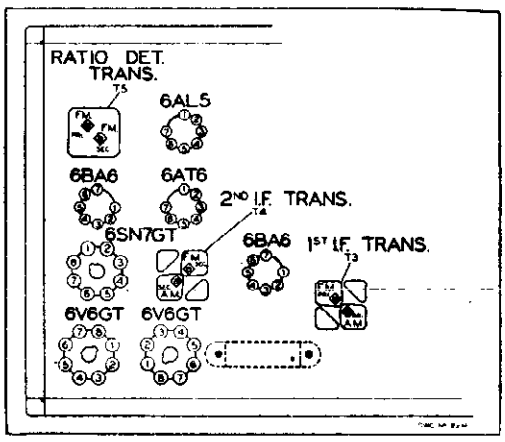
SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	ADJUSTMENTS TO BE MADE	ADJUST FOR
455 Kc. Use 1000 microvolts	Pin No. 1 of 6BA6 No. 2 and ground	Primary and Secondary of T4 AM windings See top and bottom views	Maximum output Should be ½ watt
455Kc. Use 30 microvolts	Pin No. 2 of 12AT7 and ground	Primary and Secondary of T3 AM windings See top and bottom views	Maximum output Should be ½ watt
400 cycles. Use 28 millivolts	Hot end of volume control and ground	None	Maximum output Should be ½ watt

BROADCAST BAND-R.F. ALIGNMENT

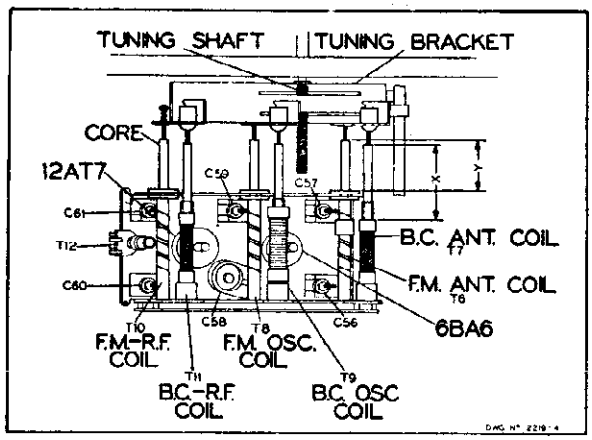
Check pointer so that the right hand edge of the pointer skirt coincides with the right hand edge of marker to the extreme right when iron cores are all the way out. For Adjustment, see dial mechanism illustration.

SIGNAL GENERATOR FREQ.	CONNECTION TO RADIO	DUMMY ANTENNA	ADJUST
1620 Kc.	AM Antenna and Ground	200 mmf.	C59 Osc. trimmer for maximum
535 Kc.	AM Antenna and Ground	200 mmf.	T12 for maximum ½ watt
1620 Kc. Use 3 microvolts	AM Antenna and Ground	200 mmf.	C57 and C61 for max. ½ watt. See note

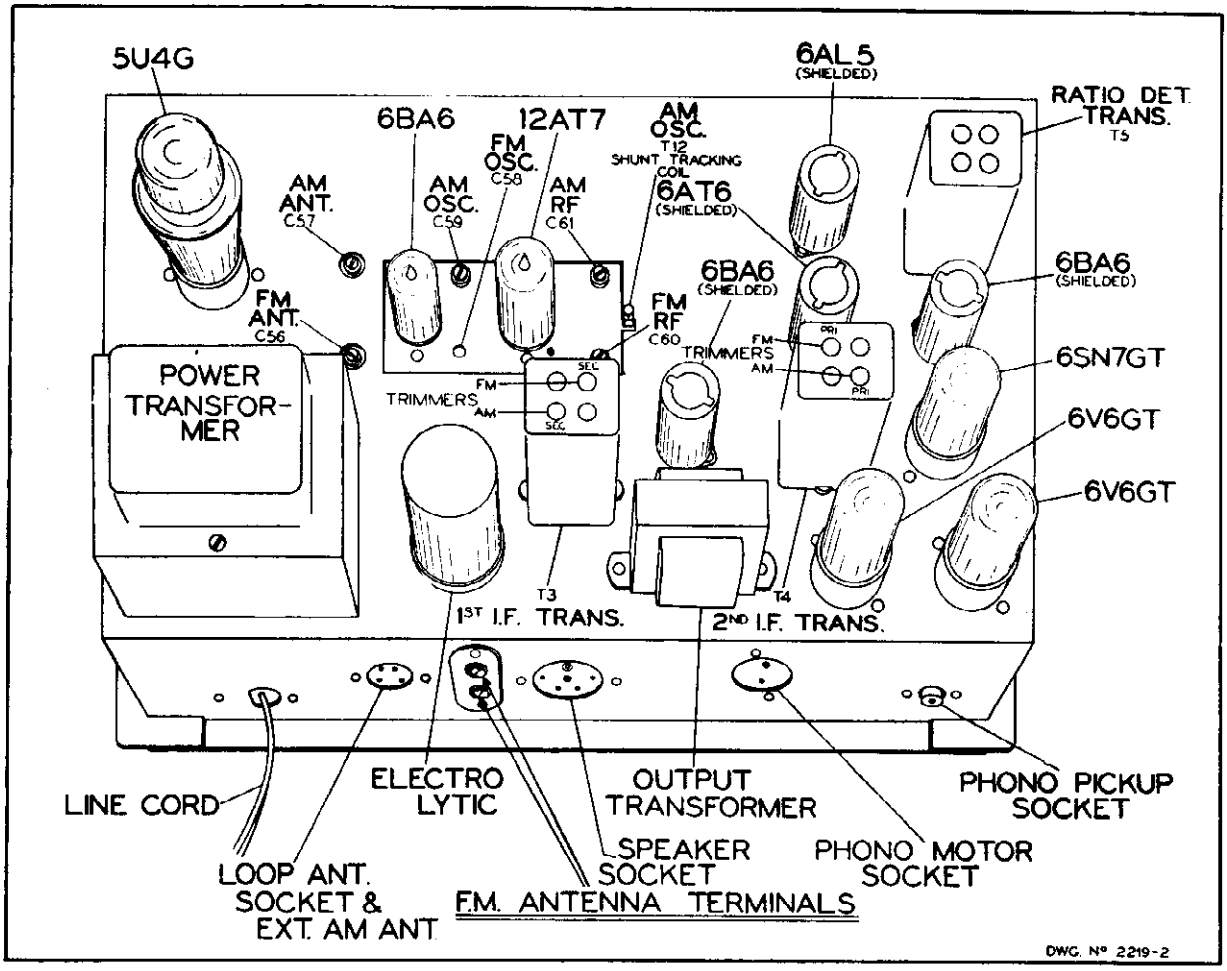
NOTE: Re-check first two adjustments after this adjustment because of inter-locking effects.



TUNER ADJUSTMENT

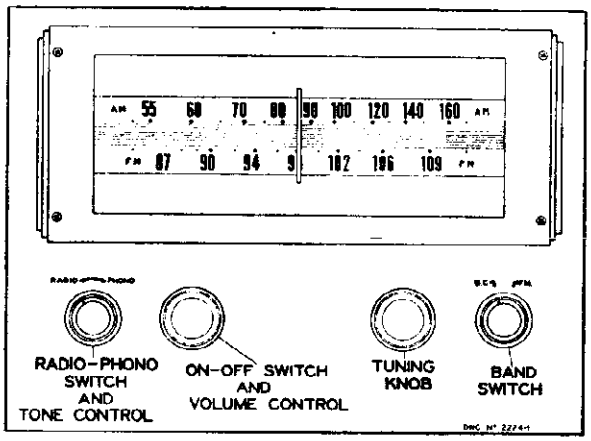


With tuner all the way out, dimension "X" should be 1½ inches. "Y" should be 1-1/16 inches. "X" is from the end of the slug to edge of the coil winding. Check these dimensions before R.F. alignment is attempted of either the AM or FM Band. No slug adjustment should be necessary since the slugs are properly set at the factory.



Chassis—top view

GENERAL DESCRIPTION— This is a 2-band, nine tube (plus rectifier) superheterodyne receiver for the reception of both AM and FM stations. It features the most advanced type of FM ratio detector, permeability tuning of both bands, combination double-frequency I. F. coils and miniature tubes. Built-in antennas are provided for broadcast and FM reception; provision is also made for connection of an external broadcast antenna as well as an FM antenna with 300 ohm lead-in. Both antennas may be connected to the radio at the same time.



Loud Speaker.....12" electrodynamic. Voice coil impedance 3.2 ohms, 400 cycles.

ELECTRICAL SPECIFICATIONS

Power Supply.....105 to 125 volts, AC, 60-cycles; Chassis only 122 watts. With phono operation 150 watts.

Frequency Range.....Broadcast Band—535 to 1620 kc.
FM—Band 88 to 108 mc.

Intermediate Freq......AM-455 kc; FM-10.7 mc.

Selectivity.....AM-48 kc. broad at 1000 times signal, measured at 1000 kc.
I.F. FM-180 kc. broad at 2 times down.
I.F. FM-320 kc. broad at 10 times down.

AM Sensitivity.....(For .5 watt output with external antenna)—3 microvolts average.

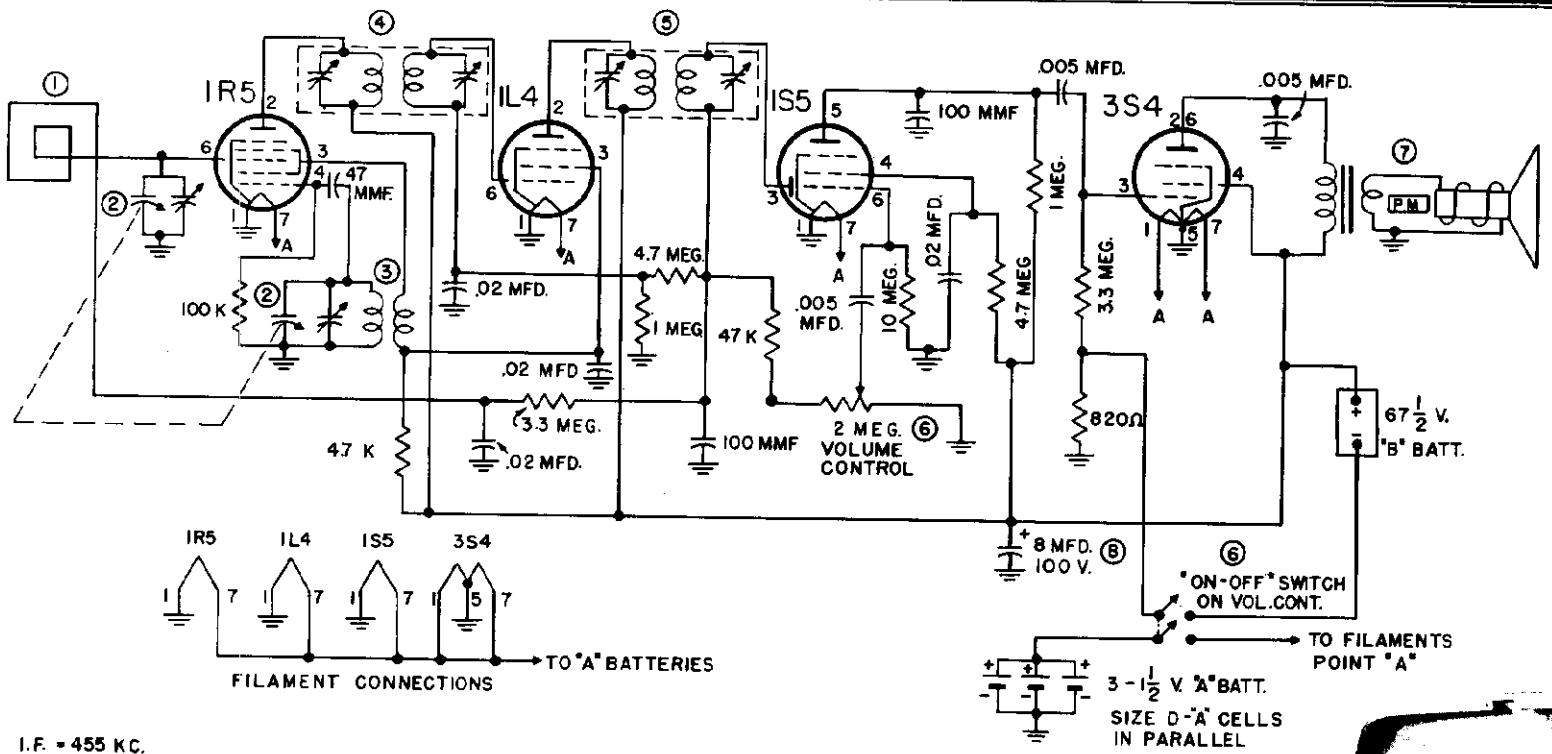
FM Sensitivity.....(For .5 watt output)—10 microvolts average.

Power Output.....8 watts, 10% distortion. 10 watts maximum.

MODEL 43-7660 GAMBLE-SKOGMO, INC.

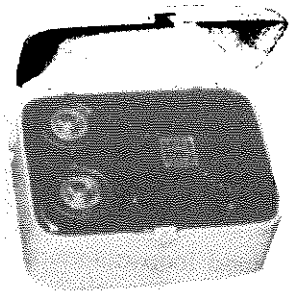
REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description	Qty. Used
		TUNER PARTS	
		Condensers	
C58	A-8E-13575	Trimmer condenser	1
C56, 57, 59, 60, 61	A-2M-12618	Trimmer cond. plate	5
C1, C11	C-8G-11732	470 mmf, ±20%	2
C2	C-8G-13695	1000 mmf, ±20%	1
C6, 7, 9, 14 51, 53	C-8G-13201	1000 mmf, +20%—10%	6
C4	C-8G-13018	62 mmf, ±10%	1
C12	C-8G-11731	1500 mmf, ±20%	1
C10	C-8G-13017	15 mmf, +10%	1
C3	C-8G-11484	50 mmf, ±10%	1
C8	C-8G-11789	10 mmf, ±10%	1
C13	A-8G-12495-6	4.7 mmf, ±20%	1
C15	A-8G-12495-4	2.2 mmf, ±20%	1
C5	C-8D-11304	.02 mfd, 200 volts, ±20%	1
		Resistors	
R4	C-9B2-79	27K ohms, 1 watt, 10%	1
R1	C-9B1-21	22K ohms, ½ watt, 20%	1
R3	C-9B1-52	150 ohms, ½ watt, 10%	1
R5	C-9B1-17	4700 ohms, ½ watt, 20%	1
R6	C-9B1-11	470 ohms, ½ watt, 20%	1
R8	C-9B1-19	10K ohms, ½ watt, 20%	1
R2, R10	C-9B1-31	1 megohm, ½ watt, 20%	2
R9	C-9B1-62	1000 ohms, ½ watt, 10%	1
R21	C-9B1-34	3.3 megohms, ½ watt, 20%	1
R45	C-9B1-50	100 ohms, ½ watt, 10%	1
R46	C-9B1-42	22 ohms, ½ watt, 10%	1
		Coils	
T8	B-13D-13027	FM oscillator coil assembly	1
T6	B-13E-13028	FM antenna coil assembly	1
T10	B-13C-13029	FM R.F. coil assembly	1
T9	B-13D-13030	AM oscillator coil assembly	1
T7	B-13E-13031	AM antenna coil assembly	1
T11	B-13C-13032	AM R.F. coil assembly	1
L1	A-16A-13033	Choke coil assembly	1
T12	B-13D-12974	AM osc. shunt coil assembly	1
		Miscellaneous	
	B-208-13553 or B-201-12967	Band change slide switch	1
	A-15B-12997	7 prong, miniature tube socket	1
	A-15B-13430	9 prong, miniature tube socket	1
	N-200-13802	Pointer guide and bracket assembly	1
	A-3A-12308-1	Lead screw	1
	A-3J-12309	Pinion gear for lead screw	1
	A-49A-13447	Tension spring for lead screw	1
	A-25A-13019	Core grommets, for AM Band	3
	A-3M-13020	Insert for core grommet	3
	A-49A-12394	Spiral spring for FM cores	3
	C-2D-12990	Tape guide	1
	B-2J-13006	Rack, with teeth, with A-2D-11194 bracket	1
	A-5M-13741	Pointer	1
	32F6SE-5274	6-32 x ¼" screw to mount pointer	1
		MAIN CHASSIS PARTS	
		Condensers	
63A, 63B	B-8C-11629	Electrolytic condenser, dual, 30-30 x 450 volts	1
C21	C-8G-11734	100 mmf, 20%, ceramic	1
C37	C-8F3-229	150 mmf, mica	1
C38	C-8G-13059	1500 mmf, ceramic	1
C34	C-8G-13060	51 mmf, ceramic	1
C20, 23, 24, 30, 31, 43, 44	C-8D-10785	.006 mf x 600 volts, paper	7
C22, C29	C-8D-10761	.01 mf x 400 volts, paper	2
C45, 46	C-8D-10813	.05 mf x 400 volts, paper	2
C55	A-8C-12154	Electrolytic condenser 10 mf x 450 volts	1
C49	C-8D-10789	.002 mf x 600 volts, paper	1
C39, 40	C-8G-13201	1000 mmf, ceramic	2
C41	A-8C-13132	Electrolytic condenser 10 mf x 50 volts	1
C62	C-8J-11321	.02 mf x 600 volts	1
C48	C-8D-10770	.05 mf x 200 volts	1
C50	C-8G-11741	330 mmf, ceramic	1
C42	C-8D-11304	.02 mf x 200 volts	1
C52	C-8D-13439	.25 mf x 400 volts	1
C47, 54	C-8D-10760	.1 mf x 400 volts	2
C35, 36	A-8F-13047	50 mmf, dual mica	1
C32	C-8G-11789	10 mmf, ceramic, 10%	1
C33	C-8G-11891	51 mmf, ceramic, 5%	1
C27, 28	C-8G-13025	150 mmf, ceramic	2
C17, 25, 26	C-8G-12159	30 mmf, ceramic	3
C18, 19	C-8G-12160	91 mmf, ceramic	2
C16	C-8G-13026	51 mmf, ceramic	1
		Resistors	
R27	A-10A-13001	Volume control (500K) and switch	1
R31	A-11A-12988	Tone control (500K) and radio-phono switch	1
R32	C-9B1-86	100K ohms, ½ watt, 10%	1
R29, 44	C-9B1-94	470K ohms, ½ watt 10%	2
R39, 41	C-9B1-83	56K ohms, ½ watt, 10%	2
R33, 34	C-9B1-68	3300 ohms, ½ watt, 10%	2
R30	C-9B1-35	4.7 megohms, ½ watt, 20%	1
R23, 28	C-9B1-80	33K ohms, ½ watt, 10%	2
R20	C-9B1-79	27K ohms, ½ watt, 10%	1
R22	C-9B1-78	22K ohms, ½ watt, 20%	1
R13, 16	C-9B1-48	68 ohms, ½ watt, 10%	2
R14, 17	C-9B2-81	39K ohms, 1 watt, 10%	2
R24, 26, 37	C-9B1-29	470K ohms, ½ watt, 20%	3
R25	C-9B1-302	15 megohms, ½ watt, 10%	1
R19	C-9B1-23	47K ohms, ½ watt, 20%	1
R7	C-9B4-76	15K ohms, 2 watts, 10%	1
R12, 35, 43	C-9B1-31	1 megohm, ½ watt, 20%	3
R40	C-9B1-66	2200 ohms, ½ watt, 10%	1
R36, 42	C-9B1-200	51K ohms, ½ watt, 5%	2
R38	C-9B4-55	270 ohms, 2 watts, 10%	1
R47	C-9B1-71	5600 ohms, ½ watt, 10%	1
R18	C-9B1-13	1000 ohms, ½ watt, 20%	1
R15, 11	C-9B2-15	2200 ohms, 1 watt, 20%	2
		Coils	
T3	C-13A-13009-1	Input I.F. transformer, combination 455 kc. and 10.7 mc	1
T4	C-13B-13014-1	Output transformer, combination 455 kc. and 10.7 mc.	1
T5	C-203-11745-1	Ratio det. coil assembly 10.7 mc.	1
L3	A-16A-13243	Loop loading coil	1
L4	B-14MA-11066	Loop antenna—B.C. Band	1
		Transformers	
T2	B-12C-13042	Output transformer for speaker	1
	B-12A-13038	Power transformer, primary, 50-60 cycles, 105-125 volts, AC	1
		Speaker	
	B-18B-13043	Electrodynamic speaker, 12" less output transformer	1
		Miscellaneous	
	C-30B-13943	Dial glass	1
	B-30A-13734	Dial scale	1
	B-5B-13738-41	Knob, small, with dot, mahogany	2
	B-5B-13737-41	Knob, large, without dot, mohag.	2
	B-2G-13596	Escutcheon	1
	B-14M-11479	A.C. line cord	1
	A-3A-13003	Switch shaft	1
	A-2D-12983	Detent bracket (U shaped on front of set)	
	A-43D-12934	"U" speed clip	1
	A-55C-12935	Ball bearing	1
	A-2D-13004	Switch activator bracket	1
	A-47A-13801	Pilot lite assembly	1
	A-46A-11739	Pilot lite, 6-8 volts, T-44	2
	A-15C-10717	7 prong, miniature tube socket	4
	A-15B-10440	8 prong, octal socket	4
	A-19B-12644	Antenna socket	1
	A-7B-13050	FM dipole, 2-screw strip	1
	A-15B-11538	Speaker socket	1
	A-19B-12468	Phono motor socket	1
	A-19B-12170	Phono input socket	1
		RECORD CHANGER	
	B-201-13109	Record changer (Webster 50) with QT cartridge	1
QT		Crystal cartridge with needle	1
		Needle only	1



I.F. = 455 KC.
ALL RESISTORS 1/8 WATT AND ALL PAPER CAPACITORS 150 VOLTS UNLESS OTHER WISE MARKED.
K = KILOHMS

① 1.468 LOOP ANTENNA
② 2.215 2 GANG VARIABLE CONDENSER
③ 1.470 OSCILLATOR COIL
④ 1.412-3 1 ST. I.F. TRANSFORMER
⑤ 1.413-3 2 ND I.F TRANSFORMER
⑥ 8.201-6 VOLUME CONTROL & SWITCH
⑦ 30.317 SPEAKER WITH TRANSFORMER
⑧ 5.417 OR 5.426 8 MFD, 100 V. ELEC. CAPACITOR



TUNING RANGE: Broadcast 540 to 1650 Kilocycles (180 to 555 meters).
DIAL SCALE: The dial scale is calibrated in kilocycles. Example: Read "60" as 600 Kc.

TUBES: The tubes used and their functions are as follows:

1R5 Converter	1S5 Detector, AVC and Audio Amp.
1L4 I.F. Amplifier	3S4 Power Amplifier

For the placement of these tubes, see the diagram showing tube layout.

BATTERY VOLTAGE: This personal receiver is designed for operation from three self contained 1½ volt "A" batteries and a 67½ volt "B" battery.

BATTERY REQUIREMENTS: The following batteries are required:

QUANTITY	TYPE	MANUFACTURER
3	1½ volt "A"	Eveready size "D", Burgess No. 2, Ray-O-Vac size "D" or equivalent.
1	67½ volt "B"	Eveready #467, Burgess Type XXD, Ray-O-Vac Type 4367 or equivalent.

ALIGNMENT: (Receiver removed from cabinet.) Should it become necessary at any time to check the alignment of this receiver, proceed as follows:

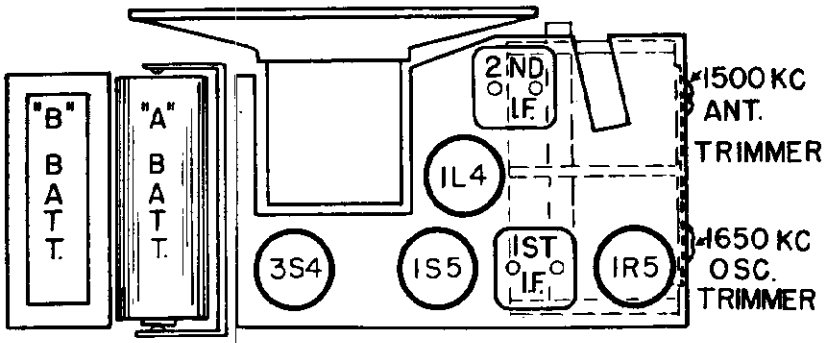
(1) Set the signal generator to 455KC and connect to the Stator Lug or green wire (front section) of Variable Capacitor. Connect the signal generator ground lead to the chassis. Connect a suitable output meter across the speaker voice coil connections. Turn the Volume Control to the maximum position. Turn the Variable Capacitor to the extreme clockwise position (minimum capacity). Remove P.K. screws holding loop in place and move loop away from I.F. transformers.

(2) Adjust the trimmers located at the top of the first and second I.F. Transformers for maximum output, as indicated on the output meter. Replace the loop in its original position.

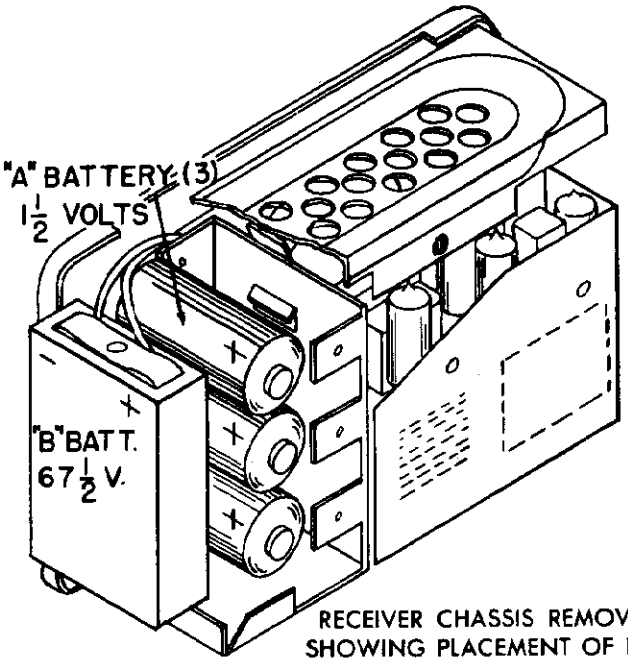
(3) Loosely couple the signal generator lead to the loop and set to 1650 KC.

(4) With the Variable Capacitor set at minimum capacity, tune in the 1650 KC signal by means of the oscillator trimmer on the Variable Capacitor (Rear Section).

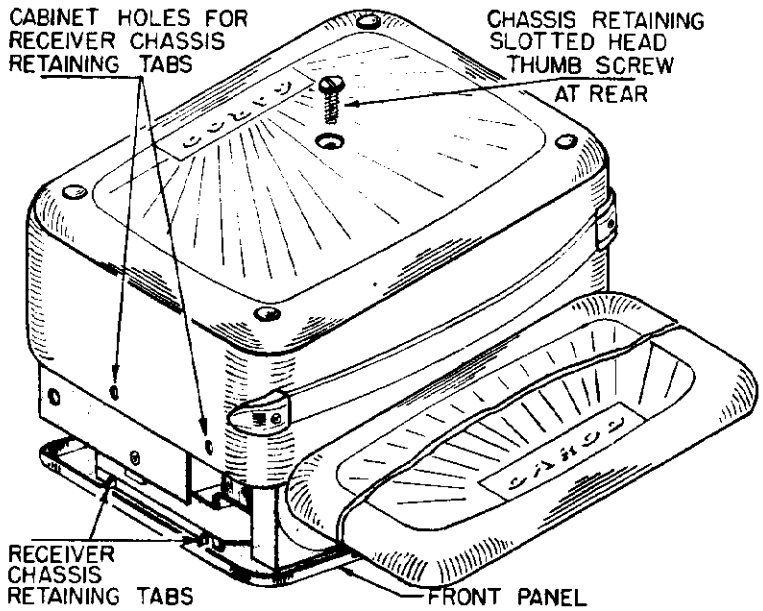
(5) Set the signal generator to 1500 KC and turn the tuning control until this frequency is heard. Adjust the antenna trimmer on the Variable Capacitor (front section) for maximum output. No other adjustments are necessary.



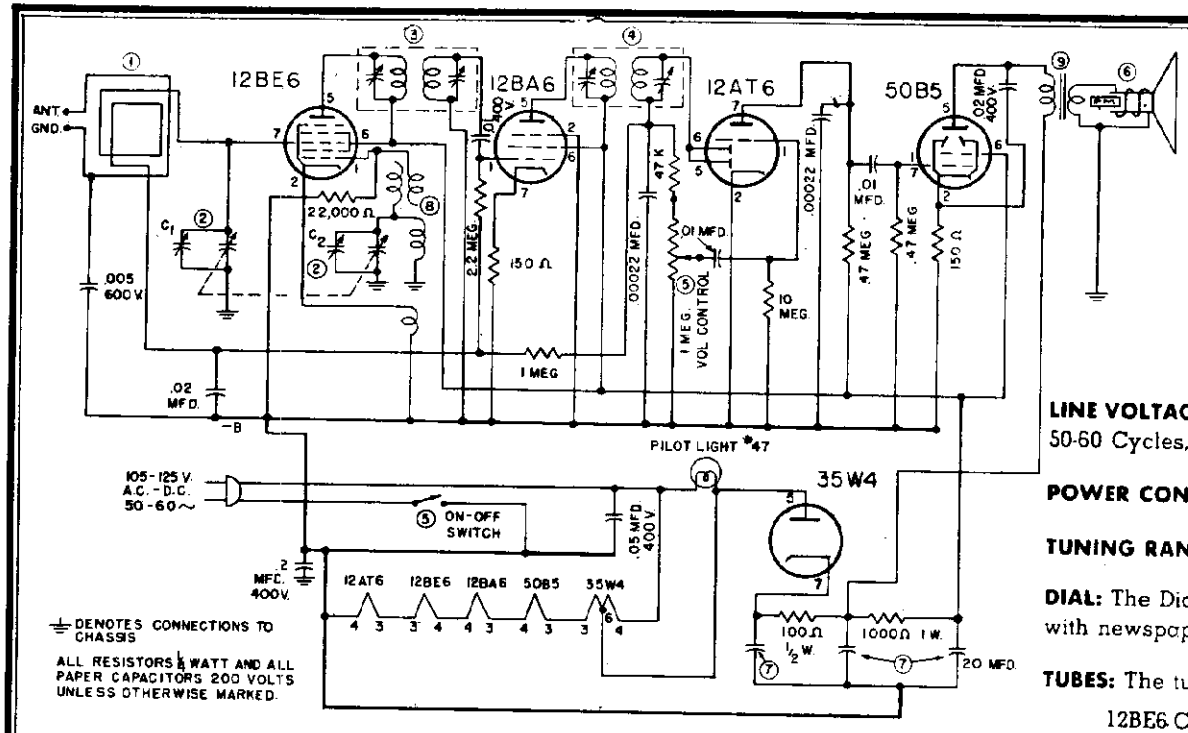
TUBE AND TRIMMER LOCATION DIAGRAM



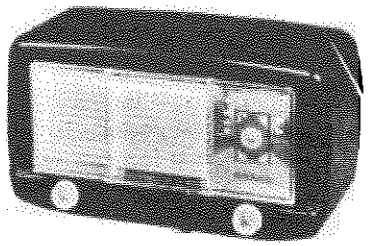
RECEIVER CHASSIS REMOVED FROM CABINET SHOWING PLACEMENT OF BATTERIES



RECEIVER CHASSIS PARTIALLY RELEASED FROM CABINET FOR BATTERY INSTALLATION



① 1.464 LOOP ANTENNA
② 2.213 2 GANG VARIABLE COND.
③ 1.259 1ST I.F. TRANSFORMER
④ 1.409 2ND I.F. TRANSFORMER
⑨ 9.200 OUTPUT TRANSFORMER
⑤ 8.200-1 VOLUME CONTROL & SWITCH
⑥ 30.300 P.M. SPEAKER
⑦ 5.415-1 ELECTROLYTIC CAP. 40-40-20 MFD.
⑧ 1.402-1 OSCILLATOR COIL



LINE VOLTAGE: This receiver is designed for operation on 105-125 Volts, 50-60 Cycles, either Alternating or Direct Current (AC-DC).

POWER CONSUMPTION: 30 Watts.

TUNING RANGE: Broadcast: 540 to 1650 Kilocycles (180 to 555 meters).

DIAL: The Dial Scale is calibrated in Kilocycles times 10 to correspond with newspaper or periodical listings.

TUBES: The tubes used, and their functions, are as follows:

12BE6 Converter	12AT6 Detector, Avc and Audio Amp.
12BA6 I.F. Amplifier	50B5 Beam Power Amplifier
	35W4 Rectifier

ALIGNMENT: Should it become necessary at any time to check the alignment of this receiver, proceed as follows:

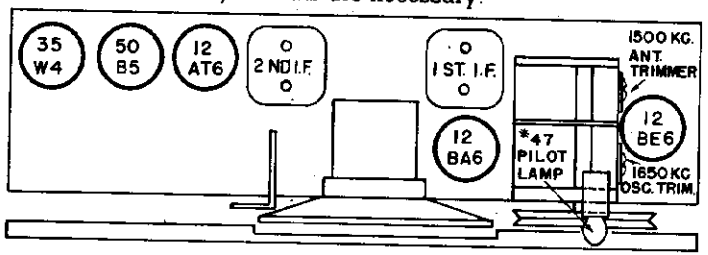
(1) Set the Signal Generator to 455 KC and connect to the stator lug on the rear section of the Variable Capacitor. Connect the Signal Generator Ground lead to the chassis. Connect a suitable output meter across the Speaker Voice Coil Connections. Turn the Volume Control to the maximum position. Turn the Variable Capacitor to the extreme clockwise position.

(2) Adjust the trimmers located at the top of the first and second I. F. Transformers for maximum output as indicated on the Output Meter.

(3) Loosely couple the Signal Generator lead to the Loop and set to 1650 KC.

(4) With Variable Capacitor set at the extreme clockwise position, tune in the 1650 KC signal by means of the Oscillator Trimmer on the Variable Capacitor (front section).

(5) Set the Signal Generator to 1500 KC and turn the Tuning Control so that this frequency is indicated on the dial. Adjust the Antenna Trimmer on the Variable Capacitor (rear section) for maximum output. No other adjustments are necessary.



TRIMMER AND TUBE LOCATION DIAGRAM

MODELS 9FMP,
9FMPA, 9FMPU

GAROD RADIO CORP.

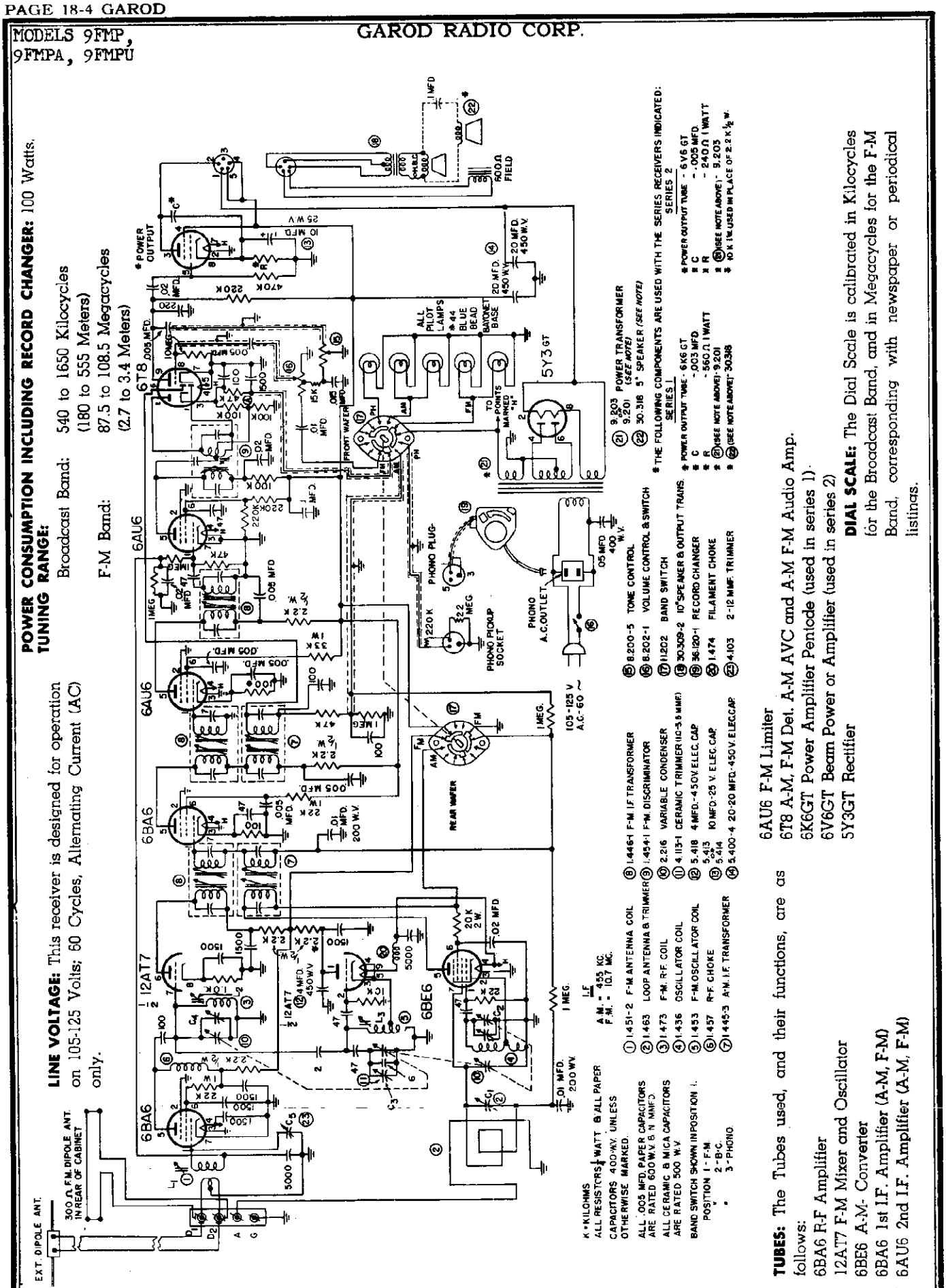
POWER CONSUMPTION INCLUDING RECORD CHANGER: 100 Watts.

TUNING RANGE:

Broadcast Band: 540 to 1650 Kilocycles (180 to 555 Meters)

F-M Band: 87.5 to 108.5 Megacycles (2.7 to 3.4 Meters)

LINE VOLTAGE: This receiver is designed for operation on 105-125 Volts; 60 Cycles, Alternating Current (AC) only.



TUBES: The Tubes used, and their functions, are as follows:

6BA6 R-F Amplifier
12AT7 F-M Mixer and Oscillator
6BE6 A-M- Converter
6BA6 1st I.F. Amplifier (A-M, F-M)
6AU6 2nd I.F. Amplifier (A-M, F-M)
6AU6 F-M Limiter
6T8 A-M, F-M Det. A-M AVC and A-M F-M Audio Amp.
6K6GT Power Amplifier Pentode (used in series 1).
6V6GT Beam Power or Amplifier (used in series 2)
5Y3GT Rectifier

DIAL SCALE: The Dial Scale is calibrated in Kilocycles for the Broadcast Band, and in Megacycles for the F-M Band, corresponding with newspaper or periodical listings.

GAROD RADIO CORP.

MODELS 9FMF
9FMPA, 9FMF

ALIGNMENT CHART

(Follow Sequence as Indicated)

CIRCUIT ALIGNED	STEP	RCVR. DIAL POINTER	SIGNAL GENERATOR FREQUENCY	SIGNAL GENERATOR CONNECTIONS	METER	METER CONNECTIONS	TRIMMER OR CORE ADJ.	PROCEDURE
B.C. I.F.	1	1650 KC. B.C. Band	455 KC. 30% Mod.	Through .1 MFD CAP. TO GRID of 6BE6.	A.C. Output Meter	Across voice coil	Cores on top and bottom of 1st and 2nd I.F. trans.	Adjust for maximum output
F-M I.F.	2	108.5 MC. F-M Band	10.7 MC. unmod.	Through .01 MFD. Cap. to grid of 12AT7.	D.C. VTVM	From Pin 1 limiter grid and ground	Top and bottom cores of 1st, 2nd and 3rd I.F. Trans. F-M	Same as step 1
F-M I.F.	3							Repeat step 2
F-M Disc.	4	108.5 MC. F-M Band	10.7 MC. unmod.	Same as step 2	D.C. VTVM	From junction of 100K disc. load resistor point "A" and ground	Bottom core of 10.7 MC Disc. Trans.	Same as step 1
F-M Disc.	5	108.5 MC. F-M Band	10.7 MC. unmod.	Same as step 2	D.C. VTVM	From Pin 3 6T8 and ground	Top core of 10.7 Mc Disc. Trans.	Adjust for zero between positive and negative meter reading
F-M Osc. (high) Freq. end)	6	108.5 MC. F-M Band	108.5 MC. unmod.	Through balanced 300 ohm dummy ant. to D1, D2 and ground terminals	D.C. VTVM	From Pin 1 limiter grid and ground	C3	Same as step 1
F-M Osc. (low freq. end)	7	87.5 MC. Band 1	87.5 MC. unmod.	Same as #6	D.C. VTVM	Same as #6	Oscillator coil core L3	Same as step 1
F-M Osc.	8	REPEAT STEPS 6 AND 7 AS NECESSARY						
F-M R.F. Circuit	9	105 MC. Band 1	105 MC. unmod.	Same as #6	D.C. VTVM	Same as #6	C4	Same as step 1
	10	90 MC. Band 1	90 MC. unmod.	Same as #6	D.C. VTVM	Same as #6	R.F. coil core L2	Same as step 1
F-M ANT. Circuit	11	105 MC.	105 MC.	Same as #6	D.C. VTVM	Same as #6	C5	Same as step 1
	12	90 MC. Band 1	90 MC. unmod.	Same as #6	VTVM D.C.	Same as #6	Antenna coil core L1	Same as step 1
B.C. Osc.	13	1650 KC. Band 2	1650 KC. 30% mod.	Through loop, or coupled to receiver loop by a 2 or 3 turn loop.	Output meter	Across voice coil	C2	Same as step 1
B.C.R.F.	14	1500 KC. Band 2	1500 KC. 30% mod.	Same as #13	Output meter	Across voice coil	C1	Same as step 1

During the alignment procedure all adjustments should be made under the following conditions:

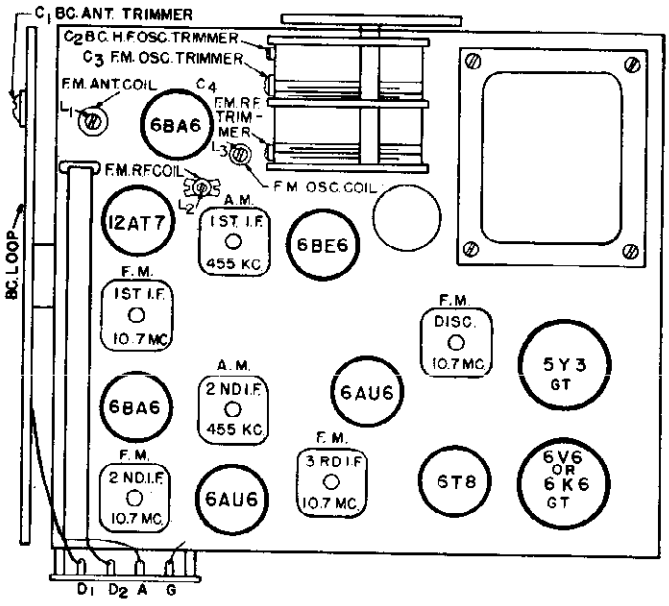
(A) Line voltage set at 117 volts A.C.

(B) Volume control at maximum position.

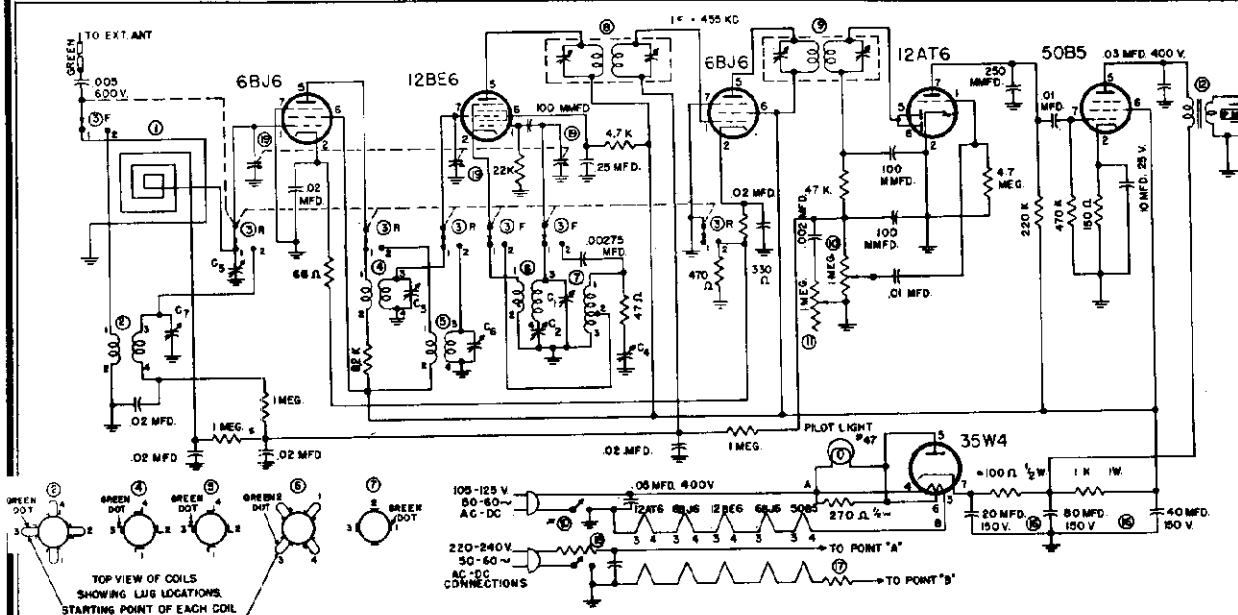
(C) Tone control set at extreme left position (Treble).

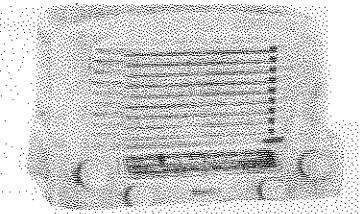
(D) Minimum input from the signal generator. This procedure should be adhered to, otherwise adjustments will be broad, due to the action of the automatic volume control.

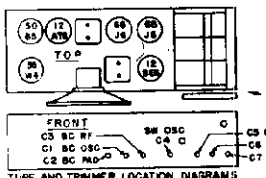
Refer to the trimmer and tube location diagram below for trimmer and core location. Follow the sequence in the alignment chart for proper alignment procedure.



TUBE AND TRIMMER LOCATION DIAGRAM







TUBE AND TRIMMER LOCATION DIAGRAMS

① 1.435 LOOP ASSEMBLY
② 1.433 SW ANT. COIL
③ 11209-1 BAND SWITCH
④ 1.432 BC INTERSTAGE COIL
⑤ 1.434 SW INTERSTAGE COIL
⑥ 1.436 BC OSCILLATOR COIL
⑦ 1.431 SW OSCILLATOR COIL
⑧ 1.259 IF TRANSFORMER
⑨ 1.409 IF TRANSFORMER
⑩ 6.200-4 VOLUME CONTROL & SWITCH
⑪ 6.205-1 TONE CONTROL
⑫ 9.200 OUTPUT TRANSFORMER

⏚ DENOTES CONNECTIONS TO CHASSIS
ALL RESISTORS ½ WATT AND ALL PAPER CAPACITORS 200 V. UNLESS OTHERWISE SPECIFIED.

⑬ 30.311 6" P.M. SPEAKER
⑭ 4.106 TRIMMER STRIP - C_1 C_2 C_3 C_4
⑮ 4.107 TRIMMER STRIP - C_5 C_6 C_7
⑯ 5.400-7 ELECTROLYTIC CAP. 80-40-20 MFD-150 V.
⑰ 6.206 150 Ω WIRE WOUND RESISTOR-5W } USED FOR 220-240 V. OPERATION ONLY
⑱ 20.211 380 Ω LINE CORD RESISTOR-40 W }
⑲ 2.202 VARIABLE CAP. 3GANG

BANDSWITCH: POSITION 1 - BROADCAST
POSITION 2 - SHORT WAVE
F - FRONT WAFER
R - REAR WAFER

LINE VOLTAGE: This receiver is designed for operation on 105-125 volts, 50-60 cycles, either Alternating or Direct Current (AC-DC) or 220-240 Volts when changed as indicated on the schematic diagram (rear page).

POWER CONSUMPTION: 30 Watts.

TUNING RANGE: Broadcast: 540 to 1650 Kilocycles (180 to 555 Meters). Short Wave: 5.7 to 18.5 Megacycles (16 to 53 Meters).

DIAL: The dial scale is calibrated in Kilocycles times 10 for the Broadcast Band, and in Megacycles for the Short Wave Band.

TUBES: The tubes used, and their functions, are as follows:

6BJ6 R. F. Amplifier	12AT6 Detector, Avc and Audio Amp.
12BE6 Converter	50B5 Beam Power Amplifier
6BJ6 I. F. Amplifier	35W4 Rectifier

For the placement of these tubes, see the diagram showing tube layout on the back page of this folder.

CONTROLS: Four control knobs are provided on the front of the cabinet. From left to right they are as follows:

(A) On-Off Switch and Volume Control: This control combines the line On-Off Switch and Volume Control.

(B) Tone Control: When turned to the right (clockwise) a deep bass effect is produced, while rotation to the left (counter-clockwise) produces a more brilliant treble tone. Various shadings between the extremes may be obtained at intermediate settings of the control.

(C) Band Selector Switch: This two-position control selects the frequency band to be used. The extreme left hand position selects the "Short Wave" band and the extreme right hand position selects the "Broadcast" band.

(D) Tuning Control: This control is coupled to the tuning capacitor through a reduction drive and serves to select the desired broadcast or short-wave station along the slide-rule dial, the frequency of which is indicated by the dial pointer.

ALIGNMENT:

Re-alignment of this receiver should not be attempted unless all other possible causes have been thoroughly investigated. An accurately calibrated signal generator, which will cover the necessary bands, and an output meter for indicating the effect of adjustments are required.

During the alignment procedure described below, all adjustments should be made under the following conditions (refer to trimmer and tube location diagram, rear page, for trimmer locations):

(a) Line voltage as indicated on page one of this folder.
(b) Volume control at maximum.
(c) Tone control at extreme left hand position (treble).
(d) Minimum input from signal generator. This procedure should be adhered to, otherwise adjustments will be broad, due to the action of the automatic volume control.

BROADCAST (Band Switch in extreme right position)

I. F. Adjustment:

(1) Set the signal generator to 455 KC and connect to the stator lug on the front section of the Variable Capacitor through a .1 MFD. capacitor. Connect the signal generator ground lead to the chassis. Connect a suitable output meter across the speaker voice coil connections. Turn the Variable Capacitor to the extreme clockwise position (minimum capacity).

(2) Adjust the trimmers located at the top of the first and second I. F. Transformers for maximum output as indicated on the output meter.

BC. R. F. Adjustment: It is desirable to align this band on the loop.

(1) Couple the signal generator to the receiver loop by means of a two or three turn loop 8" in diameter.

(2) With the Variable Capacitor set at the extreme clockwise position (minimum capacity), tune in the 1650 KC signal by means of the broadcast oscillator trimmer (C1).

(3) Set the signal generator to 1500 KC and turn the Tuning Control so that this frequency is indicated on the dial. Adjust the antenna trimmer (C5) and R. F. trimmer (C3) for maximum output.

(4) Set the signal generator to 600 KC and turn the Tuning Control so that this frequency is indicated on the dial. Adjust the broadcast oscillator padder capacitor (C2) for maximum response while "rocking" the variable capacitor. Repeat the last three steps until no further improvement can be made.

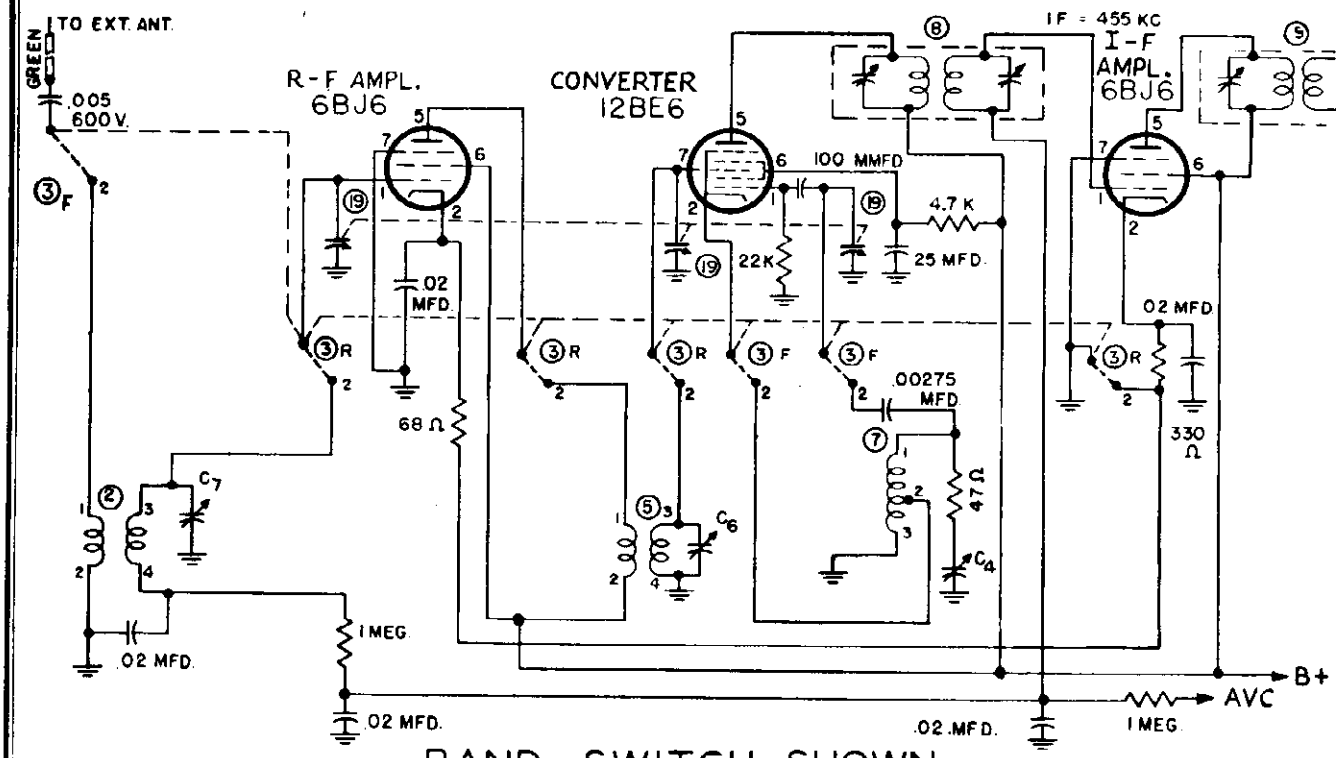
SHORT WAVE (Band Switch set to extreme left hand position)

(1) Connect the signal generator through a standard short wave dummy antenna or a 400 ohm resistor to the antenna (green wire) and the ground lead of the signal generator to the chassis of the receiver. Set the signal generator to 18.5 MC.

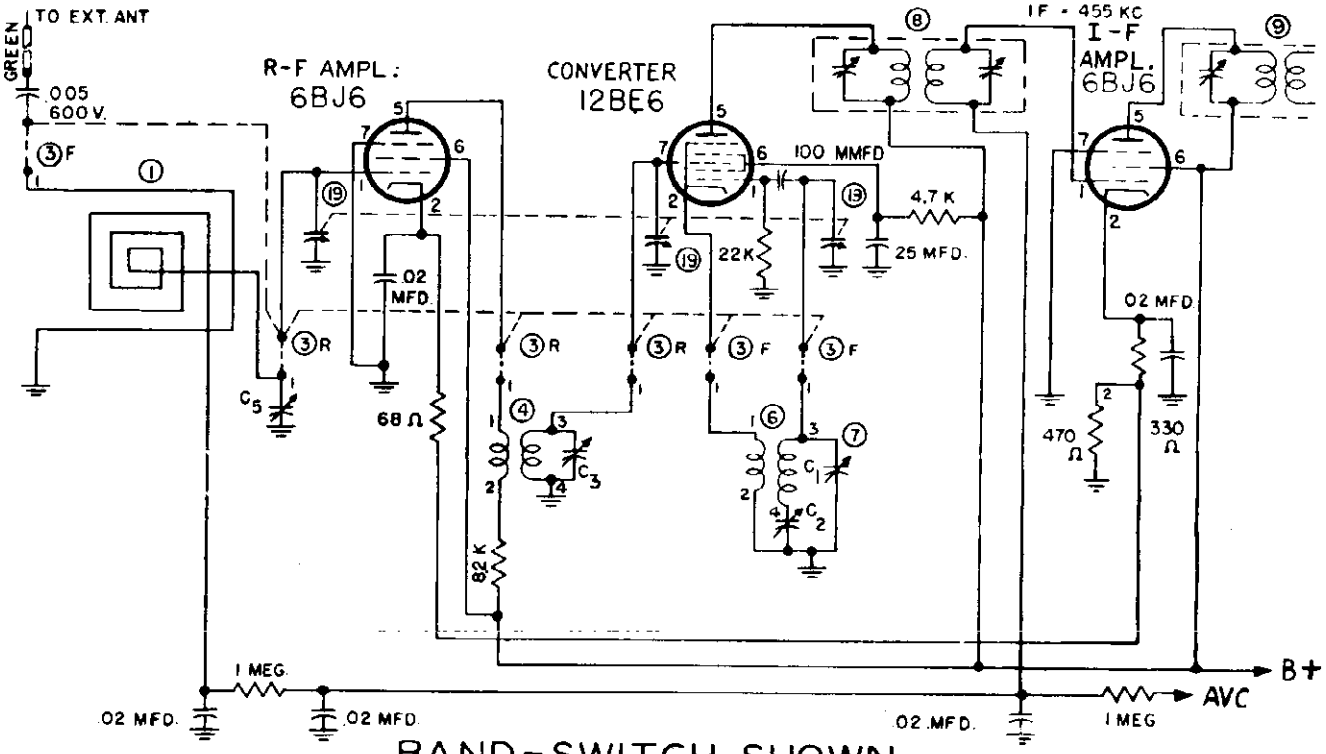
(2) With the Variable Capacitor set at the extreme clockwise position (minimum capacity), tune in the 18.5 MC signal by means of the S. W. oscillator trimmer (C4).

(3) Set the signal generator to 16 MC and turn the Tuning Control so that this frequency is indicated on the dial. Adjust the antenna trimmer (C7) and R. F. trimmer (C6) for maximum output while rocking the variable capacitor from left to right. No other adjustments are necessary.

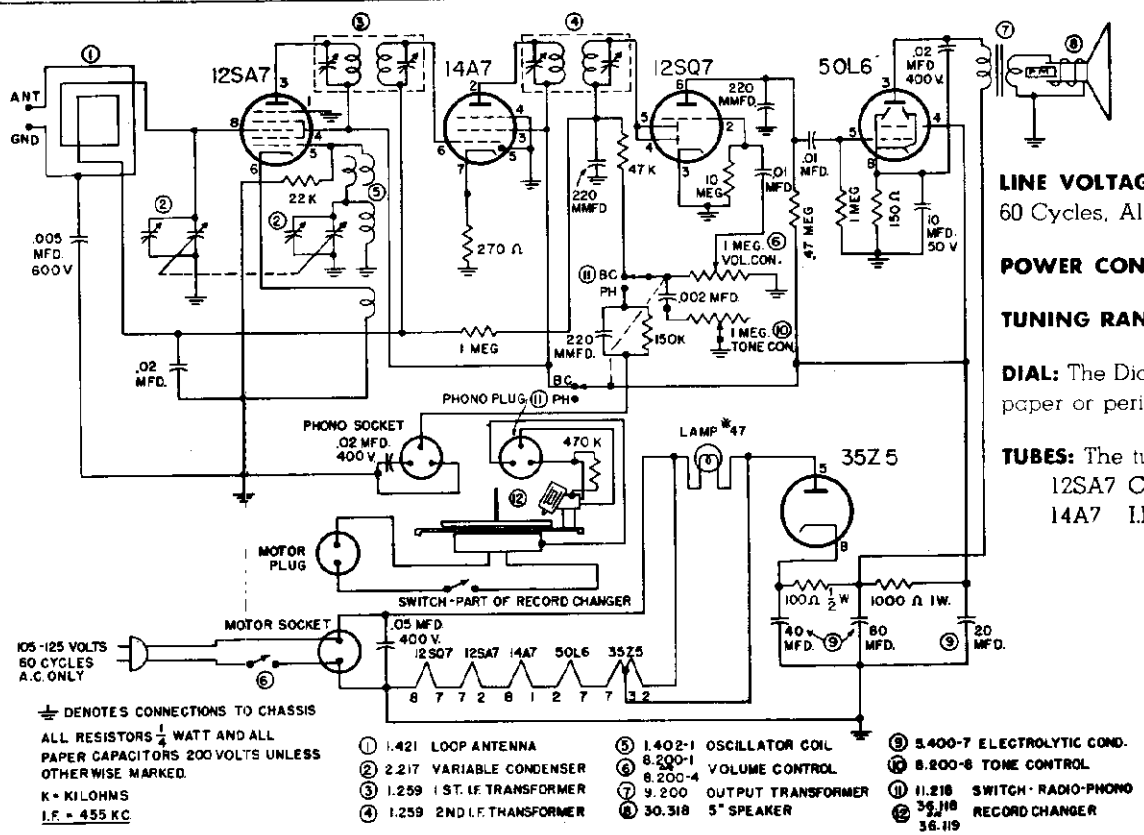
GAROD RADIO CORP. MODEL 62



BAND-SWITCH SHOWN
AT 1ST POSITION.
SHORT WAVE BAND.
5.7 - 18.5 MC



BAND-SWITCH SHOWN
AT 2ND POSITION CLOCKWISE.
BROADCAST BAND
540 - 1650 KC



LINE VOLTAGE: This unit is designed for operation on 105-125 Volts, 60 Cycles, Alternating Current (AC) only.

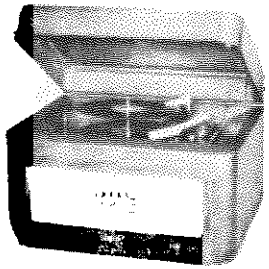
POWER CONSUMPTION: 45 Watts.

TUNING RANGE: Broadcast 540 to 1650 Kilocycles (180 to 555 meters).

DIAL: The Dial Scale is calibrated in Kilocycles, corresponding to newspaper or periodical listings. Example: Read 60 as 600 KC.

TUBES: The tubes used, and their functions are as follows:

12SA7 Converter — 12SQ7 Detector, AVC and Audio Amp
14A7 I.F. Amplifier — 50L6 Beam Power Amplifier
35Z5GT Rectifier



ALIGNMENT: Should it become necessary at any time to check the alignment of this receiver, proceed as follows:

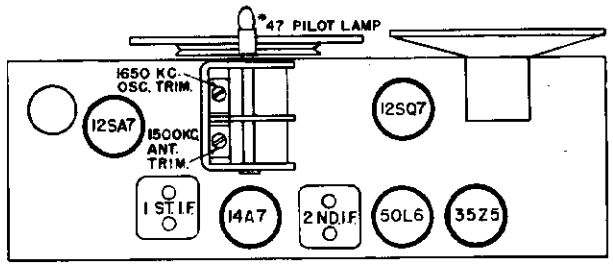
(1) Set the Signal Generator to 455 KC and connect to the stator lug on the rear section of the Variable Capacitor. Connect the Signal Generator Ground lead to the chassis. Connect a suitable output meter across the Speaker Voice Coil connections. Turn the Volume Control to the maximum position. Turn the Variable Capacitor to the extreme clockwise position.

(2) Adjust the trimmers located at the top of the first and second I.F. Transformers for maximum output as indicated on the Output Meter.

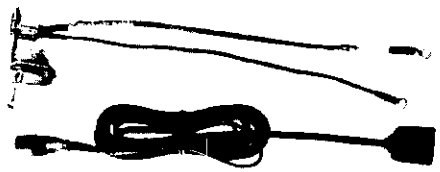
(3) Loosely couple the Signal Generator lead to the Loop and set to 1650 KC.

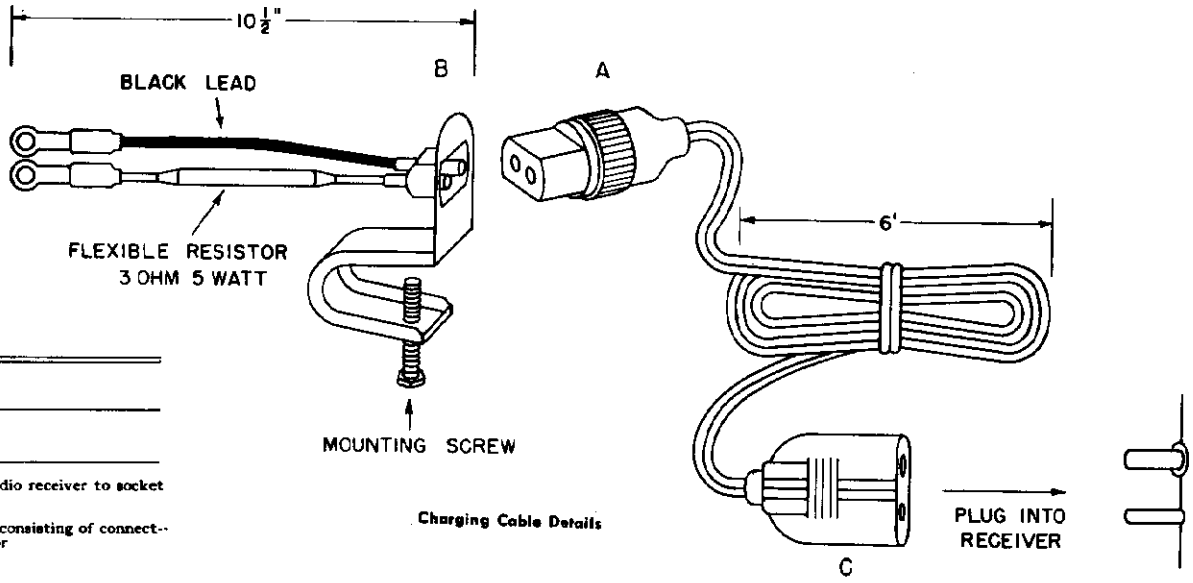
(4) Wtih the Variable Capacitor set at the extreme clockwise position, tune in the 1650 KC signal by means of the Oscillator Trimmer on the Variable Capacitor (front section).

(5) Set the Signal Generator to 1500 KC and turn the Tuning Control so that this frequency is indicated on the dial. Adjust the Antenna Trimmer on the Variable Capacitor (rear section) for maximum output. No other adjustments are necessary.



TRIMMER AND TUBE LOCATION DIAGRAM





Charging Cable Details

REPLACEMENT PARTS LIST

CAT. NO.	SYMBOL	DESCRIPTION
		SPECIALIZED REPLACEMENT PARTS
RJX-012		CORD—6-foot cord assembly, connecting radio receiver to socket on automobile dashboard
RJX-013		BRACKET ASSEMBLY—Socket assembly, consisting of connecting leads, socket, clamp, and flexible resistor
RRW-017		RESISTOR—3 ohm, 5 w., flexible resistor

GENERAL INFORMATION

The Model LM-1A charging cable may be used with General Electric receivers using a 2-volt rechargeable battery unit. It provides a convenient means of charging the radio battery directly from your automobile battery when the 115-volt house current is not available, such as when traveling or camping.

With a fully charged automobile battery, it is normally unnecessary to run the engine of your car while charging the radio battery. However, operating the automobile engine during part of the charging cycle will hasten the charging process.

The cable is supplied in two sections as shown in the illustration. The short section is permanently installed to the underside of the automobile dashboard and connects the longer cable to the 6-volt automobile battery at the ammeter or fuse block. The leads connected to the shorter cable must not be cut nor lengthened. The longer cable connects the receiver to the end of the short cable to which receptacle "B" is attached.

INSTALLATION

1. Determine the polarity of the car battery. If the positive battery terminal is connected to the frame of the car, the black lead of the short cable should be connected to the ammeter terminal.

CAUTION: *If the positive terminal of the automobile battery is grounded, avoid contact between the metal of the receiver case and the metal of the car.*

If the negative terminal is connected to the frame of the car, the colored lead or the lead with the flexible resistor should be connected to the ammeter terminal.

(***NOTE:*** Connection may be made to either terminal of the ammeter. If this connection is made to the battery side of the ammeter, the ammeter will not indicate discharge while the radio battery is being charged.)

2. The remaining terminal on the short cable must be securely fastened to the car dashboard or frame of the car.

3. Fasten the male plug B to the underside of the dashboard so that it is convenient to insert plug A of the remainder of the charging cable.

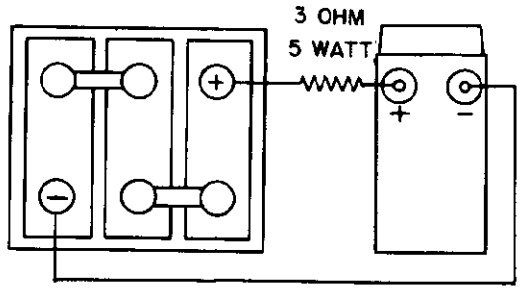
HOW TO CHARGE THE RADIO BATTERY

1. Open the rear door of the radio. Two prongs will be found mounted on the chassis near the tuning capacitor. Plug "C" of the charging cable should be pressed fully on these prongs with the larger prong fitting into the larger hole of the plug.

2. Insert plug "A" into the receptacle "B" which is installed on the dashboard.

3. With the receiver switched to the CHARGE position, a completely discharged battery will in most cases be fully charged within 20 hours. After the red ball in the radio battery has risen, checks should be made every two hours to determine the degree of charge. When both indicator balls are visible, the charging should be discontinued.

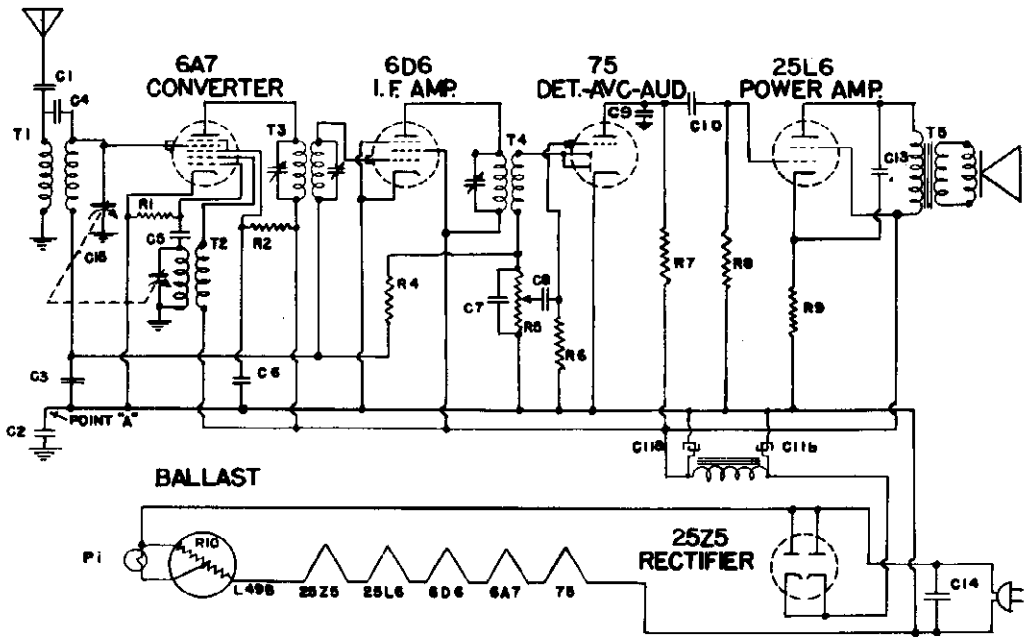
4. If the receiver is switched to the ON position, it can be operated while the battery is being charged. However, since the receiver will be consuming power at about the same rate as the radio battery is being charged, little or no improvement in the condition of the radio battery will result.



IMPORTANT: TERMINALS OF LIKE POLARITY MUST BE CONNECTED TOGETHER.

Basic Charging Circuit

MODELS GD-510, GD-511, GD-512, GD-512W, GD-512X, GD-513 GENERAL ELECTRIC CO.



GENERAL INFORMATION

Models GD-510 and GD-513 are five-tube AC-DC superheterodyne receivers employing five General Electric Pre-Tested Tubes plus a ballast tube. One side of the power line is connected directly to the chassis ground in either receiver; therefore, caution should be exercised in servicing.

Models GD-511, GD-512, GD-512W, and GD-512X, are five-tube AC-DC superheterodyne receivers, employing five General Electric Pre-Tested Tubes plus a ballast tube. These models are fully approved by Underwriters' Laboratories.

When operating from a DC source of power, it is necessary to insert the power plug with proper polarity; otherwise, the receiver will fail to function. If excessive hum is noticed when the receiver is used on AC, reverse the power plug in the receptacle.

ALIGNMENT PROCEDURE

Alignment Frequencies

I.F.—456 kc.....Broadcast—1500 kc

The location of all trimmers is shown in Fig. 1.

I.F. Alignment

Connect an output meter across the voice coil. Set the volume control for maximum.

Set test oscillator to 456 kc and apply signal to the control grid of the 6A7 tube through a .05 mfd. capacitor. Do not remove the grid lead from the 6A7. Keep the test oscillator output as low as possible to give a readable output. Adjust all three I.F. trimmers for maximum output.

R.F. Alignment

Set test oscillator to 1500 kc and connect one output lead to the receiver chassis† and the other through a 250 mmf. capacitor in series with 200 ohms to the receiver antenna lead. Adjust the oscillator trimmer (C-15) and antenna trimmer (C-16) for a maximum output.

† **Precaution**—In Models GD-510 and GD-513, one side of the power supply is connected to the chassis. Do not connect chassis to any external ground. If the signal generator is AC operated, connect a .05 mfd. capacitor in series with the ground side before connecting it to the receiver chassis.

NOTE:

C2 USED ON MODELS GD-511, 512, 512W, 512X ONLY. ON MODELS GD-510 AND GD-513 POINT "A" IS CONNECTED TO CHASSIS.

VOLTAGE CHART

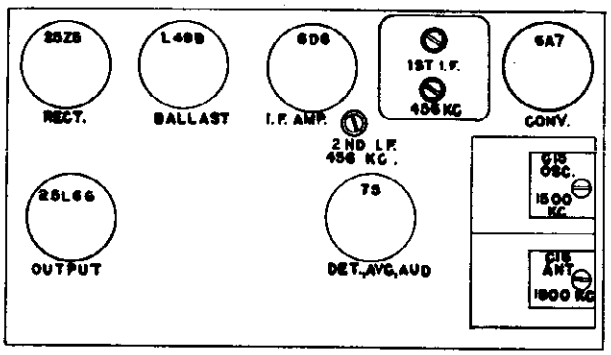
Tube No.	6A7	6D6	75	25L6	25Z5
Plate to −B Volts	90	90	55*	75	120 AC
Screen to −B Volts	40	90	..	90	..
Cathode to −B Volts	0	0	0	7	135
Filament Volts	6.3	6.3	6.3	25	25

Voltage measured when volume control is set to minimum.

Line Voltage—120 AC. No signal input.

* Measured on 500-volt scale.

On DC, voltages should read approximately 10 per cent lower.



Trimmer Location

GENERAL ELECTRIC CO. MODELS GD-510, GD-511 GD-512, GD-512W, GD-512X, GD-513

Tuning Control Drive Ratio 7-1/2:1

Electrical Specifications

105-125 V. AC-DC, 40-60 Cycles, 45 Watts

Tuning Frequency Range

Band "B" ..... 540–1700 kc

Electrical Power Output

Undistorted ..... 1.1 watts
Maximum ..... 2.0 watts

Loud-speaker—Electrodynamic

Outside Cone Diameter ..... 5 inches
Voice Coil Impedance (400 cycles) ..... 6 ohms
Field Resistance (cold) ..... 450 ohms

Tubes

Oscillator and Converter GE-6A7
I.F. Amplifier GE-6D6
Det., AVC, 1st Audio GE-75
Power Output GE-25L6
Rectifier GE-25Z5
Ballast BL-49-B
Pilot Lamp ..... Mazda No. 4

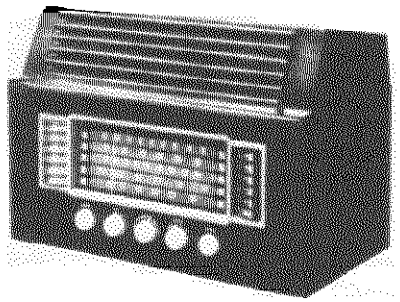
Symbol	Description	Symbol	Description	Symbol	Description
C-1	.005 mfd., paper capacitor	C-10	.01 mfd., paper capacitor	R-6	5 megohms, carbon resistor
C-2	.25 mfd., paper capacitor (Used on Models GD-511, 512, 512W, 512X)	C-11a	20 mfd., dry electrolytic	R-7	250,000 ohms, carbon resistor
		C-11b	20 mfd., dry electrolytic	R-8	500,000 ohms, carbon resistor
C-3	.02 mfd., paper capacitor	C-13	.005 mfd., paper capacitor	R-9	150 ohms, carbon resistor
C-4	.5 mmf., Gimmik	C-14	.05 mfd., paper capacitor	R-10	Ballast resistor
C-5	50 mmf. mica capacitor	C-15	Tuning condenser	T-1	Antenna transformer
C-6	.05 mfd., paper capacitor	P-1	Pilot light	T-2	Oscillator transformer
C-7	250 mmf., mica capacitor	R-1	50,000 ohms, carbon resistor	T-3	1st I.F. transformer
C-8	.01 mfd., paper capacitor	R-2	30,000 ohms, carbon resistor	T-4	2nd I.F. transformer
C-9	250 mmf., mica capacitor	R-4	2 megohms, carbon resistor	T-5	Output transformer
		R-5	500,000 ohms, volume control		

REPLACEMENT PARTS LIST
Models GD-510, GD-511, GD-512, GD-512X, GD-512W, and GD-513

Stock No.	Description	Stock No.	Description
RB-907R	BACK COVER—Cabinet back cover, for GD-512, GD-512X, GD-512W, GD-513	*RQ-1317	RESISTOR—250,000 ohm, ½-W. carbon (R-7) (Pkg. of 5)
RB-908R	BACK COVER—Cabinet back cover, for GD-510 and GD-511	*RQ-1324	RESISTOR—0.5 megohm, ½-W. carbon (R-8) (Pkg. of 5)
*RC-023	CAPACITOR—.005 mfd., 600 V. paper (C-1, -13)	*RQ-1339	RESISTOR—2.0 megohm, ½-W. carbon (R-4) (Pkg. of 5)
*RC-039	CAPACITOR—.01 mfd., 600 V. paper (C-8, -10)	*RQ-1347	RESISTOR—5.0 megohm, ½-W. carbon (R-6) (Pkg. of 5)
*RC-048	CAPACITOR—.02 mfd., 600 V. paper (C-3)	*RR-749	RESISTOR—Ballast resistor BL-49B (R-10)
*RC-092	CAPACITOR—.05 mfd., 600 V. paper (C-6, -14)	RS-199R	SHIELD—Tube shield, base and cap (complete)
*RC-216	CAPACITOR—50 mmf. mica (C-5)	RS-245R	SOCKET—Tube socket, 6 prong
*RC-259	CAPACITOR—250 mmf. mica (C-7, -9)	RS-246R	SOCKET—Tube socket, 7 prong
RC-740R	CONDENSER—Tuning condenser (C-15)	*RS-200	SOCKET—Tube socket, Octal (Pkg. of 5)
RC-5126R	CAPACITOR—20 mfd., 150 V. electrolytic (C-11a, -11b)	RS-248R	SOCKET—Pilot lamp socket
RC-8113R	CORD—Line cord	RS-1006R	SPEAKER—Speaker complete with transformer
RC-9006R	CONE—Speaker cone and voice coil assembly	RT-305R	TRANSFORMER—1st I.F. transformer (T-3)
RK-038R	KNOB—Control knob (walnut)	RT-306R	TRANSFORMER—2nd I.F. transformer (T-4)
RK-039R	KNOB—Control knob (ivory)	RT-458R	TRANSFORMER—Output transformer (T-5)
RL-079R	COIL—Antenna coil (T-1)	RV-062R	VOLUME CONTROL—Volume control and power switch (R-5)
RL-282R	COIL—Oscillator coil (T-2)	RW-033R	WINDOW—Celluloid dial scale window
RP-120R	POINTER—Dial pointer	RZ-142R	CABINET—Cabinet for GD-512X
*RQ-1239	RESISTOR—150 ohm, ½-W. carbon (R-9) (Pkg. of 5)	RZ-143R	CABINET—Cabinet for GD-512W
*RQ-1295	RESISTOR—30,000 ohm, ½-W. carbon (R-2) (Pkg. of 5)	RZ-144R	CABINET—Cabinet for GD-512 and GD-513
*RQ-1299	RESISTOR—50,000 ohm, ½-W. carbon (R-1)(Pkg. of 5)	RZ-149R	CABINET—Cabinet for GD-510 and GD-511

* Used on previous receivers.

MODEL X-415 GENERAL ELECTRIC CO.



SPECIFICATIONS

CABINET:

Model	X415
Material	Wood
Color	Mahogany
Height	14½ in.
Width	20 in.
Depth	12⅛ in.

ELECTRICAL RATING (INPUT):

50–60 Cycles Nominal Voltage	105 Watts Range in Volts
110	103–117
125	117–133
150	140–160
200	185–213
225	213–234
245	234–260

OPERATING FREQUENCIES:

Standard Band	540 to 1600 kc
Short Wave 1	9.4 to 9.9 mc
Short Wave 2	11.6 to 12.1 mc
Frequency Modulation 1	42 to 50 mc
Frequency Modulation 2	88 to 108 mc
AM I-F Frequency	455 kc
FM I-F Frequency	10.7 mc

POWER OUTPUT (117 volts line):

Undistorted	4.0 watts
Maximum	5.5 watts

LOUDSPEAKER:

Type	Alnico PM
Size	8 inches
Voice Coil Impedance (400 cps)	3.5 ohms

ANTENNA INPUTS:

Broadcast and Shortwave—conventional antenna
FM—300-ohm input for folded dipole

TUBE COMPLEMENT:

R-F Amplifier	6AK5
Converter	6AK5
Oscillator	6AK5
1st I-F Amplifier	6SG7
2nd I-F Amplifier	6SV7
FM Limiter—AM Detector	6SH7
Discriminator—1st A-F Amplifier	6AQ7-GT
Power Amplifier	6V6GT
Rectifier	5Y3GT
Dial Lamp (2)	G-E No. 44

GENERAL INFORMATION

THE TUNING SYSTEM

The "r-f end" of the receiver is unusual in a number of respects. Variable inductance tuning is employed instead of using a conventional tuning capacitor. This design makes possible two distinct advantages. First, it provides a high efficiency FM circuit in the 88 to 108 megacycle range which would not be possible with the more conventional methods of tuning. Second, it provides stable short-wave spread-bands which tune as easily as the broadcast band. Other advantages are also obtained but the two mentioned above are the most important.

Tuning is accomplished by an "elevator" which consists of a rigid plastic horizontal plate raised and lowered by means of a windlass controlled by the tuning knob at the panel. From this plate are suspended three powdered iron cores which tune the broadcast r-f, converter, and oscillator coils; and three tuning "vanes" which tune three low-inductance circuits. These latter circuits are employed in both FM bands and both short wave bands, with the exception of the antenna circuit for the shortwave spread bands when a broad tuned antenna coil is used and the r-f guillotine tuner is switched out. They are called "guillotine" tuners because of their appearance.

FACTS ABOUT "GUILLOTINE" TUNING

The "guillotine" tuners are designed primarily for the 88–108 megacycle FM band where special technique is needed to realize high gain and circuit stability. Ordinary coils, tuned by a variable capacitor are inefficient at these frequencies, first, because of the low inductances required to reach these frequencies when a variable tuning capacitor is employed and, second, because shunt capacity reduces the gain of the amplifier circuit; shunt capacity must be kept very low. Another disadvantage of standard tuning arrangements at these frequencies is that common coupling is obtained through the shaft of a ganged tuning capacitor unless insulated single sections are used (cumbersome and costly). Common coupling of this type tends to cause oscillation or general instability and precludes high gain per stage. The guillotines make possible short leads, completely isolated sections, stable tuning, high Q circuits, low shunt capacity, and location of each tuner in the best physical and electrical position in the assembly. Furthermore, since the shunt capacity is small and the inductance is consequently at its highest corresponding value, the additional unavoidable inductance introduced in the wiring, bandswitch, etc., produces a minimum of circuit losses and unbalance.

The guillotine tuner consists of a heavy, silver-plated, two-turn square coil, rigidly supported between two plastic posts. A flat, solid vane slides up and down between the two turns. It is guided in grooves in the plastic posts so that it passes between the two sections of the coil without touching them. The posts are so moulded and the coil so constructed that the whole assembly is held rigidly at a predetermined spacing. The tuning vane is raised and lowered by the tuning elevator. When the elevator is all the way up (set tuned to lowest frequency), the vane is completely above the coil which then acts as a simple two-turn coil. As the set is tuned toward the higher frequencies, the vane moves downward into the field of the coil until, finally, it is all the way in. The vane reduces the inductance of the coil through two principles. First, it acts as a shorted turn, and thus reduces inductance directly; second, it provides a barrier between the two turns of the coil which reduces the mutual coupling and thus also reduces inductance.

The tuners described above are identified as T2, T4, and T5, on the schematic diagram.

FM BANDS

Guillotine tuners T2, T5, and T4 are used as the tuned circuits for the r-f amplifier, converter, and local oscillator respectively, in both FM bands. In the higher frequency band, the tuner is used with only a small shunt trimmer for adjusting distributed capacity. In the lower band, a higher value shunt trimmer is used to reduce the frequency. The layout of band switch, tuners, and tube sockets is arranged to give the shortest possible leads when the FM bands are in use. The lead length in the other bands is not nearly so critical.

SHORT WAVE SPREAD-BANDS

Bandspread tuning in the short wave bands is obtained in the converter and oscillator circuits by inserting the guillotine tuners in series with a higher inductance so that the two inductances together form the "L" part of the short wave tuned circuit. The small percentage change in inductance obtained in the tuner provides smooth, wide, and stable tuning. The "C" part of the tuned circuit consists primarily of a shunt trimmer. Switching from one short wave band to the other is accomplished by selecting a different shunt trimmer.

The converter grid circuit, as an example, includes L7 and T5 in series in both the SW1 and SW2 bands. Tuner T5 is in the ground end of the circuit and the signal is fed into the grid end through C10. The shunt tuning capacity is either C56 or C57, depending upon which of the two short wave bands is used. Additional oscillator coupling capacitors, C72 or C73, are also added to compensate for the lower coupling through C67 when the higher shunt capacitors are in the circuit.

In the r-f stage, a section of the antenna tracking coil is used as the grid circuit. It is tuned for resonance by a shunt capacitor (C54 and C55) and a shunt inductance (L20). Because a tuned circuit of this type is inherently broad, tuning through the relatively narrow spread-band offers little advantage and is not done.

STANDARD BROADCAST BAND

When manual tuning is employed (Band Switch in STD position), the receiver employs an r-f stage, a converter, and an oscillator, all of which are tuned by iron slugs suspended from the tuning elevator. In the automatic position (Band Switch in the AUTO position), the r-f stage is not used. Instead, a separate antenna coil is used which couples the antenna directly into the converter. A separate coil is used in order to make the tuning circuit independent of the dial tuning mechanism so that it may be tuned by trimmers in the push-button assembly.

Switching from manual to automatic tuning is accomplished in the oscillator by using an oscillator coil which is tuned by a separate shunt inductance. In manual tuning, the inductance is one which is tuned by the tuning elevator. In automatic tuning, a fixed shunt capacity (C76) plus one of a series of push-button selected coils tunes the oscillator.

I-F AMPLIFIER

The i-f amplifier consists of a composite 455 kc and 10.7 mc circuit. The electrical changes required to transfer between AM and FM service are made by the **Band Switch. When t** switch is in either the **FM1** or **FM2** position, the amplifi operates at 10.7 megacycles and delivers the i-f signal into FM discriminator circuit. When the switch is in any of t other positions, the amplifier operates at 455 kc. Scre voltage is removed from the tube which acted as an F limiter and this tube then acts as an AM diode detect Thus, the AM audio signal appears across R16 while the F audio signal appears across R22. A section of the Band Swit switches the audio input circuit from one to the other. T AVC bus is also shorted out for FM.

STAGE GAIN AND VOLTAGE CHECKS

Stage gain measurements by vacuum tube voltmeter similar measuring devices may be used to check circuit pe formance and isolate trouble. The gain values listed may ha tolerances of 20%. Readings taken with low signal so th AVC is not effective.

(1) *R-F and I-F Stage Gains*

Signal applied through IRE dummy antenna:

Antenna post to V1 grid	4	@	1000 k
Antenna post to V1 grid	2	@	9.6 n
Antenna post to V1 grid	2	@	11.8 n

Signal applied through 300-ohms, including signal generator impedance:

Dipole terminals to V1 grid	1.5	@	45 n
Dipole terminals to V1 grid	2	@	98 n

These checks with oscillator tube (V3) removed:

V1 grid to V2 grid	13	@	1000 k
V1 grid to V2 grid	6	@	9.6 n
V1 grid to V2 grid	9	@	11.8 n
V1 grid to V2 grid	13	@	45 n
V1 grid to V2 grid	10	@	98 n

These checks with oscillator tube (V3) removed:

V2 grid to V4 grid	23	@	455 k
V2 grid to V4 grid	37	@	10.7 n
V4 grid to V5 grid	23	@	455 k
V4 grid to V5 grid	58	@	10.7 n
V5 grid to V6 grid	40	@	455 k
V5 grid to V6 grid	17	@	10.7 n

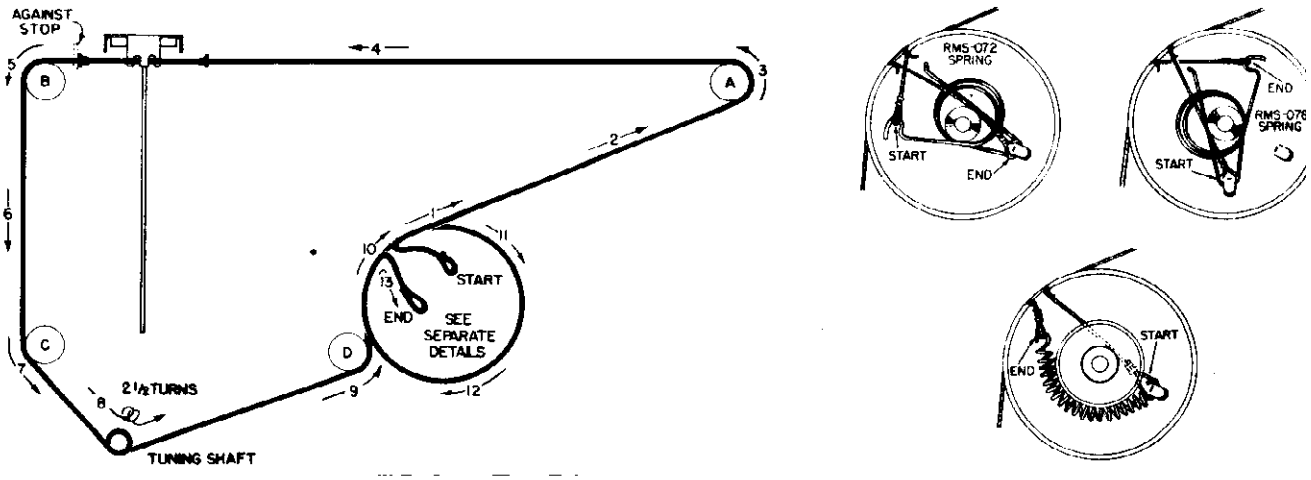


Figure 1—Dial Stringing Diagram Showing Spring Details at Right

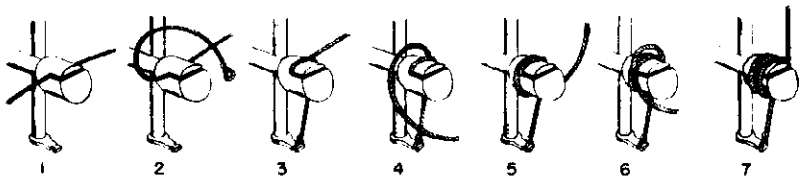


Figure 2—Elevator Windlass Stringing Procedure

(2) *Audio Gain*

.07 volts at 400 cps across volume control with control set at maximum will give approximately ½ watt output across the speaker voice coil.

(3) *Oscillator Grid Bias*

D-c voltage developed across R5 (average):

13 v. @ 1000 kc — 2.7 v. @ 11.8 mc
2.7 v. @ 9.6 mc — 5.5 v @ 45 mc
7 v. @ 98 mc

(4) *Socket Pin Voltages*

Fig. 8 shows typical tube pin voltages. All readings should be made from the pins to ground unless otherwise indicated.

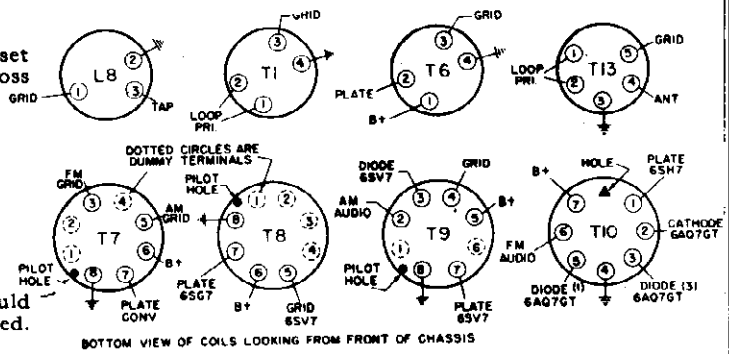


Figure 3—Terminal Identification of Coil Assemblies (Numbers correspond with schematic

REPLACEMENT OF DRIVE CORDS

Dial Stringing

Push the tuning elevator all the way down and string the dial as shown in Figure 1. This illustration shows the stringing as viewed from behind the dial scale, as you would see it when working on it. The number and arrows indicate the progression of the dial cord from start to finish. The procedure will be easier if pulley C is by-passed until the rest of the work is finished after which the cord can be pulled tight over that pulley. During the procedure, locate the two brass eyelets so that they fall between pulleys A and B. When finished, crimp the eyelets on the cord in the proper positions to act as minimum and maximum stops for the tuning mechanism and clip the pointer on the cable half-way between the eyelets.

Separate detail drawings are given to show the three different methods of attaching the ends of the cord. The arrangement with the standard helical spring was used in some earlier production receivers. If the cord and spring are to be replaced, the Type 1 spring should be used. It fits the same drum and is an improved type. The Type 2 spring should be used with the later type of drum (with two tabs). When stringing the mechanism with either the Type 1 or Type 2 spring, load the spring by pulling the hook over the projection at the other end of the spring, string the dial and, as a final step, release the hook so that it pulls up the slack in the dial cord.

Elevator Stringing

The step-by-step procedure for stringing the elevator windlass is shown in Figure 2. (The view is from the rear of the mechanism.) This is done with the elevator up. Start by inserting the metallic cord in the slot as shown in 1. Then loop the left-hand free end over (2) and solder it to the lug provided at the bottom of the vertical shaft (3). The other free end is then given two turns around the pulley, first on one side of the first half turn (4-5) and then on the other side (6-7). In making these two loops, the free end of the cord passes on *this* side of the end which is already secured. Similarly, in view 2, the end which is to be secured to the bottom of the shaft, passes on *this* side of the right-hand free end of the cord. Observe these relationships. Finally, after completing the seven steps shown, pull the upper end of the cord through the hole in the top of the elevator mechanism and solder it to the spring provided.

Concluding Comments

After replacing the dial cord or the elevator cord, it may be found that some correction in relative positioning is needed. This can be done by loosening the set screws in the large drive pulley directly behind the dial scale and re-positioning it on the shaft. The object, of course, is to permit the tuning control to drive the elevator through its full tuning range. Slight errors in final setting are not serious since leeway is provided in the location of the dial pointer itself.

WIRING OF BAND SWITCH

In order to facilitate repair, replacement, and circuit tracing, a table and diagrams are supplied with reference to the connections made in the band switch. If used properly, these will be of invaluable aid. The remarks which follow are intended to clarify the make-up of the tables and diagrams—read them carefully before using the table.

The table is broken down into six parts, one for each switch wafer. Section 1 is nearest the front and section 6 is the rearmost wafer.

Individual lugs on each wafer are numbered from 1 to 12, depending upon their position on the wafer. The method of numbering is illustrated in Fig. 5. In determining the number, turn the chassis upside down and look from the front toward the rear of the chassis. Thus, lugs 1 and 12 are the ones which are at the bottom when the set is in its normal position; lugs 3 and 4 are on the side with the broadcast band coils; and lugs 9 and 10 are on the side with the 6AK5 tubes. The numbering refers to lugs whether they be on the front or rear of the wafer.

Fig. 4 shows the physical location of various components and terminals to which reference is made in the table.

In those cases where a component symbol number is given in column two, instead of a wire, that component is connected by its own lead wire directly to the switch lug and the connection of the *other* end of the component is given in the last column.

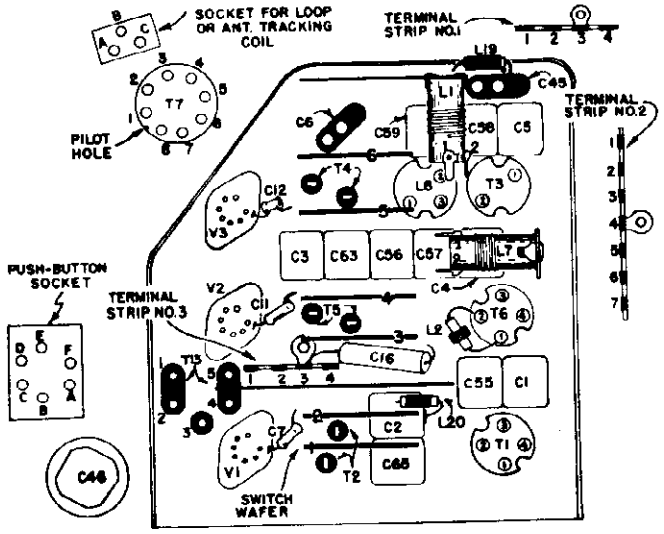


Figure 4—Physical Location of Components Listed in Band Switch Wiring Table

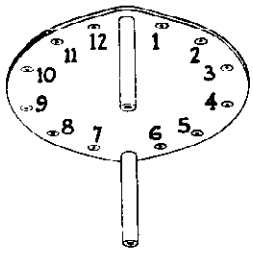


Figure 5—Identification of Switch Lugs —Set Inverted and Viewed from Panel

WIRING OF BAND SWITCH

(Wire length given from end to end before stripping)

SECTION 1

At this lug—	—connect this—	—the other end of which is connected to this—
1	Insulated wire, 5" lg.	Antenna transformer T13, terminal 4
2	a. Insulated wire, 11½" lg. b. Insulated wire, 2" lg. c. Capacitor C50	Antenna terminal at rear of chassis Switch section 1, lug 6 Switch section 2, lug 1
3	Capacitor C52	Switch section 2, lug 3
4	a. Insulated wire, 1¼" lg. b. Insulated wire, 14" lg. c. Insulated wire, 5½" lg.	Antenna transformer T1, terminal 1 Antenna tracking coil, terminal A Antenna transformer T13, terminal 2
5	a. Short bare bus b. Resistor R15	Ground lug on C65 Switch section 1, lug 11
6	See lug 2b, above	
7	Insulated wire, 11" lg.	Terminal strip 1, lug 4
8	Capacitor C31	Front terminal of T2
9	a. Insulated wire, 9" lg. b. Insulated wire, 7" lg.	Terminal strip 2, lug 5 Filter capacitor, C46C
11	See lug 5b, above	

SECTION 2

At this lug—	—connect this—	—the other end of which is connected to this—
1	See section 1, lug 2c	
3	a. Insulated wire, 2½" lg. b. See section 1, lug 3	Trimmer C1, lug nearer T1
4	Insulated wire, 1½" lg.	Trimmer C55, lug nearer T1
5	Coil L20	Ground lug on trimmer C2
6	Short bare bus	Trimmer C65, left-hand terminal*
7	Short bare bus	Trimmer C2, left-hand terminal*
8	Capacitor C7	Tube socket V1, pin 1
9	Insulated wire, 4" lg.	Antenna transformer T13, terminal 1
10	Insulated wire, 3½" lg.	Antenna transformer T1, terminal 2
11**	Insulated wire, 11½" lg.	Antenna tracking coil, terminal C

SECTION 3

At this lug—	—connect this—	—the other end of which is connected to this—
1	Shielded wire, 8¾" lg.	Terminal strip 2, lug 6
2	Insulated wire, 1½" lg.	Switch section 3, lug 12
3	a. Insulated wire, 2½" lg. b. Capacitor C16 c. Choke L3	Converter coil T6, terminal 1 Ground lug on terminal strip 3 Switch section 3, lug 11
4	Insulated wire, 7½" lg.	Terminal strip 2, lug 3
5	Insulated wire, 1⅜" lg.	Converter coil T6, terminal 2
6	Short bus with spaghetti	Chassis
7	Short bare bus	Terminal strip 3, lug 4
10	Shielded wire, 10½" lg.	Terminal strip 2, lug 2
11	a. See lug 3c, above b. Capacitor C10	Switch section 4, lug 3
12	a. See lug 2, above b. Shielded wire, 7¾" lg.	Push-button socket, Terminal B

SECTION 4

At this lug—	—connect this—	—the other end of which is connected to this—
1	a. Insulated wire, 5½" lg. b. Insulated wire, 7¼" lg.	Antenna transformer T13, termin Push-button socket, terminal F
2	Insulated wire, 2½" lg.	Trimmer C4, lug nearer T6
3	a. See Section 3, lug 11b b. Short bus with spaghetti c. Short jumper	Coil L7, terminal 2 (toward front Switch Section 4, lug 4 (adjacent
4	See lug 3c, directly above	
5**	Short bare bus	Trimmer C63, lug nearer front
6	Capacitor C88	Tuner T5, left-hand terminal*
7	Short bare bus	Tuner T5, left-hand terminal
8	Capacitor C11	Tube socket V2, pin 1
9	a. Capacitor C72 b. Insulated wire, 2½" lg.	Section 5, lug 11 Trimmer C56, front terminal
10	a. Capacitor C73 b. Insulated wire, 2½" lg.	Section 5, lug 12 Trimmer C57, front terminal
12	Bus with spaghetti, 2½" lg.	Coil L7, terminal 1

SECTION 5

At this lug—	—connect this—	—the other end of which is connected to this—
1	a. Bus with spaghetti, 1¾" lg. b. Resistor R33	Coil L1, terminal 1 Section 5, lug 4
2	a. Insulated wire, 3" lg. b. Insulated wire, 1¾"	Coil L8, terminal 1 Section 6, lug 4
4	See Section 5, lug 1b	
5	Bus with spaghetti, 3" lg.	Coil L1, terminal 2
6	a. Bus with spaghetti, 3" lg. b. Bus with spaghetti, 1½" lg.	Capacitor C45, left-hand termina Section 5, lug 10
7**	Short bare bus	Tuner T4, left-hand terminal*
8	Capacitor C12	Tube socket V3, pin 1
9	Insulated wire, 4" lg.	Trimmer C5, lug nearer T3
10	a. See Section 5, lug 6b b. Capacitor C41	Section 6, lug 6
11	a. Insulated wire, 3¾" lg. b. See Section 4, lug 9a	Trimmer C59, lug nearer front
12	a. Insulated wire, 3½" lg. b. See Section 4, lug 10a	Trimmer C58, lug nearer front

SECTION 6

At this lug—	—connect this—	—the other end of which is connected to this—
1	Insulated wire, 4½" lg.	I-F transformer T7, terminal 8
2	Bus with spaghetti, 1½" lg.	Coil L1, terminal 2
4	See Section 5, lug 2b	
5	Insulated wire, 12" lg.	Push-button socket, terminal A
6	a. Bus with spaghetti, 2" lg. b. Capacitor C75 c. See section 5, lug 10b	Trimmer C45, center terminal Ground at C59
7	Short bare bus	Trimmer C6, center terminal
8	Bare bus, 1" lg.	Tube socket V3, pin 7
9	Insulated wire, 2¼" lg.	I-F transformer T7, terminal 5
10	Insulated wire, 2¾" lg.	I-F transformer T7, terminal 3
12	Insulated wire, 3½" lg.	Coil L8, terminal 3

* Looking from front, chassis inverted.
** Double lug (front and rear) soldered together

MODEL X-415 GENERAL ELECTRIC CO.

ALIGNMENT

EQUIPMENT REQUIRED:

1. Test Oscillator with tone modulation. (See Table.)
2. D-C Voltmeter or Microammeter. (See notes 2 and 3.)
3. A-C Voltmeter, 2-volts. (See note 6.)
4. Insulated hex wrench, ¼". (See steps 1, 10, 13.)
5. .01 MF Paper Capacitor. (See steps 1 to 5.)
6. 400-ohm, ½ watt resistor. (See steps 16 to 21.)
7. 200 mmf. mica capacitor. (See steps 22 to 28.)

Important detailed instructions and references in connection with the alignment table which follows are keyed in by means of column 7, headed "See Note." The notes are included in numerical order after the table. They are important—refer to them carefully.

Step	Signal Generator Frequency	Signal Input Point	Band Switch	Dial Setting	Adjust	See Note	Remarks
				F-M I-F ALIGNMENT			
1	10.7 mc	6SH7 grid thru .01 mf	FM1	.....	C49 for zero**	1, 2	Adjust C49 for *zero* meter reading. Apply 1 volt signal input.
2	See last column	6SH7 grid thru .01 mf	FM1	.....	Signal Generator	1, 2	Detune signal generator to point of *maximum* meter reading.
3	As in step 2	6SG7 grid thru .01 mf	FM1	.....	Peak C48	1, 2	
4	10.7 mc	6SV7 grid thru .01 mf	FM1	.....	Peak C28	1, 3	6AQ7GT tube removed from its socket.
5	10.7 mc	6SG7 grid thru .01 mf	FM1	.....	Peak C26	1, 3	6AQ7GT tube removed from its socket.
6	10.7 mc	Conv. grid directly	FM1	.....	Peak C24 & L10	1, 3, 4	6AQ7GT tube removed from its socket.
				AM I-F ALIGNMENT			
7	455 kc	Conv. grid directly	STD	.....	Peak C86 & C61	5, 6	
8	455 kc	Conv. grid directly	STD	.....	Peak C15 & C23	5, 6	
9	455 kc	Conv. grid directly	STD	.....	Peak C13 & C14	5, 6	
				FM R-F ALIGNMENT			
10	88 mc	DIPOLE terminals	FM2	88 mc—6.8 to 6.9 in.*	Peak C6**	1, 3, 7, 10	Set dial accurately—then adjust C6.
11	98 mc	DIPOLE terminals	FM2	For max. output	Peak C3	1, 3, 8	Tube dial for maximum output, then peak C3 while rocking dial.
12	98 mc	DIPOLE terminals	FM2	Do not change	Peak C2	1, 3	
13	43 mc	DIPOLE terminals	FM1	43 mc—6 to 6.1 in.*	Peak C45**	1, 3, 7	Set dial accurately—then adjust C45.
14	46 mc	DIPOLE terminals	FM1	For max. output	Peak C63	1, 3, 8	Tune dial for maximum output, then peak C63 while rocking dial.
15	46 mc	DIPOLE terminals	FM1	Do not change	Peak C65	1, 3	
				S.W. R-F ALIGNMENT			
16	11.8 mc	Antenna thru 400-ohms	SW2	11.8 mc—4.5 to 4.6 in.*	Peak C58	5, 6, 7, 10	Set dial accurately—then adjust C58.
17	11.8 mc	Antenna thru 400-ohms	SW2	Do not change	Peak C57	5, 6, 8	Peak C57 while rocking dial.
18	11.8 mc	Antenna thru 400-ohms	SW2	Do not change	Peak C54	5, 6	C54 is located on back apron of chassis.
19	9.6 mc	Antenna thru 400-ohms	SW1	9.6 mc—4.5 to 4.6 in.*	Peak C59	5, 6, 7, 10	Set dial accurately—then adjust C59.
20	9.6 mc	Antenna thru 400-ohms	SW1	Do not change	Peak C56	5, 6, 8	Peak C56 while rocking dial.
21	9.6 mc	Antenna thru 400-ohms	SW1	Do not change	Peak C55	5, 6	
				BROADCAST R-F ALIGNMENT			
22	1620 kc	Antenna via 200 mmf	STD	Extreme right-hand position	Peak C5	5, 6	
23	1620 kc	Antenna via 200 mmf	STD	Extreme right-hand position	Peak C4	5, 6	
24	1620 kc	Antenna via 200 mmf	STD	Extreme right-hand position	Peak C1	5, 6,	
25	1500 kc	Antenna via 200 mmf	STD	1500 kc—1.4 to 1.5 in.*	Osc. coil T3 iron slug	5, 6, 7, 9	T3 iron slug is the rear one on the left side. Adjust for peak.
26	1000 kc	Antenna via 200 mmf	STD	For max. output	Conv. coil T6 iron-slug	5, 6, 9	T6 iron slug is the center one on the left side. Adjust for peak.
27	1000 kc	Antenna via 200 mmf	STD	Do not change	R-F coil T1 iron slug	5, 6, 9	T1 iron slug is the front one on the left side. Adjust for peak.
28	580 kc	Antenna via 200 mmf	STD	For max. output	Peak L8	5, 6, 8	Peak L8 while rocking dial.
29							Repeat steps 22 to 28.

* Important! See Note 7.
** Use insulated hex wrench, ¼".

Notes in Connection with Alignment Table

1. Use *unmodulated* signal.
2. Connect 20,000-ohm-per-volt meter from junction of R21 and C29 to chassis. Use ten-volt scale. (Steps 1-3.)
3. Connect 20,000-ohm-per-volt meter from grid pin 4 of 6SH7 to chassis with a 200,000-ohm resistor in series. The resistor must be connected directly to the grid so that capacity loading will be negligible and so that the meter is isolated from the i-f signal voltage. Keep signal generator output down so that the meter indicates not more than one volt at the grid (5 micro-amperes through 200,000-ohms). (Alignment steps 4 to 6, 10 to 15.)
4. Connect signal generator directly to the converter grid at some convenient point. The generator lead must be shielded up to this connection so that not more than 1/16 inch of exposed lead exists. Ground the shield solidly by clamping it firmly to the chassis or a shield as close to the connection as possible. (Steps 6-9.)
5. Use 400-cycle modulation. (Steps 7 to 9, 16 to 28.)
6. Connect a standard output meter across speaker voice coil. Turn volume control fully on. Keep signal generator output down so that the meter indicates not than ½ watt output (2 volts) during alignment. (7 to 9, 16 to 28.)
7. If dial scale is not available, index pointer as fol Turn pointer to right-hand limit of travel. Mar dial back plate at a reference edge of the pointer s Then set pointer by turning dial knob until the cated dimension exists between the reference edg the mark.
8. "Rocking" consists of adjusting the indicated adj while turning the dial a small amount back and through peak output. The object is to find the r mum peak. Rocking is necessary and is permi only when interlocking circuits are being adjuste
9. The main tuning iron slugs are suspended from th side of the tuning "elevator." They are individ adjustable by loosening the locknut and turning the porting screw into which the suspending wire is sold
10. *Two* oscillator settings will give response. The h frequency response point is the correct one; the ot the image. If in doubt, start with the trimmer s loosened completely and adjust for the *first* respo

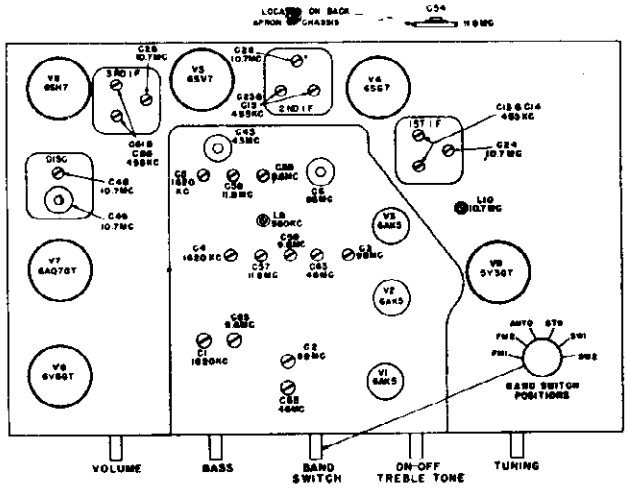


Figure 7—Location of Tubes and Adjusters

PHONO CONNECTION

A phono jack is located at the right on the re the chassis and a plug to fit this jack is provided the receiver. This plug may be connected to the of any crystal pick-up of a record player. The rec will now reproduce record recordings.

If the record player uses the General Electric tronic pick-up, RPX-010, a phono pre-amplifier be used for which a power receptacle is provide the receiver chassis. The pick-up, RPX-010, is nected to the input jack of the pre-amplifier an output cable of the pre-amplifier is then connect the phono jack on the receiver chassis.

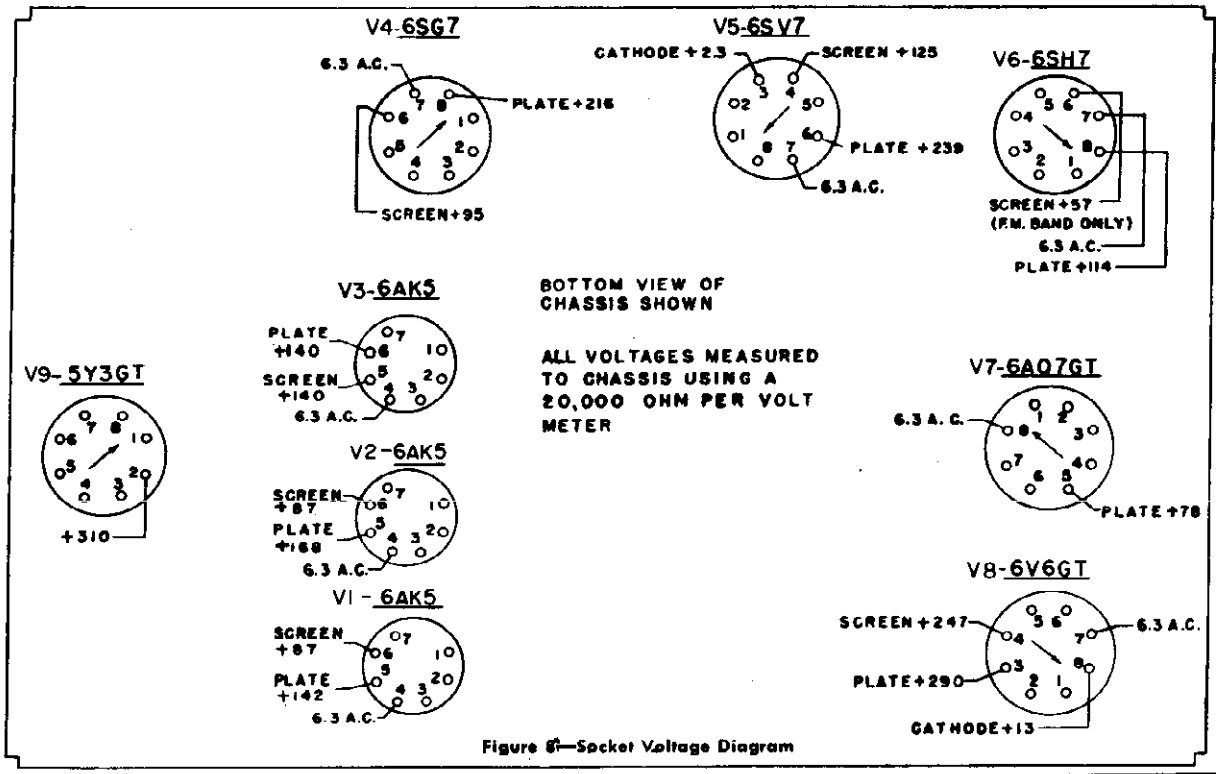


Figure 8—Socket Voltage Diagram

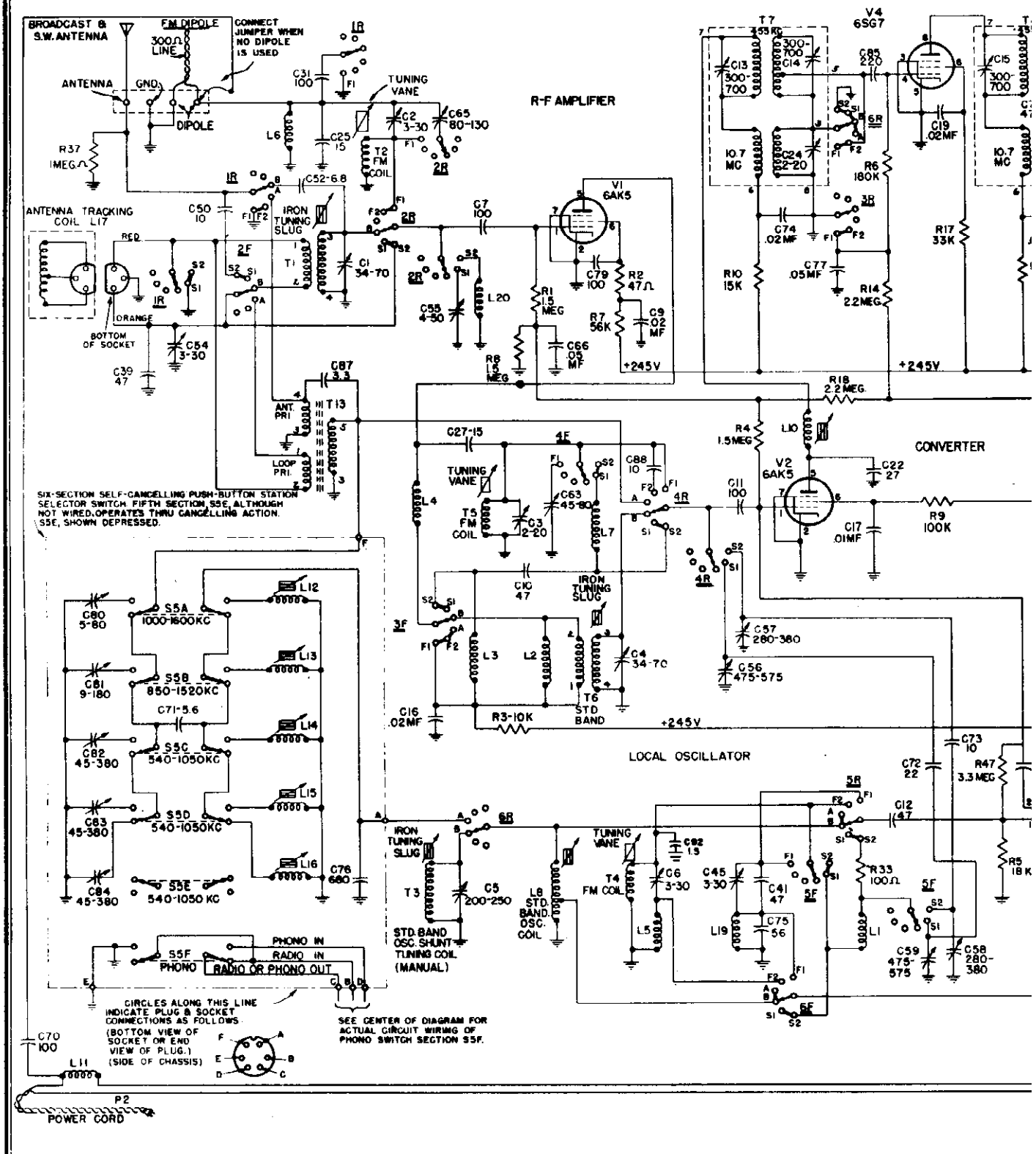
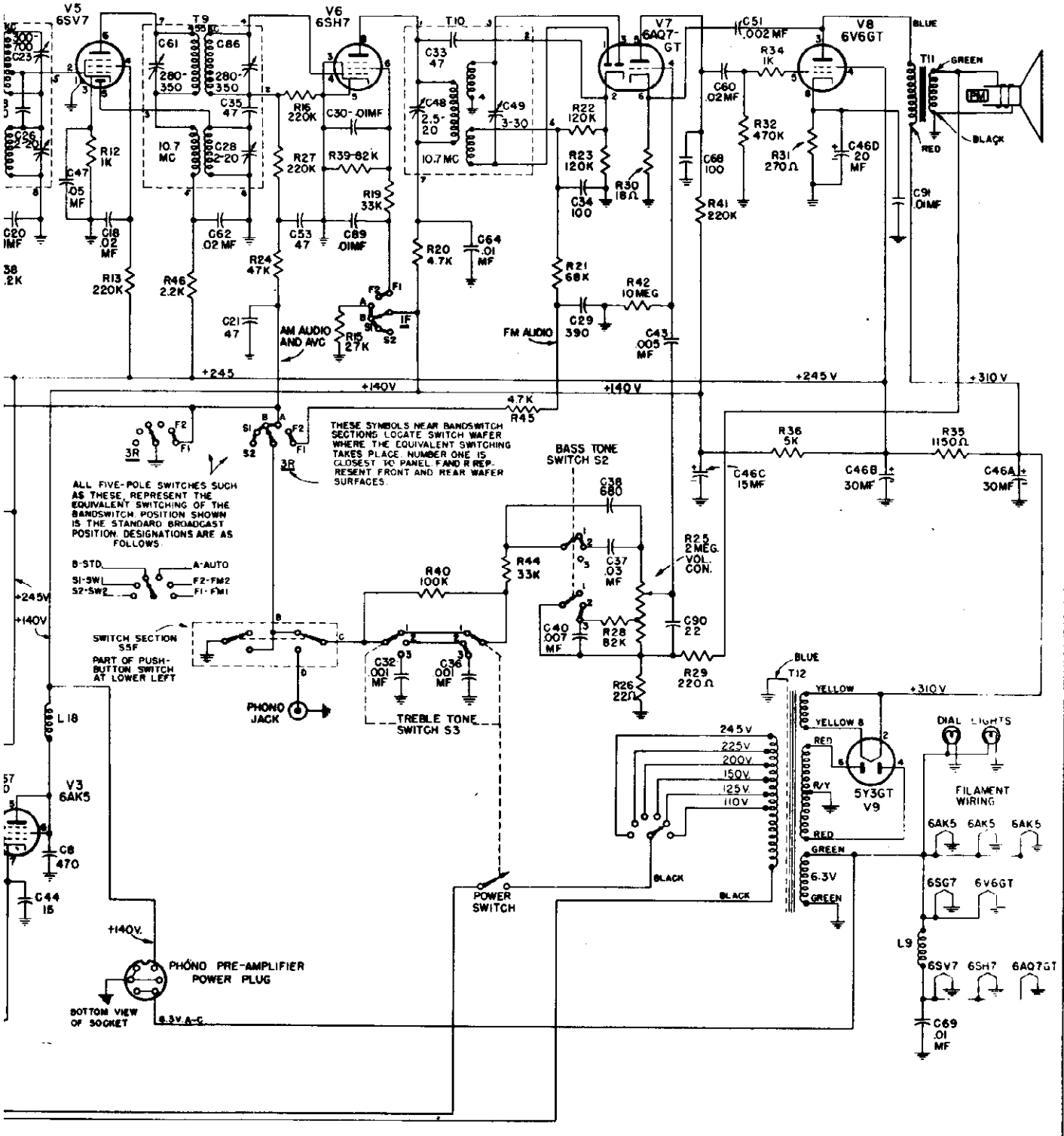


Figure 6—Schematic



Diagram, Model X415

MODEL X-415

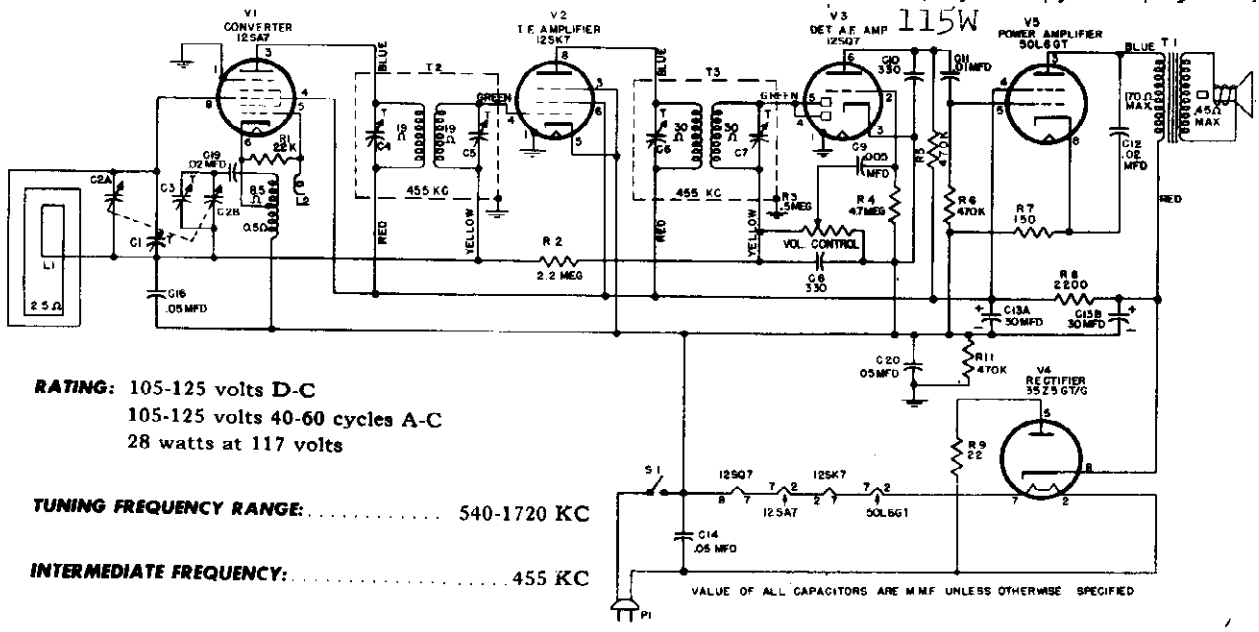
GENERAL ELECTRIC CO.

REPLACEMENT PARTS LIST

Part No.	Symbol	Description
UNIVERSAL REPLACEMENT PARTS		
UCC-039	C43	CAPACITOR—.005 mfd., 600 v., paper
UCC-040	C17, 30, 64, 69, 89, 91	CAPACITOR—.01 mfd., 600 v., paper
UCC-041	C9, 18, 74	CAPACITOR—.02 mfd., 600 v., paper
UCC-042	C37	CAPACITOR—.03 mfd., 600 v., paper
UCC-045	C47, 66, 77	CAPACITOR .05 mfd., 600 v., paper
UCG-2048	C76	CAPACITOR .680 mmfd., silver mica
UCN-506	C52	CAPACITOR—6.8 mmf., ceramic
UCU-020	C21, 53	CAPACITOR—47 mmf., mica
UCU-028	C68	CAPACITOR—100 mmf., mica
UCU-048	C38	CAPACITOR—680 mmf., mica
UCU-520	C10	CAPACITOR—47 mmf., mica
UCU-528	C31, 70, 79	CAPACITOR—100 mmf., mica
UCU-536	C85	CAPACITOR—220 mmf., mica
UCU-1042	C29	CAPACITOR—390 mmfd., mica
UCU-1504	C73	CAPACITOR—10 mmfd., mica
UCU-1512	C72, 90	CAPACITOR—22 mmfd., mica
UCU-1520	C39	CAPACITOR—47 mmfd., mica
UCU-1544	C8	CAPACITOR—470 mmfd., mica
UCW-1004	C50	CAPACITOR—10 mmf., ceramic
UCW-1014	C22	CAPACITOR 27 mmf., ceramic
UCW-1020	C41	CAPACITOR—47 mmf., ceramic
UCW-1028	C34	CAPACITOR—100 mmf., ceramic
UCW-2022	C75	CAPACITOR—56 mmf., ceramic
UIC-001		CEMENT—Speaker cone replacement cement
UJB-014		TERMINALS—4 lug terminal strip
UJB-018		TERMINALS—2 lug terminal strip
UOP-802		SPEAKER—8" permanent magnet speaker
UOX-007		CONE—Replacement cone and voice coil for speaker
URD-007	R30	RESISTOR—18 ohms, ½ w., carbon
URD-009	R26	RESISTOR—22 ohms, ½ w., carbon
URD-017	R2	RESISTOR—47 ohms, ½ w., carbon
URD-025	R33	RESISTOR 100 ohms, ½ w., carbon
URD-033	R29	RESISTOR 220 ohms, ½ w., carbon
URD-041	R12	RESISTOR—470 ohms, ½ w., carbon
URD-049	R34	RESISTOR 1000 ohms, ½ w., carbon
URD-057	R38, 46	RESISTOR—2200 ohms, ½ w., carbon
URD-065	R20, 45	RESISTOR—4700 ohms, ½ w., carbon
URD-077	R10	RESISTOR—15,000 ohms, ½ w., carbon
URD-085	R19, 44	RESISTOR—33,000 ohms, ½ w., carbon
URD-089	R24	RESISTOR—47,000 ohms, ½ w., carbon
URD-091	R7	RESISTOR—56,000 ohms, ½ w., carbon
URD-093	R13, 21	RESISTOR—68,000 ohms, ½ w., carbon
URD-095	R28, 39	RESISTOR—82,000 ohms, ½ w., carbon
URD-097	R9, 40	RESISTOR 100,000 ohms, ½ w., carbon
URD-099	R22, 23	RESISTOR—120,000 ohms, ½ w., carbon
URD-103	R6	RESISTOR—180,000 ohms, ½ w., carbon
SPECIALIZED REPLACEMENT PARTS (Cont'd)		
	C84	CAPACITOR—45-380 mmf., push-button antenna trimmer
RCX-015	C5	CAPACITOR 200-250 mmf., trimmer capacitor
	C58	CAPACITOR—280-380 mmf., trimmer capacitor
	C59	CAPACITOR 475-575 mmf., trimmer capacitor
RCX-022	C3	CAPACITOR 2-20 mmf., trimmer capacitor
	C4	CAPACITOR—34-70 mmf., trimmer capacitor
	C56	CAPACITOR 475-575 mmf., trimmer capacitor
	C57	CAPACITOR—280-380 mmf., trimmer capacitor
	C63	CAPACITOR 45-80 mmf., trimmer capacitor
RCX-023	C1	CAPACITOR 34-70 mmf., trimmer capacitor
	C55	CAPACITOR 4-50 mmf., trimmer capacitor
RCX-024	C2	CAPACITOR—3-30 mmf., trimmer capacitor
	C65	CAPACITOR—80-130 mmf., trimmer capacitor
RCY-011	C54	CAPACITOR—3-30 mmf., trimmer
RCY-017	C6, 45	CAPACITOR 3-30 mmf., air trimmer
RDB-001		PUSH BUTTON—Black push button used at bottom of strip only
RDB-004		PUSH BUTTON Black push-buttons used in upper five positions only
RDC-019		CORD Hoist cord 6½" long
RDC-021		CORD—Dial drive cord
RDE-016		ESCUTCHEON—For dial scale and push-buttons
RDG-003		BACK PLATE—Large metal panel plate
RDK-004		KNOB Black knob, plain
RDK-032		KNOB—Black control knob with pointer
RDO-001		ESCUTCHEON ORNAMENT—Left-hand plastic escutcheon ornament
RDP-016		POINTER—Dial pointer and slide
RDP-022		POINTER—Dial pointer
RDS-018		SCALE—Tuning dial scale
REX-002		CORE—Iron core with glass tubing for broadcast antenna, r f, and oscillator coils
RHC-007		PIN—Hairpin cotter for securing shaft through push-buttons
RHC-009		PIN Hairpin cotter for idler wheel
RHC-010		SPRING CLIP—Holds FM coil assembly
RHE-001		EYELET For connecting FM coil links
RHM-016		CLIP—Mounting clip for L1 and L7
RHM-024		LINK—Hoist link holding end of hoist cord
RHM-025		RING—Retaining ring for flywheel
RHM-026		COIL LINK—Rectangular coil link for assembling FM coils T2 and T5
RHM-027		COIL LINK—Rectangular coil link for assembling FM coil, T4
RII-001		POST—Mycalex posts for assembling all FM coils
RJC-001		CONTACT PIN—For speaker connection
RJJ-004		RECEPTACLE Pre-amp. and push-button receptacle
RJP-004		PLUG Phono input plug
RJP-005		PLUG—Plug for push-button cable
RJP-010		SOCKET Phono input jack
RJS-003		SOCKET—Octal socket for V5, V6, and V7
RJS-012		PLATE—For mounting electrolytic
RJS-027		SOCKET—Dial light socket
RJS-030		SOCKET—Octal socket for V4, V8, and V9
RJS-044		TUBE SOCKET—Tube socket for V1, V2, and V3
RJS-051		RECEPTACLE—3 pin receptacle for antenna tracking coil
RLA-009	T1	COIL—Broadcast band antenna coil
RLA-011	L6	COIL—FM antenna choke coil

Part No.	Symbol	Description
UNIVERSAL REPLACEMENT PARTS (Cont'd)		
URD-105	R16, 27, 41	RESISTOR—220,000 ohms, ½ w., carbon
URD-113	R32	RESISTOR—470,000 ohms, ½ w., carbon
URD-121	R37	RESISTOR—1.0 meg., ½ w., carbon
URD-125	R1, 4, 8	RESISTOR—1.5, meg., ½ w., carbon
URD-129	R14, 18	RESISTOR—2.2 meg., ½ w., carbon
URD-133	R47	RESISTOR—3.3 meg., ½ w., carbon
URD-145	R42	RESISTOR—10.0 meg., ½ w., carbon
URD-1079	R5	RESISTOR—18,000 ohms, ½ w., carbon
URE-035	R31	RESISTOR 270 ohms, 1 w., carbon
URE-073	R3	RESISTOR—10,000 ohms, 1 w., carbon
URE-083	R15	RESISTOR—27,000 ohms, 1 w., carbon
URE-085	R17	RESISTOR—33,000 ohms, 1 w., carbon
SPECIALIZED REPLACEMENT PARTS		
RAB-051		BACK—Cabinet back
RAD-016		BRACKET For band switch mounting at front
RAV-038		CABINET—Model X-415 cabinet
RAX-007	L12, 13, 14, 15, 16	COIL—Push-button coils mounted on bracket
RAX-008		BRACKET—Bracket and roller fork for elevator shaft
RCC-001	C40	CAPACITOR—.007 mfd., 600 v., paper
RCC-035	C32, 36	CAPACITOR—.001 mfd., 600 v., paper
RCC-040	C20	CAPACITOR—.01 mfd., 600 v., paper
RCC-041	C14, 19, 60, 62	CAPACITOR—.02 mfd., 600 v., paper
RCC-056	C51	CAPACITOR—.002 mfd., 1000 v., paper
RCE-029	C46A	CAPACITOR—30 mfd., 400 v., dry electrolytic
	C46B	CAPACITOR—30 mfd., 400 v., dry electrolytic
	C46C	CAPACITOR 15 mfd., 400 v., dry electrolytic
	C46D	CAPACITOR 20 mfd., 25 v., dry electrolytic
RCW-001	C12	CAPACITOR—47 mfd., ceramic
RCW-013	C67, 88	CAPACITOR—10 mmf., ceramic
RCW-014	C25, 27, 44	CAPACITOR—15 mmf., ceramic
RCW-015	C87	CAPACITOR 3.3 mmf., ceramic
RCW-017	C92	CAPACITOR—1.5 mmf., ceramic
RCW-060	C71	CAPACITOR 5.6 mmf., ceramic
RCW-1028	C7, 11	CAPACITOR—100 mmf., ceramic
RCX-011	C80	CAPACITOR—5-80 mmf., push-button antenna trimmer
RCX-011	C81	CAPACITOR—9-180 mmf., push-button antenna trimmer
	C82	CAPACITOR—45-380 mmf., push-button antenna trimmer
	C83	CAPACITOR—45-380 mmf., push-button antenna trimmer
SPECIALIZED REPLACEMENT PARTS (Cont'd)		
	L19	COIL—FM oscillator cathode choke coil
	L20	COIL—SW loop shunt coil
RLA-016	T13	COIL—Push-button antenna coil
RLA-020		COIL—Antenna tracking coil
RLB-005	T2, 5	COILS FM antenna coil and FM RF coil
RLB-006	T6	COIL Broadcast band RF coil
RLB-007	L5	COIL—FM oscillator cathode choke coil
RLB-008	L3	COIL—SW band RF plate choke coil
RLB-009	L2	COIL Broadcast band plate choke dummy
RLB-010	L4	COIL—FM RF plate choke coil
RLC-013	T4	COIL—FM band oscillator coil
RLC-014	T3	COIL—Broadcast band oscillator coil
RLC-015	L1	COIL—SW oscillator loading coil
RLC-016	L8	COIL—Broadcast band oscillator shunt coil
RLC-017	L7	COIL—SW band RF loading coil
RLF-003	L9	COIL—Filament choke coil
RLI-002	L11	CHOKE—Power line choke
RLP-004	L10	COIL FM IF plate coil
RLP-006	L18	COIL Oscillator plate choke coil
RMC-012		CLAMP—For holding cover on RF unit
RMC-013		CLIP—Support for clamp RMC-012
RMC-014		CLIP—For holding shielded phono cable
RMM-009		SPACER—Metal sleeve on hoist pulley shaft
RMM-010		VANE—Tuner vane for FM coils T2 and T5
RMM-011		VANE—Tuner vane for FM oscillator coil, T4
RMR-002		ROLLER—Presses against hoist shaft
RMS-032		SPRING—Maintains push-button tension
RMS-039		WASHER—"C" washer on idler pulley
RMS-040		SPRING—Flat spring against hoist pulley shaft
RMS-041		SPRING—Wire spring against hoist pulley shaft
RMS-042		SPRING—Hoist cord tension spring
RMS-043		SCREW—Iron core adjusting screw
RMS-044		SPRING—Guide wire spring in elevator plate
RMS-072		SPRING—Type 1 dial cord spring (earlier production)
RMS-078		SPRING—Type 2 dial cord spring (later production)
RMU-016		SHAFT—Manual tuning shaft
RMW-016		PULLEY—Main tuning drum
RMW-017		PULLEY—Small idler pulley
RMX-018		FLYWHEEL—Flywheel with setscrew
RMX-019		PULLEY—Hoist pulley and shaft
RMX-021		PLATE AND SHAFT—Elevator top plate and vertical shaft
RRC-014	R25	VOLUME CONTROL—2 meg. potentiometer tapped at 1 meg.
RRC-031	S2	SWITCH—Bass tone switch
RRT-002	R35, 36	RESISTOR—1150 and 5000 ohm, w.w.
RSP-002	S5	SWITCH—Push-button switch
RSW-023	S1	SWITCH—Band change switch
RSX-003	S3	SWITCH—Treble tone and power switch
RSX-005		SWITCH—Push-button switch assembly, complete
RTD-001	T10	TRANSFORMER—Discriminator
RTL-017	T7	TRANSFORMER—1st I-F transformer
RTL-018	T8	TRANSFORMER—2nd I-F transformer
RTL-019	T9	TRANSFORMER—3rd I-F transformer
RTO-011	T11	TRANSFORMER—Output transformer
RTP-045	T12	TRANSFORMER—Power transformer
RWL-004		CORD—Power cord
RWX-004		WIRE Guide wire for pointer
RCY-005		LIST—Station call letters

GENERAL ELECTRIC CO. MODELS 102, 102W, 1
107W, 114, 114W, 11
115W



RATING: 105-125 volts D-C
105-125 volts 40-60 cycles A-C
28 watts at 117 volts

TUNING FREQUENCY RANGE: ..... 540-1720 KC

INTERMEDIATE FREQUENCY: ..... 455 KC

ALIGNMENT PROCEDURE

ALIGNMENT FREQUENCIES

I-F ..... 455 KC
R-F ..... 1720 and 1500 KC

The location of all trimmers is shown in Fig. 1.

I-F ALIGNMENT

Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 KC and keep the oscillator output as low as a readable meter reading will permit. Apply signal to the converter grid through a .05 mfd. capacitor and align progressively the trimmers in the 2nd and 1st I-F transformer cans.

R-F ALIGNMENT

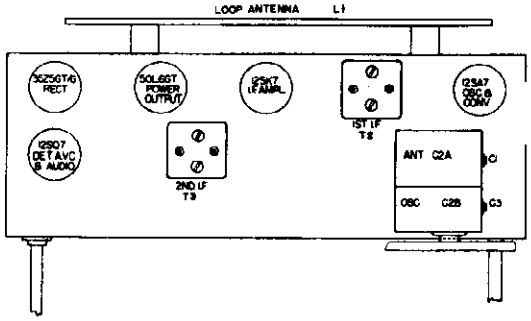
Apply the R-F alignment signals through a standard IRE dummy antenna to the primary on the loop. With the gang condenser wide open, align the oscillator trimmer (C3) to 1720 KC. Change the generator signal to 1500 KC, tune the receiver to the signal and peak the antenna trimmer (C1) for maximum output.

PRECAUTION

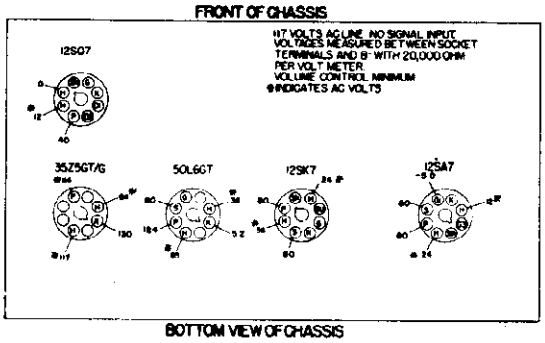
If the signal generator is A-C operated, use an isolating transformer between the power supply and the radio receiver power input. The use of an isolating capacitor is not recommended, as A-C through the capacitor will introduce hum modulation and/or create the possibility of a burned-out signal generator attenuator.

LOUDSPEAKER "ALNICO V" MAGNET DYNAMIC

Outside Cone Diameter ..... 4 in.
Voice Coil Impedance (400 cyc) ..... 3.2 ohms



Tube and Trimmer Location



Socket Voltage Diagram

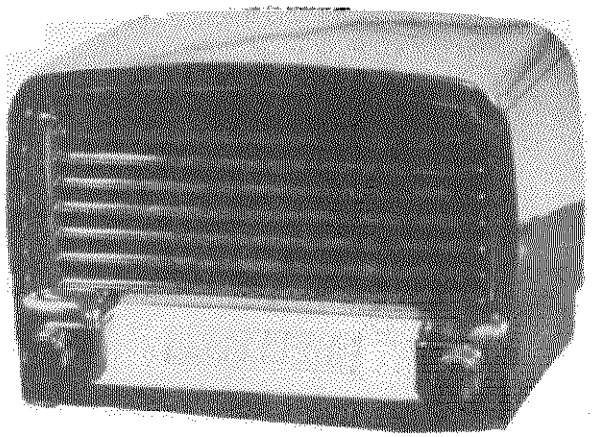
GENERAL INFORMATION

These models are 5-tube (including rectifier) superheterodyne receivers in distinctively styled brown plastic and white urea cabinets. These receivers incorporate built-in antenna, automatic volume control, oversize permanent magnet speaker and beam power output.

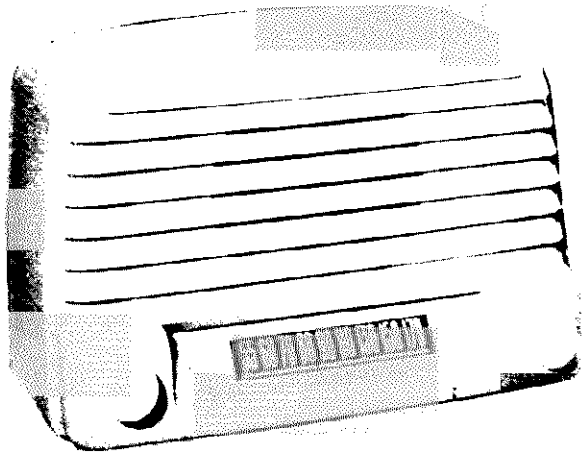
TUBES

Converter and Oscillator 12SA7
I.F. Amplifier 12SK7
Det. Audio, AVC 12SQ7
Power Output 50L6GT
Rectifier 35Z5GT

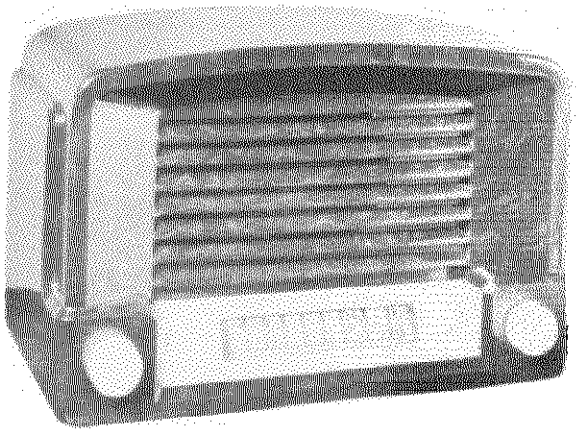
MODELS 102, 102W, 107, 107W, 114, 114W, 115, 115W GENERAL ELECTRIC CO.



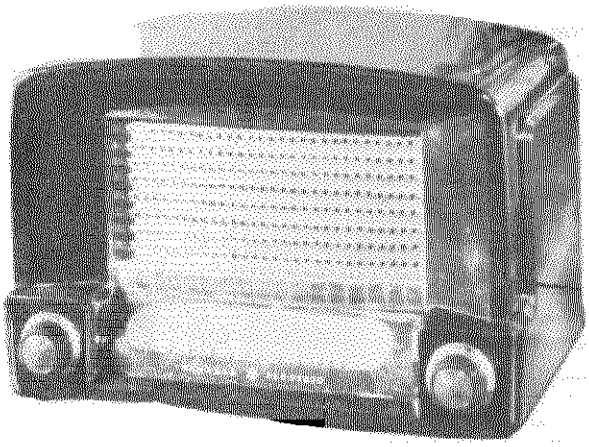
MODEL 102



MODEL 107W



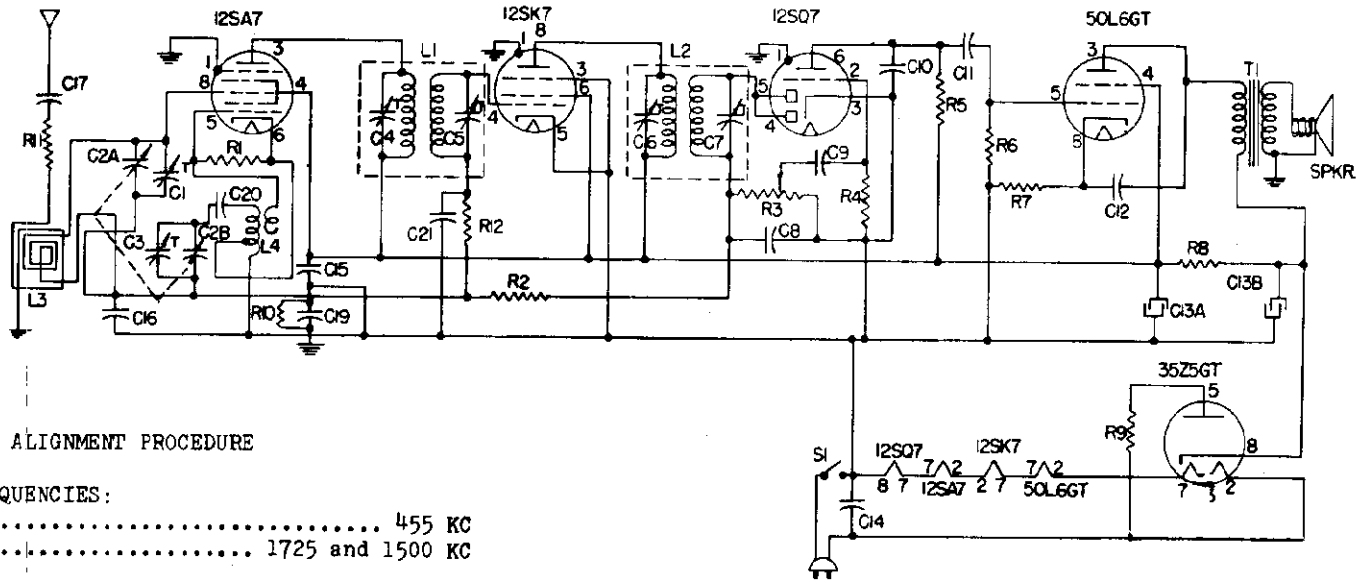
MODEL 114



MODEL 115

Cat. No.	Symbol	Description
UNIVERSAL REPLACEMENT PARTS		
UCC-625	C9	CAPACITOR—.005 mf., 600 v., paper
UCC-630	C11, 17	CAPACITOR—.01 mf., 600 v., paper
UCC-631	C12, 19	CAPACITOR—.02 mf., 600 v., paper
UCC-635	C14, 16, 20	CAPACITOR—.05 mf., 600 v., paper
UCU-040	C8, 10	CAPACITOR—330 mmf., mica
UOP-487		SPEAKER—4-inch PM speaker, same as S403D7
UOX-009		SPEAKER REPAIR KIT
URD-009	R9	RESISTOR—22 ohms, ½ w., carbon
URD-029	R7	RESISTOR—150 ohms, ½ w., carbon
URD-081	R1	RESISTOR—22,000 ohms, ½ w., carbon
URD-113	R5, 6, 11	RESISTOR—470,000 ohms, ½ w., carbon
URD-129	R2	RESISTOR—2.2 meg., ½ w., carbon
URD-137	R4	RESISTOR—4.7 meg., ½ w., carbon
URF-037	R8	RESISTOR—330 ohms, 2 w., carbon
SPECIALIZED REPLACEMENT PARTS		
RAB-070	L1	BACK—Cabinet back with loop
RAU-028		CABINET—Brown (Model 102)
RAU-029		CABINET—Brown (Model 107)
RAU-030		CABINET—Brown (Model 115)
RAU-031		CABINET—Ivory (Model 115W)
RAU-032		CABINET—Ivory (Model 114W)
RAU-033		CABINET—Brown (Model 114)
RAU-034		CABINET—Ivory (Model 107W)
RAU-035		CABINET—Ivory (Model 102W)
RCT-029	C1, 2A, 2B, C3	CAPACITOR—2-section tuning capacitor
RDC-033		CORD—Dial drive cord, 10 yds min.

Cat. No.	Symbol	Description
SPECIALIZED REPLACEMENT PARTS (Cont'd)		
RDK-020		KNOB—Control knob, Models 102W, 107W, 114W for knurled shaft
RDK-031		KNOB—Control knob for 102, 107, and 114 for knurled shaft
RDK-121		KNOB—Control knob for Model 115 for knurled shaft
RDK-122		KNOB—Control knob for Model 115W for knurled shaft
RDS-063		SCALE—Dial scale for Models 115 and 115W
RHG-017		GROMMET—(3 used for mounting tuning capacitor)
RHH-004		SNAP FASTENER—For mounting cabinet back to cabinet
RHJ-005		SPACER—For mounting tuning capacitor
RHM-046		CLIP—For mounting dial scale
RJS-003		SOCKET—Octal tube socket
RMW-040		PULLEY—Idler pulley for dial cord
RRC-077	R3, S1	CONTROL—Volume control, includes power switch with knurled shaft
SCE-001	C13A, B	CAPACITOR—30 mf., 150 v.: 30 mf., 150 v., dry electrolytic
SDK-011		KNOB—White, for flat shaft
SDP-001		POINTER—Dial scale pointer
SDS-019		SCALE—Dial scale for Models 102, 102W, 107, 107W, 114, and 114W
SLC-020	L4	COIL—Oscillator coil
SMS-013		SPRING—Dial cord tension spring
SRC-003	R3, S1	VOLUME CONTROL and switch with flat shaft
STL-007	T2	TRANSFORMER—1st IF transformer
STL-008	T3	TRANSFORMER—2nd IF transformer
STO-005	T1	TRANSFORMER—Output transformer
SWL-001		CORD—Power cord



ALIGNMENT PROCEDURE

ALIGNMENT FREQUENCIES:

I-F	455 KC
R-F	1725 and 1500 KC

I-F ALIGNMENT:

Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 kc and keep oscillator output down so that meter reads 1/2 watt output or less. Apply signal to the converter grid (pin 8 of 12SA7) through a .05 mfd. capacitor and align progressively the trimmer capacitors in the second and first i-f transformer.

R-F ALIGNMENT:

Apply the r-f alignment signals through a standard IRE dummy antenna to the receiver antenna post. With the tuning condenser completely open, align the oscillator trimmer (C3) to 1725 kc. Tune the signal generator to 1500 kc and tune the receiver for maximum signal output, then peak antenna trimmer (C1) while rocking the generator.

PRECAUTION:

If the signal generator is a-c operated, use an isolating transformer between the power supply and the radio receiver power input. The use of an isolating capacitor is not recommended, as a-c through the capacitor will introduce hum modulation and/or create the possibility of a burned-out signal generator attenuator.

SPECIFICATIONS

Rating	105-125 v. DC, 105-125 v. 25-60 CPS AC, 28 watts
Tuning Range	540-1725 KC
Intermediate Frequency	455 KC

LOUDSPEAKER:

Type	Alnico V., permanent magnet
Cone Diameter	4 inches
Voice Coil Impedance (400 cycles)	3.5 ohms

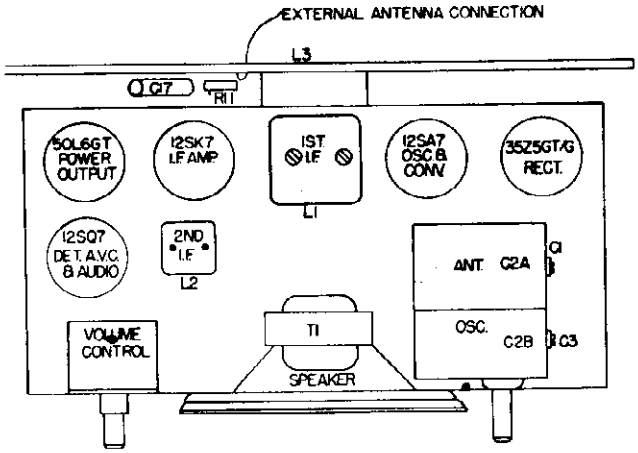
TUBE COMPLEMENT:

Converter and Oscillator	12SA7
I-F Amplifier	12SK7
Detector and Audio Amplifier	12SQ7
Power Output	50L6GT
Rectifier	35Z5GT/G

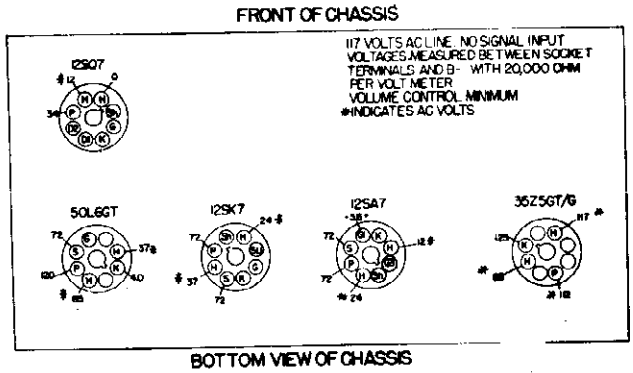
GENERAL ELECTRIC CO.

Cat. No.	Symbol	Description
		UNIVERSAL REPLACEMENT PARTS
UCC-040	C11,17	CAPACITOR - .01 mf., 600 v., paper
UCC-041	C12,20	CAPACITOR - .02 mf., 600 v., paper
UCC-044	C9,21	CAPACITOR - .005 mf., 600 v., paper
UCC-045	C14,15, 16	CAPACITOR - .05 mf., 600 v., paper
UCC-048	C19	CAPACITOR - .1 mf., 600 v., paper
UCU-036	C8,10	CAPACITOR - 220 mmf., mica
URD-007	R9	RESISTOR - 18 ohms, 1/2 w., carbon
URD-029	R7	RESISTOR - 150 ohms, 1/2 w., carbon
URD-041	R11	RESISTOR - 470 ohms, 1/2 w., carbon
URD-081	R1	RESISTOR - 22,000 ohms, 1/2 w., carbon
URD-113	R5,6, 10,12	RESISTOR - 470,000 ohms, 1/2 w., carbon
URD-129	R2	RESISTOR - 2.2 meg., 1/2 w., carbon

Cat. No.	Symbol	Description
		UNIVERSAL REPLACEMENT PARTS
URD-137	R4	RESISTOR - 4.7 meg., 1/2 w., carbon
URD-059	R8	RESISTOR - 2700 ohms, 1/2 w., carbon
		SPECIALIZED REPLACEMENT PARTS
SCE-001	C13A,B	CAPACITOR - Electrolytic capacitor
SCT-013	C2A,B	CAPACITOR - Tuning capacitor
SJS-003		SOCKET - Tube socket
SLC-001	L4	COIL - Oscillator coil
SLL-006	L3	LOOP - Antenna loop
SOP-003		SPEAKER
SRC-070	R3,S1	VOLUME CONTROL
STL-007	L1	TRANSFORMER - 1st I-F transformer
STL-015	L2	TRANSFORMER - 2nd I-F transformer
STO-004	T1	TRANSFORMER - Output transformer
SWL-001		CORD - Power cord



TUBE AND TRIMMER LOCATION



SOCKET VOLTAGE DIAGRAM

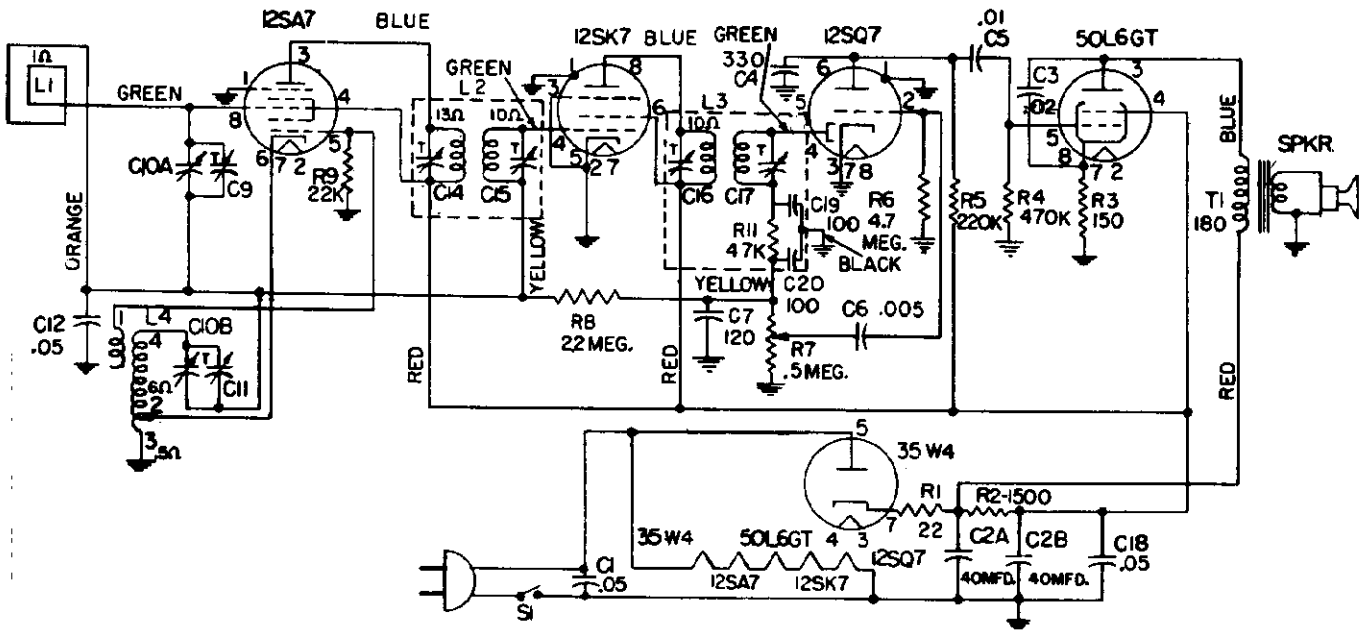


Fig. 3. Schematic Diagram

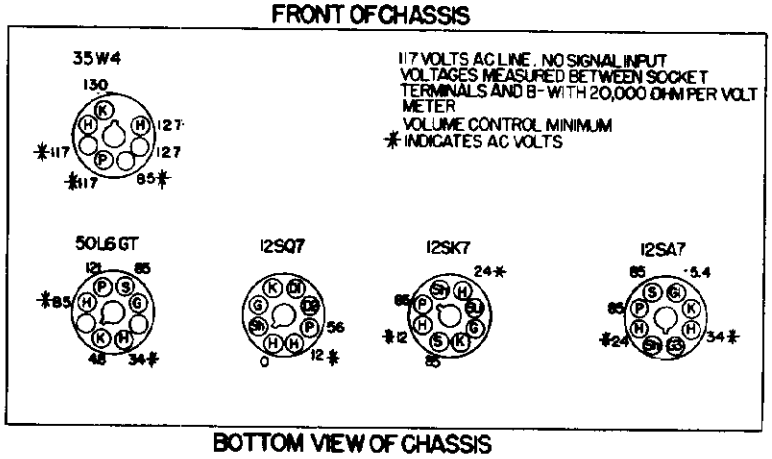
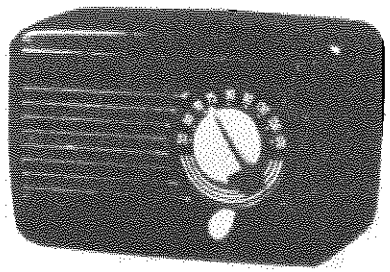


Fig. 2. Socket Voltage Diagram



SPECIFICATIONS

CABINET:

OVER-ALL DIMENSIONS:

Height . . . . . 6 in.
Width . . . . . 9¼ in.
Depth . . . . . 4¾ in.

ELECTRICAL RATING:

Voltage . . . . . 105–125 v. AC or DC
Frequency on AC . . . . . 40–60 cps
Wattage (at 117 volts) . . . . . 28 watts

OPERATING FREQUENCIES:

Broadcast Band . . . . . 540–1725 kc

Intermediate Frequency . . . . . 455 kc

LOUDSPEAKER . . . . . ***"ALNICO V" MAGNET DYNAMIC***

Outside Cone Diameter . . . . . 4 in.
Voice Coil Impedance (400 cycles) . . . . . 3.5 ohms

TUBES COMPLEMENT:

Converter-Oscillator 12SA7
I-F Amplifier 12SK7
Detector, AVC Audio 12SQ7
Power Output 50L6GT
Rectifier 35W4

GENERAL INFORMATION

Model 113 is a five-tube (including rectifier) AC-DC superheterodyne broadcast receiver in a distinctly styled cabinet. This receiver incorporates automatic volume control, attached antenna, permanent magnet "Alnico V" speaker, and beam power output.

ALIGNMENT PROCEDURE

ALIGNMENT FREQUENCIES:

I-F . . . . . 455 kc
R-F . . . . . 1725 kc and 1500 kc
The location of all trimmers is shown in Figure 1.

I-F ALIGNMENT:

Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 kc and keep the oscillator output as low as a readable meter reading will permit. Apply signal to the converter grid through a .05 mfd. capacitor and align progressively the trimmers in the 2nd and 1st i-f transformer cans.

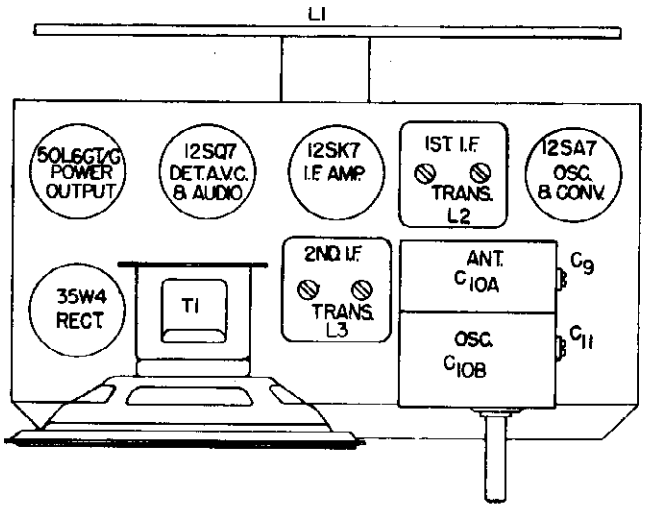


Fig. 1. Tube and Trimmer Location

R-F ALIGNMENT:

Apply the r-f alignment signals through a standard IRE dummy antenna to C9. With the gang condenser wide open, align the oscillator trimmer (C11) to 1725 kc. Change the generator signal to 1500 kc, tune the receiver to the signal, and peak antenna trimmer (C9) for maximum output.

PRECAUTION:

If the signal generator is a-c operated, use an isolating transformer between the power supply and the radio receiver power input. The use of an isolating capacitor is not recommended, as a-c through the capacitor will introduce hum modulation and/or create the possibility of a burned-out signal generator attenuator.

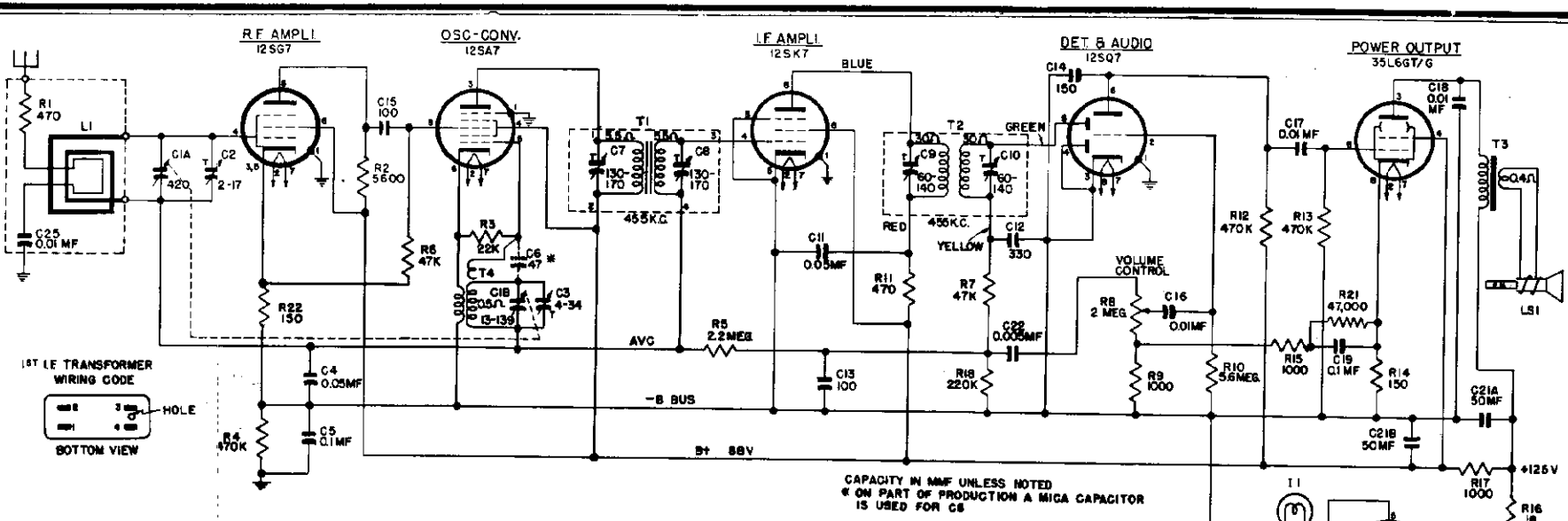
REPLACEMENT PARTS LIST

Cat. No.	Symbol	Description
UNIVERSAL REPLACEMENT PARTS		
UCC-625	C6	CAPACITOR—.005 mf., 600 v., paper
UCC-630	C5	CAPACITOR—.01 mf., 600 v., paper
UCC-631	C3	CAPACITOR—.02 mf., 600 v., paper
UCC-635	C1, 12, 18	CAPACITOR—.05 mf., 400 v., paper
UCU-036		CAPACITOR—220 mmf., mica
UCU-1030*	C7	CAPACITOR—120 mmf., mica
UOP-487	SPKR	SPEAKER—4-inch PM speaker
URD-009	R1	RESISTOR—22 ohms, ½ w., carbon
URD-029	R3	RESISTOR—150 ohms, ½ w., carbon
URD-081	R9	RESISTOR—22,000 ohms, ½ w., carbon
URD-105	R5	RESISTOR—220,000 ohms, ½ w., carbon
URD-113	R4	RESISTOR—470,000 ohms, ½ w., carbon
URD-129	R8	RESISTOR—2.2 meg., ½ w., carbon
URD-137	R6	RESISTOR—4.7 meg., ½ w., carbon
URF-053	R2	RESISTOR—1500 ohms, 2 w., carbon

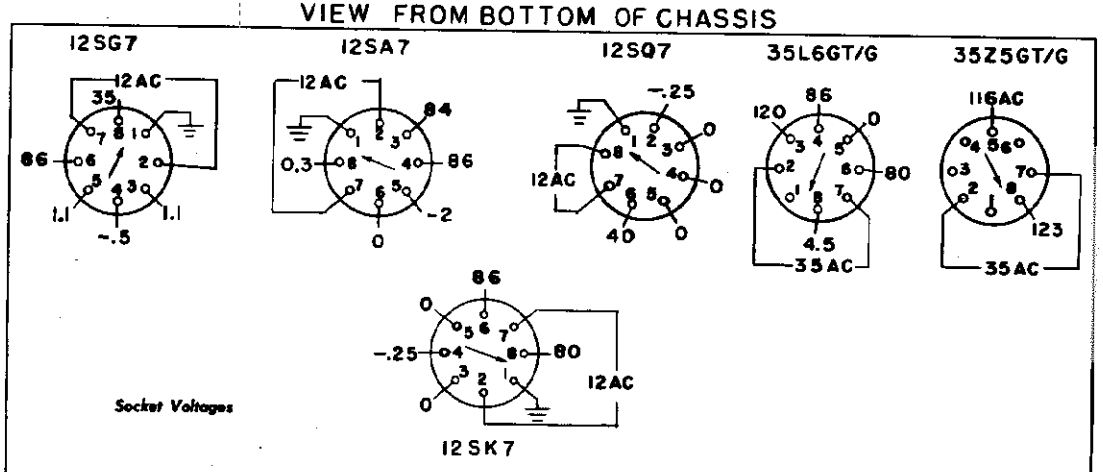
Cat. No.	Symbol	Description
SPECIALIZED REPLACEMENT PARTS		
RCW-2032	C4	CAPACITOR—330 mmf., mica
RDK-008		KNOB—Volume control (Mahogany)
RDK-041		KNOB—Tuning knob with set screw
RDK-144		KNOB—Tuning knob (Mahogany) for plain shaft
RJS-003		SOCKET—Tube socket (octal)
RJS-092		SOCKET—Tube socket
RWL-009		POWER CORD
SAB-001		BACK—Cabinet back
SAU-022		CABINET—Plastic
SCE-009	C2A, B	CAPACITOR—40 x 40 mf., electrolytic
SCT-005	C10A, B	CAPACITOR—Tuning capacitor (knurled with split shaft)
SDK-005**		KNOB—Tuning knob, for knurled shaft
SDK-007		KNOB—Knob for volume control
SLC-020	L4	COIL—Oscillator coil
SLL-002	L1	LOOP—Loop antenna
SRC-004	R7	VOLUME CONTROL AND SWITCH
STL-007	L2	I-F TRANSFORMER—1st i-f transformer
STL-008	L3	I-F TRANSFORMER—2nd i-f transformer
STO-004	T1	OUTPUT TRANSFORMER

* To be used with STL-008.

**To be used with SCT-005.



VIEW FROM BOTTOM OF CHASSIS



CONDITION OF TEST

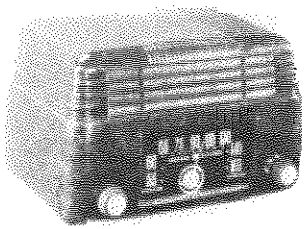
MEASUREMENTS TAKEN ON 20,000 OHMS-PER-VOLT METER

MEASURED FROM PIN TO B-BUS UNLESS SHOWN OTHERWISE

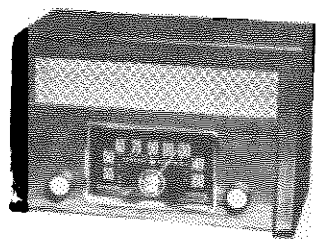
117 VOLTS LINE

VOLUME CONTROL - CLOCKWISE

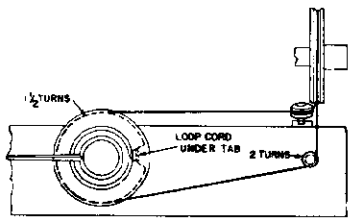
NO SIGNAL INPUT

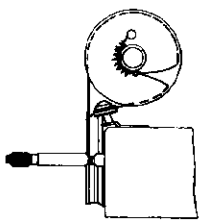


MODEL 200



MODELS 203 & 205





Dial Stringing Diagram

MODELS 200, 203, 205

GENERAL ELECTRIC CO.

ELECTRICAL RATING (INPUT)

Voltage	105-125 volts a-c or d-c
Frequency on a-c	25 to 60 cycles
Wattage	45 watts

OPERATING FREQUENCIES

Broadcast Band	540-1600 kilocycles
I-F Amplifier	455 kilocycles

POWER OUTPUT (117 VOLTS LINE)

Undistorted	1.2 watts
Maximum	1.5 watts

LOUDSPEAKER

Type	Alnico P.M.
Outside Cone Diameter	5¼ in.
Voice Coil Impedance (400 cycles)	3.5 ohms

TUBE COMPLEMENT

R.F. Amplifier	Type 12SG7
Oscillator-Converter	Type 12SA7
I.F. Amplifier	Type 12SK7
Detector-Audio	Type 12SQ7
Power Output	Type 35L6GT
Rectifier	Type 35Z5GT/G
Pilot Lamp	G-E, Type C7, 115-volt, 10-watt, clear, candelabra screw base

ELECTRICAL CIRCUIT ALIGNMENT

ALIGNMENT FREQUENCIES

R-F	1500 kilocycles
I-F	455 kilocycles

EQUIPMENT REQUIRED

1. Test oscillator with audio tone modulation
2. A.C. output meter, 1½ volts full scale
3. 0.05 mf paper capacitor
4. 50 mmf mica capacitor
5. Insulated screwdriver

PROCEDURE—GENERAL

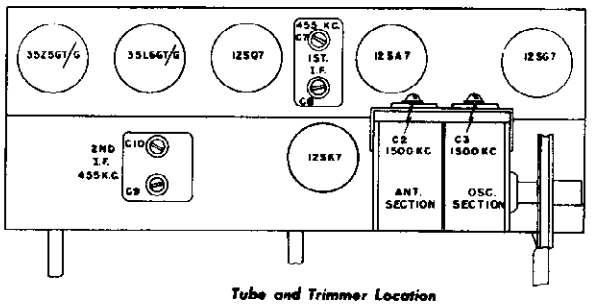
1. Turn dial scale pointer as far counterclockwise as possible. The pointer should coincide with the first marking at the left of the scale. If it doesn't, remove chassis and slip pointer on shaft until the pointer is under reference mark when chassis is bolted in place.

2. For i-f and r-f alignments, the output meter is connected across the loudspeaker voice coil terminals.

3. Keep radio volume control at maximum and attenuate test oscillator signal output so that the output meter reading never exceeds 1½ volts.

4. The chassis must be removed from the cabinet during I-F alignment. For R-F alignment bolt the chassis in the cabinet securely.

5. Connect the capacitor as listed in column 2, between the output "High Side" of test oscillator and the point of input specified.



Tube and Trimmer Location

ALIGNMENT CHART

Step	Connect Test Oscillator to	Test Osc. Setting	Pointer Setting on Radio	Adjustment for Maximum Output
1	12SK7 grid in series with 0.05 mf cap.	455 kc	1500 kc	2nd I-F Trans. Trimmers
2	12SA7 grid in series with 0.05 mf cap.	455 kc	1500 kc	1st and 2nd I-F Trans. Trimmers
3	Ant. Post in series with 50 mmf	1500 kc	1500 kc	C3 (Osc.)
4	Ant. Post in series with 50 mmf	1500 kc	1500 kc	C2 (R-F)

STAGE GAIN AND VOLTAGE CHECKS

Stage gain measurements by vacuum tube voltmeter or similar measuring devices may be used to check circuit performance and isolate trouble. The gain values listed may have tolerances of 20 per cent. Readings taken with low signal input so that AVC is not effective.

(1) R-F Stage Gains.

Antenna post to 12SG7 grid	4 at 1000 kc
12SG7 grid to 12SA7 grid	8 at 1000 kc
12SA7 grid to 12SK7 grid	30 at 455 kc
12SK7 grid to 12SQ7 diode plate	57 at 455 kc

(2) Audio Gain.
0.12 volt at 400 cycles across volume control (R8) with control set at maximum will give approximately ½-watt output across speaker voice coil.

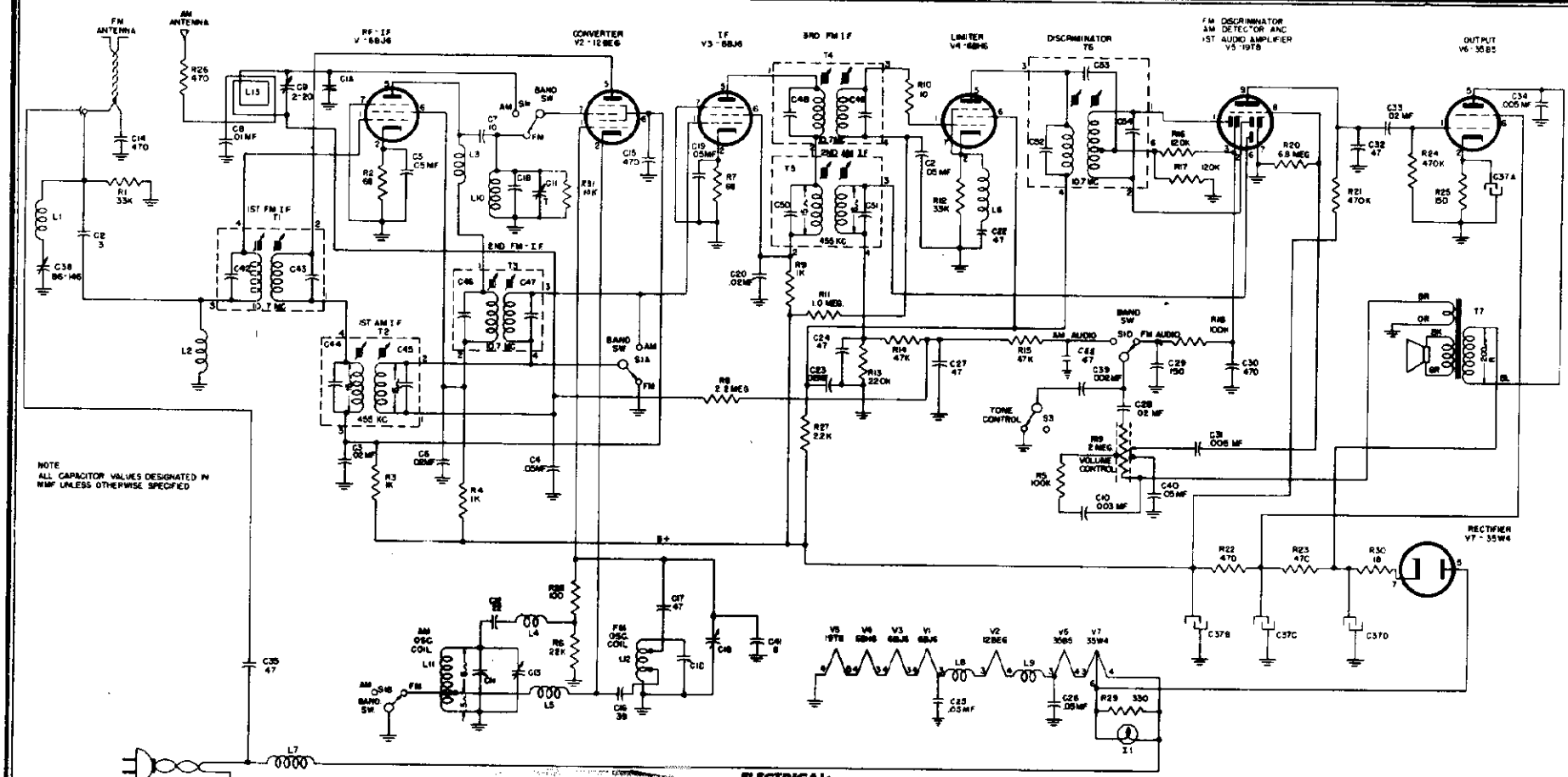
(3) Oscillator Grid Bias.
D-C voltage developed across the oscillator grid leak (R3). Averages 7.7 volts at 1000 kc.

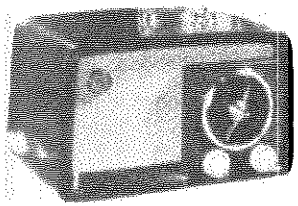
(4) Socket Pin Voltages.
Figure 4 shows voltages from all tube pins to B- unless otherwise specified. Voltage readings much lower than those specified may help localize defective components or tubes.

REPLACEMENT PARTS LIST—MODELS 200, 203, & 205

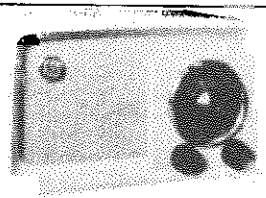
PART NO.	SYMBOL	DESCRIPTION
		UNIVERSAL REPLACEMENT PARTS
UCC-039	C22	CAPACITOR .005 mfd, 600 v, paper
UCC-040	C25	CAPACITOR .01 mfd, 600 v, paper
UCC-048	C5	CAPACITOR 0.1 mfd, 600 v, paper
UCU-020	C6	CAPACITOR 47 mmf, 500 v, mica
UCU-028	C13, 15	CAPACITOR 100 mmf, 500 v, mica
UCU-032	C14	CAPACITOR 150 mmf, 500 v, mica
UCU-040	C12	CAPACITOR 330 mmf, 500 v, mica
UIC-001		CEMENT Loudspeaker cone cement
UIC-002		THINNER Cone cement thinner
UOP-528	LS1	SPEAKER 5¼ in. PM
UOX-001		CONE Replacement cone kit
URD-029	R14, 22	RESISTOR 150 ohms, ½ w, carbon
URD-041	R1, 11	RESISTOR 470 ohms, ½ w, carbon
URD-057	R9, 15	RESISTOR 1000 ohms, ½ w, carbon
URD-067	R2	RESISTOR 5600 ohms, ½ w, carbon
URD-081	R3	RESISTOR 22,000 ohms, ½ w, carbon
URD-089	R6, 7, 21	RESISTOR 47,000 ohms, ½ w, carbon
URD-105	R18	RESISTOR 220,000 ohms, ½ w, carbon
URD-113	R4, 12, 13	RESISTOR 470,000 ohms, ½ w, carbon
URD-129	R5	RESISTOR 2.2 meg, ½ w, carbon
URD-139	R10	RESISTOR 5.6 meg, ½ w, carbon
URF-049	R17	RESISTOR 1000 ohms, 2 w, carbon
		SPECIALIZED REPLACEMENT PARTS
RAB-001		BEAM-A-SCOPE Cabinet back and loop assembly (Models 203, 205)
RAB-003		BEAM-A-SCOPE Cabinet back and loop assembly (Model 200)
RAU-002		CABINET Brown plastic (Model 200)
RAV-025		CABINET Walnut wood (Model 203)
RAV-026		CABINET Blonde wood (Model 205)
RAV-027		CABINET Maple wood (Model 205)

PART NO.	SYMBOL	DESCRIPTION
		SPECIALIZED REPLACEMENT PARTS (Cont'd)
RAX-001		PULLEY—Idler pulley assembly
RCC-013	C19	CAPACITOR—0.1 mfd, 200 v, paper
RCC-040	C16, 17, 18	CAPACITOR—.01 mfd, 600 v, paper
RCC-045	C4, 11, 20	CAPACITOR—.05 mfd, 600 v, paper
RCE-037	C21A, 21B	CAPACITOR—50-50 mfd, 150 v, dry electrolytic
RCT-015	C1A, 1B	CONDENSER—Tuning condenser (includes C2 and C3)
RDC-001		CORD—Drive cord assembly
RDD-001		DRUM—Drive drum and shaft assembly
RDE-001		ESCUTCHEON—Dial escutcheon (Models 203, 205)
RDG-002		PLATE—Dial back plate assembly
RDK-006		KNOB—Control knob
RDS-030		SCALE—Dial scale (Models 203, 205)
RDS-031		SCALE—Dial scale (Models 200, 201)
RHM-004		CLIP—Speed clip for dial scale (Model 200)
RHM-005		CLIP—Speed clip for dial scale (Models 203, 205)
RHM-016		CLIP—Osc. coil mtg. clip
RJS-003		TUBE SOCKET—Octal base tube socket (12SA7)
RJS-005		TUBE SOCKET—Octal base tube socket
RJS-053		SOCKET—Pilot lamp socket
RLC-021	T4	COIL—Oscillator coil
RRC-002	R8, S1	VOLUME CONTROL—2.0 meg potentiometer, includes power switch
RRW-008	R16	RESISTOR—18 ohms, 1 w, wirewound
RTL-001	T1	TRANSFORMER—1st I.F. transformer
RTL-029	T2	TRANSFORMER—2nd I.F. transformer
RTO-003	T3	TRANSFORMER—Output transformer
RWL-009	P1	CORD—Power cord and plug

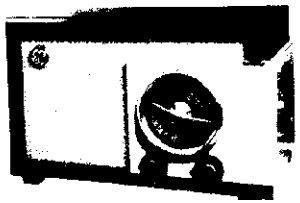




210—Mahogany



211—Ivory



212—Wood

ELECTRICAL:

Voltage....105–125 volts A-c or D-c
Frequency.....50–60 cps
Wattage.....33 watts

TUNING BAND:

AM.....540–1600 kc
FM.....88–108 mc

INTERMEDIATE FREQUENCIES:

AM.....455 kc
FM.....10.7 mc

POWER OUTPUT (117 volts line)

Undistorted.....1.1 watts
Maximum.....1.8 watts

LOUDSPEAKER:

Type.....“Alnico” permanent magnet

TUBE COMPLEMENT:

(V1) FM RF and 1st I-F Amplifier....6BJ6
(V2) Oscillator-Converter.....12BE6
(V3) I-F Amplifier.....6BJ6
(V4) Limiter.....6BH6
(V5) FM Discriminator, AM Detector, and 1st Audio Amplifier.....19T8
(V6) Power Output.....35B5
(V7) Rectifier.....35W4
(I1).....Mazda #47, 6–8 v.

MODELS 210, 211, 212

GENERAL ELECTRIC CO.

GENERAL

Models 210, 211 and 212 are alike except for cabinets. Model 210 is a mahogany-colored plastic cabinet. Model 211 is an ivory plastic cabinet, while 212 is a wood cabinet.

These models are designed to operate either from built-in antennas or from an external AM antenna or FM dipole antenna. On AM it is merely necessary to connect an external antenna to the terminal screw marked "Antenna." On FM, to operate the receiver from the built-in power line antenna, it is necessary to connect the green wire coming out the back of the cabinet back, to the right-hand terminal screw of the antenna terminal strip.

For operation from a 300-ohm FM dipole (G. E. Cat. No. UKA-006 or UKR-006), remove this green wire from the terminal and connect the 300-ohm transmission line (G. E. Cat. No. UWT-002) to the terminals marked "DIPOLE."

On AM operation, the set operates as a five-tube set with the signal being fed directly into the converter grid.

On FM, the set uses a reflex circuit, the Armstrong type discriminator and a special limiter circuit.

In the reflex circuit, V1 (6BJ6) acts both as an r-f amplifier and as the 1st i-f amplifier. The r-f signal is fed into the grid of V1 through the secondary of T1. It is amplified by V1 and tuned at the converter grid by L10, C1B and trimmer C11. In the converter, the r-f is changed to 10.7 mc i-f, and fed into the primary of T1 and again inserted into the grid of V1, which now acts as an i-f amplifier. The i-f signal is fed from the plate of V1 through choke L3 into the second i-f transformer. L1 and C38 form a 10.7 mc wave trap to eliminate any i-f signal from the antenna circuit to prevent interference. C2 and L2 are designed to peak at 98 mc with strays to increase the FM r-f sensitivity. At the FM r-f frequencies, the capacitor C42 offers little series impedance to the r-f signal. L3 and C7 form a high-pass filter to pass the FM r-f signal into the converter grid and to shunt the FM i-f frequency into the primary of the second FM i-f transformer.

It should be noted that the FM oscillator coil L12 is a section of 300-ohm line shorted at one end to form a one-turn loop. C16 and C17 are tapped in at each side of the shorted end.

L6 and C22 in the cathode circuit of the limiter tube are series tuned to 10.7 mc. This effectively grounds the cathode for IF. The presence of R12, however, provides a highly degenerative condition for any amplitude modulation applied to the limiter grid. The cathode bias developed by R12 is approximately 50 volts, which makes it necessary to insert onto the grid of V4 from B+ 50 volts through R11.

STAGE GAIN AND VOLTAGE CHECKS

Stage gain measurements by a vacuum tube voltmeter or similar measuring device may be used to check circuit performance and isolate trouble. The gain values listed may have tolerances of ±20%. Readings should be taken with low signal voltage so that AVC is not effective.

1. R-F AND I-F STAGE GAINS

Signal applied through IRE dummy antenna:

Antenna Post to V2 Grid	4.0 at 1000 kc
V2 Grid to V3 Grid	38 at 455 kc
Dipole Terminals to V1 Grid	1.3 at 98 mc
V1 to V2 Grid	8.0 at 98 mc
V2 to V1 Grid	1.6 at 10.7 mc
V1 to V3 Grid	22 at 10.7 mc
V3 to V4 Grid	26 at 10.7 mc

2. AUDIO GAIN

.09 volts at 400 cps across volume control with volume control set at maximum will give approximately ½ watt output across the speaker voice coil.

3. OSCILLATOR GRID BIAS

D-c voltage developed across R6:
4.8 volts at 1000 kc.
2.2 volts at 98 mc.

4. SOCKET PIN VOLTAGES

Figure 3 shows typical tube pin voltages. All readings should be made from the pins to ground, unless otherwise indicated.

5. HUM MEASUREMENT

Hum measured across the voice coil of the speaker with volume control at minimum and Band switch on AM should not exceed 10 millivolts.

On FM, ground limiter grid and measure hum across voice coil with volume control at maximum. Hum should not exceed 20 millivolts.

ANTENNA:

AM	Loop antenna, or outside antenna
FM	Power cord antenna, or 300-ohm FM dipole antenna

ALIGNMENT

Two methods of alignment are given: (1) The regular meter alignment as previously used; and (2) Visual alignment, which allows for more precision in aligning the i-f transformers and particularly the discriminator alignment where it is necessary that the negative and positive half cycles of the output wave have equal amplitude and symmetry.

EQUIPMENT REQUIRED FOR METER ALIGNMENT:

1. Test oscillator with tone modulation.
2. 20,000 ohm-per-volt voltmeter or microammeter.
3. A-c voltmeter, 2 volts.
4. .01 mfd., paper capacitor.
5. 200,000 ohm resistor, ½ watt.

EQUIPMENT REQUIRED FOR VISUAL ALIGNMENT:

1. General Electric YGS-3 AM and FM signal generator, or equivalent.
2. General Electric CRO-5A oscilloscope, or equivalent.
3. 200,000 ohms ½ watt resistor.
4. 20,000 ohm-per-volt meter.
5. .01 mfd paper capacitor.
6. 8 to 10 mfd Pyranol capacitor.

NOTES IN CONNECTION WITH VISUAL ALIGNMENT TABLE:

1. Connect vertical plates of scope to the limiter cathode (pin 2 or 7 of V4) through 200,000-ohm resistor and ground. Connect an 8 to 10 mfd. pyranol capacitor between junction of C21 and R11 and ground.

2. Connect vertical plates of scope to junction of R18 and C29 (FM audio).

3. Connect vertical plates of scope at junction of R15 and C27 (AM audio).

4. Use a 60-cycle, amplitude-modulated signal.

5. In some cases tuning of the converter grid will cause "pulling in" of the oscillator and will change the oscillator frequency. After centering the response curve, if peaking of C11 causes the curve to move off the screen, it is necessary to recalibrate the oscillator as in Step 9.

6. The termination impedance of the signal generator should be 300 ohms to properly match the FM imput impedance of this receiver.

7. To align the 1st i-f transformer (T1), it is necessary to disconnect the copper strap from the 12BE6 at the tube pin connection. After aligning T1, resolder the copper strap to pin 7 of the 12BE6.

8. To position the dial pointer, close the gang condenser completely and place the dial pointer on the shaft such that it is parallel to the chassis.

9. For alignment of the AM oscillator and r-f trimmers, the signal should be inductively coupled to the loop antenna by connecting a four-turn, six-inch diameter loop of bell wire to the signal generator terminals, and then locate this loop about one foot from the radio loop antenna. To prevent possible errors in peak readings, the position of the loop with respect to the radio loop antenna should not be changed during any one set of adjustments.

NOTES IN CONNECTION WITH METER ALIGNMENT CHART:

1. Use unmodulated signal.

2. Connect a 20,000 ohm-per-volt meter from junction of C29 and R18 to chassis. Use ten-volt scale.

3. Connect a 20,000 ohm-per-volt meter from cathode of limiter (pin 2 or 7 of V4) to junction of C21 and R11 in series with 200,000-ohm resistor. The resistor should be connected directly to the cathode to minimize capacity loading and to isolate the i-f signal voltage from the meter. Keep signal generator level down so that meter indicates not more than one volt at the cathode (5 microamps through 200,000 ohms).

4. Use 400-cycle modulation.

5. Connect a standard output meter across speaker voice coil. Turn volume control full on. Keep signal generator output down so that meter indicates not more than ½ watt.

6. For alignment of the AM oscillator and r-f trimmers, the signal should be inductively coupled to the loop antenna by connecting a four-turn, six-inch diameter loop of bell wire to the signal generator terminals, and then locate the loop about one foot from the radio loop antenna. To prevent possible errors in peak readings, the position of the loop with respect to the radio loop antenna should not be changed during any one set of adjustments.

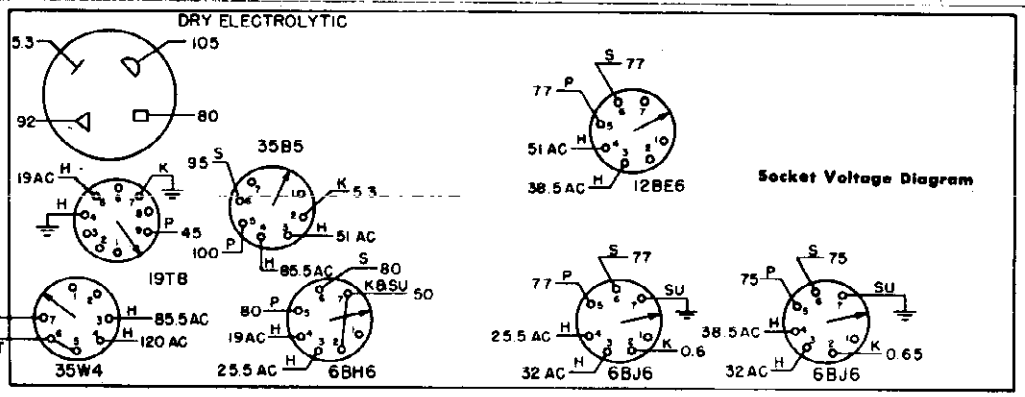
7. To align the first FM i-f transformer (T1), it is necessary to disconnect the copper strap from the tube grid connection (pin 7 of 12BE6). Resolder the strap after T1 is aligned.

8. The AM r-f alignment should be made before the FM r-f alignment. With the gang condenser fully closed or meshed, the dial pointer should be parallel to the top of the chassis.

9. Termination impedance of the signal generator should be 300 ohms.

ALIGNMENT CHARTS

STEP	SIGNAL GENERATOR FREQUENCY	SIGNAL INPUT POINT	BAND SWITCH SETTING	DIAL SETTING	ADJUST	SEE NOTE
			AM I-F METER ALIGNMENT			
1	455 kc	12BE6 grid (Pin 7 of V2) thru .01 mfd.	AM	550	Two slugs of T5 for maximum.	4, 5
2	455 kc	Same as Step 1.	AM	550	Two slugs of T2 for maximum.	4, 5
			FM I-F AND DISCRIMINATOR METER ALIGNMENT			
3	10.7 mc	6BJ6 grid (Pin 1 of V1)	FM	....	Adjust tuning slugs of T4 for maximum.	1, 3
4	10.7 mc	6BJ6 grid (Pin 1 of V1)	FM	....	Adjust tuning slugs of T3 for maximum.	1, 3
5	10.7 mc	12BE6 grid (Pin 1 of V2). See Note 7.	FM	....	Adjust tuning slugs of T1 for maximum.	1, 3, 7
6	10.7 mc	6BJ6 grid (Pin 1 of V3)	FM	....	Adjust T6 secondary for minimum 400-cycle output. Three null points will be noticed (the center one is correct). When T6 is tuned either side of this point, the sound output will increase.	4, 5
7	*	Same as Step 6.	FM	....	*Detune signal generator to smaller of two peaks found, one on each side of 10.7 mc.	1, 2
8	Same as Step 4.	Same as Steps 6 and 7.	FM	....	Adjust T6 primary for maximum.	1, 2
			AM R-F METER ALIGNMENT			
9			Repeat Step 6			
10	1500 kc	Inductively coupled. (Note 8)	AM	*1500 kc	Adjust C13 for maximum.	4, 5, 6, 8*
11	1500 kc	Inductively coupled.	AM	For max. output	Adjust C9 for maximum while rocking dial.	4, 5, 6
			FM R-F METER ALIGNMENT			
12	108 mc	**Dipole terminals	FM	108 mc	Adjust for C18 for maximum.	1, 3, 9**
13	98 mc	Dipole terminals	FM	For maximum output	Adjust C11 for maximum while rocking generator.	1, 3
14	10.7 mc	Dipole terminals	FM	....	Adjust C38 for minimum.	1, 3



ALL VOLTAGES ARE +DC
UNLESS OTHERWISE SPECIFIED
ALL VOLTAGES TO CHASSIS

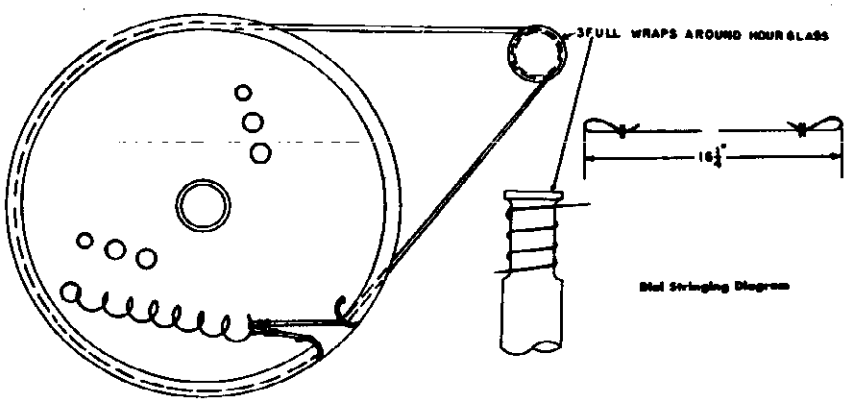
BACK OF CHASSIS
BOTTOM VIEW OF CHASSIS

VOLTAGES MEASURED WITH E_L = 120 V
DC VOLTAGES WITH 20,000 OHMS PER VOLT METER
AC VOLTAGES WITH 1,000 OHMS PER VOLT METER

MODELS 210, 211, 212

GENERAL ELECTRIC CO.

STEP	SIGNAL GENERATOR FREQUENCY	SIGNAL INPUT POINT	BAND SWITCH SETTING	DIAL SETTING	ADJUST	SEE NOTE
			AM I-F VISUAL ALIGNMENT			
1	455 kc ±20 kc at 60-cycle sweep rate	12BE6 grid (Pin 7 of V2) thru .01 mfd.	AM	....	Two slugs of T5 for maximum amplitude and minimum distortion.	3
2	455 kc ±20 kc at 60-cycle sweep rate	Same as Step 1.	AM	....	Two slugs of T2 for maximum.	3
			FM I-F AND DISCRIMINATOR VISUAL ALIGNMENT			
3	10.7 mc ±300 kc at 60-cycle rate	6BJ6 grid (Pin 1 of V1)	FM	....	Adjust tuning slugs of T4 for maximum amplitude of wave.	1
4	10.7 mc ±300 kc at 60-cycle rate	6BJ6 grid (Pin 1 of V1)	FM	....	Tuning slugs of T3 for maximum amplitude of wave.	1
5	10.7 mc ±300 kc at 60-cycle rate	12BE6 grid (Pin 1 of V2) See Note 7	FM	....	Tuning slugs of T1 for maximum amplitude of wave.	1, 7
6	10.7 mc ±300 kc at 60-cycle rate	6BJ6 grid (Pin 1 of V3)	FM	....	Adjust primary of T6 for maximum amplitude.	2
7	10.7 mc ±300 kc at 60-cycle rate	Same as Step 6.	FM	....	Adjust secondary of T6 for vertical symmetry with respect to midpoint horizontal trace.	2
8	10.7 mc ±300 kc at 60-cycle rate	Same as Steps 6 and 7.	FM	....	Adjust primary of T6 for straightest line between positive and negative peaks.	2
			AM R-F VISUAL ALIGNMENT			
9	1500 kc	*Inductively coupled	AM	1500 kc	Adjust C13 for steepest slope of straight-line trace on scope.	3, 4 * 9, 8
10	1500 kc ±20 kc at 60 cps rate	Inductively coupled	AM	For max. output	Adjust C9 for maximum amplitude and minimum distortion.	3, 5 * 9
			FM R-F VISUAL ALIGNMENT			
11	108 mc	Dipole** terminals	FM	108 mc	Adjust C18 for steepest slope of straight-line trace on scope.	1, 4 6**
12	98 mc ±300 kc at 60 cps rate	Dipole terminals	FM	For max. output	Adjust C11 for maximum amplitude and minimum distortion.	1, 6
13	10.7 mc ±300 kc at 60-cycle rate	Dipole terminals	FM	....	Adjust C38 of minimum amplitude.	1, 6

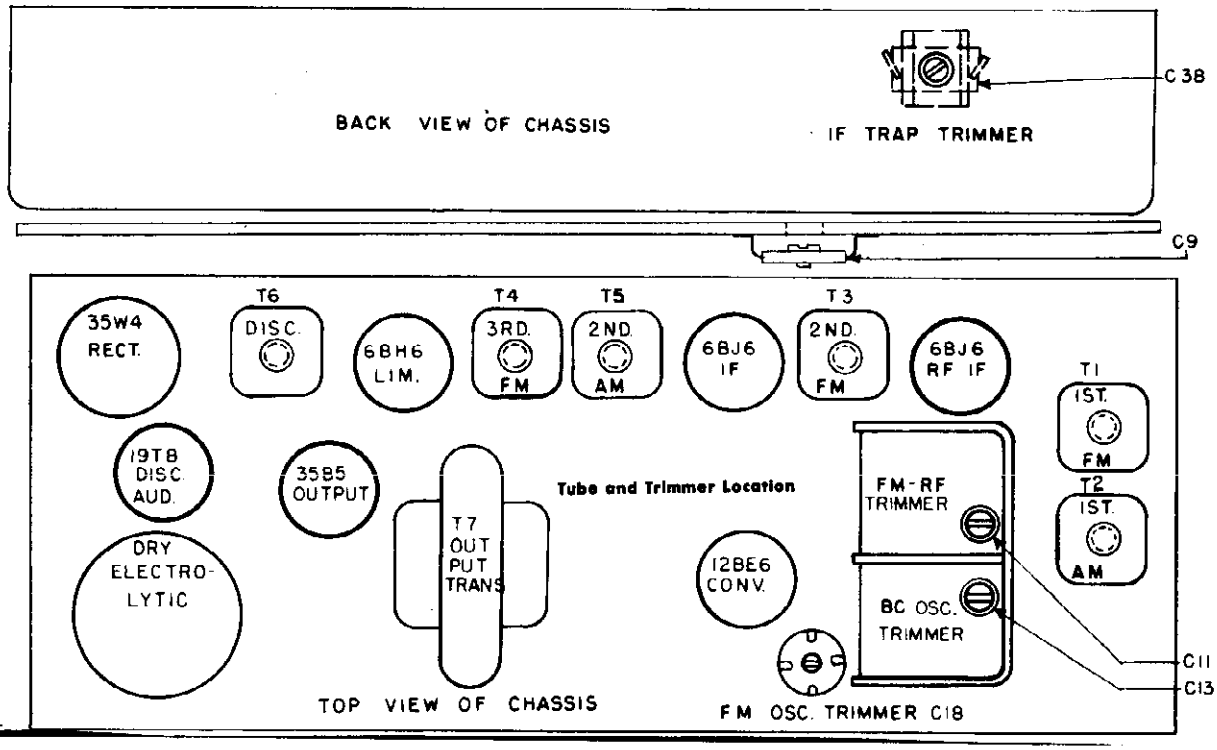


Dial Stringing Diagram

GENERAL ELECTRIC CO.

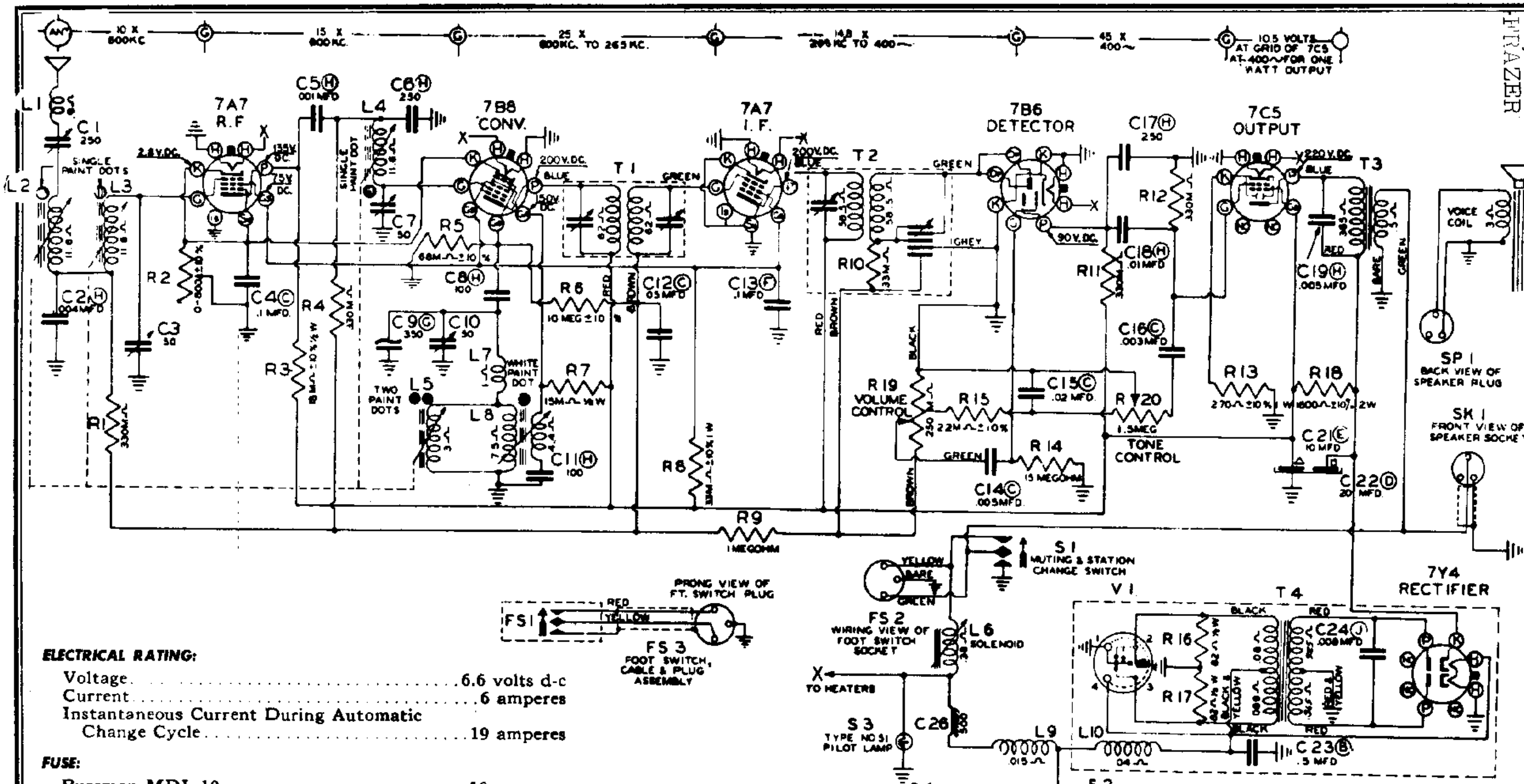
Cat. No.	Symbol	Description
UNIVERSAL REPLACEMENT PARTS		
UCC-621	C39	CAPACITOR—.002 mfd., 600 v., paper
UCC-623	C10	CAPACITOR—.003 mfd., 600 v., paper
UCC-625	C31, 34	CAPACITOR—.005 mfd., 600 v., paper
UCC-630	C8	CAPACITOR—.01 mfd., 600 v., paper
UCC-631	C3, 6, 20, 23, 28, 33	CAPACITOR—.02 mfd., 600 v., paper
UCC-635	C4, 5, 19, 25, 26, 21, 36, 40	CAPACITOR—.05 mfd., 600 v., paper
UCU-020	C24, 27, 32, 35	CAPACITOR—47 mmf., ±20%, mica
UCU-032	C29	CAPACITOR—150 mmf., ±20%, mica
UCU-044	C30	CAPACITOR—470 mmf., ±20%, mica
UOP-557		SPEAKER—5¼-inch PM speaker
URD-001	R10	RESISTOR—10 ohms, ½ w., carbon
URD-025	R2, 7, 28	RESISTOR—100 ohms, ½ w., carbon
URD-037	R29	RESISTOR—330 ohms, ½ w., carbon
URD-041	R26	RESISTOR—470 ohms, ½ w., carbon
URD-049	R3, 4, 9	RESISTOR—1000 ohms, ½ w., carbon
URD-057	R27	RESISTOR—2200 ohms, ½ w., carbon
URD-081	R6	RESISTOR—22,000 ohms, ½ w., carbon
URD-085	R1, 12	RESISTOR—33,000 ohms, ½ w., carbon
URD-089	R14, 15	RESISTOR—47,000 ohms, ½ w., carbon
URD-097	R5, 18	RESISTOR—100,000 ohms, ½ w., carbon
URD-099	R16, 17	RESISTOR—120,000 ohms, ½ w., carbon
URD-105	R13	RESISTOR—220,000 ohms, ½ w., carbon
URD-113	R21, 24	RESISTOR—470,000 ohms, ½ w., carbon
URD-121	R11	RESISTOR—1.0 meg., ½ w., carbon
URD-129	R8	RESISTOR—2.2 meg., ½ w., carbon
URD-141	R20	RESISTOR—6.8 meg., ½ w., carbon
URE-029	R25	RESISTOR—150 ohms, 1 w., carbon
URE-041	R22, 23	RESISTOR—470 ohms, 1 w., carbon
SPECIALIZED REPLACEMENT PARTS		
RAA-007		ARM—Switch arm for tone control
RAB-074	L13	LOOP AND BACK ASSEMBLY FOR MODELS 210 AND 211
RAB-075	L13	LOOP AND BACK ASSEMBLY FOR MODEL 212
RAU-036		CABINET—White plastic cabinet for Model 211
RAU-037		CABINET—Brown plastic cabinet for Model 210
RAV-057		CABINET—Wood cabinet for Model 212
RCE-065	C37A, B, C, D	CAPACITOR—Electrolytic capacitor
RCT-031	C1A, B, C, D, C11, 13	CAPACITOR—Tuning capacitor
RCW-176	C14, 15	CAPACITOR—470 mmf., ±20%, max. neg., ceramic
RCW-1052	C17	CAPACITOR—47 mmf., ±20%, max. neg., ceramic
RCW-1057	C16	CAPACITOR—39 mmf., ±10%, max. neg., ceramic
RCW-1060	C7	CAPACITOR—10 mmf., ±20%, zero temp. coef., ceramic

Cat. No.	Symbol	Description
SPECIALIZED REPLACEMENT PARTS (Cont'd)		
RCW-2010	C22	CAPACITOR—47 mmf., ±5%, zero temp. coef., ceramic
RCW-2033	C41	CAPACITOR—8 mmf., ±10%, max. neg., ceramic
RCW-3004	C2	CAPACITOR—3 mmf., ±20%, zero temp. coef., ceramic
RCW-3016	C12	CAPACITOR—20 mmf., ±5%, max. neg., ceramic
RCY-016	C9	CAPACITOR—2-20 mmf., trimmer capacitor
RCY-029	C18	CAPACITOR—FM oscillator trimmer
RCY-044	C38	CAPACITOR—86-146 mmf., trimmer capacitor
RDE-031		ESCUTCHEON
RDK-130		KNOB—Fawn for Model 210 tone control
RKD-131		KNOB—Fawn for Model 210 tuning control
RDK-132		KNOB—Fawn for Model 210 volume control and band switch
RDK-133		KNOB—Maroon for volume control and band switch on Models 211, 212
RDK-134		KNOB—Maroon for tone control on Models 211, 212
RDK-135		KNOB—Maroon for tuning on Models 211, 212
RDP-039		POINTER ASSEMBLY
RDS-071		SCALE, DIAL SCALE
RDW-009		WINDOW
RHG-015		GROMMET—Rubber grommet
RJS-033		SOCKET—For dial light
RJS-105		SOCKET—7-prong tube socket
RJS-118		SOCKET—9-prong tube socket
RJX-019		SOCKET—Female interlock socket on power cord
RLA-012	L4	CHOKE—FM oscillator grid choke
RLB-026	L10	COIL—FM R-F coil
RLC-066	L11	COIL—AM oscillator coil
RLC-067	L12	COIL—FM oscillator coil (length of 300-ohm line between tuning condenser and terminal board tapped at the converter tube)
RLI-005	L3, 8, 9	CHOKE—FM choke
RLI-044	L7	CHOKE—Power line choke
RLI-056	L2	CHOKE—FM antenna choke
RLI-057	L5	CHOKE—FM oscillator cathode choke
RLI-058	L6	CHOKE—Limiter cathode choke
RLI-062	L1	CHOKE—FM Choke
RMG-009		GEAR SEGMENT—For tone control
RMS-004		SPRING—Dial cord tension spring
RRC-082	R19, S2	VOLUME CONTROL AND POWER SWITCH
RRW-008	R30	RESISTOR—Flexible resistor, 18 ohms, 1 w., ±10%
RSI-003		SOCKET—Male interlock on chassis
RSW-056	S1	SWITCH—Bandchange switch
RSW-057	S3	SWITCH—Tone control switch
RTD-006	T6	TRANSFORMER—Discriminator transformer
RTL-054	T5	TRANSFORMER—AM-2nd I-F transformer
RTL-077	T1, 3, 4	TRANSFORMER—1st, 2nd and 3rd FM I-F transformer
RTL-078	T2	TRANSFORMER—AM 1st I-F transformer
RTO-049	T7	TRANSFORMER—Output transformer



MODEL 230
KAISER-FRAZER

GENERAL ELECTRIC CO.



ELECTRICAL RATING:

Voltage .... 6.6 volts d-c
Current .... 6 amperes
Instantaneous Current During Automatic Change Cycle .... 19 amperes

FUSE:

Bussman MDL-10 .... 10 amperes

OPERATING FREQUENCIES:

Broadcast Band .... 540-1600 kc
I-F Amplifier .... 265 kc

SENSITIVITY:

7 microvolts for one watt output (at band ends)
6 microvolts for one watt output (at points other, than band ends)

POWER OUTPUT:

Measured at the voice coil:
Undistorted .... 2.5 watts
Maximum .... 3.5 watts

VIBRATOR:

Nonsynchronous .... 6 volts

LOUDSPEAKER:

Oval, Dynamic .... 6 x 9 inch

TUBE COMPLEMENT:

R-F Amplifier 7A7
Oscillator-Converter 7B8
I-F Amplifier 7A7
Detector and Audio Amplifier 7B6
Power Output 7C5
Rectifier 7Y4

CONTROLS:

On-Off Switch and Volume Control
Tone Control
Manual Tuning
Station Selector Control (automatic tuning and silencing)
Foot Control (automatic tuning and silencing)

ALL CONDENSERS ARE MMFD. UNLESS OTHERWISE SPECIFIED

ON ALL CONDENSERS —
Ⓐ = 25 VOLTS Ⓑ = 120 VOLTS Ⓒ = 200 VOLTS
Ⓓ = 300 VOLTS Ⓔ = 350 VOLTS Ⓕ = 400 VOLTS
Ⓗ = 600 VOLTS Ⓘ = 800 VOLTS Ⓙ = 1600 VOLTS

FOR RESISTORS: M = 1000 Ω E.G. 10M = 10,000 Ω
ALL RESISTORS ARE ½ WATT & ± 20% UNLESS OTHERWISE SPECIFIED

⏚ = DESIGNATES CHASSIS GROUND

ALL TUBE SOCKETS ARE BOTTOM VIEWS

STAGE GAINS

TAKEN AT ANT. SOCKET AT R F GRID AT 800KC & TAKEN AT CONV GRID AT 265KC.

DUMMY ANTENNA

30 MMFD SERIES & 30 MMFD. SHUNT AT ANT SOCKET & 0.1 MFD. SERIES TO CONVERTER GRID

BATTERY CONDITIONS

6.3 VOLTS AT STORAGE BATTERY TERMINALS WITH POSITIVE GROUNDED

TEST CONDITIONS

VOL. CONTROL SET AT "MAX" TONE CONTROL SET ON "HIGH", WITH NO INCOMING SIGNAL

VOLTAGES READ FROM POINT SHOWN TO CHASSIS WITH 1000 OHM PER VOLT METER

ELECTRICAL CIRCUIT ALIGNMENT

EQUIPMENT REQUIRED:

1. Test oscillator with audio tone modulation.
2. A-C output meter, 2½ volts full scale.
3. Insulated screwdriver.
4. .1 mf. paper capacitor.
5. Two 30 mmf. mica capacitors.
6. Jeweler's vise (for core adjustment).

PROCEDURE—GENERAL:

1. The alignment procedure is given in the Alignment Chart, Table I.

2. Alignment Chart, Table II, will be used *only* when a tuning core or coil has been replaced.

3. Figure 9 is the schematic circuit of a recommended dummy antenna, closely resembling actual antenna capacity, to be used in series with the signal generator leads when aligning the r-f section of the receiver.

4. Reference is made to Figures 10 and 11 for trimmer locations.

5. Connect output meter across voice coil.

6. Make all adjustments with volume control on full, tone control in clockwise (treble) position.

7. Keep signal generator output reduced as much as possible for about half-scale output meter reading.

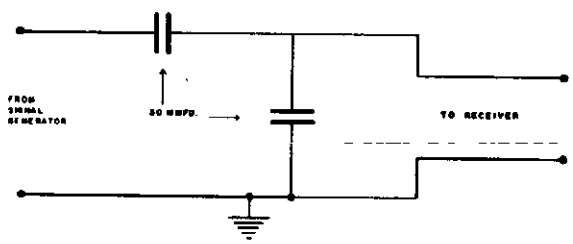
ALIGNMENT CHART, TABLE I

Step	Connect Signal Generator to	Signal Generator Setting	Dial Setting	Adjust for Maximum
	I-F ALIGNMENT			
1	†Grid (pin 6) 7A7	265 kc	*535 kc	2nd. I-F, T2, Trimmers A and B
2	†Grid (pin 6) 7B8	265 kc	*535 kc	1st. I-F, T1, Trimmers C and D
3	Repeat 1 and 2 for accuracy			
	R-F ALIGNMENT			
4	‡Antenna socket	1400 kc	**1400 kc	Oscillator trimmer C10
5	‡Antenna socket	1400 kc	**1400 kc	Converter trimmer C7, R-F trimmer C3

† Low side of signal generator to chassis, high side in series with .1 mf. paper capacitor.
‡ Signal generator through dummy antenna.
* R-F gang closed.
** Receiver in manual position.

NOTES IN CONNECTION WITH ALIGNMENT TABLE I

1. If dial calibration is off after completing alignment, a correction can be made by a screw adjustment of the eccentric cam that actuates the tail of the dial scale pointer. This can correct the pointer for position and travel.



Dummy Antenna

2. After reinstalling the receiver in the car, allow it to operate for approximately 15 minutes to reach normal operating temperature. Extend antenna to maximum. Check the antenna trimmer alignment on a weak station at approximately 1200 kc.

ALIGNMENT CHART II

For Core or Coil Replacement Only

Step	Signal Generator Setting	Dial Setting	Remarks
1	1675 kc	*1600 kc	Screw Ant., R-F, converter, and oscillator cores out of their coils
2	1675 kc	*1600 kc	Adjust oscillator trimmer C10 at 1675 kc
3	1675 kc	*1600 kc	Adjust converter trimmer C7, R-F trimmer C3, and antenna trimmer C1 for maximum
4			Replace cores to their approximate original positions
5	1400 kc	1400 kc	Adjust oscillator core to scale at 1400 kc
6	1400 kc	1400 kc	Adjust antenna core, RF core, and converter core for maximum
7	600 kc	**600 kc	"Rock-in" shunt oscillator coil for maximum
8	Recheck step 6 at 1400 kc		
9	1200 kc	1200 kc	Check receiver for calibration and gain
10	Repeat steps 5, 6, 7, and 8		If receiver is off calibration or weak

* Maximum high frequency end of dial.
** "Rocking" consists of adjusting the indicated adjuster while turning the dial a small amount back-and-forth through peak output. The object is to find the maximum peak.

NOTES IN CONNECTION WITH ALIGNMENT TABLE II

1. After alignment is complete, the maximum high frequency tuning range should be checked. If the range is greater or less than 1605 kc, the mechanical stop for the tuner cross-arm should be bent to limit the frequency coverage to 1605 kc.

2. After all adjustments have been made, glue core screws with speaker cement.

3. After reinstalling the receiver in the car, allow it to operate for approximately 15 minutes to reach normal operating temperature. Extend antenna to maximum. Check the antenna trimmer alignment on a weak station at approximately 1200 kc.

PERMEABILITY TUNING UNIT

The permeability tuning unit is a sub-assembly of the receiver. It contains the antenna and r-f coil assembly, and the oscillator and converter coil assembly. A solenoid which is energized by the six volts of the car battery is operated by the station selector bar or button and the foot control. This solenoid is mounted between the slug-tuned coil assemblies and functions to operate a cross arm assembly, pulling it from left to right or to a rest position from any one of the six turret stops. This actuates the drive of a ratchet gear to effect a change in tuning (see page 2, paragraph under Automatic Tuning Adjustments). The rest of the tuning unit is made up of the tuning control shaft, gears, ratchets, springs, cams, and brackets to complete the assembly.

This unit is covered more thoroughly under separate service data publication ER-S-231. In it are instructions for changing the ratchet gear and solenoid. It also contains all service data and a parts list on the Auto Radio Permeability Tuning Unit.

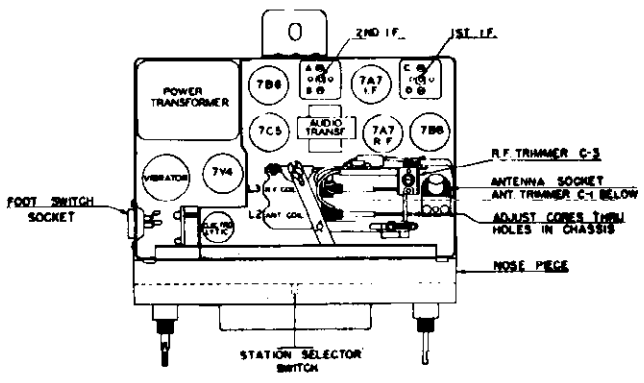
MODEL 230
KAISER-FRAZER

GENERAL ELECTRIC CO.

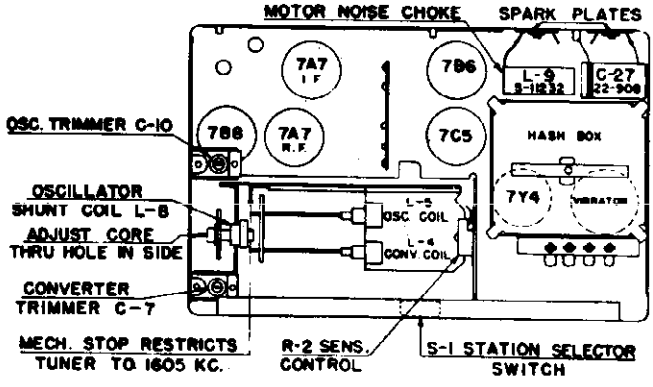
Cat. No.	Symbol	Description
DIAL AND TUNING MECHANISM ASSEMBLY		
RDB-012		BUTTON—Station selector button (Kaiser)
RDE-025		ESCUTCHEON—Dial scale escutcheon
RDM-002		FLAG—Indicator flag and window assembly (Frazer)
RDM-003		FLAG—Indicator flag and window assembly (Kaiser)
RDP-030		POINTER Dial pointer assembly (Kaiser)
RDP-031		POINTER Dial pointer assembly (Frazer)
RDS-041		SCALE—Dial scale (Frazer)
RDS-042		SCALE—Dial scale (Kaiser)
REI-007		CORE—Adjusting spring and core
RHH-005		RING—Turret screw lock ring
RJP-016		PLUG—Solenoid end plug and bracket assembly
RJS-067		SOCKET—Dial light socket and wire assembly
RLS-001	L6	COIL—Tuning solenoid and terminal assembly
RMD-001		Disc—Indexing disc
RMG-006		GEAR Ratchet gear
RML-011		LEVER—Mounting plate and lever assembly
RMM-026		ARM—Cross arm assembly
RMR-003		RATCHET—Ratchet and bracket assembly
RMS-084		SPRING Gear indexing spring
RMS-085		SPRING Cross arm return spring
RMS-086		SPRING Cam lever spring
RMS-087		SPRING Ratchet gear return spring
RMS-088		SPRING Lever spring
RMS-089		SPRING Kick-off spring
RMS-090		SPRING Tuning shaft spring
RMS-091		SPRING—Solenoid switch spring
RMS-092		SPRING—Solenoid switch contact spring
RMU-024		SHAFT—Tuning shaft and gear assembly (Kaiser)
RMU-025		SHAFT—Tuning shaft and gear assembly (Frazer)
RMX-085		ASSEMBLY Turret assembly
UDL-005	S3	LAMP Dial light bulb
CHASSIS COMPONENTS		
RAP-003		PLATE—Speaker mounting plate
RCE-049	C20, 21, 22	CAPACITOR—10 mfd., 300 v.; 20 mfd., 350 v., dry electrolytic
RCN-007	C24	CAPACITOR—.008 mfd., 1600 v., paper
RCN-008	C9	CAPACITOR—350 mmf., compensator
RCU-279	C6	CAPACITOR—250 mmf., mica
	C17	CAPACITOR 250 mmf., mica
RCY-025	C3	TRIMMER R-f trimmer, 50 mmf.
RCY-026	C7	TRIMMER—Detector trimmer, 50 mmf.
RCY-027	C10	TRIMMER—Oscillator trimmer, 50 mmf.
RCY-028	C1	TRIMMER—Antenna trimmer, 250 mmf.
RDW-003		WINDOW—Dial window
REF-002	S4	FUSE—10 amp. line fuse
REM-002	C25, 26	DISC—Spark plate disc
REV-002	V1	VIBRATOR—Nonsynchronous vibrator
RHW-005		WASHER Vibrator cushion washer
RJS-068		SOCKET Foot switch cable plug socket
RJS-069		SOCKET Loktal tube socket
RJS-070		SOCKET Antenna connector and bracket assembly
RJS-071		SOCKET Vibrator socket
RLC-048	L7	COIL Oscillator series coil
RLC-049	L8	COIL Oscillator shunt coil
RLI-026	L10	CHOKE Vibrator hash choke
RLI-027	L1	CHOKE Antenna motor noise choke
RLI-028	L9	CHOKE Motor noise choke
*RNM-027	L2, 3	COILS—Antenna and r-f coil (right hand assembly)
*RNM-028	L4, 5	COILS—Oscillator and converter coil (left hand assembly)
ROE-001	SP1	SPEAKER 6 in. x 9 in. oval dynamic speaker (field coil not replaceable)
ROG-001		GASKET Speaker gasket
ROX-001		CONE Cone and voice coil assembly
RRC-047	R19, R20, S2	CONTROL 250,000 volume control, 1.5 meg-ohm tone control and power switch (Kaiser)
RRC-048	R2	POTENTIOMETER 800 ohm, sensitivity control

Cat. No.	Symbol	Description
CHASSIS COMPONENTS (Cont'd)		
RRC-049	R19, R20, S2	CONTROL—250,000 ohm, vol. control, 1.5 meg. tone control and power switch (Frazer)
RSX-012	S1	SWITCH—Band selector and muting switch assembly
RSX-013		SWITCH—Foot switch and cable assembly (63-1287)
RTL-041	T1	TRANSFORMER—1st i-f transformer
RTL-042	T2	TRANSFORMER—2nd i-f transformer
RTO-031	T5	TRANSFORMER Speaker output transformer
RTP-043	T4	TRANSFORMER—Power transformer
RWB-001		CABLE—Battery cable (set to fuse)
RWB-002		CABLE—Battery cable (fuse to ammeter)
RWX-005	SK1	CABLE Speaker cable and socket
UCC-003	C16	CAPACITOR .003 mfd., 200 v., paper
UCC-005	C14	CAPACITOR .005 mfd., 200 v., paper
UCC-009	C15	CAPACITOR .02 mfd., 200 v., paper
UCC-011	C12	CAPACITOR .05 mfd., 200 v., paper
UCC-013	C4	CAPACITOR .1 mfd., 200 v., paper
UCC-016	C23, 27	CAPACITOR .5 mfd., 120 v., paper
UCC-030	C13	CAPACITOR .1 mfd., 400 v., paper
UCC-035	C5	CAPACITOR .001 mfd., 600 v., paper
UCC-038	C2	CAPACITOR .004 mfd., 600 v., paper
UCC-039	C19	CAPACITOR .005 mfd , 600 v., paper
UCC-040	C18	CAPACITOR .01 mfd., 600 v., paper
UCU-1028	C8, 11	CAPACITOR 100 mmf., mica
URD-023	R16, 17	RESISTOR 82 ohms, ½ w., carbon
URD-027	R22	RESISTOR 120 ohms, ½ w., carbon
URD-077	R7	RESISTOR 15,000 ohms, ½ w., carbon
URD-079	R3	RESISTOR 18,000 ohms, ½ w., carbon
URD-081	R15	RESISTOR 22,000 ohms, ¼ w., carbon
URD-085	R10	RESISTOR 33,000 ohms, ½ w., carbon
URD-097	R21	RESISTOR 100,000 ohms, ¼ w., carbon
URD-109	R1, 4, 11, 12	RESISTOR 330,000 ohms, ¼ w., carbon
URD-113	R23	RESISTOR—47,000 ohms, ¼ w., carbon
URD-117	R5	RESISTOR 68,000 ohms, ¼ w., carbon
URD-121	R9	RESISTOR—1 meg., ¼ w., carbon
URD-145	R6	RESISTOR 10 meg., ¼ w., carbon
URD-149	R14	RESISTOR—15 meg., ¼ w., carbon
URE-005	R8	RESISTOR—33,000 ohms, 1 w., carbon
URE-035	R13	RESISTOR—270 ohms, 1 w., w.w.
URF-055	R18	RESISTOR—1800 ohms, 2 w., w.w.
MOTOR NOISE SUPPRESSION KIT		
RCN-004		CAPACITOR—Ignition coil capacitor, .25 mfd., 200 v. metal case
RCN-005		CAPACITOR—Voltage regulator capacitor, .5 mfd., 200 v, metal case
RCN-006		CAPACITOR—Generator capacitor, 1 mfd., 200 v, metal case
RMS-083		SPRING—Motor hood bond spring
RRN-004		SUPPRESSOR—Distributor suppressor
KNOBS AND INSTALLATION PARTS		
RAD-21		BRACKET—Receiver mounting bracket
RAP-001		PLATE Trim plate (Frazer)
RAP-002		PLATE—Trim plate (Kaiser)
RDK-086		KNOB—Tuning knob, trim knob, and set screw (Kaiser)
RDK-087		KNOB—Volume control knob (Frazer)
RDK-088		KNOB—Tone control knob
RDK-089		KNOB—Volume control knob (Kaiser)
RDK-090		KNOB—Tuning knob and set screw assembly (Frazer)
RHM-032		STUD—Speaker mounting stud
RHN-001		NUT—Set mounting wing nut
RHN-002		NUT Speaker mounting wing nut
RHN-003		NUT—Trim plate mounting nut
RHS-004		BOLT—Mounting bracket bolt
RHS-005		SCREW—Receiver mounting bolt, ¼-20 x 1 in. hex. hd. M. S. steel cadmium plated
RMM-025		SPACER—Control knob spacer (Frazer only)
RMS-093		KNOB RETAINING SPRING

* In ordering, be sure to give color code information.



Top View of Chassis



Bottom View of Chassis

SPECIFICATIONS

CABINET:

Material	Steel
Height	5¼ inches
Depth	13⅛ inches
Width	9⅞ inches

CONTROLS:

On-Off Switch and Volume
Tone
Manual Tuning
Pushbuttons for Tuning (6)

ELECTRICAL RATINGS:

Voltage	6.6 volts d-c
Current	8.5 amperes

FUSE:

S.F.E. (2)	14 amperes

OPERATING FREQUENCIES:

Broadcast Band	540–1605 kc
I-F Amplifier	265 kc

SENSITIVITY:

7 microvolts for one watt output (at band ends)
6 microvolts for one watt output (at points other than band ends)

POWER OUTPUT:

(Measured at voice coil)

Undistorted	7.25 watts
Maximum	8.25 watts

VIBRATOR:

Nonsynchronous	6 volts

LOUDSPEAKER:

Oval, PM	6 x 9 inches

TUBE COMPLEMENT:

(V1) R-F Amplifier	6SK7
(V2) Oscillator-Converter	7B8
(V3) I-F Amplifier	6SK7
(V4) Detector and Audio Amplifier	6SQ7
(V5) Audio Phase Inverter	6J5
(V6) Power Output	6V6GT
(V7) Power Output	6V6GT
(V8) Rectifier	6X5GT
(I1, I2) Pilot Lamps	Mazda No. 55

GENERAL INFORMATION

The 1949 Kaiser-Frazer auto radio is an eight tube superheterodyne receiver employing pushbutton tuning.

OFF-ON SWITCH AND VOLUME CONTROL

The power lead of the radio is connected to the accessory post of the ignition switch and the radio cannot be turned on without the ignition key. When the key is turned to the right, the engine may be started in the usual manner and the radio can be operated. To operate the radio when the engine is not running, turn the ignition switch key to the left.

To turn the radio on, turn the Volume Control knob to the right until a click is heard. After approximately 20 seconds, the radio tubes will reach their operating temperature, permitting operation of the radio. To increase volume, rotate this control knob further to the right. To turn the radio off, rotate the volume control knob completely to the left until a click is heard, indicating the radio is turned off.

Note: In addition to the radio ON and OFF switch, the di lights are also controlled by the Instrument Panel Control. T illuminate radio dial scale at night, the control, which also co trols the brilliance of the dial lights and auto instrument pan lights to various degrees, must be advanced as desired.

MANUAL TUNING

Manual tuning is accomplished by rotating the Tuning Contr knob, which drives the tuning mechanism and dial point through a reduction drive to the desired station frequency indicated by the pointer on the dial scale. The dial is marked i numbers to which a zero must be added to correspond to th frequency numbers of the stations, as listed in radio progra schedules. Accurate tuning of the station is necessary for optimu quality of reproduction.

PUSHBUTTON TUNING

Instantaneous tuning of any one of the six preselected statio may be accomplished by fully depressing the pushbutton for th desired station. After depressing the pushbutton, the radio wi become tuned to the selected station and the pushbutton wi return to its normal position upon release.

TONE CONTROL

The Tone Control knob is located directly behind the Volum Control knob. Rotating the control to the right or left will chang the tone of receiver reproduction. Turning the control to th right will emphasize the treble tones, while turning it to the le will emphasize the bass tones. The treble position is useful i overcoming wind noise, etc., when driving; while the bass positio brings out the full mellow tones of musical programs. With th tone control set midway, the full tonal range is obtained.

PUSHBUTTON TUNING ADJUSTMENTS

There are six pushbutton positions which are available fo setting up six desired stations for instantaneous tuning. Proce to adjust as follows:

1. Release the retaining spring beneath the bottom surfac of the pearl-colored pushbutton cover by pushing it to the le with the finger tip. The cover is now free and may be remove from its shaft, exposing the knurled adjustment screw.

2. With the fingers, loosen the long screw, by a few turns o its knurled head, in the counterclockwise direction.

3. Tune in the desired station for pushbutton tuning b operating the Manual Tuning Control knob. Accurate tuning o the station is necessary for optimum quality of reproduction.

4. Depress the exposed pushbutton plunger screw fully an then release and immediately tighten screw in a clockwis direction.

5. Replace the pearl-colored pushbutton cover with th spring on the under surface of the cover, by merely slipping i over the exposed pushbutton mechanism until the spring cove lock automatically snaps in place.

The five steps above complete the procedure for adjustment o one pushbutton-controlled preselected station. Repeat the pro cedure for each of the remaining pushbutton positions or any on pushbutton position which may be changed to a new statio setting when so desired. Any pushbutton may be set up or oper ated on any station without regard to frequency or sequence.

RADIO INSTALLATION

Reference is made to the Installation Details shown in Figure 1 and 2. The necessary mounting hardware for radio installatio and, also, the radio control knobs and interference eliminatio components are found packaged in a cardboard box inside th radio shipping carton. The step-by-step procedure for installatio is given as follows:

1. Install the antenna. Complete instructions are packe with each antenna kit. Dress the antenna lead-in cable up an over the auto instrument panel wires to the center of the instru ment panel.

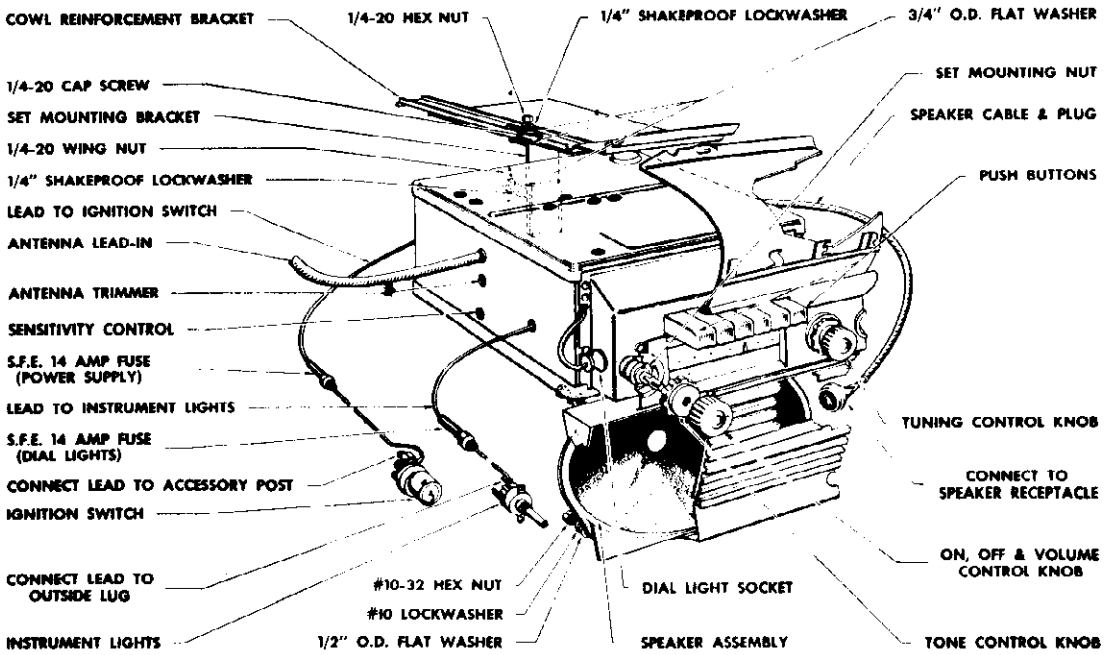


Fig. 1. Installation Details, Kaiser

2. Remove the radio opening cover plate from the auto instrument panel. The plate is held in place by speed nuts.

3. Fit the Set Mounting Bracket over the stud at the rear of the radio so that the serrated surfaces mesh, and place a ¾" O.D. flatwasher, ¼" shakeproof lockwasher, and the wing nut onto the stud and over the assembly in the order mentioned and as shown in Figures 1 and 2.

4. Lift open the auto engine compartment hood and place the Cowl Reinforcement Bracket above the cowl with its slotted opening over the hole provided for the ¼-20 Cap Screw used to fasten set mounting bracket to the automobile's cowl.

5. Carefully place radio into position from beneath and behind the auto instrument panel, so that the volume and tuning control shafts come through the panel openings provided. It may be necessary to enlist the aid of a helper in this step, since the radio must be supported while the cap screw with its first ¾" O.D. flatwasher is placed through the set mounting bracket hole, cowl, and cowl reinforcement bracket. Apply the ¾" O.D. flatwasher, ¼" shakeproof lockwasher, and ¼-20 Hex Nut. With radio and set mounting bracket in position, and the assembly pushed as far forward as set mounting bushings at control shafts will allow; tighten the hex nut.

6. With the ¼-20 wing nut (securing set mounting bracket to rear of radio) loosened a bit, raise or lower rear of radio to align the volume and tuning control shafts squarely with their respective holes in the auto instrument panel. Tighten wing nut securely.

7. Thread set mounting nuts over the volume and tuning control shafts. Using the special Spanner Wrench provided in the installation kit, tighten nuts securely.

8. Install the tone control knob on its shaft followed by the volume control knob. These knobs are the "press on" type and are merely pushed onto the shaft. Place the tuning control knob over the tuning control shaft and tighten set screw to flat of shaft.

9. Fit the radio speaker assembly over the four mounting studs with the speaker receptacle facing to the right. Place the ½" O.D. flatwasher, No. 10 lockwasher, and No. 10-32 hex nut over each stud in the order named and as shown in the illustrations. Tighten the four hex nuts securely.

10. Connect speaker cable and plug to speaker receptacle.

11. Connect antenna lead-in into its receptacle.

12. Connect the lead shown going to the ignition switch located on the auto instrument panel, to the longer accessory terminal post.

13. Connect the lead shown going to the automobile instrument light control to the load side terminal of the control.

14. Turn on the radio and allow it to operate for approximately 15 minutes to reach normal operating temperature. Tune in a weak station near 12 on the dial scale. With a small screwdriver, adjust the Antenna Trimmer until the station is heard the clearest. This setting will be optimum when adjusted for minimum noise level on station used for test. This adjustment should be made with the antenna extended to its normal operating position.

INTERFERENCE ELIMINATION

IMPORTANT: Use the utmost care in the following operations to insure freedom from motor noise. Be certain that good ground contacts are made between the interference condenser mountings and the car body. If necessary, clean away paint or dirt with emery paper. Tighten all nuts and bolts securely.

1. Remove the voltage regulator mounting screw and under this screw mount the Voltage Regulator Condenser, as shown in Figure 3. Connect the condenser lead wire under the battery terminal screw of the regulator marked "BATT."

2. Remove the high tension coil wire cable from the ignition distributor. Remove the wire cable end clip and fit cable to screw end of distributor suppressor. Screw suppressor onto cable so that screw bites into end of cable and contacts wires at its center. The distributor suppressor, in turn, is inserted into the center jack of the distributor so that the unit is now connected in series with the high tension wire lead and distributor. See Figure 4.

3. Mount the Ignition Coil Condenser under the ignition coil bracket bolt and connect its wire lead to the battery terminal of the coil as shown in Figure 4.

4. Install the Generator Condenser under the ground screw on the auto battery motor generator, as shown in Figure 5. Connect its wire lead to the generator armature post.

5. Install the two auto motor compartment hood bonding springs, one on each side of car, as shown in Figure 6.

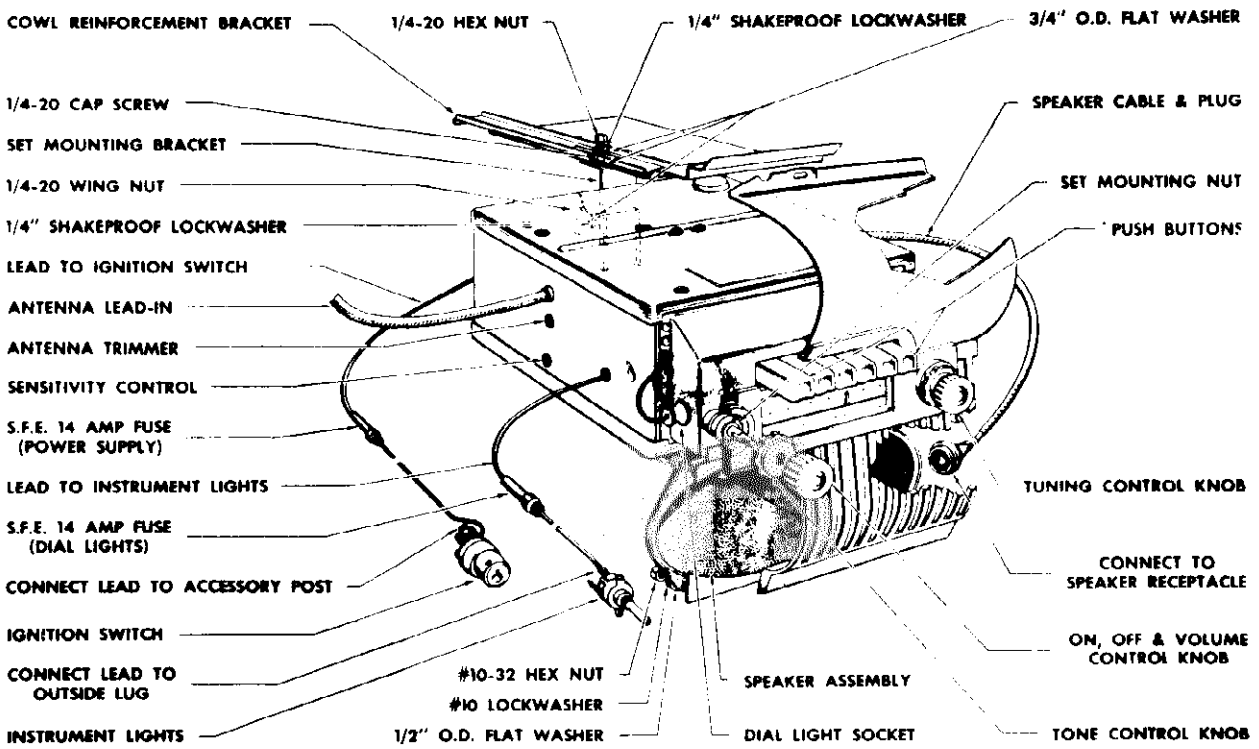


Fig. 2. Installation Details, Frazer

ELECTRICAL CIRCUIT ALIGNMENT

EQUIPMENT REQUIRED:

1. Test oscillator with audio tone modulation.
2. A-C output meter, 2½ volts full scale.
3. Insulated screwdriver.
4. .1 mf. paper capacitor.
5. Two 30 mmf. mica capacitors.
6. Jeweler's pin vise (for core adjustment).

PROCEDURE—GENERAL:

1. The alignment procedure is given in the Alignment Chart, Table I.

2. Alignment Chart, Table II, will be used *only* when a tuning core or coil has been replaced.

3. Figure 7 is the schematic circuit of a recommended dummy antenna, closely resembling actual antenna capacity, to be used in series with the signal generator leads when aligning the r-f section of the receiver.

4. Reference is made to Figures 8 and 9 for trimmer locations.

5. Connect output meter across voice coil.

6. Make all adjustments with volume control on full, tone control in clockwise (treble) position.

7. Keep signal generator output reduced as much as possible for about half-scale output meter reading.

ALIGNMENT CHART, TABLE I

Step	Connect Signal Generator to:	Signal Generator Setting	Dial Setting	Adjust for Maximum
	I-F ALIGNMENT			
1	†Grid (Pin 6) 6SK7 (V3) I-F	265 kc	*1605 kc	2nd I-F, T2, Trimmer C35 and C34
2	†Grid (Pin 6) 7B8 (V2) conv.	265 kc	*1605 kc	1st I-F, T1, Trimme C33 and C32
3	Repeat Steps 1 and 2 for accuracy			
	R-F ALIGNMENT			
4	‡Antenna socket	1400 kc	1400 kc	Oscillator trimmer C
5	‡Antenna socket	1400 kc	1400 kc	Converter trimmer C R-F trimmer C3

† Low side of signal generator to chassis, high side in series with mf paper capacitor.
‡ Signal generator through dummy antenna.
* R-F cores fully withdrawn from tuner.

NOTES IN CONNECTION WITH ALIGNMENT TABLE I

After reinstalling the receiver in the car, allow it to opera for approximately 15 minutes to reach normal operating ten perature. Extend antenna to maximum. Check the antenn trimmer alignment on a weak station at approximately 1200 k Adjust trimmer for minimum noise level on station used for tes

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GENERAL SERVICE

Where symptoms are manifested by intermittent operation, check all cables and their connections for breaks, loose or dirty contacts, chafing, grounding, and probable short circuits.

Static noise, varying in speed as the auto motor is accelerated, indicates ignition interference. Check parts and installation of distributor and ignition coil noise suppression units. Also, make certain the car motor compartment hood is bonded efficiently with two bonding springs provided.

Interference noise in the form of a ripple, varying in frequency with motor acceleration, is caused by the auto battery generator. Cures are also outlined here in section headed "Interference Elimination," regarding the generator noise condenser and voltage regulator condenser.

For other services where the trouble is in the receiver chassis, for r-f and i-f alignment, tube changes, etc., the receiver will be taken out of the car.

TAKING RECEIVER OUT OF CAR

To take the receiver out for servicing, consult the installation detail drawings of Figures 1 and 2 while following the outlined procedure below.

1. Disconnect the following leads and cables: speaker cable and plug at speaker receptacle, antenna lead at antenna receptacle, lead to ignition switch at switch accessory post, and lead to instrument lights at the load side terminal of the instrument light control.

2. Remove the volume, tone, and tuning control knobs. The volume and tone control knobs are the push-on type so that they are merely pulled off, while the tuning control knob must first be made free by loosening the No. 6-32 Allen Headless setscrew holding it fast at the flat section of its shaft.

3. Remove the special mounting nuts from the volume and tuning control shaft bushings, using the special spanner wrench supplied in the original receiver installation kits.

4. Remove the hex nut, washers, and cap screw from the mounting at the cowl. It may be necessary to enlist the aid of a helper in this step so that while one operator removes the screw the other can support the receiver, finally moving it away from the instrument panel to clear the control shafts. The receiver will then be free from its mounting and may be removed from the car.

5. To take out the speaker, remove the hex nut, lockwasher, and flatwasher from each of the four speaker mounting studs. The speaker is now free of the mounting and can be removed from the instrument panel.

ALIGNMENT CHART II

For Core or Coil Replacement Only

Step	Signal Generator Setting	Dial Setting	Remarks
1	1675 kc	*1600 kc	Screw Ant., R-F, converter, and oscillator cores out of their coils
2	1675 kc	*1600 kc	Adjust oscillator trimmer C10 at 1675 kc
3	1675 kc	*1600 kc	Adjust converter trimmer C7, R-F trimmer C3, and antenna trimmer C1 for maximum
4			Replace cores to their approximate original positions
5	1400 kc	1400 kc	Adjust oscillator core, L5, to scale at 1400 kc
6	1400 kc	1400 kc	Adjust converter, RF core, and antenna core (L4, 3, and 2 respectively), for maximum
7	600 kc	**600 kc	"Rock-in" shunt oscillator coil, L7, for maximum
8	Recheck step 6 at 1400 kc		
9	1200 kc	1200 kc	Check receiver for calibration and gain
10	Repeat steps 5, 6, 7, and 8		If receiver is off calibration or weak

* Maximum high frequency end of dial.

** "Rocking" consists of adjusting the indicated adjuster while turning the dial a small amount back-and-forth through peak output. The object is to find the maximum peak.

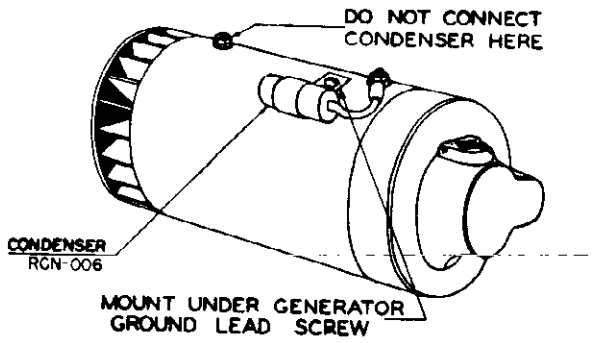

Fig. 5. Generator Noise Condenser

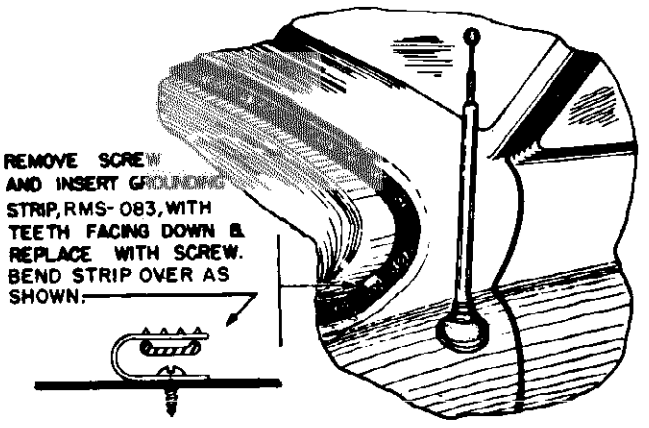

Fig. 6. Hood Bonding

NOTES IN CONNECTION WITH ALIGNMENT TABLE II

1. After alignment is complete, the maximum high frequency tuning range should be checked. If the range is greater or less than 1605 kc, the screw stop for the tuner core-bar should be adjusted to limit the frequency coverage to 1605 kc.

2. After all adjustments have been made, glue core screws with speaker cement.

3. After reinstalling the receiver in the car, allow it to operate for approximately 15 minutes to reach normal operating temperature. Extend antenna to maximum. Check the antenna trimmer alignment on a weak station at approximately 1200 kc. Adjust trimmer for minimum noise level on station used for test.

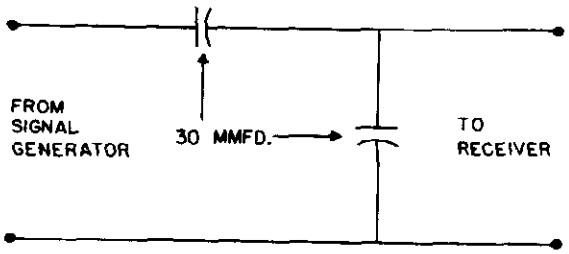

Fig. 7. Dummy Antenna

STAGE GAINS AND VOLTAGE CHECKS

Stage gain measurements may be made with a vacuum tube voltmeter to check circuit performance and to locate stages which are not operating properly. The gain values listed may have a tolerance of 10%.

1. *R-F STAGE GAIN*

Antenna Post to 6SK7 (V1) Grid.....9.5 at 1000 KC
6SK7 (V1) Grid to 7B8 (V2) Grid.....8.5 at 1000 KC

2. *CONVERSION GAIN (1000 TO 265 KC)*

7B8 (V2) Grid to 6SK7 (V3) Grid.....17 at 1000 KC

3. *I-F GAIN*

6SK7 (V3) Grid to 6SQ7 (V4) Diode Plate.....15 at 265 KC

4. *AUDIO GAIN*

The power output across the speaker voice coil should be approximately one watt (1.89 volts) with not more than 70 millivolts at 400 cycles input across volume control R19. Volume control must be fully on (clockwise) and tone control in maximum treble (clockwise) position.

5. *OSCILLATOR GRID BIAS*

The d-c voltage developed across the oscillator grid leak R5 should be approximately -9 volts as measured by a vacuum tube voltmeter.

6. *SOCKET PIN VOLTAGES*

Socket pin voltages (Figure 10) may have a tolerance of 10%. All voltages are based upon a power supply input of 6.6 volts at the receiver terminals.

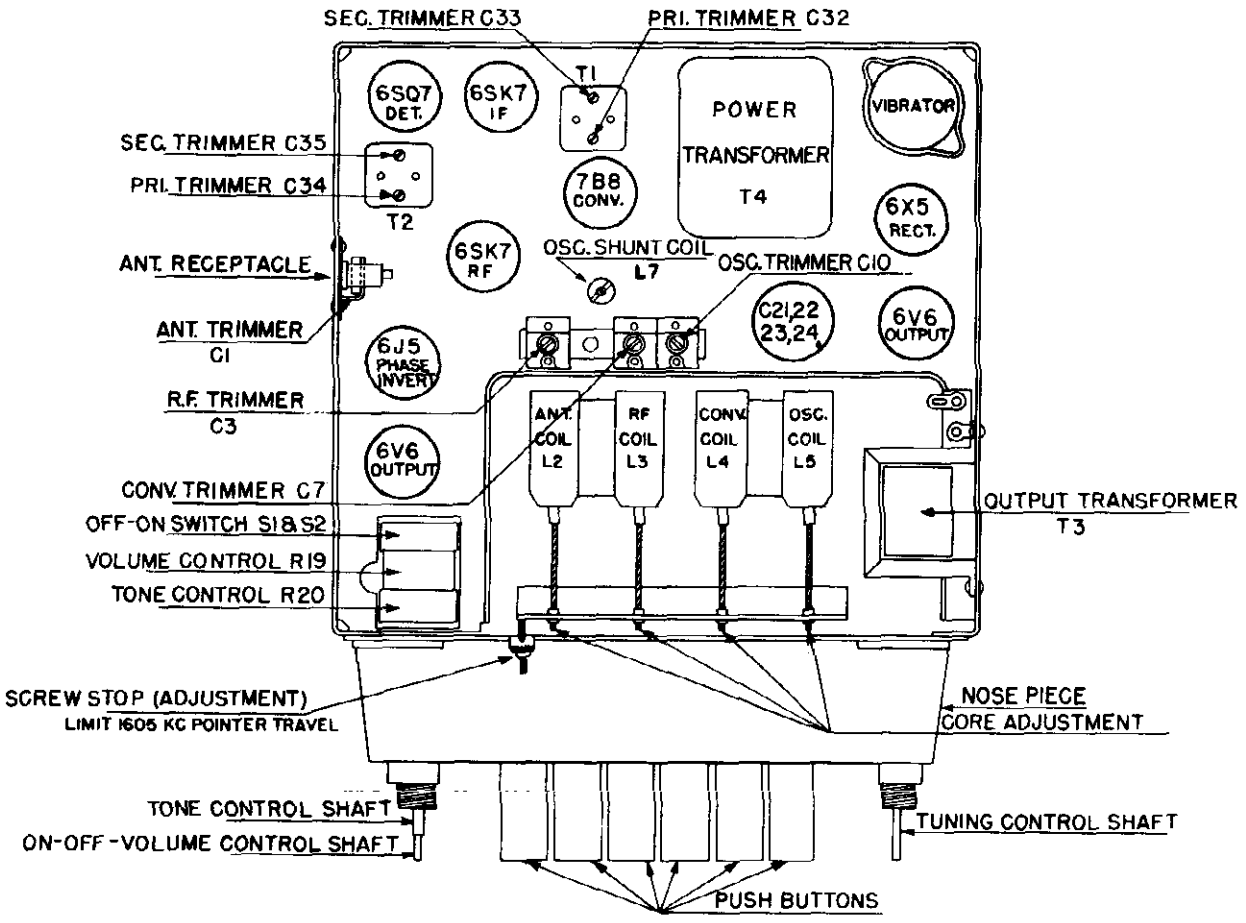

Fig. 8. Top View of Chassis

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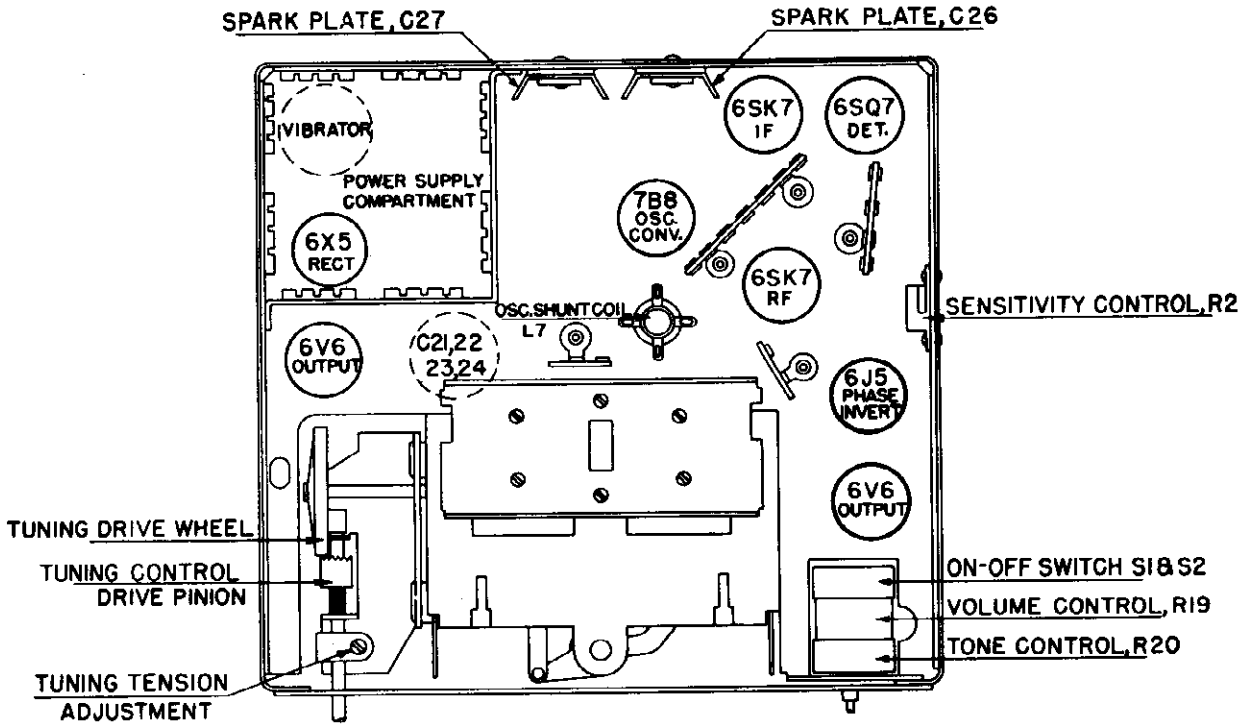
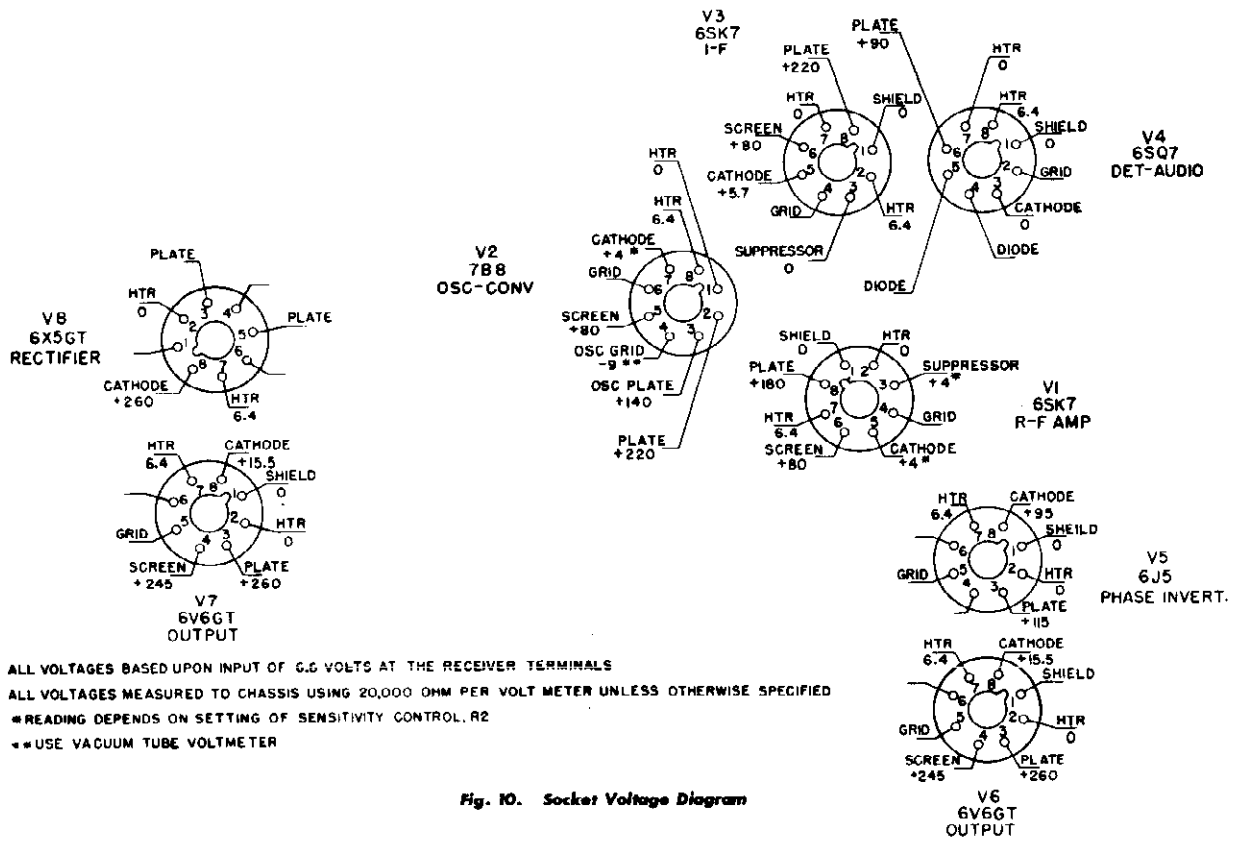


Fig. 9. Bottom View of Chassis



ALL VOLTAGES BASED UPON INPUT OF 0.0 VOLTS AT THE RECEIVER TERMINALS

ALL VOLTAGES MEASURED TO CHASSIS USING 20,000 OHM PER VOLT METER UNLESS OTHERWISE SPECIFIED

* READING DEPENDS ON SETTING OF SENSITIVITY CONTROL, R2

** USE VACUUM TUBE VOLTMETER

Fig. 10. Socket Voltage Diagram

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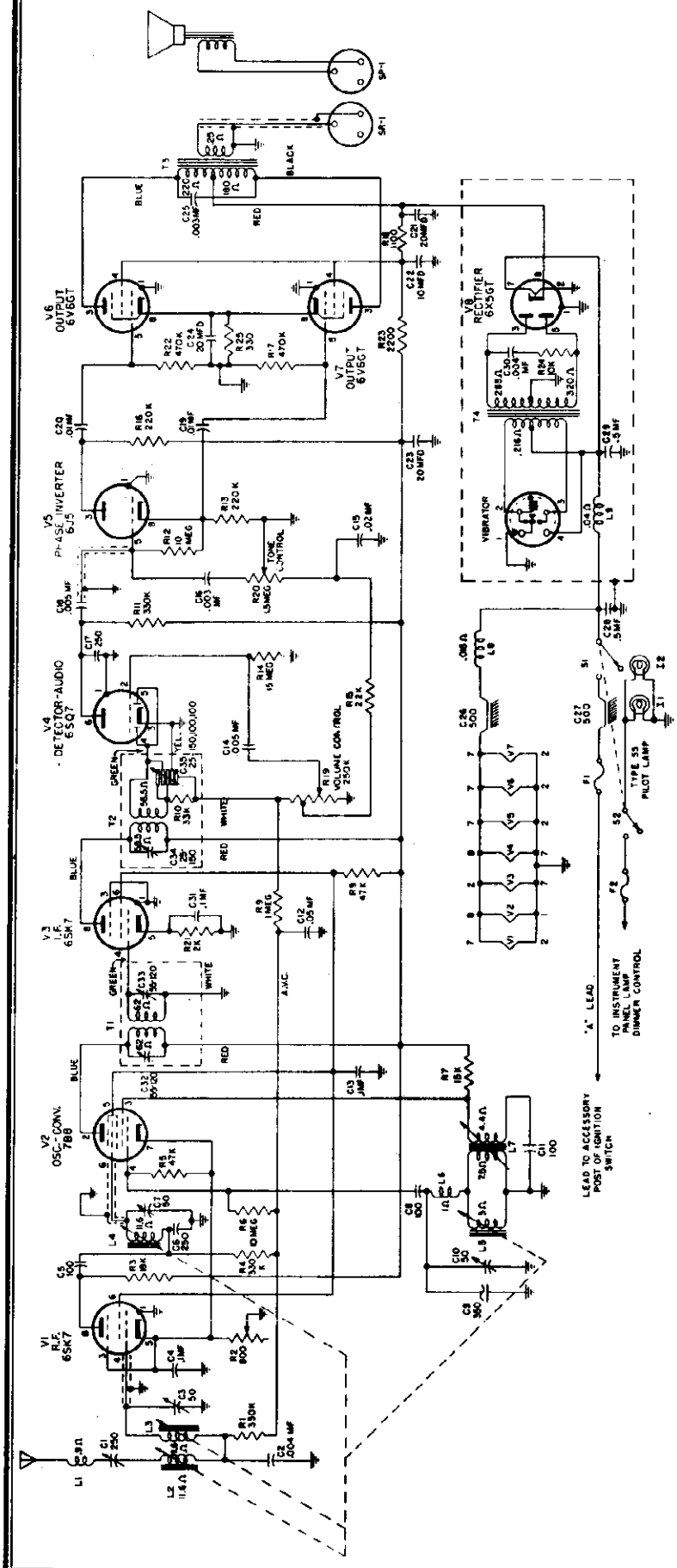

Fig. 11. Schematic Diagram

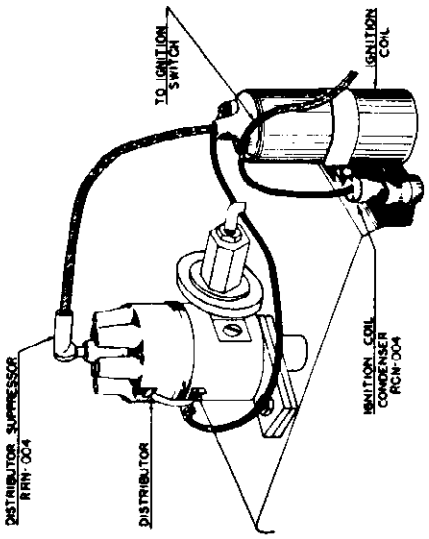

Fig. 4. Distributor and Ignition Coil Suppression

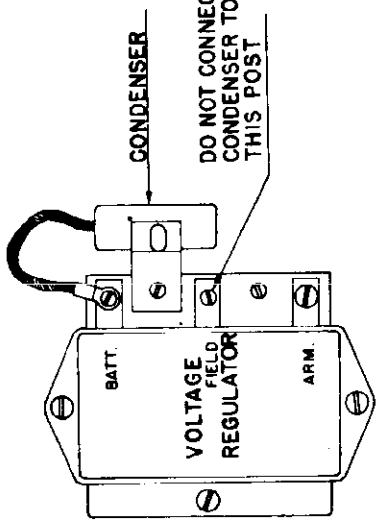

Fig. 3. Voltage Regulator Condenser

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REPLACEMENT PARTS LIST

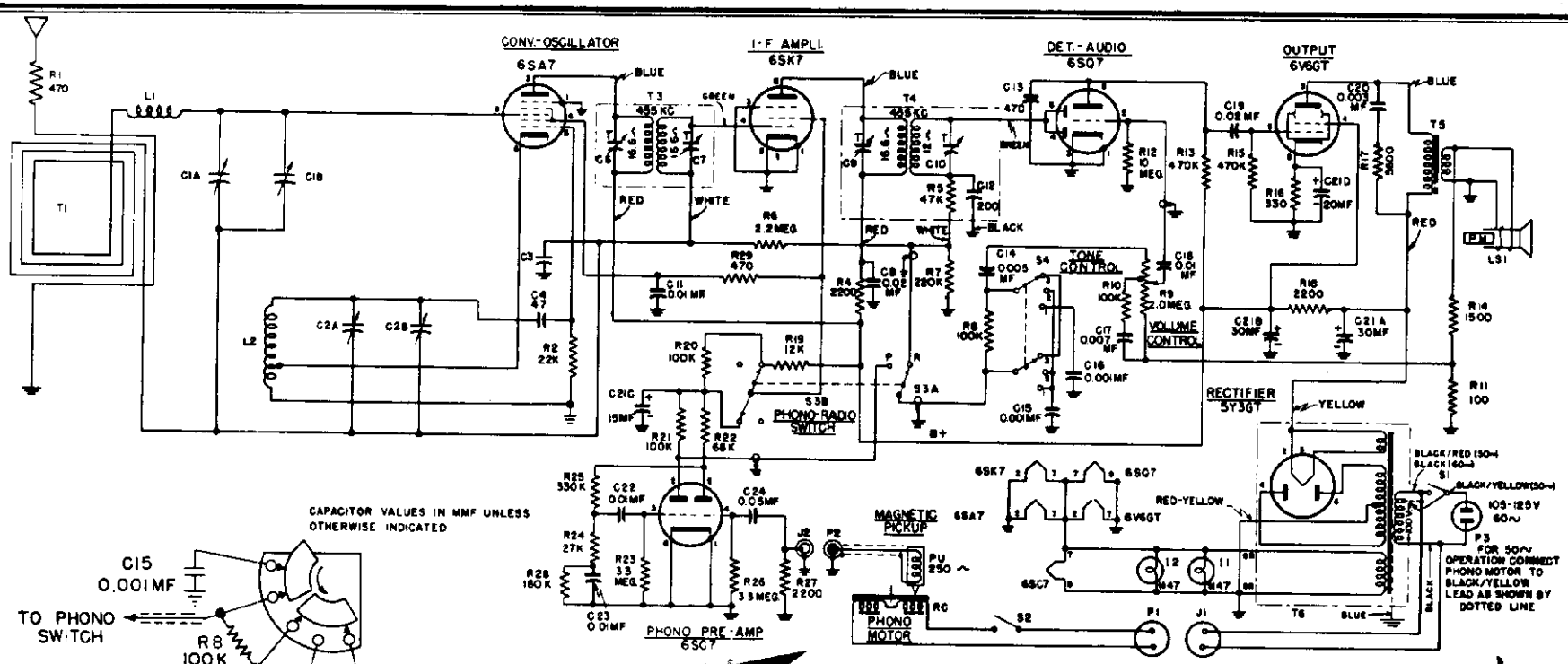
UNIVERSAL REPLACEMENT PARTS

Cat. No.	Symbol	Description
UCC-623	C16	CAPACITOR .003 mf., 600 v., paper
UCC-625	C14, 18	CAPACITOR—.005 mf., 600 v., paper
UCC-630	C19, 20	CAPACITOR - .01 mf., 600 v., paper
UCC-631	C15	CAPACITOR .02 mf., 600 v., paper
UCC-635	C12	CAPACITOR .05 mf., 600 v., paper
UCC-640	C4, 19, 20, 31	CAPACITOR .1 mf., 600 v., paper
UCC-645	C28, 29	CAPACITOR—.5 mf., 600 v., paper
UCU-1028	C5	CAPACITOR—100 mmf., 600 V., mica
URD-077	R7	RESISTOR—15,000 ohms, ½ w., carbon
URD-079	R3	RESISTOR—18,000 ohms, ½ w., carbon
URD-081	R15	RESISTOR—22,000 ohms, ½ w., carbon
URD-089	R5	RESISTOR—47,000 ohms, ½ w., carbon
URD-105	R13, 16	RESISTOR—220,000 ohms, ½ w., carbon
URD-109	R1, 4, 11	RESISTOR—330,000 ohms, ½ w., carbon
URD-113	R17, 22	RESISTOR—470,000 ohms, ½ w., carbon
URD-121	R9	RESISTOR - 1 meg., ½ w., carbon
URD-145	R6, 12	RESISTOR - 10 meg., ½ w., carbon
URD-1056	R21	RESISTOR—2,000 ohms, ½ w., carbon
URE-057	R23	RESISTOR—2,200 ohms, 1 w., carbon
URE-073	R24	RESISTOR—10,000 ohms, 1 w., carbon
URE-089	R8	RESISTOR—47,000 ohms, 1 w., carbon
URE-1050	R18	RESISTOR—1,100 ohms, 1 w., carbon
URF-037	R25	RESISTOR—330 ohms, 1 w., carbon

SPECIALIZED REPLACEMENT PARTS

Cat. No.	Symbol	Description
RAC-054		COVER—For vibrator power supply compartment
RAP-009		PLATE—Mounting plate for centering volume control
RAP-010		PLATE—Backing plate for dial scale
RAP-011		PLATE—Backing plate for dial window
RCC-092	C25	CAPACITOR—.003 mf., 1600 v., paper
RCC-093	C30	CAPACITOR—.004 mf., 1600 v., paper
RCE-075	C21, 22, 23, 24	CAPACITOR—20 mf., 350 v.; 10 mf., 300 v.; 20 mf., 300 v.; 20 mf., 25 v.; electrolytic
RCN-004		CAPACITOR—For ignition coil noise suppression
RCN-005		CAPACITOR—For voltage regulator noise suppression
RCN-006		CAPACITOR—For auto battery generator noise suppression
RCN-008	C9	CAPACITOR 350 mmf., compensator
RCU-190	C2	CAPACITOR—.004 mf., 600 v., mica
RCU-279	C6, 17	CAPACITOR—250 mmf., 600 v., mica
RCU-283	C5	CAPACITOR—.001 mf., 600 v., mica
RCU-284	C8	CAPACITOR—100 mmf., 600 v., mica
RCY-028	C1	TRIMMER—250 mmf., antenna trimmer
RCY-050	C3, 7, 10	TRIMMER STRIP—50 mmf., 50 mmf., 50 mmf., r-f, conv., and osc. trimmers
RDE-033		ESCUTCHEON—Dial scale window escutcheon
RDK-145		KNOB Tone control knob
RDK-146		KNOB Volume control knob
RDK-147		KNOB—Tuning control knob
RDP-043		POINTER—Dial scale pointer
RDS-079		DIAL SCALE
RDW-011		WINDOW—Dial scale window
RDX-042		PUSHBUTTON—Pushbutton with retaining spring
*REI-020		CORE Tuning core (coded red)
*REI-021		CORE Tuning core (coded green)
*REI-022		CORE Tuning core (coded yellow)
*REI-023		CORE Tuning core (coded blue)
REV-002		VIBRATOR
RII-015		INSULATOR—Textolite strip insulator for tuning core stem support
RIS-002		LIGHT SHIELD—Rubber strip (channeled) used as dial light barrier
RJS-015		SOCKET Octal socket for 6SK7, 6AQ7, 6J5, 6V6GT, and 6X5GT tubes
RJS-069		SOCKET Loktal socket for 7B8 tube
RJS-071		SOCKET Vibrator socket
RJS-121		SOCKET Antenna connector socket
RJS-122		SOCKET—Dial lamp socket and leads
RJX-024		SOCKET AND CABLE—Speaker socket and cable
RJX-025		CABLE ASSEMBLY—Cable and fuse ferrule (lead to instrument light control)
RKP-005		INSTALLATION KIT Knobs, mounting hardware, ignition and noise filter components, etc.
RLC-048	L6	COIL—Oscillator series coil
RLC-079	L7	COIL—Oscillator shunt coil
RLI-063	L1	CHOKE—Antenna noise choke coil
RLI-064	L8	CHOKE—Motor noise choke coil
*RLX-017	L2, 3	COIL—Antenna and r-f coil in shield assembly (coded red)
*RLX-018	L2, 3	COIL—Antenna and r-f coil in shield assembly (coded green)
*RLX-019	L2, 3	COIL—Antenna and r-f coil in shield assembly (coded yellow)
*RLX-020	L2, 3	COIL—Antenna and r-f coil in shield assembly (coded blue)
*RLX-021	L4, 5	COIL—Oscillator and converter coil in shield assembly (coded red)
*RLX-022	L4, 5	COIL—Oscillator and converter coil in shield assembly (coded green)
*RLX-023	L4, 5	COIL—Oscillator and converter coil in shield assembly (coded yellow)
*RLX-024	L4, 5	COIL—Oscillator and converter coil in shield assembly (coded blue)
RMM-083		NUT—Special, fits over control shaft bushings for mounting
RMS-083		SPRING Contact spring for motor compartment hood bonding
ROE-001		SPEAKER—6 x 9 inches, oval, PM
RRC-048	R2	POTENTIOMETER—0-800 ohms (Sensitivity control)
RRC-093	R19, 20, S1, 2	POTENTIOMETER AND SWITCH—250,000 and 1.5 meg. dual (Volume, Tone, and On-Off controls)
RRD-1014	R14	RESISTOR 15 meg., ½ w., carbon
RRN-004		DISTRIBUTOR SUPPRESSOR
RTL-086	T1	TRANSFORMER—1st I-F transformer
RTL-087	T2	TRANSFORMER—2nd I-F transformer
RTO-056	T3	TRANSFORMER—Audio output transformer
RTP-065	T4	TRANSFORMER—Power transformer
RWX-013		CABLE ASSEMBLY—Cable and fuse ferrule (lead to ignition switch)

* Be certain to specify color code marking to insure proper coil tracking.



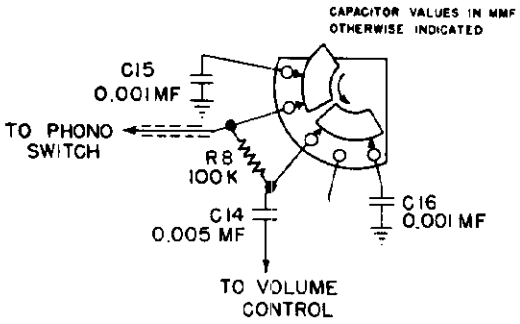
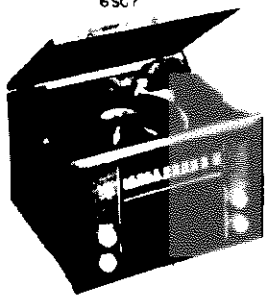
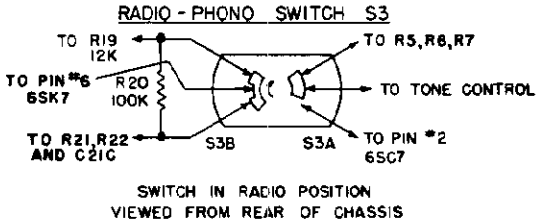


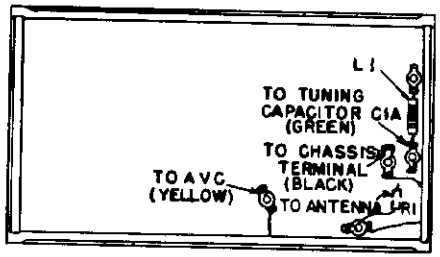
Fig. 5. Tone Control Switch, S4



FRONT OF LOOP ANTENNA

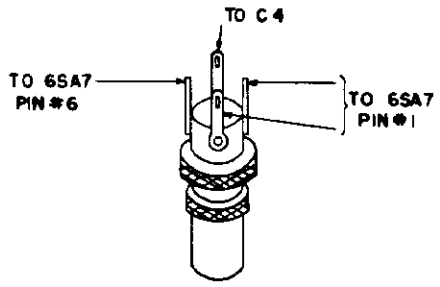


Radio-Phono Switch, S3



LOOP ANTENNA CONNECTIONS

OSCILLATOR COIL L2



VIEW FROM REAR OF CHASSIS

ELECTRICAL CIRCUIT ALIGNMENT

ALIGNMENT FREQUENCIES

R-F—1500 KC
I-F—455 KC

EQUIPMENT REQUIRED

1. Test Oscillator with Tone Modulation.
2. A-C Output Meter, 1½ volts full scale.
3. .05 Paper Condenser.
4. Insulated Screwdriver.
5. 200 $\mu\mu$f. Mica Condenser.

ALIGNMENT PROCEDURE—GENERAL

The alignment procedure is given in table form. All i-f and r-f alignments may be made with the chassis removed from the cabinet. All adjustments are accessible from the bottom of the cabinet when the chassis is installed. The location of the i-f and r-f adjustments is shown in Figure 4.

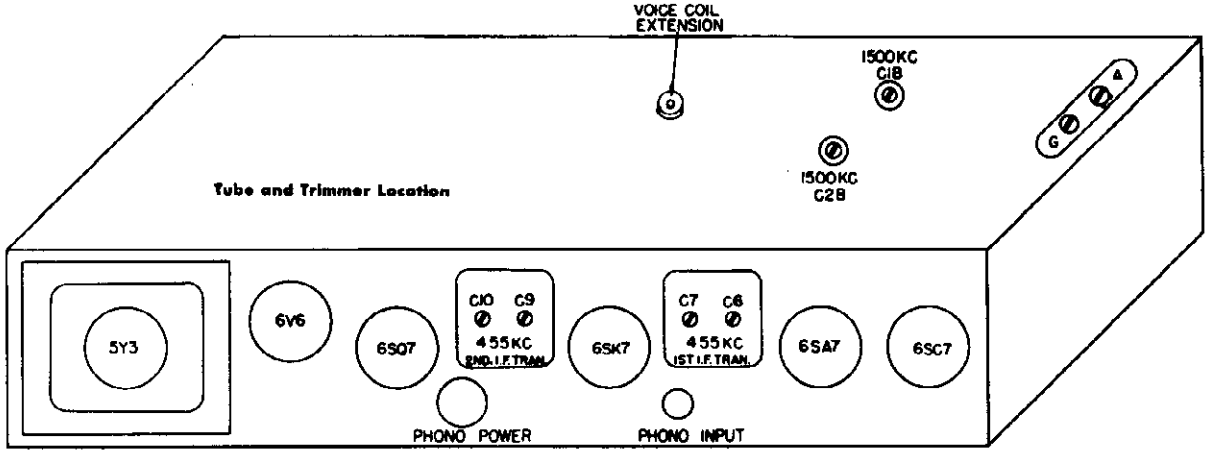
For calibration, the position of the pointer should be established prior to r-f alignment as follows. If no dial scale is available or if the chassis is removed from the cabinet, turn the tuning control knob fully counterclockwise (gang condenser closed) and secure the pointer to the dial string at some arbitrary position near the left end of the dial scale or pointer travel. Mark the pointer position on the backplate or note its position with reference to the number scale stamped on the backplate. Proceed with the alignment as indicated in the alignment chart and mark the pointer position for 1500 kc. The distance between the original reference mark and the 1500 kc mark should be $5\frac{1}{8}$ inches for dial calibration. After installation of the chassis in the cabinet, the tuning control is turned extreme counterclockwise and the pointer slid and secured to the string at the extreme left rectangular dial calibration mark on the scale. The pointer is accessible through the hole in the backplate.

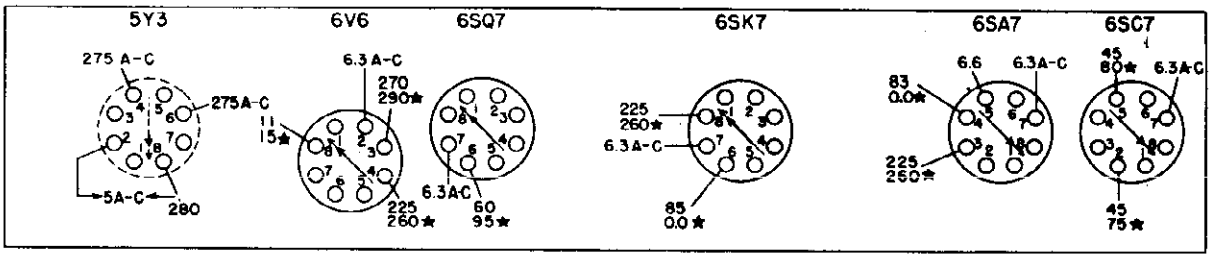
The output meter should be connected across the loudspeaker voice coil terminal. A voice coil terminal is accessible at an insulated rivet in the bottom of the chassis. The low side of the test oscillator output should be connected to the chassis ground; the high side of the test oscillator output should be connected as indicated in the alignment chart. During the entire alignment procedure, the volume control should be at its maximum position. The test oscillator output should be attenuated so that the output meter reading doesn't exceed $1\frac{1}{4}$ volts.

ALIGNMENT CHART

Step	Connect Test-Osc. To:	Test-Osc. Setting	Pointer Setting on Radio	Adj. for Max. Output
1	6SK7 pin No. 4 in series with .05 mf. paper capacitor	455 kc	1600 kc	2nd I-F Trans. Trimmers C9-C10
2	6SA7 pin No. 8 in series with .05 mf. paper capacitor	455 kc	1600 kc	1st and 2nd I-F Trans. C6, C7, C9, and C10
3	Antenna post in series with 200 mmf. capacitor.	1500 kc	*1500 kc	Oscillator Trimmer C2B
4	Antenna post in series with 200 mmf. capacitor.	1500 kc	1500 kc	R-F Trimmer C1B
5	Recheck Steps 3 and 4.			

* 1500 kc is $5\frac{1}{8}$ inches from extreme low frequency pointer position. (See alignment procedure.)





BOTTOM VIEW OF CHASSIS

Socket Voltage Diagram

CONDITIONS OF TEST
VALUES OBTAINED WITH 20000 OHMS PER VOLT METER
READINGS ARE BETWEEN PIN AND CHASSIS WITH A LINE VOLTAGE OF 117 VOLTS
VOLUME CONTROL MINIMUM
NO SIGNAL INPUT
★ VALUES OBTAINED WITH RADIO-PHONO SWITCH IN PHONO POSITION
ALL READINGS TAKEN WITH RADIO-PHONO SWITCH IN RADIO POSITION UNLESS OTHERWISE INDICATED

STAGE GAIN AND VOLTAGE CHECKS

Stage gain measurements may be made with a vacuum tube voltmeter to check circuit performance and to locate stages which are not operating properly. The gain values listed may have a tolerance of 20%.

1. R-F Stage Gain.

Antenna post to 6SA7 grid	5 at 1000 kc
6SA7 grid to 6SK7 grid	50 at 455 kc
6SK7 grid to 6SQ7 diode plate	70 at 455 kc

2. Audio Gain.

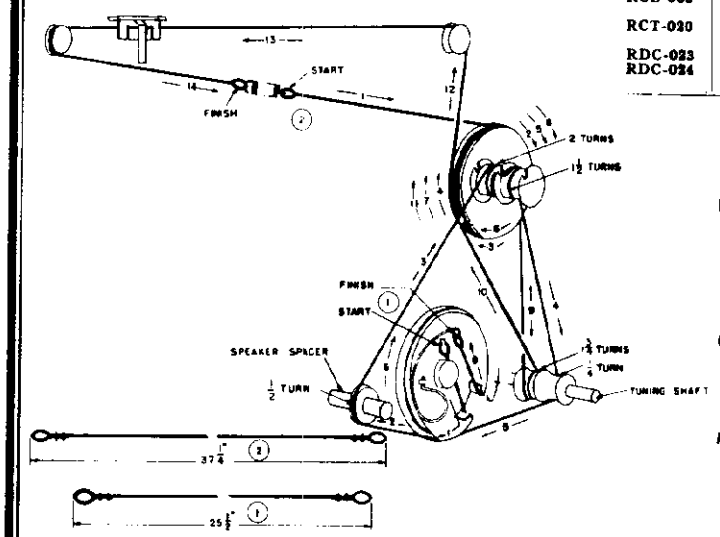
The power output across the speaker voice coil should be approximately ½ watt with .05 volts at 400 cps applied between the high side of the volume control and ground. Approximately .008 volts at 400 cps should be applied to the phonograph input for ½ watt output across the speaker voice coil.

3. Oscillator Grid Bias.

The d-c voltage developed across the oscillator grid leak R2 should be approximately 6.6 volts at 1000 kc.

4. Socket Pin Voltages.

Socket pin voltages greatly different than those shown in Figure 1 indicate defective components or tubes. It should be noted that a considerable difference in voltage exists at some voltage check points depending on the position of the radio-phono switch.



Dial Stringing Diagram

CAT. NO.	SYMBOL	DESCRIPTION
UNIVERSAL REPLACEMENT PARTS		
UCC-035	C15, 16	CAPACITOR—.001 mfd., 600 v., paper
UCC-039	C14	CAPACITOR—.005 mfd., 600 v., paper
UCC-040	C11, 18, 22, 23	CAPACITOR—.01 mfd., 600 v., paper
UCC-041	C8, 19	CAPACITOR—.02 mfd., 600 v., paper
UCC-045	C3, 24	CAPACITOR—.05 mfd., 600 v., paper
UCC-087	C20	CAPACITOR—.003 mfd., 1000 v., paper
UCU-020	C4	CAPACITOR—47 mmf., mica
UCU-044	C13	CAPACITOR—470 mmf., mica
UDL-005	I1, 2	LAMP—No. 47 pilot lamp
UIC-001		CEMENT—Speaker cone replacement cement
UOP-628	LS1	SPEAKER—6-inch PM speaker
URD-025	R11	RESISTOR—100 ohms, ½ w., carbon
URD-041	R1, 29	RESISTOR—470 ohms, ½ w., carbon
URD-053	R14	RESISTOR—1500 ohms, ½ w., carbon
URD-057	R4, 27	RESISTOR—2200 ohms, ½ w., carbon
URD-067	R17	RESISTOR—5600 ohms, ½ w., carbon
URD-081	R3	RESISTOR—22,000 ohms, ½ w., carbon
URD-083	R24	RESISTOR—27,000 ohms, ½ w., carbon
URD-089	R5	RESISTOR—47,000 ohms, ½ w., carbon
URD-093	R32	RESISTOR—68,000 ohms, ½ w., carbon
URD-097	R8, 10, 20, 21	RESISTOR—10,0000 ohms, ½ w., carbon
URD-103	R35	RESISTOR—180,000 ohms, ½ w., carbon
URD-105	R7	RESISTOR—220,000 ohms, ½ w., carbon
URD-109	R36	RESISTOR—330,000 ohms, ½ w., carbon
URD-113	R13, 15	RESISTOR—470,000 ohms, ½ w., carbon
URD-129	R6	RESISTOR—2.2 meg., ½ w., carbon
URD-133	R33, 26	RESISTOR—3.3 meg., ½ w., carbon
URD-145	R12	RESISTOR—10 meg., ½ w., carbon
URE-027	R16	RESISTOR—330 ohms, 1 w., carbon
URF-007	R18	RESISTOR—2200 ohms, 2 w., carbon
URF-075	R19	RESISTOR—12,000 ohms, 2 w., carbon
SPECIALIZED REPLACEMENT PARTS		
RAC-018		COVER—Cabinet, bottom cover
RAD-016		BRACKET—Pilot lamp bracket
RCC-001	C17	CAPACITOR—.007 mfd., 600 v., paper
RCE-033	C21A, B, C, D	CAPACITOR—30 mfd., 350 v., 30 mfd., 350 v., 15 mfd., 250 v., 20 mfd., 25 v. electrolytic
RCT-020	C1A, B, 2A, B	CONDENSER—2-section tuning condenser and trimmers (includes drive drum)
RDC-023		CORD—Dial pointer drive cord
RDC-024		CORD—Gang condenser drive cord

CAT. NO.	SYMBOL	DESCRIPTION
SPECIALIZED REPLACEMENT PARTS (Cont'd)		
RDF-009		WASHER—Felt washer for control knobs
RDK-002		KNOB—Control knob (pointer)
RDK-006		KNOB—Control knob (plain)
RDP-014		POINTER—Dial pointer and slide assembly
RDS-049		SCALE—Dial scale and cushion
RHC-012		COTTER—Hair pin cotter for dial cord idler pulleys
RHC-013		COTTER—Hair pin cotter for tuning shaft and idler drum shaft
RHG-003		GROMMET—Mounting grommet for 6SC7 tube socket
RHX-011		HARDWARE—Tuning condenser mounting hardware
RJA-001		ADAPTER—Wood extension shaft for control shafts
RJC-001		PLUG—Speaker lead plugs
RJP-010	J2	SOCKET—Phono input socket
RJS-003		SOCKET—6SA7 tube socket
RJS-006		SOCKET—Octal tube socket
RJS-031		SOCKET—6SC7 tube socket
RJS-049	J1	SOCKET—Phono power socket
RJS-086		SOCKET—Pilot lamp socket
RLA-021	L1	COIL—Antenna compensating coil
RLC-021	L2	COIL—Oscillator coil
RLL-014	T1	BEAM-A-SCOPE—Loop antenna assembly
RMC-017		CLAMP—Electrolytic capacitor mounting clamp
RMS-004		SPRING—Drive cord tension spring (in pointer drive cord)
RMS-076		SPRING—Drive cord tension spring (inside condenser drive drum)
RMW-003		PULLEY—Idler pulley for pointer drive cord
RMW-036		DRUM—Idler drum (consists of 1 ¼-inch drum and brass drive bushing)
RMX-014		SHAFT—Tuning control shaft
RPX-010	PU	PICK-UP—Magnetic pick-up unit
RRC-029	R9, S1	VOLUME CONTROL—2 meg. (includes power switch)
RSW-018	S3	SWITCH—Phono-radio switch
RSW-019	S4	SWITCH—Tone control switch
RTI-020	T4	TRANSFORMER—2nd I-F transformer
RTI-021	T3	TRANSFORMER—1st I-F transformer
RTO-013	T5	TRANSFORMER—Output transformer
RTP-021	T6	TRANSFORMER—60-cycle power transformer
RTP-039	T6	TRANSFORMER—50-cycle power transformer
RWL-009	P3	CORD—Power cord and plug
RYM-001		SCALE—Cardboard scale for backplate

ELECTRICAL RATING

Voltage	105–125 v a-c
Frequency	60 cycles
Wattage (Phonograph Operation)	75
Wattage (Radio Operation)	50

OPERATING FREQUENCIES

Tuning Frequency Range	540 KC to 1600
Intermediate Frequency	455 kc

POWER OUTPUT

Undistorted	3 watts
Maximum	5 watts

LOUDSPEAKER

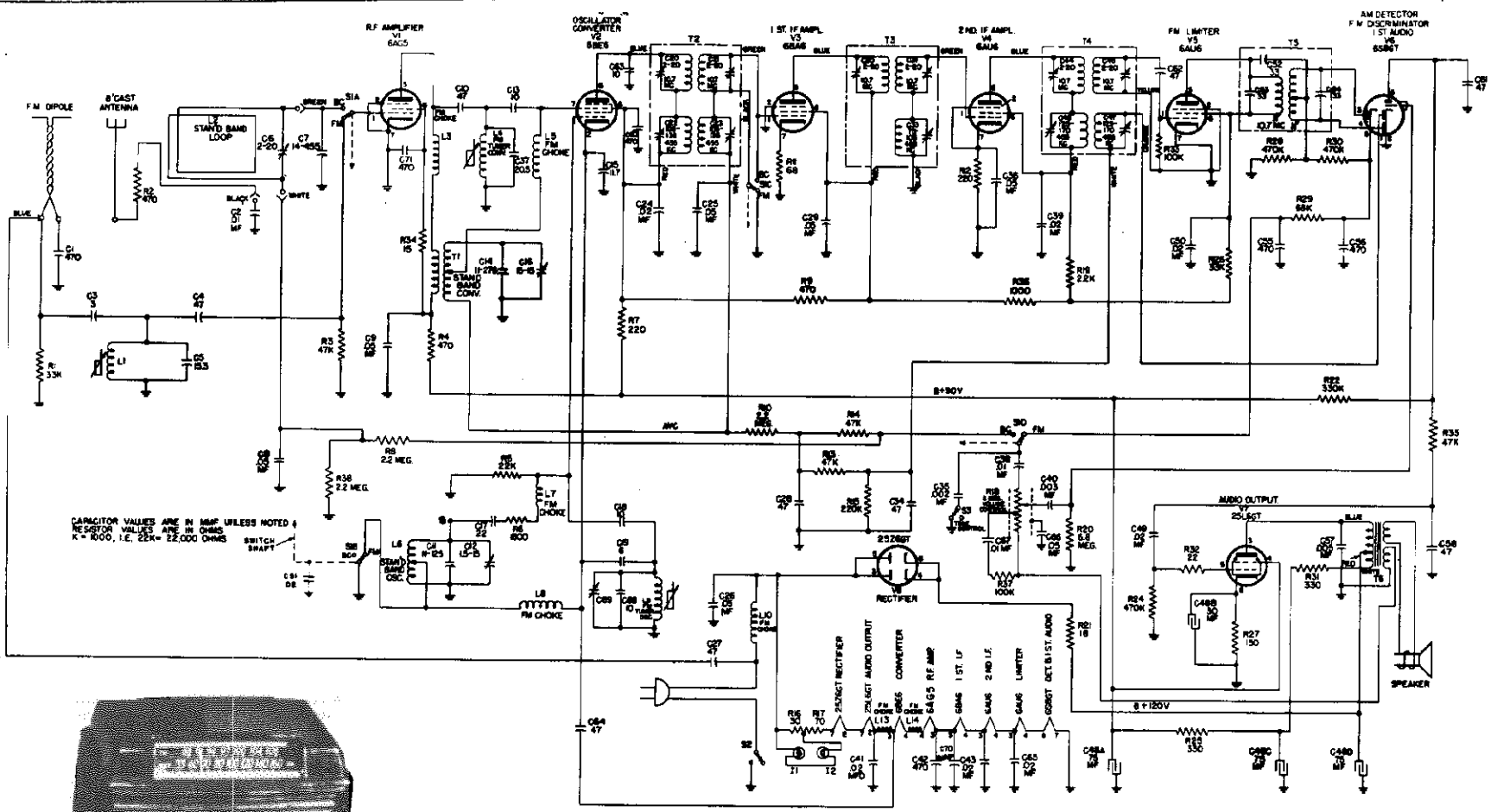
Cone Diameter	6 in.
Voice Coil Impedance	3.5 ohms
Type	Alnico P.M.

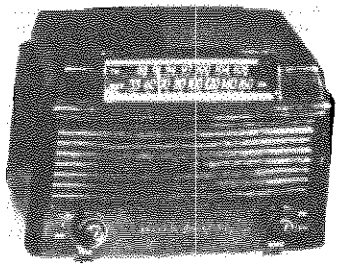
PHONOGRAPH PICKUP

Type	Magnetic
D-C Resistance	280 ohms

TUBE COMPLEMENT

Oscillator-Converter	Type 6SA7
I-F Amplifier	Type 6SK7
Detector-Audio	Type 6SQ7
Power Output	Type 6V6GT
Phono Pre-amplifier	Type 6SC7
Rectifier	Type 5Y3GT
Pilot Lamps (2)	G.E. No. 47





ANTENNA:

Broadcast . . . . . Loop antenna or outside antenna
FM . . . . . Power cord antenna or external dipole antenna

ELECTRICAL:

Voltage . . . . . 105 v.—125 v. a-c or d-c
Frequency on A-C . . . . . 25–60 cps
Wattage . . . . . 45 watts

TUNING BAND:

Standard Broadcast . . . . . 540–1600 kc
FM . . . . . 88–108 mc

INTERMEDIATE FREQUENCY:

Standard Broadcast . . . . . 455 kc
FM . . . . . 10.7 mc

POWER OUTPUT (117 Volts Line):

Undistorted . . . . . 1.2 watts
Maximum . . . . . 2.0 watts

LOUD-SPEAKER:

Type . . . . . "Alnico" permanent magnet
Outside Cone Diameter . . . . . 5¼ in.
Voice Coil Impedance (400 cycles) . . . . . 3.2 ohms

TUBE COMPLEMENT:

(V1) R-F Amplifier 6AG5
(V2) Oscillator-Converter 6BE6
(V3) 1st I-F Amplifier 6BA6
(V4) 2nd I-F Amplifier 6AU6
(V5) FM Limiter 6AU6
(V6) AM Detector, FM Discriminator, and 1st Audio Amplifier 6S8GT
(V7) Audio Output 25L6GT
(V8) Rectifier 25Z6GT
I1 and I2 . . . . . Mazda No. 47

STAGE GAIN AND VOLTAGE CHECKS

Stage gain measurements by vacuum tube voltmeter or similar measuring devices may be used to check circuit performance and isolate trouble. The gain values listed may have tolerances of ±20%. Readings should be taken with low signal voltage so that AVC is not effective.

1. *R-F AND I-F STAGE GAINS*

Signal applied through IRE dummy antenna:

Antenna Post to V1 Grid	3.5 at 1000 kc
Dipole Terminals to V1 Grid	1.0 at 98 mc
V1 Grid to V2 Grid	24 at 1000 kc
V1 Grid to V2 Grid	7.5 at 98 mc
V2 Grid to V3 Grid	21 at 455 kc
V2 Grid to V3 Grid	4.0 at 10.7 mc
V3 Grid to V4 Grid	1.75 at 455 kc
V3 Grid to V4 Grid	22 at 10.7 mc
V4 Grid to V5 Grid	16 at 10.7 mc

2. *AUDIO GAIN*

.08 volts at 400 cps across volume control with control set at maximum will give approximately ½ watt output across the speaker voice coil.

3. *OSCILLATOR GRID BIAS*

D-c Voltage Developed Across R5:
8.0 volts at 1000 kc
3.0 volts at 98 mc

4. *SOCKET PIN VOLTAGES*

Figure 3 shows typical tube pin voltages. All readings should be made from the pins to ground unless otherwise indicated.

ALIGNMENT

Two methods of aligning the i-f transformers and the discriminator are given here, (1) the regular meter alignment method as previously used on AM sets, and (2) the visual alignment which allows for much more precision in aligning the i-f transformers and, particularly, the discriminator where you can check the output wave shape for distortion, oscillations, and to see that the negative and positive half cycles of the wave have equal amplitude and are symmetrical.

EQUIPMENT REQUIRED FOR METER ALIGNMENT:

1. Test Oscillator with tone modulation.
2. D-C Voltmeter or Microammeter.
3. A-C Voltmeter, 2 volts.
4. .01 mf. paper capacitor.
5. ½ watt resistor of required resistance (note 9).
6. 200 mmf. mica capacitor.

EQUIPMENT REQUIRED FOR VISUAL ALIGNMENT:

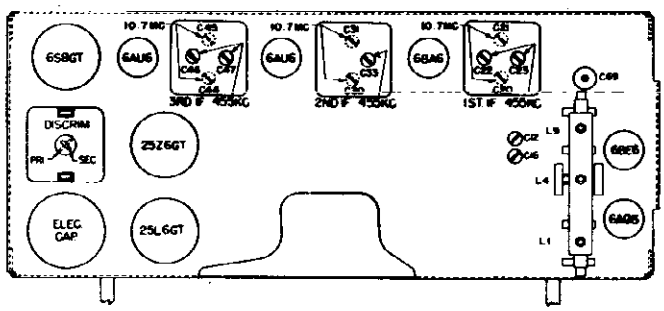
1. General Electric YGS-3 AM and FM signal generator, or equivalent.
2. General Electric CRO-5A oscilloscope, or equivalent.
3. 330,000 ohm resistor, ½ watt.
4. 20,000 ohm per volt meter.

NOTES IN CONNECTION WITH METER ALIGNMENT:

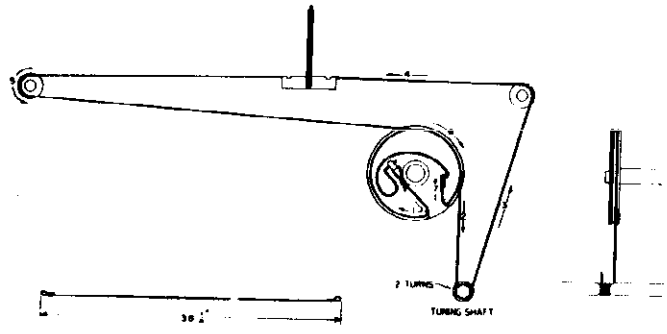
1. Use unmodulated signal.
2. Connect 20,000 ohm-per-volt meter from junction of R29 and C55.
3. Connect 20,000 ohm-per-volt meter from grid pin 1 of (V5) 6AU6 limiter to chassis with a 200,000-ohm resistor in series. The resistor must be connected directly to the grid to minimize capacity loading and to isolate the meter from the i-f voltage. Keep signal generator output down so that meter indicates not more than one volt at the grid (5 microamperes through 200,000 ohms) (Alignment Steps 7 through 13).
4. Use 400-cycle modulation (Steps 1, 2, 3, 15, 16, 17, and 18).
5. Connect a standard output meter across speaker voice coil. Turn volume control full on. Keep signal generator output down so that meter indicates not more than ½ watt output (2 volts) during alignment.
6. Two oscillator settings will give response. The higher frequency response is the correct one; the other is the image response. If in doubt, start with the trimmer screw loosened completely and adjust for the first response.
7. For alignment of the standard band oscillator and r-f trimmers, the input signal should be inductively coupled to the radio loop antenna by connecting a 4-turn, 6-inch diameter loop of bell wire across the signal generator terminals, and then locate the loop about one foot from the radio loop antenna to prevent possible errors in peak readings. The position of the loop in respect to the radio loop antenna should not be changed during any one set of adjustments. Steps 15, 16, 17 and 18.
8. The lead from the signal generator must be kept as short as possible and it must be kept away from later stages to prevent regeneration. The signal may also be fed in to the tube pin connection from the top of the chassis to prevent regeneration.
9. A dummy antenna is a resistor in series with the hot lead of the signal generator. The resistance of the resistor plus the termination impedance of the signal generator should equal 300 ohms.
10. If a dial scale is not available, index the dial pointer as follows: turn the pointer to the left hand limit of travel and mark the dial plate at a reference edge of the pointer slide. Then set the pointer by turning the dial knob until the indicated dimension exists between the reference edge and the mark.

NOTES IN CONNECTION WITH VISUAL ALIGNMENT TABLE

1. Use FM signal modulated at 60 cps ±300 kc.
2. Connect vertical plates of scope to the limiter grid (pin 1 of V5/6AU6) through 200,000 ohm resistor.
3. Connect vertical plates of scope to the junction of R29 and C55 (FM audio) through 200,000 ohms.
4. Connect vertical plates of scope at junction of R13 and C28 (AM audio output) through 200,000 ohms.
5. Use FM signal modulated at 60 cps ±20 kc.
6. Use a 60 cycle amplitude modulated signal.
7. If a dial scale is not available, index the dial pointer as follows: Turn the pointer to the left-hand limit of travel and mark the dial plate at a reference edge of the pointer slide. Then set the pointer by turning dial knob until the indicated dimension exists between the reference edge and the mark.
8. Two oscillator settings will give a response. The higher frequency response is the correct one, the other response is the image. If in doubt, start with the trimmer screw loosened completely and adjust for the *first* response.
9. In some cases tuning of the converter grid will cause "pulling" of oscillator which will change the oscillator frequency. After centering the response curve on the scope, if peaking of L4 causes the response curve to move off of the screen it is necessary to realign the oscillator for calibration.
10. A dummy antenna is a resistor in series with the hot lead of the signal generator. The resistance of the resistor plus the termination impedance of the signal generator should equal 300 ohms.
11. The lead from the generator must be kept short as possible and away from later stages to prevent regeneration. The signal can also be fed into the tube pin connection from the top of the chassis to prevent regeneration.



Tube and Trimmer Location



Dial Stringing Diagram

MODELS 356, 357, 358

GENERAL ELECTRIC CO.

ALIGNMENT CHART

STEP	SIGNAL GENERATOR FREQUENCY	SIGNAL INPUT POINT	BAND SWITCH	DIAL SETTING	ADJUST	SEE NOTE	REMARKS
			AM I-F METER ALIGNMENT				
1	455 kc	V2 Pin 7 Conv. grid directly thru .01 mfd	STD	....	Peak C47 and C46	4, 5	Adjust for max.
2	455 kc	V2 Pin 7 Conv. grid directly thru .01 mfd	STD	....	Peak C33	4, 5	Adjust for max.
3	455 kc	V2 Pin 7 Conv. grid directly thru .01 mfd	STD	....	Peak C23 and C22	4, 5	Adjust for max.
			FM DISCRIMINATOR AND I-F METER ALIGNMENT				
4	10.7 mc	Pin 1 of V5 (6AU6) thru .01 mf	FM	....	Discrim. Secondary for zero meter	1, 2	Apply 1 volt signal input.
5	*Detune signal generator	Pin 1 of V5 (6AU6) thru .01 mf	FM	....	*Signal Generator	1, 2	*Detune signal generator to point of maximum meter reading.
6	As in Step 5.	Pin 1 of V5 (6AU6) thru .01 mf	FM	....	Peak discr. primary	1, 2	Adjust for max.
7	10.7 mc	Pin 1 of V4 (6AU6) thru .01 mf	FM	....	Peak C45 and C44	1, 3	Adjust for max.
8	10.7 mc	Pin 1 of V3 (6BA6) thru .01 mf	FM	....	C31 and C30	1, 3	Adjust for max.
9	10.7 mc	Pin 7 of V2 (6BE6) thru .01 mf	FM	....	C21 and C20	1, 3 8	Adjust for max.
			FM R-F METER ALIGNMENT				
10	98 mc	Dipole terminals thru dummy antenna	FM	98 mc or $3\frac{3}{8}$ inches	Peak C69	1, 3, 6, 9, 10	
11	98 mc	Dipole terminals thru dummy antenna	FM	For max. output	Peak L4 vane	1, 3, 9	
12	Repeat steps 10 and 11 until no further improvement in sensitivity.						
13	98 mc	Dipole terminals thru dummy antenna	FM	98 mc	Peak L1 vane	1, 3, 9	
14	Repeat steps 10, 11, 12.						
			AM R-F METER ALIGNMENT				
15	1500 kc	Inductively coupled	STD	1500 kc or $4\frac{1}{8}$ inches	Peak C12	4, 5, 7, 10	
16	1500 kc	Inductively coupled	STD	For max. output	Peak C16	4, 5, 7	
17	Repeat steps 15 and 16 until no further improvement in sensitivity.						
18	1500 kc	Inductively coupled	STD	1500 kc	Peak C6	4, 5, 7	

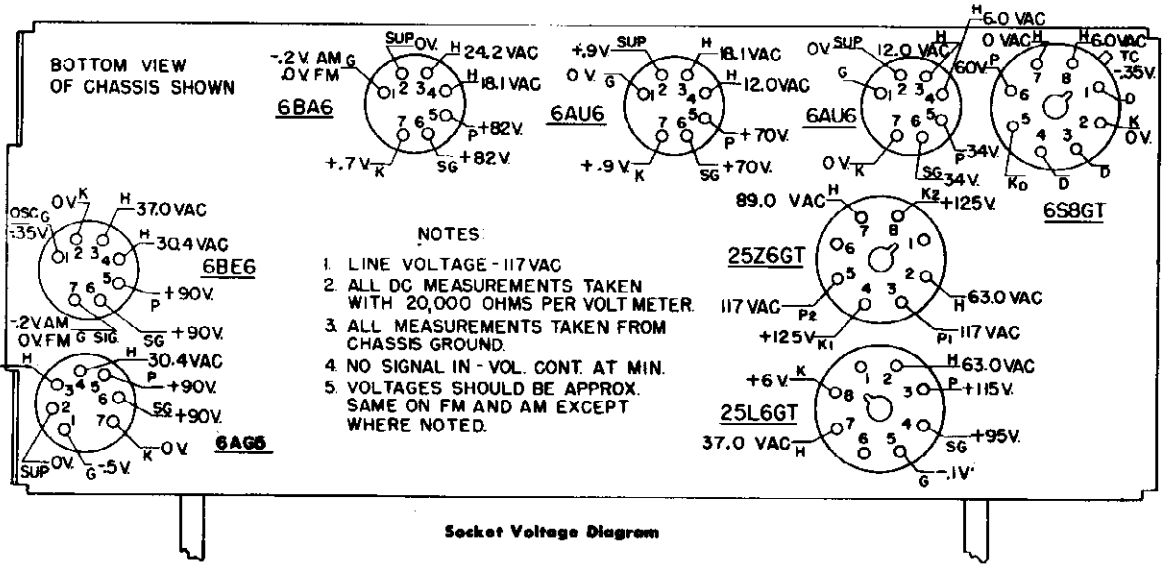
GENERAL ELECTRIC CO.

MODELS 356, 357, 358

STEP	SIGNAL GENERATOR FREQUENCY	SIGNAL INPUT POINT	BAND SWITCH	DIAL SETTING	ADJUST	SEE NOTE	REMARKS
			AM I-F VISUAL ALIGNMENT				
1	455 kc ±20 kc at 60-cycle sweep	Conv. grid directly pin 7 V2 (6BE6) thru .01 mf	AM	....	C47 and C46*	4, 5	*Adjust for max. amplitude min. distortion of curve scope screen.
2	Same as Step 1	Same as Step 1	AM	....	C33	4, 5	Same as Step 1.
3	Same as Step 1 and 2	Same as Step 1 and 2	AM	....	C23 and C22	4, 5	Same as Steps 1 and 2.
			FM I-F VISUAL ALIGNMENT				
4	10.7 mc ±.3 mc at 60-cycle sweep	Conv. grid directly pin 7 V2 (6BE6) thru .01 mf	FM	....	C45 and C44	1, 2, 11	Adjust for max. amplitude a min. distortion.
5	Same as Step 4	Same as Step 4	FM	....	C31 and C30	1, 2, 11	Same as Step 4.
6	Same as Steps 4 and 5	Same as Steps 4 and 5	FM	....	C21 and C20	1, 2, 11	Same as Steps 4 and 5.
			DISCRIMINATOR VISUAL ALIGNMENT				
7	10.7 mc ±.3 mc at 60-cycle rate	Conv. grid directly pin 7 V2 (6BE6) thru .01 mf	FM	....	Primary of T5 discrim. transformer	1, 3, 11	Adjust primary for max. amp tude.
8	Same as Step 7	Same as Step 7	FM	....	Secondary of T5	1, 3, 11	Adjust secondary for vertic symmetry with respect to mi point horizontal traces.
9	Same as Step 7	Same as Step 7	FM	....	Primary of T5	1, 3, 11	Adjust primary of T5 f straightest possible slope straight line trace.
			FM R-F VISUAL ALIGNMENT				
10	98 mc	Dipole terminals thru dummy antenna	FM	98 mc or $3\frac{3}{8}$ in.	Adjust C69*	2, 6, 7, 8, 10	*Set dial pointer accurate then adjust for steepest slope straight line trace on scope.
11	98 mc Note 1	Dipole terminals thru dummy antenna	FM	98 mc	Peak L4 vane	1, 2, 9, 10	Center response curve on scop then peak for max. amplitude.
12	98 mc Note 1	Dipole terminals thru dummy antenna	FM	98 mc	Peak L1 tuning vane	1, 2, 10	Peak for max. amplitude.
			AM R-F VISUAL ALIGNMENT				
13	1500 kc Note 6	Antenna thru 200 mmf	STD	1500 kc or $4\frac{13}{16}$ in.	Adjust C12	4, 6, 7	Adjust C12 for steepest slope straight line trace on scope.
14	1500 kc Note 5	Antenna thru 200 mmf	STD	1500 kc or $4\frac{13}{16}$ in.	Adjust C16	4, 5, 7, 9	Adjust C14 for max. amplitu
15	1500 kc Note 5	Antenna thru 200 mmf	STD	1500 kc or $4\frac{13}{16}$ in.	Adjust C6	4, 5, 7	Adjust C6 for max. amplitud

MODELS 356, 357, 358

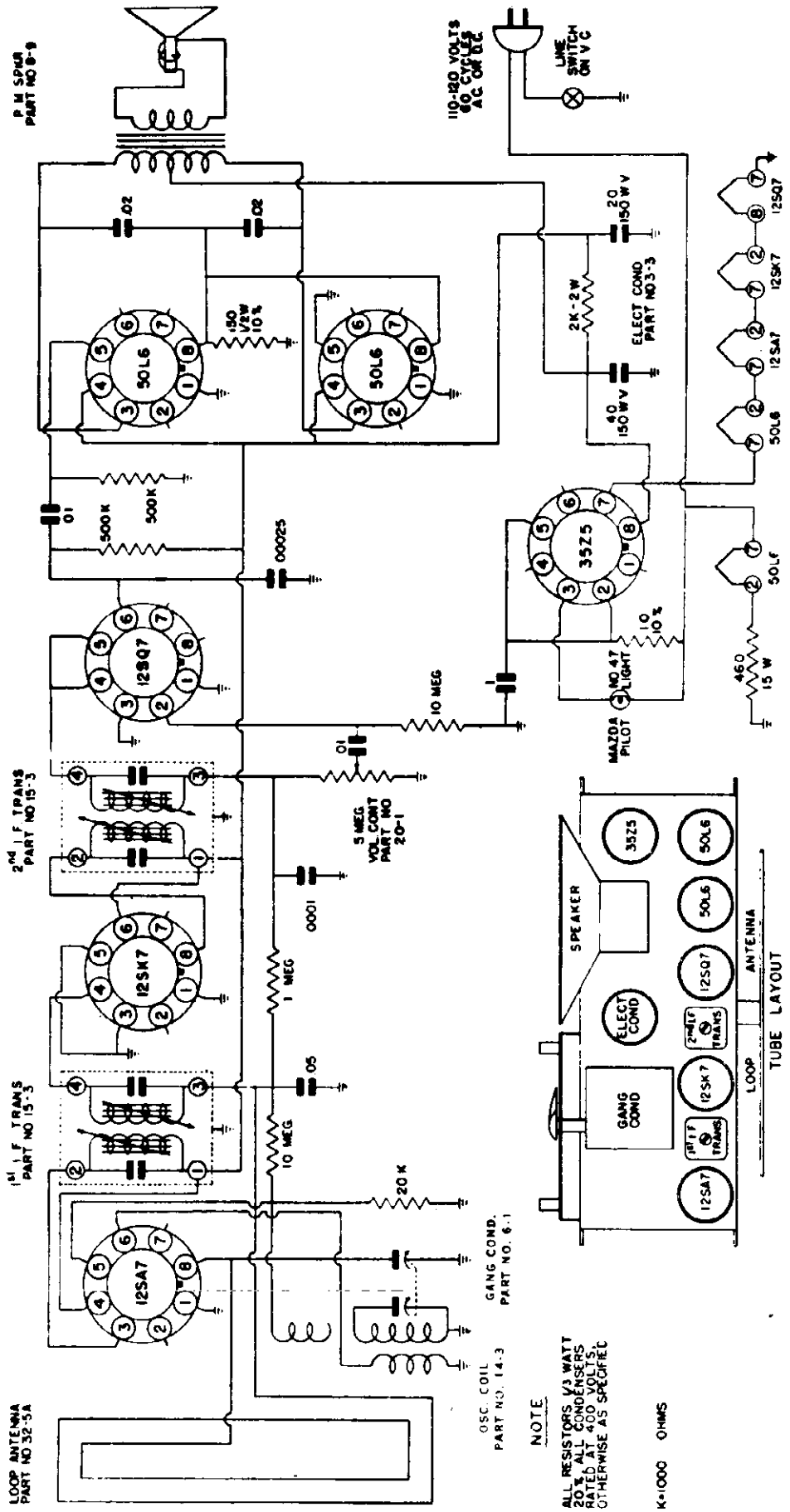
GENERAL ELECTRIC CO.



Socket Voltage Diagram

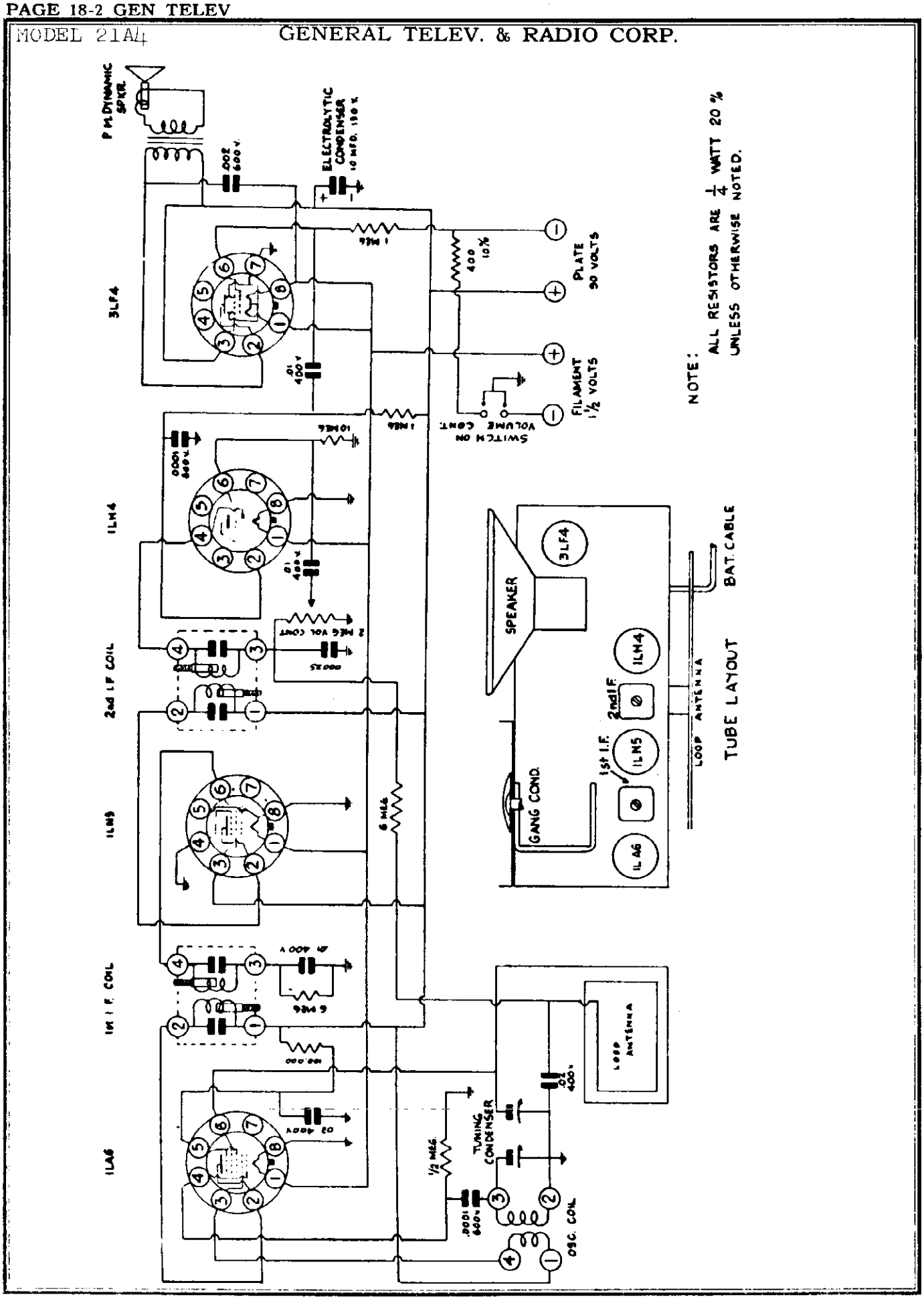
Cat. No.	Symbol	Description
UNIVERSAL REPLACEMENT PARTS		
UCC-003	C40	CAPACITOR—.003 mf., 200 v., paper
UCC-008	C38	CAPACITOR—.01 mf., 200 v., paper
UCC-011	C8, 25, 36	CAPACITOR—.05 mf., 200 v., paper
UCC-025	C43, 65, 2, 70	CAPACITOR—.01 mf., 400 v., paper
UCC-026	C24, 39, 49, 50	CAPACITOR—.02 mf., 400 v., paper
UCC-028	C9, 26, 29, 66	CAPACITOR—.05 mf., 400 v., paper
UCC-039	C57	CAPACITOR—.005 mf., 600 v., paper
UCC-621	C35	CAPACITOR—.002 mf., 200 v., paper
UCU-020	C27, 28, 34, 58	CAPACITOR—47 mmf., mica
UCU-044	C1, 55	CAPACITOR—470 mmf., mica
UCU-520	C61	CAPACITOR—470 mmf., mica
UCU-544	C56	CAPACITOR—470 mmf., mica
UCW-044	C41, 42, 60, 71	CAPACITOR—470 mmf., ceramic
UCW-2004	C18, 68	CAPACITOR—10 mmf., ceramic
UOP-527		SPEAKER—PM speaker
URD-005	R34	RESISTOR—15 ohms, ½ w., carbon
URD-009	R32	RESISTOR—22 ohms, ½ w., carbon
URD-021	R11	RESISTOR—68 ohms, ½ w., carbon
URD-033	R7, 12	RESISTOR—220 ohms, ½ w., carbon
URD-041	R2, 49	RESISTOR—470 ohms, ½ w., carbon
URD-049	R36	RESISTOR—1000 ohms, ½ w., carbon
URD-055	R6	RESISTOR—1800 ohms, ½ w., carbon
URD-057	R19	RESISTOR—2200 ohms, ½ w., carbon
URD-081	R5	RESISTOR—22,000 ohms, ½ w., carbon
URD-085	R1, 26	RESISTOR—33,000 ohms, ½ w., carbon
URD-089	R3, 13, 14, 35	RESISTOR—47,000 ohms, ½ w., carbon
URD-093	R29	RESISTOR—68,000 ohms, ½ w., carbon
URD-097	R33, 37	RESISTOR—100,000 ohms, ½ w., carbon
URD-105	R15	RESISTOR—220,000 ohms, ½ w., carbon
URD-109	R22	RESISTOR—330,000 ohms, ½ w., carbon
URD-113	R24, 28, 30	RESISTOR—470,000 ohms, ½ w., carbon
URD-129	R8, 10, 38	RESISTOR—2.2 meg., ½ w., carbon
URD-141	R20	RESISTOR—6.8 meg., ½ w., carbon
URE-029	R27	RESISTOR—150 ohms, 1 w., carbon
URE-037	R25, 31	RESISTOR—330 ohms, 1 w., carbon
SPECIALIZED REPLACEMENT PARTS		
RAU-012		CABINET—Brown plastic, for Model 356
RAU-013		CABINET—Ivory plastic, for Model 357
RAV-052		CABINET—Wood, for Model 358
RCC-087	C67	CAPACITOR—.01 mf., 200 v.
RCE-065	C48A, B, C, D	CAPACITOR—Electrolytic
RCT-028		CAPACITOR—Tuning capacitor
RCW-020	C13, 63	CAPACITOR—10 mmf., ceramic
RCW-1048	C3	CAPACITOR—3 mmf., ceramic
RCW-1050	C19	CAPACITOR—6 mmf., ceramic
RCW-1052	C4, 20, 64	CAPACITOR—47 mmf., ceramic
RCW-1053	C17	CAPACITOR—22 mmf., ceramic
RCW-1054	C5	CAPACITOR—15.3 mmf., ceramic
RCW-1055	C15	CAPACITOR—11.7 mmf., ceramic

Cat. No.	Symbol	Description
SPECIALIZED REPLACEMENT PARTS (Cont'd)		
RCW-1056	C37	CAPACITOR—20.5 mmf., ceramic
RCY-016	C6	CAPACITOR—Trimmer capacitor
RCY-038	C69	CAPACITOR—Trimmer capacitor
RDC-032		CORD—Dial drive cord (10 yard min.)
RDD-009		DRUM—Tuner drum
RDK-110		KNOB—Black knob for band change and volume control
RDK-123		KNOB—Ivory for band change and volume control
RDK-124		KNOB—Black for tone control
RDK-125		KNOB—Ivory for tone control
RDK-126		KNOB—Black for tuning control
RDK-127		KNOB—Ivory for tuning control
RDS-065		SCALE—Dial scale for Models 356, 357
RDS-066		SCALE—Dial scale for Model 358
RDX-039		POINTER—Dial pointer assembly
RHJ-006		SPACERS—For mounting tuner assembly, 3 required
RHM-038		TUNER FRAME—2 required for coils L1, L4 and L9
RHX-011		GROMMET—For mounting tuner assembly, three required
RII-010		INSULATOR—Tuner insulator
RJS-003		SOCKET—Octal tube socket
RJS-098		SOCKET—Pilot light socket
RJS-105		SOCKET—Miniature tube socket
RJX-019		INTERLOCK ASSEMBLY
RLA-012	L3, 5, 7	COIL—FM R-F choke coil
RLB-024	T1	TRANSFORMER—B-C R-F transformer
RLC-060	L6	COIL—B-C oscillator coil
RLF-012	L8	COIL—FM oscillator choke coil
RLI-005	L13, 14	COIL—FM oscillator choke coil
RLI-044	L10	COIL—FM power line choke coil
RLX-014	L2	LOOP AND BACK ASSEMBLY For Model 358
RLX-016	L2	LOOP AND BACK ASSEMBLY - For Models 356 and 357
RMG-009		GEAR—Plastic gear segment on tone control
RMS-076		SCREW—Adjusting screw for tuning vane
RMS-125		SPRING—Tuner arm return spring
RMS-126		SPRING—Vane holder spring
RMS-130		SPRING—Dial cord tension spring
RMX-108		TUNER VANE AND WIRE ASSEMBLY - For L1 and L4
RMX-110		TUNER VANE AND WIRE ASSEMBLY For L9
RMW-004		PULLEY—Dial cord idler pulley
RRC-076	R18, S2	VOLUME CONTROL AND POWER SWITCH
RRW-008	R21	RESISTOR—Flexible, 18 ohms
RRW-025	R16, 17	RESISTOR—70 ohms, tapped at 30 ohms, wirewound
RSI-003		INTERLOCK CONTROL ASSEMBLY—(Male)
RSW-049	S1	SWITCH—Band change switch
RSW-050	S3	SWITCH—Tone control switch
RTD-006	T5	TRANSFORMER—Discriminator
RTL-062	T2	TRANSFORMER—1st I-F transformer
RTL-064	T4	TRANSFORMER—3rd I-F transformer
RTL-072	T3	TRANSFORMER—2nd I-F transformer
RTO-044	T6	TRANSFORMER—Output transformer
RWL-009		CORD—Power cord

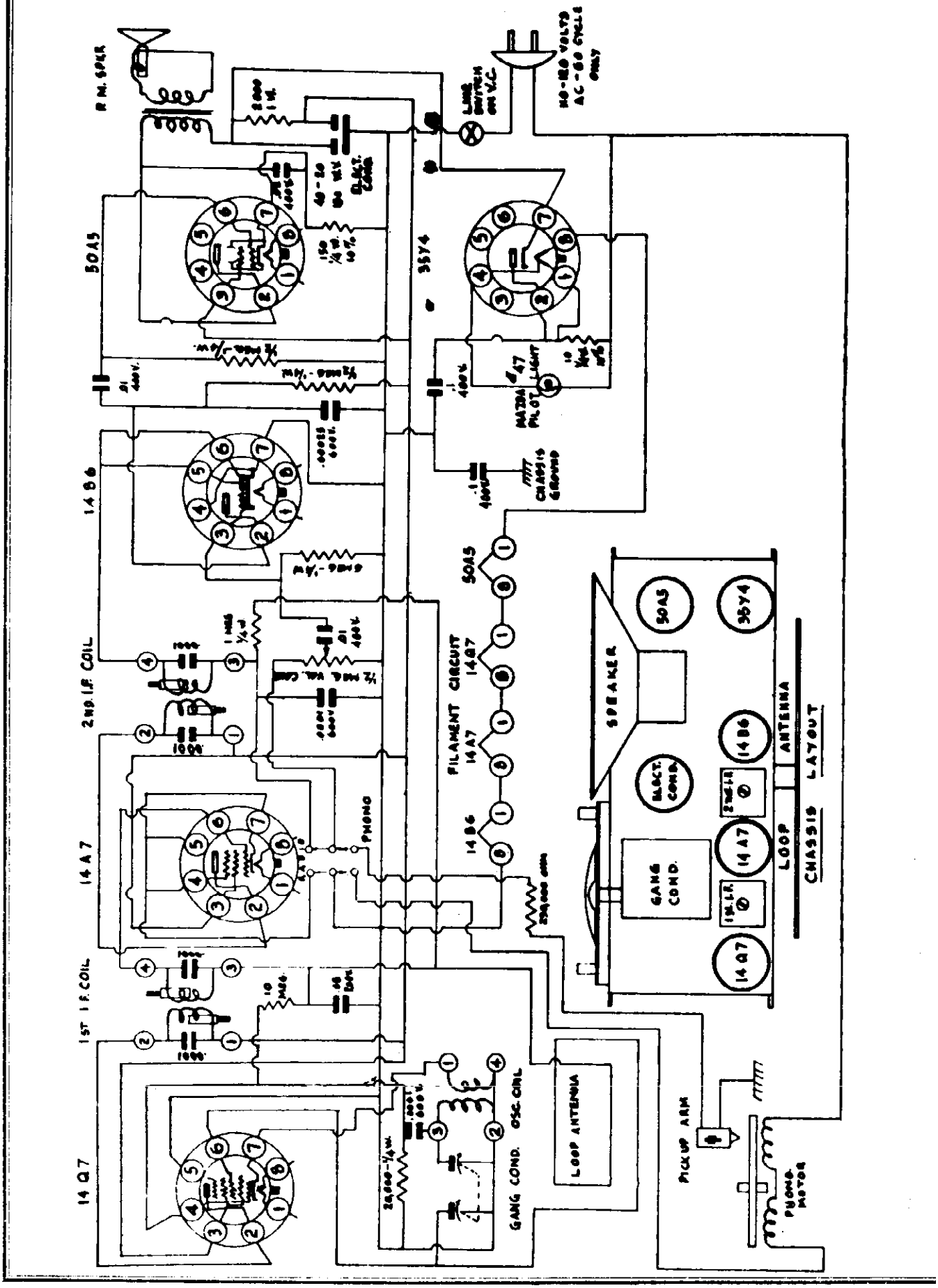

P M SPKR PART NO 8-9
110-120 VOLTS 60 CYCLES AC OR DC
LINE SWITCH ON V C
.02
.02
50L6
150 V2W 10%
50L6
2K-2W
20 150 W V
ELECT COND PART NO 3-3
40 150 W V
12SQ7
12SK7
12SA7
50L6
50L6
.01
500 K
500 K
.0025
3525
12SQ7
10 MEG
10 %
NO 47 LIGHT
MAZDA PILOT
460 15 W
50L6
.01
5 MEG VOL CONT PART NO 20-1
2nd I F TRANS PART NO 15-3
.0001
12SK7
1 MEG
.05
1st I F TRANS PART NO 15-3
10 MEG
20 K
12SA7
GANG COND. PART NO. 6-1
OSC. COIL PART NO. 14-3
LOOP ANTENNA PART NO 32-5A
NOTE
ALL RESISTORS 1/2 WATT 20 % ALL CONDENSERS RATED AT 400 VOLTS OTHERWISE AS SPECIFIED
K=1000 OHMS
SPEAKER
3525
50L6
50L6
ELECT COND
12SQ7
ANTENNA
2nd I F TRANS
GANG COND
12SK7
1st I F TRANS
LOOP
12SA7
TUBE LAYOUT

MODEL 21A4

GENERAL TELEV. & RADIO CORP.

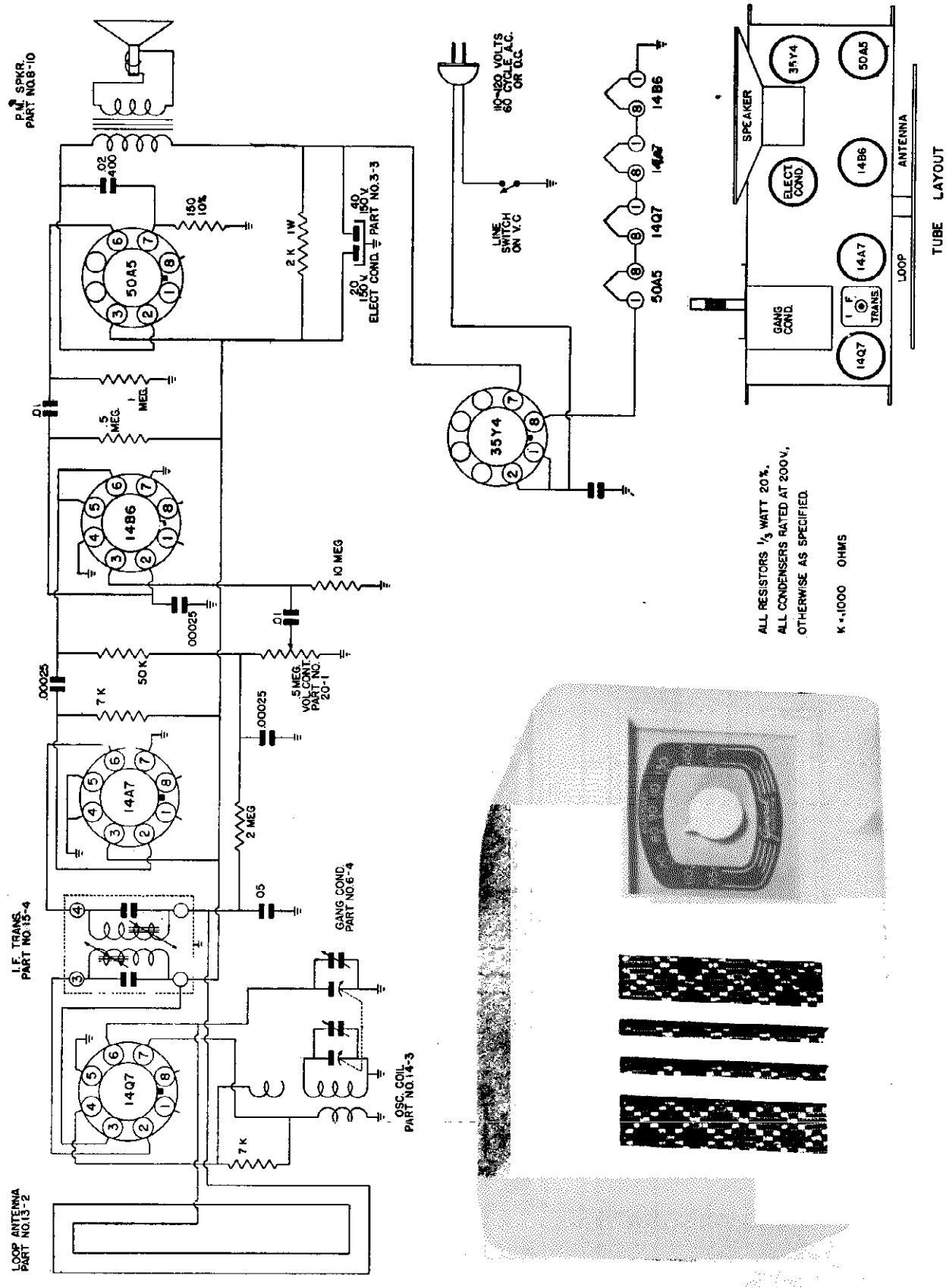


GENERAL TELEV. & RADIO CORP. MODEL 2245

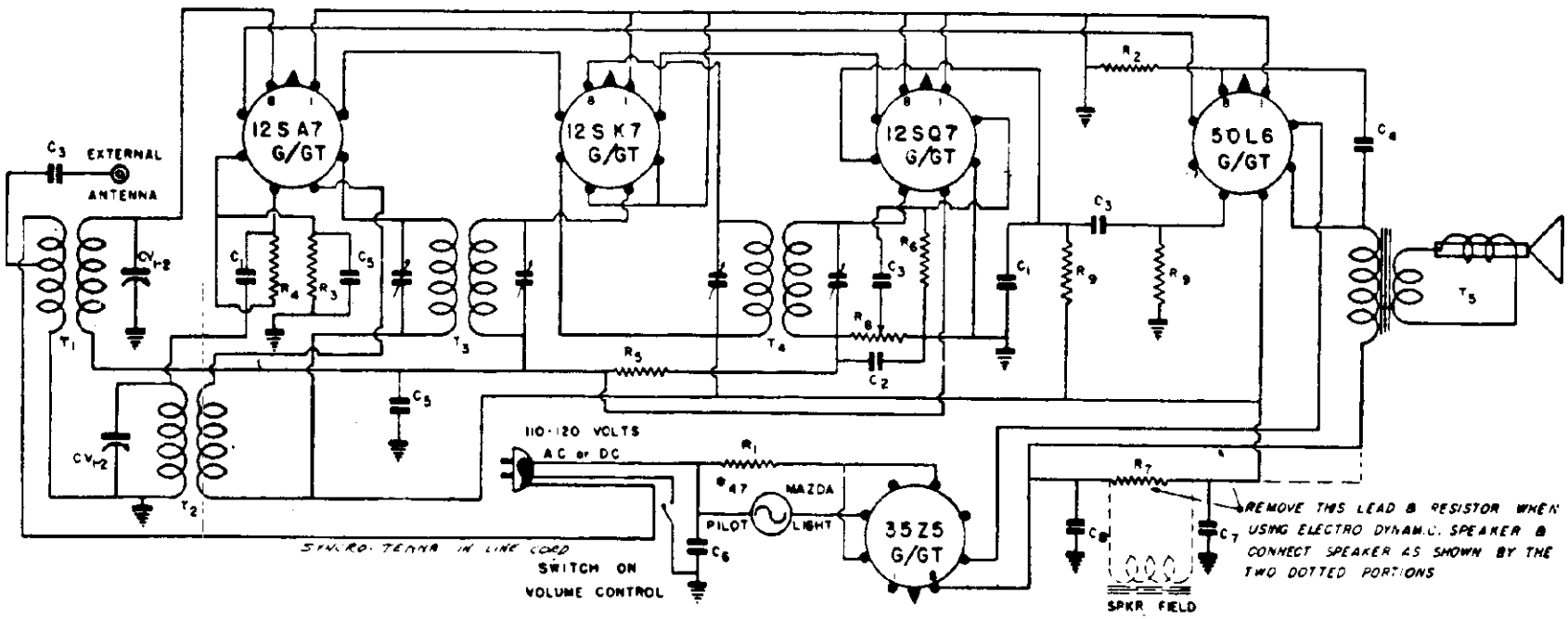


MODEL 27C5L

GENERAL TELEV. & RADIO CORP.

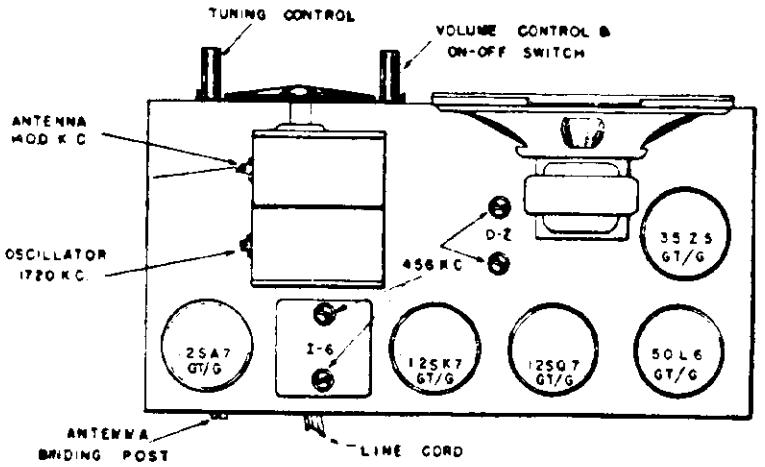


5 TUBE AC-DC SUPERHETERODYNE CIRCUIT



C_1	—	.00025 MFD.	600 V. PAPER CONDENSER
C_2	—	.0005 MFD.	600 V. " "
C_3	—	.01 MFD.	600 V. " "
C_4	—	.02 MFD.	400 V. " "
C_5	—	.05 MFD.	200 V. " "
C_6	—	.1 MFD.	400 V. " "
C_7	346	20 MFD.	150 W.V. ELECTROLYTIC CONDENSER
C_8	346	40 MFD.	150 W.V. " "
CV_{1-2}	648SB	TWO GANG VARIABLE CONDENSER	
R_1	—	10 OHM	1/4 WATT CARBON RESISTOR
R_2	—	150 OHM	1/4 " " "
R_3	—	600 OHM	1/4 " " " ± 10%
R_4	—	50000 OHM	1/4 " " "
R_5	—	2 MEGOHM	1/4 " " "
R_6	—	6 MEGOHM	1/4 " " "
R_7	—	2500 OHM	1/2 " " "
R_8	2009x	1/2 MEGOHM	VOLUME CONTROL
R_9	—	1/2 MEGOHM	1/4 WATT CARBON RESISTOR
T_1	A-B	ANTENNA Coil	
T_2	O-B	OSCILLATOR COIL	
T_3	I-6	1st I F	TRANSFORMER
T_4	D 2	DIODE I.F	TRANSFORMER

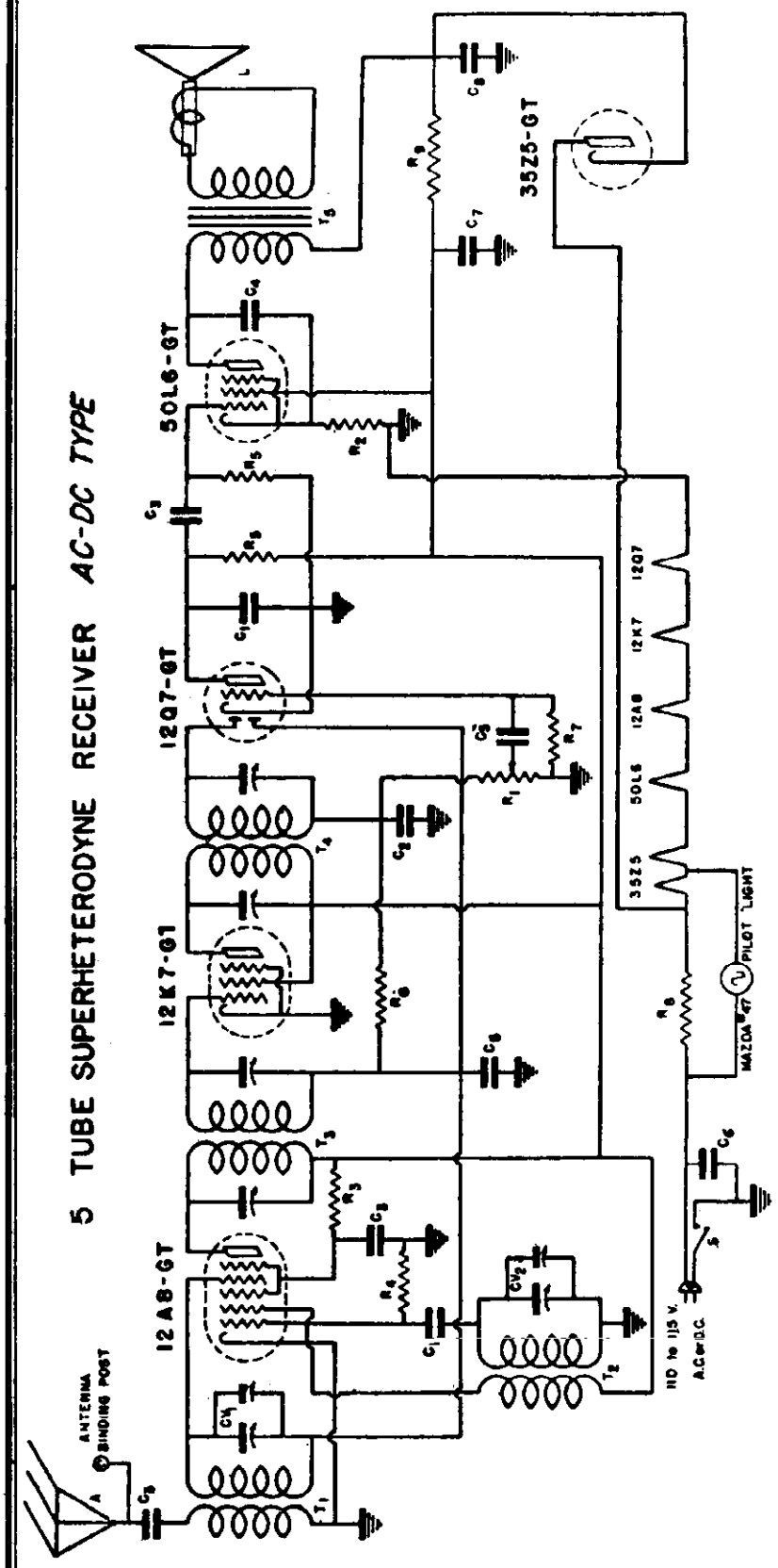
TUBE LOCATION AND CHASSIS LAYOUT



MODELS 526, 534, 547, 549, 558, 588, 591 (Double-ended tubes)

GENERAL TELEV. & RADIO CORP.

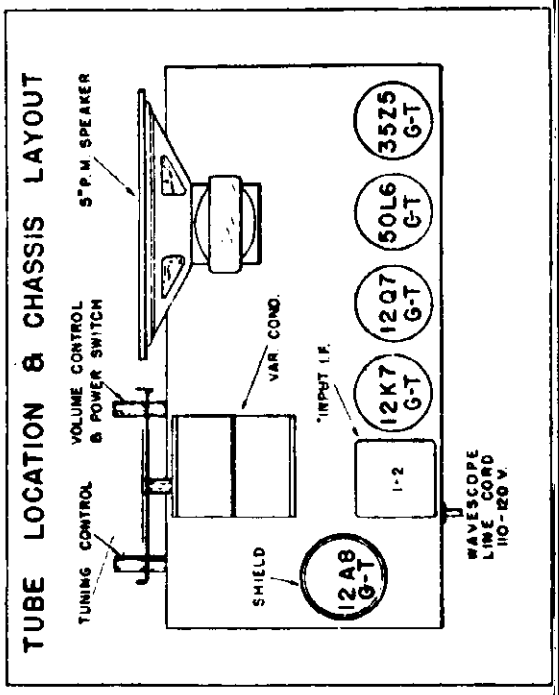
5 TUBE SUPERHETERODYNE RECEIVER AC-DC TYPE



DIA. NO.	PART NO.	DESCRIPTION
C_1	—	.00025 MFD. 600 V. TUBULAR CONDENSER
C_2	—	.0005 MFD. 200 V. TUBULAR CONDENSER
C_3	—	.01 MFD. 400 V. TUBULAR CONDENSER
C_4	—	.02 MFD. 400 V. TUBULAR CONDENSER
C_5	—	.05 MFD. 200 V. TUBULAR CONDENSER
C_6	—	.1 MFD. 400 V. TUBULAR CONDENSER
C_7	IN 346	20 MFD. 150 W.V. ELECTROLYTIC COND.
C_8	IN 346	40 MFD. 150 W.V. ELECTROLYTIC COND.
CV_{1-2}	648	2 GANG VARIABLE CONDENSER
R_5	—	2500 OHM ½ W. CARBON RESISTOR
A	—	WAVESCOPE AERIAL
L	838	P.M. SPEAKER
S	—	LINE SWITCH ON VOLUME CONTROL

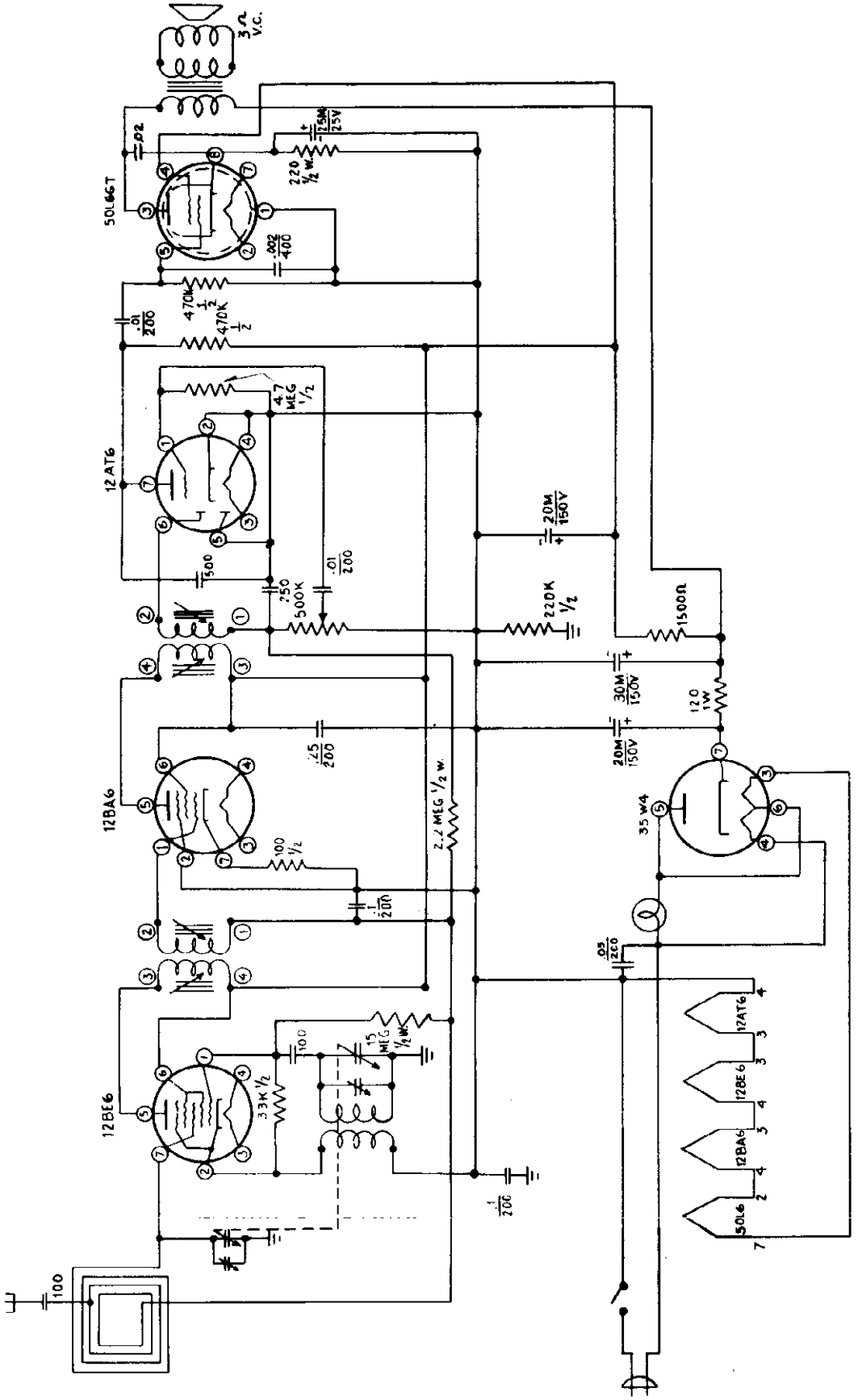
DIA. NO.	PART NO.	DESCRIPTION
R_1	2008F	500,000 OHM VOLUME CONTROL
R_2	—	150 OHM ½ WATT CARBON RESISTOR - 10%
R_3	—	50000 OHM ¼ WATT CARBON RESISTOR
R_4	—	50,000 OHM ¼ WATT CARBON RESISTOR
R_5	—	500,000 OHM ¼ WATT CARBON RESISTOR
R_6	—	2 MEGOHM ¼ WATT CARBON RESISTOR
R_7	—	6 MEGOHM ¼ WATT CARBON RESISTOR
R_8	—	10 OHM ½ WATT CARBON RESISTOR
T_1	A-5-A	ANTENNA COIL
T_2	0-5	OSCILLATOR COIL
T_3	1-2	INPUT I.F. TRANSFORMER
T_4	D-2	OUTPUT I.F. TRANSFORMER
T_5	IN 838	SPEAKER TRANSFORMER

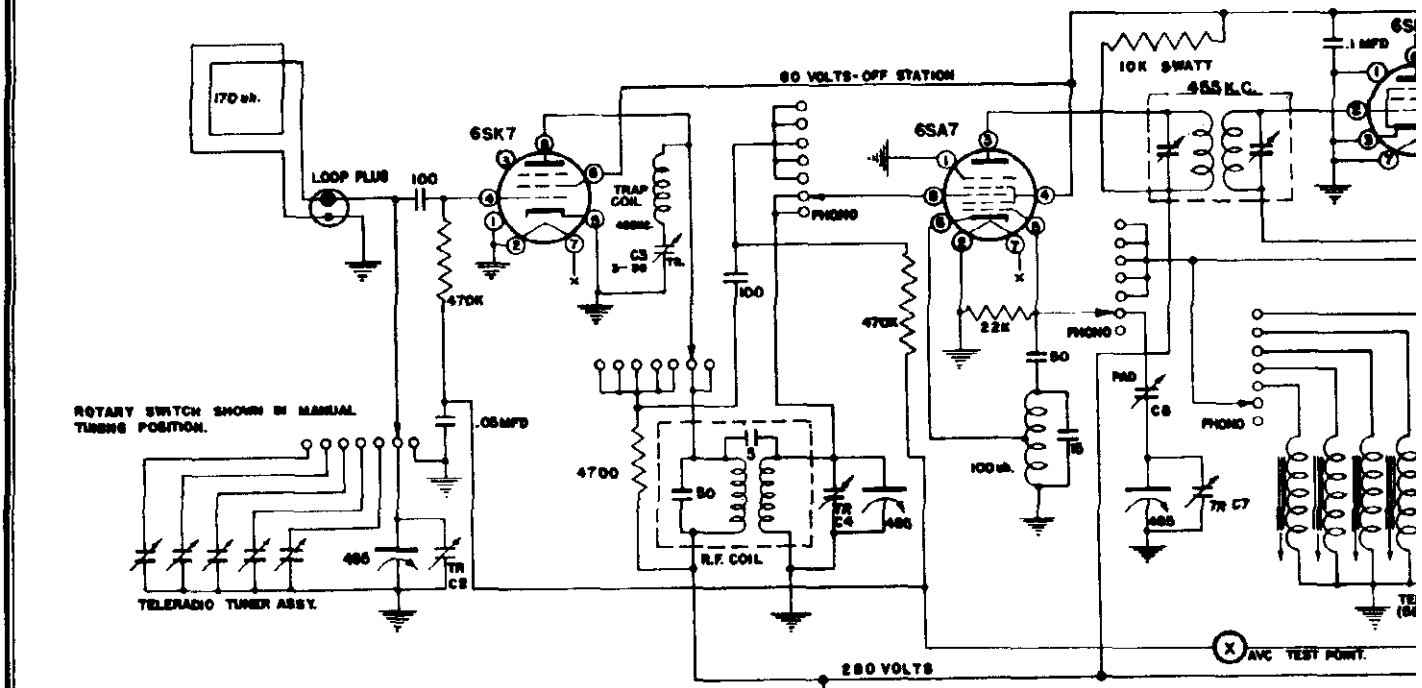
TUBE LOCATION & CHASSIS LAYOUT

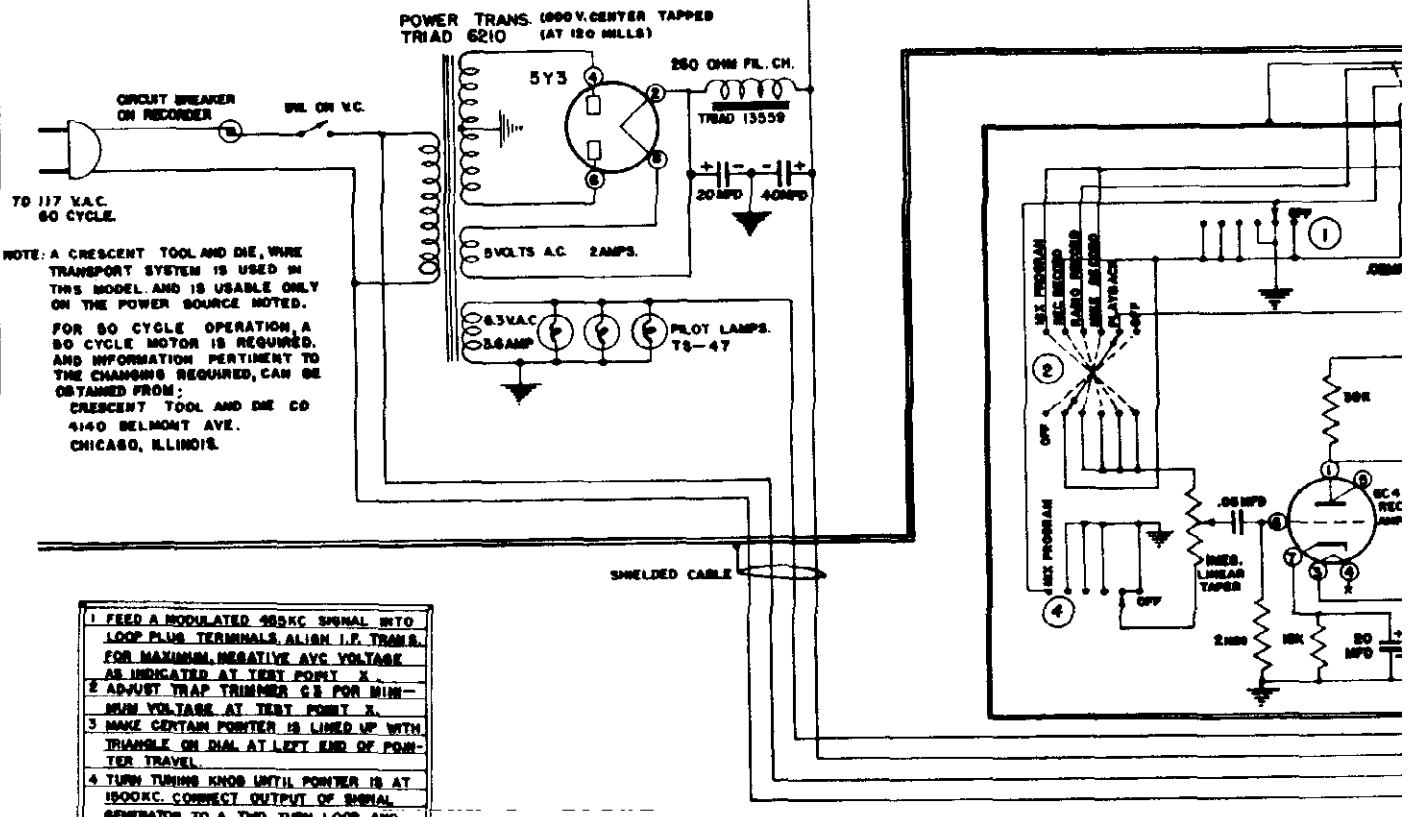


GILFILLAN BROS., INC.

MODELS
58W







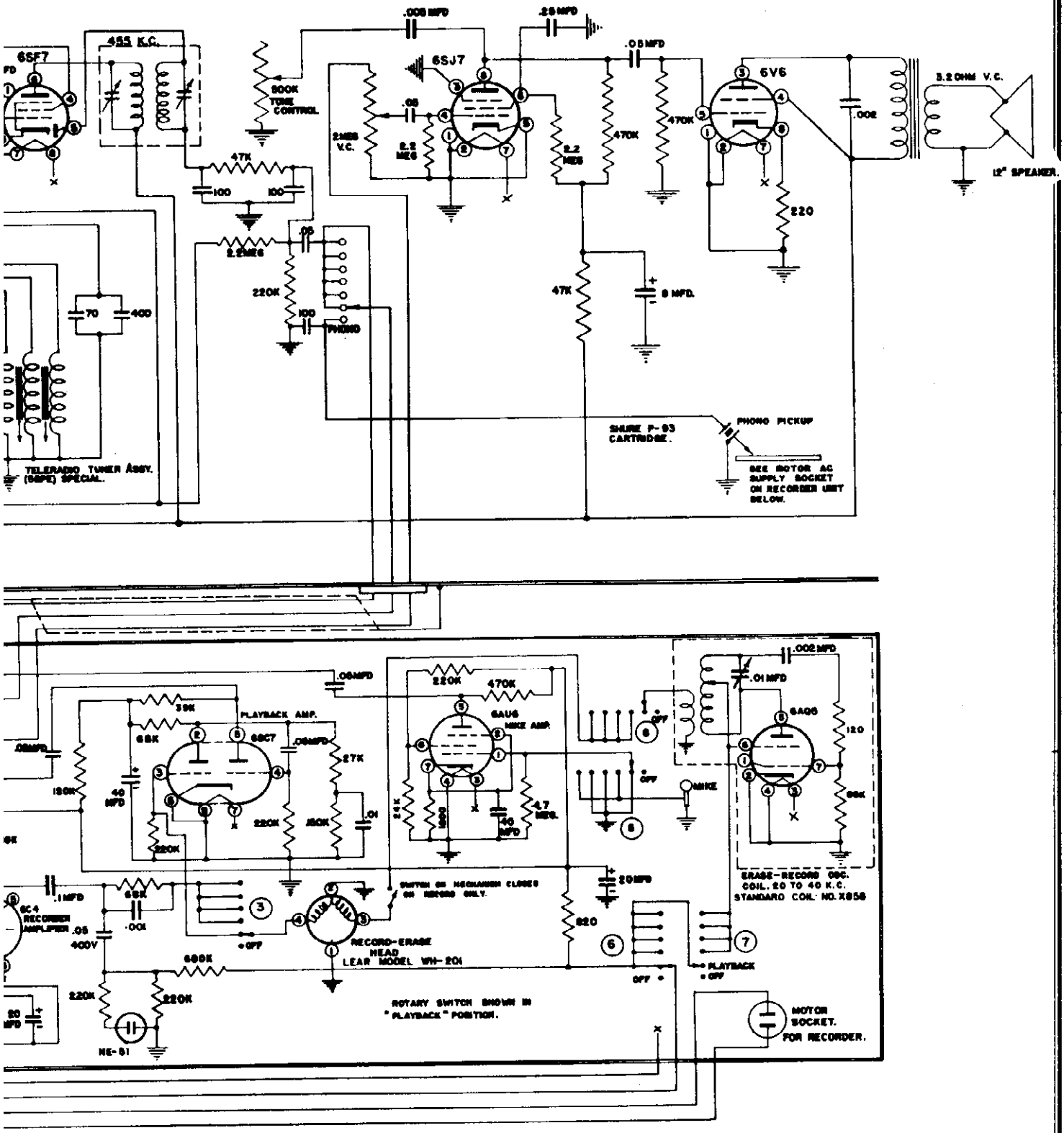
NOTE: A CRESCENT TOOL AND DIE, WIRE TRANSPORT SYSTEM IS USED IN THIS MODEL AND IS USABLE ONLY ON THE POWER SOURCE NOTED.

FOR 50 CYCLE OPERATION, A 50 CYCLE MOTOR IS REQUIRED. AND INFORMATION PERTINENT TO THE CHANGING REQUIRED, CAN BE OBTAINED FROM:
CRESCENT TOOL AND DIE CO
4140 BELMONT AVE.
CHICAGO, ILLINOIS.

1 FEED A MODULATED 455KC SIGNAL INTO LOOP PLUG TERMINALS, ALIGN I.F. TRANS. FOR MAXIMUM, NEGATIVE AVC VOLTAGE AS INDICATED AT TEST POINT X.
2 ADJUST TRAP TRIMMER C3 FOR MINIMUM VOLTAGE AT TEST POINT X.
3 MAKE CERTAIN POINTER IS LINED UP WITH TRIANGLE ON DIAL AT LEFT END OF POINTER TRAVEL.
4 TURN TUNING KNOB UNTIL POINTER IS AT 1500KC. CONNECT OUTPUT OF SIGNAL GENERATOR TO A TWO TURN LOOP AND RADIATE A MOD. 1500KC SIGNAL INTO THE RECVR LOOP FROM AT LEAST 12".
5 ADJUST OSC. TRIMMER C7 UNTIL SIGNAL IS HEARD.
6 ADJUST C2 AND C4 FOR MAXIMUM AVC VOLTAGE
7 SET POINTER AND GENERATOR AT 600KC AND ADJUST C8 PAD UNTIL SIGNAL IS HEARD.
8 ROCK GANG AND C8 FOR MAX AVC VOLTAGE.
9 RECHECK 1500KC. ALIGNMENT.

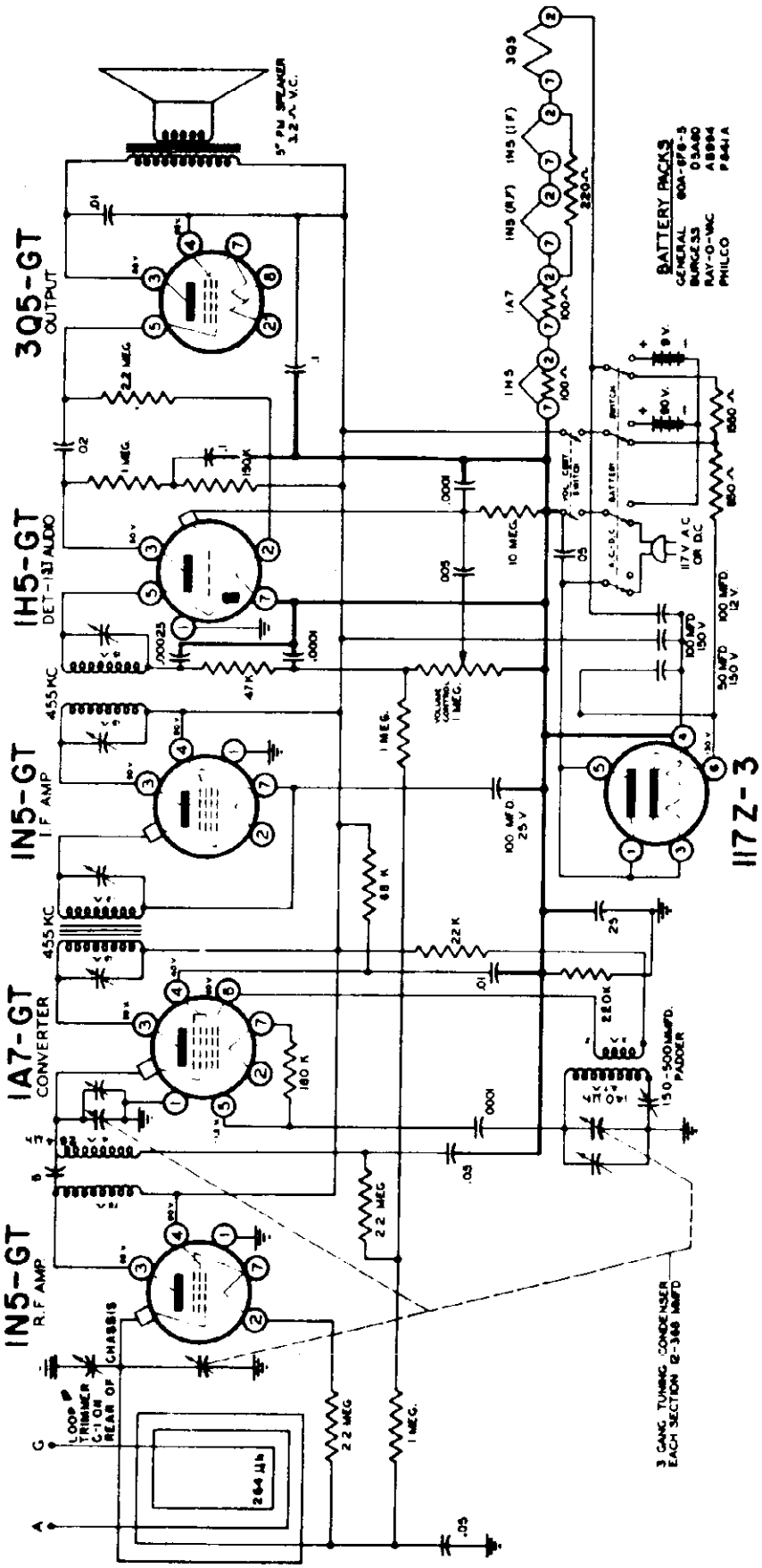
GILFILLAN BROS., INC.

MODEL 68-48



MODELS 68B, 68D

GILFILLAN BROS., INC.

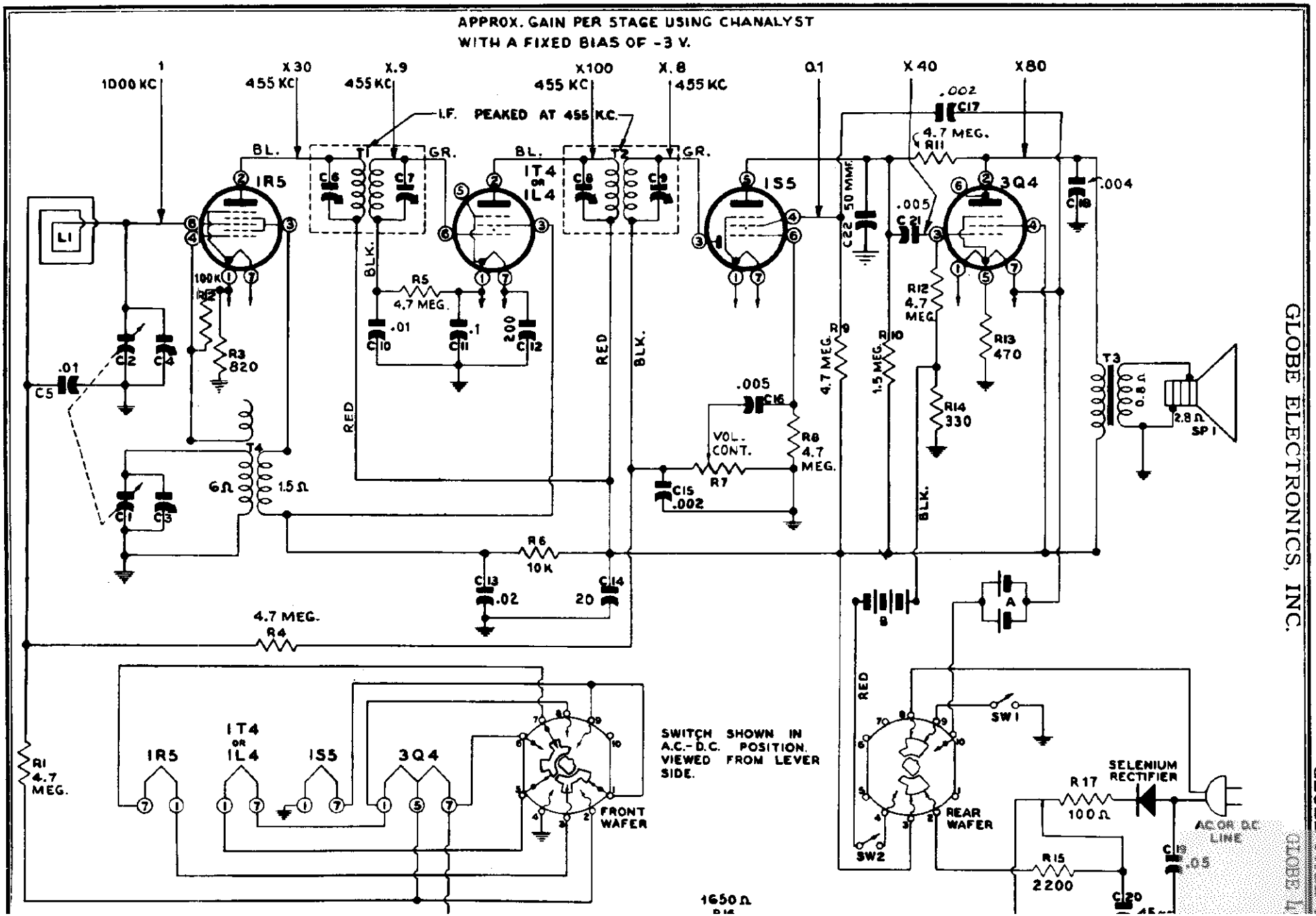


ALIGNMENT INSTRUCTIONS

1. REMOVE CHASSIS, BATTERY AND LOOP FROM CABINET AND PLACE IN SAME RELATIVE POSITION AS IF SET WERE IN CABINET. LOOP MUST BE CLOSE TO BACK OF CHASSIS TO OBTAIN PROPER ALIGNMENT.
2. CONNECT SIGNAL GENERATOR LEADS TO EXTERNAL LOOP AS IN STEP 3. CONNECT AUDIO OUTPUT METER ACROSS VOICE COIL TERMINALS. DO NOT EXCEED .3 VOLT READING ON METER. ADJUST POINTER TO HORIZONTAL POSITION WITH GANG CLOSED.

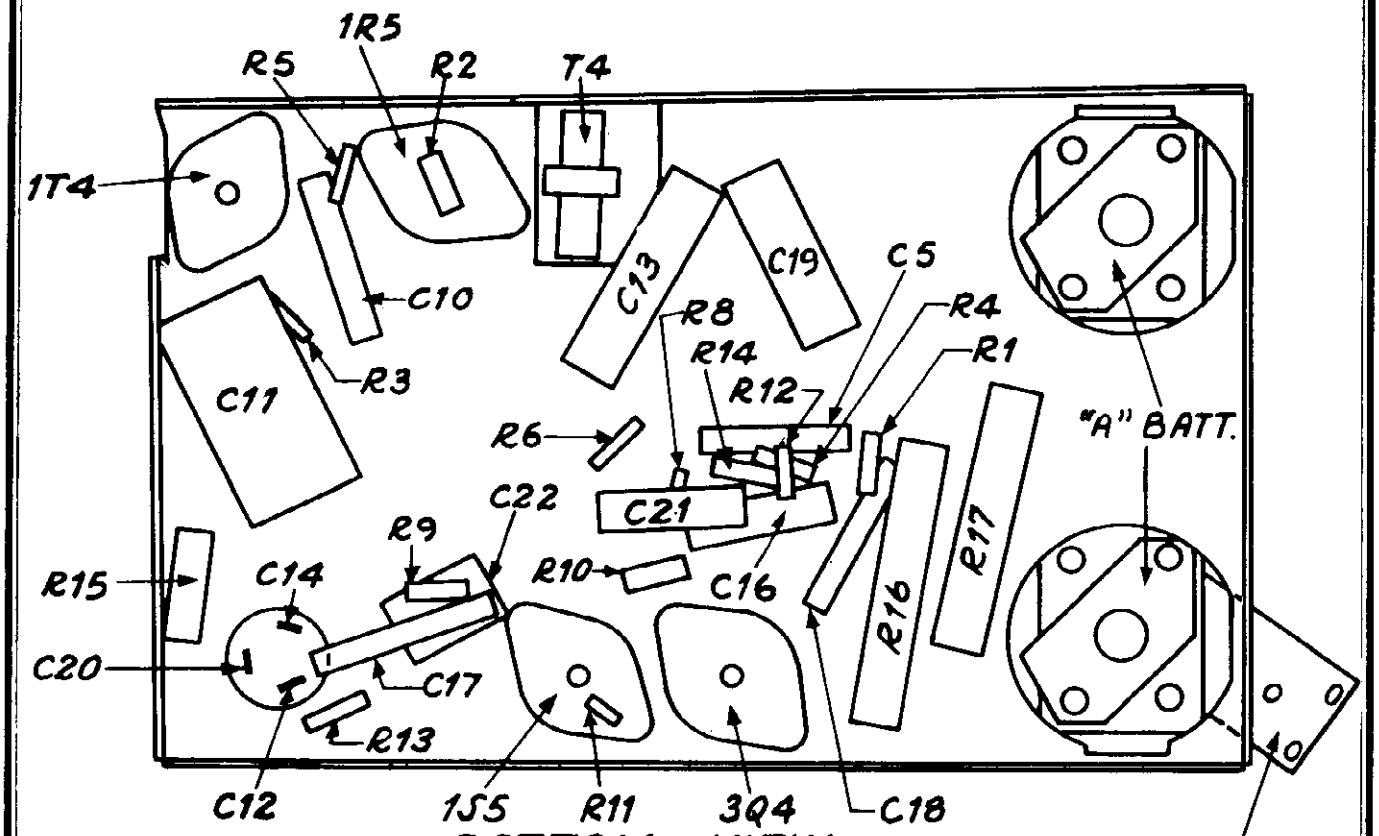
STEP	TUNE TEST OSCILLATOR TO	TUNE RADIO DIAL TO	ADJUST TRIMMERS FOR MAXIMUM OUTPUT READING
1	455 KC	1500 KC	I F TRANSFORMERS
2	1400 KC	1400 KC	OSC., R.F., ANT.
3	600 KC	600 KC	PADDER CONDENSER

3. IN SOME CASES IT IS IMPOSSIBLE TO OBTAIN SUFFICIENT ATTENUATION OF THE GENERATOR SIGNAL FOR ACCURATE ALIGNMENT. IN SUCH CASES THE GENERATOR SHOULD BE CONNECTED TO AN AUXILIARY LOOP PLACED A FOOT OR SO FROM THE RECEIVER LOOP.



GLOBE ELECTRONICS, INC.

GLOBE 454 GLOBE ELECTRONICS, INC.



BOTTOM VIEW

TUBE	PIN	VTVM	20,000Ω/V	1,000Ω/V	RESISTANCE
1R5	1	1.5	1.4	1.4	10 Ω
CONV.	2	82	86	80	4200 Ω
	3	5.5	5.6	56	15000 Ω
	4	-6.9	-2.4	0	105K
	5	---	---	--	9Ω
	6	2.2	0	0	2.4 Meg
	7	3	2.7	2.8	26 Ω
1T4	1	3	2.7	2.8	22 Ω
IF AMP.	2	82	86	80	4000 Ω
	3	55	55	50	15000 Ω
	4	2.2	0	0	4.6 Meg
	5	3	2.7	2.7	26 Ω
	6	2.1	0	0	4.6 Meg
	7	4.2	3.9	4	33 Ω
1S5	1	0	0	0	0
DET AVC	2	0	0	0	0
1st AUD	3	-0.5	0	0	1 Meg
	4	20	16	0	5 Meg
	5	32	24	6	1 Meg
	6	0.2	0	0	5 Meg
	7	1.5	1.3	1.3	14 Ω
3Q4	1	4	4	4	32 Ω
OUTPUT	2	80	82	77	4600 Ω
	3	0	0	0	4.4 Meg
	4	82	86	79	4500 Ω
	5	5.5	5.3	5.4	40Ω
	6	80	82	77	4600 Ω
	7	7.2	7	7	50 Ω

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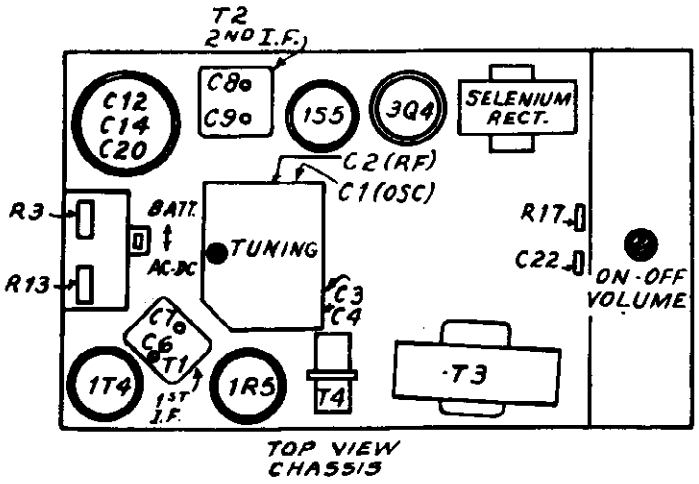
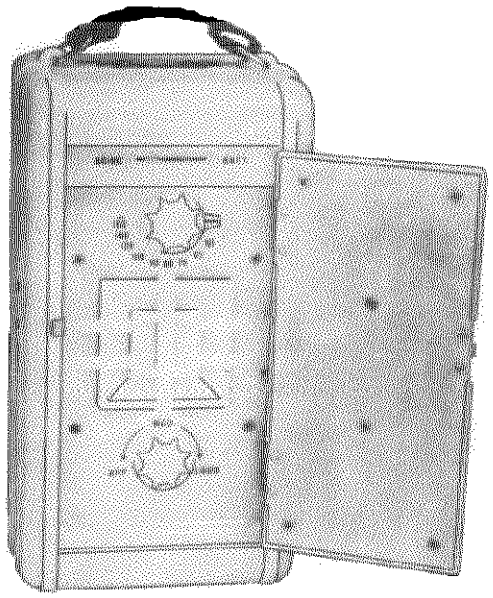




ITEM	DESCRIPTION
C1, C2	TWO GANG VARIABLE CONDENSER
C3	TRIMMER - PART OF C1
C4	TRIMMER - PART OF C2
C5	.01 MF 150 VOLTS
C6, C7	TRIMMERS - PART OF T1
C8, C9	TRIMMERS - PART OF T2
C10	.01 MF 150 VOLTS
C11	.1 MF 150 VOLTS
C12	200 MF 6 VOLTS - SECTION OF ELECT.
C13	.02 MF 150 VOLTS
C14	20 MF 150 VOLTS - SECTION OF ELECT.
C15	.005 MF 150 VOLTS
C16	.005 MF 150 VOLTS
C17	.002 MF 150 VOLTS
C18	.004 MF 200 VOLTS
C19	.05 MF 400 VOLTS
C20	45 MF 150 VOLTS - SECTION OF ELECT.
C21	.005 MF 150 VOLTS
C22	30 MMF MICA
L1	LOOP ANTENNA
R1	4.7 MEG OHMS 1/4 WATT
R2	100000 OHMS 1/4 WATT
R3	820 OHMS 1/4 WATT
R4	4.7 MEG. OHMS 1/4 WATT
R5	4.7 MEG. OHMS 1/4 WATT
R6	100000 OHMS 1/4 WATT
R7	1 MEG. VOLUME CONTROL
R8	4.7 MEG. OHMS 1/4 WATT
R9	4.7 MEG. OHMS 1/4 WATT
R10	1.5 MEG. OHMS 1/4 WATT
R11	4.7 MEG. OHMS 1/4 WATT
R12	4.7 MEG. OHMS 1/4 WATT
R13	470 OHMS 1/4 WATT
R14	330 OHMS 1/4 WATT
R15	2200 OHMS 1 WATT
R16	1650 OHMS 10 WATTS
R17	100 OHMS
SP1	3 P.M. SPEAKER
SW1, SW2	ON-OFF SWITCH ON VOLUME CONTROL
T1	FIRST I.F. TRANSFORMER
T2	SECOND I.F. TRANSFORMER
T3	OUTPUT TRANSFORMER
T4	OSCILLATOR COIL
A	TWO 1 1/2 VOLT TYPE "D" CELLS
B	67 1/2 VOLTS NO. 467 MINIMAX BAT.

ALIGNMENT PROCEDURE

Connect output meter across the voice coil.

Connect the signal generator to the standard Hazeltine Loop Model 1150 and couple it loosely to the receiver loop. Set the volume control at maximum, and fully mesh the tuning capacitor.

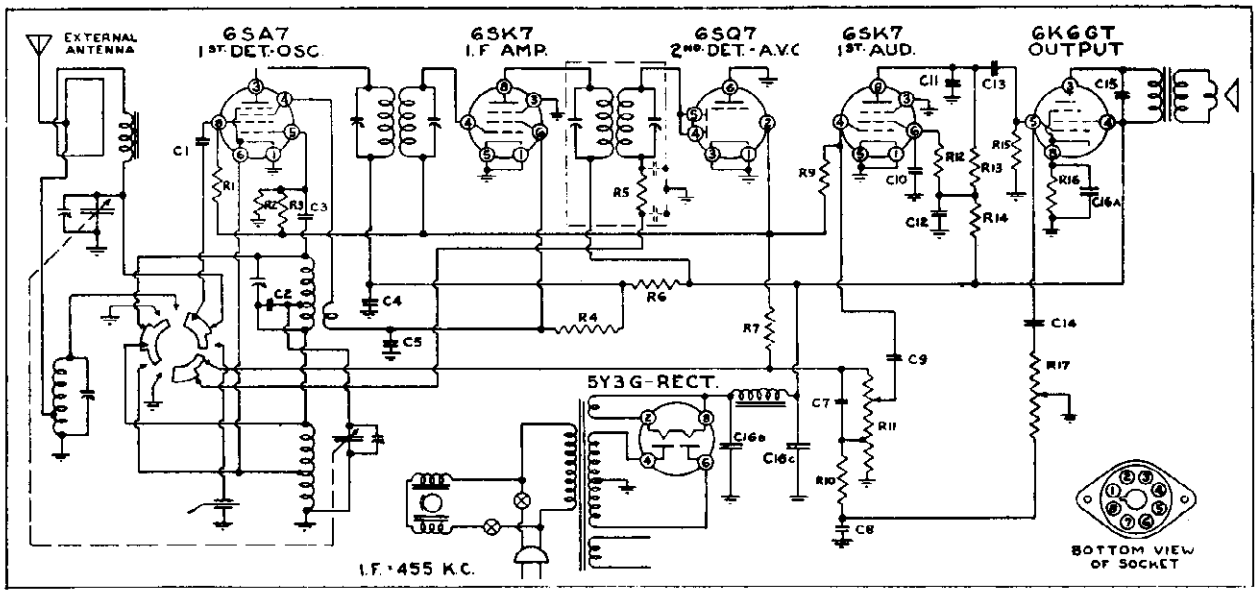
The output of the signal generator should be just sufficien to give a readable deflection on the output meter.

Set the signal generator to 455 kc and adjust i-f trimmers for maximum output in the following order: C9, C8, C7, C6. Repeat sequence if trimmers were badly maladjusted.

Set the signal generator and receiver to 1600 kc and adjust the oscillator trimmer C3 for maximum output.

Set the signal generator and receiver to 1400 kc and adjust the antenna trimmer C4 for maximum output.

Set the signal generator and receiver to 1600 kc and readju oscillator trimmer C3 for maximum output.



RESISTORS

No.	Ohms	Watts	No.	Ohms	Watts
R1	2,000,000	½	R10	20,000	½
R2	20,000	½	R11	500,000	V.C.
R3	10,000,000	½	R12	1,000,000	½
R4	15,000	1	R13	200,000	½
R5	70,000	½	R14	50,000	½
R6	100,000	½	R15	500,000	½
R7	1,000,000	½	R16	600,000	½
R8	1,000,000	½	R17	500,000	T.C.
R9	1,000,000	½			

CONDENSERS

No.	Capacity (Mfd.)	Volts	No.	Capacity (Mfd.)	Volts
C1	.00025	Mica	C10	.05	400
C2	.00025—5%	Mica	C11	.00025	Mica
C3	.00005	Mica	C12	.1	400
C4	.05	400	C13	.01	400
C5	.05	400	C14	.002	400
C6	.05	200	C15	.005	400
C7	.00025	Mica	C16a	20.	25
C8	.02	200	C16b	20.	350
C9	.01	400	C16c	20.	350

R8 and C6 were used only on early models.

SERVICE INFORMATION

Speaker (Part No. P5078) 10" Dyn.

D.C. voice coil resistance.....3.7 ohms
Field coil (hot) .....1000 ohms

B.C. and S.W. Oscillator Coil (Part No. P4804)

Looking at the mounting strip end in a clockwise direction starting at the chassis, the terminals are: No. 1, S.W. pri.; No. 2, B.C. pri.; other end, No. 3, B.C. tap; No. 4, S.W. pri.; No. 5, S.W. sec.; No. 6, S.W. sec. tap; No. 7, S.W. and B.C. sec:

S.W. Primary—No. 4 and No. 1—
Resistance ..... .2 ohm

S.W. Secondary—No. 7 and No. 5—
Resistance ..... .11 ohm

B.C. Primary—No. 2 and No. 3—
Resistance ..... .3 ohm

B.C. Secondary—No. 3 and No. 7—
Resistance ..... 3.7 ohms

First I.F. Transformer (Part No. P-4108)

Primary—Blue, plate; red, B+
Resistance .....18.2 ohms

Secondary—White, grid; black, AVC
Resistance .....15.1 ohms

Second I.F. Transformer (Part No. P-4858)

Primary—Blue, plate; red, B+
Resistance .....20.8 ohms

Secondary—White, diode; other end inside can
Resistance .....17.4 ohms

VOLTAGE CHART

All voltages measured with a 20,000 ohm per volt meter on the 300 volt scale. Line voltage 117 volts A.C. Volume control maximum and no signal tuned in. Power consumption 70 watts.

	Volts
6SA7 TUBE	
Plate (3) to ground	270
Screen (4) to ground	105
6SK7 (I.F.) TUBE	
Plate (8) to ground	270
Screen (6) to ground	105
6SK7 (A.F.) TUBE	
Plate (8) to ground	64
Screen (6) to ground	23
6K6GT TUBE	
Plate (3) to ground	270
Screen (4) to ground	245
Cathode (8) to ground	19
6X5GT TUBE	
Filament (8) to ground	340

ALIGNMENT DATA

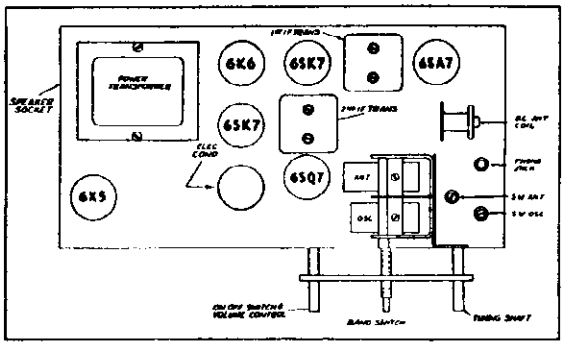


Fig. 2—Top View of Chassis

All of the adjustments have been very carefully set with signal generators at the factory and require no further adjustment, unless it becomes necessary to replace a coil or transformer, or if the adjustments have been tampered with in the field. Under no circumstances attempt any adjustments without first making certain that adjustment is necessary and only after voltages, tubes and condensers have been checked and found to be normal.

The alignment of this receiver requires the use of a signal generator that will cover the frequencies of 455, 1400, 1630 and 9500 kc., and an output meter to be connected across the primary or secondary of the output transformer. All alignments should be made with the volume control in the maximum position, to prevent the AVC from operating and giving false readings.

I.F. ALIGNMENT

Adjust the signal generator to 455 KC and connect the output to the grid of the first detector tube (6SA7) through a .05 or .1 mfd. condenser. Align all I. F. trimmers to peak or maximum reading on the output meter.

B.C. AND S.W. BAND ALIGNMENT

Disconnect loop leads and set the band switch to the broadcast position. Adjust signal generator to 1630 K.C. and connect thru a .0002 mfd. mica condenser to the green loop lead. Set the gang condenser to minimum capacity and adjust the B.C. oscillator trimmer (see fig. 2) to receive this signal. Set the band switch to the short wave position, adjust the signal generator to exactly 9,500 K.C. and connect thru a 400 ohm resistor to the green loop lead. Set the dial pointer at 9.5 megacycles and carefully peak S.W. oscillator trimmer and then peak S.W. antenna trimmer. Re-install chassis in cabinet and connect loop leads. Set the band switch to the broadcast position. Adjust the signal generator to 1400 K.C. and connect the output to a shielded loop radiator and place this loop about two feet from the loop antenna. If no loop radiator is available the output of the signal generator should be connected to the green loop lead thru a .0002 mfd. mica condenser. Tune signal and carefully peak the B.C. antenna trimmer.

REPLACEMENT PARTS LIST

PAPER CONDENSERS

P904	.002 mfd. 600 volt	
P1322	.005 mfd. 600 volt	
P164	.01 mfd. 400 volt	
P393	.02 mfd. 200 volt	
P148	.05 mfd. 200 volt	
P334	.05 mfd. 400 volt	
P276	.1 mfd. 400 volt	

MICA CONDENSERS

P1382	.00005 mfd.	
P817	.00025 mfd.	
P4806	.00025 mfd. 5%	

ELECTROLYTIC CONDENSERS

P4130	20 mfd. 25 volt 20 mfd. 350 volt 20 mfd. 350 volt	

VARIABLE CONDENSERS

P4728	Gang condenser	
P4609	Trimmer condenser	

RESISTORS

P3800	100 ohm ½ watt	
P3821	600 ohm ½ watt	
P4807	15,000 ohm 1 watt	
P3844	20,000 ohm ½ watt	
P3853	50,000 ohm ½ watt	
P3864	200,000 ohm ½ watt	
P3876	500,000 ohm ½ watt	
P3882	1,000,000 ohm ½ watt	
P3883	2,000,000 ohm ½ watt	
P3889	10,000,000 ohm ½ watt	

VARIABLE RESISTORS

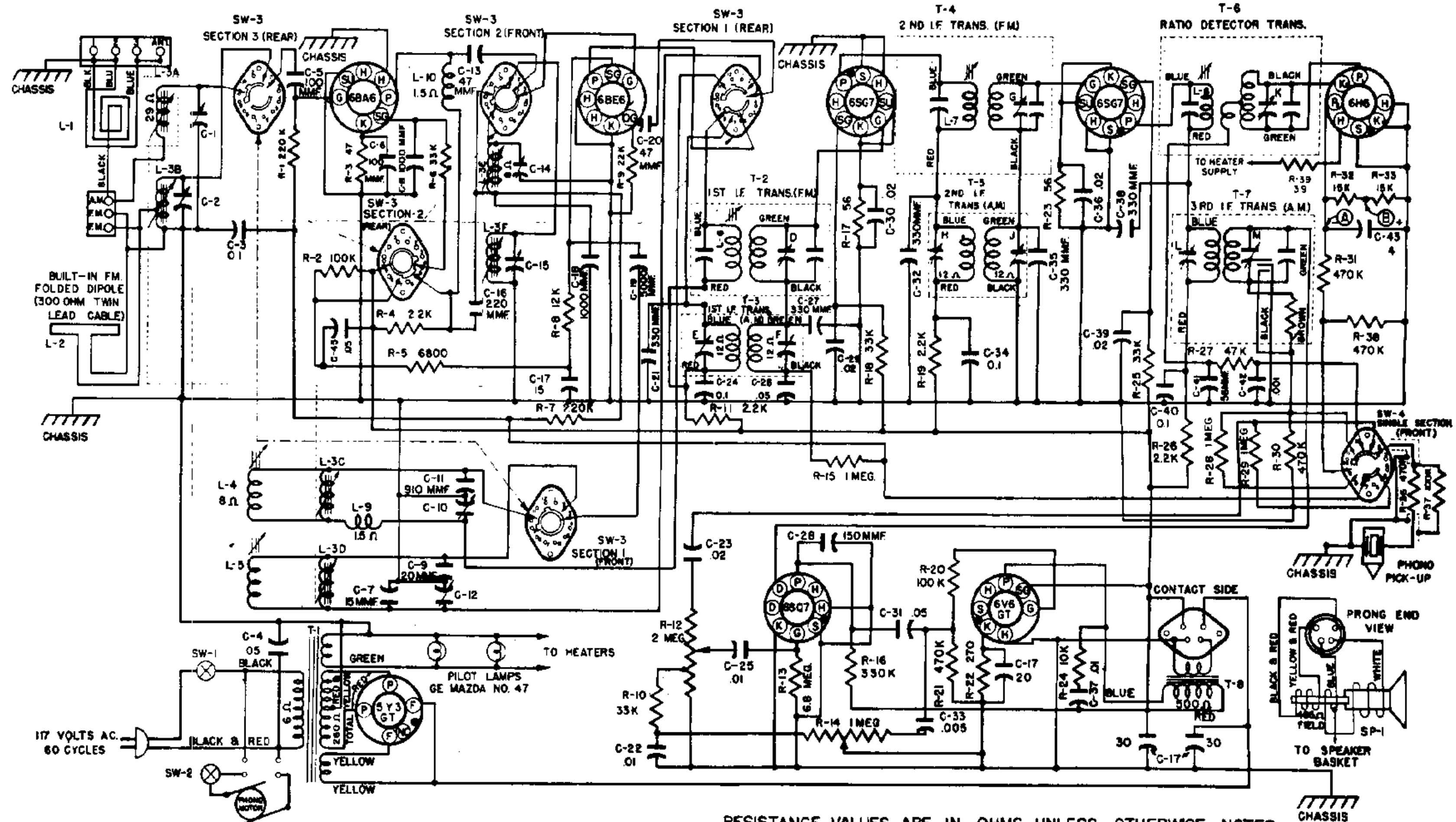
P4089	Volume control and switch
P4729	Tone control
RC4010	Record changer mounting spring
RC7017	Record changer mounting screw
RC6008	Needle
RC3020	Center post
RC50	Record changer (60 cycle)
RC51	Record changer (50 cycle)
P3948	Chassis mounting screw

TRANSFORMERS AND COILS

G6425	B.C. antenna coil
P4802	S.W. antenna coil
P4804	B.C. and S.W. oscillator coil
P4108	1st I.F. transformer
P4858	2nd I.F. transformer
P3926	Filter choke
P4512	Power transformer (60 cycle)
P4513	Power transformer (50 cycle)

MISCELLANEOUS

P3005	Tube socket
P945	Speaker socket
P4138	Electrolytic mounting base
P4404	Phono jack
P929	Line cord
P3557	Line cord clamp
P4800	Dial background
	Pointer; order by name and model number
P4179	Drive shaft
P1399	Horseshoe washer (for drive shaft)
P1587	Spring washer (for drive shaft)
P2925	Takeup spring
	Knobs; order by name and model number
P4205	Band switch lever
P4197	Pilot light socket
P1713	Pilot light bulb
P4248	Pilot light reflector
P4801	Band switch
P4805	10" PM speaker and output transformer
P4784	Phono cable
P4542	Phono motor AC cord



RESISTANCE VALUES ARE IN OHMS UNLESS OTHERWISE NOTED.
"K" EQUALS 1000 OHMS. "MEG" EQUALS 1,000,000 OHMS.

CAPACITY VALUES ARE IN MICROFARADS UNLESS OTHERWISE NOTED.

F.M.- 10.7 MC I.F.

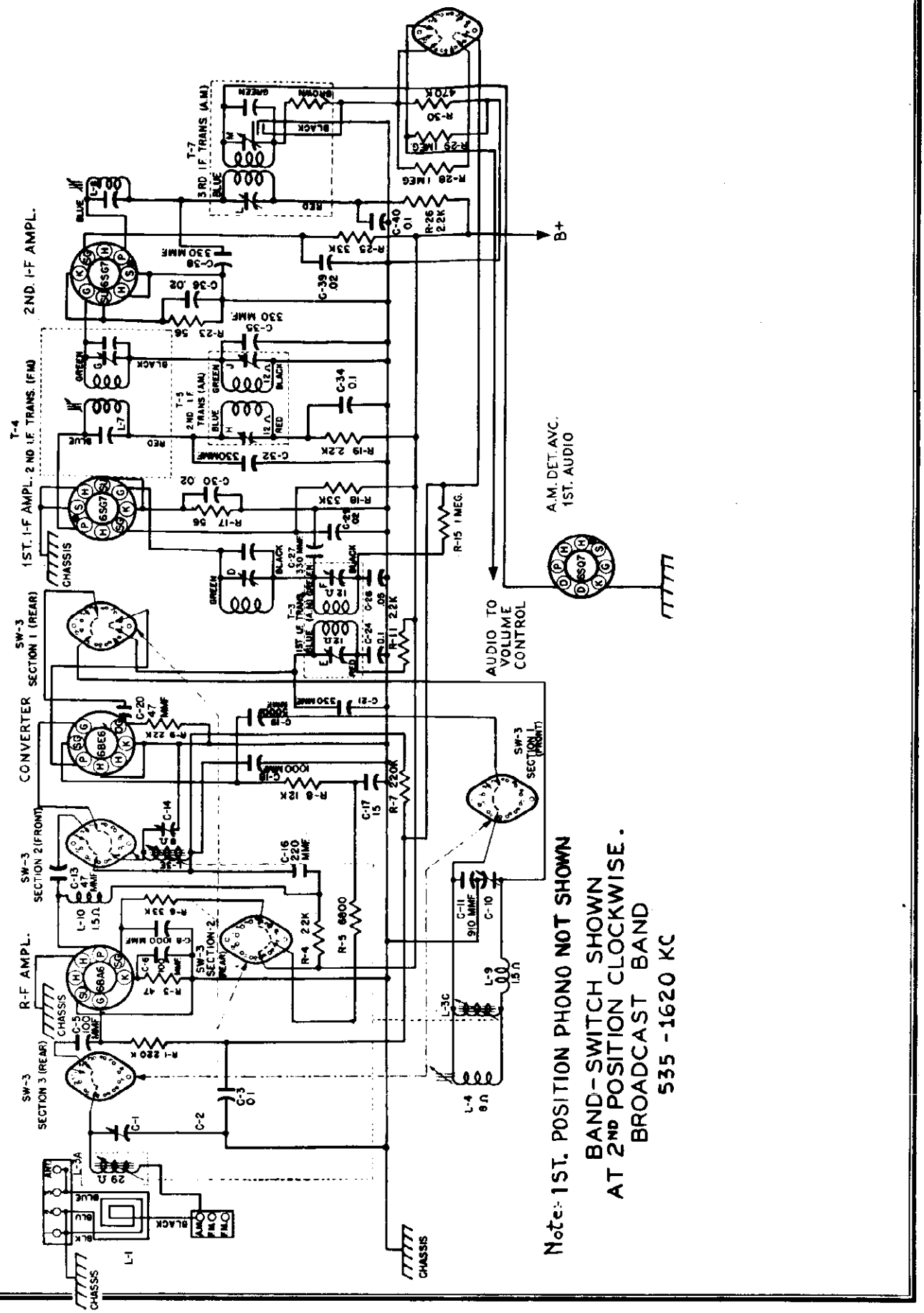
AM - 455 KC I.F.

ALL TUBE SOCKETS ARE SHOWN FROM PIN END VIEW.
SWITCHES ARE SHOWN IN EXTREME COUNTERCLOCKWISE POSITION (PHONO POSITION) SHAFT END VIEW.

Frequency Range	(AM) 535 KC to 1620 KC
Intermediate	(FM) 87.25 MC to 103.75 MC
Frequency	(AM) 455 KC (FM) 10.7 MC
Power Supply	105 to 125 volts AC, 60 cycles
Speaker	12 inch, Electro-Dynamic
V.C. Impedance	3.2 ohms at 400 cycles
Power Output (Undistorted)	3.5 watts
Power Output (Maximum)	5 watts

MODELS R-78162, R-78262

THE B. F. GOODRICH COMPANY



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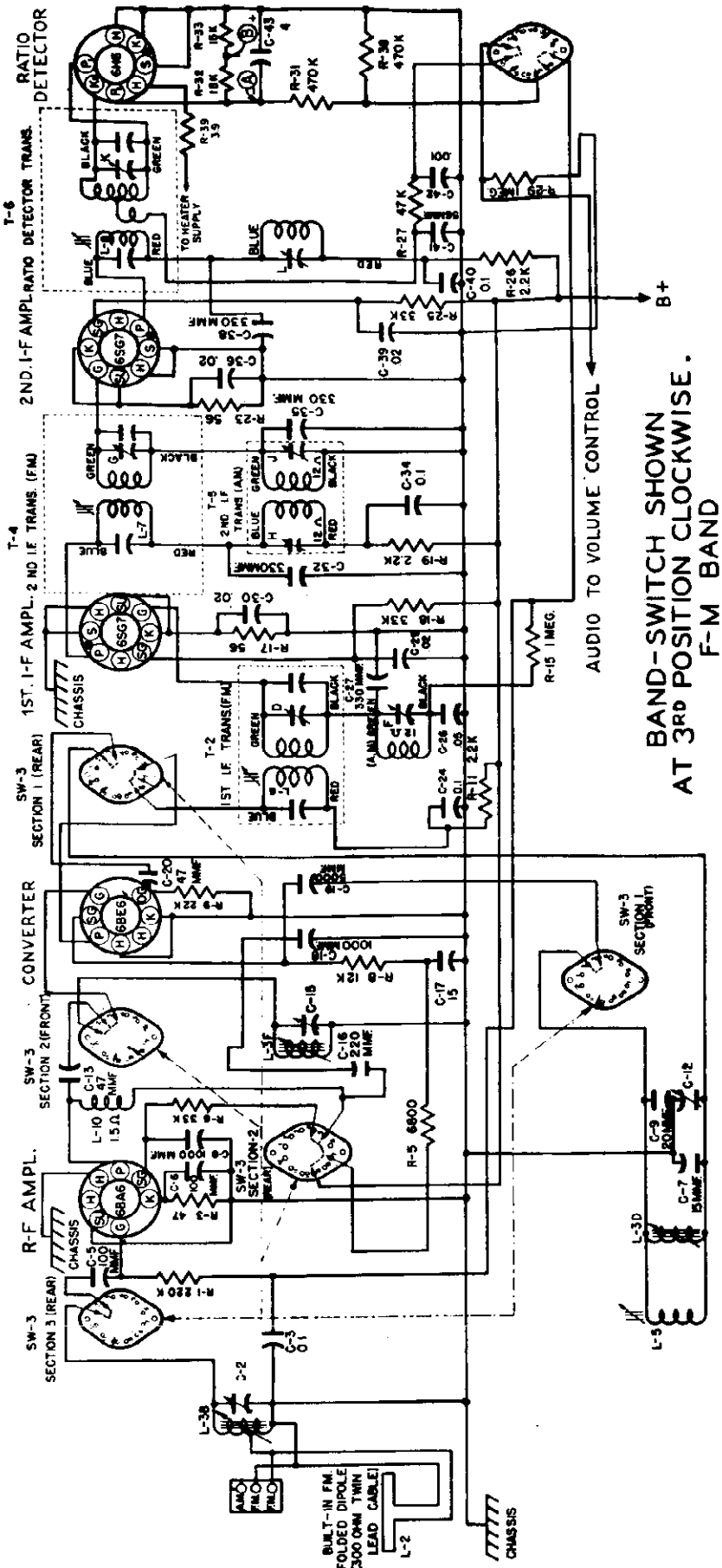
MODELS R-7816
R-78262

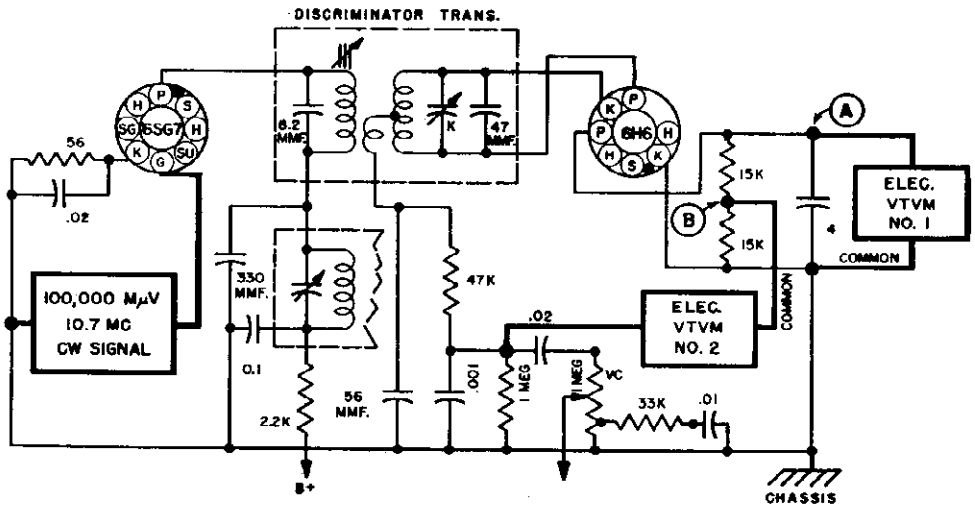


MODELS R-78162, R-78262 THE B. F. GOODRICH COMPANY

RATIO DETECTOR

Proper operation of the ratio detector stage is extremely important for best performance on the FM band of this receiver.

The performance of the ratio detector stage may be checked by closely following the procedure and diagram given below.



Wiring Diagram—Ratio Detector

1. After setting up the signal generator and VTVM, turn the trimmer adjustment screw "K" until tight. Turn the core adjustment "L" to maximum counterclockwise position. These two adjustments are on the top of the Ratio Detector transformer. (See Trimmer Location diagram.)

2. Now turn adjustment "L" clockwise until VTVM in No. 1 position indicates maximum voltage. This maximum value should be from five to seven volts with input as indicated in above diagram. Then slowly turn adjustment "K" in a counterclockwise direction, observing VTVM in No. 2 position. It will approach a maximum value and then rapidly drop to zero. If adjustment "K" is turned beyond this point, VTVM in No. 2 position will indicate a polarity change. The proper adjustment of "K" is at the point where the VTVM indicates zero volts between the polarity change.

3. Shift the 10.7 mc. signal to 10.725 mc. (10.7 mc. +25 kc.). VTVM in No. 2 position should now indicate a plus .3 volts minimum.

4. Change the 10.725 mc. signal to 10.675 mc. (10.7 mc. —25 kc.). VTVM in No. 2 position should indicate a minus .3 volts minimum. STEPS 3 and 4 constitute a sensitivity check on the ratio detector transformer.

5. Place the polarity switch of VTVM in No. 2 position to "plus" position and observe VTVM as the frequency of the signal generator is increased above 10.7 mc. It should indicate an increasing positive voltage. Continue increasing the frequency until the meter indicates a peak and begins to decrease. Reduce the generator frequency slightly until the peak is obtained. Record the generator frequency.

6. Set the polarity switch of VTVM to "minus" position. Repeat STEP 5, reducing the generator frequency from 10.7 mc. instead of increasing. Record the generator frequency when VTVM in No. 2 position indicates a peak.

7. The difference between the generator frequencies noted in STEPS 5 and 6 is the "Static Band Width" of the Ratio Detector transformer. This should be approximately 220 kc.

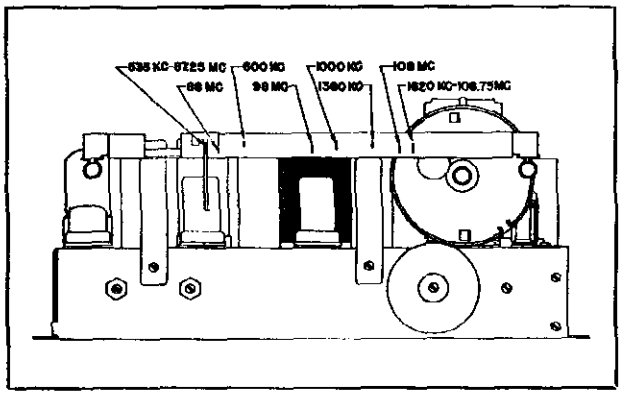
ALIGNMENT PROCEDURE

First determine if factory adjustments of the permeability tuner cores have been altered. This may be done by checking core positions against dimensions shown in tuner illustration. Broken wax seals on the core adjustments may also indicate altering. If the slug adjustments have been changed, it will be necessary to first adjust them in accordance with the dimensions given in tuner illustration before proceeding with alignment.

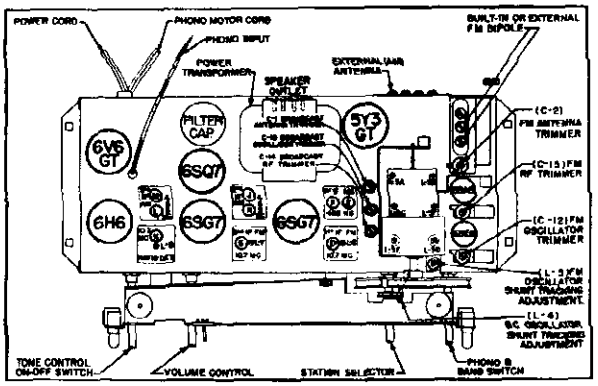
The following equipment is necessary to properly align this receiver:

1. AM signal generator with frequency coverage from 455 kc. to 1700 kc.
2. FM or CW signal generator covering the FM band from 87.25 mc. to 108.75 mc. and the 10.7 mc. frequency for FM IF alignment.
3. Vacuum Tube Voltmeter (VTVM).
4. Output meter—to match 4 ohms, 5 watts maximum.
5. Insulated alignment screwdriver.
6. Dummy antenna—0.1 mfd. capacitor, 300 ohm carbon resistor and inductive loop (fashioned from several turns of wire).

NOTE: Oscilloscope equipment not required if aligned according to the following procedure:
The accuracy of the AM RF and AM antenna slug adjustments may be determined by noting the trimmer adjustment at each end of the band when the oscillator is set for proper coverage. The proper setting of the AM or FM oscillator slugs is indicated by proper tracking of the receiver at the center of the respective band. The FM RF and FM antenna slugs must be adjusted to dimensions given in the permeability tuner illustration.



Calibration Points



Trimmer Location

Reference Notes to Alignment Chart on Following Page.

Note 1—If 1620 kc. signal is received lower in frequency than the 1620 kc. dial calibration, turn BC oscillator shunt tracking adjustment (L-4) outward. Retrack at 535 kc. (Step 2). If higher than the 1620 kc. dial calibration, screw adjustment inward and retrack at 535 kc. Repeat until 535 kc. and 1620 kc. signals coincide with their respective dial calibrations.

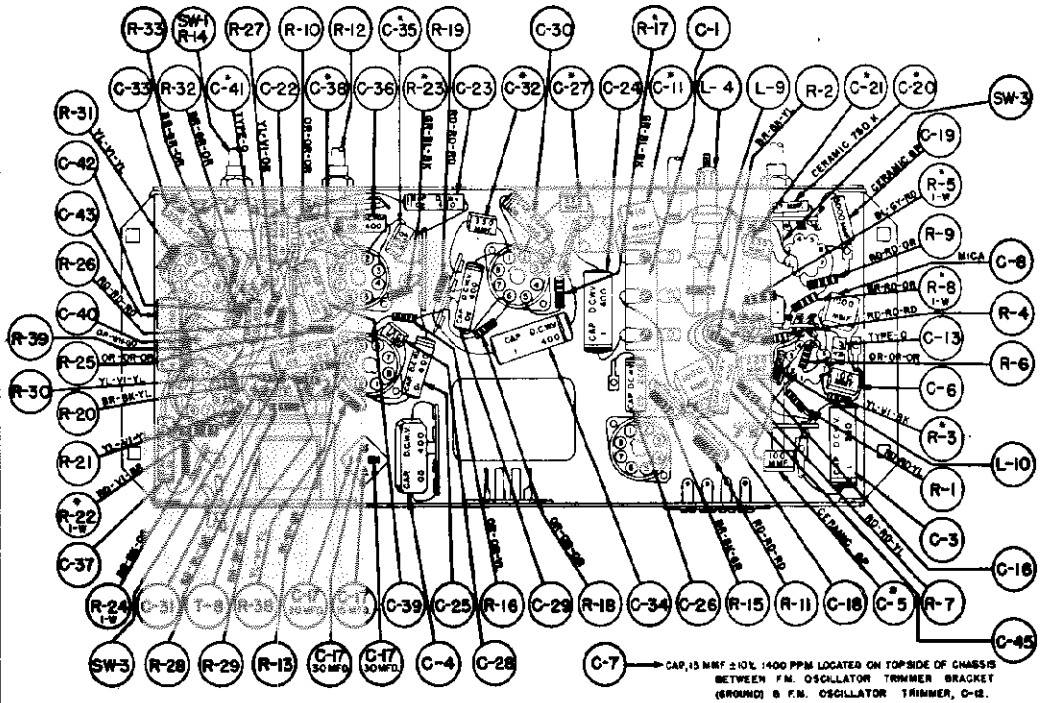
Note 2—Adjust input voltage to give approximately 5 volts AVC before final adjustment is made.

For STEPS 6 and 8A—Voltmeter "common" lead to chassis.

For STEP 7—Voltmeter "common" lead to point "B" on wiring diagram. The desired zero position is at the point where the meter indicates a polarity change from plus to minus or vice-versa.

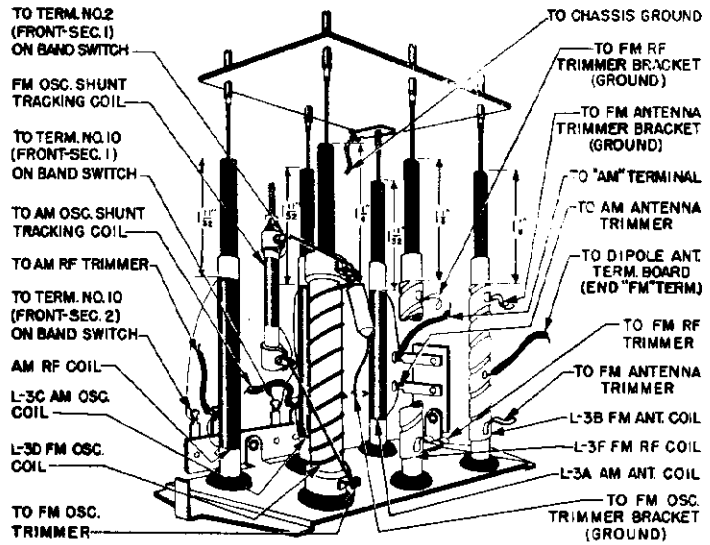
Note 3—For all tests requiring an FM signal, the generator output (22.5 kc. deviation, 400 cycles) must be adjusted to give approximately one-half watt receiver output before final adjustments are made. Either STEP 8A or 8B may be used depending on equipment available.

Note 4—If 108.75 mc. signal is received lower in frequency than the 108.75 mc. dial calibration turn FM oscillator shunt tracking adjustment (L-5) outward. Retrack at 87.25 mc. (STEP 9) If higher than the 108.75 mc. dial calibration screw adjustment inward and retrack at 87.25 mc. Repeat until 87.25 mc. and 108.75 mc. signals coincide with their respective dial calibrations.



*10% TOLERANCE

Bottom View — Parts Layout



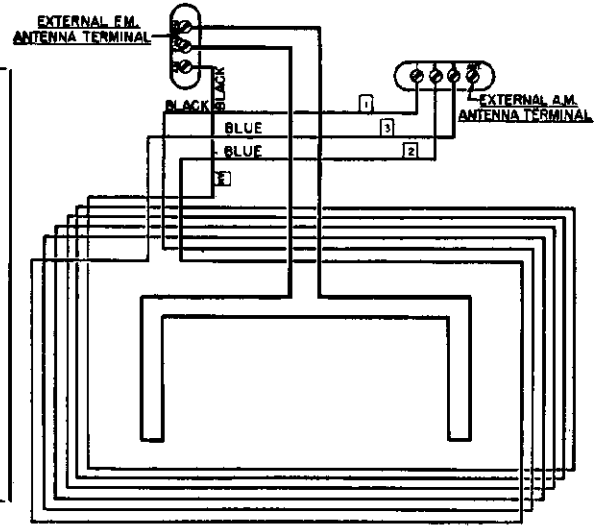
Permeability Tuner Illustration

SOCKET VOLTAGES

TUBE	POSITION	1	2	3	4	5	6	7	8
6BA6	RF Amplifier	0	0	6.3 AC	0	250	100	.6	
6BE6	Oscillator-Converter	0	0	6.3 AC	0	250	90	0	
6SG7	1st IF Amplifier	0	0	.6	0	.6	125	6.3 AC	250
6SG7	2nd IF Amplifier	0	0	.6	0	.6	125	6.3 AC	250
6SQ7	AM Detector—AVC—1st Audio (AM-FM)	0	0	0	0	0	90	6.3 AC	0
6H6	FM Detector	0	6.3 AC	0	0	0	0	0	0
6V6GT	Power Output	NC	0	240	260	0	260	6.3 AC	14
5Y3GT	Rectifier	NC	325	NC	325 AC	NC	325	NC	325

NOTE: All DC voltages measured with a 1000 ohm-per-volt meter from B— to socket contact indicated. All voltages are positive DC unless otherwise marked. Volume control full on. Zero signal input.

Tone control in clockwise position.
Band switch in "AM" position.
Line voltage 117 volts, 60 cycle AC.



Loop Antenna Connections

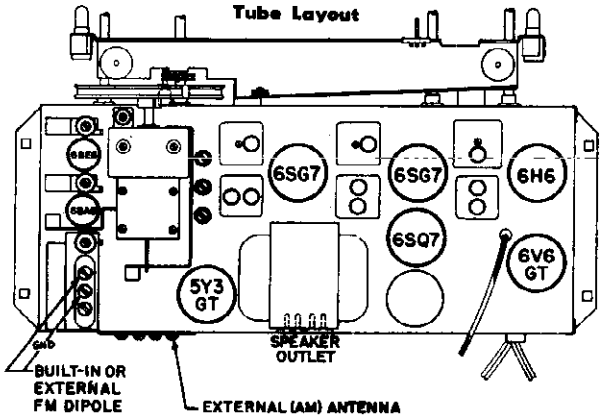
THE B. F GOODRICH COMPANY

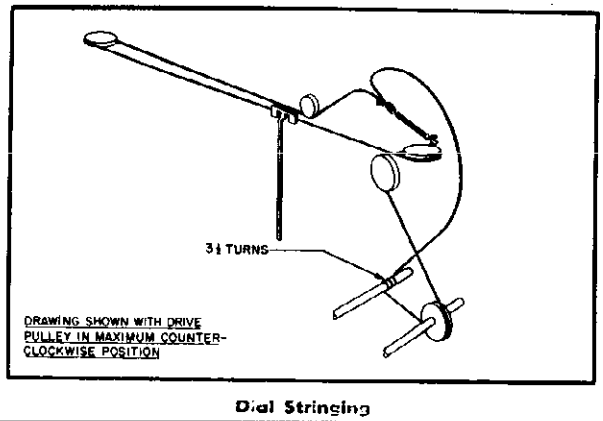
MODELS R-75152
R-78262

ALIGNMENT CHART

Step No.	Band Switch Position	Signal Generator	Connection at Receiver	Dummy Antenna	Dial Setting	Adjust Trimmer	Remarks
1	AM	455 kc.	6BE6 Converter Grid Pin No. 7	0.1 mfd.	HF end	E, F, H, J, L, M, AM IF Trimmers	Adjust for Maximum Output.
2	AM	535 kc.	6BA6 Grid Pin No. 1	0.1 mfd.	LF end	C-10 AM Osc. Trimmer	Adjust for Maximum Output.
3	AM	1620 kc.	6BA6 Grid Pin No. 1	0.1 mfd.	HF end	L-4 AM Osc. Shunt Tracking Adjustment. (Remove Flywheel from Shaft of Tuning Control.)	Adjust for Band Coverage. (See Note 1.)
4	AM	535 kc.	6BA6 Grid Pin No. 1	0.1 mfd.	LF end	C-14 AM RF Trimmer	Adjust for Maximum Output.
5	AM	1400 kc.	Thru Loop (With Receiver Loop Connected to Set.)	Inductive Loop	1400 kc.	C-1 AM Antenna Trimmer	Adjust for Maximum Output.
6	FM	10.7 mc. (CW Signal)	6SG7 Driver Grid Pin No. 4	0.1 mfd.	HF end	L-8 Ratio Detector Primary	Adjust for Maximum AVC between Point "A" on Wiring Diagram and Chassis using Electronic Voltmeter. See Notes 2 and 3.
7	FM	10.7 mc. (CW Signal)	6SG7 Driver Grid Pin No. 4	0.1 mfd.	HF end	K Ratio Detector Secondary	See Note 2. Adjust for Zero Position (Using Electronic Voltmeter) from No. 12 Position on Single Section Switch and Point "B" on Wiring Diagram.
8A	FM	10.7 mc. (CW Signal)	6BE6 Converter Grid Pin No. 7	0.1 mfd.	HF end	L-6, D, L-7, G 1st and 2nd FM IF	See Note 2. Adjust for Maximum AVC.
8B	FM	10.7 mc. (CW Signal)	6BE6 Converter Grid Pin No. 7	0.1 mfd.	HF end	L-6, D, L-7, G 1st and 2nd FM IF	See Note 3. Adjust for Maximum Output.
9	FM	87.25 mc. (FM Signal)	6BA6 Grid Pin No. 1	0.1 mfd.	LF end	C-12 FM Osc. Trimmer	Adjust for Maximum Output.
10	FM	108.75 mc. (FM Signal)	6BA6 Grid Pin No. 1	0.1 mfd.	HF end	L-5 FM Osc. Shunt Tracking Adjustment	Adjust for Band Coverage. (See Note 4.)
11	FM	87.25 mc. (FM Signal)	6BA6 Grid Pin No. 1	0.1 mfd.	LF end	C-15 FM RF Trimmer	Adjust for Maximum Output.
12	FM	87.25 mc. (FM Signal)	Thru 300 ohm Carbon Resistor to End FM Antenna Terminal and Center FM Antenna Terminal.	300 ohm Carbon Resistor	87.25 mc.	C-2 FM Antenna Trimmer	Adjust for Maximum Output.

Tube Layout





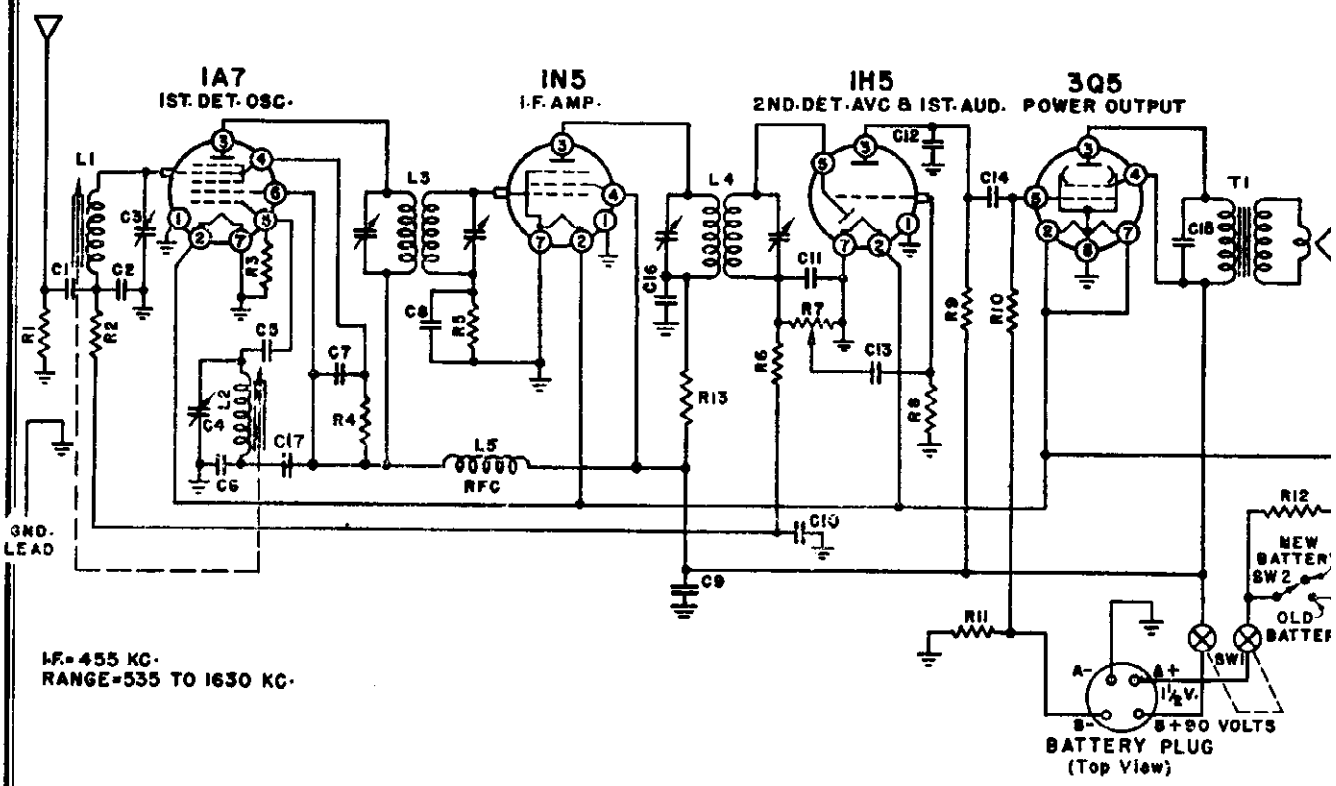
Dial Stringing

MODELS R-78162, R-78262

THE B. F. GOODRICH COMPANY

SERVICE PARTS LIST

Symbol	Part No.	Description
	A-51729	Bushing, Shaft
	A-54848	Bushing, Strain Relief
	E-59350-2	Cabinet
	A-58341	Cable, Dial
C-33	BD610502	Capacitor, .005 mfd., 600 v.
C-42	BD610102	Capacitor, .001 mfd., 600 v.
C-22, 35, 37	BD610103	Capacitor, .01 mfd., 600 v.
C-23, 29, 30, 36, 39	BD410203	Capacitor, .02 mfd., 400 v.
C-26	BD210503	Capacitor, .05 mfd., 200 v.
C-31, 45	BD410503	Capacitor, .05 mfd., 400 v.
C-4	BC31B503	Capacitor, .05 mfd., 400 v.
C-3	BD210104	Capacitor, .1 mfd., 200 v.
C-24, 34, 40	BD410104	Capacitor, .1 mfd., 400 v.
C-1	B-57942-1	Capacitor Assy., Trimmer (3 sec.)
C-19	B-58802-11	Capacitor, Ceramic, 5000 mmf., G.P.
C-5	B-58801-18	Capacitor, Ceramic, 100 mmf., G.P.
C-20	B-58800-27	Capacitor, Ceramic, 47 mmf. (—750 ppm)
C-7	B-58803-16	Capacitor, Ceramic, 15 mmf. (—1400 ppm)
C-43	B-55520-1	Cap., Electro., 4 mfd., 150 v.
C-17	A-57950	Cap., Electro., 30-30-75 mfd., 400 v.—20 mfd., 25 v.
C-8, 18	BM74A102	Capacitor, Mica, 1000 mmf.
C-11	BM64A911	Capacitor, Mica, 910 mmf.
C-21, 27, 32, 35, 38	BM55A331	Capacitor, Mica, 330 mmf.
C-16	BM74A221	Capacitor, Mica, 220 mmf.
C-28	BM74A151	Capacitor, Mica, 150 mmf.
C-6	BM74A101	Capacitor, Mica, 100 mmf.
C-41	B-58902-11	Capacitor, Mica Mold., Type Q, 56 mmf.
C-13	B-58900-6	Capacitor, Mica Mold., Type Q, 47 mmf.
C-2	B-57939-2	Cap., Trimmer, 10-25 mmf.
C-12, 15	B-57939-1	Cap., Trimmer, 1.5—14 mmf.
	B-55260-1	Clip, Capacitor Mtg.
	A-57925	Cup, Spring
L-10	A-57931	Coil Assy., R.F. Choke
L-9	B-57933	Coil Assy., Series Track. BC Osc.
L-4	B-57929	Coil Assy., Shunt Track. BC Osc.
R-14	B-58219-1	Control, Pot. and Sw., 1 megohm (T.C.)
R-12	B-58218-1	Control, Pot., 2 meg. (V.C.)
	B-57262-7	Cord, AC-Phono.
	B-58069-2	Cord, Power
	A-57999	Crank, Switch Lever
	C-59352-1	Crystal and Indicator, Dial
	A-59321	Flywheel, Tuning Shaft
	B-59355-4	Holder, Crystal, Right-Hand
	B-59355-3	Holder, Crystal, Left-Hand
	B-57998	Hub, Crank
	C-59416-1	Knob, Magnifying Insert
	C-59351-1	Knob, Magnifying Insert (Indicator)
	A-6158	Lamp, Pilot No. 47
	B-51524-4	Lead, Shielded
	B-57922	Link, Band Switch
L-3A, 3B, 3C, 3D, 3E, 3F, and L-5	D-57920	Permeability Tuner Assy.
		Perm. Tuner Assembly (on exchange basis only)
	A-59316-1	Pointer, Dial
R-39	B-55513-1	Resistor, 3.9 ohm, ½ w.
R-3	BR16B470	Resistor, 47 ohm, ⅓ w.
R-17, 23	BR16B560	Resistor, 56 ohm, ⅓ w.
R-22	BR16E271	Resistor, 270 ohm, 1 w.
R-4, 11, 19, 26	BR17B222	Resistor, 2,200 ohm, ⅓ w.
R-5	BR16E682	Resistor, 6,800 ohm, 1 w.
R-24	BR17E103	Resistor, 10,000 ohm, 1 w.
R-8	BR16E123	Resistor, 12,000 ohm, 1 w.
R-32, 33	BR17B153	Resistor, 15,000 ohm, ⅓ w.
R-9	BR17B223	Resistor, 22,000 ohm, ⅓ w.
R-6, 10, 18, 25	BR17B333	Resistor, 33,000 ohm, ⅓ w.
R-27	BR17B473	Resistor, 47,000 ohm, ⅓ w.
R-2, 20 37	BR17B104	Resistor, 100,000 ohm, ⅓ w.
R-1, 7,	BR17B224	Resistor, 220,000 ohm, ⅓ w.
R-16	BR17B334	Resistor, 330,000 ohm, ⅓ w.
R-21, 30, 31, 36, 38	BR17B474	Resistor, 470,000 ohm, ⅓ w.
R-15, 28 29	BR17B105	Resistor, 1 megohm, ⅓ w.
R-13	BR17B685	Resistor, 6.8 megohm, ⅓ w.
	A-51801	Rivet, Pronged
	B-55280-1	Shaft, Drive
	B-51469-3	Socket, Dial Light
	A-57996	Socket, Miniature
	A-54726	Socket, Octal
	A-51403	Socket, Speaker
	B-55180-3	Spacer, Metal
SP-1	D-58228-1	Speaker, 12-in., Electro-Dyn.
	A-51787	Spring, Cable
	A-50147	Spring, Conical
	A-59333	Strip, Crystal Holder (Trim)
T-3	B-57954-1	Transformer Assembly, 1st IF AM
T-5	B-57958-1	Transformer Assembly, 2nd IF AM
T-7	B-57963-1	Transformer Assembly, 3rd IF AM
T-2	B-57972-1	Transformer Assembly, 1st IF FM
T-4	B-57976-1	Transformer Assembly, 2nd IF FM
T-6	B-57994-1	Transformer Assembly, Ratio Det.
T-8	B-57997-1	Transformer, Output
T-1	C-57934	Transformer, Power



REPLACEMENT PARTS

CONDENSERS

Symbol	Description	Part No.
C1	Paper, .01 mfd., 400 V.	64B1-25
C2	Mica, .0008 mfd. ±10%	65B5-31
C3	Trimmer, Antenna	66A21-1
C4	Trimmer, Oscillator	
C5	Mica, .0001 mfd. ±20%	65B7-17
C6	Mica, .0008 mfd. ±10%	65B5-31
C7	Paper, .01 mfd., 400 V.	64B1-25
C8	Paper, .002 mfd., 600 V.	64B1-14
C9	Elect., 4 mfd., 150 V.	67A4-2
C10	Paper, .05 mfd., 200 V.	64B1-32
C11	Mica, .00025 mfd. ±20%	65B7-22
C12	Mica, .00025 mfd. ±20%	65B7-22
C13	Paper, .01 mfd., 400 V.	64B1-25
C14	Paper, .01 mfd., 400 V.	64B1-25
C15	Paper, .005 mfd., 600 V.	64B1-12
C16	Paper, .01 mfd., 400 V.	64B1-25
C17	Paper, .01 mfd., 400 V.	64B1-25

RESISTORS

R1	15,000 ohm ±10%, ½W.	60B8-153
R2	470,000 ohm ±10%, ¼W.	60B2-474
R3	220,000 ohm ±10%, ½W.	60B8-224
R4	33,000 ohm ±10%, ½W.	60B8-333
R5	4,700,000 ohm ±10%, ¼W.	60B2-475
R6	2,200,000 ohm ±10%, ¼W.	60B2-225
R7	1 megohm Volume Control & Switch	75B1-1
R8	4,700,000 ohm ±10%, ¼W.	60B2-475
R9	1,000,000 ohm ±10%, ¼W.	60B2-105
R10	1,000,000 ohm ±10%, ¼W.	60B2-105
R11	390 ohm ±10%, ¼W.	60B2-391
R12	0.75 ohm ±10%, ½W. (Wire)	61A2-1
R13	2200 ohm ±10%, ¼W.	60B2-222

TRANSFORMERS AND COILS

L1	Antenna Coil	AC105-1
L2	Oscillator Coil	A1020
L3	1st I.F. Transformer	72B5
L4	2nd I.F. Transformer	72B6
L5	Choke Coil (RF)	AB103-1
T1	Output Transformer	98A5

MISCELLANEOUS

Description	Part I
Background, Dial	X22C5
Cabinet	34D10
Cable, Battery (complete with plug)	A1026
Cap, Grid	90A1-
Clip, Dial Glass	18A2
Cord, Dial (5" on tuner and 63" on dial drive)	50A1-
Dial Scale, glass	21B25
Drum and Hub, Tuning	A1035
Grille Cloth	36B3-1
Iron Slug, with wire (Oscillator)	71B1-3
Iron Slug, with wire (Antenna)	71B1-4
Knob	33A7-
Plug, Battery, 4 Prong	88A4-
Pointer, Dial	25A9-
Pulley, Fibre Dial (Single)	17A1-
Pulley, Fibre Dial (Dual)	17A5-1
Screw Studs (for iron cores)	27A4
Shaft, Tuning	28A1-
Shaft and Pulley (Tuner)	A1040
Shield, Tube	87A8
Socket, Octal Tube	87A5-
Socket, Speaker	87A4-
Speaker and Output Transformer	78B15-
Speaker Guard	36A5-
Spring, Dial Drum Cord Tension	19B1-7
Spring, Hairpin (To hold Ant. or Osc. coil)	19A3-
Spring, Tuner Slide Cord Tension	19A1-
Spring, Tuner, back bearing takeup	19A6
Spring, Tuner, front bearing takeup	19A5
Spring, Tuner Slide Pressure	18A9
Switch, SPST (Economizer) SW2	77B1-6
Washer, C	4A4-1
Washer, spring (coils)	4A6-1
Washer, spring (shaft)	4A6-3

MODEL 92502 THE B. F. GOODRICH COMPANY

ALIGNING INSTRUCTIONS

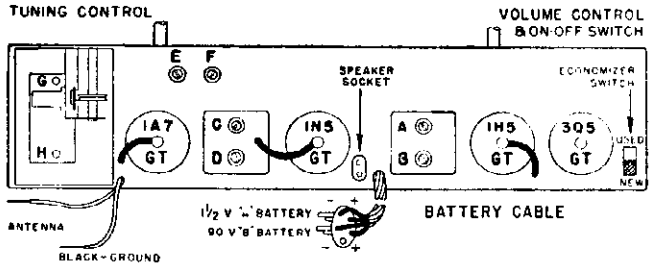
All of the adjustments have been very carefully set with signal generators at the factory and require no further adjustment, unless it becomes necessary to replace a coil or transformer, or if the adjustments have been tampered with in the field. Under no circumstances attempt any adjustments without first making certain that adjustment is necessary and only after voltages, tubes and condensers have been checked and found to be normal. To properly re-align this receiver, a signal generator as well as an output meter must be used.

POWER SUPPLY

This receiver is designed to operate on a single unit Ensign AB48, Ray-O-Vac No. AB-82, Burgess 17G-D60, Eveready 748, Bond 0528 or General 60DL-11L Battery. No other batteries are required as this battery is a combination 90 volt "B" battery and a 1½ volt "A" battery. The life of this battery is approximately 750 hours. The "A" and "B" sections are so proportioned that equal life may be expected from both. The "A" section will give satisfactory performance as low as 1.2 volts and the "B" section as low as 68 volts. This battery life may be expected with an average usage of several hours daily. If the reception becomes weak when the Economizer Switch is in the "USED" position, a new battery should be installed. A battery compartment is provided in the rear of the cabinet, and the battery cable simply plugs into the battery.

ALIGNMENT PROCEDURE

- IMPORTANT—Check to see that dial pointer reaches each end of dial scale when Station Selector Control is turned from one end to the other.
- Volume control—Maximum for all adjustments.
- Connect radio chassis to ground post of signal generator with a short heavy lead.
- Connect dummy antenna value in series with generator output lead, when needed (see below).
- Connect output meter across voice coil of speaker.
- Allow chassis and signal generator to warm up for several minutes.



- Use lowest Output setting of Signal Generator capable of producing adequate Output Meter indication and then proceed as indicated in the chart below.

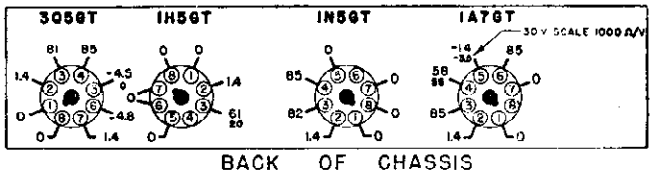
Band	Signal Generator Frequency	Dummy Antenna	Connection to Radio	Receiver Dial Setting	Trimmers Adjusted (In Order Shown)	Trimmer Function	Type of Adjustment
I. F.	455 KC.	.1 MFD.	Grid of 1A7 (Cap)	High frequency end of dial	A-B—2nd I.F.	Output I.F.	Adjust to maximum output
	455 KC.	.1 MFD.	Grid of 1A7 (Cap)	High frequency end of dial	C-D—1st I.F.	Input I.F.	Adjust to maximum output
BROAD-CAST	1630 KC.	.0002 MFD.	Antenna Lead	High frequency end of dial	E—(See note below) F—(See note below)	Oscillator Antenna	Adjust to maximum output
	1300 KC.	.0002 MFD.	Antenna Lead	1300 KC.	G H	Oscillator Antenna	Adjust to maximum output

NOTE: Before adjusting trimmers "E" and "F", make sure that each iron core is 1⅜" or more outside of its coil form. If necessary, turn adjustments "G" and "H" to accomplish this.

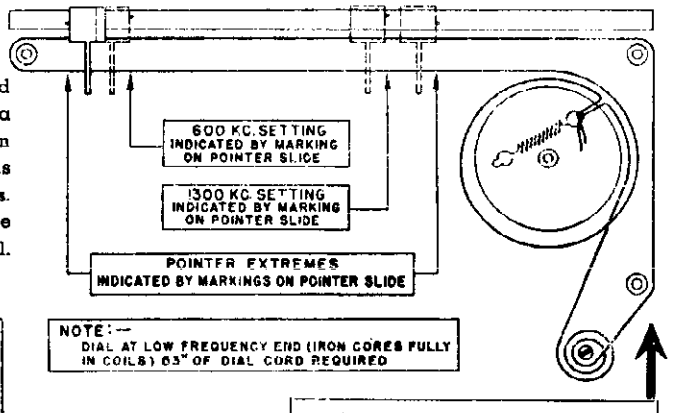
VOLTAGE DATA

All readings made between tube socket terminals and chassis. Voltages indicated have been obtained using a Vacuum Tube Voltmeter. A second voltage reading is shown made with a 1000 ohm-per-volt meter, when use of this instrument would result in appreciably lower readings. The voltages were measured using a fresh battery, volume control full on, dial at the high frequency end, and no signal.

VOLTAGE CHART BOTTOM VIEW

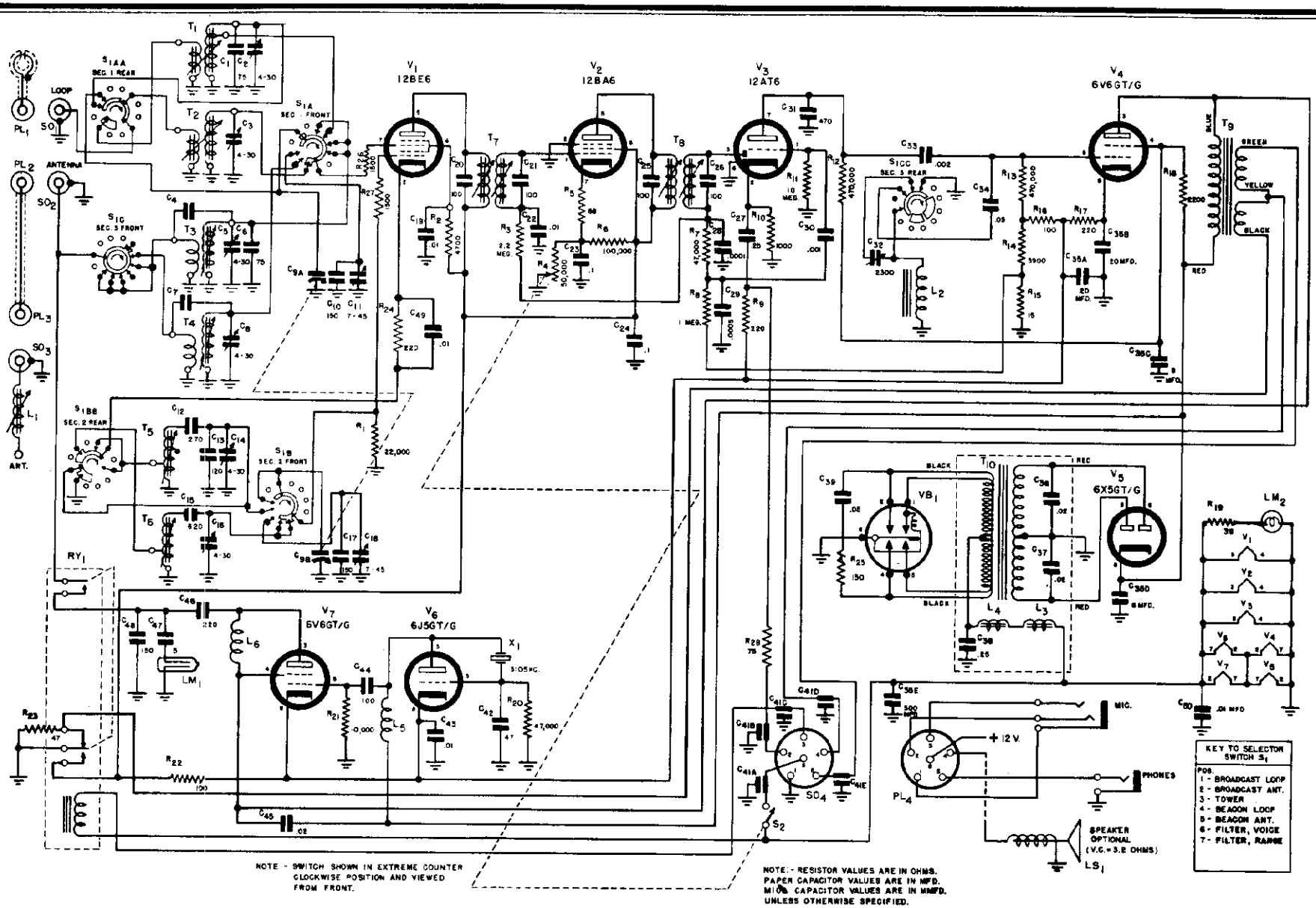


POINTER SETTINGS AND DIAL CORD STRINGING



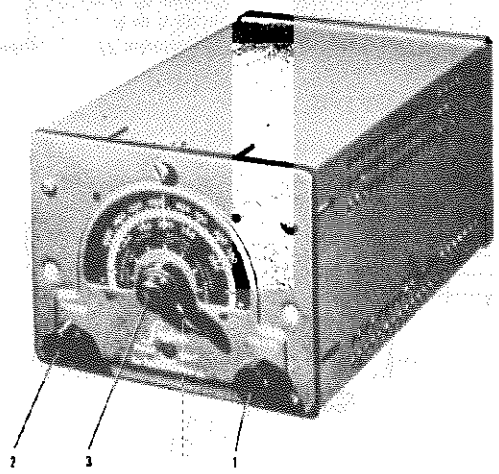
NOTE:— DIAL AT LOW FREQUENCY END (IRON CORES FULLY IN COILS) 63" OF DIAL CORD REQUIRED

In later production, a dual pulley is used here. String dial cord around inside pulley only.



DETAILED SERVICE INFORMATION

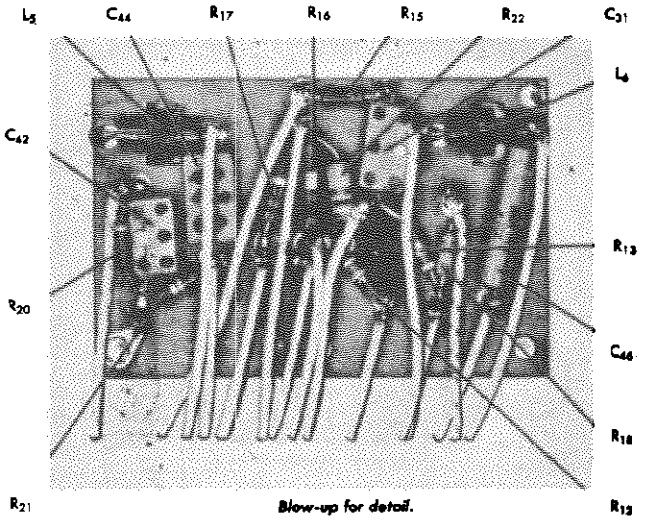
IF frequency	*IF selectivity*	*Image ratio*	*Audio output*	*Transmitter output*	*Modulation*
455 kc	4 to 5 kc at 6 db down	200:1 at 800 kc 5000:1 at 350 kc	300 milliwatts for headfones 3 watts for loud speaker	10 watts	90%, Heising



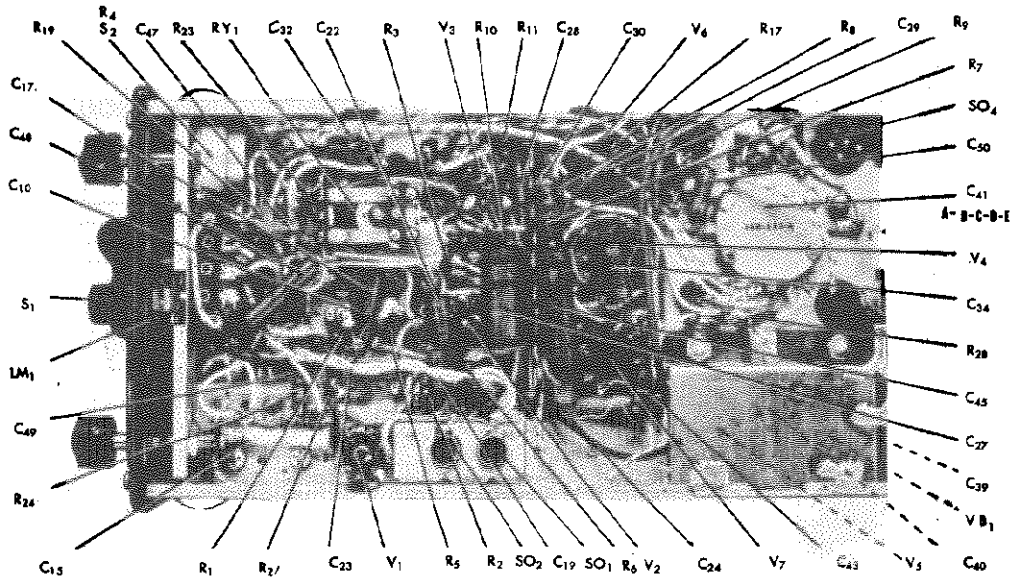
Model CA-2 front view

Controls: 1. Volume and on-off; 2. Receiver tuning; 3. Master selector for following functions:

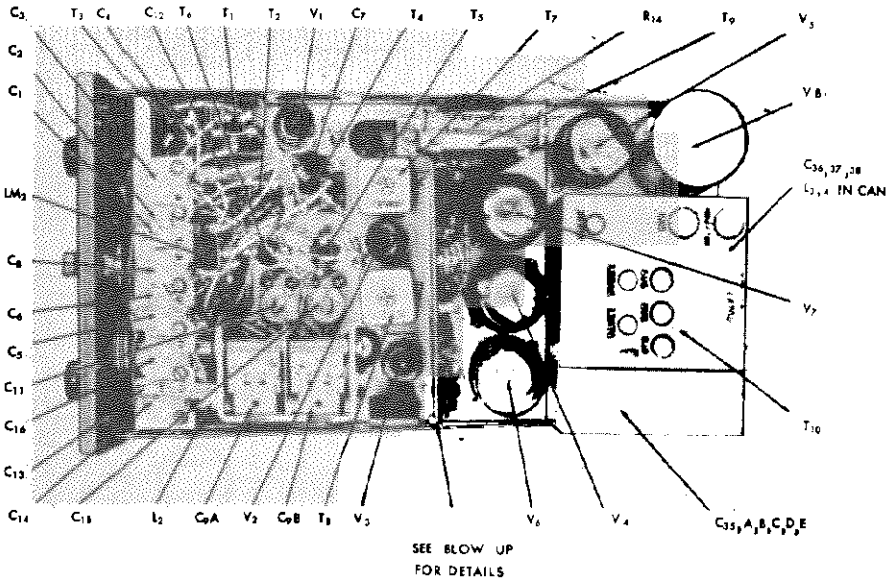
a. Broadcast, loop.
b. Broadcast, antenna.
c. Tower (pre-tuned to spot frequency).
d. Beacon, loop.
e. Beacon, antenna.
f. Filter, voice only.
g. Filter, range only.



Blow-up for detail.

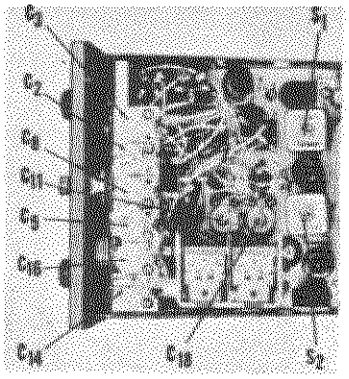


Bottom view, showing location of component parts.

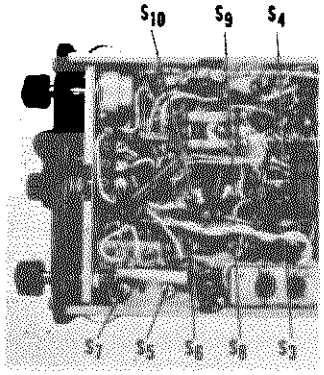


Top view, showing location of component parts.

ALIGNMENT INSTRUCTIONS



Top view.



Bottom view.

EQUIPMENT

SIGNAL GENERATOR capable of ranges indicated in the Alignment chart including a 400 cycle audio modulator.
OUTPUT METER capable of handling 3 watts of audio power.
ANTENNA DUMMY LOAD consisting of a 100 uuf condenser in series with the "hot" side of the signal generator bypassed with a 51 uuf condenser to ground on the load side of the series condenser.
LOOP DUMMY LOAD consisting of a 20 uh coil (¾" form, 1⅞" winding of #22 dcc wire) bypassed by a 150 uuf condenser to ground.
AUDIO SIGNAL GENERATOR capable of 1020 cps output.

ALIGNMENT CHART

Step Number	Connection of Sig. Generator Output to Receiver	Signal Gen. Frequency Setting	Band Switch Setting	Receiver Dial Setting	Adjust Slug, Padder, or Trimmer No.	Trimmer Description	Type of Adjustment
	I-F ADJUSTMENT						
1	Pin No. 7 of V-1 (12BE6)	455 kc	Broadcast ant.	1000 kc	1 & 4	Input IF	Maximum output
2							
3					2 & 3	Diode IF	Maximum output
							Repeat steps 1 & 2
	BROADCAST BAND						
4	SO-2	600 kc	Broadcast ant.	600 kc	S-10	Osc. slug	Maximum output
5	SO-2	1400 kc	Broadcast ant.	1400 kc	C-16	Osc. trimmer	Maximum output
6	SO-2	600 kc	Broadcast ant.	600 kc	S-8	Slug in T-4	Maximum output
7	SO-2	1400 kc	Broadcast ant.	1400 kc	C-8	Ant. trimmer	Maximum output
8	SO-2	2110 kc (image freq.)	Broadcast ant.	1200 kc	NOTE: Check for minimum image. If minimum image is not indicated, twist or untwist wire gimmick on top of coil until a minimum image is secured.		
9							Check and repeat steps 4, 5, 6, 7, & 8 if necessary
	BEACON BAND						
10	SO-2	220 kc	Beacon ant.	220 kc	S-9	Osc. slug	Maximum output
11	SO-2	220 kc	Beacon ant.	220 kc	C-14	Osc. trimmer	Maximum output
12	SO-2	220 kc	Beacon ant.	220 kc	S-7	Beacon ant.	Maximum output
13	SO-2	380 kc	Beacon ant.	380 kc	C-5	Beacon ant. trimmer	Maximum output
14	SO-2	1260 kc (image freq.)	Beacon ant.	350 kc	NOTE: Check for minimum image. If minimum image is not indicated, twist or untwist wire gimmick on top of beacon antenna coil T-3 until a minimum image is received.		
15							Check steps 10, 11, 12, 13, & 14 and repeat adjustments if necessary
	TOWER						
16	SO-2	278 kc	Tower		C-18	278 kc osc. trimmer	Adjust to frequency
17	SO-2	278 kc	Tower		C-11	278 kc ant. trimmer	Adjust to frequency
18							Repeat steps 16 & 17 for maximum output
	BROADCAST LOOP						
	Remove dummy antenna and connect dummy loop to loop socket SO-1 on unit.						
19	Dummy loop	600 kc	Broadcast loop	600 kc	S-6	Slug in broadcast loop trans. T-2	Maximum output
20	Dummy loop	1400 kc	Broadcast loop	1400 kc	C-3	Broadcast loop trimmer	Maximum output
21							Repeat steps 19 & 20 for maximum output
	BEACON LOOP						
22	Dummy loop	220 kc	Beacon loop	220 kc	S-5	Slug in beacon loop trans. T-1	Maximum output
23	Dummy loop	380 kc	Beacon loop	380 kc	C-2	Beacon loop trimmer	Maximum output
24							Repeat steps 22 & 23 for maximum output
	FILTER VOICE ADJUSTMENT						
25	*Same as for r-f alignment; connect audio oscillator to external modulation terminals on sig. gen. and set at 1020 C.P.S. 30% modulation.	300 kc	Filter voice	300 kc	C-32	Range filter condenser	Minimum output of receiver

*This adjustment should be made with a 300 microvolt input. 1020 C.P.S. should be down approximately 18 db. from 400 C.P.S. level.

TRANSMITTER ADJUSTMENT

Equipment required: Antenna loading coil, part #51B885-2, Capacitor, 27 mmfd, mica, ±10%, Resistor, 6 ohm, 2 watt carbon, ±10%, RF ammeter, 0-1 amp., Alignment tool, part #74A208, Transmission line part #87B1613-1, Microphone T-17 or M1-1.
Series connect antenna loading coil to 27 mmfd capacitor, 6 ohm resistor and 0-1 RF ammeter to ground. Connect dummy antenna across transmission line with load coil to center conductor, plug transmission line into SO-1.
Connect a 12 volt battery to power cable, turn on set and allow a few minutes warm-up period. Plug in microphone to jack, J-1.
Set bandswitch to position No. 3 (Tower) and press microphone button.
Tune antenna loading coil slug for maximum current reading on RF meter. For 12 volts DC power source, antenna current should be in the vicinity of .7 amperes. Whistling or talking in to the microphone should cause the antenna current to rise approximately 20%. Do not hold the press-to-talk microphone button down for more than 10 seconds at a time until all tuning adjustments are completed.

MODEL CA-2 THE HALLICRAFTERS CO.

GENERAL: The Model CA-2 is a 7 tube Crystal controlled transmitter and a Superheterodyne receiver. The receiver incorporates two frequency ranges; 195 to 410 kc Beacon band and 540 to 1610 kc Broadcast band. The transmitter uses any one frequency range between 2 to 7 mc depending upon the crystal used—a 3105 kc crystal is provided.

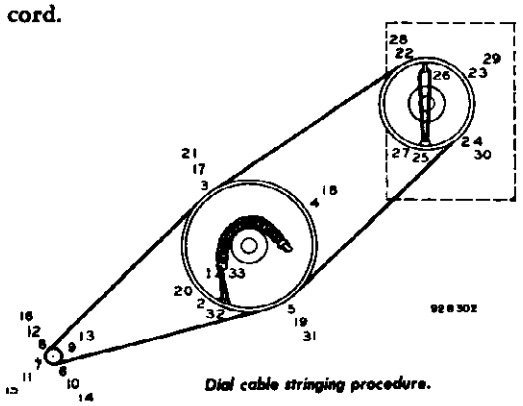
CORD CONNECTIONS: Consist of an audio and power cable, Antenna, and Direction finding loop antenna. All are located at the bottom of the set.

POWER SUPPLY DATA: Vibrator with rectifier, 12 volts DC, 13.75 volts nominal DC. Power drain is 3.5 amps on "Receive" and 5.3 amps on "Transmit."

TUBE COMPLIMENT AND FUNCTIONS: 12BE6 pentagrid converter, 12BA6 I.F. amplifier, 12AT6 detector, delayed AVC, and 1st audio, 6V6 output amplifier. The 12AT6 is used as a speech amplifier and the 6V6 as a Modulator when transmitting. The transmitter proper uses a 6J5 crystal oscillator and a 6V6 power amplifier.

HOW TO RESTRING DIAL CORDS

Cut a 30" length of 12 lb. test dial cord and tie one end to the tension spring on the pulley mounted on the hub of the bandswitch at position "1" on the diagram. Follow the numbers from "1" to "33," stretch the tension spring and tie cord securely. Cut off excess cord.



Dial cable stringing procedure.

TROUBLE SHOOTING CHART

SET IS DEAD

Cause	Remedy
Defective power cable	Repair or replace cable.
Battery connections disconnected.	Check and make the connections.
Defective master switch on plane.	Repair or replace switch.
Blown fuse	Replace fuse.

NO PLATE VOLTAGE

Dead rectifier tube	Replace tube.
Defective vibrator	Replace vibrator.
Open plate circuit	Check continuity of plate circuit and repair.

RECEIVER PERFORMS BUT TRANSMISSION IS DEAD

Cause	Remedy
Inoperative crystal	Check and replace if necessary.
Defective microphone switch	Check and replace or repair if possible.
Defective relay or relay contacts.	Check and repair or replace if necessary.
Antenna not tuned properly	Retune

FILAMENTS DO NOT LIGHT

Defective filament circuit	Check filament wiring and repair.

NOTE; Series parallel wiring on 6V6, 6X5 and 6J5 tubes.

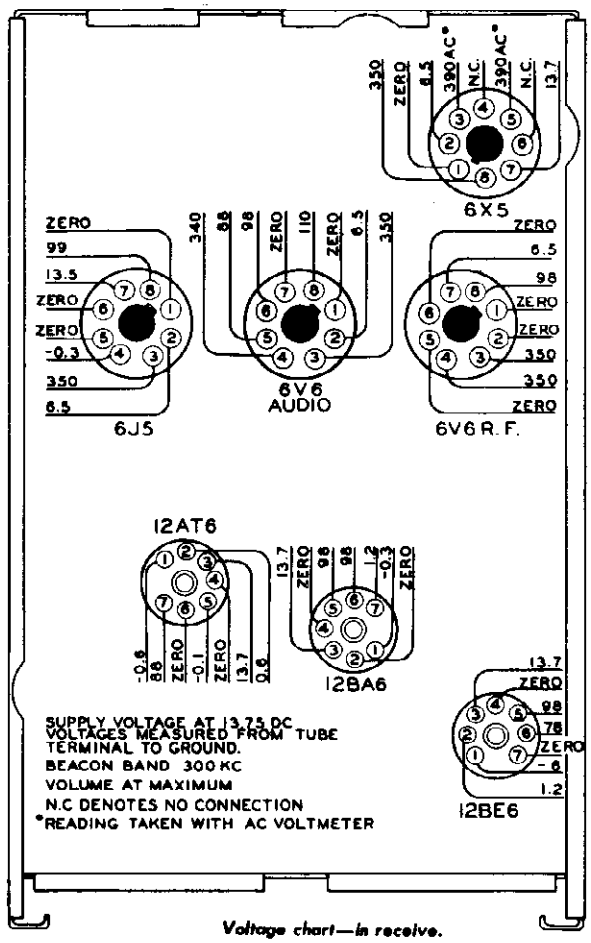
SYMPTON: Ignition Interference

ANALYSIS: Ignition noise is greatly reduced by inserting "damping" resistors in the grids of the oscillator mixer tube and a "limiting" resistor in the cathode circuit of the 2nd detector tube.

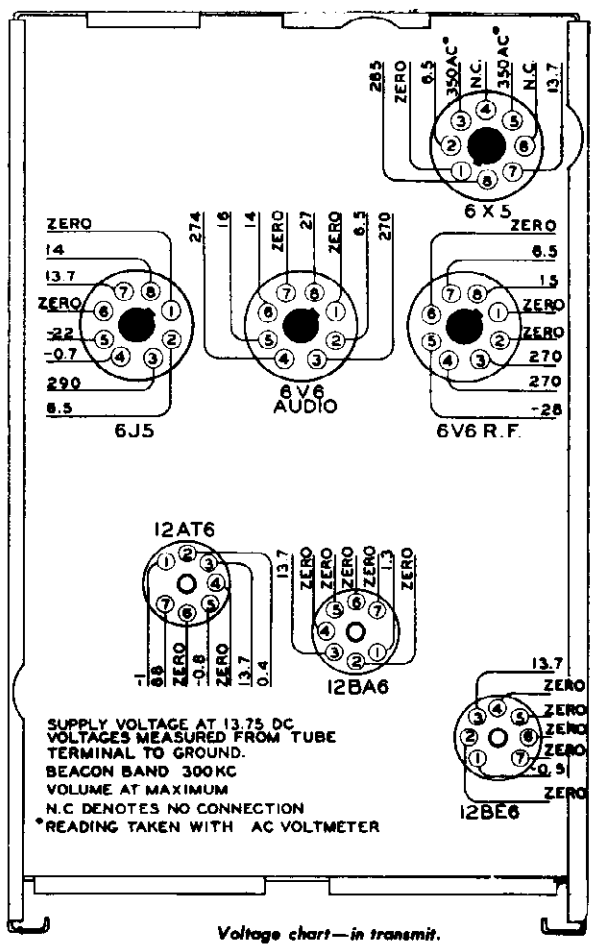
1. Install a 1500 ohm resistor in series with lead to pin no. 7 of V-1, 12BE6 tube. (R26)

2. Install a 1500 ohm resistor in series with lead to pin no. 1 of V-1, 12BE6 tube. (R27)

3. Install a 75 ohm resistor in series with lead to spark plate that is connected to pin no. 2 of socket, SO-4. (R28)



Voltage chart—in receive.



Voltage chart—in transmit.

REPLACEMENT PARTS LIST FOR MODEL CA-2 SKYFONE TRANSCEIVER

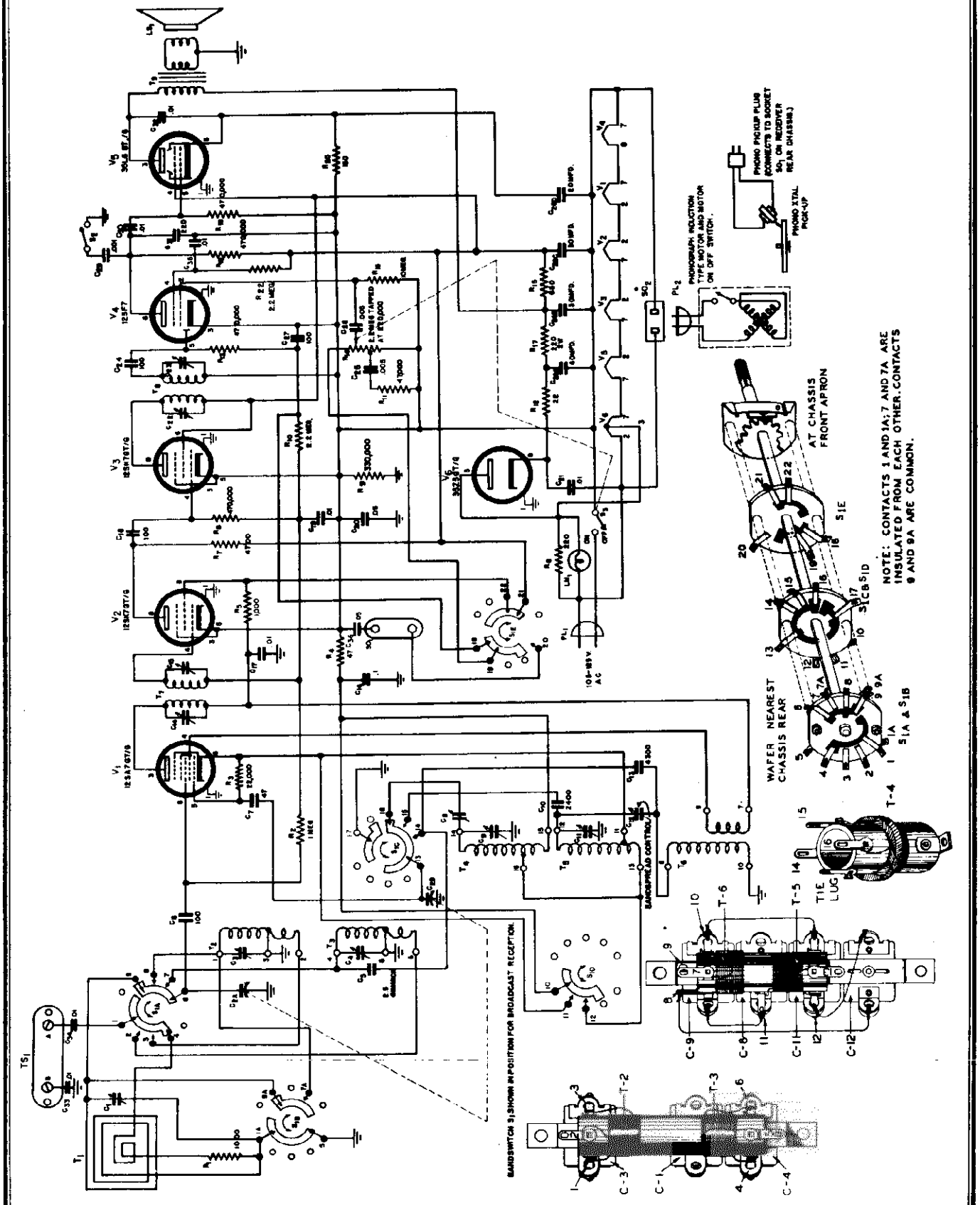
REF. NO.	DESCRIPTION	HALLICRAFTERS PART NUMBER
	CONDENSERS	
C-36, 37	.02 mfd; 600 vdcw; paper tubular	46AY203J
C-45	.02 mfd; 1600 vdcw, paper tubular	46A098-1
C-19, 22, 49, 43, 50	.01 mfd; 150 vdcw; paper tubular	46A099-2
C-23, 24	.1 mfd; 150 vdcw; paper tubular	46A099-4
C-39, 34	.05 mfd; 150 vdcw; paper tubular	46A099-3
C-30	.001 mfd; 150 vdcw; paper tubular	46A099-5
C-38	.25 mfd; 150 vdcw; paper tubular	46A099-6
C-33	.002 mfd; 600 vdcw; paper tubular	46A100-1
C-30	.0001 mfd; 600 vdcw; paper tubular	46A100-2
C-29	.0005 mfd; 600 vdcw; paper tubular	46A100-3
C-9A, B	Variable main tuning condenser	48C182
C-47	5 mmf; 20%; 500 vdcw; mica	CM20A050M
C-44, 28	100 mmf; 20%; 500 vdcw; mica	CM20A101M
C-10, 17	150 mmf; 2%; 500 vdcw; mica	CM20A151G
C-42	47 mmf; 20%; 500 vdcw; mica	CM20A470M
C-31	470 mmf; 20%; 500 vdcw; mica	CM20A471M
C-1, 6	75 mmf; 5%; 500 vdcw; ceramic	CC25UK750J
C-13	120 mmf; 5%; 500 vdcw; ceramic	CC30UK121J
C-48	150 mmf; 10%; 500 vdcw; ceramic	CC36UK151K
C-46	220 mmf; 10%; 500 vdcw; ceramic	CC36UK221K
C-12	270 mmf; 2%; 500 vdcw; ceramic	CC40TK271G
C-15	620 mmf; 5%; 500 vdcw; ceramic	CC45UK621J
C-2, 3, 5, 8, 11, 14, 16, 18	4-30 mmf trimmer; ceramic	44A103
C-32	2300 mmf trimmer; compression	44B108
C-35A, B, C, D, E	Capacitor assembly	45C104
C-41A, B, C, D, E	Ignition filter assembly	46B133
	RESISTORS	
R-14	3900 ohms; 10%; 10 watt; wire wound	24BG392E
R-4 & S-2	VOLUME control including switch	25A568
R-22	100 ohms; 20%; ½ watt; carbon	RC20AE101M
R-10	1000 ohm; 20%; ½ watt; carbon	RC20AE102M
R-21	10,000 ohm; 20%; ½ watt; carbon	RC20AE103M
R-6	100,000 ohm; 20%; ½ watt; carbon	RC20AE104M
R-8	1 megohm; 20%; ½ watt; carbon	RC20AE105M
R-11	10 megohm; 20%; ½ watt; carbon	RC20AE106M
R-15	15 ohm; 20%; ½ watt; carbon	RC20AE150M
R-9, 24	220 ohm; 20%; ½ watt; carbon	RC20AE221M
R-18	2200 ohm; 20%; ½ watt; carbon	RC20AE222M
R-1	22,000 ohm; 20%; ½ watt; carbon	RC20AE223M
R-3	2.2 megohm; 20%; ½ watt; carbon	RC20AE225M
R-23	47 ohm; 20%; ½ watt; carbon	RC20AE470M
R-2	4700 ohm; 20%; ½ watt; carbon	RC20AE472M
R-7, 20	47,000 ohm; 20%; ½ watt; carbon	RC20AE473M

REF. NO.	DESCRIPTION	HALLICRAFTERS PART NUMBER
	RESISTORS—Continued	
R-12, 13	470,000 ohm; 20%; ½ watt; carbon	RC20AE474M
R-5, 19	68 ohm; 20%; ½ watt; carbon	RC20AE680M
R-16	100 ohm; 20%; 1 watt; carbon	RC30AE101M
R-17	220 ohm; 20%; 1 watt; carbon	RC30AE221M
R-19	39 ohm; 20%; 2 watt; carbon	RC40AE390M
R-26, 27	1500 ohm; 20%; ½ watt; carbon	RC20AE152M
R-28	75 ohm; 20%; ½ watt; carbon	RC20AE750M
R-25	150 ohm; 20%; ½ watt; carbon	RC20AE151M
	TRANSFORMERS AND CHOKES	
T-7	IF- 1st	50B206
T-8	IF, 2nd	50B207
T-3	Converter, "Beacon"	51B859
T-4	Converter, Broadcast	51B860
T-6	Osc., "Beacon"	51B861
T-5	Osc., Broadcast	51B862
T-1	Loop, "Beacon"	51B863
T-2	Loop, Broadcast	51B864
T-10	Power Transformer	52C126
T-9	Output Transformer	53A075
L-3, 4	Hash choke	53A100
L-5, 6	RF choke	53A101
L-2	Range filter choke	56B072
	MISCELLANEOUS	
LM-2	Lamp, pilot, No. 44	39A003
LM-1	Lamp, neon indicator	39A012
RY-1	Relay, complete	21B072
VB-1	Vibrator, nonsynchronous	27A139
	Knob, volume and tuning	15A074-1
	Knob, bar, bandswitch	15A073-1
LS-1	Speaker	
	Antenna and loop socket assembly	10A247
	Bandswitch	60C260
	Dial light socket	86A041-1
	Octal, socket	6A273
SO-4	Socket, 6 prong, power	6A282
PL-4	Plug, 6 prong, power	10A241
	Socket, 7 prong min.	6A264
	Cable, power, audio, Microphone—GENERAL	87C1567*
X-1	Crystal, 3105 kc.	19A1210
	Dial window	22B170
	Dial scale	83C291

* Specify Aircraft Type and make when ordering.

MODELS EC-306,
EX-306

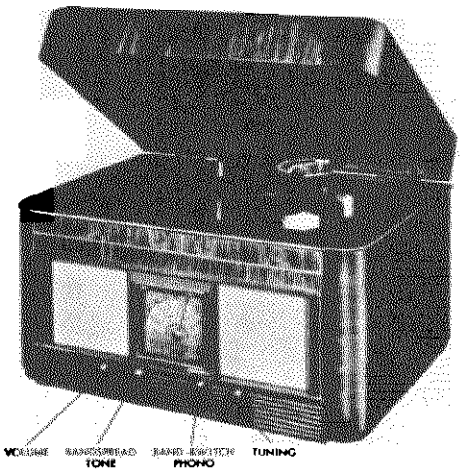
THE HALLICRAFTERS CO.



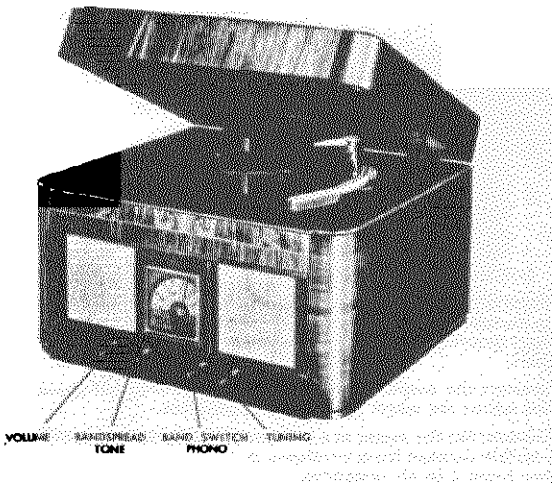
RECORD CHANGER: For EC-306, GI Model 205, RCD.CH. 15-5

THE HALLICRAFTERS CO.

MODELS EC-306
EX-306



Model EX-306 Front view of receiver showing control locations.



Model EC-306 Front view of receiver showing control locations.

GENERAL: The EC-306 and EX-306 are six tube AC, table model radio-phonographs.

These receivers incorporate a superheterodyne circuit and are capable of receiving both domestic and short-wave recep tion in three bands as follows: Band #1, domestic broadcast, 540 kc 1625 kc (position 2). Band #2, short wave rang #1, 2.2 to 7.1 mc (position 3). Band #3, short wave range #2, 6.9 to 22 mc. (position 4).

Both models have built in antennas, plus provisions for external antenna and ground systems.

PHONOGRAPH: Position #1 on band switch is for "phono" operation. The record changer is of the automatic type an will handle either ten twelve inch or twelve ten inch records. Detailed Service instructions for the automatic changer are available on request. The EC-306 uses changer model 205 and the EX-306 uses changer model 204.

POWER SUPPLY DATA: Both receiver models are designed to operate from a line voltage of 105 to 125 volts AC 5(60 cycles with a power drain of 30 watts nominal. Power to the receivers is supplied through the line cord extendin from the rear of the cabinets.

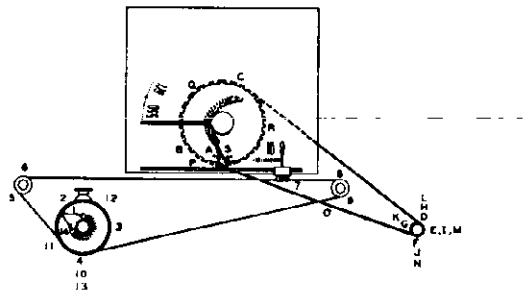
TUBE TYPES AND FUNCTIONS: 12SA7GT/G-mixer-oscillator; 2-12SK7GT/G's as I-F amplifiers; 12SF7-Detecto AVC and First audio amplifier; 35L6GT/G-Audio power amplifier; 35Z5GT/G-Power rectifier.

DETAILED SERVICE INFORMATION

IF FREQUENCY	RECEIVER OVERALL SELECTIVITY	IMAGE RATIO	*RECEIVER OVERALL SENSITIVITY	AUDIO OUTPUT
455kc	8.5kc wide at 6db down 16kc wide at 20db down 32kc wide at 40db down (for 500 milliwatt output)	65:1 at 1000kc (loop) 20:1 at 2.5mc (ant.) 8:1 at 7.0mc (ant.) 6:1 at 15.0mc (ant.) 3:1 at 20.0mc (ant.)	45 microvolt at 1000 kc 80 microvolt at 2.5 mc 35 microvolt at 6mc 140 microvolt at 8mc 50 microvolt at 20mc	0.8 watt with less than 10% distortion

*Readings for 500 milliwatt constant output. Speaker disconnected and replaced with a 3.2 ohm load resistor. Signal fro generator modulated 30% at 400 cycles.

HOW TO RESTRING DIAL CORDS



Dial cable stringing procedure; main tuning is indicated by letters, and band spread tuning is indicated by numbers.

To restring the main tuning dial cord, cut a 25" length of 18 lb test dial cord and tie one end to the tension spring of the main tuning capacitor drive pulley at position "A" on the diagram. Following the letters "A" through "S", wind the cord on the pulley and knob drive shaft. At position "S", stretch the tension spring and tie the cord securely. Cut off the excess cord. Note that three turns are wound on the knob drive shaft.

To restring the bandspread tuning dial cord, cut a 30" length of the dial cord and follow the procedure as explained above, except start at position "1" on the diagram and proceed through position "14". Then turn knob pulley maximum clockwise, slide pointer to 100 and insert cord in clip on pointer. Note that the knob pulley has two turns.

MODELS EC-306, EX-306

THE HALLICRAFTERS CO.

ALIGNMENT INSTRUCTIONS

EQUIPMENT:

1. Signal Generator capable of ranges indicated in the ALIGNMENT CHART, including a 400 cycle audio modulator.
2. Output meter capable of handling 1 watt of audio power.
3. Standard RMA dummy antenna consisting of a 200 mmf condenser in series with a 20uh r-f choke, the choke being shunted by a 400 mmf condenser in series with a 400 ohm carbon resistor.
4. Non-metal screw-driver.

CONNECTIONS: Connect the Sig. Gen. "cold" lead to "G" on the antenna terminal strip except for i-f adjustments (see chart below); the "hot" lead is connected as indicated in the chart.

Connect the output meter across voice coil of the speaker and adjust the meter for 3 ohm impedance.

Caution: Set the meter at a sufficiently high range to prevent possible damage from overload. Band 3 must be aligned before band 2 in all instances.

CONTROL SETTINGS: After allowing about a ten minute warm up period, set the receiver's control as follows:

VOLUME control at full clockwise.

BANDSPREAD tuning control at "0", (min. cap.).

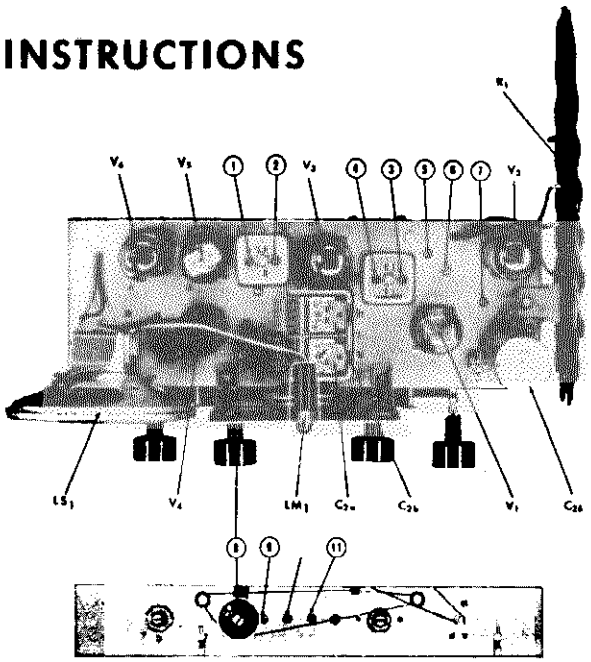


Fig. 6. Top and front views of the receiver showing tube locations and location of padder, trimmer and i-f adjustment points.

ALIGNMENT CHART

DUMMY ANT. IN SERIES WITH SIG. GENERATOR	CONNECTION OF SIG. GENERATOR OUTPUT TO RECEIVER	SIGNAL GEN. FREQUENCY SETTING	BAND SWITCH SETTING	RECEIVER DIAL SETTING	ADJUST SLUG PADDER, OR TRIMMER NO.	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT MAKE ADJUSTMENT FOR:	STEP NO.
IF ADJUSTMENT								
None	**On mixer section stator of tuning condenser gang	455kc	Range 1 (Broadcast)	1625kc	3 & 4 1 & 2	Diode IF Input IF	Maximum output Maximum Output Repeat steps 1 & 2	1 2 3
RANGE 1 (Broadcast band)—								
Standard	Couple to loop	1500kc	Range 1	1500kc	11	Osc. Trimmer	Maximum output	4
RMA Dummy*	aerial	1500kc	(Broadcast)	1500kc	6	Antenna shunt trimmer	Maximum output	5
		600kc		600kc	10	Osc. padder	Maximum output Repeat step 4	6 7
RANGE 3 (Short wave range 6.9 to 22mc)—Align oscillator for this band with bandspread indicator drive pulley set screw loose and pointer set at zero. After completing the OSCILLATOR alignment, tighten the screws securely without changing the pointer setting from zero.								
Standard								
RMA Dummy*	"A" on antenna terminal strip	22mc	Range 3	22mc	8	Bandspread & Osc. trimmer	Maximum output	8
		20mc		20mc	†5	Antenna shunt trimmer	Maximum output	9
RANGE 2 (Short wave range 2.2 to 7.1mc,)—								
Standard*	"A" on antenna	6mc	Range 2	6mc	9	Osc. trimmer	Maximum output	10
RMA Dummy*	terminal strip	6mc		6mc	7	Antenna shunt trimmer	Maximum output	11

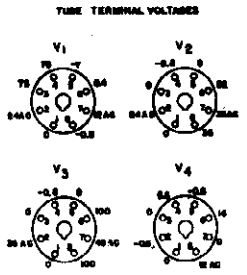
NOTE: Bandspread indicator MUST be at ZERO when making all adjustments.

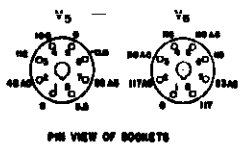
Band 2 oscillator trimmer (9) must be set AFTER bandspread trimmer (8) (Range 3 oscillator trimmer) is aligned.

*Standard RMA dummy antenna consists of a 200mmf condenser in series with a 20uh r-f choke, the choke being shunted by a 400 mmf condenser in series with a 400 ohm carbon resistor.

**Connect Sig. Gen. ground lead to receiver negative return, not to chassis. This applies only for I-F adjustment.

†When making these adjustments turn tuning capacitor slowly back and forth.





ALL VOLTAGES ARE POSITIVE DC UNLESS OTHERWISE SPECIFIED. VOLTAGES TAKEN WITH A VACUUM TUBE VOLTMETER; NO SIGNAL BEING RECEIVED; NEG. METER LEAD TO B-(AT VOLUME CONTROL LOW SIDE) POSITIVE LEAD TO EACH TUBE TERMINAL; BANDSWITCH SET FOR BROADCAST BAND; TUNE TO APPROX. 1000KC. AC LINE 117 VOLTS.

ALL VOLTAGES ARE ±10% OR 1 VOLT, WHICH EVER IS GREATER.

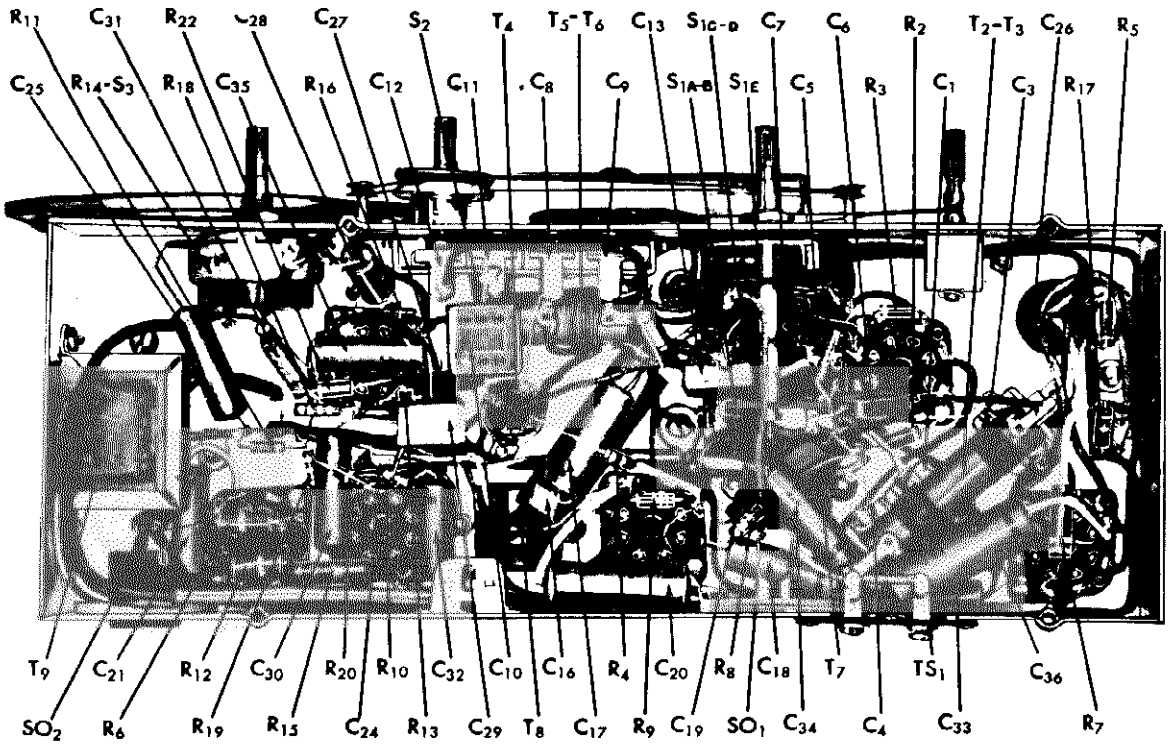
RESISTANCE VALUES ARE IN OHMS; MICA CAPACITOR VALUES ARE IN MMF; PAPER CAPACITOR VALUES ARE IN DECIMAL EQUIVALENTS OF MFD; ELECTROLYTIC CAPACITOR VALUES ARE IN MFD.

-----DENOTES UNSHIELDED UNIT ASSEMBLY.

DENOTES MECHANICAL GANGING.

THE HALLICRAFTERS CO.

MODELS EC-3C
EX-306



Model EC-306 and EX-306 bottom view of chassis showing location of component parts.

REF. NO.	DESCRIPTION	HALLICRAFTER'S PART NUMBER
	CAPACITORS	
C-1, 3 & 4	Antenna trimmers; 3 section unit	44A162
C-2	Main tuning capacitor; 2 sections, ganged; 12.3 to 354.6 mmf, each section; air	48B165
C-5	2.5 mmf gimmick; twisted insulated leads. NOT FURNISHED AS A REPLACEMENT PART SHOWN FOR REFERENCE ONLY.	
C-6, 18, 24 & 27	100 mmf; 20%; 500 vdcw; mica	CM20A101M
C-7	47 mmf; 20%; 500 vdcw; mica	CM20A470M
C-8, 9, 11 & 12	Oscillator trimmer; 4 section	44B161
C-10	2400 mmf; 20%; 500 vdcw; mica	CM30A242M
C-13	4300 mmf; 10%; 500 vdcw; mica	CM35A432K
C-14 & 15	Trimmers for IF transformer, T-7. NOT A REPLACEABLE PART. Furnished with replacement transformer T-7. SEE LISTING REF. No. T-7.	
C-16	0.1 mfd; +40-15%; 600 vdcw; tubular paper	46AX104J
C-17, 19, 21 30, 32, 33, 34, 35 & 36	0.01 mfd; 20%; 600 vdcw; tubular paper	46AX103F
C-28	0.001 mfd; +40 −15%; 600 vdcw; tubular paper	46AZ502J
C-20	0.05 mfd; +40 −15%; 600 vdcw; tubular paper	46AY503J
C-22 & 23	Trimmers for IF transformer, T-8. NOT A SEPARATE REPLACEMENT PART. FURNISHED WITH REPLACEMENT TRANSFORMER T-8. SEE LISTING REF. NO. T-8.	
C-26A, B, C & D	Electrolytic; 4 section unit; sect. A— 40 mfd, 150 vdcw; sect. B & C—are each 30 mfd, 150 vdcw; Sect. D—20 mfd, 25 vdcw	45B095
C-29	0.001 mfd; 20%; 600 vdcw; tubular paper	46AZ102H
C-31	220 mmf; 20%; 500 vdcw; mica	CM20A221M
C-25	0.005 mfd; 20%; 600 vdcw; tubular paper	46AZ502J
	PILOT LAMPS	
LM-1	6/8 volt @ 150 ma; brown bead; bayonet base; G.E. type 47	39A004
	LOUD SPEAKER	
LS-1	Loud Speaker	85B036
	PLUGS	
PL-1	Line cord with two prong plug; 6 ft cord	57A078
	RESISTORS	
R-1 & 5	1000 ohm; 20%; ½ watt; carbon; (NOTE: R-1 is included with antenna loop transformer ref. no. T-1, but is available as a separate replacement part.)	RC20A102M
R-2	1 megohm; 20%; ½ watt; carbon	RC20AE105M
R-3 & 11	47,000 ohm; 20%; ½ watt; carbon	RC20AE473M
R-4	47 ohm; 20%; ½ watt; carbon	RC20AE470M
R-6	220 ohm; 20%; 1 watt; carbon	RC20AE221M
R-7	4700 ohm; 20%; 1 watt; carbon	RC20AE472M
R-8, 13, 18 & 19	470,000 ohm; 20%; ½ watt; carbon	RC20AE474M
R-9	330,000 ohm; 20%; ½ watt; carbon	RC20AE334M
R-10	2.2 megohm; 20%; ½ watt; carbon	RC20AE225M
R-12	22 ohm; 20%; 1 watt; carbon	RC30AE220M
R-14 & S-3	VOLUME control; 2.2 megohm, tapped at 220,000 ohm, variable; includes SPST toggle action switch, S-3 on rear	25A561
R-15	680 ohm; 20%; 1 watt; carbon	RC30AE681M
R-16	10 megohm; 20%; ½ watt; carbon	RC20AE106M
R-17	470 ohm; 20%; ½ watt; carbon	RC20AE471M
R-20	150 ohm; 20%; ½ watt; carbon	RC20AE151M
R-22	2.2 megohm; 20%; ½ watt; carbon	RC20AE225M

REF. NO.	DESCRIPTION	HALLICRAFTER'S PART NUMBER
	SWITCHES	
S-1	Bandswitch; rotary; 3 section, 4 position	60B251
S-2	Tone control switch	60A246
S-3	Receiver on/off switch; part of resistor R-14 assembly. NOT FURNISHED AS SEPARATE REPLACEMENT PART. SEE LISTING REF. NO. R-14.	
	TRANSFORMERS	
T-1	Antenna loop assembly; includes resistor R-1	57C104
T-2 & 3	Mixer coil assembly for short wave bands, both short wave ranges	51B814
T-4	Oscillator coil for local broadcast band	51A811
T-5 & 6	Oscillator coil assembly for short wave bands, both short wave ranges	51B815
T-7	Input IF transformer; 455kc; trimmer tuned	50B196-5
T-8	Diode IF transformer; 455kc; trimmer tuned	50B196-2
T-9	Audio output transformer; matches output tube to 3 ohm voice coil of PM speaker	55B080-2
T-10	Autotransformer, 220 to 110 volts, AC, 50-60 cycles	52B145
	TERMINAL STRIPS	
TS-1	External antenna and ground connector strip	88A569

MISCELLANEOUS COMPONENTS COMMON TO BOTH MODELS

QUANT. IN EQUIPMENT	DESCRIPTION	HALLICRAFTER'S PART NUMBER
1	Pilot lamp dial socket; bayonet base	86A036-1
1	Bracket; tuning capacitor mounting	67B581
1	Bracket; tuning shaft mounting	67A582
1	Steel tuning shaft	74A176
1	Acetate dial window	22B161
1	Main tuning dial scale pointer	82A106
1	Bandspread tuning dial scale pointer	82A107
1	Calibrated dial scale	83B271
1	Drive pulley	26A022
2	Idler pulley	26A023
1	Line cord lock	76A299
1	Electrolytic capacitor (C-26) hold down clamp	76A300
1	Cam for switch, S—	77A207
6	Tube sockets; octal; Amphenol type MIP-8	6A256
1	Receptical, Phono	10A015
1	Receptical, Motor	88A072
3	Knob, bakelite, walnut finish	15B067-2
1	Knob, bakelite, walnut finish with dot	15B076-1

MISCELLANEOUS COMPONENTS FOR MODEL EC-306 ONLY

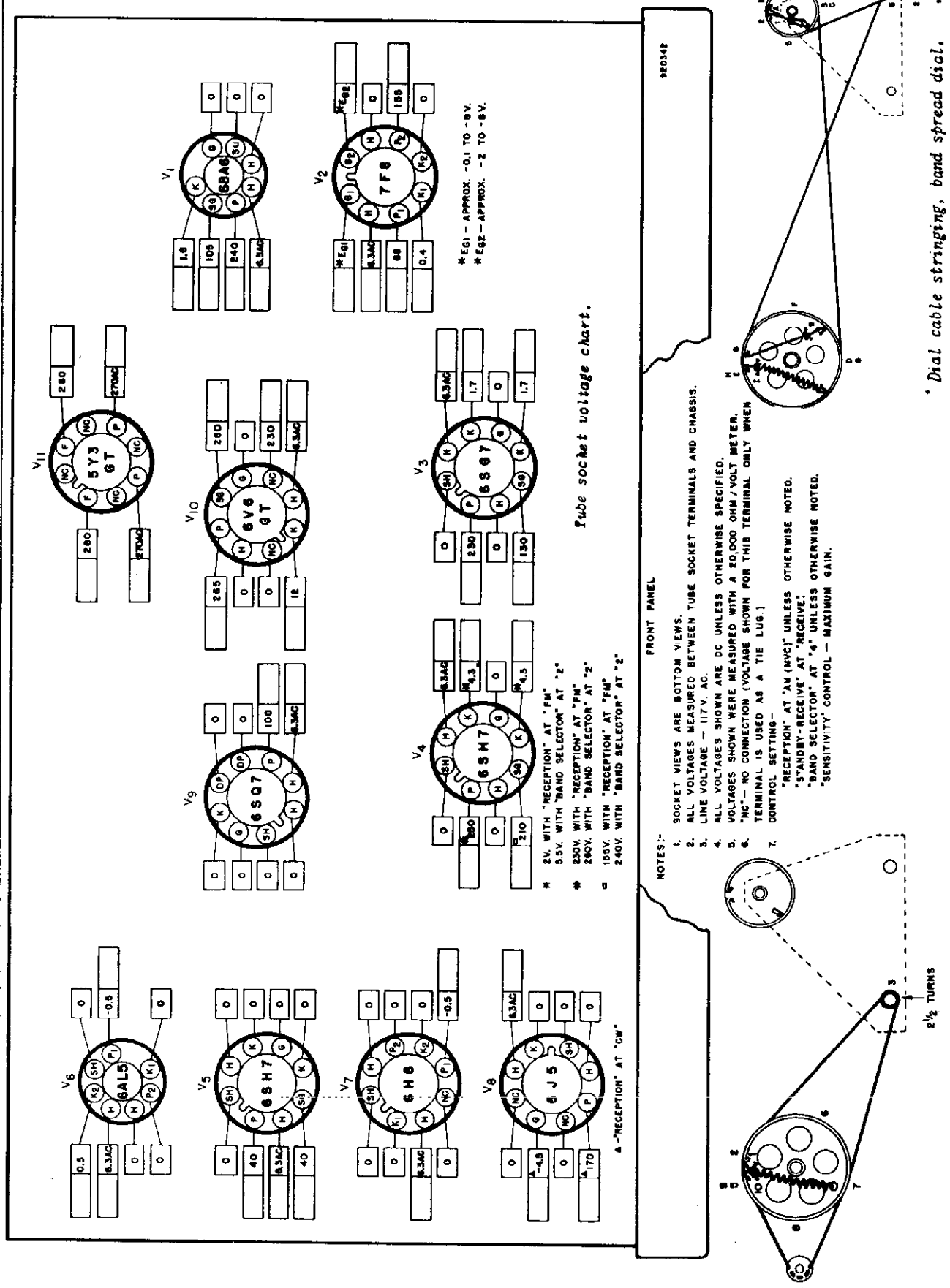
1	Cabinet, wood	66F325
1	**Record Changer	115C001-1

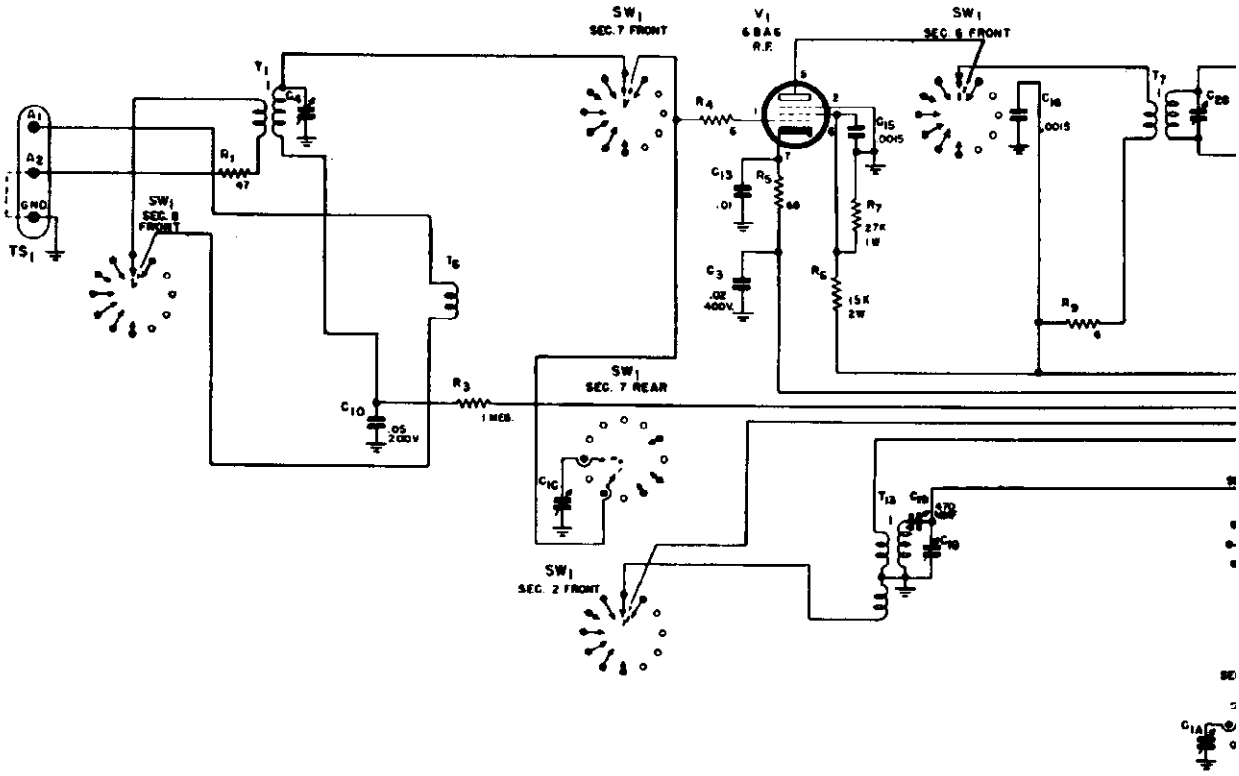
MISCELLANEOUS COMPONENTS FOR MODEL EX-306 ONLY

1	Cabinet, wood	66F326
1	**Record Changer	115C003-1

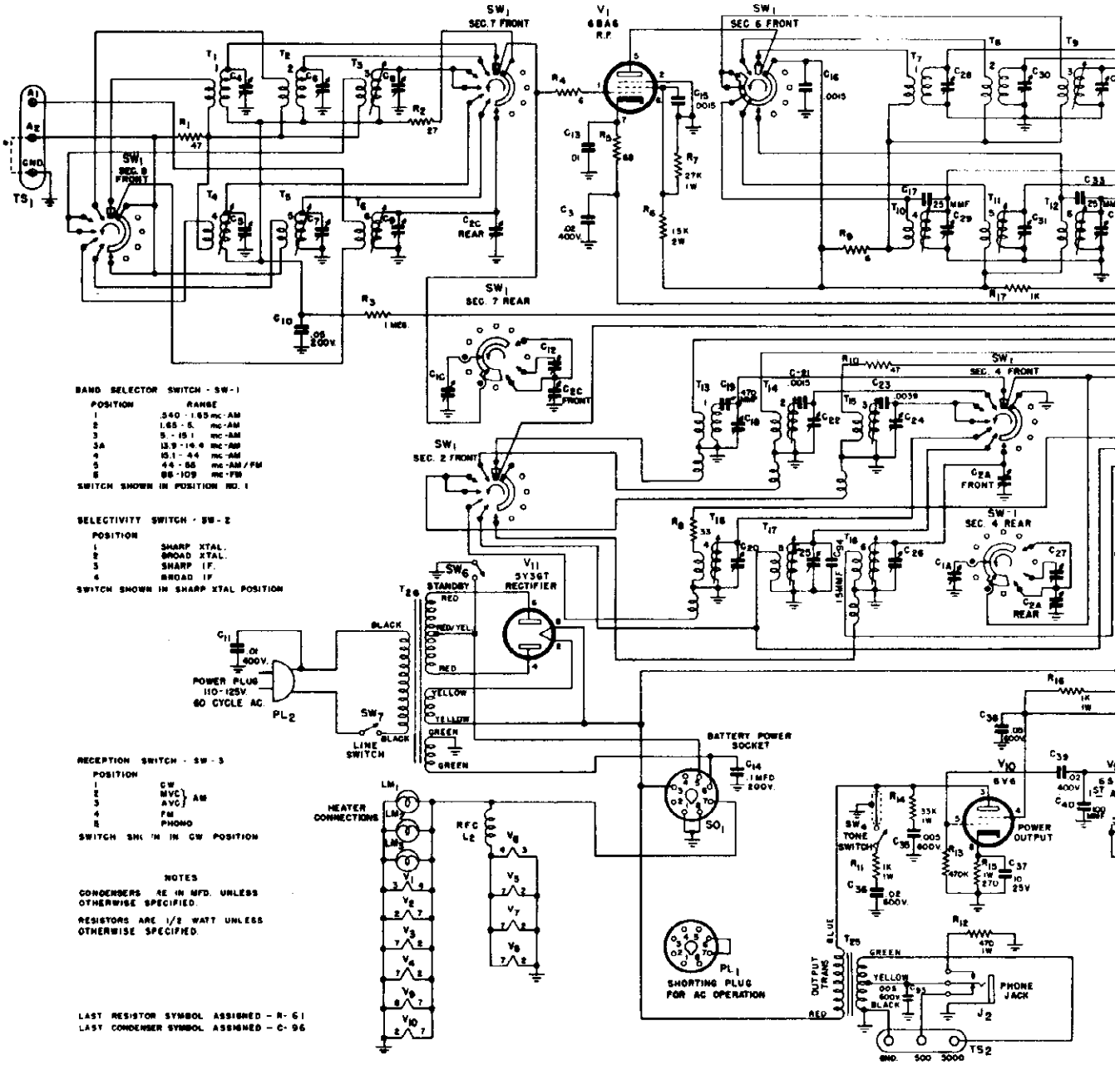
MODEL SX-43

THE HALLICRAFTERS CO.

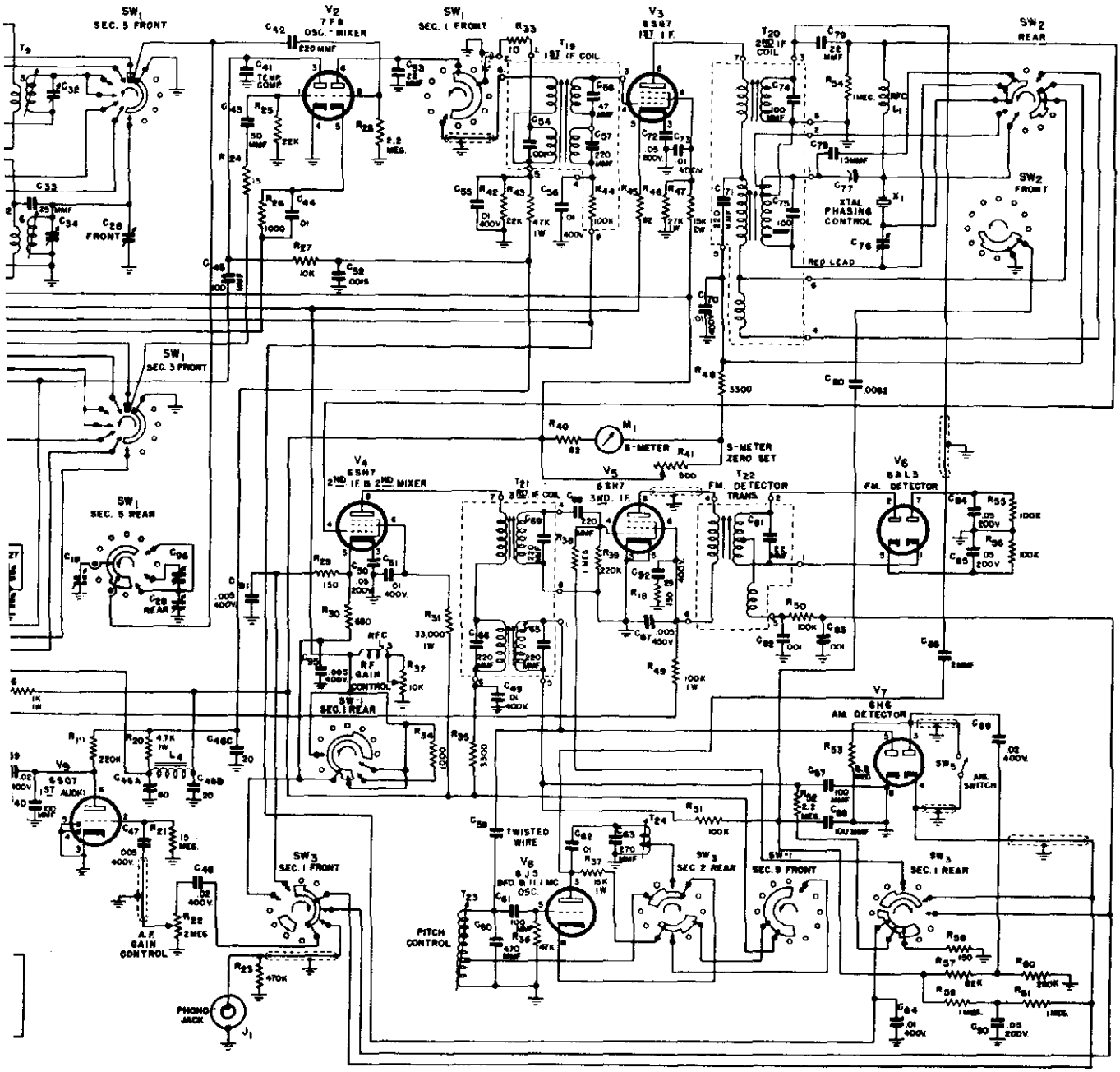




BAND-SWITCH SHOWN
AT 1ST POSITION.
BROADCAST BAND
540-1650 KC



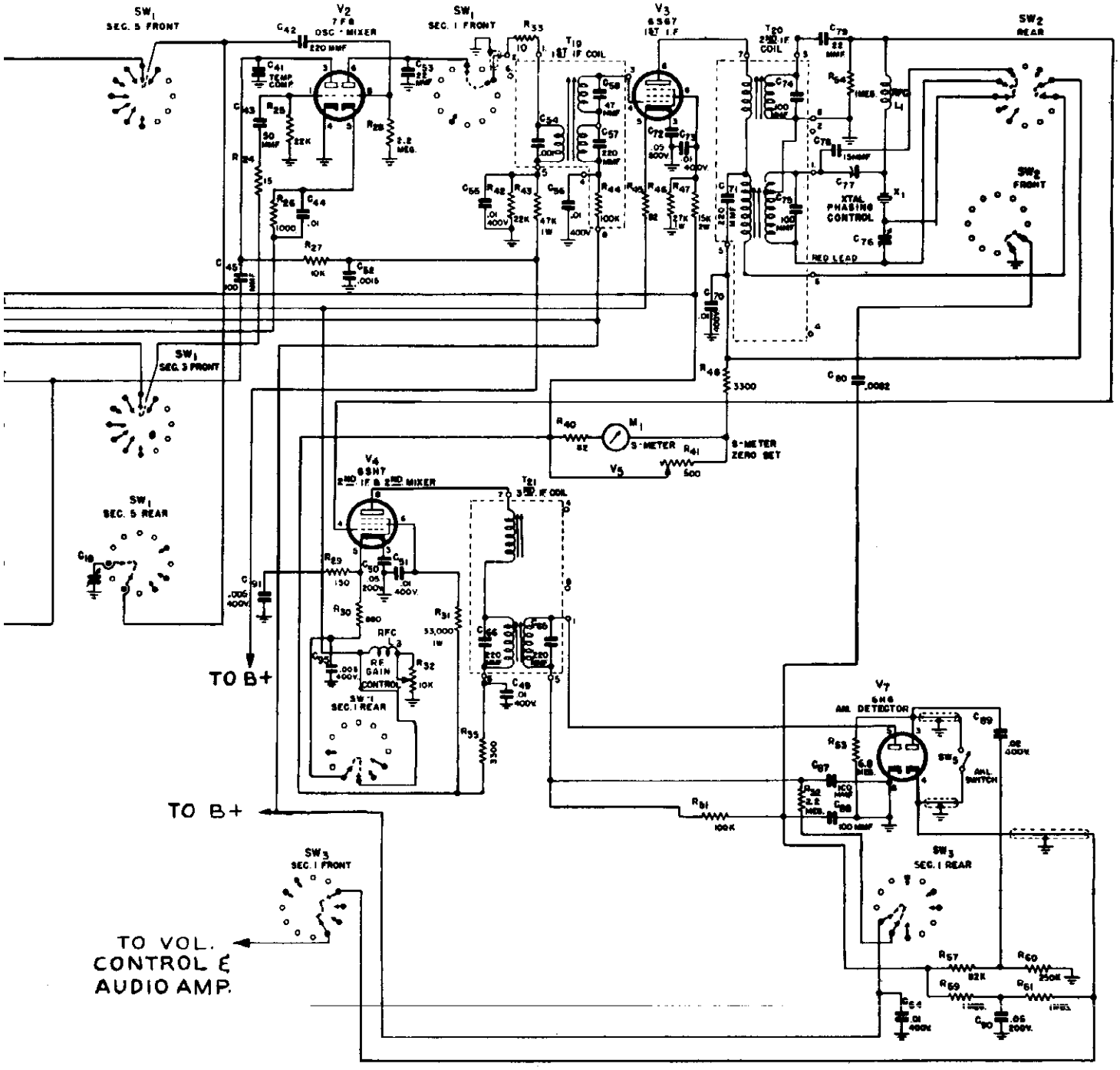
Tubes	Eleven
Speaker Output.	500/5000 Ohms.
Headset Output.	High Impedance.
Antenna Input	For 72 to 600-ohm line or single wire lead-in.
Phono Input	High Impedance.
External Power Connector.	Std. Octal Socket.

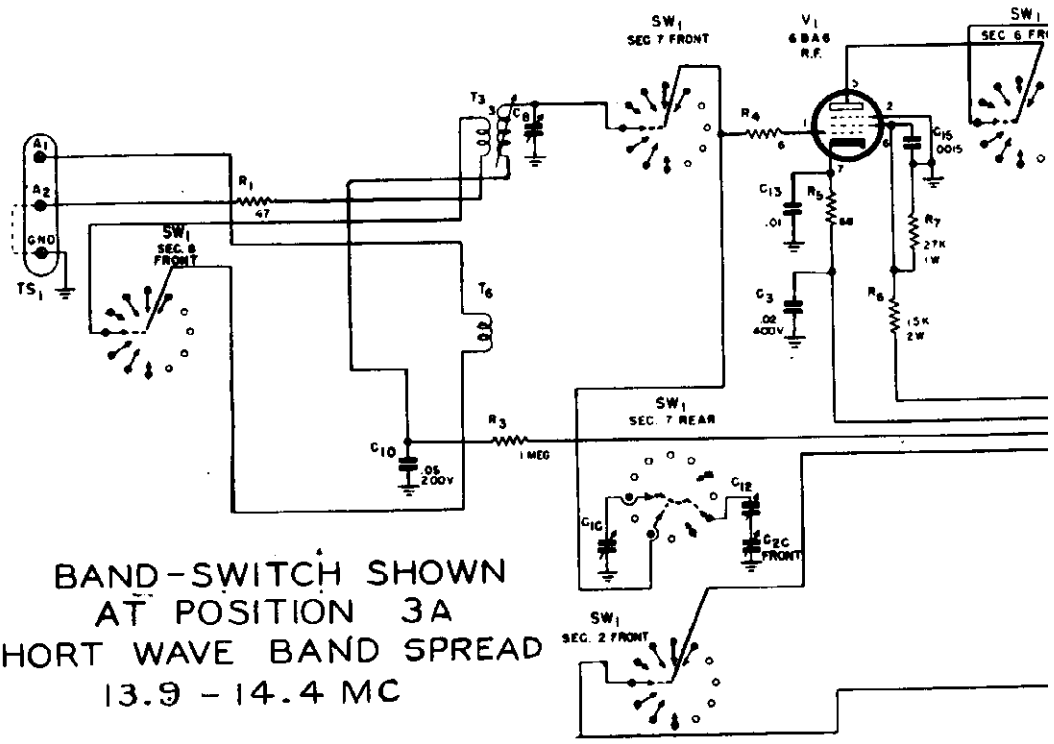


Tuning Range. . . . . Band 1. 540 kc – 1700 kc. AM.
2. 1.7 mc – 5 mc. AM.
3. 5 mc – 16 mc. AM.
3A. 14 mc – 14.4 mc. AM.
4. 15.5 mc – 44 mc. AM.
5. 44 mc – 55 mc. AM/FM
6. 86 mc – 109 mc. FM

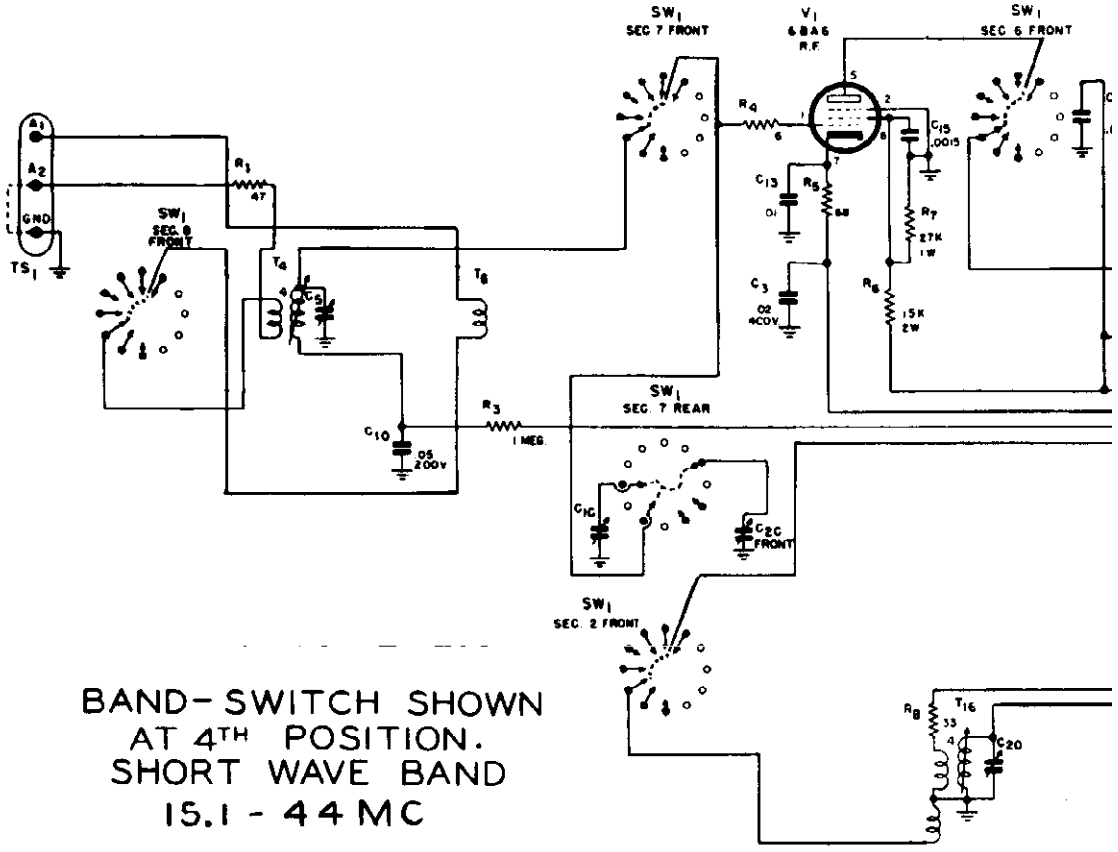
Intermediate Frequency. . 455 kc/10.7 mc.
Power Supply. . . . . 105-125 V. 50/60 cycles AC.
Power Consumption . . . . 90 Watts.

ALLICRAFTERS CO.

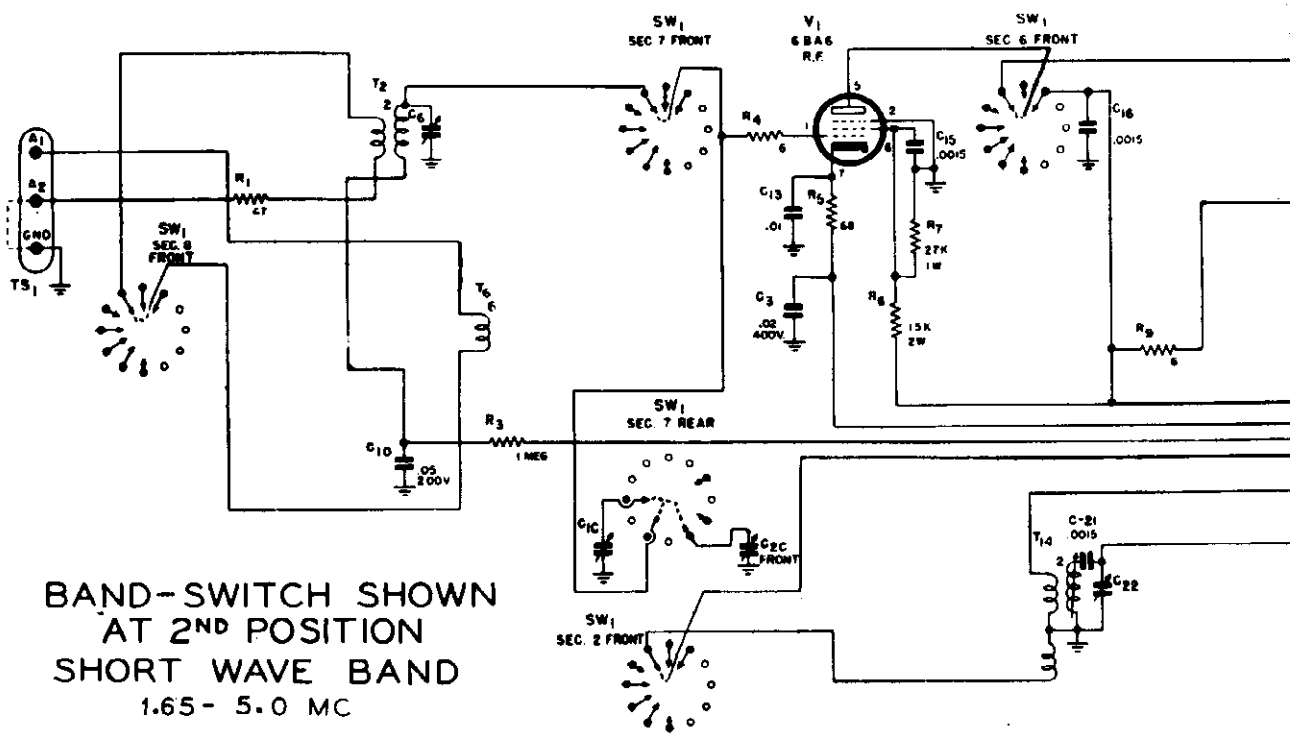




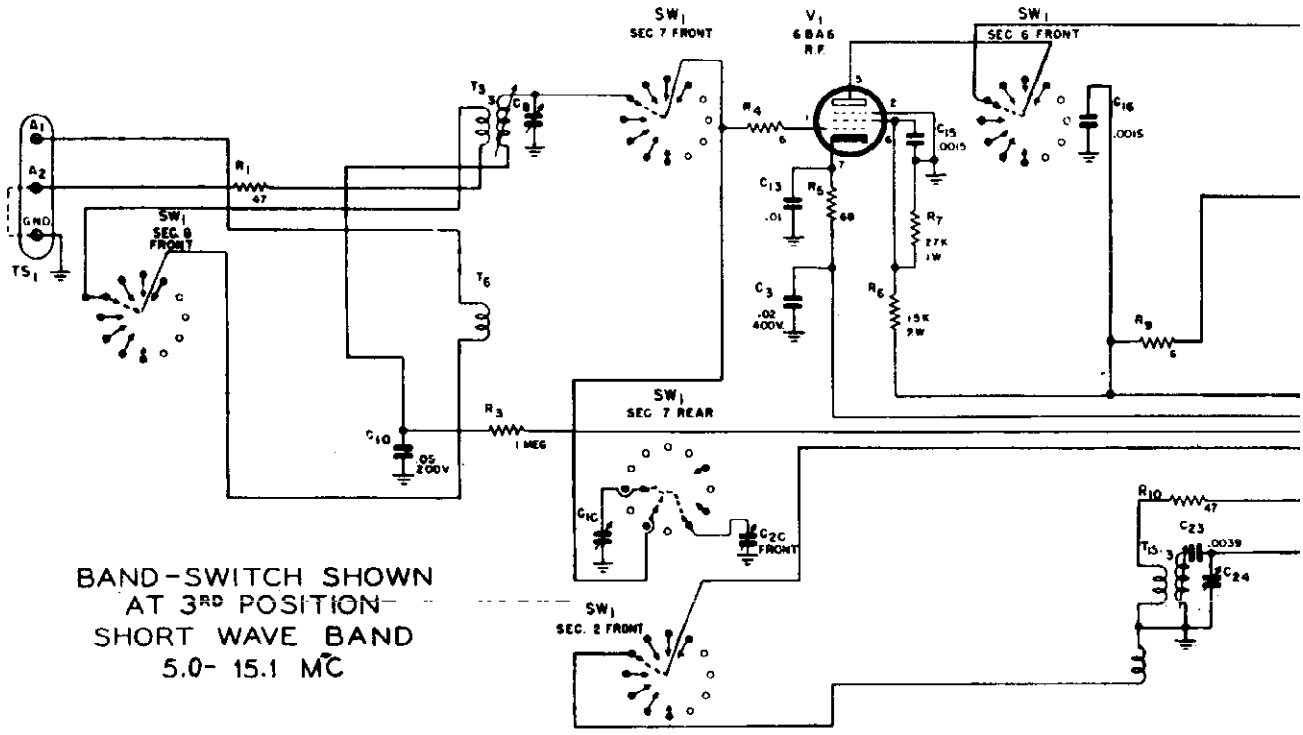
BAND-SWITCH SHOWN
AT POSITION 3A
SHORT WAVE BAND SPREAD
13.9 - 14.4 MC



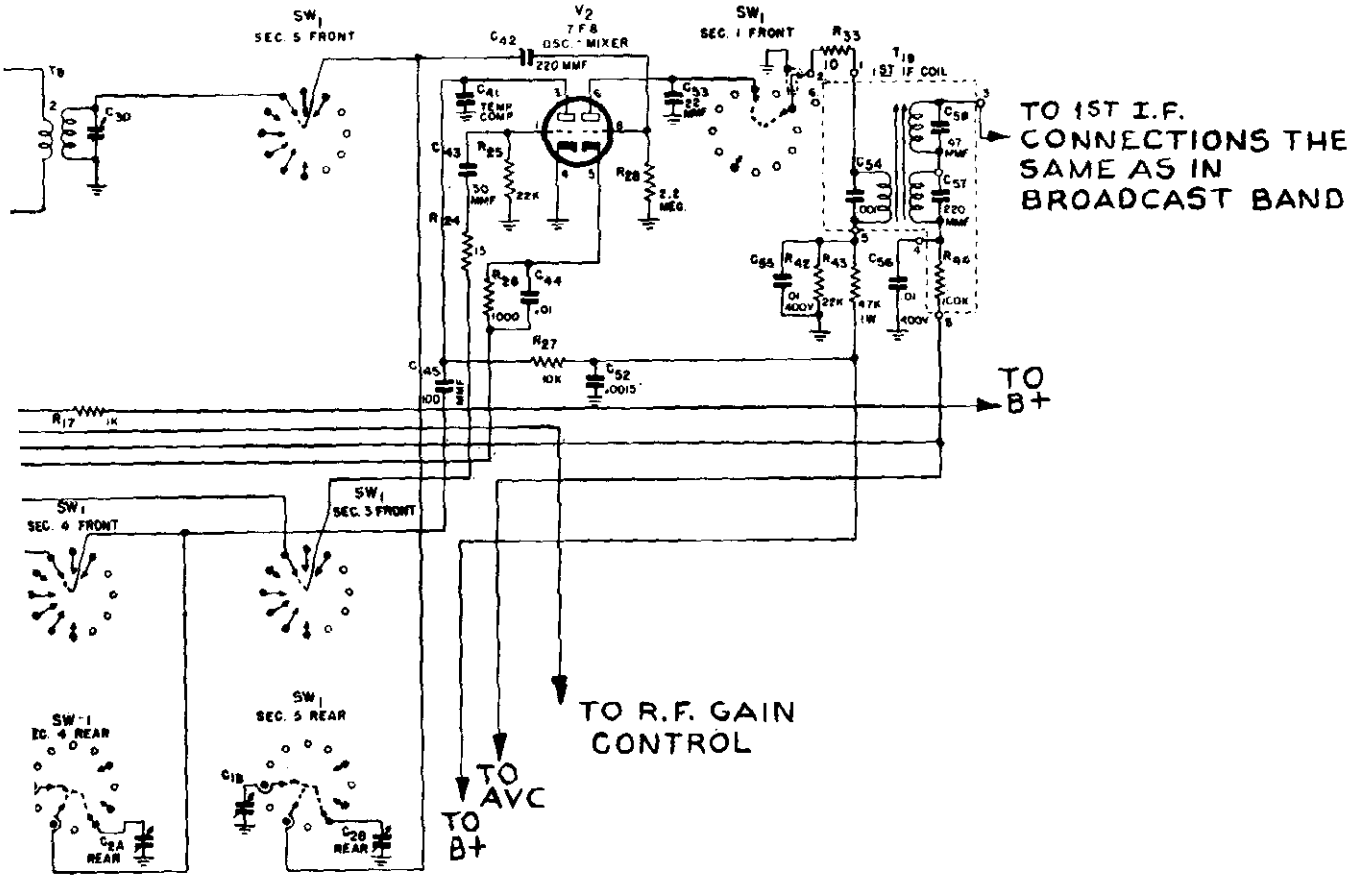
BAND-SWITCH SHOWN
AT 4TH POSITION.
SHORT WAVE BAND
15.1 - 44 MC

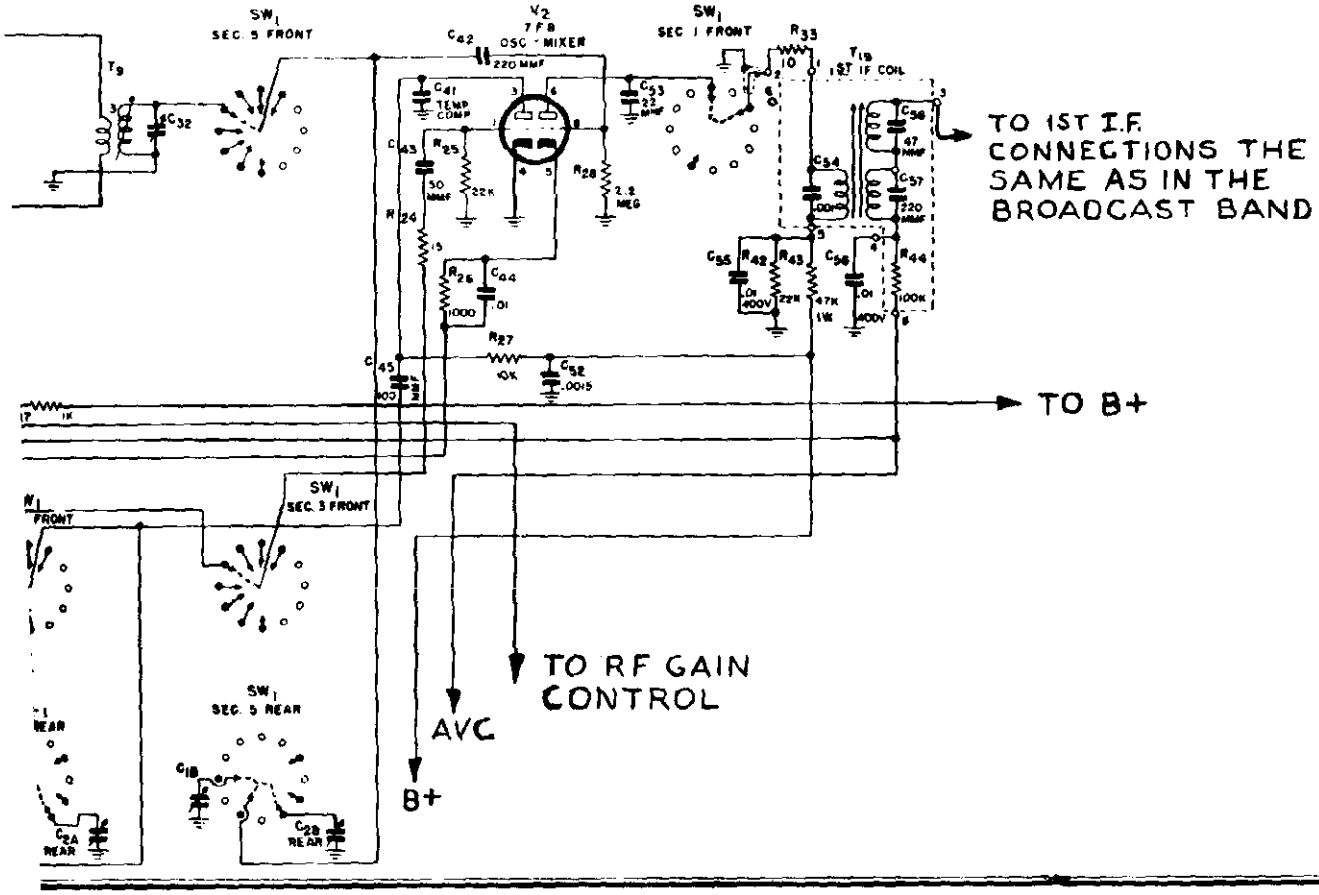


BAND-SWITCH SHOWN
AT 2ND POSITION
SHORT WAVE BAND
1.65- 5.0 MC

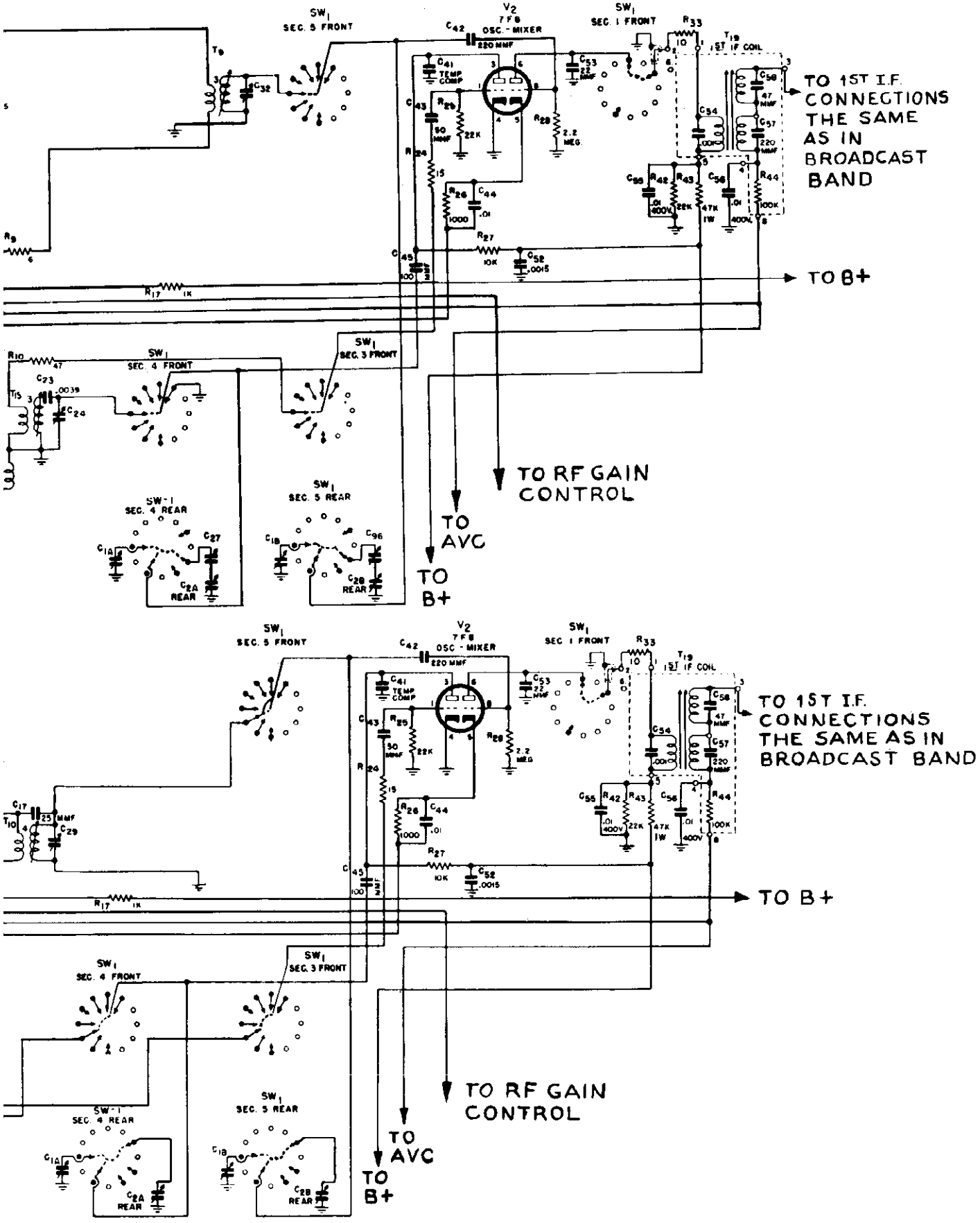


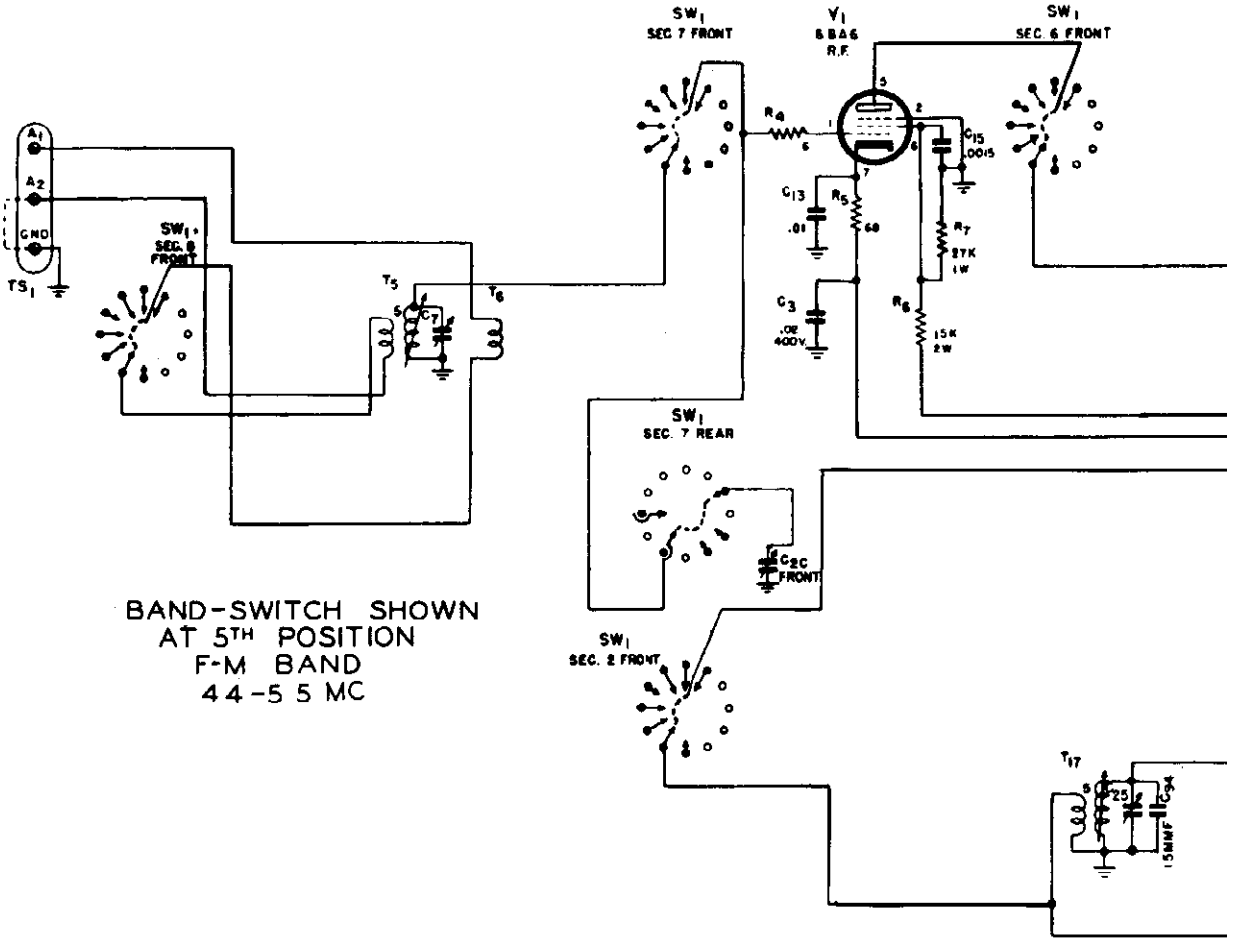
BAND-SWITCH SHOWN
AT 3RD POSITION
SHORT WAVE BAND
5.0- 15.1 MC


SW1 SEC. 5 FRONT
V2 7F8 OSC - MIXER
C42 220 MMF
SW1 SEC. 1 FRONT
R33 10
T19 1ST IF COIL
C41 TEMP COMP
C43 50 MMF
R25 22K
R28 2.2 MEG.
C53 22 MMF
R24 15
R26 1000
C44 .01
C54 .001
C58 47 MMF
C57 220 MMF
C55 .01 400V
R42 22K
R43 47K 1W
C56 .01 400V
R44 100K
R27 10K
C45 100 MMF
C52 .0015
R17 1K
SW1 SEC. 4 FRONT
SW1 SEC. 3 FRONT
SW1 SEC. 4 REAR
SW1 SEC. 5 REAR
C2A REAR
C2B REAR
TO 1ST I.F. CONNECTIONS THE SAME AS IN BROADCAST BAND
TO B+
TO R.F. GAIN CONTROL
TO AVC
TO B+

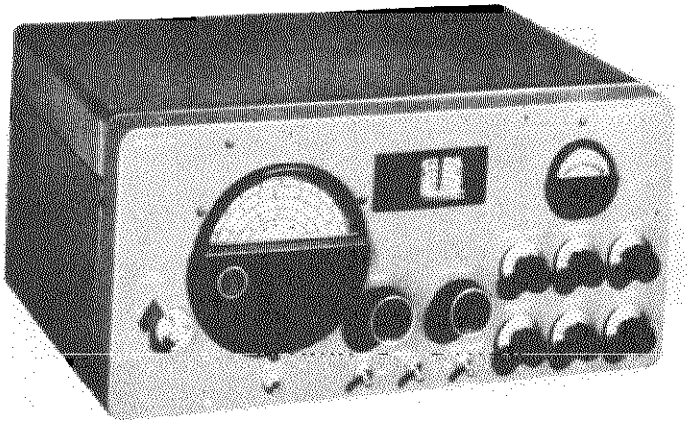

SW1 SEC. 5 FRONT
V2 7F8 OSC - MIXER
C42 220 MMF
SW1 SEC. 1 FRONT
R33 10
T19 1ST IF COIL
C41 TEMP COMP
C43 50 MMF
R25 22K
R28 2.2 MEG.
C53 22 MMF
R24 15
R26 1000
C44 .01
C54 .001
C58 47 MMF
C57 220 MMF
C55 .01 400V
R42 22K
R43 47K 1W
C56 .01 400V
R44 100K
R27 10K
C45 100 MMF
C52 .0015
SW1 SEC. 3 FRONT
SW1 SEC. 5 REAR
C2A REAR
C2B REAR
TO 1ST I.F. CONNECTIONS THE SAME AS IN THE BROADCAST BAND
TO B+
TO RF GAIN CONTROL
AVC
B+

ALLICRAFTERS CO.





BAND-SWITCH SHOWN
AT 5TH POSITION
F-M BAND
44-55 MC

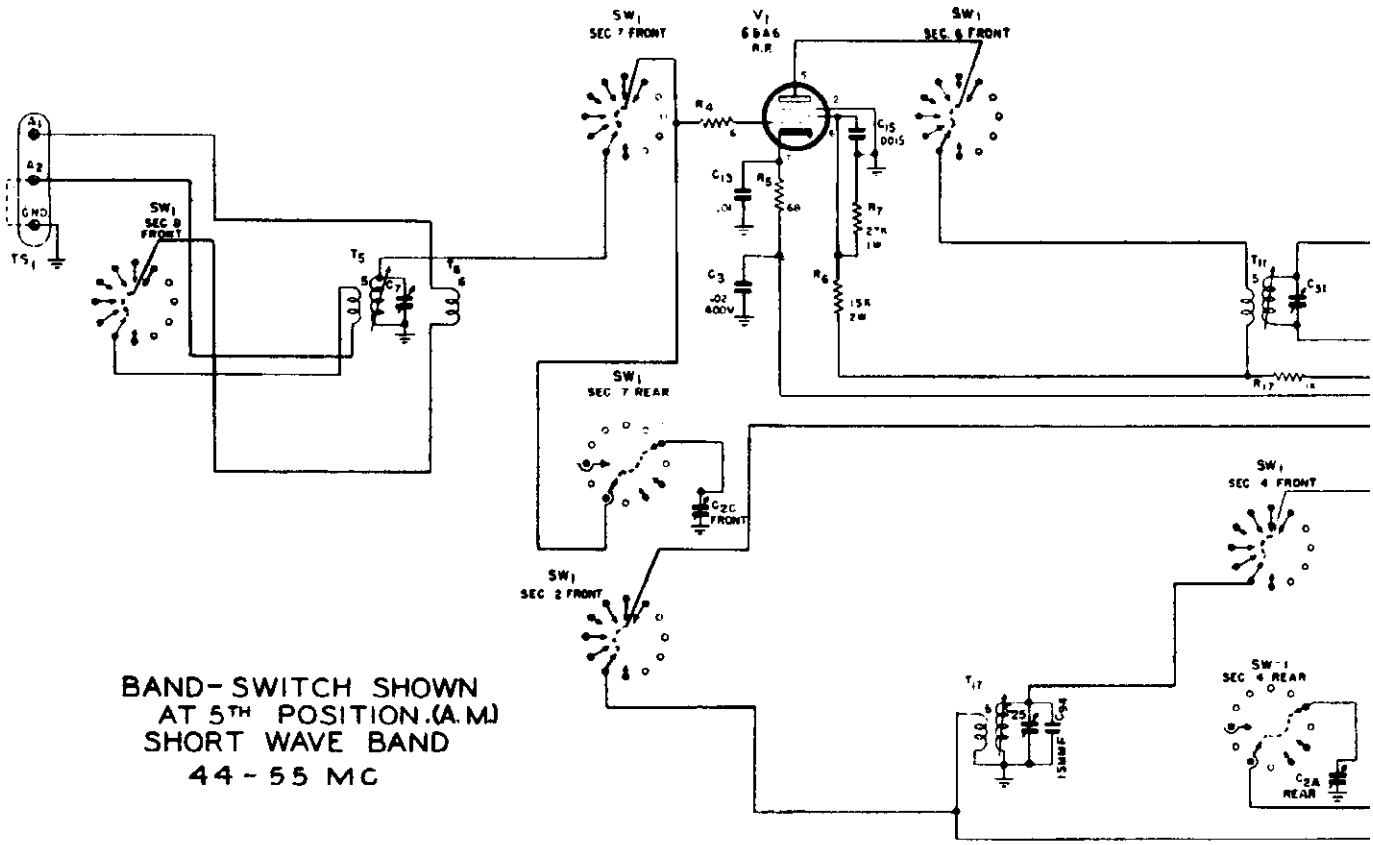


CARRIER LEVEL MET

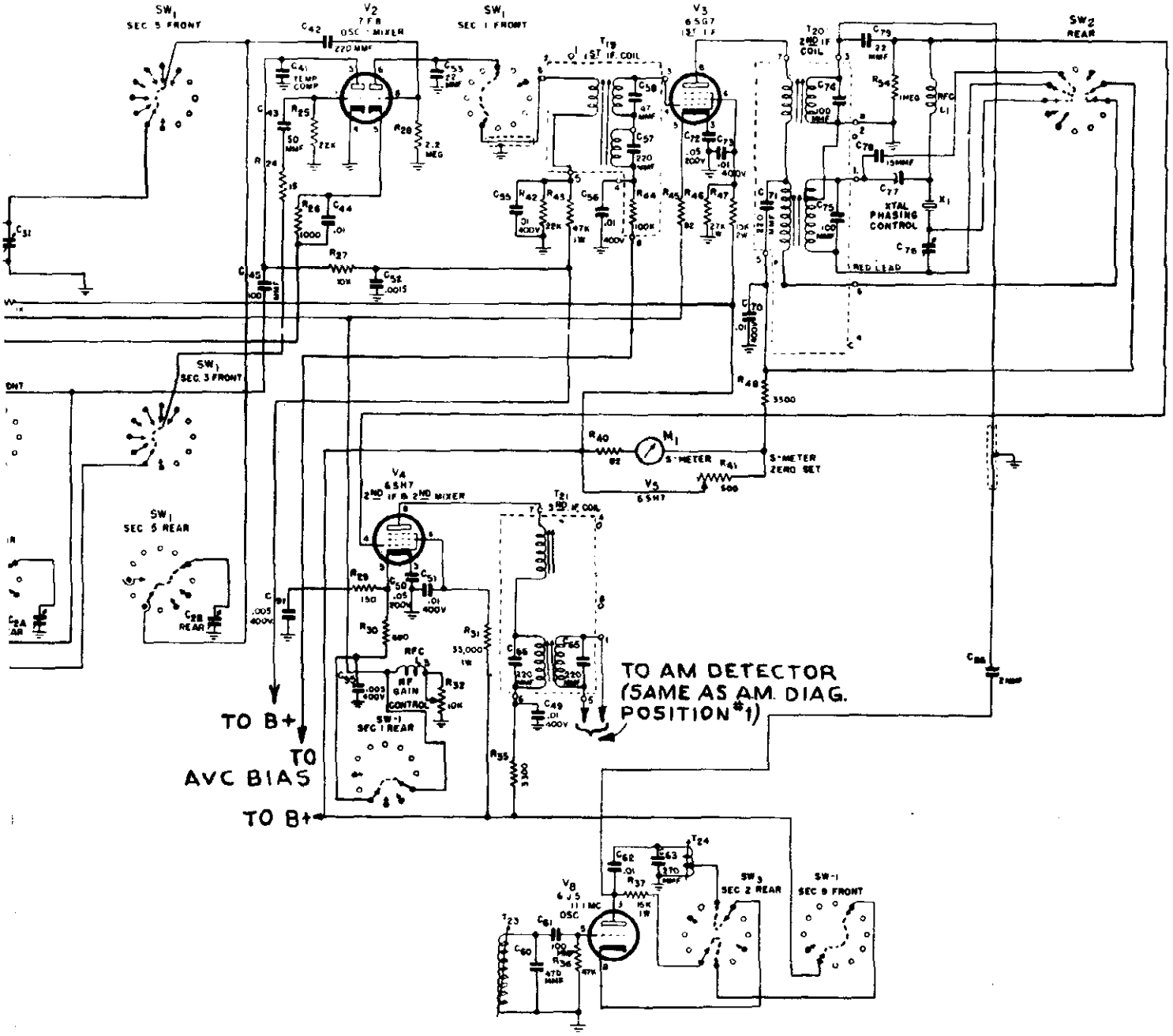
1. Connect a jumper bet
   minals and ground.
2. Set front panel cont

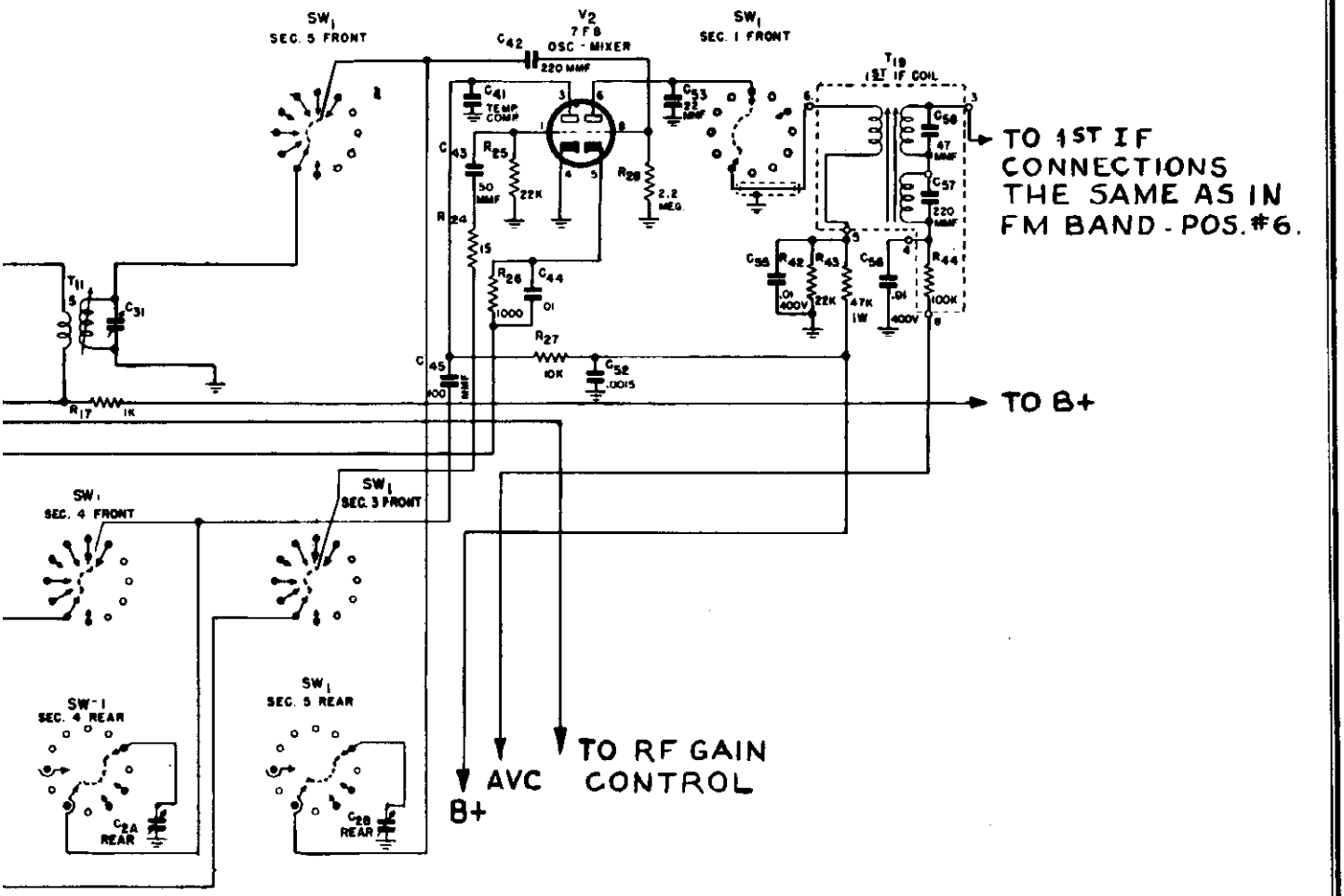
   SENSITIVITY –
   RECEPTION –
   SELECTIVITY –
   BAND SELECTOR –
   VOLUME –

3. Set "S" METER ADJ.
   sis apron for zero



BAND-SWITCH SHOWN
AT 5TH POSITION.(A.M.)
SHORT WAVE BAND
44-55 MC


SW1 SEC 5 FRONT
V2 7F8 OSC - MIXER
SW1 SEC 1 FRONT
T19 1ST I.F. COIL
V3 6SG7 1ST I.F.
T20 2ND I.F. COIL
SW2 REAR
XTAL PHASING CONTROL
RED LEAD
SW1 SEC. 3 FRONT
M1 S-METER
S-METER ZERO SET
V5 6SH7
V4 6SH7 2ND I.F. & 2ND MIXER
T21 3RD I.F. COIL
SW1 SEC 5 REAR
RF GAIN CONTROL
SW-1 SEC 1 REAR
TO AM DETECTOR (SAME AS AM. DIAG. POSITION #1)
TO B+
TO AVC BIAS
TO B+
T24
V8 6J5 TRIODE OSC
T23
SW3 SEC 2 REAR
SW-1 SEC 9 FRONT



ADJUSTMENT:

the two antenna ter-

as follows:

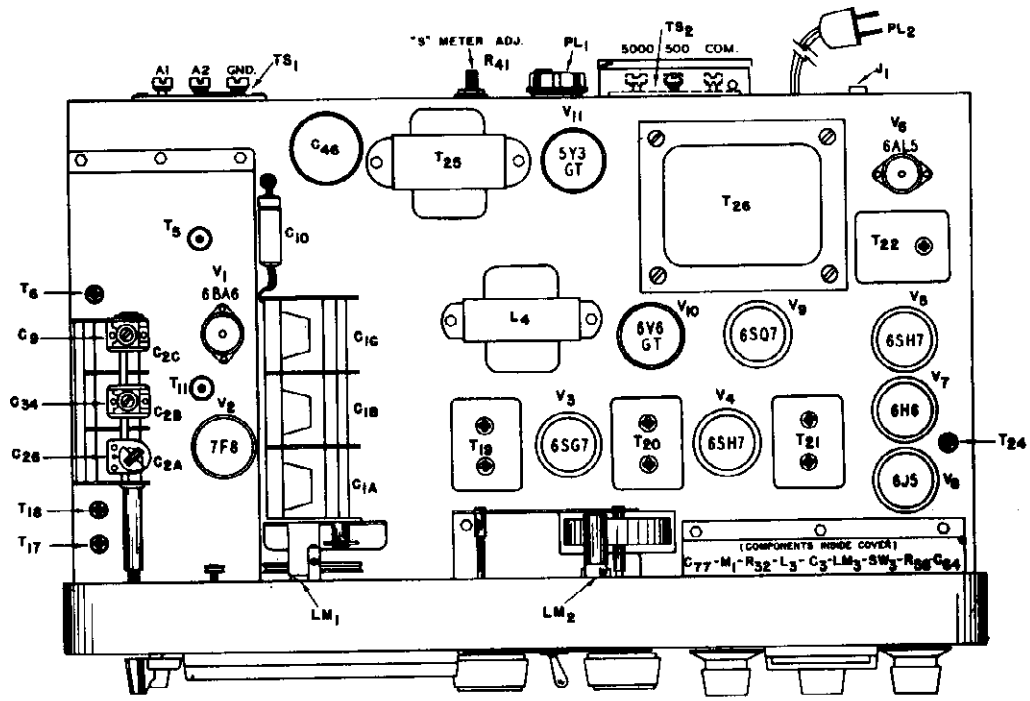
um.

L/SHARP.

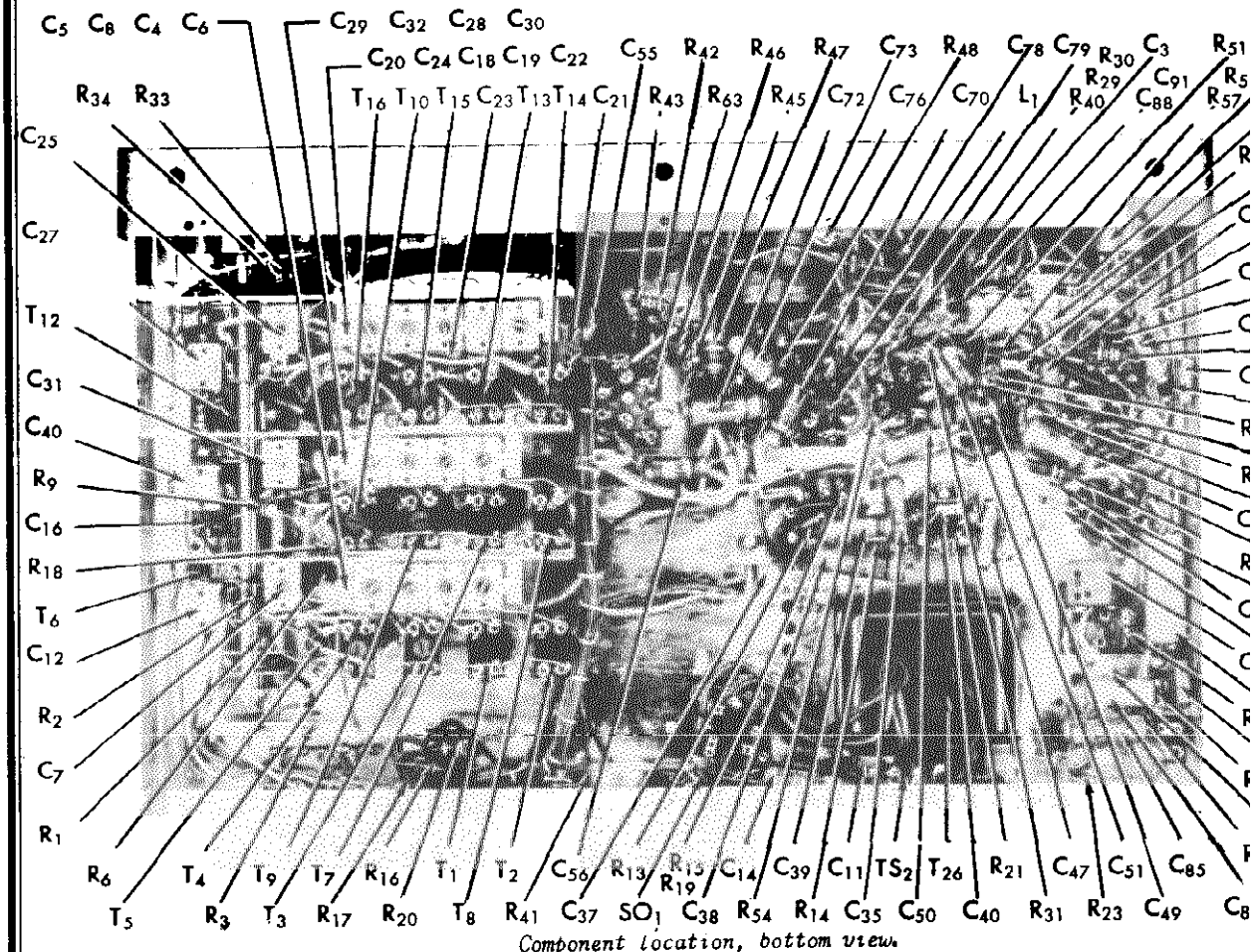
um. (No signal should
ard.)
ig. 3.) on rear chas-
CARRIER LEVEL meter.

POSITIONING CONTROL KNOBS:

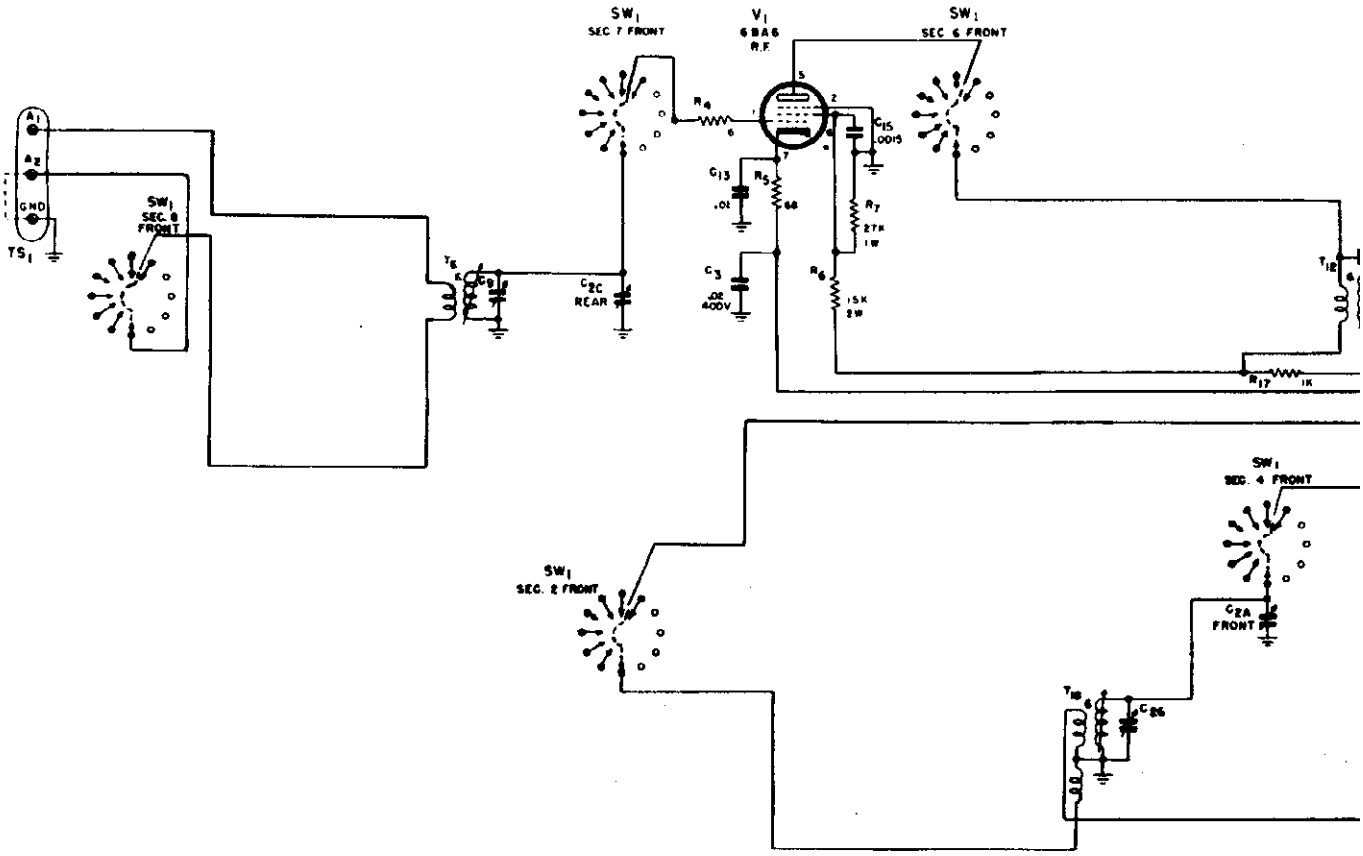
BAND SELECTOR	- As required by markings.
RECEPTION	- As required by markings.
SELECTIVITY	- As required by markings.
SENSITIVITY	- Zero at full counter clockwise rotation.
VOLUME	- Zero at full counter clockwise rotation.
CW PITCH	- See alginment chart.
CRYSTAL PHASING	- Zero with plates half meshed.



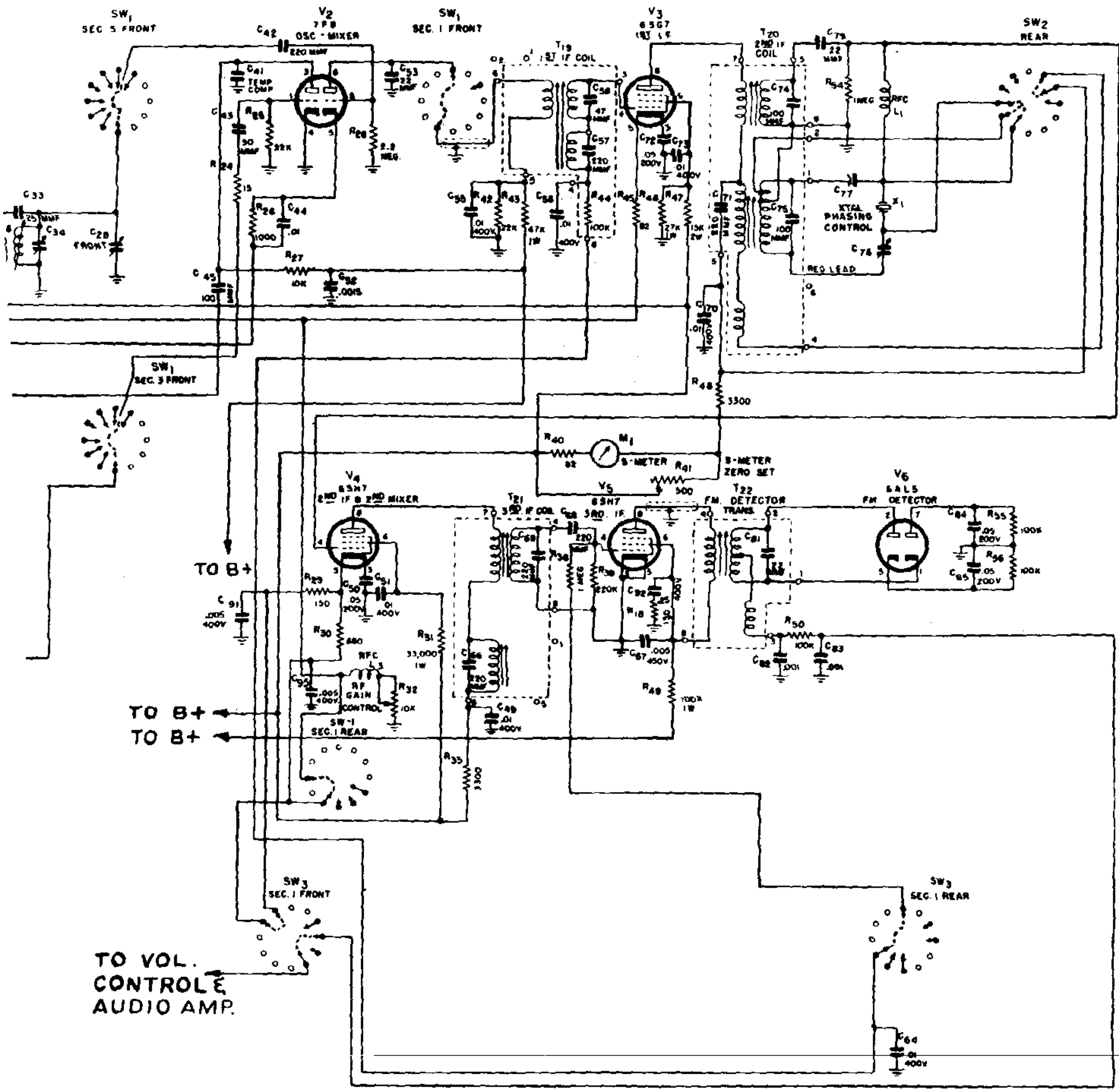
Component location, top view.



Component location, bottom view.



BAND-SWITCH SHOWN
AT 6TH POSITION
F-M BAND
86-109 MC



SW1 SEC. 5 FRONT
V2 7F8 OSC - MIXER
SW1 SEC. 1 FRONT
T19 1ST IF COIL
V3 6SG7 1ST I.F.
T20 2ND IF COIL
SW2 REAR
XTAL PHASING CONTROL
RED LEAD
SW1 SEC. 3 FRONT
S-METER
S-METER ZERO SET
V4 6SH7 2ND IF & 2ND MIXER
T21 3RD IF COIL
V5 6SH7 3RD. IF
T22 FM. DETECTOR TRANS.
V6 6AL5 FM DETECTOR
TO B+
RF GAIN CONTROL
SW-1 SEC. 1 REAR
TO B+
TO B+
SW3 SEC. 1 FRONT
SW3 SEC. 1 REAR
TO VOL. CONTROL & AUDIO AMP.

MODEL SX-43 THE HALLICRAFTERS CO.

ALIGNMENT PROCEDURE:

It will be necessary to remove the receiver chassis from the cabinet to make alignment adjustments on the i-f stages. The r-f stages receive final alignment through the holes in the bottom of the cabinet to compensate for the close proximity of the cabinet to the r-f coils. The chassis is held in the cabinet by seven screws along the edge of the flange of the front panel and by three screws through the bottom of the cabinet along the rear edge.

The standard RMA dummy antenna mentioned in the alignment chart consists of a 200 mmf condenser in series with a 20 uh r-f choke which is shunted by a 400 mmf condenser in series with a 400 ohm carbon resistor.

The following control settings are to be set before alignment:

TONE Switch	- HIGH
STANDBY-RECEIVE	- RECEIVE
NOISE LIMITER	- OFF
VOLUME	- Max. gain
SENSITIVITY	- Max. sensitivity
Band Spread Dial	- High frequency stop

ALIGNMENT CHART

Step	*Dummy Antenna*	*Signal Generator Coupling*	*Signal Generator Frequency*	*Receiver Control Settings*	*Receiver Dial Setting*	*Adjust*	*Remarks*
1	None	Connect to center section (rear stator plates) of low capacity gang.	10.7 mc (No modulation)	BAND SEL.-5 REC. sw.-FM	General coverage dial at mid-scale	S1,S2, S3,S4, S5,S6, S7	Adjust for max. D.C. voltage as measured between pin #7 of the 6AL5 and ground with a V.T. voltmeter.
2	None	See step 1.	10.7 mc (No modulation)	See Step 1	See step 1.	S8	Adjust for zero D.C. voltage as measured between junction of R-50 and C-83 and ground with a V.T. voltmeter.
3	None	See step 1.	455 kc **	BAND SEL.-4 REC. sw.-AM-MVC SEL. sw.-NORMAL-SHARP	See step 1.	S9,S10, S12,S13, S14	Adjust for max. audio output.
4	None	See step 1.	455 kc **	BAND SEL.-4 REC. sw.-AM-MVC SEL. sw.-CRYSTAL-BROAD	See step 1.	S11	Adjust for max. audio output.
5	None	See step 1.	455 kc **	BAND SEL.-4 REC. sw.-AM-MVC SEL. sw.-NORMAL-SHARP	See step 1.	A	Adjust for max. audio output.
6	None	See step 1.	455 kc ** (No modulation)	BAND SEL.-4 REC. sw.-CW SEL. sw.-NORMAL-SHARP	See step 1.	CW PITCH control.	Remove CW PITCH control knob and set shaft for zero beat. Replace knob with zero at index line.
7	Repeat steps 1 & 2 for possible detunning during adjustments in steps 3, 4, and 5.						
8£	None	See step 1.	10.7 mc	BAND SEL.-5 REC. sw.-AM-MVC SEL. sw.-NORMAL-SHARP	See step 1.	S15*	Tune slug S15 to high freq. side of 10.7 mc (11.155 mc). Tune for max. audio output.
9	Std. RMA dummy	To terminals A1 and A2 with jumper between A2 and GND.	1500 kc	BAND SEL.-1 REC. sw.-AM-MVC SEL. sw.-NORMAL-SHARP	1500 kc	B*, C, D	Adjust for max. audio output.
			600 kc		600 kc	E*	
10	Std. RMA dummy	See step 9.	4.6 mc	BAND SEL.-2 REC. sw.-AM-MVC SEL. sw.-NORMAL-SHARP	4.6 mc	F*, G, H	Adjust for max. audio output.
			2 mc		2 mc	S16*	
11	330-ohm carbon res.	See step 9.	14 mc ***	BAND SEL.-3 REC. sw.-AM-MVC SEL. sw.-NORMAL-SHARP	14 mc	I*, J, K	Adjust for max. audio output.
			6 mc ***		6 mc	S17*, S18 S19	
12	330-ohm carbon res.	See step 9.	14 mc	BAND SEL.-3A REC. sw.-AM-MVC SEL. sw.-NORMAL-SHARP	M.T. dial at 20M. band line. B.S. dial at 14 mc	L*	Adjust for calibration. Check band spread calibration and reset trimmer L if necessary. Increase trimmer cap. to decrease bandspread etc.

* Note - Calibration adjustment.

** Note - Set generator frequency to exact crystal freq. as follows: Turn on BFO and set CW PITCH for approx. 1000 cycles with signal generator set at approx. 455 kc. Set SELECTIVITY control at CRYSTAL-SHARP and tune signal generator for weakest of two response frequencies on either side of zero beat: adjust CRYSTAL PHASING control for complete null, retune signal generator for maximum output on opposite side of zero beat for the exact IF alignment frequency.

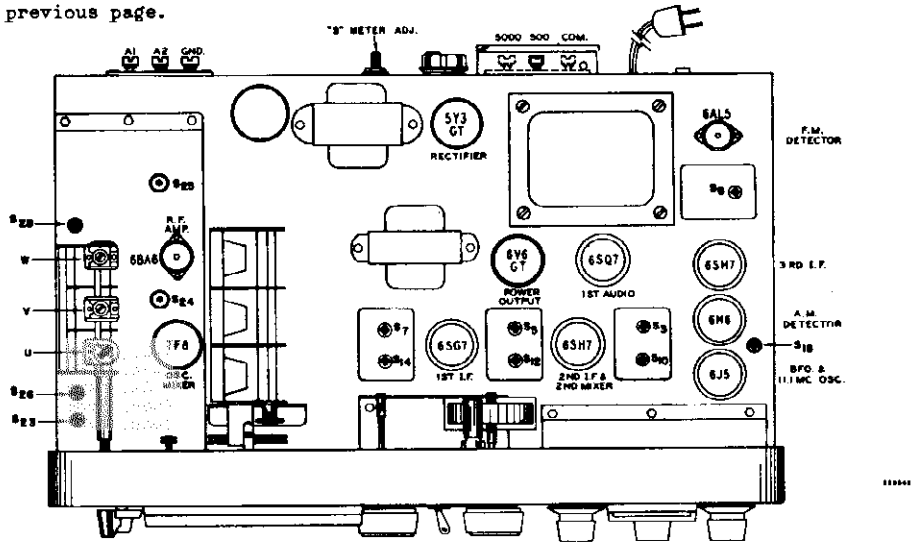
*** Note - Rock signal generator when making adjustments.

£ Note - Step 8. adjusts the 11.155 mc oscillator for the dual conversion char quired for AM reception on band 6. After aligning band 6 in step 15, tune to approx. 44.6 mc and pick up fourth harmonic of the oscillator. If the oscillator harmonic falls at approx. 51.3 mcs, the oscillator is oscillating at the low frequency side or image frequency and must be readjusted.

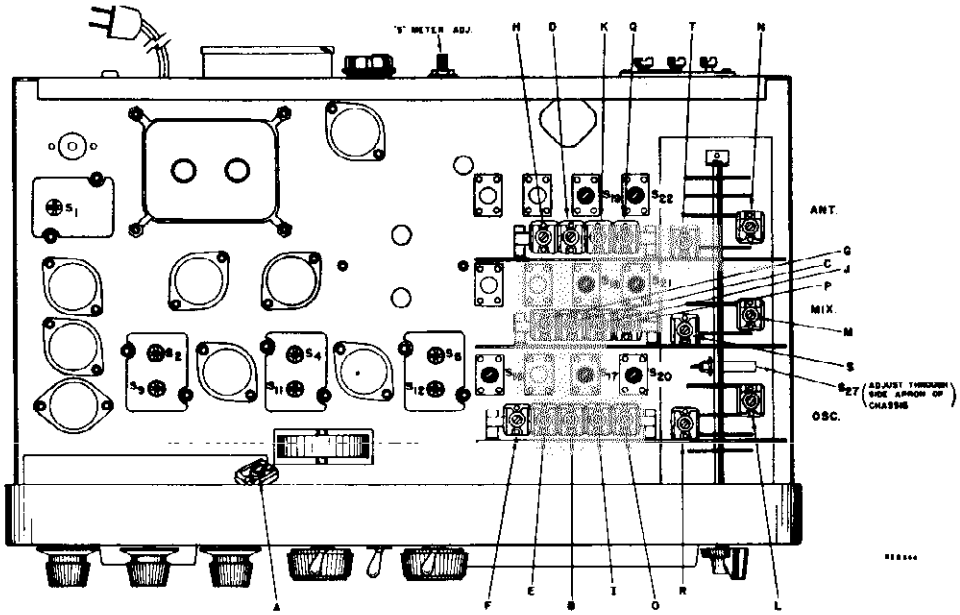
ALIGNMENT CHART —Continued

Step	Dummy Antenna	Signal Generator Coupling	Signal Generator Frequency	Receiver Control Settings	Receiver Dial Setting	Adjust	Remarks
13	330-ohm carbon res.	See step 9.	14.2 mc ***	BAND SEL.-3A REC. sw.-AM-MVC SEL. sw.-NORMAL-SHARP	M.T. dial at 20 M. band index line. B.S. dial at 14.2 mc.	M, N	Adjust for max. audio output.
14	330-ohm carbon res.	See step 9	36 mc*** 18 mc***	BAND SEL.-4 REC. sw.-AM-MVC SEL. sw.-NORMAL-SHARP	36 mc 18 mc	O*, P, Q S20*, S21, S22	Adjust for max. audio output. Osc. falls on low freq. side of sign
15	330-ohm carbon res.	See step 9	54 mc *** 46 mc ***	BAND SEL.-5 REC. sw.-AM-MVC SEL. sw.-NORMAL-SHARP	54 mc 46 mc	R*, S, T S23*, S24 S25	Adjust for max. audio output
16	330-ohm carbon res.	See step 9	106 mc *** 89 mc ***	BAND SEL.-6 REC. sw.-AM-MVC SEL. sw.-NORMAL-SHARP	106 mc 89 mc	U*, V, W, S26*, S27, S28	See step 1.

For footnotes - see previous page.



Alignment adjustments, top view.



Alignment adjustments, bottom view.

MODEL SX-43 THE HALLICRAFTERS CO.

SERVICE PARTS LIST

REF. NO.	DESCRIPTION	HALLICRAFTER'S PART NUMBER
	CAPACITORS	
C-1	Capacitor, general coverage	48C174
C-2	Capacitor, band spread	48C173
C-3,39,48,89	.02 mfd 400 V., tubular paper	46AW203J
C-4,5,6,28,29, 30,32	Capacitor, trimmer strip assy.	44B199
C-7,25,31	Capacitor, trimmer, 4-50 mmf	44A200
C-9,12,27,34,96	Capacitor, trimmer, 2-30 mmf	44A047
C-10	.05 mfd 200 V., tubular paper	46AC91
C-11	.01 mfd 400 V., molded paper	46AB103J
C-13,44,62	.01 mfd 350 V., ceramic	47A167
C-14	.1 mfd 200 V., tubular paper	46AU104J
C-15,16,52	1500 mmf 350 V., ceramic	47A161
C-17,33	25 mmf 500 V., ceramic	47A141
C-18,19,20,22,24	Capacitor, trimmer strip assy.	44B197
C-21	1500 mmf 500 V., mica	CM30A152J
C-23	3900 mmf 500 V., mica	CM35A392J
C-26	Capacitor, trimmer, 4-20 mmf	44A115
C-35,93	.005 mfd 600 V., tubular paper	46AY502J
C-36	.02 mfd 600 V., tubular paper	46AY203J
C-37	10 mfd 25 V., electrolytic	42A033
C-38	.05 mfd 600 V., tubular paper	46AY503J
C-40,45,61,87,88	100 mmf 500 V., ceramic	CC25UK101K
C-41	Capacitor, T.C.	44A158
C-42	220 mmf 500 V., mica	CM20B221K
C-43	51 mmf 500 V., ceramic	CC20UK510K
C-46	60-20-20 mfd 450 V., electrolytic	45B113
C-47,95	.005 mfd 400 V., tubular paper	46AW502J
C-49,51,55,56, 64,70,73	.01 mfd 400 V., tubular paper	46AW103J
C-50,72,84,85,90	.05 mfd 200 V., tubular paper	46AU503J
C-53,79	22 mmf 500 V., mica	CM20A220K
C-60	470 mmf 500 V., mica	CM20A471J
C-63	270 mmf 500 V., mica	CM20A271J
C-67,91	.005 mfd 450 V., ceramic	47A168
C-68	220 mmf 500 V., mica	CM20A221K
C-76	Capacitor, trimmer, 2-30 mmf	44A047
C-77	Capacitor, variable, CRYSTAL PHASING	48A182
C-78,94	15 mmf 500 V., ceramic	CC20UK150K
C-80	820 mmf 500 V., mica	CM25A821K
C-82,83	1000 mmf 500 V., mica	CM20A102K
C-86	2.2 mmf 500 V., ceramic	47A160-4
C-92	.25 mfd 400 V., tubular paper	46AV254J
	RESISTORS	
R-1,10	47 ohms ½ watt, carbon	RC20AE470K
R-2	27 ohms ½ watt, carbon	RC20AE270K
R-3,38,54,59,61	1 meg-ohm ½ watt, carbon	RC20AE105K
R-4,9	6 ohms ½ watt, carbon	23A011
R-5	68 ohms ½ watt, carbon	RC20AE680K
R-6,47	15,000 ohms 2 watts, carbon	RC40AE153K
R-7,46	27,000 ohms 1 watt, carbon	RC30AE273K
R-8,18	33 ohms ½ watt, carbon	RC20AE330K
R-11,16	1000 ohms 1 watt, carbon	RC30AE102K
R-12	470 ohms 1 watt, carbon	RC30AE471K
R-13,23	470,000 ohms ½ watt, carbon	RC20AE474K
R-14,31	33,000 ohms 1 watt, carbon	RC30AE333K
R-15	270 ohms 1 watt, carbon	RC30AE271K
R-17,26,34	1000 ohms ½ watt, carbon	RC20AE102K
R-19,39	200,000 ohms ½ watt, carbon	RC20AE224K
R-20	4700 ohms 1 watt, carbon	RC30AE472K
R-21	15 megohms ½ watt, carbon	RC20AE156K
R-22	Resistor, variable, VOLUME control	25B601
R-24	15 ohms ½ watt, carbon	RC20AE150K
R-25	22,000 ohms ½ watt, carbon	RC20AE223K
R-27	10,000 ohms 1 watt, carbon	RC30AE103K
R-28,52	2.2 megohms ½ watt, carbon	RC20AE225K
R-29,58,62	150 ohms ½ watt, carbon	RC20AE151K
R-30	680 ohms ½ watt, carbon	RC20AE681K
R-32	Resistor, variable, SENSITIVITY control	25B577
R-33	2200 ohms ½ watt, carbon	RC20AE222K
R-35,48	3300 ohms ½ watt, carbon	RC20AE332K
R-36	47,000 ohms ½ watt, carbon	RC20AE473K
R-37	15,000 ohms 1 watt, carbon	RC30AE153K
R-40,45	82 ohms ½ watt, carbon	RC20AE820K
R-41	Resistor, variable, "S" meter control	25A569
R-42	22,000 ohms ½ watt, carbon	RC20AE223K
R-43	47,000 ohms 1 watt, carbon	RC30AE473K
R-49	100,000 ohms 1 watt, carbon	RC30AE104K
R-50,51,55,56	100,000 ohms ½ watt, carbon	RC20AE104K
R-53	6.8 megohms ½ watt, carbon	RC20AE685M
R-57	82,000 ohms ½ watt, carbon	RC20AE823K
R-60	250,000 ohms ½ watt, carbon	23BX254E
R-63	10 ohms ½ watt, carbon	RC20AE100K

SERVICE PARTS LIST (Continued)

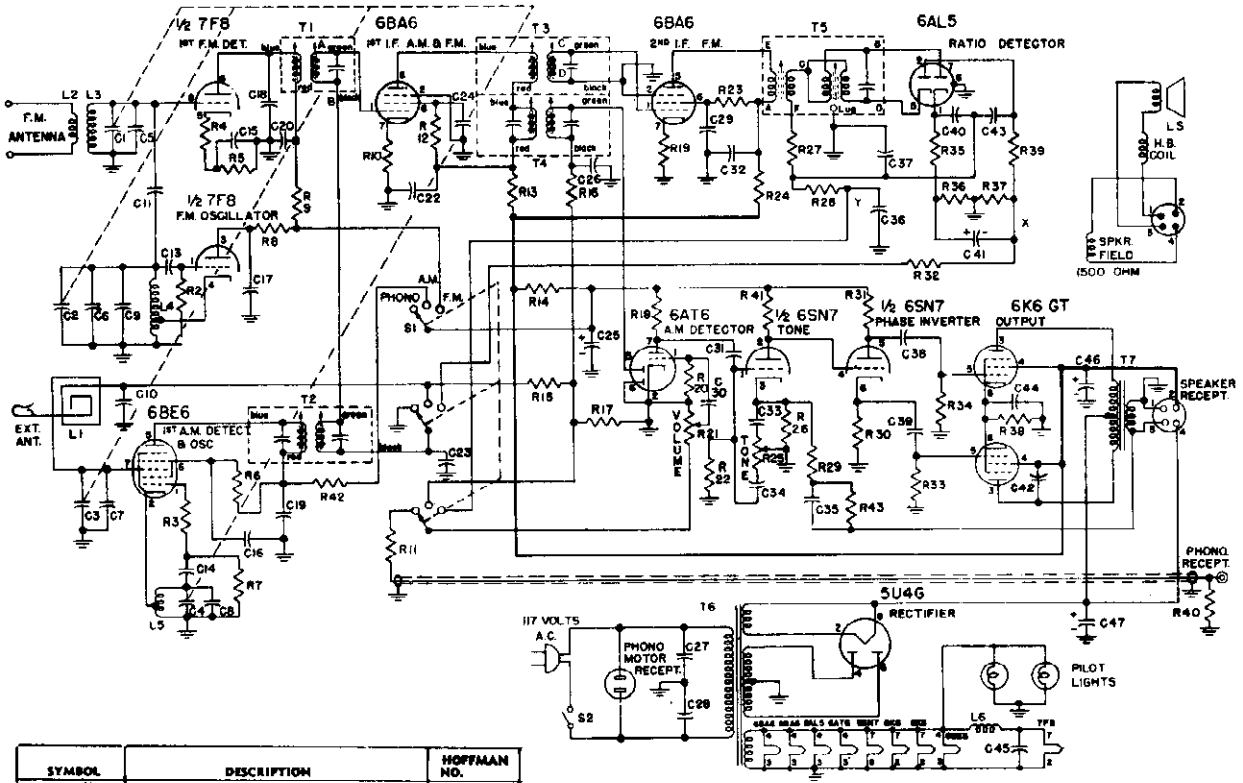
REF. NO	DESCRIPTION	HALLICRAFTER'S PART NUMBER
	COILS AND TRANSFORMERS	
L-1	R-F choke, special	53A108
L-2	R-F choke, special	53B009
L-3	R-F choke, 540 uh	53A107
L-4	Filter choke, 11 h. 75 ma.	568067
T-1	Transformer, antenna, band 1	51B928
T-2	Transformer, antenna, band 2	51B927
T-3	Transformer, antenna, band 3	51B926
T-4	Transformer, antenna, band 4	51B925
T-5	Transformer, antenna, band 5	51B924
T-6	Transformer, antenna, band 6	51B923
T-7	Transformer, mixer, band 1	51B934
T-8	Transformer, mixer, band 2	51B933
T-9	Transformer, mixer, band 3	51B932
T-10	Transformer, mixer, band 4	51B931
T-11	Transformer, mixer, band 5	51B930
T-12	Transformer, mixer, band 6	51B929
T-13	Transformer, oscillator, band 1	51B939
T-14	Transformer, oscillator, band 2	51B938
T-15	Transformer, oscillator, band 3	51B937
T-16	Transformer, oscillator, band 4	51B936
T-17	Transformer, oscillator, band 5	51B935
T-18	Transformer, oscillator, band 6	51B941
T-19	Transformer, 1st I-F	50C212
T-20	Transformer, 2nd I-F	50C213
T-21	Transformer, 3rd I-F	50C214
T-22	Transformer, F-M detector	50C208
T-23	Transformer, B.F.O.	54B033-1
T-24	Transformer, oscillator, 11 mc.	51B984
T-25	Transformer, output	55B095
T-26	Transformer, power, 105-125V. 60 cycles	52C143
T-26*	Transformer, power 115/130/150/220/250 V. 25/60 cycles	52C142

* Note — Used on special universal model only.

	TUBES AND LAMPS	
V-1	Tube, type 6BA6	90X6BA6
V-2	Tube, type 7F8	90X7F8
V-3	Tube, type 6SG7	90X6SG7
V-4,5	Tube, type 6SH7	90X6SH7
V-6	Tube, type 6AL5	90X6AL5
V-7	Tube, type 6H6	90X6H6
V-8	Tube, type 6J5	90X6J5
V-9	Tube, type 6SQ7	90X6SQ7
V-10	Tube, type 6V6GT	90X6V6GT
V-11	Tube, type 5Y3GT/G	90X5Y3GT
LM-1,2	Lamp, dial illumination, 6-8 V. 250 ma. G.E. #44	39A003
LM-3	Lamp, meter illumination, 6-8 V. 150 ma. G.E. #47	39A004
	SWITCHES	
SW-1	Switch assembly, BAND SELECTOR	60C261
SW-2	Switch assembly, SELECTIVITY	60B263
SW-3	Switch assembly, RECEPTION	60B262
SW-4,5,6	Switch, toggle, SPST	60A138
SW-7	Switch, power, part of R-22	
	PLUGS AND SOCKETS	
PL-1	Plug, octal, jumpers for a-c operation	35A003
PL-2	Plug and cord assy, a-c power	87A078
J-1	Jack, phono input	36A029
J-2	Jack, headphones	36A036
	Socket, octal, tube	6A035
	Socket, miniature, tube	6A193
	Socket, loctal, tube	6A223
	Socket, pilot lamp, dial	86B050
	Socket, pilot lamp, meter	6A262
	MISCELLANEOUS COMPONENTS	
M-1	Meter, carrier level	82B125
	Knob, TUNING and BANDSPREAD	15A048
	Knob, CW PITCH	15A089
	Knob, BAND SELECTOR	15B088-1
	Knob, RECEPTION	15A094
	Knob, SELECTIVITY	15A095
	Knob, VOLUME and SENSITIVITY	15A097
	Knob, CRYSTAL PHASING	15A087
X-1	Crystal, 455KC	19A123
TS-1, TS-2	Terminal strip, antenna or speaker	88A567
	Screw, knurled (For TS-1 or TS-2)	3A1371
	Cover, speaker terminals	69B173

HOFFMAN RADIO CORP.

MODELS B-508, B-5C
B-510, CHASSIS 129



SYMBOL	DESCRIPTION			HOFFMAN NO.
C1, C2, C3, C9	4 Section Variable			4409
C5, C6	Trimmer (F.M. Section)			4308
C7, C8	Trimmer (A.M. Section)			4313
C9, C18	8 Mmf.	±10%	Ceramic NPO	4019
C10, C23	.05 Mfd.	200 V.	Paper	4100
C11	1.5 Mmf.	±20 %	Ceramic	4008
C12	220 Mmf.	±20 %	Ceramic N750	4026
C13	22 Mmf.	±10%	Ceramic N150	4021
C14, C26	100 Mmf.	±10%	Ceramic	4012
C15, C17, C45	650 Mmf.	±20 %	Ceramic	4011
C16, C19, C21, C22, C24, C29, C30, C31	.01 Mfd.	400 V.	Paper	4112
C20, C32	2300 Mmf.	±5 %	Mica	4006
C25	10 Mfd.	450 V.	Electrolytic	4203
C27, C28	.01 Mfd.	600 V.	Paper	4103
C33	.02 Mfd.	400 V.	Paper	4106
C34	.005 Mfd.	600 V.	Paper	4102
C35	.1 Mfd.	200 V.	Paper	4111
C36, C42	.002 Mfd.	600 V.	Paper	4118
C37, C40, C43	270 Mmf.	± 20 %	Mica	4001
C38, C39	.05 Mfd.	400 V.	Paper	4101
C41	5 Mfd.	50 V.	Electrolytic	4209
C44	20 Mfd.	25 V.	Electrolytic	4200
C46, C47	20 Mfd.	450 V.	Electrolytic	
R1, R33, R34	.47 Meg.	± 20 %	½ Watt	4506
R2, R7, R28	22000 Ohm	±20 %	½ Watt	4501
R3	22 Ohm	± 20 %	½ Watt	4560
R4	68 Ohm	± 20 %	½ Watt	4524
R5	1200 Ohm	± 10%	½ Watt	4553
R6	15000 Ohm	± 20 %	1 Watt	4539
R8, R9, R13, R24	1500 Ohm	±20 %	½ Watt	4534
R10, R19	56 Ohm	± 10%	½ Watt	4561
R11, R15, R20	2.2 Meg.	± 20 %	½ Watt	4502
R12, R23	33000 Ohm	± 20 %	1 Watt	4556
R14	2200 Ohm	± 20 %	1 Watt	4540
R16, R17	.1 Meg.	± 20 %	½ Watt	4511
R18, R40, R41	.22 Meg.	± 20 %	½ Watt	4500
R21	.5 Meg. Pot. (Volume Control)			4804
R22	1.0 Meg.	± 20 %	½ Watt	4513
R25	.25 Meg. Pot. (Tone Control)			4805
R26	2200 Ohm	± 20 %	½ Watt	4512
R27	120 Ohm	± 10%	½ Watt	4546
R29	4700 Ohm	± 20 %	½ Watt	4543
R30, R31	47000 Ohm	± 10%	½ Watt	4559
R32	47000 Ohm	± 20 %	½ Watt	4504
R35, R39	390 Ohm	± 10%	½ Watt	4549
R36, R37	6800 Ohm	± 10%	½ Watt	4557
R38	400 Ohm	± 20 %	3 Watt	4517
L1	A.M. Loop Antenna			5279
L2	F.M. Antenna Primary Coil			5281
L3	F.M. Antenna Secondary Coil			5283
L4	F.M. Oscillator Coil			5280
L5	A.M. Oscillator Coil			5282
L6	Filament Choke			5266
T1	1st F.M. I.F. Transformer			5274
T2	1st A.M. I.F. Transformer			5276
T3	2nd F.M. I.F. Transformer			5275
T4	2nd A.M. I.F. Transformer			5277
T5	Discriminator Ratio Detector Coil			5278
T6	Power Transformer			5001
T7	Audio Output Transformer			5111
LS	10" Electrodynamic Speaker			9005

SPECIFICATIONS

TUNING RANGES:

Broadcast Band ..... 535 Kc to 1650 Kc
FM Band ..... 88 Mc to 108 Mc

INTERMEDIATE FREQUENCIES:

Broadcast Band ..... 455 Kc
FM Band ..... 10.7 Mc

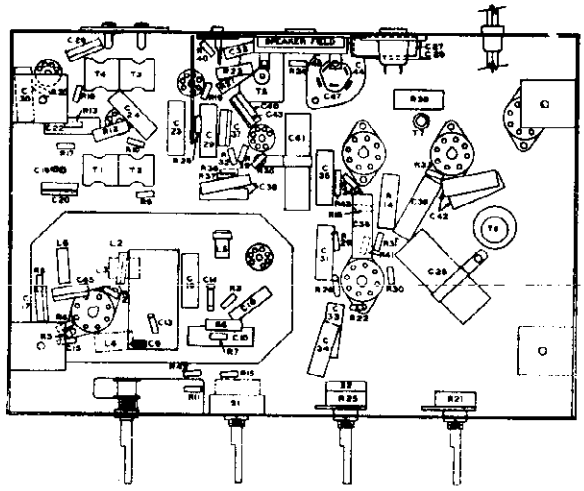
Power Supply ..... 115 V.A.C. 50-50 C.P.S.
Power Consumption (incl. phono.) ..... 110 watts
Undistorted Audio Output ..... 10 watts

NORMAL OPERATING VOLTAGES

The table below lists the normal operating voltages to be expected at the various tube socket terminals.

NORMAL OPERATING CURRENTS

5U4G Cathode Current ..... 95-100 Ma
6K6 Cathode Current (both tubes) ..... 55 Ma



Bottom of Chassis

MODELS B-508, B-509, B-510, CHASSIS 129

HOFFMAN RADIO CORP.

ALIGNMENT PROCEDURE

CAUTION: No alignment adjustments should be attempted without first thoroughly checking over all other possible causes of trouble such as defective tubes, resistors, and condensers. In order to align the receiver properly, remove the chassis from the cabinet and proceed as follows:

NOTE: IT IS PARTICULARLY IMPORTANT THAT AM ALIGNMENT BE DONE BEFORE FM ALIGNMENT. THIS IS TO AVOID POSSIBLE INTERACTION BETWEEN FM AND AM ADJUSTMENTS.

AM ALIGNMENT

I.F. ALIGNMENT:

1. Set tuning condenser on high frequency end of tuning range (minimum capacity).
2. Set band switch to AM position.
3. Turn receiver on and let it warm up for fifteen minutes or longer in order to minimize drift effects.
4. Connect output meter across speaker voice coil and set meter on lowest range, but not below 2.5 volt scale.
5. Connect output of signal generator to stator of C3 (see schematic diagram and chassis layout) through a .1 mfd. condenser; connect ground side of generator directly to chassis of receiver. Set signal generator on 455 Kc modulated.
6. Adjust I.F. slugs on T2 and T4 for maximum reading on the output meter. Keep the meter reading on the lower half of the scale.

(NOTE: The above mentioned slugs are located on the top and bottom of their respective I.F. cans. Keep the signal generator output low and the volume control on the receiver wide open during adjustment.)

R.F. ALIGNMENT:

After following the steps outlined above for I.F. alignment, proceed as follows:

1. Connect signal generator to ext. antenna connection of loop.
2. Set signal generator to 1650 Kc (modulated) and adjust oscillator trimmer (C8) to signal frequency. (Tuning gang should be at minimum capacity setting for this adjustment.)
3. Set signal generator to 1400 Kc (modulated). Tune signal in by rotating condenser gang until signal is heard. Adjust trimmer C7 for maximum reading on output meter. Keep signal generator output low so that meter reading is on lower half of scale.
4. Set signal generator to 600 Kc (modulated). Tune signal in until signal is heard. Bend antenna condenser plates (C1) for maximum output on 600 Kc as required.

FM ALIGNMENT

I.F. ALIGNMENT:

1. Set band switch in the FM position.
2. Set tuning condenser to high frequency end of tuning range (minimum capacity).
3. Solder a 5,000 ohm ½w. carbon resistor between terminals A and B of T1. Solder another 5,000 ohm ½w. carbon resistor between terminals D and C of transformer T3. DO NOT USE WIRE WOUND RESISTORS.
4. Connect the negative side of a 20,000 ohm/volt D.C. voltmeter or vacuum tube voltmeter to point "X" on diagram. Connect the positive side of meter to ground.
5. Connect output of signal generator directly to FM antenna input. Adjust signal generator to 10.7 Mc.
6. Adjust the tuning slugs on transformers T1 and T3 for maximum output. (Note: There are two slugs on each I.F. transformer, one on the top of the can and one on the bottom of the can under the chassis. tI is desirable to make this adjustment with an insulated alignment screw driver.) While making the above adjustments, keep the output of the signal generator low so that the D.C. reading on the meter is always between ½ volt and 1 volt.
7. Adjust the iron slug on the top only of T5 for maximum reading on the meter as outlined in step 6 above.
8. Remove meter lead from point "X" and connect to point "Y". Set meter to most sensitive D.C. voltage range.
9. Adjust the iron slug on the **bottom** only of T5 for a zero reading on the meter. It will be noted that as this slug is adjusted the meter will go from a positive indication to a negative indication. Proper adjustment is obtained when the meter is at the zero point between negative and positive swings of the meter.

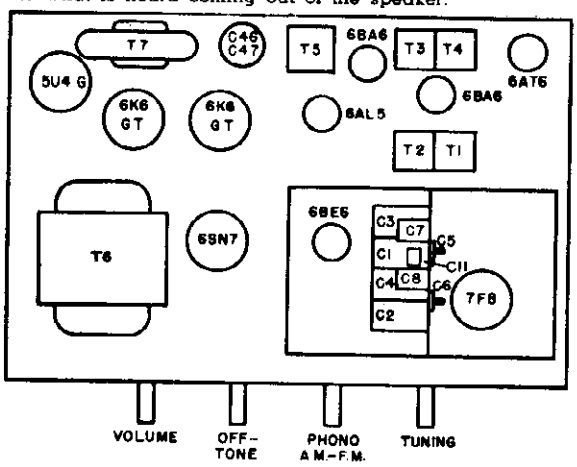
(CAUTION. This adjustment **must** be made with an insulated alignment screw driver.)

NOTE: The above adjustments must be made in sequence and the operator should take particular care that the frequency setting on the signal generator is not touched during alignment. BE SURE THAT THE TWO 5,000 OHM RESISTORS ARE REMOVED FROM THE CIRCUIT AFTER I.F. ALIGNMENT IS COMPLETED. The above adjustments should be made on the basis of meter readings only and no attention should be paid to what is heard coming out of the speaker.

R.F. ALIGNMENT:

1. Set tuning condenser to 107 Mc on the dial.
2. Set band switch to FM position.
3. Connect DC voltmeter to point "X" as outlined above in step 4.
4. Connect output of signal generator to antenna terminals on receiver through 150-ohm resistors. One resistor should be connected in series with the "hot" side of the signal generator and the other resistor should be connected in series with the ground side of the generator. Set signal generator on 107 Mc.
5. Adjust oscillator trimmer C6 for maximum indication on meter, then adjust R.F. trimmer C5.
6. Set signal generator to 90 Mc.
7. Tune set by rotating gang condenser until meter reads maximum. Bend condenser gang plates to bring signal in and to match dial calibration.

CAUTION: The above adjustments should be made on the basis of meter readings only and no attention should be paid to what is heard coming out of the speaker.



Top of Chassis

SOCKET VOLTAGES

Pin No.	1	2	3	4	5	6	7	8
7F8 (FM Det.—Osc.)	—3.0★	0	210	0	3.5	220	6.3 AC	0
6BE6 (AM Det.-Osc.)	—10.5★	0	0	6.3 AC	200	100	—1.5★	—
6BA6 (1st I.F.)	—.24★	0	0	6.5 AC	235	115	1.0	—
6BA6 (2nd I.F.)	0	0	0	6.5 AC	230	110	1.1	—
6AT6 (AM Det.)	0	0	0	6.3 AC	—.66★	0	65	—
6AL5 (Ratio Det.)	.25★	—.26★	0	6.3 AC	—.05★	0	—.05★	—
6SN7 (Tone & P.I.)	0	45	7.2	—39★	170	50	6.3 AC	0
6K6 (Output)	0	6.3 AC	340	260	0	0	0	21
6K6 (Output)	0	6.3 AC	340	260	0	0	0	21

D.C. voltages measured with 20,000 ohm/volt meter.

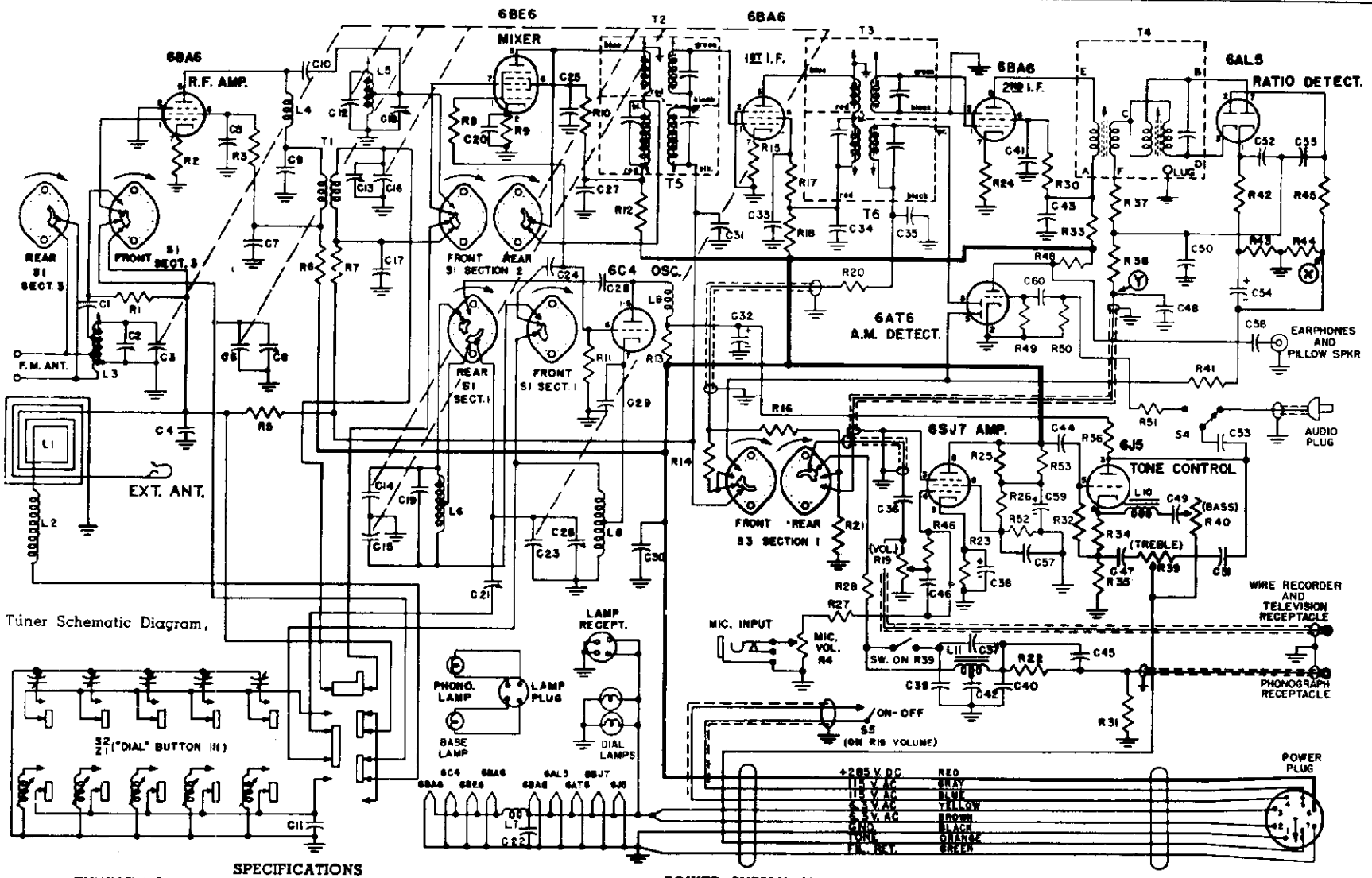
A.C. voltages measured with 1,000 ohm/volt meter.

★ Must be measured with V.T.V.M. with 100,000 ohm ±10% carbon resistor in series with probe.

All measurements made with gang closed and no signal input to receiver.

HOFFMAN RADIO CORP.

MODELS C1006, C100
CHASSIS 131, 132



Tuner Schematic Diagram,

SPECIFICATIONS

TUNING RANGES:
- Broadcast Band ..... 535 Kc to 1650 Kc
- FM Band ..... 88 Mc to 108 Mc

INTERMEDIATE FREQUENCIES:
- Broadcast Band ..... 455 Kc
- FM Band ..... 10.7 Mc

NORMAL OPERATING CURRENTS
- 5U4G Cathode Current ..... 190 Ma
- 6V6 Cathode Current (both tubes) ..... 110 Ma

POWER SUPPLY CHASSIS:
- Phase Inverter 6J5
- Audio Output (4 tubes) 6K6GT/G
- Rectifier 5U4G

Power Supply ..... 115 V.A.C. 50-60 C.P.S.

Power Consumption (incl. phono.)
- C1006 ..... 175 Watts
- C1007 ..... 235 Watts

MODELS C1006, C1007, CHASSIS 131, 132

HOFFMAN RADIO CORP.

ALIGNMENT PROCEDURE

CAUTION:

No alignment adjustments should be attempted without first thoroughly checking over all other possible causes of trouble such as defective tubes, resistors, and condensers. In order to align the receiver properly, remove the chassis from the cabinet and proceed as follows:

NOTE

IT IS PARTCULARLY IMPORTANT THAT AM ALIGNMENT BE DONE BEFORE FM ALIGNMENT. THIS IS TO AVOID POSSIBLE INTERACTION BETWEEN FM AND AM ADJUSTMENTS.

AM ALIGNMENT

I.F. ALIGNMENT:

1. Set tuning condenser on high frequency end of tuning range (minimum capacity).
2. Set band switch to AM position.
3. Depress Manual pushbutton.
4. Turn receiver on and let it warm up for fifteen minutes or longer in order to minimize drift effects.
5. Connect output meter across speaker voice coil and set meter on lowest range, but not below 2.5 volt scale
6. Connect output of signal generator to stator of C16 (see schematic diagram and chassis layout) through a .1 mfd. condenser; connect ground side of generator directly to chassis of receiver. Set signal generator on 455 Kc modulated.
7. Adjust I.F. trimmers on T2 and T3 for maximum reading on the output meter. Keep the meter reading on the lower half of the scale.

(NOTE: The above mentioned trimmers are on the top of their respective I.F. cans and are not to be confused with the iron core adjustments also coming out of the tops of the FM IF cans. Keep the signal generator output low and the volume control on the receiver wide open during adjustment.)

R.F. ALIGNMENT:

After following the steps outlined above for I.F. alignment, proceed as follows:

1. Connect signal generator to "hot" side of loop through a .1 mfd condenser and a 400 ohm resistor in series.
2. Set signal generator to 1650 Kc (modulated) and adjust oscillator trimmer (C26) to signal frequency. (Tuning gang should be at minimum capacity setting for this adjustment).
3. Set signal generator to 535 Kc. (Modulated) and adjust oscillator padder (C21) to signal frequency. (Gang should be at maximum capacity setting for this adjustment.
4. Repeat steps 2 and 3 to insure correct adjustment.
5. Set signal generator to 1400 Kc. (modulated). Tune signal in by rotating condenser gang until signal is heard. Adjust trimmers C8 and C13 for maximum reading on output meter. Keep signal generator output low so that meter reading is on lower half of scale.

FM ALIGNMENT

I.F. ALIGNMENT:

1. Set band switch in the FM po ition.
2. Set tuning condenser to high frequency end of tuning range (minimum capacity).
3. Solder a 5,000 ohm 1/2 w. carbon resistor between terminals A and B of T2. Solder another 5,000 ohm 1/2 w. carbon resistor between terminals D and E of transformer T3. DO NOT USE WIRE WOUND RESISTORS.
4. Connect the negative side of a 20,000 ohm/volt D.C. voltmeter or vacuum tube voltmeter to point "X" on diagram. Connect the positive side of meter to ground.
5. Connect output of signal generator directly to stator of C12. Adjust signal generator to 10.7 Mc.
6. Adjust the tuning slugs on transformers T2 and T3 for maximum output. (Note: There are two slugs on each I.F. transformer, one on the top of the can and one on the bottom of the can under the chassis. It is desirable to make this adjustment with an insulated alignment screw driver.) While making the above adjustments, keep the output of the signal generator low so that the D.C. reading on the meter is always between 1/2 volt and 1 volt.
7. Adjust the iron slug on the **top** only of T4 for maximum reading on the meter as outlined in step 6 above.
8. Remove meter lead from point "X" and connect to point "Y". Set meter to most sensitive D.C. voltage range.
9. Adjust the iron slug on the **bottom** only of T4 for a zero reading on the meter. It will be noted that as this slug is adjusted the meter will go from a positive indication to a negative indication. Proper adjustment is obtained when the meter is at the zero point between negative and positive swings of the meter. (CAUTION: This adjustment **must** be made with an insulated alignment screw driver).

NOTE

The above adjustments must be made in sequence and the operator should take particular care that the frequency setting on the signal generator is not touched during alignment. BE SURE THAT THE TWO 5,000 OHM RESISTORS ARE REMOVED FROM THE CIRCUIT AFTER I.F. ALIGNMENT IS COMPLETED. The above adjustments should be made on the basis of meter readings only and no attention should be paid to what is heard coming out of the speaker.

R.F. ALIGNMENT:

1. Set tuning condenser to 100 Mc on the dial.
2. Set band switch to FM position.
3. Connect DC voltmeter to point "X" as outlined above in step 4.
4. Connect output of signal generator to antenna terminals on receiver through 150-ohm carbon resistors. One resistor should be connected in series with the "hot" side of the signal generator and the other resistor should be connected in series with the ground side of the generator. Set signal generator on 100 Mc.
5. Adjust tuning slug on L6 for maximum indication on meter.
6. Set signal generator to 90 Mc.
7. Tune set by rotating gang condenser until meter reads maximum. Now adjust tuning slugs on L3 and L5 for maximum meter reading. While making the above adjustments keep the output on the signal generator low so that the meter reading is between 1/2 volt and 1 volt.
8. Set signal generator to 106 Mc.
9. Tune set by rotating gang condenser until meter reads maximum. Now adjust tubular trimmers C2 and C18 for maximum meter reading.
0. Repeat steps 6 through 9 inclusive twice for proper alignment.

CAUTION: The above adjustments should be made on the basis of meter readings only and no attention should be paid to what is heard coming out of the speaker.

PUSHBUTTON ADJUSTMENTS

The frequency ranges for the pushbuttons are given in figure 2. A layout of the pushbutton adjustments is shown in Figure 3. Note that in this figure, pushbutton number 1 is now to the extreme right, since the pushbutton assembly is being viewed from the rear. To make pushbutton adjustments, proceed as follows:

1. Turn the receiver on and let it warm up for fifteen minutes or longer in order to minimize drift effects.
2. Depress the DIAL pushbutton and tune in the station which is to be set on pushbutton number 1.
3. Now depress pushbutton number 1 and adjust tuning slug 1a and trimmer 1b (Figure 3) until the station is accurately tuned in again.

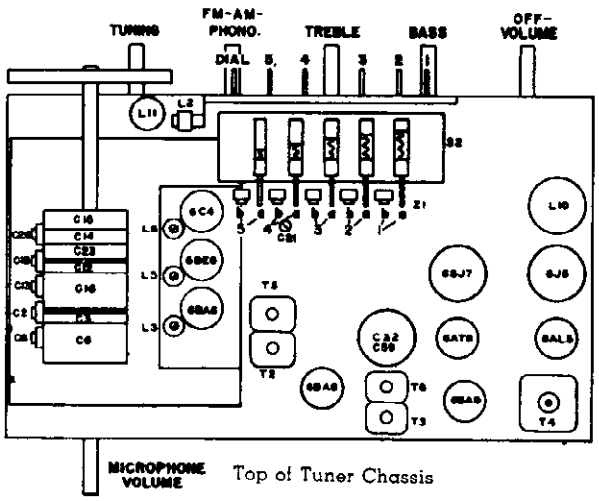
MODEL B502

4. Repeat the above procedure for the remaining pushbuttons.

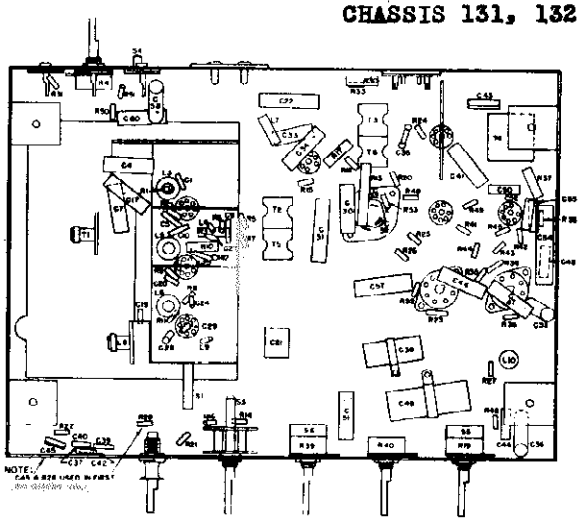
NOTE: When making oscillator coil pushbutton adjustments, it is desirable that this adjustment be made from the high-frequency end (slug all the way out). The proper oscillator coil slug setting will then be reached before there is any possibility of tuning the oscillator to the low frequency side of the carrier.

HOFFMAN RADIO CORP.

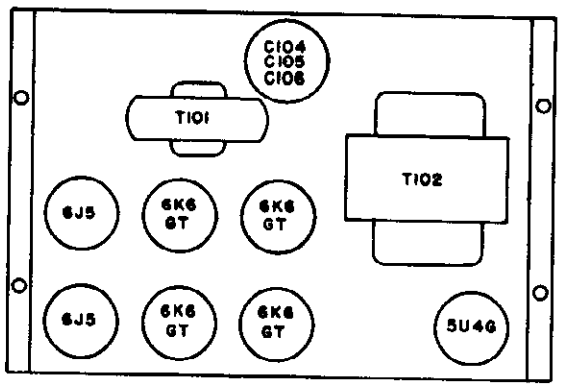
MODELS C100S, C100
CHASSIS 131, 132



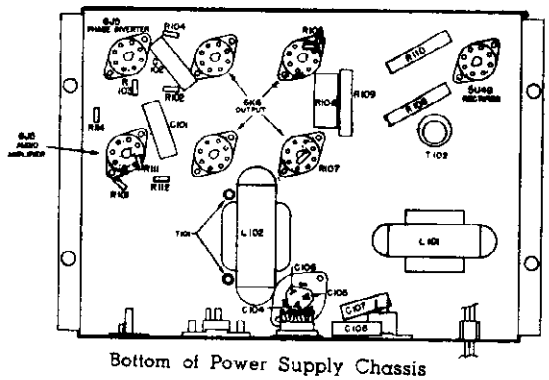
Top of Tuner Chassis



Bottom of Tuner Chassis



Top of Power Supply Chassis



Bottom of Power Supply Chassis

NORMAL OPERATING VOLTAGES

The following tables list the normal operating voltages to be expected at the various tube socket terminals.

TUNER CHASSIS

Pin No.	1	2	3	4	5	6	7	8
6BA6 (R.F.)	—6*	0	6.3 AC	0	290	195	.5	—
6BE6 (Conv.)	—11.5*	5	6.3 AC	0	290	70	—5.7*	—
6C4 (Osc.)	240	0	6.3 AC	0	240	—11.5*	0	—
6BA6 (1st I.F.)	—7*	0	6.3 AC	0	270	190	.6	—
6BA6 (2nd I.F.)	0	0	6.3 AC	0	250	100	1.0	—
6AL5 (Ratio Det.)	.25*	—.25*	6.3 AC	0	—.1*	0	—.1*	—
6AT6 (AM Det.)	—.4	0	6.3 AC	0	—1.5*	—12.5*	150	—
6SJ7 (A.F. Amp.)	0	0	0	0	3.5	65	6.3 AC	100
6J5 (Tone Control)	0	6.3 AC	200	245	43*	90	0	95

POWER SUPPLY CHASSIS

Pin No.	1	2	3	4	5	6	7	8
6J5	0	0	75	0	0	75	6.3 AC	3
6J5	0	6.3 AC	210	—	50	—	0	85
6K6	0	0	300	300	0	—	6.3 AC	0
5U4G	—	335	—	410	—	410	—	335
		5.0 AC ★						5.0 AC ★

D.C. voltages measured with 20,000 ohm/volt meter.

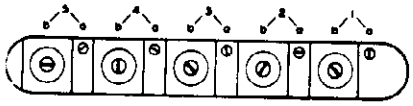
A.C. voltages measured with 1000 ohm/volt meter.

* Measured with V.T.V.M. (subject to wide variations because of tubes and V.T.V.M. used).

All voltages measured with reference to chassis except as follows:

★ Measured between pin numbers 2 and 8 on 5U4 socket.

NOTE: Above readings are obtained with no signal input to receiver and band switch in phono position.

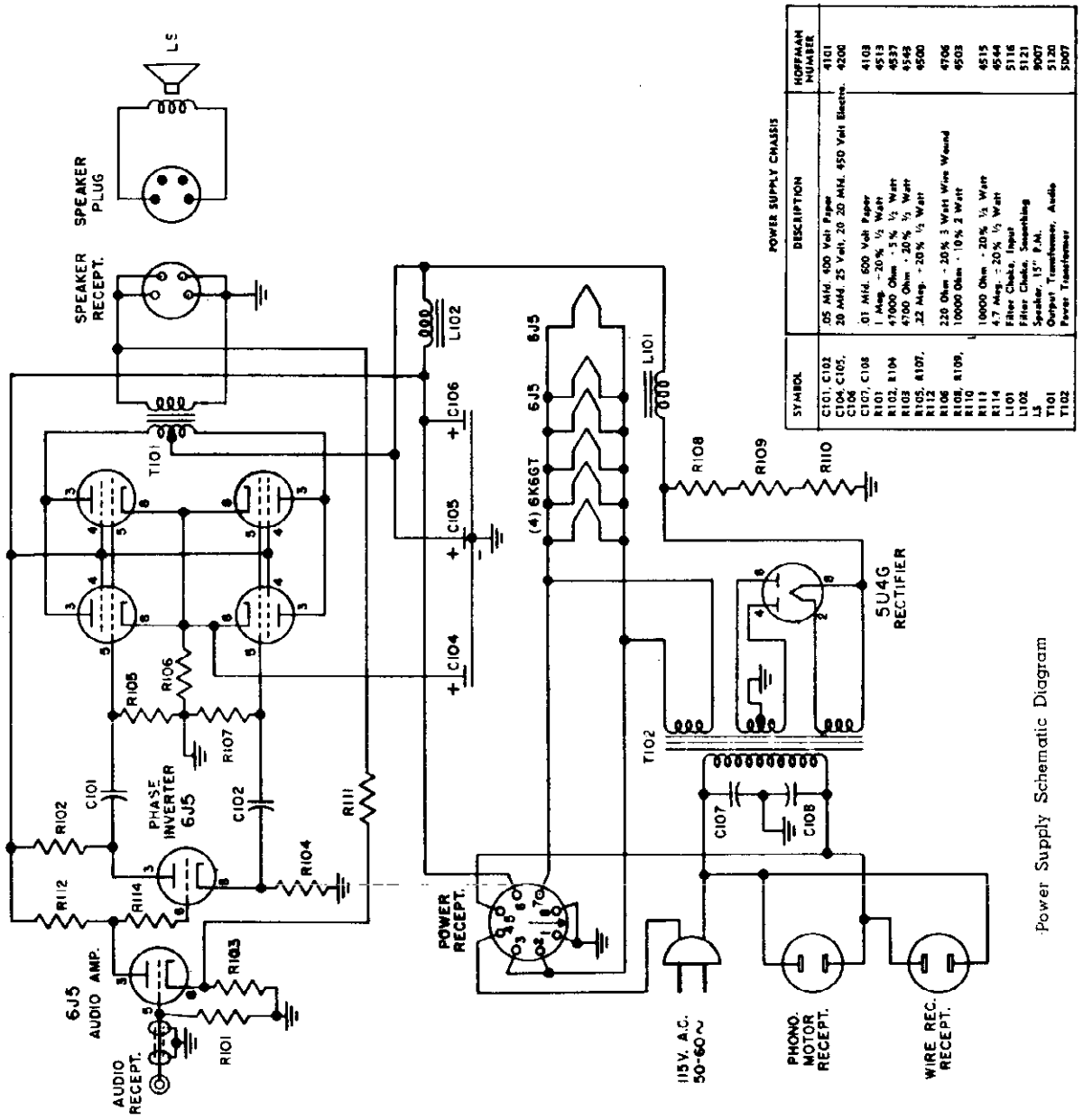


Pushbutton Adjustments

Push-button Frequencies

MODELS C1006, C1007,
CHASSIS 131, 132

HOFFMAN RADIO CORP.



Power Supply Schematic Diagram

TUNER CHASSIS

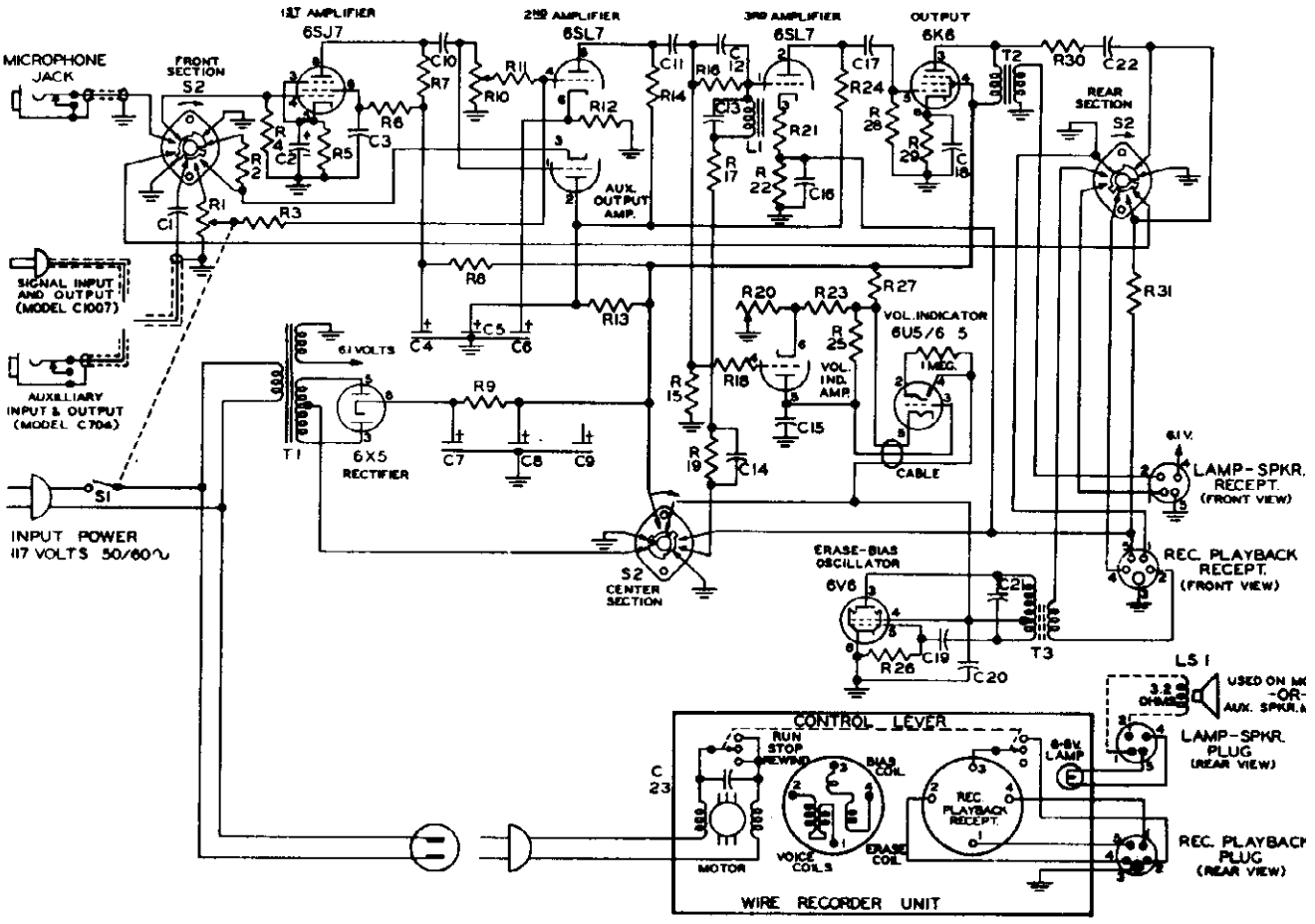
SYMBOL	DESCRIPTION		HOFFMAN NUMBER
C1, C9, C10, C28, C35	100 Mmf. ±10%	Ceramic	4012
C2, C18	1.5-15 Mmf. Trimmer		4316
C3, C6, C12, C14, C15, C16, C23	3 Sect. Variable		4408
C4, C17, C22, C31, C36	.05 Mfd. 200 V.	Tub. Paper	4100
C5, C25, C45, C46	470 Mmf ±20 %	Mica	4003
C7, C30, C34	.01 Mfd. 400 V.	Tub. Paper	4112
C44, C51			
C8, C13, C26	1.8-30 Mmf. Trimmer		4313
C11	500 Mmf. ±5%	Silver Mica	4004
C19	50 Mmf. 2%	Ceramic	4023
C20	220 Mmf. ±20 %	Ceramic	4026
C21	110-560 Mmf. Trimmer		4303
C24	22 Mmf. -10%	Ceramic	4021
C27, C43	5000 Mmf. (Min.)	Ceramic	4029
C29	50 Mmf. ±20 %	Ceramic	4031
C32, C59	20-450, 20-450 Electrolytic		4200
C33, C41	.001 Mfd. 600 V.	Tub. Paper	4104
C53	.02 Mfd. 400 V.	Tub. Paper	4106
C38	.25 Mfd. 25 V.	Electrolytic	4205
C50, C52, C55	330 Mmf. -10%	Mica or Ceramic	4010
C60	.005 Mfd. 600 V.	Tub. Paper	4102
C47, C48	.002 Mfd. 600 V.	Tub. Paper	4118
C57	.2 Mfd. 200 V.	Tub. Paper	4108
C54	5 Mfd. 50 V.	Electrolytic	4209
C39, C40	270 Mmf. ±20 %	Mica	4001
C37, C42	100 Mmf. ±20 %	Mica	4000
C58	.05 Mfd. 400 V.	Tub. Paper	4101
R1	.27 Meg. -20 %	½ Watt	4545
R2, R3, R15, R24	56 Ohm -10%	½ Watt	4561
R4, R10, R17, R30	33000 Ohm ±20 %	1 Watt	4556
R5, R7, R16, R20, R50	.1 Meg. ±20 %	½ Watt	4511
R6, R12, R18 R33	1500 Ohm ±20 %	½ Watt	4534
R8	22 Ohm ±20 %	½ Watt	4560
R11, R36	22000 Ohm ±20 %	½ Watt	4501
R13	4700 Ohm ±20 %	2 Watts	4551
R14, R52	2.2 Meg. ±20 %	½ Watt	4502
R22, R26, R32	1.0 Meg. ±20 %	½ Watt	4513
R4	.5 Meg. Pot. (Micro. Volume)		4804
R21, R35, R38	47000 Ohm ±20 %	½ Watt	4504
R48, R53			
R49	10 Meg. ±20 %	½ Watt	4505
R23, R24	2200 Ohm ±20 %	½ Watt	4512
R25, R27, R28	.22 Meg. ±20 %	½ Watt	4500
R46			
R37	120 Ohm -10%	½ Watt	4546
R19, R39	.25 Meg. Pot. with Switch (Treble, Volume)		4805
R40	50000 Ohm Pot. (Bass)		4806
R31, R41, R51	.47 Meg. ±20 %	½ Watt	4506
R42, R45	390 Ohm ±10%	½ Watt	4549
R43, R44	6800 Ohm ±10%	½ Watt	4557
C49	.5 Mfd. 200 V.	Tub. Paper	4110
L1	Loop Antenna		55210
L2	Coil—Broadcast Antenna		5265
L3	Coil—F.M. Ant.		5253
L4, L9	Coil—R.F.		5254
L5	Coil—F.M. R.F.		5252
L6	Coil—F.M. Osc.		5251
L7	Coil—Fil. R.F.		5266
L8	Coil—B.C. Osc.		5265
L10	Choke—Bass		5113
L11	Choke—Scratch Filter		5114
S1	Band Switch (R.F.)		6014
S2	Pushbutton Switch Assem.		6004
S3	Band Switch		6015
S4	Speaker Switch		6007
T1	Transformer—R.F. Interstage		5264
T2	1st F.M. I.F. Transformer		5274
T3	2nd F.M. I.F. Transformer		5275
T4	Transformer—Ratio Detect.		5278
T5	1st A.M. I.F. Transformer		5276
T6	2nd A.M. I.F. Transformer		5277
Z1	Pushbutton Tuning Assembly		55300

POWER SUPPLY CHASSIS

SYMBOL	DESCRIPTION	HOFFMAN NUMBER
C101, C102	.05 Mfd. 600 Volt Paper	4101
C104, C105, C106	20 Mfd. 25 Volt, 20-20 Mfd. 450 Volt Electro.	4200
C107, C108	.01 Mfd. 600 Volt Paper	4103
R101	1 Meg. -20% ½ Watt	4513
R102, R104	47000 Ohm -5% ½ Watt	4537
R103	4700 Ohm -20% ½ Watt	4548
R105, R107, R112	.22 Meg. -20% ½ Watt	4500
R106	220 Ohm -20% 3 Watt Wire Wound	4706
R108, R109, R110	10000 Ohm -10% 2 Watt	4503
R111	10000 Ohm -20% ½ Watt	4515
R114	4.7 Meg. -20% ½ Watt	4544
L101	Filter Choke, Input	5116
L102	Filter Choke, Smoothing	5121
L3	Speaker, 12" P.M.	9007
T101	Output Transformer, Audio	5120
T102	Power Transformer	5207

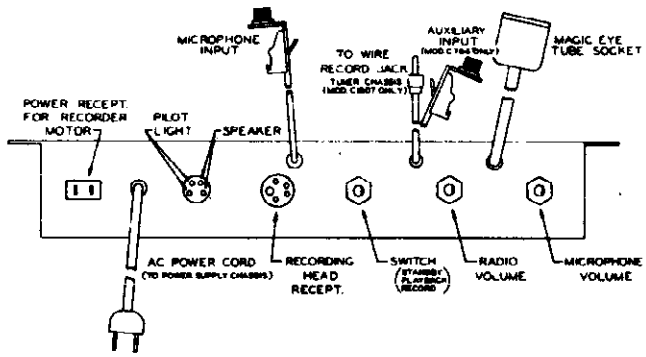
HOFFMAN RADIO CORP.

MODELS C1006, C100
CHASSIS 131, 132



-Schematic Diagram

SYMBOL	DESCRIPTION			HOFFMAN NUMBER
C1	.05 Mfd.	200 V.	Tub. Paper	4100
C2	25 Mfd.	25 V.	Electrolytic	4205
C3, C11, C20, C22, C23	.05 Mfd.	400 V.	Tub. Paper	4101
C4, C5, C7, C8	20 Mfd.	450 V.	Electrolytic	4200
C6, C9	20 Mfd.	25 V.	Electrolytic	4200
C10, C14, C16, C17	.02 Mfd.	400 V.	Tub. Paper	4106
C12	100 Mmf.	±20 %	Mica or Ceramic	4000
C13	330 Mmf.	± 10%	Mica or Ceramic	4010
C15	.1 Mfd.	200 V.	Tub. Paper	4111
C18	.01 Mfd.	400 V.	Tub. Paper	4112
C19	.001 Mfd.	600 V.	Tub. Paper	4104
C21	.01 Mfd.	± 20 %	Mica	4020
R1	.25 Meg.	(with switch)	Potentiometer	4805
R2, R5, R12, R21	2200 Ohm	±20 %	½ Watt	4512
R3, R4, R11	.22 Meg.	±20 %	½ Watt	4500
R6	2.2 Meg.	±20 %	½ Watt	4502
R7, R16, R28, R31	.47 Meg.	±20 %	½ Watt	4506
R8, R13, R17	47000 Ohm	±20 %	½ Watt	4504
R9	1500 Ohm	±5%	6½ W.	4701
R10	.5 Meg.	Potentiometer		4804
R14, R19, R24, R26	.1 Meg.	±20 %	½ Watt	4511
R15, R25	1 Meg.	±20 %	½ Watt	4513
R18	4.7 Meg.	±20 %	½ Watt	4544
R20	1000 Ohm	Wire	Rheostat	4810
R22	4700 Ohm	±20 %	½ Watt	4543
R23	15000 Ohm	±20 %	1 Watt	4539
R27	.1 Meg.	±20 %	1 Watt	4558
R29	1000 Ohm	±20 %	1 Watt	4522
R30	22000 Ohm	±20 %	½ Watt	4501
L1	Peaking Coil			5240
LS1 Model C704 only	Loudspeaker 4 x 6 P.M. 3.2 Ohm V.C.			9030
S1	On-Off Switch (Part of R1)			
S2	Selector Switch (Shown in Stand-by Pos.)			66000
T1	Power Transformer			5000
T2	Output Transformer			5119
T3	Osc. Coil, Erase and Bias			5239



Front Apron of Chassis

MODELS C1006, C1007, CHASSIS 131, 132

HOFFMAN RADIO CORP.

WIRE RECORDER FOR MODELS C1006 and C1007

DESCRIPTION

The Hoffman WIRECORD consists of a wire recorder and associate amplifier. The amplifier is a special 6-tube (plus rectifier) AC-operated unit especially designed to work with the Webster wire recorder head.

TUBE COMPLEMENT

1st A.F. Amp	6SJ7
2nd A.F. Amp. and Aux. output Amp.	6SL7
3rd A.F. Amp. and Volume Indicator Amp.	6SL7
Output Amp.	6K6
Volume Indicator	6U5/6E5
Erase-Bias Oscillator	6V6
Rectifier	6X5
Frequency Response	40 CPS to 9000 CPS

NORMAL OPERATING CURRENTS (6X5 Cathode)

Standby Position	0 Ma.
Play Back Position	30 Ma.
Record Position (Motor off)	50 Ma.
Record Position (Motor on)	54 Ma.

TEST PROCEDURE

No special test procedure is required to service the amplifier unit of the Hoffman Wirecord If the amplifier fails to function properly, proceed as follows:

1. Check all tubes, preferably by replacing them one at a time with known good tubes.
2. Check all tube socket voltages and compare readings with the voltage table. Any appreciable discrepancy in voltage readings should be investigated by looking for shorted or leaky condensers, or defective resistors.
3. Whenever it is necessary to replace a resistor or a condenser in the amplifier, make certain that the replacemnt part has the proper resistance or capitance value, otherwise the amplifier may fail to perform as it should.

VOLUME INDICATOR ADJUSTMENT

The recording level on the wire must be maintained within definite limits in order to obtain good performance from the wire recorder. If the recording level is too high, a permanent record that is difficult to, erase will result. If the recording level is too low, the reproduction on playback will be noisy because of the low signal-to-noise ratio. To adjust the volume level indicator for correct indication of volume, proceed as follows:

1. Place switch in RECORD position.
2. Turn Radio volume and microphone volume controls to minimum volume (counterclockwise) position.
3. Rotate R20 (slot adjustment at rear of amplifier chassis) in a counterclockwise direction until the pattern on the indicator tube overlaps. If the indicator pattern cannot be made to overlap:
   a. Replace indicator tube.
   b. Replace 6SL7 tube used as 3rd Amp. and volume indicator amplifier.
   c. Make necessary voltage checks according to voltage chart.
4. If indicator tube pattern overlaps satisfactorily, back off on the adjustment of R20 until the tube pattern is as wide open as it will go. Then move the R20 adjustment until the pattern JUST BEGINS TO CLOSE. This is the final and correct adjustmen..

If the wire recorder is now operated so that volume peaks just close the pattern on the indicator tube, no trouble should be experienced in erasing the original material when using the wire for subsequent recordings.

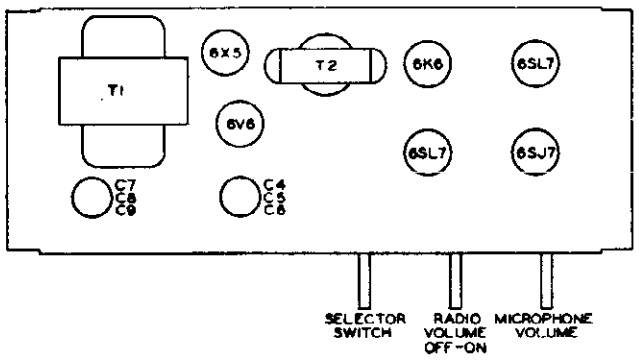
NORMAL OPERATING VOLTAGES

The following table lists the normal operating voltages to be expected at the various tube socket terminals. For tube socket terminal locations, refer to bottom view of chassis.

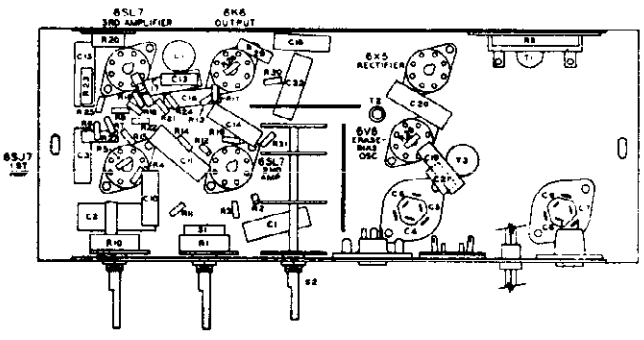
Pin No.	1	2	3	4	5	6	7	8
6SJ7 1st Ampl.	0	0	5	0	5	17	6.3 AC	65
6SL7 2nd Ampl.	0	200	3.6	0	125	1.0	6.3 AC	0
6SL7 3rd Ampl.	0	160	2.4	0	50	2.0	6.3 AC	0
6K6 Output	0	0	230	245	0	0	6.3 AC	
6V6 Osc. #	0	0	250	250	—44	0	6.3 AC	0
6V6 Osc. ★	0	0	230	230	—37	—	—	0
6X5 Rectifier	0	6.3 AC •	260	—	260	—	0	300
6U5 Indicator	0	75	29	245	50	6.3 AC		

• Between Pins 2 and 8 on 6X5
Wire Recorder switch in "OFF" position
★ Wire Recorder switch in "RUN" position

All voltage readings are made with amplifier switch in record position.



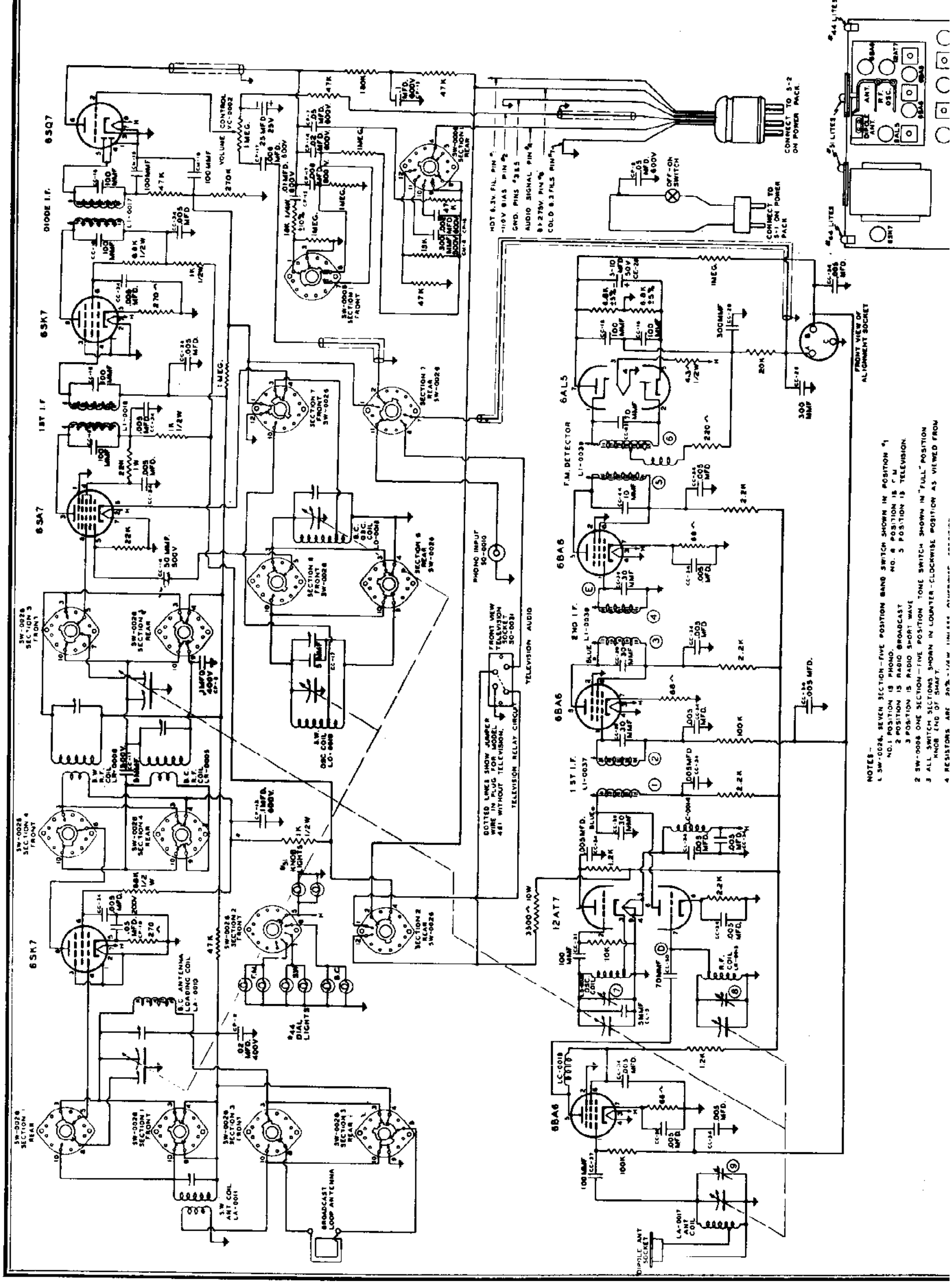
Top of Chassis



Bottom of Chassis

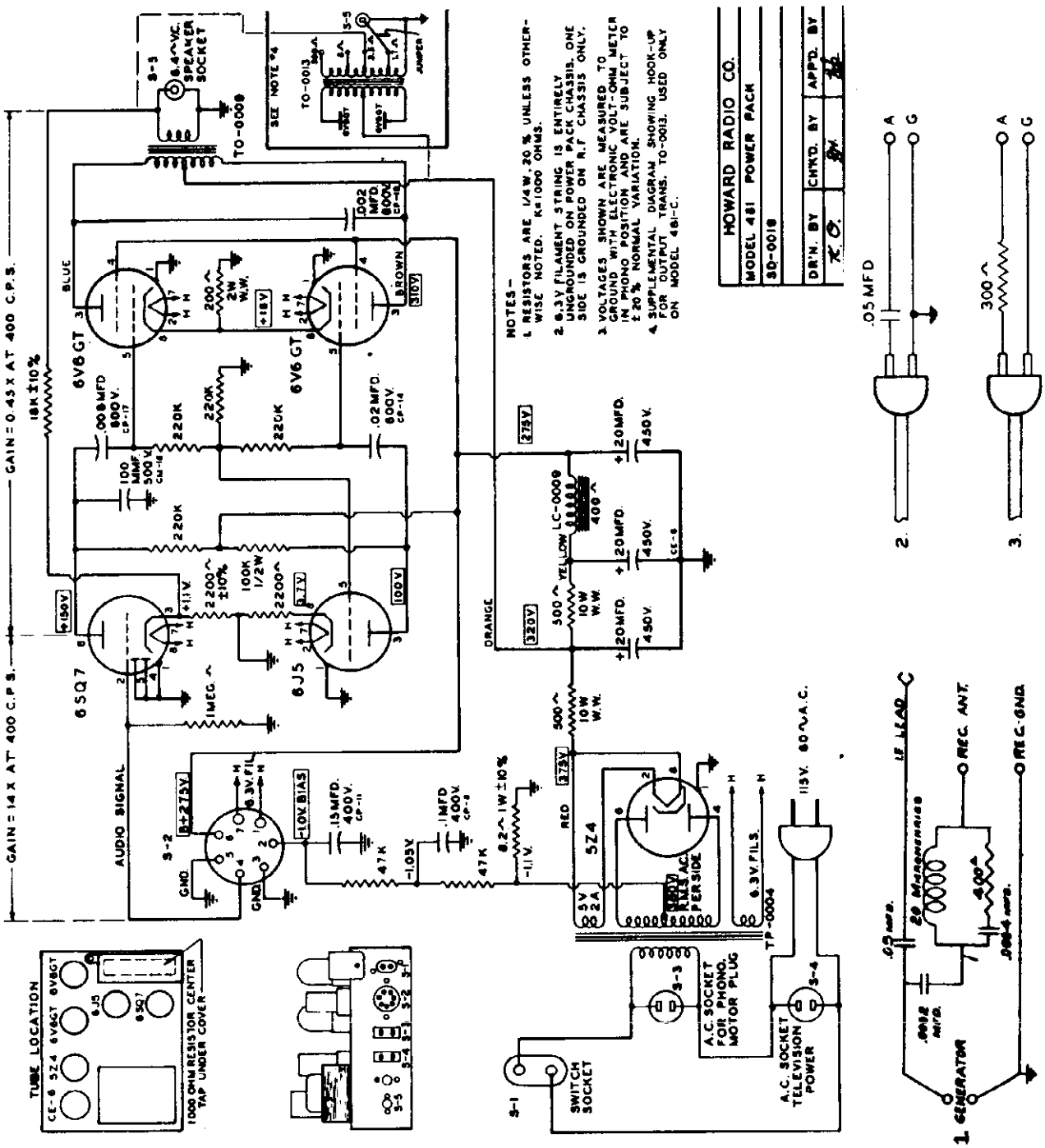
HOWARD RADIO COMPANY

MODELS 481, 481B, 481C

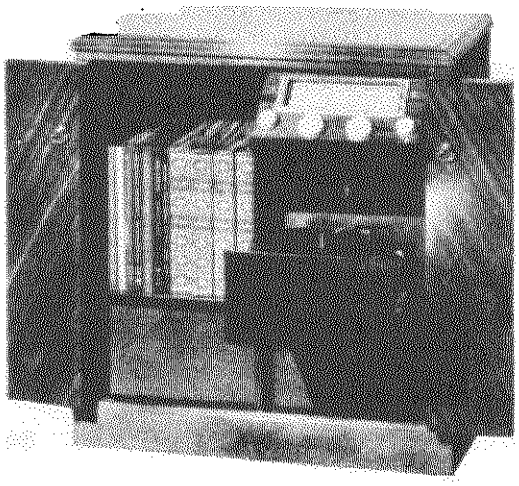


MODELS 481M,
481F, 481C

HOWARD RADIO COMPANY



HOWARD RADIO COMPANY



SERVICE DATA

FEATURES

Large, easy to read, unbreakable lucite dial with band in use only being illuminated. Coverage: Broadcast Band 540 to 1650 KC. Short Wave Band 9. to 12.5 MC. Personalized Tuning Gang - 6 sections. Individual sections for short wav with oscillator section double spaced. Frequency Modulated Band 88-108 MC. using its own Tuner, I.F., Ratio Detector, and special Tuning Gang double spaced. High Q Antenn Coils. Very large Loop. Separate Power Pack. Output 13 watts - 8.5 watts undistorte Dual HOWARD built elliptical speakers. Webster Record Changer. Illuminated Selector Control. Five position illuminated Acousticolor Switch with pleasing treble and bass accentuation. Special Feature: Large storage space for records capable of holding th HOWARD Television Chassis 475-TV.

ANTENNA REQUIREMENTS: The HOWARD Model 481 Radio contains a very large loop aerial having exceptional pickup and in use upon the Broadcast Band. For the short wave band one end of this loop is disconnected and the loop then becomes the antenna. Also installed within the cabinet is a folded Dipole antenna for use upon the FM Band. Although the FM Band is the most sensitive built today, the successful operation of this Band depends on the signal strength of the transmitter and the efficiency of the anten connected to the Band. In localities a number of miles from the sending station, it i advisable that a good antenna be used. It must be remembered that a great many things influence FM reception: elevations, high buildings or hills will intercept the waves and reduce signal strength. Each installation presents a different problem, however i most cases the built-in antenna will provide sufficient signal strength to operate the FM Band. If the folded Dipole within the cabinet does not have sufficient pick-up, we recommend the erection of a DIPOLE ANTENNA mounted as high as possible and away from a obstructions. Use a 300 ohm twin lead-in wire and place the horizontal arms of the antenna flat side to the transmitter.

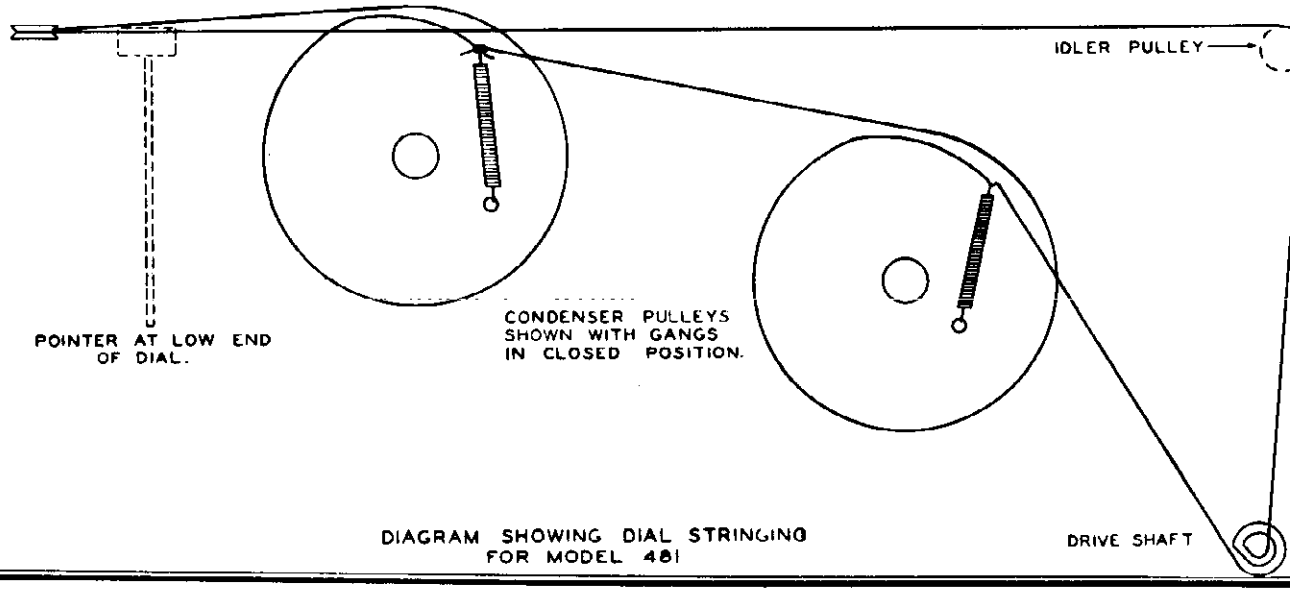


DIAGRAM SHOWING DIAL STRINGING FOR MODEL 481

MODELS 481M, 481B, 481C

HOWARD RADIO COMPANY

AM ALIGNMENT CHART

Do the following before alignment:

Remove condenser gang dust cover by taking out 4 P.K. sheet metal screws.
With both gangs closed, put the dial pointer on the last vertical line at the low frequency end of the calibrated dial scale.
Loop attached to chassis.
Volume Control on full.
Set pointer between broadcast stations at low frequency end of dial.
Tone control set at clockwise position (normal).
Band Switch at broadcast position.
Adjust all trimmers for maximum sensitivity.

See Dummy Gen. Chart	Sig. Gen. Connection	Gen. Freq.	Band Switch Position	Dial Setting	Order of Slug and Trimmer Adjustments	Trimmer or Slug Function	See Notes Below
2	Grid of 6SA7	455 K.C.	BC	Low End of BC	⑩ ⑪ ⑫ ⑬	I.F.	J
1	Generator Inductively Coupled to Loop	11.9 M.C.	SW	11.9 M.C.	⑰ ⑱ ⑲	SW	K & L
		Accurately set signal generator at one MC and check through short wave dial, harmonics to be one MC apart.					
1	Pin #4 6SK7	1400 K.C.	BC	1400 K.C.	⑭ ⑮	BC Osc. and R.F.	
1	Generator Inductively Coupled to Loop	1400 K.C.	BC	1400 K.C.	⑯	Loop	

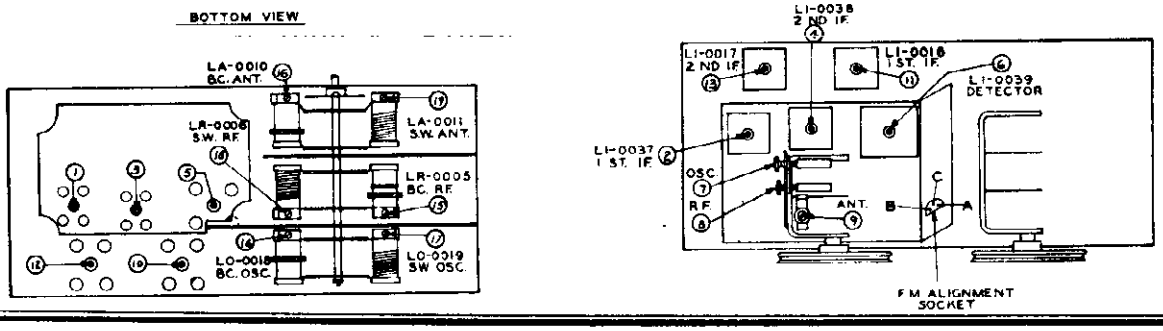
NOTE J. The I.F. adjustments are iron core slug tuning and it should not be necessary to move them very far in either direction from the factory setting since they are of a very stable nature.

NOTE K & L. Inductively couple signal generator to loop by wrapping one or two turns of wire around outside wire of loop and fasten one end to the high side of the signal generator. Rock gang while adjusting trimmers ⑱ and ⑲. In adjusting trimmer ⑰, be sure the image of the I.F. is at approximately 11. MC.

CAUTION: Do not knife gang unless absolutely necessary, and then with extreme care.

Replace gang dust cover before proceeding with FM alignment.

TRIMMER LOCATION CHARTS



HOWARD RADIO COMPANY

FM ALIGNMENT CHART

Set controls at indicated positions before following chart:

FM Dipole attached to chassis.
Volume control on full.
Set pointer between FM stations at low frequency end of dial.
Tone control in clockwise position.
Band Switch in FM position.
Adjust all trimmers for maximum sensitivity.

See Dummy Gen. Chart	Sig. Gen. Connection	Gen. Freq.	Band Switch Position	Dial Setting	Order of Slug and Trimmer Adjustments	Trimmer or Slug Function	See Notes Below
2	Point E on Circuit Diagram	10.7 MC	F.M.	Gang Closed	⑤	F.M. Det. Adj.	A & B
2	Point E on Circuit Diagram	10.7 MC	F.M.	Gang Closed	⑥ Adj. to zero voltage	F.M. Det.	C
2	Point D on Circuit Diagram	10.7 MC	F.M.	Gang Closed	①②③④	F.M.-I.F.	D
3	Ant. & Ground Socket on top F.M. Chassis	105 MC	F.M.	105	⑦⑧⑨	Osc. and R.F.-F.M.	E & F
3	Ant. & Ground Socket on top F.M. Chassis	90 MC	F.M.	90 MC		F.M.-R.F. Ind. Adj.	G H & I

A. Signal generator modulation off and turned up to about 100,000 microvolts.
B. Connect electronic voltmeter (equivalent to voltohmist) at point "B" of FM alignment socket as shown on the wiring diagram and turn slug (5) on trimmer location chart to extreme counter-clockwise position. Turn clockwise to lst peak and adjust to maximum. While making this adjustment, vary the output of the signal generator to a point which will give a reading of minus 2 volts.

C. Turn slug (6) to extreme counter-clockwise position. Connect electronic voltmeter to Point A of FM alignment socket and turn slug (6) until voltmeter is to zero voltage. Repeat adjustments given in Notes B & C until no further improvement can be made.

D. Connect voltmeter to Point B and generator at Point D. Adjust (1) (2) (3) (4), then retrim (5). Move voltmeter to Point A and recheck zero voltage. (Retrim if necessary.) These adjustments should be made with input signal necessary to produce approximately .7 volts at Point B.

E. Change generator dummy as shown on dummy antenna chart, Picture 3, and modulation on, and fasten generator to antenna socket on top of FM chassis.

F. Turn the first Detector or R.F. Trimmer 8 well to the left - almost open - so you will not have a locking condition and be able to locate the signal at 105 MC when turning Trimmer 7.

G. Should 90 M.C. signal not fall in at 90 M.C. on the dial, adjust F.M. oscillator coil to correct calibration. It is only necessary to press together or open the spacing on one turn of the coil to do so.
H. After adjusting oscillator coil for the correct calibration at 90 M.C., check the detector and antenna coil for proper tracking with the oscillator. If they do not track it will be necessary to adjust the detector and antenna coils for perfect tracking.
I. Repeat adjustments ⑦⑧⑨ until no further improvement can be made.

MODELS 481M, 481B, 481C

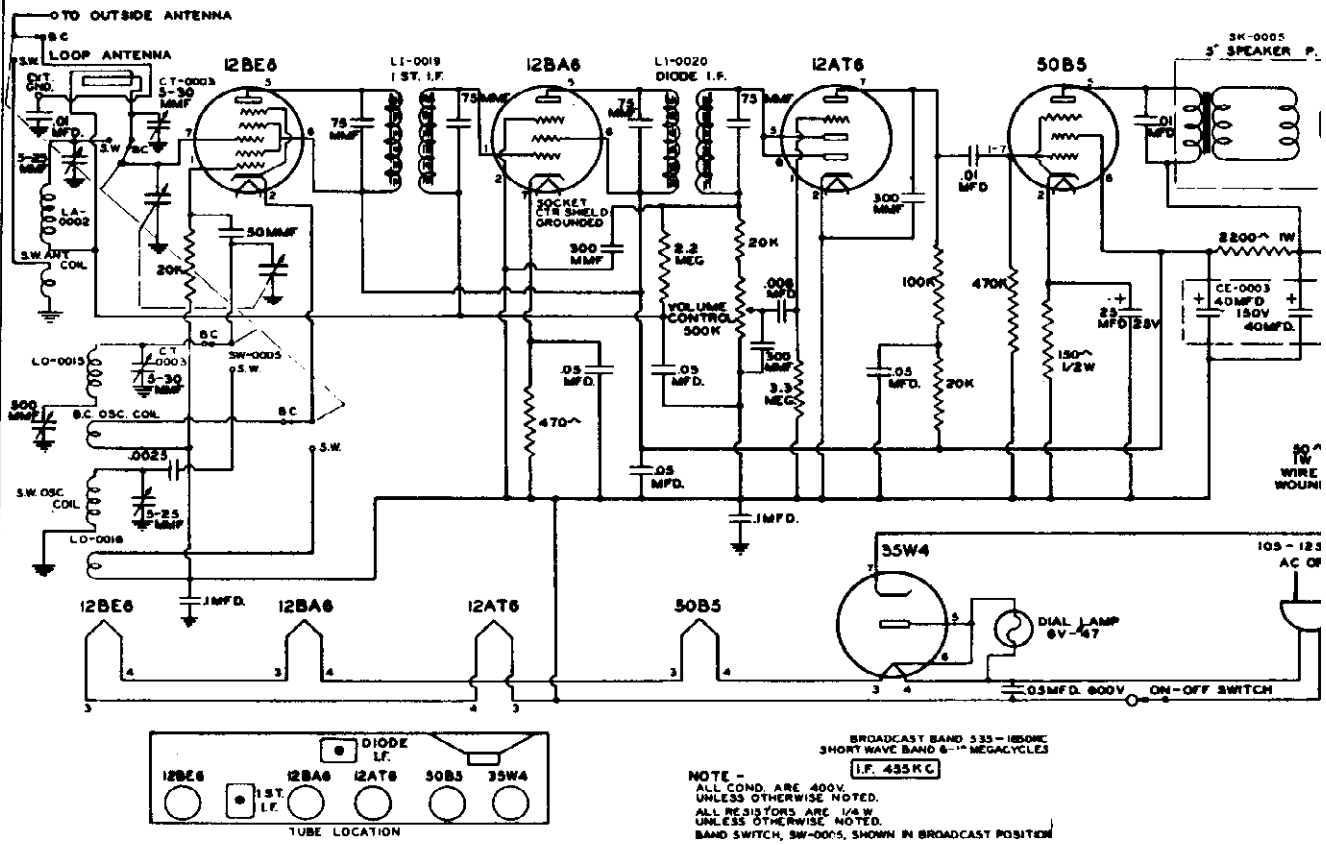
HOWARD RADIO COMPANY

PARTS LIST

	CONTROLS
VC-0002	Volume Control with Switch
	CONDENSERS
CV-0012	Variable - 3 Gang Tuning
CV-0018	Variable - F.M. Tuning
CE-0005	Capacitor - Electrolytic 25 MFD 25 V. D.C.
CE-0006	Capacitor - Electrolytic 3x20 MFD 450 V. D.C.
CE-0028	Capacitor - Electrolytic 5 to 10 MFD 50 V. D.C.
CT-0005	Trimmer - Cap. 2.5-30MMFD
CC-0005	Capacitor - Ceramic 30 MMFD 500 V. D.C.
CC-0014	Capacitor - Ceramic 50 MMFD 500 V. D.C.
CC-0050	Capacitor - Ceramic 68-72 MMFD 500 V. D.C.
CC-0016	Capacitor - Ceramic 100 MMFD 500 V. D.C.
CC-0020	Capacitor - Ceramic 10 MMFD 500 V. D.C.
CC-0022	Capacitor - Ceramic 70 MMFD 500 V. D.C.
CC-0028	Capacitor - Ceramic 300 MMFD 500 V. D.C.
CC-0034	Capacitor - Ceramic 5000 MMFD 500 V. D.C.
CC-0049	Capacitor - Ceramic 15 MMFD 500 V. D.C.
	COILS
AN-0014	F.M. Dipole Ant. Assy. 481 Cabinet
AN-0017	F.M. Dipole Ant. Assy. 481 Chassis only
AN-0016	Ant. Loop Collapsible (chassis)
AN-0015	Back Board and Loop Ant. Assy. (cabinet)
LA-0010	Broadcast Ant. Coil Assy.
LA-0011	Shortwave Ant. Coil Assy.
LA-0017	Antenna Coil
LC-0014	Choke Coil - Filament
LC-0016	F.M.-R.F. Choke Assy.
LI-0016	1st I.F. Assy.
LI-0017	2nd I.F. Assy.
LI-0037	1st I.F. Assy. F.M.
LI-0038	2nd I.F. Assy. F.M.
LI-0039	Discriminator Transformer Assy. F.M.
LO-0018	Broadcast Oscillator Coil Assy.
LO-0019	Shortwave Oscillator Coil Assy.
LO-0028	Oscillator Coil F.M.
LR-0005	Broadcast R.F. Coil Assy.
LR-0006	Shortwave R.F. Coil Assy.
LR-0015	R.F. Coil F.M.
	SWITCHES
SW-0006	Tone Switch - 5 position 1 section
SW-0026	Band Switch - 5 position 7 section
	DIAL AND CONTROL ACCESSORIES
AS-0220	Tuning Shaft Assy.
AS-0218	Pointer and Slide Assy.
AS-0242	Dial Light Assy.
DC-0001	Dial Cord, 58"
SP-0010	12 oz. Load Spring Steel
DG-0001	Dial Broadcast (Lower)
DG-0002	Dial Shortwave (Upper)
DG-0022	Dial F.M. (Center)
PR-0070-1	Escutcheon (Mahogany)
PR-0070-2	Escutcheon (Blond)
PL-0010	Antenna Cable Plug - 4 prong
PL-0005	Phono Plug
PL-0018	Plug - 2 prong
	KNOBS
KB-0007	Knob Acousticolor
KB-0024	Knob Selector Switch
KB-0015-3	Knob - Tuning and Volume
HW-0007	Door Pull
	TRANSFORMER
TP-0004	Power Transformer
LC-0009	Filter Choke (395 Ohms D.C.)
TO-0009	Output Transformer (Dual Speaker)
	TUBE COMPLEMENT
TU-5Z4	1 used
TU-6AL5	1 used
TU-6BA6	3 used
TU-6J5 GT	1 used
TU-6SA7	1 used
TU-6SK7	2 used
TU-6SQ7	2 used
TU-6V6 GT	2 used
TU-12AT7	1 used
	SOCKETS
SO-0007	Socket - Octal
SO-0008	Socket - Octal with shield
SO-0010	Socket - Phono
SO-0011	Socket - 7 prong wafer
SO-0012	Socket - Power Outlet
SO-0018	Socket - Antenna
SO-0019	Socket - Miniature - 7 Pin - Low Loss
SO-0022	Socket - Miniature - 9 Pin
SO-0027	Socket - 2 Prong
SO-0029	Socket - Miniature - 7 Pin
SO-0030	Socket - Phasing - 3 Pin
SO-0031	Socket - 4 Prong
SO-0032	Socket - 2 Prong
	LINE CORDS
CA-0039	Line Cord with Plastic Plug - 8 ft.
CA-0101	Line Cord with Plastic Plug - 3 ft.
	CABINETS
CW-0013	Cabinet (state Mahogany or Blond)
AA-0048	Drawer - Record Changer
AA-0047	Drawer - Radio
	RECORD CHANGER
PH-0009	Automatic Record Changer - Webster Model No. 148
	SPEAKER
SK-0008	Speaker - 6 x 9 Elliptical (2 used)

HOWARD RADIO COMPANY

MODEL 902



REPLACEMENT PARTS LIST

Part No.	DESCRIPTION
	CONTROL
VC-0001	Volume and on-off switch
	CONDENSERS
CV-0005	2 Gang Condenser. Variable Tuning
CE-0003	40-40 MFD 150 Volts
CE-0005	Filter, 25 MFD 25 volt (used with CE-0003)
CT-0002	Condenser - Adjustable 500 M.M.F.D. Var. 100 M.M.F.D.
CT-0003	Condenser - Adjustable 5-30 M.M.F.D.
	COIL ASSEMBLIES
LO-0015	B.C. Oscillator Coil
LO-0016	S.W. Oscillator Coil
LA-0002	S.W. Antenna Coil
AN-0009	B.C. Antenna Coil
LI-0019	1st I.F. Assembly
LI-0020	2nd (Diode) I.F.Assembly
	CABINETS
CB-0002	Cabinet - White Plastic Moulded
CB-0004	Cabinet - Mottled Walnut
CB-0006	Cabinet - Hammarloid
	DIAL AND CONTROL PARTS
DC-0001	Dial Drive Cord
LS-0001	Dial Lamp - Bayonet Type #47
WG-0001	Dial Window
SP-0005	Tension Spring for Dial Drive Cord
AR-0004	Calibrated Dial Plate
HD-0001	Dial Indicator Hand
SM-0074	Shaft Tuning

Part No.	DESCRIPTION
	KNOBS
KB-0003	Moulded - White
KB-0005	Moulded - Brown
	LINE CORDS
CA-0038	Standard 110 Volt
	SOCKETS
SO-0013	Tube Socket - Min. 7 Pin
SO-0016	Tube Socket - Min. 7 Pin
SL-0004	Dial Lamp Socket - Bayonet Type
	MISCELLANEOUS
PR-0096	Miniature Tube Shield
PR-0097	Miniature Tube Base Clip
	SPEAKER
SK-0005	5" P.M. Speaker
TO-0001	Speaker Output Transformer
	SWITCHES
SW-0005	Band Switch

MODEL 902-A

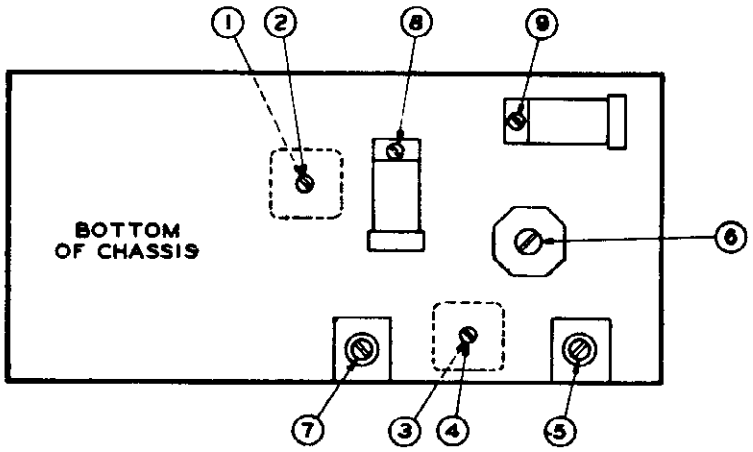
HOWARD RADIO COMPANY

VOLTAGE AND ALIGNMENT CHARTS

TUBE	FUNCTION	CATH.	SCR. GRID	PLATE	TUBE	FUNCTION	CATH.	SCR. GRID	PLATE
12BE6	Mixer	0	79	79	12AT6	Det.	0	--	56
12BA6	I.F. Det.	2	79	79	50B5	Output.	4.6	79	110

	DUMMY ANTENNA	SIG. GEN. CONNECTION	GEN. FREQ.	BAND POSITION	DIAL SETTING	ORDER OF TRIMMER ADJUSTMENTS	TRIMMER FUNCTION
1	.05 MFD.	Grid of 12BE6	445 KC	BC	Off Station	1 2 3 4	I.F. Peak to Max. Output
2	400 Ohm Resistor	Ant.	1400 KC	BC	1400 KC	5 7	BC Osc. and R.F.
3	400 Ohm Resistor	Ant.	600 KC	BC	600 KC	6	BC Osc., Pad.
4	400 Ohm Resistor	Ant.	16 MC	SW	16 MC	9, 8	SW Osc. and R.F.

TRIMMER LOCATIONS



12BE6 Mixer
12BA6 I.F.Amp.
12AT6 Diode 1st AF
50B5 Output
35W4 Rectifier

POWER SUPPLY -- (Standard Models) = 100-130 V. AC-DC CONSUMPTION 30 WATTS

SEE LABEL ON BACK OF CHASSIS

ANTENNA SYSTEM = Built-in loop on back of cabinet. Available connection for outside antenna from the back of the cabinet.

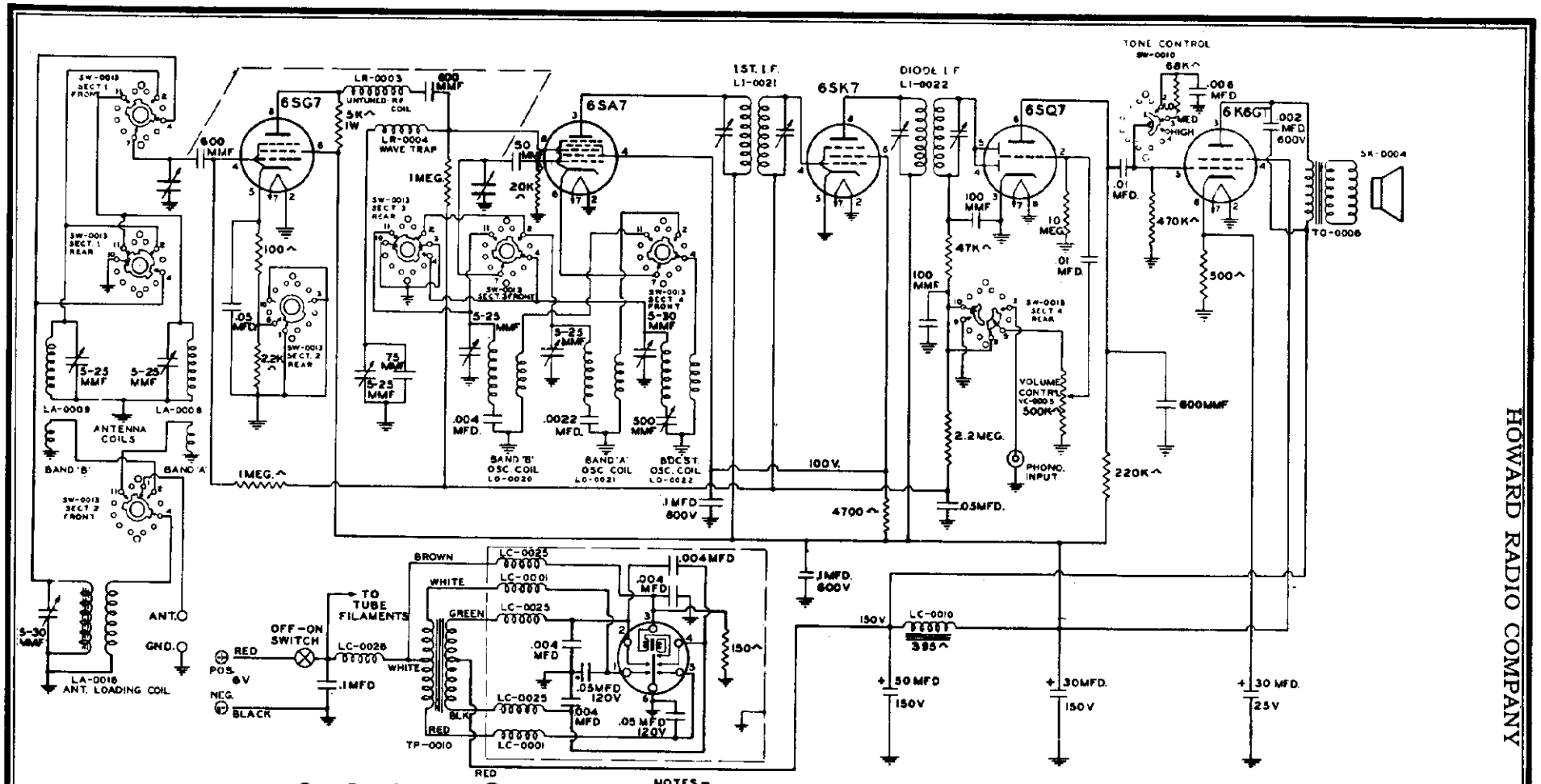
TUNING RANGE = 540-1600 KC and 6-18 MC.

I.F. - 455 KC | TYPE = Iron Core Tuned | POWER OUTPUT - (MAX.) 1.25W UPO .5 W.

TUNING SYSTEM = String Drive, Airplane Dial Full Vision.

SPEAKER = P.M. Size 5" | V.C.IMP. (400CPS) = 3.2 Ohms

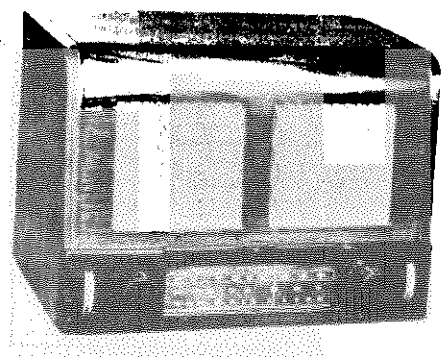
IMPORTANT: To operate this receiver with voltages higher than 130 volts A.C. or D.C., it is necessary to use a voltage reducer cord.



TUBE AND TRIMMER LOCATION

NOTES –

1. BAND SWITCH, SW-0013, SHOWN IN BROADCAST POSITION.
2. FRONT AND REAR SECTIONS OF SWITCH SHOWN VIEWED FROM KNOB END.
3. TONE CONTROL SWITCH, SW-0010, SHOWN VIEWED FROM KNOB END.
4. BAND SWITCH POSITIONS –
   1. PHONOGRAPH
   2. RADIO BROADCAST BAND
   3. RADIO SHORT WAVE BAND 'A' 2 1/2 - 7 MC.
   4. RADIO SHORT WAVE BAND 'B' 7 - 22 MC.



MODEL 906-SB

HOWARD RADIO COMPANY

ALIGNMENT CHART

Set controls at indicated positions before following alignment chart.

Volume control on full
Set dial between broadcast stations
Radio phono control at radio

	DUMMY ANTENNA	SIG. GEN. CONNECTION	GEN. FREQ.	BAND POSITION	DIAL SETTING	ORDER OF TRIMMER ADJUSTMENTS	TRIMMER FUNCTION	SEE NOTE
1	.05 Mfd.	Grid of 6SA7	455 KC	BC	Off Station	①②③④	I.F. Peak to Maximum	
2	.05 Mfd.	Ant.	455 KC	BC	Off Station	⑤	Null	A
3	400 Ohm. Line	"A" Ant. Post	600 KC	BC	600 KC	⑦	Maximum	B
4	400 Ohm. Line	"A" Ant. Post	1400 KC	BC	1400 KC	⑥⑧	BC Osc. and R.F.	C
5	Repeat operations 3 and 4							D
6	400 Ohm. Line	"A" Ant. Post	6 MC	A	6 MC	⑨⑩	Maximum	E
7	400 Ohm. Line	"A" Ant. Post	20 MC	B	20 MC	⑪⑫	Maximum	F
8	Accurately set signal generator at one MC and check through both short wave dials, harmonics to be one MC apart.							

NOTE A Important. Connect the signal generator to the antenna screw on the outside of the radio chassis and keep the metal of the chassis between the generator lead and the wave trap coil. Use your signal generator to a turned up powerful position and adjust the wave trap trimmer to null.

NOTE B Padding condenser adjustment for calibration at low frequency end of broadcast band.

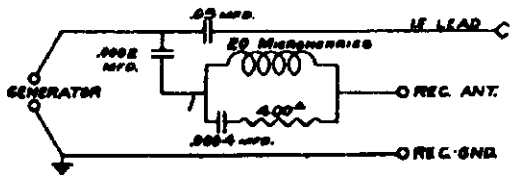
NOTE C Set dial at 1400 KC. Adjust oscillator and R.F. trimmer for maximum sensitivity.

NOTE D Check broadcast stations across dial for accuracy.

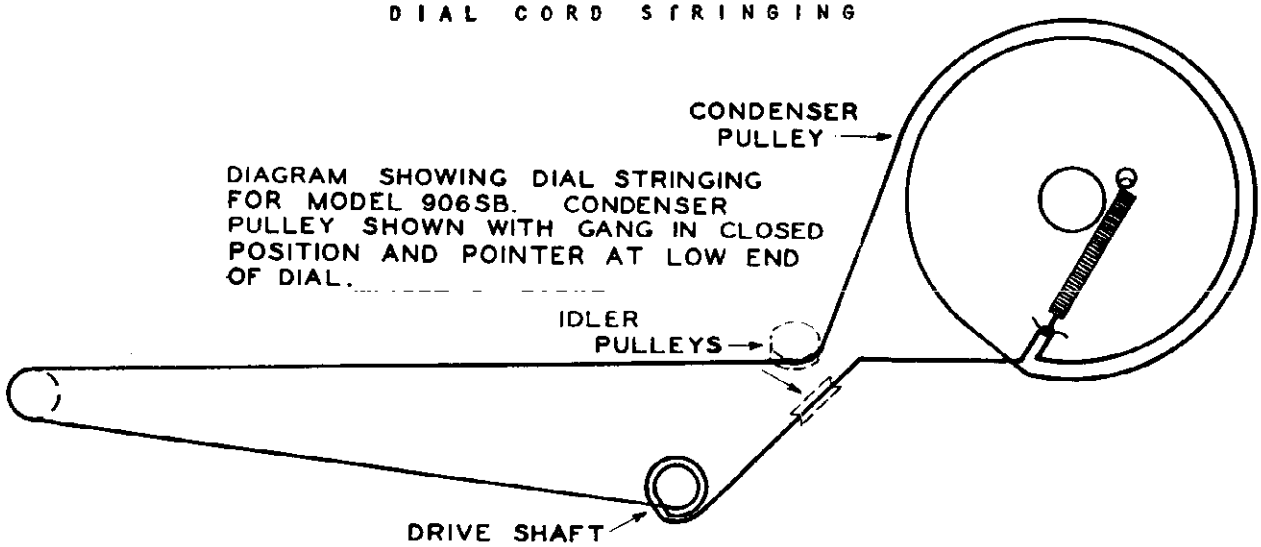
NOTE E True Signal at 6. Image at 5.

NOTE F True signal at 20. Image at 19.

RECOMMENDED DUMMY ANTENNA. Although the values as shown in above table for antenna load may be satisfactory, we urgently recommend the circuit as shown at the right to properly take care of the various frequencies to accomplish the correct alignment.



DIAL CORD STRINGING



"SOCKET VOLTAGE READINGS"

Voltage reading taken from ground with voltage at line set at 6 volts D.C. These readings were taken with a vacuum tube voltmeter of the VoltOhmyst Junior type. Amperage drain 3. Amps.

TUBE	FUNCTION	CATH.	*	SC.	*	PLATE	*
6SG7	R.F	2.7	3	120	6	120	8
6SA7	Convertor . . .			-9.6 80	5 4	120	3
6SK7	1st. I.F. . .		5	80	6	120	8
6SQ7	Det. & 1st. Audio.					90	6
6K6	Output.	7.6	8	120	4	130	3

Voltage drop across filter choke 5 volts

* Socket Terminal Number.

PARTS LIST

CONTROLS

VC-0005	Volume Control with Switch
	or
VC-0006	Volume Control with Switch

CONDENSERS

AC-0005-1	Tuning Gang with Gears and Drive Hub
CE-0007	Capacitor-Lytic 3 Section 50-20-30 MFD.
CP-0005	Capacitor-Paper .006 MFD. 400 V.
CP-0008	Capacitor-Paper .1 MFD. 400 V.
CP-0010	Capacitor-Paper .05 MFD. 400 V.
CP-0013	Capacitor-Paper .1 MFD. 600 V.
CP-0015	Capacitor-Paper .01 MFD. 600 V.
CP-0016	Capacitor-Paper .002 MFD. 600 V.
CP-0022	Capacitor-Paper .25 MFD. 200 V.
CM-0019	Capacitor-Mica .004 MFD. 500 V. + or - 5%
CT-0002	Oscillator Padding Condenser 500 MFD.

COILS

LA-0016	Ant. Coil Broadcast Band
LA-0008	Ant. Coil "A" Band
LA-0009	Ant. Coil "B" Band
LO-0022	Osc. Coil Broadcast Band
LO-0021	Osc. Coil "A" Band
LO-0020	Osc. Coil "B" Band
LI-0021	1st I.F. Transformer in Can
LI-0022	Diode I.F. Transformer in Can
LR-0004	Wave Trap Coil Assy
LR-0003	Untuned RF Coil Assy

DIAL AND CONTROL ACCESSORIES

ES-0001	Dial Covering - Plastic Escutcheon for Cabinet
SP-0010	Dial Drive Spring
DC-0001	Dial Drive Cord 52" long
GR-0001	Rubber Grommet for Tuning Gang and Speaker Mounting
DG-0005	Calibrated Lucite Dial

DIAL AND CONTROL ACCESSORIES - Cont'd

AR-0025	Thumb Wheel Assy (Tone Control)
AR-0044	Thumb Wheel Assy (Phono Radio "A"-"B")
KB-0015-1	Knobs - Brown Bakelite

SPEAKER

SK-0004	Speaker 9" Elliptical P.M.

TRANSFORMERS

TO-0006	Speaker Output Transformer
LC-0010	Power Choke (395 ohms D.C.)
TP-0010	Power Transformer

TUBE COMPLEMENT

TU-6SG7
TU-6SA7
TU-6SK7
TU-6SQ7
TU-6V6

SOCKETS

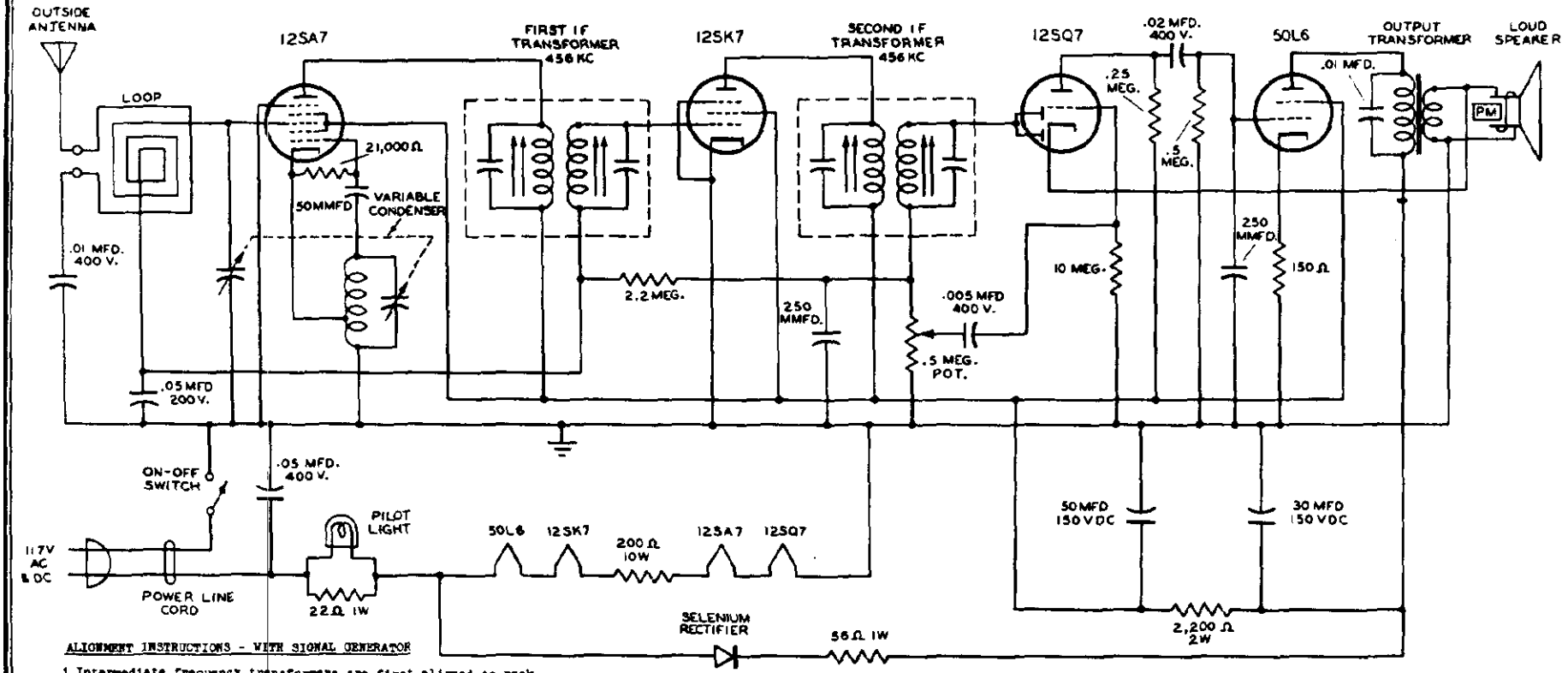
SO-0010	Phono Socket
SO-0017	Tube Socket
TB-0007	Terminal Strip, External Antenna
SO-0024	Vibrator Socket

CABINET

CW-0008	Cabinet complete with Escutcheon
AS-0240	Metal Grill Assy
BC-0009	Baffle used with above item

MISCELLANEOUS

VB-0002	Vibrator - 6 Volt - 6 Pin
PR-0009	Ground Clip - Vib.
PR-0026	Battery Clip - Negative
PR-0027	Battery Clip - Positive



ALIGNMENT INSTRUCTIONS - WITH SIGNAL GENERATOR

1. Intermediate frequency transformers are first aligned to peak at 456 kilocycles. Set signal generator at 456 kilocycles. Connect Ground lead of signal generator to receiver chassis and the signal input lead from signal generator to the radio frequency section(large condenser plates) of the variable condenser or to the grid connections of 14A7 or 12SA7 tubes.

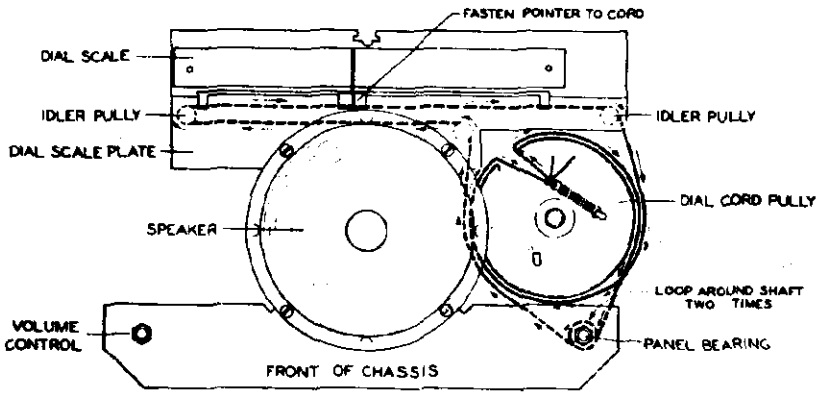
2. Have plates of variable condenser completely open (turn tuning knob as far to right as possible). Connect output meter to voice coil terminals of loud speaker, and tune for maximum signal volume.

3. Adjust both adjustment screws of second intermediate frequency transformer for maximum output signal over entire tuning range.

4. Repeat adjustments as in paragraph 82 above for first intermediate frequency transformer.

5. For radio frequency alignment adjustments, adjust signal generator to 1500 kilocycles, leaving input leads from signal generator to receiver same as in paragraph 50 above. Then set variable to 150 or 1500 kilocycles on dial scale. For maximum signal and most perfect alignment now adjust oscillator variable condenser section (small plates) trimmer condenser for strong 1500 kilocycle signal - without changing dial scale setting from 150. Then peak this 1500 kilocycle signal by slightly adjusting the radio frequency variable condenser (large plates) trimmer condenser.

6. Check the low end 55 dial position by adjusting signal generator to 550 kilocycles, which should result in good 550 kilocycle signal reception.

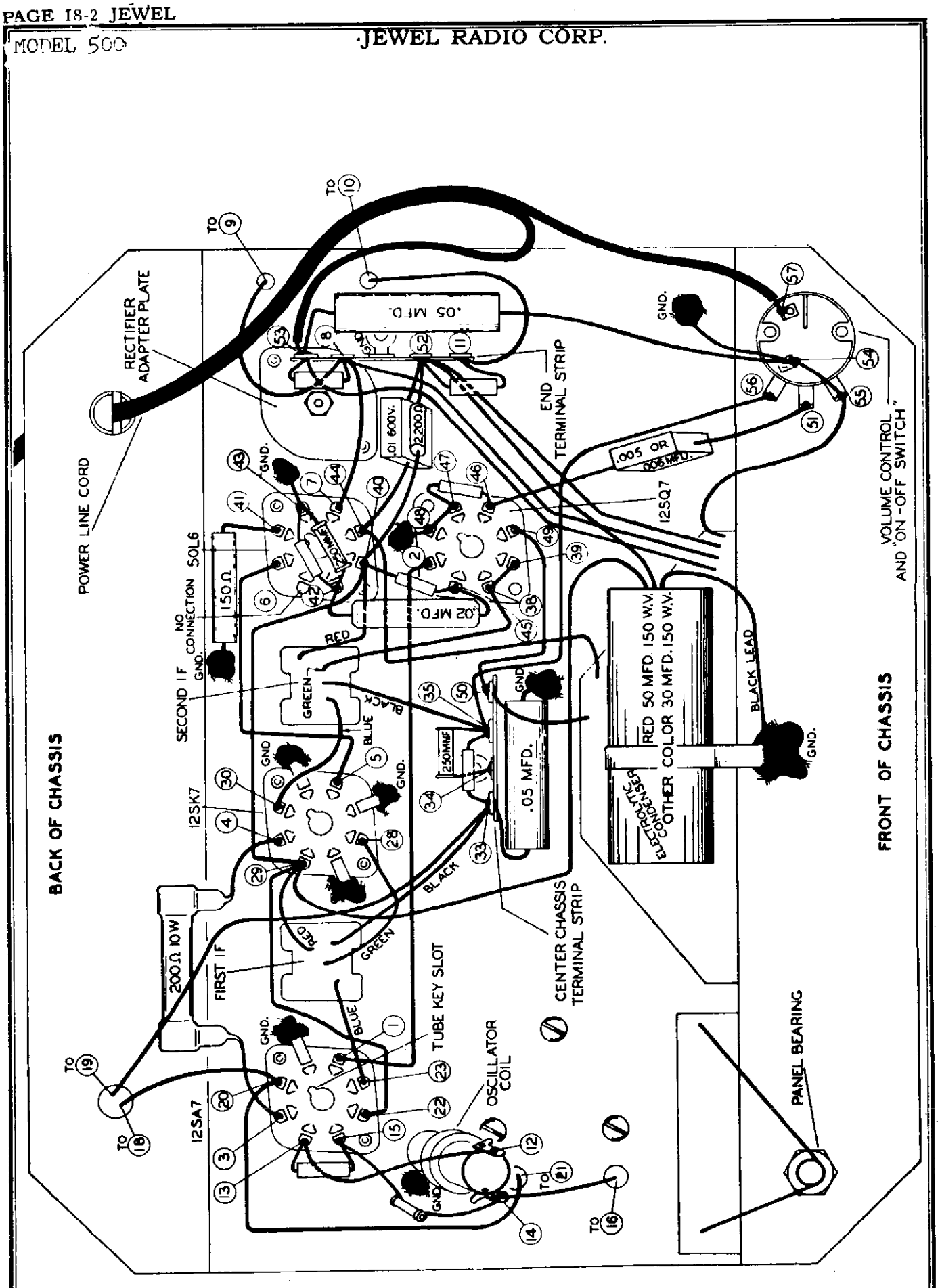


TROUBLE SHOOTING SUGGESTIONS

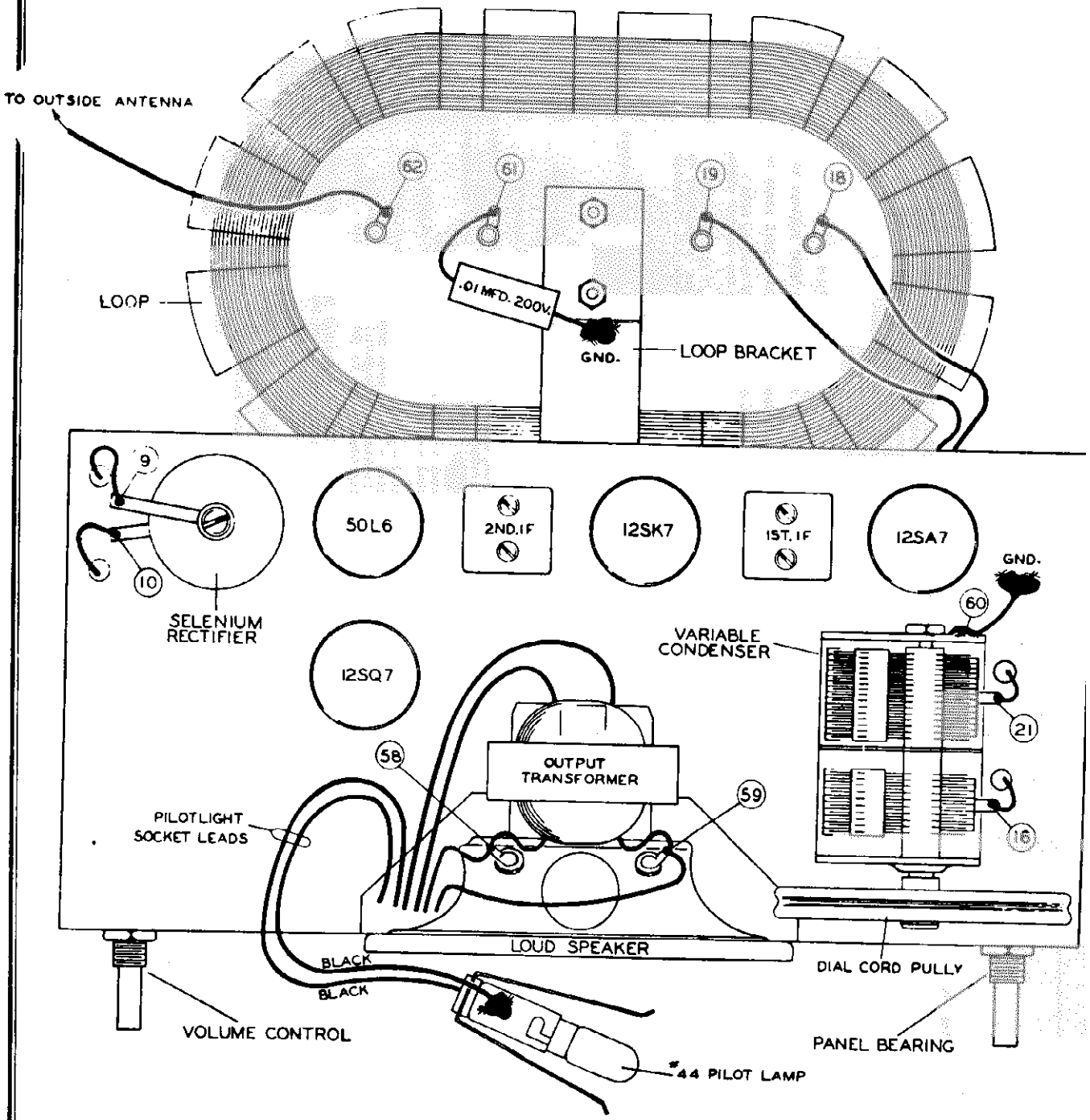
If receiver howls, oscillates or motorboats -

MODEL 500

JEWEL RADIO CORP.

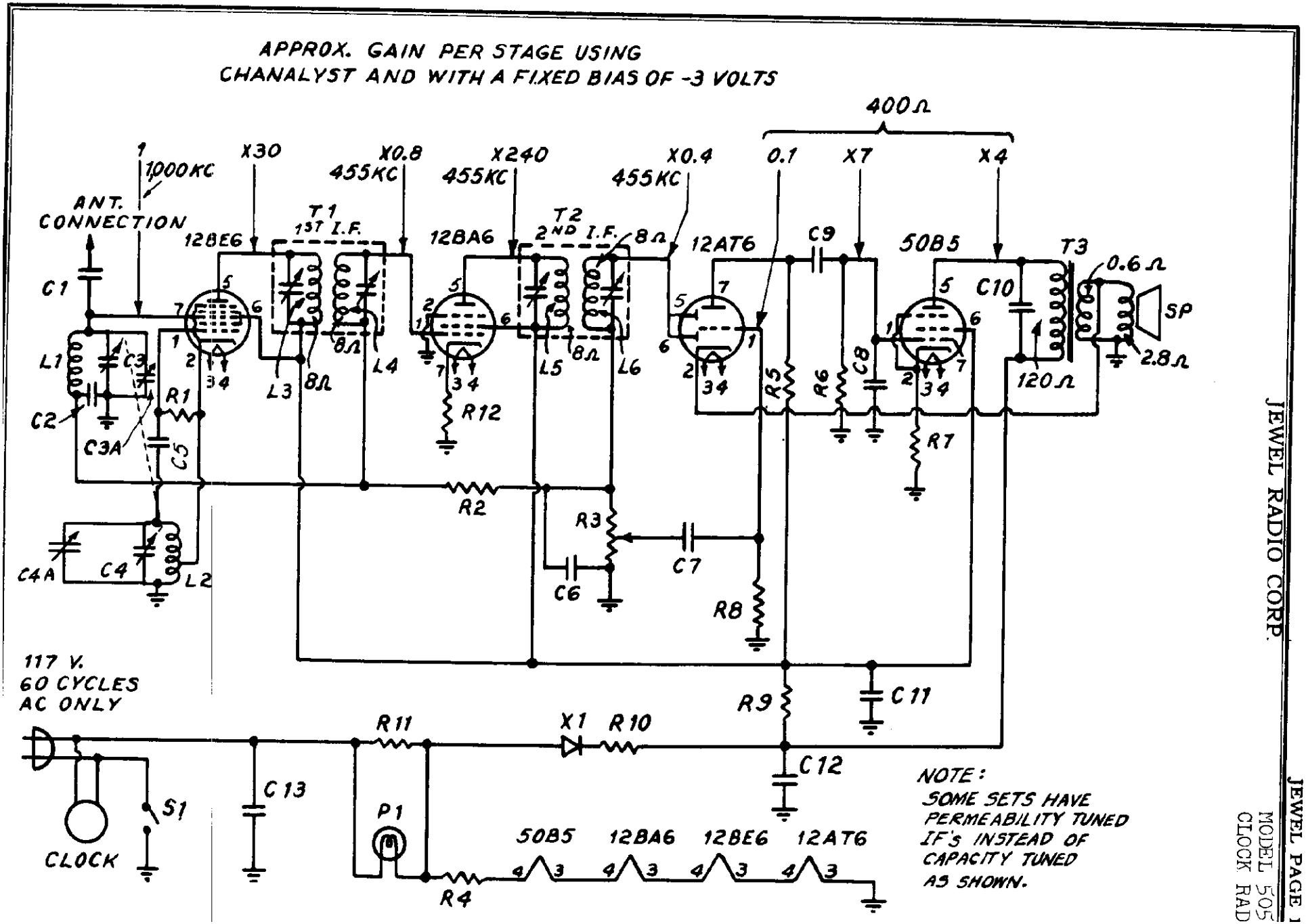


JEWEL RADIO CORP. MODEL 5C



TOP CHASSIS VIEW OF RECEIVER

Item No.	Description	Quantity
1	Antenna, Loop	1
2	Bearing, Panel	1
3	Bracket, Speaker	1
4	Cable, Dial	4 feet
5	Chassis	1
6	Coil, Oscillator	1
7	Condenser, Electrolytic 50-0-30 mfd. - 150 working volts	1
8	Condenser, ceramic 50 mmfd. 500-600 working volts	1
9	Condenser, ceramic 250 mmfd. 500-600 working volts	2
10	Condenser, paper - .005 or .006 mfd., 400 or 600 working volts	1
11	Condenser, paper - .01 mfd., 400 or 600 working volts	2
12	Condenser, paper - .02 mfd. 200 or 400 working volts	1
13	Condenser, paper - .05 mfd.200 or more working volts	1
14	Condenser, paper - .05 mfd. 400 to 600 working volts	1
15	Condenser, variable - dual section with 1" dial cord pulley attached	1
16	Cord, Power Line (rubber covered for 110 volt Model 500K and fabric covered for 220 volt Model 500KE)	1
17	Grommets, Rubber (for shock mounting variable condenser)	3
18	Knobs, Plastic (for tuning and volume control adjustments)	2
19	Light, Pilot (#44 single bayonet, 6-8 volts at 150 milliamperes)	1
20	Lockwashers, Steel - #6 for 6-32 machine screws - used as follows: 2 for speaker to dial plate; 4 for I. F. transformer	6
21	Lockwashers, Steel - #8 for 8-32 machine screws - used as follows: 2 for speaker to chassis; 2 for loop to loop bracket	4
22	Lockwashers, Steel - 3/8" inside diameter-used as follows: 1 for potentiometer volume control; 1for panel bearing	2
23	Lockwasher, Steel - #4 for 4/40 screws - used as follows:- 2 for loop bracket to chassis; 8 for sockets; 2 for adeptor plate; 1 for selenium rectifier	13
24	Nuts, Steel - 4/40 hexagon - used same as 4/40 lockwashers	13
25	Nuts, Steel - 6-32 hexagon - used same as #6 lock-washers	6
26	Nuts,Steel - 8-32 hexagon - usedsame as #8 lock-washers plus 2 additional for speaker to dial plate	6
27	Nuts,Steel - 3/8" by 36 thread hexagon - used same as 3/8" lockwashers	2
28	Plate, Dial - for mounting dial scale and idler pulleys	1
29	Plate, Selenium Rectifier Adaptor - for mounting over socket hole and then for mounting selenium rectifier	1
30	Pointer, Dial Scale	1
31	Dial Scale	1
32	Potentiometer or Volume Control with power supply "on-off" switch - 500,000 ohms	1
33	Pulleys, Idler - for dial cable and dial scale pointer assembly - rivet to back of dial plate	3
34	Rectifier, Selenium	1
35	Relief, Grip Strain - 2 pieces - plastic - for securing power line cord through rear of chassis to relieve strain on soldered connections when power supply cord is plugged in to power supply outlets	1
36	Resistor, Carbon 22 ohms 1 watt - (red-black color code)	1
37	Resistor, Carbon 56 ohms 1 watt - (green-blue-black color code)	1
38	Resistor, Carbon 150 ohms 1 watt - (brown-green color code)	1
39	Resistor, Carbon 200 ohms 10 watt - not color coded - usually marked with resistance value - has hole through center. This resistor is connected in filament circuit of tubes (from No. 3 of 12SA7 tube to No. 4 of 12SK7 tube) and is the PROTECTIVE FILAMENT CIRCUIT RESISTOR preventing current surge through filaments thus decreasing or eliminating tube burnouts and accordingly increasing tube life.	1
40	Resistor, Carbon - 2200 ohms 2 watts (red-red-red color code)	1
41	Resistor, Carbon - 21,000 ohms ½ watt (red-brown-orange color code)	1
42	Resistor, Carbon - 220,000 ohms ½ watt (red-red-yellow color code)	1
43	Resistor, Carbon - 470,000 ohms ½ watt (yellow-purple-yellow color code)	1
44	Resistor, Carbon - 2.2 megohms ½ watt (red-red-green color code)	1
45	Resistor, Carbon - 10 megohms ½ watt (brown-black-blue color code)	1
46	Rivets - shoulder - for attaching idler pulleys to back of dial plate	3
47	Rivets - Low oval head - for riveting dial scale to dial scale plate	2
48	Screws, Machine Steel - 4/40 x 3/8 binding head - used as follows:-8 for sockets; 2 for adaptor plate; 2 for loop brackst to base	12
49	Screws, Machine Steel - 6/32 by 3/4 inches long binding head - use as follows: 2 for loudspeaker to dial scale plate; 3 for mounting variable condenser	5
50	Screws, Machine Steel - 4/40 by 1½inches long - binding head - for mounting selenium rectifier.	1
51	Screws, Self-tapping steel - No. 6 by 3/4 inches long-binding head - for fastening chassis into cabinet	3
52	Screws, Machine Steel - 8/32 by ½ inches long - binding head - for loop to loop bracket.	4
53	Sockets, Octal-wafer	4
54	Socket, Pilot Light, with leads attached	1
55	Spacers, Steel - ½ inch diameter by 3/8 inch long with clearance hole for 6/32 machine screw - use for mounting variable condenser.	3.
56	Speaker, Permanent Magnet - 5 inch with attached output transformer	1
57	Spring, Dial Cable - for keeping tension in dial cable	1
58	Strip, Terminal - 4 lug with insulated mounting lug	2
59	Transformers, Intermediate Frequency - (Air) condenser tuned 456KC	2
60	Tube, Octal - 12SA7 - pentagrid converter	1
61	Tube, Octal - 12SK7 - triple-grid super-control amplifier	1
62	Tube, Octal - 12SQ7 - duplex-diode high-mu triode	1
63	Tube, Octal - 50L6 - beam power amplifier	1
64	Tubing, Insulating (Spaghetti) small - red - for insulating connections to 200 ohm resistor - pieces 1 inch long	2 pieces
65	Tubing, Insulating (Spaghetti) large - yellow - for insulating selenium rectifier connections - pieces 1 inch long	2 pieces
66	Washers, Felt - for under knobs on panel bearing and potentiometer (volume control)	2
67	Washer, Fibre - 1/2 inch diameter by 1/8 inch thick with 3/16" center hole - for spacing selenium rectifier	1
68	Washers, Metal - 3/8 inch diameter with No. 5 clearance hole - used as follows:- 6 for variable condenser; 2 for dial scale rivets	8
69	Washers, Ripple - metal ½ inch diameter with No.6 clearance hole - for use with item No. 49 self-tapping screws to fasten chassis into cabinet	3


APPROX. GAIN PER STAGE USING
CHANALYST AND WITH A FIXED BIAS OF -3 VOLTS
400Ω
1
1000KC
X30
X0.8
455KC
X240
455KC
X0.4
455KC
0.1
X7
X4
ANT.
CONNECTION
T1
1ST I.F.
T2
2ND I.F.
12BE6
12BA6
12AT6
50B5
T3
8Ω
0.6Ω
SP
2.8Ω
120Ω
C1
C2
C3
C3A
C4
C4A
C5
C6
C7
C8
C9
C10
C11
C12
C13
L1
L2
L3
L4
L5
L6
R1
R2
R3
R4
R5
R6
R7
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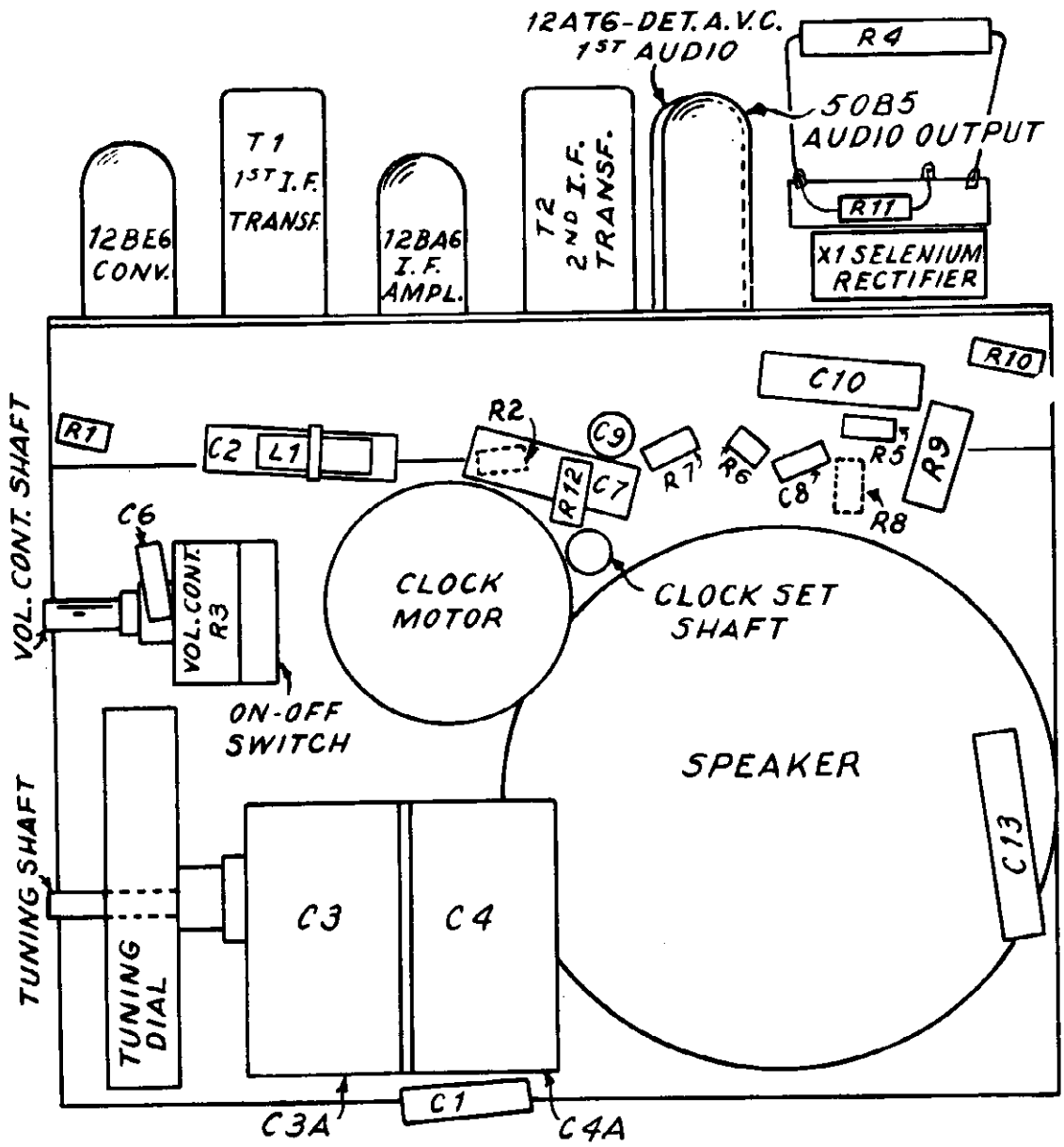
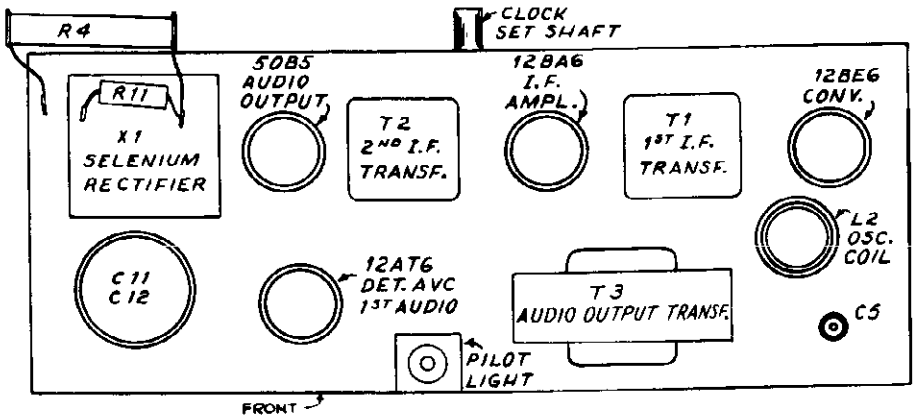
R11
R12
X1
P1
S1
CLOCK
117 V.
60 CYCLES
AC ONLY
50B5
12BA6
12BE6
12AT6
NOTE:
SOME SETS HAVE
PERMEABILITY TUNED
IF's INSTEAD OF
CAPACITY TUNED
AS SHOWN.

MODEL 505
CLOCK RADIO

JEWEL RADIO CORP.





JEWEL RADIO CORP.

MODEL 505
CLOCK RAD

TUBE	PIN	VTVM	20,000/V	1,000/V	RESISTANCE
12 BE6 Conv.					
600 KC	1	-4.5 -5	-3.8 -4.8	-2 -2.4	20K
	2	0	0	0	0.4Ω
	3	AC	AC	AC	10Ω
	4	AC	AC	AC	24Ω
	5	+84	+84	+84	over 100K
	6	+84	+84	+84	over 100K
	7	-0.3	0	0	3 megs.
12 BA6 IF AMPL	1	-0.3	0	0	3 megs.
	2	0	0	0	0
	3	AC	AC	AC	24Ω
	4	AC	AC	AC	38Ω
	5	+84	+84	+84	over 100K
	6	+84	+84	+84	over 100K
	7	+1	+1	+1	100Ω
12AT6 DET. AVC 1st AUDIO	1	-0.4	-0.2	0	10 megs.
	2	0	0	0	0.4Ω
	3	AC	AC	AC	0
	4	AC	AC	AC	10Ω
	5	-0.5	-0.4	-0.2	500K
	6	-0.5	-0.4	-0.2	500K
	7	+60	+60	+28	over 100K
50B5 Audio Output	1	0	0	0	500K
	2	+5	+5	+5	150Ω
	3	AC	AC	AC	38Ω
	4	AC	AC	AC	85Ω
	5	+125	+125	+125	over 100K
	6	+85	+85	+85	over 100K
	7	0	0	0	500K

ALL VOLTAGE AND RESISTANCE MEASUREMENTS MADE WITH RESPECT TO CHASSIS GROUND. AND WITH A LINE VOLTAGE 116 V.A.C.

ALIGNMENT PROCEDURE

Connect output meter across Voice Coil.

Connect the signal generator to the standard Hazeltine Loop Model 1150 and couple it loosely to the receiver loop. Set the volume control at maximum, and fully mesh the tuning capacitor.

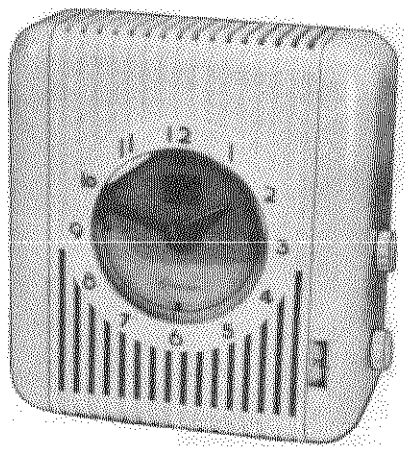
The output of the signal generator should be just sufficient to give a readable deflection on the output meter.

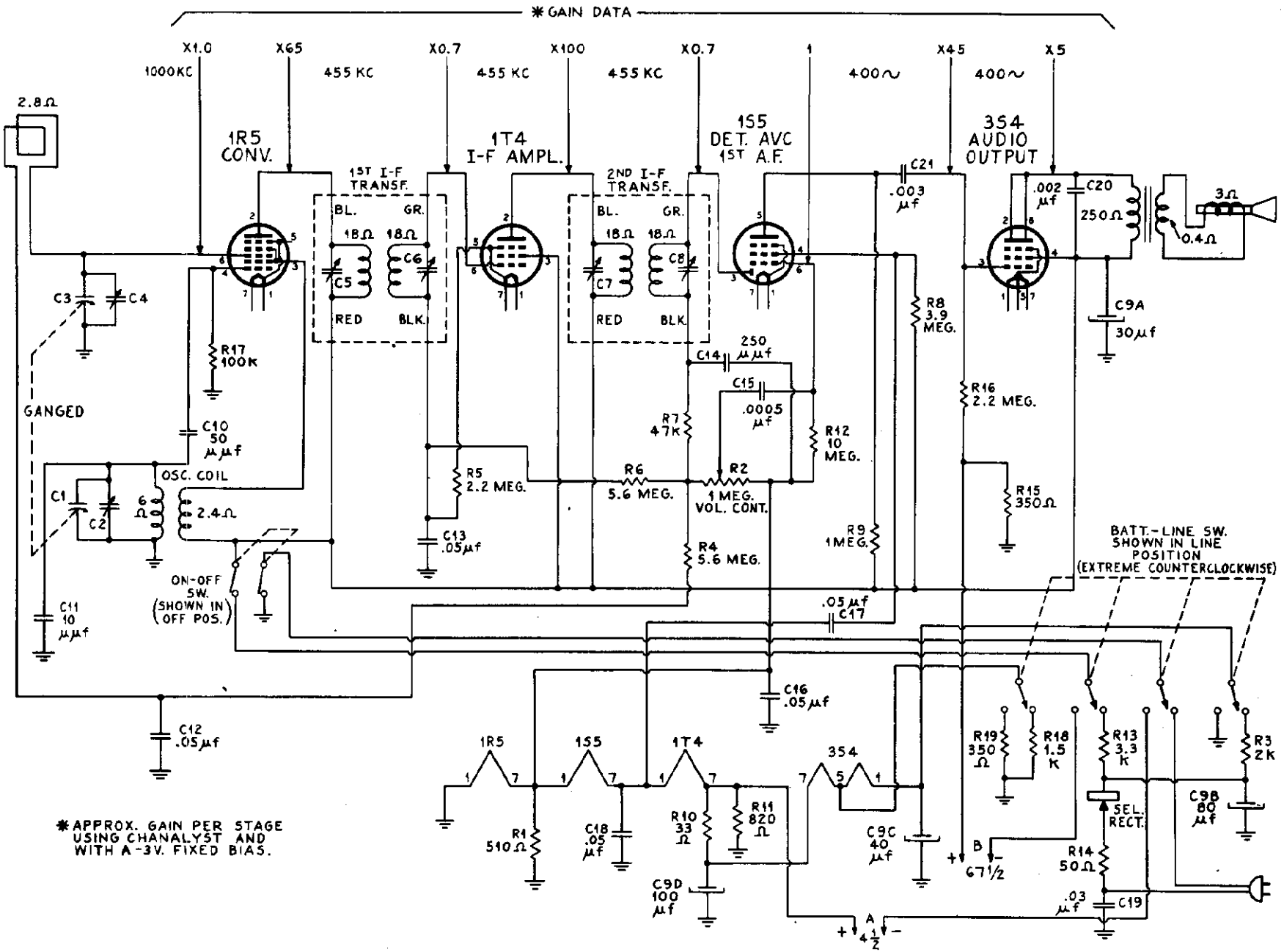
Set the signal generator to 455 kc and adjust i-f trimmers for maximum output in the following order: L6, L5, L4, L3. Repeat sequence if trimmers were badly maladjusted.

Set the signal generator and receiver to 1600 kc and adjust the oscillator trimmer C4A for maximum output.

Set the signal generator and receiver to 1400 kc and adjust the antenna trimmer C3A for maximum output.

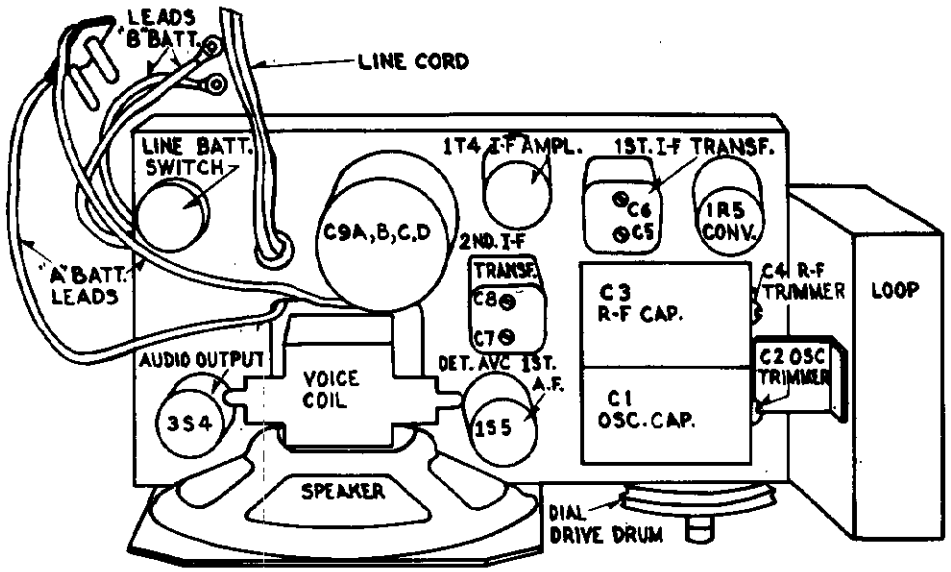
Set the signal generator and receiver to 1400 kc and readjust oscillator trimmer C3A for maximum output.



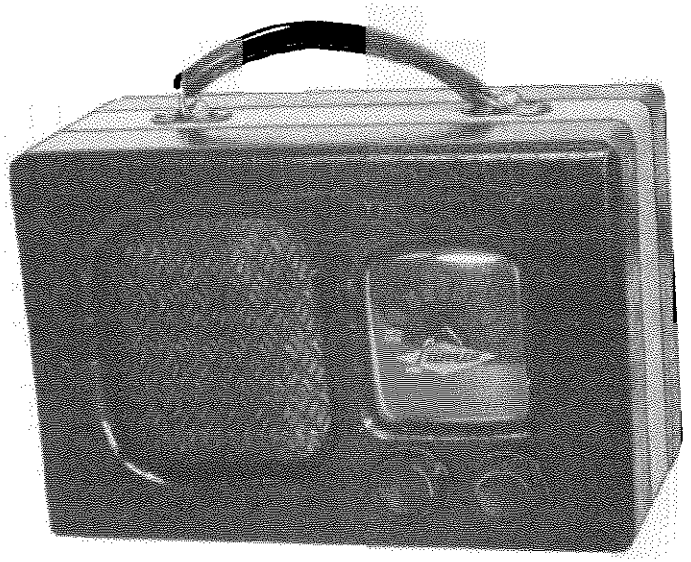


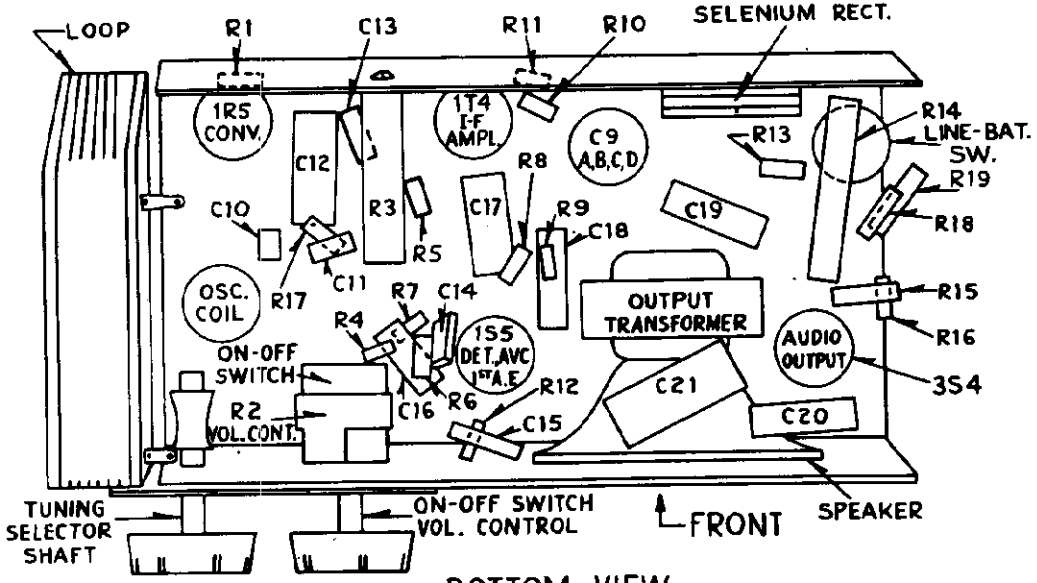
LA MAGNA MFG. CO.

LA MAGNA MODELS LAM
300C

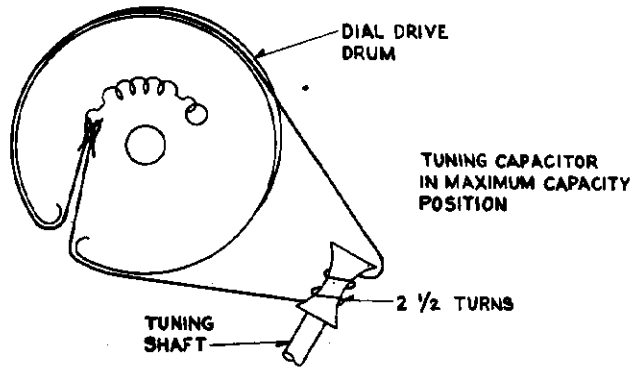


TOP VIEW





BOTTOM VIEW



DIAL STRINGING

LA MAGNA MFG. CO.

MODELS LAMC 3000

Alignment Procedure

IF ALIGNMENT

Remove chassis from cabinet. Connect an output meter across the voice coil. Connect the signal generator to the standard Hazeltine loop, Model 1150 and couple it loosely to the receiver loop.

Set the signal generator to 455 KC and fully mesn the receiver tuning capacitor. Keep the receiver volume control at maximum and the output of the signal generator sufficient to give a readable deflection on the output meter. Adjust for maximum IF trimmers, C8, C7, C6, C5.

RF OSC ADJUSTMENT

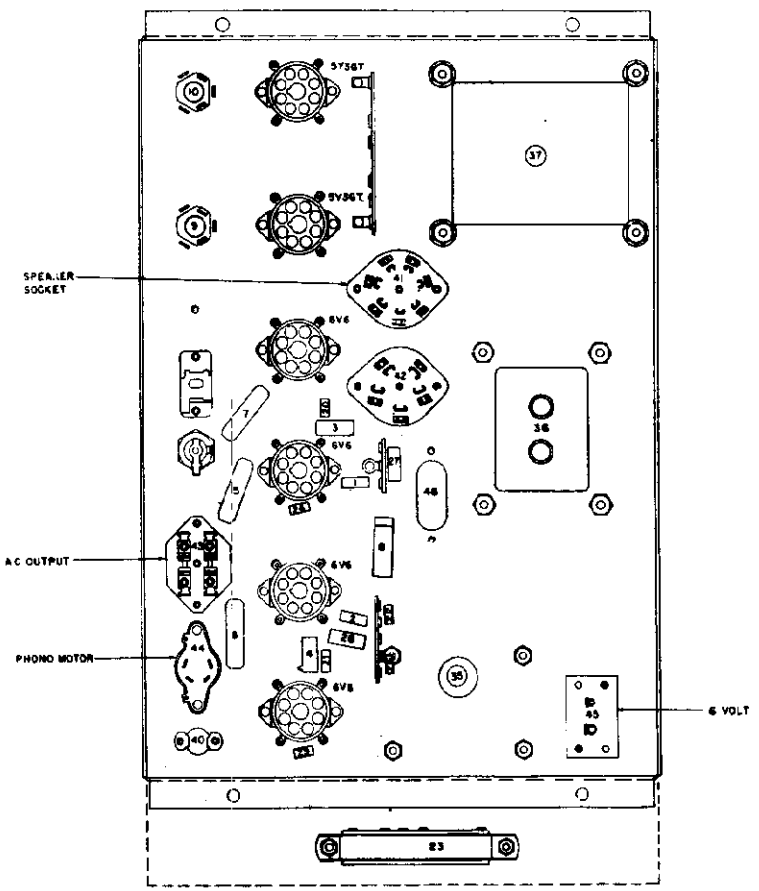
Keeping the same setup as used for the IF Alignment, set the signal generator and receiver to 1600 KC and adjust oscillator trimmer C2 for maximum output.

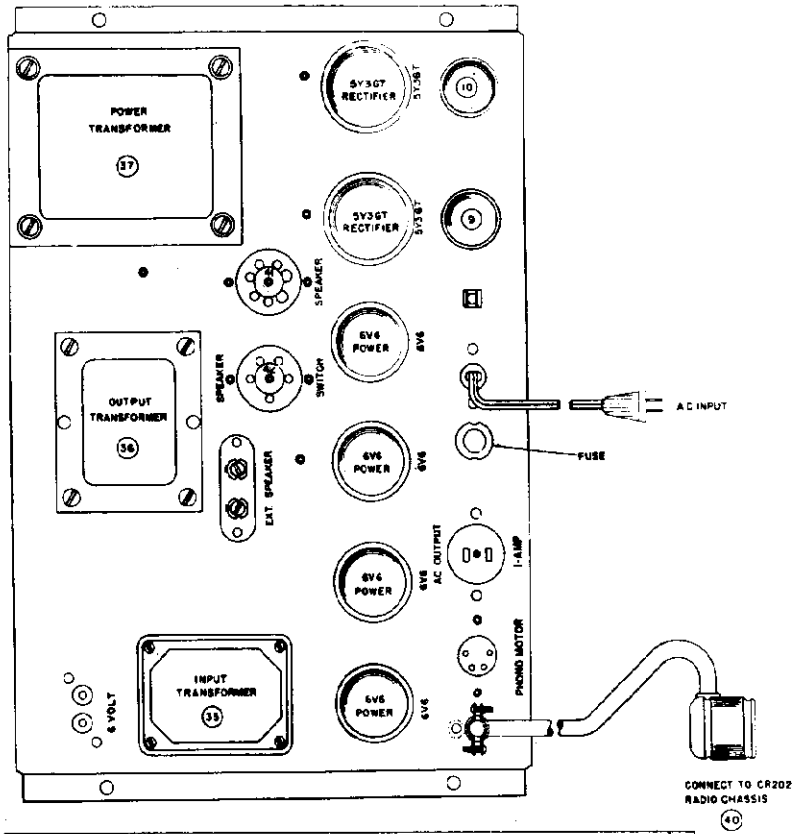
Set the signal generator and receiver to 1400 KC and adjust RF trimmer C4 for maximum output.

TUBE	PIN	VTVM	20,000Ω/V	1,000Ω/V	RESISTANCE
1R5	1	0	0	0	0
60NV	2	+71V.	+71	+71	over 5 Meg.
	3	+71V.	+71	+71	over 5 Meg.
OSC Volt	4				
	550KC	-20	-12	-5.4	100K
	1600KC	-37	-23	-22	100K
	5	0	0	0	0
	6	0	0	0	7 Meg.
	7	+1.4	+1.4	+1.4	17Ω
1T4	1	+2.75	+2.75	+2.75	31Ω
	2	+71	+71	+71	over 5 Meg.
	3	+71	+72	+71	over 5 Meg.
	4	--	--	--	---
	5	+2.75	+2.75	+2.75	21Ω
	6	+1.9	+0.3	0	1.6 Meg.
	7	+4	+4	+4	41Ω
1S5	1	+1.4	+1.4	+1.4	17Ω
DET AVC	2	+1.0	+1.0	0	0.9 Meg.
1st AF	3	+1.1	+0.3	0	0.9 Meg.
	4	+20	+17	+0.2	over 5 Meg.
	5	+17	+14	+0.8	over 5 Meg.
	6	+0.8	0	0	9 Meg.
	7	+2.8	+2.8	+2.8	31Ω
3S4	1	+9	+9	+9	95Ω
	2	+70	+70	+70	over 5 Meg.
	3	0	0	0	2.1 Meg.
	4	+71	+71	+71	over 5 Meg.
	5	+7.5	+7.5	+7.5	80Ω
	6	+70	+70	+70	over 5 Meg.
	7	+6	+6	+6	65Ω

(Bolt-line switch in line position)

All voltage and resistance measurements are made with respect to chassis ground and with a line voltage of 116V. AC

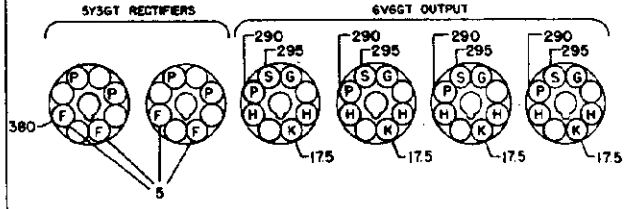




VOLTAGE TABLE

BOTTOM VIEW OF CHASSIS

MEASURE HEATER AND FILAMENT VOLTAGES DIRECTLY ACROSS SOCKET TERMINALS
ALL OTHER VOLTAGES MEASURED FROM SOCKET TERMINAL TO GROUND WITH A 20,000 OHMS/VOLT VOLTMETER. BAND SWITCH ON CR202 CHASSIS IN SHORT WAVE POSITION
HEATERS (H) 6.3 V.A.C.
TOTAL POWER CONSUMPTION (CR202 & AMP109) 200 WATTS.
LINE VOLTAGE 117 V. A.C.



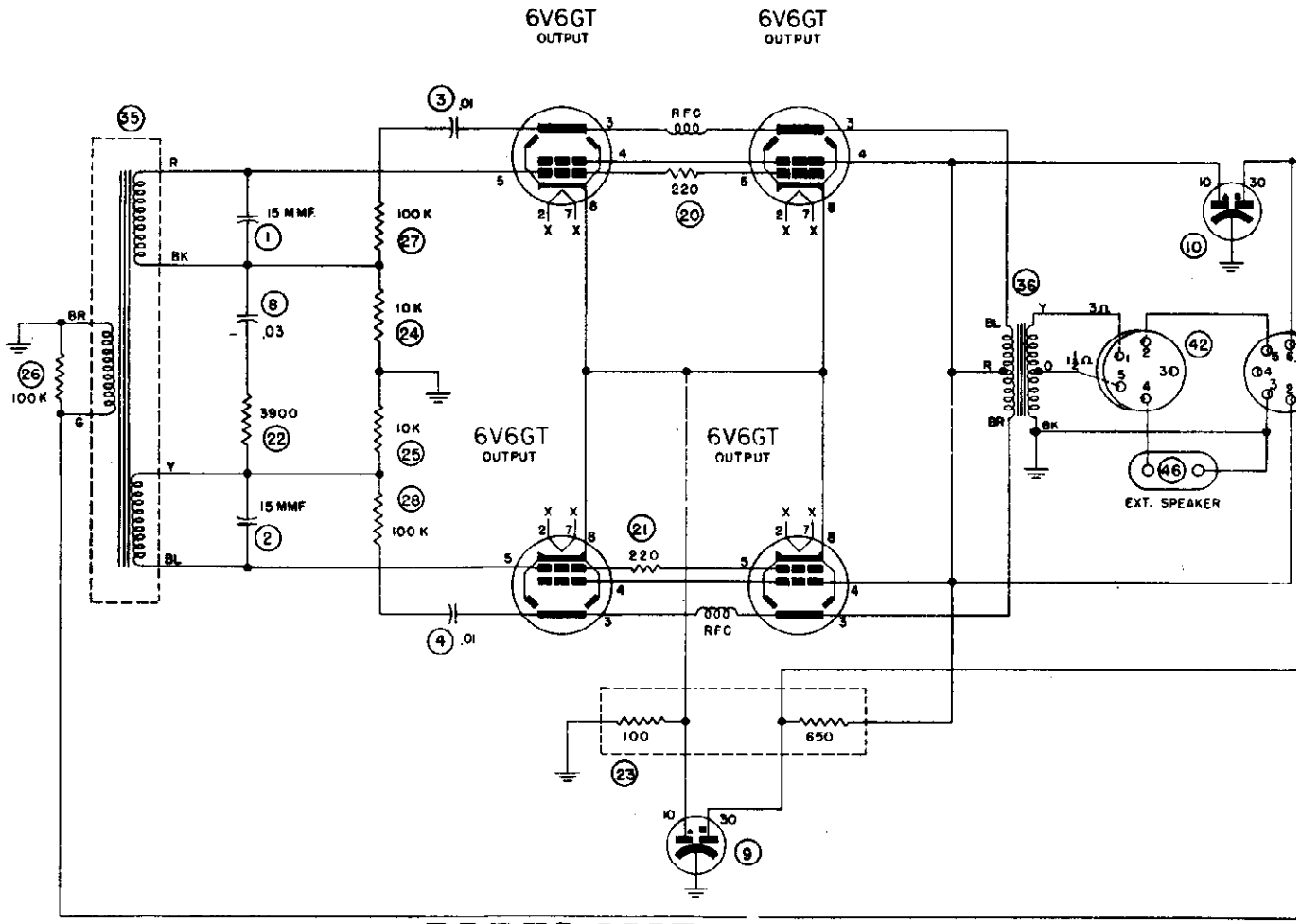
Power supply	117 volts 50/60 cycles AC
Power consumption	*200 watts
Power output	20 watts
Output impedance	2.5/1.7 ohms

Tubes:

Power output (push-pull parallel stage)	(4) 6V6GT
Rectifiers	(2) 5Y3G

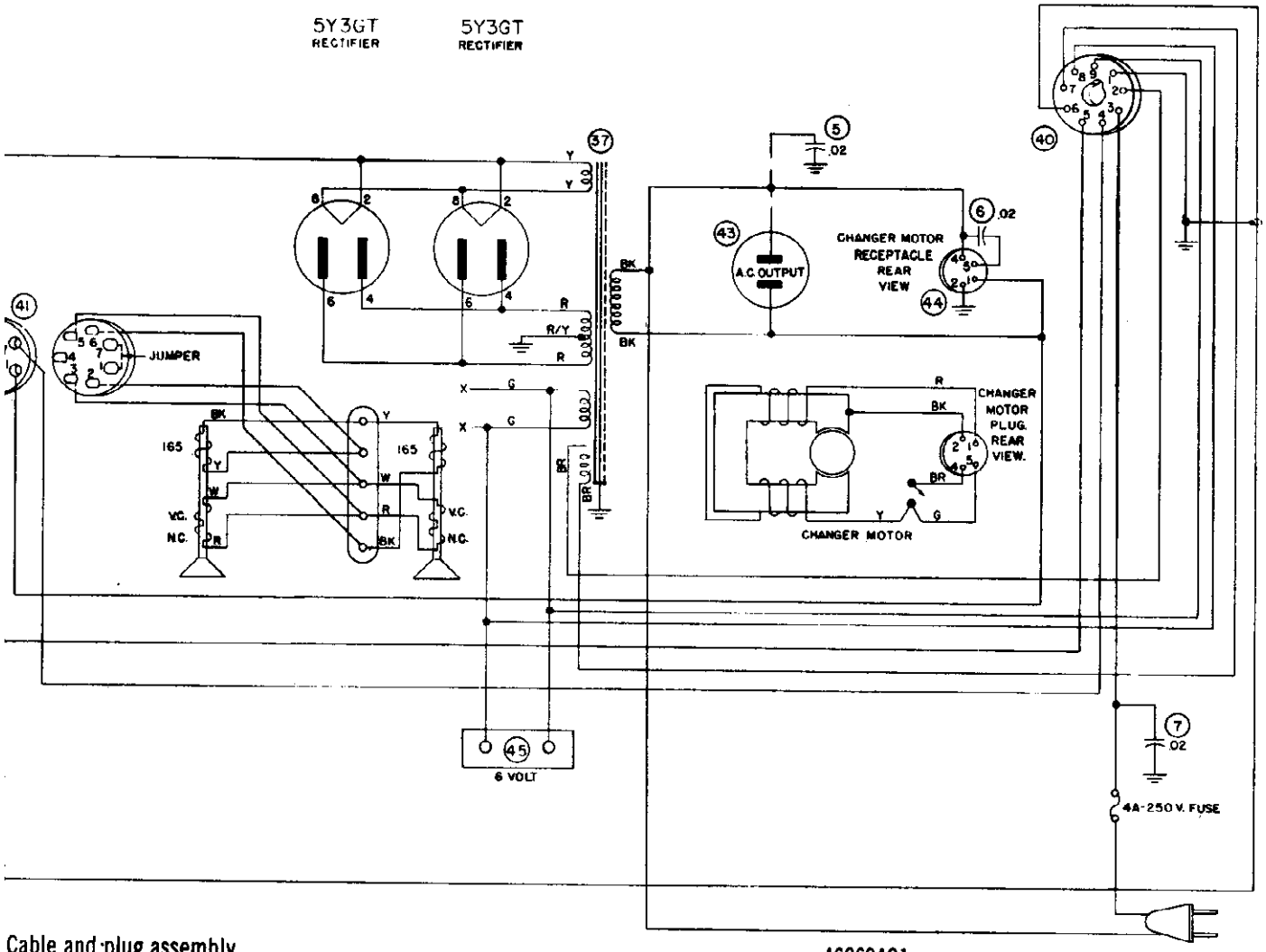
Speakers:

	No. 583108	No. 583109

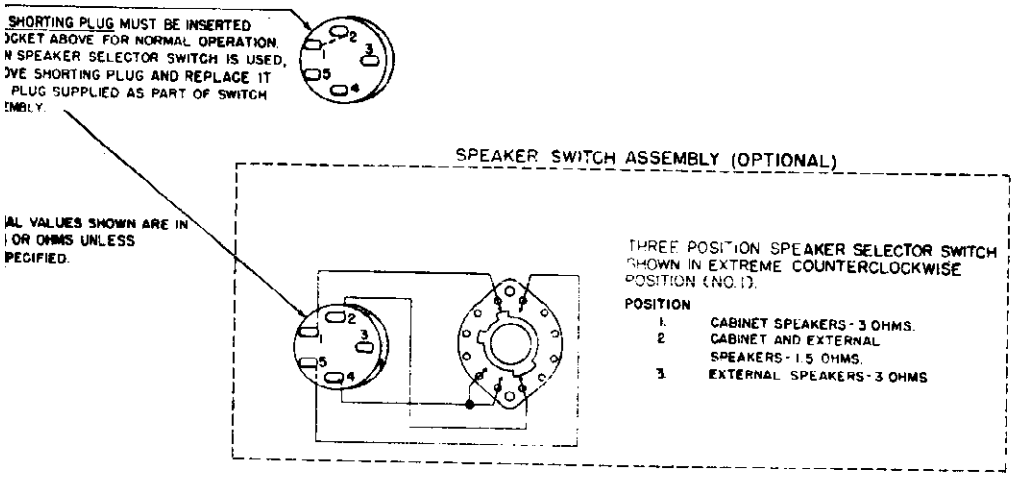


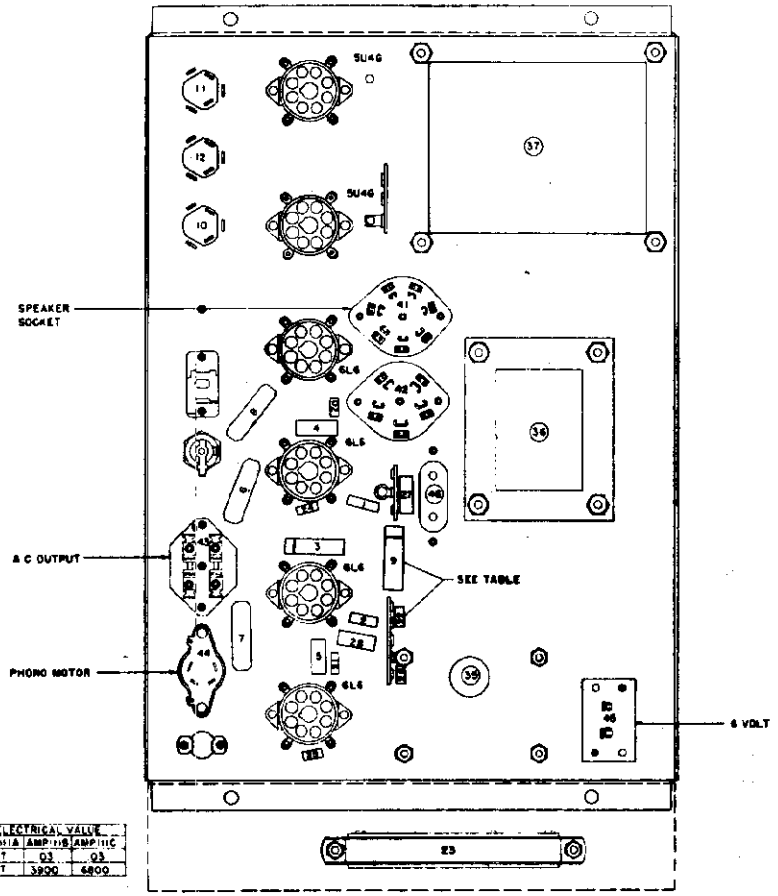
PARTS LIST

REFERENCE NO	DESCRIPTION	MAGNAVOX PART NO.
1	Capacitor, molded mica, 15 mmf	250159G93
2	Capacitor, molded mica, 15 mmf	250159G93
3	Capacitor, paper, .01 mfd. 600 V	250129G2
4	Capacitor, paper, .01 mfd. 600 V	250129G2
5	Capacitor, paper, .02 mfd. 600 V	250129G3
6	Capacitor, paper, .02 mfd. 600 V	250129G3
7	Capacitor, paper, .02 mfd. 600 V	250129G3
8	Capacitor, tubular, .03 mfd. 400 V	250152G25
9	Capacitor, electrolytic, 30-10 mfd. 475 V	270023G2
10	Capacitor, electrolytic, 30-10 mfd. 475 V	270023G2
20	Resistor, composition, 220 ohms ½ W	230084G9
21	Resistor, composition, 220 ohms ½ W	230084G9
22	Resistor, composition, 3900 ohms ± 10% ½ W	230084G69
23	Resistor, wire wound, 100-650 ohms 7 W	240040G1
24	Resistor, composition, 10,000 ohms ½ W	230084G19
25	Resistor, composition, 10,000 ohms ½ W	230084G19
26	Resistor, composition, 100,000 ohms ± 10% ½ W	230084G86
27	Resistor, composition, 100,000 ohms 1 W	230085G25
28	Resistor, composition, 100,000 ohms 1 W	230085G25
35	Transformer, input	320021G2
36	Transformer, output	330024G1
37	Transformer, power, 117 V., 50-60 cycle	300037G1
40		
41		
42		
43		
44		
45		
46		

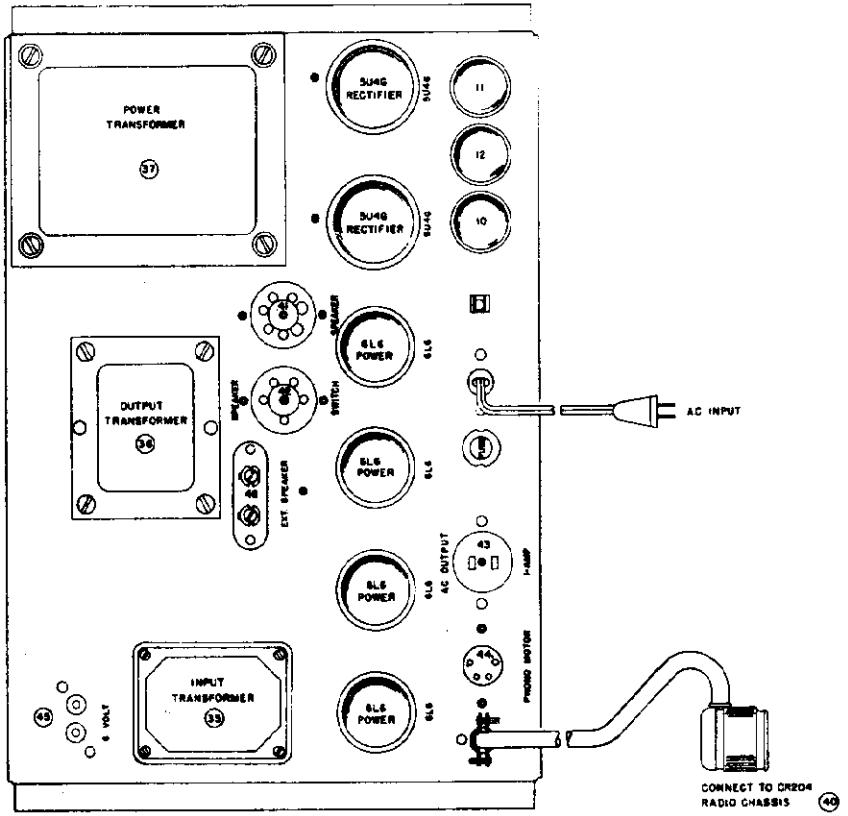


Cable and plug assembly	460634G1
Socket, speaker connection	180504G16
Socket, speaker switch	180504G6
Socket, AC power connection	180428G1
Socket, phonograph motor connection	180501G5
Socket, 6-volt outlet	189788G2
Terminal board—external speaker connection	209601G2





ITEM NO	ELECTRICAL VALUE AMP-111A	AMP-111B	AMP-111C
9	OMIT	03	03
22	OMIT	3900	6800



SPECIFICATIONS

Power supply.....117 volts 50/60 cycles AC
Power consumption.....*250 watts
Power output.....45 watts
Output impedance.....15/7.5/1.5 ohms

Tubes:
Power output (push-pull parallel stage).....(4) 6L6G
Rectifiers .....(2) 5U4G

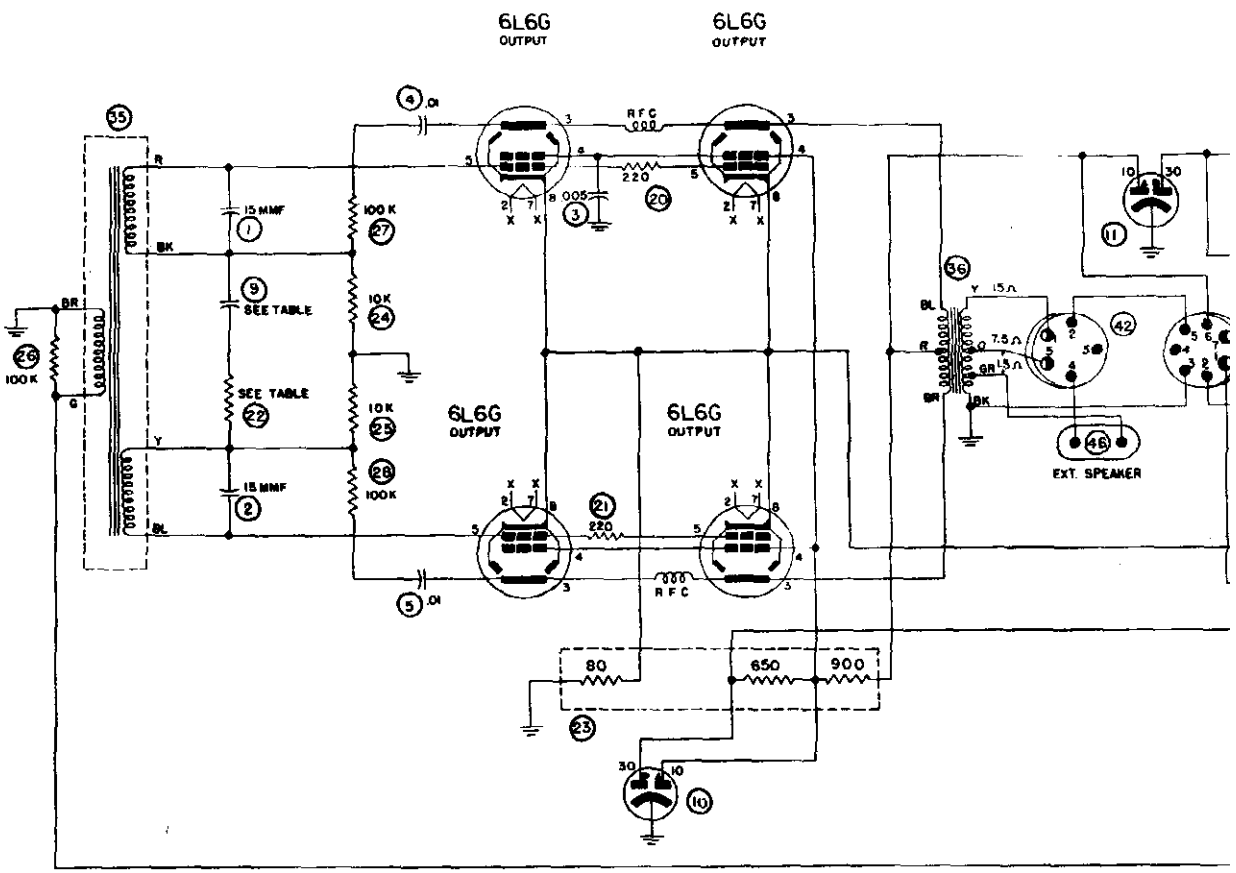
AMP-111 Speakers:	No. 583002 (Bass)	No. 580005 (Tweeter)
Field coil resistance	150 ohms	PM
Voice coil resistance	12 ohms	11 ohms
or;	No. 582999 (Bass)	No. 580006 (Tweeter)
Field coil resistance	PM	150 ohms
Voice coil resistance	12 ohms	11 ohms

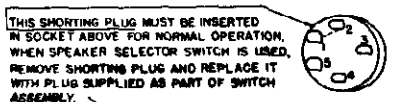
*Power consumption is for amplifier and CR-204 radio chassis.

PARTS LIST

REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
1	Capacitor, molded mica, 15 mmf	250159G93
2	Capacitor, molded mica, 15 mmf	250159G93
3	Capacitor, paper, .005 mfd. 600 V	250152G41
4	Capacitor, paper, .01 mfd, 600 V	250129G2
5	Capacitor, paper, .01 mfd, 600 V	250129G2
6	Capacitor, paper, .02 mfd, 600 V	250129G3
7	Capacitor, paper, .02 mfd, 600 V	250129G3
8	Capacitor, paper, .02 mfd, 600 V	250129G3
9	Capacitor, paper, .03 mfd, 400 V, (AMP-111B and C only)	250152G25
10	Capacitor, electrolytic, 30-10 mfd, 475 V	270023G2
11	Capacitor, electrolytic, 30-10 mfd, 475 V	270023G2
12	Capacitor, electrolytic, 30-10 mfd, 475 V	270023G2
20	Resistor, composition, 220 ohms, ½ W	230084G9
21	Resistor, composition, 220 ohms, ½ W	230084G9
22	Resistor, composition, 3900 ohms ± 10%, ½ W, (AMP-111B only)	230084G69
	Resistor, composition, 6800 ohms ± 10%, ½ W, (AMP-111C only)	230084G72
23	Resistor, wire wound, 80-650-900 ohms, 10 W	240039G1
24	Resistor, composition, 10,000 ohms, ½ W	230084G19
25	Resistor, composition, 10,000 ohms, ½ W	230084G19
26	Resistor, composition, 100,000 ohms ± 10%, ½ W	230084G86
27	Resistor, composition, 100,000 ohms, 1 W	230085G25
28	Resistor, composition, 100,000 ohms, 1 W	230085G25
35	Transformer, input	320021G1
36	Transformer, output	330028G1
37	Transformer, power, 117 V, 50-60 cycle	300042G1
40	Cable and plug assembly	460634G1
41	Socket, speaker connection	180504G16
42	Socket, speaker switch	180504G6
43	Socket, AC power connection	180428G1
44	Socket, phonograph motor connection	180501G5
45	Socket, 6-volt outlet	189788G2
46	Terminal board—external speaker connection	209601G2
51	Filter assembly, (AMP-111A only)	350041G1
52	Socket,15″ speaker connection to filter, (AMP-111A only)	180504G2
53	Socket, 15″ speaker to tweeters, (AMP-111B only)	180504G2
54	Plug, 15″ speaker	180503G3
55	Plug, tweeter, (AMP-111A only)	180503G5
56	Socket, octal, (AMP-111A only)	180194G4
57	Plug, filter to amplifier connection, (AMP-111A only)	180503G4
58	Plug, tweeter to amplifier connection, (AMP-111B only)	180503G4
59	Coil, choke, A. F., (AMP-111B only)	350042G1
60	Capacitor, paper, 8 mfd, 100 V. (AMP-111B only)	250167G1

EXTENSION SPEAKER—Two screw terminals are provided on the rear of the amplifier chassis for the connection of an extension speaker line. No. 582688 12-inch permanent-magnet extension speakers are available through all authorized Magnavox dealers.



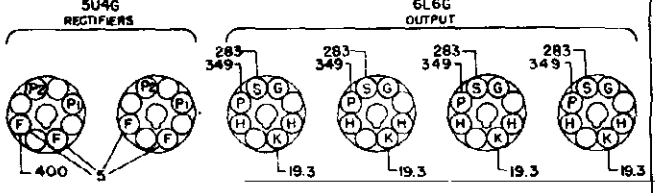


ALL ELECTRICAL VALUES SHOWN ARE IN MICROFARADS OR OHMS UNLESS OTHERWISE SPECIFIED.

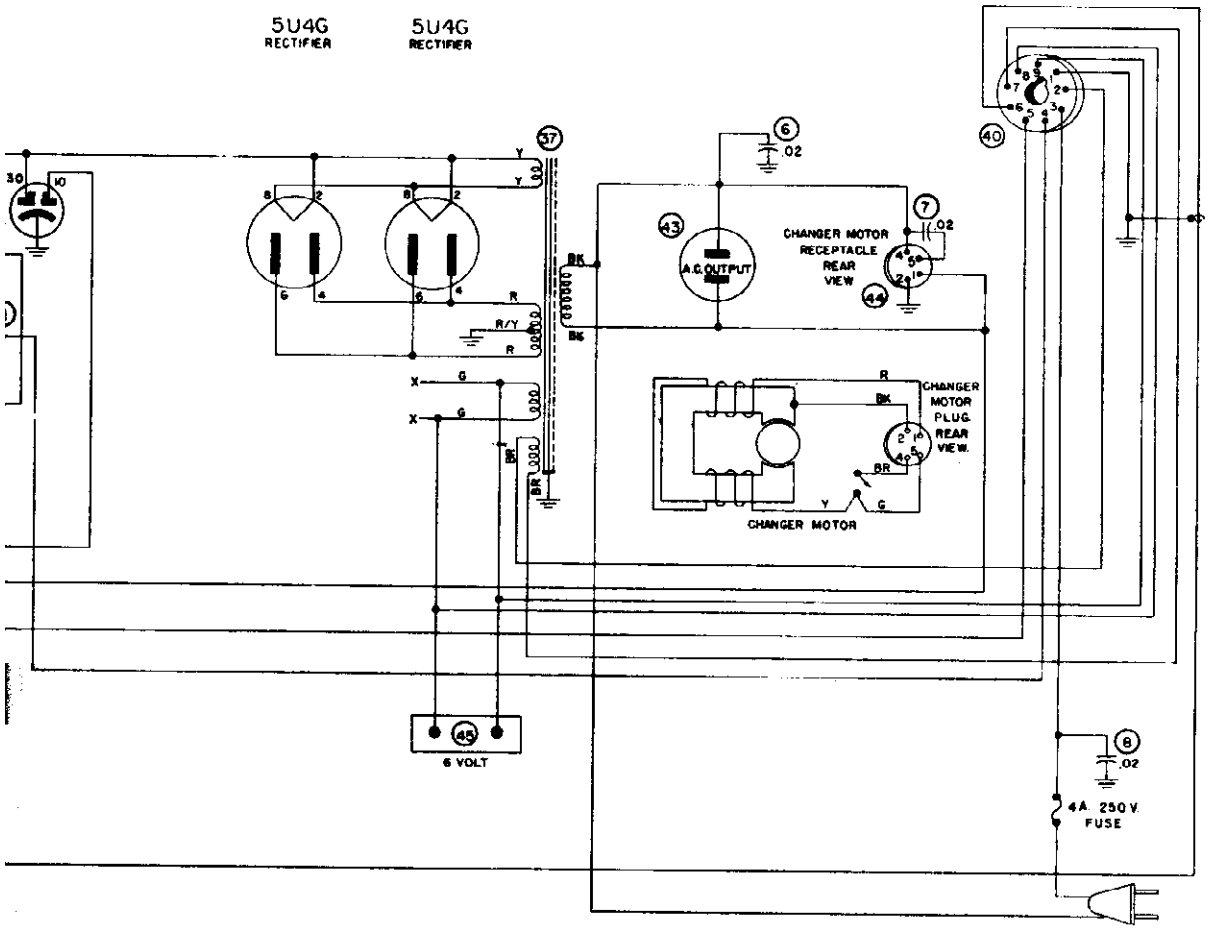
VOLTAGE TABLE

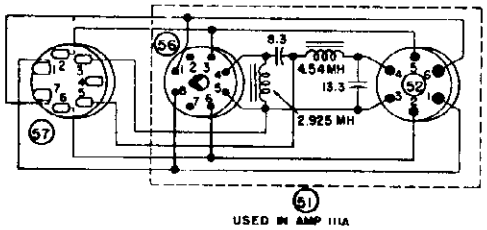
BOTTOM VIEW OF CHASSIS

MEASURE HEATER AND FILAMENT VOLTAGES DIRECTLY ACROSS SOCKET TERMINALS.
ALL OTHER VOLTAGES MEASURED FROM SOCKET TERMINAL TO GROUND WITH A 20,000 OHMS/VOLT VOLTMETER. BAND SWITCH ON CR204 CHASSIS IN SHORT WAVE POSITION.
HEATERS (H) 6.3 V A.C.
TOTAL POWER CONSUMPTION (CR204 & AMP III) 260 WATTS.
LINE VOLTAGE 117 V A.C.

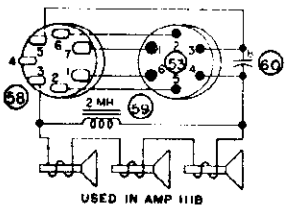


111C	.03	6800
111B	.03	3900
111A	OMIT	OMIT
MODEL	ITEM 9	ITEM 22





USED IN AMP IIIA



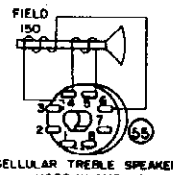
USED IN AMP IIIB

WITCH ASSEMBLY (OPTIONAL)

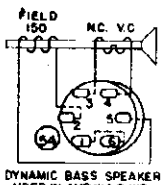
THREE POSITION SPEAKER SELECTOR SWITCH SHOWN IN EXTREME COUNTERCLOCKWISE POSITION (NO. 1).

POSITION
1. CABINET SPEAKERS
2. CABINET AND EXTERNAL SPEAKERS
3. EXTERNAL SPEAKERS

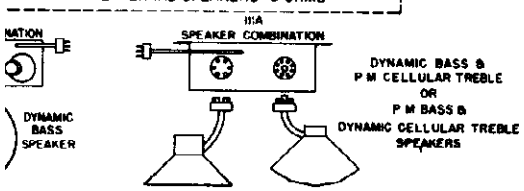
SPEAKER IMPEDANCE
CABINET SPEAKERS - 15 OHMS
EXTERNAL SPEAKERS - 3 OHMS



CELLULAR TREBLE SPEAKER
USED IN AMP IIIA



DYNAMIC BASS SPEAKER
USED IN AMP IIIA & IIIB

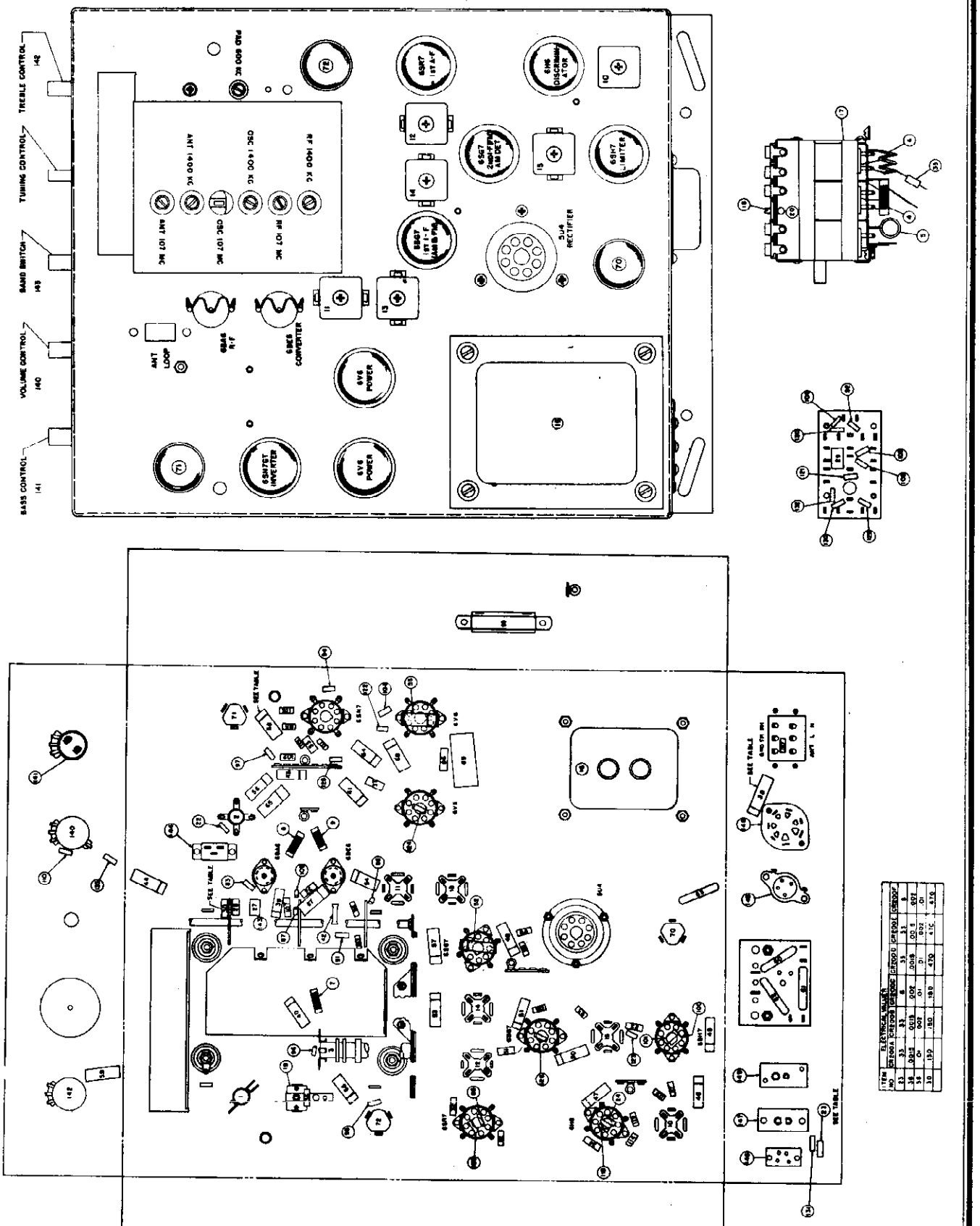


DYNAMIC BASS &
P M CELLULAR TREBLE
OR
P M BASS &
DYNAMIC CELLULAR TREBLE
SPEAKERS

NOTE - VOICE COIL CONNECTIONS TO SPEAKER PLUGS ARE THE SAME FOR PM OR DYNAMIC SPEAKERS
JUMPER BETWEEN 1 & 8 AND 1 & 6 OMITTED WITH PM SPEAKERS.

MODELS CR-200 SERIES

THE MAGNAVOX CO.



ALIGNMENT PROCEDURE

Alignment of this receiver requires the use of an accurately calibrated RF signal generator, range 455 kc. to 107 mc., an output meter, and a vacuum tube voltmeter of greater than 10 megohm input impedance. All trimmer condensers can be identified by stampings on the chassis and gang condenser cover and are shown on the chassis layout diagram.

AM ALIGNMENT

I-F ALIGNMENT

1. Set volume, treble, and bass controls to maximum. Set Band Switch to Broadcast position, and dial pointer to 1000 kc.

2. Tune the signal generator to EXACTLY 455 kc.

3. Connect output of modulated signal generator to the signal grid of the 6BE6 (pin 7) through a .01 mfd. capacitor and signal generator ground to radio chassis.

4. AM and FM i-f transformers on this model are separate and can be identified on the chassis layout diagram Figure 3.

5. Connect output meter across voice coil of speaker and adjust the i-f transformers for peak output as indicated on the output meter.

ALTERNATE VISUAL ALIGNMENT OF I-F STAGES

1. Connect 455 kc. sweep generator having approximately 40 kc. sweep to signal grid of 6BE6 (pin 7) through a .01 mfd. capacitor. Connect an oscilloscope through a 1 megohm isolating resistor across the 150,000 ohm diode load resistor. Align for best possible peak and symmetry.

R-F ALIGNMENT

1. Connect signal generator through .00025 mfd. capacitor to antenna and ground terminals on antenna terminal strip on rear of chassis. Be sure "Ant-loop" switch on top of the chassis is in the ANT. position. Connect output meter as for AM i-f alignment.

2. Tune signal generator to 1400 kc.

3. Set dial to 1400 kc. and adjust oscillator, r-f and antenna trimmers to maximum output on meter.

4. Set signal generator to 600 kc. and tune radio to signal. Adjust the 600 kc. padder to maximum output while simultaneously rocking the dial.

5. 1400 kc. calibration should then be checked and re-adjusted if necessary with the 1400 kc. oscillator trimmer.

The pointer on the radio dial should line up with t first vertical mark on the low frequency end of t dial glass. If the pointer does not line up, loosen t pointer on the dial string and move it to correct po tion. Re-tighten and re-cement the pointer to t string. Be sure the gang is fully meshed for t pointer alignment. Align AM first.

FM ALIGNMENT

DISCRIMINATOR ALIGNME

1. Tune signal generator to EXACTLY 10.775 mc connect to pin 4 of the 6SH7 Limiter tube s through a .01 mfd. capacitor.

2. Connect a DC vacuum tube voltmeter bet point "B" on schematic diagram and ground (a .00047 mfd. capacitor—Pin 6 on 6H6 to ground)

3. Peak both discriminator slugs at 10.775 mc.

4. Retune signal generator to exactly 10.7 mc. adjust bottom slug for zero volts.

5. The DC voltage at 10.625 mc. should be w 10% of the voltage at 10.775 mc. and of opp polarity.

Note: If the signal generator is not capable of s ient output to produce a readable DC voltage amplification of the last i-f stage can be use increase the signal input to the limiter for dis inator alignment. To accomplish this, align the i-f stage as indicated in "IF Alignment". Then discriminator as above leaving the signal gene connected to the grid of the 6SG7 2nd i-f tube.

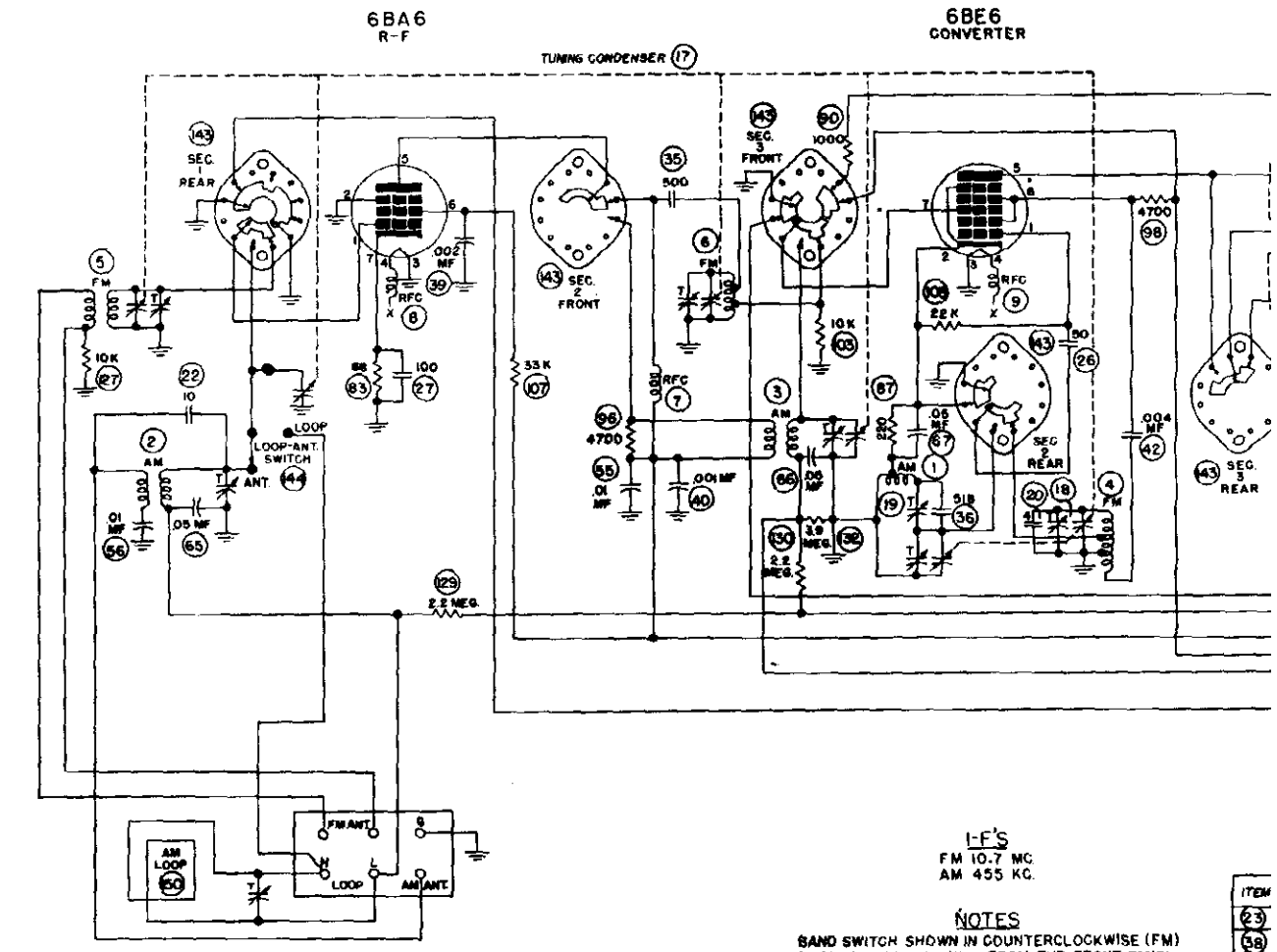
I-F ALIGNMENT

1. Connect high side of signal generator, thro .01 mfd. capacitor and a 1000 ohm resistor in s to pin 4 of the 6SG7 2nd i-f tube. Connect low si generator to chassis.

2. Close gang condenser and connect vacuum voltmeter across 220,000 ohm limiter grid res (Point "A" on schematic to ground). Adjust s generator output until a reading of at least 3 vo obtained. In order to reduce regeneration cause the vacuum tube voltmeter leads, a 1-megohm lating resistor, connected with as short leads as sible to point "A" should be used in series wit vacuum tube voltmeter. Align the 3rd i-f transfo for best peak as indicated on voltmeter.

3. Repeat above for each succeeding transform connecting signal generator to signal grid of fi tube 6SG7 then to the signal grid of 6BE6 conv The i-f stages should be aligned in this order.

WARNING—After each i-f stage has been aligne not repeak with the signal into the grid of the



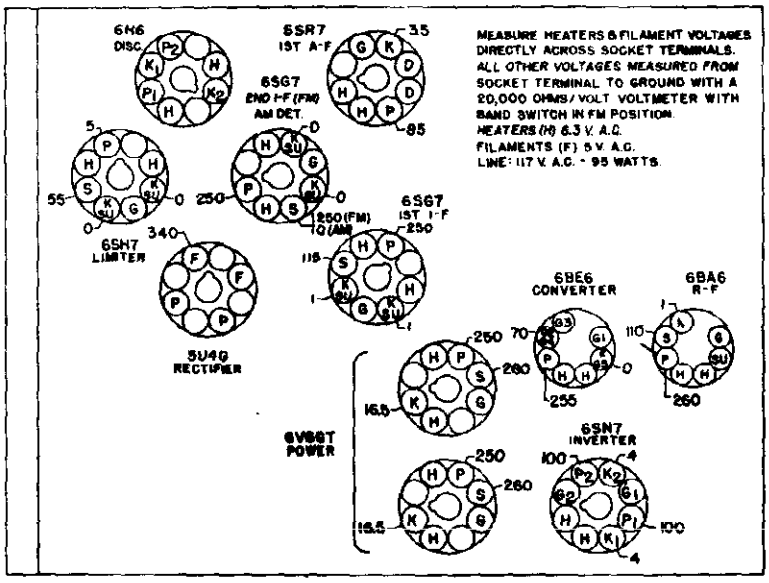
I-F'S
FM 10.7 MC.
AM 455 KC.

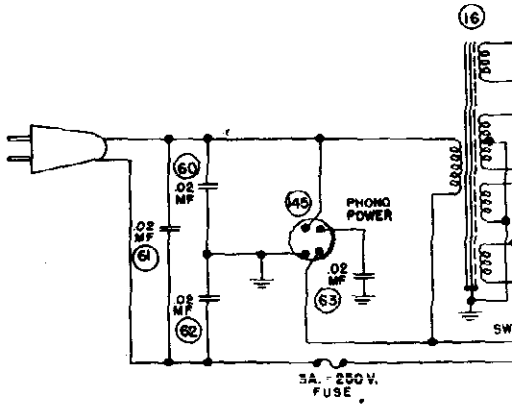
NOTES

BAND SWITCH SHOWN IN COUNTERCLOCKWISE (FM) POSITION WHEN VIEWED FROM THE FRONT PANEL.

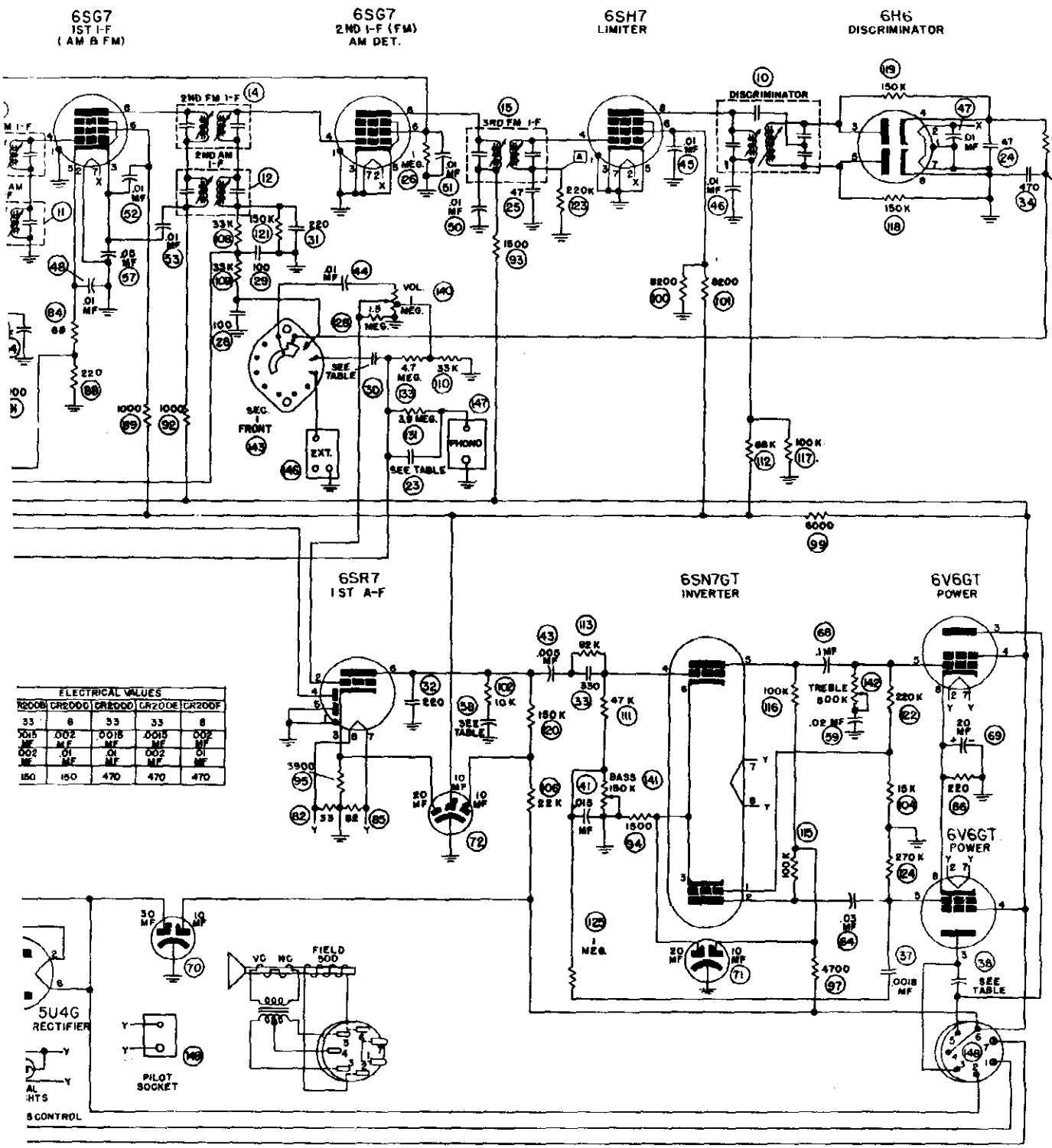
ALL ELECTRICAL VALUES SHOWN ARE IN OHMS OR MICROMICROFARADS UNLESS OTHERWISE SPECIFIED.

LETTERS SHOWN IN SQUARES DESIGNATE METER CONNECTION POINTS FOR ALIGNMENT DESCRIBED IN TEXT.





Models CR-200A, CR-200B and CR-200C a
except for circuit variations to provide
response in each of three different cabinets.
production of the CR-200 series chassis, CR-
and C were replaced by CR-200D, E and F
tively that incorporate a circuit change to
increased bass response at low volume se



e phonograph position. These circuit variations are
t all shown in the table on the schematic diagram,
r Figure 2.
3

CR-200A/D chassis is incorporated in the Model 240
Traditional, CR-200B/E in the Model 235 Chairside
and CR-200C/F in the Model 239 Mayfair.

ALTERNATE VISUAL ALIGNMENT OF I-F STAGES

1. Replace signal generator with sweep generator having approximately 300 kc. sweep and tune generator to 10.7 mc. Connect oscilloscope across 220,000 ohm limiter grid resistor through a 1-megohm isolating resistor. The order of alignment is the same as when using a vacuum tube voltmeter. Each i-f transformer should be individually aligned for best peak and symmetry.

R-F ALIGNMENT

1. Connect vacuum tube voltmeter across limiter grid resistor as in FM I-F alignment.

2. Ground one side of the FM Antenna by placing a wire jumper from one FM connection on the antenna terminal strip to the ground connection.

3. Connect unmodulated signal generator through a 300 ohm resistor to ungrounded antenna post and chassis, and tune signal generator to 107 mc.

4. Set radio dial to 107 mc. and tune oscillator trimmer to peak output on vacuum tube voltmeter. Adjust signal generator output until a reading of at least 3 volts is obtained.

5. Tune 107 mc. r-f and antenna trimmers for maximum indication on voltmeter—it may be necessary to rock the dial while adjusting the r-f trimmer.

SPECIAL SERVICE INFORMATION

The following information is provided for the service man who has a vacuum tube voltmeter or a similar measuring instrument available.

STAGE GAINS*

Antenna Post to R-F Grid at:	
600 kc.	6.60
98 mc.	1.15
R-F Grid to Converter Grid at:	
600 kc.	17.8
98 mc.	9.4
R-F on Converter Grid to 455 kc. on I-F Grid at:	
600 kc.	6.9
98 mc.	3.2
I-F on Converter Grid to 1st I-F Grid at:	
455 kc. (gang closed)	8.8
1st I-F Grid to 2nd I-F Grid** at:	
455 kc.	95
10.7 mc.	33
2nd I-F Grid to Limiter Grid at:	
10.7 mc.	33.4

OSCILLATOR OUTPUT VOLTAGE

The DC voltage developed across the Oscillator Grid Resistor (105) at:

600 kc.	6.6V.
98 mc.	6.0V.

or 0.3 ma. through 22,000 ohm Oscillator Grid Resistor at 600 kc. and 0.27 ma. at 98 mc.

AUDIO GAIN

Voltage required across the Volume Control to produce 0.1 watt speaker output*** at 400 cycles is .016 volt with Input Selector Switch in BDCST. setting.

*Variations of ±20% are permissible. All readings made with sufficient input signal to provide 0.5 watt speaker output. 0.5 speaker output at 400 cycles is equivalent to a reading of 1.25V. as measured by a high resistance AC voltmeter across the voice coil of the speaker.
**Detector Plate on AM.
***0.1 watt speaker output at 400 cycles is equivalent to a reading of 0.55 volts as measured by a high resistance AC voltmeter across the voice coil of speaker.

SPECIFICATIONS

Power supply	117 volts 50/60 cycles AC
Power consumption	95 watts
Power output	10 watts
Intermediate frequency	455 kc./10.7 mc.
Tuning frequency range:	
Broadcast Band	540-1620 kc.
FM Band	88—108 mc.
Tubes:	
R-F Amplifier	6BA6
Converter	6BE6
1st I-F Amplifier (AM-FM)	6SG7
2nd I-F (FM), Detector and AVC (AM)	6SG7
Limiter	6SH7
Discriminator	6H6
First Audio	6SR7
Inverter	6SN7GT
Power output (push-pull stage)	(2) 6V6GT
Rectifier	5U4G
Dial Lamps	Mazda No. 44
Speaker:	
Field coil resistance	500 ohms
Voice coil impedance (400 cycles)	3.0 ohms
Output transformer	8,000/3 ohms

DIAL CORD REPLACEMENT

Two separate drive cables are used in the CR-200 dial assembly. One cable is used to transmit the motion from the tuning knob to the large pulley that is coupled to the condenser gang; the other cable actuates the dial pointer whenever the large pulley on the condenser gang is rotated. Separate instructions for replacing either of these cables is given in the following paragraphs.

CONDENSER DRIVE CABLE REPLACEMENT

Remove dial assembly after taking out four screws on each side of chassis. Slide a short length (approximately ½ inch) of sleeving over one end of a length of dial cable, form a small loop and tie a knot in the manner shown on Figure 1. Tie spring to opposite end of cable making length excluding spring 19½ inches. Hook loop over the metal hook in pulley "D" and lace the cable through the pulley slot and around the pulley in a counterclockwise direction when viewed from the rear of the dial assembly keeping the cable to the rear of the pulley groove. Lace the cable around the smaller diameter portion of the tuning control shaft wrapping 2½ turns *from front to back;* then around the opposite side of pulley "D" into the pulley through the slot. Hook the end of tension spring "F" in the hole provided in pulley "D", completing this operation.

DIAL POINTER DRIVE CABLE REPLACEMENT

Remove dial assembly after taking out four screws on each side of chassis. Slip a one-half inch length of sleeving over a 42-inch length of dial cable. Tie the two ends to the loop end of the cable spring "E" securely so that the cable doubled measures 19⅝ inches end to end excluding spring.

Place spring hook in top hole and draw cable through slot of pulley "D". Loop one end of cable around pulley "D" in a clockwise direction in front of condenser drive cable (viewing dial assembly from front) then loop the remaining end around pulley in a counterclockwise direction. Secure both ends of cable to chassis at edge of pulley slot with scotch tape, keeping piece of sleeving on remaining loop of cable.

Replace dial assembly and loop cable over pulley "A". While holding cable taut remove scotch tape and loop cable over pulleys "B" and "C" as shown in Figure 1.

Turn the tuning control shaft until the condenser gang is completely meshed and slide the dial pointer on its track until it is in line with the last calibration mark at the low frequency end of the dial. The short piece of sleeving installed prior to the stringihg operation should be slid to the rear of the dial pointer and the crimping lug on the pointer pressed over the sleeving. After checking to make certain that the condenser gang is completely meshed and the dial pointer is in the position specified previously, apply a few drops of cement to each end of the sleeving to which the dial pointer is fastened. This completes the operation.

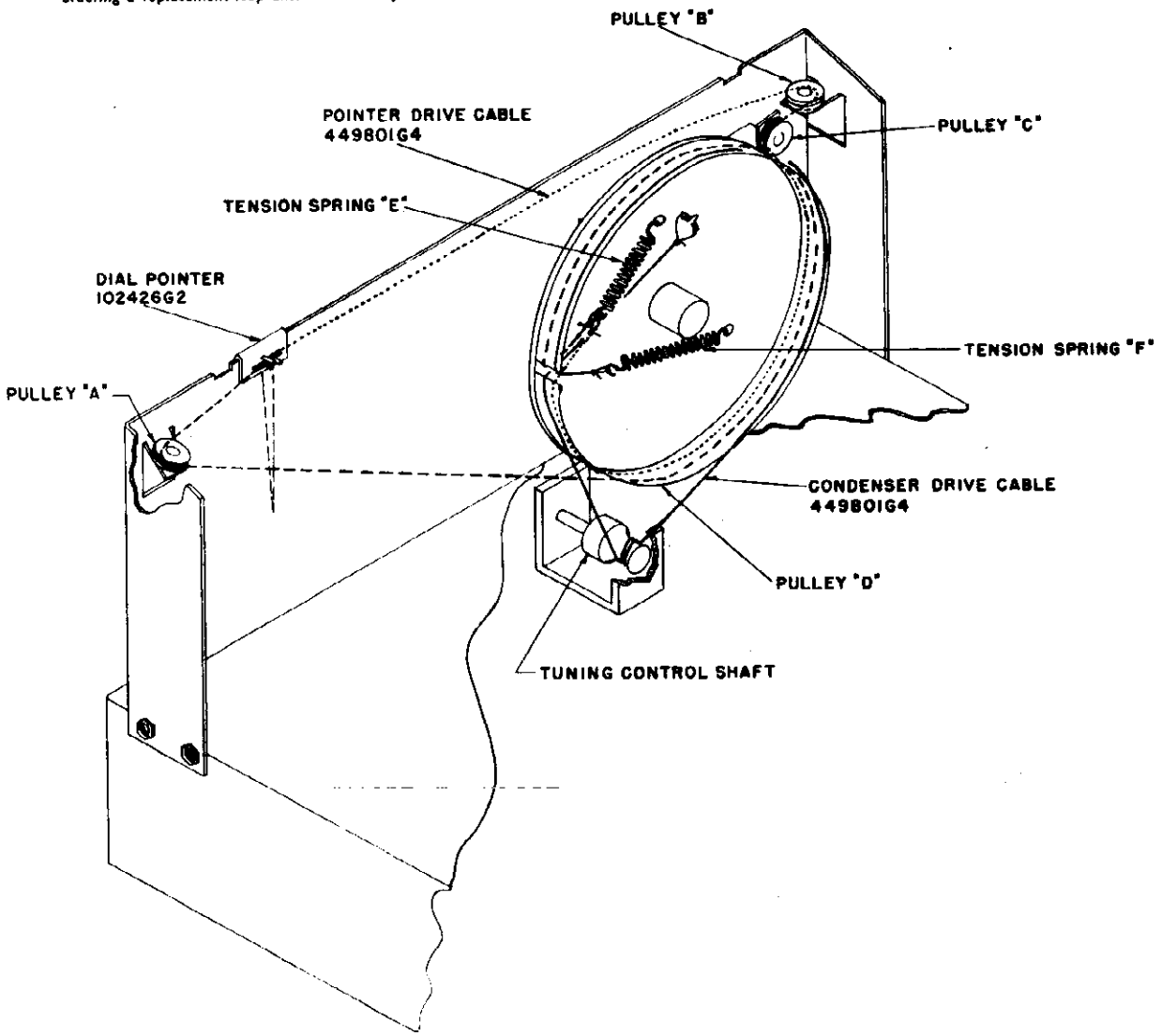
PARTS LIST

REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
1	Coil assembly, oscillator (AM)	360318G1
2	Coil assembly, antenna (AM)	360320G1
3	Coil assembly, r-f (AM)	360319G1
4	Coil assembly, oscillator (FM)	360323G1
5	Coil assembly, antenna (FM)	360321G2
6	Coil assembly, r-f (FM)	360322G2
7	Coil, choke	360284G1
8	Coil, choke	360264G1
9	Coil, choke	360264G1
10	Transformer, discriminator	360317G1
11	Transformer, first i-f	360315G1
12	Transformer, i-f (2nd AM)	360315G2
13	Transformer, i-f (FM)	360316G1
14	Transformer, i-f (FM)	360316G1
15	Transformer, i-f (FM)	360316G1
16	Transformer, power	300041G1
17	Capacitor, variable, three-gang tuning	260089G1
18	Capacitor, variable trimmer	260067G1
19	Capacitor, variable trimmer	250046G1
20	Capacitor, ceramic, 4 mmf	250088G28
22	Capacitor, composition, 10 mmf	250164G3
23	Capacitor, composition, 33 mmf—CR-200A, B, D & E	250164G4
	Capacitor, composition, 8 mmf—CR-200C & F	250164G1
24	Capacitor, mica, 47 mmf	250159G96
25	Capacitor, mica, 47 mmf	250159G96
26	Capacitor, ceramic, 50 mmf, ± 10%	250088G39

REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
27	Capacitor, mica, 100 mmf.	250159G98
28	Capacitor, mica, 100 mmf.	250159G98
29	Capacitor, mica, 100 mmf.	250159G98
30	Capacitor, mica, 150 mmf. ± 10% CR-200A, B & C.	250159G84
	Capacitor, mica, 470 mmf. ± 10%—CR-200D, E & F.	250159G90
31	Capacitor, mica, 220 mmf.	250159G100
32	Capacitor, mica, 220 mmf.	250159G100
33	Capacitor, mica, 330 mmf. ± 10%.	250159G88
34	Capacitor, mica, 470 mmf.	250159G102
35	Capacitor, ceramic, 500 mmf.	250088G31
36	Capacitor, silver mica, 518 mmf. ±1%.	250085G35
37	Capacitor, mica, 1800 mmf. ±5%.	250160G44
38	Capacitor, paper, .0015 mfd. ±10%, 600 V—CR-200A, B, D & E.	250169G1
	Capacitor, paper, .002 mfd. ±10%, 600 V—CR-200C & F.	250169G2
39	Capacitor, paper, .002 mfd. 600 V.	250152G44
40	Capacitor, paper, .001 mfd. 600 V.	250152G45
41	Capacitor, paper, .015 mfd. ±10%, 200 V.	250169G5
42	Capacitor, ceramic, .004 mfd.	250088G34
43	Capacitor, paper, .005 mfd. 600 V.	250152G41
44	Capacitor, paper, .01 mfd. 200 V.	250152G18
45	Capacitor, paper, .01 mfd. 200 V.	250152G18
46	Capacitor, paper, .01 mfd. 200 V.	250152G18
47	Capacitor, paper, .01 mfd. 200 V.	250152G18
48	Capacitor, paper, .01 mfd. 200 V.	250152G18
50	Capacitor, paper, .01 mfd. 400 V.	250152G27
51	Capacitor, paper, .01 mfd. 400 V.	250152G27
52	Capacitor, paper, .01 mfd. 400 V.	250152G27
53	Capacitor, paper, .01 mfd. 400 V.	250152G27
54	Capacitor, paper, .01 mfd. 400 V.	250152G27
55	Capacitor, paper, .01 mfd. 400 V.	250152G27
56	Capacitor, paper, .01 mfd. 400 V.	250152G27
57	Capacitor, paper, .05 mfd. 200 V.	250152G15
58	Capacitor, paper, .01 mfd. 400 V.—CR-200A, C, D & F.	250152G27
	Capacitor, paper, .002 mfd. ±10%, 600 V.—CR-200B & E.	250169G2
59	Capacitor, paper, .02 mfd. 200 V.	250152G17
60	Capacitor, paper, .02 mfd. 600 V.	250129G3
61	Capacitor, paper, .02 mfd. 600 V.	250129G3
62	Capacitor, paper, .02 mfd. 600 V.	250129G3
63	Capacitor, paper, .02 mfd. 600 V.	250129G3
64	Capacitor, paper, .03 mfd. 400 V.	250152G25
65	Capacitor, paper, .05 mfd. 200 V.	250152G15
66	Capacitor, paper, .05 mfd. 200 V.	250152G15
67	Capacitor, paper, .05 mfd. 200 V.	250152G15
68	Capacitor, paper, .1 mfd. 400 V.	250152G22
69	Capacitor, electrolytic, 20 mfd. 25 V.	270027G2
70	Capacitor, electrolytic, 10 mfd. 475 V.—30 mfd. 475 V.	270023G2
71	Capacitor, electrolytic, 10 mfd. 450 V.—20 mfd. 20 V.	270023G6
72	Capacitor, electrolytic, 10 mfd. 450 V.—10 mfd. 450 V.—20 mfd. 25 V.	270023G7
82	Resistor, composition, 33 ohms, ½ W.	230084G4
83	Resistor, composition, 68 ohms, ½ W.	230084G6
84	Resistor, composition, 68 ohms, ½ W.	230084G6
85	Resistor, composition, 82 ohms, ±10%, ½ W.	230084G49
86	Resistor, composition, 220 ohms, 2 W.	230086G9
87	Resistor, composition, 220 ohms, ½ W.	230084G9
88	Resistor, composition, 220 ohms, ½ W.	230084G9
89	Resistor, composition, 1000 ohms, ½ W.	230084G13
90	Resistor, composition, 1000 ohms, ½ W.	230084G13
91	Resistor, composition, 1000 ohms, ½ W.	230084G13
92	Resistor, composition, 1000 ohms, ½ W.	230084G13
93	Resistor, composition, 1500 ohms, ½ W.	230084G14
94	Resistor, composition, 1500 ohms, ½ W.	230084G14
95	Resistor, composition, 3900 ohms, ±10%, ½ W.	230084G69
96	Resistor, composition, 4700 ohms, ½ W.	230084G17
97	Resistor, composition, 4700 ohms, ½ W.	230084G17
98	Resistor, composition, 4700 ohms, ½ W.	230084G17
99	Resistor, wire wound, 6000 ohms, ±10%, 7.5 W.	240035G6
100	Resistor, composition, 8200 ohms, ±10%, 1 W.	230085G73
101	Resistor, composition, 8200 ohms, ±10%, 1 W.	230085G73
102	Resistor, composition, 10,000 ohms, 1 W.	230085G19
103	Resistor, composition, 10,000 ohms, ½ W.	230084G19
104	Resistor, composition, 15,000 ohms, ±5%, ½ W.	230084G187
105	Resistor, composition, 22,000 ohms, ½ W.	230084G21
106	Resistor, composition, 22,000 ohms, ½ W.	230084G21
107	Resistor, composition, 33,000 ohms, 1 W.	230085G22
108	Resistor, composition, 33,000 ohms, ½ W.	230084G22
109	Resistor, composition, 33,000 ohms, ½ W.	230084G22
110	Resistor, composition, 33,000 ohms, ½ W.	230084G22
111	Resistor, composition, 47,000 ohms, ½ W.	230084G23
112	Resistor, composition, 68,000 ohms, ±10%, ½ W.	230084G84
113	Resistor, composition, 82,000 ohms, ±10%, ½ W.	230084G85
114	Resistor, composition, 100,000 ohms, ±10%, ½ W.	230084G86
115	Resistor, composition, 100,000 ohms, ½ W.	230084G25
116	Resistor, composition, 100,000 ohms, ½ W.	230084G25
117	Resistor, composition, 100,000 ohms, ½ W.	230084G25
118	Resistor, composition, 150,000 ohms, ±10%, ½ W.	230084G88
119	Resistor, composition, 150,000 ohms, ±10%, ½ W.	230084G88
120	Resistor, composition, 150,000 ohms, ½ W.	230084G26
121	Resistor, composition, 150,000 ohms, ½ W.	230084G26

122	**Resistor, composition, 220,000 ohms, ±5%, ½ W.**	230084G215
123	**Resistor, composition, 220,000 ohms, ½ W.**	230084G27
124	**Resistor, composition, 270,000 ohms, ±10%, ½ W.**	230084G91
125	**Resistor, composition, 1 megohm, ±5%, ½ W.**	230084G231
126	**Resistor, composition, 1 megohm, ½ W.**	230084G31
127	Resistor, composition, 10,000 ohms, ½ W.	230084G19
128	Resistor, composition, 1.5 megohm, ½ W.	230084G32
129	Resistor, composition, 2.2 megohm, ½ W.	230084G33
130	Resistor, composition, 2.2 megohm, ½ W.	230084G33
131	Resistor, composition, 3.9 megohm, ±10%, ½ W.	230084G105
132	Resistor, composition, 3.9 megohm, ±10%, ½ W.	230084G105
133	Resistor, composition, 4.7 megohm, ±10%, ½ W.	230084G106
140	Potentiometer, volume control	220074G1
141	Potentiometer, bass control, with switch	220073G5
142	Potentiometer, treble control	220072G8
143	Switch, band selector	160182G1
144	Switch, loop-ant	160176G1
145	Socket, motor	180501G5
146	Socket, input, FM	180060G1
147	Socket, phonograph input	189741G1
148	Socket, speaker	180504G16
149	Socket, 6-volt	189788G2
150	Antenna loop assembly	*

*The part number of the loop antenna assembly changes with different cabinets. It is therefore important that you specify the Style Number of the instrument when ordering a replacement loop antenna assembly.



ALIGNMENT PROCEDURE

Alignment of this receiver requires the use of an accurately calibrated RF signal generator, range 455 kc. to 107 mc., an output meter, and a vacuum tube voltmeter of approximately 10 megohm input impedance. All trimmer condensers can be identified by stampings on the chassis and gang condenser cover and are shown on the chassis layout diagram.

AM ALIGNMENT

I-F ALIGNMENT

1. Set treble control to SHARP TUNE position. Set volume and bass controls to maximum, the Band Switch to Broadcast position, and dial pointer to 1000 kc.

2. Tune the signal generator to EXACTLY 455 kc.

3. Connect output of modulated signal generator to the signal grid of the 6SB7Y (pin 8) through a .01 mfd. capacitor and signal generator ground to radio chassis.

4. All i-f transformers on this chassis are slug-tuned. Both slug adjustments for 455 kc. are located on top of the transformers; the 10.7 mc. adjustments are accessible on the bottom.

5. Connect output meter across voice coil of 12-inch speaker and peak in order the third, second and first i-f transformers.

ALTERNATE VISUAL ALIGNMENT OF I-F STAGES

1. Connect 455 kc. sweep generator having approximately 40 kc. sweep to signal grid of 6SB7Y (pin 8) through a .01 mfd. capacitor. Connect an oscilloscope through a 1 megohm isolating resistor across the 220,000 ohm diode load resistor. Align for best possible peak in sharp tune position and symmetry in full range position.

BROADCAST BAND R-F ALIGNMENT

1. Connect signal generator through .00025 mfd. capacitor to antenna and ground terminals on antenna terminal strip on rear of chassis. Be sure "Ant-loop" switch on top of the chassis is in the ANT. position. Connect output meter as for AM i-f alignment.

2. Tune signal generator to 1400 kc.

3. Set dial to 1400 kc. and adjust oscillator, r-f and antenna trimmers for maximum indication on meter.

4. Set signal generator to 600 kc. and tune radio to signal. Adjust the 600 kc. padder to maximum output while simultaneously rocking the gang.

5. 1400 kc. calibration should then be checked and re-adjusted if necessary with the 1400 kc. oscillator trimmer.

The pointer on the radio dial should line up with the first horizontal mark on the low frequency end of the dial glass. If the pointer does not line up, loosen the screws on the pointer drive pulley at the end of the tuning gang and adjust the pointer setting; tighten the screws after this adjustment. Be sure the gang is fully meshed for this pointer alignment.

SHORT WAVE BAND R-F ALIGNMENT

1. Set the Band Switch to Short Wave and replace the .00025 mfd. capacitor in series with the signal generator lead to the antenna terminal, with a 400-ohm resistor.

2. Set the signal generator and the receiver to 15 mc. and adjust the oscillator, r-f and antenna trimmers for maximum indication on the meter. While adjusting the 15 mc. oscillator trimmer, two peaks may be observed; only one is the correct peak for 15 mc. alignment. To obtain the correct peak, screw trimmer in to maximum capacitance, then decrease until the first peak is observed. This is the correct one.

Another method for checking for the correct peak is to tune the receiver to 15.91 mc. with signal generator at 15 mc. and with the output increased. If the 15 mc. oscillator is properly aligned, the signal will be received at 15.91 mc.—if incorrectly aligned, the signal will be received at 14.09 mc.

FM ALIGNMENT

DISCRIMINATOR ALIGNMENT

1. Tune signal generator to EXACTLY 10.775 mc. and connect to pin 4 of the 6SH7 limiter tube socket through a .01 mfd. capacitor.

2. Connect a DC vacuum tube voltmeter from Pin 4 on 6H6 tube socket to ground through a 1 megohm isolating resistor.

3. Peak both discriminator slugs at 10.775 mc.

4. Retune signal generator to exactly 10.7 mc. and adjust bottom slug for zero volts.

5. The DC voltage at 10.625 mc. should be within 10% of the voltage at 10.775 mc. and of opposite polarity.

Note: If the signal generator is not capable of sufficient output to produce a readable DC voltage, the amplification of the last i-f stage can be used to increase the signal input to the limiter for discriminator alignment. To accomplish this, align the last i-f stage as indicated in "IF Alignment". Then align discriminator as above leaving the signal generator connected to the grid of the 6SG7 2nd i-f tube.

I-F ALIGNMENT

1. Connect high side of signal generator, through a

.01 mfd. capacitor and a 1000 ohm resistor in series, to pin 4 of the 6SG7 2nd i-f tube. Connect low side of generator to chassis.

2. Close gang condenser and connect vacuum tube voltmeter across 220,000 ohm limiter grid resistor; (Points "A" to "X" on schematic). Adjust signal generator output until a reading of at least 3 volts is obtained. In order to reduce regeneration caused by the vacuum tube voltmeter leads, a 1-megohm isolating resistor, connected with as short leads as possible to point "A" should be used in series with the vacuum tube voltmeter. Align the 3rd i-f transformer for best peak as indicated on voltmeter.

3. Repeat above for the 2nd and 1st transformer by connecting signal generator to signal grid of first i-f tube 6SG7 then to the signal grid of 6SB7Y converter. The i-f stages should be aligned in this order.

WARNING—After each i-f stage has been aligned, do not repeak with the signal into the grid of the 6SB7Y.

ALTERNATE VISUAL ALIGNMENT OF I-F STAGES

1. Replace signal generator with sweep generator having approximately 300 kc. sweep and tune generator to 10.7 mc. Connect oscilloscope across 220,000 ohm limiter grid resistor through a 1-megohm isolating resistor. The order of alignment is the same as when using a vacuum tube voltmeter. Each i-f transformer should be individually aligned for best peak and symmetry.

R-F ALIGNMENT

1. Connect vacuum tube voltmeter across limiter grid resistor as in FM I-F alignment. Adjust signal generator output until a reading of at least 3 volts is obtained.

2. Ground one side of the FM Antenna by placing a wire jumper from one FM connection on the antenna terminal strip to the ground connection.

3. Connect unmodulated signal generator through a 300 ohm resistor to ungrounded antenna post and chassis, and tune signal generator to 107 mc.

4. Set radio dial to 107 mc. and tune oscillator trimmer to peak output on vacuum tube voltmeter.

5. Tune 107 mc. r-f and antenna trimmers for maximum indication on voltmeter—it may be necessary to rock the gang while adjusting the r-f trimmer.

STAGE GAINS*

Antenna Post to R-F Grid at:

600 kc.	5.8
6.5 mc.	2.9
98 mc.	1.0

R-F Grid to Converter Grid at:

600 kc.	11.6
6.5 mc.	9.5
98 mc.	6.8

R-F on Converter Grid to 455 kc. or I-F Grid at:

600 kc.	1.7
6.5 mc.	2.4
98 mc.	6.8

I-F on Converter Grid to 1st I-F Grid at:

455 kc. (dial pointer at 600 kc.)	2.6

1st I-F Grid to 2nd I-F Grid at:

455 kc.	20.5
10.7 mc.	37

2nd I-F Grid to Limiter Grid at:

10.7 mc.	34.5

AUDIO GAIN

Voltage required across the Volume Control to produce 0.1 watt speaker output** at 400 cycles is:
.015 volt with Amplifier AMP-109
with Band Selector Switch in BDCST setting.

OSCILLATOR OUTPUT VOLTAGE

The DC voltage developed across the Oscillator Grid Resistor (105) at:

600 kc.	4.5V.
6.5 mc.	4.6V.
98 mc.	5.4V.

or 0.3 ma. through 15,000 ohm Oscillator Grid Resistor at 600 kc., 0.31 ma. at 6.5 mc. and 0.36 ma. at 98 mc.

*Variations of ± 20% are permissible. All AM readings made with sufficient input signal to provide 0.5 watt speaker output. 0.5 watt speaker output at 400 cycles is equivalent to a reading of 1.22 V. as measured by a high resistance AC voltmeter across the voice coil.

**0.1 watt speaker output at 400 cycles is equivalent to a reading of 0.55 volts as measured by a high resistance AC voltmeter across the voice coil.

10 KC. FILTER ADJUSTMENT

This chassis incorporates a 10 kc. filter circuit to eliminate the beat note heard as a whistle between stations on the broadcast band. If the trimmer is out of adjustment the following procedure should be observed:

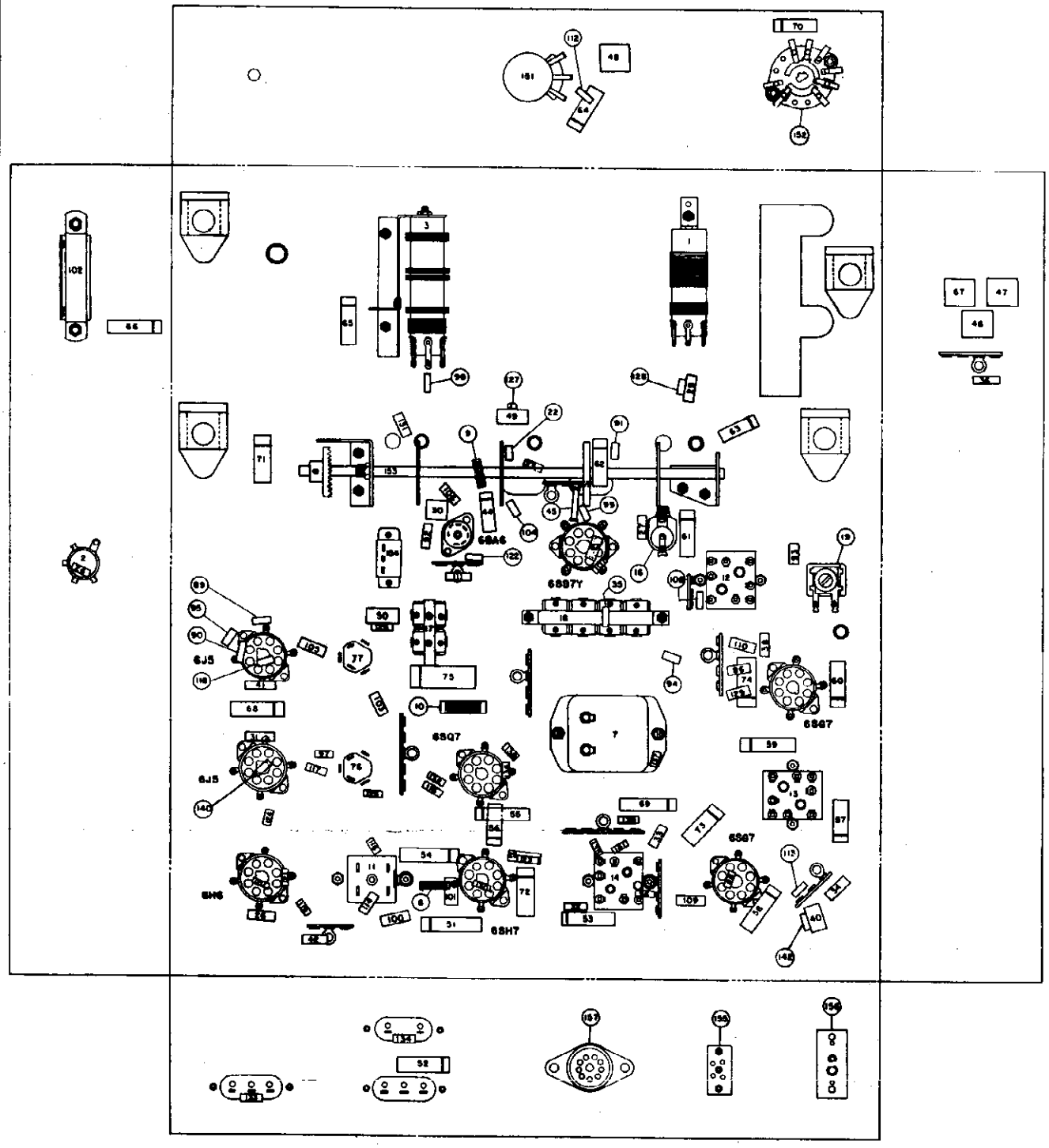
1. Adjust the treble control switch to the No. 4 setting.

2. Connect the output of an audio oscillator to the phonograph pickup socket on the radio chassis and adjust the oscillator to exactly 10,000 cycles.

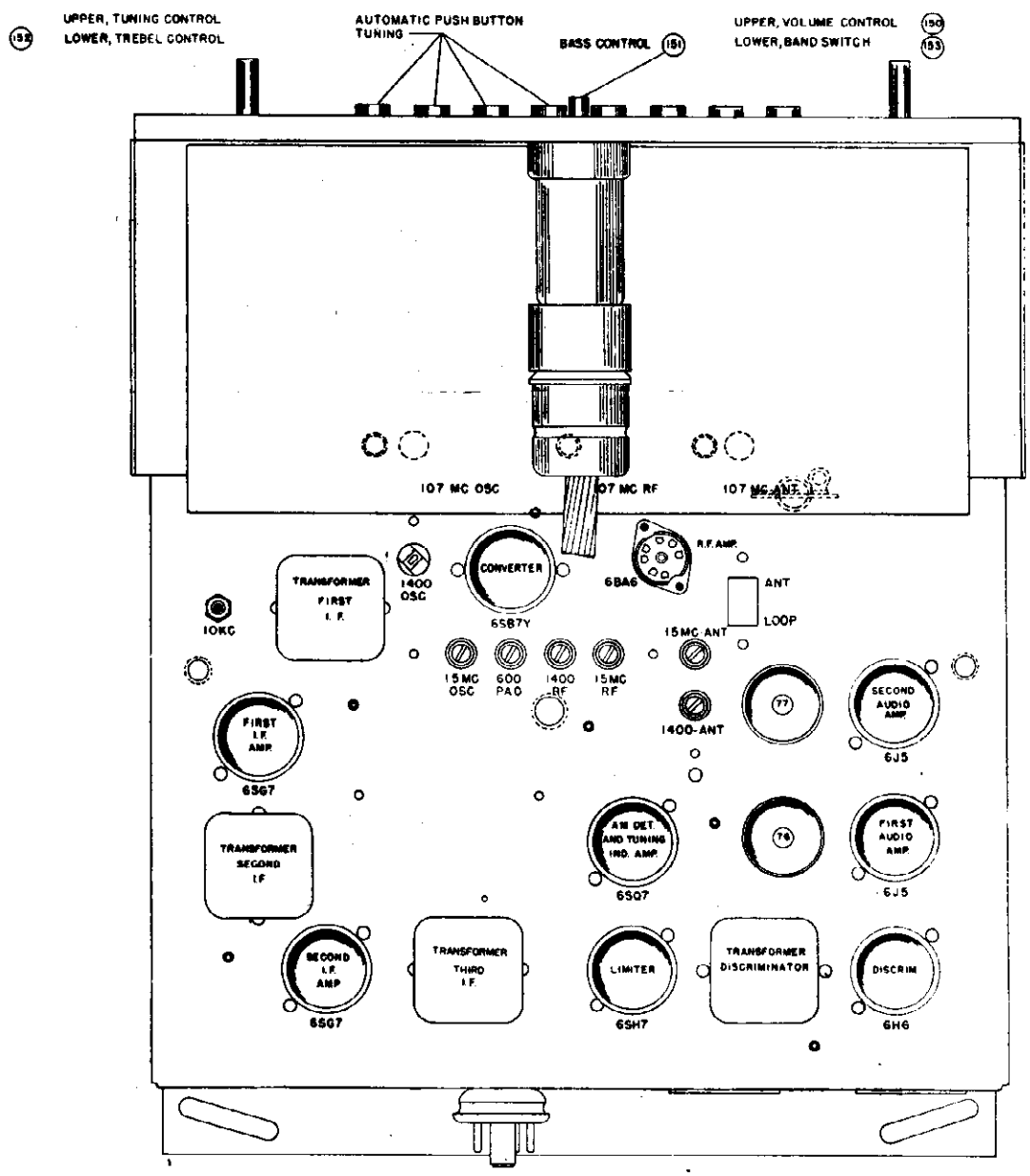
3. Set the band selector to PHONO and adjust the 10 kc. trimmer for *minimum* output.

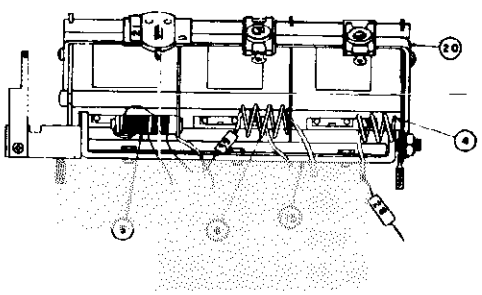
4. If an audio oscillator is not available for making this adjustment set the band selector to BDCST, set the treble control to position 4, connect the antenna to the receiver and set the gang condenser to a point between two stations on adjacent channels having approximately the same power. If the 10 kc. trimmer is out of adjustment, a whistle will be heard. Adjust the trimmer until the whistle is eliminated.

MODELS CR-202 SERIES THE MAGNAVOX CO.



THE MAGNAVOX CO. MODELS CR-202 SERIE





ITEM NOS.	ELECT. VALUES CR202A	CR202B
142	OMIT	3.3 MEG.

DIAL CORD REPLACEMENT

Rotate the brass pulley designated "A" in Figure 1 until the dial pointer strikes the stop at the high frequency end of the dial calibration. In this condition the slot in pulley "A" should be approximately ten degrees to the left of being vertical—see Figure 1. If the slot in the pulley is in some other position under the above mentioned conditions, the pointer set screw is probably loose and has allowed the pointer to slip.

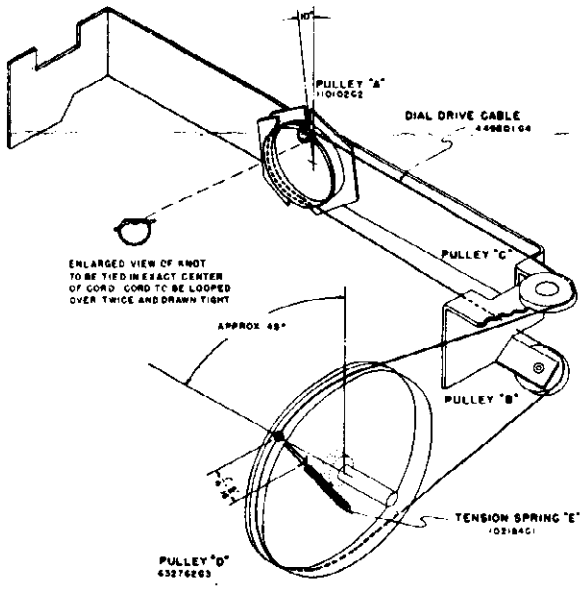


FIGURE 1

To correct this condition, first remove the glass dial and loosen the pointer screw. Then while holding pulley "A" so that its slot is approximately ten degrees to the left of vertical (when viewed from the rear) adjust the pointer until it is resting against the stop at the high frequency end of its travel. Then tighten the pointer set screw securely and replace the glass dial.

Completely unmesh the condenser gang and check the location of the hole or slot in pulley "D." If this hole is not approximately 45 degrees back from vertical as shown on Figure 1, loosen the two No. 6 Allen set screws in the hub of pulley "D" and slip the pulley on its shaft (while holding the condenser gang unmeshed) until the specified adjustment is obtained; then tighten one of the set screws securely. It will be shown later that this is a temporary setting. Next, tie a double knot in the exact center of a 25-inch length of dial cable and fold the cable back on itself so that the knot is at one end. The correct method for tying this knot is shown as an inset on Figure 1. Grasp the cable near the knotted end and slide it into the pulley slot so that the knot is against the inside rim of the pulley as shown in the sketch. The piece of cable nearest the dial frame should be wound in the direction shown for one-half turn; then over the lower pulley "B," around the bottom of the large pulley "D" and into the hole. Pull the cable taut and wrap the end around the small hook on pulley "D" temporarily.

The remaining piece of cable should be wound around pulley "A" in the direction shown, for one complete turn, over the upper pulley "C," and over the top of pulley "D." Thread the end through the small hole in pulley "D" and pull both ends of the cable taut. With one end of tension spring "E" fastened to the hook on pulley "D" lace the two free ends of the cable through the opposite end of the spring and tie a knot at a point that will allow ¼" to 5/16" of cable between the spring and the inside rim of pulley "D." Be sure to tie the knot around one coil of the spring in the manner shown.

Now with the condenser gang completely meshed, check the position of the dial pointer. If it is not in line with the last calibration mark at the low frequency end of the dial, loosen the set screw in pulley "D" and turn it until the pointer is in the specified position. Be sure that the condenser gang does not move during this adjustment. Then tighten the two screws in pulley "D" securely completing the operation.

Tubes:

R-F Amplifier	6BA6
Converter	6SB7Y
1st I-F Amplifier (AM-FM)	6SG7
2nd I-F Amplifier (AM-FM)	6SG7
Limiter	6SH7
Discriminator	6H6
Detector and AVC (AM) and Tuning Indicator Amplifier	6SQ7
First Audio	6J5
Second Audio	6J5
Tuning Indicator	6U5
Dial Lamps	Mazda No. 44

CONDENSER GANG DRIVE ADJUSTMENTS

Whenever any of the mechanical parts in the condenser gang drive assembly require replacement due to rough handling or for any other reason, it is extremely important that clearances and adjustments shown on Figures 2 and 3 are correct; otherwise, the tuning mechanism will be sluggish or it may slip during operation.

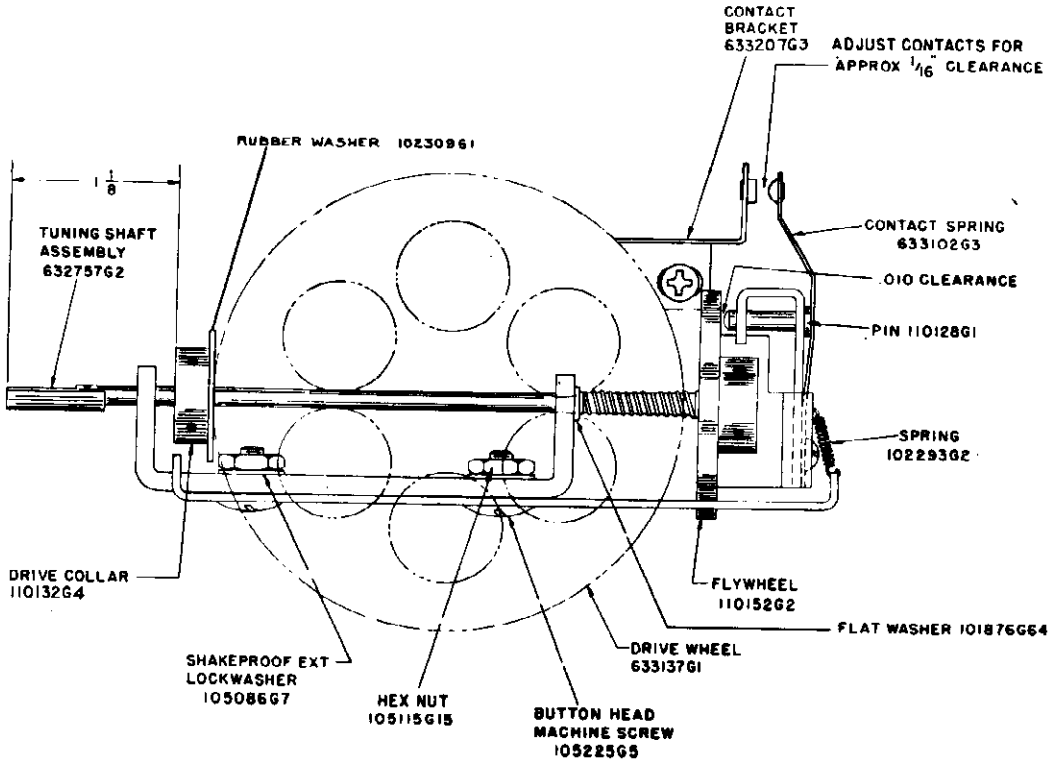


FIGURE 2

In reassembling the mechanism after any part was replaced, follow the procedure outlined below:

1. Assemble the Tuning Shaft, Drive Collar, Compression Spring and Flywheel in the order shown on Figure 3. The distance between the front of the Drive Collar and the front of the Tuning Shaft must be 1⅛ inches as specified on Figure 2. Install the Flywheel on the rear of the Tuning Shaft and slide it forward until it nearly touches the edge of the Drive Wheel; then tighten one of the set screws in the Flywheel hub. Insert a .010" gauge between the Flywheel and the Pin, and while holding the gauge in this position, loosen the set screw in the Flywheel hub that was previously tightened. The Compression Spring should force the Flywheel back against the gauge—when this occurs, tighten both set screws in the Flywheel hub.

2. Adjust the Muting Switch contact clearance by loosening the two screws in the Contact Bracket and sliding the bracket in the required direction until a 1/16" clearance is obtained. If this adjustment cannot be obtained in the manner prescribed, bend the Contact Bracket until proper clearance is realized.

3. The Drive Wheel is properly located on its shaft when its edge nearest the hub is in line with the outside edge of the Drive Collar as shown on Figure 3. Two Allen set screws in the Drive Wheel hub provide a means of adjusting the position of this wheel.

4. When the adjustment outlined in paragraph 2 is correct, the proper contact clearance will automatically be obtained when the Muting Switch is to be "unmuted" while the push buttons are being set. While pressure is applied to any one of the push buttons while they are being set up, a pressure applied simultaneously to the Tuning Control knob will cause the Muting Switch contacts to open. Detailed instructions on setting up these push buttons are shown elsewhere in this bulletin.

5. If the push button shafts at both ends do not engage the Treadle Bar as shown on Figure 3, the three screws in the Treadle Bar must be loosened and the Treadle Bar should be moved until the required condition is obtained.

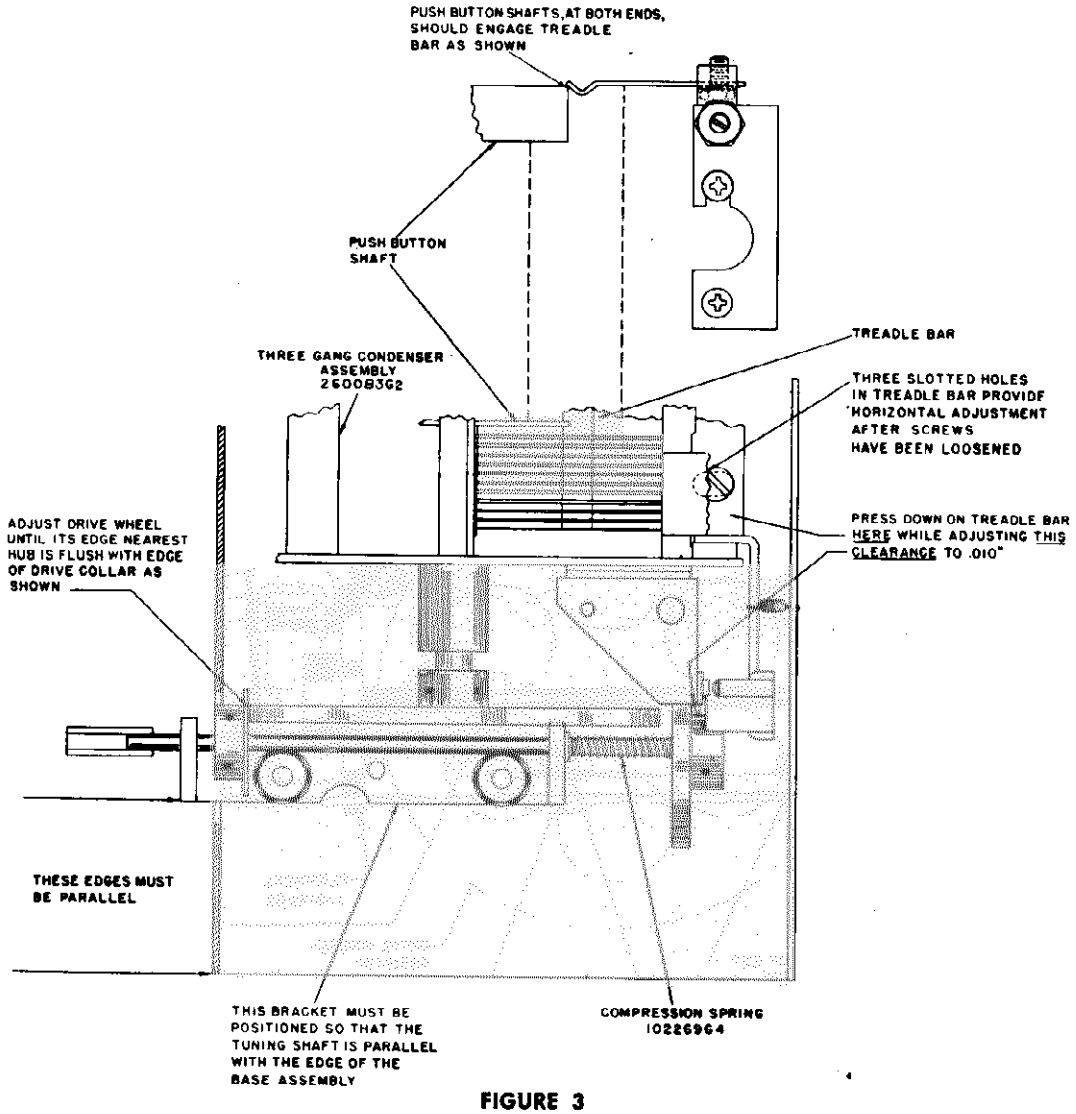


FIGURE 3

PARTS LIST

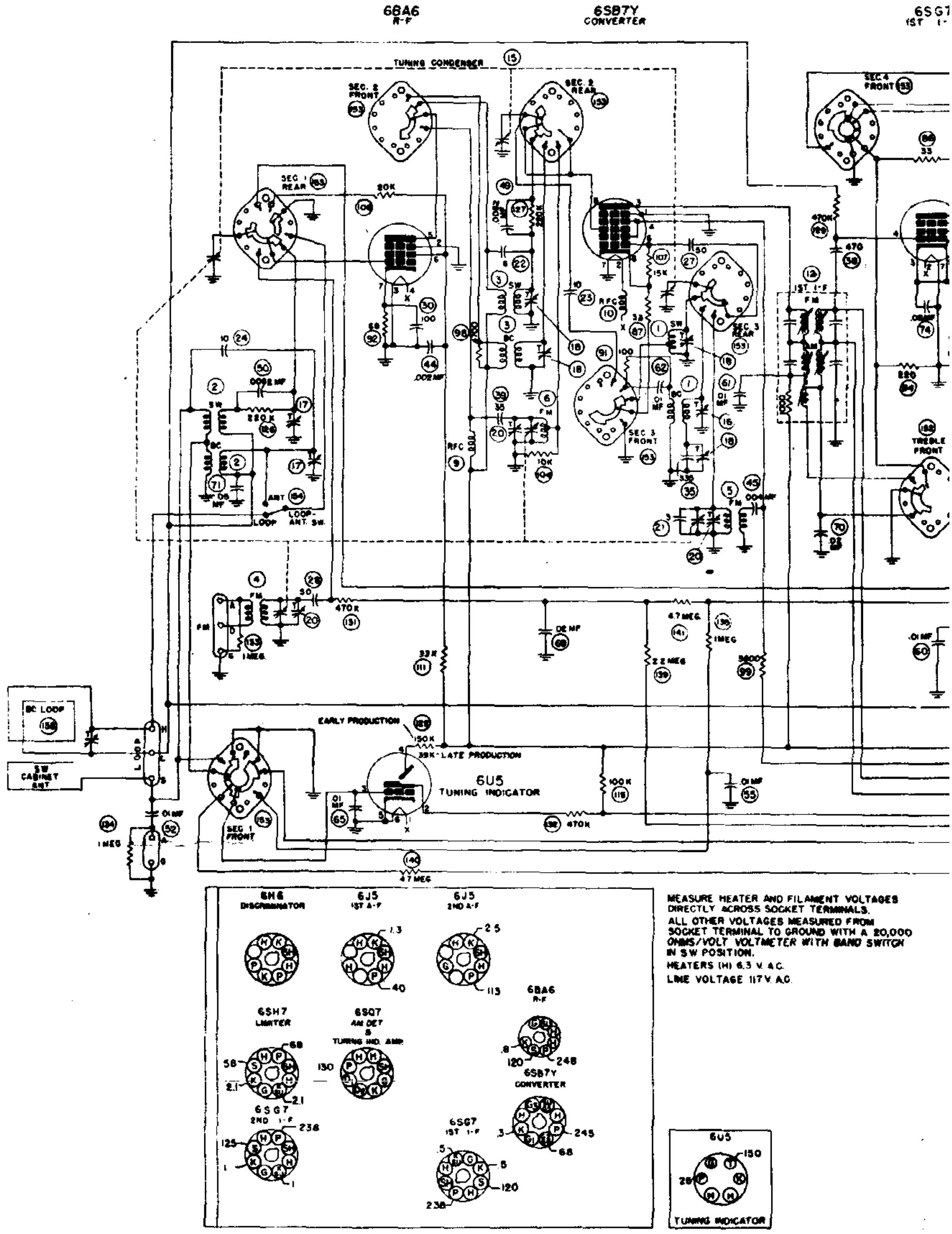
REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
1	Coil Assembly, oscillator, AM	360298G1
2	Coil Assembly, antenna, AM	360299G1
3	Coil Assembly, r-f, AM	360300G1
4	Coil Assembly, antenna, FM	360296G2
5	Coil Assembly, oscillator, FM	360295G1
6	Coil Assembly, r-f, FM	360297G2
7	Coil Assembly, 10 kc.	360244G1
8	Coil, choke	360284G1
9	Coil, choke	360284G1
10	Coil, filament choke	360264G1
11	Transformer, discriminator	360305G1
12	Transformer, i-f	360285G1
13	Transformer, i-f	360285G1
14	Transformer, limiter	360286G1
15	Capacitor, variable, three-gang tuning	260083G1
16	Capacitor, variable, oscillator trimmer, broadcast	260067G4
17	Capacitor, variable, two-gang trimmer	260080G1
18	Capacitor, variable, four-gang trimmer and oscillator padder	260082G1
19	Capacitor, variable, 10 kc. trimmer	259610G2
20	Capacitor, trimmer assembly	260084G1

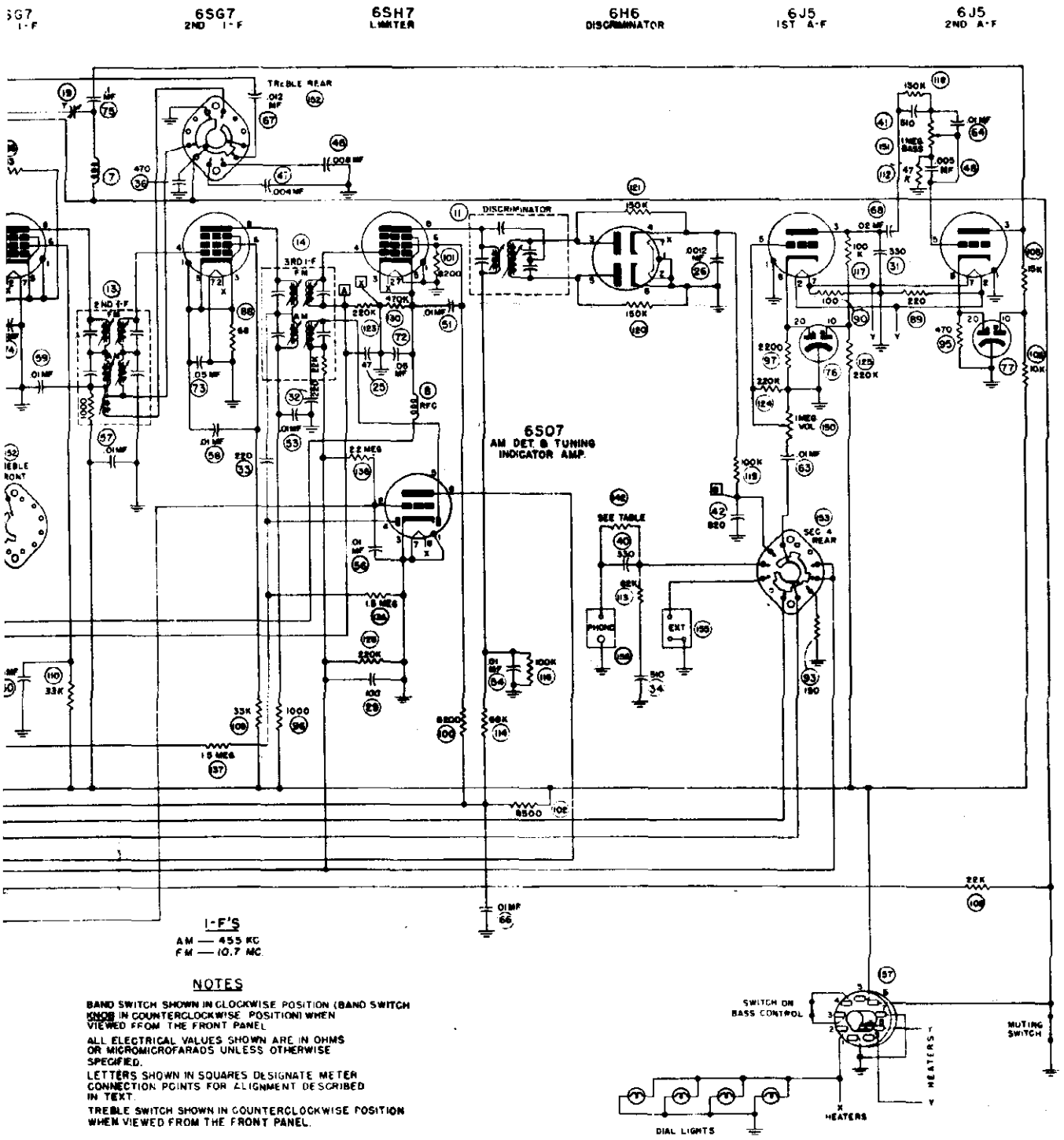
THE MAGNAVOX CO. MODELS CR-202 SERIE

REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
21	Capacitor, ceramic, 3 mmf.	250088G38
22	Capacitor, ceramic and composition, 6 mmf.	250164G2
23	Capacitor, ceramic and composition, 10 mmf.	250164G3
24	Capacitor, ceramic and composition, 10 mmf.	250164G3
25	Capacitor, mica, 47 mmf.	250159G96
26	Capacitor, mica, .0012 mfd, ±10%, 600 V	250169G12
27	Capacitor, ceramic, 50 mmf.	250088G39
28	Capacitor, ceramic, 50 mmf.	250088G39
29	Capacitor, mica, 100 mmf.	250159G98
30	Capacitor, mica, 100 mmf.	250159G98
31	Capacitor, mica, 330 mmf.	250159G101
32	Capacitor, mica, 220 mmf.	250159G100
33	Capacitor, mica, 220 mmf.	250159G100
34	Capacitor, mica, 510 mmf., ±5%	250159G64
35	Capacitor, silver mica, 335 mmf., ±1%	250085G38
36	Capacitor, mica, 470 mmf.	250159G102
38	Capacitor, mica, 470 mmf.	250159G102
39	Capacitor, ceramic, 35 mmf.	250088G40
40	Capacitor, mica, 330 mmf ± 10%	250159G88
41	Capacitor, mica, 510 mmf., ±5%	250159G64
42	Capacitor, mica, 820 mmf., ±10%	250159G132
44	Capacitor, paper, .002 mfd., 600 V.	250152G44
45	Capacitor, ceramic, .004 mfd.	250088G34
46	Capacitor, molded paper, .008 mfd., 600 V.	250129G11
47	Capacitor, molded paper, .004 mfd., 600 V.	250129G7
48	Capacitor, molded paper, .004 mfd., 400 V.	250129G10
49	Capacitor, mica, .0062 mfd., ±5%	250161G27
50	Capacitor, mica, .0062 mfd., ±5%	250161G27
51	Capacitor, paper, .01 mfd., 400 V.	250152G27
52	Capacitor, paper, .01 mfd., 400 V.	250152G27
53	Capacitor, paper, .01 mfd., 400 V.	250152G27
54	Capacitor, paper, .01 mfd., 400 V.	250152G27
55	Capacitor, paper, .01 mfd., 400 V.	250152G27
56	Capacitor, paper, .01 mfd., 400 V.	250152G27
57	Capacitor, paper, .01 mfd, 400 V	250152G27
58	Capacitor, paper, .01 mfd., 400 V.	250152G27
59	Capacitor, paper, .01 mfd., 400 V.	250152G27
60	Capacitor, paper, .01 mfd., 400 V.	250152G27
61	Capacitor, paper, .01 mfd., 400 V.	250152G27
62	Capacitor, paper, .01 mfd., 400 V.	250152G27
63	Capacitor, paper, .01 mfd., 400 V.	250152G27
64	Capacitor, paper, .01 mfd., 400 V.	250152G27
65	Capacitor, paper, .01 mfd., 400 V.	250152G27
66	Capacitor, paper, .01 mfd., 400 V.	250152G27
67	Capacitor, molded paper, .012 mfd., 200 V.	250129G13
68	Capacitor, paper, .02 mfd., 400 V.	250152G26
69	Capacitor, paper, .02 mfd., 400 V.	250152G26
70	Capacitor, paper, .02 mfd., 400 V.	250152G26
71	Capacitor, paper, .05 mfd., 200 V.	250152G15
72	Capacitor, paper, .05 mfd., 200 V.	250152G15
73	Capacitor, paper, .05 mfd., 200 V.	250152G15
74	Capacitor, paper, .05 mfd., 200 V.	250152G15
75	Capacitor, paper, .1 mfd., 400 V.	250152G22
76	Capacitor, electrolytic, 10 mfd., 450 V.—20 mfd., 25 V.	270023G6
77	Capacitor, electrolytic, 10 mfd., 450 V.—20 mfd., 25 V.	270023G6
86	Resistor, composition, 33 ohms, ½ W.	230084G4
87	Resistor, composition, 33 ohms, ½ W.	230084G4
88	Resistor, composition, 68 ohms, ½ W.	230084G6
89	Resistor, composition, 220 ohms, ±10%, ½ W.	230084G54
90	Resistor, composition, 100 ohms, ±10%, ½ W.	230084G50
91	Resistor, composition, 100 ohms, ½ W.	230084G7
92	Resistor, composition, 68 ohms, ½ W.	230084G6

MODELS CR-202 SERIES THE MAGNAVOX CO.

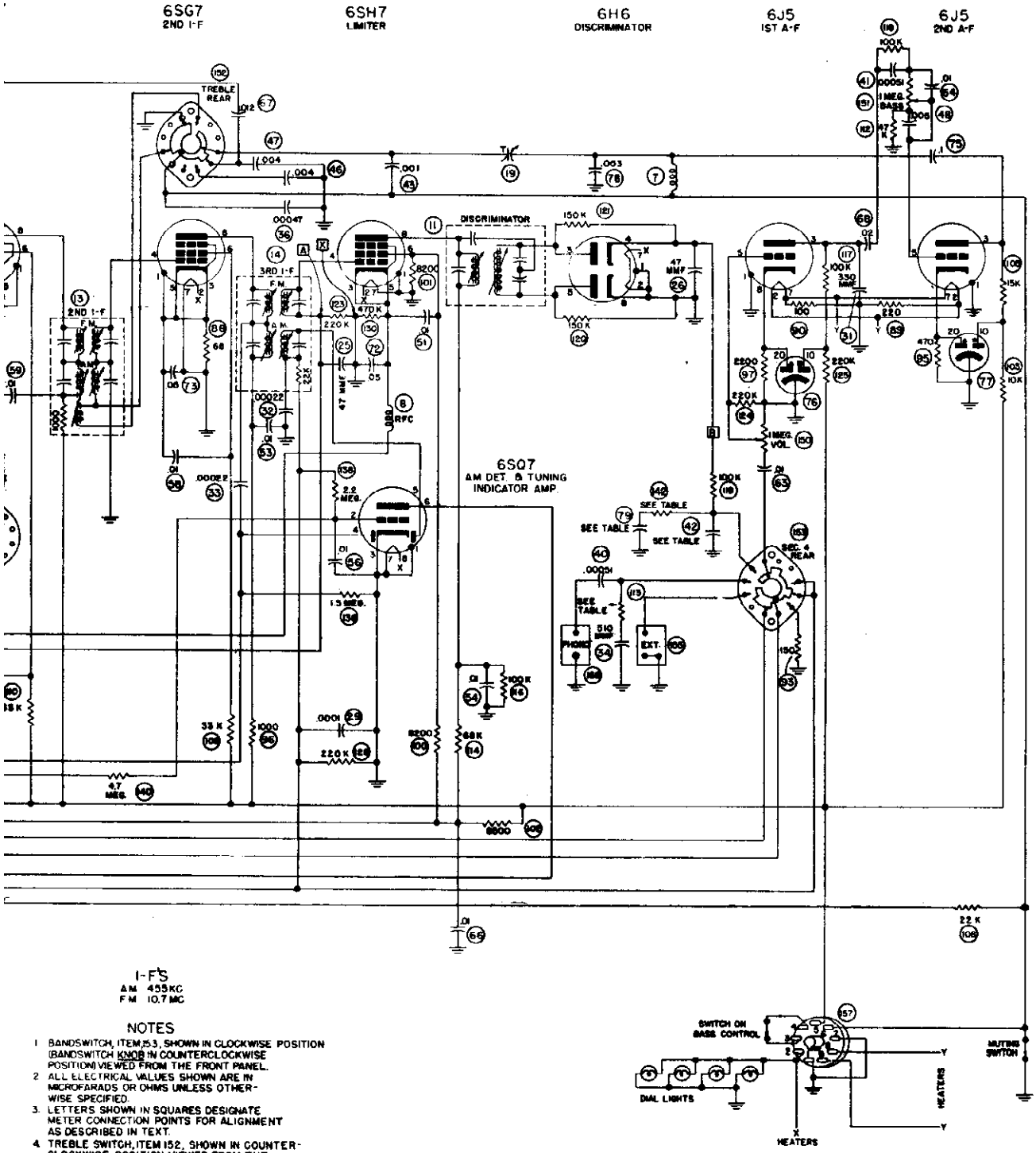
REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
93	Resistor, composition, 150 ohms, ½ W.	230084G8
94	Resistor, composition, 220 ohms, ½ W.	230084G9
95	Resistor, composition, 470 ohms, ½ W.	230084G11
96	Resistor, composition, 1000 ohms, ½ W.	230084G13
97	Resistor, composition, 2200 ohms, ½ W.	230084G15
98	Resistor, composition, 4700 ohms, ½ W.	230084G17
99	Resistor, composition, 5600 ohms, ±10%, ½ W.	230084G71
100	Resistor, composition, 8200 ohms, ±10%, 1 W.	230085G73
101	Resistor, composition, 8200 ohms, ±10%, 1 W.	230085G73
102	Resistor, strip, 8500 ohms	240035G5
103	Resistor, composition, 10,000 ohms, 1 W.	230085G19
104	Resistor, composition, 10,000 ohms, ½ W.	230084G19
105	Resistor, composition, 15,000 ohms, 1 W.	230085G20
106	Resistor, composition, 20,000 ohms, ±5%, 1 W.	230085G190
107	Resistor, composition, 15,000 ohms, ½ W.	230084G20
108	Resistor, composition, 22,000 ohms, ½ W.	230084G21
109	Resistor, composition, 33,000 ohms, 1 W.	230085G22
110	Resistor, composition, 33,000 ohms, 1 W.	230085G22
111	Resistor, composition, 33,000 ohms, ±10%, 2 W.	230086G80
112	Resistor, composition, 47,000 ohms, ½ W.	230084G23
113	Resistor, composition, 82,000 ohm, ± ½ W.	230084G85
114	Resistor, composition, 68,000 ohms, ±10%, ½ W.	230084G84
115	Resistor, composition, 100,000 ohms, ½ W.	230084G25
116	Resistor, composition, 100,000 ohms, ½ W.	230084G25
117	Resistor, composition, 100,000 ohms, ½ W.	230084G25
118	Resistor, composition, 150,000 ohm, ½ W.	230084G26
119	Resistor, composition, 100,000 ohms, ±10%, ½ W.	230084G86
120	Resistor, composition, 150,000 ohms, ½ W., ±10%	230084G88
121	Resistor, composition, 150,000 ohms, ½ W., ±10%	230084G88
122	Resistor, composition, 150,000 ohms, ½ W. (EARLY PRODUCTION)	230084G26
	Resistor, composition, 39,000 ohms, ½ W. (LATE PRODUCTION)	230084G81
123	Resistor, composition, 220,000 ohms, ½ W.	230084G27
124	Resistor, composition, 220,000 ohms, ½ W.	230084G27
125	Resistor, composition, 220,000 ohms, ½ W.	230084G27
126	Resistor, composition, 220,000 ohms, ½ W.	230084G27
127	Resistor, composition, 220,000 ohms, ½ W.	230084G27
128	Resistor, composition, 220,000 ohms, ½ W.	230084G27
129	Resistor, composition, 470,000 ohms, ½ W.	230084G29
130	Resistor, composition, 470,000 ohms, ½ W.	230084G29
131	Resistor, composition, 470,000 ohms, ½ W.	230084G29
132	Resistor, composition, 470,000 ohms, ½ W.	230084G29
133	Resistor, composition, 1 megohm, ½ W.	230084G31
134	Resistor, composition, 1 megohm, ½ W.	230084G31
135	Resistor, composition, 1 megohm, ½ W.	230084G31
136	Resistor, composition, 1.5 megohm, ½ W.	230084G32
137	Resistor, composition, 1.5 megohm, ½ W.	230084G32
138	Resistor, composition, 2.2 megohm, ½ W.	230084G33
139	Resistor, composition, 2.2 megohm, ½ W.	230084G33
140	Resistor, composition, 4.7 megohm, ½ W.	230084G35
141	Resistor, composition, 4.7 megohm, ½ W.	230084G35
142	Resistor, composition, 3.9 megohm, ±10%, ½ W. (CR-202 B only)	230084G34
150	Control, volume, 1 megohm	220044G24
151	Control, bass, 1 megohm with switch	220073G6
152	Switch, treble control	160178G1
153	Switch, rotary, band switch	160179G1
154	Switch, slide SPDT	160176G1
155	Socket, external input	180060G1
156	Socket, phonograph input	189741G1
157	Socket, amplifier	180427G2
158	Antenna Loop Assembly	460637G1
	Dial Glass Assembly	150303G1
	Push Button Assembly for Gang	260093G1


6BA6
R-F
6SB7Y
CONVERTER
TUNING CONDENSER
SEC. 2 FRONT
SEC. 2 REAR
SEC. 1 REAR
SEC. 3 REAR
SEC. 3 FRONT
SEC. 4 FRONT
1ST I-F
TREBLE FRONT
LOOP-ANT. SW.
BC LOOP
SW CABINET ANT
EARLY PRODUCTION
39K - LATE PRODUCTION
6U5
TUNING INDICATOR
SEC. 1 FRONT
6H6
DISCRIMINATOR
6J5
1ST A-F
6J5
2ND A-F
6BA6
R-F
6SH7
LIMITER
6SQ7
AM DET & TUNING IND. AMP.
6SB7Y
CONVERTER
6SG7
2ND I-F
6SG7
1ST I-F
MEASURE HEATER AND FILAMENT VOLTAGES DIRECTLY ACROSS SOCKET TERMINALS.
ALL OTHER VOLTAGES MEASURED FROM SOCKET TERMINAL TO GROUND WITH A 20,000 OHMS/VOLT VOLTMETER WITH BAND SWITCH IN SW POSITION.
HEATERS (H) 6.3 V. A.C.
LINE VOLTAGE 117 V. A.C.
6U5
TUNING INDICATOR



ITEM	OMIT	3.5 MEG
	CR202A	CR202B

Intermediate frequency	455 kc. 10.7 mc.
Tuning frequency range:	
Broadcast Band	540–1620 kc.
Short Wave Band	5.9–17.3 mc.
FM Band	88–108 mc.



I-F'S
AM 455KC
FM 10.7 MC

NOTES

1. BANDSWITCH, ITEM 153, SHOWN IN CLOCKWISE POSITION (BANDSWITCH KNOB IN COUNTERCLOCKWISE POSITION) VIEWED FROM THE FRONT PANEL.
2. ALL ELECTRICAL VALUES SHOWN ARE IN MICROFARADS OR OHMS UNLESS OTHERWISE SPECIFIED.
3. LETTERS SHOWN IN SQUARES DESIGNATE METER CONNECTION POINTS FOR ALIGNMENT AS DESCRIBED IN TEXT.
4. TREBLE SWITCH, ITEM 152, SHOWN IN COUNTERCLOCKWISE POSITION VIEWED FROM THE FRONT PANEL.

CR204C	OMIT	35	.0018	.002	330K
CR204B	OMIT	500	.00082	OMIT	OMIT
CR204A	47K	35	.00082	OMIT	OMIT
MODEL	ITEM 113	ITEM 39	ITEM 42	ITEM 79	ITEM 149

DIAL CORD REPLACEMENT

Rotate the brass pulley designated "A" in Figure 1 until the dial pointer strikes the stop at the high frequency end of the dial calibration. In this condition the slot in pulley "A" should be approximately ten degrees to the left of being vertical--see Figure 1. If the slot in the pulley is in some other position under the above mentioned conditions, the pointer set screw is probably loose and has allowed the pointer to slip.

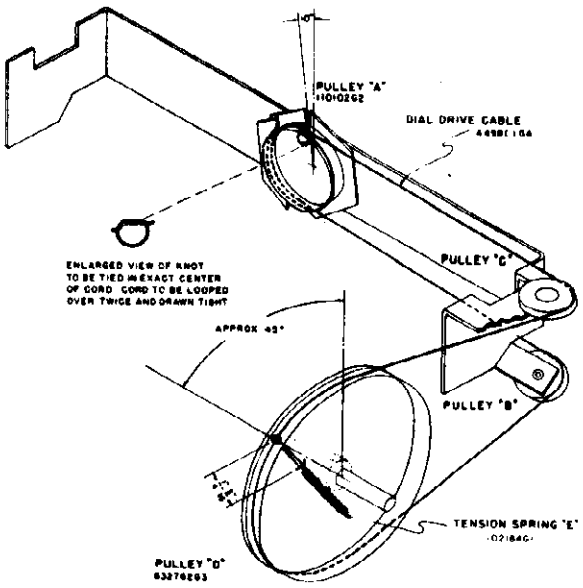


FIGURE 1

To correct this condition, first remove the glass dial and loosen the pointer screw. Then while holding pulley "A" so that its slot is approximately ten degrees to the left of vertical (when viewed from the rear) adjust the pointer until it is resting against the stop at the high frequency end of its travel. Then tighten the pointer set screw securely and replace the glass dial.

Completely unmesh the condenser gang and check the location of the hole or slot in pulley "D." If this hole is not approximately 45 degrees back from vertical as shown on Figure 1, loosen the two No. 6 Allen set screws in the hub of pulley "D" and slip the pulley on its shaft (while holding the condenser gang unmeshed) until the specified adjustment is obtained; then tighten one of the set screws securely. It will be shown later that this is a temporary setting. Next, tie a double knot in the exact center of a 25-inch length of dial cable and fold the cable back on itself so that the knot is at one end. The correct method for tying this knot is shown as an inset on Figure 1. Grasp the cable near the knotted end and slide it into the pulley slot so that the knot is against the inside rim of the pulley as shown in the sketch. The piece of cable nearest the dial frame should be wound in the direction shown for one-half turn; then over the lower pulley "B," around the bottom of the large pulley "D" and into the hole. Pull the cable taut and wrap the end around the small hook on pulley "D" temporarily.

The remaining piece of cable should be wound around pulley "A" in the direction shown, for one complete turn, over the upper pulley "C," and over the top of pulley "D." Thread the end through the small hole in pulley "D" and pull both ends of the cable taut. With one end of tension spring "E" fastened to the hook on pulley "D" lace the two free ends of the cable through the opposite end of the spring and tie a knot at a point that will allow ¼" to 5/16" of cable between the spring and the inside rim of pulley "D." Be sure to tie the knot around one coil of the spring in the manner shown.

Now with the condenser gang completely meshed, check the position of the dial pointer. If it is not in line with the last calibration mark at the low frequency end of the dial, loosen the set screw in pulley "D" and turn it until the pointer is in the specified position. Be sure that the condenser gang does not move during this adjustment. Then tighten the two screws in pulley "D" securely completing the operation.

Tubes:

R-F Amplifier	6BA6
Converter	6SB7Y
1st I-F Amplifier (AM-FM)	6SG7
2nd I-F Amplifier (AM-FM)	6SG7
Limiter	6SH7
Discriminator	6H6
Detector and AVC (AM) and Tuning Indicator Amplifier	6SQ7
First Audio	6J5
Second Audio	6J5
Tuning Indicator	6U5
Dial Lamps	Mazda No. 44

ALIGNMENT PROCEDURE

Alignment of this receiver requires the use of an accurately calibrated RF signal generator, range 455 kc. to 107 mc., an output meter, and a vacuum tube voltmeter of approximately 10 megohm input impedance. All trimmer condensers can be identified by stampings on the chassis and gang condenser cover and are shown on the chassis layout diagram.

AM ALIGNMENT

I-F ALIGNMENT

1. Set treble control to SHARP TUNE position. Set volume and bass controls to maximum, the Band Switch to Broadcast position, and dial pointer to 1000 kc.

2. Tune the signal generator to EXACTLY 455 kc.

3. Connect output of modulated signal generator to the signal grid of the 6SB7Y (pin 8) through a .01 mfd. capacitor and signal generator ground to radio chassis.

4. All i-f transformers on this chassis are slug-tuned. Both slug adjustments for 455 kc. are located on top of the transformers; the 10.7 mc. adjustments are accessible on the bottom.

5. Connect output meter across voice coil of 15-inch speaker and peak in order the third, second and first i-f transformers.

ALTERNATE VISUAL ALIGNMENT OF I-F STAGES

1. Connect 455 kc. sweep generator having approximately 40 kc. sweep to signal grid of 6SB7Y (pin 8) through a .01 mfd. capacitor. Connect an oscilloscope through a 1 megohm isolating resistor across the 220,000 ohm diode load resistor. Align for best possible peak in sharp tune position and symmetry in full range position.

BROADCAST BAND R-F ALIGNMENT

1. Connect signal generator through .00025 mfd. capacitor to antenna and ground terminals on antenna terminal strip on rear of chassis. Be sure "Ant-loop" switch on top of the chassis is in the ANT. position. Connect output meter as for AM i-f alignment.

2. Tune signal generator to 1400 kc.

3. Set dial to 1400 kc. and adjust oscillator, r-f and antenna trimmers for maximum indication on meter.

4. Set signal generator to 600 kc. and tune radio to signal. Adjust the 600 kc. padder to maximum output while simultaneously rocking the gang.

5. 1400 kc. calibration should then be checked and re-adjusted if necessary with the 1400 kc. oscillator trimmer.

The pointer on the radio dial should line up with the first horizontal mark on the low frequency end of the dial glass. If the pointer does not line up, loosen the screws on the pointer drive pulley at the end of the tuning gang and adjust the pointer setting; tighten the screws after this adjustment. Be sure the gang is fully meshed for this pointer alignment.

SHORT WAVE BAND R-F ALIGNMENT

1. Set the Band Switch to Short Wave and replace the .00025 mfd. capacitor in series with the signal generator lead to the antenna terminal, with a 400-ohm resistor.

2. Set the signal generator and the receiver to 15 mc. and adjust the oscillator, r-f and antenna trimmers for maximum indication on the meter. While adjusting the 15 mc. oscillator trimmer, two peaks may be observed; only one is the correct peak for 15 mc. alignment. To obtain the correct peak, screw trimmer in to maximum capacitance, then decrease until the first peak is observed. This is the correct one.

Another method for checking for the correct peak is to tune the receiver to 15.91 mc. with signal generator at 15 mc. and with the output increased. If the 15 mc. oscillator is properly aligned, the signal will be received at 15.91 mc.—if incorrectly aligned, the signal will be received at 14.09 mc.

FM ALIGNMENT

DISCRIMINATOR ALIGNMENT

1. Tune signal generator to EXACTLY 10.775 mc. and connect to pin 4 of the 6SH7 limiter tube socket through a .01 mfd. capacitor.

2. Connect a DC vacuum tube voltmeter from Pin 4 cn 6H6 tube socket to ground through a 1 megohm isolating resistor.

3. Peak both discriminator slugs at 10.775 mc.

4. Retune signal generator to exactly 10.7 mc. and adjust bottom slug for zero volts.

5. The DC voltage at 10.625 mc. should be within 10% of the voltage at 10.775 mc. and of opposite polarity.

Note: If the signal generator is not capable of sufficient output to produce a readable DC voltage, the amplification of the last i-f stage can be used to increase the signal input to the limiter for discriminator alignment. To accomplish this, align the last i-f stage as indicated in "IF Alignment". Then align discriminator as above leaving the signal generator connected to the grid of the 6SG7 2nd i-f tube.

I-F ALIGNMENT

1. Connect high side of signal generator, through a .01 mfd. capacitor and a 1000 ohm resistor in series,

to pin 4 of the 6SG7 2nd i-f tube. Connect low side of generator to chassis.

2. Close gang condenser and connect vacuum tube voltmeter across 220,000 ohm limiter grid resistor; (Points "A" to "X" on schematic). Adjust signal generator output until a reading of at least 3 volts is obtained. In order to reduce regeneration caused by the vacuum tube voltmeter leads, a 1-megohm isolating resistor, connected with as short leads as possible to point "A" should be used in series with the vacuum tube voltmeter. Align the 3rd i-f transformer for best peak as indicated on voltmeter.

3. Repeat above for the 2nd and 1st transformer by connecting signal generator to signal grid of first i-f tube 6SG7 then to the signal grid of 6SB7Y converter. The i-f stages should be aligned in this order.

WARNING—After each i-f stage has been aligned, do not repeak with the signal into the grid of the 6SB7Y.

ALTERNATE VISUAL ALIGNMENT OF I-F STAGES

1. Replace signal generator with sweep generator having approximately 300 kc. sweep and tune generator to 10.7 mc. Connect oscilloscope across 220,000 ohm limiter grid resistor through a 1-megohm isolating resistor. The order of alignment is the same as when using a vacuum tube voltmeter. Each i-f transformer should be individually aligned for best peak and symmetry.

R-F ALIGNMENT

1. Connect vacuum tube voltmeter across limiter grid resistor as in FM I-F alignment. Adjust signal generator output until a reading of at least 3 volts is obtained.

2. Ground one side of the FM Antenna by placing a wire jumper from one FM connection on the antenna terminal strip to the ground connection.

3. Connect unmodulated signal generator through a 300 ohm resistor to ungrounded antenna post and chassis, and tune signal generator to 107 mc.

4. Set radio dial to 107 mc. and tune oscillator trimmer to peak output on vacuum tube voltmeter.

5. Tune 107 mc. r-f and antenna trimmers for maximum indication on voltmeter—it may be necessary to rock the gang while adjusting the r-f trimmer.

STAGE GAINS*

Antenna Post to R-F Grid at:

600 kc.	5.8
6.5 mc.	2.9
98 mc.	1.0

R-F Grid to Converter Grid at:

600 kc.	11.6
6.5 mc.	9.5
98 mc.	6.8

R-F on Converter Grid to 455 kc. on I-F Grid at:

600 kc.	1.7
6.5 mc.	2.4
98 mc.	6.8

I-F on Converter Grid to 1st I-F Grid at:

455 kc. (dial pointer at 600 kc.)	2.6

1st I-F Grid to 2nd I-F Grid at:

455 kc.	20.5
10.7 mc.	37

2nd I-F Grid to Limiter Grid at:

10.7 mc.	34.5

AUDIO GAIN

Voltage required across the Volume Control to produce 0.1 watt speaker output** at 400 cycles is:

.013 volt with Amplifier AMP-111A

.008 volt with Amplifier AMP-111B or C

with Band Switch in BDCST setting.

OSCILLATOR OUTPUT VOLTAGE

The DC voltage developed across the Oscillator Grid Resistor (105) at:

600 kc.	4.5V.
6.5 mc.	4.6V.
98 mc.	5.4V.

or 0.3 ma. through 15,000 ohm Oscillator Grid Resistor at 600 kc., 0.31 ma. at 6.5 mc. and 0.36 ma at 98 mc.

*Variations of ±20% are permissible. All AM readings made with sufficient input signal to provide 0.5 watt speaker output. 0.5 watt speaker output at 400 cycles is equivalent to a reading of 2.75V. as measured by a high resistance AC voltmeter across the voice coil of the 15-inch speaker.

**0.1 watt speaker output at 400 cycles is equivalent to a reading of 1.22 volts as measured by a high resistance AC voltmeter across the voice coil of 15-inch speaker

10 KC. FILTER ADJUSTMENT

This chassis incorporates a 10 kc. filter circuit to eliminate the beat note heard as a whistle between stations on the broadcast band. If the trimmer is out of adjustment the following procedure should be observed:

1. Adjust the treble control switch to the No. 4 setting.

2. Connect the output of an audio oscillator to the phonograph pickup socket on the radio chassis and adjust the oscillator to exactly 10,000 cycles.

3. Set the band selector to PHONO and adjust the 10 kc. trimmer for *minimum* output.

4. If an audio oscillator is not available for making this adjustment set the band selector to BDCST, set the treble control to position 4, connect the antenna to the receiver and set the gang condenser to a point between two stations on adjacent channels having approximately the same power. If the 10 kc. trimmer is out of adjustment, a whistle will be heard. Adjust the trimmer until the whistle is eliminated.

CONDENSER GANG DRIVE ADJUSTMENTS

Whenever any of the mechanical parts in the condenser gang drive assembly require replacement due to rough handling or for any other reason, it is extremely important that clearances and adjustments shown on Figures 2 and 3 are correct; otherwise, the tuning mechanism will be sluggish or it may slip during operation.

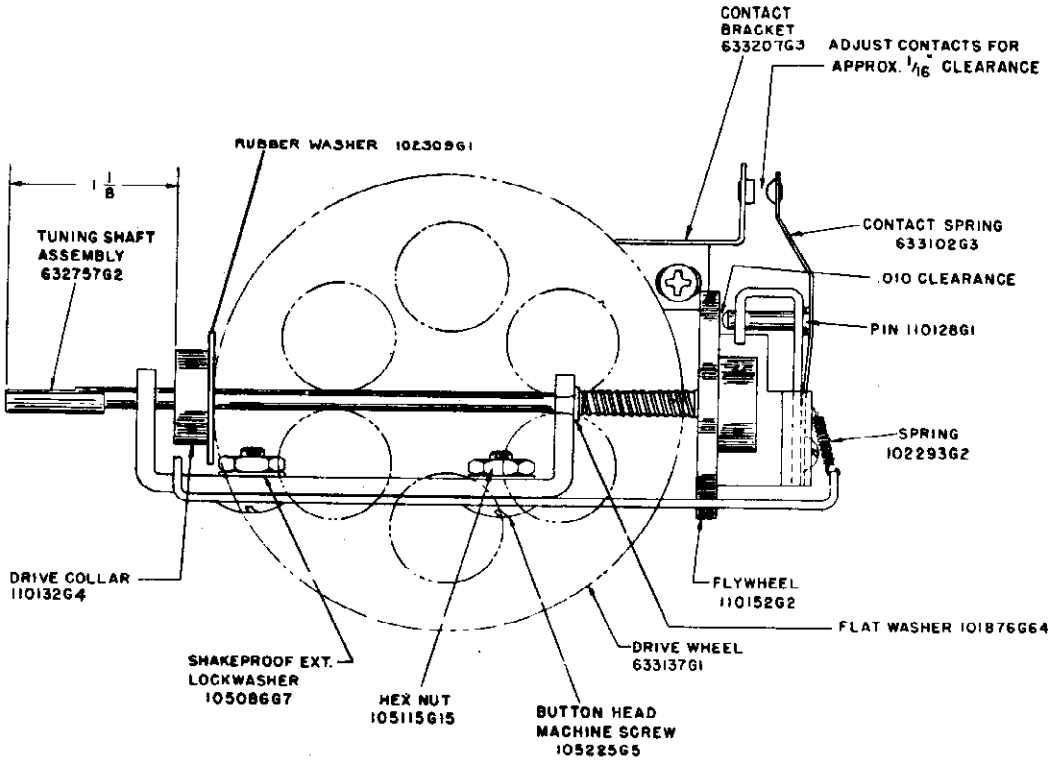


FIGURE 2

In reassembling the mechanism after any part was replaced, follow the procedure outlined below:

1. Assemble the Tuning Shaft, Drive Collar, Compression Spring and Flywheel in the order shown on Figure 3. The distance between the front of the Drive Collar and the front of the Tuning Shaft must be 1⅛ inches as specified on Figure 2. Install the Flywheel on the rear of the Tuning Shaft and slide it forward until it nearly touches the edge of the Drive Wheel; then tighten one of the set screws in the Flywheel hub. Insert a .010" gauge between the Flywheel and the Pin, and while holding the gauge in this position, loosen the set screw in the Flywheel hub that was previously tightened. The Compression Spring should force the Flywheel back against the gauge—when this occurs, tighten both set screws in the Flywheel hub.

2. Adjust the Muting Switch contact clearance by loosening the two screws in the Contact Bracket and sliding the bracket in the required direction until a 1/16" clearance is obtained. If this adjustment cannot be obtained in the manner prescribed, bend the Contact Bracket until proper clearance is realized.

3. The Drive Wheel is properly located on its shaft when its edge nearest the hub is in line with the outside edge of the Drive Collar as shown on Figure 3. Two Allen set screws in the Drive Wheel hub provide a means of adjusting the position of this wheel.

4. When the adjustment outlined in paragraph 2 is correct, the proper contact clearance will automatically be obtained when the Muting Switch is to be "unmuted" while the push buttons are being set. While pressure is applied to any one of the push buttons while they are being set up, a pressure applied simultaneously to the Tuning Control knob will cause the Muting Switch contacts to open. Detailed instructions on setting up these push buttons are shown elsewhere in this bulletin.

5. If the push button shafts at both ends do not engage the Treadle Bar as shown on Figure 3, the three screws in the Treadle Bar must be loosened and the Treadle Bar should be moved until the required condition is obtained.

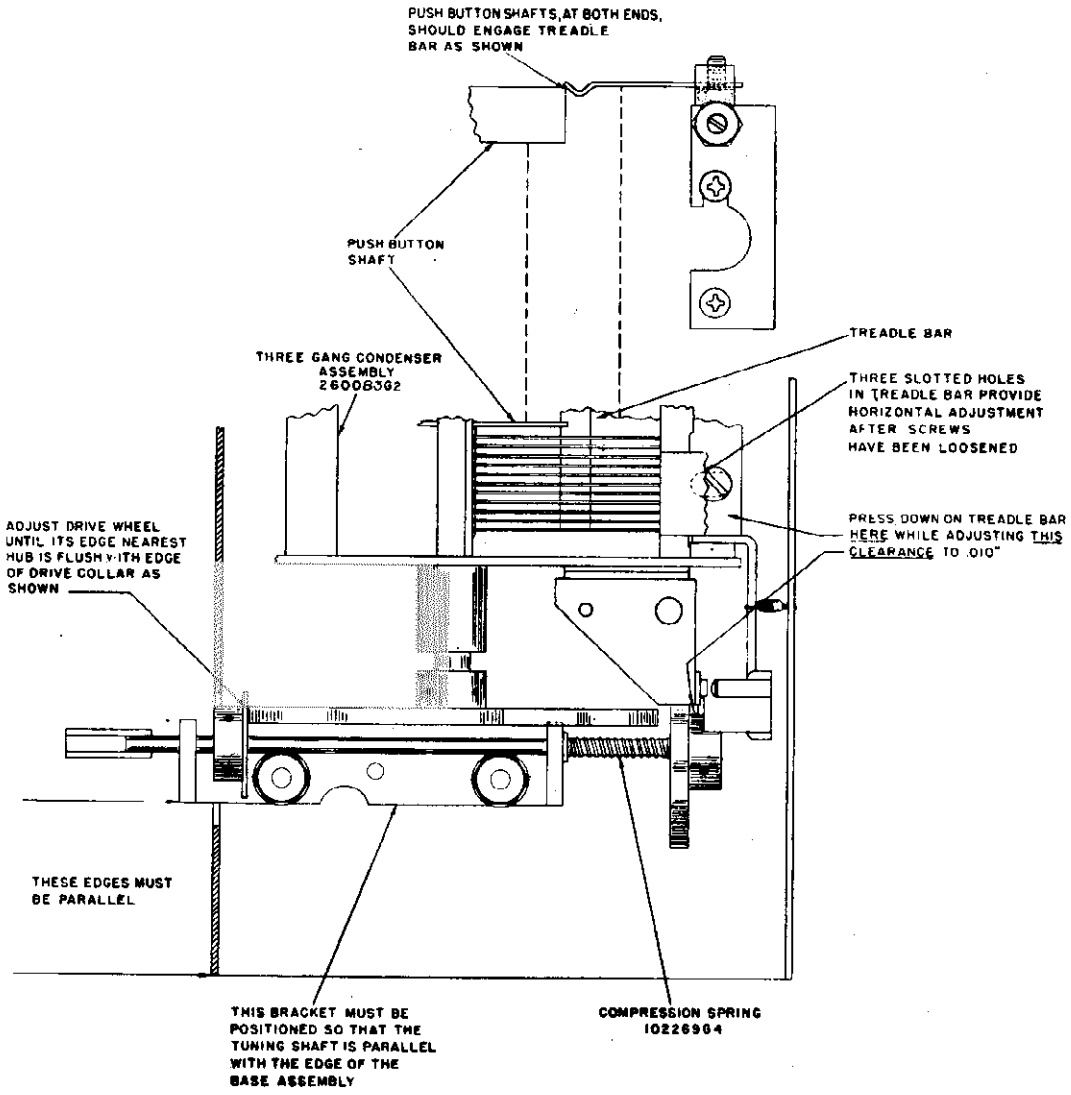


FIGURE 3

PARTS LIST

REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
1	Coil Assembly, oscillator, AM	360298G1
2	Coil Assembly, antenna, AM	360299G1
3	Coil Assembly, r-f, AM	360300G1
4	Coil Assembly, antenna, FM (CR-204B only)	360296G2
	Coil Assembly, antenna, FM (CR-204A and C only)	360296G3
5	Coil Assembly, oscillator, FM	360295G1
6	Coil Assembly, r-f, FM (CR-204B only)	360297G2
	Coil Assembly, r-f, FM (CR-204A and C only)	360297G3
7	Coil Assembly, 10 kc	360244G1
8	Coil, choke	360284G1
9	Coil, choke	360284G1
10	Coil, filament choke	360264G1
11	Transformer, discriminator	360305G1
12	Transformer, i-f	360285G1
13	Transformer, i-f	360285G1
14	Transformer, limiter	360286G1
15	Capacitor, variable, three-gang tuning	260083G1
16	Capacitor, variable, oscillator trimmer, broadcast	260067G4
17	Capacitor, variable, two-gang trimmer	260080G1

MODELS CR-204 SERIES THE MAGNAVOX CO.

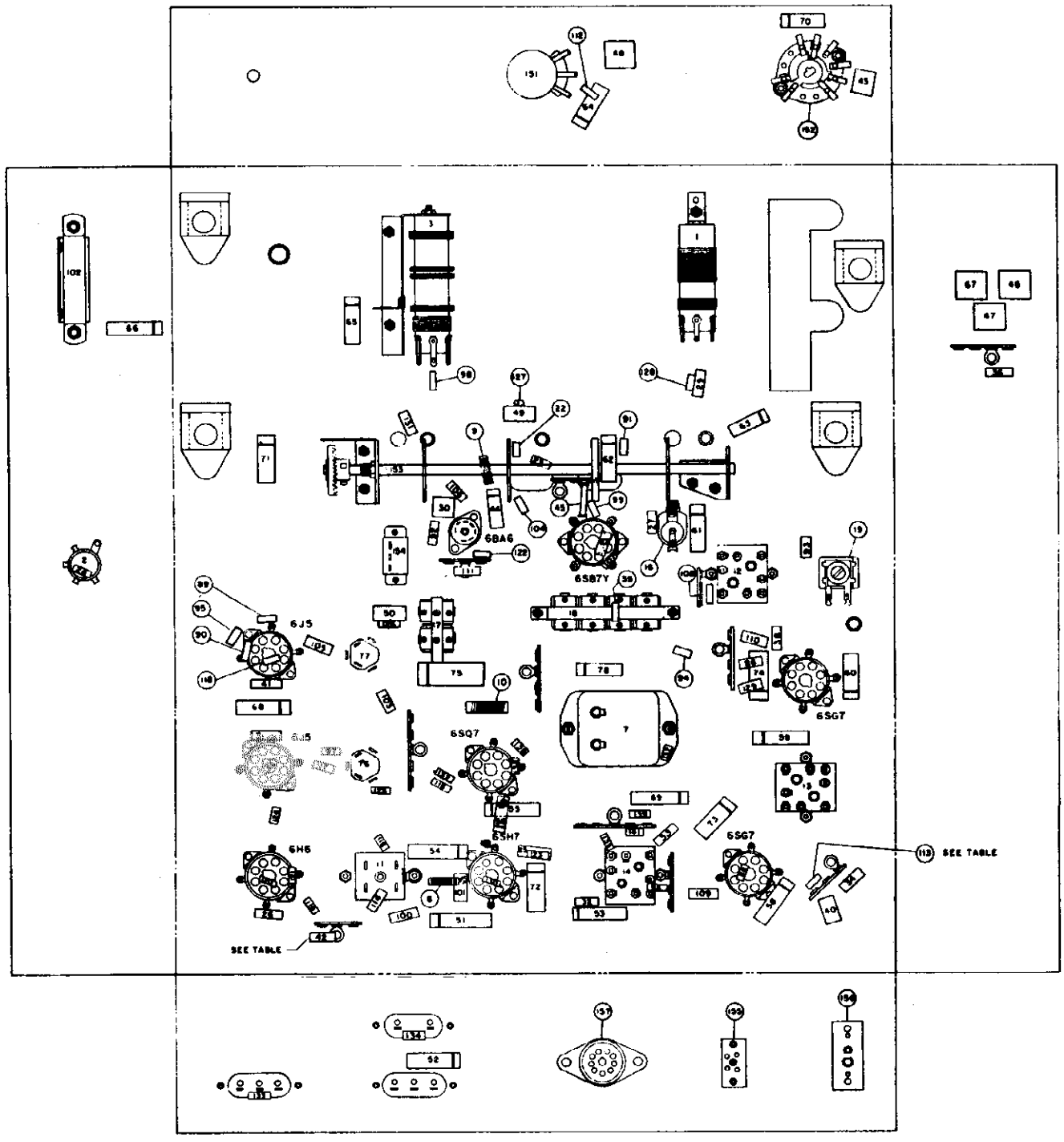
REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
18	Capacitor, variable, four-gang trimmer and oscillator padder	260082G1
19	Capacitor, variable, 10 kc. trimmer	259610G2
20	Capacitor, trimmer assembly	260084G1
21	Capacitor, ceramic, 3 mmf.	250088G38
22	Capacitor, ceramic and composition, 6 mmf.	250164G2
23	Capacitor, ceramic and composition, 10 mmf.	250164G3
24	Capacitor, ceramic and composition, 10 mmf.	250164G3
25	Capacitor, mica, 47 mmf.	250159G96
26	Capacitor, mica, 47 mmf.	250159G96
27	Capacitor, ceramic, 50 mmf.	250088G39
28	Capacitor, ceramic, 50 mmf.	250088G39
29	Capacitor, mica, 100 mmf.	250159G98
30	Capacitor, mica, 100 mmf.	250159G98
31	Capacitor, mica, 330 mmf.	250159G101
32	Capacitor, mica, 220 mmf.	250159G100
33	Capacitor, mica, 220 mmf.	250159G100
34	Capacitor, mica, 510 mmf., ±5%	250159G64
35	Capacitor, silver mica, 335 mmf., ±1%	250085G38
36	Capacitor, mica, 470 mmf.	250159G102
38	Capacitor, mica, 470 mmf.	250159G102
39	Capacitor, ceramic, 500 mmf. (CR-204B only)	250088G31
	Capacitor, ceramic, 35 mmf. (CR-204A and C only)	250088G40
40	Capacitor, mica, 510 mmf., ±5%	250159G64
41	Capacitor, mica, 510 mmf., ±5%	250159G64
42	Capacitor, mica, 820 mmf., ±10% (CR-204A and B only)	250159G132
	Capacitor, mica, 1800 mmf., ±10% (CR-204C only)	250160G67
43	Capacitor, mica, 1000 mmf., ±20%	250160G82
44	Capacitor, paper, .002 mfd., 600 V.	250152G44
45	Capacitor, ceramic, .004 mfd.	250088G34
46	Capacitor, molded paper, .004 mfd., 600 V.	250129G7
47	Capacitor, molded paper, .004 mfd., 600 V.	250129G7
48	Capacitor, molded paper, .004 mfd., 400 V.	250129G10
49	Capacitor, mica, .0062 mfd., ±5%	250161G27
50	Capacitor, mica, .0062 mfd., ±5%	250161G27
51	Capacitor, paper, .01 mfd., 400 V.	250152G27
52	Capacitor, paper, .01 mfd., 400 V.	250152G27
53	Capacitor, paper, .01 mfd., 400 V.	250152G27
54	Capacitor, paper, .01 mfd., 400 V.	250152G27
55	Capacitor, paper, .01 mfd., 400 V.	250152G27
56	Capacitor, paper, .01 mfd., 400 V.	250152G27
58	Capacitor, paper, .01 mfd., 400 V.	250152G27
59	Capacitor, paper, .01 mfd., 400 V.	250152G27
60	Capacitor, paper, .01 mfd., 400 V.	250152G27
61	Capacitor, paper, .01 mfd., 400 V.	250152G27
62	Capacitor, paper, .01 mfd., 400 V.	250152G27
63	Capacitor, paper, .01 mfd., 400 V.	250152G27
64	Capacitor, paper, .01 mfd., 400 V.	250152G27
65	Capacitor, paper, .01 mfd., 400 V.	250152G27
66	Capacitor, paper, .01 mfd., 400 V.	250152G27
67	Capacitor, molded paper, .012 mfd., 200 V.	250129G13
68	Capacitor, paper, .02 mfd., 400 V.	250152G26
69	Capacitor, paper, .02 mfd., 400 V.	250152G26
70	Capacitor, paper, .02 mfd., 400 V.	250152G26
71	Capacitor, paper, .05 mfd., 200 V.	250152G15
72	Capacitor, paper, .05 mfd., 200 V.	250152G15
73	Capacitor, paper, .05 mfd., 200 V.	250152G15
74	Capacitor, paper, .05 mfd., 200 V.	250152G15
75	Capacitor, paper, .1 mfd., 400 V.	250152G22
76	Capacitor, electrolytic, 10 mfd., 450 V.—20 mfd., 25 V.	270023G6
77	Capacitor, electrolytic, 10 mfd., 450 V.—20 mfd., 25 V.	270023G6
78	Capacitor, paper, .003 mfd., ±10%, 600 V.	250169G6

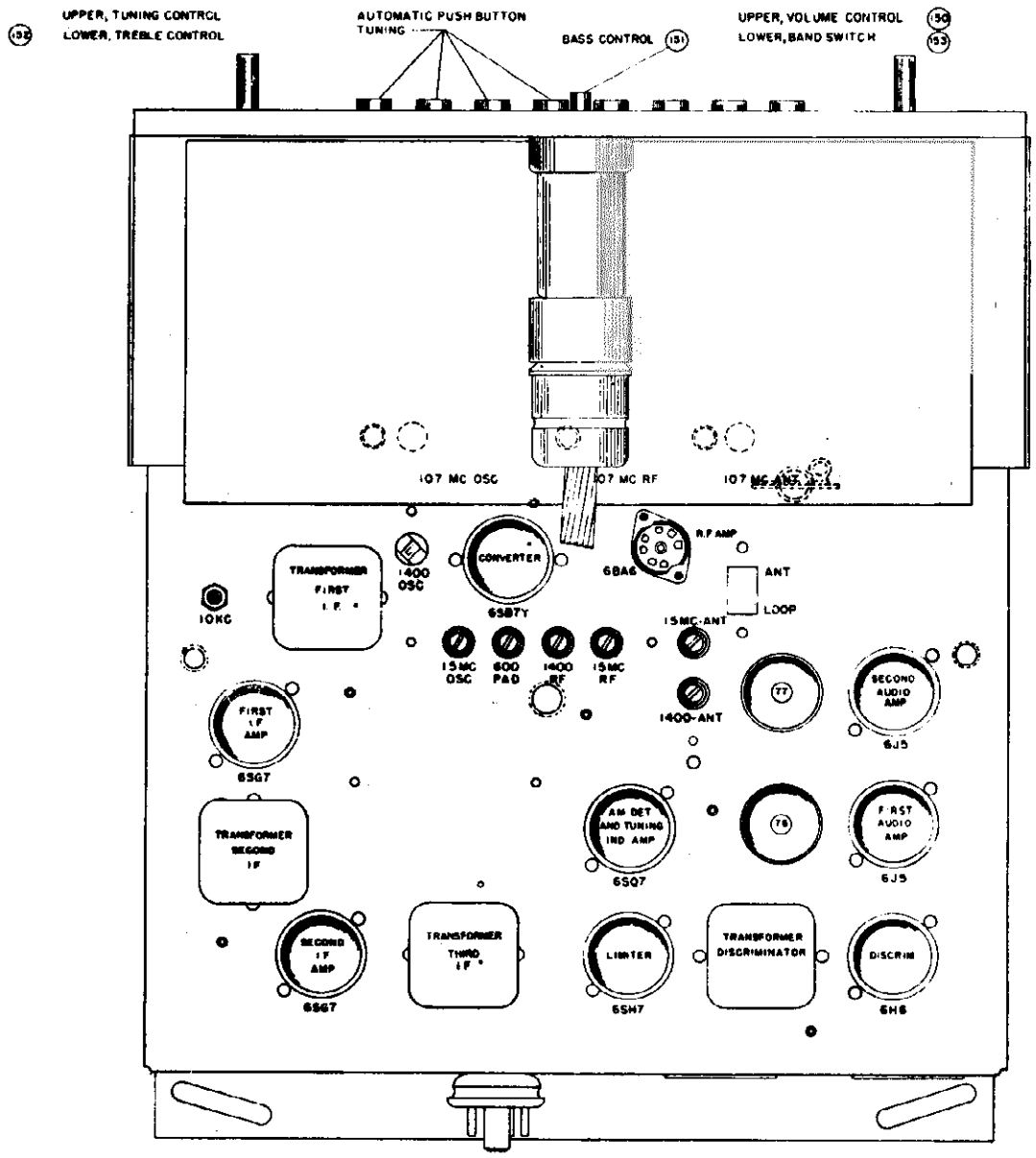
THE MAGNAVOX CO. MODELS CR-204 SERIES

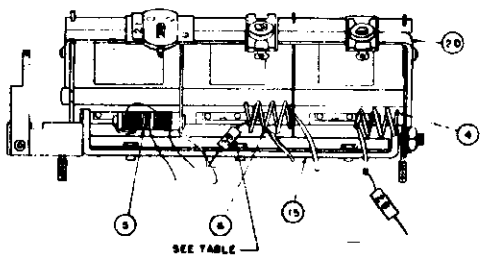
REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
79	Capacitor, paper, .002 mfd., 600 V., ±10% (CR-204C only)	250169G2
86	Resistor, composition, 33 ohms, ½ W.	230084G4
87	Resistor, composition, 33 ohms, ½ W.	230084G4
88	Resistor, composition, 68 ohms, ½ W.	230084G6
89	Resistor, composition, 220 ohms, ±10%, ½ W.	230084G54
90	Resistor, composition, 100 ohms, ±10%, ½ W.	230084G50
91	Resistor, composition, 100 ohms, ½ W.	230084G7
92	Resistor, composition, 68 ohms, ½ W.	230084G6
93	Resistor, composition, 150 ohms, ½ W.	230084G8
94	Resistor, composition, 220 ohms, ½ W.	230084G9
95	Resistor, composition, 470 ohms, ½ W.	230084G11
96	Resistor, composition, 1000 ohms, ½ W.	230084G13
97	Resistor, composition, 2200 ohms, ½ W.	230084G15
98	Resistor, composition, 4700 ohms, ½ W.	230084G17
99	Resistor, composition, 5600 ohms, ±10%, ½ W.	230084G71
100	Resistor, composition, 8200 ohms, ±10%, 1 W.	230085G73
101	Resistor, composition, 8200 ohms, ±10%, 1 W.	230085G73
102	Resistor, strip, 8500 ohms	240035G5
103	Resistor, composition, 10,000 ohms, 1 W.	230085G19
104	Resistor, composition, 10,000 ohms, ½ W.	230084G19
105	Resistor, composition, 15,000 ohms, 1 W.	230085G20
106	Resistor, composition, 20,000 ohms, ±5%, 1 W.	230085G190
107	Resistor, composition, 15,000 ohms, ½ W.	230084G20
108	Resistor, composition, 22,000 ohms, ½ W.	230084G21
109	Resistor, composition, 33,000 ohms, 1 W.	230085G22
110	Resistor, composition, 33,000 ohms, 1 W.	230085G22
111	Resistor, composition, 33,000 ohms, ±10%, 2 W.	230086G80
112	Resistor, composition, 47,000 ohms, ½ W.	230084G23
113	Resistor, composition, 47,000 ohms, ½ W. (CR-204A only)	230084G23
114	Resistor, composition, 68,000 ohms, ±10%, ½ W.	230084G84
115	Resistor, composition, 100,000 ohms, ½ W.	230084G25
116	Resistor, composition, 100,000 ohms, ½ W.	230084G25
117	Resistor, composition, 100,000 ohms, ½ W.	230084G25
118	Resistor, composition, 100,000 ohms, ½ W.	230084G25
119	Resistor, composition, 100,000 ohms, ±10%, ½ W.	230084G86
120	Resistor, composition, 150,000 ohms, ½ W., ±10%	230084G88
121	Resistor, composition, 150,000 ohms, ½ W., ±10%	230084G88
122	Resistor, composition, 150,000 ohms, ½ W. (EARLY PRODUCTION)	230084G26
	Resistor, composition, 39,000 ohms, ½ W. (LATE PRODUCTION)	230084G81
123	Resistor, composition, 220,000 ohms, ½ W.	230084G27
124	Resistor, composition, 220,000 ohms, ½ W.	230084G27
125	Resistor, composition, 220,000 ohms, ½ W.	230084G27
126	Resistor, composition, 220,000 ohms, ½ W.	230084G27
127	Resistor, composition, 220,000 ohms, ½ W.	230084G27
128	Resistor, composition, 220,000 ohms, ½ W.	230084G27
129	Resistor, composition, 470,000 ohms, ½ W.	230084G29
130	Resistor, composition, 470,000 ohms, ½ W.	230084G29
131	Resistor, composition, 470,000 ohms, ½ W.	230084G29
132	Resistor, composition, 470,000 ohms, ½ W.	230084G29
133	Resistor, composition, 1 megohm, ½ W.	230084G31
134	Resistor, composition, 1 megohm, ½ W.	230084G31
135	Resistor, composition, 1 megohm, ½ W.	230084G31
136	Resistor, composition, 1.5 megohm, ½ W.	230084G32
137	Resistor, composition, 1.5 megohm, ½ W.	230084G32
138	Resistor, composition, 2.2 megohm, ½ W.	230084G33
139	Resistor, composition, 2.2 megohm, ½ W.	230084G33
140	Resistor, composition, 4.7 megohm, ½ W.	230084G35
141	Resistor, composition, 4.7 megohm, ½ W.	230084G35
142	Resistor, composition, 330,000 ohms, ±10%, ½ W. (CR-204C only)	230084G92
150	Control, volume, 1 megohm	220044G24
151	Control, bass, 1 megohm with switch	220073G6
152	Switch, treble control	160178G1

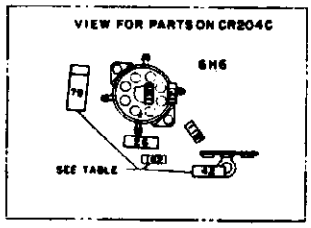
MODELS CR-204 SERIES THE MAGNAVOX CO.

153	Switch, rotary, band switch	160179G1
154	Switch, slide SPDT	160176G1
155	Socket, external input	180060G1
156	Socket, phonograph input	189741G1
157	Socket, amplifier	180427G2
158	Antenna Loop Assembly	460637G1
	Dial Glass Assembly	150303G1
	Push Button Assembly for Gang	260093G1









ITEM NO.	ELECTRICAL VALUES		
	CR204A	CR204B	CR204C
113	47K	OMIT	OMIT
39	35	500	35
42	820	820	1800
79	OMIT	OMIT	0.2
142	OMIT	OMIT	330K

Intermediate frequency ..... 455 kc. 10.7 mc.

Tuning frequency range:

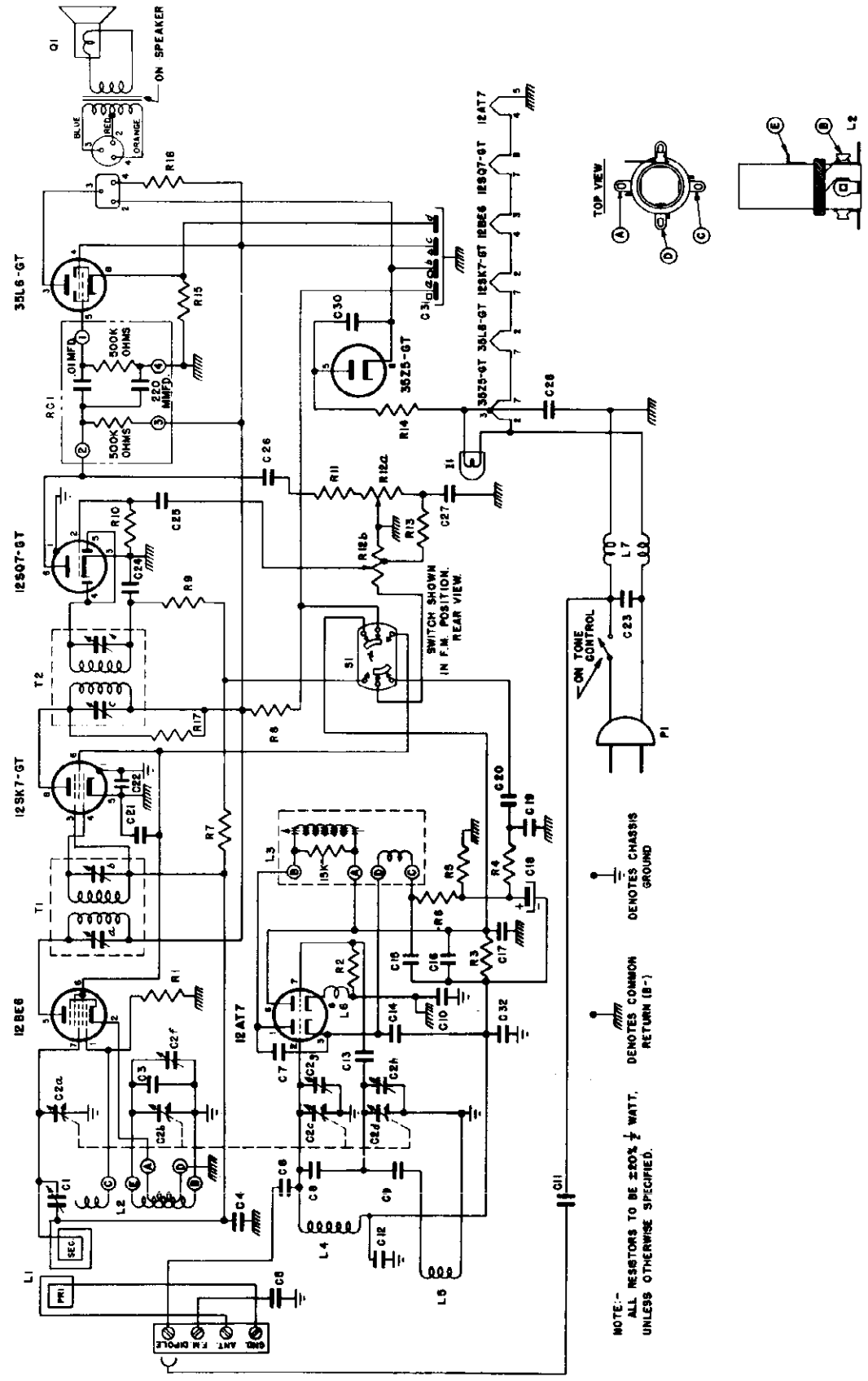
Broadcast Band ..... 540--1620 kc.

Short Wave Band ..... 5.9--17.3 mc.

FM Band ..... 88--108 mc.

MAJESTIC RADIO & TELEV. CORP.

MODEL 6FM71
CHASSIS 6BC



MODEL 6FM714,
CHASSIS 6B02D

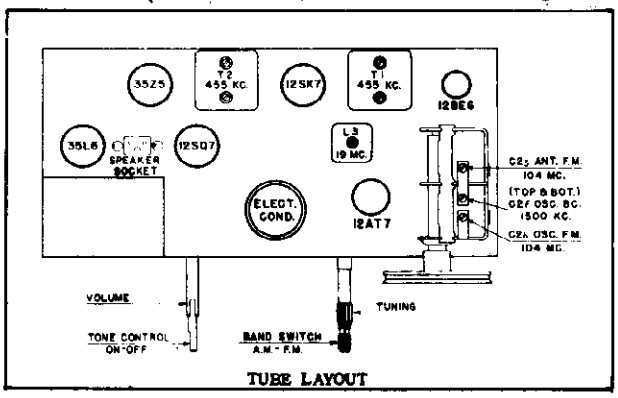
MAJESTIC RADIO & TELEV. CORP.

ALIGNMENT

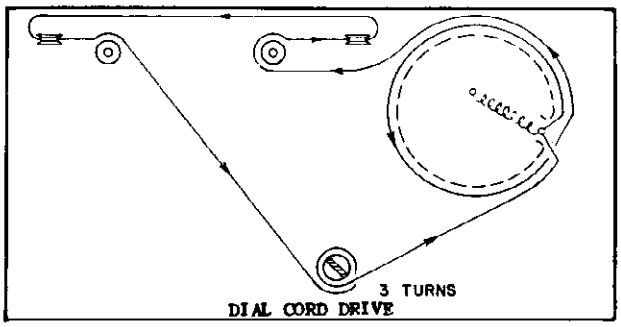
Before aligning, set the dial pointer as follows: close the tuning gang condenser (plates fully closed). Set pointer in line with the last mark at the low frequency end of the dial scale. Set volume control on full, keep the signal output as low as possible to prevent AVC action and false readings.

STEP	DUMMY ANT.	TEST OSC. CONNECTION	TEST OSC. FREQUENCY	RECEIVER DIAL	ADJUST	REMARKS
1	.01 mf.	Ant.	455KC Modulated	Any quiet spot	D-C-B-A for max. output	Repeat in reverse order
2	--	*Loop	1500KC Modulated	150	C2F for max. output	--
3	--	*Loop	1500KC Modulated	150	C1 for max. output	Rock Gang while tuning
4	300 ohms	*FM Terminals	19M.C.Unmodulated	Any quiet spot	L3 for min. output	Min. noise in speaker
5	300 ohms	FM Terminals	104M.C.Unmodulated	104	C2h for min. output	Min. noise in speaker
6	300 ohms	FM Terminals	104M.C.Unmodulated	104	C2g for min. output	Rock Gang while tuning

*All Steps: Connect output meter across speaker.
Step 2 & 3: Make a 2 turn loop & connect to signal generator. Loosely couple the 2 turn loop to receiver loop.
Step 4: Disconnect lug if present from FM dipole terminal. Connect hot side of generator through 300 resistor to dipole terminal where lug was connected.



TUBE LAYOUT



DIAL CORD DRIVE

VOLTAGE TABLE

D. C. VOLTAGES MEASURED TO COMMON GROUND

TUBE	ELEMENT	PIN	VOLTS
12BE6 Converter	Plate	5	87
	Cathode	2	0
	Screen Grid	6	78
	Control Grid	1&7	.8
12SK7 I.F.Amplifier	Plate	8	87
	Cathode	5	0
	Screen Grid	6	78
	Control Grid	4	.8
12SQ7 Det-AVC 1st AF	Plate	6	56
	Cathode	3	0
	Control Grid	2	.9
	Diodes	4&5	.6 - .8
35L6 Output	Plate	3	105
	Cathode	8	5.3
	Screen	4	87
	Control Grid	5	0
3525 Rectifier	Cathode	8	112
FM 12AT7 Osc. Section	Plate	1	99
	Cathode	3	0
	Grid	2	.4
12AT7 Det. Section	Plate	6	99
	Cathode	8	37
	Grid	7	34

All Measurements made with line voltage at 117 A.C., volume control at minimum, no signal, using a vacuum tube volt meter.

PARTS LIST

SYMBOL DESIG.	PART NO.	DESCRIPTION
C1	8-59	2-30 uuf. Trimmer
C2a,b,c,d, f,g,h	7-33	A.M. & F.M. Variable Condenser (2 gang)
C3	6-88	15 uuf. 500 V. Ceramic
C4	015-8	.05 uf. 200 V. Paper
C5,11,19, 21,30,32	4-6	1000 uuf. Ceramic
C6&8	6-134	2.2 uuf. Molded Bakelite
C7,13&14	4-5	30 uuf. Ceramic
C9	4-8	68 uuf. Ceramic
C10,12	020-67	470 uuf. 500 V. Mica
C15	021-38	3300 uuf. 500 V. Mica
C16	4-4	5000 uuf. Ceramic
C17	6-228	700 uuf. 500 V. Mica
C18	19-58	10 uf. 25 V. Electrolytic
C20	015-6	.02 uf. 200 V. Paper
C22	5-51	.2 uf. 200 V. Paper
C23	4-7	100 uuf. Ceramic
C24	020-53	220 uuf. 500 V. Mica
C25	016-5	.01 uf. 400 V. Paper
C26	017-4	.005 uf. 600 V. Paper
C27	015-5	.01 uf. 200 V. Paper
C28	016-8	.05 uf. 400 V. Paper
C29	6-229	820 uuf. Mica
C31a,b,c,d	19-59	40 uf. 150 V. 100 uf. 10 V. electrolytic
R1,5,9	02-143**	22 K Ohms Resistor
R2	02-150**	33 K Ohms Resistor
R3	02-178**	150 K Ohms Resistor
R4&17	02-171**	100 K Ohms Resistor
R6	02-94**	1500 Ohms Resistor
R7	02-234**	3.3 Meg. Resistor
R8&16	03-90	1200 Ohms ± 10% 1 W. Resistor
R10	02-255**	10 Meg. Resistor
R11	02-118	5600 Ohms 1/2 W. 10% Resistor
R12a&b	13-30**	Tone Control 2 Meg. Volume Control 500 K Ohm
R13	02-132	12K Ohms ± 10% 1W. Resistor
R14	02-17**	22 Ohms Resistor
R15	02-52**	150 Ohms Resistor
T1	3-116	1st. I.F. Transformer
T2	3-117	2nd. I.F. Transformer
RC1	37-1	Printed Circuit Plaque (Audio Coupling)
L2	S-1684	Oscillator Coil Assembly
L3	S-1678	S. R. Coil Assembly
L4	3-209	F.M. Antenna Coil
L5	3-208	F.M. Oscillator Coil
L6	S-1928	R. F. Choke
L7	S-1681	Line Choke Coil Assem.
S1	11-78	Band Switch
I1	26-2	Pilot Light (Mazda #47, Br. Bead)
Q1	22-39	Speaker 4" P.M.
P1	27-202	Plug & Line Cord-8'
	116-12	Cabinet Plastic (State Color)
	117-96	Dial Scale
	135-23	Dial Pointer
	S1686	Loop Ant. Assem.
	123-35	Cabinet Back
	128-62	Knob Band Switch
	128-63	Knob Tuning
	128-68	Knob On-Off-Tone
	128-69	Knob Volume

* Plus Excise Tax.
** Resistors to be ± 20% 1/2 watt.

MAJESTIC RADIO & TELEV. CORP.

MODEL 6FM773,
CHASSIS 6B11D

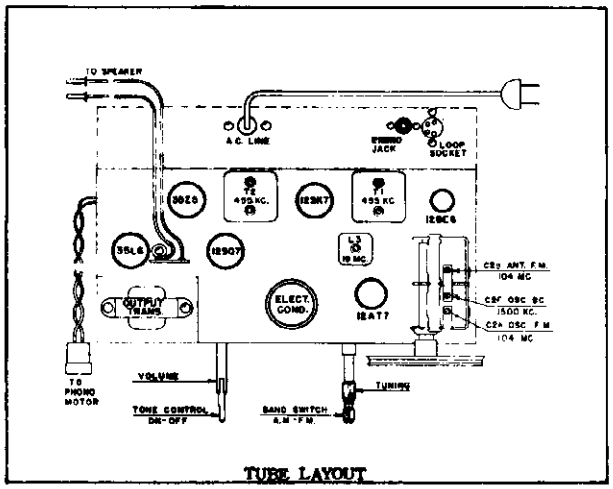
MAJESTIC RADIO & TELEV. CORP.

ALIGNMENT

Before aligning, set the dial pointer as follows: close the tuning gang condenser (plates fully closed). Set pointer in line with the last mark at the low frequency end of the dial scale. Set volume control on full, keep the signal output as low as possible to prevent AVC action and false readings.

STEP	DUMMY ANT.	TEST OSC. CONNECTION	TEST OSC. FREQUENCY	RECEIVER DIAL	ADJUST	REMARKS
1	.01 mf.	Ant.	455KC Modulated	Any quiet spot	D-C-B-A for max. output	Repeat in reverse order
2	--	*Loop	1500KC Modulated	150	C2F for max. output	--
3	--	*Loop	1500KC Modulated	150	C1 for max. output	Rock Gang while tuning
4	300 ohms	*FM Terminals	19M.C. Unmodulated	Any quiet spot	L3 for min. output	Min. noise in speaker
5	300 ohms	FM Terminals	104M.C. Unmodulated	104	C2h for min. output	Min. noise in speaker
6	300 ohms	FM Terminals	104M.C. Unmodulated	104	C2g for min. output	Rock Gang while tuning

*All Steps: Connect output meter across speaker.
Step 2 & 3: Make a 2 turn loop & connect to signal generator. Loosely couple the 2 turn loop to receiver loop.
Step 4: Disconnect lug if present from FM dipole terminal. Connect hot side of generator through 300 resistor to dipole terminal where lug was connected.



TUBE LAYOUT

VOLTAGE TABLE

D. C. VOLTAGES MEASURED TO COMMON GROUND

TUBE	ELEMENT	PIN	VOLTS
12BE6 Converter	Plate	5	87
	Cathode	2	0
	Screen Grid	6	78
	Control Grid	1&7	.8
12SK7 I.F. Amplifier	Plate	8	87
	Cathode	5	0
	Screen Grid	6	78
	Control Grid	4	.8
12SQ7 Det-AVC 1st AF	Plate	6	56
	Cathode	3	0
	Control Grid	2	.9
	Diodes	4&5	.6 - .8
35L6 Output	Plate	3	105
	Cathode	8	5.3
	Screen	4	87
	Control Grid	5	0
3525 Rectifier	Cathode	8	112
FM 12AT7 Osc. Section	Plate	1	99
	Cathode	3	0
	Grid	2	.4
12AT7 Det. Section	Plate	6	99
	Cathode	8	37
	Grid	7	34

All Measurements made with line voltage at 117 A.C., volume control at minimum, no signal, using a vacuum tube volt meter.

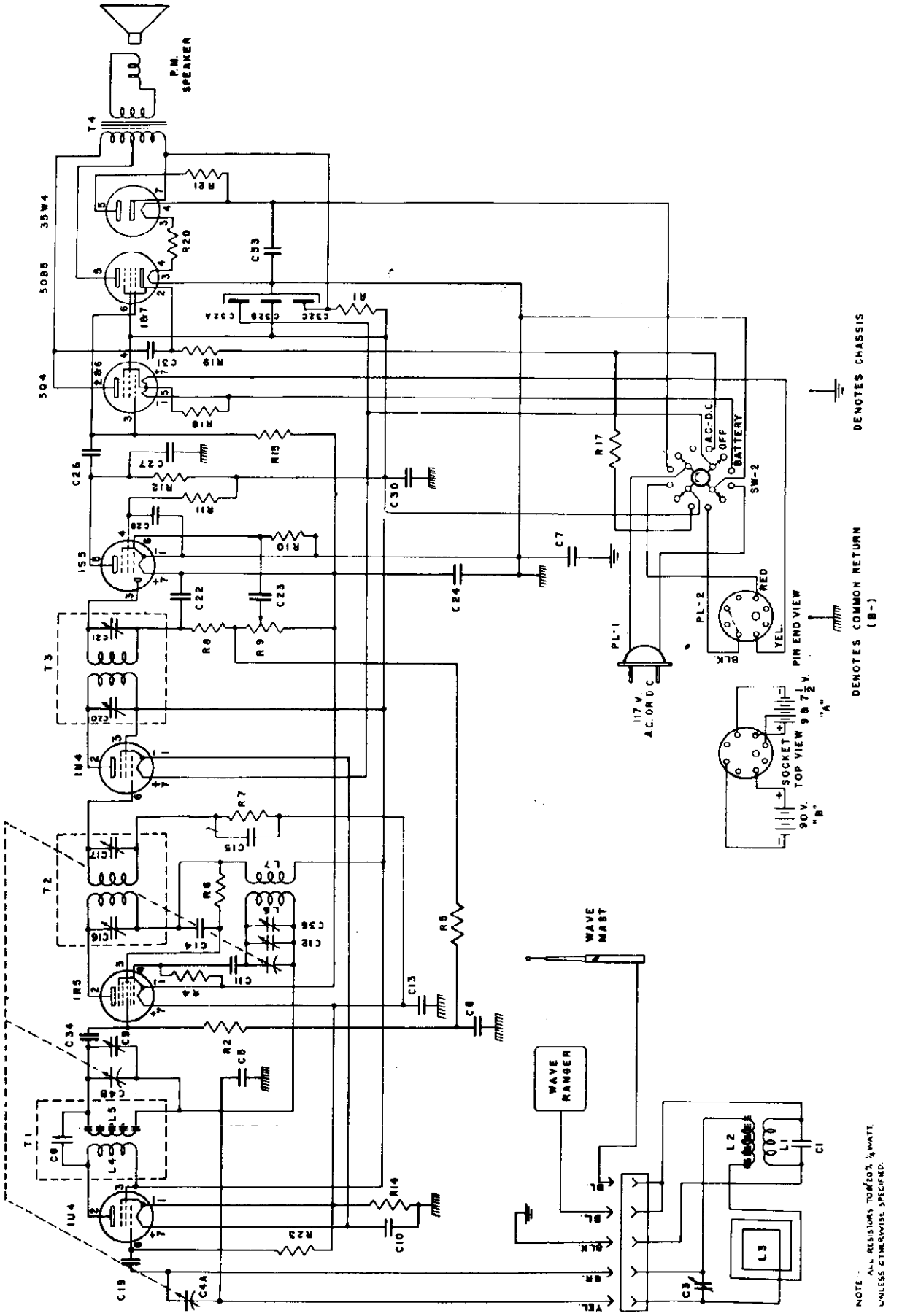
PARTS LIST

SYMBOL DESIG.	PART NO.	DESCRIPTION
C1	8-59	2-30 uuf Trimmer
C2a,b,c,d, f,g, & h	7-33	A.M. & F.M. Variable Condenser (2 Gang)
C3	6-88	15 uuf 500v Ceramic
C4,23,27	015-8	.05 uf 200v Paper
C5,14,19, 22,30	4-6	1000 uuf Ceramic
C6,8	6-134	2.2 uuf Molded Bakelite
C7,11,12	4-5	30 uuf Ceramic
C9,13	020-67	470 uuf 500v Mica
C10	4-8	68 uuf Ceramic
C15	021-38	3300 uuf 500v Mica
C16	4-4	5000 uuf Ceramic
C17	6-228	700 uuf 500v Mica
C18	19-58	10 uf 25v Electrolytic
C20	015-6	.02 uf 200v Paper
C21	5-51	.2 uf 200v Paper
C24	020-53	220 uuf 500v Mica
C25	016-5	.01 uf 400v Paper
C26	017-4	.005 uf 600v Paper
C28	016-8	.05 uf 400v Paper
C29	015-5	.01 uf 200v Paper
C30a,b,c, d	19-61	40-100-40 uf 1500 40 uf 10v Electrolytic
C32	6-229	820 uuf Mica
R1,5,10	02-143**	22K ohm Resistor
R2	02-150**	33K ohm Resistor
R3	02-178**	150K ohm Resistor
R4,8	02-171**	100K ohm Resistor
R6	02-94**	1500 ohm Resistor
R7	02-234**	3.3 Meg. Resistor
R9,18	03-90	1200 ohm ± 10% 1W Resistor
R11	02-255**	10 Meg Resistor
R12	02-118	5600 ohm ½ W ± Resistor
R13a,b	13-30	Tone Control 2 Meg Volume Control 500K ohm
R14	02-132	12K ohm ½W ± 10% Resistor
R15	04-69	390 ohm 2W ± 10% Resistor
R16	02-17**	22 ohm Resistor
R17	02-52**	150 ohm Resistor
T1	3-116	1st I.F. Transformer
T2	3-117	2nd I.F. Transformer
T3	2-40	Output Transformer
L1	S1922	Loop Antenna & back Assem.
L2	S1684	Oscillator Coil Assem.
L3	S1678	S.R. Coil Assem.
L4	3-209	F.M. Antenna Coil
L5	3-208	F.M. Oscillator Coil
L6	S1928	Choke Coil
RC-1	37-1	Printed Circuit Plaque (Audio Coupling)
S1	11-81	Band Switch
I1	26-21	Pilot Light, 115-125v G.E. #10C7DC
Q1	22-30	Speaker 8" P.M.
P1	18-32	4 Prong Plug
P2	140-6	Phono Pick-up Connector Plug
P3	27-201	8' Plug & Line Cord
X1	15-96	Socket
X2	15-87	Phono Pick-up Connector Socket
X4	15-118	Phono Motor Connector Socket
	135-33	Dial Pointer
	115-50-1	Cabinet (Aero Cut-Out)
	115-50-2	Cabinet (milw.cut-out)
	122-50	Escutcheon & Dial Scale Ass'y
	128-63	Knob (Tuning)
	128-68	Knob (Tone-on-off)
	128-69	Knob (Volume)
	128-80	Knob (Band Switch)
	21-34	Aero Record Changer
	21-35	Milwaukee " "

* Plus Excise Tax
** Resistors to be ± 20% ½ watt.

MAJESTIC RADIO & TELEV. CORP.

MODEL 7P4
CHASSIS 4

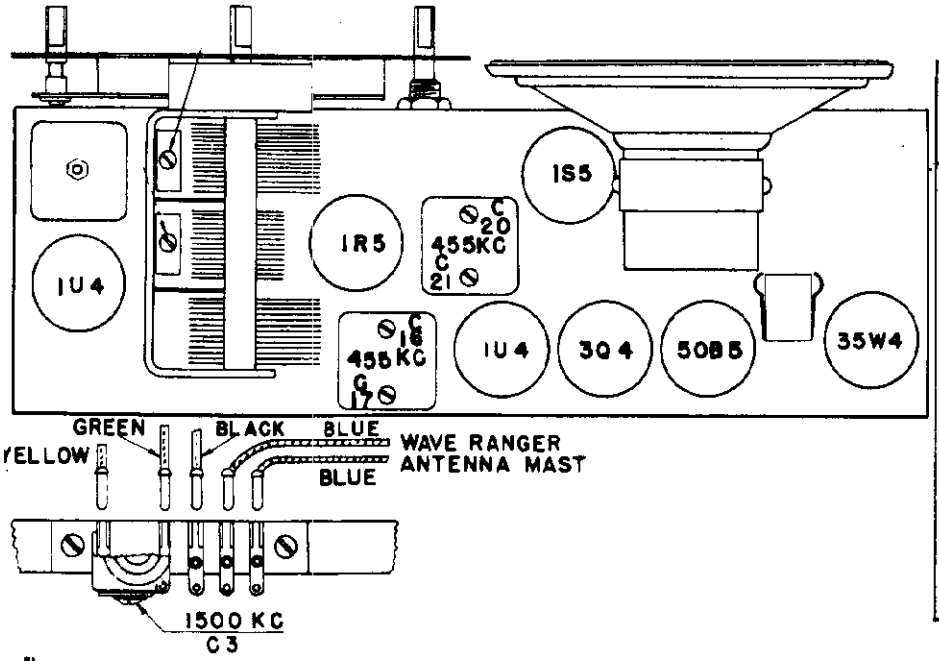


ALIGNMENT PROCEDURE

STEP	DUMMY ANTENNA	TEST OSCILLATOR CONNECTION	TEST OSCILLATOR FREQUENCY	RECEIVER DIAL	ADJUST FOR MAXIMUM	NOTES
1	.01 MFD.	1R5 GRID	455 KC	ANY QUIET SPOT	C16, C17 C20, C21	
2	LOOP		1500 KC	150	C12, C9, C3	NOTE #1

NOTE #1 ADJUST C12 FIRST FOR DIAL CALIBRATION. THEN ADJUST C9, C3 FOR RESONANCE. (MAX: OUTPUT)

1500 KC C12 — 1500 KC C9



SERVICE NOTES:

1. Before adjusting the loop trimmer, have complete set and loop assembled in the cabinet.

VOLTAGE TABLE

TUBE		FILAMENT	PLATE	SCREEN E_s	CATHODE E_k	GRID E_g
(R. F. AMP.)	1U4	1.47	86	86	-	.05
(CONVERTER)	1R5	1.28	87	55	-	.85
(I. F.)	1U4	1.5	84	84	-	1.5
(DET. A.V.C. - A.F.)	1S5	1.3	12.7	19.6	-	0.3
(OUTPUT - (A.C.))	50B5	47	108	88	7.4	1.4
(OUTPUT - (BATT.))	3Q4	2.4	69	78	-	4.6
(RECTIFIER	35W4	29	100AC		117	

ALL VOLTAGES MEASURED WITH A 20,000 OHM PER VOLT METER.

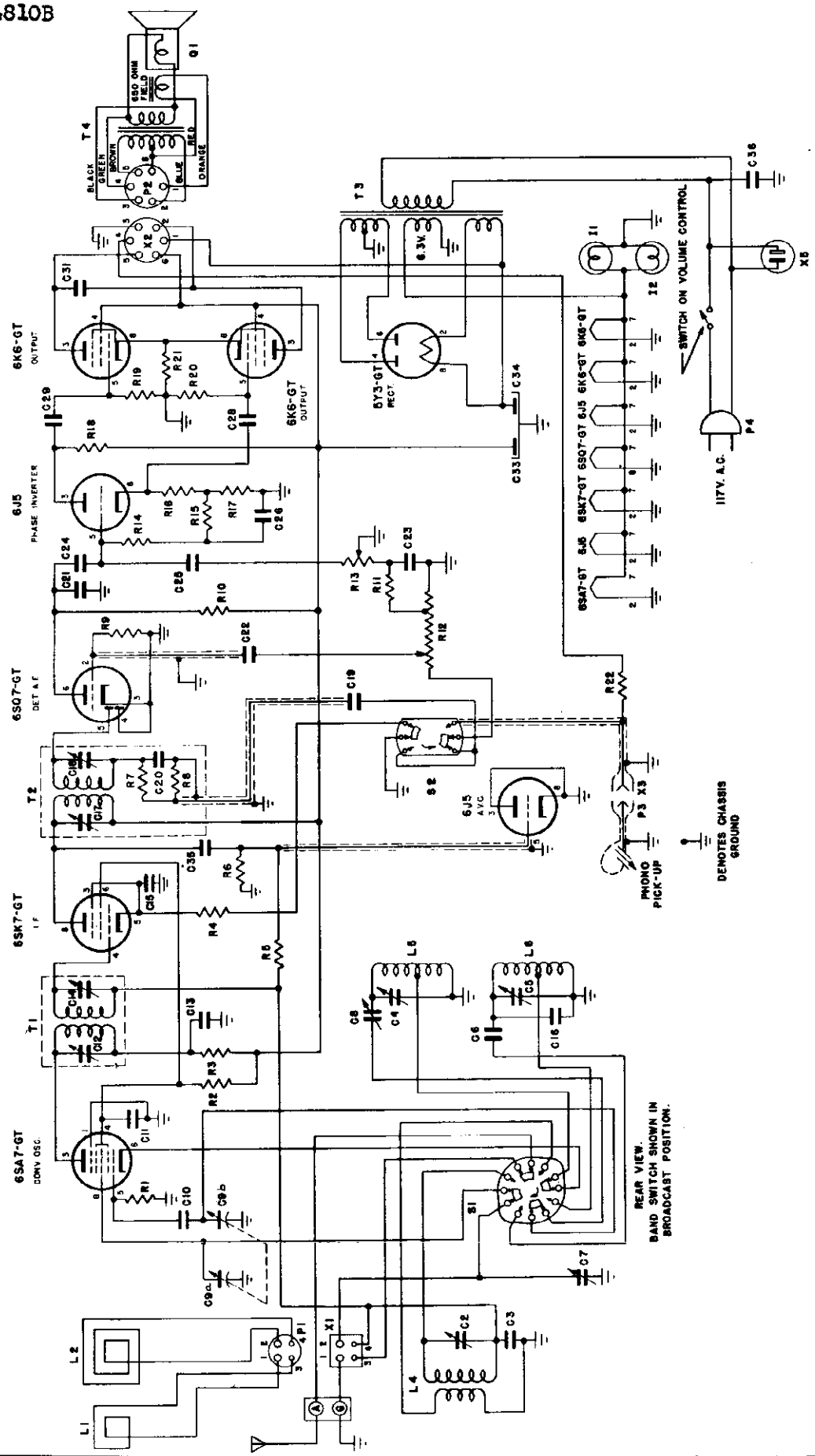
MAJESTIC RADIO & TELEV. CORP.

MODEL 71
CHASSIS

ITEM	DESCRIPTION	PART NO
L6, L7	Oscillator coil	3-125
L4, L5	R. F. coil	3-126
T1, (incl. C16, C17)	1st I. F. transformer	3-127
T2, (incl. C20, C21)	2nd I. F. transformer	3-128
C5, C6, C10		
C28, C30	0.1 mfd. + 40% - 10% 200v paper	5-39
C26	.002 mfd. + 80% - 25% 400v paper	6-184
C14	.001 mfd. + 20% - 10% 200v paper	5-50
C33	.05 mfd. ± 20% 400v paper	5-64
C7,C13, C24	.05 mfd. + 40% - 10% 200v paper	5-40
C15, C26	.002 mfd. + 40% - 10% 200v paper	5-52
C22, C25, C27, C34	220 mmfd. ± 20% 500v mica	6-86
C11	100 mmfd. ± 20% 500v mica	6-232
C4A, C4B, C4C incl. (C9,C12, C36	Tuning condenser	7-13
R10	10 megohms ± 20% 1/4 w.	9-213
R1	1200 ohms ± 10% 1 w.	9-216
R2, R11	3.3 megohms ± 20% 1/4 w.	9-221
R7, R15	470,000 ohms + 20% 1/4 w.	9-223
R5, R12	1 megohm ± 20% 1/4 w.	9-255
R4	100,000 ohms ± 20% 1/4 w.	9-304
R6	12,000 ohms ± 10% 1/4 w.	9-305
R8	47,000 ohms ± 20% 1/4 w.	9-306
R23	2.2 megohms + 20% 1/4 w.	9-114
R21	27 ohms ± 10% 1/3 w.	9-204
R18	270 ohms ± 10% 1/4 w.	9-310
R14	390 ohms ± 10% 1/4 w.	9-315
R17	5000 ohms ± 5% 2 w.	9-317
R19	56 ohms ± 10% 1/2 w.	9-314
S2	Power switch	11-62 o 11-49
R9	Volume control	13-17
C32A, C32B, C32C	70 mfd. 150v, 20 mfd. 150v, 200 mfd. 10v	19-37
	Speaker	22-9
	Battery plug & cable	27-269
	Power cord & plug	27-202
	Dial scale	117-45
	Drive cord spring	129-34
	Drive cord	134-7
	Dial pointer	135-15
	Loop assembly	20-12
	Wave Ranger assembly	20-13
	Antenna mast	20-25
	Cabinet	116-13
	Escutcheon	122.32
	Knob (power switch)	128-59
	Knob (tuning-volume)	128-58

MODEL 8JL885,
CHASSIS 4810B

MAJESTIC RADIO & TELEV. CORP.



RECORD CHANGER: Aero Model 46-A, RCD.CH. 16-1

ALIGNMENT

Before aligning, close tuning condenser (plates fully meshed). Set pointer to center of extreme left hand mark on the dial.

When aligning broadcast band, connect to output of the signal generator a loop, about 12 inches in diameter, consisting of two or three turns of wire. Place this loop in a plane parallel to that of the receiver loop antenna and about a foot away from it. The receiver loop antenna should be in about the same portion relative to the chassis as it is when installed in the cabinet.

While aligning, turn the volume control full on and keep the generator output as low as possible.

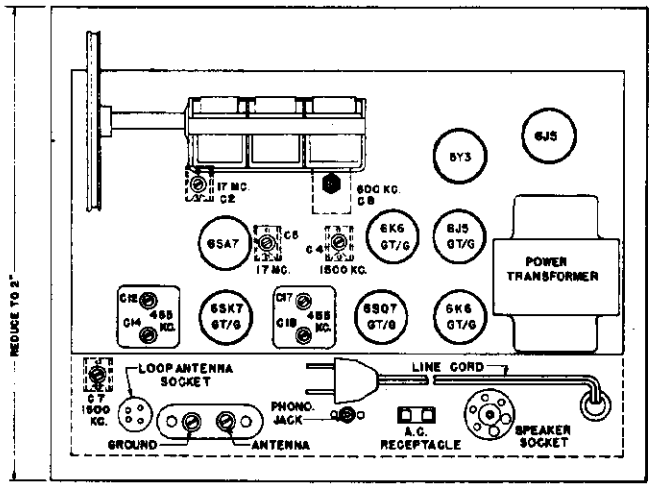
STEP	DUMMY ANTENNA	TEST OSCILLATOR CONNECTION	TEST OSCILLATOR FREQUENCY	RECEIVER BAND-SWITCH	RE-CEIVER DIAL	ADJUST FOR MAXIMUM	NOTES
1	.01 mfd	6SA7 grid	455 KC	BC	Any quiet spot	C18,C17 C14,C12	-----
2	Loop	---------	1500 KC	BC	150	C4,C7	-----
3	Loop	---------	600 KC	BC	60	C8	Note #1
4	400 ohms	Receiver antenna post	17 MC	SW	17	C2,C5	-----

Note #1 - Rock gang while making this adjustment. Then recheck step 2.

VOLTAGE TABLE

TUBE	PLATE	SCREEN	GRID
6SA7 (Conv.)	240-265	105	0
6SK7 (I.F.)	282-296	106-122	2.1 - 2.5
6SQ7 (A.F.)	72-84	---	0
6J5 (Ph.Inv.)	208-220	---	6.0 - 7.5
6K6 (Out)	270-280	280-285	22.5 - 24
6J5 (AVC)	---	---	*0.6
5Y3	320 A.C. 340 D.C.	--- ---	--- ---

NOTE: All voltages measured to ground with 20,000 ohm per voltmeter. or *vacuum tube voltmeter.

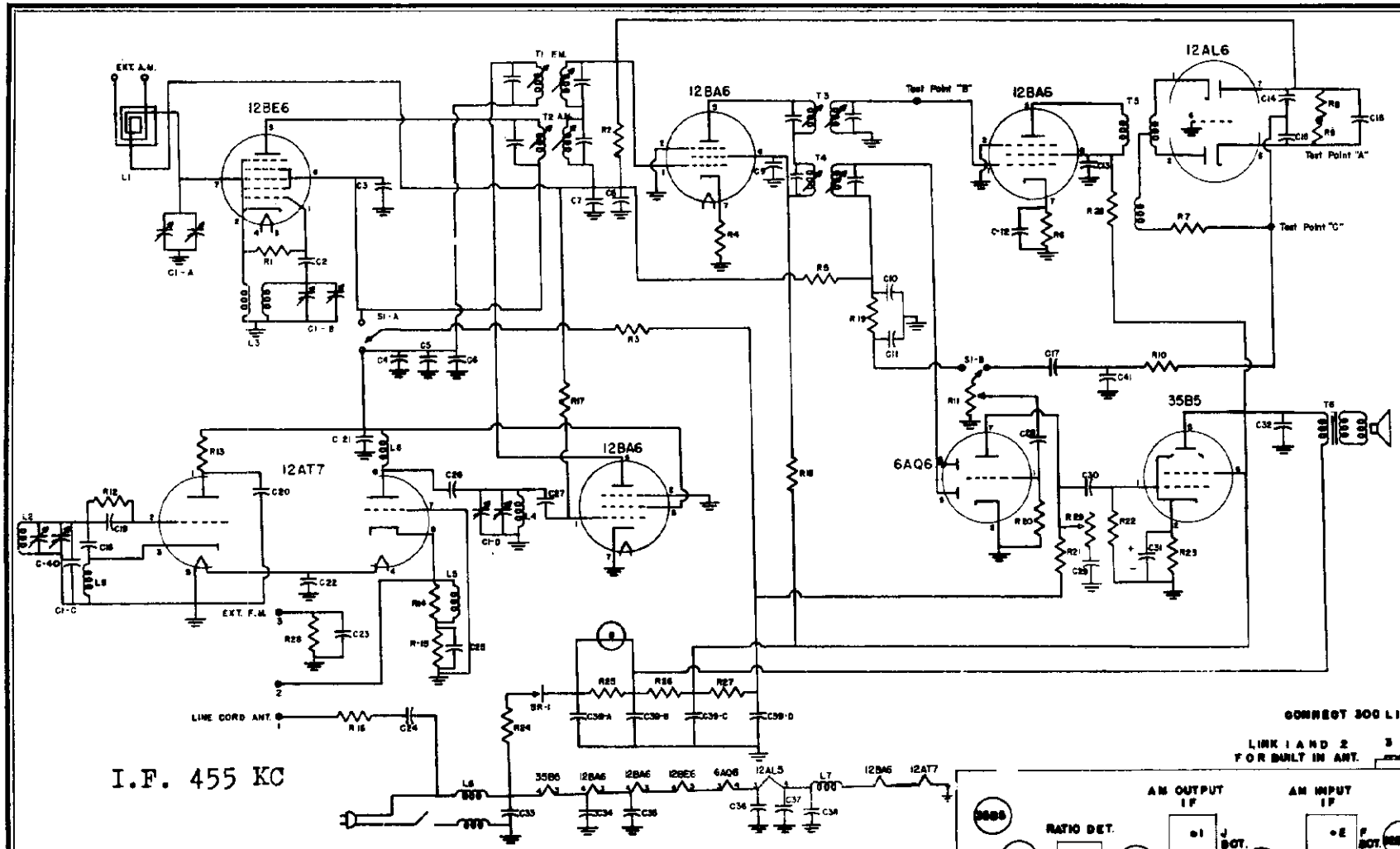


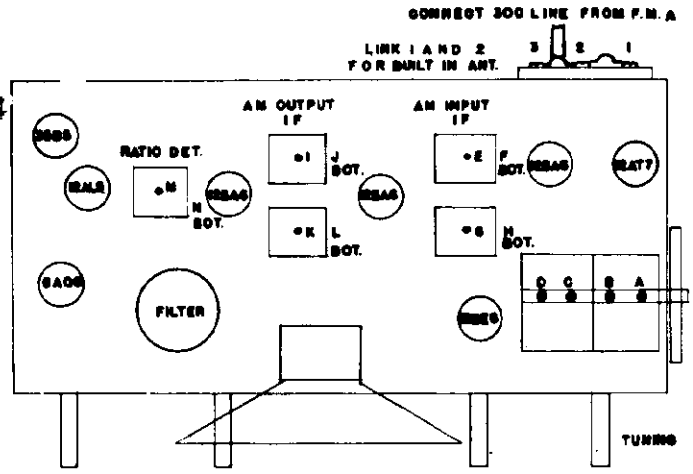
TUBE LAYOUT

PARTS LIST

SYMBOL NO.	PART NO.	DESCRIPTION
C2,C4,C5	8-35	Trimmer, 2½-30 mmf
C3,C15	015-9	Condenser, .1 mfd. 200 volt paper.
C6	6-177	Condenser, 6900 mmf. 500 volt mica
C7	8-36	Trimmer, 1¼-15 mmf.
C8	8-33	Padder, 330-960 mmf.
C9a,b,c	7-30	Tuning Condenser (3 Section)
C10	6-159	Condenser, 47 mmf. 500 volt Ceramic.
C11	017-5	Condenser, .01 mfd. 600 volt paper
C12,C14,		Part of T1 Transformer
C13	017-8	Condenser, .05 mfd. 600 volt paper
C16	6-264	Part of L5 & L6 (5 mmf ceramic)
C17,C18		Part of T2 Transformer
C19,C24,C28,C29,C36	016-5	Condenser, .01 mfd. 400 volt paper
C20		Part of T2 Transformer
C21	020-53	Condenser, 220 mmf. 500 volt mica.
C22,C25	6-133	Condenser, .006 mfd. 600 volt paper.
C23	015-5	Condenser, .01 mfd. 200 volt paper
C26	015-8	Condenser, .05 mfd. 200 volt paper
C31	017-1	Condenser, .001 mfd. 600 volt paper.
C33,C34	19-16	Condenser, 16-16 mfd. 450 volt Electrolytic.
C35	020-39	Condenser, 100 mmf. 500 volt mica.
R1	01-143	Resistor, 22,000 ohms ½ watt 20%
R2	04-136	Resistor, 15,000 ohms 2 watts 10%.
R3	02-128	Resistor, 10,000 ohms ½ watt 10%
R4	02-55	Resistor, 180 ohms ½ watt 10%.
R5,R23	01-213	Resistor, 1 megohm ½ watt 20%.
R6	02-213	Resistor, 1 megohm ½ watt 10%.
R7	01-156	Part of T2 (47,000 ohms)
R8	01-198	Part of T2 (470,000 ohms).
R9	01-255	Resistor, 10 megohms ½ watt 20%.
R10,R14,R19,R20	02-198	Resistor, 470,000 ohms ½ watt 10%.
R11	01-139	Resistor, 18,000 ohms ½ watt 10%
R12	13-15	Volume control, 2 megohm with SPST switch.
R13	14-4	Tone control, 2 megohms
R15	01-185	Resistor, 220,000 ohm ½ watt 20%
R16	02-100	Resistor, 2200 ohms ½ watt 10%
R17	02-139	Resistor, 18,000 ohms ½ watt 10%
R18	02-142	Resistor, 22,000 ohms ½ watt 10%
R21	04-69	Resistor, 390 ohms 2 watt 10%.
R22	01-227	Resistor, 2.2 megohms ½ watt 20%
L1,L2	20-8 or 20-20R	Loop (pri- sec) (Revised winding of 20-8 & 20-20)
L4	S-1938	S.W. Antenna coil.
L5,L6	S-1937	S.W. & B.C. Oscillator coil.
I1,I2	26-2	Dial lite, .15 A 6.3 volt (brown bead)
Q1	22-46	Speaker, with output transformer & plug.

SYMBOL NO.	PART NO.	DESCRIPTION
P1	18-32	Loop plug
P2	18-43	Speaker plug.
P3	18-47	Phono plug.
P4	27-201	A.C. lead & plug.
S1	11-46 or 11-64	Band switch
S2	11-45 or 11-63	Phono-Radio switch.
T1	3-165	1st I.F. Transformer.
T2	3-166	2nd I.F. Transformer.
T3	2-12	Power transformer
T4	52-46	Output transformer (part of speaker ass'y).
X1	15-80	Loop socket
X2	15-103	Speaker socket.
X3	15-87	Phono socket.
X4	15-135	Phono A.C. socket
	15-69	Octal tube sockets.
	135-29	Dial pointer.
	129-29	Dial cord spring.
	S-1263	Dial cord assembly.
	117-92	Dial glass scale.
	115-51-1	Cabinet, combination (walnut)
	128-45	Knob, phono-radio
	128-46	Knob, off-volume.
	128-47	Knob, B.C.-S.W.
	128-48	Knob, bass-treble
	128-49	Knob, tuning.
	21-29	Record changer, Aero.
	122-42	Escutcheon, including glass (plain)





The tuning range of the receiver is 550 to 1600 Kc on AM (standard broadcast) and 88 to 108 Mc on FM.

ANTENNA

This receiver incorporates a high efficiency built-in loop antenna. For most locations and under average receiving conditions, this antenna will be adequate to provide excellent results. However, where extreme distance is desired, or where considerable local interference is present, reception may be improved by connecting the receiver to an external aerial and ground. Connections are provided on the rear of the receiver (A and G) for this purpose.

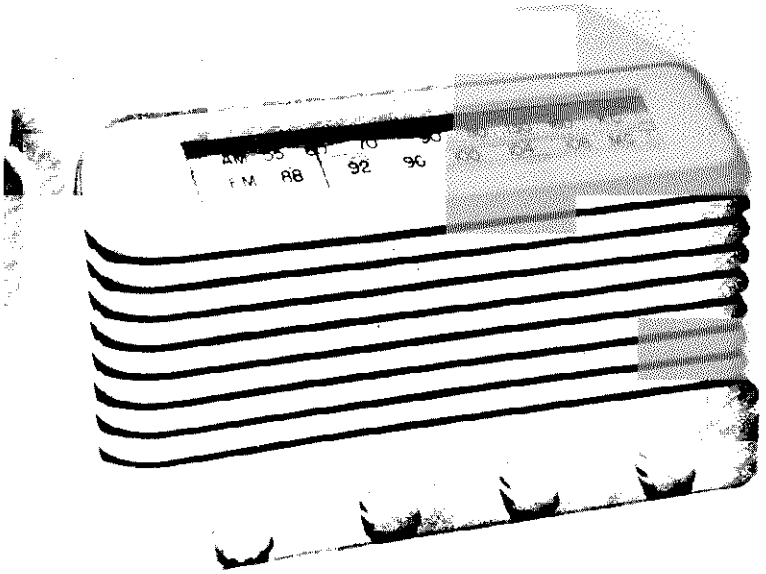
This receiver also incorporates a built-in FM antenna that will provide good local reception under average receiving conditions.

Where more distance is desired or where noise conditions make it desireable, a standard FM dipole antenna may be connected to Terminal #1 and #3. In

MODELS DE-640,DF-641
MODEL CD-500

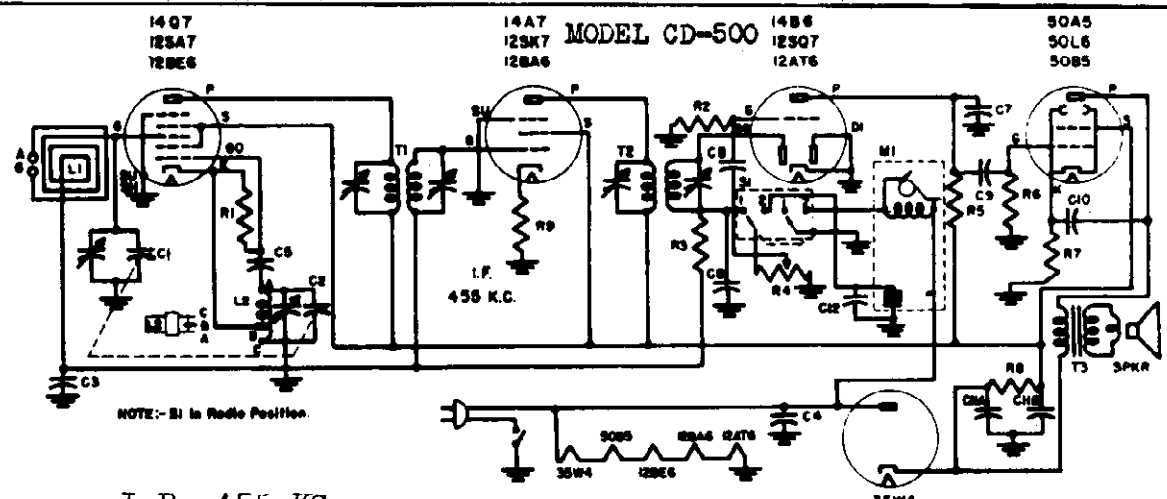
JOHN MECK IND., INC.

MODELS DE-640,DF-641



CIRCUIT SYMBOL	PART NO.	DESCRIPTION
C1-A-B-C-D	CV-10002	CONDENSER VARIABLE 4 SECTION
C2	CC-15500	" CERAMIC 50 MMF
C3	CMX-10002E	" .002 MFD
C4-5-6-7-8-9-10-11-12-13-14-15-16-17-18	CMX-10004	" .004 MFD 600 V.
C19-20-21-22-23-24	CC-15101	" CERAMIC 100 MMF
C25-26-27-28-29-30	CP-12503	" PAPER .05 MFD 200 V.
C31-32-33-34-35-36-37	CC-15251	" CERAMIC 250 MMF
C38	CMX-10003	" .003 MFD
C39	CE-10027	" ELECT. 4 MFD 50 V
C40	CC-15051	" CERAMIC 5 MMF
C41	CC-15001	" CERAMIC 10 MMF
C42	CE-10028	" ELECT. 8 MFD 150 V.
C43	CP-14203	" PAPER .02 MFD 400 V.
C44-A-B-C-D	CE-10029	" ELECT. 20-20-20-20 MFD 150 V.
C45	CMX-10002F	" .002 MFD
C46	CMX-10002F	" .002 MFD
C47	CMX-10002F	" .002 MFD
CR1	CR-10001	ANTENNA LOOP
L1	TRC-10008	R.F. OSCILLATOR COIL
L2	TRC-10009	A.M. OSCILLATOR COIL
L3	TRF-10015	R.F. R.F. COIL
L4	LCS-10005	CATHODE CHOKE
L5	LCS-10004	POWER LINE ANTENNA CHOKE
L6	LCS-10003	10.7 M.C. CHOKE
L7	LCS-10002	F.M. SIGNAL FREQUENCY CHOKE
MR1	MR-10001	SELENIUM RECTIFIER 100 MA
S1-A-B	VS-10006	SELECTER SWITCH

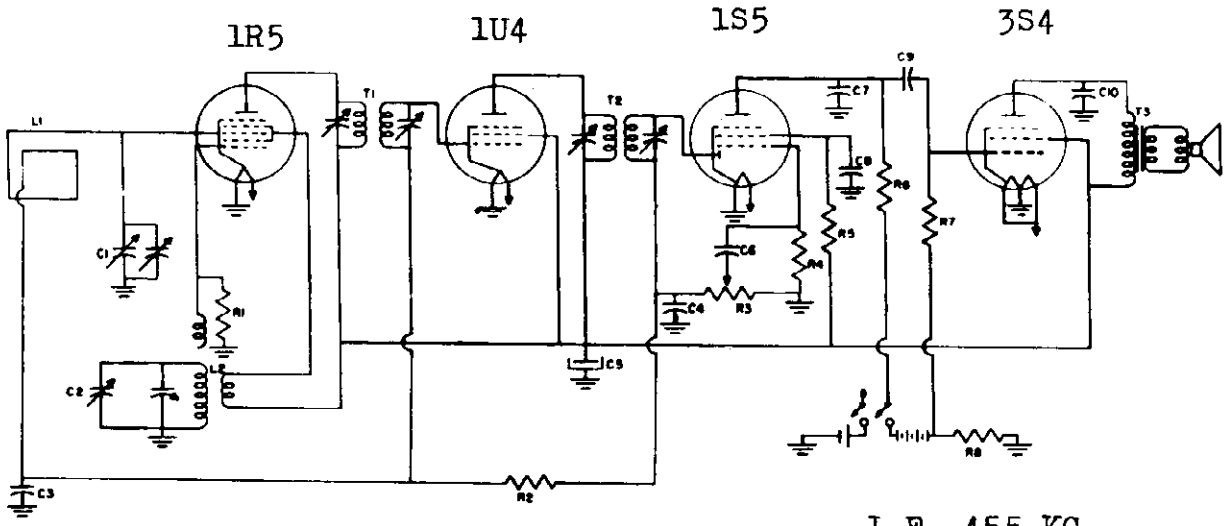
CIRCUIT SYMBOL	PART NO.	DESCRIPTION
R1-2	RC-10202	RESISTOR CARBON 22,000 OHMS 1/4 WATT
R3-17-22	RC-14703	" " 470,000 OHMS 1/4 WATT
R4	RC-14701	" " 470 OHMS 1/4 WATT
R5-6	RC-10682	" " 6800 OHMS 1/2 WATT
R7	RC-12204	" " 2.2 MEG. OHMS 1/2 WATT
R8	RC-10330	" " 33 OHMS 1/2 WATT
R9-23	RC-14801	" " 68,000 OHMS 1/4 WATT
R10-19	RC-14702	" " 4,700 OHMS 1/4 WATT
R11	RC-11003-C	VOLUME CONTROL WITH SWITCH
R12	RC-11001	RESISTOR CARBON 1000 OHMS 1/4 WATT
R14	RC-34001	" " 1500 OHMS 2 WATT
R15	RC-14801	" " 68,000 OHMS 1/4 WATT
R16	RC-14601	" " 1000 OHMS 1/4 WATT
R24-27-28	RC-34001	" " 1500 OHMS 2 WATT
R29	RC-14601	" " 1000 OHMS 1/4 WATT
R30	RC-11000	" " 10 MEG. OHMS 1/2 WATT
R31	RC-12203	" " 220,000 OHMS 1/2 WATT
R25	RC-11500	" " 150 OHMS 1/2 WATT
R32	RC-30080	" " 15 OHMS 1/2 WATT
R33	RC-12800	" " 820 OHMS 1/2 WATT
R34	RC-12800	" " 820 OHMS 1/2 WATT
R35	VC-13005-B	TONE CONTROL
T1-3	TS-10000	10.7 MC F.M. I.F.
T4	TS-10028	455 KC INPUT I.F.
T5	TS-10028	455 KC OUTPUT I.F.
T6	TS-10027	10.7 MC F.M. RATIO DETECTOR
T7	TO-10000	OUTPUT TRANSFORMER



I.F. 455 KC

Circuit Symbol	Part Number	Description
C1,C2	CV-10002-E	Condenser-Variable, with pulley
C3	CP-12508	Condenser-Paper, 0.05 mfd., 200 volt
C4,C10	CP-14503	Condenser-Paper, 0.05 mfd., 400 volt
C5	CM-15500	Condenser-Mica, 0.00006 mfd., 500 volt
C6,C7	CM-15251	Condenser-Mica, 0.00025 mfd., 500 volt
C8	CP-12103	Condenser-Paper, 0.01 mfd., 200 volt
C9	CP-14103	Condenser-Paper, 0.01 mfd., 400 volt
C11A,C11B	CL-10001	Condenser-Electrolytic 20/20/20 mfd., 150 volt
R1	RC-32002	Resistor-Carbon, 20,000 ohms ½ watt
R2	RC-31005	Resistor-Carbon, 10 Megohms ½ watt
R3	RC-32004	Resistor-Carbon, 2 Megohms ½ watt
R4	VC-10105	Control-Volume, with switch, 1 Megohm
R5	RC-32503	Resistor-Carbon, 250,000 ohms ½ watt
R6	RC-35003	Resistor-Carbon, 500,000 ohms 1 watt
R7	RC-31500	Resistor-Carbon, 150 ohms ½ watt
R8	RC-32000	Resistor-Carbon, 200 ohms ½ watt
R9	RC-30680	Resistor-Carbon, 68 ohms 1 watt
M1	PRA-10000	Changer Automatic
L1	AL-10003	Loop-Antenna
L2	TRC-10000-D	Coil-Oscillator
T1	TS-10000	Transformer-1st I.F.
T2	TS-10001	Transformer-2nd I.F.
T3	TO-10000	Transformer-Output
SPKR	SO-10000	Speaker-P.M. 4" round less T3
S1	VS-10000	Switch-Radio Phono, d.p. three position

MODEL 4D8

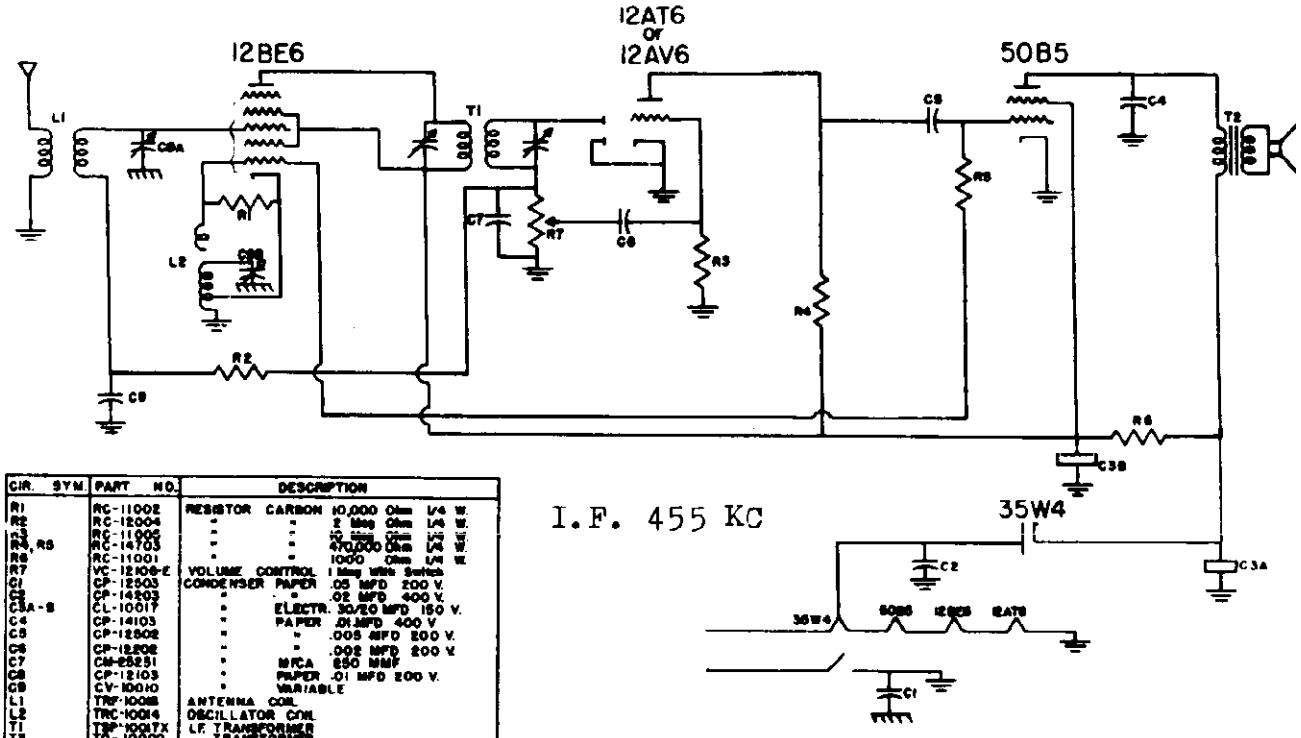


I.F. 455 KC

CIR. SYM.	PART NO.	DESCRIPTION
C1-C2	CV-10008	CONDENSER VARIABLE
C3-C8	CP-12103	" PAPER .01 200 V.
C4-C7	CM-13101	" MICA 100 MMF
C5	CL-10022	" ELECTROLITIC 10 MFD 75 V.
C6-C9	CP-12502	" PAPER .005 MFD 200 V.
C10	CP-12502	" PAPER .005 MFD 200 V.
L1	ALP-10023	ANTENNA LOOP
L2	TRC-10001	OSCILLATOR COIL

CIR. SYM.	PART NO.	DESCRIPTION
R1-R5	RC-10008	RESISTOR CARBON 30,000 OHMS
	RC-12304	" " 2.2 MEG
R2	VC-11103	VOLUME CONTROL 1 MEG SPST SWITCH
R3	RC-11005	RESISTOR CARBON 10 MEG
R4	RC-11004	" " 1 MEG
R6	RC-11003	" " .5 MEG
R7	RC-11002	" " 470 OHMS
T1	TRANS. IST I.F.	
T2	TRANS. 2ND I.F.	
T3	TRANS. OUTPUT	

MODEL 4H8



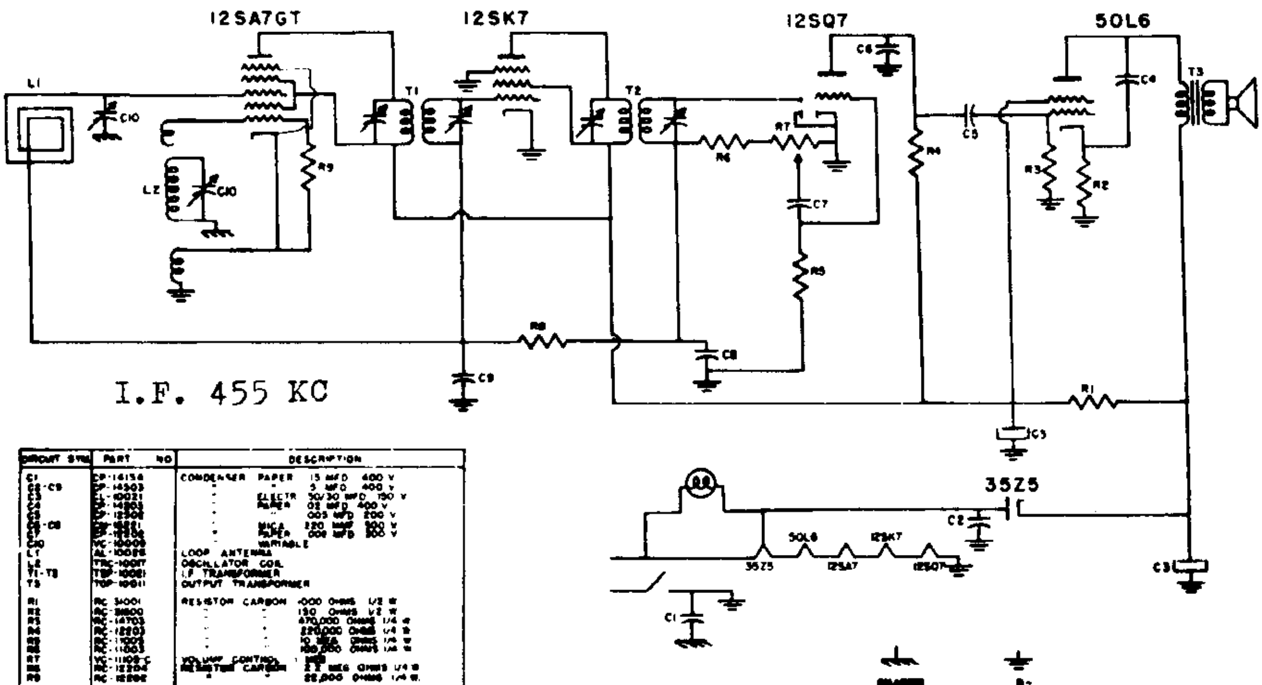
I.F. 455 KC

CIR. SYM.	PART NO.	DESCRIPTION
R1	RC-11002	RESISTOR CARBON 10,000 Ohm 1/4 W.
R2	RC-12004	" " 2 Meg Ohm 1/4 W.
R3	RC-11006	" " 50 Meg Ohm 1/4 W.
R4, R5	RC-14703	" " 470,000 Ohm 1/4 W.
R6	RC-11001	" " 1000 Ohm 1/4 W.
R7	VC-12103-E	VOLUME CONTROL 1 Meg with Switch
C1	CP-12503	CONDENSER PAPER .05 MFD 200 V.
C2	CP-14203	" " .02 MFD 400 V.
C3A-B	CL-10017	" ELECTR. 30/20 MFD 150 V.
C4	CP-14103	" PAPER .01 MFD 400 V.
C5	CP-12502	" " .005 MFD 200 V.
C6	CP-12502	" " .005 MFD 200 V.
C7	CM-25251	" MICA 250 MMF
C8	CP-12103	" PAPER .01 MFD 200 V.
C9	CV-10010	" VARIABLE
L1	TRF-10008	ANTENNA COIL
L2	TRC-10014	OSCILLATOR COIL
T1	TRF-10017X	I.F. TRANSFORMER
T2	TO-10000	" TRANSFORMER

MODEL 5H8
MODEL 5G8

JOHN MECK IND., INC.

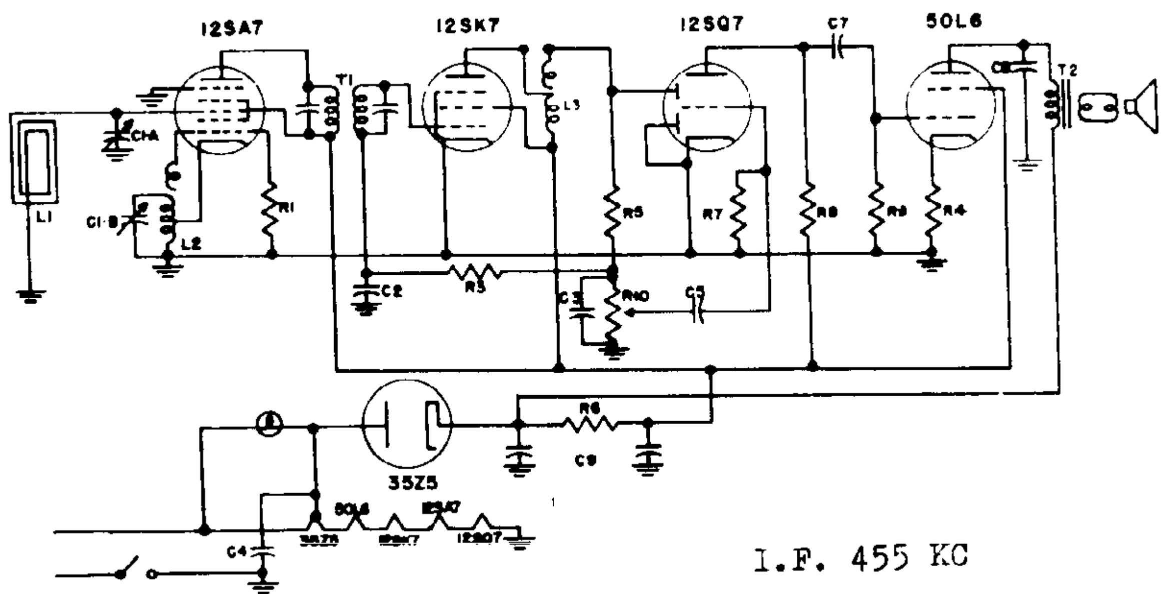
MODEL 5H8



I.F. 455 KC

CIRCUIT SYM	PART NO	DESCRIPTION
C1	CP-14154	CONDENSER PAPER .15 MFD 400 V
C2-C9	CP-14503	" " .5 MFD 400 V
C3	CL-10021	" ELECTR 30/30 MFD 150 V
C4	CP-14203	" PAPER .02 MFD 400 V
C5	CP-12502	" " .005 MFD 200 V
C6-C8	CM-15221	" MICA 220 MMF 500 V
C7	CP-12506	" PAPER .006 MFD 200 V
C10	VC-10009	" VARIABLE
L1	AL-10026	LOOP ANTENNA
L2	TRC-10017	OSCILLATOR COIL
T1-T2	TBP-10081	I.F. TRANSFORMER
T3	TOP-10011	OUTPUT TRANSFORMER
R1	RC-31001	RESISTOR CARBON 1000 OHMS 1/2 W
R2	RC-31500	" " 150 OHMS 1/2 W
R3	RC-14703	" " 470,000 OHMS 1/4 W
R4	RC-12203	" " 220,000 OHMS 1/4 W
R5	RC-11005	" " 10 MEG. OHMS 1/4 W
R6	RC-11003	" " 100,000 OHMS 1/4 W
R7	VC-11105-C	VOLUME CONTROL 1 MEG
R8	RC-12204	RESISTOR CARBON 2.2 MEG OHMS 1/4 W
R9	RC-12202	" " 22,000 OHMS 1/4 W

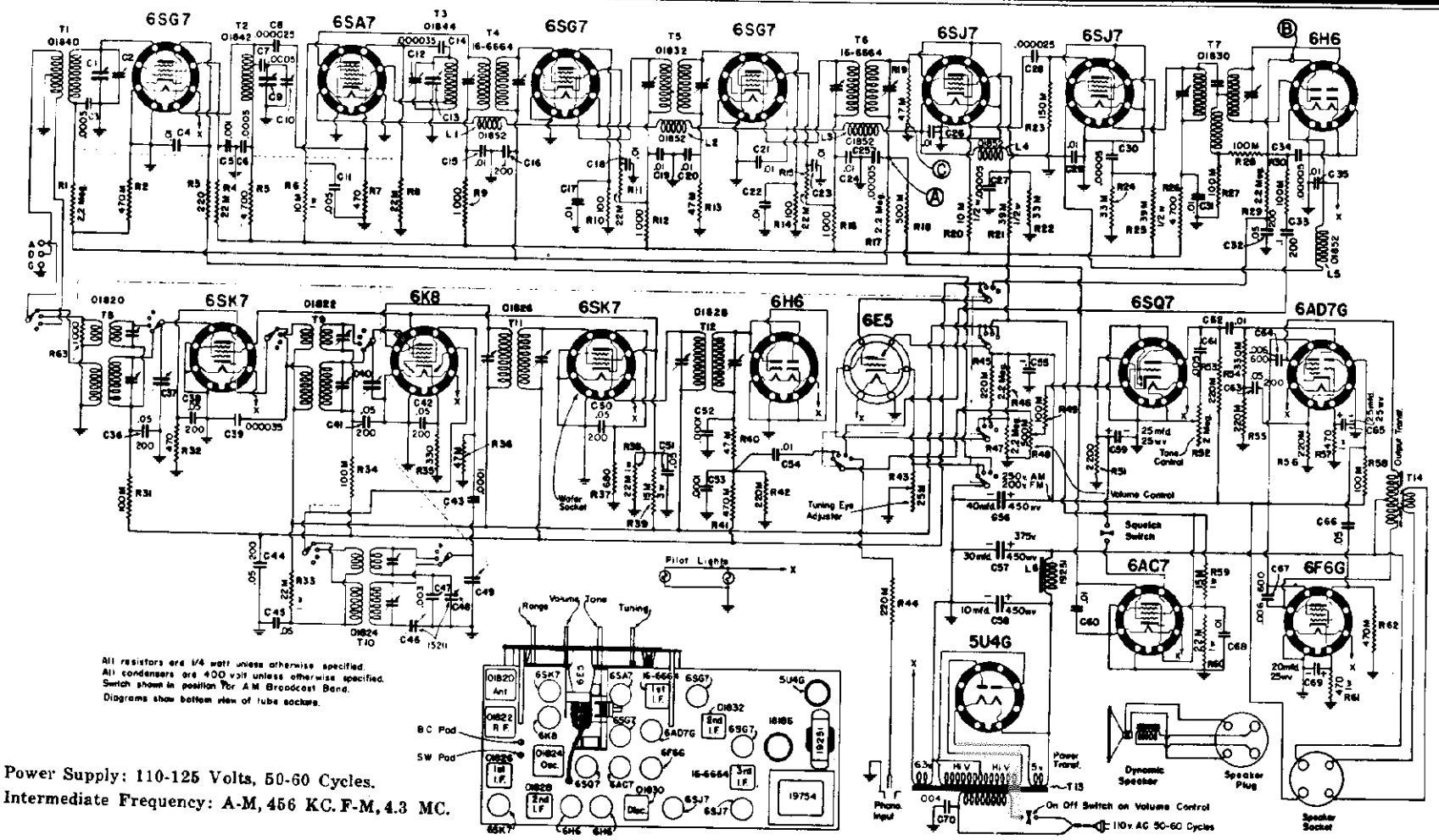
MODEL 5G8



I.F. 455 KC

CIR SYM	PART NO	DESCRIPTION
C1 A-B	CV-10010	CONDENSER VARIABLE
C2	CPP-12103	" PAPER .01 MFD 200 V
C3	CMP-12281	" MICA 250 MMF 500 V
C4	CPP-14503	" PAPER .05 MFD 400 V
C5	CPP-12202	" " .002 MFD 200 V
C6	CPP-14103	" " .01 MFD 400 V.
C7	CPP-12802	" PAPER .008 MFD 200 V
C8	CL-10007	" ELECTROLYTIC 30/30 MFD 150 V.
L1	ALP-10004 A	ANTENNA LOOP
L2	TRC-10011 A	OSCILLATOR COIL
L3	TRP-10020	INTERSTAGE I.F. COIL

CIR SYM	PART NO	DESCRIPTION
R1	RC 18002	RESISTOR CARBON 80,000 OHM 1/4 WATT
R3	RC 12204	" " 2.2 MEG OHM 1/4 WATT
R4	RC 11500	" " 150 OHMS 1/2 WATT
R5	RC 13303	" " 33,000 OHM 1/4 WATT
R6	RC 31001	" " 1000 OHM 1/2 WATT
R7	RC 11005	" " 10 MEG. OHM 1/4 WATT
R8	RC 12203	" " 220,000 OHM 1/4 WATT
R9	RC 14703	" " 470,000 OHM 1/4 WATT
R10	VCP-10108	VOLUME CONTROL WITH SWITCH
T1	TS-10017 A	I.F. TRANSFORMER
T2	TO-10000	OUTPUT TRANSFORMER



Power Supply: 110-125 Volts, 50-60 Cycles.

Intermediate Frequency: A-M, 456 KC. F-M, 4.3 MC.

NOTES ON VOLTAGE CHART

* These voltages are AC and should not be measured with a DC Voltmeter.

a These points show a slight voltage indication due to the thermal noise of the receiver unless one of the limiter tubes is removed from its socket.

b This voltage must be measured with the Interstation Noise Silencer Switch in the "on" position.

N A varying negative voltage of 15 to 20 volts may be measured at this point, depending upon the setting of the tuning condenser.

All voltages indicated above are measured with a 1000-ohms-per-volt meter with a line voltage of 117 volts.

NORMAL OPERATING VOLTAGES

On Tube Socket Terminals Designated by RMA Number

Voltages shown below are measured with Range Switch turned to F-M Position.

Tube	Use	1	2	3	4	5	6	7	8
6SG7	FM RF Amp.	0	0	2.1	0	2.1	120	6.3*	145
6SA7	FM Converter	0	6.3*	185	95	0	0	0	0
6SG7	FM 1st I-F	0	0	1.3	0	1.3	105	6.3*	175
6SG7	FM 2nd I-F	0	0	1.2	0	1.2	105	6.3*	175
6SJ7	FM 1st Lim.	0	6.3*	0	0	0	65	0	135
6SJ7	FM 2nd Lim.	0	6.3*	0	0	0	65	0	165

Voltages shown below are measured with Range Switch turned to Broadcast Position.

Tube	Use	1	2	3	4	5	6	7	8
6SK7	AM RF Ampl.	0	6.3*	0	0	3.5	90	0	250
6K8	AM Converter	0	0	250	90	N	150	6.3*	2.7
6SK7	AM I-F Ampl.	0	0	0	0	3.5	90	6.3*	2.7
6H6	AM Detector	0	0	0	0	0	0	6.3*	0
6SQ7	Audio Ampl.	0	0	1.0	0	0	90	6.3*	0
6AD7G	Audio Ampl.	0	6.3*	350	250	0	85	0	16.5
6F6G	Power Ampl.	0	0	350	250	0	0	6.3*	16.5
5U4G	Rectifier	0	400	0	380*	0	380*	0	400
6E5	Tuning Ind.								

MODELS 9-1053, 9-1054

MEISSNER MFG. DIV.
MAGUIRE INDUSTRIES, INC.

ALIGNMENT PROCEDURE

The minimum of equipment required for correctly aligning this receiver is listed below.

A modulated service oscillator or signal generator capable of generating the frequencies 456 KC, 600 KC, 1400 KC, 6.0 MC, 16.0 MC and 46.0 MC.

An output meter.

A 0-200 or a 0-100 microampere meter.

An oscilloscope with vertical and horizontal amplifiers.

A wide-band frequency-modulated generator or "wobbulator" covering the intermediate frequency of 4.3 MC and with either 400-cycle or 60-cycle modulation. It must be capable of producing a deviation frequency of 150 KC. (Total frequency swing of 300 KC.)

While this instruction sheet describes the use of a generator for F-M alignment which has 400-cycle modulation and which has provision for bringing out the 400-cycle voltage for application to the horizontal plates of the oscilloscope, it is also possible to use a generator with 60-cycle modulation, and to use the 60-cycle sweep which is built into the oscilloscope, instead of obtaining the synchronizing voltage from the generator. If the service man has been using such a generator for A-M visual alignment he will be familiar with his instrument and will be able to adapt it to this alignment procedure.

Although it is possible to align this receiver wtih a generator or wobbulator not having quite as great a total frequency swing as 300 KC, it will be difficult to get satisfactory results. Note that the I-F response curve in Figure 1 is flat over a region about 150 KC wide. An unsymmetrical response curve in an F-M receiver quite seriously affects its performance at low signal levels. It is therefore essential to have proper equipment for alignment in order to get the best results.

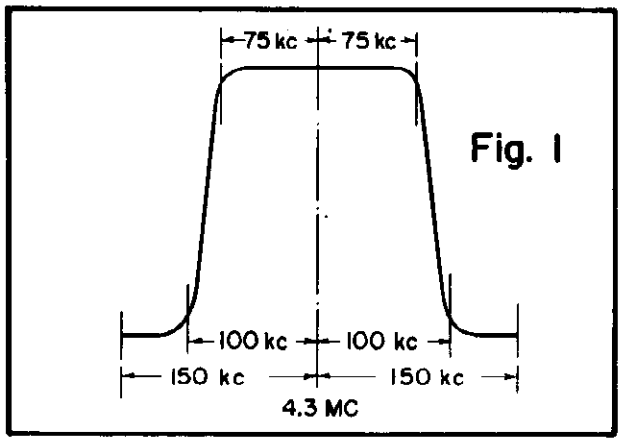


Fig. 1

A-M ALIGNMENT

The alignment of the A-M portion of this receiver is conventional and should be carried out as follows:

Connect the output meter to the receiver by any of the usual methods.

Connect the A-M signal generator between the chassis and the grid of the 6K8 tube, using a .0005-mfd. to .25-mfd. condenser between the grid and the high side of the generator output. Do not remove the grid clip for this operation. The range switch should be turned to the Broadcast band and the dial pointer set near 600 KC. Tune the signal generator to 456 KC and proceed to align the four I-F trimmers for maximum output. On this and on all following adjustments turn the audio control on full and use as weak a signal from the generator as will give a satisfactory indication on the output meter.

The generator should now be connected to the antenna-and-ground terminal strip. Leave "D" unconnected. Use a proper dummy antenna in series with the high side of the generator output (200-mmf. for Broadcast; 400-ohms for Short-Wave).

SHORT-WAVE BAND

Turn the range switch to the Short-Wave position and set the tuning dial and the signal generator to 16.0 MC. Adjust the oscillator trimmer (top trimmer in oscillator coil) to maximum response. If two responses of nearly equal intensity are found, adjust for the one with the trimmer farthest open. Now adjust the top trimmers in the Antenna and R-F coils for maximum response. Since, at this frequency, the R-F tuning slightly affects the oscillator frequency, it will be necessary to rock the tuning condenser slightly while adjusting the R-F trimmer in order to keep the signal tuned in.

Set the signal generator to 6.0 MC and tune in this signal with the receiver dial. Now, while rocking the tuning condenser back and forth, adjust the S-W oscillator padding condenser. (The rear section of the dual padder located in the top of the chassis over the range switch) for maximum output. This adjustment is not critical and the tuning of the S-W padder will be found to be quite broad.

BROADCAST BAND

Turn the range switch to the Broadcast position and substitute the 200-mmf. dummy antenna for the 400 ohms. Set the dial and the generator to 1400 KC and adjust the oscillator trimmer (bottom trimmer on oscillator coil) to maximum response. Next adjust the bottom trimmers of the Antenna and R-F coils for maximum response.

Now set the generator to 600 KC and tune in the signal with the dial. Rocking the gang condenser slightly, adjust the oscillator padder (front section of the dual padder) for maximum response. This adjustment will be much sharper than the padding adjustment on the short-wave band.

This completes the alignment of the A.M. portion of the receiver.

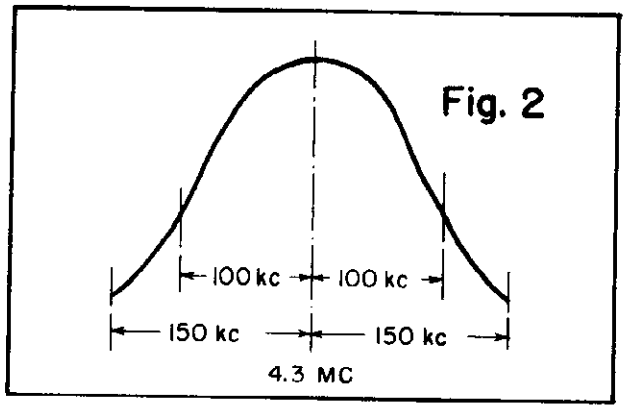
F-M ALIGNMENT

The F-M alignment is made in three major steps: namely, I-F alignment, discriminator alignment and R-F alignment.

For the first operation, I-F alignment, connect the output of the frequency-modulated generator between the grid of the 6SG7 2nd IF stage and chassis, using an .05-mfd. condenser in series with the high side of the generator output and connecting this condenser to the 6SG7 grid. Leave the grid lead of the 6SG7 tube connected. Now connect the synchronizing voltage output from the generator to the input of the horizontal amplifier of the oscilloscope. Note: The ground lead from the generator should always be connected to the chassis near the tube to whose grid the generator is connected to avoid spurious regeneration phenomena which change the shape of the IF curve.

Now connect the input to the oscilloscope vertical amplifier between chassis and the low potential end of the last I-F transformer (point "A" in circuit diagram) using a 100,000-ohm resistor in series with the high side. This resistor should be located at the receiver end of the connecting wires and should be connected with a short lead to the Point "A".

Having made the set-up, turn on the oscilloscope and the frequency-modulated generator. Turn down the receiver volume control. Set the generator to 4.3 MC and the deviation frequency (if calibrated on the generator) to 150 KC. Turn the vertical gain control of the oscilloscope well up and the horizontal gain control just high enough to give almost full-screen deflection of the horizontal pattern. Using just enough output from the generator to give good deflection on the screen adjust the trimmers of the last I-F transformer for the greatest gain and to give a pattern that is centered in the screen and that is symmetrical. This pattern should be similar to the one shown in Figure 2



Now without changing the generator frequency, remove the generator connection from the grid of the 6SG7 2nd I.F. amplifier and place it on the grid of the 6SG7 1st I.F. amplifier, using the .05-mfd. condenser as before, and changing the position of the ground lead as described above. Again use only enough output from the generator to give good vertical deflecton on the screen, and adjust the trimmers of the second I-F transformer in the same manner as before. The curve shape should remain practically the same as it was before.

Now remove the generator connections (ground as well as "hot") from the 6SG7 first I-F amplifier and place them on the signal grid and ground of the 6SA7, again using the .05-mfd. condenser. Proceed as before, turning down the output from the generator until there is just enough for good vertical deflection on the oscilloscope screen. Adjust the trimmers of the first I-F transformer for the greatest gain and to give a pattern similar to the one shown in Figure 2.

In all of the foregoing adjustments note that the oscilloscope vertical amplifier gain control has been turned well toward maximum gain, and that a low input from the generator has been used. The reason for this is that, as higher signal-input levels are used, the response curve of the I-F amplifier stages will change shape. If the symmetry of the response curve is kept good at low input levels, then any dissymmetry occurring at high input levels will be unimportant, since at high input levels the limiter tube will level out the response before the signal reaches the discriminator.

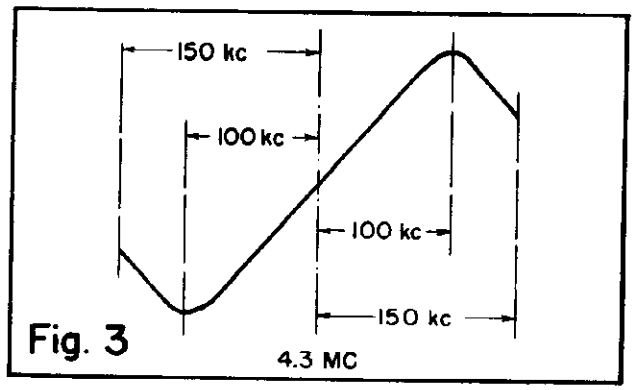
Should the I-F circuits for any reason be badly misaligned, the first 6SG7 I-F stage may oscillate when the input from the generator is placed on the grid of the 6SG7 second I-F tube, making it difficult to get a readable pattern on the oscilloscope screen. Should this condition occur, the remedy is to remove the 6SG7 first I-F tube from its socket until the last I-F stage has been aligned.

This completes the alignment of the I-F stages and the alignment of the discriminator comes next. Before proceeding with the discriminator alignment, however, it will be necessary to balance the tuning-eye circuit. With the 6SJ7 second-limiter tube removed from its socket, adjust the eye balance control, which is the short shaft with the screw driver slot on the back of the chassis, until the eye just closes but does not overlap. Now replace the 6SJ7 second-limiter tube.

DISCRIMINATOR ALIGNMENT

Leaving the set up as it was when the I-F alignment was completed, adjust the generator frequency until the I-F response pattern on the oscilloscope screen is centered and is symmetrical.

Now remove the connection to the low-potential side of the 1st I-F coil, which is the lead containing the 100,000-ohm resistor, and move this connection to the 6H6 discriminator cathode marked "B" in the circuit diagram. The pattern on the oscilloscope screen will go off scale and the input from the generator will have to be decreased. If the generator leakage is bad and its output cannot be turned down to a sufficiently low level, the oscilloscope vertical amplifier gain control may be turned down. With the setup made as described and with the generator deviation-frequency still set at 150 KC, adjust the trimmer on the primary side of the discriminator coil (The red Trimmer Screw) for greatest vertical deflection on the oscilloscope screen.



Next adjust the trimmer on the secondary side of this coil until a pattern similar to the one shown in Figure 3 is obtained. This adjustment is quite critical and should be made so that the pattern is as near symmetrical as possible. If the portion of the pattern in Figure 3 which appears straight, is not quite straight on the oscilloscope screen it may be made so by a slight readjustment of the trimmer on the primary side of the coil. Before leaving the adjustment of the discriminator coil a further refinement in the adjustment of the secondary trimmer should be made as follows: Decrease the frequency deviation of the generator from 150 KC to about 100 KC, or until the pattern on the oscilloscope screen just takes in the straight portion of the curve. Now, watching the action of the tuning eye, make a very slight readjustment of the secondary trimmer of the discriminator coil until the eye just closes but does not overlap. This completes two steps in the I-F alignment and the connections to the frequency-modulated generator and the oscilloscope may now be removed.

ANTENNA, R-F AND OSCILLATOR

In order to align the R-F Antenna and Oscillator circuits, an amplitude-modulated signal generator covering the range of 42-50 MC and a 0-200 microampere meter may be used. The signal generator need not be modulated.

Connect the meter in series with the ground end of the grid resistor of the 6SJ7 first-limiter tube, with the positive side of the meter to ground. This point is marked "C" in the circuit diagram. Now apply the output of the signal generator to the antenna and ground posts of the terminal strip on the back of the chassis which are marked "A" and "G". Leave "D" unconnected. Set the receiver dial and the signal generator to 46 MC and adjust the oscillator trimmer, which is the air trimmer mounted on top of the middle section of the tuning condenser, for maximum deflection on the 0-200 microampere meter. If two positions of the oscillator trimmer give almost equal deflection on the meter, select the point with the trimmer farthest in mesh, since the oscillator on this band operates below the signal frequency. Keep the generator output adjusted to such a value that about one quarter of full scale deflection is obtained on the meter. Next adjust the R-F trimmer, mounted on the front section of the tuning condenser, for maximum deflection of the meter; then perform the same operation for the antenna trimmer, which is mounted on the back section of the tuning condenser. The adjustment of the R-F trimmer affects the oscillator frequency slightly and the tuning condenser should be rocked back and forth when making this adjustment in order to keep the oscillator tuned to the signal frequency. If two points of response are found on the R-F or antenna trimmers, the point which requires the least amount of capacity in these trimmers should be selected.

As a final check of antenna, R-F and oscillator adjustment, signals from the generator should be tuned in at various points on the band to see that the sensitivity is equal over the band.

MODELS 9-1053, 9-1054

MEISSNER MFG. DIV.
MAGUIRE INDUSTRIES, INC.

REPLACEMENT PARTS LIST

MISCELLANEOUS

Part No.	Description
19746	Tuning Indicator Socket Assembly
19759	Multiple Section Range Switch
17280	Interstation Silencer Switch
19698	Molded Bakelite Knob
	8" Dynamic Speaker, 2700-ohm Field, with cable and plug

TRANSFORMERS AND COILS

Part No.	Code	Description
01840	T1	F-M Antenna Coil
01842	T2	F-M RF Mixer Coil
01844	T3	F-M Oscillator Coil
16-6664	T4	F-M 1st I-F Transformer
01832	T5	F-M 2nd I-F Transformer
16-6664	T6	F-M 3rd I-F Transformer
01830	T7	F-M Discriminator Transformer
01820	T8	Two-band Antenna Coil
01822	T9	Two-band RF Mixer Coil
01824	T10	Two-band Oscillator Coil
01826	T11	A-M Input I-F Transformer
01828	T12	A-M Output I-F Transformer
19754	T13	Power Transformer, 110-volt, 60-cycle
19753	T14	Output Transformer
01852	L1 to L5	Filament Choke
19251	L6	Filter Choke

CONDENSERS

TUBULAR

Part No	Code	Capacity	Voltage
15187	C64,C67	.006 mfd.	600
14110	C4,C15,C17 C18,C19,C20 C21,C22,C23 C24,C26,C29 C31,C35,C54		
	C60,C62,C68	.01 mfd.	400
14181	C45,C51,C66	.05 mfd.	400
15142	C16,C33	0.1 mfd.	200
14160	C32,C36,C38 C41,C42,C44		
	C50,C63	.05 mfd.	200
15143	C55	0.1 mfd.	400

ELECTROLYTIC

18186	C56	40 mfd.	450
	C57	30 mfd.	450
	C58	10 mfd.	450
	C69	20 mfd.	25
16184	C59,C65	25 mfd.	25

MOLDED

15101	C25,C27 C30,C34	50 mmfd.
14180	C8,C28	25 mmfd.
15132	C14,C39	35 mmfd.
14101	C43,C52,C53	100 mmfd.
14139	C3,C6,C7	500 mmfd.
14108	C5,	.001 mfd.
17120	C11,C61	.005 mfd.
18154	C70	.004 mfd.
16138	C47	.003 mfd.

TRIMMER

9583	C2,C10	1½-plate	Ceramic
21-5175	C12	14 -plate	Ceramic
15211	C46,C48	6 -plate	Ceramic

SPECIAL

18185	C1,C9,C13	5-plate	F-M Tuning
	C37,C40,C49	19-plate	A-M Tuning

RESISTORS

CARBON

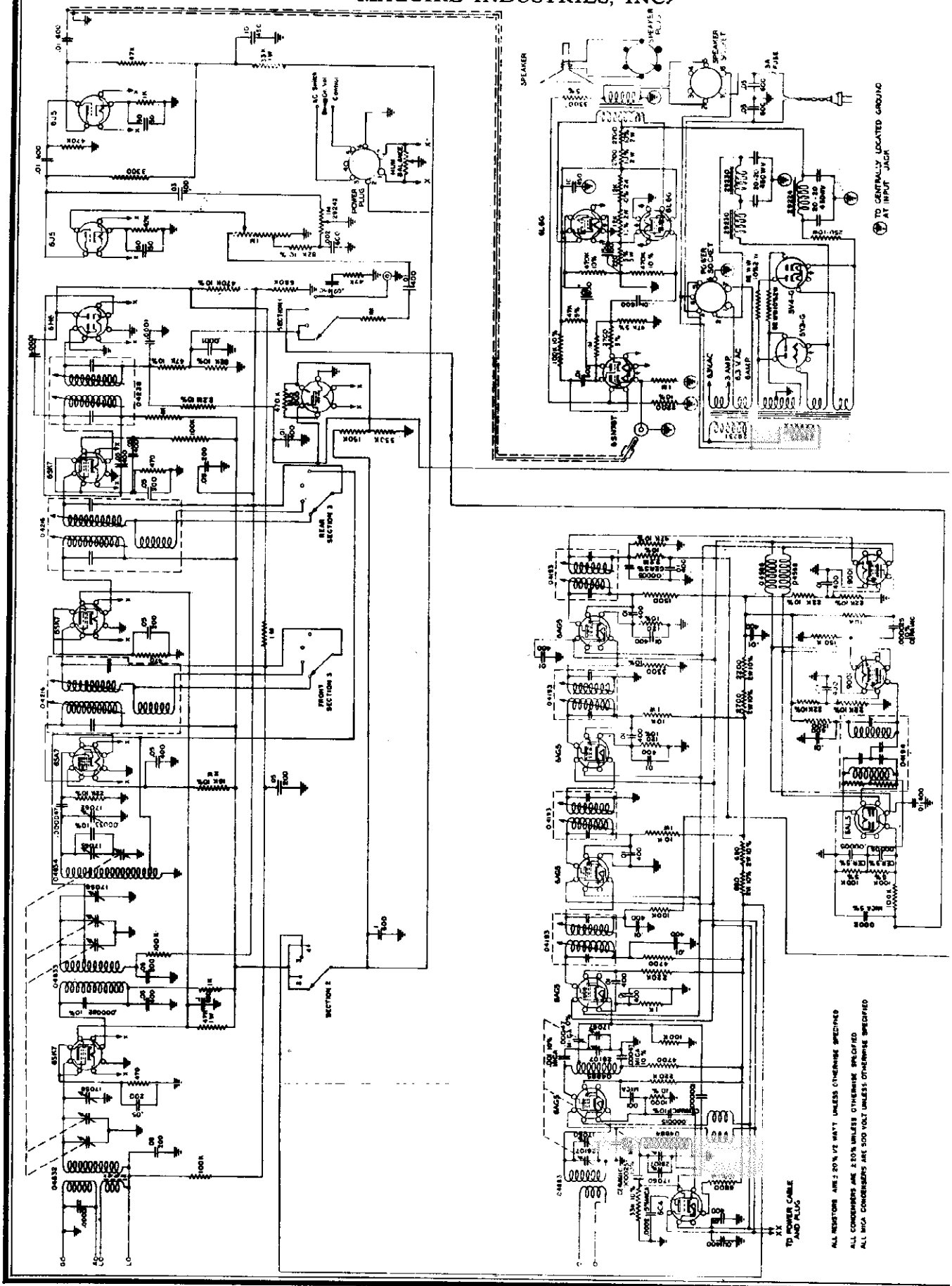
Part No.	Code	Resistance	Wattage
15102	R10,R14	100-ohm	0.25
15136	R3	220-ohm	0.25
14175	R35	330-ohm	0.25
15145	R7	470-ohm	0.25
18104	R57,R61	470-ohm	1.00
16126	R37	680-ohm	0.25
14191	R9,R12 R16,R63	1,000-ohm	0.25
16117	R51	2,200-ohm	0.25
14179	R5,R26	4,700-ohm	0.25
15153	R20	10,000-ohm	0.50
14193	R6	10,000-ohm	1.00
15156	R59	15,000-ohm	1.00
17121	R39	15,000-ohm	3.00
14190	R33,R38,R60	22,000-ohm	1.00
14169	R4,R8 R11,R15	22,000-ohm	0.25
17111	R22,R24	33,000-ohm	0.25
15155	R21,R25	39,000-ohm	0.50
14151	R13,R19 R36,R40	47,000-ohm	0.25
17184	R27,R28	100,000-ohm	0.25
14144	R30,R31,R34 R49,R58	100,000-ohm	0.25
16193	R23	150,000-ohm	0.25
14170	R42,R44,R45 R53,R55,R56	220,000-ohm	0.25
14145	R54	330,000-ohm	0.25
14155	R2,R18,R32 R41,R62	470,000-ohm	0.25
17109	R1,R17,R29 R46,R47	2.2-megohm	0.25

VARIABLE

19752	R43	25,000-ohm	Tuning Indicator Adjustment
19748	R48	500,000-ohm	Volume Control, With Switch.
19747	R52	2.0-megohm	Tone Control

MEISSNER MFG. DIV.
MAGUIRE INDUSTRIES, INC.

MODEL 9-109



MODEL 9-1093

MEISSNER MFG. DIV
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Broadcast Band Alignment Data -

Intermediate Frequency	455 Kilocycles
Adjust Trimmers at	1550 Kilocycles
Adjust Oscillator Padder at	580 Kilocycles

Frequency Modulation Band Alignment -

Equipment required for alignment: unmodulated R.F. signal generator that will cover 10.7 Megacycles and a range of 88 to 108 Megacycles, a D.C. vacuum tube voltmeter, and a microammeter capable of reading 50 microamperes. A more satisfactory discriminator alignment may be obtained if the following additional equipment is available. An F.M. generator capable of 200 kilocycles deviation at 10.7 megacycles and a cathode-ray oscilloscope.

Discriminator Alignment - (With F.M. signal and oscilloscope)

Remove 2nd I.F. tube.

Apply 1 V. modulated, 200 kc. deviation, 10.7 mc. signal to 1st limiter grid through .005 mica capacitor. Adjust bottom slug of discriminator transformer so that peaks of curve are symmetrical about the vertical axis. Adjust top slug to give maximum amplitude of peaks.

Discriminator Alignment - (With unmodulated signal and vacuum tube voltmeter)

Remove 2nd I.F. tube.

Apply 1 V. unmodulated signal 10.7 mc. to 1st limiter grid through .005 mica capacitor. Connect vacuum tube voltmeter (with high impedance input) from the junction of two .000050 ceramic condensers in discriminator output circuit to chassis and adjust top slug of discriminator transformer for maximum voltmeter reading. Then connect VT meter from discriminator audio output lead to chassis and balance bottom slug for zero reading.

I.F. Alignment -

Remove second 6001 limiter from socket. Insert microammeter in series with 47K 1st limiter grid resistor to ground. With 10.7 mc. signal input to antenna, adjust each I.F. transformer for maximum limiter grid current.

R.F. Alignment -

The R.F. section contains a double converter system in which the oscillator operates at one half signal frequency, minus 5.35 mcs. The image frequency is so far away from the signal frequency that it is normally not necessary to locate or pay any particular attention to the image during the alignment procedure.

Trimmers should be adjusted for maximum output at limiter stage with generator set to 108 mcs.

Standard Broadcast	535-1620 Kilocycles
Frequency Modulation	88-108 Megacycles

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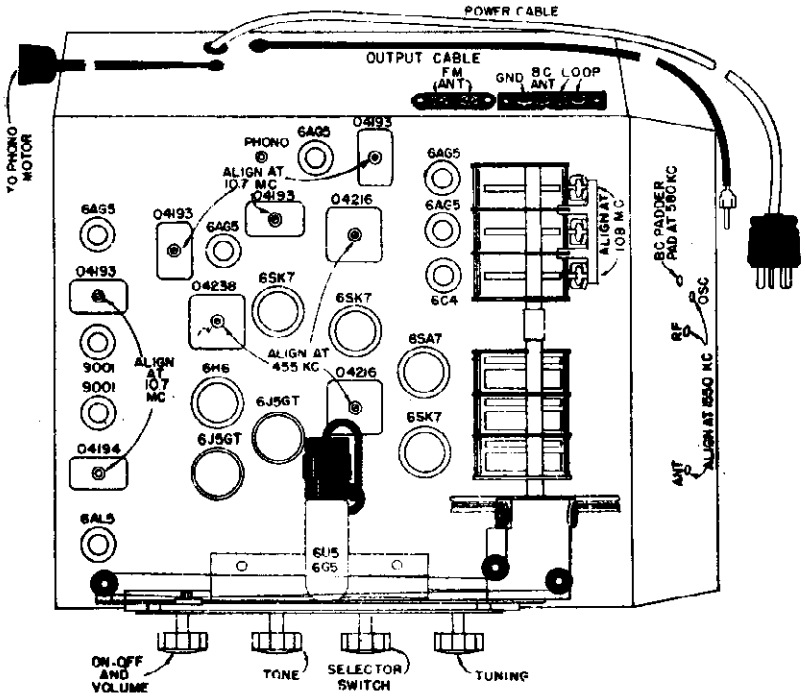
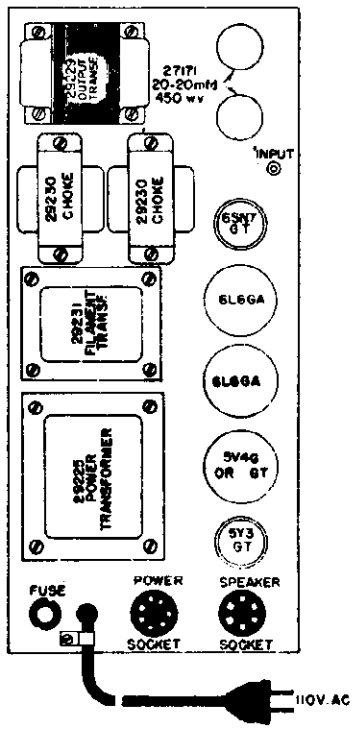
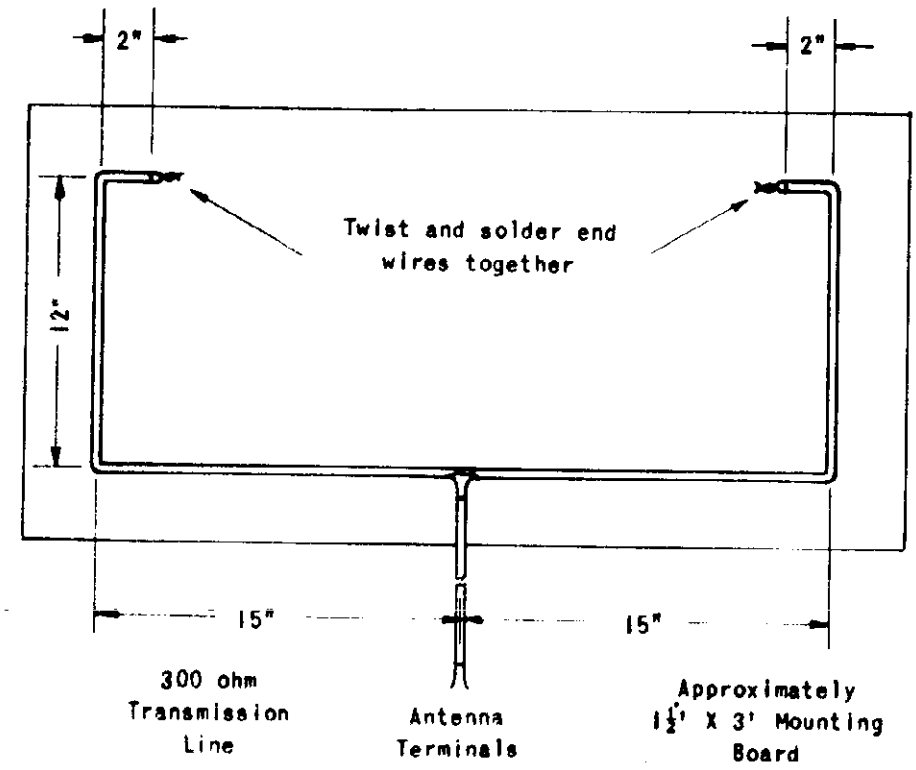






MODEL 9-1093

MEISSNER MFG. DIV.
MAGUIRE INDUSTRIES, INC.

D.C. VOLTAGE TABLE

Tube	Function	Plate	Screen	Cathode
6SK7	R.F.	280	107	4.4
6SA7	Converter	285	108	-
6SK7	1st I.F.	285	107	4.7
6SK7	2nd I.F.	280	111	5
6H6	Detector	-	-	(Pin 4) 5 (Pin 8) 0
6J5	1st Audio	150	-	6.7
6J5	2nd Audio	67.5	-	1.7
6E5	Tuning Eye	125	-	-
6AG5	1st Conv.	260	107	2.7
6AG5	2nd Conv.	270	133	2.9
6C4	Osc.	180	-	-
6AG5	1st. I.F.	100	100	0
6AG5	2nd I.F.	125	125	1.1
6AG5	3rd I.F.	102	102	1
9001	1st Limiter	98	46.5	-
9001	2nd Limiter	117	45	-
6AL5	Discriminator	-	-	(Pin 5) 3.4
6SN7G	Driver	(Pin 2) 76 (Pin 5) 197.5	-	(Pin 3) 2.6 (Pin 6) 83
6L6G	Output	365	270	22.2
5Y3G	Rectifier	-	-	310
5V4G	Rectifier	-	-	405

Power Supply

This receiver is designed to operate from a power supply main of 105-125 volts, 50-60 cycle alternating current (A.C.). NEVER PLUG INTO ANY OTHER SUPPLY !!

Speaker

The power amplifier is designed to operate a permanent magnet type of speaker with a voice coil impedance of 12 ohms.

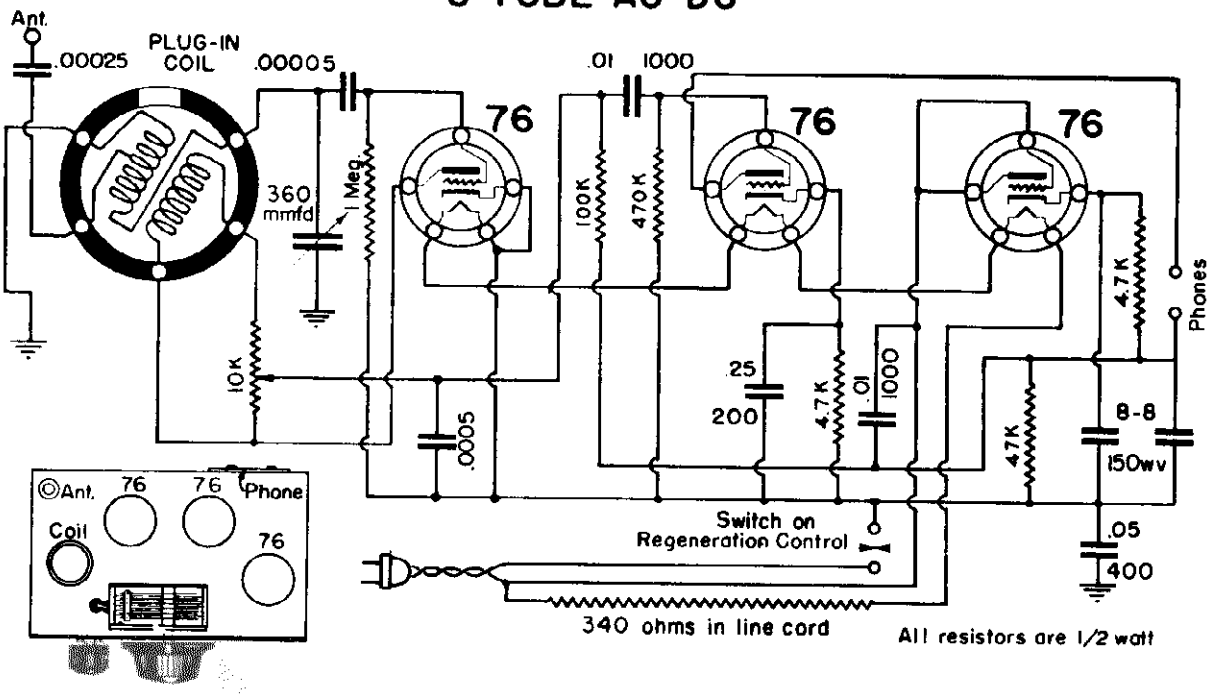
D.C. Voltage Table -

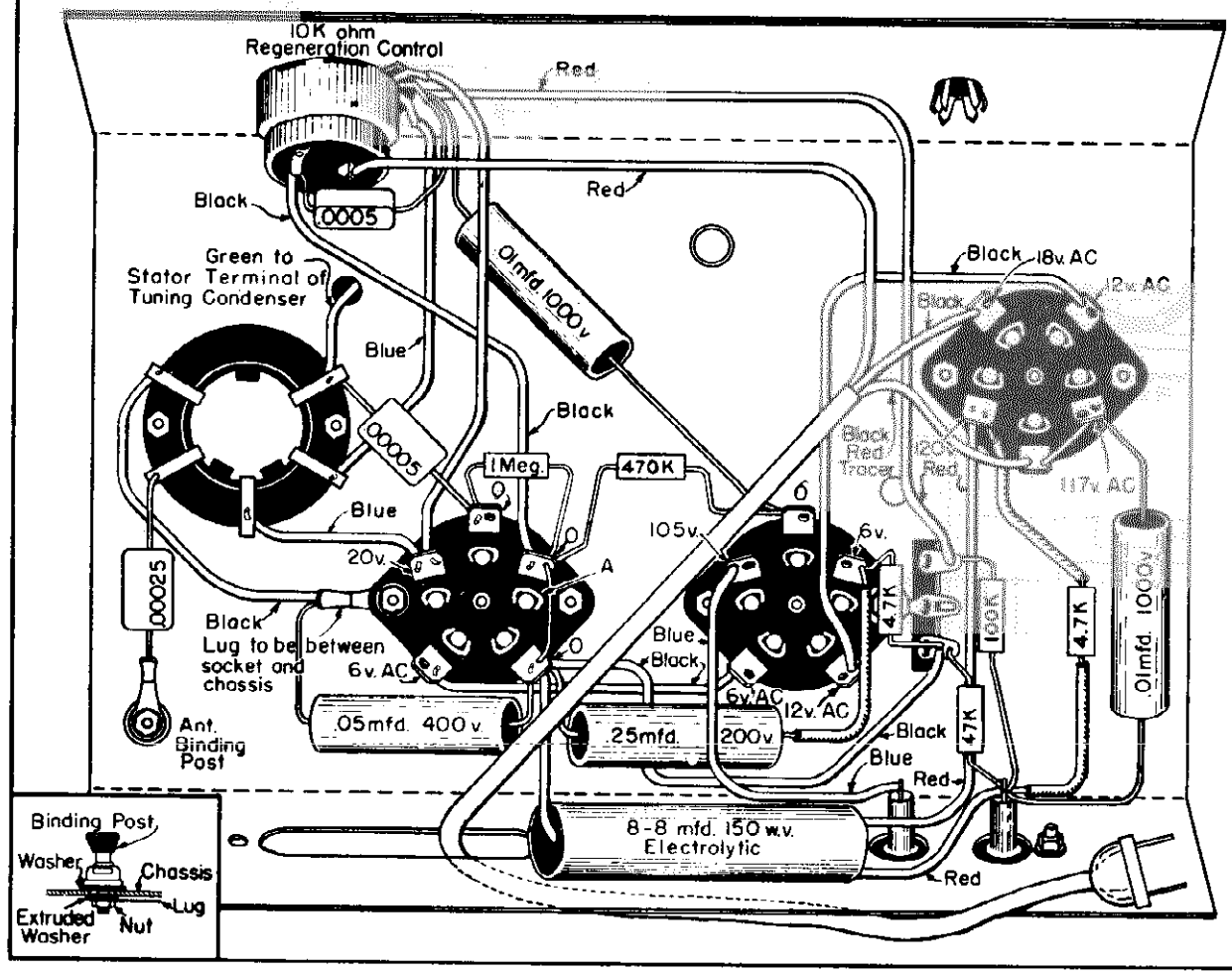
The voltages in the table above are the correct voltages which should be measured between the socket terminal and chassis with nominal line voltage and no signal. All voltages measured with a high impedance voltmeter (20,000 ohms/volt). Allowance should be made for loading if a low impedance voltmeter is used.

MEISSNER MFG. DIV.
MAGUIRE INDUSTRIES, INC.

MODEL 10-1

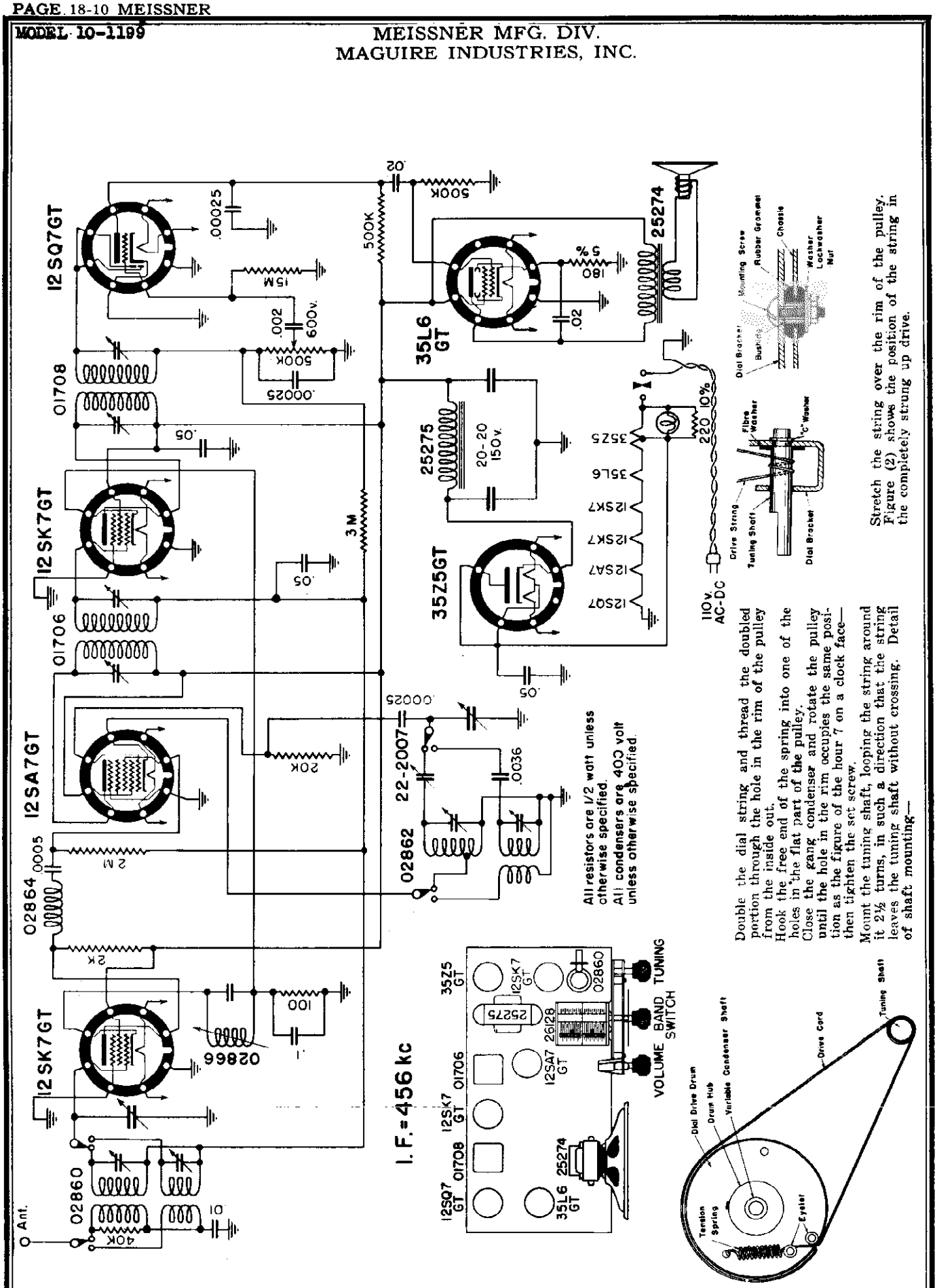
3 TUBE AC-DC





MODEL 10-1199

MEISSNER MFG. DIV.
MAGUIRE INDUSTRIES, INC.



Double the dial string and thread the doubled portion through the hole in the rim of the pulley from the inside out.
Hook the free end of the spring into one of the holes in the flat part of the pulley.
Close the gang condenser and rotate the pulley until the hole in the rim occupies the same position as the figure of the hour 7 on a clock face—then tighten the set screw.
Mount the tuning shaft, looping the string around it 2½ turns, in such a direction that the string leaves the tuning shaft without crossing. Detail of shaft mounting—

Stretch the string over the rim of the pulley, Figure (2) shows the position of the string in the completely strung up drive.

The signal generator should be connected to the signal grid or pin No. 8 of the 6SA7 mixer tube. This connection should be made through a .0005 to .25 mfd. condenser, the condenser being between the high side of the signal generator and the connection to the mixer grid. The signal generator should be set to 456 KC, which is the IF frequency, and the volume control of the receiver should be set at maximum or extreme clockwise. The output of the signal generator should then be turned up until a signal is heard and then the trimmers on the IF transformers adjusted (with insulated shaft screwdriver) for maximum output, reducing the output of the generator as the receiver becomes progressively more sensitive, always using as weak a signal as possible.

After the IF transformers have been properly adjusted, remove the connection from the generator to the mixer grid, reconnecting the generator to the antenna binding post. Leaving the frequency of the signal generator at 456 KC, adjust the wave trap by turning the adjusting screw which protrudes through the chassis. This adjustment should be made for the minimum of signal output. The generator output should be increased as the adjustment proceeds to insure maximum IF rejection.

When the IF transformers are adjusted for a maximum sensitivity, the antenna and oscillator trimmers should be adjusted in the following manner:

(1) Check the dial pointer position to see that it is horizontal when the gang condenser is closed.

(2) Set the band switch in the broadcast position or counter clockwise.

(3) Rotate the gang condenser until the pointer indicates 1400 KC.

(4) Adjust the signal generator to 1400 KC and connect the output of the signal generator to the antenna lead, using a .0002 mfd. condenser between the antenna and the high side of the oscillator. Increase the generator output to a medium level and adjust the oscillator trimmer, which is located through a hole on the top of the chassis just to the right of the speaker. The next step is to adjust the antenna coil by adjusting the trimmer which is closest to the chassis. Both of these trimmer adjustments should be made for maximum output, decreasing the generator signal strength as the set progressively becomes aligned. Leaving connections as they are, turn the dial pointer to approximately 600 KC and reset the signal generator for 600 KC, increasing the generator output until a signal can be heard. Adjust the padder screw, which is located near the center of the chassis, to maximum output. The best adjustment is obtained by simultaneously adjusting the padder screw and rocking the tuning control around 600 KC. Variation in wiring in circuit capacities may give the maximum output for 600 KC very slightly in error of 600 KC on the receiver dial.

(5) In the aligning of the short wave band, the the .0002 mfd. condenser with a 400 ohm resistor between the antenna post of the receiver and the output of the generator, set the generator to 16 megacycles and also the receiver dial pointer to 16 megacycles. Then adjust the oscillator trimmer, which is located through a hole on top of the chassis just to the right of the broadcast trimmer, for maximum output. When adjusting the oscillator trimmer on the short wave band, the trimmer should be tightened and then loosened to the second peak. The second peak will be the correct peak for this adjustment. Next adjust the short wave antenna coil, which is a trimmer located near the top of the coil. As before, the adjustments of these trimmers should be made with as low a signal level from the generator as possible, as the alignment proceeds. The padding of the short wave band is fixed.

CAUTION

The power line is connected directly to this chassis. The receiver must be suitably protected by a non-metallic cabinet and non-metallic knobs so that no one can make contact with any metal part of this radio when in operation. A cabinet back must be used to prevent accidental contact with the chassis. This back should have small holes or slots to permit ventilation yet prevent contact. Mounting screws used to hold the set in a cabinet should also be covered to prevent contact.

COMPLETE PARTS LIST

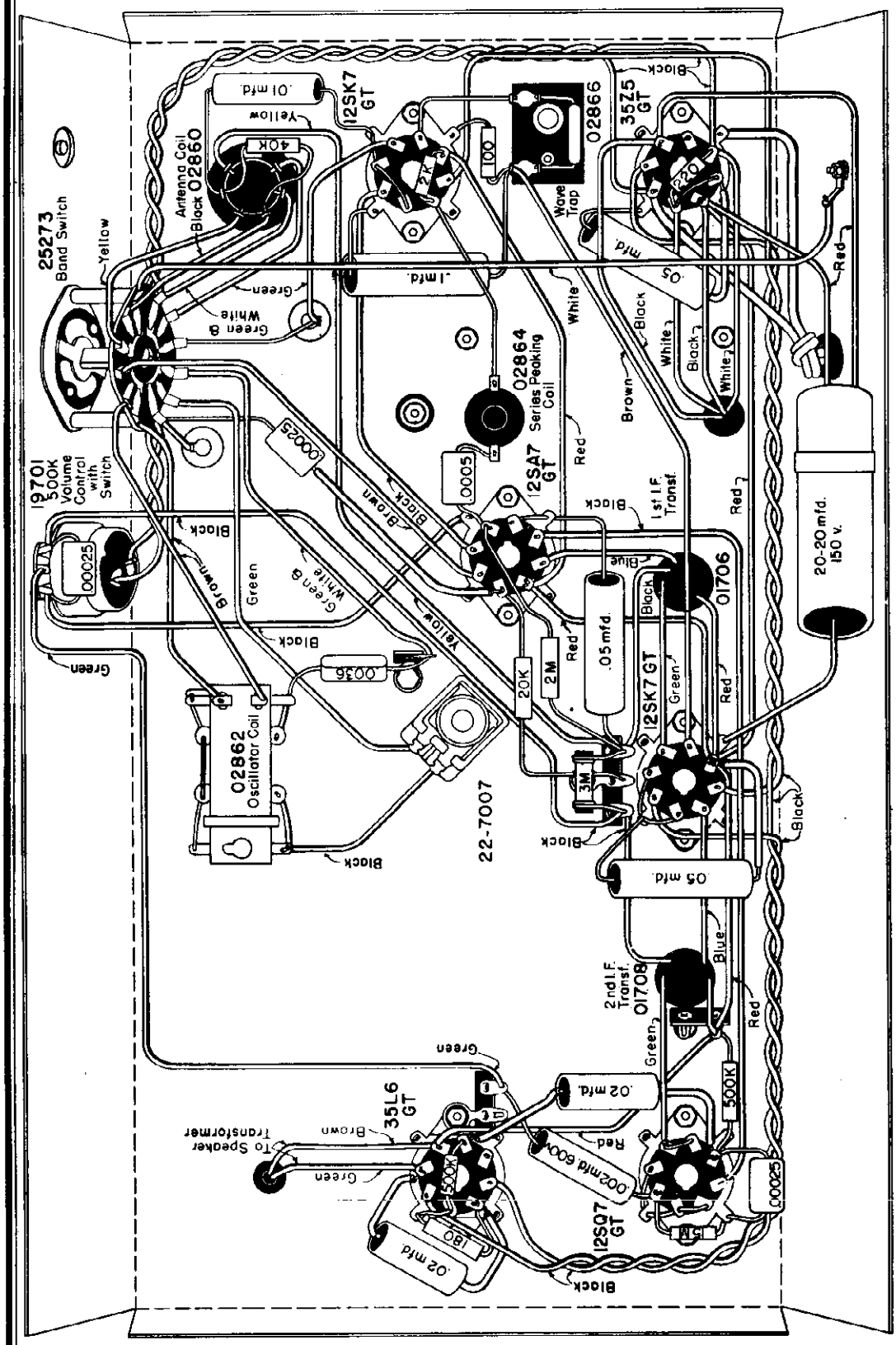
1 Chassis No. 02859
1 Input IF Transformer No. 01706
1 Output IF Transformer No. 01708
1 Broadcast and short wave antenna coil No. 02860
1 Broadcast and short wave oscillator coil No. 02862
1 Series peaking coil No. 02864
1 IF wave trap No. 02866
1 PM speaker with output transformer No. 25274
1 Variable condenser No. 26128
1 Filter choke No. 25275
6 Octal sockets
3 Tie lugs
1 Padder 22-7007
1 500 ohm volume control with switch
1 Band switch
1 Dial mechanism plate
1 Trimmer base assembly
1 Dial drum
4 Wood dowels
1 Dial cord and spring assembly
1 Dial shaft
1 "C" washer for dial shaft
1 Bakelite washer for dial shaft
1 Dial scale
1 Pilot socket and 6-8 volt pilot light
1 Dial pointer
3 Knobs
1 Line cord
1 Binding post assembly
2 Black rubber grommets for ⅜" hole
1 Black rubber grommet for ½" hole
3 Gum rubber grommets ⅜ I. D. for ¼" hole
1 Condenser mounting bracket
4 Chassis mounting brackets
2 Solder lugs
1 180 ohm resistor 5% ½ W. carbon
2 500,000 ohm resistor 20% ½ W. carbon
1 15 megohm resistor 20% ½ W. carbon
1 3 megohm resistor 20% ½ W. carbon
1 20,000 ohm resistor 10% ½ W. carbon
1 2 megohm resistor 20% ½ W. carbon
1 220 ohm resistor 10 % ½ W. carbon
1 100 ohm resistor 10% ½ W. carbon
1 2,000 ohm resistor 20% ½ W. carbon
1 40,000 ohm resistor 20% ½ W. carbon
2 .02 mfd. 400 volt paper condenser
1 .002 mfd. 600 volt paper condenser
3 .05 mfd 400 volt paper condenser
1 .01 mfd. 400 volt paper condenser
1 .1 mfd. 400 volt paper condenser
1 20-20 mfd. 150 volt electrolytic condenser
3 .00025 mfd. 20% mica condenser
1 .0036 mfd. 2% silver mica condenser
1 .0005 mfd. mica condenser

It has a high impedance primary antenna coil which permits the use of almost any length of antenna available. It also has one stage of untuned R. F. and an I. F. wave trap.

This receiver covers a frequency range of 530 KC to 1650 KC and from 5.7 MC to 18 MC, and will operate satisfactorily on voltages from 105 to 125, either D. C. or 50-60

MODEL 10-1199

MEISSNER MFG. DIV.
MAGUIRE INDUSTRIES, INC.



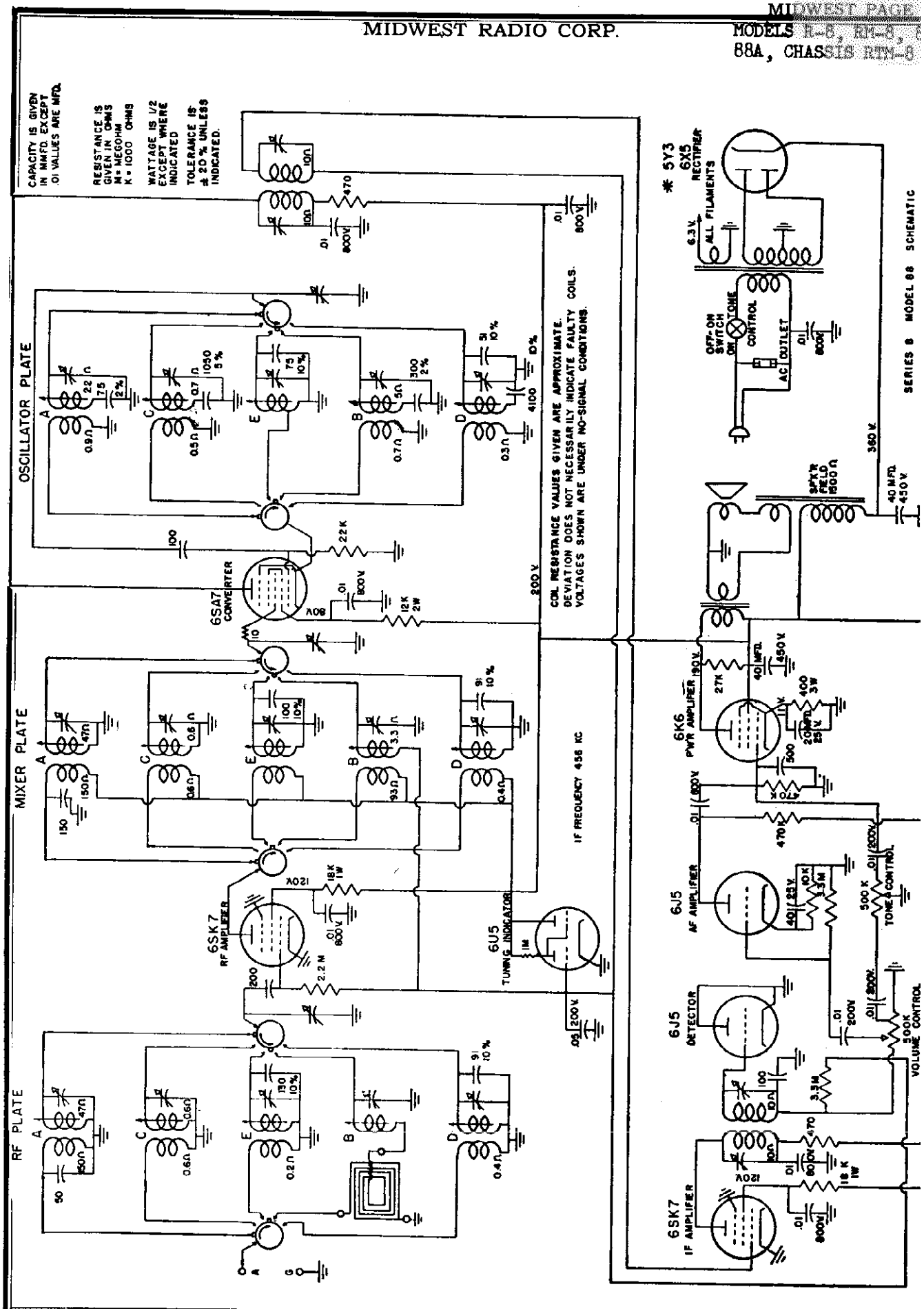
VOLTAGE ON SOCKET PIN NUMBERS

TUBE	1	2	3	4	5	6	7	8
12SK7GT RF	0	24VAC	0	grid	1.2DC	95VDC	37VAC	75VDC
35Z5GT	NC	110VAC	110VAC	NC	110VAC	NC	76VAC	112VDC
12SA7GT	0	12VAC	95VDC	95VDC	grid	0	24VAC	grid
12SK7GT IF	0	37VAC	0	grid	1.2DC	95VDC	50VAC	95VDC
				diode	plate			
12SQ7GT	0	grid	0	plate	plate	10VDC	12VAC	0
35L6GT	0	76VAC	95VDC	95VDC	grid	NC	50VAC	6VDC

Measurements taken with 1,000 ohms per volt meter. 115 volts AC line.
NC indicates "No Connection"; all voltages indicated are positive with respect to chassis unless otherwise marked.

MIDWEST RADIO CORP.

MODELS R-8, RT-8, T
88A, CHASSIS RTW-8



ALIGNMENT — The output indicator may be an audio frequency meter across the voice coil or a vacuum tube voltmeter at the avc. For 0.5 watt the voltage at the voice coil is 1.2 volts or 2.5 to 3.5 volts avc. if a 30% modulated signal is used. I.F. alignment should be made with band switch on "B," pointer turned to 1000 kc. and signal to mixer grid through a .05 mfd. condenser. Trim both I.F. transformers for maximum reading.

R. F. alignment should be made in the usual manner. There is no inter-action between bands. The only precaution is that a dummy antenna be used between the generator and the antenna post on the receiver. This may be simply a 200 micro micro farad condenser in series with a 400 ohm resistor. The B band RF padder, 550 KC, is very broad and should not be adjusted. The loop must be plugged in when adjusting the B band RF trimmer, 1600 kc.

ALIGNMENT CHART

Coupling	Signal	Band Switch	Dial	Adjustment
To converter grid thru .05 mfd capacitor	456 KC	B	1000 KC	Peak 1st and 2nd IF trimmers.
To "A" on antenna-ground terminal strip through 200 mmfd. and 400 ohms in series.	400 KC	A	400 KC	Peak RF, converter and oscillator trimmers marked "A".
	150 KC	A	150 KC	Peak RF, converter and oscillator cores marked "A".
	1600 KC	B	1600 KC	Peak "B" trimmers. Loop must be plugged in.
	550 KC	B	550 KC	Peak "B" cores except RF. Loop must be plugged in.
	4.7 MC	C	4.7 MC	Peak "C" trimmers.
	1.6 MC	C	1.6 MC	Peak "C" cores.
	10 MC	D	10 MC	Peak "D" trimmers.
	5 MC	D	5 MC	Peak "D" cores.
	22 MC	E	22 MC	Peak "E" trimmers.
	11.5 MC	E	11.5 MC	Peak "E" cores.

Note: Modulate the signal with 400 cycles 30%. The output indicator may be an audio meter at the voice coil or a VTVM on the avc. The voltage at the voice coil is 1.2 and the avc. voltage is between 2.5 and 3.5 for ½ watt output. Do not use signals for alignment which will give output in excess of ½ watt.

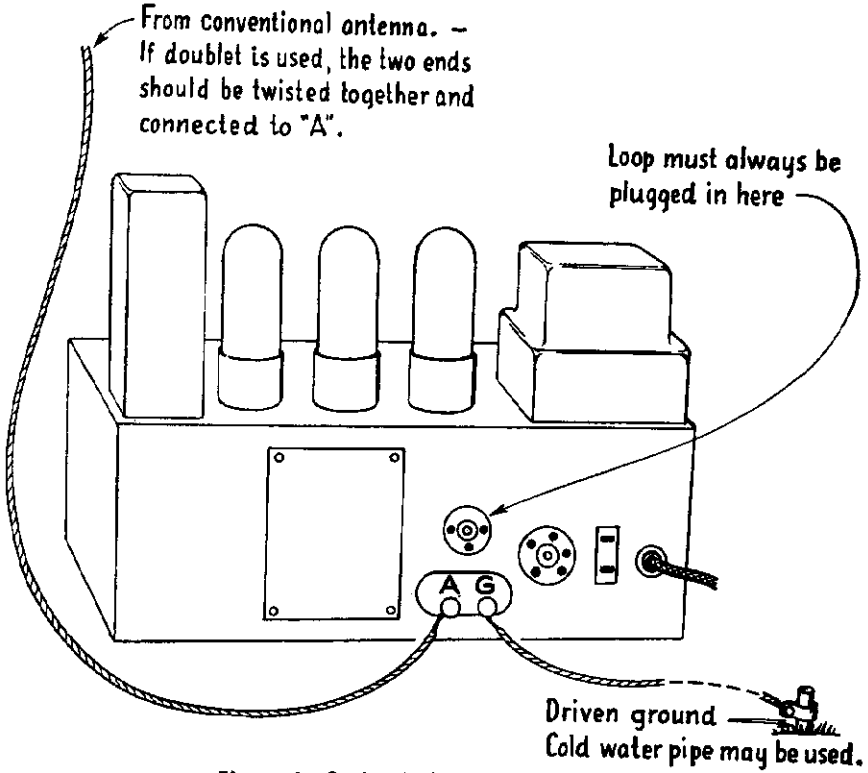


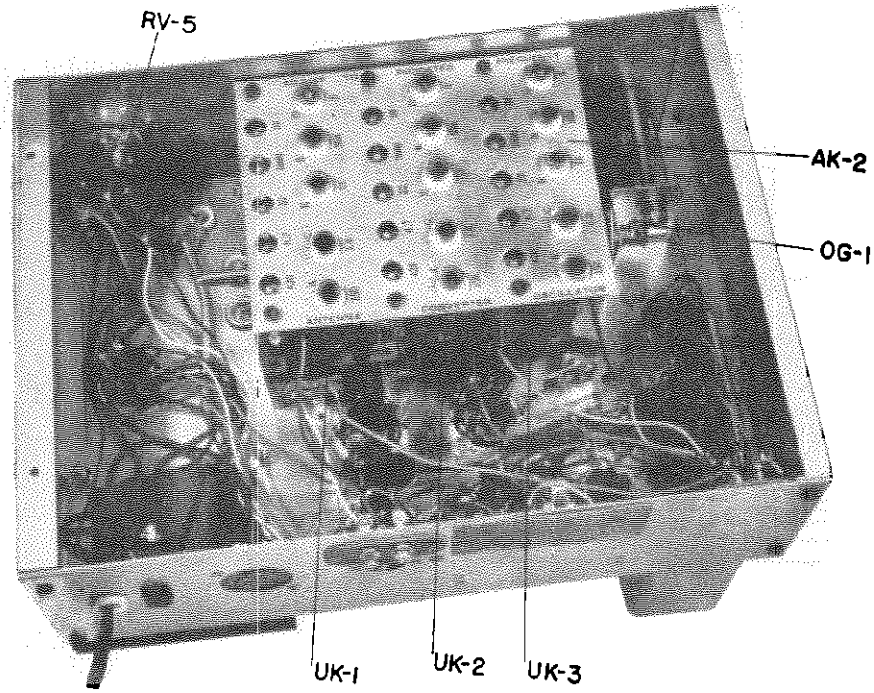
Figure 1. Series 8 Antenna Connections

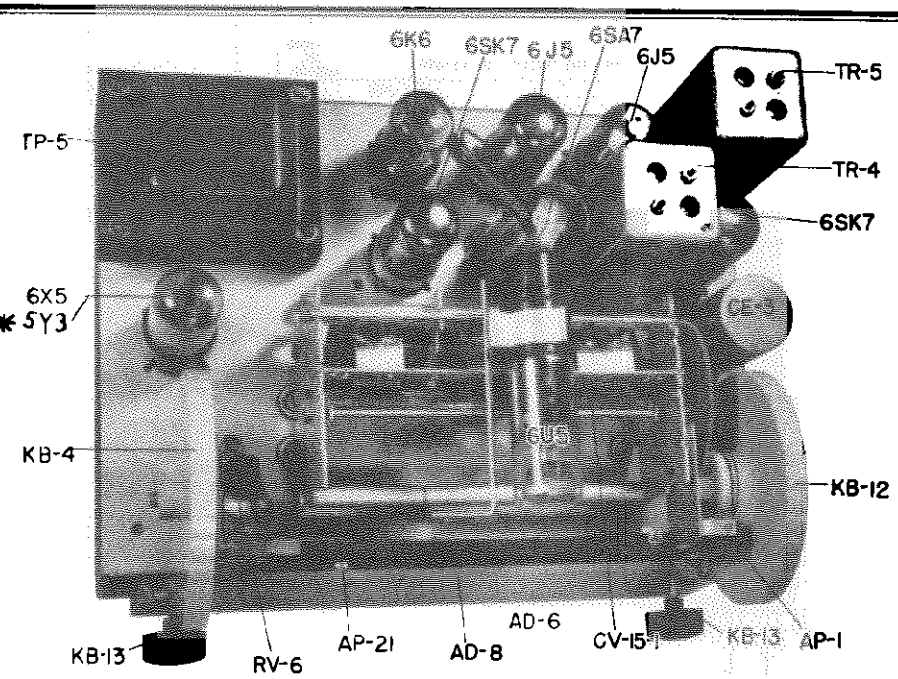
In locations which have too high an interference level, reception can be greatly improved by the use of an external antenna and ground.

In areas far removed from radio stations you may need an external antenna and ground system for best reception. The Antenna System illustrated in our catalog is highly recommended.

Simply plug the power cord into a nominal 115 volt 60 cycles receptacle. If you are not sure that your power is 115 volt 60 cycles, call your power company because extensive damage can result if the receiver is connected to direct current or alternating current other than 60 cycles, or voltage other than 105 to 125.

Special receivers can be supplied for some non-standard power sources. When ordering for non-standard power sources check with your power company for the exact voltage and frequency





* MODEL 88A

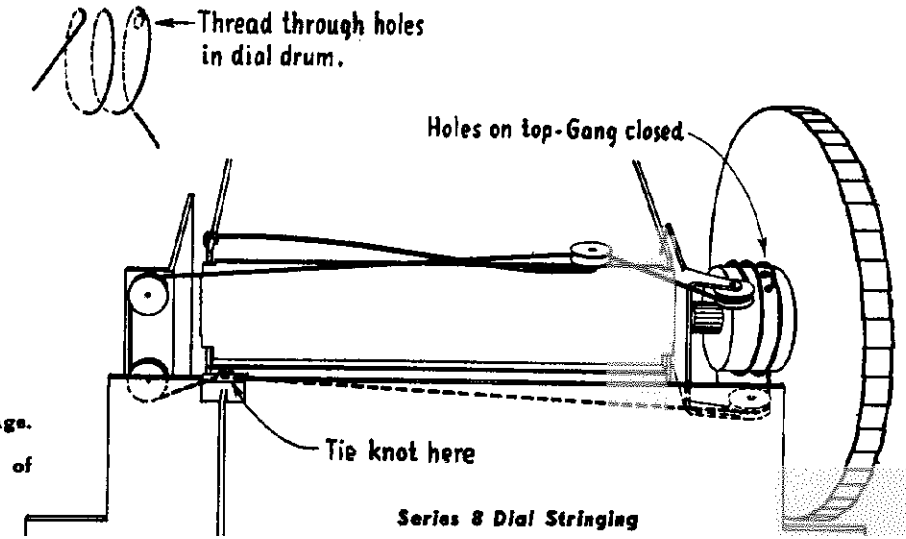
PARTS LIST

Part	Description
AD-6	Dial, C, D, E
AD-8	Dial, glass
AE-6	Escutcheon
AK-2	Coil plate cover
AP-1	Wood pulley
AP-31	Pointer
AS-1	Wood pulley mtg. stud
CE-3	Filter condenser 40-40-20
CE-4	Cathode by pass 40 mfd. 25 v
*CV-15-1	Tuning gang
EG-2	Speaker mtg. grommet
ES-13	Tube shield
HE-1	Speaker mtg. eyelet
IL-1	Panel Lamp, 6-8 volts
KB-12	Tuning knob
KB-4	Volume control knob
KB-13	Tone or Band knob
OG-1	Miter gear, pair
OS-3	Dial string spring
PC-3	Loop plug
RV-5	Tone control
RV-3	Volume control
*SP-1	Speaker, oval 6 x 9
TP-5	Power transformer
*TR-4	1st I.F. transformer
*TR-5	2nd I.F. transformer
*UK-1	R. F. coil plate
*UK-2	Mixer coil plate
*UK-3	Oscillator coil plate

Note: Order resistors and condensers by value, tolerance and wattage or voltage.

Note: When ordering include serial number of chassis, since Midwest records of changes in parts specifications are kept by that number.

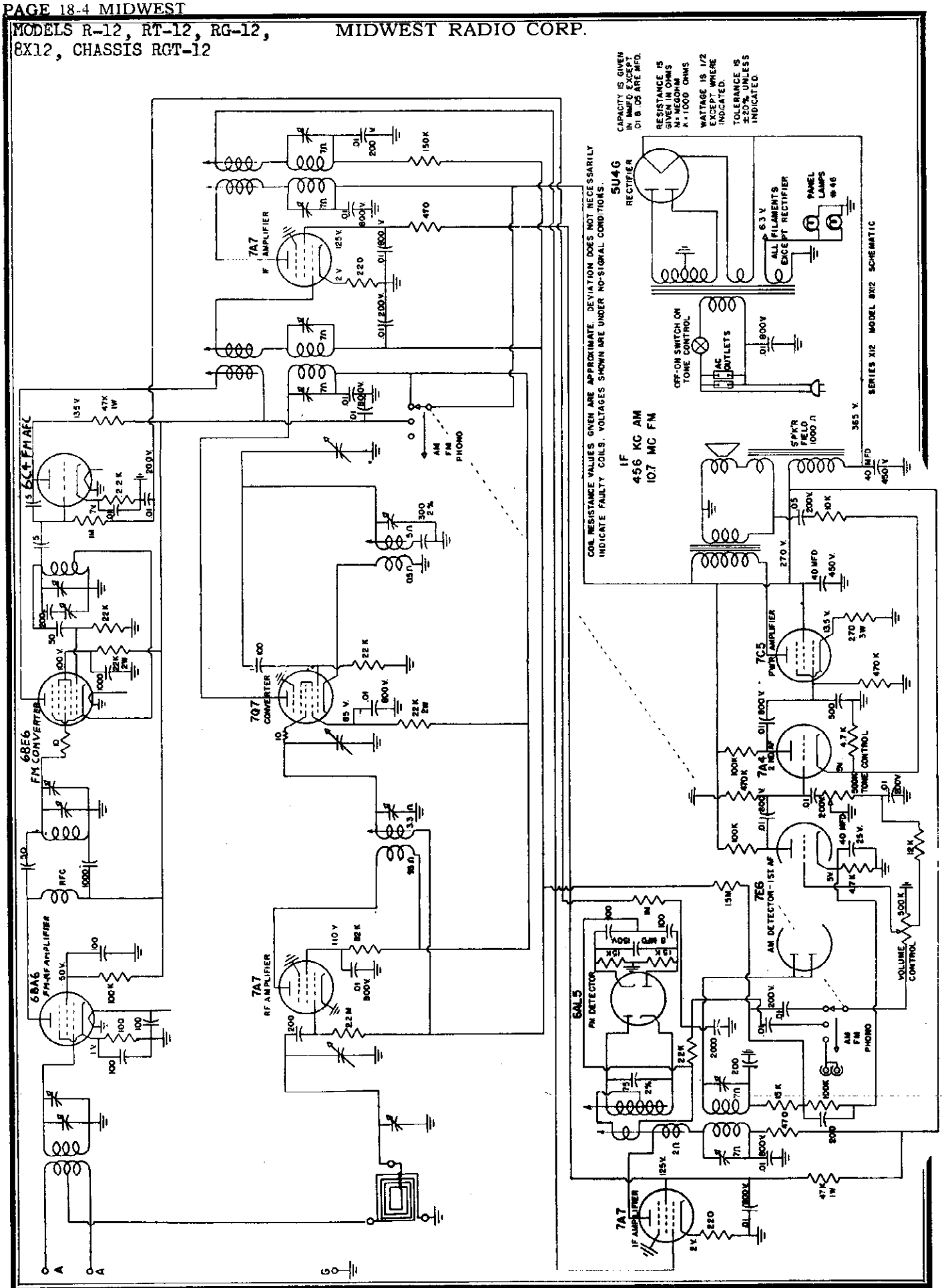
DIAL STRINGING — Use a light weight flexible dial cord when replacing worn or broken cord such as Beven-Wilcox FSN-25-12.



Series 8 Dial Stringing

MODELS R-12, RT-12, RG-12, 8X12, CHASSIS RGT-12

MIDWEST RADIO CORP.



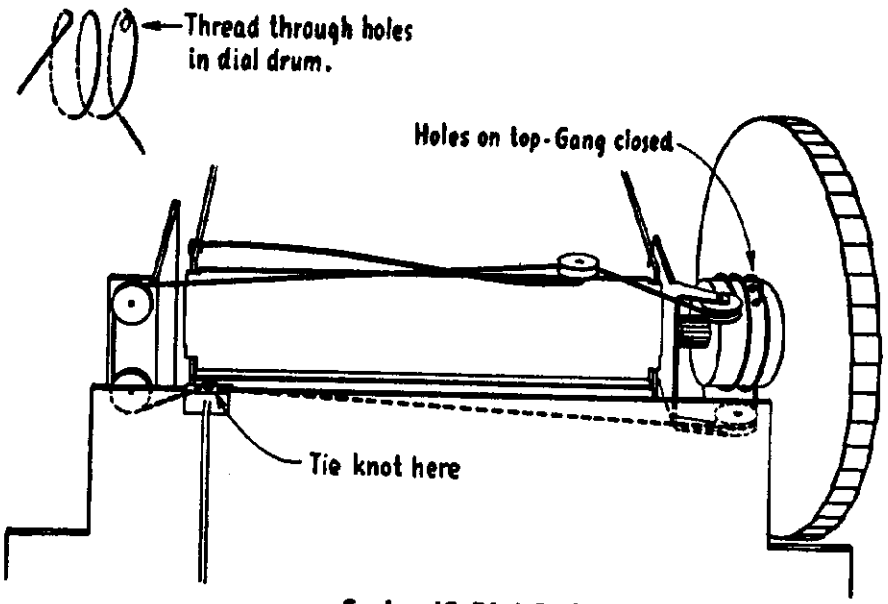
ALIGNMENT — Refer to the alignment chart for step by step procedure. It is preferable to align the FM IF stages with an AM or CW Signal. It should be noted that all adjustment are made for peak avc reading except the secondary of the third transformer. At this point, if you use an AM signal, it may be tuned for minimum audio signal; or the discriminator voltage may be used, reading it with a VTVM, and the secondary may be adjusted to the zero voltage. There may be some discrepancy between these methods, and if it is not excessive, is of no importance.

The FM RF alignment should be made using an FM signal and either avc or audio for peaking. In doing this alignment, or when feeding the IF signal into the FM mixer grid, care must be taken not to move the wiring. If the wiring is displaced so as to affect the inductance of the RF circuits it is difficult to re-establish the RF-Oscillator tracking.

The AM, RF and IF alignment should be done with a VTVM across the avc. The recommended signal value is one which will generate 10 volts of avc. When aligning the "AM" band the loop must be plugged in and you need not adjust the RF padder core. The RF padder is very broad and can be aligned only if the converter grid lead is connected to an RF type VTVM as indicator; this will usually involve a signal level greater than is normally available.

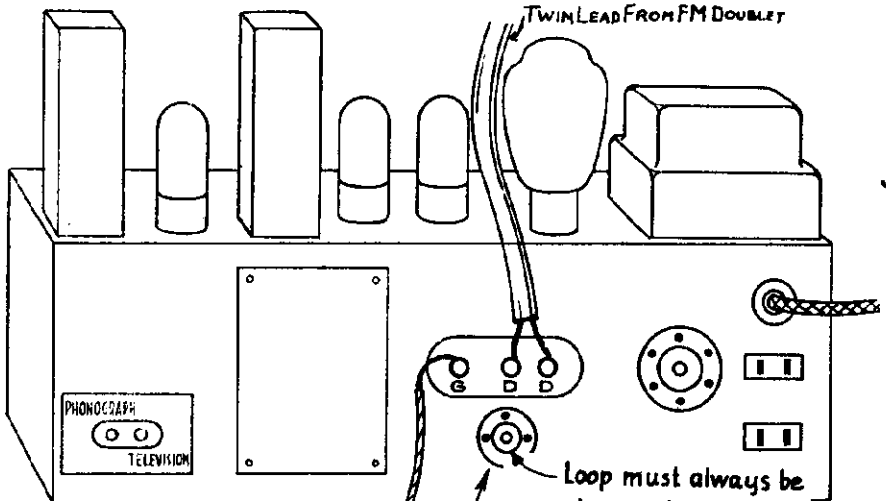
ALIGNMENT CHART

Coupling	Signal	Band Switch	Dial	Adjustment
To 7Q7 converter grid through .05 mfd. capacitor.	456 KC AM	AM	1000 KC	Peak 1st, 2nd and 3rd IF trimmers on top of IF cans.
To "A" on antenna ground terminal strip through 200 mfd. and 400 ohms in series.	1600 KC AM	AM	1600 KC	Peak RF, converter and oscillator trimmers marked "B"
	550 KC AM	AM	550 KC	Peak converter and oscillator padder cores marked "B". Loop must be plugged in. Do not adjust RF.
To 6BE6 mixer grid direct.	10.7 MC AM or CW *	FM	100 MC	Peak core adjustments for avc (around 3 volts) at 1st, 2nd and primary of 3rd IF. Adjust secondary of 3rd IF for audio null from 30% amplitude modulated 10.7 MC IF signal.
To "A" and "A" on doublet terminal strip through a pair 150 ohm resistors.	105 MC FM	FM	105 MC	Peak RF mixer and oscillator trimmers for avc or audio.



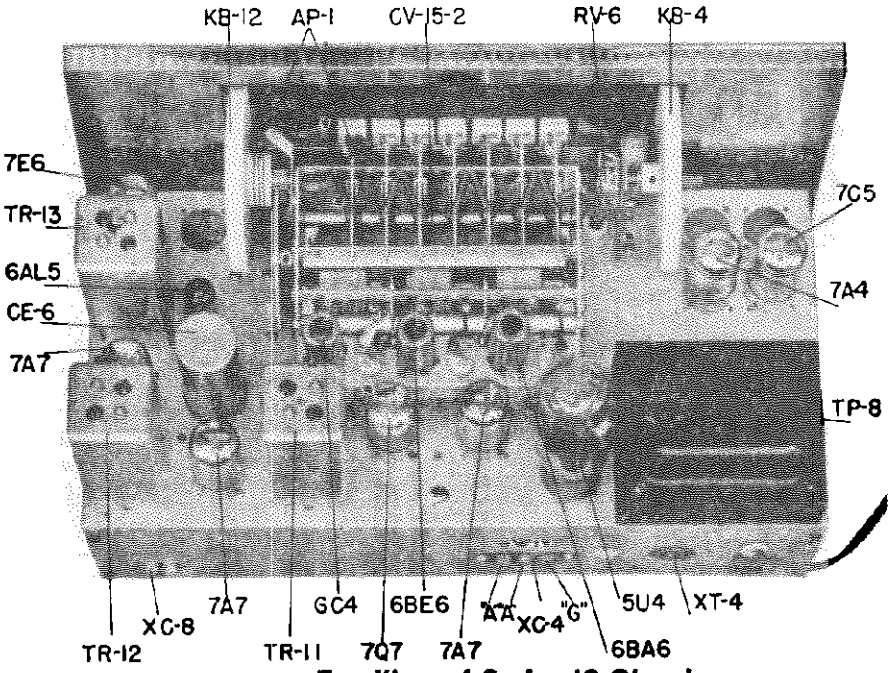
Series 12 Dial Stringing

DIAL STRINGING — Use a light weight flexible dial cord when replacing worn or broken cord such as Beven-Wilcox FSN-25-12.

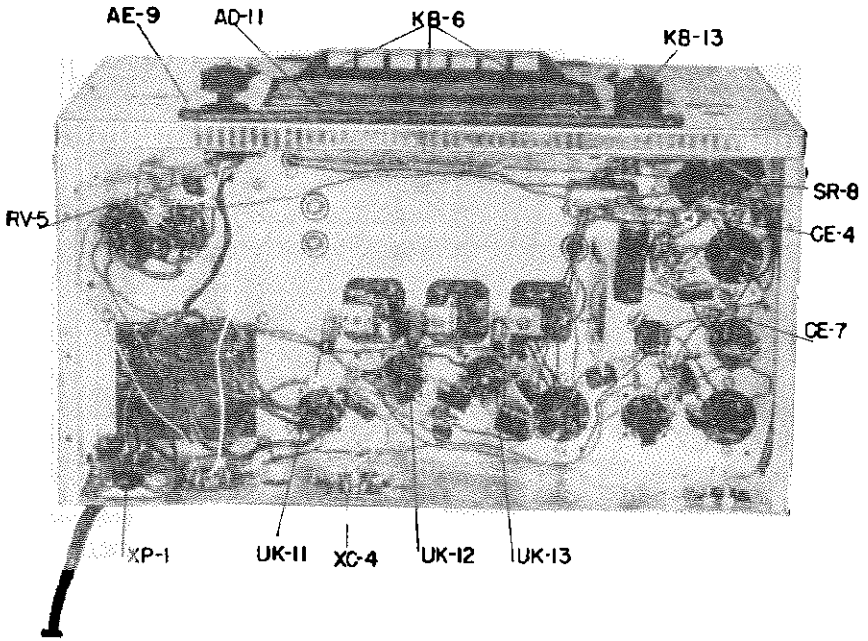


Note: Order resistors and condensers by value, tolerance and wattage or voltage.

Note: When ordering include serial number of chassis, since Midwest records of changes in parts specifications are kept by that number.



Top View of Series 12 Chassis



Bottom View of Series 12 Chassis

PARTS LIST

Part	Description
AD-11	Glass Dial
AE-9	Escutcheon
AP-1	Wood Pulley
AP-21	Pointer
AS-1	Wood Pulley Stud
CE-6	Filter Condenser 40-40
CE-4	Cathode Bypass 40 mfd. 25v
CE-7	Electrolytic 8 mfd. 150v
*CV-15-2	Tuning Gang
EG-5	Speaker Grommet
ES-12	Miniature Tube Shield
HE-7	Speaker Mtg. Eyelet
IL-1	Panel Lamp 6-8v
KB-4	Volume Knob
KB-12	Tuning Knob
KB-13	Tone & Band Knob
KB-6	Push Buttons, Set of 7
OG-1	Miter Gear, Pair
PC-3	Loop Plug
PC-5	Phono & Television Plug
RV-5	Tone Control
RV-6	Volume Control
SP-5	Speaker
SR-8	Band Switch
TP-8	Power Transformer
*TR-11	1st IF Transformer
*TR-12	2nd IF Transformer
*TR-13	3rd IF Transformer
*UK-12	Mixer Coil Assembly
*UK-13	Oscillator Coil Assembly

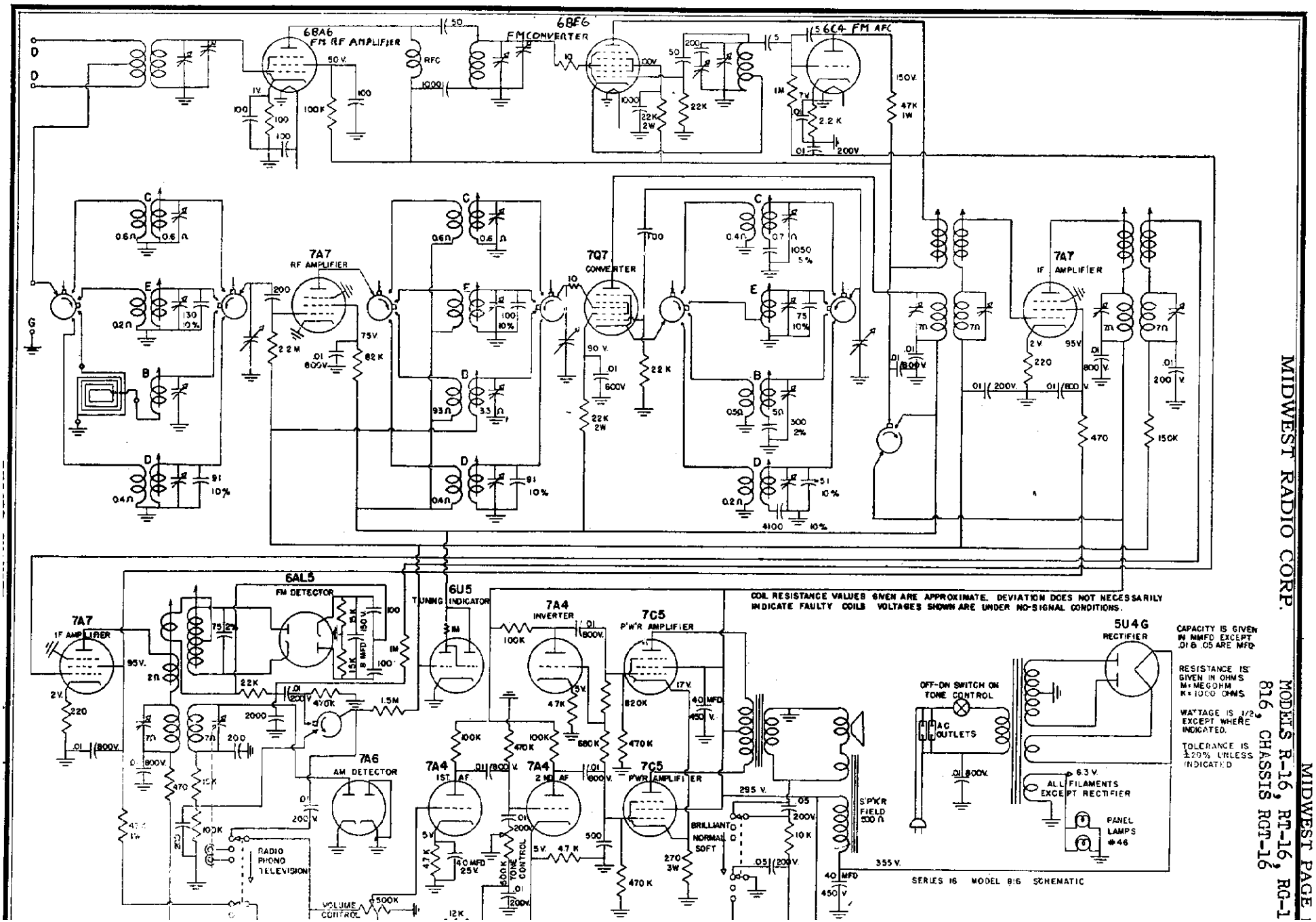
To set the push buttons this exact procedure should be followed. A small screw driver will be needed.

1. Turn on the receiver and allow at least three minutes to warm up.
2. Remove the push button by pulling straight out. A hooked instrument will assist in removing the end buttons.
3. Loosen the LOCK SCREW at least one half turn.
4. Using the screw driver with the blade in the screw slot, push the mechanism in firmly. Hold in during step 5. The mechanism may bind at first. Use sufficient force to break loose so that the push button and tuning control are independent.
5. Tune the pointer past the desired station then back to the desired station and make the tuning adjustment as carefully as you know how.
6. Tighten the LOCK SCREW.
7. Check the setting of this push button by tuning away from the station manually, then pushing in firmly. Pushing the button must return the pointer to the position it had when the LOCK SCREW was tightened. If the station is not now tuned in perfectly repeat the steps 2 to 6 carefully.
8. Adjust each of the seven buttons, or as many as you wish to set, exactly as outlined above.

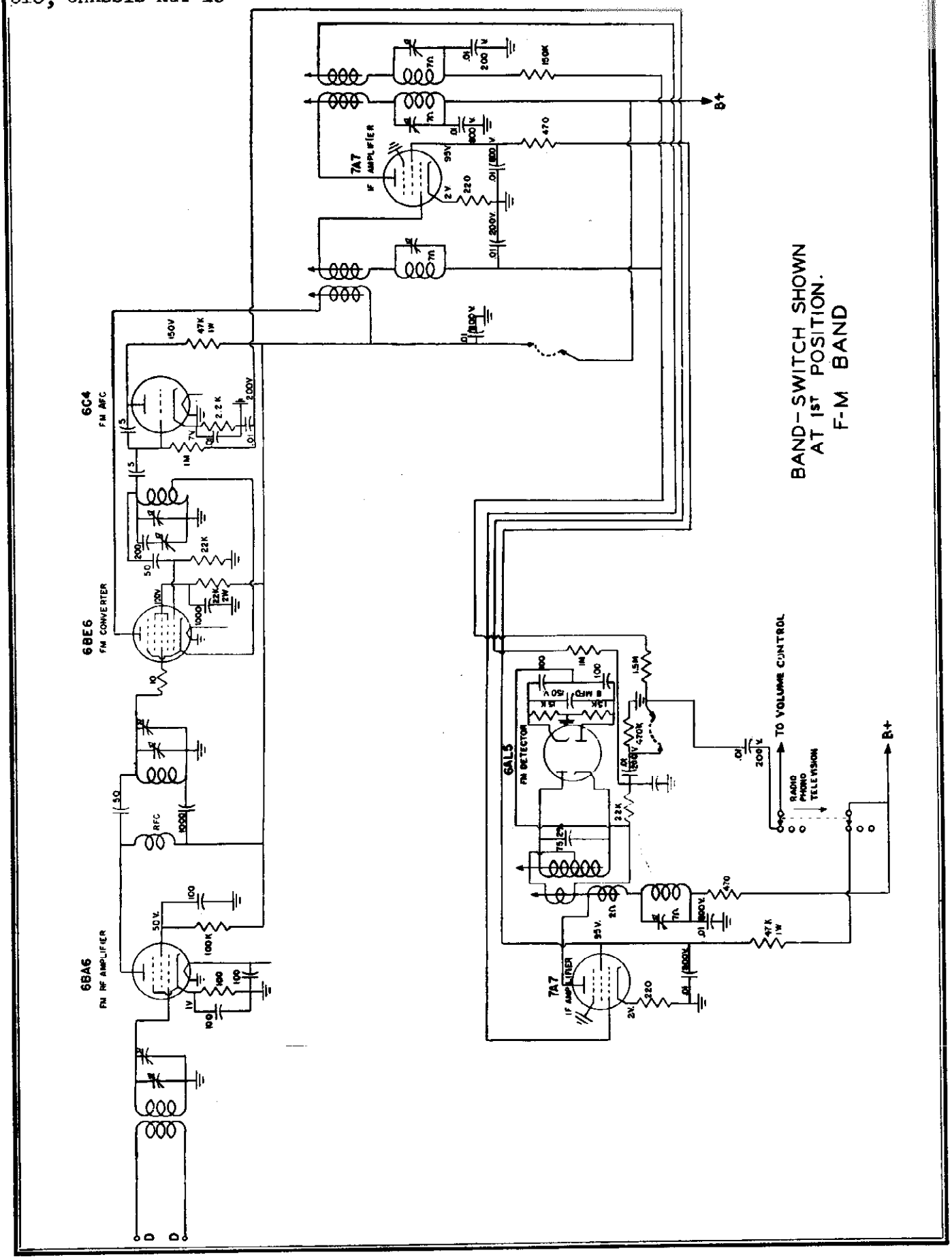
Any button can be set for any pointer position, however, you may find it more desirable to select the button nearest the pointer position so that each successive adjustment moves the pointer in the same direction. That is, the "M" button will be set for a station at the left of the dial, the "W" button will set for a station near the center, etc.

MIDWEST RADIO CORP.

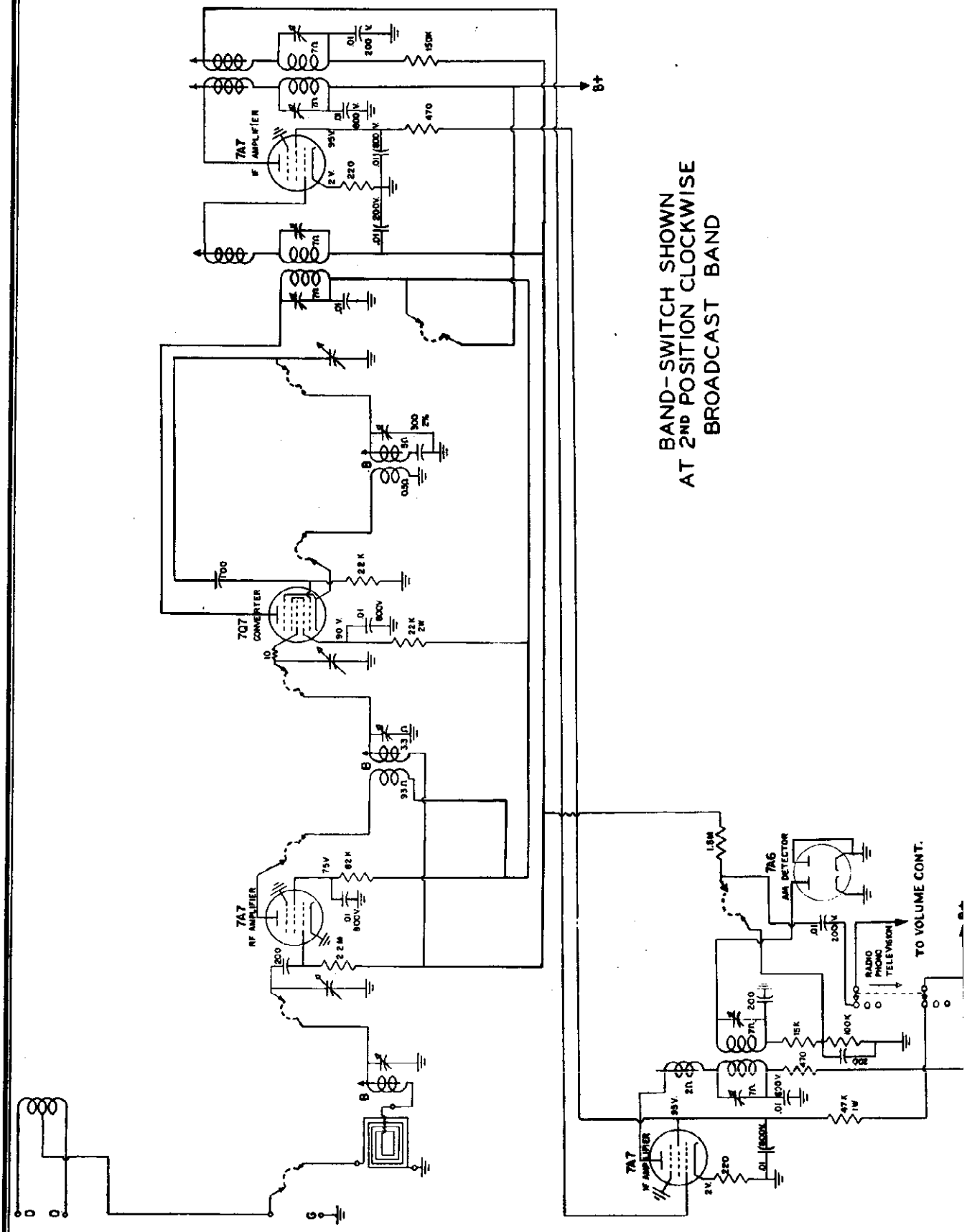
MODELS R-16, RT-16, RG-16, CHASSIS RGT-16



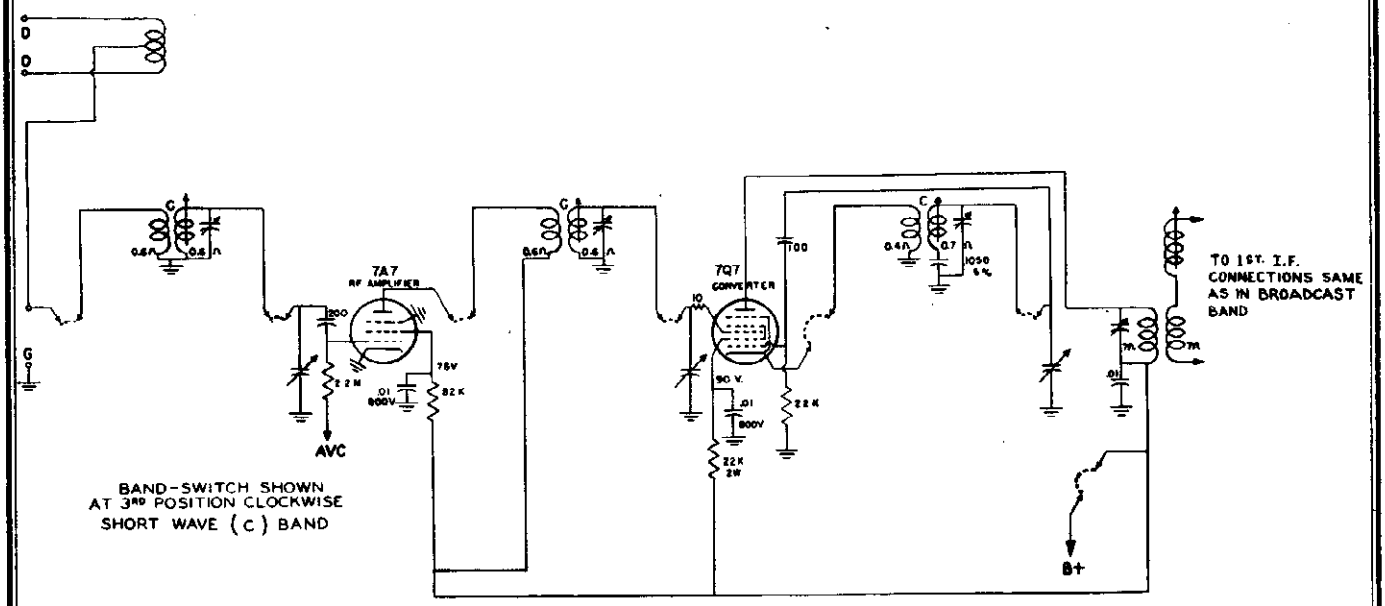
MODELS R-16, RT-16, RG-16, MIDWEST RADIO CORP.
816, CHASSIS RGT-16



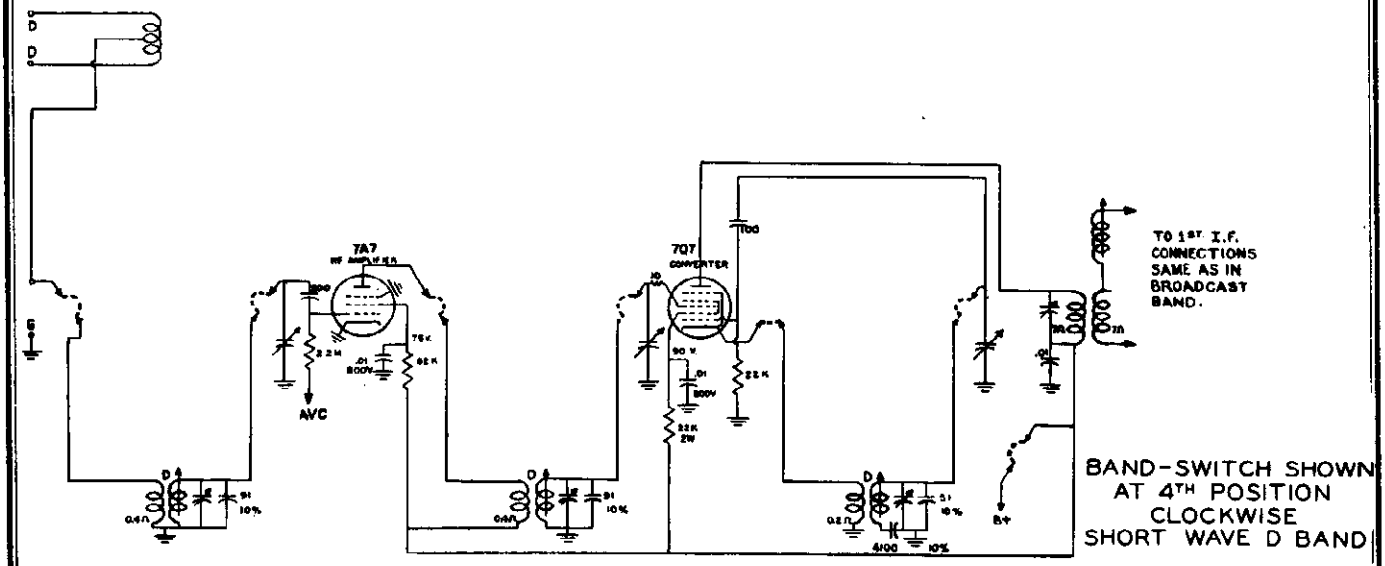
MIDWEST RADIO CORP. MODELS R-16, RT-16, RG-1
816, CHASSIS RGT-16



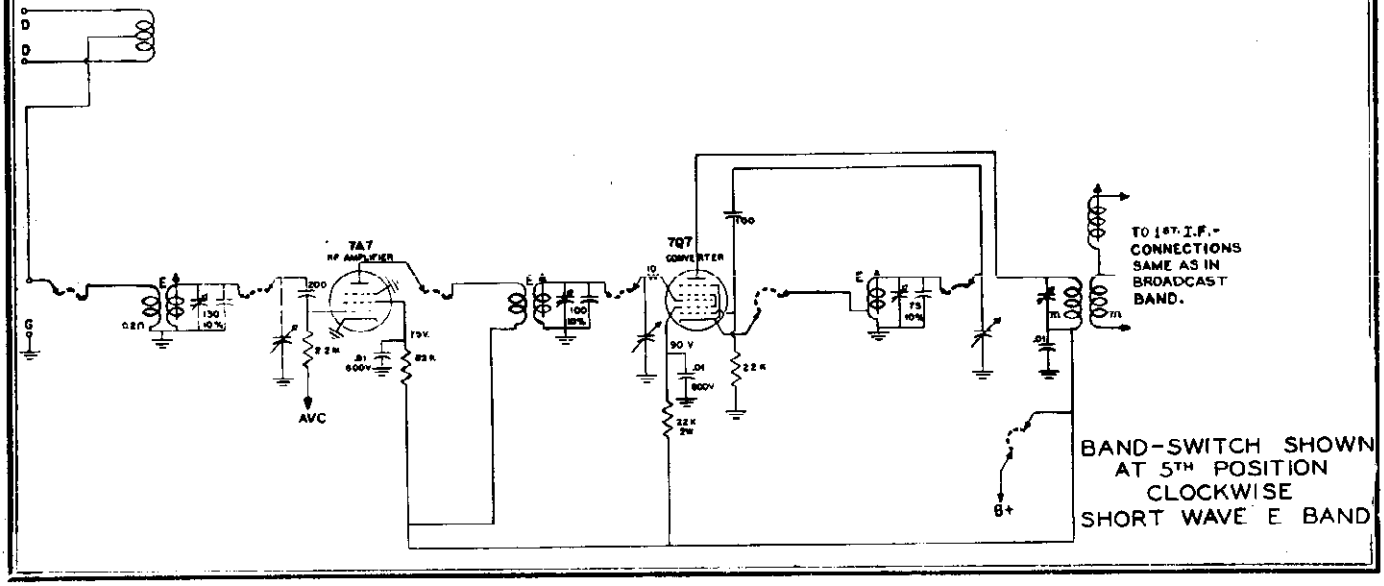
MODELS R-16, RT-16, RG-16, 816, CHASSIS RGT-16 MIDWEST RADIO CORP.



BAND-SWITCH SHOWN AT 3RD POSITION CLOCKWISE SHORT WAVE (C) BAND



BAND-SWITCH SHOWN AT 4TH POSITION CLOCKWISE SHORT WAVE D BAND

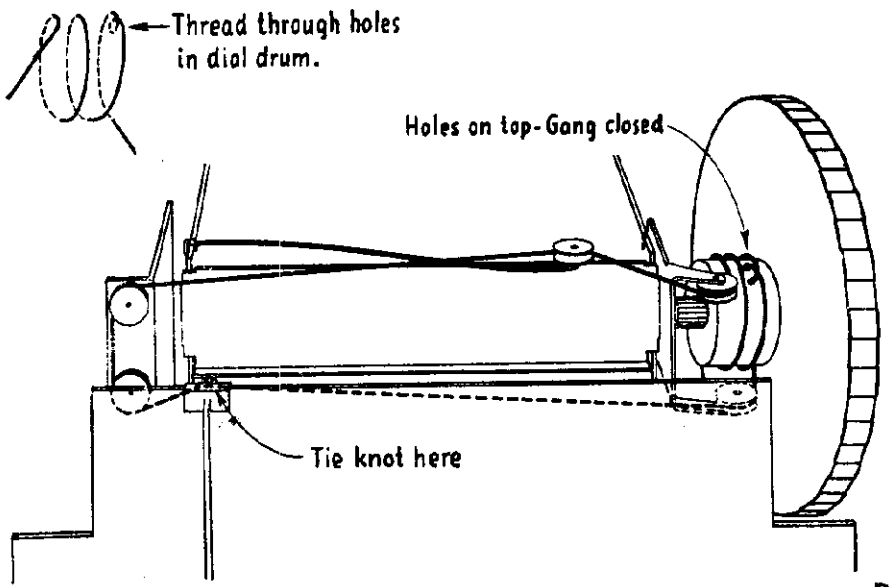


BAND-SWITCH SHOWN AT 5TH POSITION CLOCKWISE SHORT WAVE E BAND

ALIGNMENT — Refer to the alignment chart for step by step procedure. It is preferable to align the FM IF stages with an AM or CW Signal. It should be noted that all adjustment are made for peak avc reading except the secondary of the third transformer. At this point, if you use an AM signal, it may be tuned for minimum audio signal; or the discriminator voltage may be used, reading it with a VTM, and the secondary may be adjusted to the zero voltage. There may be some discrepancy between these methods, and if it is not excessive, is of no importance.

The FM RF alignment should be made using an FM signal and either avc or audio for peaking. In doing this alignment, or when feeding the IF signal into the FM mixer grid, care must be taken not to move the wiring. If the wiring is displaced so as to affect the inductance of the RF circuits it is difficult to re-establish the RF-Oscillator tracking.

The AM, RF and IF alignment should be done with a VTVM across the avc. The recommended signal value is one which will generate 10 volts of avc. When aligning the "B" band the loop must be plugged in and you need not adjust the RF padder core. The RF padder is very broad and can be aligned only if the converter grid lead is connected to an RF type VTVM as indicator; this will usually involve a signal level greater than is normally available.



Series 16 Dial Stringing

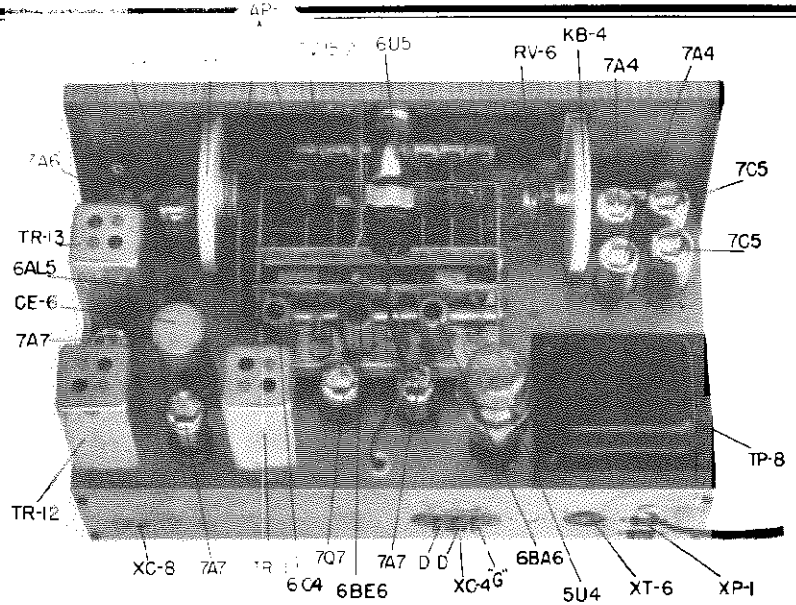
ALIGNMENT CHART

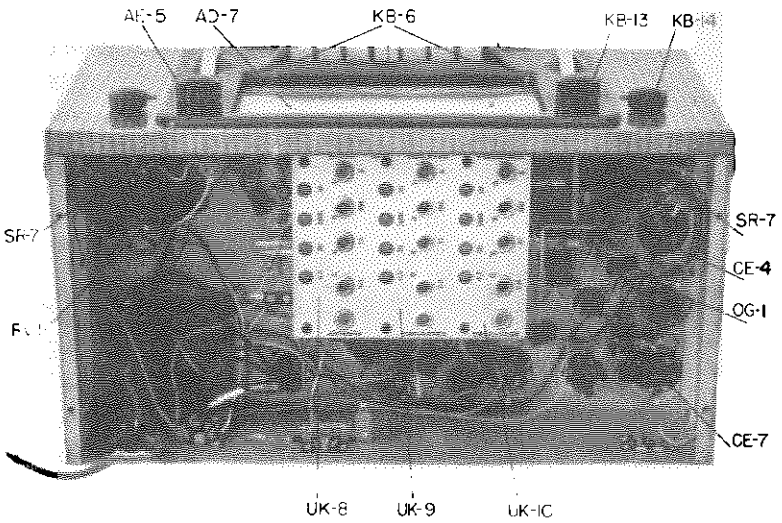
Coupling	Signal	Band Switch	Dial	Adjustment
To 7Q7 converter grid through .05 mfd. capacitor.	456 KC AM	B	1000 KC	Peak 1st, 2nd and 3rd IF trimmers on top of IF cans.
To "D" on antenna ground terminal strip through 200 mfd. and 400 ohms in service.	1600 KC AM	B	1600 KC	Peak RF, converter and oscillator trimmers marked "B".
	550 KC AM	B	550 KC	Peak converter and oscillator padder cores marked "B". Loop must be plugged in. Do not adjust RF.
	4.7 MC AM	C	4.7 MC	Peak "C" trimmers.
	1.6 MC AM	C	1.6 MC	Peak "C" cores.
	10 MC AM	D	10 MC	Peak "D" trimmer
	5 MC AM	D	5 MC	Peak "D" cores.
	22 MC AM	E	22 MC	Peak "E" trimmer.
	11.5 MC AM	E	11.5 MC	Peak "E" cores.
To 6BE6 mixer grid direct.	10.7 MC AM or CW *	A	100 MC	Peak core adjustments for avc (around 3 volts) at 1st, 2nd and primary of 3rd IF. Adjust secondary of 3rd IF for audio null from 30% amplitude modulated 10.7 MC IF signal.
To "D" and "D" on doublet terminal strip above "A-G" strip through a pair 150 ohm resistors.	105 MC FM	A	105 MC	Peak RF mixer and oscillator trimmers for avc or audio.

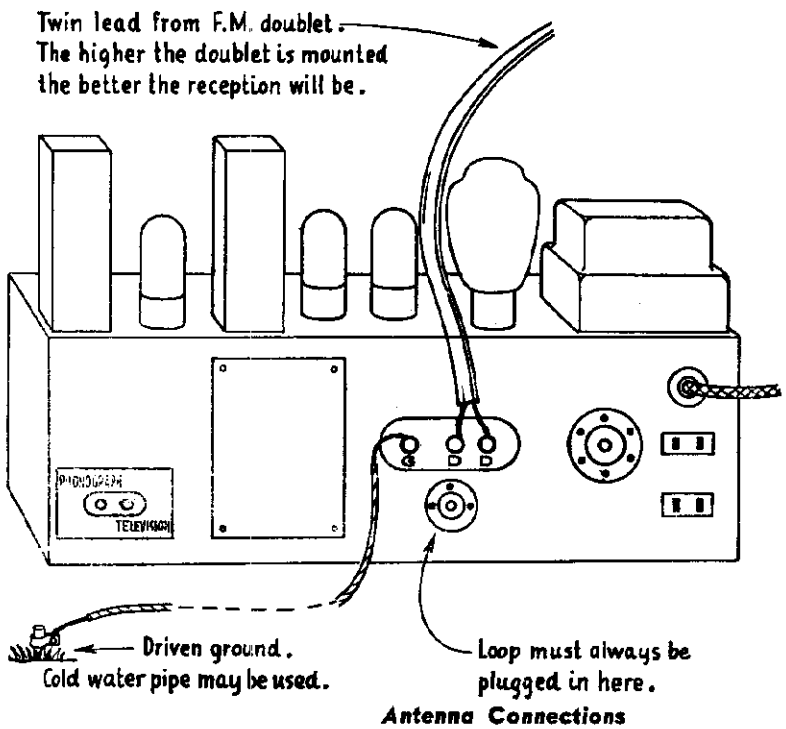
*Read text for use of CW for FM-IF alignment.

DIAL STRINGING — Use a light weight flexible dial cord when replacing worn or broken cord such as Beven-Wilcox FSN-25-12.

REPLACEMENT PARTS — Certain parts are available on an exchange basis; these are shown on the parts list with an "*."







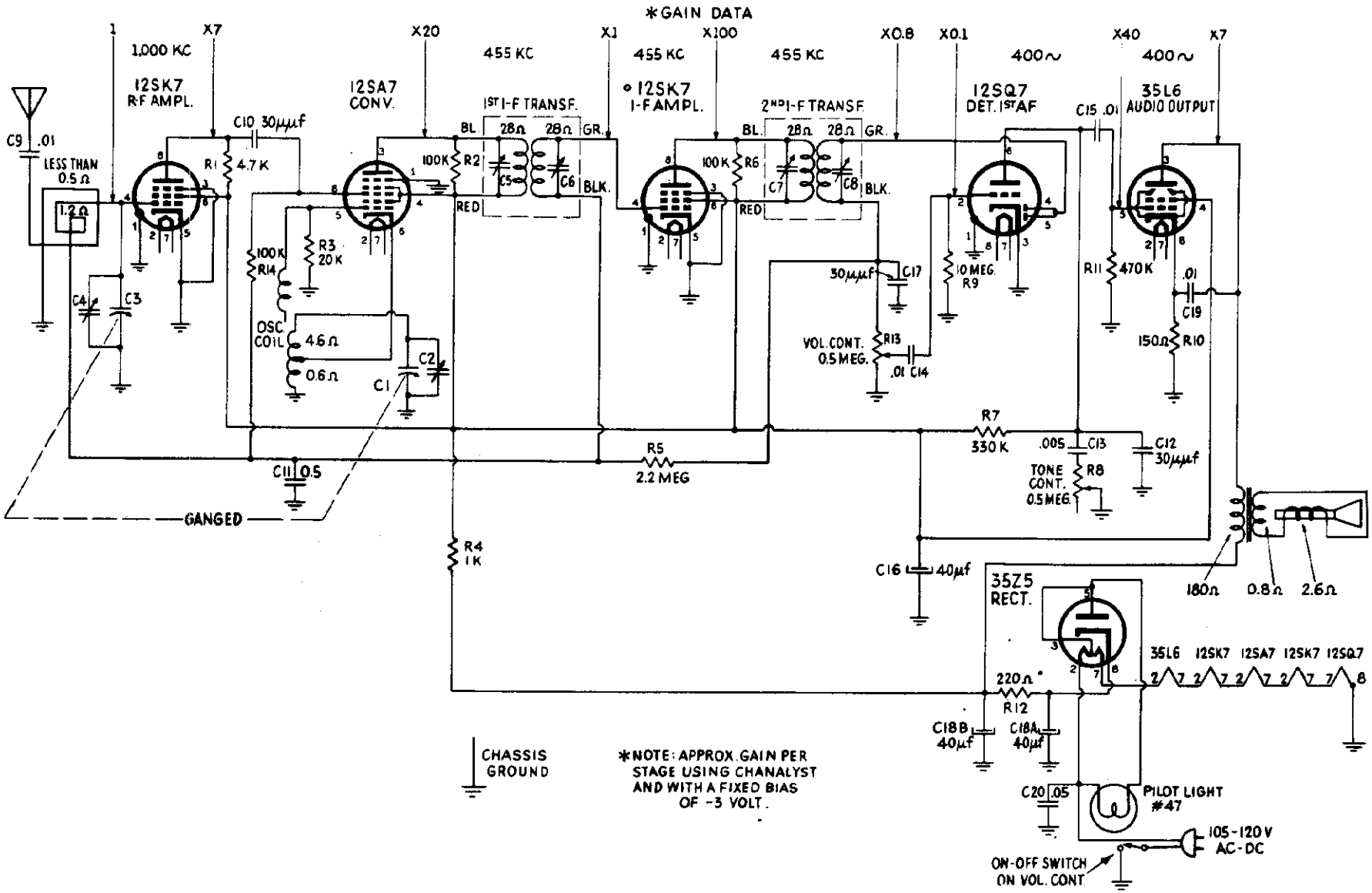
Antenna Connections

PARTS LIST

Part	Description
AD-6	Short Wave Dial
AD-7	Glass Dial
AD-9	Tone Disc Assembly
AD-10	Selector Disc Assembly
AE-5	Escutcheon
AP-1	Wood Pulley
AP-21	Pointer
AS-1	Wood Pulley Stud
CE-6	Filter Condenser 40-40
CE-4	Cathode Bypass 40 mfd. 25v
CE-7	Electrolytic 8 mfd. 150v
*CV-15-2	Tuning Gang
EG-5	Speaker Grommet
ES-12	Miniature Tube Shield
HE-7	Speaker Mtg. Eyelet
IL-1	Panel Lamp 6-8v
KB-4	Volume Knob
KB-12	Tuning Knob
KB-13	Tone & Band Knob
KB-14	Tone & Selector Knob, Small
KB-6	Push Buttons, Set of 7
OG-1	Miter Gear, Pair
PC-3	Loop Plug
PC-5	Phono & Television Plug
RV-5	Tone Control
RV-6	Volume Control
SP-2	Speaker
TP-8	Power Transformer
*TR-11	1st IF Transformer
*TR-12	2nd IF Transformer
*TR-13	3rd IF Transformer
*UK-8	RF Coil Plate
*UK-9	Mixer Coil Plate
*UK-10	Oscillator Coil Plate

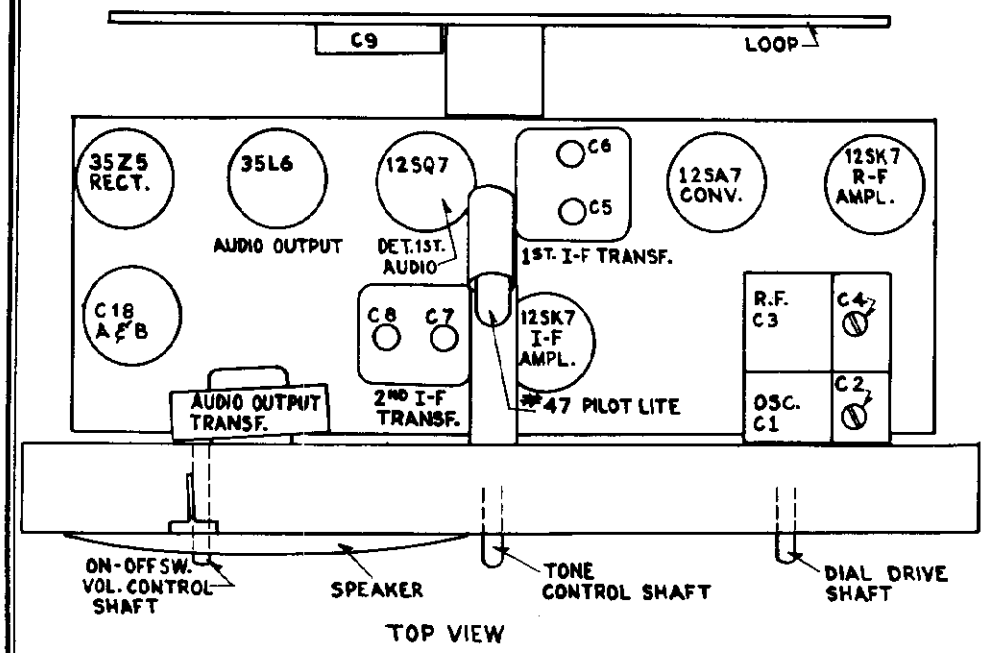
Note: Order resistors and condensers by value, tolerance and wattage or voltage.

Note: When ordering include serial number of chassis, since Midwest records of changes in parts specifications are kept by that number.

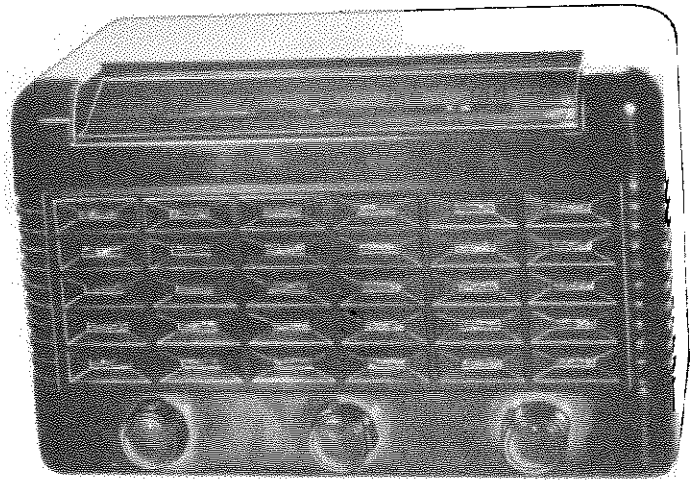


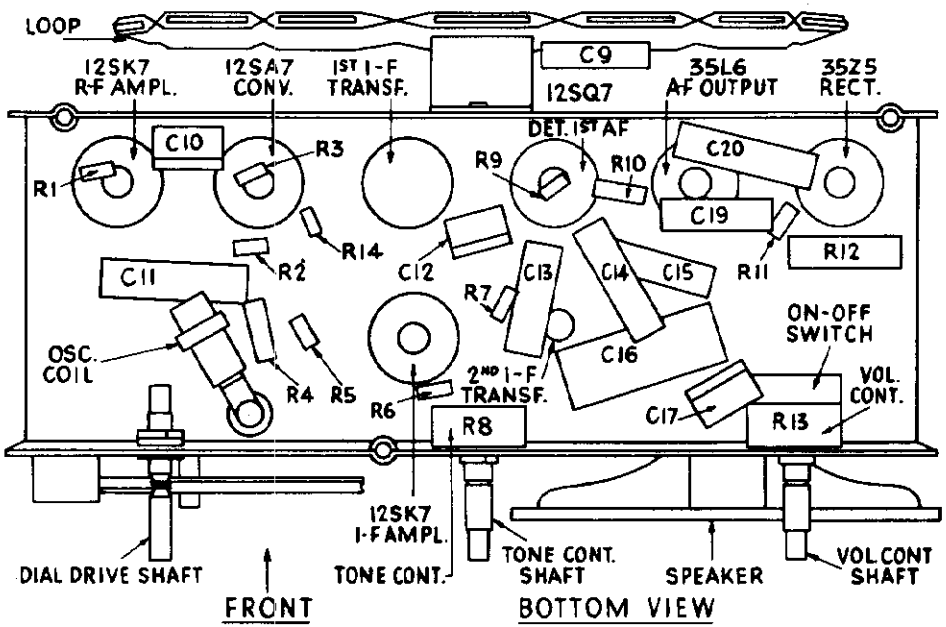
MINERVA CORP. OF AMERICA

MINERVA PAGE MODEL 47

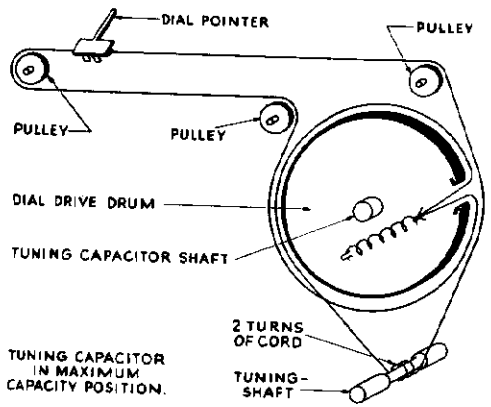


TOP VIEW





BOTTOM VIEW



MINERVA CORP. OF AMERICA

TUBE	PIN NO.	VTVM	20,000 OHM V	1,000 OHM V	RESISTANCE
12SK7	1	0	0	0	0
RF Amp.	2	AC	AC	AC	60 OHM
	3	0	0	0	0
	4	-0.85	-0.4	-0.2	3.0 MEG
	5	0	0	0	0
	6	83	83	83	OVER 5 MEG
	7	AC	AC	AC	45 OHM
	8	41	41	41	OVER 5 MEG
12SA7	1	0	0	0	0
CONVERTER	2	AC	AC	AC	44 OHM
	3	82	82	82	OVER 5 MEG
	4	83	83	83	OVER 5 MEG
Osc. Voltage	5				
	550 KC	-8.4	-7.0	-3.1	23K
	1600 KC	-9.2	-7.9	-3.7	23K
	6	0	0	0	0.6 OHM
	7	AC	AC	AC	29.0
	8	-0.85	-0.4	0	3.2 MEG
12SK7	1	0	0	0	0
IF Amp.	2	AC	AC	AC	28 OHM
	3	0	0	0	0
	4	-0.85	-0.4	-0.2	3.0 MEG
	5	0	0	0	0
	6	83	83	83	OVER 5 MEG
	7	AC	AC	AC	13 OHM
	8	82	82	82	OVER 5 MEG
12SQ7	1	0	0	0	0
DET & 1st AUDIO	2	-1.1	-0.7	-0.4	11.5 MEG
AVC	3	0	0	0	0
	4	-0.7	-0.4	-0.2	0.4 MEG
	5	-0.7	-0.4	-0.2	0.4 MEG
	6	56	52	16	OVER 5 MEG
	7	AC	AC	AC	13 OHM
	8	0	0	0	0
35L6	1	--	--	--	--
AUDIO OUTPUT	2	AC	AC	AC	88 OHM
	3	107	107	107	OVER 500 K
	4	83	83	83	OVER 500 K
	5	0	0	0	.6 MEG
	6	--	--	--	--
	7	AC	AC	AC	52 OHM
	8	5	5	5	170 OHM
35Z5	1	--	--	--	--
RECTIFIER	2	AC	AC	AC	120 OHM
	3	AC	AC	AC	120 OHM
	4	114	114	114	OVER 500 K
	5	AC	AC	AC	120 OHM
	6	--	--	--	--
	7	AC	AC	AC	90 OHM
	8	128	128	128	OVER 500 K

IF ALIGNMENT

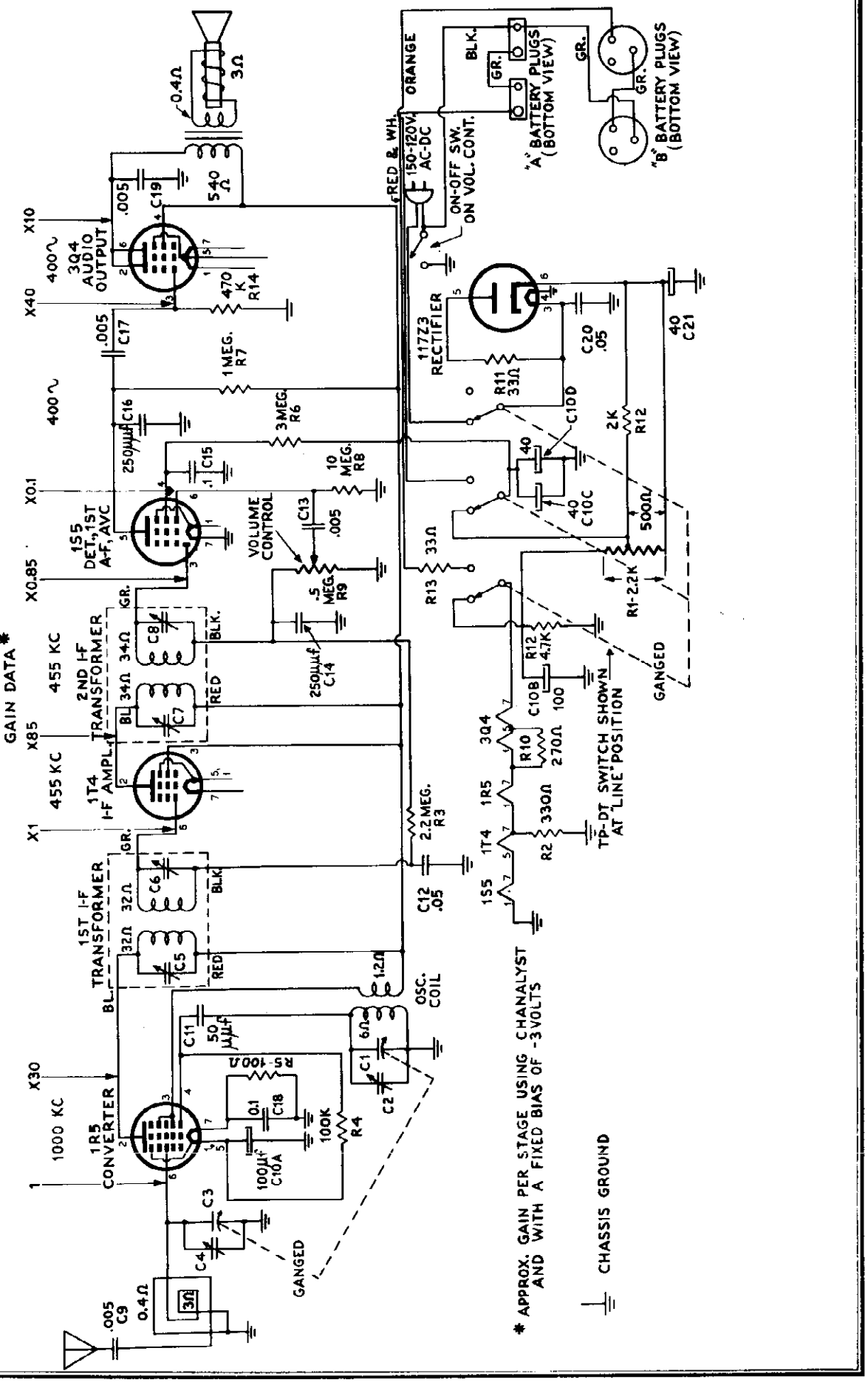
CONNECT AN OUTPUT METER ACROSS THE VOICE COIL OF THE RECEIVER. CONNECT A SIGNAL GENERATO TO THE STANDARD HAZELTINE LOOP MODEL 1150 AND COUPLE IT LOOSELY TO THE RECEIVER LOOP. SE THE SIGNAL GENERATOR TO 455 KC AND FULLY MESH THE RECEIVER TUNING CAPACITOR. KEEP THE RE EIVER VOLUME CONTROL AT MAXIMUM AND THE OUTPUT OF THE SIGNAL GENERATOR SUFFICIENT TO GIVE A READABLE DEFLECTION ON THE OUTPUT METER. ADJUST FOR MAXIMUM IF TRIMMERS C8, C7, C6, C5

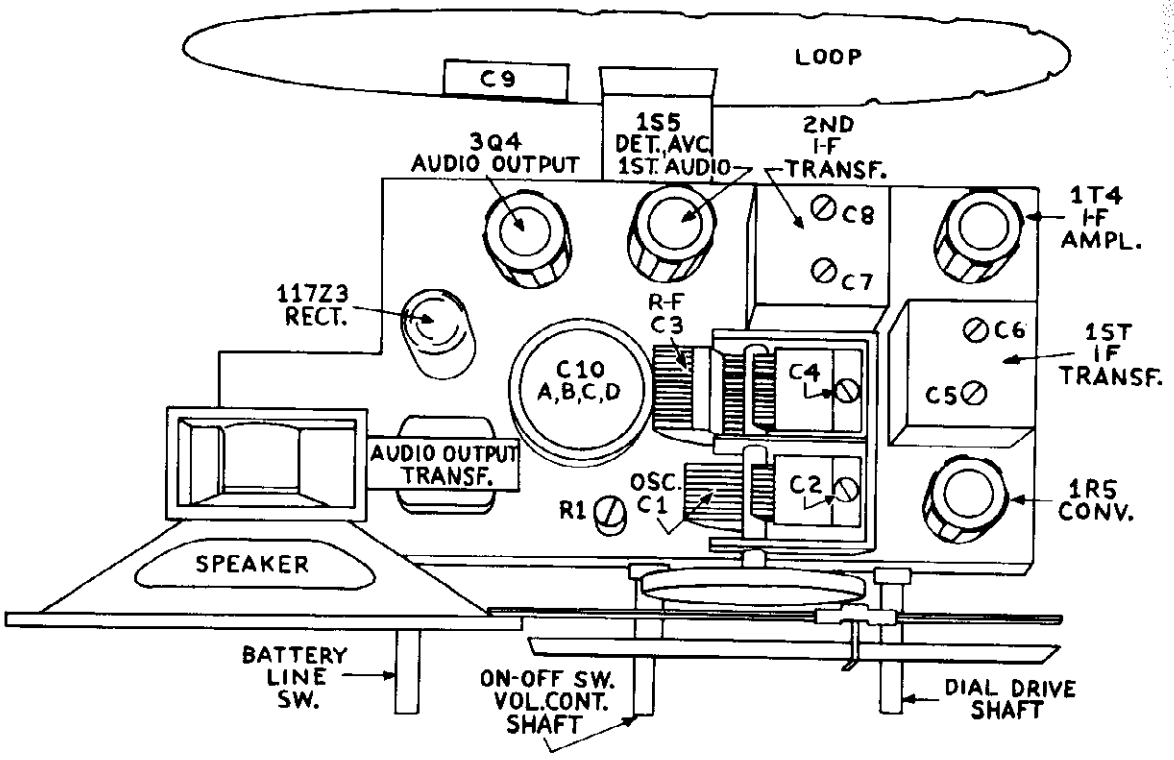
RF OSC. ADJUSTMENT

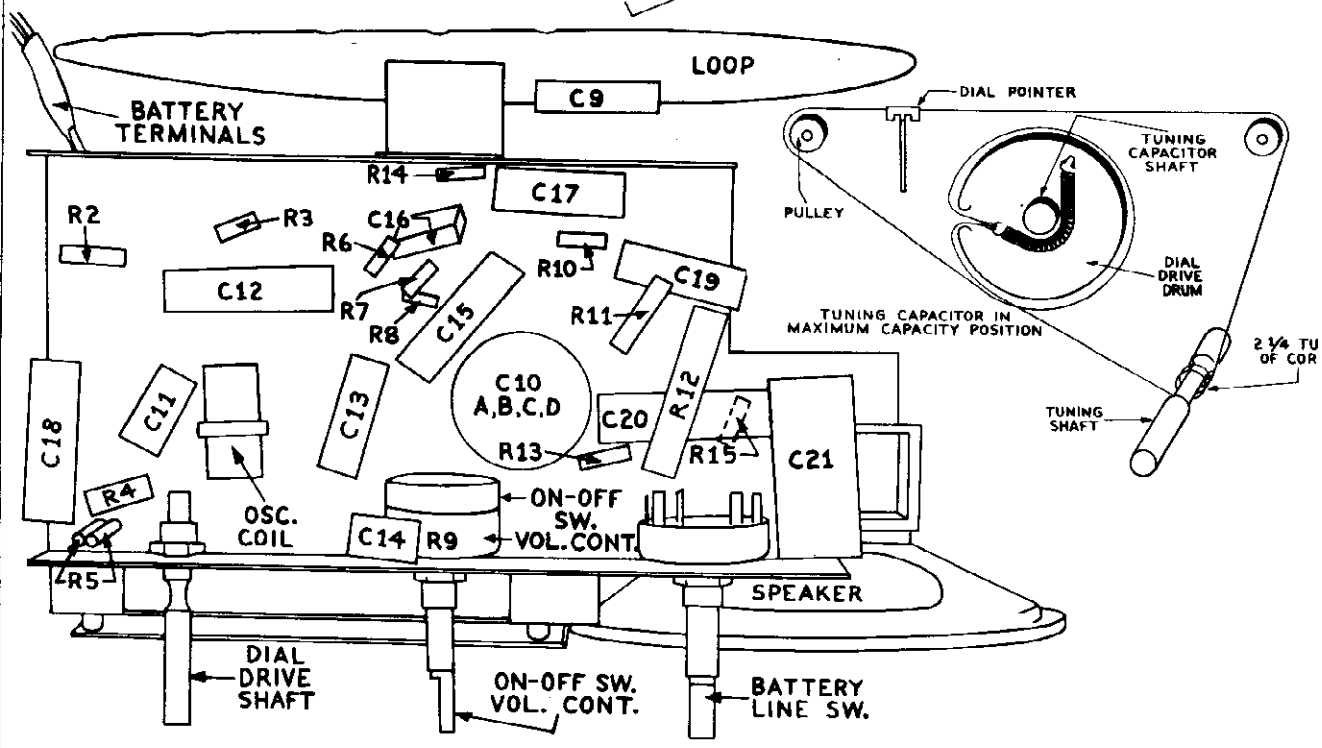
KEEPING THE SAME SETUP AS USED FOR IF ALIGNMENT SET THE SIGNAL GENERATOR AND RECEIVER TO 1600 KC AND ADJUST OSCILLATOR TRIMMER C2 FOR MAXIMUM OUTPUT. NEXT, SET THE SIGNAL GENERATOR AND RECEIVER TO 1400 KC AND ADJUST THE ANTENNA TRIMMER C4 FOR MAXIMUM OUTPUT.

MODEL #729 Porta Pal

MINERVA CORP. OF AMERICA







IF ALIGNMENT

CONNECT AN OUTPUT METER ACROSS THE VOICE COIL OF THE RECEIVER. CONNECT A SIGNAL GENERATO TO THE STANDARD HAXELTINE LOOP MODEL 1150 AND COUPLE IT LOOSELY TO THE RECEIVER LOOP. SE THE SIGNAL GENERATOR TO 455 KC AND FULLY MESH THE RECEIVER TUNING CAPACITOR. KEEP THE RE CEIVER VOLUME CONTROL AT MAXIMUM AND THE OUTPUT OF THE SIGNAL GENERATOR SUFFICIENT TO GIV A READABLE DEFLECTION ON THE OUTPUT METER. ADJUST FOR MAXIMUM IF TRIMMERS C8, C7, C6, C5

RF OSC. ADJUSTMENT

KEEPING THE SAME SETUP AS USED FOR IF ALIGNMENT SET THE SIGNAL GENERATOR AND RECEIVER TO 1600 KC AND ADJUST OSCILLATOR TRIMMER C2 FOR MAXIMUM OUTPUT. NEXT, SET THE SIGNAL GENER- ATOR AND RECEIVER TO 1400 KC AND ADJUST THE ANTENNA TRIMMER C4 FOR MAXIMUM OUTPUT.

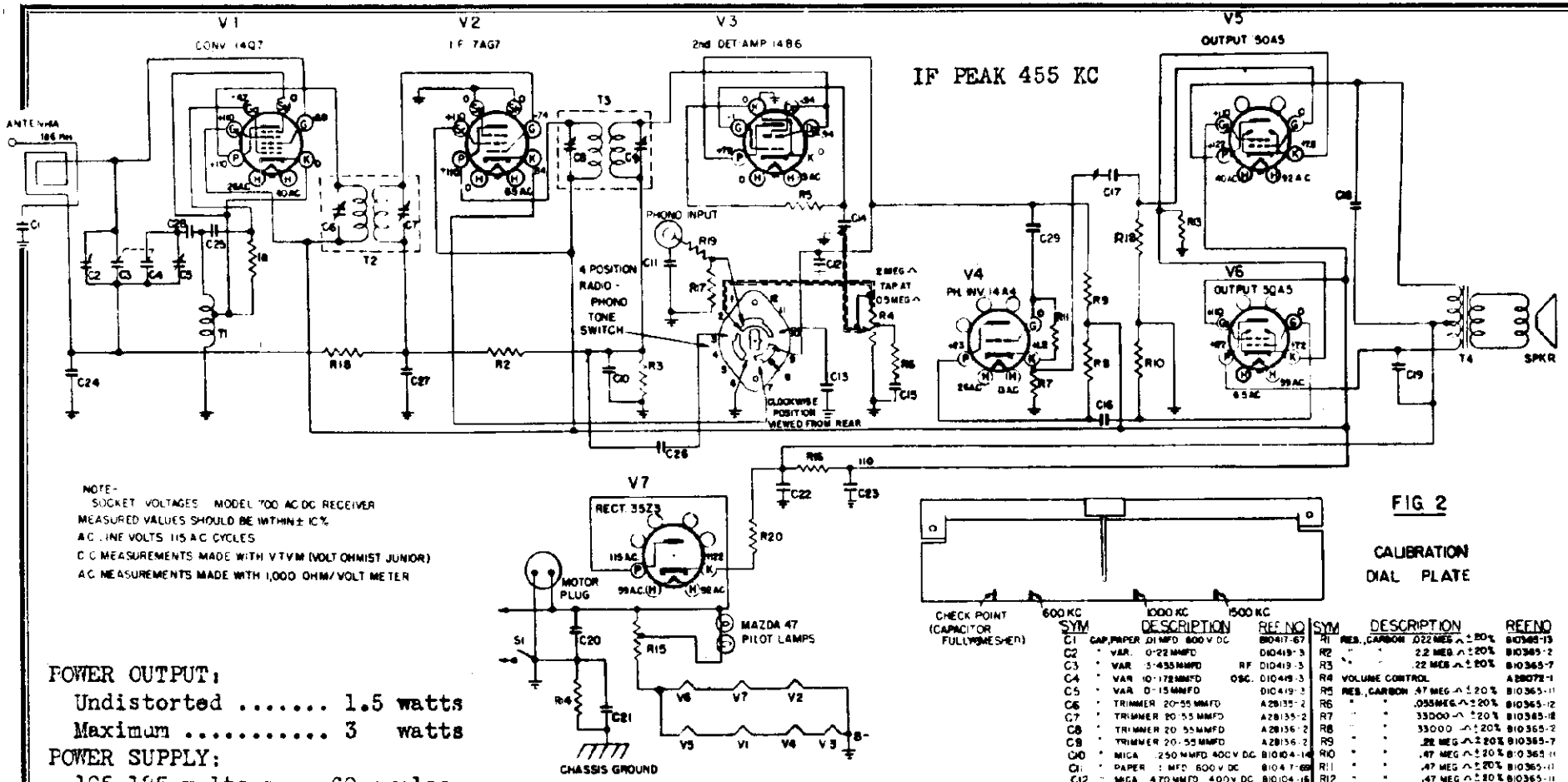
MINERVA CORP. OF AMERICA

MINERVA PORTA PAL MODEL W729

TUBE	PIN NO.	VTVM	20,000 OHM V	1,000 OHM V	RESISTANCE
1R5 CONVERTER	1	+2.3	+2.3	+2.3	32 OHM
	2	+86	+86	+86	1.8 K
	3	+86	+86	+86	1.7 K
	4				
OSC. VOLTAGE	550 KC	-14	-6.3	-2.1	100 K
	1600 KC	-25	-14	-6	100 K
	5	+2.3	+2.3	+2.3	32 OHM
	6	0	0	0	3 OHM
	7	+3.5	+3.5	+3.5	46 OHM
1T4 IF AMP	1	+1.1	+1.1	+1.1	,8 OHM
	2	+86	+86	+86	1.9 K
	3	+86	+86	+86	1.9 K
	4	-0.4	0	0	2.8 MEG
	5	+1.15	+1.15	+1.15	18 OHM
	6	-0.13	0	0	2.8 MEG
	7	+2.25	+2.25	+2.25	30 OHM
1S5	1	0	0	0	0
DET. and 1st	2	--	--	--	--
AF AVC	3	-0.15	-0.1	0	.5 MEG
	4	+22	+20	+6	2.8 MEG
	5	+10	+8	+2	1 MEG
	6	-0.1	0	0	10.5 MEG
	7	+1.15	+1.15	+1.15	18 OHM
3Q4	1	+3.5	+3.5	+3.5	44 OHM
AUDIO OUTPUT	2	+82	+82	+82	2.4 K
	3	0	0	0	.5 MEG
	4	+86	+86	+86	1.7 K
	5	+4.5	+4.5	+4.5	56 OHM
	6	+82	+82	+82	2.4 K
	7	+6	+6	+6	70 OHM
117 Z3	1	--	--	--	--
RECTIFIER	2	+120	+120	+120	2.2 K
	3	AC	AC	AC	480 OHM
	4	0	0	0	0
	5	AC	AC	AC	500 OHM
	6	+120	+120	+120	2.4 K
	7	0	0	0	0

ALL VOLTAGE AND RESISTANCE MEASUREMENTS MADE WITH RESPECT TO CHASSIS GROUND A ND WITH A LINE VOLTAGE OF 117 V AC.

LINE-BATTERY SWITCH IN "LINE" POSITION



NOTE-
SOCKET VOLTAGES MODEL 700 AC DC RECEIVER
MEASURED VALUES SHOULD BE WITHIN ± 10%
A C LINE VOLTS 115 A C CYCLES
D C MEASUREMENTS MADE WITH V T V M (VOLT OHMIST JUNIOR)
A C MEASUREMENTS MADE WITH 1,000 OHM/VOLT METER

FIG 2

CALIBRATION DIAL PLATE

SYM	DESCRIPTION	REF NO
C1	CAP, PAPER .01 MFD 600 V DC	B10417-67
C2	" VAR. 0-22 MMFD	D10419-3
C3	" VAR 5-455 MMFD RF	D10419-3
C4	" VAR 10-172 MMFD OSC.	D10419-3
C5	" VAR 0-15 MMFD	D10419-3
C6	" TRIMMER 20-55 MMFD	A28135-2
C7	" TRIMMER 20-55 MMFD	A28135-2
C8	" TRIMMER 20-55 MMFD	A28135-2
C9	" TRIMMER 20-55 MMFD	A28135-2
C10	" MICA .250 MMFD 400 V DC	B10104-14
C11	" PAPER .1 MFD 600 V DC	B10417-69
C12	" MICA 470 MMFD 400 V DC	B10104-16
C13	" PAPER .005 MFD 600 V DC	B10417-47
C14	" " .01 MFD 400 V DC	B10417-17
C15	" " .01 MFD 400 V DC	B10417-17
C16	" " .001 MFD 600 V DC	B10417-45
C17	" " .001 MFD 600 V DC	B10417-45
C18	" " .01 MFD 400 V DC	B10417-17
C19	" " .01 MFD 400 V DC	B10417-17
C20	" " .05 MFD 600 V DC	B10417-68
C21	" " .1 MFD 600 V DC	B10417-69
C22	" ELECTROLYTIC 40 MFD 150 V DC	A10427
C23	" " 80 MFD 150 V DC	A10427
C24	" PAPER .05 MFD 600 V DC	B10417-68
C25	" MICA 56 MMFD 400 V DC	B10104-9
C26	" PAPER .01 MFD 400 V DC	B10417-17
C27	" PAPER .01 MFD 400 V DC	B10417-17
C28	CAP, PAPER .05 MFD 400 V DC	B10417-20
C29	CAP, PAPER .01 MFD 400 V DC	B10417-17

SYM	DESCRIPTION	REF NO
R1	RES., CARBON .022 MEG ± 20%	B10365-13
R2	" " 2.2 MEG ± 20%	B10365-2
R3	" " .22 MEG ± 20%	B10365-7
R4	VOLUME CONTROL	A28072-1
R5	RES., CARBON .47 MEG ± 20%	B10365-11
R6	" " .055 MEG ± 20%	B10365-12
R7	" " 33000 Ω ± 20%	B10365-18
R8	" " 33000 Ω ± 20%	B10365-2
R9	" " .22 MEG ± 20%	B10365-7
R10	" " .47 MEG ± 20%	B10365-11
R11	" " .47 MEG ± 20%	B10365-11
R12	" " .47 MEG ± 20%	B10365-11
R13	" " 100 Ω ± 20%	A10366-2
R14	" " .22 MEG ± 20%	B10365-7
R15	" BLEEDER 90 Ω, TAP AT 50 Ω	A10388-2
R16	" CARBON 560 Ω ± 10%	C10351-72
R17	" " .22 MEG ± 20%	B10365-7
R18	" " .47 MEG ± 20%	B10365-11
R19	" " .47 MEG ± 20%	B10365-11
R20	RES., CARBON 10 Ω ½ W ± 20%	C10351-1
T1	OSC COIL	A28145
T2	I F COIL 455 KC	A28135-2
T3	I F COIL 455 KC	A28136-2
T4	AUDIO OUTPUT TRANSFORMER	A28088-2
SPKR	SPEAKER 5" X 7" P M	C20485-2

POWER OUTPUT:
  Undistorted ..... 1.5 watts
  Maximum ..... 3 watts
POWER SUPPLY:
  105-125 volts, a.c. 60 cycles
POWER CONSUMPTION: 45 watts
LOUDSPEAKER:
  5x7 inch oval (or 5-inch round);
  permanent magnet.
Voice Coil Impedance: 3.2 ohms at 400 cycles.

NOTES:
R19, R20 and C28, shown in the above schematic, were not included in earlier models.
The following changes were effected in later models: R2 changed from 10 to 2.2 megohms; R16 changed from 1800 to 560 ohms; R17 changed from 0.47 megohm to 0.22 megohm.
The rectifier output voltage of +110 volts, as shown above, may be 10 to 15 volts

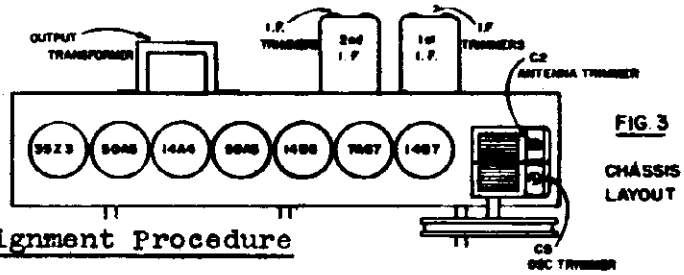


FIG. 3
CHASSIS LAYOUT

Alignment Procedure

A signal generator capable of producing a modulated radio-frequency signal, and a suitable output meter are required for proper alignment of the receiver.

Adjust the signal generator for 30%, 400 cycle modulation. At all times, use only the minimum signal intensity which will produce a readable indication on the output meter, in order to minimize alignment error due to a.v.c. action in the receiver.

Set the receiver controls for "Radio", maximum volume, and treble tone.

Make all adjustments with the signal generator connected directly to the external antenna lead of the receiver, and with the output meter across the speaker voice coil.

Use a non-metallic screwdriver in making all receiver alignment adjustments.

NOTE: The calibrated tuning dial of the receiver is fastened in the cabinet and cannot be used for reference during alignment. Therefore, calibration marks have been stamped on the plate on the front of the chassis, as shown in Figure 2. These are the reference marks referred to in the following procedure:

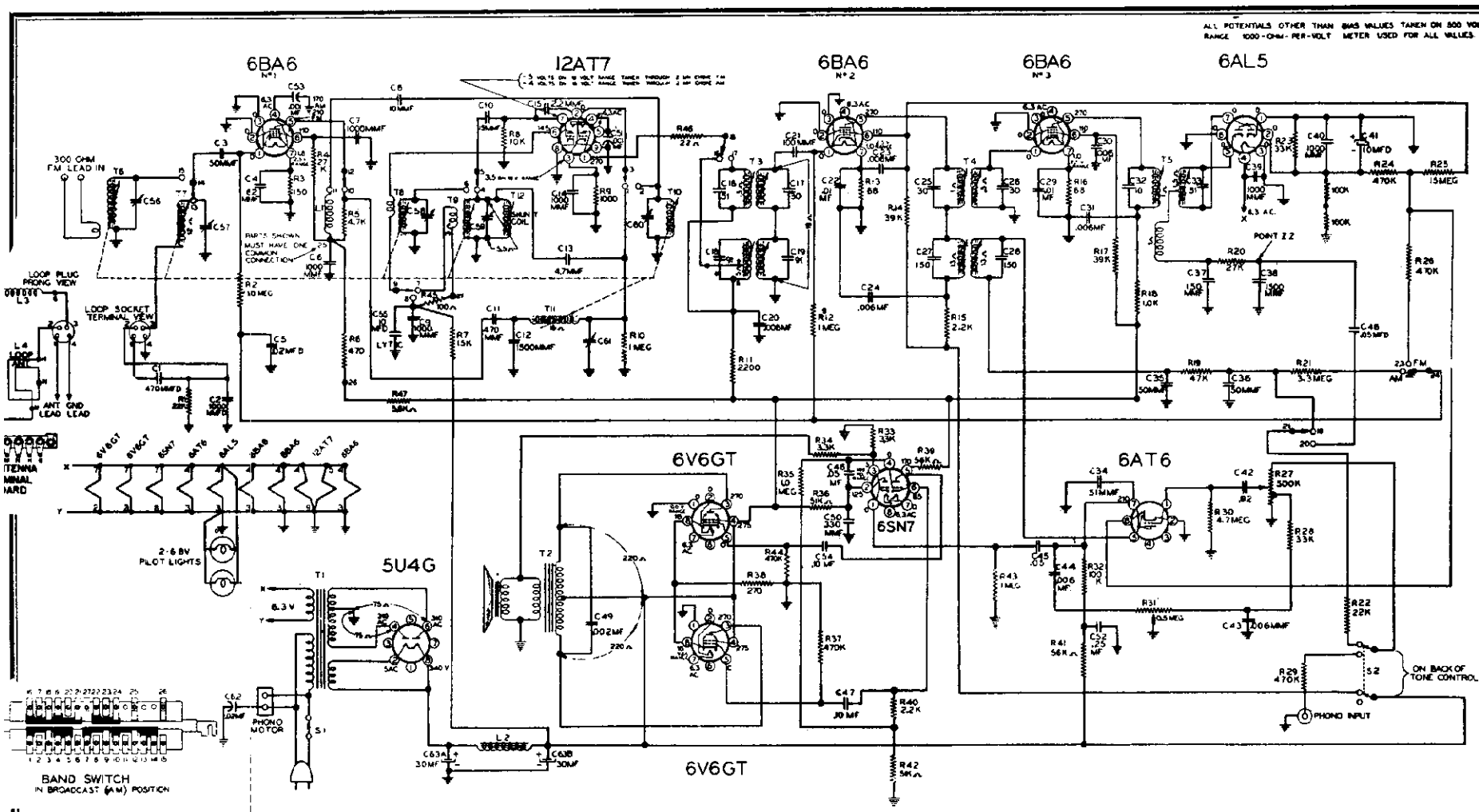
Step 1. Set signal generator to 455 kc. and the receiver dial to a "quiet spot" between stations. Peak the I.F trimmer condensers (Figure 3) for maximum signal indication on the output meter, beginning with the 2nd I.F. transformer.

Step 2. Turn ganged tuning condenser to maximum capacity (fully meshed) and adjust dial pointer on cord so that it coincides with the extreme left hand white mark on the metal dial plate.

Step 3. Set signal generator to 1500 kc. Turn ganged tuning condenser until pointer coincides with extreme right hand (1500 kc.) calibration mark. Adjust oscillator trimmer condenser C5 (Figure 3) for maximum indication on the output meter.

Step 4. With the signal generator and receiver dial set as in step 3, adjust the antenna trimmer condenser C2 for maximum indication on the output meter.

When chassis has been returned to cabinet after alignment, the receiver calibration should be checked against the tuning dial. It may be found necessary to slide the dial pointer slightly in either direction on the cord to correct for small deviations in calibration.



NOTE: The two 100K ohm resistors in series from PIN NO. 2 to ground are connected as shown only when aligning the FM I.F. Refer to FM I.F. alignment procedure.

NOTE: On some sets R46 — 22 ohm resistor is replaced with a 39 ohm resistor, Part no. C-9B1-45.

Power Supply	105 to 125 volts, AC, 60-cycles; Chassis only 122 watts. With phono operation 150 watts.
Frequency Ranges	Broadcast Band—535 to 1620 kc. FM Band—88 to 108 mc.
Intermediate Freq.	AM-455 kc.; FM-10.7 mc.
Selectivity	AM-48 kc. broad at 1000 times signal, measured at 1000 kc. I.F. FM-320 kc. broad at 10 times down.
AM Sensitivity	(For .5 watt output with external antenna)—3 microvolts average
FM Sensitivity	(For .5 watt output—10 microvolts average.
Power Output	8 watts, 10% distortion. 10 watts maximum.
Loud Speaker	12" electrodynamic. Voice coil impedance 3.2 ohms, 400 cycles.

ALIGNMENT PROCEDURE

Broadcast Band Section I.F. and R.F.

The alignment procedure below includes the sensitivities at the inputs of various stages. All signal input values are based on an output of ½ watt. This may be measured by disconnecting the speaker voice coil and substituting a 3.2-ohm resistor across the secondary winding of the output transformer. A reading of 1.3 volts AC across this resistor will be approximately equivalent to a ½-watt output with the speaker connected. The volume control must be set at maximum. The tone control must be set for maximum treble.

The signal source must be an accurately calibrated signal generator capable of supplying the frequencies designated, modulated 30% with a 400-cycle audio signal. A 400 cycle audio signal is required for the audio measurement. Variations in sensitivities of plus or minus 25% are usually permissible.

AM - I. F. ALIGNMENT

Band Switch in AM Position. Tune Set to 1400 Kc. Dummy Antenna .1 Mfd.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	ADJUSTMENTS TO BE MADE	ADJUST FOR
455 Kc. Use 1000 microvolts	Pin No. 1 of 6BA6 No. 2 and ground	Primary and Secondary of T4 AM windings. See top and bottom views	Maximum output Should be ½ watt
455 Kc. Use 30 microvolts	Pin No. 2 of 12AT7 and ground	Primary and Secondary of T3 AM windings. See top and bottom views	Maximum output Should be ½ watt
400 cycles. Use 28 millivolts	Hot end of volume control and ground	None	Maximum output Should be ½ watt

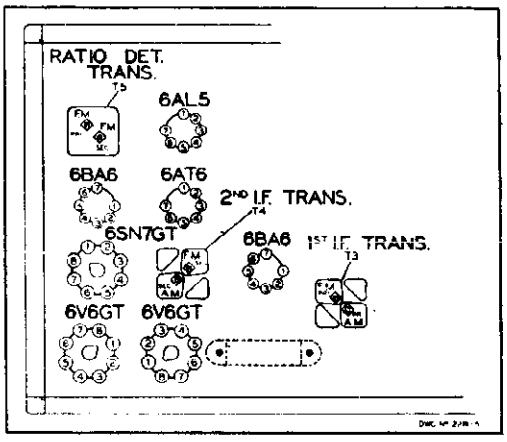
BROADCAST BAND - R. F. ALIGNMENT

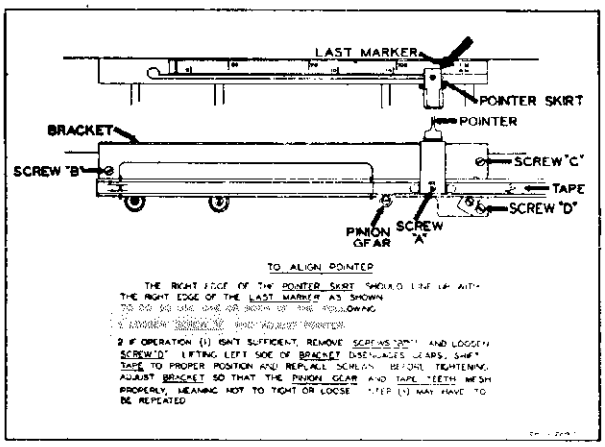
Check pointer so that the right hand edge of the pointer skirt coincides with the right hand edge of marker to the extreme right when iron cores are all the way out. For adjustment, see dial mechanism illustration.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	DUMMY ANTENNA	ADJUST
1620 Kc.	AM Antenna and Ground	200 mmf.	C59 Osc. trimmer for maximum
535 Kc.	AM Antenna and Ground	200 mmf.	T12 for maximum ½ watt
1620 Kc. Use 3 microvolts	AM Antenna and Ground	200 mmf.	C57 and C61 for max. ½ watt. See note

NOTE: Recheck first two adjustments after this adjustment because of inter-locking effects.

Procedure for disassembly and assembly of dial mechanism





ALIGNMENT PROCEDURE

FM Band Section. I.F. and R.F.

A non-metallic alignment tool must be used.

IMPORTANT

No alignment of the FM section of this radio should be attempted unless you are positive that the circuits are in need of adjustment and you have the necessary equipment.

All components used in this radio are extremely stable and the tuned circuits should require no adjustment over long periods of time.

NOTE

The following alignment is based on the use of the new Simpson vacuum tube volt-meter which has a "floating ground". In other words, the meter, when used as a vacuum tube volt-meter, can have both the positive and negative sides connected to points above ground and still give true readings.

A standard AM signal generator is required.

FM - I. F. ALIGNMENT

Band Switch in FM Position. Dummy Antenna .1 Mfd.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	VACUUM TUBE VOLT METER CONNECTION TO RADIO	ADJUSTMENTS TO BE MADE	ADJUST FOR
10.7 Mc. Use about .1 volt	Pin No. 1 of 6BA6 no. 3 and ground	Pin no. 2 of 6AL5 and ground	Primary of T5	Resonance should be about 3 volts
10.7 Mc. Use about .1 volt	Pin No. 1 of 6BA6 no. 3 and ground	See note "A"	Secondary of T5	Zero. Use zero center scale. See note "B"
10.7 Mc. Use about 3300 microvolts	Pin No. 1 of 6BA6 no. 2 and ground	Pin no. 2 of 6AL5 and ground	Primary and Secondary of T4 10.7 m.c. windings See top and bottom views	Resonance should be about 3 volts
10.7 Mc. Use about 200 microvolts	Pin no. 2 of 12AT7 and ground	Pin no. 2 of 6AL5 and ground	Primary and Secondary of 10.7 m.c. windings of T3 See top and bottom views	Resonance should be about 3 volts

NOTES ON FM—I.F. ALIGNMENT

NOTE "A" Connect two resistors, 100K OHMS each, from Pin No. 2 of 6AL5 to ground. These resistors must be matched within 5%. Connect as shown in dotted lines on schematic diagram. Connect vacuum tube voltmeter between the mid-point of the resistors and point zz.

NOTE "B" If T5 has been tampered with, it is possible that no crossover point will be found at first. Careful adjustment of both primary and secondary is necessary.

GENERAL: Input signals should be adjusted to give approximately 3 volts. The ratio detector is operating at a reasonable level at this point and will give the truest indication of correct alignment with the procedure specified.

FM - R. F. ALIGNMENT

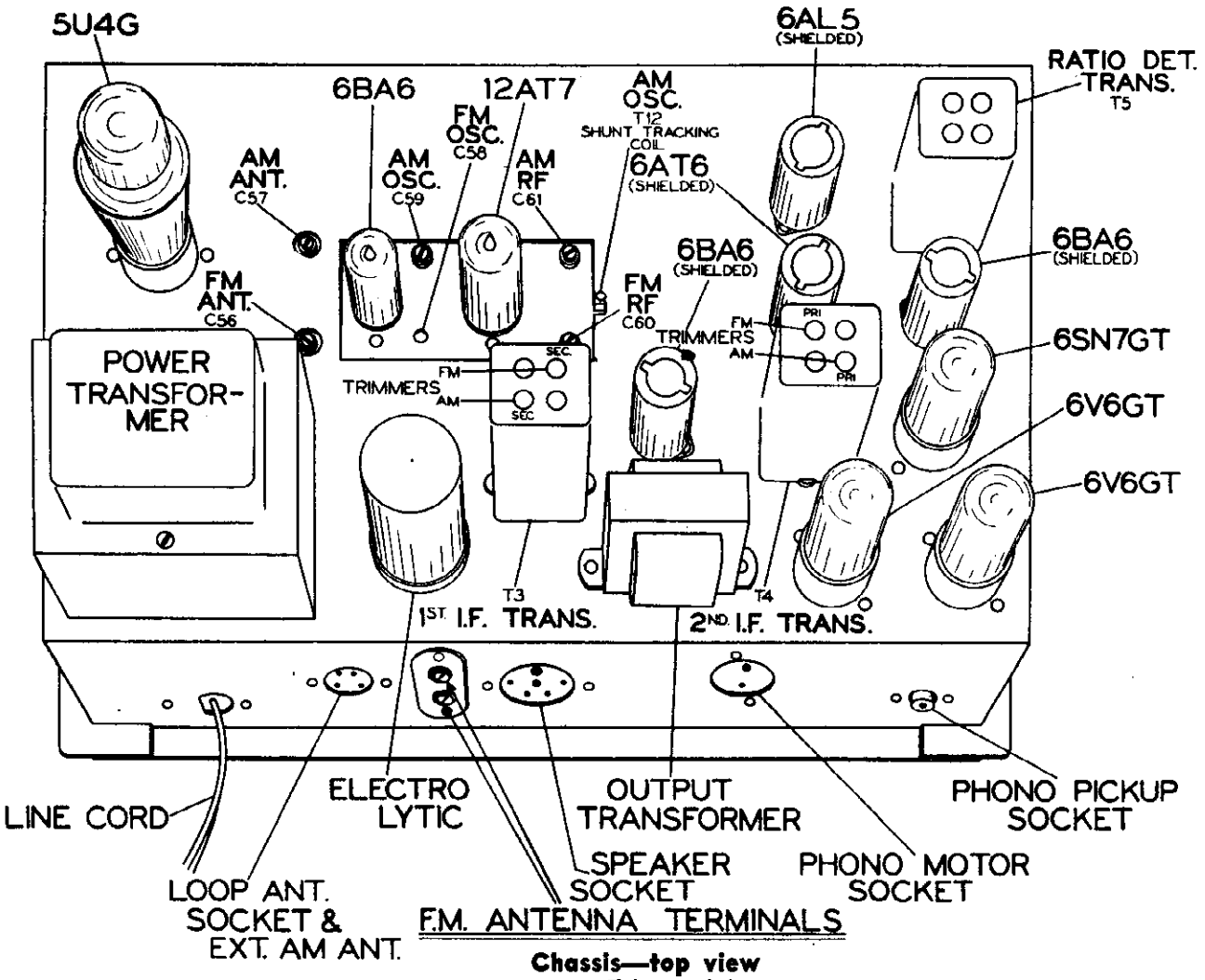
Check pointer so that the right hand edge of the pointer skirt coincides with the right hand edge of marker to the extreme right when iron cores are all the way out. For adjustment, see dial mechanism illustration.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	DUMMY ANTENNA	ADJUST	VACUUM TUBE VOLT METER CONNECTION TO RADIO	ADJUST TO
100 Mc. Use about 10 microvolts	FM Antenna Terminals See note	300 ohms	C58 Osc. C60 R.F. C56 Ant.	Pin no. 2 of 6AL5 and Ground	Resonance about 3 volts

NOTE: If a signal generator with the above fundamental frequency is not available, it is sometimes possible to use harmonics. Use extreme care in picking harmonics. An alternate procedure is to use a local station carrier of known frequency to align the FM Band and to use the vacuum tube volt-meter as above for resonance indication. A weak carrier, however will not produce 3 volts.

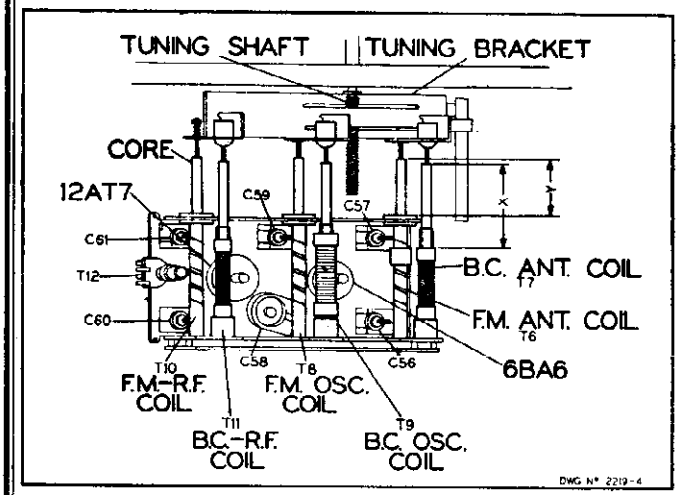
NOTE: Connect 300 ohms in series with hot side of generator and connect to one screw. Connect cold side of generator to other screw

MODEL 74BR-2707A MONTGOMERY WARD



Chassis—top view

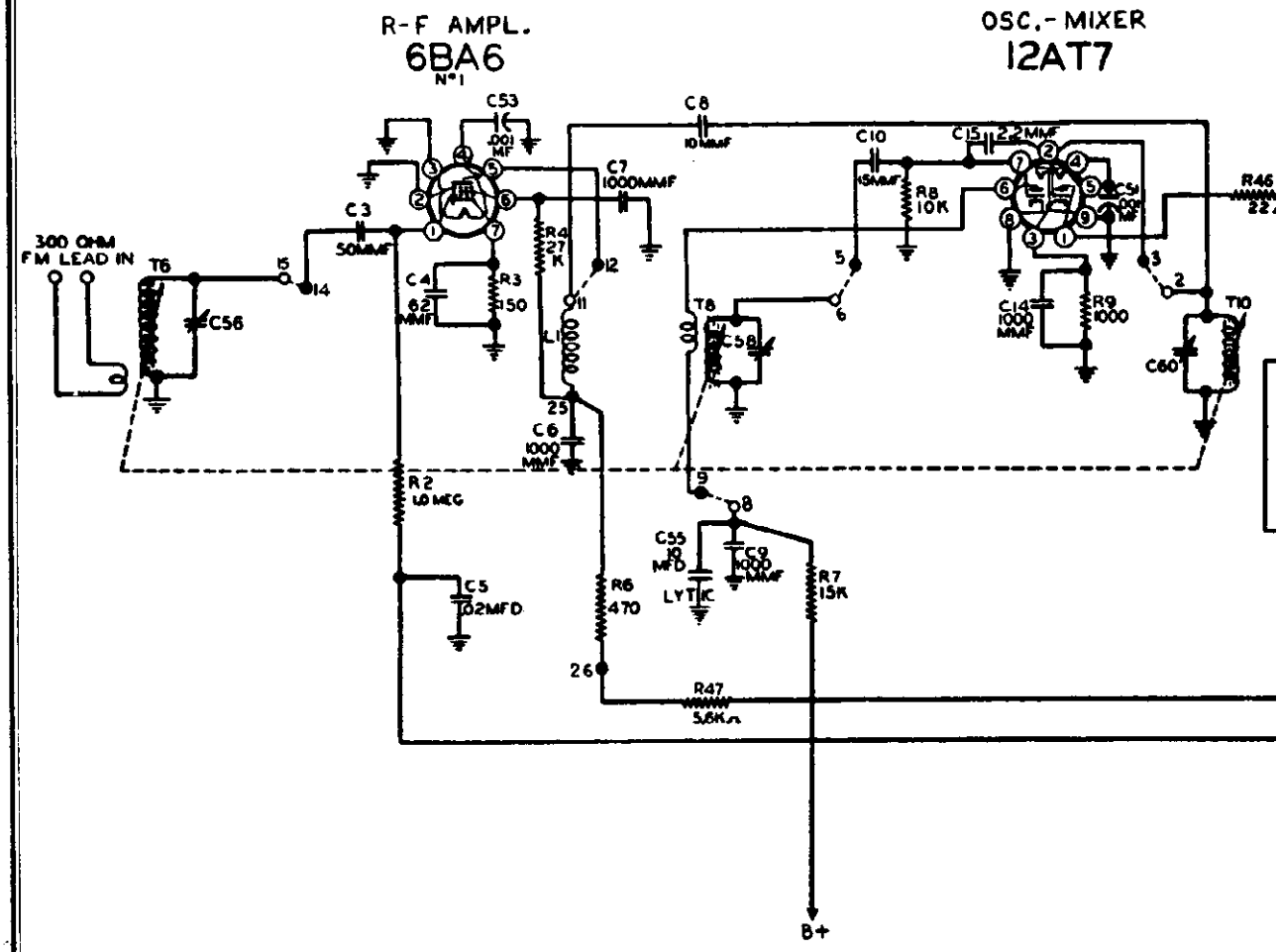
Tube and Lamp Complement.....
- 6BA6, FM—AM R.F. stage.
- 12AT7, FM—AM oscillator and mixer.
- 6BA6, FM—AM 1st I.F.
- 6BA6, FM— 2nd I.F.
- 6AL5, FM— ratio detector.
- 6AT6, AM detector. A. F. AMP. and A.V.C.
- 6SN7, Push-pull. Driver and phase-inverter.
- 5U4G, rectifier.
- 6V6, output.
- 6V6, output.
- T-44 dial lamp (2 used).



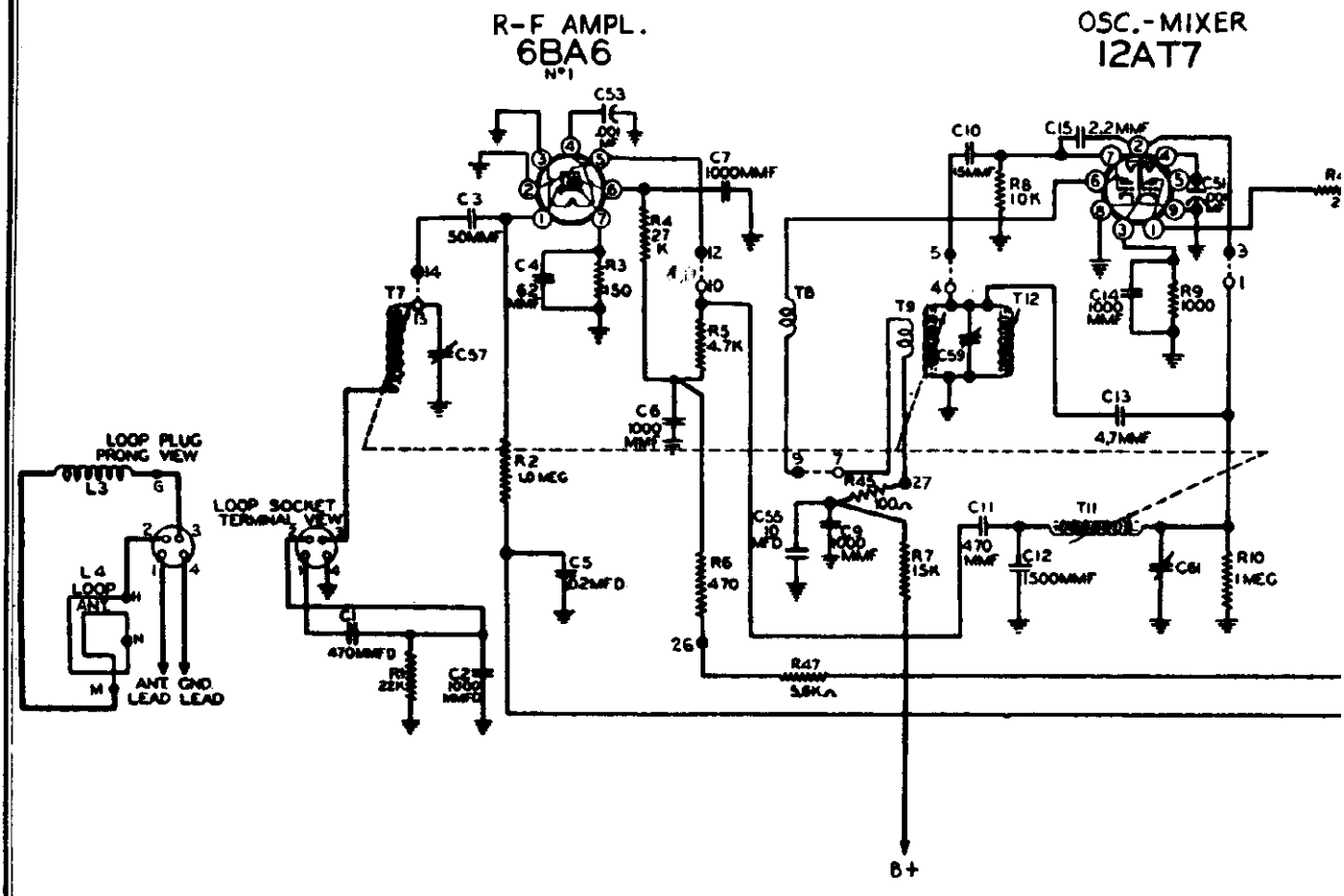
TUNER ADJUSTMENT

With tuner all the way out, dimension "X" should be 1½ inches. "Y" should be 1-1/16 inches. "X" is from the end of the slug to the edge of the coil winding. Check these dimensions before R.F. alignment is attempted of either the AM or FM band. No slug adjustment should be necessary since the slugs are properly set at the factory.

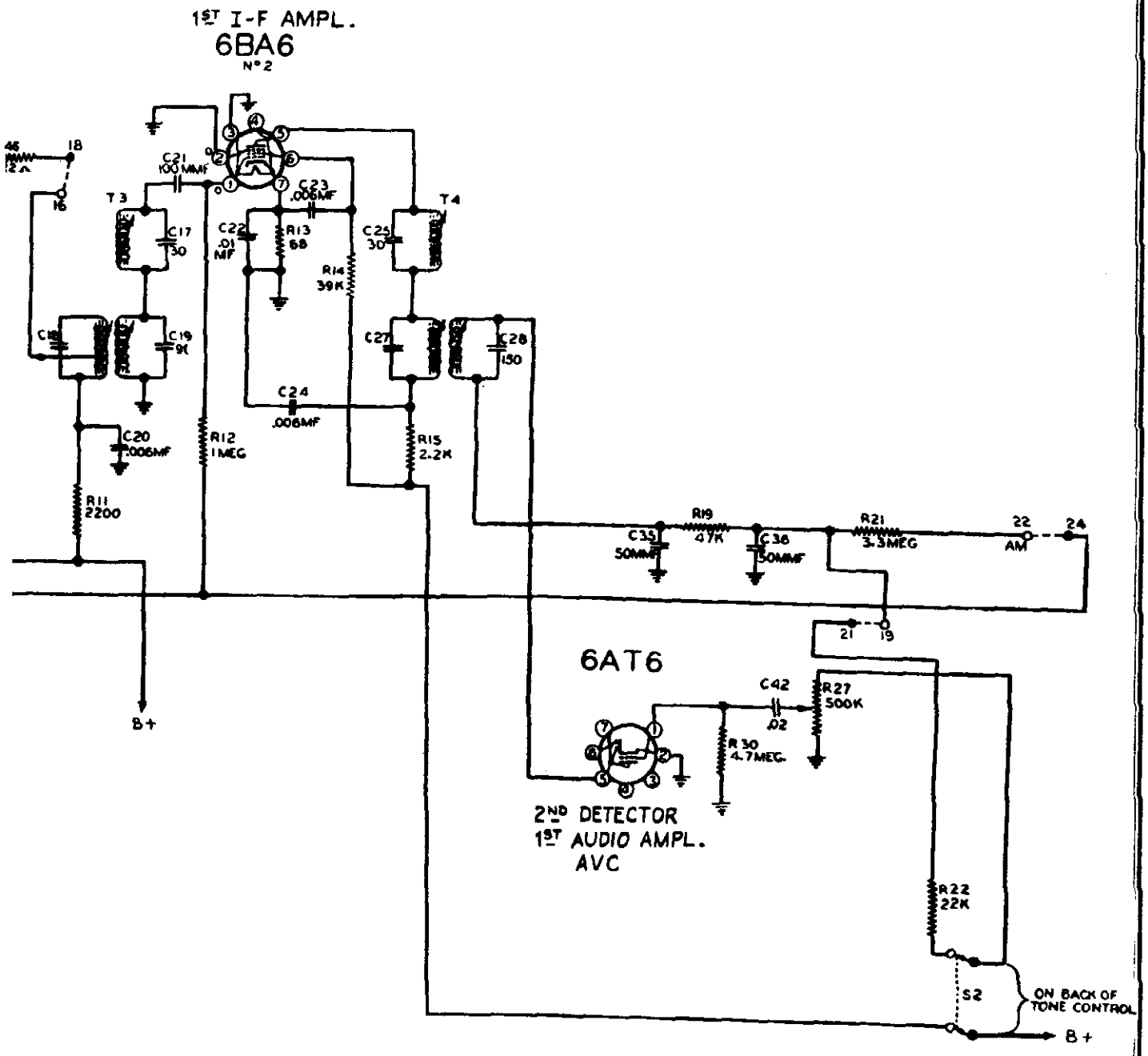
MODELS 74BR-2707A, 74BR-2710A

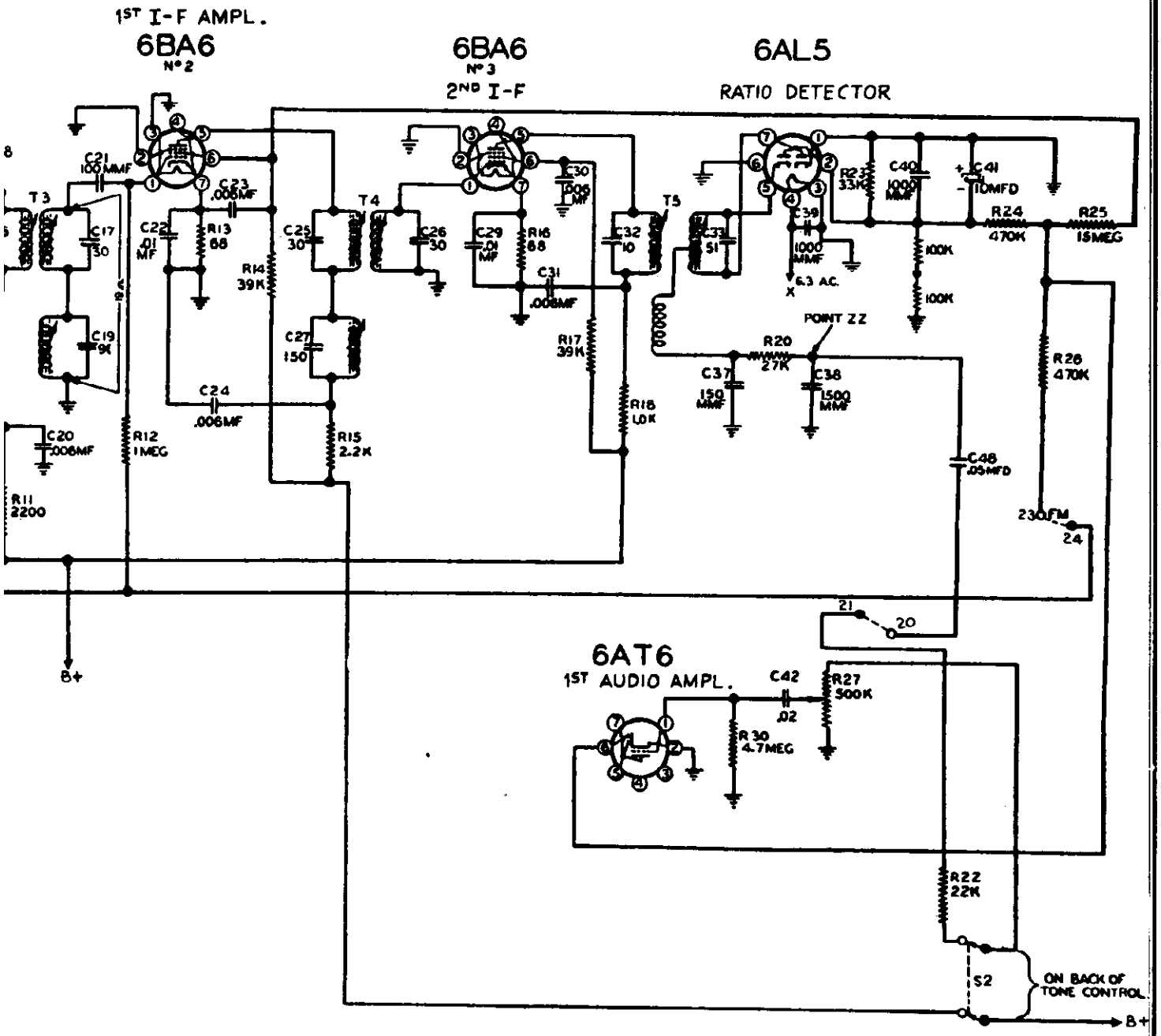


BAND-SWITCH SHOWN
AT 2ND POSITION CLOCKWISE.
F-M BAND
88 - 108 MC



BAND-SWITCH SHOWN
AT 1ST POSITION.
BROADCAST BAND
535-1620 KC

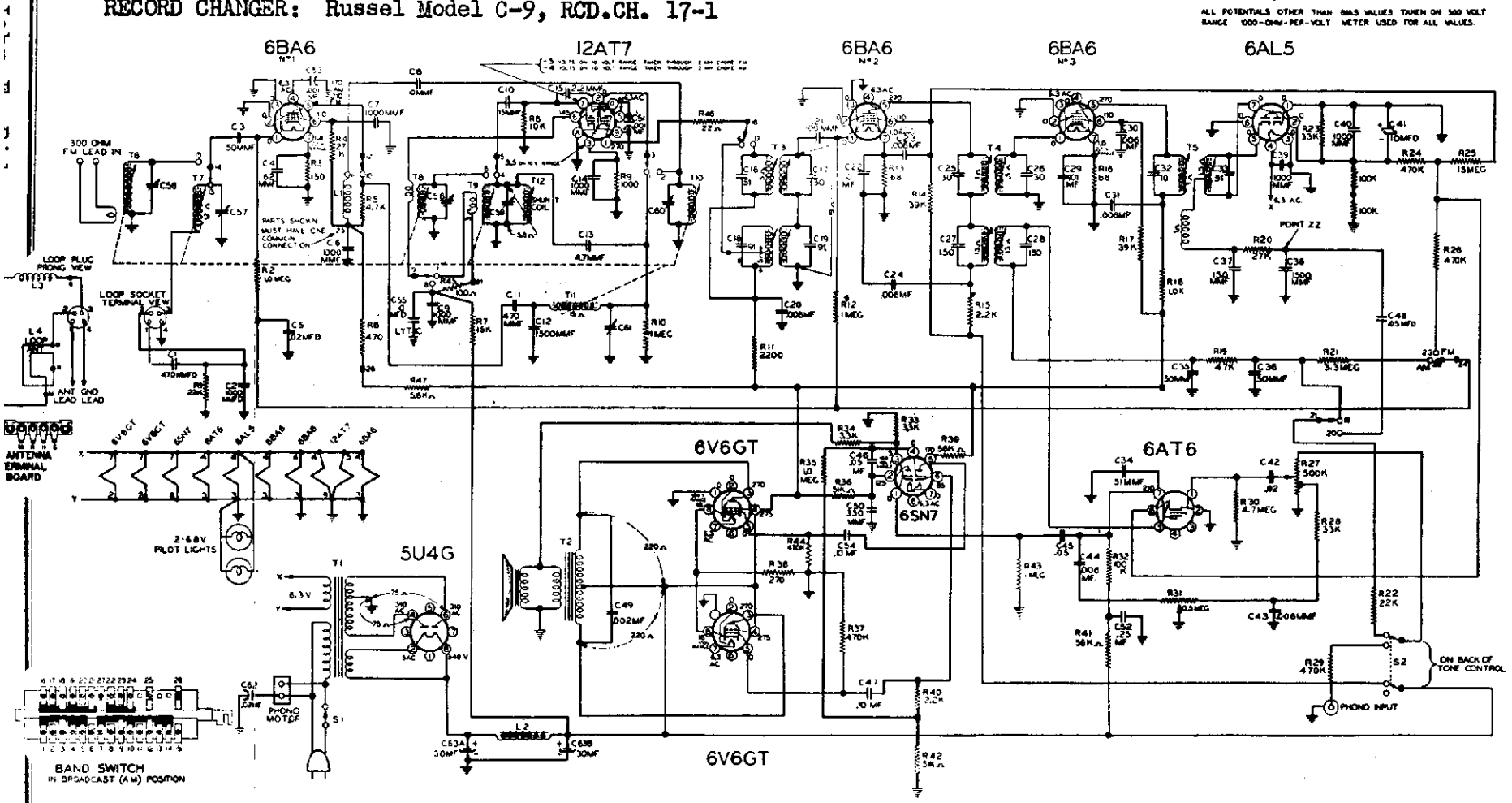

1ST I-F AMPL.
6BA6
N°2
46
12A
18
16
C21
100 MMF
T3
C17
30
C22
.01
MF
R13
68
C23
.006MF
T4
C25
30
R14
39K
C18
C19
91
C27
C28
150
C24
.006MF
C20
.006MF
R12
1MEG
R15
2.2K
R11
2200
B+
R19
47K
C35
50MMF
C36
50MMF
R21
3.3MEG
22
AM
24
21
19
6AT6
C42
.02
R27
500K
R30
4.7MEG.
2ND DETECTOR
1ST AUDIO AMPL.
AVC
R22
22K
S2
ON BACK OF
TONE CONTROL
B+


1ST I-F AMPL.
6BA6
N°2
6BA6
N°3
2ND I-F
6AL5
RATIO DETECTOR
T3
T4
T5
C21 100 MMF
C23 .006MF
C22 .01 MF
R13 68
C17 30
C19 9K
R14 39K
C25 30
C27 150
C24 .006MF
C20 .006MF
R12 1MEG
R11 2200
R15 2.2K
C26 30
C29 .01 MF
R16 68
C30 .006 MF
C31 .006MF
R17 39K
R18 10K
C32 10
C33 51
C39 1000 MMF
6.3 A.C.
X
R23 33K
C40 100 MMF
C41 10MFD
R24 470K
R25 1.5MEG
100K
100K
POINT ZZ
R20 27K
C37 150 MMF
C38 1500 MMF
R26 470K
C48 .03MFD
230 FM
24
21
20
B+
6AT6
1ST AUDIO AMPL.
C42 .02
R27 500K
R30 4.7MEG
R22 22K
S2
ON BACK OF TONE CONTROL
B+

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description	Qty. Used In Set
		TUNER PARTS	
		CONDENSERS	
C58	A-8E-13575	Trimmer condenser	1
C56, 57, 59, 60, 61	A-2M-12618	Trimmer cond. plate	5
C1, C11	C-8G-11732	470 mmf, ±20%	2
C2	C-8G-13695	1000 mmf, ± 20%	1
C6, 7, 9, 14 51, 53	C-8G-13201	1000 mmf, +20%—10%	6
C4	C-8G-13018	62 mmf, ± 10%	1
C12	C-8G-11731	1500 mmf, ±20%	1
C10	C-8G-13017	15 mmf, +10%	1
C3	C-8G-11484	50 mmf, ±10%	1
C8	C-8G-11789	10 mmf, ±10%	1
C13	A-8G-12495-6	4.7 mmf, ±20%	1
C15	A-8G-12495-4	2.2 mmf, ± 20%	1
C5	C-8D-11304	.02 mfd, 200 volts, ±20%	1
		RESISTORS	
R4	C-9B2-79	27K ohms, 1 watt, 10%	1
R1	C-9B1-21	22K ohms, 1/2 watt, 20%	1
R3	C-9B1-52	150 ohms, 1/2 watt, 10%	1
R5	C-9B1-17	4700 ohms, 1/2 watt, 20%	1
R6	C-9B1-11	470 ohms, 1/2 watt, 20%	1
R8	C-9B1-19	10K ohms, 1/2 watt, 20%	1
R2, R10	C-9B1-31	1 megohm, 1/2 watt, 20%	2
R9	C-9B1-62	1000 ohms, 1/2 watt, 10%	1
R21	C-9B1-34	3.3 megohms, 1/2 watt, 20%	1
R45	C-9B1-50	100 ohms, 1/2 watt, 10%	1
R46	C-9B1-42	22 ohms, 1/2 watt, 10%	1
		COILS	
T8	B-13D-13027	FM oscillator coil assembly	1
T6	B-13E-13028	FM antenna coil assembly	1
T10	B-13C-13029	FM R.F. coil assembly	1
T9	B-13D-13030	AM oscillator coil assembly	1
T7	B-13E-13031	AM antenna coil assembly	1
T11	B-13C-13032	AM R.F. coil assembly	1
L1	A-16A-13033	Choke coil assembly	1
T12	B-13D-12974	AM osc. shunt coil assembly	1
		MISCELLANEOUS	
	B-208-13553 or	Band change slide switch	1
	B-201-12967	Band change slide switch	1
	A-15B-12997	7 prong, miniature tube socket	1
	A-15B-13430	9 prong, miniature tube socket	1
	A-200-12912	Drive bracket assembly	1
	A-200-13044	Pointer guide and bracket assembly	1
	A-3A-12308-1	Lead screw	1
	A-3J-12309	Pinion gear for lead screw	1
	A-49A-13447	Tension spring for lead screw	1
	A-25A-13019	Core grommets, for AM Band	3
	A-3M-13020	Insert for core grommet	3
	A-49A-12394	Spiral spring for FM cores	3
	C-2D-12990	Tape Guide	1
	B-2J-13006	Rack, with teeth	1
	A-2J-11041	Pointer tension spring, "M" shaped	1
	B-2G-10588-2	Pointer	1
	32F4-10830	4-40 x 1/8" screw to mount pointer	1
		MAIN CHASSIS PARTS	
		CONDENSERS	
63A, 63B	B-8C-11629	Electrolytic condenser, dual, 30-30 x 450 volts	1
C21	C-8G-11734	100 mmf, 20%, ceramic	1
C37	C-8F3-229	150 mmf, mica	1
C38	C-8G-13059	1500 mmf, ceramic	1
C34	C-8G-13060	51 mmf, ceramic	1
C20, 23, 24, 30, 31, 43, 44	C-8D-10785	.006 mf x 600 volts, paper	7
C22, C29	C-8D-10761	.01 mf x 400 volts, paper	2
C45, 46	C-8D-10813	.05 mf x 400 volts, paper	2
C55	A-8C-12154	Electrolytic condenser 10 mf x 450 volts	1
C49	C-8D-10789	.002 mf x 600 volts, paper	1
C39, 40	C-8G-13201	1000 mmf, ceramic	2
C41	A-8C-13132	Electrolytic condenser 10 mf x 50 volts	1
C52	C-8J-11321	.02 mf x 600 volts	1
C48	C-8D-10770	.05 mf x 200 volts	1
C50	C-8G-11741	330 mmf, ceramic	1
C42	C-8D-11304	.02 mf x 200 volts	1
C52	C-8D-13439	.25 mf x 400 volts	1
C47, 54	C-8D-10760	.1 mf x 400 volts	2
C35, 36	A-8F-13047	50 mmf, dual mica	1
C32	C-8G-11789	10 mmf, ceramic, 10%	1
C33	C-8G-11891	51 mmf, ceramic, 5%	1
C27, 28	C-8G-13025	150 mmf, ceramic	2
C17, 25, 26	C-8G-12159	30 mmf, ceramic	3
C18, 19	C-8G-12160	91 mmf, ceramic	2
C16	C-8G-13026	51 mmf, ceramic	1
		RESISTORS	
R27	A-10A-13001	Volume control (500K) and switch	1
R31	A-11A-12988	Tone control (500K) and radio-phono switch	1
R32	C-9B1-86	100K ohms, 1/2 watt, 10%	1
R29, 44	C-9B1-94	470K ohms, 1/2 watt, 10%	2
R39, 41	C-9B1-83	56K ohms, 1/2 watt, 10%	2
R33, 34	C-9B1-68	3300 ohms, 1/2 watt, 10%	2
R30	C-9B1-35	4.7 megohms, 1/2 watt, 20%	1
R23, 28	C-9B1-80	33K ohms, 1/2 watt, 10%	2
R20	C-9B1-79	27K ohms, 1/2 watt, 10%	1
R22	C-9B1-78	22K ohms, 1/2 watt, 20%	1
R13, 16	C-9B1-48	68 ohms, 1/2 watt, 10%	2
R14, 17	C-9B2-81	39K ohms, 1 watt, 10%	2
R24, 26, 37	C-9B1-29	470K ohms, 1/2 watt, 20%	3
R25	C-9B1-302	15 megohms, 1/2 watt, 10%	1
R19	C-9B1-23	47K ohms, 1/2 watt, 20%	1
R7	C-9B4-76	15K ohms, 2 watts, 10%	1
R12, 35, 43	C-9B1-31	1 megohm, 1/2 watt, 20%	3
R40	C-9B1-66	2200 ohms, 1/2 watt, 10%	1
R36, 42	C-9B1-200	51K ohms, 1/2 watt, 5%	2
R38	C-9B4-55	270 ohms, 2 watts, 10%	1
R47	C-9B1-71	5600 ohms, 1/2 watt, 10%	1
R18	C-9B1-13	1000 ohms, 1/2 watt, 20%	1
R15, 11	C-9B2-15	2200 ohms, 1 watt, 20%	2
		COILS	
T3	C-13A-13009-1	Input I.F. transformer, combination 455 kc. and 10.7 mc.	1
T4	C-13B-13014-1	Output I.F. transformer, combination 455 kc. and 10.7 mc.	1
T5	C-203-11745-1	Ratio det. coil assembly 10.7 mc.	1
L3	A-16A-13243	Loop loading coil	1
L4	B-14MA-11066-5	Loop antenna, B.C. Band	1
		TRANSFORMERS	
T2	B-12C-13042	Output transformer for speaker	1
	B-12A-13038	Power transformer, primary, 50-60 cycles. 105-125 volts, AC	1
		SPEAKER	
	B-18B-13043	Electrodynamic speaker, 12" less output transformer	1
		MISCELLANEOUS	
	C-30A-13578	Dial scale	1
	B-5B-14153-41	Knob, small, with dot, mahogany	2
	B-5B-13308-41	Knob, large, without dot, mahog.	2
	B-5C-12457-41	Escutcheon, side pieces	2
	107259	Shield for pilot lite	2
	B-14M-11479	A.C. line cord	1
	A-3A-13003	Switch shaft	1
	A-2D-12983	Detent bracket (U shaped on front of set)	
	A-43D-12934	"U" speed clip	1
	A-55C-12935	Ball bearing	1
	A-2D-13004	Switch activator bracket	1
	B-47A-12458	Pilot lite assembly	1
	A-46A-11739	Pilot lite, 6-8 volts, T-44	2
	A-25G-13448	Rubber chassis mounting cushion	4
	A-15C-10717	7 prong, miniature tube socket	4
	A-15B-10440	8 prong, octal socket	4
	A-19B-12644	Antenna socket	1
	A-7B-13050	FM dipole, 2-screw strip	1
	A-15B-11538	Speaker socket	1
	A-19B-12468	Phono motor socket	1
	A-19B-12170	Phono input socket	1
		RECORD CHANGER	
	B-201-13455	Record changer (C-10) with Retracto cartridge	1
	8K-14224	Retracto crystal cartridge with needle	1
	55A-14225	Retracto needle only	

RECORD CHANGER: Russel Model C-9, RCD.CH. 17-1



NOTE: The two 100K ohm resistors in series from PIN NO. z to ground are connected as shown only when aligning the FM I.F. Refer to FM I.F. alignment procedure.

NOTE: On some sets R46 — 22 ohm resistor is replaced with a 39 ohm resistor, Part no. C-9B1-45.

ELECTRICAL SPECIFICATIONS

Power Supply	105 to 125 volts, AC, 60-cycles; Chassis only 122 watts. With phono operation 150 watts.
Frequency Ranges	Broadcast Band—535 to 1620 kc. FM Band—88 to 108 mc.
Intermediate Freq.	AM-455 kc.; FM-10.7 mc.
Selectivity	AM-48 kc. broad at 1000 times signal, measured at 1000 kc.
	I.F. FM-180 kc. broad at 2 times down.
	I.F. FM-320 kc. broad at 10 times down.
AM Sensitivity	(For .5 watt output with external antenna)—3 microvolts average
FM Sensitivity	(For .5 watt output—10 microvolts average.
Power Output	8 watts, 10% distortion. 10 watts maximum.

ALIGNMENT PROCEDURE

Broadcast Band Section I.F. and R.F.

The alignment procedure below includes the sensitivities at the inputs of various stages. All signal input values are based on an output of ½ watt. This may be measured by disconnecting the speaker voice coil and substituting a 3.2-ohm resistor across the secondary winding of the output transformer. A reading of 1.3 volts AC across this resistor will be approximately equivalent to a ½-watt output with the speaker connected. The volume control must be set at maximum. The tone control must be set for maximum treble.

The signal source must be an accurately calibrated signal generator capable of supplying the frequencies designated, modulated 30% with a 400-cycle audio signal. A 400 cycle audio signal is required for the audio measurement. Variations in sensitivities of plus or minus 25% are usually permissible.

AM - I. F. ALIGNMENT

Band Switch in AM Position. Tune Set to 1400 Kc. Dummy Antenna .1 Mfd.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	ADJUSTMENTS TO BE MADE	ADJUST FOR
455 Kc. Use 1000 microvolts	Pin No. 1 of 6BA6 No. 2 and ground	Primary and Secondary of T4 AM windings. See top and bottom views	Maximum output Should be ½ watt
455 Kc. Use 30 microvolts	Pin No. 2 of 12AT7 and ground	Primary and Secondary of T3 AM windings. See top and bottom views	Maximum output Should be ½ watt
400 cycles. Use 28 millivolts	Hot end of volume control and ground	None	Maximum output Should be ½ watt

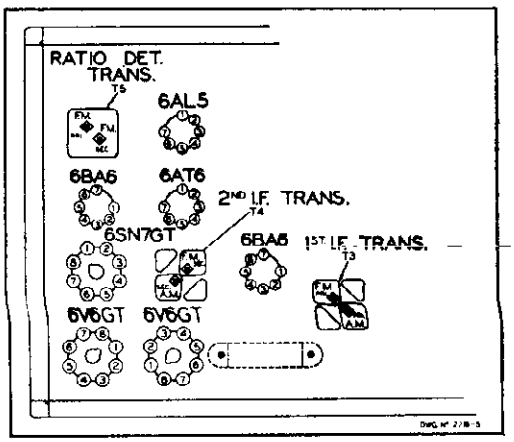
BROADCAST BAND - R. F. ALIGNMENT

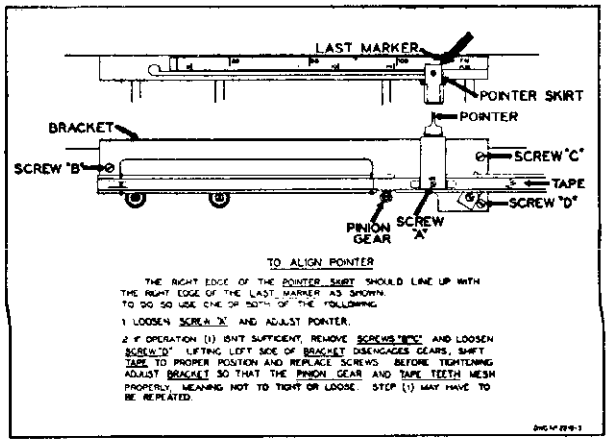
Check pointer so that the right hand edge of the pointer skirt coincides with the right hand edge of marker to the extreme right when iron cores are all the way out. For adjustment, see dial mechanism illustration.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	DUMMY ANTENNA	ADJUST
1620 Kc.	AM Antenna and Ground	200 mmf.	C59 Osc. trimmer for maximum
535 Kc.	AM Antenna and Ground	200 mmf.	T12 for maximum ½ watt
1620 Kc. Use 3 microvolts	AM Antenna and Ground	200 mmf.	C57 and C61 for max. ½ watt. See note

NOTE: Recheck first two adjustments after this adjustment because of inter-locking effects.

Procedure for disassembly and assembly of dial mechanism





MODEL 74BR-2710A

MONTGOMERY WARD

ALIGNMENT PROCEDURE

FM Band Section. I.F. and R.F.

A non-metallic alignment tool must be used.

IMPORTANT

No alignment of the FM section of this radio should be attempted unless you are positive that the circuits are in need of adjustment and you have the necessary equipment.

All components used in this radio are extremely stable and the tuned circuits should require no adjustment over long periods of time.

NOTE

The following alignment is based on the use of the new Simpson vacuum tube volt-meter which has a "floating ground". In other words, the meter, when used as a vacuum tube volt-meter, can have both the positive and negative sides connected to points above ground and still give true readings.

A standard AM signal generator is required.

FM - I. F. ALIGNMENT

Band Switch in FM Position. Dummy Antenna .1 Mfd.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	VACUUM TUBE VOLT METER CONNECTION TO RADIO	ADJUSTMENTS TO BE MADE	ADJUST FOR
10.7 Mc. Use about .1 volt	Pin No. 1 of 6BA6 no. 3 and ground	Pin no. 2 of 6AL5 and ground	Primary of T5	Resonance should be about 3 volts
10.7 Mc. Use about .1 volt	Pin No. 1 of 6BA6 no. 3 and ground	See note "A"	Secondary of T5	Zero. Use zero center scale. See note "B"
10.7 Mc. Use about 3300 microvolts	Pin No. 1 of 6BA6 no. 2 and ground	Pin no. 2 of 6AL5 and ground	Primary and Secondary of T4 10.7 m.c. windings See top and bottom views	Resonance should be about 3 volts
10.7 Mc. Use about 200 microvolts	Pin no. 2 of 12AT7 and ground	Pin no. 2 of 6AL5 and ground	Primary and Secondary of 10.7 m.c. windings of T3 See top and bottom views	Resonance should be about 3 volts

NOTES ON FM—I.F. ALIGNMENT

NOTE "A" Connect two resistors, 100K OHMS each, from Pin No. 2 of 6AL5 to ground. These resistors must be matched within 5%. Connect as shown in dotted lines on schematic diagram. Connect vacuum tube voltmeter between the mid-point of the resistors and point zz.

NOTE "B" If T5 has been tampered with, it is possible that no crossover point will be found at first. Careful adjustment of both primary and secondary is necessary.

GENERAL: Input signals should be adjusted to give approximately 3 volts. The ratio detector is operating at a reasonable level at this point and will give the truest indication of correct alignment with the procedure specified.

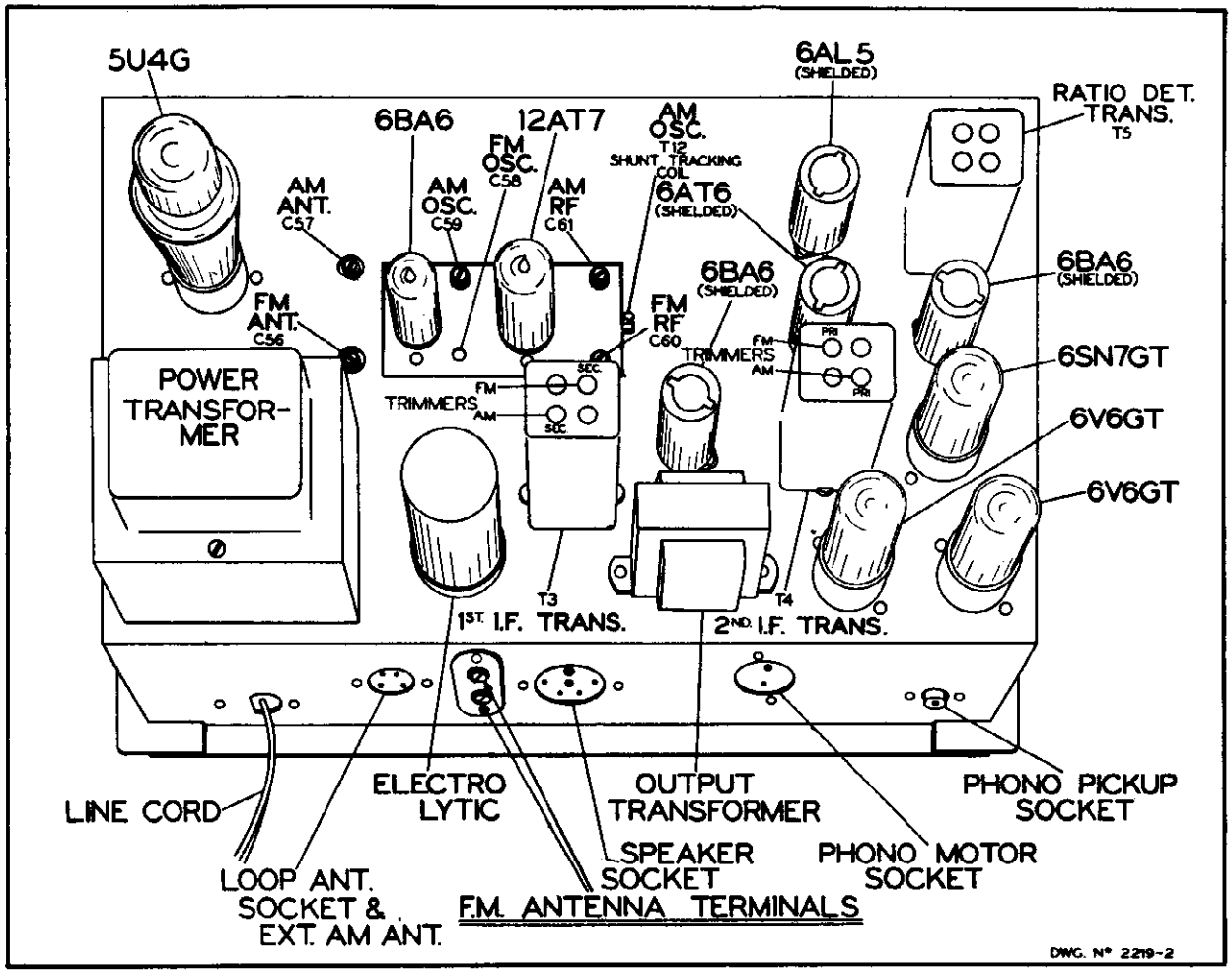
FM - R. F. ALIGNMENT

Check pointer so that the right hand edge of the pointer skirt coincides with the right hand edge of marker to the extreme right when iron cores are all the way out. For adjustment, see dial mechanism illustration.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	DUMMY ANTENNA	ADJUST	VACUUM TUBE VOLT METER CONNECTION TO RADIO	ADJUST TO
100 Mc. Use about 10 microvolts	FM Antenna Terminals See note	300 ohms	C58 Osc. C60 R.F. C56 Ant.	Pin no. 2 of 6AL5 and Ground	Resonance about 3 volts

NOTE: If a signal generator with the above fundamental frequency is not available, it is sometimes possible to use harmonics. Use extreme care in picking harmonics. An alternate procedure is to use a local station carrier of known frequency to align the FM Band and to use the vacuum tube volt-meter as above for resonance indication. A weak carrier, however will not produce 3 volts.

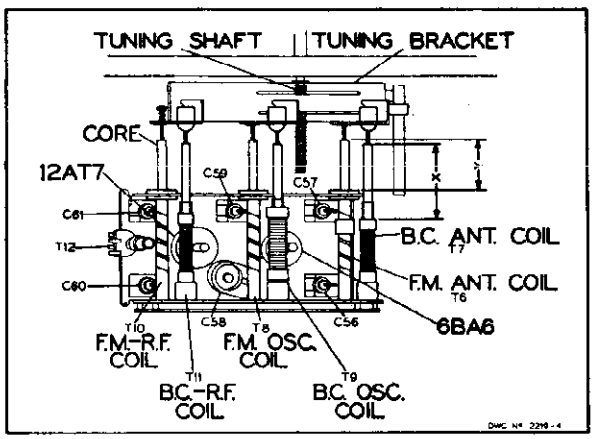
NOTE: Connect 300 ohms in series with hot side of generator and connect to one screw. Connect cold side of generator to other screw



Chassis—top view

Loud Speaker.....12" electrodynamic. Voice coil impedance 3.2 ohms, 400 cycles.

Tube and Lamp Complement.....
- 6BA6, FM—AM R.F. stage.
- 12AT7, FM—AM oscillator and mixer.
- 6BA6, FM—AM 1st I.F.
- 6BA6, FM— 2nd I.F.
- 6AL5, FM— ratio detector.
- 6AT6, AM detector. A. F. AMP. and A.V.C.
- 6SN7, Push-pull. Driver and phase-inverter.
- 5U4G, rectifier.
- 6V6, output.
- 6V6, output.
- T-44 dial lamp (2 used).



TUNER ADJUSTMENT

With tuner all the way out, dimension "X" should be 1½ inches. "Y" should be 1-1/16 inches. "X" is from the end of the slug to the edge of the coil winding. Check these dimensions before R.F. alignment is attempted of either the AM or FM band. No slug adjustment should be necessary since the slugs are properly set at the factory.

Ref. No.	Part No.	Description	Qty. Used In Set
		TUNER PARTS	
		CONDENSERS	
C58	A-8E-13575	Trimmer condenser	1
C56, 57, 59, 60, 61	A-2M-12618	Trimmer cond. plate	5
C1, C11	C-8G-11732	470 mmf, ±20%	2
C2	C-8G-13695	1000 mmf, ± 20%	1
C6, 7, 9, 14 51, 53	C-8G-13201	1000 mmf, +20%—10%	6
C4	C-8G-13018	62 mmf, ± 10%	1
C12	C-8G-11731	1500 mmf, ±20%	1
C10	C-8G-13017	15 mmf, +10%	1
C3	C-8G-11484	50 mmf, ±10%	1
C8	C-8G-11789	10 mmf, ±10%	1
C13	A-8G-12495-6	4.7 mmf, ±20%	1
C15	A-8G-12495-4	2.2 mmf, ± 20%	1
C5	C-8D-11304	.02 mfd, 200 volts, ±20%	1
		RESISTORS	
R4	C-9B2-79	27K ohms, 1 watt, 10%	1
R1	C-9B1-21	22K ohms, 1/2 watt, 20%	1
R3	C-9B1-52	150 ohms, 1/2 watt, 10%	1
R5	C-9B1-17	4700 ohms, 1/2 watt, 20%	1
R6	C-9B1-11	470 ohms, 1/2 watt, 20%	1
R8	C-9B1-19	10K ohms, 1/2 watt, 20%	1
R2, R10	C-9B1-31	1 megohm, 1/2 watt, 20%	2
R9	C-9B1-62	1000 ohms, 1/2 watt, 10%	1
R21	C-9B1-34	3.3 megohms, 1/2 watt, 20%	1
R45	C-9B1-50	100 ohms, 1/2 watt, 10%	1
R46	C-9B1-42	22 ohms, 1/2 watt, 10%	1
		COILS	
T8	B-13D-13027	FM oscillator coil assembly	1
T6	B-13E-13028	FM antenna coil assembly	1
T10	B-13C-13029	FM R.F. coil assembly	1
T9	B-13D-13030	AM oscillator coil assembly	1
T7	B-13E-13031	AM antenna coil assembly	1
T11	B-13C-13032	AM R.F. coil assembly	1
L1	A-16A-13033	Choke coil assembly	1
T12	B-13D-12974	AM osc. shunt coil assembly	1
		MISCELLANEOUS	
	B-208-13553 or	Band change slide switch	1
	B-201-12967	Band change slide switch	1
	A-15B-12997	7 prong, miniature tube socket	1
	A-15B-13430	9 prong, miniature tube socket	1
	A-200-12912	Drive bracket assembly	1
	A-200-13044	Pointer guide and bracket assembly	1
	A-3A-12308-1	Lead screw	1
	A-3J-12309	Pinion gear for lead screw	1
	A-49A-13447	Tension spring for lead screw	1
	A-25A-13019	Core grommets, for AM Band	3
	A-3M-13020	Insert for core grommet	3
	A-49A-12394	Spiral spring for FM cores	3
	C-2D-12990	Tape Guide	1
	B-2J-13006	Rack, with teeth	1
	A-2J-11041	Pointer tension spring, "M" shaped	1
	B-2G-10588-2	Pointer	1
	32F4-10830	4-40 x 1/8" screw to mount pointer	1
		MAIN CHASSIS PARTS	
		CONDENSERS	
63A, 63B	B-8C-11629	Electrolytic condenser, dual, 30-30 x 450 volts	1
C21	C-8G-11734	100 mmf, 20%, ceramic	1
C37	C-8F3-229	150 mmf, mica	1
C38	C-8G-13059	1500 mmf, ceramic	1
C34	C-8G-13060	51 mmf, ceramic	1
C20, 23, 24, 30, 31, 43, 44	C-8D-10785	.006 mf x 600 volts, paper	7
C22, C29	C-8D-10761	.01 mf x 400 volts, paper	2
C45, 46	C-8D-10813	.05 mf x 400 volts, paper	2
C55	A-8C-12154	Electrolytic condenser 10 mf x 450 volts	1
C49	C-8D-10789	.002 mf x 600 volts, paper	1
C39, 40	C-8G-13201	1000 mmf, ceramic	2
C41	A-8C-13132	Electrolytic condenser 10 mf x 50 volts	1
C62	C-8J-11321	.02 mf x 600 volts	1
C48	C-8D-10770	.05 mf x 200 volts	1
C50	C-8G-11741	330 mmf, ceramic	1

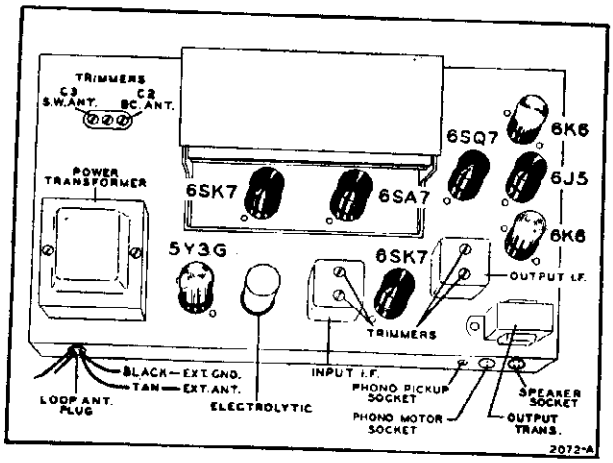
Ref. No.	Part No.	Description	Qty. Used In Set
C42	C-8D-11304	.02 mf x 200 volts	1
C52	C-8D-13439	.25 mf x 400 volts	1
C47, 54	C-8D-10760	.1 mf x 400 volts	2
C35, 36	A-8F-13047	50 mmf, dual mica	1
C32	C-8G-11789	10 mmf, ceramic, 10%	1
C33	C-8G-11891	51 mmf, ceramic, 5%	1
C27, 28	C-8G-13025	150 mmf, ceramic	2
C17, 25, 26	C-8G-12159	30 mmf, ceramic	3
C18, 19	C-8G-12160	91 mmf, ceramic	2
C16	C-8G-13026	51 mmf, ceramic	1
		RESISTORS	
R27	A-10A-13001	Volume control (500K) and switch	1
R31	A-11A-12988	Tone control (500K) and radio-phono switch	1
R32	C-9B1-86	100K ohms, 1/2 watt, 10%	1
R29, 44	C-9B1-94	470K ohms, 1/2 watt, 10%	2
R39, 41	C-9B1-83	56K ohms, 1/2 watt, 10%	2
R33, 34	C-9B1-68	3300 ohms, 1/2 watt, 10%	2
R30	C-9B1-35	4.7 megohms, 1/2 watt, 20%	1
R23, 28	C-9B1-80	33K ohms, 1/2 watt, 10%	2
R20	C-9B1-79	27K ohms, 1/2 watt, 10%	1
R22	C-9B1-78	22K ohms, 1/2 watt, 20%	1
R13, 16	C-9B1-48	68 ohms, 1/2 watt, 10%	2
R14, 17	C-9B2-81	39K ohms, 1 watt, 10%	2
R24, 26, 37	C-9B1-29	470K ohms, 1/2 watt, 20%	3
R25	C-9B1-302	15 megohms, 1/2 watt, 10%	1
R19	C-9B1-23	47K ohms, 1/2 watt, 20%	1
R7	C-9B4-76	15K ohms, 2 watts, 10%	1
R12, 35, 43	C-9B1-31	1 megohm, 1/2 watt, 20%	3
R40	C-9B1-66	2200 ohms, 1/2 watt, 10%	1
R36, 42	C-9B1-200	51K ohms, 1/2 watt, 5%	2
R38	C-9B4-55	270 ohms, 2 watts, 10%	1
R47	C-9B1-71	5600 ohms, 1/2 watt, 10%	1
R18	C-9B1-13	1000 ohms, 1/2 watt, 20%	1
R15, 11	C-9B2-15	2200 ohms, 1 watt, 20%	2
		COILS	
T3	C-13A-13009-1	Input I.F. transformer, combination 455 kc. and 10.7 mc.	1
T4	C-13B-13014-1	Output I.F. transformer, combination 455 kc. and 10.7 mc.	1
T5	C-203-11745-1	Ratio det. coil assembly 10.7 mc.	1
L3	A-16A-13243	Loop loading coil	1
L4	B-14MA-11066-5	Loop antenna, B.C. Band	1
		TRANSFORMERS	
T2	B-12C-13042	Output transformer for speaker	1
	B-12A-13038	Power transformer, primary, 50-60 cycles. 105-125 volts, AC	1
		SPEAKER	
	B-18B-13043	Electrodynamic speaker, 12" less output transformer	1
		MISCELLANEOUS	
	C-30A-13578	Dial scale	1
	B-5B-14153-41	Knob, small, with dot, mahogany	2
	B-5B-13308-41	Knob, large, without dot, mahog.	2
	B-5C-12457-41	Escutcheon, side pieces	2
	107259	Shield for pilot lite	2
	B-14M-11479	A.C. line cord	1
	A-3A-13003	Switch shaft	1
	A-2D-12983	Detent bracket (U shaped on front of set)	1
	A-43D-12934	"U" speed clip	1
	A-55C-12935	Ball bearing	1
	A-2D-13004	Switch activator bracket	1
	B-47A-12458	Pilot lite assembly	1
	A-46A-11739	Pilot lite, 6-8 volts, T-44	2
	A-25G-13448	Rubber chassis mounting cushion	4
	A-15C-10717	7 prong, miniature tube socket	4
	A-15B-10440	8 prong, octal socket	4
	A-19B-12644	Antenna socket	1
	A-7B-13050	FM dipole, 2-screw strip	1
	A-15B-11538	Speaker socket	1
	A-19B-12468	Phono motor socket	1
	A-19B-12170	Phono input socket	1
		RECORD CHANGER	
	B-201-13964	Record changer (C-9) with P-30 cartridge	1
	P-30	Crystal cartridge with needle	1

MONTGOMERY WARD

MODELS 74BR-2703A, 74BR-2708B, 74BR-2708

GENERAL DESCRIPTION

The radio is a 5-band, superheterodyne, AC set using seven tubes plus a rectifier. The five bands, permeability-tuned, include the standard broadcast band and four shortwave spread bands. Six pushbuttons are provided. A loop antenna is built into the cabinet; provision is made also for the connection of an external antenna and ground.



ELECTRICAL SPECIFICATIONS

Power Supply.....105 to 125 volts AC, 60 cycles; 95 watts. Chassis only. 125 watt with phono operation.

Frequency Ranges....Broadcast band—540 to 1600 kc.
49-meter band—5.96 to 6.19 mc.
31-meter band—9.1 to 10 mc.
25-meter band—11.45 to 12.16 mc.
19-meter band—14.94 to 15.46 mc.

Intermediate Freq...455 kc.

Selectivity.....at 1000 kc, 35 kc at 1000 x signal

Sensitivity.....3.75 microvolts average for ½ watt output.

Power Output.....5.5 watts undistorted, 7.5 watts maximum.

Loud Speaker.....12" electrodynamic. Voice coil impedance 3.2 ohms.

Tube and Lamp Complement.....6SK7, tuned R. F. amplifier.
6SA7, converter.
6SK7, I. F. amplifier.
6SQ7, detector, AVC, 1st audio.
6J5GT, phase inverter.
6K6GT, push-pull output.
6K6GT, push-pull output.
5Y3G, rectifier.
T-44 dial lamp (2 used).

RECEIVER STAGE SENSITIVITIES

The table below lists the sensitivities at the inputs of various stages. All measurements are based on an output of ½ watt. This may be measured by disconnecting the speaker voice coil and substituting a 3.2-ohm resistor across the secondary winding of the output transformer. A reading of 1.3 volts AC across this resistor will be approximately equivalent to a ½-watt output with the speaker connected. The volume control must be set at maximum.

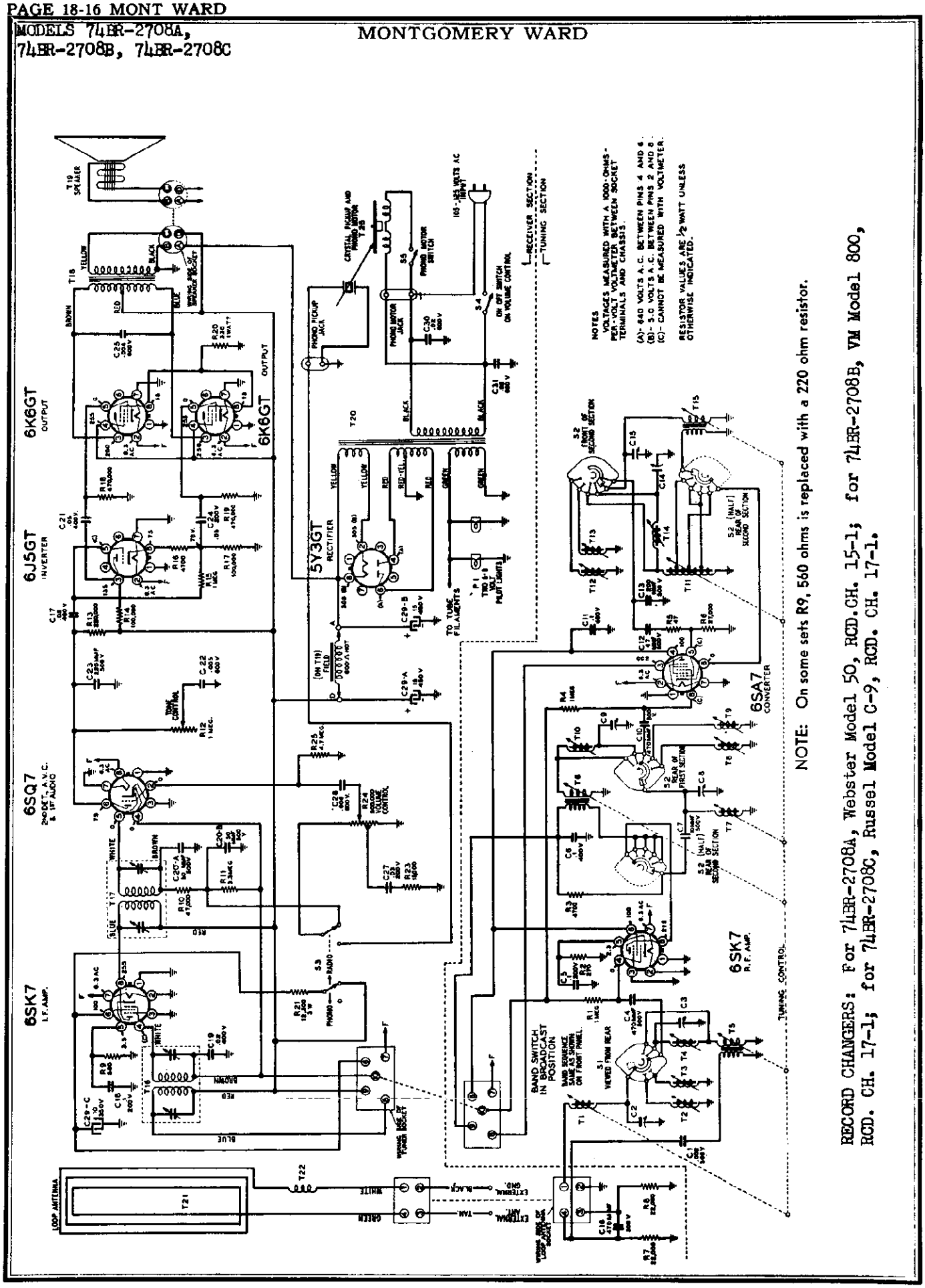
The signal source must be an accurately calibrated signal generator capable of supplying the frequencies designated, modulated 30% with a 400-cycle audio signal. Variations in sensitivities of plus or minus 25% are usually permissible.

BAND	SIGNAL GENERATOR				INPUT FOR 500-MILLIWATT OUTPUT
	Frequency	Dummy Antenna	Connection to Receiver	Ground Connection	
Broadcast	1000 kc	200 mmf	External Antenna clip	Chassis	3.5 microvolts
	1000 kc	.1 mf	Grid (pin 4) of R. F. amp. (6SK7)	Chassis	8.9 microvolts
	1000 kc	.1 mf	Grid (pin 8) of Converter (6SA7)	Chassis	125 microvolts
	455 kc	.1 mf	Grid (pin 8) of Converter (6SA7)	Chassis	100 microvolts
	455 kc	.1 mf	Grid (pin 4) of I. F. amp. (6SK7)	Chassis	4500 microvolts
	400 cycles	.1 mf	Grid (pin 2) of Audio amp. (6SQ7)	Chassis	.1 volt
	400 cycles	.1 mf	Grid (pin 5) of Inverter (6J5GT)	Chassis	4.8 volts
31 meter*	9.6 mc	400 ohms	External Antenna clip	Chassis	1.6 microvolts
49 meter*	6.1 mc	400 ohms	External Antenna clip	Chassis	3.0 microvolts
25 meter*	11.8 mc	400 ohms	External Antenna clip	Chassis	5.0 microvolts
19 meter*	15.2 mc	400 ohms	External Antenna clip	Chassis	9.0 microvolts

*Average sensitivity on short-wave bands at grid (pin 4) of R. F. amplifier is 8.5 microvolts.

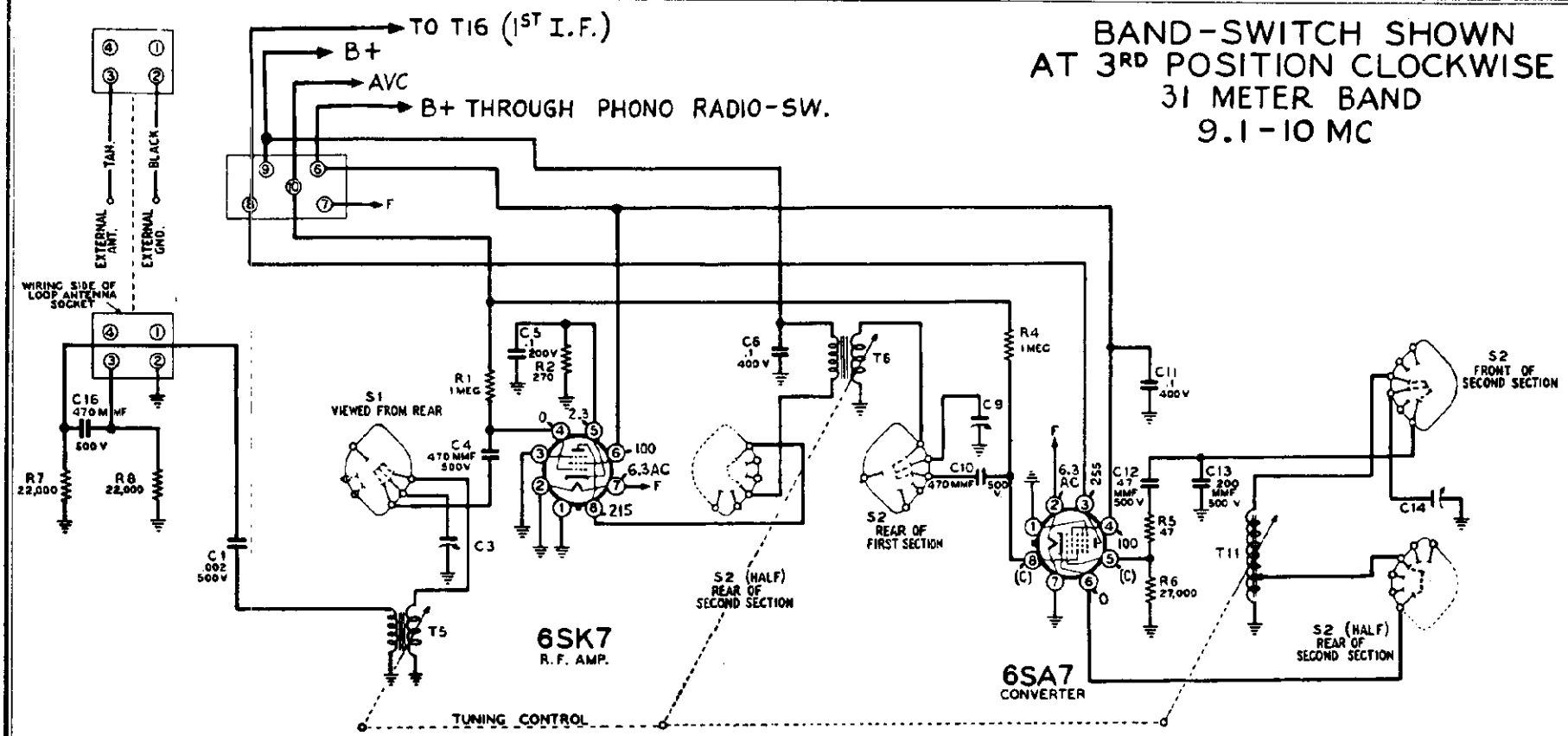
MODELS 74ER-2708A,
74ER-2708B, 74ER-2708C

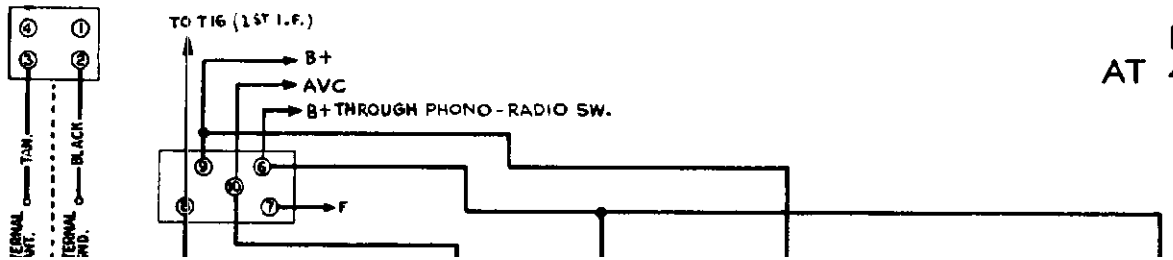
MONTGOMERY WARD

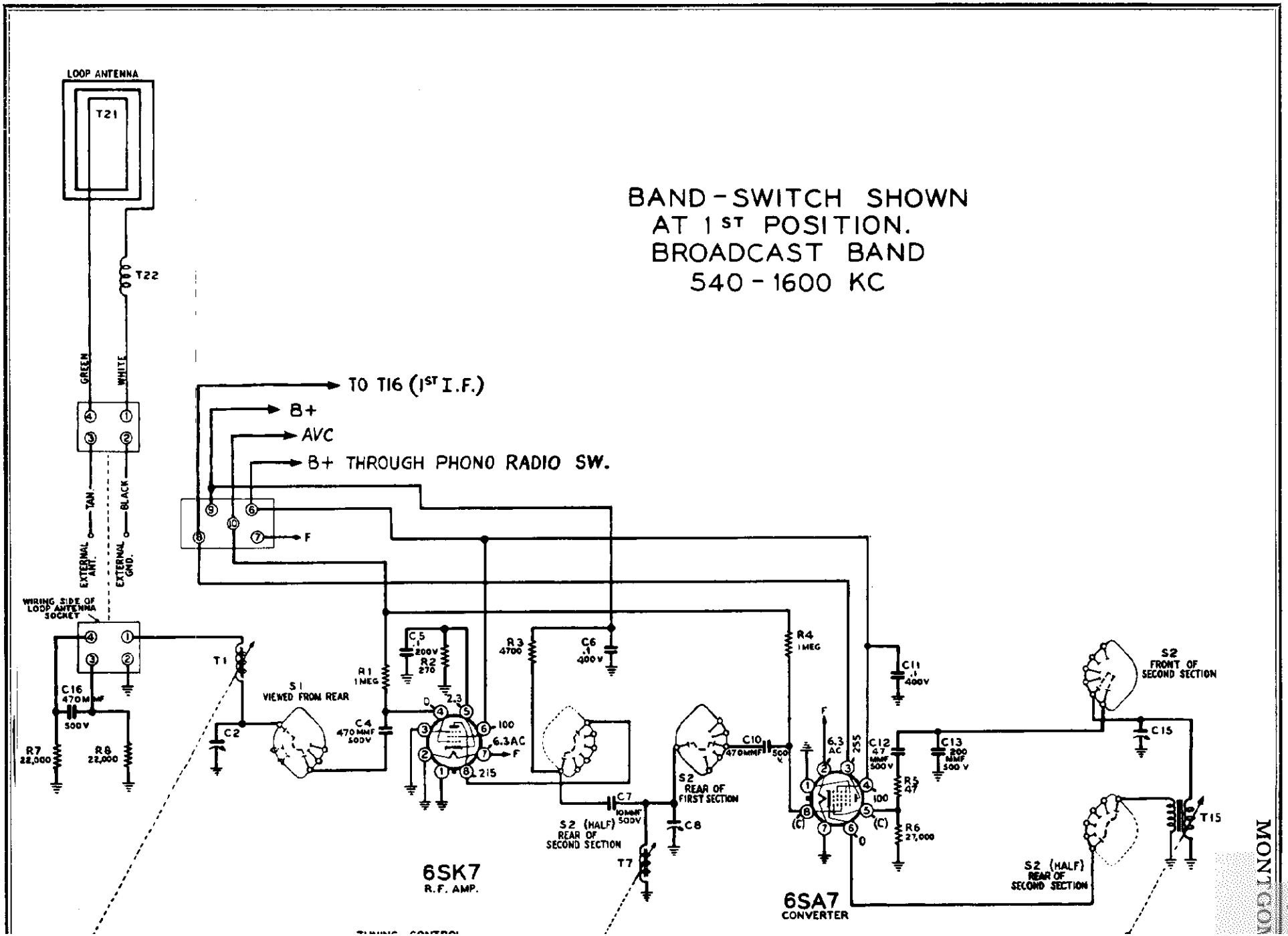


NOTE: On some sets R9, 560 ohms is replaced with a 220 ohm resistor.

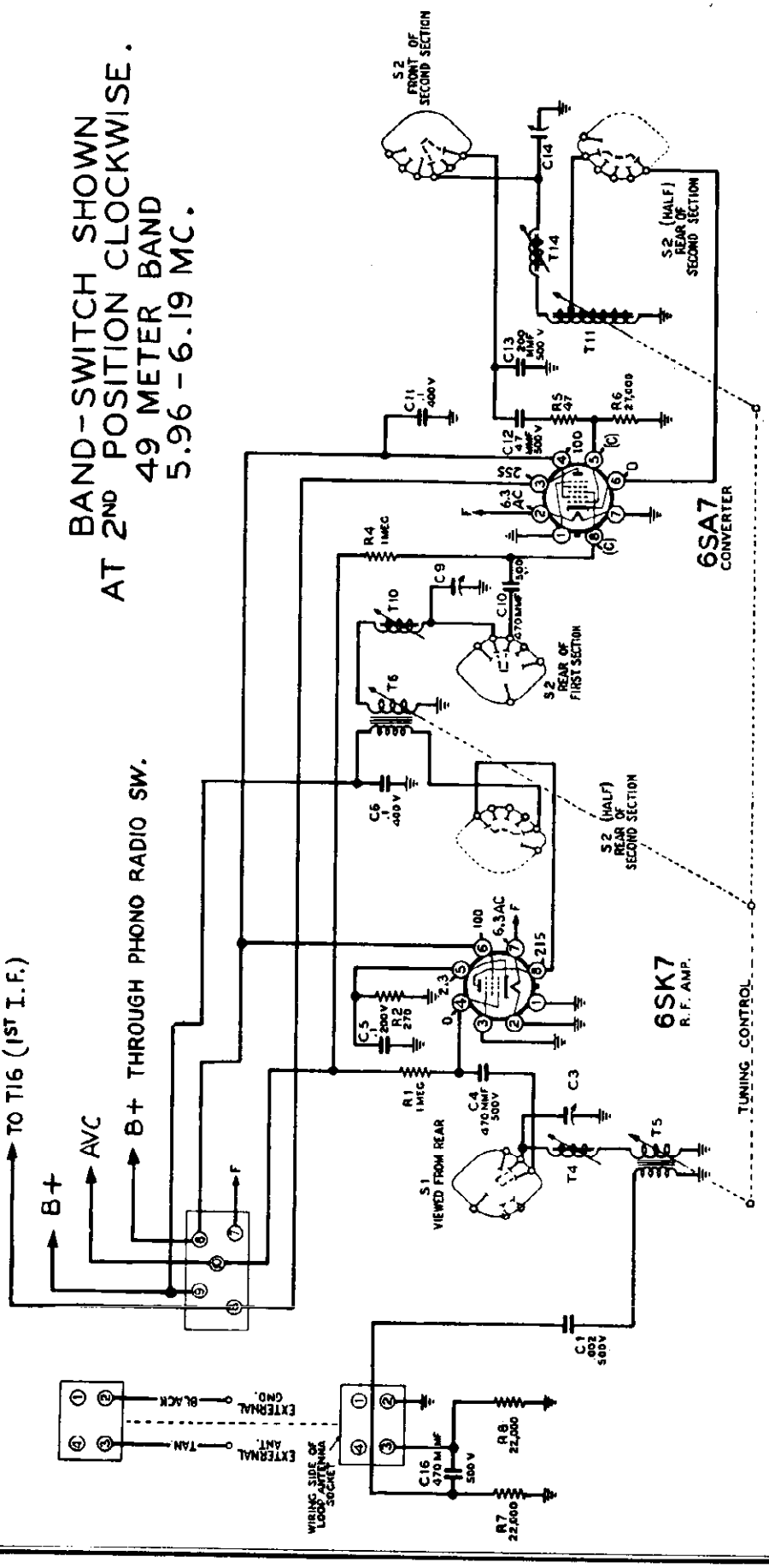
RECORD CHANGERS: For 74ER-2708A, Webster Model 50, RCD.CH. 15-1; for 74ER-2708B, VM Model 800, RCD. CH. 17-1; for 74ER-2708C, Russel Model C-9, RCD. CH. 17-1.

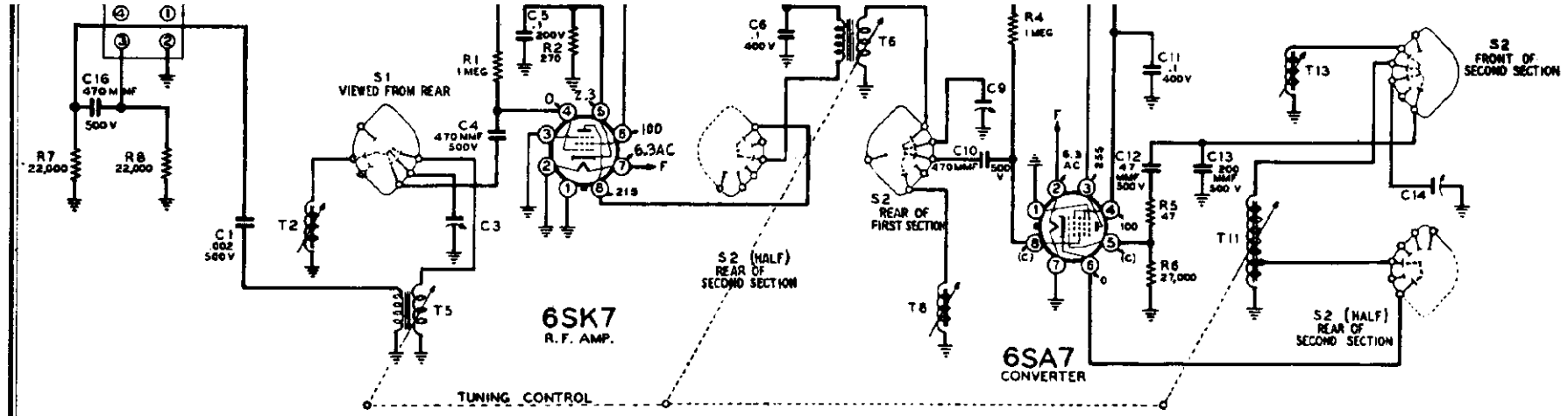

TO T16 (1ST I.F.)
B+
AVC
B+ THROUGH PHONO RADIO-SW.
F
BAND-SWITCH SHOWN
AT 3RD POSITION CLOCKWISE
31 METER BAND
9.1-10 MC
EXTERNAL ANT.
EXTERNAL GND.
TAN
BLACK
WIRING SIDE OF LOOP ANTENNA SOCKET
C16 470 MMF 500 V
R7 22,000
R8 22,000
C1 .002 500 V
S1 VIEWED FROM REAR
R1 1 MEG
C5 .1 200 V
R2 270
C4 470 MMF 500 V
C3
T5
6SK7
R.F. AMP.
C6 .1 400 V
T6
S2 (HALF) REAR OF SECOND SECTION
S2 REAR OF FIRST SECTION
R4 1 MEG
C9
C10 470 MMF 500 V
6SA7
CONVERTER
C11 .1 400 V
C12 47 MMF 500 V
C13 200 MMF 500 V
R5 47
R6 27,000
T11
S2 FRONT OF SECOND SECTION
C14
S2 (HALF) REAR OF SECOND SECTION
TUNING CONTROL

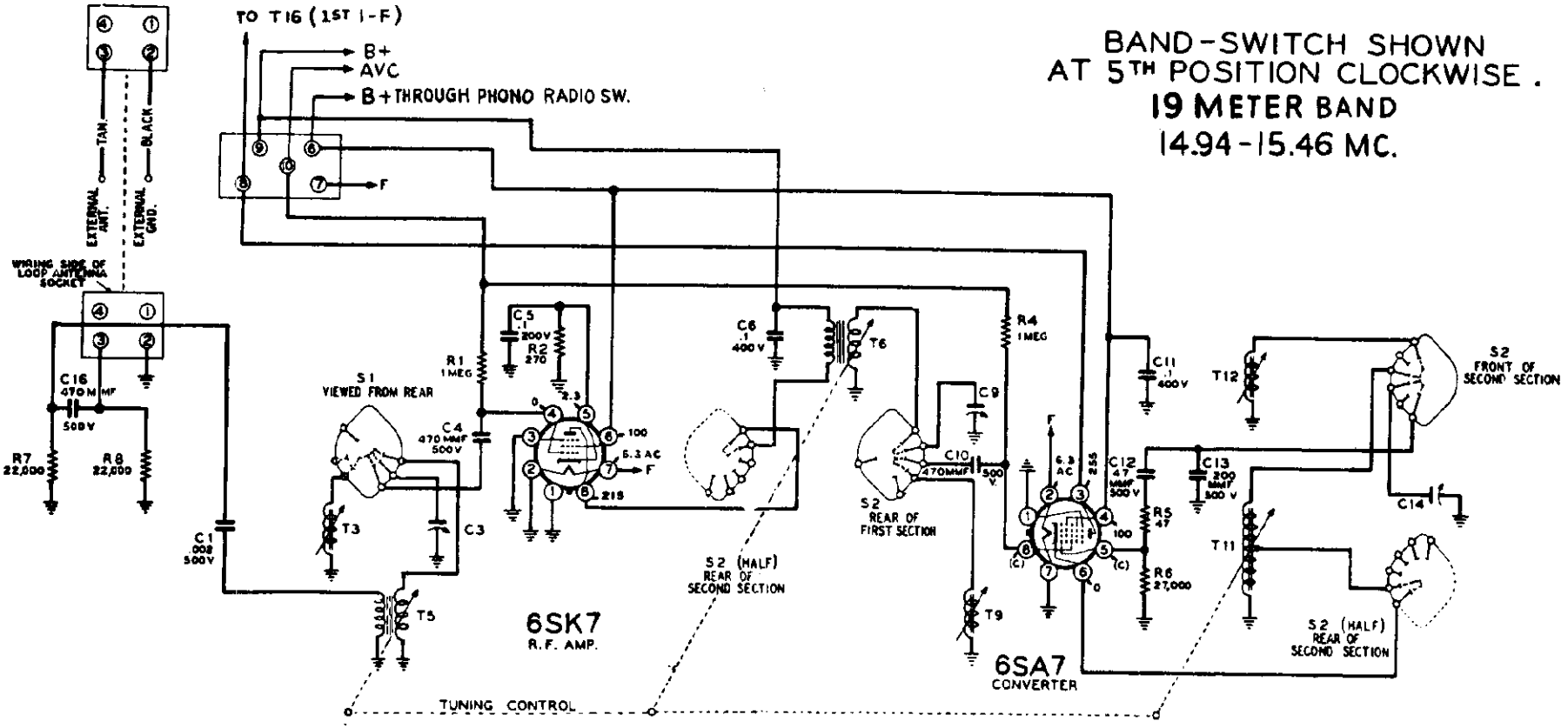

TO T16 (1ST I.F.)
B+
AVC
B+ THROUGH PHONO-RADIO SW.
F
BAND-SWITCH SHOWN
AT 4TH POSITION CLOCKWISE.
25 METER BAND
11.45-12.16 MC.


LOOP ANTENNA
T21
T22
GREEN
WHITE
TAN
BLACK
EXTERNAL ANT.
EXTERNAL GND.
WIRING SIDE OF LOOP ANTENNA SOCKET
BAND-SWITCH SHOWN AT 1ST POSITION. BROADCAST BAND 540-1600 KC
TO T16 (1ST I.F.)
B+
AVC
B+ THROUGH PHONO RADIO SW.
F
T1
S1 VIEWED FROM REAR
C16 470 MMF 500V
R7 22,000
R8 22,000
C2
R1 1MEG
C4 470 MMF 500V
C5 .1 200V
R2 270
R3 4700
C6 .1 400V
R4 1MEG
C11 .1 400V
S2 FRONT OF SECOND SECTION
C15
C10 470MMF 500V
C12 47 MMF 500V
C13 200 MMF 500V
R5 47
R6 27,000
S2 REAR OF FIRST SECTION
C7 10MMF 500V
C8
S2 (HALF) REAR OF SECOND SECTION
T7
T15
S2 (HALF) REAR OF SECOND SECTION
6SK7
R.F. AMP.
6SA7
CONVERTER
6.3AC
100
215
255

MODELS 74BR-2708A, 74BR-2708B, 74BR-2708C







MONTGOMERY WARD

MODELS 74BR-2708A, 74BR-2708B, 74BR-2708

ALIGNMENT PROCEDURE

MECHANICAL ADJUSTMENT—The core tuning bar (see illustration of coils below) and dial pointer must be adjusted mechanically before any electrical alignment is attempted. Rotate the manual tuning control until the core bar is farthest from the coils. For proper adjustment the bar should be approximately 1/32 of an inch from the two rod guide angles.

With the core bar in this position, adjust the dial pointer to coincide with 1600 kc on the dial scale (see pointer alignment diagram below).

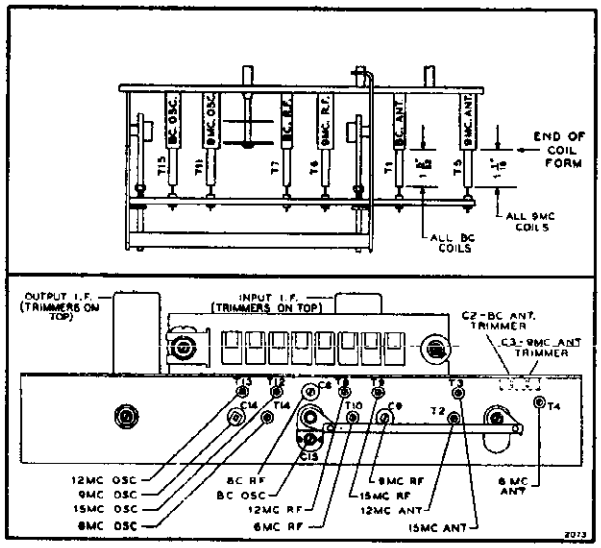
Rotate the core of each of the three broadcast coils (see illustration) until the end of the core is 1-5/32" from the end of the coil form. Rotate the three 9-mc cores until this dimension is 1-1/6" for these coils. After these adjustments have been made, the unit can be aligned electrically.

ELECTRICAL ADJUSTMENT—To align the set make the following preliminary adjustments: Set the tone control for treble tone; set the volume control at maximum; connect the ground post of the signal generator to the radio chassis; connect the output meter across a 3.2-ohm output load; and allow the receiver and signal generator to warm up for several minutes.

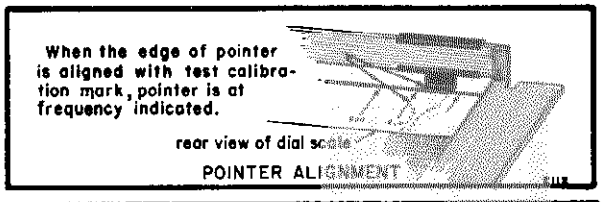
Align the set according to the sequence given in the chart. The indicated coupling capacitor is to be connected in series between the signal generator output lead and the receiver. Adjust the set for maximum output; reduce the input as needed to keep the output near 1.3 volts.

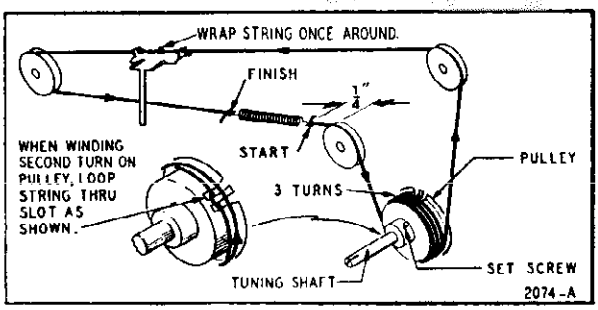
Locations of all the trimmers and coils are shown in the illustrations below. After adjustment, seal the coil cores with collodion or a similar substance (do not use cement).

BAND SWITCH SETTING	SIGNAL GENERATOR			DIAL POINTER SETTING	ADJUST TO MAXIMUM OUTPUT IN ORDER SHOWN
	Frequency	Coupling Capacitor	Connection to Receiver		
Broadcast (for I. F.)	455 kc	.1 mf	Grid (pin 8) of converter (6SA7)	1600 kc	Trimmers on output and input I. F. cans
Broadcast	1600 kc	200 mmf	Antenna lead	1600 kc	BC Osc. trimmer C15 BC R. F. trimmer C8 BC Ant. trimmer C2
	1400 kc	200 mmf	Antenna lead	1400 kc	Rotate cores of BC R. F. coil T7 and BC Ant. coil T1
31 Meter	9.6 mc	400 ohms	Antenna lead	9.6 mc	9 mc Osc. trimmer C14 9 mc R. F. trimmer C9 9 mc Ant. trimmer C3
49 Meter	6.1 mc	400 ohms	Antenna lead	6.1 mc	6 mc Osc. coil T14 6 mc R. F. coil T10 6 mc Ant. coil T4
25 Meter	11.8 mc	400 ohms	Antenna lead	11.8 mc	12 mc Osc. coil T13 12 mc R. F. coil T8 12 mc Ant. coil T2
19 Meter	15.2 mc	400 ohms	Antenna lead	15.2 mc	15 mc Osc. coil T12 15 mc R. F. coil T9 15 mc Ant. coil T3



View of Trimmers and Tuning Coils





Replacing Dial Pointer Drive Cord

After stringing, spring must be 1/4" from idler when tuning shaft is in extreme counterclockwise position. To do this: Loosen set screw; hold tuning shaft firm and turn pulley by hand until spring is 1/4" from idler; tighten screw.

Ref. No.	Part No.	Description	Qty. Used In Set

REMOVABLE TUNER ASSEMBLY

CAPACITORS*

C1	BEB-8F-10767	.002 mf, 500 volts, 10%, mica	1
C2, C3	BE-124143	Dual, broadcast (67-123 mmf) and 9 mc (95-175 mmf) ant. trimmers	1
C4, C10	BEB-8F3-121	470 mmf, 500 volts, 10%, mica	2
C5	BEC-8D-10771	.1 mf, 200 volts, +20%—10%	1
C6, C11	BEC-8D-10760	.1 mf, 400 volts, +20%—10%	2
C7	BEB-8F5-101	10 mmf, 500 volts, 10%, silver mica	1
C8	BEA-8G-7205	Broadcast RF trimmer (120-220 mmf)	1
C9	BEA-8G-7206	9 mc RF trimmer (60-110 mmf)	1
C12	BEB-8F3-109	47 mmf, 500 volts, 10%, mica	1
C13	BEB-8F-10763	220 mmf, 500 volts, 3%, silver mica	1
C14	BE-124145	9 mc oscillator trimmer (7-35 mmf)	1
C15	BE-124144	Broadcast oscillator trimmer (15-27 mmf)	1

RESISTORS*

R1, R4	BEC-9B1-31	1 megohm ½ watt, 20%	2
R2	BEC-9B1-55	270 ohms, ½ watt, 10%	1
R3	BEC-9B1-70	4700 ohms, ½ watt, 10%	1
R5	BEC-9B1-46	47 ohms, ½ watt, 10%	1
R6	BEC-9B1-79	27,000 ohms, ½ watt, 10%	1
R12	BEC-9B1-22	33,000 ohms, ½ watt, 20%	1

COILS (complete with cores)

T1	BE-111195	Broadcast antenna coil	1
T2	BE-111191	12 mc antenna coil	1
T3	BE-111192	15 mc antenna coil	1
T4	BE-111189	6 mc antenna coil	1
T5	BE-111190	9 mc antenna coil	1
T6	BE-10959	9 mc RF coil	1
T7	BE-10962	Broadcast RF coil	1
T8	BE-10960	12 mc RF coil	1
T9	BE-10961	15 mc RF coil	1
T10	BE-10958	6 mc RF coil	1
T11	BE-110157	9 mc oscillator coil	1
T12	BE-110159	15 mc oscillator coil	1
T13	BE-110158	12 mc oscillator coil	1
T14	BE-110156	6 mc oscillator coil	1
T15	BE-110161	Broadcast oscillator coil	1

MISCELLANEOUS

S1	BEB-20A-10964	Band switch, antenna	1
S2	BEB-20A-10965	Band switch, oscillator and RF	1
	BE-121210	Socket, octal, molded (6SA7)	1
	BE-121171	Socket, laminated (6SK7GT)	1
	BE-117907	Tuning shaft	1
	BE-117798	Pinion gear on tuning shaft	1
	BE-120393	Spring, intermediate link, under ends of treadle bar	2
	BE-131251	Washer, "C" on slug tuning bar	4
	BEB-2C-7246	Gear segment	1
	BEA-2J-7439	Spring clip, for coils	9
	BE-131368	Washer "C", for 9 mc coils	3
	BE-134134	Grommet for core mounting (all broadcast and 9 mc coils)	6
	BE-134126	Grommet for coil mounting (broadcast RF and antenna coils)	2
	BE-134125	Grommet for coil mounting (broadcast oscillator coil)	1
	BEA-25A-7619	Grommet for all 9 mc coils	3
	BEB-202-10475	Pushrod assembly, station selectors	6
	BE-120366	Spring, pushrod return	6
	BEA-2J-7176	Cam-locking spring on pushrod assembly	6
	BEA-2J-7627-1	Retainer spring on pushrod assy.	6
	BE-121281	Plug, 5-prong	1
	BE-128-759-37	Pushbutton	6
	BE-131210	Washer, "C", on end plate	2
	BE-112801	Drive pulley	1

*The values of the resistors and mica capacitors listed above (except C13) are based on RMA standards. Due to conditions beyond our control some sets have been shipped with components of pre-standardized values. This set will operate equally well with components of either group. An illustration of the differences in both resistors and capacitors follows:

Pre-standardized value—50,000 ohms, ⅓ watt, 10%
RMA value—47,000 ohms, ½ watt, 10%
Pre-standardized value—200 mmf, 500 volts, 20%
RMA value—220 mmf, 500 volts, 20%

MAIN CHASSIS

CAPACITORS*

C16	BEC-8F3-12	470 mmf, 20%, mica	1
C17, C19	BEC-8D-10774	.02 mf, 400 volts, 20%	2
C18	BEC-8D-10771	.1 mf, 200 volts, +20%—10%	1
C20-A, C20-B	BE-129165B	Dual, 50 mmf each section, mica 20%	1
C21	BEC-8D-10813	.05 mf, 400 volts, 20%	1
C23	BEC-8F3-10	220 mmf, 20%, mica	1
C22	BEC-8D-10935	.005 mfd x 600 v. +40—15%	1
C24	BEC-8D-10770	.05 mf, 200 volts, 20%	1
C25	BEC-8D-10788	.004 mf, 600 volts, 20%	1
C27	BEC-8D-10992	.03 mf, 200 volts, 20%	1
C28	BEC-8D-10785	.006 mf, 600 volts, 20%	1
C29-A, -B, -C	8E-119109	Electrolytic, 15 x 450 volts, 15 mf x 450 volts, 10 mf x 350 volts	1
C30, C31	BEC-8J-11321	.02 mf, 600 volts, 20%	2

RESISTORS*

R7, R8	BEC-9B1-21	22,000 ohms, ½ watt, 20%	2
R9	BEC-9B1-59	560 ohms, ½ watt, 10%	1
R10	BEC-9B1-23	47,000 ohms, ½ watt, 20%	1
R11	BEC-9B1-34	3.3 megohms, ½ watt, 20%	1
R13	BEC-9B1-27	220,000 ohms, ½ watt, 20%	1
R14, R17	BEC-9B1-86	100,000 ohms, ½ watt, 10%	2
R15	BEC-9B1-31	1 megohm, ½ watt, 20%	1
R16	BEC-9B1-70	4700 ohms, ½ watt, 10%	1
R18, R19	BEC-9B1-29	470,000 ohms, ½ watt, 20%	2
R20	BEC-9B2-56	330 ohms, 1 watt, 10%	1
R21	BE-10662	12,500 ohms, 3 watts, 10%	1
R23	BEC-9B1-20	15,000 ohms, ½ watt, 20%	1
R24, S4	BEA-10A-10586	Volume control (500,00 ohms) and on-off switch	1
R25	BEC-9B1-35	4.7 megohms, ½ watt, 20%	1
R12, S3	BE-125180	Tone control (1 megohm) and radio-phono switch	1

COILS AND TRANSFORMERS

T16	BE-108177	Input IF coil complete in can Range of trimmers: 110-210 mmf)	1
T17	BE-108176	Output IF coil complete in can (Range of trimmers: 80-140 mmf)	1
T18	BEB-12C-10234	Output transformer	1
T20	BE-104202B	Power transformer, for 50-60 cycles	1

SOCKETS

	BE-121200	Socket, 4-terminal, for loop ant	1
	BE-121279	Socket, 5-terminal, for tuner	1
	BEA-15B-11538	Socket, 4-terminal, for speaker	1
	BE-121199	Socket, 2-terminal, for phono motor	1
	BE-121210	Socket, octal, molded (all tubes except 6SK7, IF amp.)	5
	BE-121273	Socket, octal, laminated (for 6SK7, IF amplifier)	1
	BE-121280	Socket, 1-terminal, for phono pickup	1
	BEB-47A-10808	Socket assembly, for dial light	1

MISCELLANEOUS

T19	BEB-18B-10616	Speaker, 12" electrodynamic	1
	BEA-19A-11539	Plug on speaker leads	1
T21	BEA-14MA-11066-5	Loop antenna (ribbon only)	1 ft.
T22	BEA-16A-11113	Choke on loop terminal board	1
	BEA-19A-11322	Plug on loop antenna leads	1
	BE-107401	Phono motor cable assembly	1
P1	BE-10724	Plug on phono pickup leads	1
	BE-112-1001	Dial scale	1
	BE-10794	Dial light, 6-8 volts, type 44	2
	BEB-2G-10588-1	Dial pointer	1
	BEB-53A-10989	String for dial pointer	32" yd.
	BE-120377	Tension spring for dial pointer string	1
	BE-112985D-37	Escutcheon	1
	BEB-5B-13320-37	Knob, band switch or radio-phono	2
	BEB-5D-13307-37	Knob, tuning and volume	2
	BE-107266	Line cord and plug	1
	BEA-2L-11293	Band switch link	1
	BE-112961	Station call letters	1 set
	BE-112-1017-37	Clips, for escutcheon	2

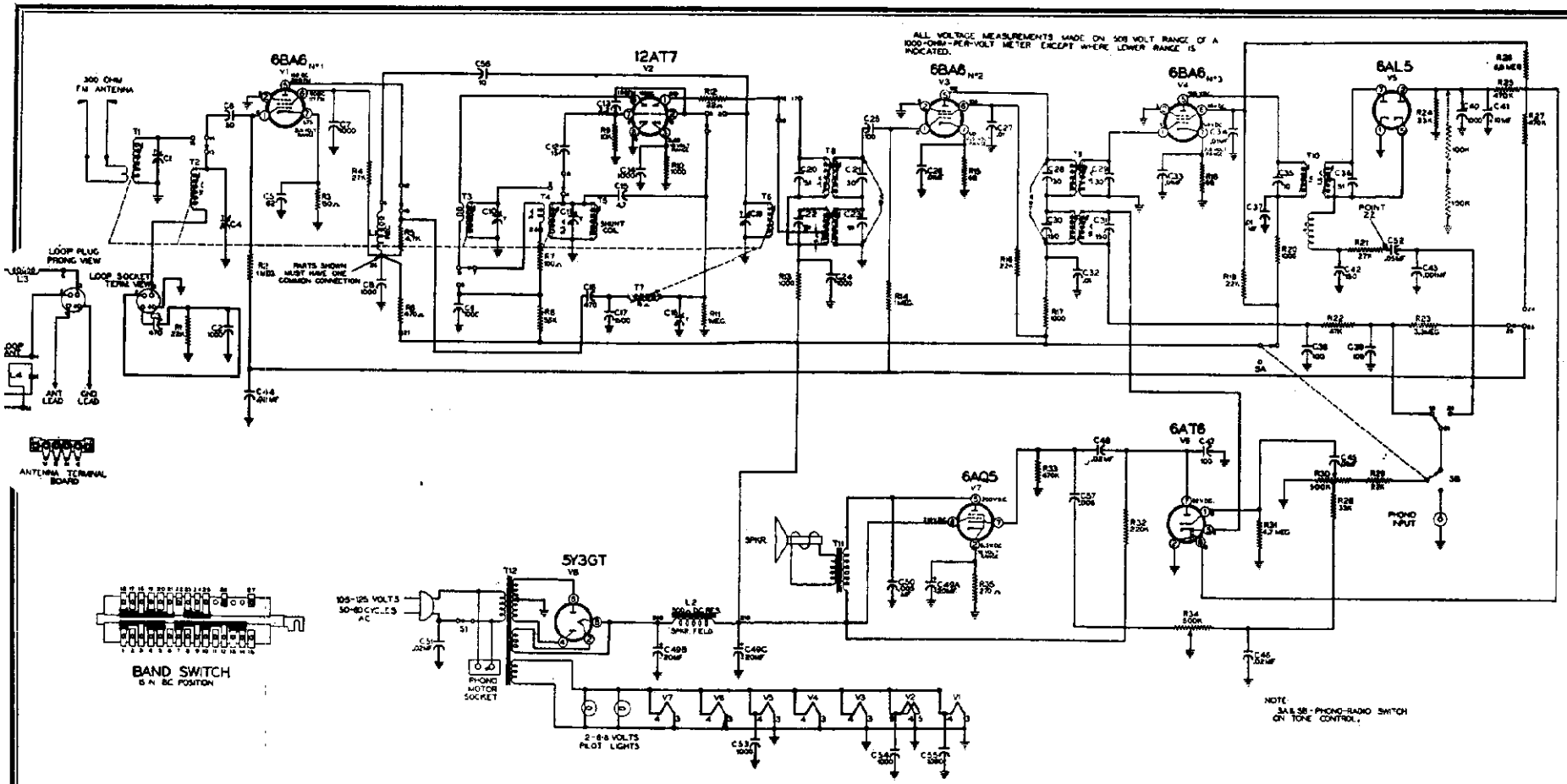
RECORD CHANGER PARTS

MODELS 74BR-2708A, B

	Nylon I-J crystal cartridge with needle	1
	Nylon needle only for above	1

MODEL 74BR-2708C

B-201-13304-1	C-9 Changer	1
P30	Crystal cartridge with special needle	1



NOTES: The two 100K ohm resistors in series from Pin No. 2 to ground are connected as shown only when aligning the FM I.F. Refer to FM I.F. alignment procedure

On some sets R12, 22 ohms, C-9B1-42 is replaced with C-9B1-45, a 39 ohm resistor.

On some sets C24, 40, 53 Part No. C-8G-13016 (uninsulated type) is replaced with an insulated type, same value, Part No. C-8G-13201.

On some sets C26 is .05 — 200 volts.

When T10 is Part No. B-13M-15475 which is tuned top and bottom, condenser C42 is 100 mmfd instead of 150 mmfd.

When T10 is Part No. B-13M-15475 which is top and bottom tuned, C34 and R19 are connected to the junction between C35 and C37.

Assembly number B-201-15176 is the 148 Changer with a P-30 cartridge as shown in the radio service manual and radio owner's guide. The needle information is correct.

On some sets, assembly number B-201-15173 is the 148 Changer with an Astatic LT crystal cartridge. This cartridge and needle is different than the P-30 above and when requiring a new needle, it should be specified for use with an LT cartridge.

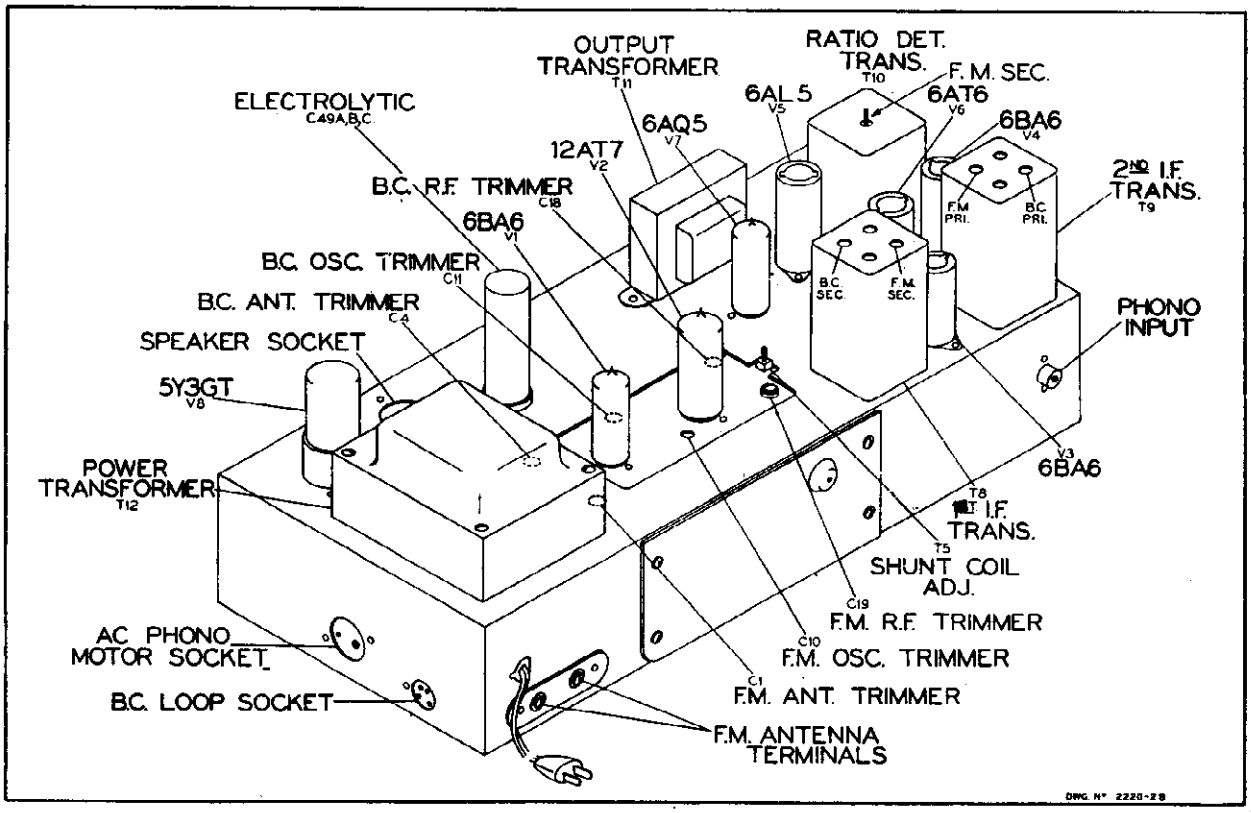
RECORD CHANGERS: For 74BR-2715A and 84BR-2715A, VM Model 800, RCD.CH. 17-1. For 84BR-2715B, Webster Model 148, RCD. CH. 18-1

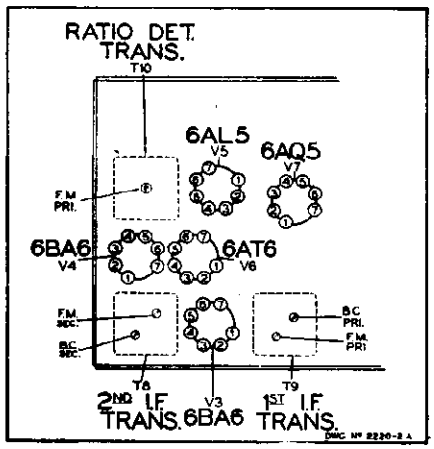
MODELS 74BR-2715A,
84BR-2715A, 84BR-2715B

MONTGOMERY WARD

SPECIAL ALIGNMENT INFORMATION

Read this before attempting any alignment.





ELECTRICAL SPECIFICATIONS

Power Supply	105 to 125 volts, AC, 60-cycles; Chassis only 75 watts. With phono operation 100 watts.
Frequency Ranges	Broadcast Band—535 to 1620 kc. FM Band— 88 to 108 mc.
Intermediate Freq.	AM-455 kc.; FM-10.7 mc.
Selectivity	AM-42 kc. broad at 1000 times signal, measured at 1000 kc.
	I.F. FM-200 kc. broad at 2 times down.
	I.F. FM-400 kc. broad at 10 times down.

This model radio is made with two groups of I. F. coil assemblies.

One group has T8 and T9 with iron cores which are slotted to accommodate the alignment tool and T10 with trimmers on top and bottom. The two views shown here should be used when aligning this type. The part numbers of these I. F.'s are as follows:

T 8	B-13A-15473	INPUT I. F.
T 9	B-13B-15474	SECOND I. F.
T10	B-13M-15475	RATIO DET. (top and bottom tuned)

The other group of I. F.'s has iron cores which have molded into them threaded screws which are slotted for the alignment tool.

The two views for the alignment of this type of I. F. are shown elsewhere in this manual. The part numbers of these I. F.'s are:

T 8	C-13A-13009	INPUT I. F.
T 9	C-13B-13014	SECOND I. F.
T10	C-203-11745-1	RATIO DET. (bottom tuned)

AM Sensitivity	(For .5 watt output with external antenna)—5 microvolts average.
FM Sensitivity	(For .5 watt output)—25 microvolts average.
Power Output	2 watts, 10% distortion. 4 watts maximum.
Loud Speaker	12" electrodynamic. Voice coil impedance 3.2 ohms, 400 cycles.

MONTGOMERY WARD

MODELS 74BR-2715A
84BR-2715A, 84BR-

ALIGNMENT PROCEDURE

Broadcast Band Section I.F. and R.F.

The alignment procedure below includes the sensitivities at the inputs of various stages. All signal input values are based on an output of ½ watt. This may be measured by disconnecting the speaker voice coil and substituting a 3.2-ohm resistor across the secondary winding of the output transformer. A reading of 1.3 volts AC across this resistor will be approximately equivalent to a ½-watt output with the speaker connected. The volume control must be set at maximum. The tone control must be set for imum treble.

The signal source must be an accurately calibrated signal g rator capable of supplying the frequencies designated, modul 30% with a 400-cycle audio signal. A 400 cycle audio signa required for the audio measurement. Variations in sensitivitie plus or minus 25% are usually permissible.

AM - I. F. ALIGNMENT

Band Switch in AM Position. Tune Set to 1400 Kc. Dummy Antenna .1 Mfd.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	ADJUSTMENTS TO BE MADE	ADJUST FOR
455 Kc. Use 2400 microvolts	Pin No. 1 of 6BA6 No. 2 and ground	Primary and Secondary of T9 AM windings. See top and bottom views	Maximum output Should be ½ watt
455 Kc. Use 70 microvolts	Pin No. 2 of 12AT7 and ground	Primary and Secondary of T8 AM windings. See top and bottom views	Maximum output Should be ½ watt
400 cycles. Use 60 millivolts	Hot end of volume control and ground	None	Maximum output Should be ½ watt

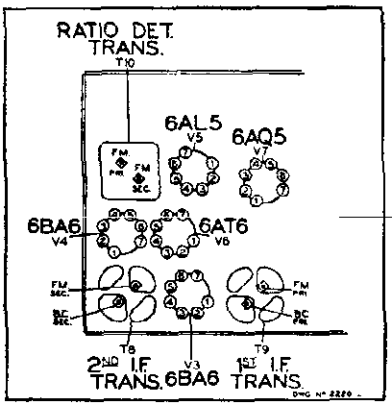
BROADCAST BAND - R. F. ALIGNMENT

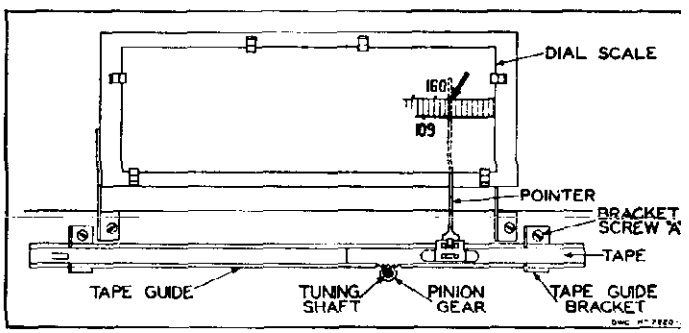
Check pointer so that it coincides with the marker to the extreme right when iron cores are all the way out. For adjustment, see dial mechanism illustration.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	DUMMY ANTENNA	ADJUST
1620 Kc.	AM Antenna and Ground	200 mmf.	C11 Osc. trimmer for maximum
535 Kc.	AM Antenna and Ground	200 mmf.	T5 for maximum ½ watt
1620 Kc. Use 5 microvolts	AM Antenna and Ground	200 mmf.	C4 and C18 for max. ½ watt. See note

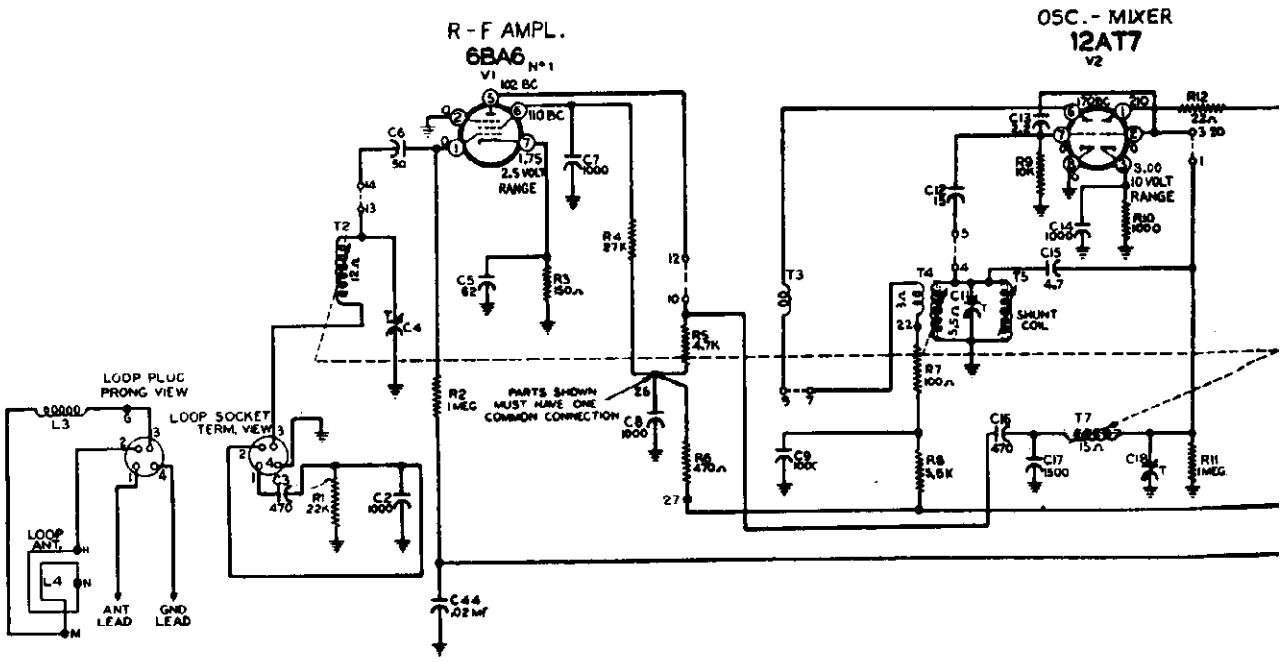
NOTE: Racheck first two adjustments after this adjustment because of inter-locking effects.

Procedure for disassembly and assembly of dial mechanism.

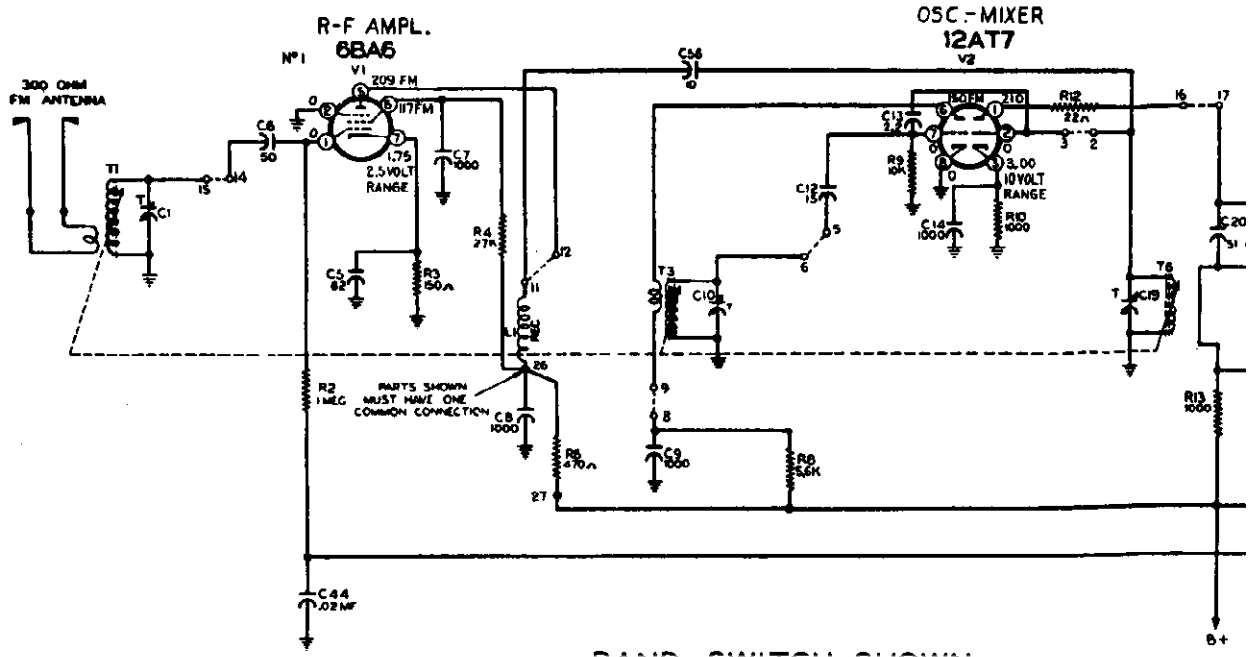




TO ALIGN POINTER— Loosen bracket screw "A". Then tape guide bracket be moved up to allow proper meshing of tape teeth with pinion gear. Read bracket to eliminate backlash.



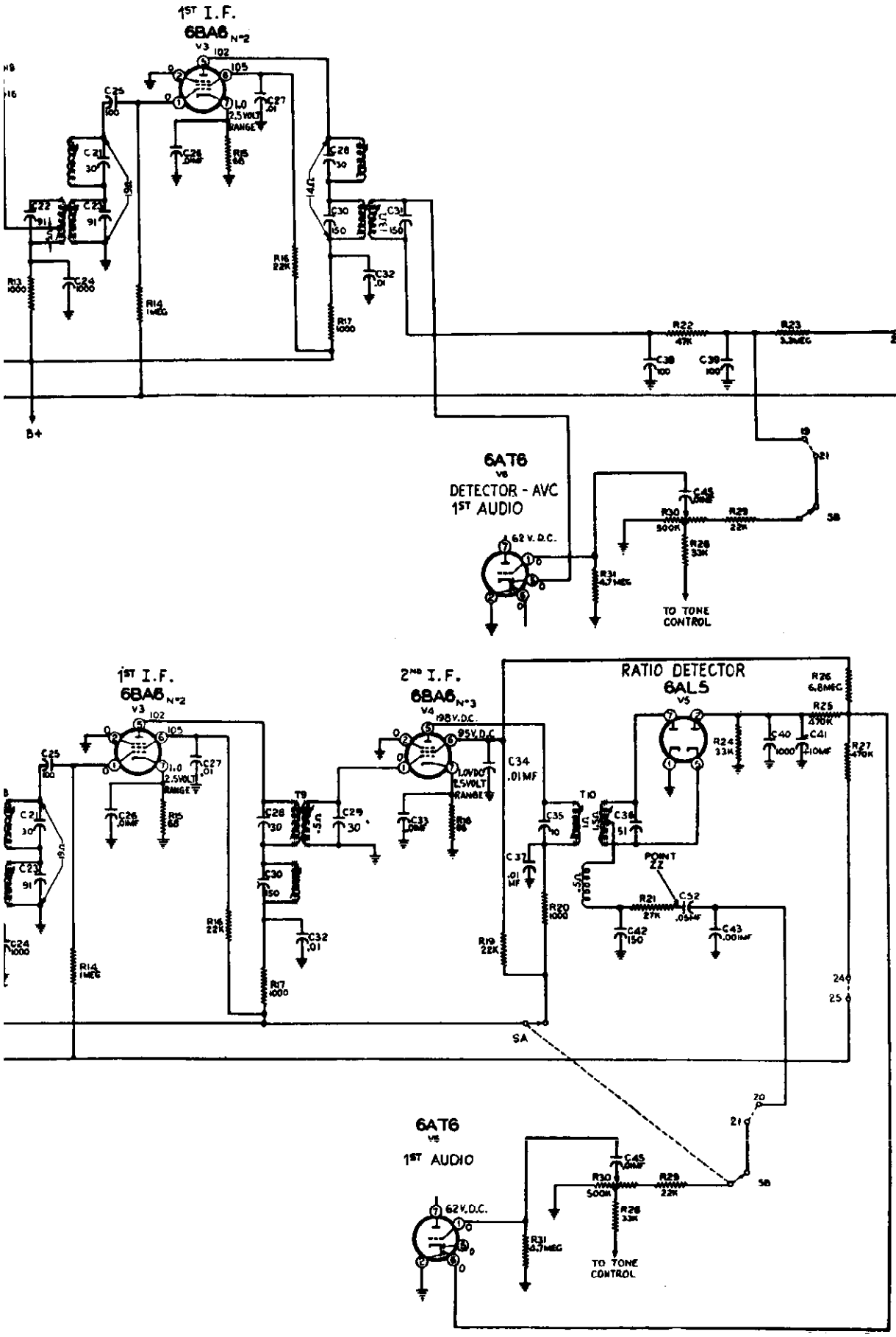
BAND - SWITCH SHOWN
AT 1 ST POSITION.
BROADCAST BAND
535 - 1620 KC.



BAND - SWITCH SHOWN
AT 2ND POSITION CLOCKWISE .
F-M BAND
88 - 108 MC

ERY WARD

MODELS 74BR-2715A, 84BR-2715A, 84BR-2715B



MODELS 74BR-2715A, 84BR-2715A, 84BR-2715B

MONTGOMERY WARD

ALIGNMENT PROCEDURE

FM Band Section. I.F. and R.F.

A non-metallic alignment tool must be used.

IMPORTANT

No alignment of the FM section of this radio should be attempted unless you are positive that the circuits are in need of adjustment and you have the necessary equipment.

All components used in this radio are extremely stable and the tuned circuits should require no adjustment over long periods of time.

NOTE

The following alignment is based on the use of the new Simpson vacuum tube volt-meter which has a "floating ground". In other words, the meter, when used as a vacuum tube volt-meter, can have both the positive and negative sides connected to points above ground and still give true readings.

A standard AM signal generator is required.

FM - I. F. ALIGNMENT

Band Switch in FM Position. Dummy Antenna .1 Mfd.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	VACUUM TUBE VOLT METER CONNECTION TO RADIO	ADJUSTMENTS TO BE MADE	ADJUST FOR
10.7 Mc. Use about .1 volt	Pin No. 1 of 6BA6 no. 3 and ground	Pin No. 2 of 6AL5 and ground	Primary of T10	Resonance should be about 3 volts
10.7 Mc. Use about .1 volt	Pin No. 1 of 6BA6 no. 3 and ground	See note "A"	Secondary of T10	Zero. Use zero center scale See note "B"
10.7 Mc. Use about 3300 microvolts	Pin No. 1 of 6BA6 no. 2 and ground	Pin No. 2 of 6AL5 and ground	Primary and Secondary of T9 10.7 m.c. windings See top and bottom views	Resonance should be about 3 volts
10.7 Mc. Use about 200 microvolts	Pin No. 2 of 12AT7 and ground	Pin No. 2 of 6AL5 and ground	Primary and Secondary of 10.7 m.c. windings of T8 See top and bottom views	Resonance should be about 3 volts

NOTE ON FM - I.F. ALIGNMENT

NOTE "A" Connect two resistors, 100K OHMS each, from Pin No. 2 of 6AL5 to ground. These resistors must be matched within 5%. Connect as shown in dotted lines on schematic diagram. Connect vacuum tube volt-meter between the mid-point of the resistors and points zz.

NOTE "B" If T10 has been tampered with, it is possible that no crossover point will be found at first. Careful adjustment of both primary and secondary is necessary.

GENERAL: Input signals should be adjusted to give approximately 3 volts. The ratio detector is operating at a reasonable level at this point and will give the truest indication of correct alignment with the procedure specified.

FM - R. F. ALIGNMENT

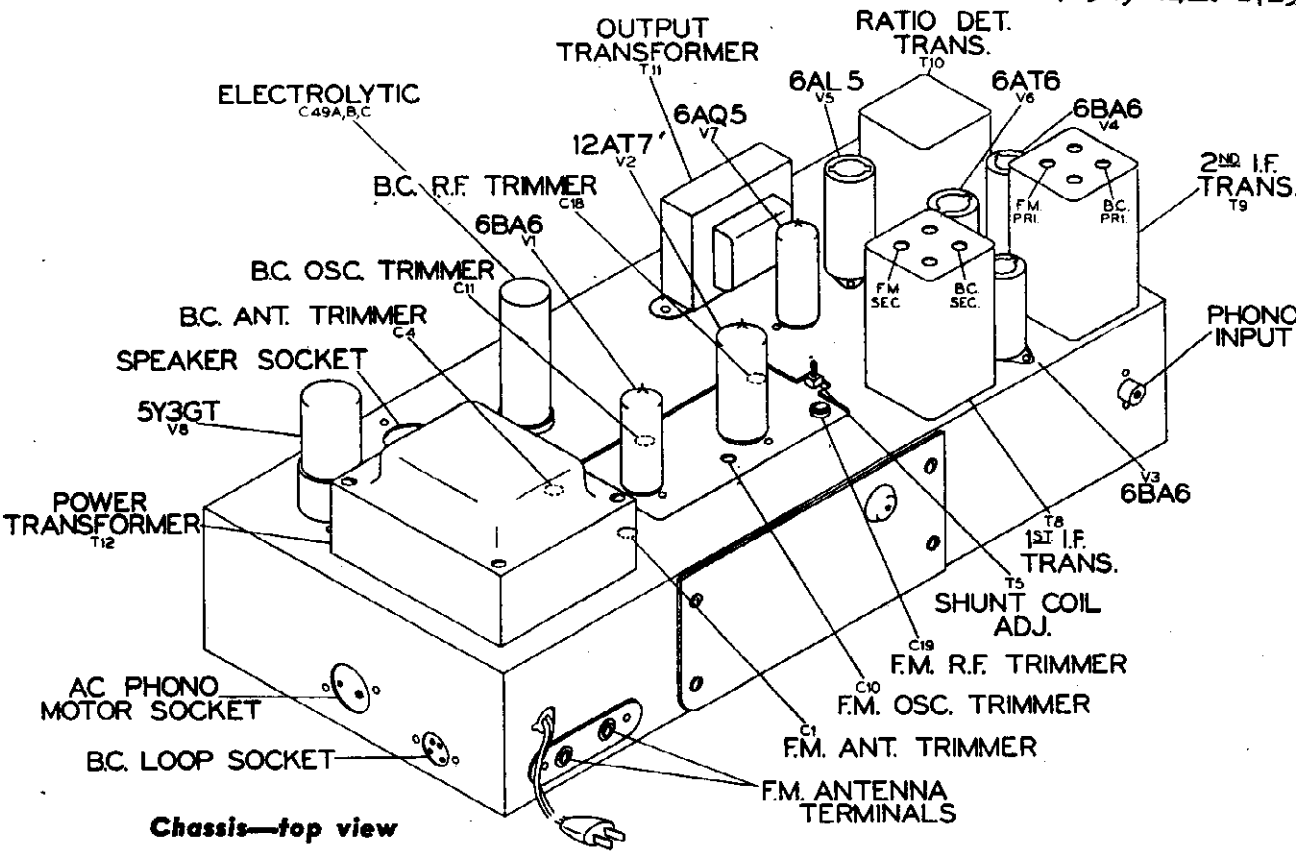
Check pointer so that it coincides with the marker to the extreme right when iron cores are all the way out. For adjustment, see dial mechanism illustration.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	DUMMY ANTENNA	ADJUST	VACUUM TUBE VOLT METER CONNECTION TO RADIO	ADJUST TO
100 Mc. Use about 25 microvolts	FM Antenna Terminals See note	300 ohms	C10 Osc. C19 R.F. C1 Ant.	Pin No. 2 of 6AL5 and Ground	Resonance about 3 volts

NOTE: If a signal generator with the above fundamental frequency is not available, it is sometimes possible to use harmonics. Use extreme care in picking harmonics. An alternate procedure is to use a local station carrier of known frequency to align the FM Band and to use the vacuum tube volt-meter as above for resonance indication. A weak carrier, however will not produce 3 volts. NOTE: Connect 300 ohms in series with hot side of generator and connect to one screw. Connect cold side of generator to other screw.

MONTGOMERY WARD

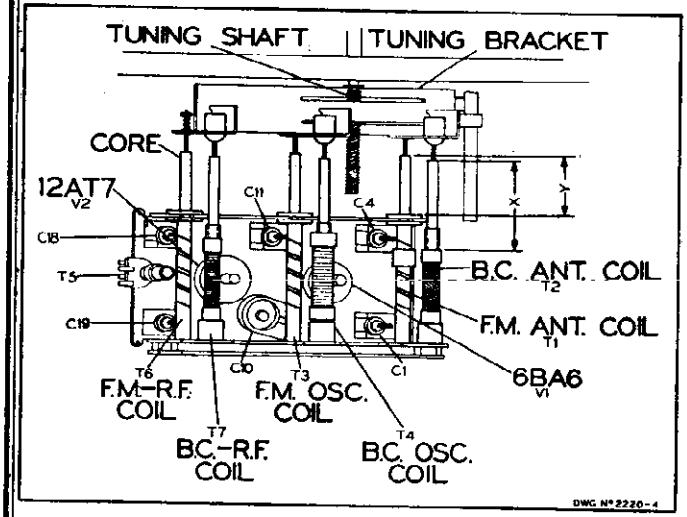
MODELS 74BR-2715A, 84BR-2715A, 84BR-2715



Chassis—top view

Tube and Lamp Complement

- 6BA6, FM—AM R.F. stage.
- 12AT7, FM—AM oscillator and mixer.
- 6BA6, FM—AM 1st I.F.
- 6BA6, FM—2nd I.F.
- 6AL5, FM ratio detector.
- 6AT6, AM detector. A.F. AMP. and A.V.C.
- 6AQ5, Audio output.
- 5Y3, rectifier.
- T-44 dial lamp (2 used).



TUNER ADJUSTMENT

With tuner all the way out, dimension "X" should be 1½ inches. "Y" should be 1-1/16 inches. "X" is from the end of the slug to the edge of the coil winding. Check these dimensions before R.F. alignment is attempted of either the AM or FM band. No slug adjustment should be necessary since the slugs are properly set at the factory.

MODELS 74BR-2715A, 84BR-2715A, 84BR-2715B

MONTGOMERY WARD

Ref. No.	Part No.	Description	Qty. Used In Set
		TUNER CHASSIS PARTS	
		CONDENSERS	
C10	A-8E-13575	Trimmer condenser	1
C1, 4, 11, 19, 18	A-2M-12618	Trimmer cond. plate	5
C3, 16	C-8G-11732	470 mmf, ±20%	2
C2	C-8G-13695	1000 mmf, ±20%	1
C8, 7, 9, 14, 54, 55	C-8G-13201	1000 mmf, +20%—10%	6
C5	C-8G-13018	62 mmf, ±10%	1
C17	C-8G-11731	1500 mmf, ±20%	1
C12	C-8G-13017	15 mmf, +10%	1
C6	C-8G-11484	50 mmf, ±10%	1
C56	C-8G-11789	10 mmf, ±10%	1
C15	A-8G-12495-6	4.7 mmf, ±20%	1
C13	A-8G-12495-4	2.2 mmf, ±20%	1
C44	C-8D-11304	.02 mfd, 200 volts, ±20%	1
		RESISTORS	
R4	C-9B2-79	27K ohms, 1 watt, 10%	1
R1	C-9B1-21	22K ohms, 1/2 watt, 20%	1
R3	C-9B1-52	150 ohms, 1/2 watt, 10%	1
R5	C-9B1-17	4700 ohms, 1/2 watt, 20%	1
R6	C-9B1-11	470 ohms, 1/2 watt, 20%	1
R9	C-9B1-19	10K ohms, 1/2 watt, 20%	1
R2, 11	C-9B1-31	1 megohm, 1/2 watt, 20%	2
R10	C-9B1-62	1000 ohms, 1/2 watt, 10%	1
R23	C-9B1-34	3.3 megohms, 1/2 watt, 20%	1
R7	C-9B1-50	100 ohms, 1/2 watt, 10%	1
R12	C-9B1-42	22 ohms, 1/2 watt, 10%	1
		COILS	
T3	B-13D-13027	FM oscillator coil assembly	1
T1	B-13E-13028	FM antenna coil assembly	1
T6	B-13C-13029	FM R.F. coil assembly	1
T4	B-13D-13030	AM oscillator coil assembly	1
T2	B-13E-13031	AM antenna coil assembly	1
T7	B-13C-13032	AM R.F. coil assembly	1
L1	A-16A-13033	Choke coil assembly	1
T5	B-13D-12974	AM osc. shunt coil assembly	1
		MISCELLANEOUS	
	B-208-13553 or B-201-12967	Band change slide switch	1
	A-15B-12997	7 prong, miniature tube socket	1
	A-15B-13430	9 prong, miniature tube socket	1
	C-2D-14437	Drive bracket assembly	1
	A-25A-13019	Core grommets, for AM Band	3
	A-3M-13020	Insert for core grommet	3
	A-49A-12394	Spiral spring for FM cores	3
	A-2J-11041	Pointer tension spring, "M" shaped	1
	B-2D-12316	Tape guide	1
	B-2J-12922	Rack tape, with teeth and pointer bracket	1
	B-2G-13613	Pointer	1
	A-200-15016	Drive, pinion and lead screw assembly	1
		MAIN CHASSIS PARTS	
		CONDENSERS	
C49B, 49C, 49A	A-8C-13555	Electrolytic, 20—20 x 350 volts; 20 x 25 volts	1
C50	C-8D-10935	.005 mf x 600 volts	1
C27, 32, 33, 34, 37, 45	C-8D-10761	.01 mf x 400 volts, 20%	6
C57	C-8D-10785	.006 mf x 600 volts, 20%	1
C41	A-8C-13132	Electrolytic, 10 mf x 50 volts	1
C43	C-8D-10787	.001 x 600 volts, 20%	1
C52, C26	C-8D-10770	.05 x 200 volts, 20%	2
C51, 46	C-8D-10774	.02 x 400 volts, 20%	2
C48	C-8J-11321	.02 x 600 volts, 20%	1
C25, 47	C-8G-13131	100 mmf, ceramic, 10%	2
C24, 40, 53	C-8G-13016	1000 mmf, ceramic, 20%	3
C42	C-8F3-229	150 mmf, mica, 5%	1
C38, 39	A-8F-13127	.0001 mf, dual mica, 20%	1
C22, 23	C-8G-12160	91 mmf, ceramic, 5%	2

Ref. No.	Part No.	Description	Qty. Used In Set
C20	C-8G-13026	51 mmf, ceramic, 5%	1
C30, 31	C-8G-13025	150 mmf, ceramic, 5%	2
C21, 28, 29	C-8G-12159	30 mmf, ceramic, 5%	3
C35	C-8G-11789	10 mmf, ceramic,	1
C36	C-8G-11891	51 mmf, ceramic	1
		RESISTORS	
R30, S1	A-10A-13114	Volume control (500K ohms) and switch	1
R34, SA, SB	A-11A-13115	Tone control (500K ohms) and radio-phono switch	1
R32	C-9B1-27	220K ohms, 1/2 watt, 20%	1
R15, 18	C-9B1-48	68 ohms, 1/2 watt, 10%	2
R14	C-9B1-31	1 megohm, 1/2 watt, 20%	1
R19, 16	C-9B2-78	22K ohms, 1 watt, 10%	2
R24, 28	C-9B1-80	33K ohms, 1/2 watt, 10%	2
R21	C-9B1-79	27K ohms, 1/2 watt, 10%	1
R8	C-9B2-71	5600 ohms, 1 watt, 10%	1
R22	C-9B1-23	47K ohms, 1/2 watt, 20%	1
R29	C-9B1-21	22K ohms, 1/2 watt, 20%	1
R31	C-9B1-35	4.7 megohms, 1/2 watt, 20%	1
R25, 27, 33	C-9B1-29	470K ohms, 1/2 watt, 20%	3
R35	C-9B1-55	270 ohms 1/2 watt, 10%	1
R26	C-9B1-36	6.8 megohms, 1/2 watt, 20%	1
R13, 20, 17	C-9B1-13	1000 ohms, 1/2 watt, 20%	2
		COILS	
		See Notes on I.F. Coils in Alignment Section	
T8	C-13A-13009 or B-13A-15473	Input I.F. transformer, combination, 455 kc. and 10.7 mc.	1
T9	C-13B-13014 or B-13B-15474	Second I.F. transformer, combination, 455 kc. and 10.7 mc.	1
T10	C-203-11745-1 or B-13M-15475	Ratio det. coil assembly 10.7 mc.	1
L3	A-16A-13243	Loop loading coil	1
L4	A-14MA-11066-1	Loop antenna ribbon	1
		TRANSFORMERS	
T12	B-12A-13120	Power transformer, primary, 50-60 cycles. 105-125 volts A.C.	1
T11	B-12C-13556	Output transformer, for speaker	1
		SPEAKER	
L2	B-18B-13585-1	Electrodynamic speaker, 12-inch, less output transformer	1
		MISCELLANEOUS	
	B-30A-13611	Dial scale	1
	B-5B-13744	Knob, mahog. or wal. "Volume"	1
	B-5B-13745	Knob, mahog. or wal. "Tone"	1
	B-5B-13746	Knob, mahog. or wal. "Tuning"	1
	B-5B-13747	Knob, mahog. or wal. "Band switch"	1
	B-2G-13612	Escutcheon, mahog. or walnut	1
	B-14M-11479	Line cord and plug	1
	A-3A-12933-1	Band switch shaft	1
	A-55C-12935	Ball bearing	1
	B-47A-11094-4	Pilot lite and bracket assembly	1
	A-46A-11739	Pilot lite, 6-8 volts, T-44	2
	A-15C-13174	Miniature socket, 7 prong	5
	A-15B-10440	Octal socket, 8 prong	1
	A-19B-12644	Loop antenna socket	1
	B-7B-13050	FM terminal strip	1
	A-15B-11538	Speaker socket	1
	A-19B-12468	Phono motor socket	1
	A-19B-12170	Phono input socket	1

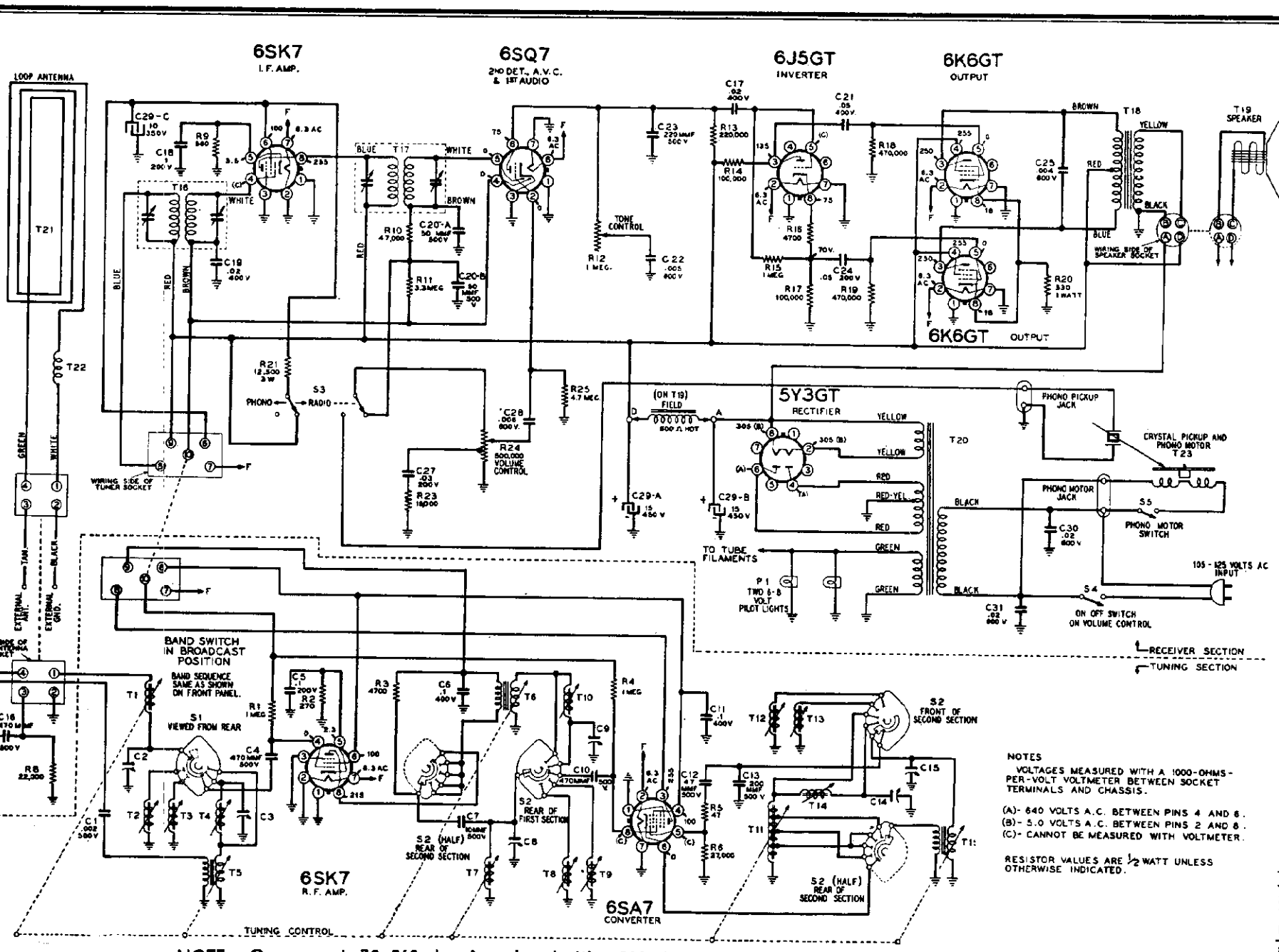
RECORD CHANGER

MODELS 74BR-2715A, 84BR-2715A

D-21H-13293	V-M Changer with P-30 cartridge	1
P-30	Crystal cartridge with needle	1

MODEL 84BR-2715B

B-201-15176	148 Changer with P-30 cartridge	1
P-30	Crystal cartridge with needle	1



NOTES

VOLTAGES MEASURED WITH A 1000-OHMS-PER-VOLT VOLTMETER BETWEEN SOCKET TERMINALS AND CHASSIS.

(A)- 640 VOLTS A.C. BETWEEN PINS 4 AND 6.
(B)- 5.0 VOLTS A.C. BETWEEN PINS 2 AND 8.
(C)- CANNOT BE MEASURED WITH VOLTMETER.

RESISTOR VALUES ARE ½ WATT UNLESS OTHERWISE INDICATED.

NOTE: On some sets R9, 560 ohms is replaced with a 220 ohm resistor.

MONTGOMERY WARD

MODEL 74ER-2717

MODEL 74BR-2717A MONTGOMERY WARD

RECEIVER STAGE SENSITIVITIES

The table below lists the sensitivities at the inputs of various stages. All measurements are based on an output of ½ watt. This may be measured by disconnecting the speaker voice coil and substituting a 3.2-ohm resistor across the secondary winding of the output transformer. A reading of 1.3 volts AC across this resistor will be approximately equivalent to a ½-watt output with the speaker connected. The volume control must be set at maximum.

The signal source must be an accurately calibrated signal generator capable of supplying the frequencies designated, modulated 30% with a 400-cycle audio signal. Variations in sensitivities of plus or minus 25% are usually permissible.

BAND	SIGNAL GENERATOR				INPUT FOR 500-MILLIWATT OUTPUT
	Frequency	Dummy Antenna	Connection to Receiver	Ground Connection	
Broadcast	1000 kc	200 mmf	External Antenna clip	Chassis	3.5 microvolts
	1000 kc	.1 mf	Grid (pin 4) of R. F. amp. (6SK7)	Chassis	8.9 microvolts
	1000 kc	.1 mf	Grid (pin 8) of Converter (6SA7)	Chassis	125 microvolts
	455 kc	.1 mf	Grid (pin 8) of Converter (6SA7)	Chassis	100 microvolts
	455 kc	.1 mf	Grid (pin 4) of I. F. amp. (6SK7)	Chassis	4500 microvolts
	400 cycles	.1 mf	Grid (pin 2) of Audio amp. (6SQ7)	Chassis	.1 volt
	400 cycles	.1 mf	Grid (pin 5) of Inverter (6J5GT)	Chassis	4.8 volts
31 meter*	9.6 mc	400 ohms	External Antenna clip	Chassis	1.6 microvolts
49 meter*	6.1 mc	400 ohms	External Antenna clip	Chassis	3.0 microvolts
25 meter*	11.8 mc	400 ohms	External Antenna clip	Chassis	5.0 microvolts
19 meter*	15.2 mc	400 ohms	External Antenna clip	Chassis	9.0 microvolts

*Average sensitivity on short-wave bands at grid (pin 4) of R. F. amplifier is 8.5 microvolts.

ELECTRICAL SPECIFICATIONS

Power Supply.....105 to 125 volts AC, 60 cycles; 95 watts. Chassis only. 125 watt with phono operation.

Frequency Ranges.....Broadcast band—540 to 1600 kc.
49-meter band—5.96 to 6.19 mc.
31-meter band—9.1 to 10 mc.
25-meter band—11.45 to 12.16 mc.
19-meter band—14.94 to 15.46 mc.

Intermediate Freq....455 kc.

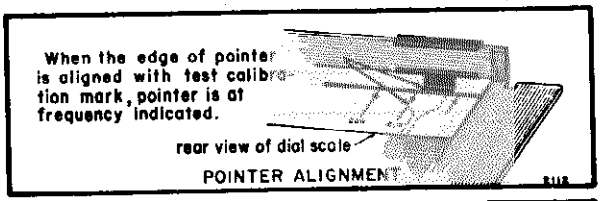
Selectivity.....at 1000 kc, 35 kc at 1000 x signal

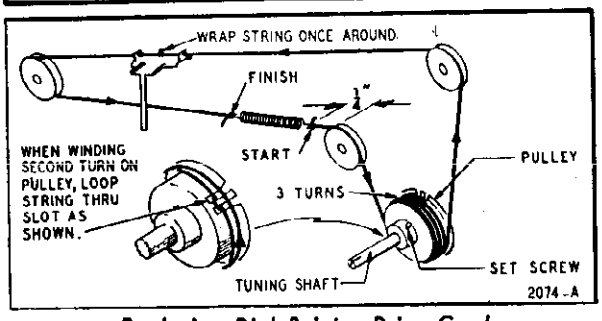
Sensitivity.....3.75 microvolts average for ½ watt output.

Power Output.....5.5 watts undistorted, 7.5 watts maximum.

Loud Speaker.....10" electrodynamic. Voice coil impedance 3.2 ohms.

Tube and Lamp Complement.....6SK7, tuned R. F. amplifier.
6SA7, converter.
6SK7, I. F. amplifier.
6SQ7, detector, AVC, 1st audio.
6J5GT, phase inverter.
6K6GT, push-pull output.
6K6GT, push-pull output.
5Y3G, rectifier.
T-44 dial lamp (2 used).





Replacing Dial Pointer Drive Cord

After stringing, spring must be 1/4" from idler when tuning shaft is in extreme counterclockwise position. To do this: Loosen set screw; hold tuning shaft firm and turn pulley by hand until spring is 1/4" from idler; tighten screw.

MONTGOMERY WARD MODEL 74BR-2717

ALIGNMENT PROCEDURE

MECHANICAL ADJUSTMENT—The core tuning bar (see illustration of coils below) and dial pointer must be adjusted mechanically before any electrical alignment is attempted. Rotate the manual tuning control until the core bar is farthest from the coils. For proper adjustment the bar should be approximately 1/32 of an inch from the two rod guide angles.

With the core bar in this position, adjust the dial pointer to coincide with 1600 kc on the dial scale (see pointer alignment diagram below).

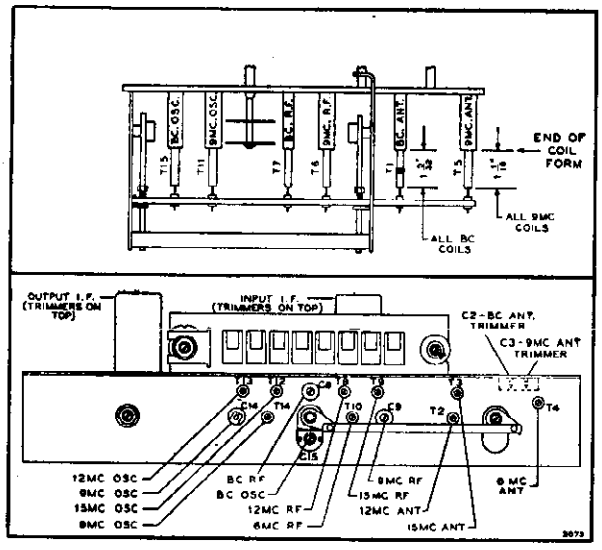
Rotate the core of each of the three broadcast coils (see illustration) until the end of the core is 1-5/32" from the end of the coil form. Rotate the three 9-mc cores until this dimension is 1-1/6" for these coils. After these adjustments have been made, the unit can be aligned electrically.

ELECTRICAL ADJUSTMENT—To align the set make the following preliminary adjustments: Set the tone control for treble tone; set the volume control at maximum; connect the ground post of the signal generator to the radio chassis; connect the output meter across a 3.2-ohm output load; and allow the receiver and signal generator to warm up for several minutes.

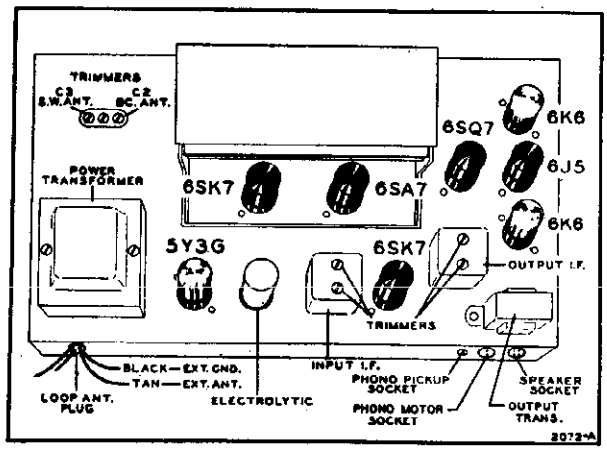
Align the set according to the sequence given in the chart. The indicated coupling capacitor is to be connected in series between the signal generator output lead and the receiver. Adjust the set for maximum output; reduce the input as needed to keep the output near 1.3 volts.

Locations of all the trimmers and coils are shown in the illustrations below. After adjustment, seal the coil cores with collodion or a similar substance (do not use cement).

BAND SWITCH SETTING	SIGNAL GENERATOR			DIAL POINTER SETTING	ADJUST TO MAXIMUM OUTPUT IN ORDER SHOWN
	Frequency	Coupling Capacitor	Connection to Receiver		
Broadcast (for I. F.)	455 kc	.1 mf	Grid (pin 8) of converter (6SA7)	1600 kc	Trimmers on output and input I. F. cans
Broadcast	1600 kc	200 mmf	Antenna lead	1600 kc	BC Osc. trimmer C15 BC R. F. trimmer C8 BC Ant. trimmer C2
	1400 kc	200 mmf	Antenna lead	1400 kc	Rotate cores of BC R. F. coil T7 and BC Ant. coil T1
31 Meter	9.6 mc	400 ohms	Antenna lead	9.6 mc	9 mc Osc. trimmer C14 9 mc R. F. trimmer C9 9 mc Ant. trimmer C3
49 Meter	6.1 mc	400 ohms	Antenna lead	6.1 mc	6 mc Osc. coil T14 6 mc R. F. coil T10 6 mc Ant. coil T4
25 Meter	11.8 mc	400 ohms	Antenna lead	11.8 mc	12 mc Osc. coil T13 12 mc R. F. coil T8 12 mc Ant. coil T2
19 Meter	15.2 mc	400 ohms	Antenna lead	15.2 mc	15 mc Osc. coil T12 15 mc R. F. coil T9 15 mc Ant. coil T3



View of Trimmers and Tuning Coils



Ref. No.	Part No.	Description	Qty. Used In Set

REMOVABLE TUNER ASSEMBLY

CAPACITORS*

C1	BEB-8F-10767	.002 mf, 500 volts, 10%, mica	1
C2, C3	BE-124143	Dual, broadcast (67-123 mmf) and 9 mc (95-175 mmf) ant. trimmers	1
C4, C10	BEB-8F3-121	470 mmf, 500 volts, 10%, mica	2
C5	BEC-8D-10771	.1 mf, 200 volts, +20%—10%	1
C6, C11	BEC-8D-10760	.1 mf, 400 volts, +20%—10%	2
C7	BEB-8F5-101	10 mmf, 500 volts, 10%, silver mica	1
C8	BEA-8G-7205	Broadcast RF trimmer (120-220 mmf)	1
C9	BEA-8G-7206	9 mc RF trimmer (60-110 mmf)	1
C12	BEB-8F3-109	47 mmf, 500 volts, 10%, mica	1
C13	BEB-8F-10763	220 mmf, 500 volts, 3%, silver mica	1
C14	BE-124145	9 mc oscillator trimmer (7-35 mmf)	1
C15	BE-124144	Broadcast oscillator trimmer (15-27 mmf)	1

RESISTORS*

R1, R4	BEC-9B1-31	1 megohm ½ watt, 20%	2
R2	BEC-9B1-55	270 ohms, ½ watt, 10%	1
R3	BEC-9B1-70	4700 ohms, ½ watt, 10%	1
R5	BEC-9B1-46	47 ohms, ½ watt, 10%	1
R6	BEC-9B1-79	27,000 ohms, ½ watt, 10%	1
R12	BEC-9B1-22	33,000 ohms, ½ watt, 20%	1

COILS (complete with cores)

T1	BE-111195	Broadcast antenna coil	1
T2	BE-111191	12 mc antenna coil	1
T3	BE-111192	15 mc antenna coil	1
T4	BE-111189	6 mc antenna coil	1
T5	BE-111190	9 mc antenna coil	1
T6	BE-10959	9 mc RF coil	1
T7	BE-10962	Broadcast RF coil	1
T8	BE-10960	12 mc RF coil	1
T9	BE-10961	15 mc RF coil	1
T10	BE-10958	6 mc RF coil	1
T11	BE-110157	9 mc oscillator coil	1
T12	BE-110159	15 mc oscillator coil	1
T13	BE-110158	12 mc oscillator coil	1
T14	BE-110156	6 mc oscillator coil	1
T15	BE-110161	Broadcast oscillator coil	1

MISCELLANEOUS

S1	BEB-20A-10964	Band switch, antenna	1
S2	BEB-20A-10965	Band switch, oscillator and RF	1
	BE-121210	Socket, octal, molded (6SA7)	1
	BE-121171	Socket, laminated (6SK7GT)	1
	BE-117907	Tuning shaft	1
	BE-117798	Pinion gear on tuning shaft	1
	BE-120393	Spring, intermediate link, under ends of treadle bar	2
	BE-131251	Washer, "C" on slug tuning bar	4
	BEB-2C-7245	Gear segment	1
	BEA-2J-7439	Spring clip, for coils	9
	BE-131316B	Washer "C", for 9 mc coils	3
	BE-134134	Grommet for core mounting (all broadcast and 9 mc coils)	6
	BE-134126	Grommet for coil mounting (broadcast RF and antenna coils)	2
	BE-134125	Grommet for coil mounting (broadcast oscillator coil)	1
	BEA-25A-7619	Grommet for all 9 mc coils	3
	BEB-202-10475	Pushrod assembly, station selectors	6
	BE-120366	Spring, pushrod return	6
	BEA-2J-7176	Cam-locking spring on pushrod assembly	6
	BEA-2J-7627-1	Retainer spring on pushrod assy.	6
	BE-121281	Plug, 5-prong	1
	BE-128-759-37	Pushbutton	6
	BE-131210	Washer, "C", on end plate	2
	BE-112801	Drive pulley	1

MAIN CHASSIS

CAPACITORS*

C16	BEC-8F3-12	470 mmf, 20%, mica	1
C17, C19	BEC-8D-10774	.02 mf, 400 volts, 20%	2
C18	BEC-8D-10771	.1 mf, 200 volts, +20%—10%	1
C20-A	BE-129165B	Dual, 50 mmf each section, mica 20%	1
C20-B			
C21	BEC-8D-10813	.05 mf, 400 volts, 20%	1
C23	BEC-8F3-10	220 mmf, 20%, mica	1
C22	BEC-8D-10935	.005 mfd x 600 v. +40—15%	1
C24	BEC-8D-10770	.05 mf, 200 volts, 20%	1
C25	BEC-8D-10788	.004 mf, 600 volts, 20%	1
C27	BEC-8D-10992	.03 mf, 200 volts, 20%	1
C28	BEC-8D-10785	.006 mf, 600 volts, 20%	1
C29-A, -B, -C	BE-119109	Electrolytic, 15 x 450 volts, 15 mf x 450 volts, 10 mf x 350 volts	1
C30, C31	BEC-8J-11321	.02 mf, 600 volts, 20%	2

RESISTORS*

R7, R8	BEC-9B1-21	22,000 ohms, ½ watt, 20%	2
R9	BEC-9B1-59	560 ohms, ½ watt, 10%	1
R10	BEC-9B1-23	47,000 ohms, ½ watt, 20%	1
R11	BEC-9B1-34	3.3 megohms, ½ watt, 20%	1
R13	BEC-9B1-27	220,000 ohms, ½ watt, 20%	1
R14, R17	BEC-9B1-86	100,000 ohms, ½ watt, 10%	2
R15	BEC-9B1-31	1 megohm, ½ watt, 20%	1
R16	BEC-9B1-70	4700 ohms, ½ watt, 10%	1
R18, R19	BEC-9B1-29	470,000 ohms, ½ watt, 20%	2
R20	BEC-9B2-56	330 ohms, 1 watt, 10%	1
R21	BE-10662	12,500 ohms, 3 watts, 10%	1
R23	BEC-9B1-20	15,000 ohms, ½ watt, 20%	1
R24, S4	BEA-10A-10586	Volume control (500,00 ohms) and on-off switch	1
R25	BEC-9B1-35	4.7 megohms, ½ watt, 20%	1
R12, S3	BE-125180	Tone control (1 megohm) and radio-phono switch	1

COILS AND TRANSFORMERS

T16	BE-108177	Input IF coil complete in can (Range of trimmers: 110-210 mmf)	1
T17	BE-108176	Output IF coil complete in can (Range of trimmers: 80-140 mmf)	1
T18	BEB-12C-10234	Output transformer	1
T20	BE-1042028	Power transformer, for 50-60 cycles	1

SOCKETS

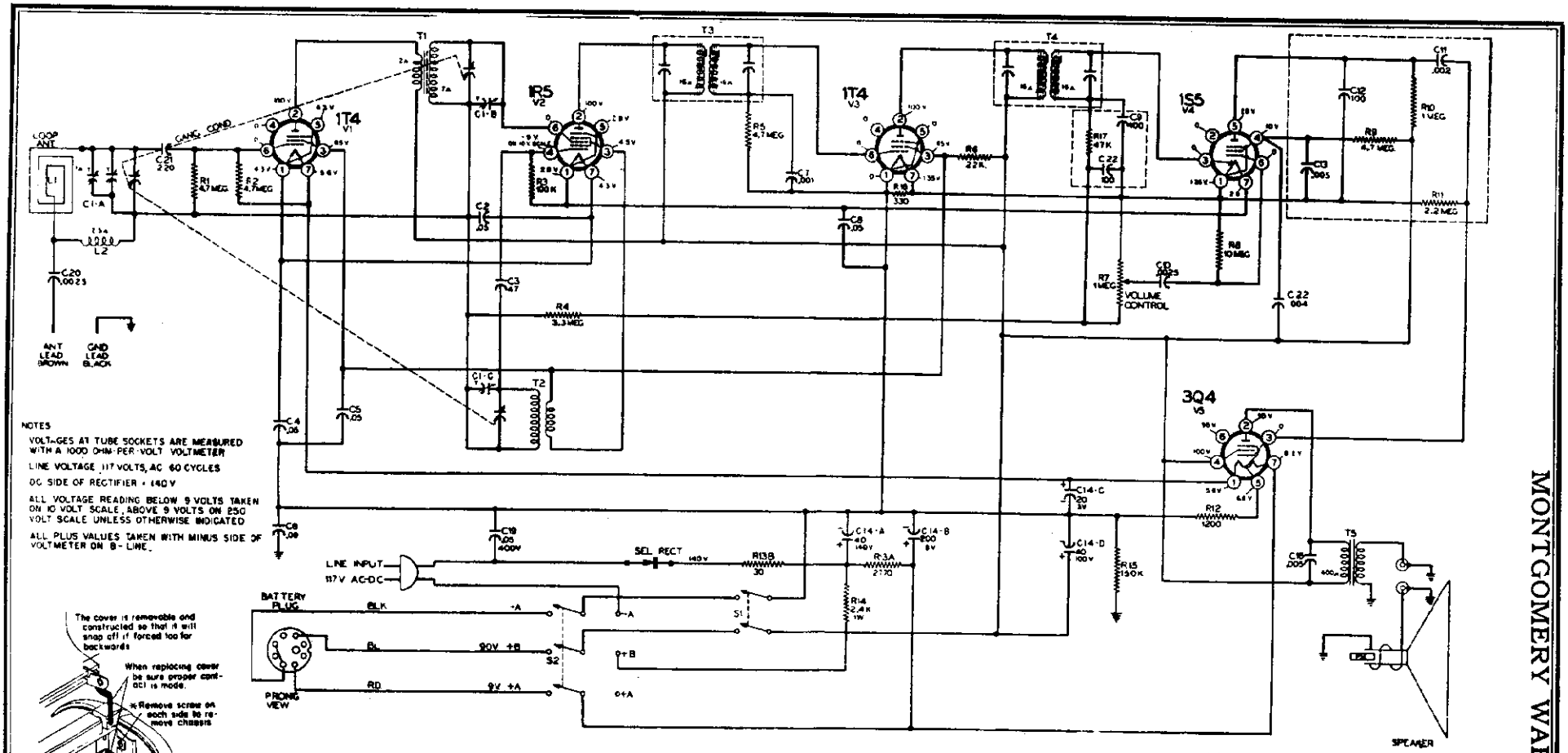
	BE-121200	Socket, 4-terminal, for loop ant	1
	BE-121279	Socket, 5-terminal, for tuner	1
	BEA-15B-11538	Socket, 4-terminal, for speaker	1
	BE-121199	Socket, 2-terminal, for phono motor	1
	BE-121210	Socket, octal, molded (all tubes except 6SK7, IF amp.)	5
	BE-121273	Socket, octal, laminated (for 6SK7, IF amplifier)	1
	BE-121280	Socket, 1-terminal, for phono pickup	1
	BEB-47A-10808	Socket assembly, for dial light	1

MISCELLANEOUS

T19	BEB-18B-10617-1	Speaker, 10" electrodynamic	1
	BEA-19A-11539	Plug on speaker leads	1
T21	BEB-14MA-11066	Loop antenna (ribbon only)	1
T22	BEA-16A-11113	Choke on loop terminal board	1
	BEA-19A-11322	Plug on loop antenna leads	1
	BE-107401	Phono motor cable assembly	1
P1	BE-10724	Plug on phono pickup leads	1
	BE-112-1001	Dial scale	1
	BE-10794	Dial light, 6-8 volts, type 44	2
	BEB-2G-10588-1	Dial pointer	1
	BEB-53A-10989	String for dial pointer	32"
	BE-120377	Tension spring for dial pointer string	1
	BE-112985D-37	Escutcheon, Walnut	1
	or		
	BE-112985D-41	Escutcheon, mahogany	1
	BEB-5B-13320-37	Knob, band switch or radio-phono, Walnut	2
	or		
	BEB-5B-13320-41	Knob, band switch or radio-phono, mahogany	2
	BEB-5D-13307-37	Knob, tuning and volume, Walnut	2
	or		
	BEB-5B-13307-41	Knob, tuning and volume, mahogany	2
	BE-107266	Line cord and plug	1
	BEA-2L-11293	Band switch link	1
	BE-112961	Station call letters	1 set
	BE-112-1017-37	Clips, for escutcheon, Walnut	2
	or		
	BE-112-1017-37	Clips, for escutcheon, mahogany	2

RECORD CHANGER PARTS

	B-201-13304-3	VM-800 Changer	1
	P30	Crystal cartridge with special needle	1



NOTES

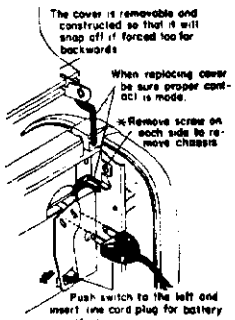
VOLTAGES AT TUBE SOCKETS ARE MEASURED WITH A 1000 OHM-PER-VOLT VOLTMETER

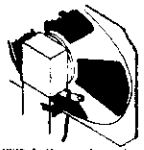
LINE VOLTAGE 117 VOLTS, AC 60 CYCLES

DC SIDE OF RECTIFIER + 140 V

ALL VOLTAGE READING BELOW 9 VOLTS TAKEN ON 10 VOLT SCALE, ABOVE 9 VOLTS ON 250 VOLT SCALE UNLESS OTHERWISE INDICATED

ALL PLUS VALUES TAKEN WITH MINUS SIDE OF VOLTMETER ON B- LINE.

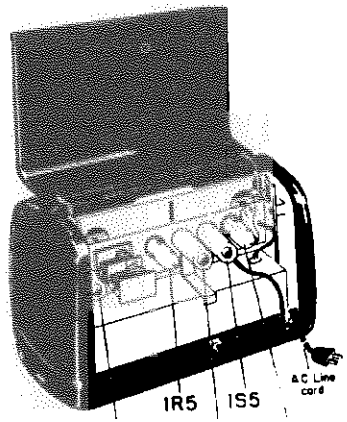




* With battery out, reach in and disconnect speaker lead before removing chassis

GENERAL DESCRIPTION

This model is a 3-way portable radio with 5 tubes plus rectifier. It contains a loop antenna built into the front cover and leads for external antenna and ground connections. When battery operation is desired, the line-cord plug is inserted into a socket switch on the chassis; the insertion automatically moves the switch contacts for battery operation. When the line-cord plug is out of the chassis socket and ready for insertion into a 105 to 125 volt outlet, the battery is automatically disconnected.



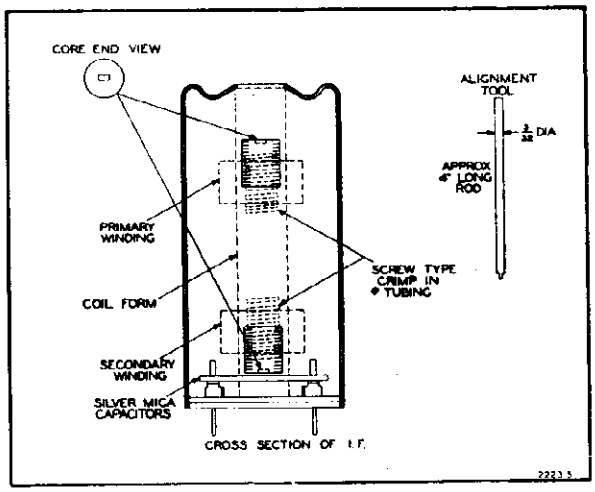
ALIGNMENT PROCEDURE AND RECEIVER STAGE SENSITIVITIES

The Alignment Procedure below includes the sensitivities at the input of various stage. All measurements are based on an output of 50 milliwatts. This may be measured by disconecting the speaker voice coil and substituting a 3.2 ohm, 5 watt resistor across the secondary winding of the output transformer. A reading of .4 volts AC across this resistor will be equivalent to a 50 milliwatt output with speaker connected. The volume control must be set to maximum.

The signal source must be an accurately calibrated signal generator capable of supplying the frequencies designated, modulated 30% with a 400-cycle audio signal. A 400-cycle audio signal is required for the audio measurement. Variations in sensitivities of plus or minus 25% are usually permissable.

FREQUENCY	COUPLING CAPACITOR	DIAL SETTING	CONNECTION TO RADIO	GROUND CONNECTION	ADJUST	INPUT FOR 50 MILLIWATTS OUTPUT
455 kc.	.1 mfd.	1000 kc.	Pin No. 6 of 1R5	B— (shell of lytic)	I.F. slugs	100 microvolts
1600 kc.	.1 mfd.	1600 kc.	Pin No. 6 of 1R5	B— (shell of lytic)	C1-C	———
1400 kc.	.1 mfd.	1400 kc.	Pin No. 6 of 1T4 R.F. tube	B— (shell of lytic)	C1-B	10 microvolts
1400 kc.	200 mmf.	1400 kc.	Ant. lead (see note below)	Ground lead	C1-A	2 microvolts
400 cycles	.05 mfd.	———	Pin No. 6 of 1S5	B— (shell of lytic)	———	.06 volts
400 cycles	.05 mfd.	———	Pin No, 3 of 3Q4	B— (shell of lytic)	———	3 volts

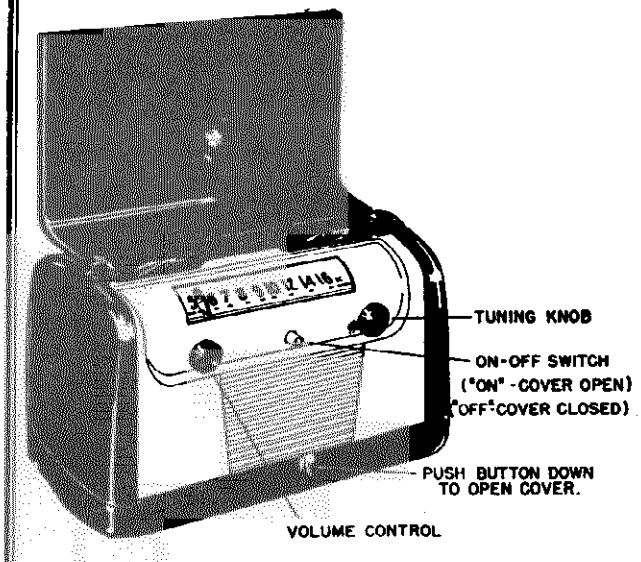
NOTE: This adjustment must be made with chassis installed in cabinet and loop knife switches connected. With one hand hold both covers open with their shoulders together. This allows access to the chassis and also allows the loop to work without undue chassis capacity effects. The antenna section of the gang has two trimmers. One is C1-A and the other is on the opposite side of the gang which is accessible when chassis is in the cabinet.

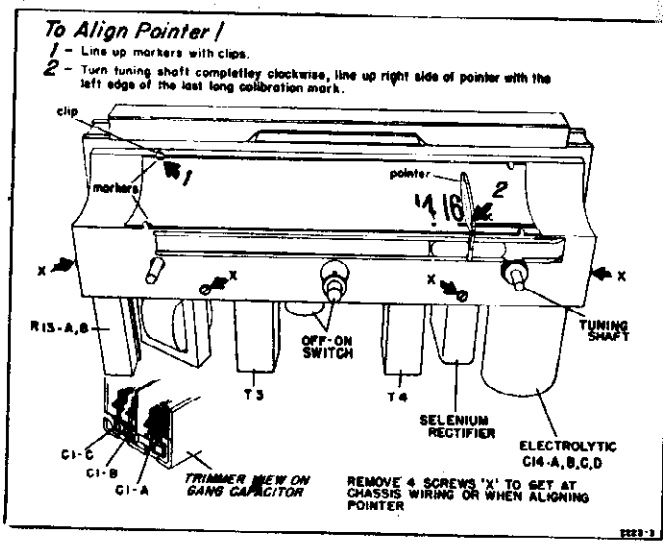


CAUTION—The I.F. transformer construction is such that two resonance peaks occur for each winding, one peak when the slug is above its coil and another peak when the slug is below its coil. Be sure the upper cores are above the top coils and the lower cores are below the bottom coils (see coil drawing).

ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts DC or 50-60 cycle AC, 25 watts. Battery: Wards Battery Pack No. 62-33. Size: 9½" by 2⅝" by 4⅜". "A"—9 volts, 50 milliamperes. "B"—90 volts, 14 milliamperes.
Frequency Range	535 to 1600 kc.
Intermediate Freq.	455 kc.
Selectivity	At 1000 kc, 36 kc at 1000 x signal.
Sensitivity	4 microvolts average for .05 watt output.
Power Output	125 milliwatts undistorted. 250 milliwatts maximum.
Loud Speaker	4" x 6", P.M., v.c. impedance 3.2 ohms.
Tube Complement	1T4 R.F. stage. 1R5 converter. 1T4 I.F. amplifier. 1S5 detector, AVC, audio amplifier. 3Q4 output amplifier.
Rectifier	Selenium type.

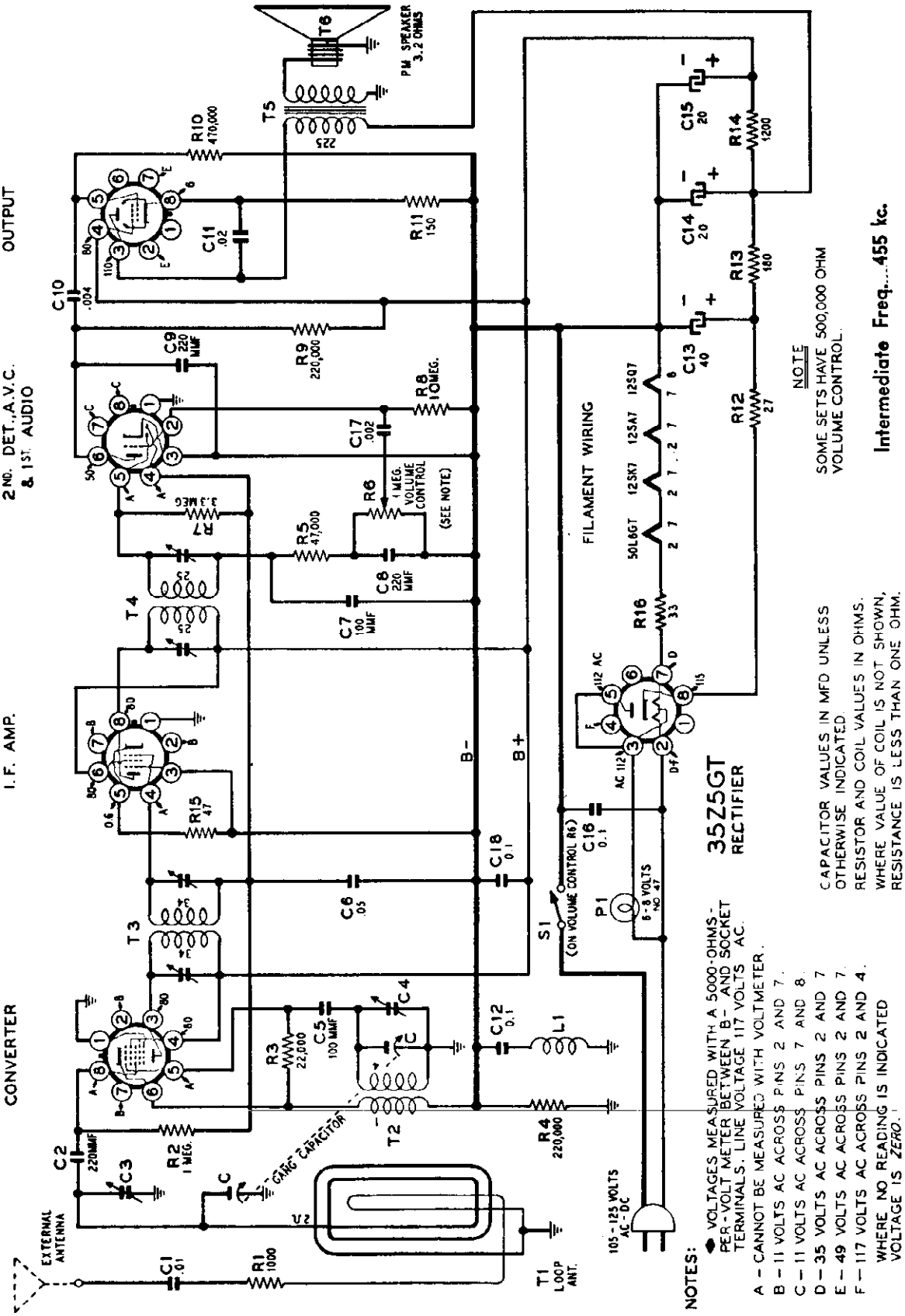




Ref. No.	Part No.	Description	Qty. Used in Set
		CONDENSERS	
C14A, C14B, C14C, C14D	A-8C-14453	Electrolytic filter cond. 40 x 150, 200 x 10, 20 x 50, 40 x 150.	1
C1A, C1B, C1C	B-8A-14073	3 gang var. condenser, with trimmers	1
C2, C4, C5, C8	C-8D-14460	.05 x 200 volts, tubular	4
C6	C-8D-11251	.09 x 400 volts, tubular	1
C19	C-8D-14461	.05 x 400 volts, tubular	1
C16	C-8D-14462	.005 x 200 volts, tubular	1
C20, C10	C-8G-14454	2500 mmf, ceramic	2
C7	C-8G-13695	1000 mmf, ceramic	1
C21	C-8G-14459	220 mmf, ceramic	1
C3	C-8G-12198	47 mmf, ceramic	1
C22	C-8D-10788	.004 x 600 volts, tubular	1
		RESISTORS	
R7	A-10B-14070	Volume control (1 megohm) less switch	1
R1, R2, R5	C-9B1-106	4.7 megohms, 1/2 watt,	3
R3	C-9B1-86	100K ohms, 1/2 watt	1
R4	C-9B1-104	3.3 megohms, 1/2 watt	1
R6	C-9B1-78	22K ohms, 1/2 watt	1
R15	C-9B1-88	150K ohms, 1/2 watt	1
R12	C-9B1-63	1200 ohms, 1/2 watt	1
R14	C-9B2-168	2400 ohms, 1 watt	1
R8	C-9B1-37	10 megohms, 1/2 watt	1
R16	C-9B1-56	330 ohms, 1/2 watt	1
R13A, R13B	A-9D-14067	2770 ohms; 30 ohms, 7.5 watts candohm	1
		CONDENSERS AND RESISTOR COMBINATION	
C9, C22, R17	A-201-15005	Diode filter assembly. 100 mmf; 100 mmf; 47K ohms	1
C11, C12, C13, R9, R10, R11	B-201-14083	Audio coupling strip. .002 mf; 100 mmf; .005 mf; 4.7 meg.; 1 meg.; 2.2 meg.	1
		DIAL AND TUNING PARTS	
	B-2M-14426	Dial scale	1
	A-6M-14088	Pointer	1
	A-2J-14085	Rack tape with teeth and pointer carriage	1
	B-2D-14084	Tape guide	
	A-5B-14109-61	Knob, volume and tuning	2
	D-2G-13979	Escutcheon	
	B-6A-14099	Crystal	
	200-14138	Dual gear assembly, with backlash spring A-49A-14403	
	A-3A-14079	Tuning shaft	1
	A-3J-14077	Pinion gear that drives tape	1
	A-3J-14080	Spur gear, drives dual gears	1
		SPEAKER	
	B-18A-14100	4 x 6-inch, oval, P.M. speaker, transformer	1
T5	B-12C-14066	Output transformer, for speaker	1
		COILS	
T3	B-13A-14394	Input I.F. transformer, 455 K.C.	1
T4	B-13B-14395	Output I.F. transformer, 455 K. C.	1
T2	A-43D-14071	Oscillator coil	1
T1	A-13C-14072	R.F. coil	1
L2	A-16A-14398	Loading coil	1
L1	200-14449	Front cover assembly, with built in loop	1
		MISCELLANEOUS	
	200-14450	Rear cover assembly	1
	A-20C-14069	AC-DC-Battery slide switch	1
	B-14M-13860	A.C. line cord and plug	1
	A-15C-13174	7-prong, miniature, tube socket	5
	B-20C-14114	On-off switch	1
	A-2M-14110	Pushrod, for on-off switch	1
	A-49A-14111	Compression spring, for push-rod	1
	A-5B-14112-61	Pushbutton, for on-off switch	1
	B-14A-14082	Battery cable assembly	1
	A-21J-12775	Rectifier, selenium type	1
	C-5M-13961-59	Handle	1
	A-5B-13988-59	Tenite door lock	2
	A-2M-14056	Spring, for lock	2
	D-5C-13817-59	Cabinet end pieces	2

MODELS 84BR-1503D,
84BR-1504D

MONTGOMERY WARD



MONTGOMERY WARD

MODELS 84BR-1503
84BR-1504D

ALIGNMENT PROCEDURE

(Position of trimmers shown on next page)

- Output meter across 3.2-ohm output load.
- Volume control at maximum for all adjustments.
- Align for maximum output. Reduce input as needed to keep output near 0.4 volts.
- Loop antenna should be connected to receiver and in its proper position when making adjustments.

SIGNAL GENERATOR				TUNER SETTING	ADJUST TRIMMERS TO MAXIMUM OUTPUT in order shown
Frequency	Coupling Capacitor	Connection to Radio	Ground Connection		
455 kc	0.1 mf	Grid (pin 4) of 12SK7	Pin 3 of 12SK7 (B- of set)	Capacitor full open (plates out of mesh)	2 trimmers on output IF can
455 kc	0.1 mf	Grid (pin 8) of 12SA7	Pin 3 of 12SK7 (B- of set)	Capacitor full open (plates out of mesh)	2 trimmers on input IF can
1630 kc	0.1 mf	Grid (pin 8) of 12SA7	Pin 3 of 12SK7 (B- of set)	Capacitor full open (plates out of mesh)	Oscillator trimmer C4 on gang
1400 kc	200 mmf	External antenna clip	Pin 3 of 12SK7 (B- of set)	Set dial pointer at 1400 kc	Antenna trimmer C3 on gang

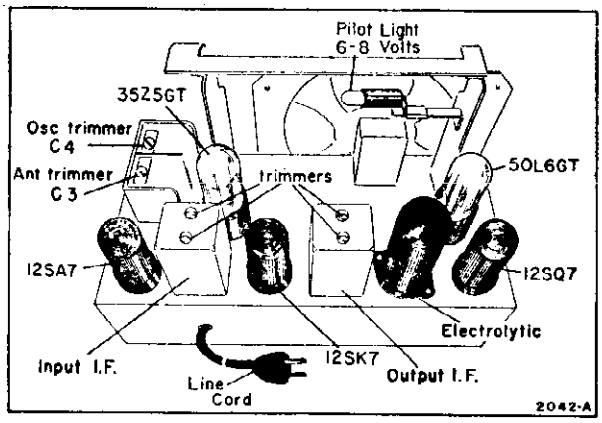
RECEIVER STAGE SENSITIVITIES

The table below lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 kc for all readings. All measurements are based on an output of 50 milliwatts. This may be measured by disconnecting the speaker voice coil and substituting a 3.2-ohm, 5-watt resistor across the secondary winding of the output transformer. A reading of 0.4 volts AC across this resistor will be equivalent to a 50-milliwatt output with the speaker connected.

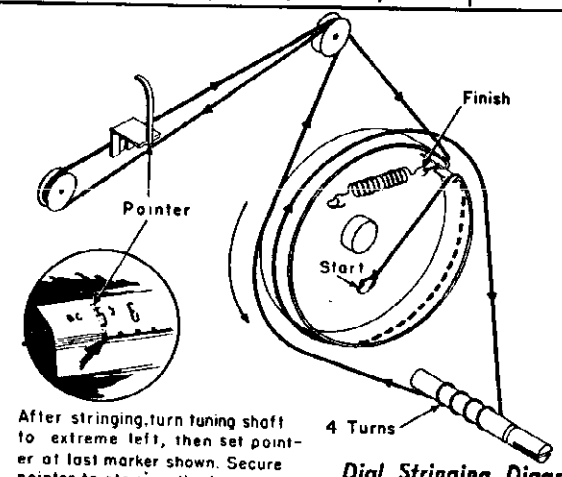
The signal source must be an accurately calibrated signal generator capable of supplying both 1000 kc and 455 kc signals modulated 30% with a 400-cycle audio signal. Variations of plus or minus 25% are usually permissible.

The volume control must be set to maximum.

SIGNAL GENERATOR				INPUT FOR 50-MILLIWATT OUTPUT
Frequency	Coupling Capacitor	Connection to Radio	Ground Connection	
1000 kc	200 mmf or RMA dummy antenna	External antenna clip	Pin 3 of 12SK7 (B- of set)	24 microvolts
1000 kc	0.1 mf	Grid (pin 8) of converter (12SA7)	Pin 3 of 12SK7 (B- of set)	98 microvolts
455 kc	0.1 mf	Grid (pin 8) of converter (12SA7)	Pin 3 of 12SK7 (B- of set)	74 microvolts
455 kc	0.1 mf	Grid (pin 4) of I.F. amp. (12SK7)	Pin 3 of 12SK7 (B- of set)	3200 microvolts
400 cycles	0.1 mf	Grid (pin 2) of audio amp. (12SQ7)	Pin 3 of 12SK7 (B- of set)	.043 volts
400 cycles	0.1 mf	Grid (pin 5) of output amp. (50L6GT)	Pin 3 of 12SK7 (B- of set)	2.0 volts



Chassis View, Showing Trimmer Location



After stringing, turn tuning shaft to extreme left, then set pointer at last marker shown. Secure pointer to string with glue.

Dial Stringing Diagram

MODELS 84BR-1503D, 84BR-1504D

MONTGOMERY WARD

GENERAL DESCRIPTION

This receiver is a single-band, AC-DC set which uses 4 tubes plus a rectifier. The antenna input and oscillator circuits are tuned by a two-gang capacitor. A loop antenna is built into the cabinet; provision is made also for the connection of an external antenna. Simple AVC voltage is applied to the grids of the converter and IF-amplifier tubes.

ELECTRICAL SPECIFICATIONS

Power Supply.....105 to 125 volts, DC or 50-60 cycle AC, 24 watts. Also made for 25-cycle AC.

Frequency Range .....530 to 1630 kc.

Selectivity .....At 1000 kc, 60 kc at 1000 x signal.

Sensitivity .....26 microvolts average for .05-watt output.

Power Output .....0.9 watt undistorted, 1.0 watt maximum.

Loud Speaker.....4" x 6" oval, P.M., v.c. impedance 3.2 ohms.

Tube Complement ....12SA7, converter
12SK7, IF amplifier
12SQ7, detector, AVC, audio
50L6GT, output amplifier
35Z5GT, rectifier
T-47, dial lamp, G.E., 6-8 volts

NOTE:— Disregard gang condenser and loop information shown below. B-8A-11628 gang condenser must be used with loop C-212-13035 (Walnut) or C-212-13035-1 (Ivory). B-8A-10827 gang must be used with C-212-10435 or C-212-11058 loops. Check part number on defective item and order accordingly.

Ref. No.	Part No.	Description	Qty. Used In Set
		CAPACITORS*	
C, C3, C4	B-210-10040-1	2-gang capacitor assembly, including antenna and oscillator trimmers	1
C1	C-8D-10761	.01 mf, 400 volts, 20%	1
C2, C8, C9	C-8F3-10	220 mmf, 500 volts, 20%, mica	3
C5, C7	C-8F3-8	100 mmf, 500 volts, 20%, mica	2
C6	C-8D-10770	.05 mf, 200 volts, 20%	1
C10	C-8D-10788	.004 mf, 600 volts, 20%	1
C11	C-8D-10772	.02 mf, 600 volts, 20%	1
C12, C16	C-8D-10760	.1 mf, 400 volts, +20—10%	2
C13, C14, C15	A-8C-10077	Electrolytic for 60 cycles; 40 mf x 150 volts, 20 mf x 150 volts, 20 mf x 150 volts	1
C13, C14, C15	A-8C-10946	Electrolytic for 25 cycles; 60 mf x 150 volts, 40 mf x 150 volts, 40 mf x 150 volts	1
C17	C-8D-10789	.002 mf, 600 volts, 20%	1
C18	C-8D-10771	.1 mf, 200 volts, +20—10%	1
		RESISTORS*	
R1	C-9B1-13	1000 ohms, 1/2 watt, 20%	1
R2	C-9B1-31	1 megohm, 1/2 watt, 20%	1
R3	C-9B1-78	22,000 ohms, 1/2 watt, 10%	1
R4, R9	C-9B1-90	220,000 ohms, 1/2 watt, 10%	2
R5	C-9B1-82	47,000 ohms, 1/2 watt, 10%	1
R6, S1	A-10A-10075 or	Volume control (500,000 ohms) and switch	1
	A-10A-12540	Volume control (1 megohm) and switch	1
R7	C-9B1-34	3.3 megohms, 1/2 watt, 20%	1
R8	C-9B1-37	10 megohms, 1/2 watt, 20%	1
R10	C-9B1-94	470,000 ohms, 1/2 watt, 10%	1
R11	C-9B1-52	150 ohms, 1/2 watt, 10%	1
R12	C-9B2-43	27 ohms, 1 watt, 10%	1
R13	C-9B2-53	180 ohms, 1 watt, 10%	1
R14	C-9B2-63	1200 ohms, 1 watt, 10%	1
R15	C-9B1-5	47 ohms, 1/2 watt, 20%	1
R16	C-9B2-44	33 ohms, 1 watt, 10%	1
		TRANSFORMERS AND COILS	
L1	A-16A-10090	Choke coil	1
T1	C-212-13035	Loop antenna assembly, (includes loop, back, resistor R1, and capacitor C1)	1
T2	A-13D-10089	Oscillator coil	1
T3	B-13B-10091	Input IF transformer, complete in can. (Range of trimmers: 45-85 mmf each)	1
T4	B-13B-10092	Output IF transformer, complete in can. (Range of trimmers: 43-80 mmf each)	1
T5	B-12C-10074	Output transformer for speaker	1
		SPEAKER	
T6	B-18A-14352	4-in. x 6-in. oval P.M. speaker	1
		DIAL AND TUNING PARTS	
	200-14383	Dial bracket assembly	1
	B-6D-14354	Dial scale	1
	A-6A-14350	Crystal for dial	1
	A-2D-10036	Bracket for crystal (walnut)	2
	A-2D-10036-1	Bracket for crystal (ivory)	2
	A-2G-10095	Pointer	1
	A-53A-10576	Drive cord for dial pointer	36"
	A-49A-10078	Tension spring for dial drive cord	1
	A-46A-10793	Dial light bulb, 6-8 volts, type T-47	1
	A-55A-10093	Socket and bracket for dial light	1
	A-3A-10035	Tuning shaft	1
	B-29E-466	Spring washer, for tuning shaft	1
		MISCELLANEOUS	
	5C-10000-46	Cabinet, bakelite, walnut	1
	5C-10000-9	Cabinet, bakelite, ivory	1
	C-23J-10433	Back only for cabinet	
	B-5B-10011-17	Knob, tenite, walnut	2
	B-5B-10011-8	Knob, tenite, ivory	2
	A-15B-10440	Socket, octal, for all tubes but 12SK7	4
	121177	Socket, octal, for 12SK7	1
	B-14M-10088	Line cord and plug	1
	A-2M-10096	Stud, for fastening back to cabinet	4
	42A-10097	Screw, 8-18 x 7/8 hex head, for mounting chassis	3

*The values of the resistors and mica capacitors listed above are based on RMA standards. Due to conditions beyond our control some receivers have been shipped with components of pre-standardized values. This receiver will operate equally well with components of either group. An illustration of the differences in both resistors and capacitors follows:

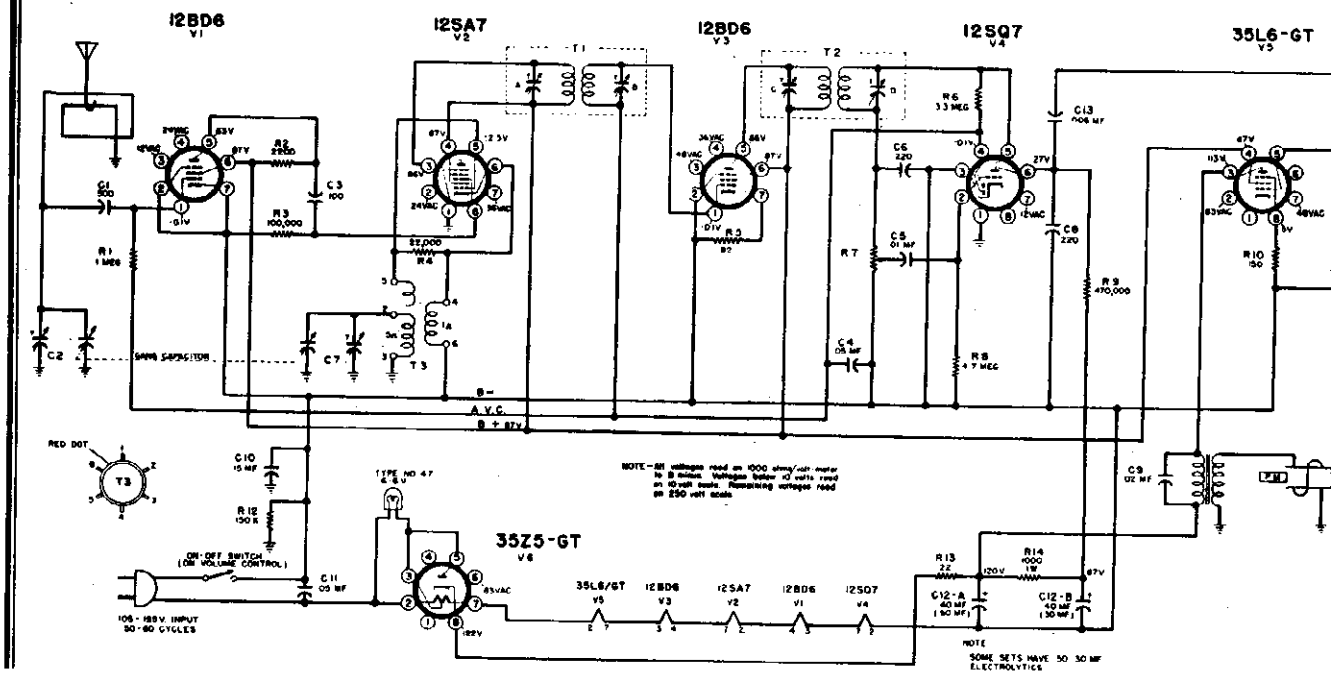
Pre-standardized value—50,000 ohms, 1/3 watt, 10%
RMA value—47,000 ohms, 1/2 watt, 10%
Pre-standardized value—200 mmf, 500 volts, 20%
RMA value—220 mmf, 500 volts, 20%

NOTE ON TUBE REPLACEMENT

Replace a defective metal 12SK7 tube with another metal tube. Replace a glass 12SK7 tube with a metal tube or with an exact duplicate of the tube now in the set.

MONTGOMERY WARD

MODELS 84BR-1507
84BR-1508B



NOTE: On some sets slug tuned I.-F.'s are used instead of trimmer tuned I.-F.'s. 108-140H and 108-145 are trimmer tuned. B-13A-12023 and B-13B-12022 are slug tuned. The slug tuned I.-F.'s are tuned from the top and bottom (secondary on top, primar bottom).

When slug tuned I. F.'s are used, R5 is 270 ohms.

GENERAL DESCRIPTION

This receiver is a single-band, AC-DC set which uses 5 tubes plus a rectifier. The antenna input and oscillator circuits are tuned by a two-gang capacitor. A loop antenna is built into the cabinet; provision is made also for the connection of an external antenna. AVC voltage is applied to the grids of the R.F. converter, and IF-amplifier tubes.

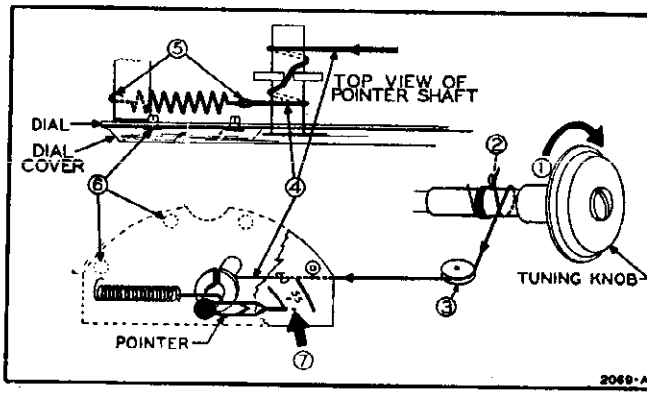
ELECTRICAL SPECIFICATIONS

Power Supply	105 to 125 volts, DC or 50-60 cycle AC, 35 watts.
Frequency Range	530 to 1650 kc.
Intermediate Freq.	455 kc.
Selectivity	At 1000 kc, 55 kc at 1000 x signal.
Sensitivity	40 microvolts average for .05 watt output.
Power Output	0.8 watts undistorted, 1 watt maximum.
Loud Speaker	5" P.M., v.c. impedance 3.2 ohms.
Tube Complement	12BD6, R. F. stage. 12SA7, converter. 12BD6, I. F. amplifier. 12SQ7, detector, AVC, audio amplifier. 35L6GT, output amplifier. 35Z5GT, rectifier.

REPLACING DIAL POINTER DRIVE CORD— Six inches of cord are required in the set. Use a piece slightly longer so that knots may be tied at each end. Numbers below correspond to circled numbers in diagram.

1. Rotate tuning knob to extreme clockwise positi This closes tuning condenser. Knob should remain in t position until installation is completed.
2. Tie cord to loop in spring as shown. Wind cord a turn around shaft in direction shown.
3. Pass cord over idler pulley.
4. Pass cord over pointer shaft; wind it one turn arou shaft; pass it through key washer; wind it one more tu around shaft.
5. Hook spring over end of dial support. Tie cord spring. *IMPORTANT:* Before tying knot stretch spri enough so that full contraction of spring will rota pointer shaft at least one-half turn.
6. Remove dial crystal by removing Cinch buttons.
7. Make sure tuning knob is in extreme clockwise po tion.

Then rotate pointer clockwise, against friction of sha until it is in horizontal position, as shown.



2069-A

MODELS 84BR-1507B, 84BR-1508B

MONTGOMERY WARD

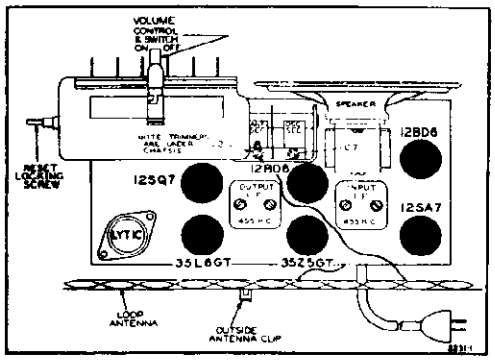
ALIGNMENT PROCEDURE AND RECEIVER STAGE SENSITIVITIES

The signal source must be an accurately calibrated signal generator capable of supplying R. F. signals modulated 30% with a 400-cycle audio signal. A 400-cycle source is necessary for the audio measurement.

The table below lists the sensitivity at various points. All measurements are based on an output of 50-milliwatts. This may be measured by disconnecting the speaker voice coil and substituting a 3.2-ohm, 5-watt resistor across the secondary winding of the output transformer. A reading of .4 volts AC across this resistor will be equivalent to a 50-milliwatt output with the speaker connected. Variations of plus or minus 25% are usually permissable. Volume control at maximum for all adjustments.

SIGNAL GENERATOR				TUNER SETTING	ADJUST FOR MAXIMUM OUTPUT	INPUT FOR 50-MILLIWATT OUTPUT
Frequency	Coupling Capacitor	Connection to Radio	Ground Connection			
455 kc.	.1 mf.	Pin No. 8 of 12SA7	12SQ7 Pin 3	Rotor full open	Trimmers on output and input I.F. cans	100 microvolts
1650 kc.	.1 mf.	Pin No. 8 of 12SA7	12SQ7 Pin 3	Rotor full open	Oscillator trimmer C7 (on bottom)	———
1400 kc.	none	See note A	none	Set dial at 1400	Antenna trimmer C2 (on bottom)	———
1400 kc.	.1 mf.	External antenna clip	12SQ7 Pin 3	1400 kc.	———	13 microvolts
400 cycles	.1 mf.	12SQ7, Pin 2	12SQ7 Pin 3	———	———	.05 volts

Note A: Lay output lead of generator in back of loop antenna. Turn up generator output. Loop antenna will pick up energy.



CHASSIS VIEW, SHOWING TUBE LOCATIONS
(See note on I.-F.'s.)

INSTALLATION

This radio is a superheterodyne set which may be operated from either alternating (AC) or direct (DC) current. The set contains a built-in antenna (aerial) and may be used to tune in stations on the standard broadcast band, 530 to 1650 kilocycles.

ANTENNA AND GROUND—The antenna built into the rear of the cabinet is sufficient for receiving programs from local stations and from powerful nearby stations. This antenna is directional, that is, reception is improved when the antenna is facing in certain directions. Therefore after tuning in a station try the radio in several positions.

In locations remote from broadcasting stations or where receiving conditions are poor, an outside antenna, 50 to 75 feet long including lead-in, will give best results. The antenna should be erected as high as possible, as far from surrounding objects as is practical, and at right angles to street car lines and power lines. Connect the antenna lead-in wire to the antenna clip at the rear of the radio.

No ground wire is required with this radio.

POWER—This receiver has been designed to operate on 105 to 125 volt, either DC or 50- to 60-cycle AC. If you are in doubt as to the voltage of your power supply, consult your local power company. Do not insert the plug in the power receptacle unless you are sure that the correct voltage is available.

AC OPERATION—Insert the line-cord into your AC receptacle. Turn the set on and tune in a station. Keep the volume low. A low steady hum may be heard. Reverse the plug in the receptacle and notice whether there is any difference. Leave the plug in the position which gives less hum.

DC OPERATION—On direct current the set will not operate with the plug in one position in the receptacle even though the pilot lamp lights, but will operate normally with the plug in the other position. Insert the plug and turn the volume control to the right. If no sound is heard after one minute, reverse the plug.

OPERATION

CONTROLS—The knob on the front is both the on-off switch and the volume control. When this control is turned all the way to the left the set is off. A slight rotation to the right will click the switch and turn the set on. The knob may then be used to regulate the volume. When the set is turned on the dial lamp lights dimly; as the tubes warm up the light becomes brighter. Be sure your radio is turned completely off when not in use; otherwise the tubes will wear out unnecessarily.

The knob on the right side of the cabinet is the tuning knob; it may be used to tune in (select) stations in the standard broadcast band. When selecting a station turn the knob back and forth until the tone is clearest and loudest. Do not use the tuning knob to regulate volume; the volume control should be used for that purpose after the station has been tuned in properly.

The operating frequency, in kilocycles, of each of your local stations is listed in the radio section of your

newspaper. The numbers on the radio dial may be converted into kilocycles by multiplying by 10; for example, 90 on the dial represents 900 kilocycles.

SETTING THE PUSHBUTTONS—The pushbuttons may be used, after proper adjustment, for the automatic tuning of any six stations which you select. They can be set up in any order.

1. Turn on the radio. Allow it to warm up for at least one minute.

2. Push out the call letters of the six stations from the call-letter sheets supplied with this manual.

3. Insert one call-letter tab in the rectangular opening in each of the pushbuttons, in any sequence. Press an acetate tab (supplied in small envelope) into each of the pushbuttons.

4. With the screwdriver supplied, check to see that the locking screw in the center of the tuning knob (see illustration) is loose. If it is not, turn it several turns to the left (counterclockwise).

5. Press the first pushbutton down *all the way*. With one hand hold the button down *firmly* and with the other carefully tune in the desired station. Release the pushbutton.

6. Follow this procedure for each of the five other buttons, adjusting each one for a different station.

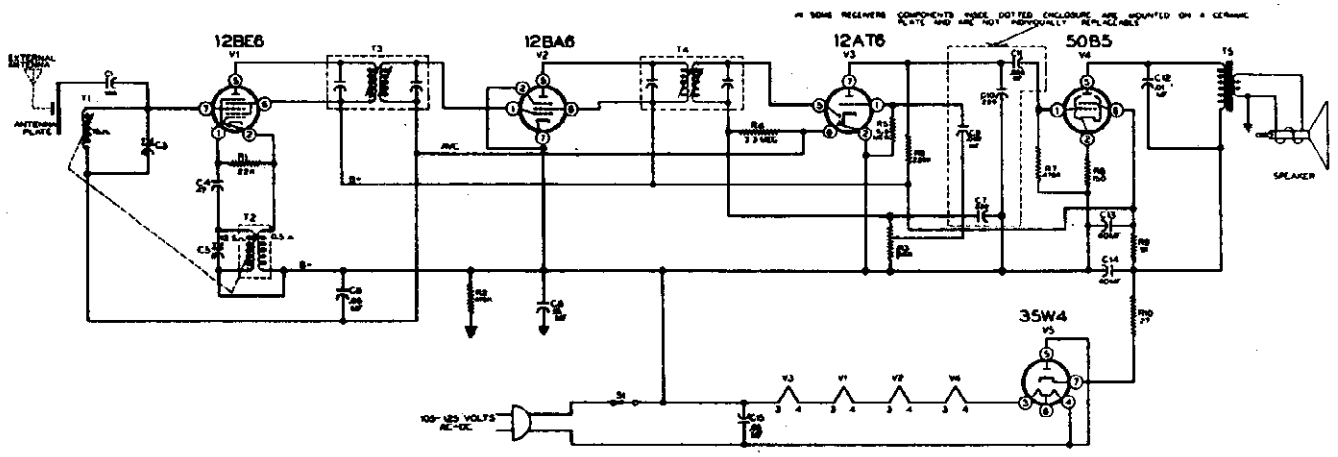
7. Rotate the tuning knob on the side of the cabinet as far to the right as it will go. Tighten the locking screw in the center of the knob. IT IS IMPORTANT THAT THIS SCREW BE TIGHTENED VERY FIRMLY.

8. The pushbuttons are now properly set for automatic tuning. Any of the six stations may now be tuned in simply by pressing the proper button down as far as it will go. If it is desired to reset any of the buttons for a new station, loosen the locking screw in the center of the tuning knob, set the pushbutton as described above, and re-tighten the locking screw.

Ref. No.	Part No.	Description
		CONDENSERS
C12A, C12B	A-8C-11375	Filter cond., 40 mfd. x 40 mfd. x 150 volts
	or	
	A-8C-15030	Filter cond., 40 mfd. x 40 mfd. x 150 volts
	or	
	A-8C-15262	Filter cond. 50 mfd. x 30 mfd. x 150 volts
C4	C-8D-10770	.05 x 200 volts, tubular
C9	C-8D-10774	.02 x 400 volts tubular
C5	C-8D-11738	.01 x 200 volts, tubular
C11	C-8D-10813	.05 x 400 volts, tubular
C10	C-8D-10953	.15 x 400 volts, tubular
C13	C-8D-10785	.006 x 600 volts, tubular
C6, C8	C-8G-11733	220 mmf., ceramic
C1	C-8G-11822	500 mmf., ceramic
C3	C-8G-11734	100 mmf., ceramic
		RESISTORS
R14	C-9B2-62	1000 ohms, 1 watt, 10%
R9, R11	C-9B1-94	470K ohms, 1/2 watt, 20%
R8	C-9B1-35	4.7 megohms, 1/2 watt, 20%
R6	C-9B1-34	3.3 megohms, 1/2 watt, 20%
R4	C-9B1-78	2.2K ohms, 1/2 watt, 20%
R13	C-9B1-42	22 ohms, 1/2 watt, 10%
R3	C-9B1-25	100K ohms, 1/2 watt, 20%
R2	C-9B1-66	2200 ohms, 1/2 watt, 10%
R12	C-9B1-26	150K ohms, 1/2 watt, 20%
R1	C-9B1-31	1 megohm, 1/2 watt, 20%
R10	C-9B1-52	150 ohms, 1/2 watt, 10%
R5	C-9B1-49	82 ohms, 1/2 watt, 10%
	or	270 ohms, 1/2 watt, 10%
	C-9B1-55	
		COILS
	C-13E-15281 or C-13E-15294	Loop antenna assembly, complete on back
T3	B-13D-15277	Oscillator coil
T1	108140Q or B-13A-12023-1	Input I.F. coil in can, 455 Kc.
T2	108145H or B-13B-12022-1	Output I.F. coil in can, 455 Kc.
		SOCKETS
	A-15C-15189	7-prong, tube socket
	121171	8-prong socket, laminated
	121216	Socket base, bakelite
	A-47A-11470	Pilot light socket assembly
		SPEAKER
	114197	5-inch P.M. speaker
	B-12C-15278	Output transformer for speaker

Ref. No.	Part No.	Description
		DIAL PARTS
	115448	End plate (right hand bracket)
	115448C	End plate (left hand bracket)
	115146	Cams
	115143	Key washer (13 used on cam shaft)
	117528	Brass spacer (one used on cam shaf
	117602	Brass spacer (four used on cam shaf
	131181	Spring washers, for locking collar
	117604	Locking collar
	117600	Level shaft
	115361	Lever with roller
	120283	Return spring for levers
	115449B	Dial bracket assembly
	112785	Pointer
	A-53A-10989	Drive cord, 6 inches used
	A-49A-11087	Spring on tuning shaft, for cord
	A-3N-11086	Spacer under above spring
	120143	Take-up spring for drive cord
	B-6D-10241-2	Dial scale
	112-659-1	Crystal, clear, for dial scale
	A-2M-7758	Cinch buttons for fastening scale to bracket
	117833	Brass spacer (for spacing pointer from dial)
		MISCELLANEOUS
	10798	Line cord and plug
R7	101218 or A-10A-10626	Volume control and switch, 1 meg.
C1-A, C1-B	B-8A-10211	2-gang variable condenser
	107249	Pilot light bulb, type T-47
	134123	Rubber bumper (bottom of cabinet
	13141	Cinch buttons, to cover trimmer holes in cabinet
	B-5B-14298-8	Pushbutton (6 used), Ivory
	A-23L-11900	Station call letters, set
	A-6C-14299	Acetate tabs for call letters
	5C-11228-9	Cabinet, bakelite, ivory color
	128-686-8	Knob, volume, ivory color
	A-5B-10994-9	Knob, tuning, ivory color
	A-3F-10995	Locking screw for tuning knob
	120388	Locking spring for tuning knob
	A-2H-10996	Reset key
	5C-11228-36	Cabinet, walnut
	128-686-37	Knob, volume, walnut
	A-5B-10994-36	Knob, tuning, walnut
	B-5B-14298-37	Pushbuttons, walnut

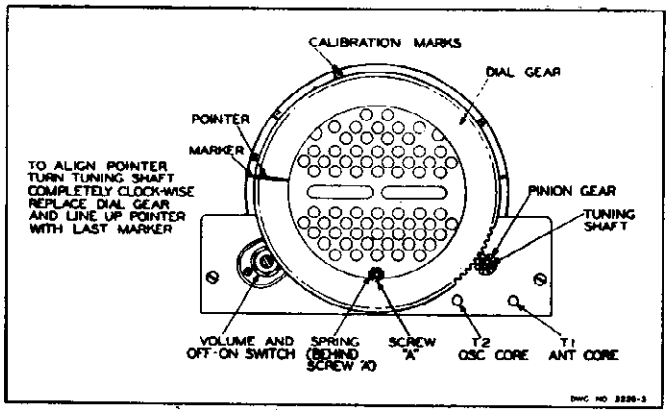
MODELS 84BR-1515A, 84BR-1516A, MONTGOMERY WARD 84BR-1815A, 84BR-1816A

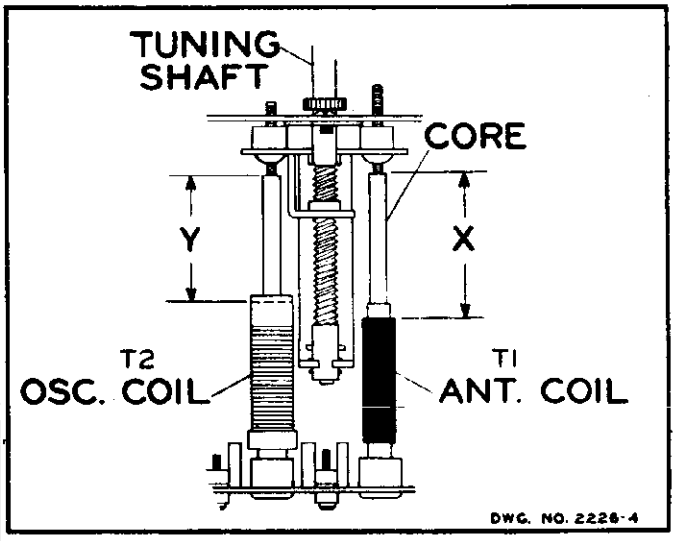


On some sets the four condensers C7, C9, C10, C11 are in one unit. Replace a defective section with an external single unit.

GENERAL DESCRIPTION

This radio is a permeability-tuned, AC-DC set using 4 tubes plus a rectifier. The metal back plate of the cabinet serves as a self-contained antenna. A clip is provided for connection of an external antenna; it is riveted to a washer which is capacity-coupled to the back plate. Simple AVC voltage is applied to the converter and IF-amplifier tubes. The filament string is across the AC line.





With tuner all the way out, dimension "Y" is 1-15/64". Dimension "X" is 1½".

ELECTRICAL SPECIFICATIONS

Power Supply	105 to 125 volts, DC or 50-60 cycles AC, 35 watts.
Frequency Range	535 to 1620 kc.
Intermediate Freq.	455 kc.
Selectivity	At 1000 kc., 55 kc. at 1000 x signal.
Sensitivity	20 microvolts average for .05 watt output.
Power Output	0.7 watts undistorted, 1.0 watts maximum.
Loud Speaker	4", P.M., v.c. impedance 3.2 ohms.
Tube Complement	12BE6, converter 12BA6, I.F. amplifier 12AT6, detector, AVC, audio amplifier 50B5, output amplifier 35W4, rectifier.

MONTGOMERY WARD MODELS 84BR-1515A, 84BR-151(
84BR-1815A, 84BR-1816A

ALIGNMENT PROCEDURE AND RECEIVER STAGE SENSITIVITIES

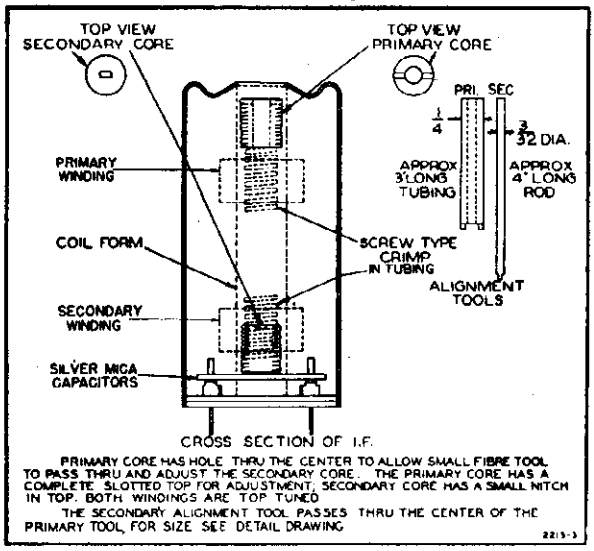
The signal source must be an accurately calibrated signal generator capable of supplying R. F. signals modulated 30% with a 400-cycle audio signal. A 400-cycle source is necessary for the audio measurements.

The table below lists the sensitivity at various points. All measurements are based on an output of 50-milliwatts. This may be measured by disconnecting the speaker voice coil and substituting a 3.2-ohm, 5-watt resistor across the secondary winding of the output transformer. A reading of .4 volts AC across this resistor will be equivalent to a 50-milliwatt output with the speaker connected. Variations of plus or minus 25% are usually permissable. Volume control at maximum for all adjustments.

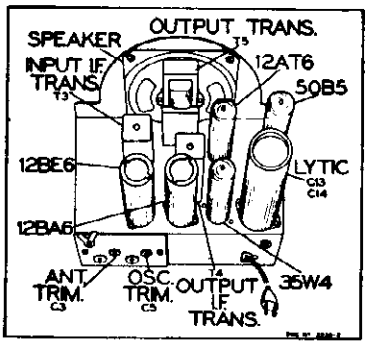
SIGNAL GENERATOR				TUNER SETTING	ADJUST FOR MAXIMUM OUTPUT	INPUT FOR 50-MILLIWATT OUTPUT
Frequency	Coupling Capacitor	Connection to Radio	Ground Connection			
455 kc.	.1 mf	12BE6, Pin 7	12AT6, Pin 2	Iron cores all the way out	Cores in output and input I.F. cans	45 microvolts
1620 kc.	.1 mf	12BE6, Pin 7	12AT6, Pin 2	Iron cores all the way out	Oscillator trimmer C5	———
1620 kc.	2 mmf see note	External antenna clip	12AT6, Pin 2	1620 kc.	Antenna trimmer C3*	20 microvolts
1400 kc.	2 mmf see note	External antenna clip	12AT6, Pin 2	1400 kc.	Adjust position of ant. core (see coil illustration view)	20 microvolts
400 cycles	.1 mf	12AT6, Pin 1	12AT6, Pin 2	———	———	.03 volts

*After the antenna coil has been tracked at 1400 kc., it is necessary to check the antenna trimmer C3 again at 1620 kc. If no appreciable change in trimmer adjustment is necessary, the coil is in track. If the trimmer requires considerable change, the position of the antenna core at 1400 kc. must be readjusted. These two adjustments should be made several times, until no trimmer adjustment is required at 1620 kc.

NOTE: Anything larger than 2 mmfd. will produce mistrack.



CAUTION—The I.F. transformer construction is such that two resonance peaks occur for each winding, one peak when the slug is above its coil and another peak when the slug is below its coil. Be sure the upper core is above the top coil and the lower core is below the bottom coil (see coil drawing above).



ANTENNA AND GROUND—The plate antenna on the rear of the cabinet is sufficient for receiving programs from local stations and from powerful nearby stations. In locations remote from broadcasting stations or where receiving conditions are poor, an outside antenna, 50 to 75 feet long including lead-in, will give best results. The antenna should be erected as high as possible, as far from surrounding objects as is practical, and at right angles to street car lines and power lines. Connect the antenna lead-in wire to the antenna clip at the rear of the radio.

No ground wire is required with this radio.

POWER—This receiver has been designed to operate on 105-125 volts, either DC or 50- to 60-cycle AC. If you are in doubt as to the voltage of your power supply, consult your local power company. Do not insert the plug in the power receptacle unless you are sure that the correct voltage is available.

INSTALLATION

This radio is a superheterodyne set which may be operated from either alternating (AC) or direct (DC) current. The plate antenna on the rear of the cabinet serves as a built-in antenna for the set, which tunes over the standard broadcast band, 535 to 1620 kilocycles.

OPERATION

CONTROLS—The knob on the left is both the on-off switch and the volume control. When this control is turned all the way to the left the set is off. A slight ro-

MODELS 84BR-1515A, 84BR-1516A, 84BR-1815A, 84BR-1816A — MONTGOMERY WARD

tation to the right clicks the switch and turns the set on. The knob may then be used to regulate the volume. Be sure your radio is turned completely off when not in use; otherwise the tubes will wear out unnecessarily.

The knob on the right is the tuning knob; it may be used to tune in stations on the standard broadcast band. When selecting a station turn the knob back and forth until the tone is clearest and loudest. Do not use the tuning knob to regulate volume; the volume control should be used for that purpose after the station has been tuned in properly.

The operating frequency, in kilocycles, of each of your local stations is usually listed in the radio section of your newspaper. The numbers on the radio dial may be converted into kilocycles by multiplying by 10. For example, 80 on the dial represents 800 kilocycles.

DC OPERATION—On direct current the set will not operate with the plug in one position in the receptacle, but will operate normally with the plug in the other position. Insert the plug and turn the volume control to the right. If no sound is heard after one minute, reverse the plug.

AC OPERATION—Insert the line-cord into your AC receptacle. Turn the set on and wait 30 seconds for tubes to warm up; tune in a station; keep the volume low. A low steady hum may be heard. Reverse the plug in the receptacle and notice whether there is any difference. Leave the plug in the position which gives less hum.

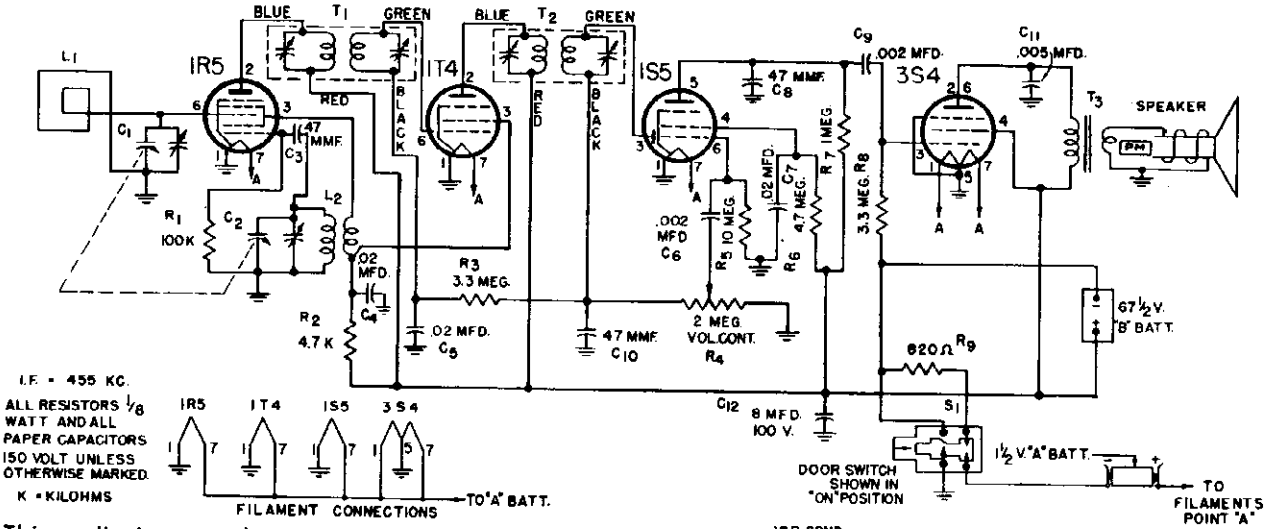
Ref. No.	Part No.	Description	Qty. Used
		CAPACITORS	
C13, C14	A-8C-15030	Electrolytic, 40 mfd x 40 mfd x 150 volts	1
C4	C-8G-12198	.000047 mfd, ceramic	1
C1	C-8G-11734	100 mmf, 20%, ceramic	1
C7, C10	C-8G-11733	.00022 mmf, ceramic	2
C9	C-8D-10778	.002 x 600 volts, paper	1
C11	C-8D-10935	.005 x 600 volts, paper	1
C12	C-8D-11738	.01 x 200 volts, paper	1
C6	C-8D-10770	.05 x 200 volts, paper	1
C15	C-8D-10813	.05 x 400 volts, paper	1
C8	C-8D-10953	.15 x 400 volts, paper	1
C5	A-2M-14468	Trimmer plate for osc. small, with 1 ear	1
C3	A-2M-12618	Trimmer plate for antenna, small, with 2 ears	1
C3, C5	A-2M-14467	Trimmer bottom plate, for both trimmers. Large, flat, with 1 ear	2
	A-6M-12616	Insulator, clear, for antenna	1
	B-6M-12616-S-2	Insulator, silvered, for osc.	1
		RESISTORS	
R3, S1	A-10A-12380	Volume control (1 megohm) and switch	1
R1	C-9B1-78	22K ohms, 1/2 watt, 10%	1
R10	C-9B1-43	27 ohms, 1/2 watt, 10%	1
R4	C-9B1-34	3.3 megohms, 1/2 watt, 20%	1
R8	C-9B1-52	150 ohms, 1/2 watt, 10%	1
R9	C-9B2-62	1000 ohms, 1 watt, 10%	1
R2, R7	C-9B1-94	470K ohms, 1/2 watt, 10%	2
R6	C-9B1-90	220K ohms, 1/2 watt, 10%	1
R5	C-9B1-36	6.8 megohms, 1/2 watt, 20%	1
		SPEAKER	
	B-18A-14390	Speaker, 4" P.M., less transformer	1
T5	B-12C-14320	Output transformer, for speaker	1
		COILS	
T3	B-13A-13071	Input I.F. transformer	1
T4	B-13B-13072	Output I.F. transformer	1
T2	A-13D-14418	Oscillator coil assembly	1
T1	A-13E-14417	Antenna coil assembly	1
	B-51A-13812 or A-51A-12443	Iron core for oscillator coil	1
	B-51A-14463 or B-51A-14396	Iron core for antenna coil	1

NOTE: Ref. No. C8, Part No. C-8D-10935 should be C-8D-10953.

Ref. No.	Part No.	Description	Qty. Used
		DIAL AND TUNING PARTS	
	B-29A-7479	Washer, used with tension spring	1
	A-2J-13522	Tension spring for dial ring gear	1
	A-3A-13478	Drive shaft	1
	A-3L-12388	Drive pinion	1
	A-200-14497	Dial ring gear and pointer assembly	1
		MODELS 84BR-1515A 84BR-1516A	
	B-23G-13951	Dial scale, (Decal)	1
	A-5B-13948-8	Knob, Ivory	2
	A-5B-13948-37	Knob, Walnut	2
		MODELS 84BR-1815A 84BR-1816A	
	B-6D-15086	Dial scale	1
	A-5B-15067-63	Knob, Ivory	2
	D-5C-14466-64	Escutcheon	1
	A-43D-15144	Push-on clips	2
		MISCELLANEOUS	
	A-2M-10096	Snap-in rivet to fasten top of antenna plate	2
	B-2M-11205	Snap-in rivet to fasten bottom of antenna plate	2
	A-15C-13174	Socket, 7-prong, miniature	5
	B-14M-10088-3	Line cord	1
	A-2H-10974	Tube shield	2
		MODELS 84BR-1515A 84BR-1516A	
	5C-12514-9	Cabinet, Ivory color	1
	5C-12514-36	Cabinet, Walnut color	1
	B-13E-14421	Antenna plate	1
		MODELS 84BR-1815A 84BR-1816A	
	D-24D-14321	Cabinet, walnut	1
	D-24D-14321	Cabinet, bleached	1
	B-13E-15100	Antenna plate	1

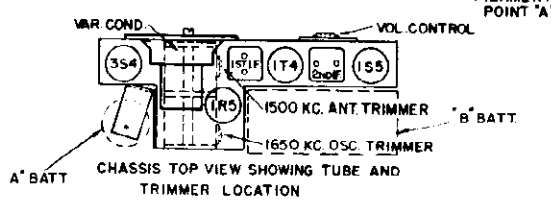
NOTE:— CORRECT DRIVE SHAFT NUMBER IS: A-3A-15154.

MONTGOMERY WARD MODEL 8L4GCB-1062

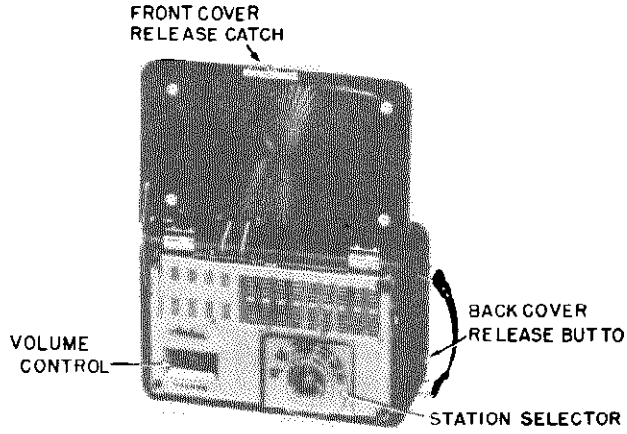


This radio is a condenser tuned receiver using cut plate tracking oscillator section and employs four tubes in a superheterodyne circuit. A highly efficient litz wound loop is assembled in a low loss polystyrene cover and is connected to the receiver input by means of flexible plastic covered leads passing through an insulating bushing. No provision is made for the use of an external antenna.

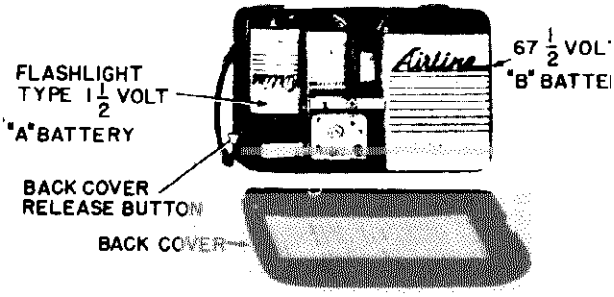
Power is obtained from a single 1½ volt flashlight type cell and a 67½ volt "B" battery. All tube filaments are connected in parallel. A.V.C. voltage is applied to the I.F. amplifier tube only. Bias for the output tube is obtained from a resistor in the minus B lead.



CHASSIS TOP VIEW SHOWING TUBE AND TRIMMER LOCATION



RECEIVER IN OPERATING POSITION



REAR VIEW - BACK COVER REMOVED SHOWING LOCATION OF BATTERIES

ELECTRICAL SPECIFICATIONS

Power Supply.....1½ volt "A" cell @ 250 MA and 67½ volt "B" battery @ 9 MA (with fresh batteries)

Frequency Range....540 to 1650 KC

Intermediate Freq. ..455 KC

Selectivity .....At 1000 Kilocycles, 28 KC at 10 X signal

Sensitivity .....400 Microvolts per meter average for .05 watt ouput.

Power Output .....70 Milliwatts undistorted (with fresh batteries)

Loud Speaker .....2½" P.M. v.c. impedance 3.2 ohms

Tube Complement....1R5 Converter
1T4 I.F. Amplifier
1S5 Detector, AVC, audio amplifier
3S4 Power Amplifier

BATTERY REQUIREMENTS—The following batteries are required:

QUANTITY	TYPE	MANUFACTURER
1	1½ volt "A"	Airline #62-23, Eveready size "D", Burgess No. 2, Ray-O-Vac size "D" or equivalent.
1	67½ volt "B"	Airline #62-43 or #62-10, Eveready #467, Burgess type XXD, Ray-O-Vac Type #4367 or equivalent.

MODEL 84GCB-1062A MONTGOMERY WARD

ALIGNMENT PROCEDURE AND RECEIVER STAGE SENSITIVITIES

The signal source must be an accurately calibrated signal generator capable of supplying R.F. signals modulated 30% with a 400-cycle audio signal. A 400-cycle source is necessary for the audio measurements.

In order to make the adjustments listed in the table below, it is necessary to first remove the front panel in order to remove the chassis from the cabinet. The loop leads must also be disconnected (unsolder) and extended by means of short leads. The table below lists the sensitivity at various points. All measurements are based on an output of 50 milliwatts. This may be measured by disconnecting the speaker voice coil and substituting a 3.2 ohm, 5 watt resistor across the secondary winding of the output transformer. A reading of .4 volts AC across this resistor will be equivalent to a 50-milliwatt output with the speaker connected. Variations of plus or minus 25% are usually permissible. Volume control at maximum for all adjustments.

SIGNAL GENERATOR				DIAL SETTING	ADJUST FOR MAXIMUM OUTPUT	INPUT FOR 50-MILLIWATT OUTPUT
Frequency	Coupling	Connection to Radio	Ground Connection			
455 KC	.1 mfd condenser	Stator lug Var. Capacitor (front section)	Chassis	Variable Condenser fully open	Trimmers 1st and 2nd I.F. transformer	100 microvolts
1650 KC	Coupling loop see note 1	None	None	Variable Condenser fully open	Oscillator Trimmer (Rear section)	———
1500 KC	Coupling loop see note 2	None	None	1500 KC	Ant. trimmer (front section)	———
400 cycles	.1 mfd condenser	High side of volume control	Chassis	———	———	.045 volts

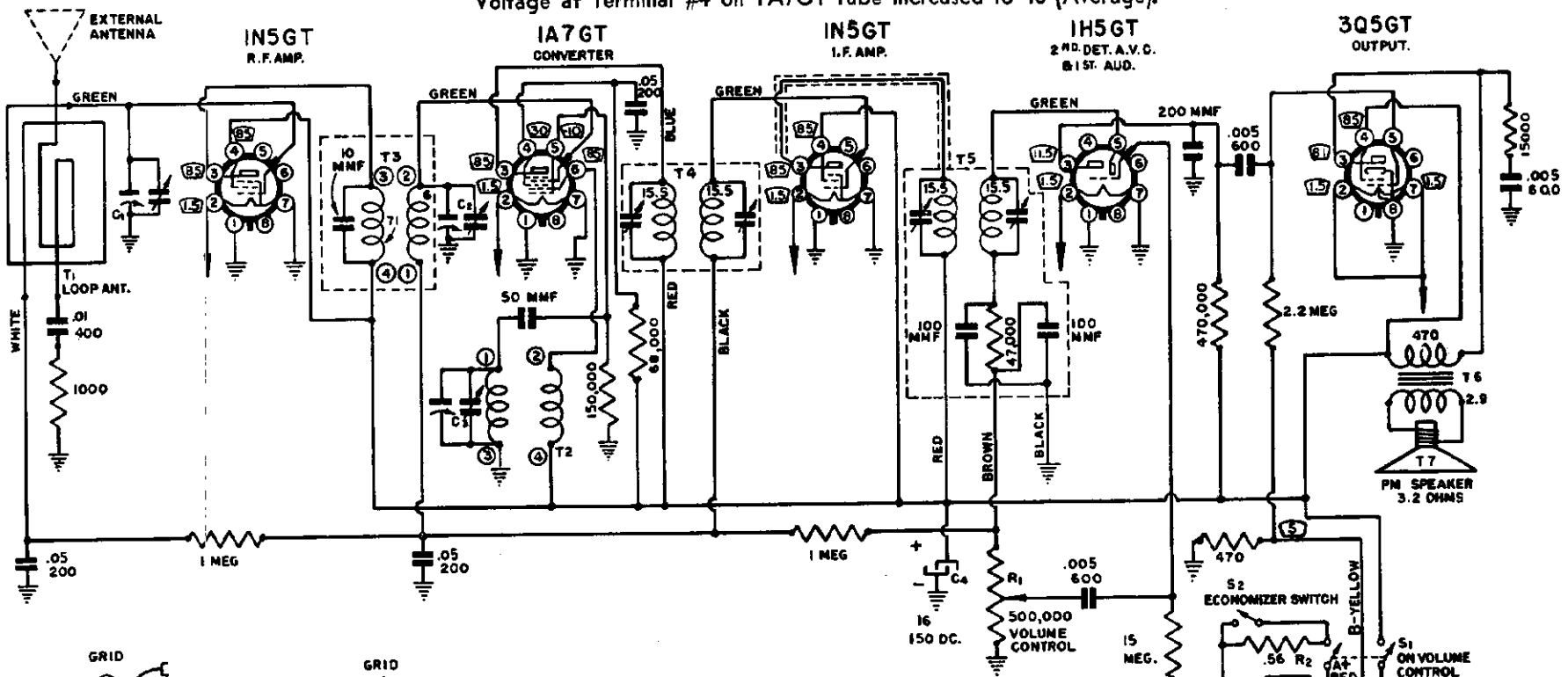
Note 1 — Connect signal generator leads to a three turn radiating loop approximately 4" in diameter placed about 8" from the loop of the receiver.

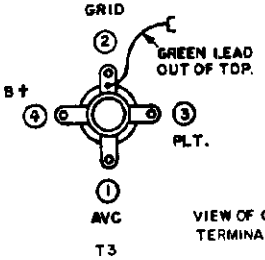
Note 2 — After chassis is installed in cabinet and reconnected to its loop re-adjust the antenna trimmer by ear, with low signal input.

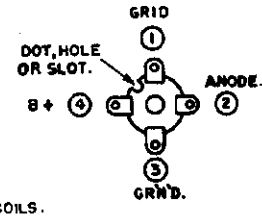
Ref. No.	Part No.	Description	Qty. Used
		CAPACITORS	
C12	5.417	Electrolytic, 8 mfd. 100 V.	1
C3, C8, C10	4.109-12	47 mmf. Ceramic	3
C6, C9	3.101-3	.002 x 150 volts, Paper	2
C11	3.101-5	.005 x 150 volts, Paper	1
C4, C5, C7	3.101-11	.02 x 150 volts, Paper	3
		RESISTORS	
R4	8.216-1	Volume Control (2 meg-ohms)	1
R9	7.105-185	820 ohms ⅛ watt, 20%	1
R2	7.105-13	4.7 K ⅛ watt, 20%	1
R1	7.105-45	100 K ohms, ⅛ watt, 20%	1
R3, R8	7.105-101	3.3 Meg ohm, ⅛ watt, 20%	2
R6	7.105-164	4.7 meg ohm, ⅛ watt, 20%	1
R5	7.105-171	10 meg ohm, ⅛ watt, 20%	1
		SPEAKER	
	30.315	Speaker, 2½" P.M., less trans.	1
T3	9.207-A	Output Transformer	1
		COILS	
T1	1.412-2	Input I.F. Transformer	1
T2	1.413-2	Output I.F. Transformer	1
L2	1.466	Oscillator Coil	1
L1	35.209	Loop Ant. Assembled to plate	1
		DIAL PARTS	
	13.123	Tuning Knob	1
	13.124	Volume Knob	1
		MISCELLANEOUS	
	35.246	Cabinet complete (less loop plate and front panel and baffle) specify color	1
	13.155	Back Cover (specify Color)	1
	35.244	Front Cover (with catch and stay arm)	1
	35.245	Front Panel (with screws)	1
	35.198	Handle with loops	1
	33.172	Snap-in Rivet, for holding loop antenna	4
	24.220	Socket, 7 prong, miniature	4
	35.243	Door Switch (with resistor)	1
	35.242	"A" Battery holder assembly (less output transformer)	1
	35.210	"B" Battery connector ass'y	1

Note on "B" Models—Resistor - 68,000 Ohm in Screen Circuit of 1A7GT Tube, Replaced with 33,000 Ohm.

Voltage at Terminal #4 on 1A7GT Tube Increased to 48 (Average).







VIEW OF COILS. TERMINAL END.

NOTES:

- VOLTAGES MEASURED WITH A 1000 OHMS PER VOLT D.C. METER BETWEEN CHASSIS AND POINTS DESIGNATED.
- CAPACITOR VALUES IN MFD. UNLESS OTHERWISE INDICATED.
- RESISTOR AND COIL VALUE IN OHMS.
- WHERE VALUE OF COILS IS NOT SHOWN, RESISTANCE IS LESS THAN ONE OHM.
- ALL RESISTORS ARE RATED AT 1/2 WATT, ±20%

TUNING RANGE . . . 535-1620 KC.

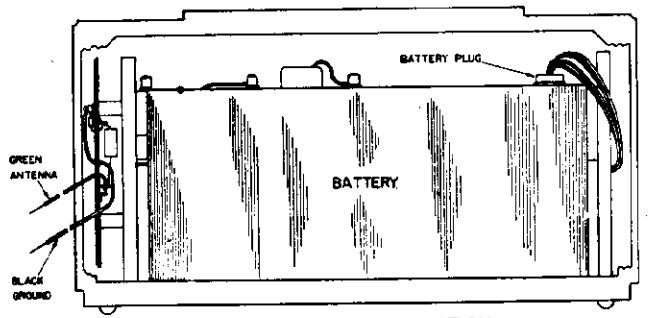
INTERMEDIATE-FREQUENCY . . . 455 KC.

SELECTIVITY . . . Over-all band width 35 KC at 1000 X signal at 1000 KC.

SENSITIVITY . . . 12 Microvolts for 50 Milliwatts output.

POWER OUTPUT . . . 150 M. W. undistorted 330 M. W. maximum.

LOUD SPEAKER . . . 5 inch diameter P. M. Magnet 2.15



BATTERY INSTALLATION

MONTGOMERY WARD

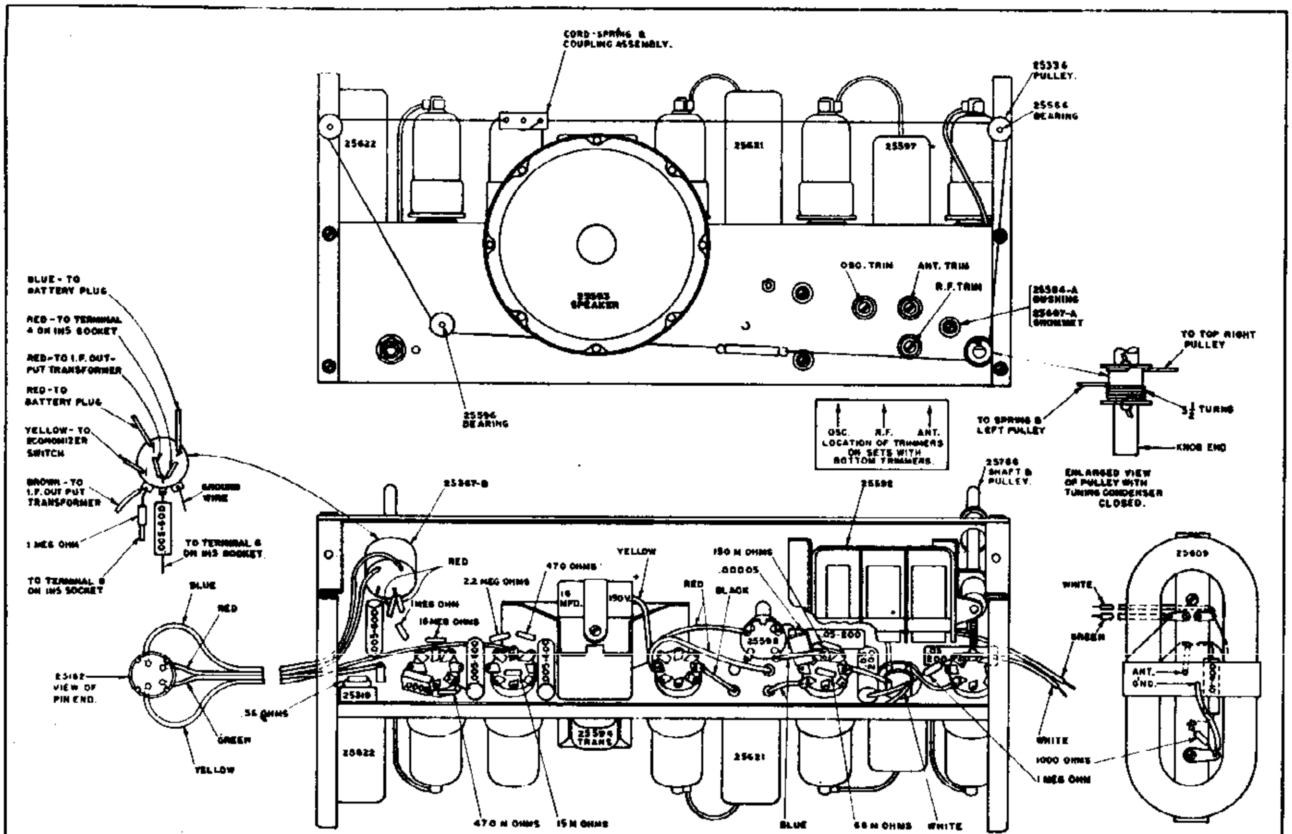
RECEIVER STAGE SENSITIVITIES

The table below lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 kc for all readings. All measurements are based on an output of 50 milliwatts. This may be measured by disconnecting the speaker voice coil and substituting a 3.2-ohm, 5-watt resistor across the secondary winding of the output transformer. A reading of 0.4 volts AC across this resistor will be equivalent to a 50-milliwatt output with the speaker connected.

The signal source must be an accurately calibrated signal generator capable of supplying both 1000 kc and 455 kc signals modulated 30% with a 400-cycle audio signal. Variations of plus or minus 25% are usually permissible.

The volume control must be set to maximum.

SIGNAL GENERATOR				INPUT FOR 50 MILLIWATT OUTPUT
FREQUENCY	COUPLING CAPACITOR	CONNECTION TO RADIO	GROUND CONNECTION	
1000 KC	200 Mmf or RMA Dummy Antenna	External Antenna Clip	To Ground Lead	12 uv
1000 KC	.1 Mfd.	Grid (Top Connection) of R. F. Amp. (1N5)	To Chassis	20 uv
1000 KC	.1 Mfd.	Grid (Top Connection) of Converter (1A7)	To Chassis	220 uv
455 KC	.1 Mfd.	Grid (Top Connection) of Converter (1A7)	To Chassis	125 uv
455 KC	.1 Mfd.	Grid (Top Connection) I. F. Amp. (1N5)	To Chassis	6000 uv
400 Cycles	.1 Mfd.	Grid (Top Connection) Audio Amp. (1H5)	To Chassis	.1 v.
400 Cycles	.1 Mfd.	Grid (Pin) of Output Amp. (3Q5)	To Chassis	1.5 v.



- Output meter across 3.2-ohm output load.
- Volume control at maximum for all adjustments.
- Align for maximum output. Reduce input as needed to keep output near 0.4 volts.
- Loop antenna should be connected to receiver and in its proper position when making adjustments.

SIGNAL GENERATOR				TUNER SETTING	ADJUST TRIMMERS TO MAXIMUM OUTPUT IN ORDER SHOWN
FREQUENCY	COUPLING CAPACITOR	CONNECTION TO RADIO	GROUND CONNECTION		
455 KC	.1	Grid Cap of 1N5GT (I.F.)	To Chassis	Capacitor full open (plates out of mesh)	2 trimmers on output IF can T5 (25622)
455 KC	.1	Grid Cap of 1A7GT	To Chassis	Capacitor full open (plates out of mesh)	2 trimmers on input IF can T4 (25621)
1620 KC	200 Mmf	Antenna Lead	To Chassis	Capacitor full open (plates out of mesh)	Oscillator trimmer C3 on gang
1400 KC	200 Mmf	Antenna Lead	To Chassis	Set dial pointer at 1400 KC	Antenna and R. F. trimmers C1, C2 on gang

Ref. No.	Part No.	Description	Qty. Used In Set
		CAPACITORS	
C 1-2-3	25592	3 Gang Tuning Capacitor Including Trimmers	1
C 4	25600	Electrolytic 16 Mfd. 150 V.	1
	8661	.05 Mfd. 200 V. Tubular	3
	8583	.01 Mfd. 400 V. Tubular	1
	14061	.005 Mfd. 600 V. Tubular	3
	14370	200 Mmf. Mica	1
	17091	50 Mmf. Mica	1
		RESISTORS	
R 1	25367	Control-Volume Including On-Off Switch	1
	14365	15 Megohm 1/2 Watt 20%	1
	25134	2.2 Megohm 1/2 Watt 20%	1
	8766	1 Megohm 1/2 Watt 20%	2
	25042	470,000 Ohm 1/2 Watt 20%	1
	14616	150,000 Ohm 1/2 Watt 20%	1
NOTE—	25040	68,000 Ohm 1/2 Watt 20%	1
	17164	15,000 Ohm 1/2 Watt 20%	1
	25414	1,000 Ohm 1/2 Watt 20%	1
	25085	470 Ohm 1/2 Watt 20%	1
	25613	.56 Ohm 1/2 Watt 10%— Wire Wound	1
		TRANSFORMERS AND COILS	
T 1	25609	Loop Antenna (Includes Mounting Strips and Ter-	1
T 2	25598	cillator	1
T 3	25597	: (Includes Shield Can and 10 Mmf. Condenser)	1
T 4	25621	Transformer—IF Input	1
T 5	25622	Transformer — IF Output (Complete in Can — Includes 2 - 100 Mmf. Capacitors Built-In With Trimmers)	1
T 6	25594	Transformer—Speaker (Includes Mounting Clamp)	1

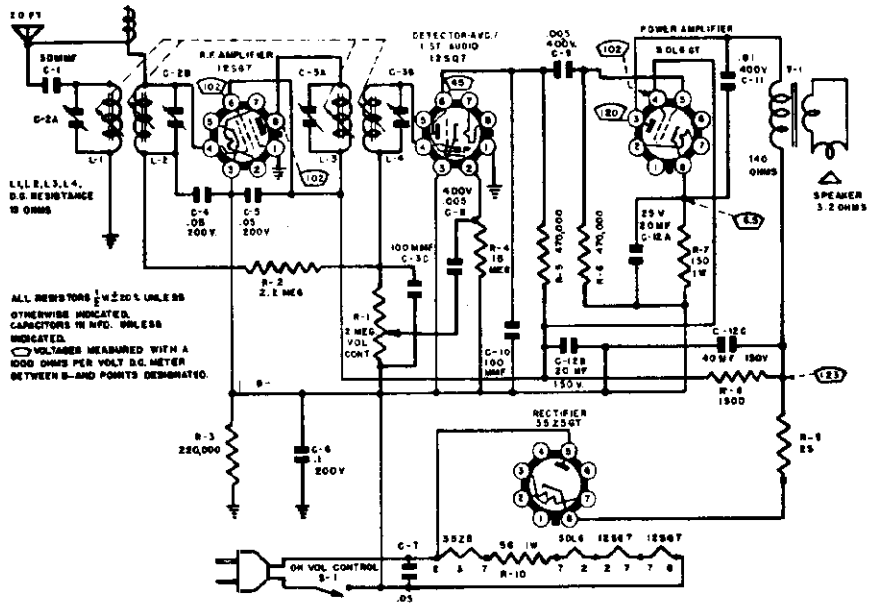
Ref. No.	Part No.	Description	Qty. Used In Set
		SPEAKER	
T 7	25593	5" P. M. Speaker	1
		SWITCHES	
S 1		Part of Volume Control	
S 2	25319	S. P. S. T. Slide Switch	1
		DIAL AND TUNING PARTS	
	25566	Bearing—Short (For Upper Wood Pulleys)	2
	25596	Bearing—Long (For Lower Wood Pulley)	1
	25767	Cord — Dial (Includes Spring and Pointer Coupling)	1
	25336	Pulley—Wood	3
	25809	Plate—Assembly (Includes Dial Backing Plate with Bracket, Track and Pointer)	1
	25586	Pointer	1
	25581	Track (For Pointer)	1
	25590	Scale—Dial	1
	25766	Shaft — Tuning (Includes "Spool" Pulley)	1
	25774	Screw — Set 8 — 32 x 1/8 (Used in Worm Gear of Tuning Condenser)	1
	25654	Screw — Wood #4 x 1/4 (Mounting Dial Back Plate)	4
		MISCELLANEOUS	
	25553	Back — Chassis (Removable Back Plate)	1
	25591	Cabinet—Wood	1
	25603	Cap—Grid	4
	25605	End—Chassis	2
	25696	Knob—Bakelite	2
	25612	Plug — 4 Prong (For Battery Cable)	1
	25620	Socket—Octal, For Tubes	5
	25618	Screw — 10-32 x 7/8 (For Mounting Chassis)	2

*The values of the resistors listed above are based on RMA standards. Due to conditions beyond our control some receivers have been shipped with resistors of pre-standardized values. This receiver will operate equally well with resistors of either group. An illustration of the difference follows:

Pre-standardized value - 50,000 ohms,
RMA value - 47,000 ohms,

Note on "B" Models—#25040 resistor replaced with #25144 resistor 33,000 ohm, 1/2 watt 20%.

BATTERY USED . . . (Wards 62-57): Battery dimensions, 16 x 6 5/8 x 4 1/2". "A" 1 1/2 volts. "B" 90 volts. "A" current 300 M. A., B current 11.5 M. A.



ANTENNA—For maximum operating performance unwind the full length of the antenna wire from the back of the radio. For local stations it is not necessary to unwind more than sufficient length to obtain satisfactory volume.

CAUTION—Do not use a ground connection or attach to a water pipe in any manner.

POWER SUPPLY—This radio will operate on a power supply of 117 volts AC, 50 to 60 cycle or 117 volts DC. Reverse the line plug, selecting the position which gives the least hum.

CAUTION—117 Volt DC Operation—When used on a DC line, if the set does not operate after one minute, reverse the line plug.

GENERAL DESCRIPTION

This model is a 3 tube (plus rectifier) tuned radio frequency receiver using four core tuned circuits.

ELECTRICAL SPECIFICATIONS

POWER SUPPLY	105-125 Volt AC or DC 50-60 Cycles
FREQUENCY RANGE	540-1620 KC
SELECTIVITY	80 KC Broad at 100 times signal, 1,000 KC
SENSITIVITY	450 Microvolts input for 50 MW (.05 watts) output
POWER OUTPUT	1.6 Watts maximum
LOUD SPEAKER	4" PM Dynamic
VOICE COIL IMPEDANCE	3.2 Ohms at 400 cycles
ANTENNA	20 Ft. of Antenna wire attached to radio
TUBE COMPLEMENT	1-12SG7 R.F. Amplifier 1-12SQ7 Det., 1st Audio A.V.C. 1-50L6 Power Output 1-35Z5 Rectifier

RECEIVER STAGE SENSITIVITIES

SIGNAL GENERATOR			INPUT FOR 50 MW OUTPUT
FREQUENCY	COUPLING CAPACITOR	CONNECTION TO RECEIVER	
1000 KC	50 MMF	Disconnect Antenna and use 50 MMF coupling capacitor	450 Microvolts
1000 KC	.05 MFD	12SG7 R.F., Pin 4	1,400 Microvolts
1000 KC	.05 MFD	12SQ7 DET., Pin 4	13,000 Microvolts
400 Cycle	.05 MFD	12SQ7 1st A.F., Pin 2	.024 Volts
400 Cycle	.05 MFD	50L6 Output, Pin 5	1.1 Volts

NOTE: Generator Grounded to B—.

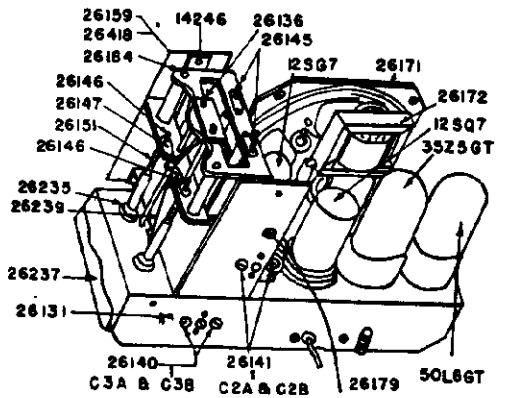
ALIGNMENT PROCEDURE

Volume Control—Maximum for all adjustments. Use output meter across voice coil terminals. Core adjustment tool can be made by slotting end of Bakelite rod.

CAUTION: Do not make any alignment adjustments except at frequencies shown on chart.

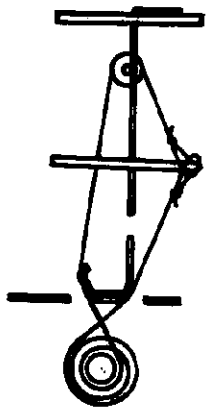
SIGNAL GENERATOR		RADIO	
FREQUENCY SETTING	CONNECTION TO RADIO	DIAL SETTING	ADJUST TO MAXIMUM
1620 KC	No direct connection (See Note)	High frequency extreme (Cores backed out of coils)	Trimmer Condensers 26140, 26141 (Remove cardboard back to expose trimmer adjustment)
1400 KC	No direct connection (See Note)	1400 KC	Cores 26145, 26146 (Be sure there is a resonance point on all 4 cores)

NOTE: Unwind attached antenna wire and place near a short wire connected to signal generator terminal. Do not make direct connection between radio and generator. No ground connection required.



REF. NO.	PART NO.	DESCRIPTION	QTY. USED IN SET
	26236	Ivory White Cabinet	1
	26291	Red Cabinet	1
	26290	Green Cabinet	1
	26289	Yellow Cabinet	1
	26292	Blue Cabinet	1
	26184	Assembly Carriage	1
L 1-2-4	26238	Assembly Coil	3
	26239	Assembly Dial Cord	1
L 3	26247	Assembly Plate Coil and Terminal Panel	1
	26180-D	Back—Cabinet—Cardboard	1
	26189-A	Clip—Electrolytic Condenser Mounting	1
C 2-A, 2-B	26141-B	Condenser—Trimmer—Input	1
C 3-A, 3-B, 3-C	26140-C	Condenser—Trimmer—Output	1
12-A-B-C	26156-B	Condsr.—Electrolytic 40-20-150V., 20-25V.	1
C 10	26190	Condenser—100 MMF	1
C 6	26157	Condenser—Tubular .1 — 200V.	1
C 11	8583	Condenser—Tubular .01 — 400V.	1
C 4-5-7	8661	Condenser—Tubular .05 — 200V.	3
C 8-9	17646	Condenser—Tubular .005 — 400V.	2
C 1	26412	Condenser—Ceramic 30 MMF	1
R 1 - S 1	26177-A	Control—Volume with Sw. 2.2 Meg.	1
	26145-F	Core—Iron (Short Screw)	2
	26146-F	Core—Iron (Long Screw)	2
	26235	Grommets—Coil	4
	26136-B	Guide—Carriage (Brass Rods)	2
	26161-B	Ivory White Knob	2
	26408	Red Knob	2
	26409	Green Knob	2

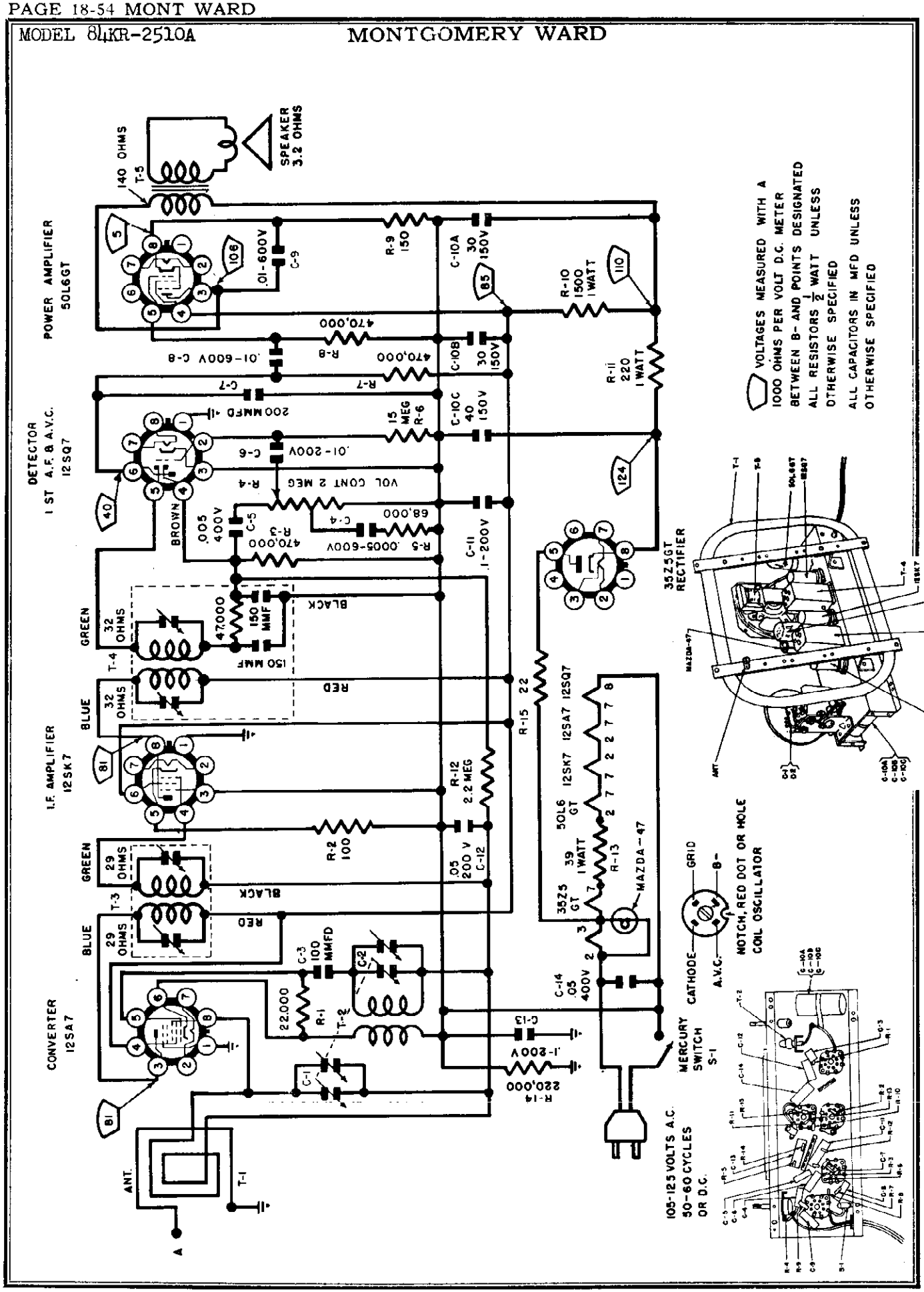
REF. NO.	PART NO.	DESCRIPTION	QTY. USED IN SET
	26410	Yellow Knob	2
	26411	Blue Knob	2
	26147	Nut—Stamped (Used on Cores)	4
	26135-A	Pulley—Dial	1
R 7	26110	Resistor—Carbon 150 Ohm 1W.	1
R 9	26006	Resistor—Fuse 25 Ohm	1
R 5-6	25042	Resistor—Carbon 470,000 Ohm 1/2W.	2
R 8	26169	Resistor—Carbon 1500 Ohm 1/2W.	1
R 2	25134	Resistor—Carbon 2.2 Meg. 1/2W.	1
R 3	25041	Resistor—Carbon 220,000 1/2W.	1
R 4	14365	Resistor—Carbon 15 Meg. 1/2W.	1
R 10	26168-A	Resistor—Wire Wound 56 Ohm 1W.	1
	26170-A	Screw—Chassis Mounting	2
	26159-A	Scale—Dial—Ivory-Red	1
	26418	Scale—Dial—Gold-White	1
	26131	Shaft—Tuning	1
	26171-B	Speaker—4" (Less Transformer)	1
	26148-A	Spring—Pulley Bearing	1
	26150	Spring—Core Lock (Short)	2
	26151	Spring—Core Lock (Long)	2
	26149	Spring—Tuning Shaft	1
	26237	Spring—Chassis to Cabinet	1
T 1	26172-C	Transformer (For Speaker only)	1
	14246	Tri-Mounts (For Dial Scale)	2
	26267	Tri-Mounts (For Back)	3
	26152-A	Washer—.250 O.D., .090 I.D.	4
	26181-A	Washer—Cup—Antenna Spool	3
	26179	Wire—Antenna 20 Ft.	



DIAL STRING 9-9/16" over loops

MODEL 84KR-2510A

MONTGOMERY WARD



ALIGNMENT PROCEDURE

VOLUME CONTROL MAXIMUM FOR ALL ADJUSTMENTS

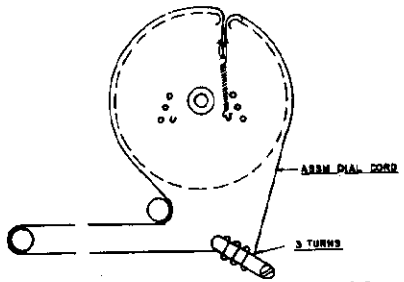
Connect radio to Signal Generator. (See Page 2.)
Allow the chassis and signal generator to "heat up" for several minutes.

The following equipment is required for aligning:
A signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
Output indicating meter; non-metallic screw driver.
Dummy antennas—.1 mfd., 200 mmfd. condensers.

Signal Generator		Connection To Radio	Condenser Setting	Adjust Trimmers To Maximum
Frequency Setting	Dummy Antenna			
455 kc	.1 Mfd.	12SA7, Pin 8	Turn rotor plates to full open	1st IF Transformer 2nd IF Transformer
1620 kc	200 Mmfd.	Antenna Lead "A"	Turn rotor plates to full open	Osc. trimmer on tuning condenser
1400 kc	200 Mmfd.	Antenna Lead "A"	Tune rotor to Maximum output	Ant. section trimmer on tuning condenser

The dial pointer may be adjusted to the scale calibration by slipping the pointer on the dial cord.

DIAL CORD REPLACEMENT—Is best accomplished by replacing complete cord assembly No. 26440 which is made up to correct length. In an emergency 30 lb. fish line may be used. See picture for correct installation.



DIAL CORD 31½" OVER LOOPS

RECEIVER STAGE SENSITIVITIES

The following table lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 KC for all readings. All measurements are based on an output of .05 watts. This may be measured by disconnecting the speaker voice coil and substituting a 3.2 ohm, 5 watt resistor across the secondary winding of the output transformer. A reading of 0.4 volts across this resistor will be equivalent to a .05 watt output with the speaker connected. The volume control must be set to maximum. The signal source must be an accurately calibrated signal generator capable of supplying both 1000 KC and 455 KC signals modulated 30% with a 400 cycle audio signal. Variations of Plus or Minus 25% are usually permissible.

SIGNAL GENERATOR				INPUT FOR .05 WATT OUTPUT
Frequency	Coupling Capacitor	Connection to Receiver	Ground Connection	
1000 kc	200 mmf or RMA Dummy Antenna	External Antenna Lead "A"	No Connection	23 microvolts
1000 kc	.1 mfd.	12 SA7 Mixer, Pin 8	12SK7 Pin 8 (B–)	110 microvolts
455 kc	.1 mfd.	12 SA7 Mixer, Pin 8	Same as above	95 microvolts
455 kc	.1 mfd.	12SK7 I-F, Pin 4	Same as above	5700 microvolts
400 cycles	.1 mfd.	12SQ7 1st A-F, Pin 2	Same as above	.065 volts
400 cycles	1 mfd.	50L6GT Output, Pin 5	Same as above	1.6 volts

GENERAL DESCRIPTION

This model is a 4-tube (plus rectifier) A.C.-D.C. End Table Radio. Controls are provided for tuning and volume. Other features include a P. M. dynamic speaker, bass boost circuit, and built-in loop antenna. An automatic "Off-On" switch is provided.

ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts A.C. or D.C. 27 watts.
Frequency Range	540-1620 KC.
Intermediate Frequency	455 KC.
Selectivity	48 KC broad at 1000 times signal, 1000 KC.
Sensitivity	(for .05 watts output) 23 microvolts average.
Power Output	550 milliwatts maximum 330 milliwatts at less than 10% distortion.
Loud Speaker	4" P.M. dynamic.
Voice Coil Impedance	3.2 ohms at 400 cycles.
Tube and Dial Light Complement	1 12SA7 Mixer 1 12SK7 I.F. Amp. 1 12SQ7 2nd Det. 1st AF. & A.V.C. 1 50L6GT Power output 1 35Z5GT Rectifier 1 No. 47 Dial Lamp

ANTENNA—This radio has an effective self-contained loop antenna and should require no outside antennan for the average installation. If an outside antenna is required, attach to the connection "A" (see Removal of Chassis). The loop is directional and various room locations may affect the stations received.

CAUTION—Do not use a ground connection or attach to a water pipe in any manner.

POWER SUPPLY—This radio will operate on a power supply of 117 volts A.C. 50-60 cycle, or 117 volts D.C. Reverse the line plug, selecting the position which gives the least hum.

CAUTION—117 Volt D.C. Operation—When used on a D.C. line if the set does not operate after one minute reverse the line plug.

CAPICITORS

REF. NO.	PART NO.	DESCRIPTION	QTY. USED IN SET
C10-A, C10-B, C10-C	26079	Electrolytic-40-30-30 Mfd. 150V.	1
C-14	17531	.05 Mfd. 400V. Tubular	1
C-3	8872	.0001 Mfd. Mica	1
C-7	14370	.0002 Mfd. Mica Ceramic	1
C-12	26467	.05 Mfd. 200V. Tubular	1
C-11, C-13	26157	.1 Mfd. 200V. Tubular	2
C-5	17646	.005 Mfd. 400V. Tubular	1
C-6	8877	.01 Mfd. 200V. Tubular	1
C-8, C-9	8876	.01 Mfd. 600V. Tubular	2
C-1, C-2	26081	Gang Tuning Capacitor	1
C-4	8874	.0005 Mfd. 600V.	1

RESISTORS

R-5	25040	68,000 Ohm 1/2W. Carbon	1
R-3, R-7, R-8	25042	470,000 Ohm 1/2W. Carbon	3
R-14	25041	220,000 Ohm 1/2W. Carbon	1
R-1	25038	22,000 Ohm 1/2W. Carbon	1
R-12	25134	2.2 Meg. 1/2W. Carbon	1
R-9	25202	150 Ohm 1/2W. Carbon	1
R-2	26445	100 Ohm 1/2W. Carbon	1
R-6	14365	15 Meg. 1/2W. Carbon	1
R-15	26466	22 Ohm 1/2W. Carbon	1
R-10	25230	1500 Ohm 1W. Carbon	1
R-11	26084	220 Ohm 1W. Carbon	1
R-13	26085	39 Ohm 1W. Wire Wound	1
R-4	26485	Volume Control	1

TRANSFORMERS & COILS

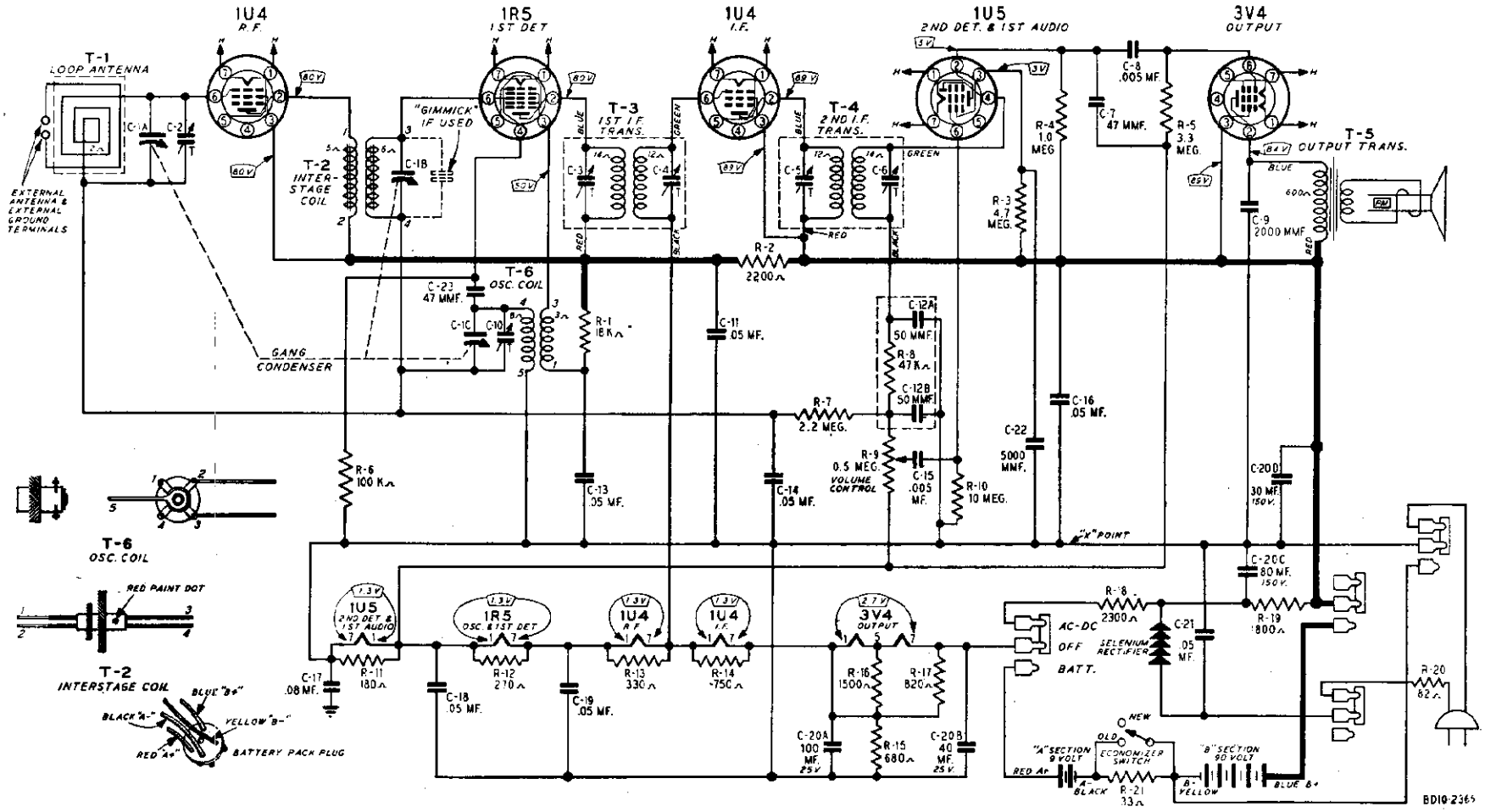
T-1	26439	Loop Antenna	1
T-2	26078	Coil-Oscillator	1
T-4	26432	Transformer-I.F. Output	1
T-3	26433	Transformer-I.F. Input	1
T-5	26092	Transformer Output Speaker Only	1

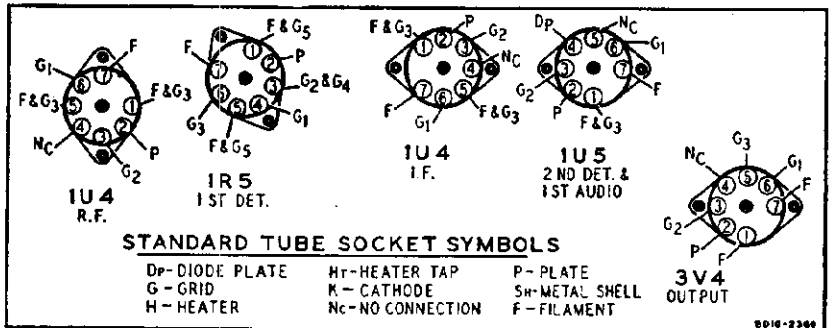
DRIVE AND DIAL ASSEMBLY

.....	26440	Dial Cord Assembly	1
.....	26491	Tuning Condenser Pulley and Bearing	1
.....	25987	Bearing Dial Pulley	2
.....	26077-B	Bearing-Tuning Shaft	1
.....	25584-A	Bushing-Headed	3
.....	25607-B	Rubber Grommet	3
.....	25925	Dial Pointer	1
.....	25336	Dial Pulley (Wood)	2
.....	26026	Set Screw (For Tuning Condenser Pulley)	1
.....	26086-D	Tuning Shaft	1
.....	14786	Spring-Dial Cord	1
.....	26429	Track-Dial Pointer	1
.....	17466	"C" Washer	1
.....	26452	Knob—Volume and Tuning	2
.....	26453-B	Dial Scale	1

MISCELLANEOUS

.....	26438	4" Speaker & Transformer	1
.....	26428	Bracket—Speaker Mounting	1
.....	26240	Cord—AC with Plug	1
.....	26087	Socket—Dial Lamp	1
.....	26139	Socket—Tube	5
.....	26171-B	4" PM Speaker Only	1
S-1	26089	Mercury Switch	1
.....	26094-B	Washer—Strip (For I.F. Transformer)	1
.....	26099	Hinge Pin for Door Front	2





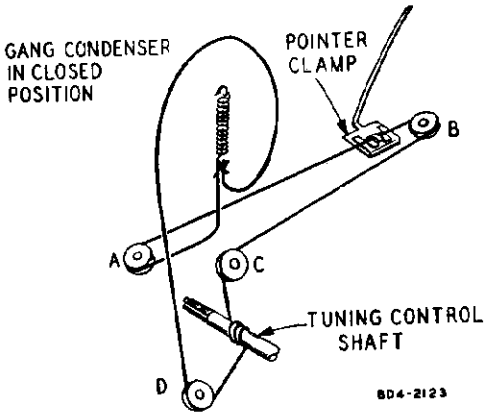
TUBE SOCKET VOLTAGES

Socket voltages are shown on the schematic diagram at the tube socket terminals with set operating on AC. All voltages except those for the filaments are between the socket terminal and "X" point.

The readings were taken with a 1000 ohm-per-volt meter and all plate and screen voltages read on a 500 volt scale. Conditions of measurement are:

Line voltage.....117 volts AC
Volume control.....maximum
Signal input.....none

A variation of ±10% is usually permissible.

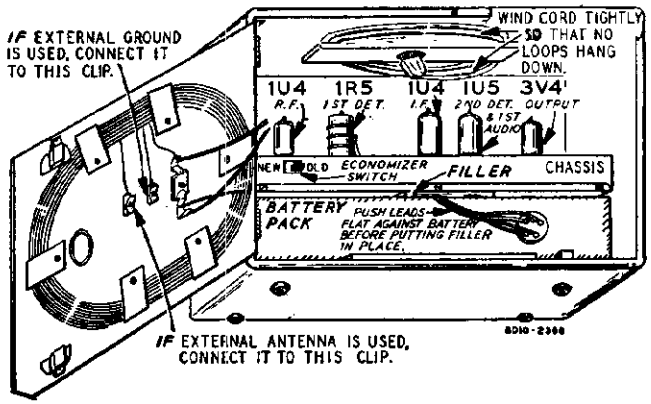


DRIVE CORD REPLACEMENT

Turn the gang condenser to the fully closed position. Use a new 10X52 Drive Cord Assembly and fasten one end to the tension spring. Fasten the other end of the tension spring to the hook on the drive pulley. Pass the cord through the slot in the drive pulley rim and continue around pulley rim ¼ turn clockwise. Pass cord around pulleys A, B, and C as shown in the illustration. Wind three turns clockwise (viewed from rear of chassis) around tuning control shaft. The turns must progress toward rear of chassis. Pass cord around pulley D and continue ¾ turn clockwise around large drive pulley. Pass cord through the slot in the pulley rim then stretch the tension spring and fasten free end of cord to it.

GENERAL DESCRIPTION

This model is a five tube AC-DC or battery operated portable radio. Controls are provided for tuning, volume and AC-DC or Battery selection. Other features include a built-in Air Wave Loop Aerial, automatic volume control, tuned R-F stage, PM dynamic speaker and a selenium rectifier for AC operation. The dial scale is calibrated to cover frequencies between 540 and 1600 kilocycles.



ELECTRICAL SPECIFICATIONS

Power Supply	"A" Battery Supply—9 Volts, 50 Ma. "B" Battery Supply—90 Volts, 11 Ma. or 105-125 volts AC, 25-60 cycles, 12 watts or 105-125 volts DC
Battery Pack	Ward's Battery Pack No. 62-35
Frequency Range	540-1600 KC
Intermediate Frequency	455 KC
Selectivity	At 1000 KC, 45 KC wide at 1000 times signal
Sensitivity	(for .05 watt output with external antenna) 10 microvolts average
Power Output	0.3 watt maximum 0.125 watt 10% distortion
Loud Speaker	5¼" PM dynamic
Voice Coil Impedance	3.2 ohms at 400 cycles

Tube Complement

1 1R5 1st Detector
1 1U4 I-F Amplifier
1 1U4 R-F Amplifier
1 1U5 2nd Detector, AVC and 1st A-F Amplifier
1 3V4 Power Output

ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.
Allow Chassis and Signal Generator to "Heat Up" for several Minutes.
The equipment in column at right is required for aligning:
Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.
Output Indicating Meter; Non-Metallic Screwdriver.
Dummy Antenna—.1 mf., 50 mmf.

SIGNAL GENERATOR				CONDENSER SETTING	ADJUST TRIMMERS TO MAXIMUM See Trimmer Illustration
Frequency Setting	Coupling Capacitor	Connection to Radio	Ground Connection		
455 kc	.1 mf	Control Grid 1U4 I-F Pin 6	"X" Point	Turn Rotor To Full Open	2nd I-F (C-5) & (C-6)
455 kc	.1 mf	Control Grid 1R5 1st Det. Pin 6	"X" Point	Turn Rotor To Full Open	1st I-F (C-3) & (C-4)
1620 kc	.1 mf	Control Grid 1U4 R-F Pin 6	"X" Point	Turn Rotor To Full Open	Oscillator (C-10)
1400 kc Note C	50 mmf	External Antenna Clip On Loop See Note A	External Ground clip on loop	Turn Rotor To Max. Output. Set Indicator to 1400 KC See Note B	Gimmick
1400 kc	Same as Above	Same as Above	Same as Above	Same as Above	Antenna (C-2)

NOTE A—Re-assemble chassis in cabinet and close the cabinet back before making adjustment.

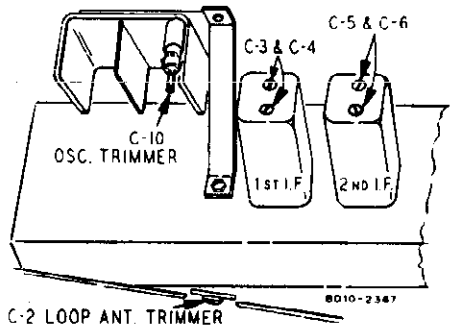
NOTE B—Tune in a 1400 KC signal. If pointer is not at the 1400 KC mark on the dial scale, move the pointer on the string to the 1400 KC mark.

NOTE C—Some receivers may have a "gimmick" capacity formed by twisting two wires together on the gang condenser. The "gimmick" capacity is set at the factory and normally will not require adjustments when realigning the receiver. Adjustment is obtained by twisting or untwisting the wires.

RECEIVER STAGE SENSITIVITIES

The table below lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 KC for all readings. All measurements are based on an output of 50 milliwatts. This may be measured by disconnecting the speaker voice coil and substituting a 3.2 ohm 5 watt resistor across the secondary winding of the output transformer. A reading of .4 volt AC across this resistor will be equivalent to a 50 milliwatt output with the speaker connected. The volume control must be set to maximum.
The signal source must be an accurately calibrated signal generator capable of supplying both 1000 KC and 455 KC signals modulated 30% with a 400 cycle audio signal. Output variations of Plus or Minus 25% are usually permissible.

SIGNAL GENERATOR				INPUT FOR 50 MILLIWATT OUTPUT
Frequency	Coupling Capacitor	Connection to Receiver	Ground Connection	
1000 kc	200 mmf or RMA Dummy Antenna	Loop Antenna—External antenna clip	Ext. Gnd. Clip	4.0 microvolts
1000 kc	.1 mf.	1U4 R-F—Pin 6	"X" Point	25 microvolts
455 kc	.1 mf.	1R5 1st Detector—Pin 6	"X" Point	90 microvolts
455 kc	.1 mf.	1U4 I-F—Pin 6	"X" Point	3500 microvolts
400 cycles	.1 mf.	1U5 1st A-F—Pin 6	"X" Point	.022 volt
400 cycles	.1 mf.	3V4 Output—Pin 3	"X" Point	1.8 volts



REPLACEMENT PARTS

CAPACITORS

Ref. No.	Part No.	Description	Qty. Used in Set
C-1A, C-1B, C-1C	14A205	Gang Condenser & Drive Pulley	1
C-2	17A123	1.5 — 12 mmf Trimmer	1
C-3, C-4		Part of T-3 (1st I.F. Transformer)	
C-5, C-6		Part of T-4 (2nd I.F. Transformer)	
C-7	47X463	47 mmf Ceramic	1
C-8, C-15	B66502	.005 mf 200 V Tubular	2
C-9	47X520	2000 mmf Ceramic	1
C-10	26A489	1-8 mmf Trimmer Assy	1
C-11, C-13, C-14, C-16, C-18, C-19	B66503	.05 mf 200 V Tubular	6
C-12A, C-12B		Part of 76X1 Resistor Capacitor Combination	
C-17	B66803	.08 200 V Tubular	1
C-20A	45X356	100 mf 25 V Dry Electrolytic	1
C-20B		40 mf 25 V	
C-20C		80 mf 150 V	
C-20D		30 mf 150 V	
C-21	D66503	.05 400 V Tubular	1
C-22	47X507	5000 mmf Ceramic	1
C-23	47X516	20 mmf Ceramic	1

RESISTORS

Ref. No.	Part No.	Ohms	Watts		Qty. Used in Set
R-1	B84183	18K	.5	Carbon	1
R-2	B84222	2200	.5	Carbon	1
R-3	B85475	4.7 meg.	.5	Carbon	1
R-4	B84105	1 meg.	.5	Carbon	1
R-5	B85335	3.3 meg.	.5	Carbon	1
R-6	B84104	100K	.5	Carbon	1
R-7	B85225	2.2 meg.	.5	Carbon	1
R-8		Part of 76X1 Resistor Capacitor Combination			
R-9	36X370	.5 meg.		Volume Control	1
R-10	B85106	10 meg.	.5	Carbon	1
R-11	B84181	180	.5	Carbon	1
R-12	B84271	270	.5	Carbon	1
R-13	B84331	330	.5	Carbon	1
R-14	B84751	750	.5	Carbon	1
R-15	B84681	680	.5	Carbon	1
R-16	B84152	1500	.5	Carbon	1
R-17	B84821	820	.5	Carbon	1
R-18	43X237	2300		Wire Wound	1
R-19	B84182	1800	.5	Carbon	1
R-20	43X223	82		Wire Wound	1
R-21	B85330	33	.5	Carbon	1

TRANSFORMERS AND COILS

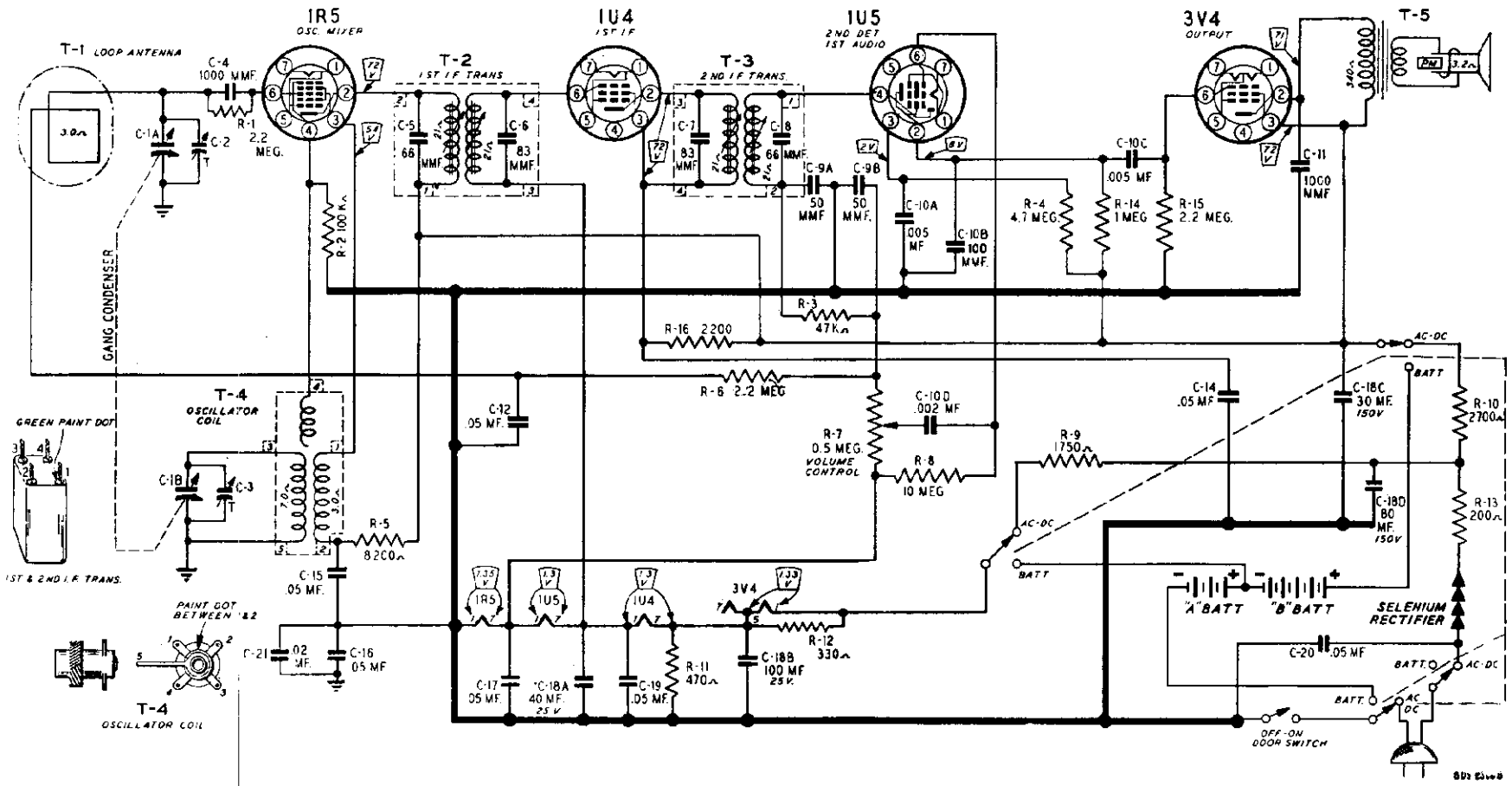
Ref. No.	Part No.	Description	Qty. Used in Set
T-1	9A1993	"B" Range Loop Anetnna	1
T-2	9A1989	Interstage Coil Assembly	1
T-3	9A1991	1st I-F Transformer and Can Assembly	1
T-4	9A1992	2nd I-F Transformer and Can Assembly	1
T-5		Output Transformer (see Miscellaneous)	
T-6	9A1990	Oscillator Coil Assembly	1

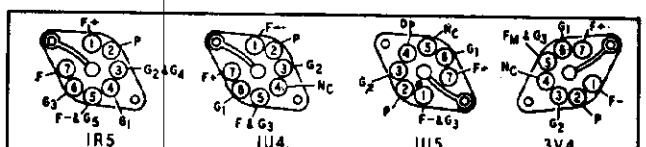
DIAL AND DRIVE ASSEMBLY

Part No.	Description	Qty. Used in Set
25X1504	Dial Brace Bracket	1
58X693	Dial Scale	1
17X97"	Celluloid Crystal	1
15X191	Pointer (For Dial Scale)	1
25X832	Gang Condenser Mounting Bracket	1
6X21	Grommet (Mtg. Gang Condenser)	3
20X329	Cond. Cushion Stud (Mtg. Gang Condenser)	3
28X95	Drive Cord Tension Spring	1
10X52	Drive Cord Assembly	1
4X989	Escutcheon	1
26X505	Drive Shaft	1
19X192	"C" Washer for Drive Shaft	2

MISCELLANEOUS

Part No.	Description	Qty. Used in Set
12A443	5¼" P.M. Speaker complete with Output Transformer	1
3A426	Tube Socket (Miniature)	5
32X390	Tube Shield (1R5)	1
2A175	Battery Saver Switch	1
2A371	AC-DC-Off-Batt. Switch	1
13X429	Battery Cable and Plug Assembly	1
10A626	Knob, Switch	1
10A627	Knob, Tuning	1
10A628	Knob, Volume	1
13X546	Line Cord and Plug Assembly	1
11X117	Shield, Volume Control and Switch (Paper)	1
32X368	Shield, Volume Control and Switch (Metal)	1
66X7	Selenium Rectifier	1
76X1	Resistor Capacitor Combination	1





STANDARD TUBE SOCKET SYMBOLS

Dp – DIODE PLATE	Nc – NO CONNECTION
F – FILAMENT	Fm – FILAMENT MID-TAP
G – GRID	P – PLATE

BD9-2307

TUBE SOCKET VOLTAGES

Socket voltages are shown on the schematic diagram at the tube socket terminals. All voltages except those for the filaments are between the socket terminals and the negative terminal on C-18.

The readings were taken with a 1000 ohm per volt meter and all plate and screen voltages read on a 300 volt scale. Conditions of measurement are:

Line voltage..... 117 volts AC
Volume control..... maximum
Signal input..... none

A variation of ±10% is usually permissible.

ALIGNMENT PROCEDURE

The following equipment is required for aligning.

A Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.

Output Indicating Meter — Non-Metallic Screwdriver.

Dummy Antenna—.1 mf.

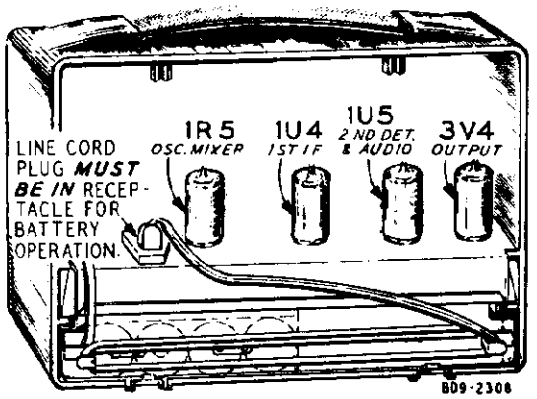
Volume Control — Maximum All Adjustments.

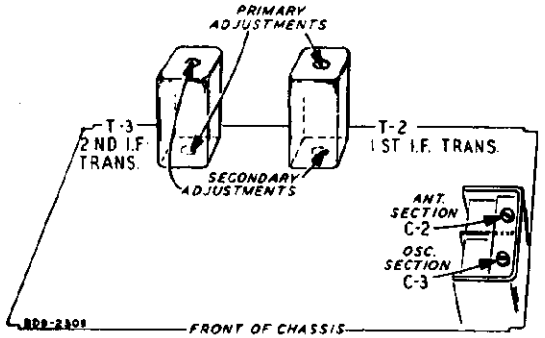
Allow Signal Generator to "Heat Up" for several minutes.

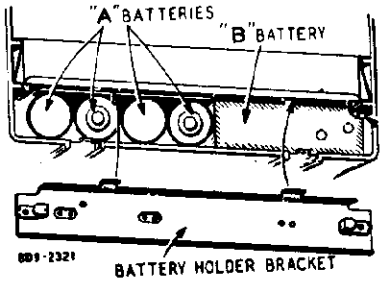
SIGNAL GENERATOR				RECEIVER	
Frequency Setting	Coupling Capacitor	Connection to Radio	Ground Connection	Condenser Setting	Adjust for maximum output. See trimmer illustration.
	Remove chassis from case (See paragraph Removal of Chassis From Case) and temporarily solder a .5 megohm resistor across the two loop terminals on the chassis.				
455 kc	.1 mf	Control Grid 1R5 - Pin 6	"X" Point See Note "B"	Rotor fully open	1st IF Pri. & Sec. 2nd IF Pri. & Sec.
	Remove temporary resistor, replace chassis in case and resolder loop leads to terminals.				
1610 kc		Loop See Note A	Loop See Note A	Rotor fully open	Oscillator (C-3)
1500 kc		Loop See Note A	Loop See Note A	Turn Rotor to Maximum Output	Set Pointer at 1500 kc
1400 kc		Loop See Note A	Loop See Note A	Turn Rotor to Maximum Output	Antenna (C-2)

NOTE A: Connect a loop of wire approximately one foot in diameter across the antenna and ground posts of the signal generator. Place radio approximately 2 feet from loop.

NOTE B: Heavy lines (B-) on circuit diagram designate "X" Point.







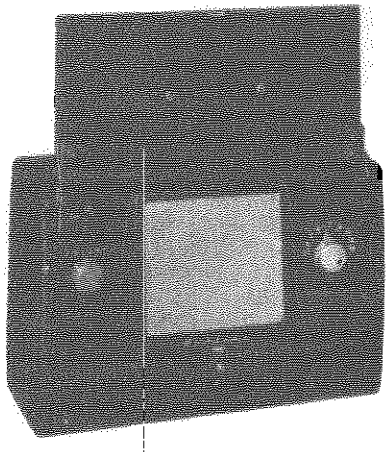
RECEIVER STAGE SENSITIVITIES

The table below lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 KC for all readings. All measurements are based on an output of 50 milliwatts. This may be measured by disconnecting the speaker voice coil and substituting a 3.2 ohm 5 watt resistor across the secondary winding of the output transformer. A reading of .4 volt across this resistor will be equivalent to a 50 milliwatt output. The volume control must be set to maximum. The signal source must be an accurately calibrated signal generator capable of supplying both 1000 KC and 455 KC signals modulated 30% with a 400 cycle audio signal. Variations in sensitivity of plus or minus 25% are usually permissible.

SIGNAL GENERATOR				INPUT FOR 50 MILLIWATT OUTPUT
Freq.	Coupling Capacitor	Connection to Receiver	Ground Connection	
1000 kc	.1 mf	1R5 Mixer Pin 6	X Point (Note B, Page 2)	130 microvolts
455 kc	.1 mf	1R5 Mixer Pin 6	X Point (Note B, Page 2)	120 microvolts
455 kc	.1 mf	1U4 IF Amp. Pin 6	X Point (Note B, Page 2)	4000 microvolts
400 cycles	.1 mf	1U5 2nd Det. Pin 6	X Point (Note B, Page 2)	.053 volt
400 cycles	.1 mf	3V4 Output Pin 6	X Point (Note B, Page 2)	3.2 volts

REMOVAL OF CHASSIS FROM CASE

To remove the chassis from the case it will be necessary to open the front cover and carefully remove the two control knobs, pointer and the screw on the front panel above the volume control knob at the side of the ON-OFF switch plunger. Then open the back cover and unsolder two antenna leads. Remove two chassis mounting clamps located underneath the chassis and withdraw the batteries.



GENERAL DESCRIPTION

This model is a 4 tube AC-DC or battery operated portable radio receiver. Controls are provided for tuning, volume, and AC-DC or battery selection. Features include a built-in Airwave Loop Aerial, automatic volume control, PM dynamic speaker and a Selenium rectifier for AC operation. The dial scale is calibrated to cover frequencies between 540-1600 kilocycles.

ELECTRICAL SPECIFICATIONS

Power Supply	One—67½ Volt "B" Battery Four—1½ Volt "A" Batteries (Size "D" Flashlight Cells) 105-125 volts AC, 25-60 cycles, 10 watts or 105-125 volts DC
Wards Battery Numbers	62-43 or 62-10 "B" Battery 62-23—"A" Battery (4 required)
Frequency Range	540-1600 kc
Intermediate Frequency	455 kc
Selectivity	At 1000 kc, 45 kc wide at 1000 times signal
Sensitivity	300 microvolts per meter average (for .05 watt output)
Power Output	.100 watt maximum .060 watt 10% distortion
Loud Speaker	4" PM Dynamic
Voice Coil Imp	3.2 ohms at 400 cycles

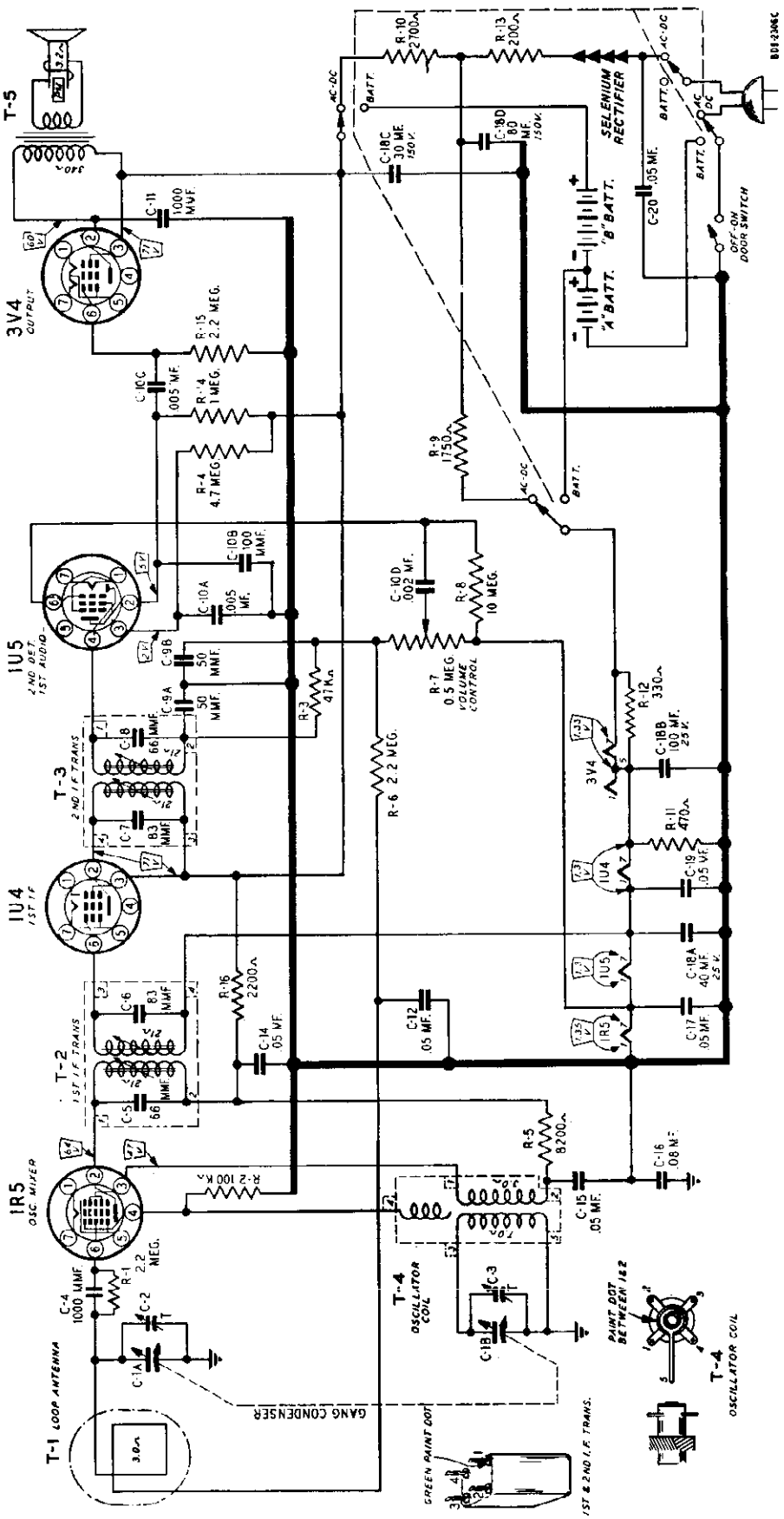
Ref. No.	Part No.	Description	Qty. Used in Set
CAPACITORS			
C-1A, C-1B	14A200	Gang Condenser Assembly	1
C-2, C-3		Part of C-1 Gang Condenser	
C-4, C-11	47X519	1000 mmf Ceramic	2
C-5, C-6, C-7, C-8		Part of T-2 1st I.F. Trans.	
		Part of T-3 2nd I.F. Trans.	
C-9A, C-9B		Part of 76X1 Resistor Capacitor Combination (See Miscellaneous)	
C-10A, C-10B, C-10C, C-10D	76X2	Multiple Capacitor Combination	1
C-12, C-14, C-15, C-16, C-17, C-19, C-20	46X393	.05 200 V. Tub. (Hi-Temp)	7
C-18A	45X356	40 mf 25 V	
C-18B		100 mf 25 V	
C-18C		30 mf 150 V	
C-18D		80 mf 150 V	Dry Electrolytic 1
*C-21	B66203	.02 mf 200 V Tubular	1
RESISTORS		OHMS WATTS	
R-1, R-6, R-15	B85225	2.2 Meg. 0.5 Carbon	3
R-2	B84104	100 K 0.5 Carbon	1
R-3		Part of 76X1 Resistor Capacitor Combination (See Miscellaneous)	
R-4	B85475	4.7 Meg. 0.5 Carbon	1
R-5	B84822	8200 0.5 Carbon	1
R-7	36X375	0.5 Meg. Volume Control	1
R-8	B85106	10 Meg. 0.5 Carbon	1
R-9	43X226	1750 6.0 Wire Wound	1
R-10	B84272	2700 0.5 Carbon	1
R-11	B83471	470 0.5 Carbon	1
R-12	B83331	330 0.5 Carbon	1
R-13	43X225	200 6.0 Wire Wound	1
R-14	B85105	1 Meg. 0.5 Carbon	1
*R-16	B84222	2200 0.5 Carbon	1

*Added in later production issue "A" receivers.

Ref. No.	Part No.	Description	Qty. Used in Set
TRANSFORMERS AND COILS			
T-1	9A1951	Loop Antenna	1
T-2, T-3	9A1955	1st and 2nd I.F. Transformers	2
T-4	9A1952	Oscillator Coil	1
T-5		Output Transformer (See Miscellaneous)	
MISCELLANEOUS			
	76X1	Resistor Capacitor Combination	1
	66X8	Selenium Rectifier	1
	12A483	4" P.M. Speaker Complete with Output Transformer	1
	13X600	Line Cord & Plug Assembly	1
	2A379	Changeover Switch	1
	2A380	On-Off Switch	1
	3A426	Miniature Tube Socket	4
	15X243	Pointer	1
	28X545	Drive Cord Tension Spring	1
	10A656	Knob (Tuning)	1
	10A657	Knob (Volume)	1
	13X596	"B" Battery Cable Assembly	1
	16X127	Rectifier Shield	1
	28X548	Spring (Mtg. Rear Cover to Case)	2
	14X430	Grille	1
	14X432	Baffle	1
	26A479	Rear Cover Assembly Complete with Clips and Pins	1
	26A482	Front Cover Assembly	1
	9X215	Loop Back (Less Loop Antenna)	1
	26A480	Escutcheon (Handle) Assembly Complete with Mtg. Hardware	2
	4X1003	Right Hinge Assembly	1
	4X1004	Left Hinge Assembly	1
	26A481	Case Assembly Complete with Bumpers, Spring Holders, Spring Washers, Release Button, Case, Latch and Springs, (Less Front and Rear Cover)	1

MODEL 84WG-1060C

MONTGOMERY WARD



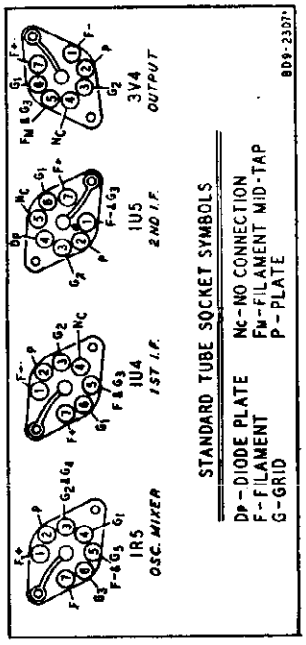
TUBE SOCKET VOLTAGES

Socker voltages are shown on the schematic diagram at the tube socket terminals. All voltages except those for the filaments are between the socket terminals and the negative terminal on C-18.

The readings were taken with a 1000 ohm per volt meter and all plate and screen voltages read on a 300 volt scale. Conditions of measurement are:

Line voltage.....117 volts AC
Volume control.....maximum
Signal input.....none

A variation of ±10% is usually permissible.



MONTGOMERY WARD MODEL GUWG-10(

ALIGNMENT PROCEDURE

The following equipment is required for aligning.

A Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.

Output Indicating Meter — Non-Metallic Screwdriver.

Dummy Antenna—.1 mf.

Volume Control — Maximum All Adjustments.

Allow Signal Generator to "Heat Up" for several minu

SIGNAL GENERATOR				RECEIVER	
Frequency Setting	Coupling Capacitor	Connection to Radio	Ground Connection	Condenser Setting	Adjust for maximum outp See trimmer illustration.
Remove chassis from case (See paragraph Removal of Chassis From Case) and temporarily solder a .5 megohm resistor across the two loop terminals on the chassis.					
455 kc	.1 mf	Control Grid 1R5—Pin 6	"X" Point See Note "B"	Rotor fully open	1st IF Pri. & Sec. 2nd IF Pri. & Sec.
Remove temporary resistor, replace chassis in case and resolder loop leads to terminals.					
1610 kc		Loop See Note A	Loop See Note A	Rotor fully open	Oscillator (C-3)
1500 kc		Loop See Note A	Loop See Note A	Turn Rotor to Maximum Output	Set Pointer at 1500 kc
1400 kc		Loop See Note A	Loop See Note A	Turn Rotor to Maximum Output	Antenna (C-2)

NOTE A: Connect a loop of wire approximately one foot in diameter across the antenna and ground posts of the signal generator. Place radio approximately 2 feet from loop.

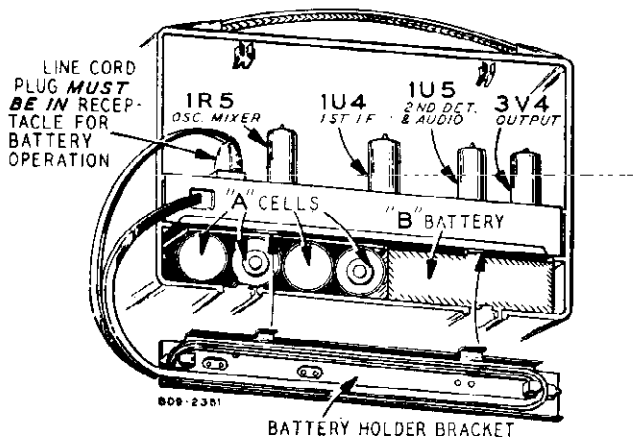
NOTE B: Heavy lines (B-) on circuit diagram designate Point.

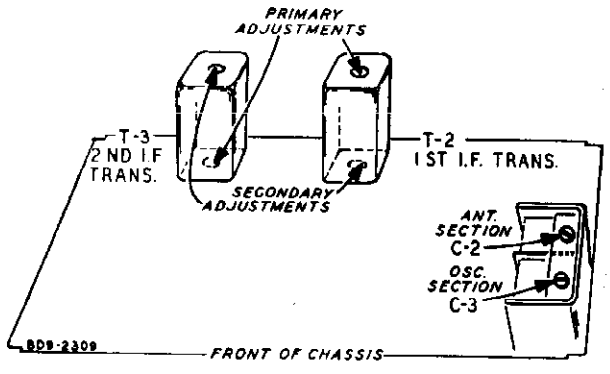
RECEIVER STAGE SENSITIVITIES

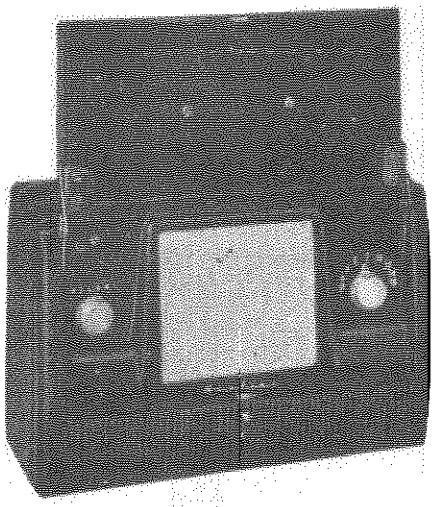
The table below lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 KC for all readings. All measurements are based on an output of 50 milliwatts. This may be measured by disconnecting the speaker voice coil and substituting a 3.2 ohm 5 watt resistor across the secondary winding of the output transformer.

A reading of .4 volt across this resistor will be equivalent to a milliwatt output. The volume control must be set to maximum. The signal source must be an accurately calibrated signal gener capable of supplying both 1000 KC and 455 KC signals modul 30% with a 400 cycle audio signal. Variations in sensitivity of or minus 25% are usually permissible.

SIGNAL GENERATOR				INPUT FOR 50 MILLIWATT OUTPUT
Freq.	Coupling Capacitor	Connection to Receiver	Ground Connection	
1000 kc	.1 mf	1R5 Mixer Pin 6	X Point (Note B, Page 2)	130 microvolt
455 kc	.1 mf	1R5 Mixer Pin 6	X Point (Note B, Page 2)	120 microvolt
455 kc	.1 mf	1U4 IF Amp. Pin 6	X Point (Note B, Page 2)	4000 microvolt
400 cycles	.1 mf	1U5 2nd Det. Pin 6	X Point (Note B, Page 2)	.053 volt
400 cycles	.1 mf	3V4 Output Pin 6	X Point (Note B, Page 2)	3.2 volts







ELECTRICAL SPECIFICATIONS

Power Supply	One—67½ Volt "B" Battery Four—1½ Volt "A" Batteries (Size "D" Flashlight Cells) 105-125 volts AC, 25-60 cycles, 10 watts or 105-125 volts DC
Wards Battery Numbers	62-43 or 62-10 "B" Battery 62-23—"A" Battery (4 required)
Frequency Range	540-1600 kc
Intermediate Frequency	455 kc
Selectivity	At 1000 kc, 45 kc wide at 1000 times signal
Sensitivity	300 microvolts per meter average (for .05 watt output)
Power Output	.100 watt maximum .060 watt 10% distortion
Loud Speaker	4" PM Dynamic
Voice Coil Imp	3.2 ohms at 400 cycles

Tube Complement			
	1	1R5	Mixer
	1	1U4	IF Amplifier
	1	1U5	2nd Detector AVC and 1st AF Amplifier
	1	3V4	Output

CAPACITORS

Ref. No.	Part No.	Description	Qty. Used in Set
C-1A, C-1B	14A200	Gang Condenser Assembly	1
C-2, C-3		Part of C-1 Gang Condenser	
C-4, C-11	47X519	1000 mmf Ceramic	2
C-5, C-6		Part of T-2 1st I.F. Trans.	
C-7, C-8		Part of T-3 2nd I.F. Trans.	
C-9A, C-9B		Part of 76X1 Resistor Capacitor Combination (See Miscellaneous)	
C-10A, C-10B, C-10C, C-10D	76X2	Multiple Capacitor Combination	1
C-12, C-14, C-15, C-17, C-19, C-20	46X393	.05 200 V. Tub. (Hi-Temp)	6
C-16	B66803	.08 mf 200 V Tubular	1
C-18A	45X356	40 mf 25 V	
C-18B		100 mf 25 V	
C-18C		30 mf 150 V	
C-18D		80 mf 150 V Dry Electrolytic	1

RESISTORS

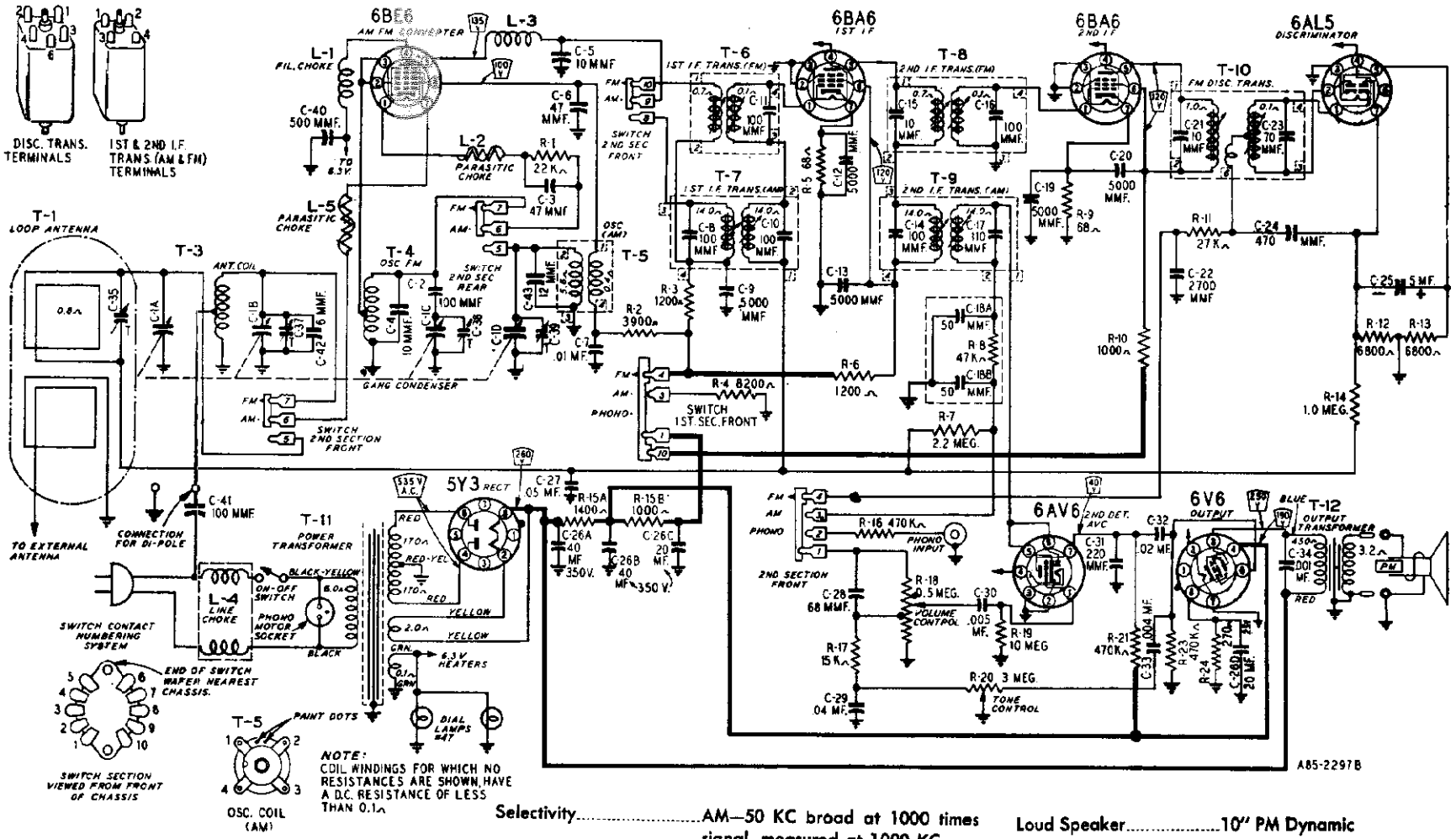
Ref. No.	Part No.	OHMS	WATTS		Qty. Used in Set
R-1, R-6, R-15	B85225	2.2 Meg.	0.5	Carbon	3
R-2	B84104	100 K	0.5	Carbon	1
R-3		Part of 76X1 Resistor Capacitor Combination (See Miscellaneous)			
R-4	B85475	4.7 Meg.	0.5	Carbon	1
R-5	B84822	8200	0.5	Carbon	1
R-7	36X375	0.5 Meg.		Volume Control	1
R-8	B85106	10 Meg.	0.5	Carbon	1
R-9	43X226	1750	6.0	Wire Wound	1
R-10	B84272	2700	0.5	Carbon	1
R-11	B83471	470	0.5	Carbon	1
R-12	B83331	330	0.5	Carbon	1
R-13	43X225	200	6.0	Wire Wound	1
R-14	B85105	1 Meg.	0.5	Carbon	1
R-16	B84222	2200	0.5	Carbon	1

TRANSFORMERS AND COILS

Ref. No.	Part No.	Description	Qty. Used in Set
T-1	9A1951	Loop Antenna	1
T-2, T-3	9A1995	1st and 2nd I.F. Transformers	2
T-4	9A1952	Oscillator Coil	1
T-5		Output Transformer (See Miscellaneous)	

MISCELLANEOUS

Part No.	Description	Qty. Used in Set
76X1	Resistor Capacitor Combination	1
66X8	Selenium Rectifier	1
12A483	4" P.M. Speaker Complete with Output Transformer	1
13X600	Line Cord & Plug Assembly	1
2A379	Changeover Switch	1
2A380	On-Off Switch	1
3A426	Miniature Tube Socket	4
15X243	Pointer	1
28X545	Drive Cord Tension Spring	1
10A709	Knob (Tuning)	1
10A710	Knob (Volume)	1
13X596	"B" Battery Cable Assembly	1
16X127	Rectifier Shield	1
28X548	Spring (Mtg. Rear Cover to Case)	2
14X440	Baffle	1
14X441	Grille	1
26A479	Rear Cover Assembly Complete with Clips and Pins	1
26A482	Front Cover Assembly	1
9X215	Loop Back (Less Loop Antenna)	1
26A495	Escutcheon (Handle) Assembly Complete with Mtg. Hardware	2
4X1003	Right Hinge Assembly	1
4X1004	Left Hinge Assembly	1
26A481	Case Assembly Complete with Bumpers, Spring Holders, Spring Washers, Release Button, Case, Latch and Springs, (Less Front and Rear Cover)	1



ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts AC 50-60 cycles, 60 watts.
Frequency Ranges	Broadcast 540-1600 KC Frequency Modulation 88-108 MC
Intermediate Frequency	AM—455KC FM—10.7 MC
Selectivity	AM—50 KC broad at 1000 times signal, measured at 1000 KC I.F. FM—200 KC broad at 2 times down I.F. FM—800 KC broad at 200 times down
AM Sensitivity	(For .5 watt output with external antenna) 20 microvolts average
FM Sensitivity	(For .5 watt output) 200 microvolts average
Power Output	4.5 watts maximum
Loud Speaker	10" PM Dynamic
Voice Coil Impedance	3.2 ohms 400 cycles
Tube and Dial Lamp Complement	1 6BE6 FM-AM Converter 1 6BA6 1st I-F Amplifier 1 6BA6 2nd I-F Amplifier 1 6AL5 FM Discriminator 1 6AV6 Audio Amplifier, AM 2nd Detector and AVC 1 6V6GT Audio Output 1 5Y3GT Rectifier 2 No. 47 Dial Lamps

MODEL 8LWG-2506A MONTGOMERY WARD

RECEIVER STAGE SENSITIVITIES

AM AND AUDIO STAGES

The table below lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 KC for all readings. All measurements are based on an output of .5 watt. This may be measured by disconnecting the speaker voice coil and substituting a 3.2 ohm, 5 watt resistor across the secondary winding of the output transformer. A reading of 1.26 volts across this resistor will be equivalent to a .5 watt output.

The volume control must be set to maximum.

The signal source must be an accurately calibrated signal generator capable of supplying both 1000 KC and 455 KC signals modulated 30% with a 400 cycle audio signal. Variations in sensitivity of Plus or Minus 25% are usually permissible.

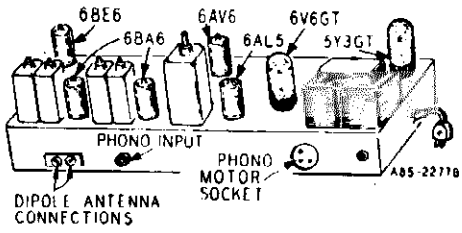
SIGNAL GENERATOR				INPUT FOR .5 WATT OUTPUT
FREQUENCY	COUPLING CAPACITOR	CONNECTION TO RECEIVER	GROUND CONNECTION	
1000 KC	200 mmf or RMA Dummy Antenna	External Antenna Lead	Chassis	25 Microvolts
1000 KC	.05 mf	6BE6 Converter Pin 7	Chassis	60 Microvolts
455 KC	.05 mf	6BE6 Converter Pin 7	Chassis	58 Microvolts
455 KC	.05 mf	6BA6 1st I-F Pin 1	Chassis	2400 Microvolts
400 cycles	.05 mf	6AV6 1st A-F Pin 1	Chassis	.07 Volt
400 cycles	.05 mf	6V6GT Output Pin 5	Chassis	3.2 Volts

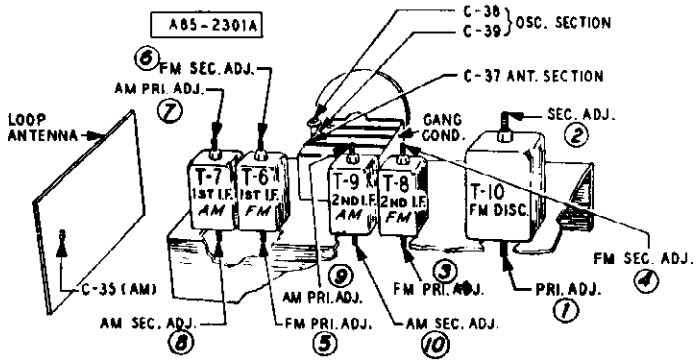
FM STAGES

The tables below lists the sensitivity for the FM stages of the receiver. The receiver must be tuned to 98 MC for all readings. Measurements are based on a .5 watt output the same as for the AM and Audio stage measurements.

The signal source must be an accurately calibrated signal generator capable of supplying a 98 MC signal modulated by a 400 cycle audio signal. For these measurements the generator must be adjusted for a 22.5 KC deviation. This will correspond to 30% AM modulation.

SIGNAL GENERATOR				INPUT FOR .5 WATT OUTPUT
FREQUENCY	COUPLING TO RECEIVER	CONNECTION TO RECEIVER	GROUND CONNECTION	
98 MC	300 ohms	External Antenna Terminal	Chassis	200 Microvolts
10.7 MC	.01 mf	6BA6 1st I-F Pin 1	Chassis	1,000 Microvolts
10.7 MC	.01 mf	6BA6 2nd I-F Pin 1	Chassis	40,000 Microvolts



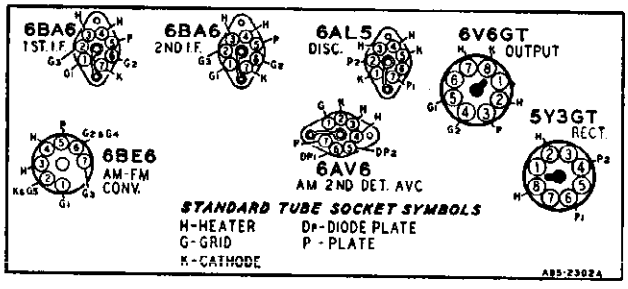


TUBE SOCKET VOLTAGES

Socket voltages are shown on the schematic diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube volt-meter. Conditions of measurement are:

Line voltage.....117 Volts AC
Signal Input.....None

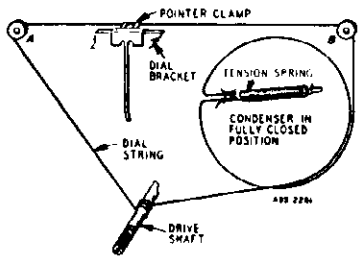
A variation of ±10% is usually permissible.



DRIVE CORD REPLACEMENT

DIAL POINTER CORD

Use a new 10X66 drive cord assembly or a new length of cord 46 inches long for the installation. Install the cord as shown in the illustration, winding three turns clockwise around the drive shaft with the turns progressing away from the chassis. After completing the installation rotate the drive shaft a few turns to take up the slack in the cord.



ALIGNMENT PROCEDURES

AM STAGES

The following is required for aligning:
An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.
Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas — .1 mf, and 50mmf.

Volume Control Maximum all Adjustments.
Connect Radio Chassis to Ground Post of Signal Generator with Short Heavy Lead.
Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.

SIGNAL GENERATOR						
FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	CONNECT GROUND TO	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
455 KC	Control Grid 1st 6BA6 Pin No. 1	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. Pri. and Sec. (9) and (10)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7 1st Det.	.1 mf	Chassis Base	Rotor Fully Open	1st I.F. Pri. and Sec. (7) and (8)	Maximum Output
1620 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	Oscillator C-39	Maximum Output
1400 KC	External Antenna Lead	50 mmf	Chassis Base	Turn Rotor to Max. Output. Set Pointer to 1400 KC See Note A	Antenna C-35	Maximum Output

NOTE A—If the pointer is not at 1400 KC on the dial, reset pointer to the 1400 KC mark on the dial scale.

FM STAGES

The following is required for aligning:
An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.
Non-metallic screwdriver.
Dummy Antennas and I-F Loading Resistor — .01 mf, 300 ohms and 100K ohms

Zero center scale DC vacuum tube voltmeter having a range approximately 3 volts.
(If a zero center scale meter is not available, a standard s vacuum tube voltmeter may be used by reversing the meter con tions for negative readings).
Allow chassis and signal generator to "Heat Up" for several minu

	SIGNAL GENERATOR		THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJU FOR
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO					
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Pri. (1) Note A	Maxim Deflect
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Sec. (2) Note B	
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Pri. (1) Note A	Maxim Deflect
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Sec. (2) Note B	
I-F	10.7 MC	6BA6 1st I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	2nd I-F Pri. (3) 2nd I-F Sec. (4) Note C	Maxim Deflec
	10.7 MC	Unsolder lead from Pin 7 to band switch. Insert 100K ohm resistor between Pin 7 and Ground and feed signal into Pin 7 of 6BE6	.01 mf	FM	Rotor Fully Open	1st I-F Pri. (5) Note C	Maxim Deflect
	10.7 MC	Same as above	.01 mf	FM	Rotor Fully Open	1st I-F Sec. (6) Note C	Maxim Deflec
RECHECK I-F ADJUSTMENTS IN ORDER GIVEN							
Ant. and Osc.	108.5 Note D	Disconnect built-in line antenna and connect generator to dipole terminals with resistor in series	300 ohms	FM	Rotor Fully Open	Osc. C-38	Maxim Deflect
	104.5	Same as above	300 ohms	FM	Tune rotor for max. AVC voltage	Ant. C-37	Maxim Deflect
RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN							

FM ALIGNMENT NOTES

NOTE A—The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the A.V.C. line at the 27 K. ohm resistor (R-11) and its junction with terminal strip. A signal of .1 volt must be fed into the receiver for this adjustment.
Note output voltage on the zero center DC vacuum tube voltmeter.

NOTE B—Disconnect zero center DC vacuum tube voltmeter from A.V.C. and connect it at the audio takeoff point at the 1 megohm resistor (R-14) and its junction with the term strip. Adjust for zero voltage indication.

NOTE C—Connect zero center DC vacuum tube voltmeter as in N A. Adjust input to give some output on the zero center vacuum tube voltmeter as in Note A.

NOTE D—Remove the 100 K. ohm load resistor and solder the l from pin 7 of 6BE6 tube to the band switch before atten ing to check the antenna and oscillator adjustments.

CAPACITORS

Ref. No.	Part No.	Description			Qty. Used in Set
C-1A, C-1B, C-1C, C-1D	14A204	Gang Condenser & Pulley			1
C-2	47X511	100 mmf		Ceramic	1
C-3	47X517	47 mmf		Ceramic	1
C-4	47X523	10 mmf		Ceramic	1
C-5	47X512	10 mmf		Ceramic	1
C-6	47X463	47 mmf		Ceramic	1
C-7	D66103	.01 mf	400 V	Tubular	1
C-8, C-10		Part of T-7 (1st I.F. Trans.—AM)			
C-11		Part of T-6 (1st I.F. Trans.—FM)			
C-9, C-12, C-13, C-19, C-20	47X507	5000 mmf		Silvered Ceramic	5
C-14, C-17		Part of T-9 (2nd I.F. Trans.—AM)			
C-15, C-16		Part of T-8 (2nd I.F. Trans.—FM)			
C-18A, C-18B		50-50 mmf (Part of 76X1 Resistor-Capacitor Combination)			
C-21, C-23		Part of T-10 (Discriminator Trans.)			
C-22	47X492	2700 mmf		Molded Mica	1
C-24	47X510	470 mmf		Silvered Mica	1
C-25	45X361	5 mf	100 V	Dry Electrolytic	1
C-26A	45X359	40 mf	350 V	Dry Electrolytic	1
C-26B		40 mf	350 V		
C-26C		20 mf	350 V		
C-26D		20 mf	25 V		
C-27	B66503	.05 mf	200 V	Tubular	1
C-28	47X471	68 mmf		Molded Mica	1
C-29	B66403	.04 mf	200 V	Tubular	1
C-30	D66502	.005 mf	400 V	Tubular	1
C-31	47X468	220 mmf		Ceramic	1
C-32	D66203	.02 mf	400 V	Tubular	1
C-33	B66402	.004 mf	200 V	Tubular	1
C-34	H66102	.001 mf	800 V	Tubular	1
C-35	17A235	2-24 mmf		Trimmer	1
C-37, C-39		Part of C-1 Gang Condenser			
C-38	26A489	1-8 mmf		Trimmer	1
C-40	47X508	500 mmf		Ceramic	1
C-41	47X476	100 mmf		Molded	1
C-42	47X521	6 mmf		Ceramic	1
C-43	47X522	12 mmf		Ceramic	1

RESISTORS

Ref. No.	Part No.	Ohms	Watts		Qty. Used in Set
R-1	B84223	22 K	0.5	Carbon	1
R-2	B83392	3900	0.5	Carbon	1
R-3, R-6	B84122	1200	0.5	Carbon	2
R-4	D84822	8200	2.0	Carbon	1
R-5, R-9	B83680	68	0.5	Carbon	2
R-7	B85225	2.2 meg.	0.5	Carbon	1
R-8		47 K	(Part of 76X1 Resistor-Capacitor Combination)		
R-10	B84102	1000	0.5	Carbon	1
R-11	B84273	27 K	0.5	Carbon	1
R-12, R-13	B84682	6800	0.5	Carbon	2
R-14	B85105	1 meg.	0.5	Carbon	1
R-15A	43X224	1400	6.0	Wire Wound	1
R-15B		1000	4.0		
R-16, R-21, R-23	B85474	470 K	0.5	Carbon	3
R-17	B84153	15 K	0.5	Carbon	1
R-18	36X372	.5 meg.		Volume control and switch	1
R-19	B85106	10 meg.	0.5	Carbon	1
R-20	40X285	3 meg.		Tone Control	1
R-24	B84271	270	0.5	Carbon	1

TRANSFORMERS AND COILS

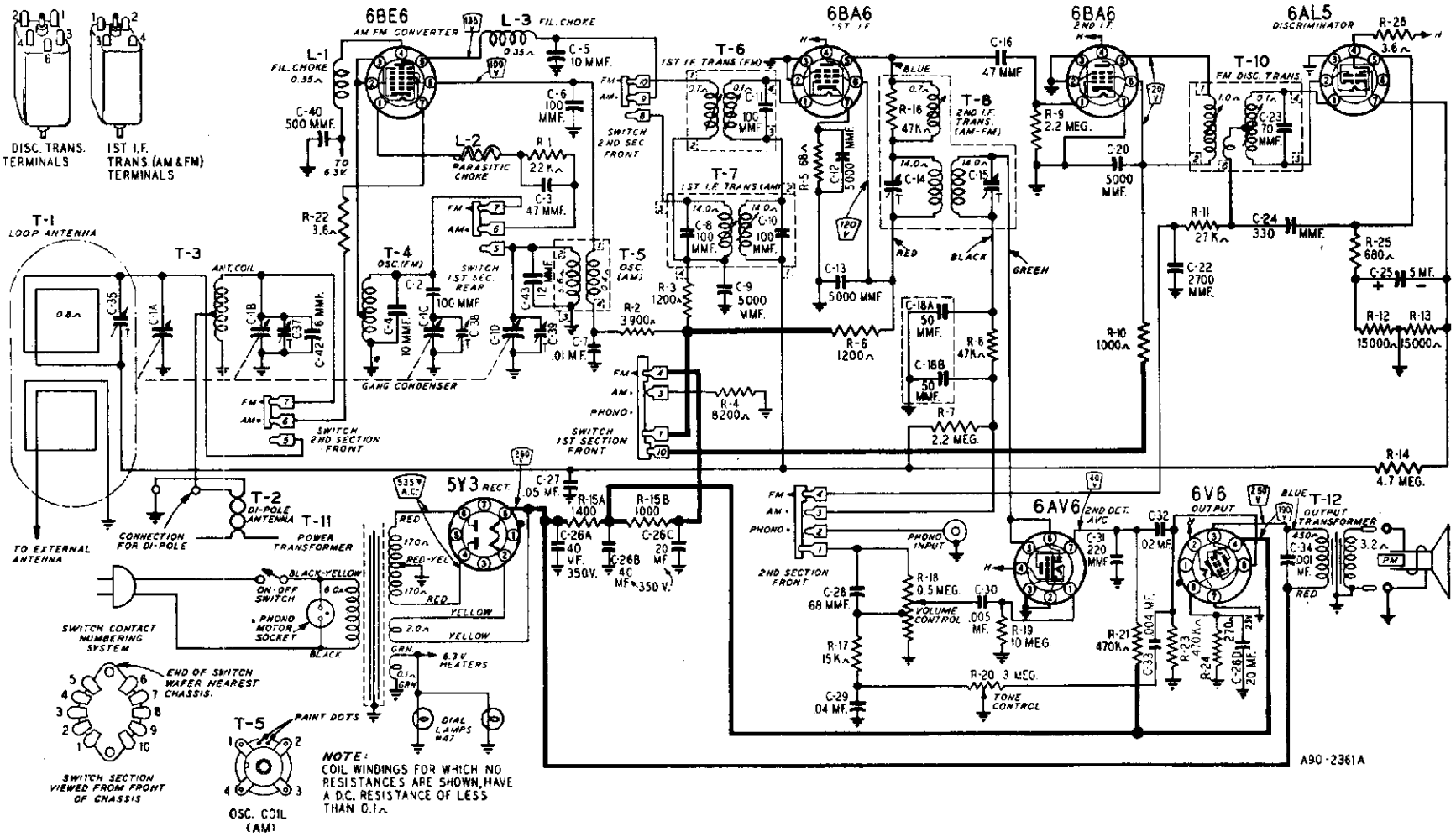
Ref. No.	Part No.	Description	Qty. Used in Set
L-1, L-3	9A1882	Filament Choke	2
L-2	9A1940	Parasitic Choke	1
L-4	9A1930	Line Choke	1
L-5	9A1967	Parasitic Choke	1
T-1	26A478	"B" Range Loop Antenna Assembly	1
T-3	9A1956	Antenna Coil Assembly	1
T-4	9A1938	Oscillator Coil (FM)	1
T-5	9A1929	Oscillator Coil Assembly (AM)	1
T-6	9A1932	1st I.F. Transformer (FM)	1
T-7	9A1934	1st I.F. Transformer (AM)	1
T-8	9A1933	2nd I.F. Transformer (FM)	1
T-9	9A1935	2nd I.F. Transformer (AM)	1
T-10	9A1936	Discriminator Coil Assembly	1
T-11	53X290	Power Transformer	1
T-12	51X134	Output Transformer	1

MISCELLANEOUS

Ref. No.	Part No.	Description	Qty. Used in Set
	76X1	Resistor-Capacitor Combination	1
	12A480	10" P.M. Speaker	1
	3A303	Tube Socket—Octal (8 prong) Molded	2
	3A426	Tube Socket—Miniature	4
	3A427	Tube Socket—Miniature (for AM-FM Converter Tube)	1
	3A304	Phono Motor Socket	1
	3A305	Phono Socket—Single Pin Tip	1
	2A375	Band Change Switch	1
	13X546	Line Cord and Plug Assembly	1
	10A651	Knob (Tuning)	1
	10A652	Knob (Volume Control and Switch)	1
	10A654	Knob (Tone)	1
	10A655	Knob (Phono—BC—FM)	1
	4X999	Escutcheon	1

DIAL AND DRIVE ASSEMBLY

	58X699	Dial Glass	1
	24X446	Idler Pulley	2
	15X241	Pointer	1
	25X1569	Dial Bracket	1
	7A103	No. 47 Pilot Light Bulb	2
	7A202	Pilot Light Socket Assembly	1
	26X486	Drive Shaft	1
	41X26	Reflector, Dial Light	2
	28X113	Drive Cord Tension Spring	1
	10X66	Drive Cord Assembly	1
	19X192	"C" Washer (Mtg. drive shaft)	2
	6X21	Rubber Grommet (Mtg. gang cond.)	3
	20X260	Condenser Cushion Stud (Mtg. gang condenser)	3
	58X702	Dial background	1



MONTGOMERY WARD

MONT WARD PAGE

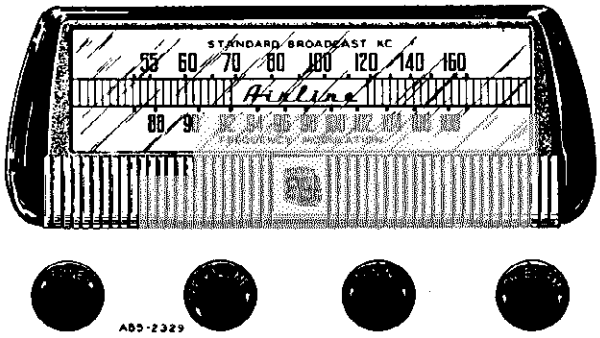
MODEL 8MG-250

MODEL 84WG-2506B

MONTGOMERY WARD

Tube and Dial Lamp Complement

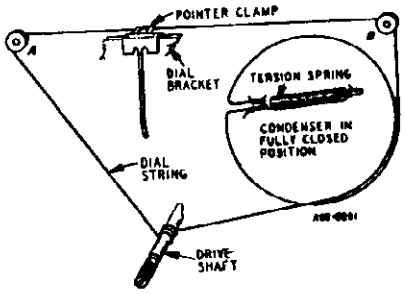
1 6BE6 FM-AM Converter
1 6BA6 1st I-F Amplifier
1 6BA6 2nd I-F Amplifier
1 6AL5 FM Discriminator
1 6AV6 Audio Amplifier, AM 2nd Detector and AVC
1 6V6GT Audio Output
1 5Y3GT Rectifier
2 No. 47 Dial Lamps



DRIVE CORD REPLACEMENT

DIAL POINTER CORD

Use a new 10X66 drive cord assembly or a new length of cord 46 inches long for the installation. Install the cord as shown in the illustration, winding three turns clockwise around the drive shaft with the turns progressing away from the chassis. After completing the installation rotate the drive shaft a few turns to take up the slack in the cord.



MISCELLANEOUS

12A480	10" P.M. Speaker	1
3A303	Tube Socket—Octal (8 prong) Molded	2
3A426	Tube Socket—Miniature	4
3A427	Tube Socket—Miniature (for AM-FM Converter Tube)	1
3A304	Phono Motor Socket	1
3A305	Phono Socket—Single Pin Tip	1
2A375	Band Change Switch	1
13X546	Line Cord and Plug Assembly	1
10A651	Knob (Tuning)	1

ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts AC 50-60 cycles, 60 watts.
Frequency Ranges	Broadcast 540-1600 KC Frequency Modulation 88-108 MC
Intermediate Frequency	AM—455KC FM—10.7 MC
Selectivity	AM—50 KC broad at 1000 times signal, measured at 1000 KC I.F. FM—200 KC broad at 2 times down I.F. FM—800 KC broad at 200 times down
AM Sensitivity	(For .5 watt output with external antenna) 20 microvolts average
FM Sensitivity	(For .5 watt output) 200 microvolts average
Power Output	4.5 watts maximum 2.5 watts 10% distortion
Loud Speaker	10" PM Dynamic
Voice Coil Impedance	3.2 ohms 400 cycles

ALIGNMENT PROCEDURES

AM STAGES

The following is required for aligning:

An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.

Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas — .1 mf, and 50mmf.

Volume Control Maximum all Adjustments.

Connect Radio Chassis to Ground Post of Signal Generator with Short Heavy Lead.

Allow Chassis and Signal Generator to "Heat Up" for Sever Minutes.

SIGNAL GENERATOR						
FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	CONNECT GROUND TO	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
455 KC	Control Grid 1st 6BA6 Pin No. 1	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. C-14 and C-15	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7 1st Det.	.1 mf	Chassis Base	Rotor Fully Open	1st I.F. Pri. and Sec. (7) and (8)	Maximum Output
1620 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	Oscillator C-39	Maximum Output
1400 KC	External Antenna Lead	50 mmf	Chassis Base	Turn Rotor to Max. Output. Set Pointer to 1400 KC See Note A	Antenna C-35	Maximum Output

NOTE A—If the pointer is not at 1400 KC on the dial, reset pointer to the 1400 KC mark on the dial scale.

FM STAGES

The following is required for aligning:

An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.

Non-metallic screwdriver.

Dummy Antennas and I-F Loading Resistor — .01 mf, 300 ohms and 100K ohms

Zero center scale DC vacuum tube voltmeter having a range approximately 3 volts.

(If a zero center scale meter is not available, a standard sca vacuum tube voltmeter may be used by reversing the meter conne tions for negative readings).

Allow chassis and signal generator to "Heat Up" for several minute

SIGNAL GENERATOR							
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Pri. (1) Note A	Maximu Deflectio
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Sec. (2) Note B	
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Pri. (1) Note A	Maximu Deflectio
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Sec. (2) Note B	
I-F	10.7 MC Note E	6BA6 1st I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	2nd I-F (3) Note C	Maximu Deflecti
	10.7 MC	Unsolder lead from Pin 7 to band switch. Insert 100K ohm resistor between Pin 7 and Ground and feed signal into Pin 7 of 6BE6	.01 mf	FM	Rotor Fully Open	1st I-F Pri. (5) Note C	Maximu Deflecti
	10.7 MC	Same as above	.01 mf	FM	Rotor Fully Open	1st I-F Sec. (6) Note C	Maximu Deflecti
RECHECK I-F ADJUSTMENTS IN ORDER GIVEN							
Ant. and Osc.	108.5 Note D	Disconnect built-in dipole antenna and connect generator to dipole terminals with resistor in series	300 ohms	FM	Rotor Fully Open	Osc. C-38	Maximu Deflectio
	104.5	Same as above	300 ohms	FM	Tune rotor for max. AVC voltage	Ant. C-37	Maximu Deflecti
RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN							

FM ALIGNMENT NOTES

NOTE A—The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line. A signal of .1 volt must be fed into the receiver for this adjustment.

Note output voltage on the zero center DC vacuum tube voltmeter.

NOTE B—Disconnect zero center DC vacuum tube voltmeter from AVC and connect it at the audio takeoff point at the 27 K ohm resistor (R-11) and its junction with the terminal strip. Adjust for zero voltage indication.

NOTE C—Connect zero center DC vacuum tube voltmeter as in No A. Adjust input to give same output on the zero center D vacuum tube voltmeter as in Note A.

NOTE D—Remove the 100 K. ohm load resistor and solder the lea from pin 7 of 6BE6 tube to the band switch before attemp ing to check the antenna and oscillator adjustments.

NOTE E—2nd I-F trimmers (AM) must be aligned before attempti to adjust 2nd I-F (FM) tuning slug.

MODEL 8LWG-2506B

MONTGOMERY WARD

RECEIVER STAGE SENSITIVITIES

AM AND AUDIO STAGES

The table below lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 KC for all readings. All measurements are based on an output of .5 watt. This may be measured by disconnecting the speaker voice coil and substituting a 3.2 ohm, 5 watt resistor across the secondary winding of the output transformer. A reading of 1.26 volts across this resistor will be equivalent to a .5 watt output.

The volume control must be set to maximum.

The signal source must be an accurately calibrated signal generator capable of supplying both 1000 KC and 455 KC signals modulated 30% with a 400 cycle audio signal. Variations in sensitivity of Plus or Minus 25% are usually permissible.

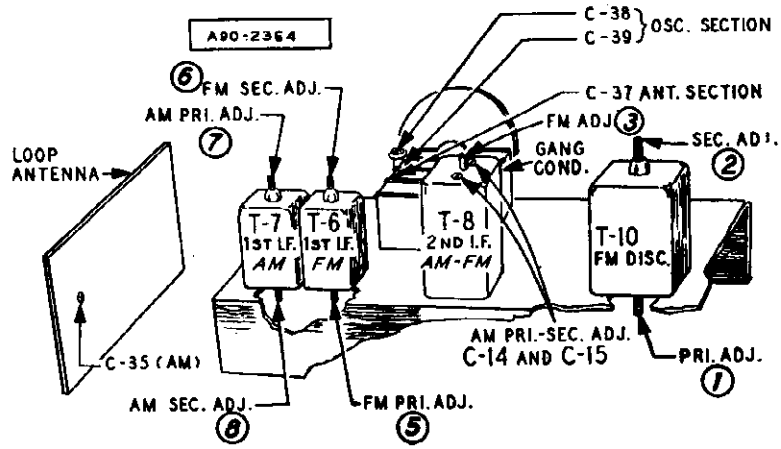
SIGNAL GENERATOR				INPUT FOR .5 WATT OUTPUT
FREQUENCY	COUPLING CAPACITOR	CONNECTION TO RECEIVER	GROUND CONNECTION	
1000 KC	200 mmf or RMA Dummy Antenna	External Antenna Lead	Chassis	25 Microvolts
1000 KC	.05 mf	6BE6 Converter Pin 7	Chassis	60 Microvolts
455 KC	.05 mf	6BE6 Converter Pin 7	Chassis	58 Microvolts
455 KC	.05 mf	6BA6 1st I-F Pin 1	Chassis	2400 Microvolts
400 cycles	.05 mf	6AV6 1st A-F Pin 1	Chassis	.07 Volt
400 cycles	.05 mf	6V6GT Output Pin 5	Chassis	3.2 Volts

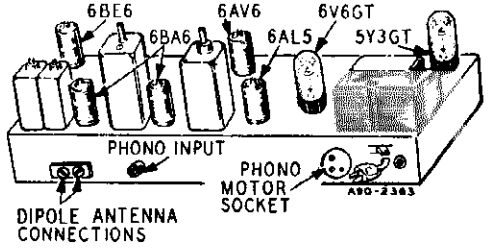
FM STAGES

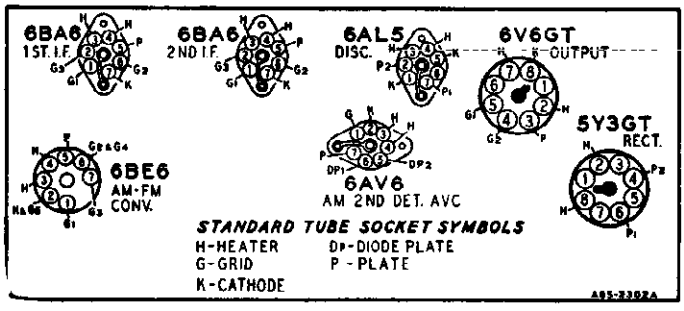
The table below lists the sensitivity for the FM stages of the receiver. The receiver must be tuned to 98 MC for all readings. Measurements are based on a .5 watt output the same as for the AM and Audio stage measurements.

The signal source must be an accurately calibrated signal generator capable of supplying a 98 MC signal modulated by a 400 cycle audio signal. For these measurements the generator must be adjusted for a 22.5 KC deviation. This will correspond to 30% AM modulation.

SIGNAL GENERATOR				INPUT FOR .5 WATT OUTPUT
FREQUENCY	COUPLING TO RECEIVER	CONNECTION TO RECEIVER	GROUND CONNECTION	
98 MC	300 ohms	External Antenna Terminal	Chassis	200 Microvolts
10.7 MC	.01 mf	6BA6 1st I-F Pin 1	Chassis	1,000 Microvolts
10.7 MC	.01 mf	6BA6 2nd I-F Pin 1	Chassis	40,000 Microvolts







TUBE SOCKET VOLTAGES

Socket voltages are shown on the schematic diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube volt-meter. Conditions of measurement are:

Line voltage.....117 Volts AC

Signal Input.....None

A variation of ±10% is usually permissible.

C-1A, C-1B, C-1C, C-1D	14A204	Gang Condenser & Pulley			1
C-2	47X511	100 mmf		Ceramic	1
C-3	47X517	47 mmf		Ceramic	1
C-4	47X523	10 mmf		Ceramic	1
C-5	47X512	10 mmf		Ceramic	1
C-6	47X476	100 mmf		Molded Mica	1
C-7	D66103	.01 mf	400 V	Tubular	1
C-8, C-10		Part of T-7 (1st I.F. Trans.—AM)			
C-11		Part of T-6 (1st I.F. Trans.—FM)			
C-9, C-12, C-13, C-20	47X507	5000 mmf		Silvered Ceramic	4
C-14, C-15		Part of T-8 (2nd I.F. Trans.—AM-FM)			
C-16	47X463	47 mmf		Ceramic	1
C-18A, C-18B	47X112	50-50 mmf		Dual Mica	1
C-22	47X492	2700 mmf		Molded Mica	1
C-23		Part of T-10 (Discriminator Trans.)			
C-24	47X529	330 mmf		Silvered Mica	1
C-25	45X361	5 mf	100 V	Dry Electrolytic	1
C-26A	45X359	40 mf	350 V	Dry Electrolytic	1
C-26B		40 mf	350 V		
C-26C		20 mf	350 V		
C-26D		20 mf	25 V		
C-27	B66503	.05 mf	200 V	Tubular	1
C-28	47X471	68 mmf		Molded Mica	1
C-29	B66403	.04 mf	200 V	Tubular	1
C-30	D66502	.005 mf	400 V	Tubular	1
C-31	47X468	220 mmf		Ceramic	1
C-32	D66203	.02 mf	400 V	Tubular	1
C-33	B66402	.004 mf	200 V	Tubular	1
C-34	H66102	.001 mf	800 V	Tubular	1
C-35	17A235	2-24 mmf		Trimmer	1
C-37, C-39		Part of C-1 Gang Condenser			
C-38	26A489	1-8 mmf		Trimmer	1
C-40	47X508	500 mmf		Ceramic	1
C-42	47X521	6 mmf		Ceramic	1
C-43	47X522	12 mmf		Ceramic	1

RESISTORS

		Ohms	Watts		
R-1	B84223	22 K	0.5	Carbon	1
R-2	B83392	3900	0.5	Carbon	1
R-3, R-6	B84122	1200	0.5	Carbon	2
R-4	D84822	8200	2.0	Carbon	1
R-5	B83680	68	0.5	Carbon	1
R-7, R-9	B85225	2.2 meg.	0.5	Carbon	2
R-8	B85473	47 K	0.5	Carbon	1
R-10	B84102	1000	0.5	Carbon	1
R-11	B84273	27 K	0.5	Carbon	1
R-12, R-13, R-17	B84153	15 K	0.5	Carbon	3
R-14	B85475	4.7 meg.	0.5	Carbon	1
R-15A	43X224	1400	6.0	Wire Wound	1
R-15B		1000	4.0		
R-16		Part of T-8 (2nd I.F. Transformer AM—FM)			
R-21, R-23	B85474	470 K	0.5	Carbon	2
R-18	36X372	.5 meg.		Volume control and switch	1
R-19	B85106	10 meg.	0.5	Carbon	1
R-20	40X285	3 meg.		Tone Control	1
R-22, R-26	43X233	3.6	0.5	Wire Wound	2
R-24	B84271	270	0.5	Carbon	1
R-25	B85681	680	0.5	Carbon	1

TRANSFORMERS AND COILS

L-1, L-3	9A1882	Filament Choke	2
L-2	9A1940	Parasitic Choke	1
T-1	9A1972	"B" Range Loop Antenna Assembly	1
T-2	9A2001	Dipole Antenna Assembly	1
T-3	9A1956	Antenna Coil Assembly	1
T-4	9A1938	Oscillator Coil (FM)	1
T-5	9A1929	Oscillator Coil Assembly (AM)	1
T-6	9A1932	1st I.F. Transformer (FM)	1

	10A652	Knob (Volume Control and Switch)	1
	10A654	Knob (Tone)	1
	10A655	Knob (Phono—BC—FM)	1
	4X 999	Escutcheon	1

DIAL AND DRIVE ASSEMBLY

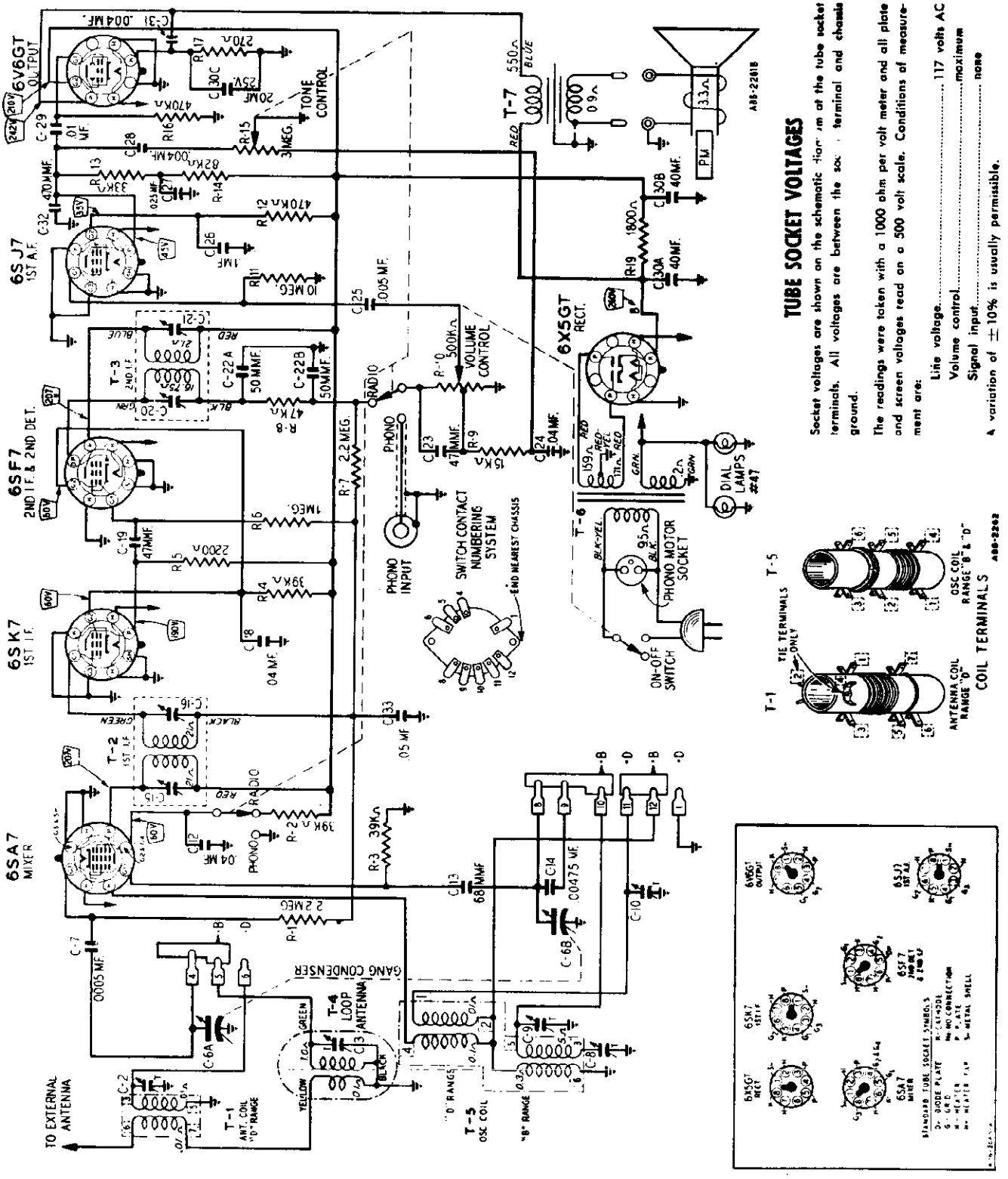
58X699	Dial Glass	1
24X446	Idler Pulley	2
15X241	Pointer	1
25X1569	Dial Bracket	1
7A103	No. 47 Pilot Light Bulb	2
7A202	Pilot Light Socket Assembly	1
26X486	Drive Shaft	1
41X26	Reflector, Dial Light	2
28X113	Drive Cord Tension Spring	1
10X66	Drive Cord Assembly	1
19X192	"C" Washer (Mtg. drive shaft)	2
6X21	Rubber Grommet (Mtg. gang cond.)	3
20X260	Condenser Cushion Stud (Mtg. gang condenser)	3

TRANSFORMERS AND COILS (Cont.)

T-7	9A1934	1st I.F. Transformer (AM)	1
T-8	9A1973	2nd I.F. Transformer (AM—FM)	1
T-10	9A1970	Discriminator Coil Assembly	1
T-11	53X290	Power Transformer	1
T-12	51X134	Output Transformer	1

MODEL 84WG-2704D

MONTGOMERY WARD



TUBE SOCKET VOLTAGES

Socket voltages are shown on the schematic diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground.

The readings were taken with a 1000 ohm per volt meter and all plate and screen voltages read on a 500 volt scale. Conditions of measurement are:

Line voltage..... 117 volts AC
Volume control..... maximum
Signal input..... none

A variation of ±10% is usually permissible.

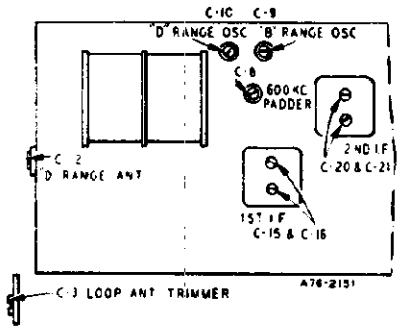
ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.

Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.

Allow Chassis and Signal Generator to "Heat Up" for several minutes.

The following equipment is required for aligning:
An All Wave Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.
Output Indicating Meter; Non-Metallic Screwdriver.
Dummy Antennas—.1 mf., 50 mmf., and 400 ohms.



After each range is completed, repeat the procedure as a final check.

NOTE A—If the pointer is not at 1400 KC on the dial, re-set pointer at the 1400 KC mark on the dial scale.

NOTE B—Turn the rotor back and forth and adjust the trimmer until the peak of greatest intensity is obtained.

	SIGNAL GENERATOR		Dummy Antenna	Band Switch Setting	CONDENSER SETTING	ADJUST TRIMMERS TO MAXIMUM
	Frequency Setting	Connection at Radio				
I-F	455 kc	6SA7, Pin 8	.1 mf	B Range	Turn Rotor to Full Open	2nd I-F (C-20) & (C-21) 1st I-F (C-15) & (C-16)
RANGE B	1620 kc	Antenna Lead	50 mmf	B Range	Turn Rotor to Full Open	Oscillator Range B (C9)
	1400 kc	Antenna Lead	50 mmf	B Range	Tune Rotor to Max. Output. Set Indicator to 1400 KC. See Note A	Antenna Range B (C3)
	600 kc	Antenna Lead	50 mmf	B Range	Tune Rotor to Max. Output	600 kc (C8) Rock Rotor—See Note B
Repeat above oscillator adjustments at 1620 and 600 KC until readjusting the oscillator Range B Trimmer (C9) causes no further improvement in output.						
RANGE D	18.3 mc	Antenna Lead	400 Ohm	D Range	Turn Rotor to Full Open	Oscillator Range D (C10)
	16 mc	Antenna Lead	400 Ohm	D Range	Tune Rotor to Max. Output	Antenna Range D (C2) Rock Rotor—See Note B
LOOP RANGE B	Reassemble chassis in cabinet. 1400 kc	Antenna Lead	50 mmf	B Range	Tune Rotor to Max. Output	Antenna Range B (C3)

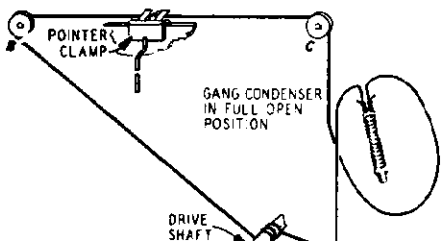
RECEIVER STAGE SENSITIVITIES

The table below lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 KC for all readings. All measurements are based on an output of .5 watt. This may be measured by disconnecting the speaker voice coil and substituting a 3.2 ohm, 5 watt resistor across the secondary winding of the output transformer. A reading of 1.26 volts across this resistor will be equivalent to a .5 watt output with the speaker connected. The volume control must be set to maximum. The signal source must be an accurately calibrated signal generator capable of supplying both 1000 KC and 455 KC signals modulated 30% with a 400 cycle audio signal. Variations of Plus or Minus 25% are usually permissible.

SIGNAL GENERATOR				INPUT FOR .5 WATT OUTPUT
Frequency	Coupling Capacitor	Connection to Receiver	Ground Connection	
1000 kc	200 mmf or RMA Dummy Antenna	External antenna lead	Chassis	9 microvolts
1000 kc	.05 mf	6SA7 Mixer, Pin 8	Same as above	42 microvolts
455 kc	.05 mf	6SA7 Mixer, Pin 8	Same as above	40 microvolts
455 kc	.05 mf	6SK7 1st I-F, Pin 4	Same as above	1075 microvolts
455 kc	.05 mf	6SF7 2nd I-F, Pin 2	Same as above	3900 microvolts
400 cycles	.05 mf	6SJ7 1st A-F, Pin 4	Same as above	.08 volt
400 cycles	.05 mf	6V6GT Output, Pin 5	Same as above	3.75 volts

DRIVE CORD REPLACEMENT

Turn the gang condenser to the fully open position. Use a new 10X65 drive cord assembly or a piece of cord 48 inches long and tie one end to the tension spring. Hook the other end of the tension spring to the tab on the drive pulley. Pass the cord through the slot in the drive pulley rim around idler stud A and wind three and one-half turns clockwise around the tuning shaft (turns must progress away from chassis). Then pass cord over idler pulleys B and C. Wrap cord counterclockwise around drive pulley, stretch tension spring and fasten free end of cord to spring.



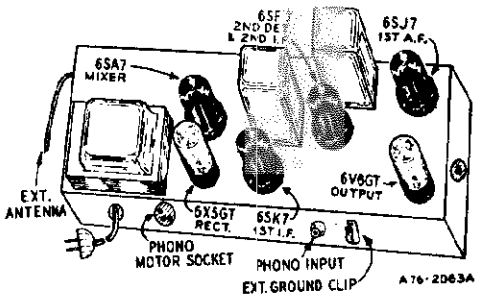
GENERAL DESCRIPTION

This model is a five tube (plus rectifier tube) AC console receiver with automatic record changer. Controls are provided for tuning, volume, tone, and band selection. The dial scale is calibrated in two bands, the broadcast band in channel numbers to cover frequencies between 540-1600 KC and the short wave band directly in megacycles from 5.75 to 18.3 MC. Other features include a built-in Air Wave Aerial, automatic volume control, beam power audio output stage and a PM dynamic speaker. A switch is provided on the tone control for selection of either radio or phono operation.

50 CYCLE OPERATION

If it is desired to use the record changer on a 50 cycle power supply, it will be necessary to replace the drive sleeve assembly on the record changer motor shaft with a 50 cycle drive sleeve assembly. This assembly is listed in the parts list.

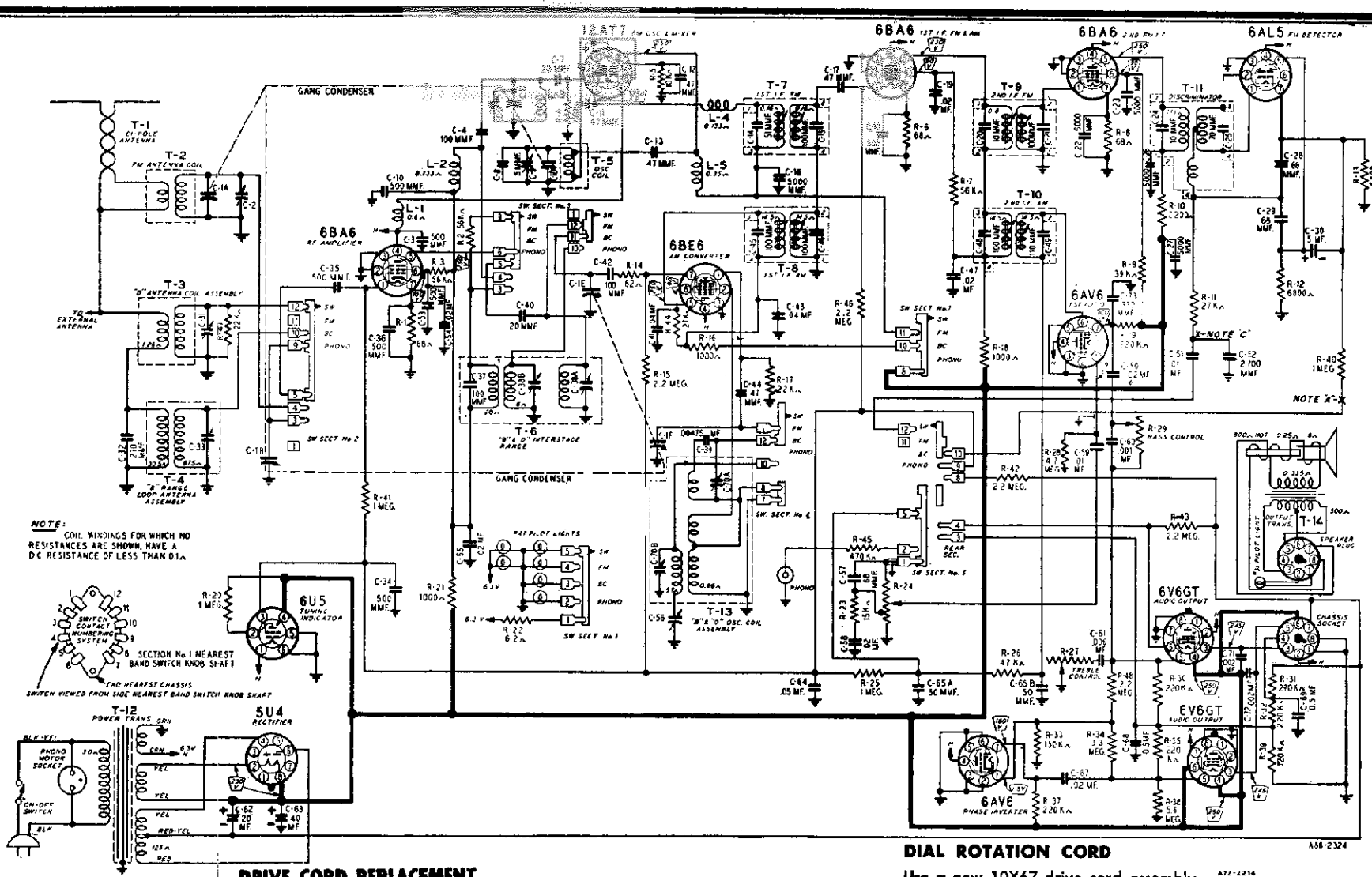
To change the sleeve turn the record selector shelf to the 12" position and lift the turntable off of the record changer. Loosen the set screw holding the drive sleeve on the motor shaft and remove the old sleeve. Install the new 50 cycle drive sleeve and replace the turntable.



Power Supply	105-125 volts AC, 60 cycles, 45 watts. (65 watts phono operating)
Frequency Range	B range—540-1600 KC D range—5.75 to 18.3 MC
Intermediate Frequency	455 KC
Selectivity	40 KC broad at 1000 times signal, 1000 KC
Sensitivity	(for .5 watt output) with external antenna B range—9 microvolts average D range—20 microvolts average
Power Output	4 watts maximum 2.3 watts, 10% distortion
Loud Speaker	10" PM dynamic
Voice Coil Impedance	3.2 ohms at 400 cycles

Ref. No.	Part No.	Description	Qty. Used in Set
CAPACITORS			
C-2	17A164	5-50 mmf Trimmer	1
C-3	17A235	2-24 mmf Trimmer	1
C-6A, C-6B	14A196	Gang Condenser with Drive Pulley	1
C-7	B66501	.0005 mf 200 V Tubular	1
C-8	17A155	350-430 mmf Trimmer	1
C-9, C-10	17A109	2.5-35 mmf Dual Trimmer	1
C-12, C-18	D66403	.04 mf 400 V Tubular	2
C-13	47X466	68 mmf Moulded	1
C-14	46X289	.00475 mf Tubular	1
C-15, C-16		Part of T-2 (1st I-F Coil Assy.)	
C-19, C-23	47X463	47 mmf Moulded	2
C-20, C-21		Part of T-3 (2nd I-F Coil Assy.)	
C-22A, C-22B	47X112	50-50 mmf Dual Mica	1
C-24	D64403	.04 mf 400 V Tubular	1
C-25	D66502	.005 mf 400 V Tubular	1
C-26	D67104	.10 mf 400 V Tubular	1
C-27	D64253	.025 mf 400 V Tubular	1
C-28	D66402	.004 mf 400 V Tubular	1
C-29	D66103	.01 mf 400 V Tubular	1
C-30A	45X346	40 mf 450 V 3 Section Electrolytic	1
C-30B		40 mf 450 V	
C-30C		20 mf 25 V	
C-31	H66402	.004 mf 800 V Tubular	1
C-32	47X467	470 mmf Moulded	1
C-33	B66503	.05 mf 200 V Tubular	1
RESISTORS		OHMS WATTS	
R-1, R-7	B85225	2.2 meg. 0.5 Carbon	2
R-2, R-4	C84393	39 K 1.0 Carbon	2
R-3	B84393	39 K 0.5 Carbon	1
R-5	B84222	2200 0.5 Carbon	1
R-6	B85105	1 meg. 0.5 Carbon	1
R-8	B85473	47 K 0.5 Carbon	1
R-9	B84153	15 K 0.5 Carbon	1
R-10	36X358	500 K Volume Control & Line Switch	1
R-11	B85106	10 meg. 0.5 Carbon	1
R-12, R-16	B85474	470 K 0.5 Carbon	2
R-13	B84333	33 K 0.5 Carbon	1
R-14	B84823	82 K 0.5 Carbon	1
R-15	40X276	3.0 meg. Tone Control & Radio Phono Switch	1
R-17	C84271	270 1.0 Carbon	1
R-19	D84182	1800 2.0 Carbon	1

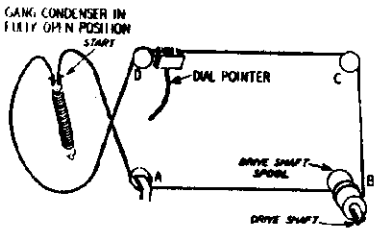
Part No.	Ref. No.	Description	Qty. Used in Set
TRANSFORMERS AND COILS			
	T-1	9A1917 "D" Range Antenna Coil Assembly	1
	T-2	9A1814 1st I-F Coil Assembly	1
	T-3	9A1815 2nd I-F Coil Assembly	1
	T-4	26A474 "B" Range Loop Antenna Assembly	1
	T-5	9A1918 "B" & "D" Range Oscillator Coil Assembly	1
	T-6	53X282 117 Volt, 60 Cycle, Standard Power Transformer	1
	T-7	51X134 Output Transformer	1
DIAL AND DRIVE ASSEMBLY			
S-58X13		Dial Bracket Assembly (including Dial Bracket, Idler Pulley, Rivets, and Dial Glass)	1
6X21		Rubber Grommet (Mtg. Gang Cond.)	3
20X329		Cond. Cushion Stud (Mtg. Gang Cond.)	3
26X485		Drive Shaft	1
19X192		"C" Washer (For Drive Shaft)	2
15X241		Pointer	1
28X113		Drive Cord Tension Spring	1
10X65		Drive Cord Assembly	1
7A199		Pilot Light Socket Assembly	1
7A103		No. 47 Pilot Light Bulb	2
58X696		Dial Glass	1
4X999		Escutcheon	1
MISCELLANEOUS			
12A476		10" P.M. Speaker	1
3A303		Tube Socket-Octal (8 prong) moulded	6
3A304		Phono Motor Socket	1
3A305		Phono Socket—Single Pin Tip	1
2A372		Band Change Switch	1
13X328		Line Cord and Plug Assembly	1
10A651		Knob (Tuning)	1
10A652		Knob (Off-On Volume)	1
10A653		Knob (SW-BC)	1
10A650		Knob (Tone—R.P.)	1
TYPE W-28A148 RECORD CHANGER PARTS			
W-15X090-1		Motor Assembly, 60 cycles, 115-120 V.	1
W-17X412-11		50 Cycle Drive Sleeve Assembly	1
Shure P30-1		Crystal Cartridge and Semi-Permanent Needle Assembly	1
		Semi-Permanent Needle (Specify part number and letters stamped on crystal)	1



DRIVE CORD REPLACEMENT

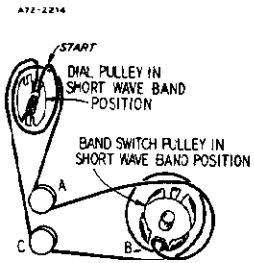
DIAL POINTER CORD

Use a new 10X61 drive cord assembly or a new length of cord 50 inches long for the installation. Install the cord as shown in the illustration, winding three turns counterclockwise around the drive shaft spool with the turns progressing towards the front end of the drive shaft. After complet-



DIAL ROTATION CORD

Use a new 10X67 drive cord assembly or a new length of cord 21 inches long for the installation. Both the dial pulley and the band switch pulley must be turned to the short wave band position as shown in the illustration. Install the new cord exactly as shown then change the position of the band switch several times and note the



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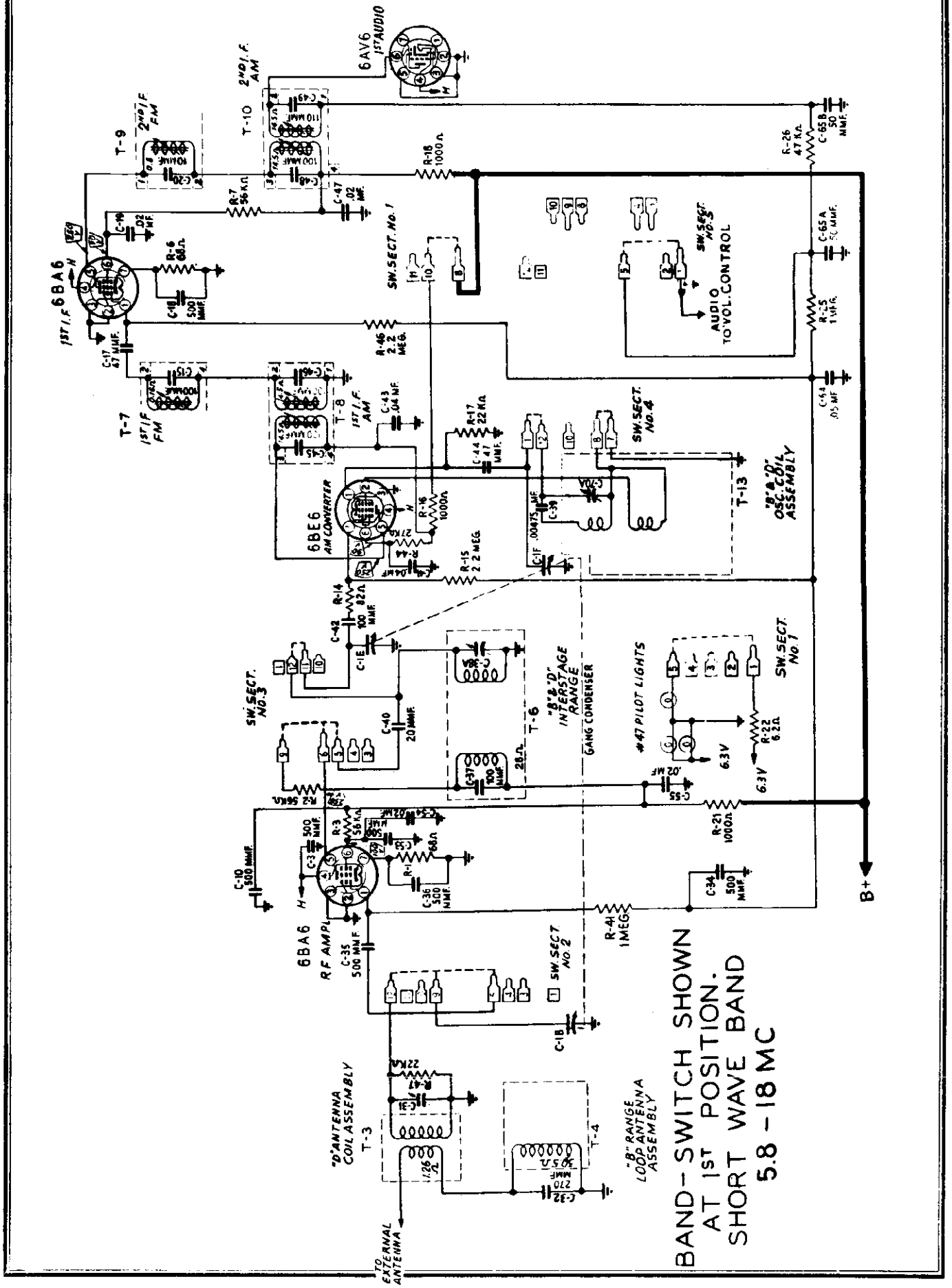
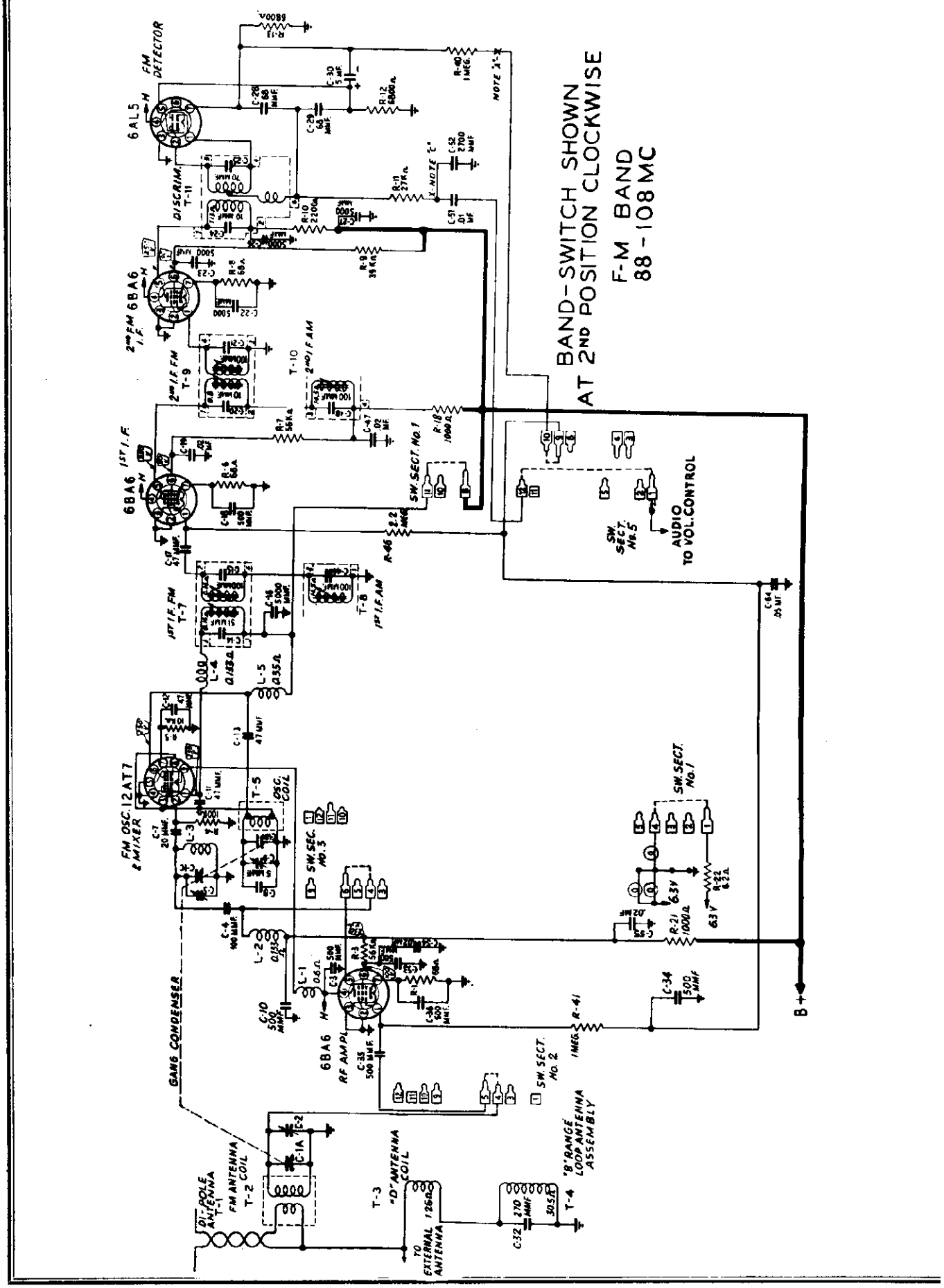
MODEL 84WG-2712A

MONTGOMERY WARD




BAND-SWITCH SHOWN
AT 2ND POSITION CLOCKWISE
F-M BAND
88 - 108 MC
6AL5
FM DETECTOR
DISCRIM.
T-11
2ND FM 6BA6
I.F.
2ND I.F. FM
T-9
T-10
2ND I.F. AM
6BA6
1ST I.F.
1ST I.F. FM
T-7
1ST I.F. AM
T-8
FM OSC. 12AT7
& MIXER
T-5
OSC. COIL
GANG CONDENSER
6BA6
RF AMPL.
SW. SECT. No. 1
SW. SECT. No. 2
SW. SEC. No. 3
SW. SECT. No. 5
AUDIO TO VOL. CONTROL
B+
DT POLE ANTENNA
FM ANTENNA T-1
T-2 COIL
T-3
"D" ANTENNA COIL
TO EXTERNAL ANTENNA
"B" RANGE LOOP ANTENNA ASSEMBLY
T-4

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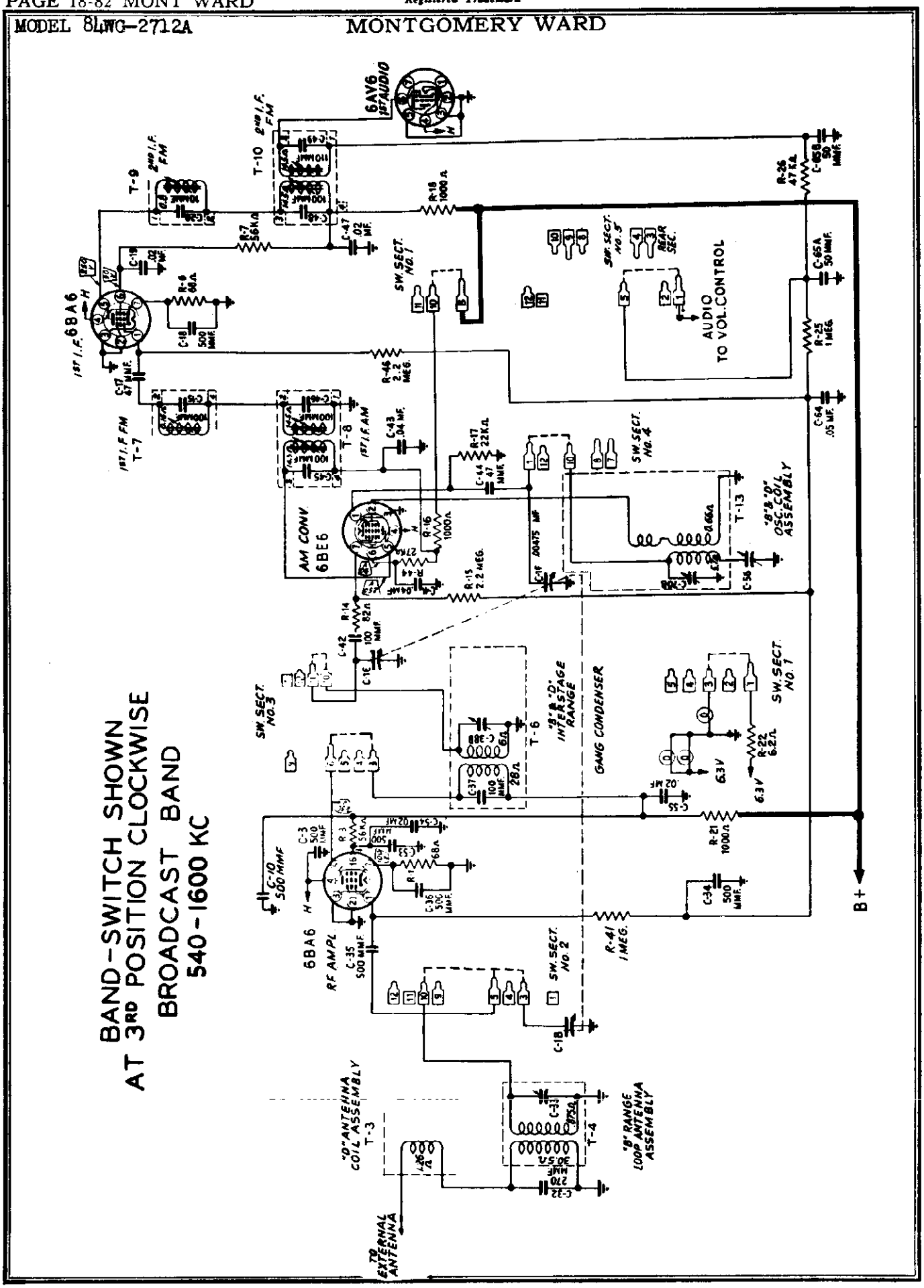
MODEL 84WG-2712A

MONTGOMERY WARD



A 100,000 Ohm 1/2 Watt Resistor (R50) was connected between the top of the Volume Control R-24 and ground, this resistor improves the Audio Amplifier stability. See Figure 2. for the location of this Resistor.

The following additional parts are used:

REFERENCE NO.	PART NO.	DESCRIPTION
R-49	B-84222	2,200 Ohm 0.5 Watt
R-50	B-85104	100 K Ohm 0.5 Watt

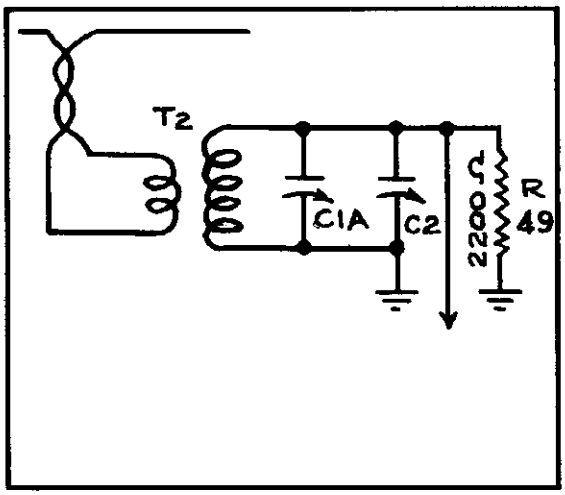


FIG. 1

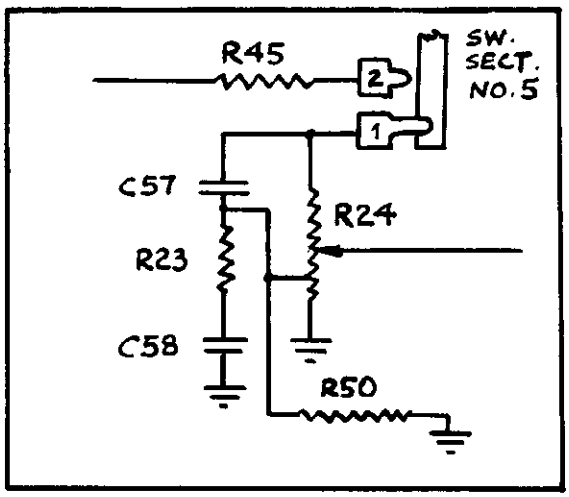


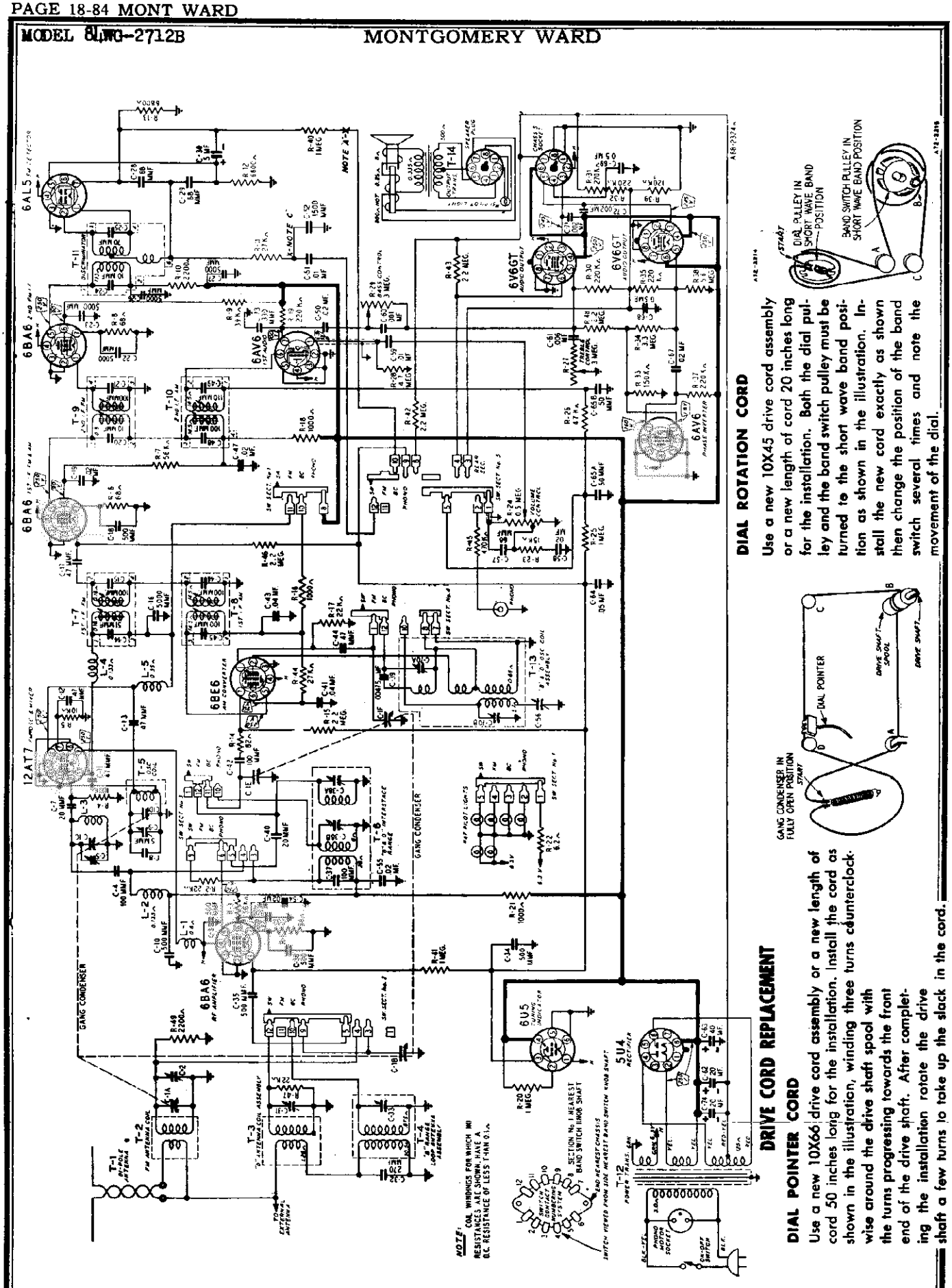
FIG. 2

Two production changes were made as follows:

A 2,200 Ohm, 1/2 watt Resistor (R49) was connected across the secondary of the F.M. Antenna Coil T-2. This resistor broadens the frequency response curve of this coil. See Figure 1. for location of this Resistor.

MODEL 8UWG-2712B

MONTGOMERY WARD



DIAL ROTATION CORD

Use a new 10X45 drive cord assembly or a new length of cord 20 inches long for the installation. Both the dial pulley and the band switch pulley must be turned to the short wave band position as shown in the illustration. Install the new cord exactly as shown then change the position of the band switch several times and note the movement of the dial.

DRIVE CORD REPLACEMENT

DIAL POINTER CORD

Use a new 10X66 drive cord assembly or a new length of cord 50 inches long for the installation. Install the cord as shown in the illustration, winding three turns counterclockwise around the drive shaft spool with the turns progressing towards the front end of the drive shaft. After completing the installation rotate the drive shaft a few turns to take up the slack in the cord.

ALIGNMENT PROCEDURE

FM STAGES

The following equipment is required for aligning:

An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.

Non-metallic screwdriver.

Dummy Antennas and I-F Loading Resistor—.01 mf, 300 ohms and 5000 ohms.

Zero center scale DC vacuum tube voltmeter having a range of approximately 3 volts.

(If a zero center scale meter is not available, a standard scale vacuum tube voltmeter may be used by reversing the meter connections for negative readings.

Allow chassis and signal generator to warm up for several minutes.

	SIGNAL GENERATOR		THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO					
Discriminator	10.7 MC Note B	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Pri. (5) Note A	Maximum Deflection
	10.7 MC Note B	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Sec. (6) Note C	Zero Center
	10.7 MC Note B	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Pri. (5) Note A	Maximum Deflection
	10.7 MC Note B	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Sec. (6) Note C	Zero Center
I-F	10.7 MC Note F	6BA6 1st I-F, Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	2nd I-F Pri. Note A and D (7) 2nd I-F Pri. Note A and E (8)	Maximum Deflection
	10.7 MC Note F	FM-RF Gang Condenser terminal on top of chassis	.01 mf	FM	Rotor Fully Open	1st I-F Pri. (9) 1st I-F Sec. (10) Note A	Maximum Deflection
Recheck I-F Adjustments in order given							
R-F & Osc.	108.4	Disconnect dipole and connect generator to dipole terminals with resistor in series	300 ohms	FM	Rotor Fully Open	Oscillator C-9 Note G	Maximum Deflection
	104.5	Disconnect dipole and connect generator to dipole terminals with resistor in series	300 ohms	FM	Tune Rotor for Max. AVC voltage	RF, C-5	Maximum Deflection
	104.5	Disconnect dipole and connect generator to dipole terminals with resistor in series	300 ohms	FM	Tune Rotor for Max. AVC voltage	Ant. C-2	Maximum Deflection
Recheck R-F and Osc. Adjustments in order given							

NOTE A—Test Equipment connections are as given in the table. The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line at the 1 megohm resistor R-40 and the band switch terminal for all adjustments except the discriminator secondary adjustment, for which see Note C.

NOTE B—A signal of .1 volt must be fed into the receiver for this adjustment.

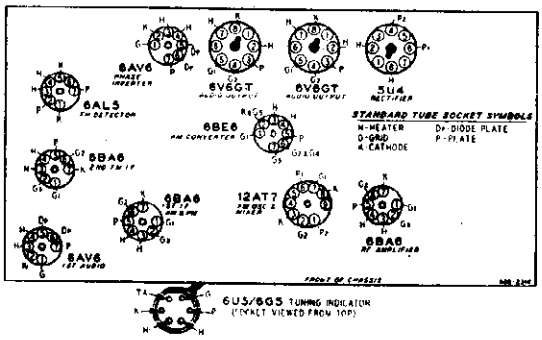
NOTE C—Disconnect zero center DC vacuum tube voltmeter from AVC and reconnect to junction of R-11, C-51 and C-52. Adjust for zero voltage indication.

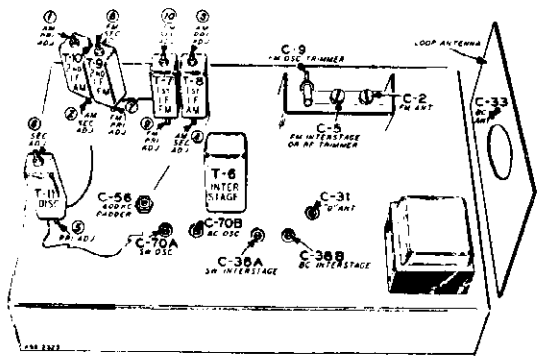
NOTE D—Before adjusting Pri. core connect 5000 ohm load resistor across the 2nd I.F. secondary terminals.

NOTE E—Disconnect 5000 ohm load resistor from secondary terminals and reconnect across the 2nd I.F. primary terminals.

NOTE F—Input can be reduced to 10,000 microvolts.

NOTE G—Oscillator frequency below signal frequency.





TUBE SOCKET VOLTAGES

Socket voltages are shown on the schematic diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube volt-meter. Conditions of measurement are:

Line voltage.....117 Volts AC

Signal Input.....None

A variation of ±10% is usally permissible.

MODELS 8LWG-2712A, 8LWG-2712B

MONTGOMERY WARD

RECEIVER STAGE SENSITIVITIES
AM AND AUDIO STAGES

The table below lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 KC for all readings. All measurements are based on an output of .5 watt. This may be measured by disconnecting the speaker voice coil and substituting an 8 ohm, 10 watt resistor across the secondary winding of the output transformer. A reading of 2 volts across this resistor will be equivalent to a .5 watt output. The volume control must be set to maximum.

The signal source must be an accurately calibrated signal generator capable of supplying both 1000 KC and 455 KC signals modulated 30% with a 400 cycle audio signal. Variations in sensitivity of Plus or Minus 25% are usually permissible.

SIGNAL GENERATOR				INPUT FOR .5 WATT OUTPUT
FREQUENCY	COUPLING CAPACITOR	CONNECTION TO RECEIVER	GROUND CONNECTION	
1000 KC	200 mmf or RMA Dummy Antenna	External Antenna Lead	Chassis	2 Microvolts
1000 KC	.05 mf	6BA6 Interstage Pin 1	Chassis	8 Microvolts
1000 KC	.05 mf	6BE6 Converter Pin 7	Chassis	65 Microvolts
455 KC	.05 mf	6BE6 Converter Pin 7	Chassis	55 Microvolts
455 KC	.05 mf	6BA6 1st I-F Pin 1	Chassis	3500 Microvolts
400 cycles	.05 mf	6AV6 1st A-F Pin 1	Chassis	.045 Volt
400 cycles	.05 mf	6V6GT Output Pin 5	Chassis	1.65 Volts

FM STAGES

The table below lists the sensitivity for the FM stages of the receiver. The receiver must be tuned to 98 MC for all readings. Measurements are based on a .5 watt output the same as for the AM and Audio stage measurements.

The signal source must be an accurately calibrated signal generator capable of supplying a 98 MC signal modulated by a 400 cycle audio signal. For these measurements the generator must be adjusted for a 22.5 KC deviation. This will correspond to 30% AM modulation.

SIGNAL GENERATOR				INPUT FOR .5 WATT OUTPUT
FREQUENCY	COUPLING TO RECEIVER	CONNECTION TO RECEIVER	GROUND CONNECTION	
98 Mc	300 ohms	External Antenna Terminal	External Ant. Terminal	25 Microvolts
10.7 MC	.01 mf	6BA6 1st I-F Pin 1	Chassis	2200 Microvolts
10.7 MC	.01 mf	6BA6 2nd I-F Pin 1	Chassis	50,000 Microvolts

ALIGNMENT PROCEDURE
AM BROADCAST AND SHORT WAVE BAND

The following is required for aligning:

An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.

Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas — .1 mf, 200 mmf and 400 ohms.

Volume Control—Maximum all Adjustments.

Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.

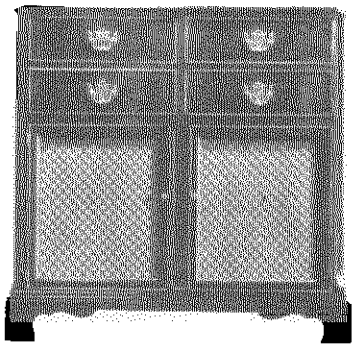
Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.

	SIGNAL GENERATOR		THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO					
I-F	455 kc	6BE6 Pin 7 and Chassis	.1 mf	Broadcast	Rotor Fully Open	1st I-F Pri. & Sec. (3) & (4) 2nd I.-F. Pri. & Sec. (1) & (2)	Maximum Output
Broadcast	1620 kc	External ant. lead	200 mmf	Broadcast	Rotor Fully Open	Broadcast Oscillator C-70B	
	1403 kc	External ant. lead	200 mmf	Broadcast	Turn Rotor to Max. Output Set pointer to 1400 kc See Note A	Broadcast Interstage C-38B	
	1400 kc	External ant. lead	200 mmf	Broadcast		Loop Antenna C-33	
	600 kc	External ant. lead	200 mmf	Broadcast	Turn Rotor to Max. Output and Rock See Note B	600 kc padder C-56	
Repeat above oscillator adjustments at 1620 and 600 KC until readjusting the oscillator Range B Trimmer C-70B causes no further improvement in output.							
Short Wave	18.3 MC	External ant. lead	400 ohm	Short Wave	Rotor Fully Open	SW Oscillator C-70A	Maximum Output
	17 MC	External ant. lead	400 ohm	Short Wave	Turn Rotor to Max. Output	SW Interstage C-38A "D" Antenna C-31	
Reassemble chassis in cabinet							
Broadcast	1400 kc	External ant. lead	200 mmf	Broadcast	Turn Rotor to Max. Output	Loop Antenna C-33	

After each range is completed, repeat the procedure as a final check.

Note A—If the pointer is not at 1400 KC on the dial, reset pointer at the 1400 KC mark on the dial scale.

Note B—Turn the rotor back and forth and adjust the trimmer until the peak of greatest intensity is obtained.



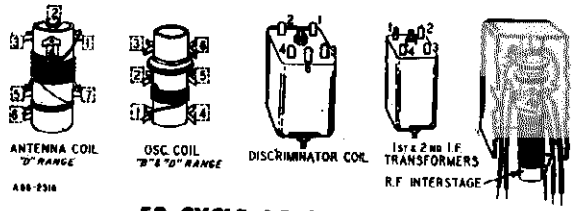
This is a three band, ten tube (plus tuning eye and rectifier tube) receiver with automatic record changer, for the reception of both AM and FM stations. The R-F and I-F stages use the latest type high gain miniature type tubes and built-in Air Wave Aerials are provided for the FM and Broadcast bands. Features include the new Roto-Selector dial with only one band visible at a time, compensator circuits to prevent oscillator drift, automatic volume control, beam power output stage, electro dynamic loud speaker and an electrostatic shield in the power transformer to reduce power line noise.

Tube and Dial Lamp Complement

1 6BA6 AM-FM R-F Amplifier
1 12AT7 FM Osc. & Mixer
1 6BE6 AM Converter
1 6BA6 FM-AM 1st I-F Amplifier
1 6BA6 FM 2nd I-F Amplifier
1 6AL5 FM Detector
1 6AV6 Audio Amplifier, AM 2nd Detector and AVC
2 6V6GT Audio Output
1 6U5/6G5 Tuning Indicator
1 5U4 Rectifier
1 6AV6 Phase Inverter
6 No. 47 Dial Lamps

ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts AC 60 cycles, 110 watts, 130 watts with record changer
Frequency Ranges	Broadcast 540-1600 KC Frequency Modulation 88-108 MC Short Wave 5.8-18 MC
Intermediate Frequency	AM—455 KC FM—10.7 MC
Selectivity	AM—37 KC broad at 1000 times signal, measured at 1000 KC I.F. FM—200 KC broad at 2 times down I.F. FM—700 KC broad at 200 times down
AM Sensitivity	(For .5 watt output with external antenna) Broadcast, 2 microvolts average Short Wave, 4 microvolts average
FM Sensitivity	(For .5 watt output) 25 microvolts average
Power Output	12.0 watts maximum 9.0 watts 10% distortion
Loud Speaker	12" Electro Dynamic
Voice Coil Impedance	8.0 ohms 400 cycles

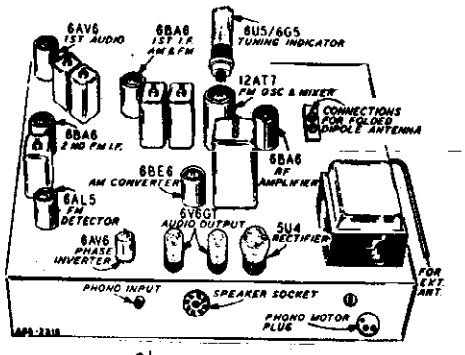


50 CYCLE AC OPERATION

If it is desired to operate this radio on a 50 cycle 105-125 volt AC power source no changes are necessary to the radio chassis.

If it is desired to use the record changer on a 50 cycle power supply, it will be necessary to replace the drive sleeve assembly on the record changer motor shaft with a 50 cycle drive sleeve assembly. This assembly is listed in the parts list.

To change the sleeve turn the recorder selector shelf to the 12" position and lift the turntable off of the record changer. Loosen the set screw holding the drive sleeve on the motor shaft and remove the old sleeve. Install the new 50 cycle drive sleeve and replace the turntable.



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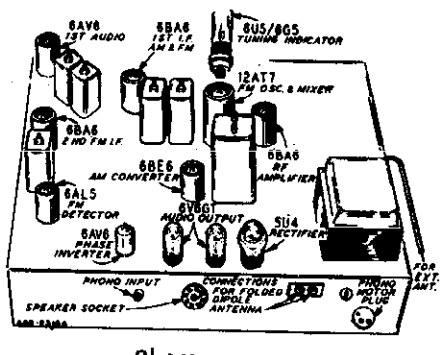


84WG-2712B

CAPACITORS

Ref. No.	Part No.	Description			Qty. Used in Set
C-1	26A483	Tuner and Gang Assembly			1
C-2, C-5	17A247	3.0-12 mmf		Trimmer	2
C-3, C-10, C-18, C-34, C-35, C-36, C-53	47X496	500 mmf		Ceramic	7
C-4, C-42	47X497	100 mmf		Ceramic	2
C-7	47X516	20mmf		Ceramic	1
C-8	47X500	5 mmf		Ceramic	1
C-9	17A255	1-8 mmf		Trimmer	1
C-11	47X499	47 mmf		Ceramic	1
C-12, C-13, C-44	47X498	47 mmf		Ceramic	3
C-14, C-15	Part of T-7 1st I-F (FM)				
C-16, C-22, C-23, C-26, C-27	47X507	5000 mmf		Ceramic	5
C-17, C-19, C-47	47X495	47 mmf		Ceramic	1
C-50, C-54, C-55, C-67	D66203	.02 mf	400 V	Tubular	6
C-20, C-21	Part of T-9 2nd I-F (FM)				
C-24, C-25	Part of T-11 Discriminator				
C-28, C-29, C-57	47X501	68 mmf		Ceramic	3
C-30	45X361	5 mf	100 V	Dry Electrolytic	1
C-31	17A253	5-50 mmf		Trimmer	1
C-32	47X445	270 mmf		Molded	1
C-37	47X57	100 mmf		Molded	1
C-39	46X289	.00475 mf	180 V	Tubular	1
C-38A, C-38B	17A252	1.3-12 mmf		Dual Trimmer	1
C-40	47X516	20 mmf		Ceramic	1
C-41, C-43	D66403	.04 mf	400 V	Tubular	2
C-45, C-46	Part of T-8 1st I-F (AM)				
C-48, C-49	Part of T-10 2nd I-F (AM)				
C-51, C-59	B66103	.01 mf	200 V	Tubular	2
C-52	47X492	2700 mmf		Molded	1
C-56	17A241	300-475 mmf		Trimmer	1
C-58	B66203	.02 mf	200 V	Tubular	1
C-60	D66102	.001 mf	400 V	Tubular	1
C-61	D66602	.006 mf	400 V	Tubular	1
C-62	45X351	20 mf	450 V	Dry Electrolytic	1
C-63	45X302	40 mf	450 V	Dry Electrolytic	1
C-64	B66503	.05 mf	200 V	Tubular	1
C-65A, C-65B	47X112	50-50 mmf		Dual Mica	1
C-68, C-69	A66504	.5 mf	100 V	Tubular	2
C-70A, C-70B	17A246	3.2-35 mmf		Dual Trimmer	1
C-71, C-72	D66202	.002 mf	400 V	Tubular	2
C-73	47X470	330 mmf		Molded	1

RESISTORS

Ref. No.	Part No.	Ohms	Watts		Qty. Used in Set
R-1, R-6, R-8	B83680	68	0.5	Carbon	3
R-2	C85223	22K	1.0	Carbon	1
R-3	B85563	56K	0.5	Carbon	1
R-4	B84104	100K	0.5	Carbon	1
R-5	B84103	10K	0.5	Carbon	1
R-7	C84563	56K	1.0	Carbon	1
R-9	C84393	39K	1.0	Carbon	1
R-10	B85222	2200	0.5	Carbon	1
R-11	B84273	27K	0.5	Carbon	1
R-12, R-13	B83682	6800	0.5	Carbon	2
R-14	B84820	82	0.5	Carbon	1
R-15, R-42, R-46, R-48, R-16	B85225	2.2 meg.	0.5	Carbon	4
R-18, R-21	B85102	1000	0.5	Carbon	3
R-17, R-47, R-19, R-30, R-35, R-37	B84223	22K	0.5	Carbon	2
R-20, R-22	43X217	6.2		Wire Wound	1
R-23	B85153	15K	0.5	Carbon	1
R-24	36X374	.5 meg.		Volume Control	1
R-25, R-40, R-41	B85105	1 meg.	0.5	Carbon	3
R-26	B85473	47 K	0.5	Carbon	1
R-27, R-29	40X286	3 meg.	Tone Controls (Bass & Treble)		2
R-28	B85475	4.7 meg.	0.5	Carbon	1
R-31	B83274	270K	0.5	Carbon	1
R-32	B83224	220K	0.5	Carbon	1
R-33	B84154	150K	0.5	Carbon	1
R-34	B85335	3.3 meg.	0.5	Carbon	1
R-38	B85565	5.6 meg.	0.5	Carbon	1
R-39	B83124	120K	0.5	Carbon	1
R-43	B84225	2.2 meg.	0.5	Carbon	1
R-44	C84273	27K	1.0	Carbon	1
R-45	B85474	470K	0.5	Carbon	1
R-22	43X217	6.2		Wire Wound	1
R-23	B85153	15K	0.5	Carbon	1
R-24	36X374	.5 meg.		Volume Control	1

TRANSFORMERS AND COILS

Ref. No.	Part No.	Description	Qty. Used in Set
L-1	9A1881	Filament Choke Assembly	1
L-2, L-4	9A1880	FM R-F Plate Choke	2
L-3	9A1946	FM R-F Coil	1
L-5	9A1882	FM Oscillator Plate Choke	1
T-1	9A1900	Di-Pole Antenna Assembly	1
T-2	9A1945	FM Antenna Coil	1
T-3	9A1957	"D" Antenna Coil Assembly	1
T-4	26A436	Loop Antenna Assembly	1
T-5	9A1948	Oscillator Coil (FM)	1
T-6	9A1947	Interstage "B" & "D" Range Coil Assembly	1
T-7	9A1950	1st I-F Transformer (FM)	1
T-8	9A1934	1st I-F Transformer (AM)	1
T-9	9A1933	2nd I-F Transformer (FM)	1
T-10	9A1935	2nd I-F Transformer (AM)	1
T-11	9A1936	Discriminator Coil	1
T-12	53X293	Power Transformer	1
T-13	9A1918	"B" & "D" Oscillator Coil Assembly	1
T-14		Output Transformer (See Miscellaneous)	1

CAPACITORS

Ref. No.	Part No.	Description	Qty. Used in Set
C-1	26A483	Tuner and Gang Assembly	1
C-2, C-5	17A247	3.0-12 mmf Trimmer	2
C-3, C-10, C-18, C-34, C-35, C-36, C-53	47X496	500 mmf Ceramic	7
C-4, C-42	47X497	100 mmf Ceramic	2
C-7, C-40	47X516	20mmf Ceramic	2
C-8	47X500	5 mmf Ceramic	1
C-9	17A255	1-8 mmf Trimmer	1
C-11	47X499	47 mmf Ceramic	1
C-12, C-13, C-44	47X498	47 mmf Ceramic	3
C-14, C-15		Part of T-7 1st I-F (FM)	
C-16, C-22, C-23, C-26, C-27	47X507	5000 mmf Ceramic	5
C-17, C-19, C-47	47X495	47 mmf Ceramic	1
C-50, C-54, C-55, C-67	D66203	.02 mf 400 V Tubular	6
C-20, C-21		Part of T-9 2nd I-F (FM)	
C-24, C-25		Part of T-11 Discriminator	
C-28, C-29, C-57	47X501	68 mmf Ceramic	3
C-30	45X361	5 mf 100 V Dry Electrolytic	1
C-31	17A253	5-50 mmf Trimmer	1
C-32	47X445	270 mmf Molded	1
C-33	17A123	1.5-12 mmf Trimmer	1
C-37	47X57	100 mmf Molded	1
C-38A, C-38B	17A252	1.3-12 mmf Dual Trimmer	1
C-39	46X289	.00475 mf 180 V Tubular	1
C-41, C-43	D66403	.04 mf 400 V Tubular	2
C-45, C-46, C-48, C-49, C-51		Part of T-8 1st I-F (AM)	
C-59	B66103	.01 mf 200 V Tubular	2
C-52	47X528	1500 mmf Molded	1
C-56	17A241	300-475 mmf Trimmer	1
C-58	B66203	.02 mf 200 V Tubular	1
C-60	D66102	.001 mf 400 V Tubular	1
C-61	D66602	.006 mf 400 V Tubular	1
C-62	45X351	20 mf 450 V Dry Electrolytic	1
C-63	45X302	40 mf 450 V Dry Electrolytic	1
C-64	B66503	.05 mf 200 V Tubular	1
C-65A, C-65B	47X112	50-50 mmf Dual Mica	1
C-68, C-69	A66504	.5 mf 100 V Tubular	2
C-70A, C-70B	17A246	3.2-35 mmf Dual Trimmer	1
C-71, C-72	D66202	.002 mf 400 V Tubular	2
C-73	47X470	330 mmf Molded	1
C-74	45X373	20 mf 450 V Dry Electrolytic	1

RESISTORS

Ref. No.	Part No.	Ohms	Watts		Qty. Used in Set
R-1, R-6, R-8	B83680	68	0.5	Carbon	3
R-2	C85223	22K	1.0	Carbon	1
R-3	B85563	56K	0.5	Carbon	1
R-4	B84104	100K	0.5	Carbon	1
R-5	B84103	10K	0.5	Carbon	1
R-7	C84563	56K	1.0	Carbon	1
R-9	C84393	39K	1.0	Carbon	1
R-10	B85222	2200	0.5	Carbon	1
R-11	B84273	27K	0.5	Carbon	1
R-12, R-13	B83682	6800	0.5	Carbon	2
R-14	B84820	82	0.5	Carbon	1
R-15, R-42, R-46, R-48	B85225	2.2 meg.	0.5	Carbon	4
R-16, R-18, R-21	B85102	1000	0.5	Carbon	3
R-17, R-47	B84223	22K	0.5	Carbon	2
R-19, R-30, R-35, R-37	B85224	220K	0.5	Carbon	4
R-20		Part of 13X549 Cable and Socket Assembly			
R-22	43X217	6.2	0.5	Wire Wound	1
R-23	B85153	15K	0.5	Carbon	1
R-24	36X374	.5 meg.		Volume Control	1
R-25, R-40, R-41	B85105	1 meg.	0.5	Carbon	3
R-26	B85473	47 K	0.5	Carbon	1
R-27, R-29	40X286	3 meg.		Tone Controls (Bass & Treble)	2
R-28	B85475	4.7 meg.	0.5	Carbon	1
R-31	B83274	270K	0.5	Carbon	1
R-32	B83224	220 K	0.5	Carbon	1
R-33	B84154	150 K	0.5	Carbon	1
R-34	B85335	3.3 meg.	0.5	Carbon	1
R-38	B85565	5.6 meg.	0.5	Carbon	1
R-39	B83124	120 K	0.5	Carbon	1
R-43	B84225	2.2 meg.	0.5	Carbon	1
R-44	C84273	27K	1.0	Carbon	1
R-45	B85474	470K	0.5	Carbon	1
R-49	B84222	2200	0.5	Carbon	1

TRANSFORMERS AND COILS

Ref. No.	Part No.	Description	Qty. Used in Set
L-1	9A1881	Filament Choke Assembly	1
L-2, L-4	9A1880	FM R-F Plate Choke	2
L-3	9A1946	FM R-F Coil	1
L-5	9A1882	FM Oscillator Plate Choke	1
T-1	9A1962	Di-Pole Antenna Assembly	1
T-2	9A1966	FM Antenna Coil	1
T-3	9A1957	"D" Antenna Coil Assembly	1
T-4	26A436	Loop Antenna Assembly	1
T-5	9A1948	Oscillator Coil (AM)	1
T-6	9A1947	Interstage "B" & "D" Range Coil Assembly	1
T-7	9A1950	1st I-F Transformer (FM)	1
T-8	9A1934	1st I-F Transformer (AM)	1
T-9	9A1933	2nd I-F Transformer (FM)	1
T-10	9A1935	2nd I-F Transformer (AM)	1
T-11	9A1936	Discriminator Coil	1
T-12	53X293	Power Transformer	1
T-13	9A1988	"B" & "D" Oscillator Coil Assembly	1
T-14		Output Transformer (See Miscellaneous)	1

MODELS 84WG-2712A, 84WG-2712B

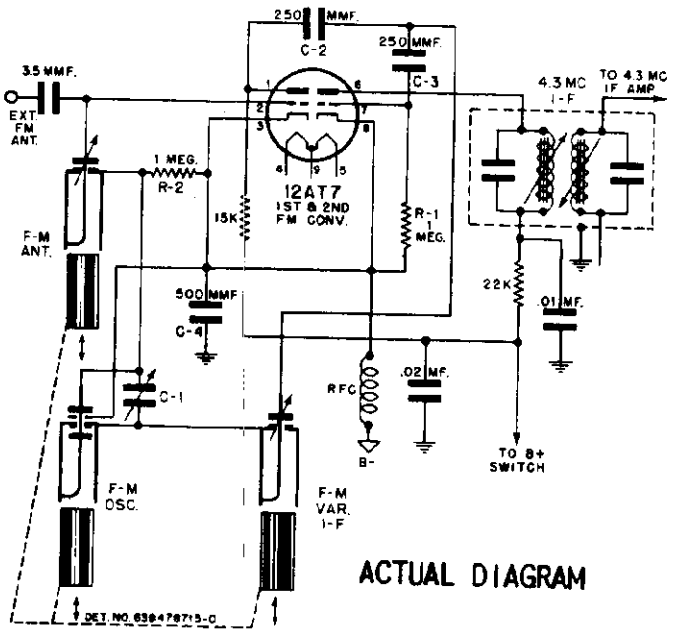
MONTGOMERY WARD

MODEL 84WG-2712A

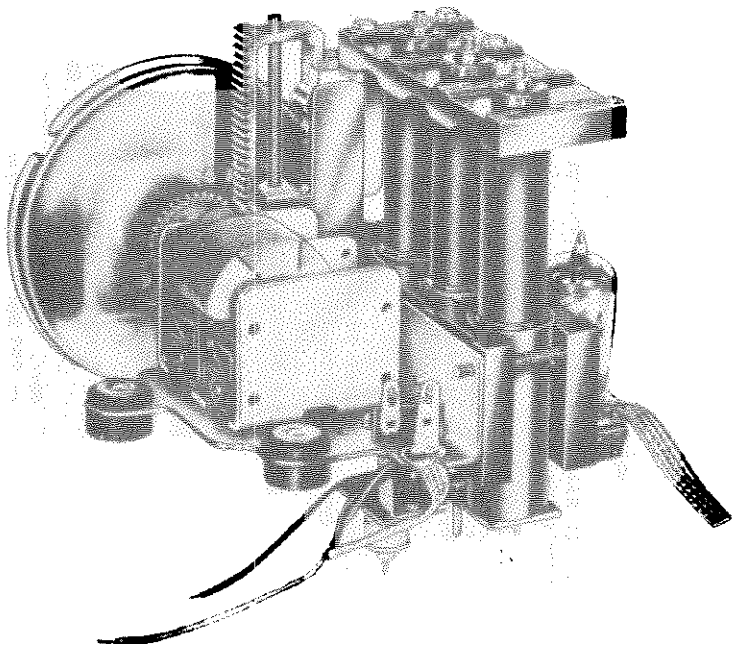
Ref. No.	Part No.	Description	Qty. Used in Set
		MISCELLANEOUS	
	12A481	12" E.D. Speaker complete with output transformer	1
	3A303	Tube socket—octal (8 prong) molded	4
	3A425	Tube socket (miniature)	6
	32X346	Tube shield (miniature	6
	32X388	Tube Shield (For 12AT7)	1
	3A436	Tube socket (For 12AT7)	1
	3A427	Tube socket (R-F Amp)	1
	3A304	Phono Motor Socket	1
	3A305	Phono Socket—Single pin	1
	2A376	Rotary, Snap Switch	1
	2A377	Band Switch	1
	13X328	Line Cord and Plug Assembly	1
	10A509	Tuner Buttons	6
	28X320	Springs (Tuner Button)	6
	10A662	Knob (Band)	1
	10A667	Knob (Tuning)	1
	10A666	Knob (Bass)	1
	10A665	Knob (Treble)	1
	10A664	Knob (Volume)	1
	10A663	Knob (Off-On)	1
	4X870	Escutcheon Eye	1
	7A32	No. 51 Pilot Light (Jewel)	1
	7A222	Jewel (Pilot Light)	1
	13X549	Cable and Socket Assembly—Tuning Indicator	1
	6X21	Rubber Grommets } Mtg. Gang	4
	20X329	Condenser Cushion Stud } Cond.	4
		DIAL AND DRIVE ASSEMBLY	
	26A435	Dial Bracket Assembly	1
	26A484	Dial and Drum Assembly Complete with Dial Background, Collar, Dial Drum and Dial Scale	1
	15X221	Pointer	1
	26X500	Dial Drum Shaft	1
	26A440	Pulley and Collar Assembly (For dial drum shaft)	1
	26A437	Band Switch Pulley Assembly	1
	26X468	Band Switch Shaft	
	26A441	Crown Gear Assembly (For Mtg. to Band Switch)	2
	26A434	Idler Bracket Assembly	1
	25X1389	Drive Shaft Bracket	1
	26X467	Drive Shaft	1
	24X551	Drive Shaft Spool	1
	10X67	Drive Cord Assembly (Band Change)	1
	28X524	Tension Spring (Band Change)	1
	10X61	Drive Cord and Clip Assembly (Dial Drive)	1
	28X530	Tension Spring (Dial Drive)	1
	41X72	Light Shield (Band Indicator)	4
	41X35	Light Shield (Dial)	2
	7A103	No. 47 Pilot Light	6
	7A187	Pilot Light Socket Assembly (Dual)	1
	7A209	Indicator Light Socket Assembly	4
	25X498	Tuning Eye Clamp	1
	25X1396	Tuning Eye Bracket	1
	26A485	Escutcheon and Crystal Assembly Complete with name plate, escutcheon, etc.	1
		TYPE W-28A146 RECORD CHANGER PARTS	
	W-15X090-1	Motor Assembly, 60 cycles, 115-120 V.	1
	W-15X090-1	50 Cycle Drive Sleeve Assembly	1
	Shure P30-1	Crystal Cartridge and semi-Permanent Needle Assembly	1
		Semi-Permanent Needle (Specify part number and letters stamped on crystal)	1

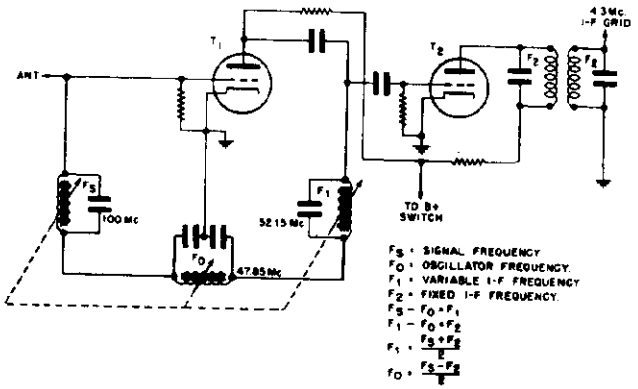
MODEL 84WG-2712B

Ref. No.	Part No.	Description	Qty. Used in Set
		MISCELLANEOUS	
	12A481	12" E.D. Speaker complete with output transformer	1
	3A303	Tube socket—octal (8 prong) molded	4
	3A425	Tube socket (miniature)	6
	32X386	Tube shield (miniature)	6
	32X388	Tube Shield (For 12AT7)	1
	3A436	Tube socket (For 12AT7)	1
	3A427	Tube socket (R-F Amp)	1
	3A304	Phono Motor Socket	1
	3A305	Phono Socket—Single pin	1
	2A376	Rotary Snap Switch	1
	2A377	Band Switch	1
	13X328	Line Cord and Plug Assembly	1
	26A485	Escutcheon and Crystal Assy.	1
	10A509	Tuner Buttons	6
	28X320	Springs (Tuner Button)	6
	4X870	Escutcheon Eye	1
	10A662	Knob, Band	1
	10A567	Knob, Tuning	1
	10A563	Knob, On-Off	1
	10A564	Knob, Volume	1
	10A565	Knob, Treble	1
	10A666	Knob, Bass	1
	25X498	Tuning Eye Clamp	1
	25X1396	Tuning Eye Bracket	1
	13X549	Cable and Socket Assembly—Tuning Indicator	1
	6X21	Rubber Grommets } Mtg. Gang	4
	20X329	Condenser Cushion Stud } Cond.	4
	7A32	No. 51 Pilot Light (Jewel)	1
	7A222	Jewel	1
		DIAL AND DRIVE ASSEMBLY	
	26A435	Dial Bracket Assembly	1
	26A484	Dial and Drum Assembly Complete with Dial Background, Collar, Dial Drum and Dial Scale	1
	15X221	Pointer	1
	26X500	Dial Drum Shaft	1
	26A440	Pulley and Collar Assembly (For dial drum shaft)	1
	26A437	Band Switch Pulley Assembly	1
	26X468	Band Switch Shaft	1
	26A441	Crown Gear Assembly (For Mtg. to Band Switch)	2
	26A434	Idler Bracket Assembly	1
	25X1389	Drive Shaft Bracket	1
	26A494	Drive Shaft & Spool Assembly	1
	10X45	Drive Cord Assembly (Band Change)	1
	28X524	Tension Spring (Band Change)	1
	10X66	Drive Cord and Clip Assembly (Dial Drive)	1
	28X530	Tension Spring (Dial Drive)	1
	41X72	Light Shield (Band Indicator)	4
	41X35	Light Shield (Dial)	2
	7A103	No. 47 Pilot Light	6
	7A187	Pilot Light Socket Assembly (Dual)	1
	7A209	Indicator Light Socket Assembly	4
		TYPE W-28A146 RECORD CHANGER PARTS	
	W-15X090-1	Motor Assembly, 60 cycles, 115-120 V.	1
	W-17X412-11	50 Cycle Drive Sleeve Assembly	1
	Shure P30-1	Crystal Cartridge and semi-Permanent Needle Assembly	1
		Semi-Permanent Needle (Specify part number and letters stamped on crystal)	1



ACTUAL DIAGRAM





FUNCTIONAL DIAGRAM

THEORY OF THE FM TUNER

Referring to the functional schematic diagram in Figure 2, the triode T1 serves both as an oscillator and first converter, and triode T2 serves as the second converter. Oscillator voltage injection for the second converter is obtained thru the coupling capacitor from the plate of T1. T1 and T2 are sections of the 12AT7 twin-triode tube.

The frequency relationships are given in Figure 2. The oscillator F_O beats with the incoming signal F_S to produce the first intermediate frequency F_1, which is variable. F_1 then beats with the same oscillator frequency F_O in the second converter to produce the second intermediate frequency F_2 which is 4.3 Mc. With a 100 Mc signal the oscillator frequency is 47.85 Mc and the variable intermediate frequency is 52.15 Mc.

This system of reception permits the oscillator to be resonated with a high capacitance, 250 micromicrofarads in this case. Consequently, changes in the tube characteristics during warm-up do not produce objectionable changes in oscillator frequency. This contributes materially to the stability of the system.

Below are instructions and methods for replacing the integral parts of the Tuner. Although this paragraph does not include instructions for all of the replaceable parts, the instructions are explicit enough to guide and assist the service man whenever it becomes necessary to replace any part that becomes faulty. A short analysis of the Tuner mechanism by the service man before attempting any replacement is highly recommended. It will be noticed that it is necessary, in some cases, to remove the Tuner from the chassis before making the replacement. Since it entails disconnecting leads, removing the Tuner from the chassis should be avoided, unless it is an absolute necessity. Many parts, such as cores, dial pulley, tuning gang and top core clamp, can be replaced without removing the Tuner from the chassis. A constant reference to Figure 4 will be necessary for the exact location of the component parts. Also, it will be necessary to refer to the specific receiver service manual for dial cord restringing instructions and alignment procedure. Of course, alignment of the FM and BC circuits will be necessary if the gang capacitor, iron cores, inductors, or trimmers are replaced, or if the position of the iron cores or inductors have changed in the Tuner.

IRON CORE REPLACEMENT

1. Remove the three screws (29) and lockwashers (17).

2. Remove the clamp and iron core assembly from the Tuner by merely lifting "up" on the bakelite piece (7) to which the cores are mounted.

3. Remove the core requiring replacement by turning the core in a counterclockwise direction.

4. To make the replacement, place spring (33) over the core stud and screw the core into the swivel nut (18).

5. Reassemble the Tuner.

6. It will be necessary to realign the FM circuits after replacing any core.

V.H.F. INDUCTOR REPLACEMENT

1. Unsolder all leads attached to the Tuner.

2. Disconnect the dial restringing system.

3. Remove the tuner mounting screws and lift the Tuner from the chassis.

4. Loosen the four screws (39).

5. To replace the faulty inductor, insert the center conductor of the inductor into the slot in the iron core. The tip must be pointed toward the front of the Tuner. The inductor should be placed between the clamp (7) as follows: The metal tubing of the first inductor (from the rear of the tuner) must be even with the top of the clamps (7); 1/32" of the metal tubing must be above the top of the clamps for the center inductor and 1/16" of the metal tubing of the third inductor should be above the clamps. It must be remembered that the oscillator frequencies depend upon the amount of iron core inserted in the inductor and during alignment the setting of this initial dimension is obtained by turning the swivel nuts (18).

6. Tighten the four screws (30). Care must be exercised when tightening these screws. If the screws are extremely tight, the inductor may be damaged or the iron core will not slide freely in the inductor.

7. Mount the tuner in the chassis.

8. Resolder all leads.

CAUTION: When soldering to the antenna or variable IF inductor, be careful that solder does not run over the threads of the capacitor. Never attempt to change the length of the connecting leads, as this may affect tuner tracking and performance.

9. It will be necessary to realign the FM circuits after replacing any inductor.

DRIVE PULLEY NOTES

Should it ever become necessary to remove or adjust the drive pulley (19) observe the following points when replacing:

1. The gang capacitor (C-5) must be positioned by means of its mounting screws (27) so that the drive pulley split gear (19) engages the rack gear (20) properly.

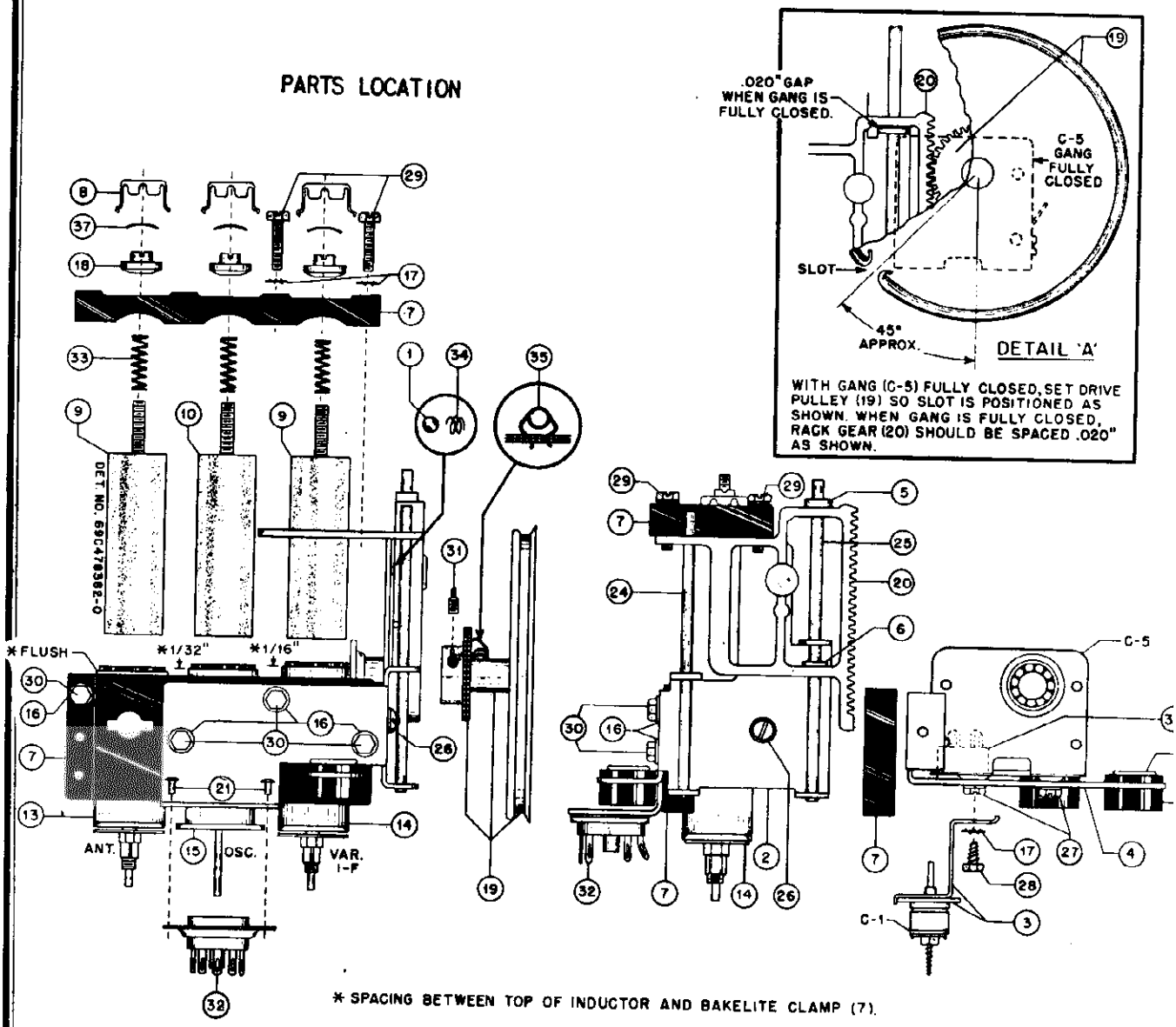
2. To eliminate play between the drive pulley and rack gear, it is necessary to offset the drive pulley split gear so that the torsion spring (35) will exert tension against the two halves of the split gear.

3. Before tightening the drive pulley setscrews (31) make sure that you position the drive pulley (19) as shown in Figure 4 - Detail A. With gang capacitor (C-5) fully meshed, the perm tuning cores should be spaced .020 as shown.

REPLACEMENT PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
	1X470540	FM-BC TUNING UNIT PT-14 (complete) ..... Exchange
C-1	19A470426	Trimmer, variable air: 2.5 mmf to 30 mmf
C-2	21R2729	Mica: 250 mmf 500V .....
C-3	21R2729	Mica: 250 mmf 500V .....
C-4	21R2730	Mica: 500 mmf 500V .....
C-5	19K75415	Variable, 2 gang; cut oscillator plates
R-1	6R6046	1 meg 10% 1/2 W insulated .....
R-2	6R6004	1 meg 1/2 W insulated .....

PARTS LOCATION



* SPACING BETWEEN TOP OF INDUCTOR AND BAKELITE CLAMP (7).

1	43K470555	Ball, steel	20	44C470436	Rack, drive gear: die cast; includes two brass guide rod bushings
2	7C470437	Bracket, guide rod	21	5S7770	Rivet: .088 x 5/32; nickel plated
3	1X470554	Bracket & Strip Assembly (trimmer mtg)	22	5S7707	Rivet: .122 x 5/32; nickel plated
4	7C470436	Bracket, tuner	24	47K470419	Rod, guide: 3-17/32" long
5	43A478009	Bushing, guide rod (upper)	25	47A470418	Rod, guide: 3-29/32" long
6	43A478010	Bushing, guide rod (lower)	26	3S7156	Screw: 6-32 x 3/16 slotted binderhead machine screw; cadmium plated
7	42B470431	Clamp, core and inductor	27	3S7155	Screw: 6-32 x 3/16 slotted hex head machine screw; cadmium plated
8	42A72725	Clip, swivel nut	28	3S7506	Screw: #6 x 1/4 PKZ plain hex head; cadmium plated
9	46K471627	Core, powdered iron (FM Ant & Var IF) Specify color of paint dot on old core when ordering	29	3S1925	Screw: 6-32 x 5/8 slotted hex head machine screw; cadmium plated
10	46K471799	Core, powdered iron (FM Osc) Specify color of paint dot on old core when ordering	30	3S476002	Screw: 6-32 x 1-5/8 slotted hex head machine screw; cadmium plated
11	5A12105	Eyelet, mtg	31	3S7113	Setscrew: 6-32 x 1/4 slab head; cadmium plated
12	37K15125	Grommet, rubber (tuner mtg)	32	9A470424	Socket, tube: Noval; 9 prong; tan
13	24C470580	Inductor, VHF, and Capacitor (antenna)	33	41A74880	Spring, core tension
14	24K470581	Inductor, VHF, and Capacitor (Var IF)	34	41A470518	Spring, compression
15	24K470582	Inductor, VHF, and Capacitor (Osc)	35	41A478047	Spring, torsion
16	4S7650	Lockwasher: #6 internal; cadmium plated	36	31A70083	Strip, terminal: 1 insulated #2 ground
17	4S7666	Lockwasher: #6 external; cadmium plated	37	4A74936	Washer, spring (swivel nut)
18	2A72726	Nut, swivel			
19	1X470552	Pulley, Gears and Bushing Assembly			

MODEL SR7

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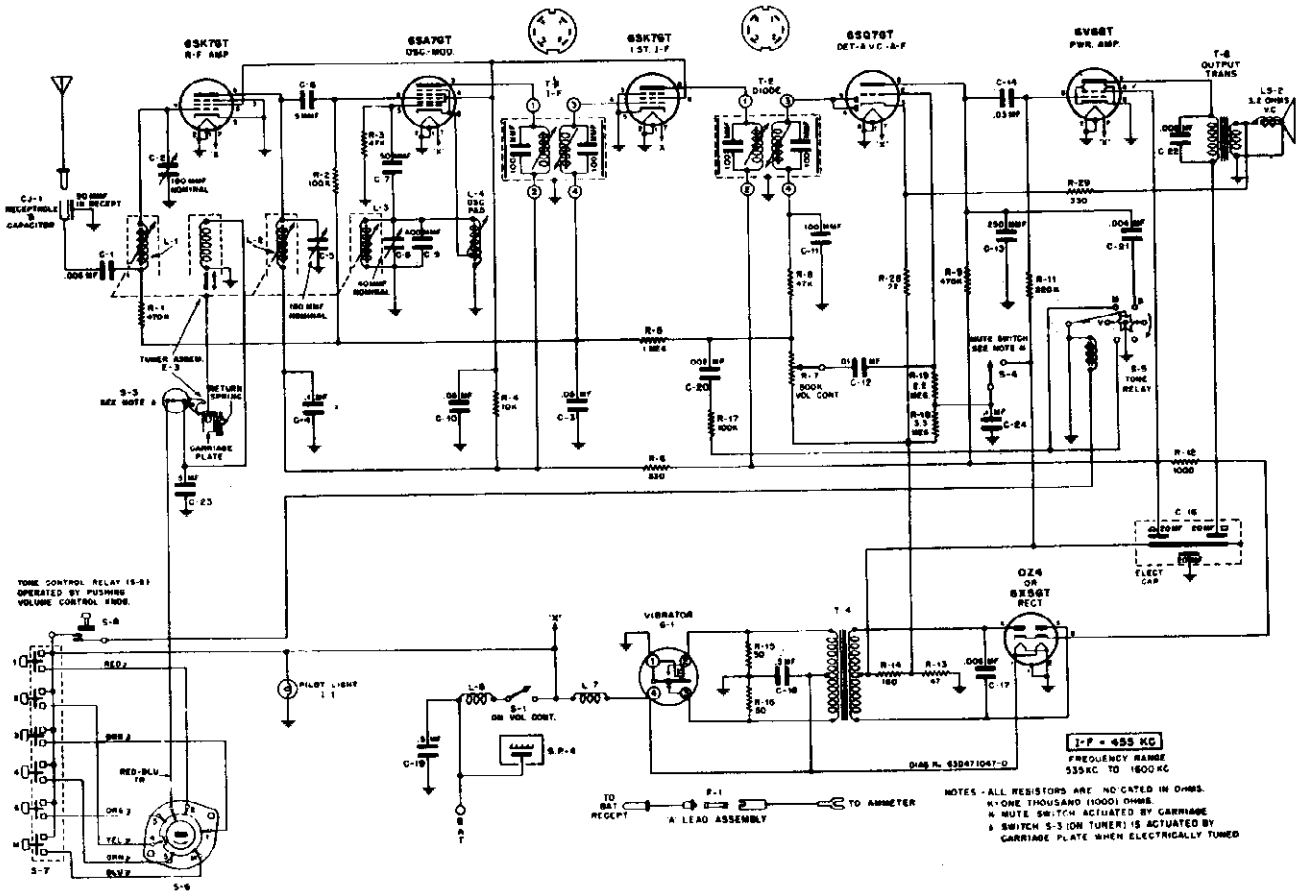
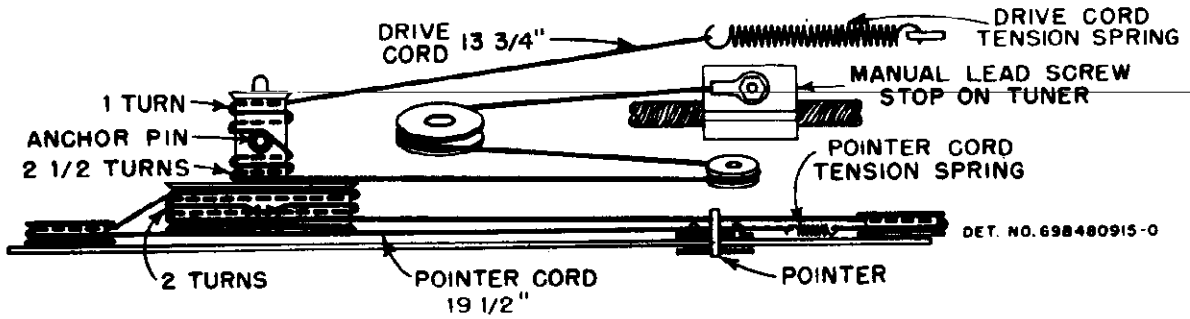


TO SET THE PUSH BUTTONS

1. Turn on the receiver and press the "M" button.
2. With the tuning knob, tune in the station you desire to set up. Make a mental note of the program.
3. Press the No. 1 button.
4. Push the set-up button(on left side of radio) in as far as it will go and release.
5. Turn the tuning knob until the previously noted program is heard. (The dial will not indicate the station to which the button is set). The dial pointer may reach the end of the dial scale before the desired station is received; however, continue turning the tuning knob until the station is received. The dial mechanism will not be affected.
6. Press the "M" button and the No. 1 button is set. Check the setting of the button by tuning in the desired station having the "M" button pushed in and then push the automatic button. Either button should give the same volume and clarity.
7. Repeat the above procedure, steps 2 through 6 for each of the remaining push buttons.



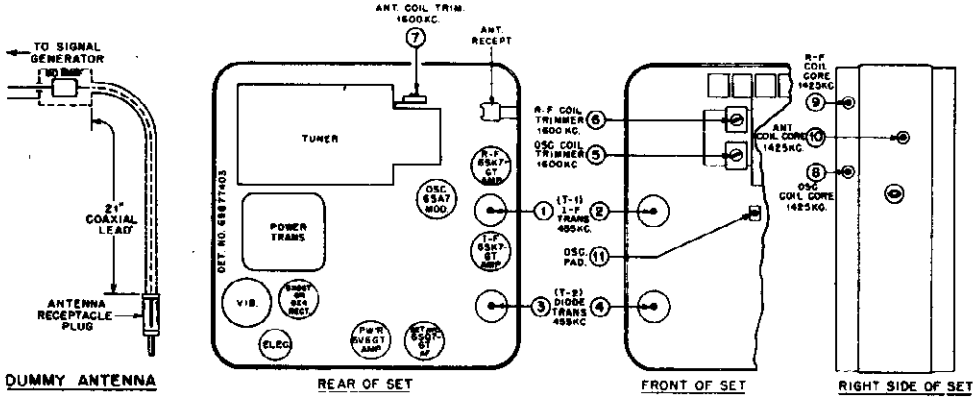
STRING DRIVE

ALIGNMENT

INSTRUCTIONS.- Remove front and rear covers to expose all adjustments. Use alignment tool (Motorola Part No. 66A76278) for adjusting tuner cores; a small screwdriver can be used for all other adjustments. Construct RF dummy antenna as shown in Figure 1; the 21" coaxial lead needed in its construction is the same type as used for lead-in on Motorola car antennas. Tuner gauge (Motorola Part No. 66X76825) is useful though not essential for more accurate setting of tuner to alignment frequencies at 1600 and 1425 Kc. Set volume control at maximum and keep output of signal generator no higher than is necessary to obtain output reading. Push "M" button to place tuner in manual position. IMPORTANT: Do not push in on the alignment tool when adjusting the tuner cores; the slightest inward pressure may move the tuner carriage and result in inaccurate alignment.

STEP	TUNER POSITION SET TO	DUMMY ANTENNA	SIG. GEN. LEAD CONNECTED TO	SIG. GEN. SET AT	ADJUST FOR PEAK
1.	High frequency end (cores out).	.1 mfd at Sig.Gen.	Osc.Mod grid (#8 pin)	455 Kc	1 & 2, 3 & 4
2.	High freq. end, tuning shaft against stop. Cores should be set to project 1-1/8" from cans.*	60 mmf at Sig.Gen. in series with 21" long coax lead.	Ant. recpt.	1600 Kc	5, 6 & 7
3.	EXACTLY one full turn in from high freq.end. Use knob setscrew as indicator. Start measuring turn the moment tuner carriage starts moving inward. *	"	"	1425 Kc	8, 9 & 10
4.	EXACTLY four more full turns in (as indicated by knob setscrew)	"	"	Power off.	11 for max. noise.
	NOTE: If oscillator padder core (11) adjustment is too far off, repeat alignment procedure, steps 2, 3, & 4. It may be necessary to repeat alignment more than once if padder adjustment has been tampered with.				
5.	Assemble receiver and peak antenna trimmer (#7) to car antenna.				

*For greater accuracy in setting tuner to alignment frequencies, use gauge (Motorola Part No. 66X76825).



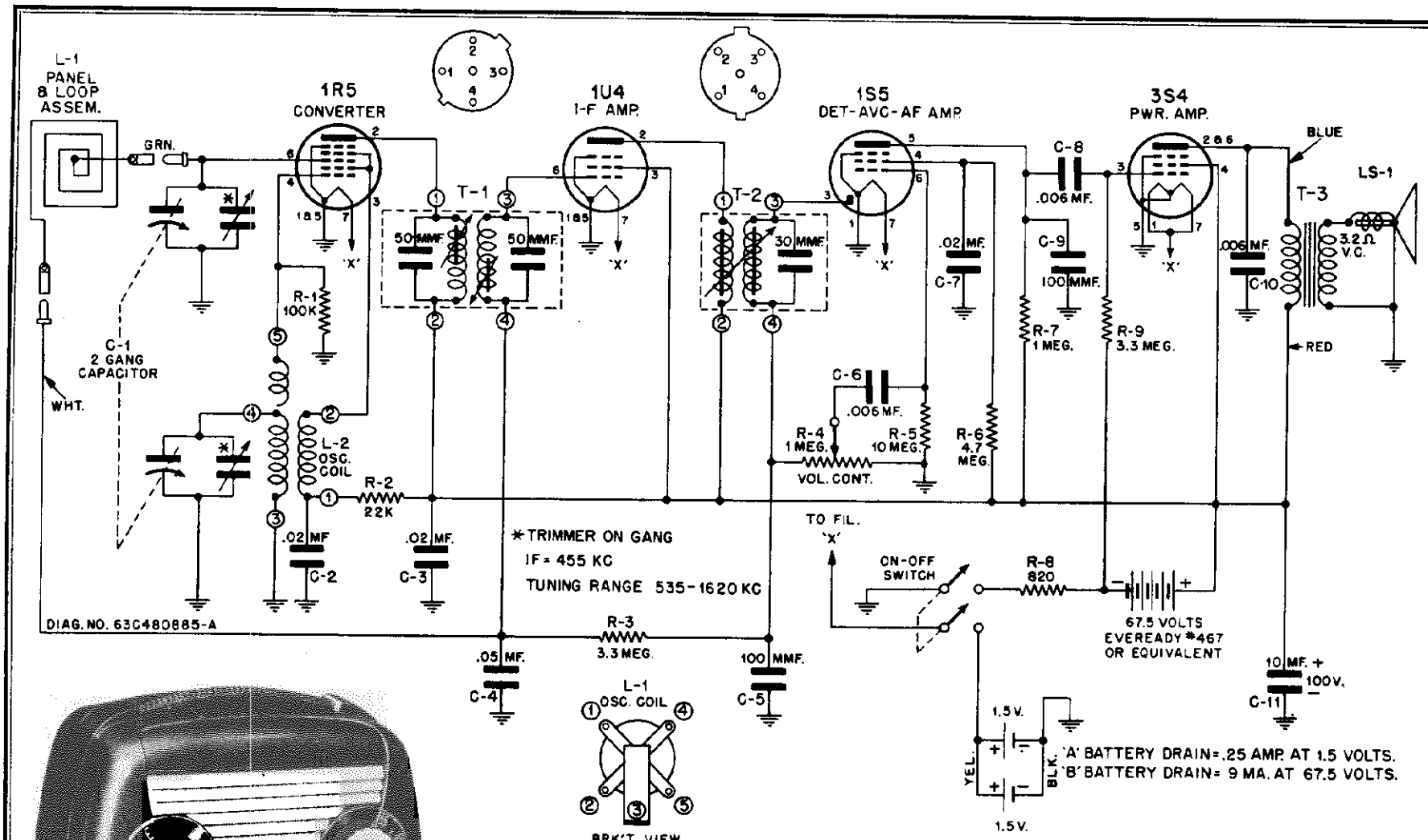
TUBE & TRIMMER LOCATION

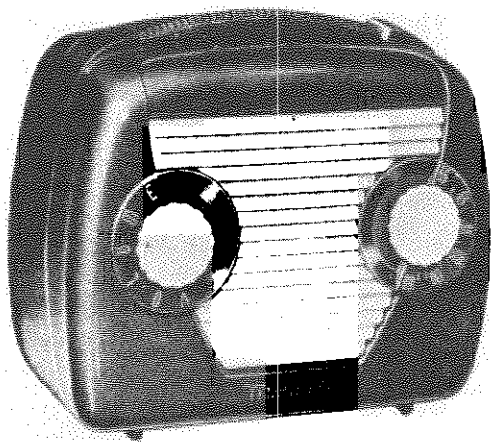
REF. NO.	PART NO.	DESCRIPTION
CAPACITORS		
C-1	8C4529	Paper: .006 mmf 100V .....
C-2	20A70601	Mica trimmer: 50-180 mmf; with mtg bracket
C-3	8A13514	Paper: .05 mf 100V .....
C-4	8K13166	Paper: .1 mf 400V .....
C-5	20A70601	Mica trimmer: 50-180 mmf; with mtg bracket
C-6	21K70720	Mica: 5 mmf 500V .....
C-7	21R6513	Mica: 50 mmf 300V .....
C-8	20A70214	Mica trimmer: 30-60 mmf: with mtg bracket
C-9	21A71872	Ceramic: 400 mmf 5% .....
C-10	8A14791	Paper: .05 mf 400V .....
C-11	21B77562	Ceramic: 100 mmf .....
C-12	8K23690	Paper: .01 mf 400V .....
C-13	21R6648	Mica: 250 mmf 500V .....
C-14	8A71911	Paper: .03 mf 400V .....
C-16	23A75429	Electrolytic: 20-20 mf 400V 20 mf 25V ..
C-17	8A12840	Paper: .006 mf 1600V (use with power transformer 25B70950 only) .....
or	8K472215	Paper: .008 mf 1600V (use with power transformer 25B472214 only) .....
C-18	8A19133	Paper: .5 mf 100V .....
C-19	8A17028	Paper: .5 mf 100V .....
C-20	8A4736	Paper: .002 mf 400V .....
C-21	8A71909	Paper: .004 mf 400V .....
C-22	8A71910	Paper: .006 mf 400V .....
C-23	8A19133	Paper: .5 mf 100V .....
C-24	8A472035	Paper: .1 mf 100V .....
CAPACITOR-JACK		
CJ-1	9A78027	Receptacle & Capacitor Assembly: antenna receptacle with built-in 90 mmf capacit
TUNER ASSEMBLY		
E-3	-	ST-56 (Order Stock Tuner Part No. 1X47107 and Adaptor Kit #4 Part No. 1X471074) (SF For complete tuner informa- tion, refer ST-56 Service Manual Part No. 54P75045. Exchar
FUSE		
F-1	66X4637	20 amp: type 3AG .....

MODEL SR7 MOTOROLA INC.

REF. NO.	PART NO.	DESCRIPTION
VIBRATOR		
C-1	48B33333	Full wave: non-sync .....
PILOT LIGHT		
I-1	65X4151	Pilot light: 6-8V clear; #51 .....
COILS		
L-1 & L-2	24B71881	Antenna or RF (specify color of paint dot when ordering) .....
L-3	24B71879	Oscillator (specify color of paint dot when ordering) .....
L-4	24A70227	Oscillator padder: includes mtg clip and adjustable iron core .....
L-5	24K70840	"A" Choke .....
L-6	24K73535	Dial light & speaker field choke: 9 turns #16 yellow wire .....
L-7	24A70199	"A" Choke: with mtg bracket .....
L-8	24A74934	"A" Choke .....
SPEAKER		
LS-2	50B76589	
or	50B472011	PM: 6-1/4"; 3.2 ohm VC .....
RESISTORS		
Note:	Unless otherwise specified, all resistors are fixed carbon, insulated type, 20%.	
R-1	6R6032	470,000 1/2W .....
R-2	6R6075	100,000 1/2W .....
R-3	6R6056	47,000 1/2W .....
R-4	6R6106	10,000 1W N.I. .....
R-5	6R6004	1 meg 1/2W .....
R-6	6R6147	330 1W .....
R-7	18A71920	
or	18A70170	Volume control: 500,000: with SPST switch
R-8	6R6056	47,000 1/2W .....
R-9	6R6032	470,000 1/2W .....
R-10	6R2122	4.7 meg 1/2W .....
R-11	6R6015	220,000 1/2W .....
R-12	6R3953	1,000 1W .....
R-13	6R5550	47 10% 1/2W .....
R-14	6R6390	180 10% 1W N.I. .....
R-15	6R476042	50 1W .....
R-16	6R476042	50 1W .....
R-17	6R6075	100,000 1/2W .....
R-18	6R2118	3.3 meg 1/2W .....
R-19	6R3927	2.2 meg 1/2W .....
R-22	6R6015	220,000 1/2W .....
R-29	6R6010	330 1/2W .....
SWITCHES		
S-1		ON-OFF: part of volume control .....
S-2	40A70872	Tone: slider type .....
S-3	1B70944	Solenoid: with mtg plate .....
S-4	40A70931	Mute .....
S-5	1X71470	Relay MR-5, tone control: complete .....
	1K70617	Magnet, tone relay .....
S-6	40B70952	Selector .....
S-7	1K73625	Push button assembly
S-8	40B71383	Tone control actuating .....
SPARK PLATE		
SP-4	1X74252	Spark Plate Assembly .....
TRANSFORMERS		
T-1,2	24B76553	IF or diode: 455 Kc; with padding capacitor: iron core tuned; less shield can..
T-4	25B70950	Power transformer .....
or	25B472214	Power transformer .....
T-6	25B72258	Output transformer: with tone relay mtg

REF. NO.	PART NO.	DESCRIPTION
MECHANICAL PARTS		
	1X76848	Background & Strip Assembly: plastic background with reinforcing strip .....
	43A28112	Bushing, shaft .....
	38A10544	Button, plug: for 1/4 hole; copper oxide finish (ant. trim. hole plug) .....
	47A76529	Button, station set-up: (automatic tuner station set-up button - on housing) ...
	42A4215	Clip, vibrator grounding .....
	11M8944	Cord, dial: 18 lb; black .....
	1X76832	Cover, back .....
	15D76809	Cover, front .....
	1X76535	Escutcheon & Dial Scale Assembly .....
	5S7805	Eyelet: .140 x .141 steel (dial background mtg) .....
	37C24621	Gasket, speaker: rubber .....
	14K17059	Insulator, electrolytic: cardboard tube.
	36A76525	Knob, control: with setscrew .....
	4S8412	Lockwasher: #4 split (tuning shaft) ....
	29R5294	Lug, soldering (on flexible tuning shaft) .....
	2S7061	Nut: 3/8-32 x 9/16 hex Palnut (vol. cont. mtg) .....
	2S7029	Nut: 3/8-32 x 1/2 hex; nickel plated (shaft bushing mtg) .....
	64K73978	Plate, dial scale retainer .....
	1A76580	Pointer & Slider .....
	1X76842	Pulley Assembly, dial ratio: one large and one small pulley assembled together ...
	34B76524	Scale, dial .....
	3S6932	Screw: 4-40 x 3/16 slotted binderhead locking type machine screw; cad pl (tone relay mtg) .....
	3S6175	Screw: #4 x 3/16 PKZ slotted hex head sheet metal screw; cad pl (fastens drive cord to tuner) .....
	3S6022	Screw: 4-40 x 1/4 slotted binderhead machine screw; cad pl (tuning shaft retainer)..
	3S7454	Screw: #8 x 1/4 PKZ plain hex head sheet metal screw; cad pl .....
	3S7456	Screw: #8 x 1/4 PKA slotted acorn head sheet metal screw; antique copper finish (housing screws) .....
	3S7453	Screw: #8 x 1 PKZ plain hex head sheet metal screw; cad pl (power trans. mtg) .....
	3S7368	Screw: 8-32 x 1-25/32 slotted oval head machine screw; cad pl .....
	1X472064	Shaft Assembly, tuning: flexible shaft complete with gear, bearing & bracket..
	1X76833	Shaft, volume control: knob shaft with tone control contact actuating washer .....
	47A73635	Shaft, volume control: hair-pin shaped; 29/32" long (plugs into vol. cont.) ...
	37A17215	Shield, rubber light (on push buttons)..
	1X71049	Shield & Sleeve Assembly (for T-1,2) ...
	26A77123	Shield, tube socket (soldered between tube socket contacts) .....
	1X76841	Socket, dial light: complete with lead..
	9A6788	Socket, tube: octal .....
	9A70208	Socket, tube: 4 pin (vibrator) .....
	2S7087	Speednut: for .093 round (dial scale mtg)
	41A73619	Spring, string tension: small (pointer cord tension) .....
	41A73996	Spring, string tension: large (drive cord tension) .....
	31A72404	Strip, terminal: 1 insulated lug, #1 mtg.
	31A71196	Strip, terminal: 3 insulated lugs, #1 mtg
	9A12705	Wafer, electrolytic insulating: bakelite.
	9K14906	Wafer, insulating: armite (used under electrolytic) .....





TUBE COMPLEMENT - 1R5 - Converter
1U4 - IF Amplifier
1S5 - Detector, AVC & 1st AF Amplifier
3S4 - Power Amplifier

MODEL 48L11, CHASSIS HS-113

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ALIGNMENT

Maximum performance can only be obtained if extreme care is exercised during alignment. Follow the procedure carefully.

A low range output meter should be connected to the speaker voice coil terminal and receiver chassis. Set receiver volume control to maximum. For greatest accuracy, keep output of receiver at approximately .05 watt (.05 watt = .40 volt on output meter) throughout alignment by reducing generator output (not receiver volume control) as stages are brought into alignment.

The IF and diode transformer tuning cores are slotted for a small size fibre screwdriver. Do not press hard on the fibre screwdriver during alignment as damage to the coil forms or tuning cores may result.

Loop antenna should be connected to chassis during alignment.

Chart I gives complete alignment procedure for Chassis HS-113.

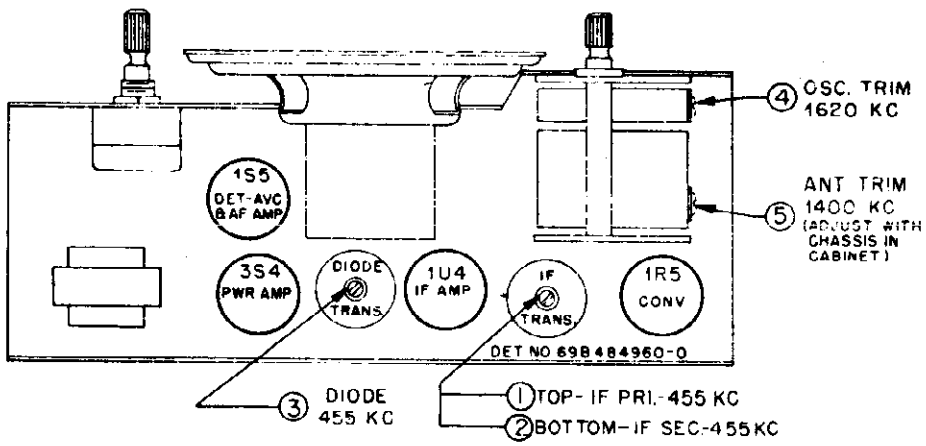
ALIGNMENT PROCEDURE

(Refer to Figure 2 for location of all alignment trimmers and cores).

STEP	DIAL SET TO	DUMMY	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR SET AT	ADJUST TRIMMER OR CORE	REMARKS
IF ALIGNMENT						
1.	Gang fully opened	.1 mf	Converter grid* & chassis	455 Kc	1,2 & 3	Adjust for maximum.
RF ALIGNMENT						
2.	Gang fully opened	.1 mf	Converter grid* & chassis	1620 Kc	4	This sets oscillator to dial scale
3.	-	-	-	-	-	Install chassis in cabinet, leaving output meter connected to speaker.
4.	1400 Kc	None	Radiation loop**	1400 Kc	5	Tune signal in on receiver, then adjust loop trimmer (5) for maximum. Loop trimmer is reached through hole under plug button on side of cabinet.

* A convenient point for this connection is the stator lug of the loop section of the tuning capacitor.

** Connect output of signal generator to a 5" diameter, 3 turn loop and bring loop close enough to receiver loop to obtain output of 50 milliwatts (.40V) on output meter. Vary distance between loops to maintain this output during alignment. Minimum distance between loops should never be less than 12".



TUBE & ALIGNMENT ADJUSTMENT LOCATIONS

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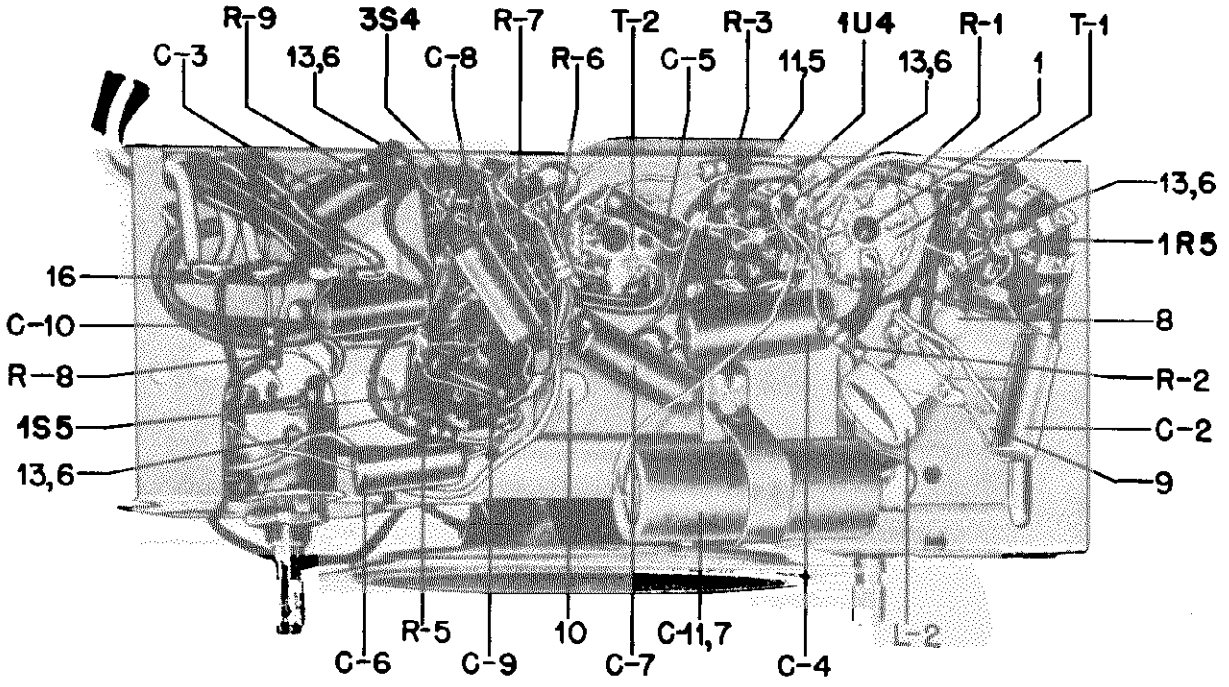
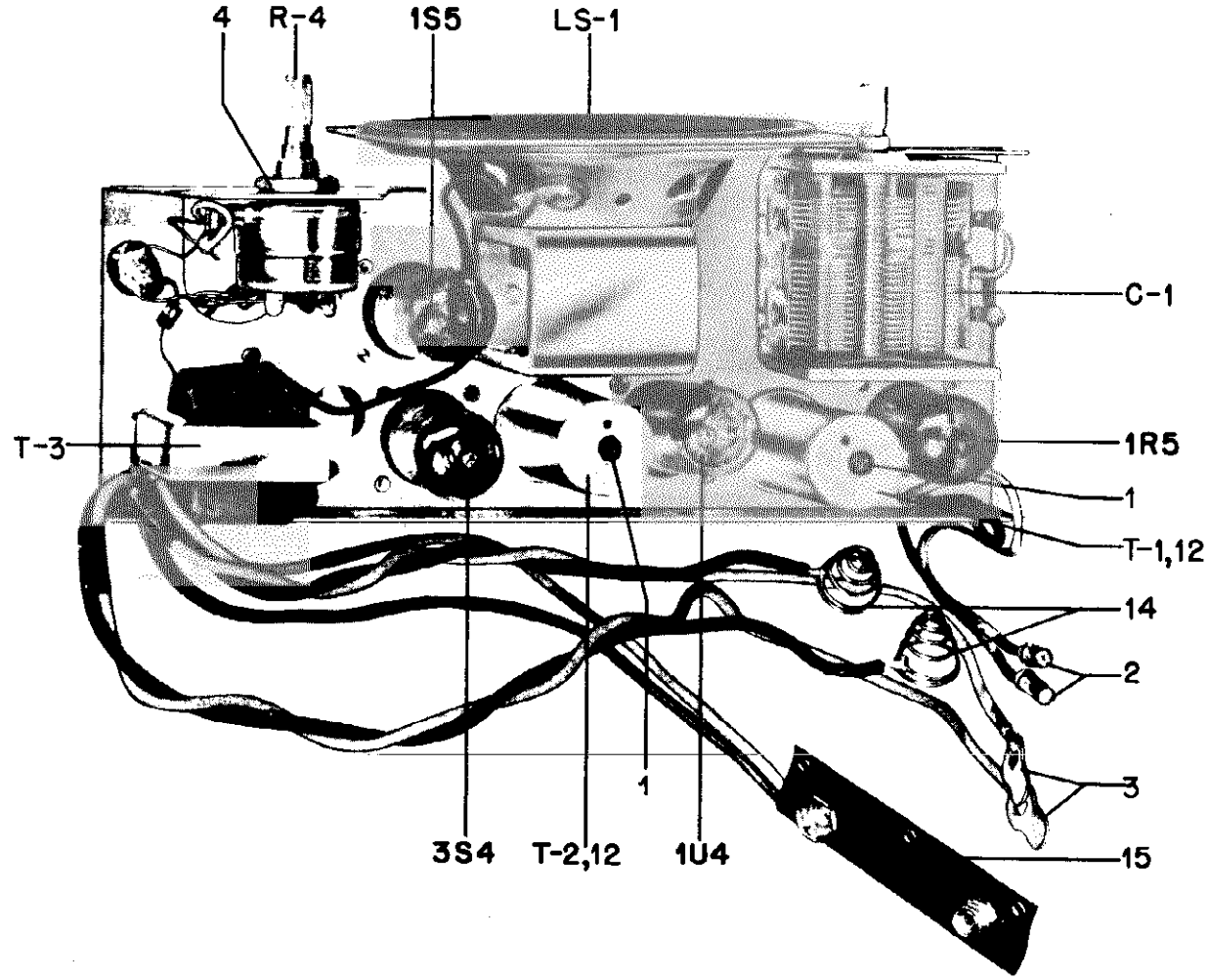
MODEL 48L11, CHASS
HS-113

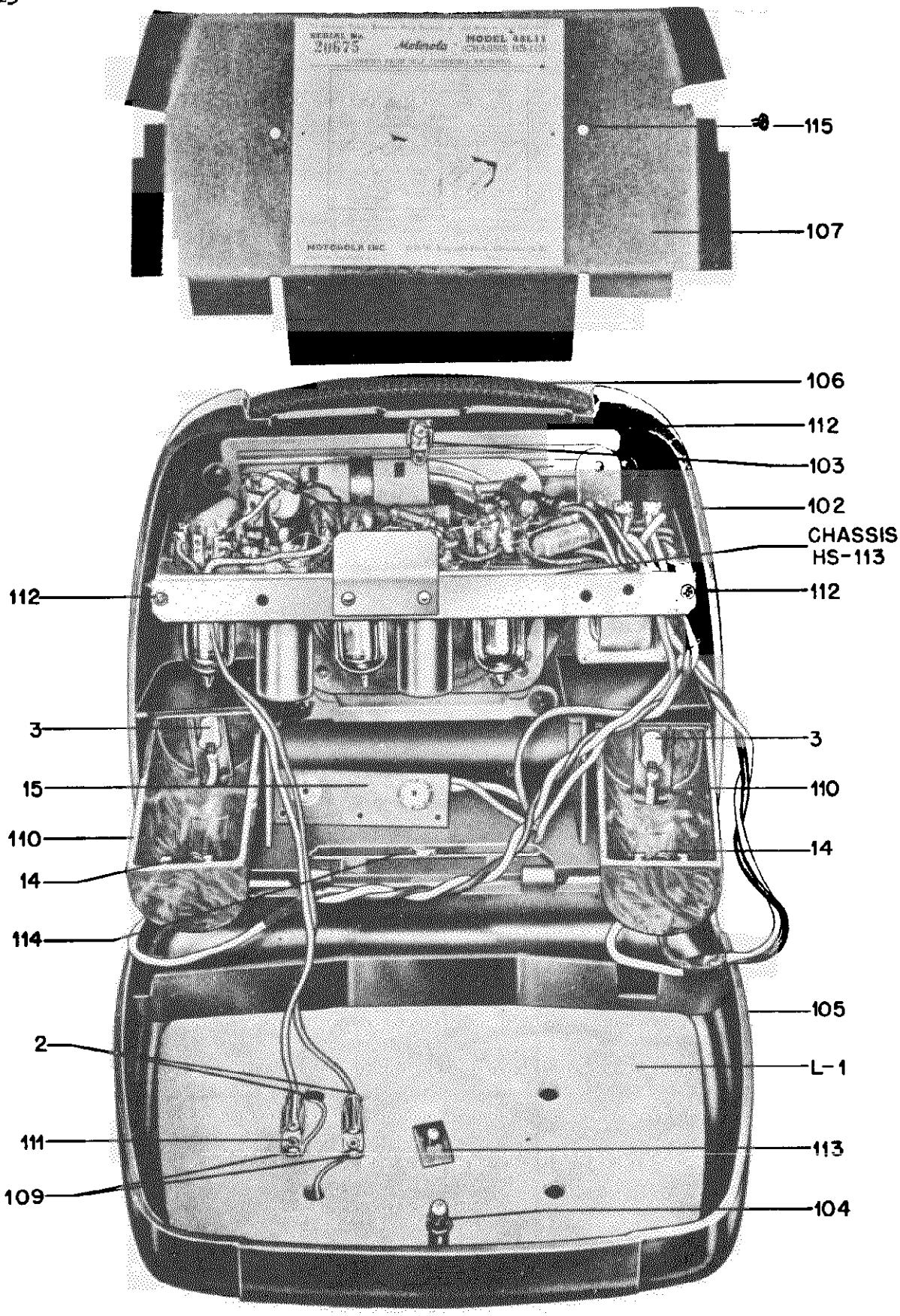




PARTS LOCATION - TOP & BOTTOM VIEW

MODEL 48L11, CHASSIS HS-113

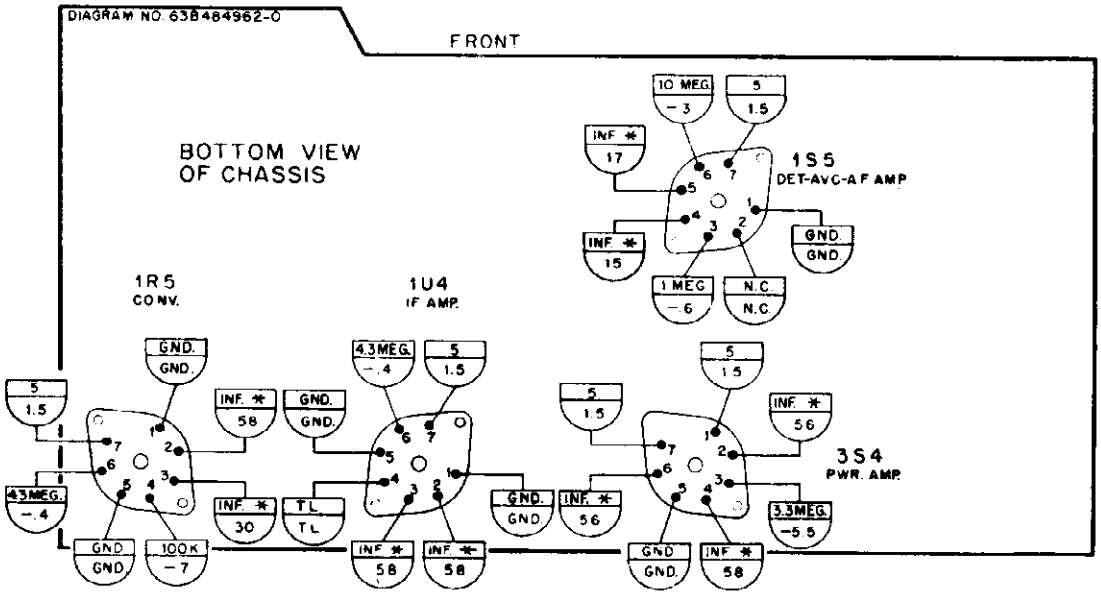
MOTOROLA INC.



PARTS LOCATION - REAR VIEW

MOTOROLA INC.

MODEL 48L11, CHASS
HS-113



▭ = RESISTANCE MEASUREMENTS.

⌓ = VOLTAGE MEASUREMENTS.

* = MEASUREMENTS MAY VARY, DEPENDING ON CONDITION OF ELECTROLYTIC CAPACITOR.

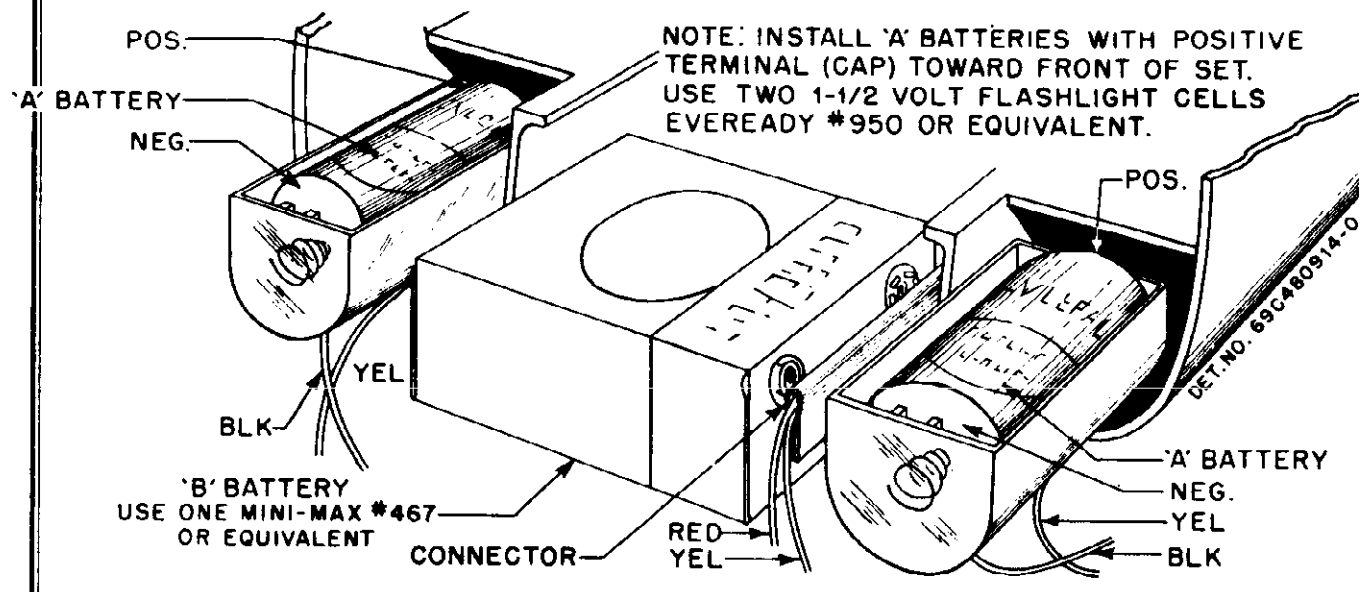
TL = TIE LUG.

NC = NO CONNECTION.

CONDITIONS OF MEASUREMENTS

A VTVM WAS USED TO MAKE ALL MEASUREMENTS.
MEASUREMENTS ARE MADE FROM TUBE BASE PIN INDICATED TO CHASSIS.
SET IS OPERATED FROM FRESH BATTERIES DURING VOLTAGE MEASUREMENTS.
VOLTAGE TOLERANCE ±10%. RESISTANCE TOLERANCE ±20%.

VOLTAGE & RESISTANCE DIAGRAM



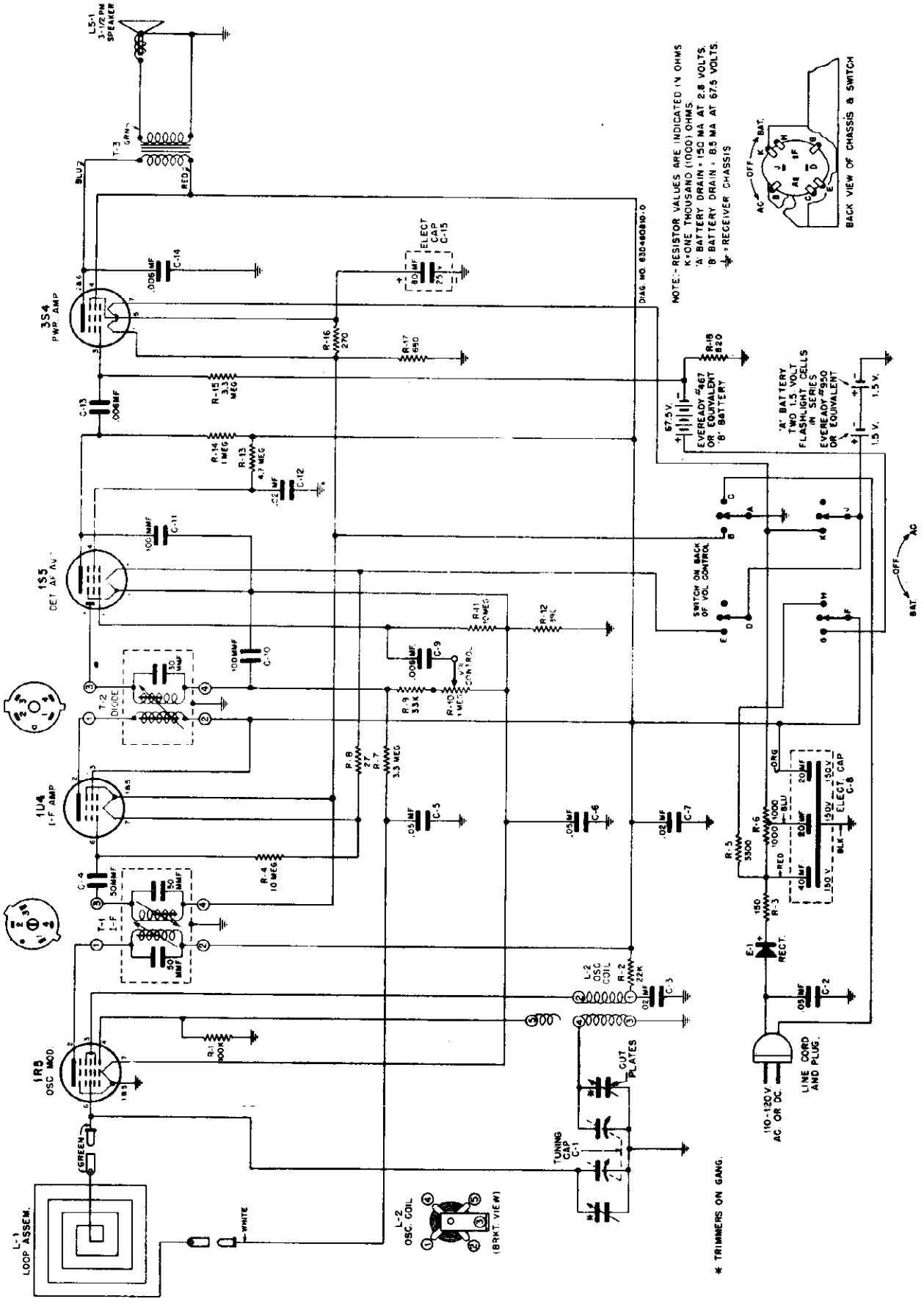
BATTERY REPLACEMENT DETAIL

REF. NO.	PART NO.	DESCRIPTION
CAPACITORS		
C-1	19K480051	Variable: 2 gang .....
C-2	8K471628	Paper: .02 mf 100V .....
C-3	8K471628	Paper: .02 mf 100V .....
C-4	8A71213	Paper: .05 mf 100V .....
C-5	21B77286	Ceramic: 100 mmf 500V .....
C-6	8C4529	Paper: .006 mf 100V .....
C-7	8K471628	Paper: .02 mf 100V .....
C-8	8C4529	Paper: .006 mf 100V .....
C-9	21B77286	Ceramic: 100 mmf 500V .....
C-10	8C4529	Paper: .006 mf 100V .....
C-11	23A75235	Electrolytic: 10 mf 100V .....
COILS		
L-1	24B480092	Panel and Loop Assembly .....
L-2	24A478022	Oscillator coil .....
RESISTORS		
NOTE:		All resistors are 1/2w, 20% carbon, insulated type unless otherwise specified.
R-1	6R6031	100,000 10% .....
R-2	6R6397	22,000 10% .....
R-3	6R2118	3.3 meg .....
R-4	18K480039	Volume control: 1 meg; with LPST switch.
R-5	6R2109	10 meg .....
R-6	6R2122	4.7 meg .....
R-7	6R6004	1 meg .....
R-8	6R6269	820 10% .....
R-9	6R2118	3.3 meg .....
SPEAKER		
	50B480048 or	
	50B480050 or	
	50B482759	Speaker: 3-1/2" PM; 3.2 ohm VC
TRANSFORMERS		
T-1	24B480042	IF Transformer: 455 Kc; complete less shield
T-2	24B480040	Diode transformer: 455 Kc; complete less shield .....
T-3	25B470622	Output transformer .....
CHASSIS PARTS - MECHANICAL		
1	46A470885	Core, iron: threaded (T-1 & T-2 tuning).
2	5S7855	Eyelet: .156 x .484 (loop lead tips)....
3	29R3020	Lug, soldering (battery contact) .....
4	2S7051	Nut: 3/8-32 x 9/16 hex; cad pl (vol control mtg)

REF. NO.	PART NO.	DESCRIPTION
5	5S7769	Rivet: .088 x 3/32 steel; nkl pl (shield mounting) .....
6	5S7771	Rivet: .088 x 3/16 steel; nkl pl (tube socket mtg) .....
7	6S7706	Rivet: .122 x 1/8 steel; pol nkl (electrolytic mtg) .....
8	3S7506	Screw: #6 x 1/4 PKZ plain hex head sheet metal screw; cad pl (osc coil mtg) ....
9	3S7247	Screw: 6-32 x 3/16 slotted locking hex head machine screw; cad pl (tuning cap mounting) .....
10	3S7205	Screw: 8-32 x 1/4 slotted locking hex head machine screw; cad pl (spkr mtg) .....
11	26A480084	Shield, circuit .....
12	1K482716	Shield & Sleeve Assembly (for T-1 & T-2)
13	9A472534	Socket, tube: 7 prong miniature; wafer type
14	41A480057	Spring, battery contact .....
15	31A480032	Strip, terminal ("B" battery connector).
16	31K51511	Strip, terminal: 3 insulated lugs, #3 gnd; 3/8 spacing .....
CABINET PARTS		
101	38K480148	Button, plug: 1/4"; maroon .....
102	1X481314	Cabinet Assembly: complete with handle, grille and back cover catch. Less back cover and hinge spring .....
103	42A480079	Clip, fuse (cover catch) .....
104	42A480078	Clip, speed (on back cover catch stud)..
105	16D480088	Cover, cabinet back .....
106	55B478415	Handle, carrying .....
107	14C480095	Insulator, chassis: gray fibre .....
108	36B480195	Knob, control .....
109	9A481743	Receptacle, 1-pin (on loop) .....
110	15B481896	Retainer "A" battery: plastic .....
111	5S7720	Rivet: .083 x 1/8 steel; nkl pl (loop receptacle mtg) .....
112	3S488008	Screw: #4 x 1/4 Phillips round head thread cutting screw (cover retainer mtg & chassis retainer) .....
113	2S7089	Speednut: for .187 round 3/8 x 5/8; black parkerized finish (loop retainer) .....
114	41A480094	Spring, hinge (back cover) .....
115	46B480108	Stud, trimount (chassis insulator mtg)..

MOTOROLA INC.

MODEL 58L11, CHASS
HS-114



MODEL 58L11, CHASSIS HS-114

MOTOROLA INC.

ALIGNMENT

Maximum performance can only be obtained if extreme care is exercised during alignment. Follow the procedure carefully.

If the receiver is operated from an AC power line during alignment, use an isolating transformer between receiver and power line.

A low range output meter should be connected to the speaker voice coil terminal and receiver chassis. Set receiver volume control to maximum.

For greatest accuracy, keep output of receiver at approximately .05 watt (.05 watt = .40 volt on output meter) throughout alignment by reducing generator output (not receiver volume control) as stages are brought into alignment.

The IF & diode transformer tuning cores are slotted for a small size fibre screwdriver. Do not press hard on the fibre screwdriver during alignment as damage to the coil forms or tuning cores may result.

Loop antenna should be connected to chassis during alignment.

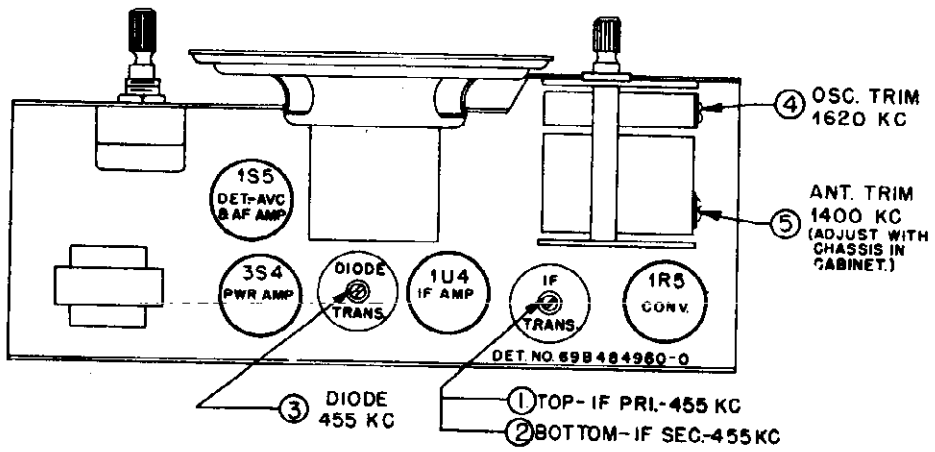
CHART I. ALIGNMENT PROCEDURE

(Refer to Figure 2 for location of all alignment trimmers and cores).

STEP	DIAL SET TO	DUMMY	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR SET AT	ADJUST TRIMMER OR CORE	REMARKS
IF ALIGNMENT						
1.	Gang fully opened	.1 mf	Converter Grid* & chassis	455 Kc	1,2 & 3	Adjust for maximum.
RF ALIGNMENT						
2.	Gang fully opened	.1 mf	Converter grid* & chassis	1620 Kc	4	This sets oscillator to dial scale.
3.	-	-	-	-	-	Install chassis in cabinet, leaving output meter connected to speaker.
4.	1400 Kc	None	Radiation loop**	1400 Kc	5	Tune signal in on receiver, then adjust loop trimmer (5) for maximum. Loop trimmer is reached through hole under plug button on side of cabinet.

* A convenient point for this connection is the stator lug of the loop section of the tuning capacitor.

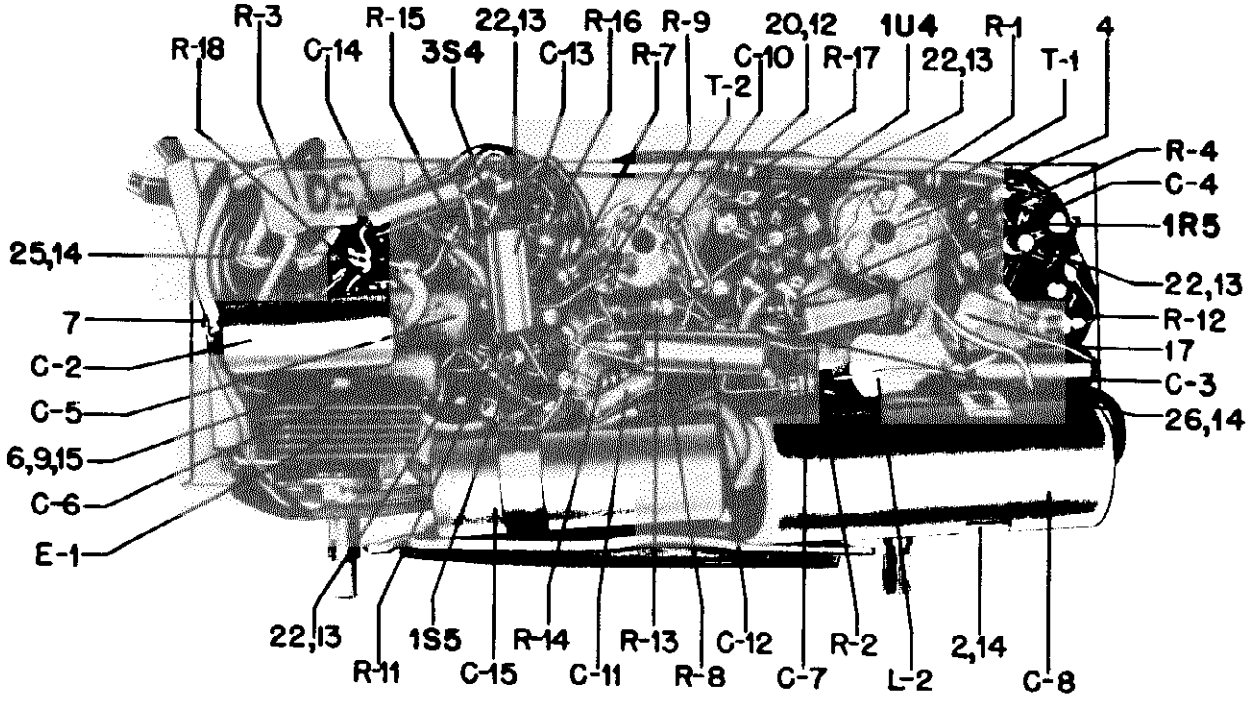
** Connect output of signal generator to a 5" diameter, 3 turn loop and bring loop close enough to receiver loop to obtain output of 50 milliwatts (.40V) on output meter. Vary distance between loops to maintain this output during alignment. Minimum distance between loops should never be less than 12".

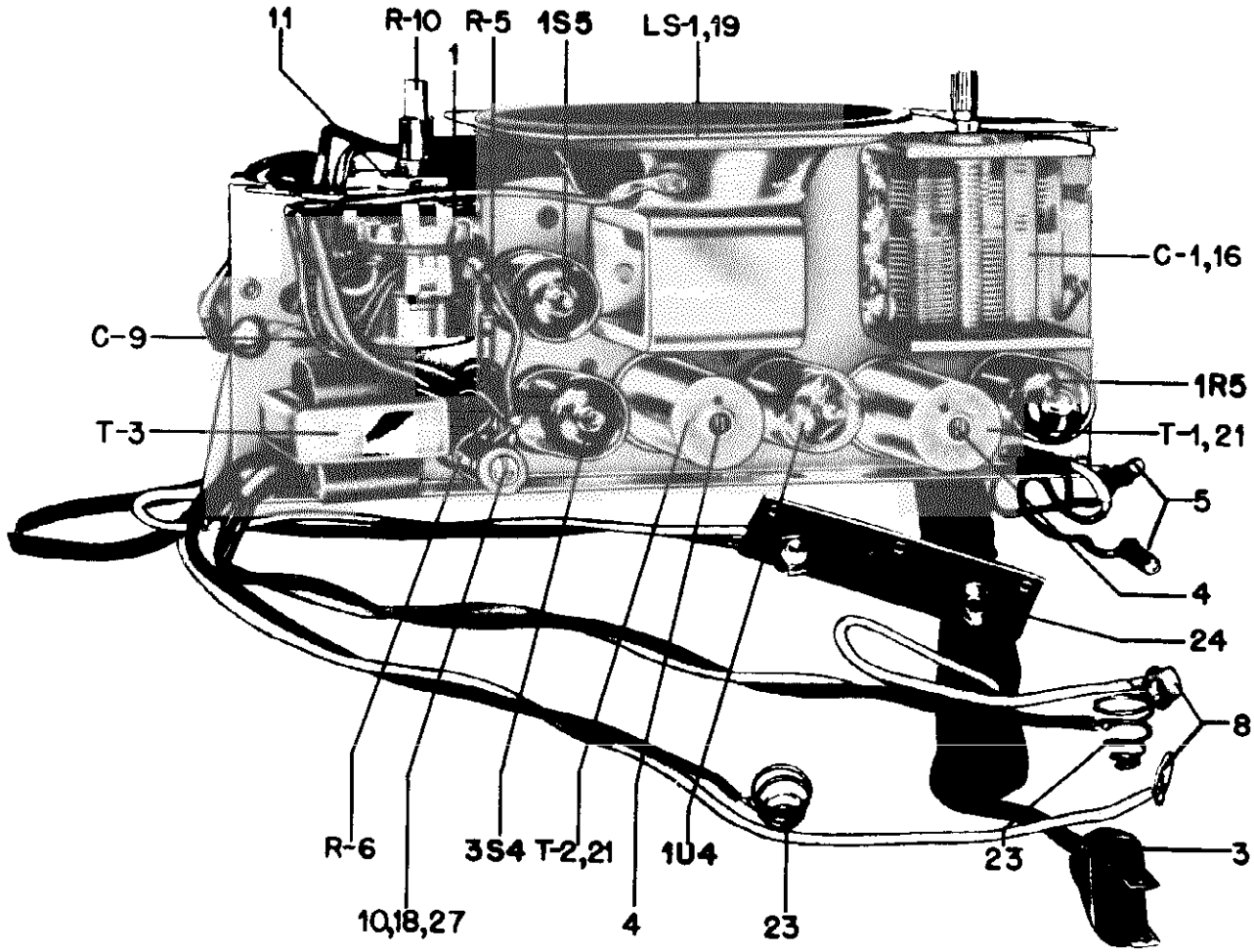


TUBE & ALIGNMENT ADJUSTMENT LOCATIONS

MOTOROLA INC.

MODEL 58L11, CHASS
HS-114

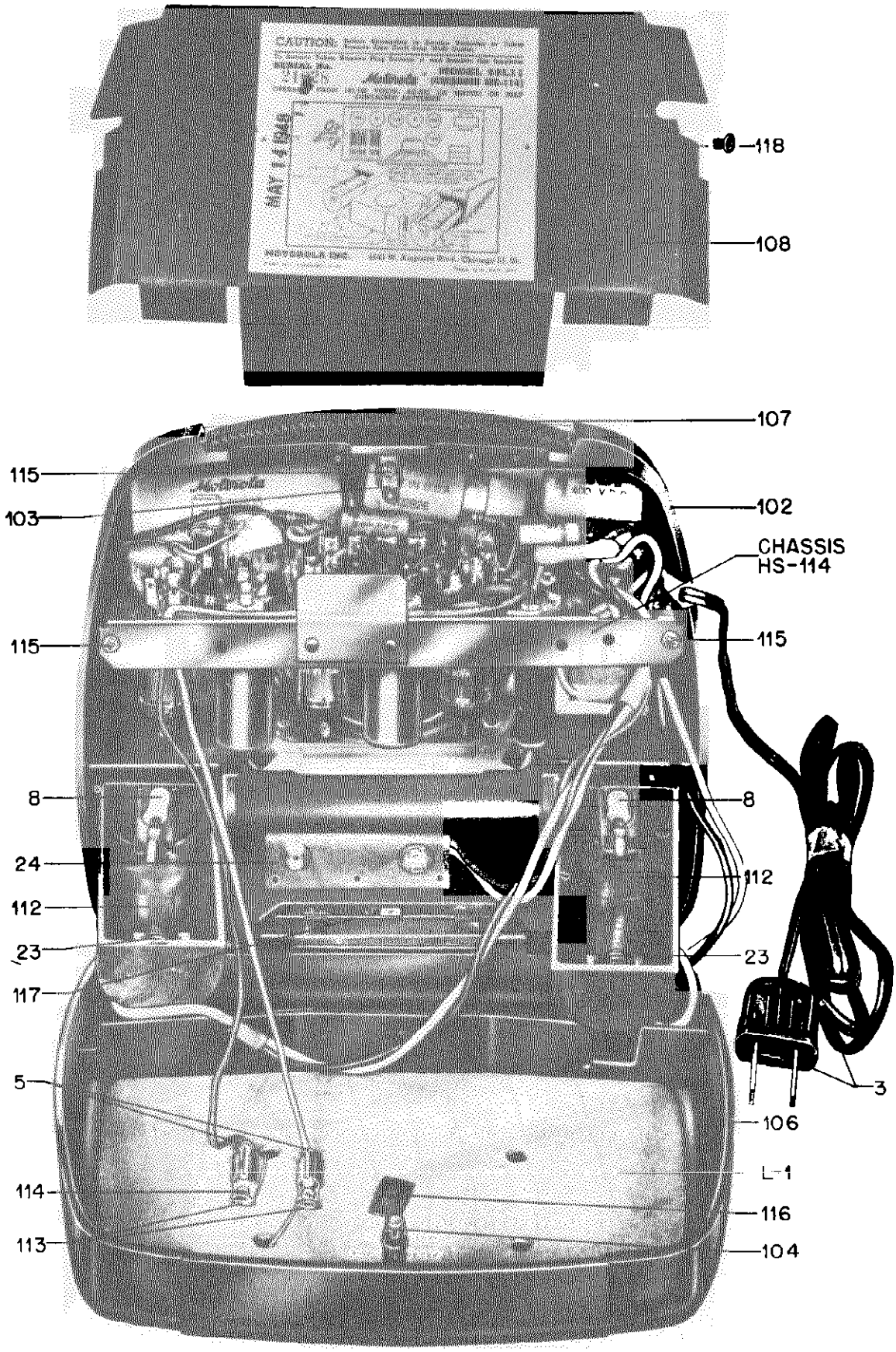




PARTS LOCATION - TOP & BOTTOM VIEWS

MODEL 58L11, CHASSIS HS-114

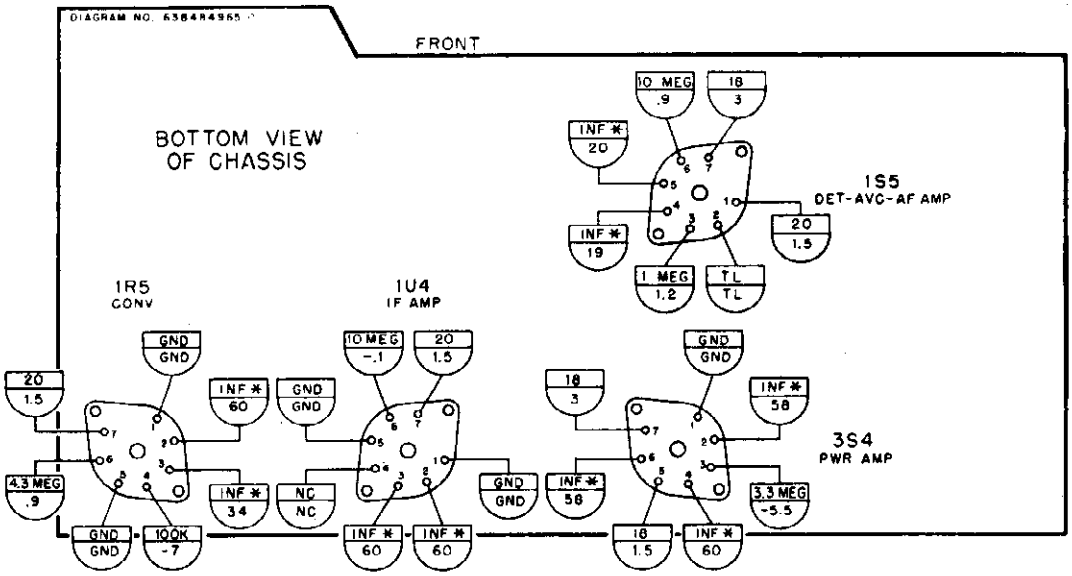
MOTOROLA INC.



PARTS LOCATIONS - REAR VIEW

MOTOROLA INC.

MODEL 58L11, CHASSI
HS-114



= RESISTANCE MEASUREMENTS.

= VOLTAGE MEASUREMENTS.

* = MEASUREMENTS MAY VARY, DEPENDING ON CONDITION OF ELECTROLYTIC CAPACITOR.

TL = TIE LUG.

NC = NO CONNECTION.

CONDITIONS OF MEASURMENTS

A VTVM WAS USED TO MAKE ALL MEASUREMENTS

MEASUREMENTS ARE MADE FROM TUBE BASE PIN INDICATED TO CHASSIS.

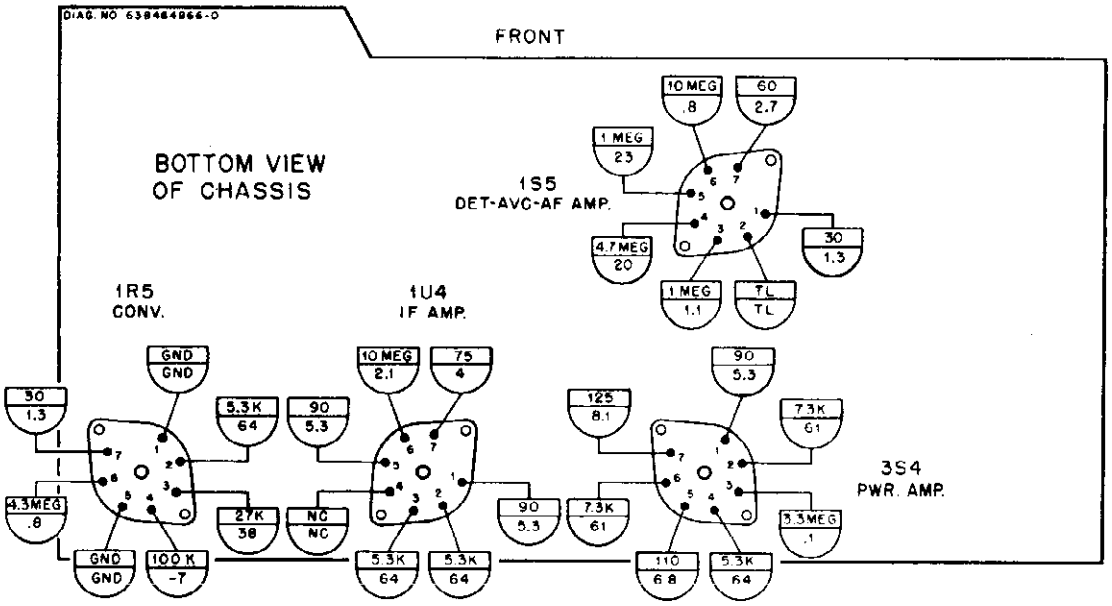
SET IS OPERATED FROM FRESH BATTERIES DURING VOLTAGE MEASUREMENTS.

SWITCH LEVER IS SET TO 'BAT.' POSITION.

VOLTAGE TOLERANCE ± 10%.

RESISTANCE TOLERANCE ± 20%.

VOLTAGE & RESISTANCE DIAGRAM - BATTERY OPERATED



= RESISTANCE MEASUREMENTS.

= VOLTAGE MEASUREMENTS

TL = TIE LUG.

NC = NO CONNECTION.

CONDITIONS OF MEASUREMENTS

A VTVM WAS USED TO MAKE ALL MEASUREMENTS.

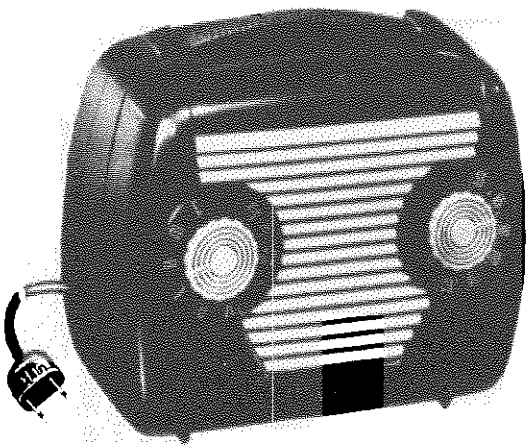
MEASUREMENTS ARE MADE FROM TUBE BASE PIN INDICATED TO CHASSIS.

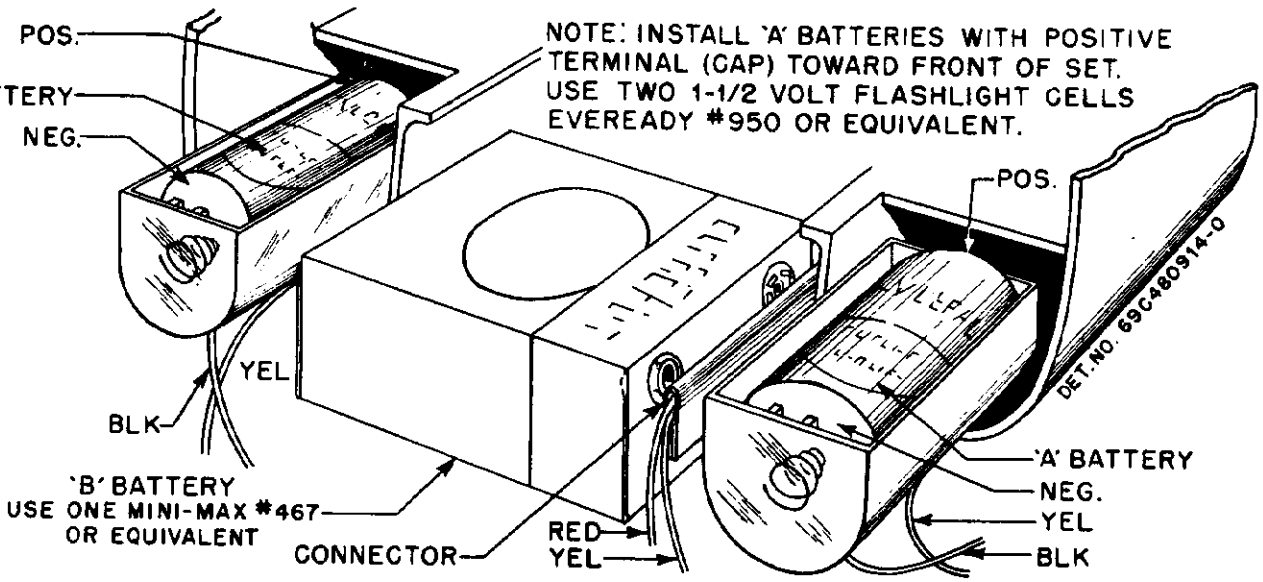
SET IS OPERATED FROM 117 V AC DURING VOLTAGE MEASUREMENTS.

SWITCH LEVER IS SET TO AC/DC POSITION

VOLTAGE TOLERANCE ±10%. RESISTANCE TOLERANCE ±20%.

VOLTAGE & RESISTANCE DIAGRAM - AC OPERATED





BATTERY REPLACEMENT DETAIL

TUBE COMPLEMENT - 1R5 - Converter
1U4 - IF Amplifier
1S5 - Detector, AVC & 1st AF Amplifier
3S4 - Power Amplifier
Rectifier - Selenium type - for AC/DC operation

POWER SUPPLY - Operates from 105-125 volts AC/DC (15 watts) or from the following self-contained batteries:
Two 1-1/2V flashlight cells (Eveready #950 or equivalent)
One 67-1/2V "B" battery (Eveready #467 or equivalent)

NOTE: The chassis of this receiver is connected directly to the power line. When operating chassis outside of its cabinet (from an AC power line) use an isolating transformer between power line and receiver to reduce possibility of electrical shock.

Tubes can be replaced without removing chassis from cabinet. Just open back cover and remove chassis insulator to expose tubes. Two plug buttons hold chassis insulator in position.

To remove the chassis from the cabinet:

1. Remove control knobs.
2. Open back cover and remove chassis insulator.
3. Disconnect the two loop leads from the pin receptacles.
4. Remove the two Phillips head screws on each end of chassis and slide chassis out of cabinet.

MOTOROLA INC.

MODEL 58L11, CHASS
HS-114

REF. NO.	PART NO.	DESCRIPTION
ELECTRICAL PARTS		
CAPACITORS		
C-1	19K480051	Variable: 2 gang .....
C-2	8K14791	Paper: .05 mf 400V .....
C-3	8K471628	Paper: .02 mf 100V .....
C-4	21K77373	Ceramic: 50 mmf 500V .....
C-5	8A71213	Paper: .05 mf 100V .....
C-6	8A71213	Paper: .05 mf 100V .....
C-7	8K471628	Paper: .02 mf 100V .....
C-8	23B75808	Electrolytic: 40-20-20 mf/150V .....
C-9	8C4529	Paper: .006 mf 100V .....
C-10	21B77286	Ceramic: 100 mmf 500V .....
C-11	21B77286	Ceramic: 100 mmf 500V .....
C-12	8K471628	Paper: .02 mf 100V .....
C-13	8C4529	Paper: .006 mf 100V .....
C-14	8C4529	Paper: .006 mf 100V .....
C-15	23A25888	Electrolytic and strap: 80 mf-25V .....
RECTIFIER		
E-1	48B478111	Selenium Rectifier: half-wave .....
COILS		
L-1	24B480092	Panel and Loop Assembly .....
L-2	24A478022	Oscillator Coil .....
SPEAKER		
LS-1	50B480048 or 50B480050 or 50B482759	Speaker: 3-1/2"; PM ..... Exchange
TRANSFORMERS		
T-1	24B480042	IF, 455 Kc: complete but less shield ...
T-2	24B480040	Diode, 455 Kc: complete but less shield.
T-3	25B470622	Output Transformer .....
RESISTORS		
Note;	All resistors are 1/2 watt, 20%, carbon, insulated type unless otherwise specified.	
R-1	6R6031	100,000 10% .....
R-2	6R6397	22,000 10% .....
R-3	17A76986	Wirewound: 150 10% 2-1/2W .....
R-4	6R2109	10 meg .....
R-5	6R5581	3,300 10% .....
R-6	17A470618	Wirewound: 2,000 10% 5W; center tapped
R-7	6R2118	3.3 meg .....
R-8	6R5683	27 10% .....
R-9	6R6012	33,000 .....
R-10	18B480049	Volume Control: 1 meg; with switch .....
R-11	6R2109	10 meg .....
R-12	6R5554	390 10% .....
R-13	6R2122	4.7 meg .....
R-14	6R6004	1 meg .....
R-15	6R2118	3.3 meg .....
R-16	6R6432	270 10% .....
R-17	6R6040	680 10% .....
R-18	6R6269	820 10% .....
CHASSIS PARTS - MECHANICAL		
1	15A481339	Baffle, switch .....
2	42K75826	Clip, electrolytic mtg .....
3	30B470621	Cord, line & plug: 6 feet long .....
4	46A470885	Core, iron: threaded (T-1 & T-2 tuning
5	5S7856	Eyelet: .156-.484 (loop lead tips) ...
6	4S7696	Lockwasher: #5 internal; cad pl (recti mtg) .....
7	29R3019	Lug, soldering: #6 (line cord anchor)
8	29R3020	Lug, soldering (battery contact) .....
9	2S7010	Nut: 5-40 x 1/4 hex; cad pl (rect. mtg
10	2S7006	Nut: 6-32 x 1/4 hex; cad pl (resistor mtg) .....
11	2S7051	Nut: 3/8-32 x 9/16 hex; cad pl (volume control mtg) .....
12	5S7769	Rivet: .088 x 3/32 steel; nkl pl (circuit shield mtg) .....
13	5S7771	Rivet: .088 x 3/16 steel; nkl pl (sock mounting) .....
14	5S7706	Rivet: .122 x 1/8 steel; nkl pl (electrolytic clip & term strip mtg) .....
15	3S7311	Screw: 5-40 x 7/8 slotted hex head mac screw; cad pl (rectifier mtg) .....
16	3S7247	Screw: 6-32 x 3/16 slotted locking hex machine screw; cad pl (gang mtg) .....
17	3S7506	Screw: #6 x 1/4 PKZ plain hex head she metal screw; cad pl (osc coil mtg) ...
18	3S1451	Screw: 6-32 x 2 slotted round head mac screw; cad pl (resistor mtg) .....
19	3S7205	Screw: 8-32 x 1/4 slotted locking type head machine screw; cad pl (spkr mtg)
20	26A480034	Shield, circuit .....
21	1K482716	Shield & Sleeve Assembly (for T-1 & T-2
22	9A472534	Socket, tube: 7 prong miniature; wafer
23	41A480057	Spring, battery contact .....
24	31A480032	Strip, terminal ("B" battery connector)
25	31K51511	Strip, terminal: 3 insulated lugs, #3 g 3/8 spacing .....
26	31K471565	Strip, terminal: 3 insulated lugs, #4 g 3/8 spacing .....
27	9K470839	Washer, insulating: 3/8-.136-.062; armi (R-6 insulating) .....
CABINET PARTS		
101	36K480148	Button, plug: 1/4"; maroon .....
102	1X480149	Cabinet Assembly: complete with handle, grille and back cover catch. Less back cover and hinge spring .....
103	42A480079	Clip, fuse (cover catch) .....
104	42A480078	Clip, speed (on back cover catch stud)..
105	42K482797	Clip, speed (on volume knob) .....
106	16D480088	Cover, cabinet back .....
107	55B478416	Handle, carrying .....
108	14C480095	Insulator, chassis: gray fibre .....
109	36K480195	Knob, control (tuning) .....
110	36B480082	Knob, volume control: includes clip ....
111	36B480086	Lever, switch (BAT-OFF-AC/DC switch leve
112	15B481896	Retainer, "A" battery; plastic .....
113	9A481743	Receptacle, 1-pin (on loop) .....
114	5S7720	Rivet: .083 x 1/8 steel; nkl pl (loop receptacle mtg) .....
115	3S488008	Screw: #4 x 1/4 Phillips round head, thread cutting screw (cover retainer mt & chassis retainer) .....
116	2S7089	Speednut: for .187 round; 3/8 x 5/8; bla parkerized finish (loop retainer) ....
117	41A480094	Spring, hinge (back cover) .....
118	46B480108	Stud, trimount (chassis insulator mtg)

MODEL 65F21, CHASSIS HS-26 MOTOROLA INC.

ALIGNMENT

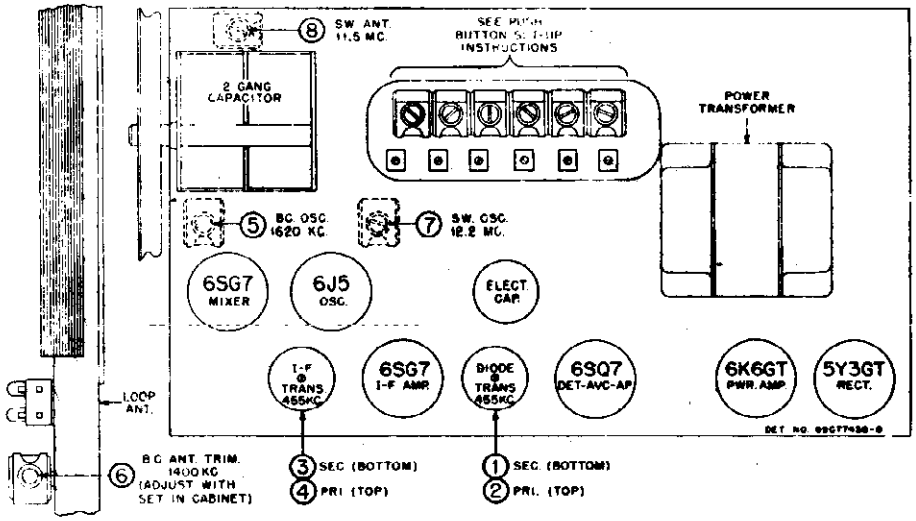
Refer to Figure 2 for location of adjustment trimmers and cores. Connect a low range output meter across speaker voice coil. Volume control should be set at maximum for all operations.

The signal generator used, should possess good frequency stability and should be of the modulated type. For greatest accuracy, keep the receiver output at approximately 50 milliwatts (.38V on output meter) during aligment. Vary signal generator output (not receiver volume control) to maintain this output during alignment.

Step	Gang Setting	Band	Dummy	Generator Connected to	Generator Frequency	Trimmer or Core	Remarks
1	Fully opened	B.C	.1mf	Mixer grid & chassis	455 kc	1,2,3,&4	Adjust I.F. & Diode trans. for maximum
2	Fully opened	B.C	-	Radiation loop*	1620 kc	5	Set oscillator to dial scale
3	1400 KC	B.C	-	Radiation loop*	1400 kc	6 ‡	Tune signal generator for max. on output meter, then peak trimmer.
4	12.2 MC	SW	50mmf	Short wave antenna terminal	12.2 Mc	7	Set osc. to dial scale.
5	11.5 MC	SW	50mmf	Short wave antenna terminal	11.5 Mc	8	Tune signal generator for max. on output meter, then peak trimmer.

‡ Repeak after chassis and loop are installed in cabinet.

* Connect output of signal generator to a 5" diameter, 3 turn loop. With volume on full, bring loop close enough to receiver until output of 50 milliwatts is obtained. (.38V on output meter). Vary distance between generator and receiver loops to maintain this output during alignment. Minimum distance between loops should never be less than 12".



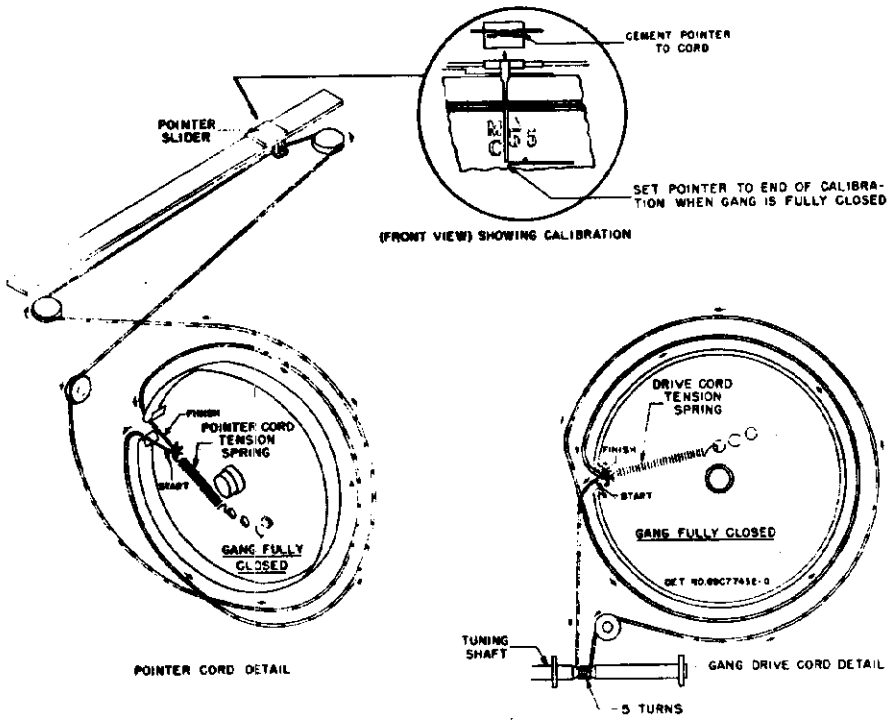
TUBE & TRIMMER LOCATIONS

FOR SCHEMATIC SEE PAGE 15-56

MOTOROLA INC.

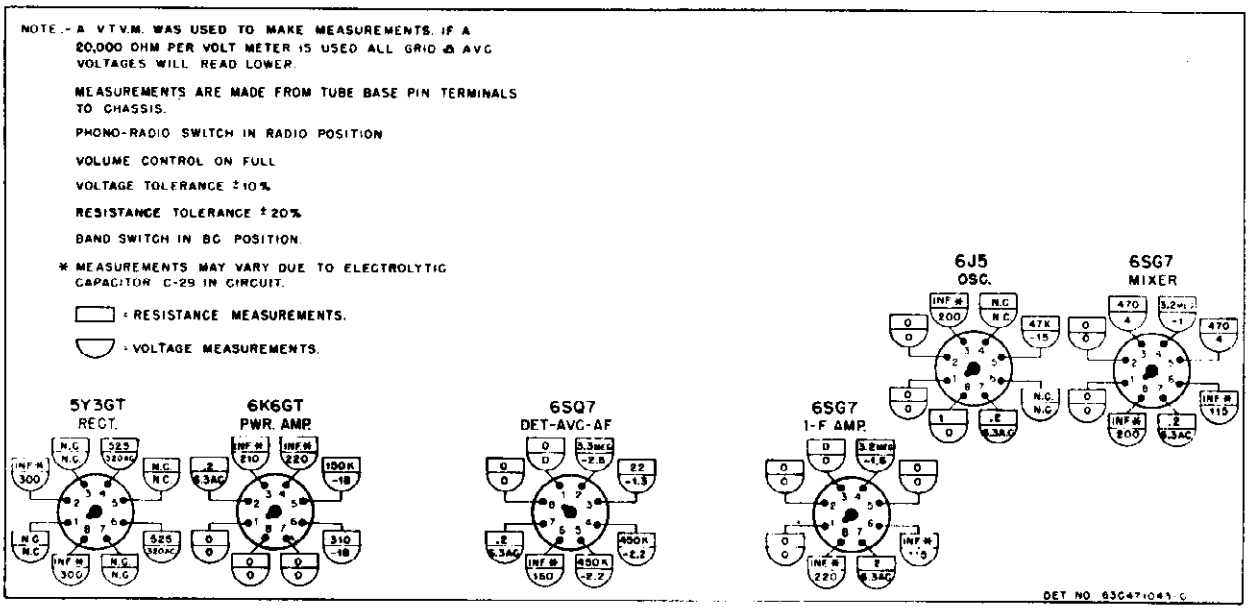
MODEL 65F21, CHASSI
HS-26

PARTS LOCATION BOTTOM VIEW



POINTER AND DRIVE CORD RESTRINGING DETAIL

REF. NO.	PART NO.	DESCRIPTION
CAPACITORS		
C-1 to C-6		Capacitor and Mounting Strip Assembly, push button tuning: see Permeability Tuner PT-8 Parts List
C-7	1X72363	Variable: 2 gang; with pulley
C-8	20A71140	Mica trimmer: 10-80 mmf; includes "L" mounting bracket
C-9	20A71141	Mica trimmer: 10-80 mmf
C-10	20A71226	Mica trimmer: 2-12 mmf; includes mounting bracket
C-11	21R6642	Mica: 50 mmf 500 V
C-12	20A71125	Mica: 10-80 mmf; includes "L" mounting bracket
C-13	21R2724	Mica: 1000 mmf 5% 500 V
C-14	21A28020	Silver mica: 535 mmf 3%
C-15	21R6642	Mica: 50 mmf 500V
C-16	8S9816	Paper: .05 mf 400V
C-17	8S9816	Paper: .05 mf 400V
C-18	8S9816	Paper: .05 mf 400V
C-19	8S9816	Paper: .05 mf 400V
C-20	8S9816	Paper: .05 mf 400V
C-21	21R6641	Mica: 100 mmf 500V
C-22	8S9813	Paper: .005 mf 600V
C-23	21R6639	Mica: 500 mmf 500 V
C-24	21R6639	Mica: 500 mmf 500 V
C-25	8S9813	Paper: .005 mf 600 V
C-26	8S9813	Paper: .005 mf 600 V
C-27	8S9816	Paper: .05 mf 400 V
C-28	8S9813	Paper: .005 mf 600 V
C-29	23A27718	Electrolytic: 30-30-20Mf/350-300-25 V.
DIAL LIGHTS		
I-1 & I-2	65X4151	6-8 V; bayonet base; type #51
COILS		
L-1 to L-6		Coil Assembly, P.B. oscillator: See Permeability Tuner PT-8 Parts List
L-7	24K71224	Loop Assembly, antenna: complete; includes loop, trimmer and lead assembly
L-8	24A70549	S.W. oscillator
L-9	24A70546	B.C. oscillator
L-10	24A70548	S.W. antenna
RESISTORS		
Note:		All resistors are 1/2 W 20% insulated type unless otherwise specified.
R-1	6R6032	470,000 1/2 W
R-2	6R6056	47,000 1/2 W
R-3	6R6090	470 1/2 W
R-4	6R2122	4.7 meg 1/2 W



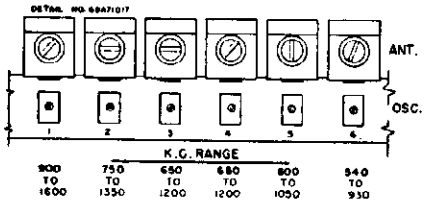
VOLTAGE & RESISTANCE DIAGRAM

TUBE COMPLEMENT - 6SG7 Mixer, 6J5 Oscillator, 6SG7 I.F. Amplifier, 6SQ7 Detector, AVC and 1st A.F. Amplifier, 6K6GT Power Amplifier and 5Y3GT Rectifier.

POWER SUPPLY - 117V A.C. 65 Watts.

INSTRUCTIONS FOR SETTING PUSH BUTTONS

1. Turn the radio "on" and allow it to warm up for a period of at least fifteen minutes.
2. Make a list of the frequencies of the nearby stations you wish to tune in automatically. It is recommended that you select the most powerful stations.
3. Turn the band switch to "BC" position and carefully tune in the first station to be set up.
4. Adjust a signal generator to zero beat with this station. NOTE: While it is advisable to use a signal generator for accuracy, it is not an absolute necessity.
5. Turn the band switch to "PB" position.
6. Push the button to be set up, making sure to select a button having the proper frequency range to include the station you are setting. See Figure 3.
7. The tuner adjustment screws are accessible from the back of the radio. (See Figure 2).
8. Adjust the oscillator screw until the signal from the generator, or station is heard. Carefully adjust the screw to maximum volume.
9. Now adjust the antenna trimmer screw for maximum volume.
10. Follow the same procedure for the remaining buttons.
11. It is advisable, after all buttons are set up, to repeat steps 6,8 and 9 for maximum performance



PUSH BUTTON SET-UP DETAIL

MODEL 65F21, CHASSIS HS-26 MOTOROLA INC.

REF. NO.	PART NO.	DESCRIPTION
R-5	6R2122	4.7 meg 1/2 W
R-6	6R3927	2.2 meg 1/2 W
R-7	6R6068	22,000 1/2 W. N.I.
R-8	6R6053	1000 1/3 W. N.I.
R-9	6R6004	1 meg 1/2 W
R-10	18A70066	Volume control: 1 meg; with SPST switch; tapped at 300,000 ohms
R-11	6R6004	1 meg 1/2 W
R-12	6R2118	3.3 meg 1/2 W
R-13	6R6406	22 1/2 W
R-14	6R6015	220,000 1/2 W
R-15	6R2085	39 1/2 W
R-16	6R6035	270 1 W N.I.
R-17	6R6012	33,000 1/2 W
R-18	18A70086	Tone control: 1 meg; with DPDT switch
R-19	6R6339	160,000 1/2 W
SPEAKER		
	50B71799	Electrodynamic: 10"; 1275 ohm field; 3.2 ohm V.C.
SWITCHES		
S-1 & S-2	40A71127	Band selector: three position
S-3		Switch Assembly, push button: See Permeability Tuner PT-8 Parts List
TRANSFORMERS		
T-1	24B70545	I.F.: 455 KC; complete with iron cores and padding capacitor, but less shield
T-2	24B70537	Diode: 455 KC; complete with iron cores and padding capacitor, but less shield
T-3	25B21175	Output
T-4	25B21246	Power
MISCELLANEOUS		
	38B71139	Button, push: plastic (includes insert spring 41A12993)
	16E71221	Cabinet Assembly: console type
	35K71223	Cloth, grill
	11M8944	Cord, dial: 18 lb; black
	30K21859	Cord, line: 9 ft. long; with plug
	1X72436	Dial Assembly: complete: includes dial plate, pointer rail, 3 cord pulleys, 2 mounting brackets and glass dial scale. (pointer not included)
	13B70494	Escutcheon, push button
	5A71081	Eyelet, chassis mounting: 1/4" x 1/4" diameter body; 1/4" diameter head
	5A71092	Grommet, rubber: 5/8" x 3/4" diam. (chassis mounting)
	5A70404	Grommet, rubber: gang cushion
	5A71130	Grommet, rubber: 1/4" x 1/2" diameter body; 3/4" diameter head (chassis retainer)
	36C70505	Knob, control: plain
	36K70509	Knob, control: branded
	1X76402	Lead Assembly, phono-pick-up: includes plug; 42" long
	1X72364	Lead Assembly, speaker: four conductor; with receptacle
	32A24815	Lock, line cord: fibre
	4S7655	Lockwasher, steel: 3/8 internal; cadmium plated (band switch mounting)
	4S1376	Nut, steel: 3/8-32 x 1/2" hex; cadmium plated (band switch mounting)
	2S7051	Nut, steel: 3/8-32 x 9/16" hex; palnut; cadmium plated (volume & tone control mounting)
	9A12705	Plate, electrolytic capacitor mounting: bakelite
	28K71775	Plug, 1 pin (on phono pick-up lead)
	28K19871	Plug, 4 pin (on antenna loop)
	52B71136	Pointer, dial
	49A23960	Pulley, cord: 1/4" groove (cord guide)
	49A21552	Pulley, cord: 1/2" groove (cord guide)
	9A30680	Receptacle, 3 prong (on phono motor leads)
	9K28049	Receptacle, 4 prong: bakelite (loop antenna receptacle)
	5A11072	Rivet, shoulder: .235" long; nickel plated (cord pulley mounting)
	5A71735	Rivet, shoulder: 1/2" long; nickel plated (cord pulley mounting)
	34B70471	Scale, dial: glass
	3S8301	Screw, steel: #2 x 1/2" Phillips ovl. hd wood screw; antique bronze finish (escutcheon mounting)
	3S7634	Screw, steel: #6 x 1-3/8" PKA slotted sheet metal screw; cadmium plated (chassis mounting)
	3S7396	Screw, steel: 10-32 x 2" slotted hex head machine screw; copper plated (record changer mounting)
	47A71129	Shaft, tuning
	1A71049	Shield & Iron Core Sleeve Assembly (for I.F. or diode transformer)
	9K71233	Socket, pilot light: with 10-1/2" lead
	9A6790	Socket, tube: molded octal; plain type (for all but I.F. amp)
	9A6788	Socket, tube: (replacement) molded octal; plain type (to be used in place of 9A6790 when mounting lugs on chassis break off)
	9A6792	Socket, tube: molded octal with center shield (for I.F. amp)
	9A70165	Socket, tube: (replacement) molded octal; with center shield (to be used in place of 9A6792 when mounting lugs on chassis break off)
	41A28190	Spring, cushion: top (record changer mounting)
	41A21607	Spring, cushion: bottom (record changer mounting)
	41A14244	Spring, tension coil (pointer cord)
	41A14111	Spring, tension coil (drive cord)
	37K21114	Strip, channel: rubber; 1" long (dial scale mtg.)
	31A12847	Strip, terminal: 2 insulated lugs; #3 mounting
	31A22190	Strip, terminal: 4 insulated lugs; #3 ground
	32A27678	Strip, shaft bearing: fibre
	66X31609	Support, cabinet lid
	38C70588	Tabs, call letter
	4A21577	Washer, "C" (used on tuning shaft)
	4A71133	Washer, spring (used on tuning shaft)
PERMEABILITY TUNER		
	1X71110	Permeability Tuner PT-8: complete
CAPACITORS		
C-1 to C-6	20A72338	Capacitor and Mounting Strip Assembly: capacitors not replaceable separately; consist of C-1, 145-521 mmf; C-2, 100-412 mmf; C-3, 65-344 mmf; C-4, 65-344 mmf; C-5, 41-246 mmf; C-6, 6-155 mmf.
COILS		
L-1	1X72416	Coil Assembly, P.B. oscillator: 540-930 kc; includes core and clip (brown)
L-2	1X72417	Coil Assembly, P.B. oscillator: 600-1050 kc; includes core and clip (red)
L-3	1X72418	Coil Assembly, P.B. oscillator: 650-1200 kc; includes core and clip (orange)
L-4	1X72418	Coil Assembly, P.B. oscillator: 650-1200 kc; includes core and clip (orange)
L-5	1X72419	Coil Assembly, P.B. oscillator: 730-1350 kc; includes core and clip (yellow)
L-6	1X72420	Coil Assembly, P.B. oscillator: 900-1600 kc; includes core and clip (green)
SWITCH		
S-3	40B71105	Switch Assembly, push button
MISCELLANEOUS		
	5A70098	Eyelet, steel: 23/64" thick x 7/32" I.D. x 1/2" diameter head (tuner mounting)
	5A70404	Grommet, rubber (tuner mounting)
	3S8175	Screw, steel: #4 x 3/16" PKZ slotted hex head, sheet metal screw; cadmium plated (trimmer mounting)

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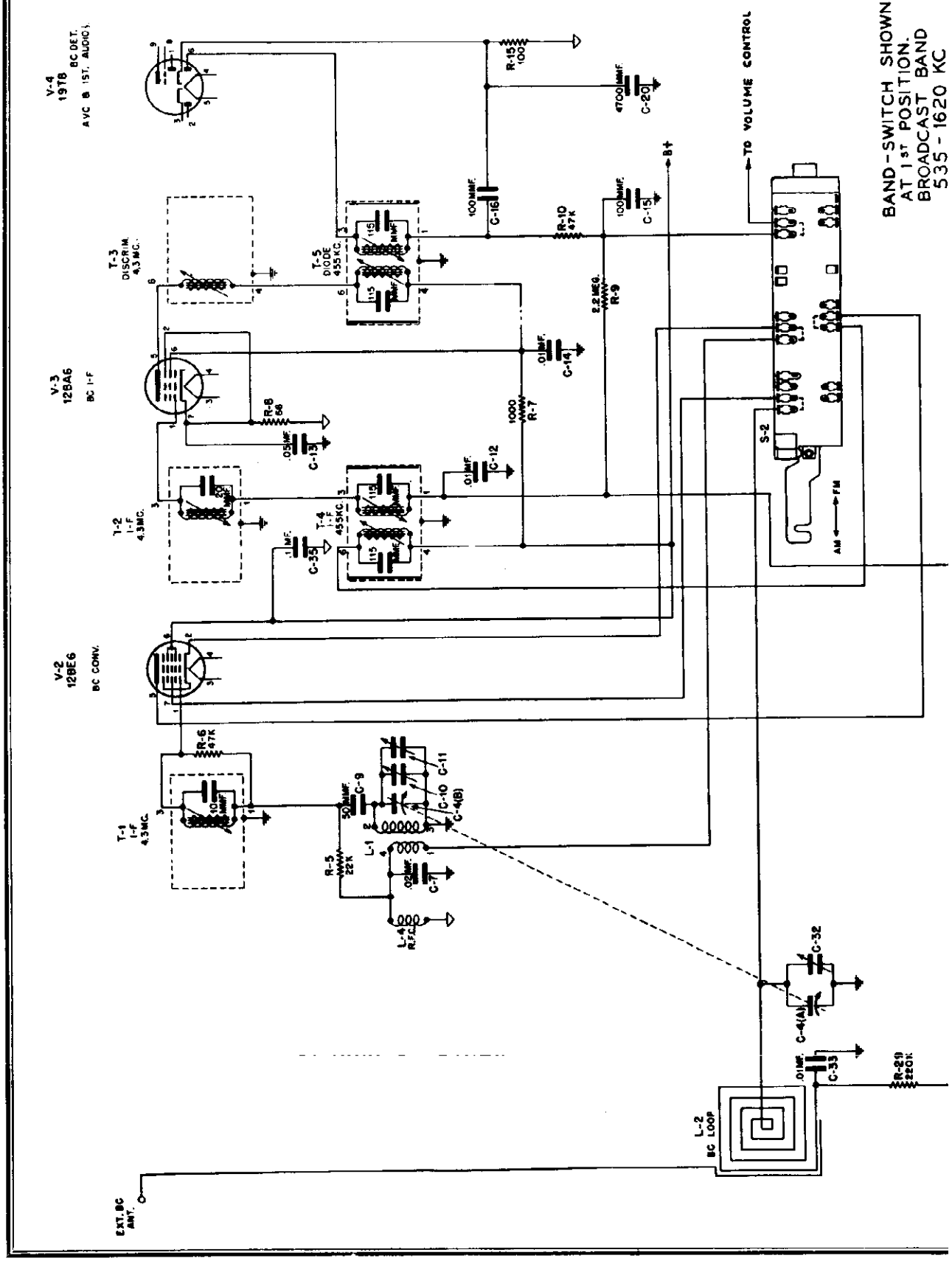
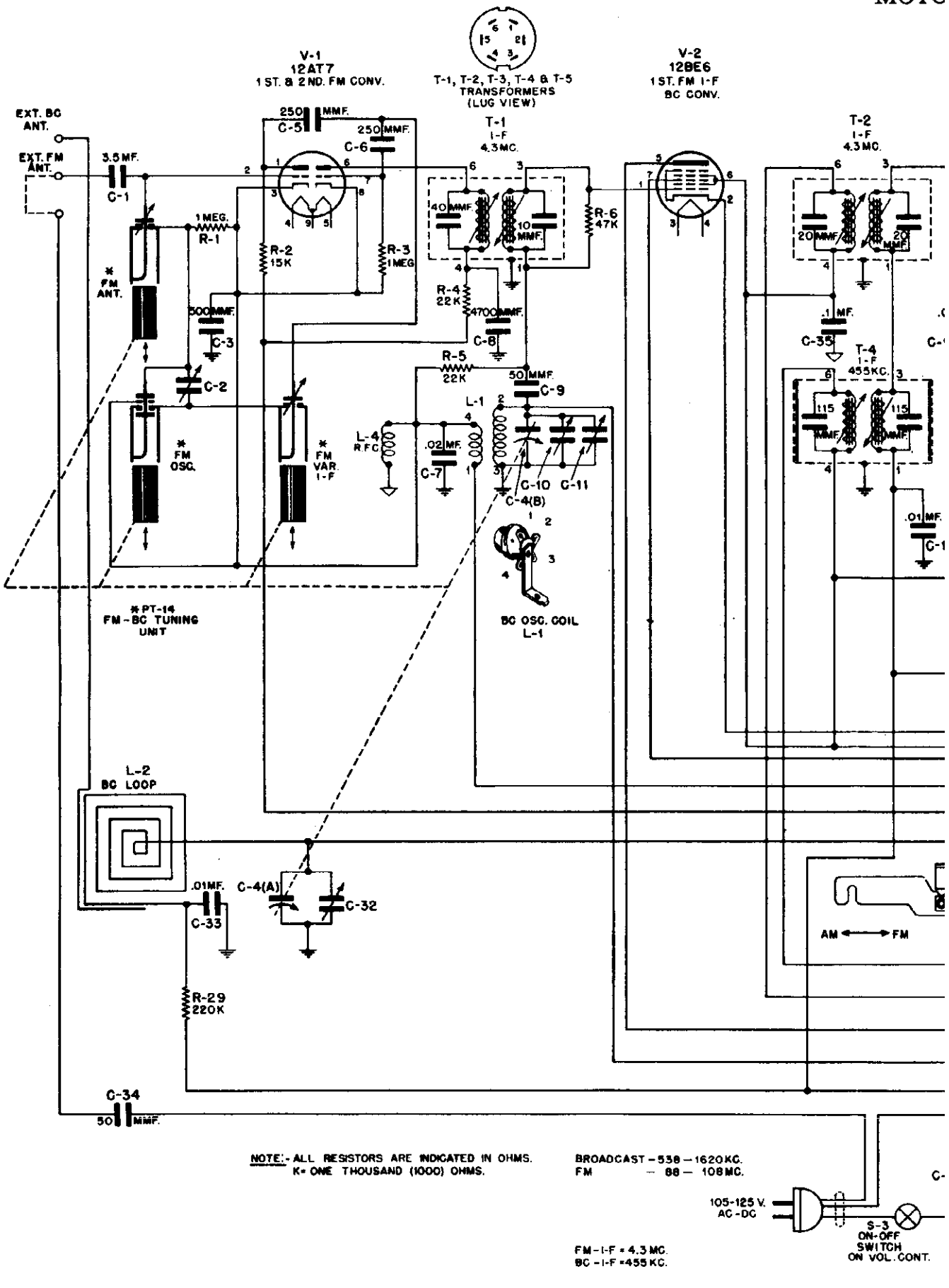
MODEL 67XM21, CHAS
HS-64




V-1
12AT7
1ST. & 2ND. FM CONV.
T-1, T-2, T-3, T-4 & T-5
TRANSFORMERS
(LUG VIEW)
V-2
12BE6
1ST. FM I-F
BC CONV.
EXT. BC ANT.
EXT. FM ANT.
3.5 MF.
C-1
250 MMF.
C-5
250 MMF.
C-6
1 MEG.
R-1
R-2
15K
R-3
1 MEG
* FM ANT.
500 MMF.
C-3
C-2
* FM OSC.
* FM VAR. I-F
T-1
I-F
4.3 MC.
40 MMF.
10 MMF.
R-6
47K
R-4
22K
4700 MMF.
C-8
R-5
22K
50 MMF.
C-9
L-1
L-4
R.F.C.
.02 MF.
C-7
C-10
C-11
C-4(B)
BC OSC. COIL
L-1
T-2
I-F
4.3 MC.
20 MMF.
20 MMF.
.1 MF.
C-35
T-4
I-F
455 KC.
115 MMF.
115 MMF.
.01 MF.
C-1
* PT-14
FM-BC TUNING
UNIT
L-2
BC LOOP
.01 MF.
C-33
C-4(A)
C-32
R-29
220K
C-34
50 MMF.
AM
FM
105-125 V.
AC-DC
S-3
ON-OFF
SWITCH
ON VOL. CONT.
NOTE:- ALL RESISTORS ARE INDICATED IN OHMS.
K= ONE THOUSAND (1000) OHMS.
BROADCAST - 538 - 1620 KC.
FM - 88 - 108 MC.
FM-I-F = 4.3 MC.
BC-I-F = 455 KC.

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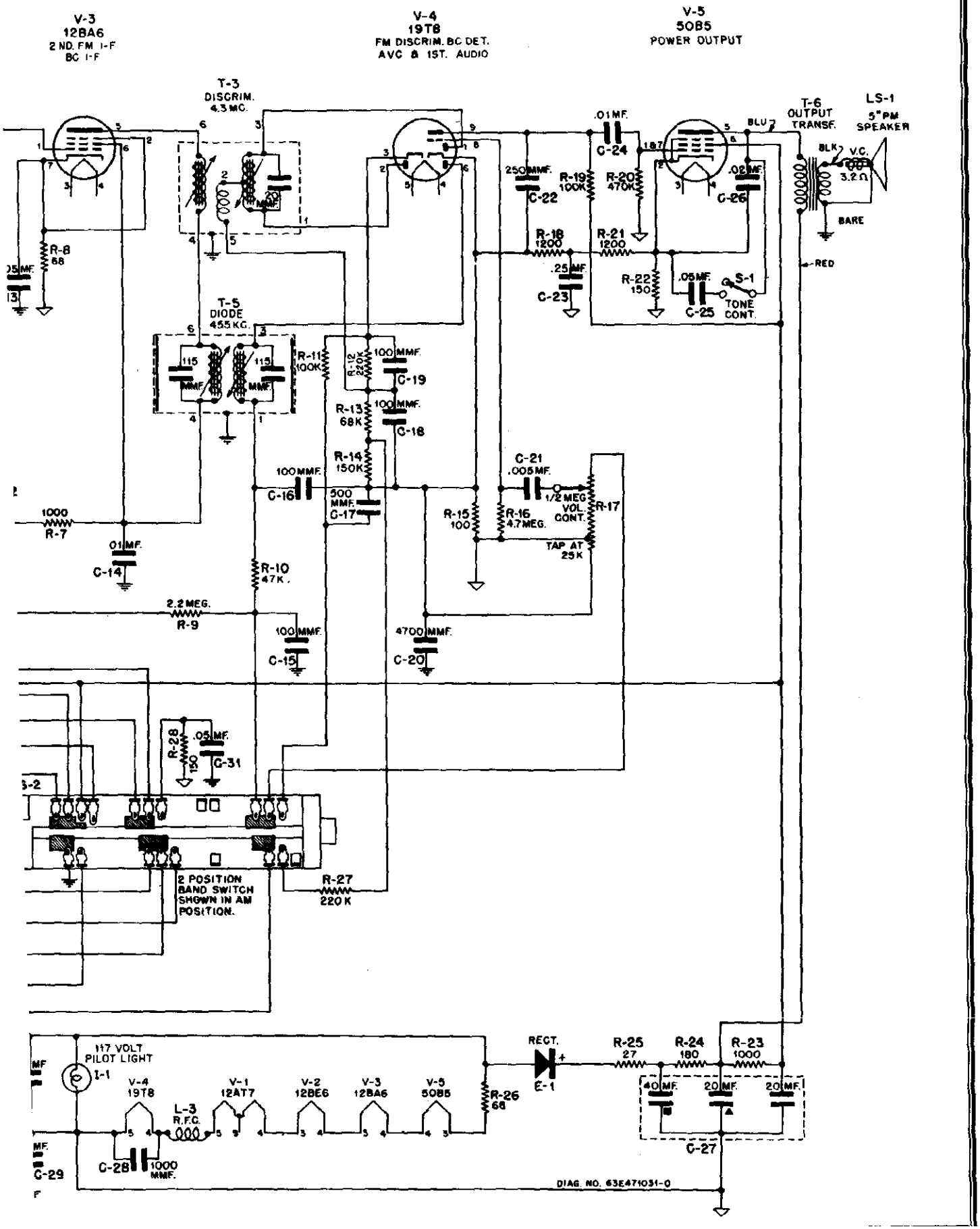
MODEL 67XM21, CHASSIS HS-64



MODEL 67XM21, CHASSIS HS-64

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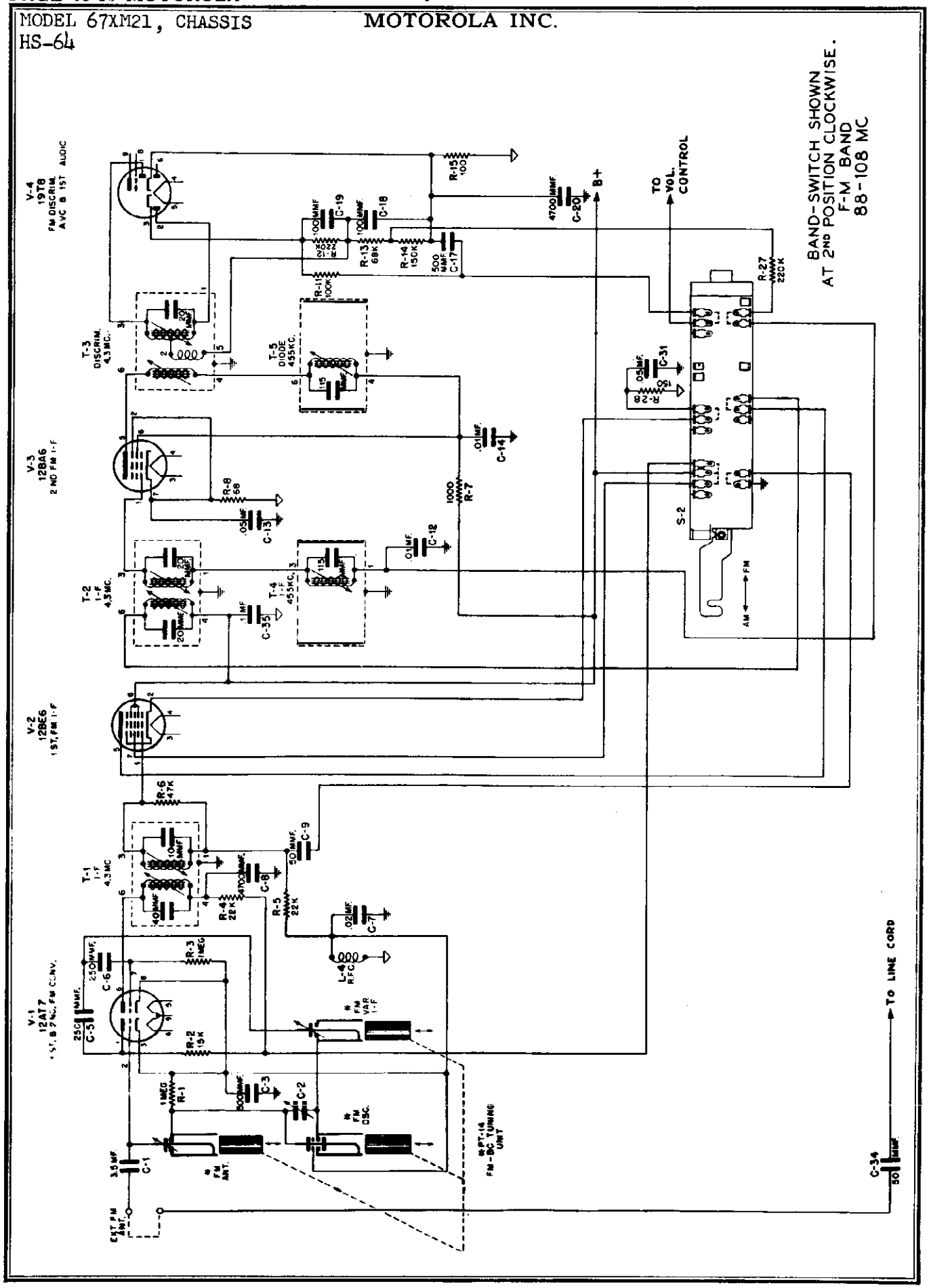

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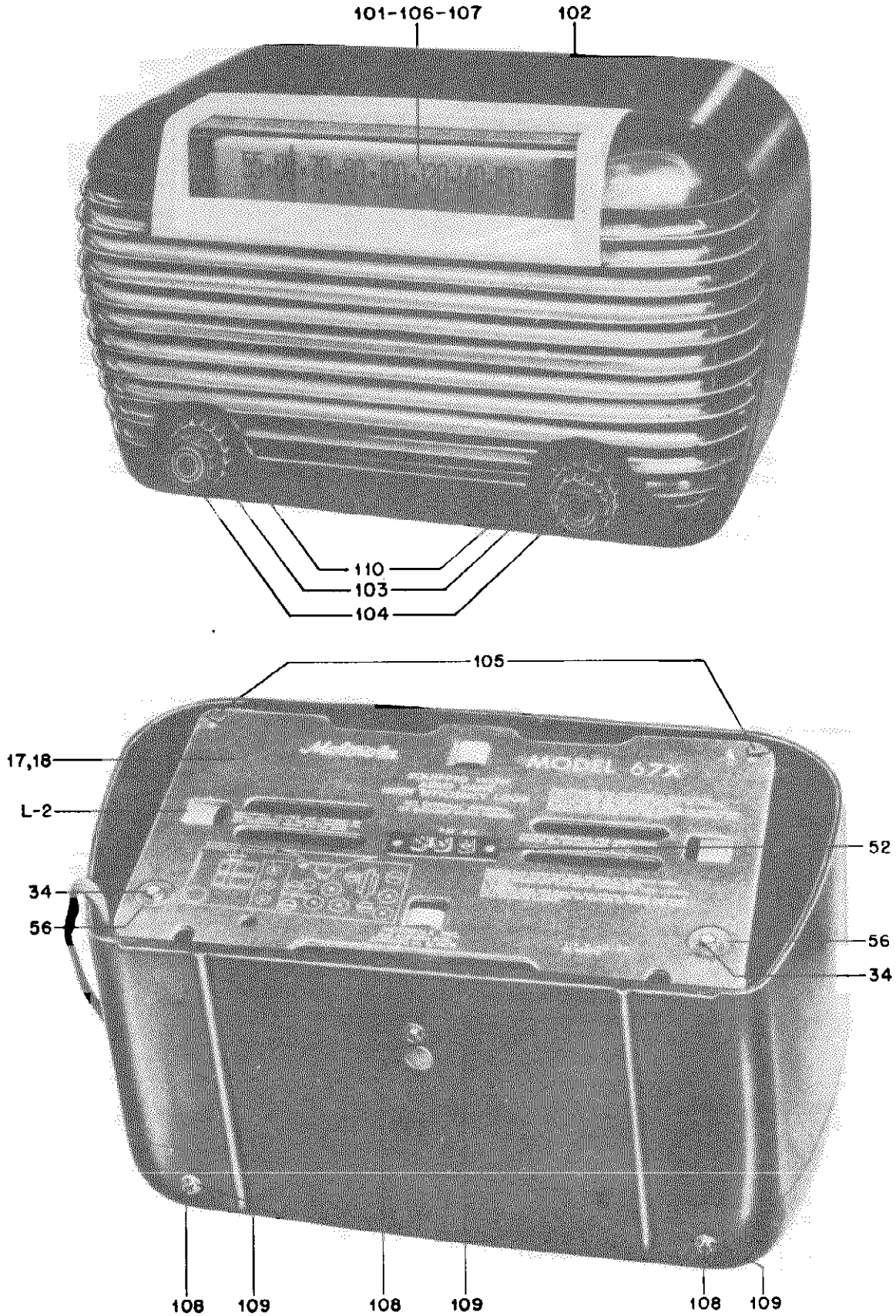
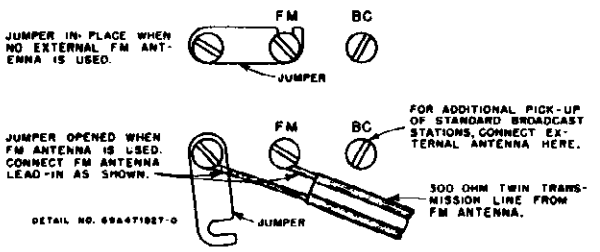
MODEL 67XM21, CHASSI
HS-64

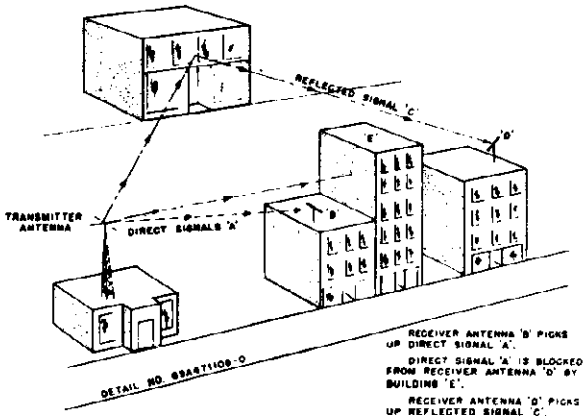


PARTS LOCATION - CABINET

MODEL 67XM21, CHASSIS HS-64 MOTOROLA INC.



EXTERNAL ANTENNA TERMINALS



DIRECT & REFLECTED FM RECEPTION PATHS

ALIGNMENT

Maximum performance can only be obtained if extreme care is exercised during alignment.

It is suggested that an isolation transformer be used between receiver and power line. If no isolation transformer is used and hum is encountered during alignment, connect the ground side of the signal generator output to B- instead of the receiver chassis.

If set oscillates when aligning the broadcast band, connect receiver B- to receiver chassis. CAUTION: Don't forget to disconnect B- from receiver chassis after alignment.

Use an insulated wrench when adjusting the FM tuner trimmers. Order Motorola FM Alignment Wrench, Part Number 66A471864.

A special wrench for adjusting the slotted nuts on the tuner cores will be required also. You can easily fabricate one from a Motorola auto set Volume Control Shaft and Coupling Assembly (Part Number 1B70847, $.30 list) by simply spreading out the forked ends and filing to fit. Solder the assembly together to make it rigid.

COMPLETE ALIGNMENT PROCEDURE USING AM SIGNAL GENERATOR

An AM (30% amplitude modulated) signal generator covering the frequencies shown in Alignment Chart I, is used to align the broadcast and FM bands. A low range output meter, connected across the speaker voice coil, is used as an output indicator.

The broadcast alignment is conventional; instructions are given in the following alignment chart.

The FM band alignment can be satisfactorily performed by following the instructions in the chart. When properly aligned, the discriminator does not respond to amplitude modulation and since an AM type signal generator is used for aligning the FM circuits, it is necessary to detune the discriminator secondary and leave it that way until all of the FM circuits have been aligned. After completing the alignment of the FM circuits, proceed to align the discriminator secondary by applying a 4.3 Mc AM signal to the control grid (Pin #7) of the 2nd FM converter tube and adjusting the discriminator secondary core for minimum audio output. No adjustment of the FM circuits should be attempted with AM after the discriminator secondary has been properly aligned.

CHART I. ALIGNMENT PROCEDURE USING AM SIGNAL GENERATOR

STEP	DIAL SET TO	BAND SW. SET TO	DUMMY	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR SET AT	ADJUST TRIMMER OR CORE	REMARKS
455 Kc IF CHANNEL ALIGNMENT							
1.	1620 Kc	BC	.1 mf	12BE6 (V-2) BC Conv. Grid (Pin #1)	455 Kc	1, 2, 3 & 4	Adjust for maximum output.
BROADCAST BAND ALIGNMENT							
2.	1620 Kc (gang fully opened)	BC	.1 mf	12BE6 (V-2) BC Conv. Grid (Pin #1)	1620 Kc	5	This sets oscillator to dial. (Calibrate pointer by fully closing gang and noting position of pointer slider. Pointer slider should be in line with right hand hole in dial background, as shown in Figure 7.)

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MODEL 67XM21, CHASSI
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ALIGNMENT (cont'd)

STEP	DIAL SET TO	BAND SW. SET TO	DUMMY	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR SET AT	ADJUST TRIMMER OR CORE	REMARKS
3.	1400 Kc	BC	None	Radiation loop*	1400 Kc	6	Tune in signal with receiver tuning knob, then peak trimmer 6.
4.3 MC IF CHANNEL ALIGNMENT							
4.	-	-	-	-	-	7	Detune discriminator secondary by screwing core out as far as it will go.
5.	(extreme high frequency end)	FM	.001 mf	12AT7 (V-1) 2nd FM Converter Grid (#7 Pin)	4.3 Mc	8,9,10, 11 & 12	Adjust for maximum output.
6.	-	-	-	-	-	13	Check the position of the FM Osc. tuning core 13. Set spacing between the core and bakelite piece to which it is mounted, to two turns fro tight by turning tuning core slotted nut.
7.	98 Mc	FM	None	FM Ant. terminal	98 Mc	16	Tuner is set to 98 Mc by moving cores out with tuning shaft until spacing between bakelite pieces is 1-9/32". See Figure 4. Peak 16 for maximum output.
8.	90 Mc	FM	None	FM Ant. terminal	90 Mc	17 & 18	Tune in signal with receiver tuning knob, then adjust 17 & 18 for maximum output.
9.	105 Mc	FM	None	FM Ant. terminal	105 Mc	14 & 15	Tune in signal with receiver tuning knob, then adjust 14 & 15 for maximum output.
10.	-	-	-	-	-	-	Repeat Steps 8 and 9 several times until further adjustment does not increase the output. Make the final trimmer adjustment at 105 Mc. (i.e., trimmers 17 & 18 105 Mc).
11.	105 Mc	FM	None	Radiate signal (or use station after performing Step 12).	105 Mc	17	Adjust for maximum output with built-in antenna connected.
ALIGN DISCRIMINATOR SECONDARY							
12.	-	FM	.001 mf	12AT7 (V-1) 2nd FM Converter Grid (#7 Pin)	4.3 Mc	7	Adjust discriminator secondary for minimum response. The correct adjustment is sharply defined minimum response point between the two peaks.

* Connect output of signal generator to a 5" diameter, 3 turn loop and radiate signal into receiver loop. Minimum distance between loops should never be less than 12".

MODEL 67XM21, CHASSIS HS-64 MOTOROLA INC.

ALIGNMENT PROCEDURE WHEN USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

STEP **OPERATION**

455 Kc IF Channel Alignment

1. Same as Step 1 in Chart I (Use AM signal generator)

Broadcast Band Alignment

2. Same as Steps 2 and 3 in Chart I (Use AM signal generator)

4.3 Mc IF Channel Alignment (Use FM Signal Generator & Oscilloscope)

3. (A) Discriminator

   1. Connect the input terminals of the oscilloscope vertical amplifier to the high side of the receiver volume control and B-.

   2. Connect the FM generator synchronizing voltage output terminals to a phase shifting network, consisting of a variable 1/2 megohm resistor in series with a .002 mf capacitor. The input to the oscilloscope horizontal amplifier is connected across the .002 mf capacitor. See Figure 5. (This phase shifting network may not work with every oscilloscope. Different values of R & C may be required.

   3. Apply an FM 4.3 Mc signal (125 Kc deviation) through a .001 mf capacitor to the control grid (pin #1) of tube V-3 in the 2nd FM IF Amplifier stage.

   4. Adjust discriminator primary (8) for maximum amplitude. The phase shifting network resistor is adjusted to give only one trace.

   5. Adjust discriminator secondary (7) until a symmetrical pattern is obtained, with peaks occurring at about 100 Kc above and below 4.3 Mc and is substantially linear between peaks. The trace should pass through the intersection of the vertical and horizontal axis. The phase shifting network should be adjusted to give only a single pattern at all times. See Figure 6. It will be necessary to go over discriminator primary (8) and secondary (7) adjustments several times before a pattern of maximum amplitude and correct symmetry is obtained.

   (B) 4.3 Mc IF Amplifiers

   1. Apply an FM 4.3 Mc signal (100 Kc deviation) to the control grid (pin #1) of tube V-2 in the 1st FM IF amplifier stage, through a .001 mf capacitor and adjust both primary and secondary cores (9 & 10) to get a symmetrical pattern as before, with peaks occurring at a slightly lower deviation.

   2. Apply an FM 4.3 Mc signal (100 Kc deviation) to the FM antenna terminal and adjust both primary and secondary cores (11 & 12) until a symmetrical pattern substantially linear between peaks, is obtained.

FM Band Alignment - Use FM Signal Generator & Output Meter

4. Check the position of the FM oscillator tuning core (13). Set the spacing between the core and the bakelite piece to two turns from tight by turning tuning core slotted nut.

5. Connect generator output directly to the receiver FM antenna terminal.

6. Set receiver tuner to 98 Mc by moving cores out with tuning shaft until spacing between bakelite pieces is 1-9/32". See Figure 4. Also set FM signal generator to 98 Mc (22-1/2 Kc deviation). Adjust FM oscillator trimmer (16) for maximum output.

7. Set FM signal generator to 90 Mc (22-1/2 Kc deviation). Tune in signal with receiver tuning knob and then adjust FM variable IF and FM antenna trimmers (17 & 18) for maximum output.

8. Set FM signal generator to 105 Mc (22-1/2 Kc deviation). Tune in signal with receiver tuning knob and then adjust variable IF and antenna cores (14 & 15) for maximum indication on output meter.

9. Repeat steps 7 and 8 several times until further adjustment does not increase the output. Make the final trimmer adjustment at 105 Mc. (i.e., 17 & 18 at 105 Mc.)

10. Close FM antenna link on loop panel. Radiate an FM 105 Mc (22-1/2 Kc deviation) signal into FM antenna (line cord). Tune in signal with receiver tuning knob and then repeak FM antenna trimmer (17).

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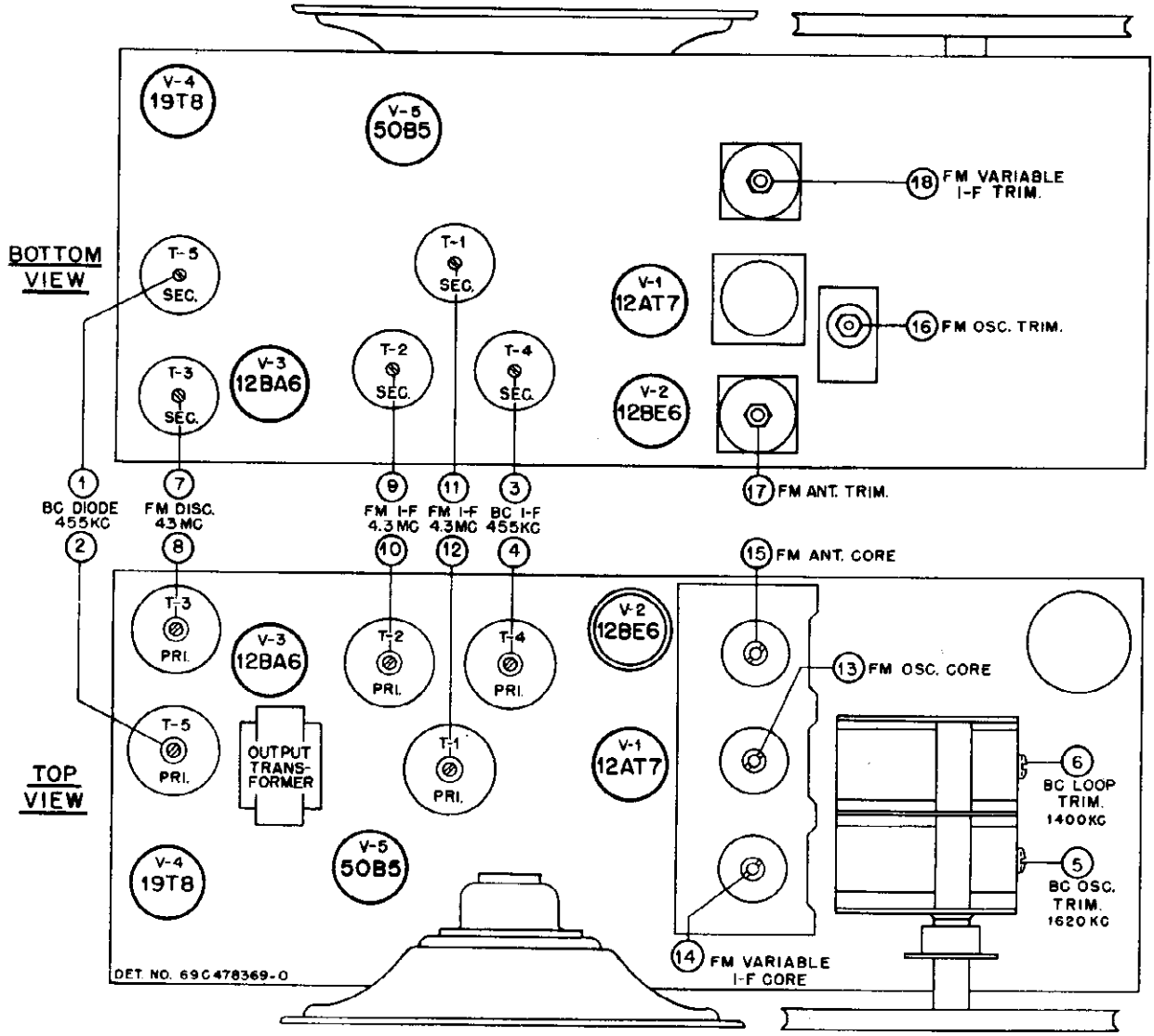
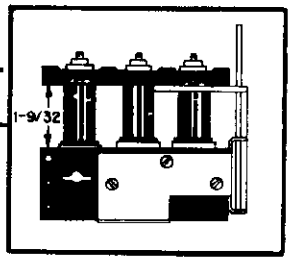
MODEL 67XM21, CHASSI
HS-64

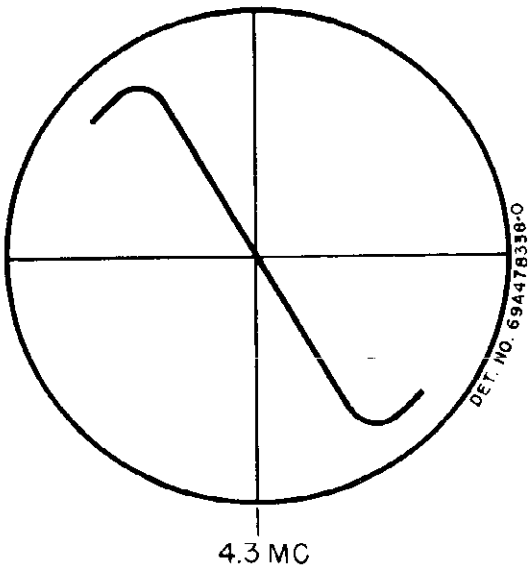


TUBE & TRIMMER LOCATIONS

METHOD OF SETTING TUNER TO 98MC.

TURN TUNING SHAFT UNTIL DISTANCE BETWEEN BAKELITE PIECES IS 1-9/32" AS SHOWN IN ILLUSTRATION.

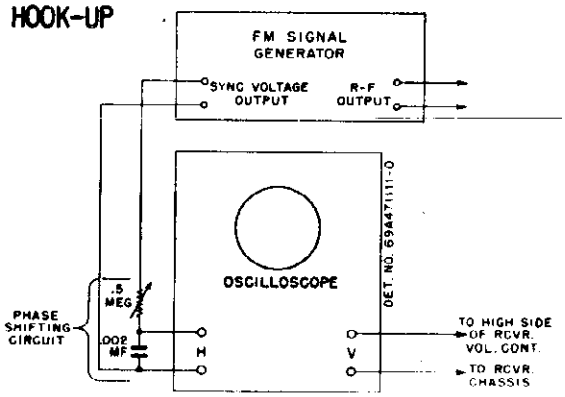




4.3 MC

OSCILLOSCOPE PATTERN

SIGNAL GENERATOR & OSCILLOSCOPE HOOK-UP



MODEL 67XM21, CHASSIS HS-64

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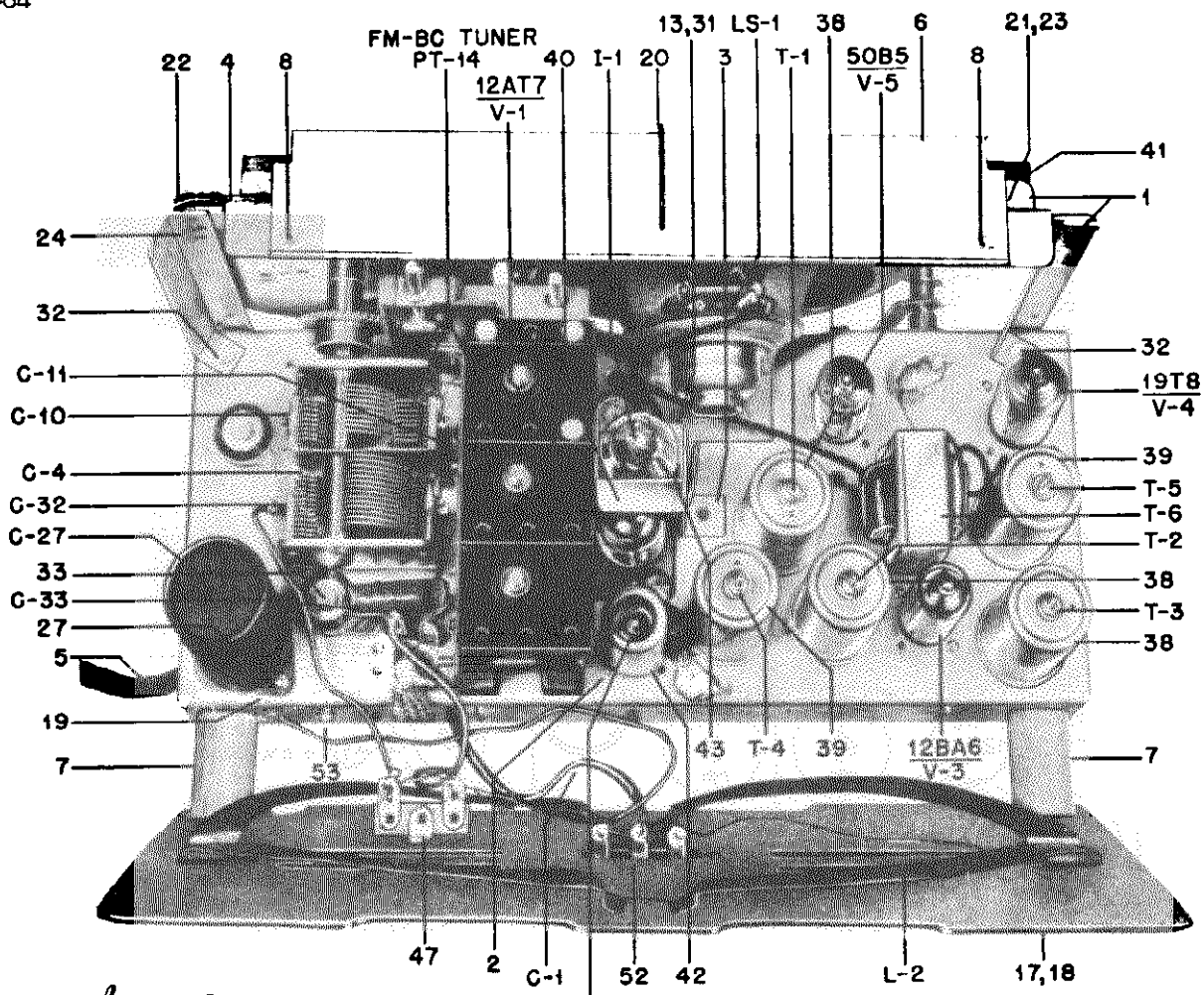
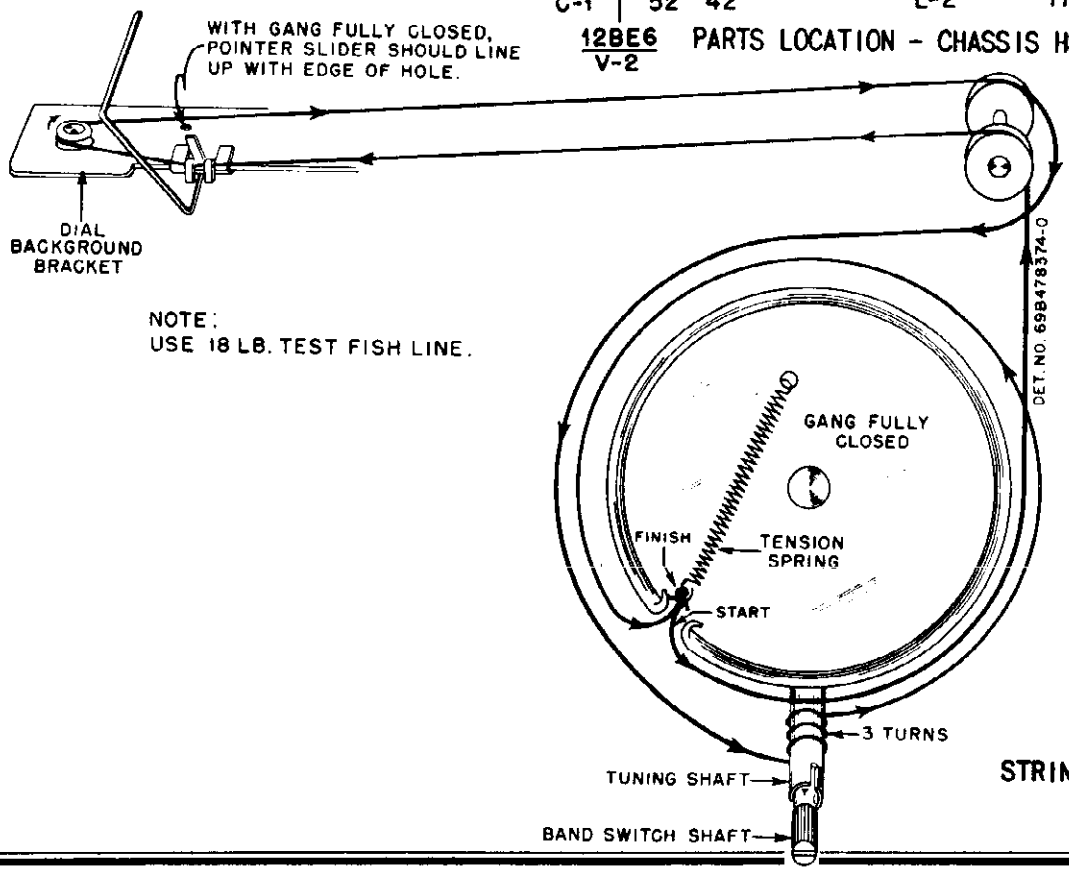
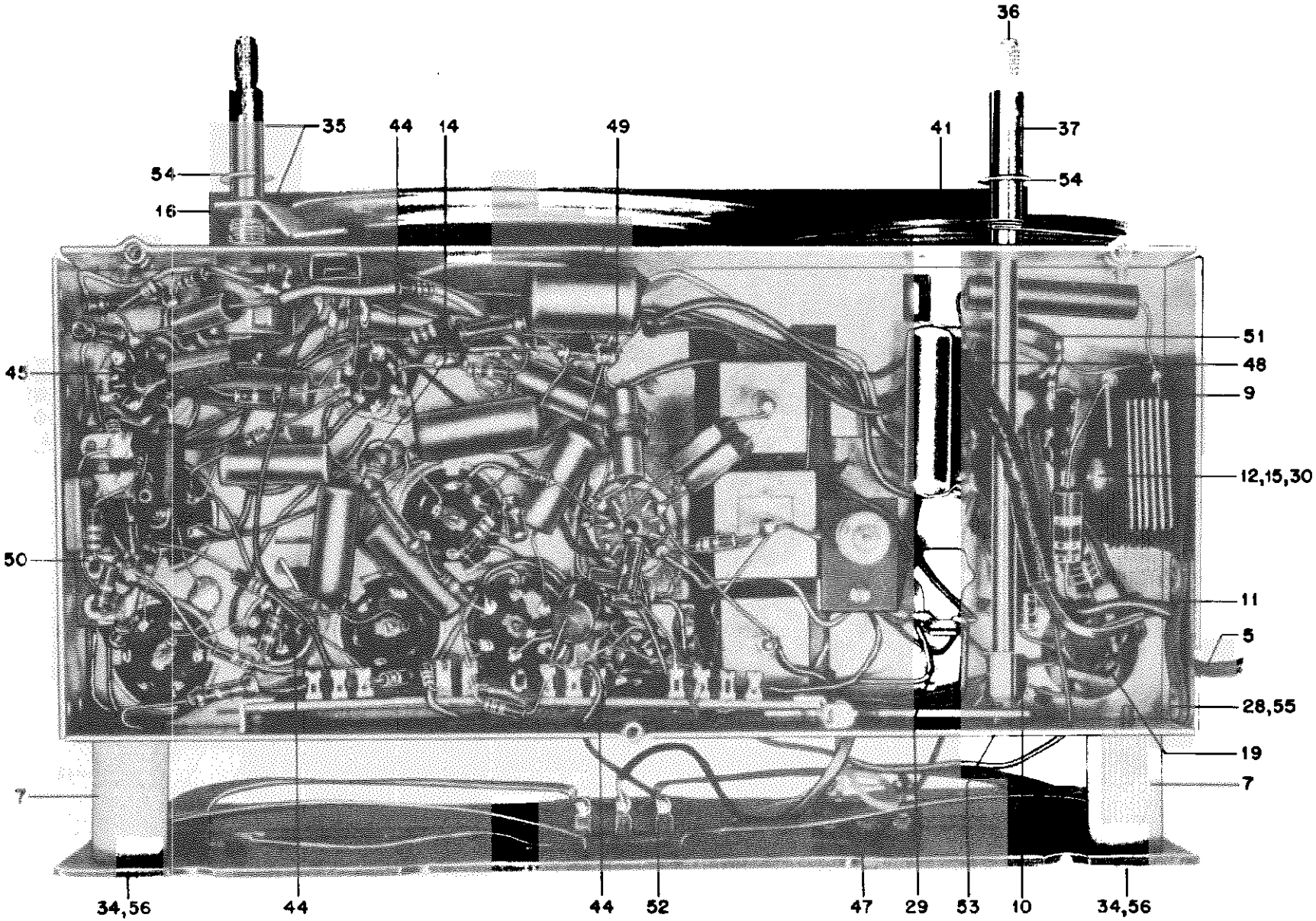


PARTS LOCATION - CHASSIS HS-64 - TOP VIEW



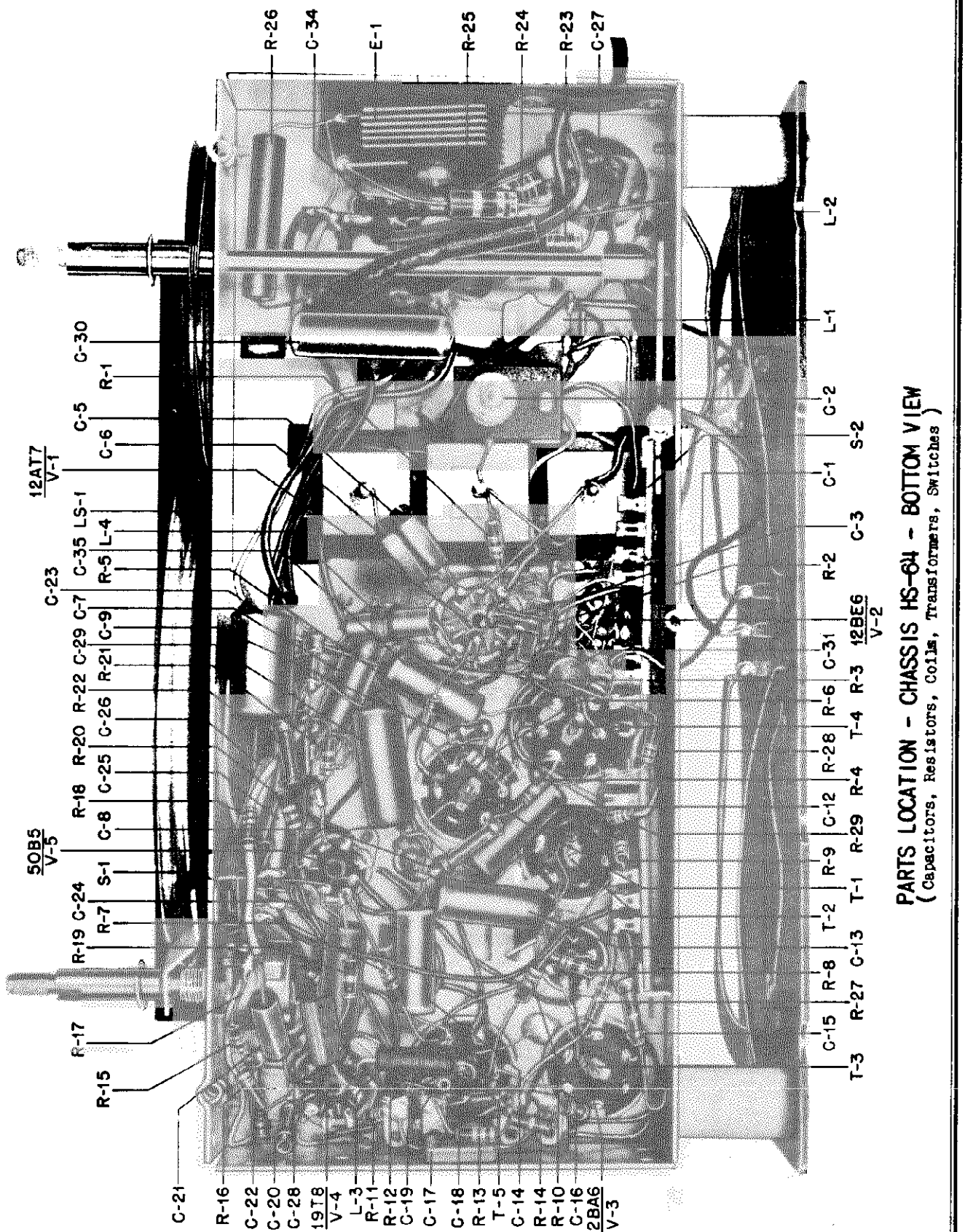
STRING DRIVE



PARTS LOCATION - CHASSIS HS-64 - BOTTOM VIEW
(Miscellaneous Parts)

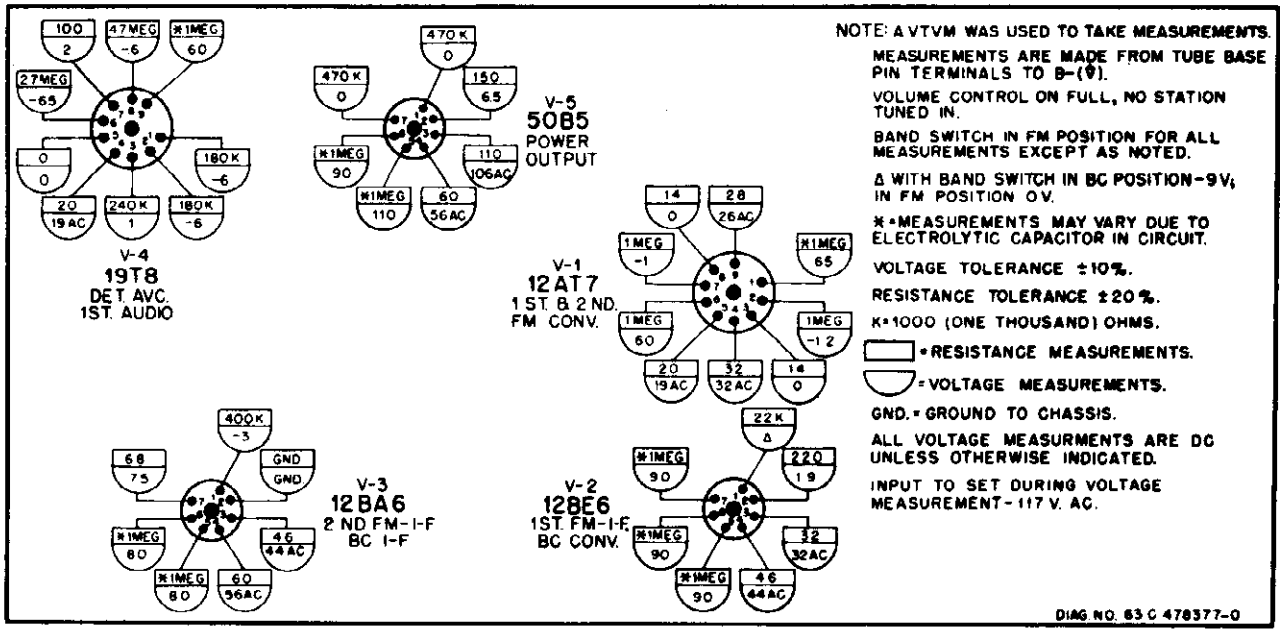
MODEL 67XM21, CHASSIS HS-64

MOTOROLA INC.

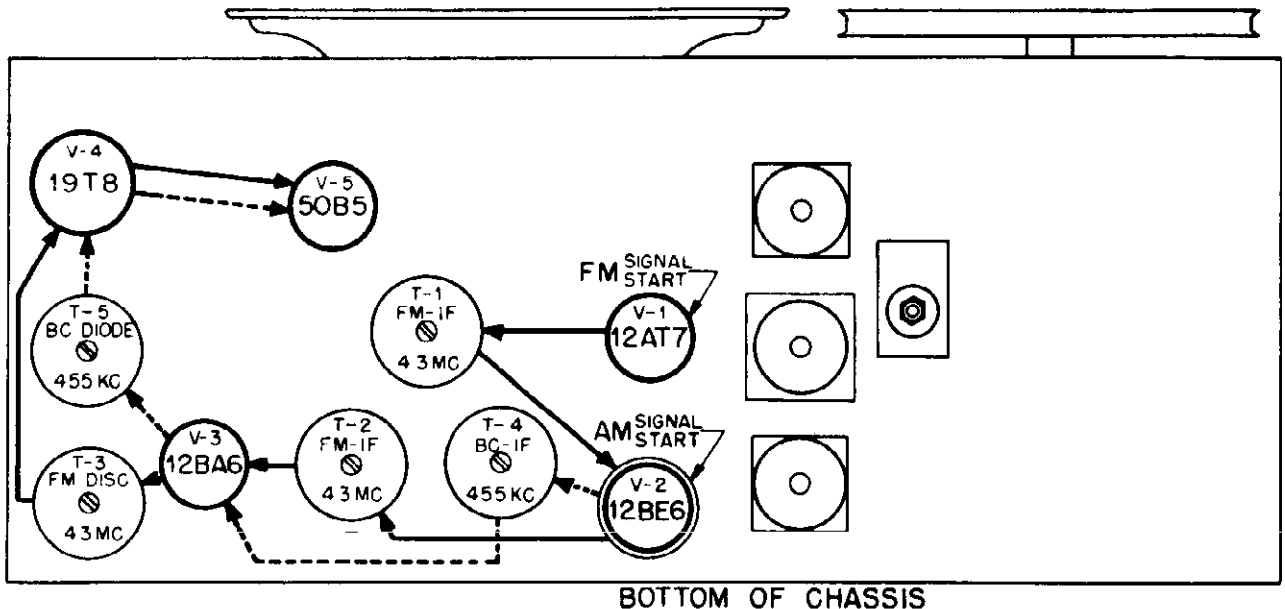


PARTS LOCATION - CHASSIS HS-64 - BOTTOM VIEW
(Capacitors, Resistors, Coils, Transformers, Switches)

MOTOROLA INC. MODEL 67XM21, CHASSIS HS-64



VOLTAGE & RESISTANCE DIAGRAM



BC & FM SIGNAL PATHS THROUGH RECEIVER

MODEL 67XM21, CHASSIS HS-64 — MOTOROLA INC.

REF. NO.	PART NO.	DESCRIPTION
CHASSIS PARTS HS-64		
CAPACITORS		
C-1	21K470678	Special: 3.5 mmf
C-2	19A470426	Trimmer: variable air; 2.5 mmf to 30 mmf
C-3	21R2730	Silver Mica: 500 mmf 500V
C-4	19K75416	Variable: 2 gang; cut oscillator plates; with trimmers C-10, C-11 & C-32
C-5	21R2729	Silver Mica: 250 mmf 500V
C-6	21R2729	Silver Mica: 250 mmf 500V
C-7	8S9802	Paper: .02 mf 400V
C-8	21B470567	Ceramic: 4700 mmf 500V
C-9	21K77373	Ceramic: 50 mmf 500V
C-10	-	Trimmer: part of gang capacitor C-4
C-11	-	Trimmer: part of gang capacitor C-4
C-12	8S9801	Paper: .01 mf 100V
C-13	8A71213	Paper: .05 mf 100V
C-14	8S9809	Paper: .01 mf 400V
C-15	21B77286	Ceramic: 100 mmf 500V
C-16	21B77286	Ceramic: 100 mmf 500V
C-17	21R6639	Mica: 500 mmf 500V
C-18	21B77286	Ceramic: 100 mmf 500V
C-19	21B77286	Ceramic: 100 mmf 500V
C-20	21B470567	Ceramic: 4700 mmf 500V
C-21	8A24966	Paper: .005 mf 100V
C-22	21K77375	Ceramic: 250 mmf 500V
C-23	8A470504	Paper: .25 mf 50V
C-24	8S9809	Paper: .01 mf 400V
C-25	8K471635	Paper: .05 mf 400V
C-26	8A471019	Paper: .02 mf 400V
C-27	23B470429	Electrolytic: 40 mf-200V, 20-20 mf 150V: includes insulating tube
C-28	21R6638	Mica: 1000 mmf 500V
C-29	8A471623	Paper: .05 mf 200V
C-30	8S9816	Paper: .05 mf 400V
C-31	8A71213	Paper: .05 mf 100V
C-32	-	Trimmer: part of gang capacitor C-4
C-33	8S9801	Paper: .01 mf 100V
C-34	21R6642	Mica: 50 mmf 500V
C-35	8K471636	Paper: .1 mf 200V
RECTIFIER		
E-1	48B90140	Selenium Rectifier: half wave
DIAL LIGHT		
I-1	65A470930	Lamp, incandescent: 117V 10W
COILS		
L-1	24A470656	BC Oscillator
L-2	24K77323	Loop Antenna: winding only
L-3	24A74989	Filament Choke
L-4	24A470505	RF Choke
SPEAKER		
LS-1	50B76196	5" PM; 3.2 ohm voice coil
RESISTORS		
Note: All resistors are insulated carbon type, 20%, 1/2W unless otherwise specified.		
R-1	6R6004	1 meg
R-2	6R3996	15,000 not insulated
R-3	6R6046	1 meg 10%
R-4	6R6028	22,000
R-5	6R6028	22,000
R-6	6R6056	47,000
R-7	6R6301	1000
R-8	6R2039	68 10%
R-9	6R3927	2.2 meg
R-10	6R6056	47,000
R-11	6R6075	100,000
R-12	6R6015	220,000
R-13	6R6001	68,000
R-14	6R6182	150,000
R-15	6R6018	100
R-16	6R2122	4.7 meg
R-17	18A470427	Volume Control: .5 meg; tapped at 25,000 ohms; with SPST switch
R-18	6R6393	1200 10%
R-19	6R6075	100,000
R-20	6R6052	470,000
R-21	6R6393	1200 10%
R-22	6R6293	150 not insulated
R-23	6R476004	1000 2 watt
R-24	6R3968	180 10% 2 watt
R-25	6R3994	27 10% 2 watt
R-26	17A470492	Wire wound: 68 5% 2 watt insulated
R-27	6R6015	220,000
R-28	6R3982	150
R-29	6R6015	220,000
SWITCHES		
S-1	40K21758	Slider Switch: SPDT
S-2	40B470432	Bandswitch
TRANSFORMERS		
T-1	24B470561	1st IF, 4.3 Mc: complete with iron cores and padding capacitors, but less shield
T-2	24B470563	2nd IF, 4.3 Mc: complete with iron cores and padding capacitors, but less shield
T-3	24B470565	Discriminator, 4.3 Mc: complete with iron cores and padding capacitors, but less shield
T-4	24B75487	IF, 455 Kc: complete with iron cores and padding capacitors, but less shield
T-5	24B470569	Diode, 455 Kc: complete with iron cores and padding capacitors, but less shield
T-6	25B76117	Output
MISCELLANEOUS CHASSIS PARTS		
1	1X77345	Background Support & Pulleys Assembly
2	26A24869	Base, tube shield
3	7K470917	Bracket, pilot light mounting
4	11M6944	Cord, dial: #18 1b black
5	30K31258	Cord, line and plug: 3 conductor
6	35B77311	Dial Background: tan plastic; with reinforcing strip
7	57K470568	Dowel, back mounting: wood; 1-3/16" long
8	5S7805	Eyelet, snap-in (dial background mtg)
9	14A470428	Insulator, rectifier: armite paper
10	1X470545	Lever & Rivet Assembly (on band switch shaft)
11	32K31259	Lock, line cord: fibre
12	4S7650	Lockwasher: #6 internal; cadmium plated (rectifier mtg)
13	4S7657	Lockwasher: #8 external; cadmium plated (speaker mtg)
14	29R5227	Lug, soldering: #6L
15	2S7002	Nut: 6-32 x 5/16 hex; cadmium plated (rectifier mtg)
16	2S7051	Nut: 3/8-32 x 9/16 Palnut; cadmium plated (volume control mtg)
17	1X470547	Panel Assembly, cabinet back: less loop winding but includes 3 screw terminal strip and 2 lug terminal strip
18	24C470597	Panel & Loop Assembly: complete cabinet back panel, including loop winding

REF. NO.	PART NO.	DESCRIPTION
19	9A12705	Plate, electrolytic mtg: bakelite .....
20	1K77309	Pointer & Slider Assembly: painted red
21	49A12646	Pulley, cord: 1/4 groove .....
22	49A21552	Pulley, cord: 1/2 groove .....
23	5A71246	Rivet, shoulder: .187 long (cord pulley mtg) .....
24	5A15045	Rivet, shoulder: .437 long (cord pulley mtg) .....
25	5S8497	Rivet: .088 x 1/8 steel; nickel plated (socket mtg) .....
26	5S7707	Rivet: .122 x 5/32 steel; nickel plated (slider switch mtg) .....
27	5S7701	Rivet: .122 x 3/16 steel; nickel plated (electrolytic plate mtg) .....
28	5S7708	Rivet: .122 x 9/32 steel; nickel plated (line cord lock mtg) .....
29	3S7506	Screw: #6 x 1/4 PKZ plain hex head sheet metal screw; cadmium plated (BC Osc Coil mtg) .....
30	3S2927	Screw: 6-32 x 7/8 slotted hex head machine screw; cadmium plated (rectifier mtg) .....
31	3S7163	Screw: 8-32 x 1/4 slotted hex head machine screw; cadmium plated (speaker mounting) .....
32	3S7454	Screw: #8 x 1/4 PKZ plain hex head sheet metal screw; cadmium plated (dial background brkt. mtg) .....
33	3S7481	Screw: #8 x 3/4 slotted hex head sheet metal screw; cadmium plated (tuner mtg)
34	3S7530	Screw: #8 x 1-1/2 PKZ slotted hex head sheet metal screw; cadmium plated (back panel mtg) .....
35	1X470546	Shaft & Arm Assembly (tone control shaft)
36	47A470405	Shaft, band switch: grooved .....
37	47A470404	Shaft, tuning: brass .....
38	26B70107	Shield, coil (for T-1, T-2 & T-3) .....
39	1A71049	Shield & Sleeve Assembly (for T-4 & T-5)
40	26A478109	Shield, light & static: metal (used around pilot light).....
41	26A470805	Shield, speaker baffle & light: fibre ..
42	26A24970	Shield, tube .....
43	9A470407	Socket, dial light & bracket .....
44	9A470506	Socket, tube: miniature 7 prong; black bakelite .....
45	9K470425	Socket, tube: noval 9 prong; black bakelite .....
46	41A14244	Spring, tension coil (drive cord spring) .....
47	31K15026	Strip, terminal: 2 insulated lugs, #2 mtg (on loop panel) .....
48	31A10029	Strip, terminal: 3 insulated lugs, #2 mtg
49	31A471913	Strip, terminal: 4 insulated lugs, #2 gnd
50	31A75232	Strip, terminal: 4 insulated lugs, #3 mtg
51	31K22174	Strip, terminal: 4 insulated lugs, #4 mtg
52	31A470403	Strip, terminal: 3 screw; with jumper (Ext Ant. terminal) .....
53	4A70015	Washer,"C" (band sw. shaft retainer) ...
54	4A73639	Washer, "C" (tuning & tone shaft retainer) .....
55	4S1719	Washer: 3/8 x .140 x .030 thick, steel; cadmium plated (line cord lock mtg) ...
56	4S7613	Washer: 3/4 x 13/64 x .027 thick, steel; antique copper finish (back panel mtg).

CABINET PARTS

101	7A77382	Bracket, dial scale mounting .....
102	16B471766	Cabinet, table model: molded; walnut plastic; painted .....
103	36A470602	Knob, control (large): walnut plastic ..
104	36A470604	Knob, control (small): walnut plastic ..
105	38A25507	Plug, split: 5/8 long (for holding back panel to cabinet) .....
106	34C470601	Scale, dial .....
107	3S7155	Screw: 8-32 x 3/16 slotted hex head machine screw; cadmium plated (dial scale mtg) .....
108	3S8117	Screw: #8 x 1" PKZP slotted hex washer head sheet metal screw; antique copper finish (chassis mtg) .....
109	32A20575	Washer, paper: 3/8 x .171 x .062 thick (used under chassis mtg screws to prevent cracking cabinet) .....
110	4K77702	Washer, paper: 1 x 1/2 x 1/32 thick; dark brown (used between knobs and cabinet) .....

MODEL 68L11, CHASSIS HS-119

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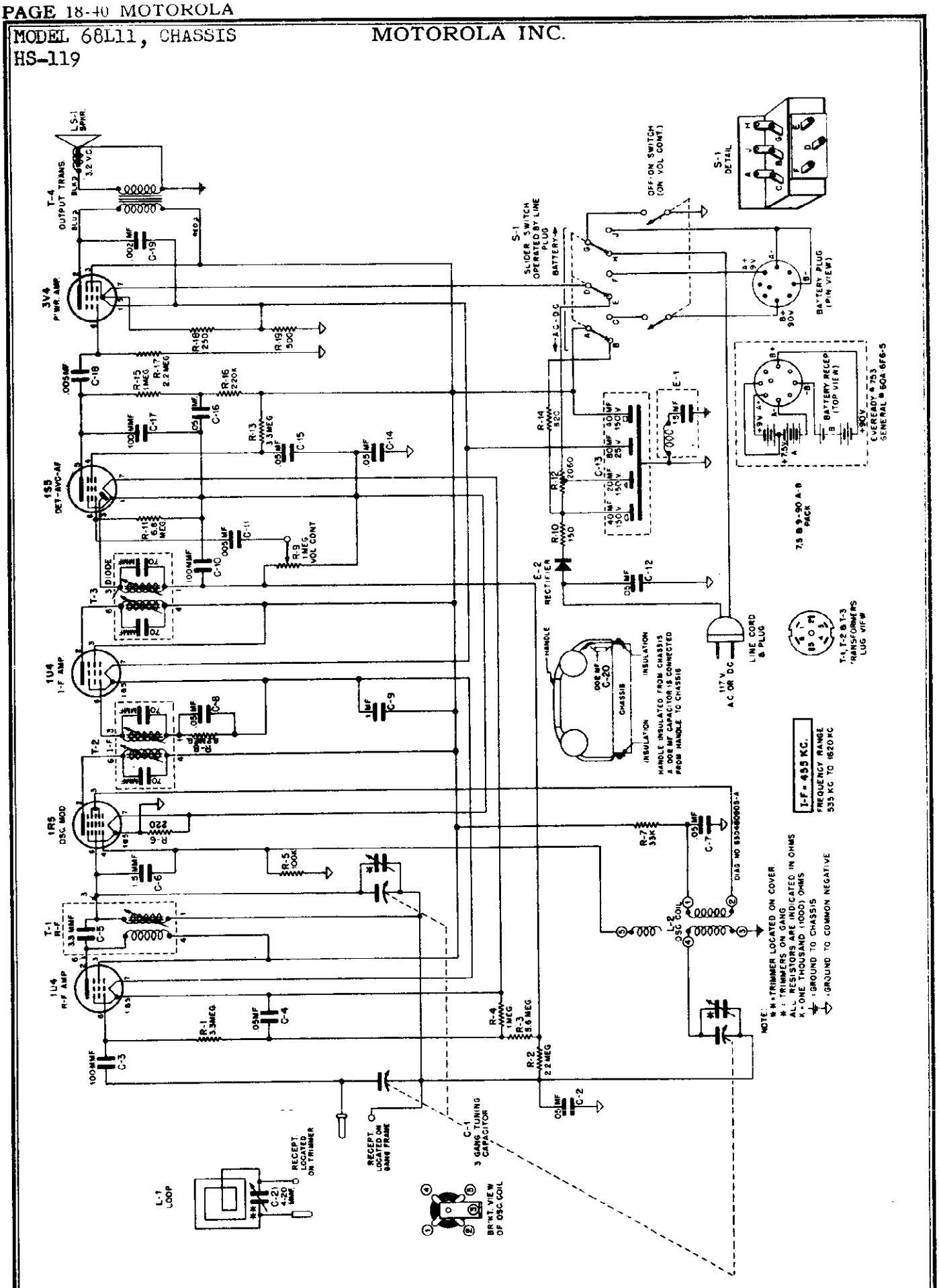

MOTOROLA INC.

MODEL 68L11, CHASSI
HS-119

ALIGNMENT

Maximum performance can only be obtained if extreme care is exercised during alignment. Follow the procedure carefully.

A suitable output meter should be connected across the speaker voice coil. Set receiver volume control to maximum; for greatest accuracy keep output of receiver at approximately .05 watt throughout alignment by reducing generator output (not receiver volume control) as stages are brought into alignment. (.05 watt = .40 volt on output meter). The alignment tool should be of an insulated type such as Motorola part number 66A71008.

If receiver is operated from AC line during alignment, it is suggested that an isolating transformer be used between receiver and power line. If no isolation transformer is used and hum is encountered during alignment, connect the ground side of the signal generator to B- instead of the receiver chassis.

Refer to Figure 1 for location of all adjustments.

Normally, alignment can be made with trimmers 5, 6 & 7. However, if range of these trimmers is insufficient to obtain peak, adjustment can be made with trimmers 5A and 6A.

R.F. COIL. The inductance of this coil is set at time of manufacture by adjusting the iron core. No resetting of this core should be made unless it has been tampered with. If so, readjustment can be made by proceeding as follows:

Tune in 600 Kc signal and peak Padder Adj. (8). Next tune in 1400 Kc signal and peak trimmer (6). Repeat both adjustments until maximum response is obtained at both ends; the last adjustment should be trimmer (6).

ALIGNMENT PROCEDURE CHART

STEP	DIAL SET TO	DUMMY	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR SET TO	ADJUST TRIMMER OR CORE	REMARKS
IF ALIGNMENT						
1.	Gang fully opened	.1 mf	OSC-MOD grid*	455 Kc	1,2,3 & 4	Adjust for maximum output
RF ALIGNMENT						
2.	1600 Kc**	-	Radiation loop***	1600 Kc	5	This sets osc. to dial scale
3.	1400 Kc	-	Radiation loop***	1400 Kc	6 & 7	Tune signal for max. with receiver tuning knob, then peak trimmers 6 & 7.
4.	1400 Kc	-	Radiation loop***	1400 Kc	7	With chassis assembled into cabinet, repeak antenna trimmer. Cabinet rear cover should be closed.

* A convenient point is the stator of the tuning capacitor.

** First close gang fully and set last mark on dial scale tape to calibration mark as shown in Figure 2 then set to 1600 Kc.

*** Connect output of signal generator to a 5" diameter, 3 turn loop and bring loop close enough to receiver loop to obtain output of 50 milliwatts (.40V) on output meter. Vary distance between loops to maintain this output during alignment. Minimum distance between loops should never be less than 12".

TUNING RANGE - 535 to 1620 Kc **IF FREQUENCY** - 455 Kc

TUBE COMPLEMENT - 1U4 - RF Amplifier
1R5 - Oscillator-Modulator
1U4 - IF Amplifier
1S5 - Detector, AVC & 1st AF Amplifier
3V4 - Power Amplifier
Rectifier - Selenium type (for house current operation)

POWER SUPPLY - Operates from 105-125 volts AC or DC (15 watts), or self-contained battery pack. Use Eveready #753 or General #80A-6F8-5.

MODEL 68L11, CHASSIS HS-119

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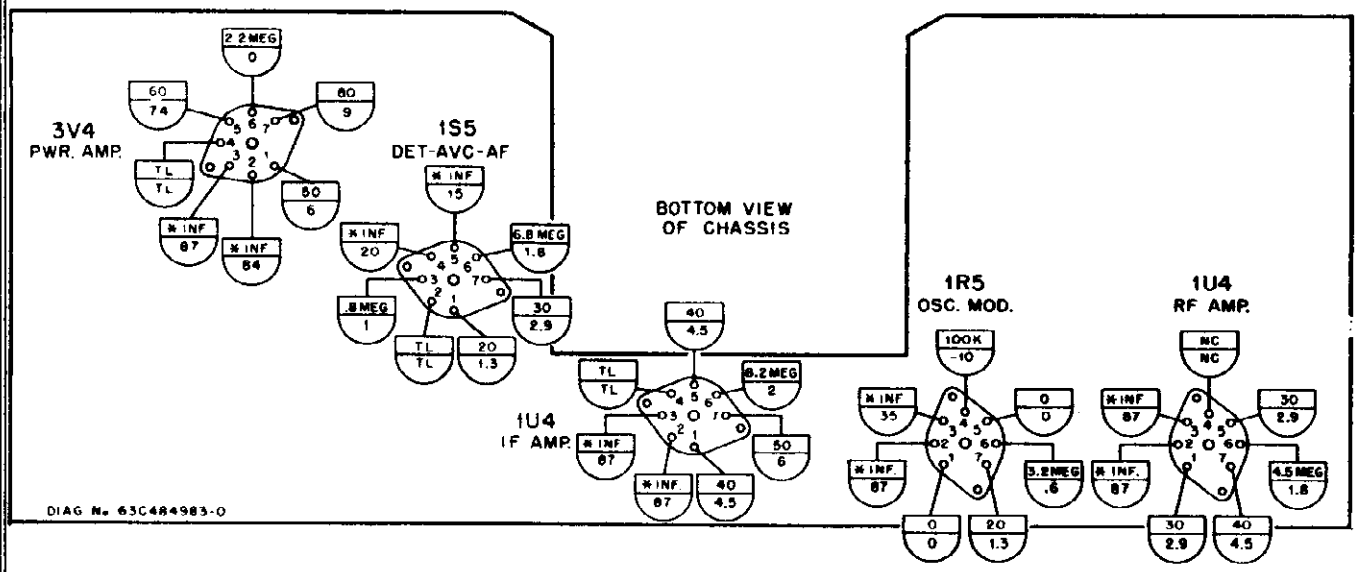


NOTE: A VTVM WAS USED TO MAKE MEASUREMENTS.

MEASUREMENTS ARE MADE FROM TUBE BASE PIN TO B-(⏚)

SET WAS OPERATED FROM FRESH BATTERY FOR VOLTAGE MEASUREMENTS.

SET WAS IN 'BATTERY' POSITION AND POWER SWITCH WAS 'ON' FOR RESISTANCE MEASUREMENTS; BATTERY WAS DISCONNECTED.

VOLTAGE TOLERANCE ±10%. RESISTANCE TOLERANCE ±20%.

= RESISTANCE MEASUREMENTS.

= VOLTAGE MEASUREMENTS

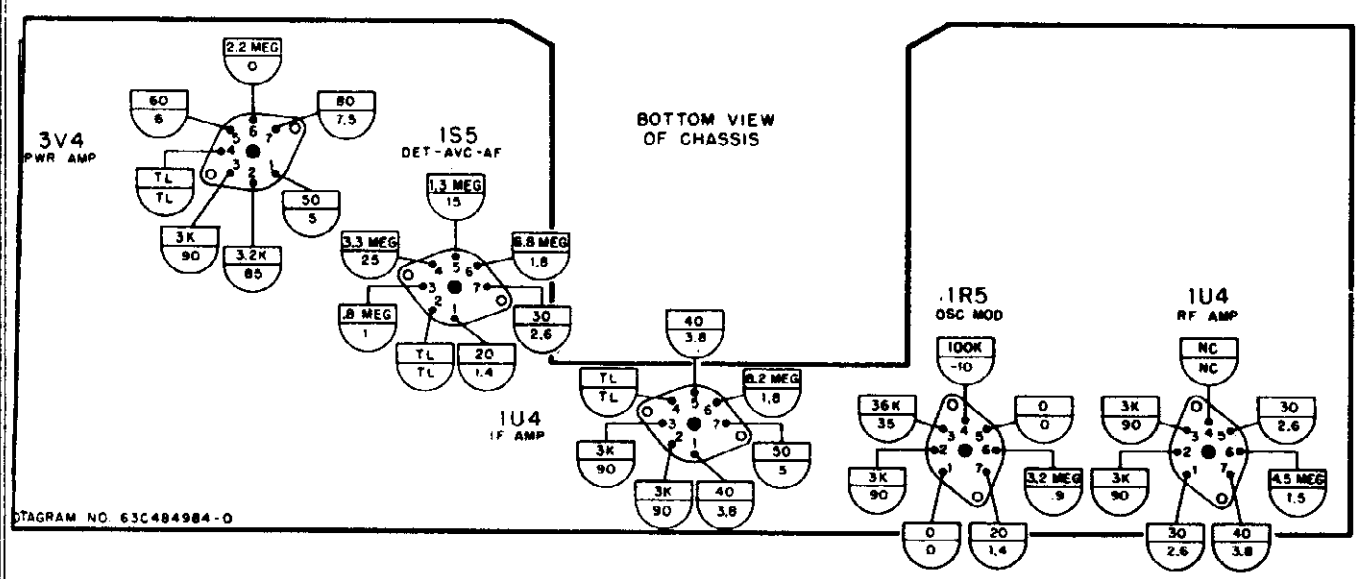
K = ONE THOUSAND (1000) OHMS.

TL = TIE LUG.

NC = NO CONNECTIONS

* = WILL VARY, DEPENDING ON CONDITION OF ELECTROLYTIC CAPACITOR.

VOLTAGE & RESISTANCE DIAGRAM - BATTERY OPERATED



NOTE: A VTVM WAS USED TO MAKE MEASUREMENTS. MEASUREMENTS ARE MADE FROM TUBE BASE PIN TO B-(⏚).

SET WAS OPERATED FROM 117 V. AC LINE FOR VOLTAGE MEASUREMENTS..

SET WAS IN AC POSITION AND POWER SWITCH WAS 'ON' FOR RESISTANCE MEASUREMENTS.

= RESISTANCE MEASUREMENTS

= VOLTAGE MEASUREMENTS.

K = 1000 (ONE THOUSAND) OHMS.

VOLTAGE TOLERANCE ±10%

RESISTANCE TOLERANCE ±20%

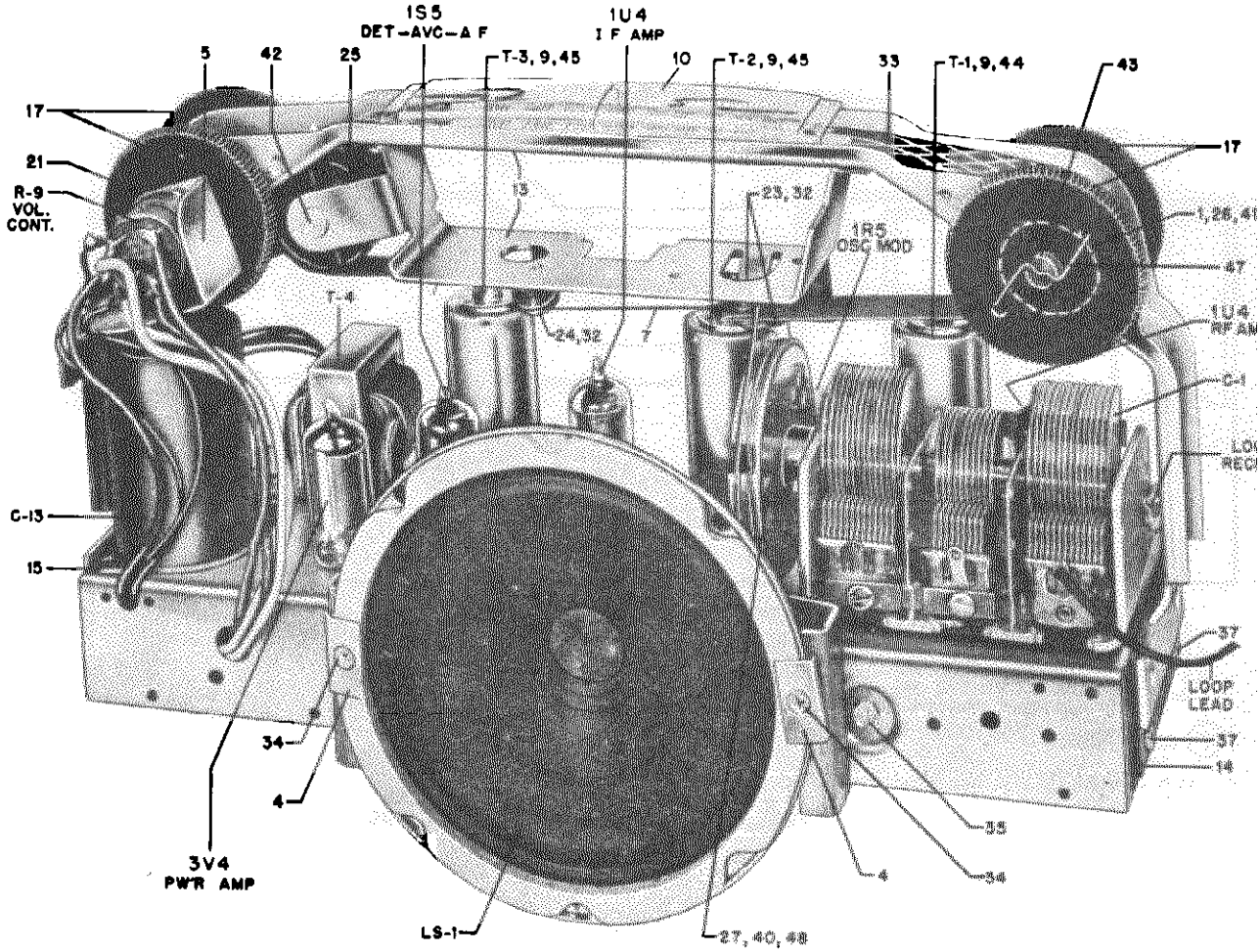
TL = TIE LUG

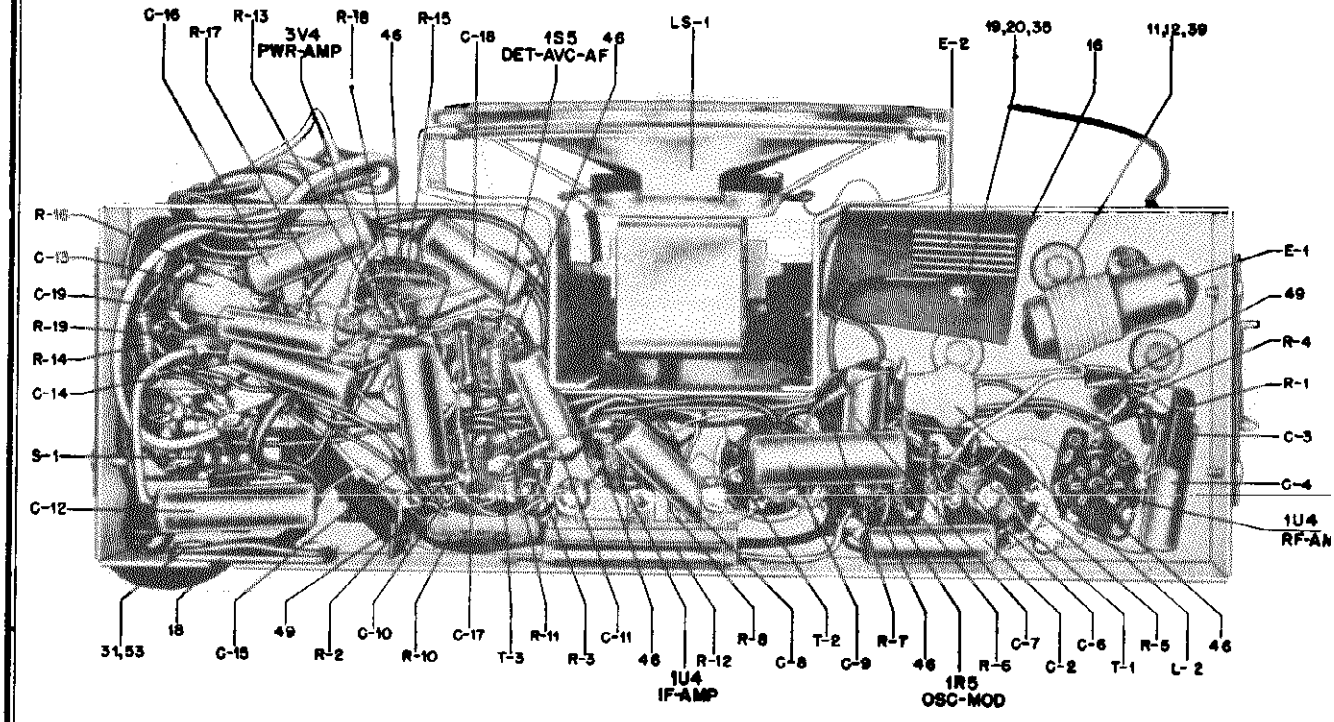
NC = NO CONNECTION

VOLTAGE & RESISTANCE DIAGRAM - AC OPERATED

MOTOROLA INC.

MODEL 68L11, CHASS
HS-119

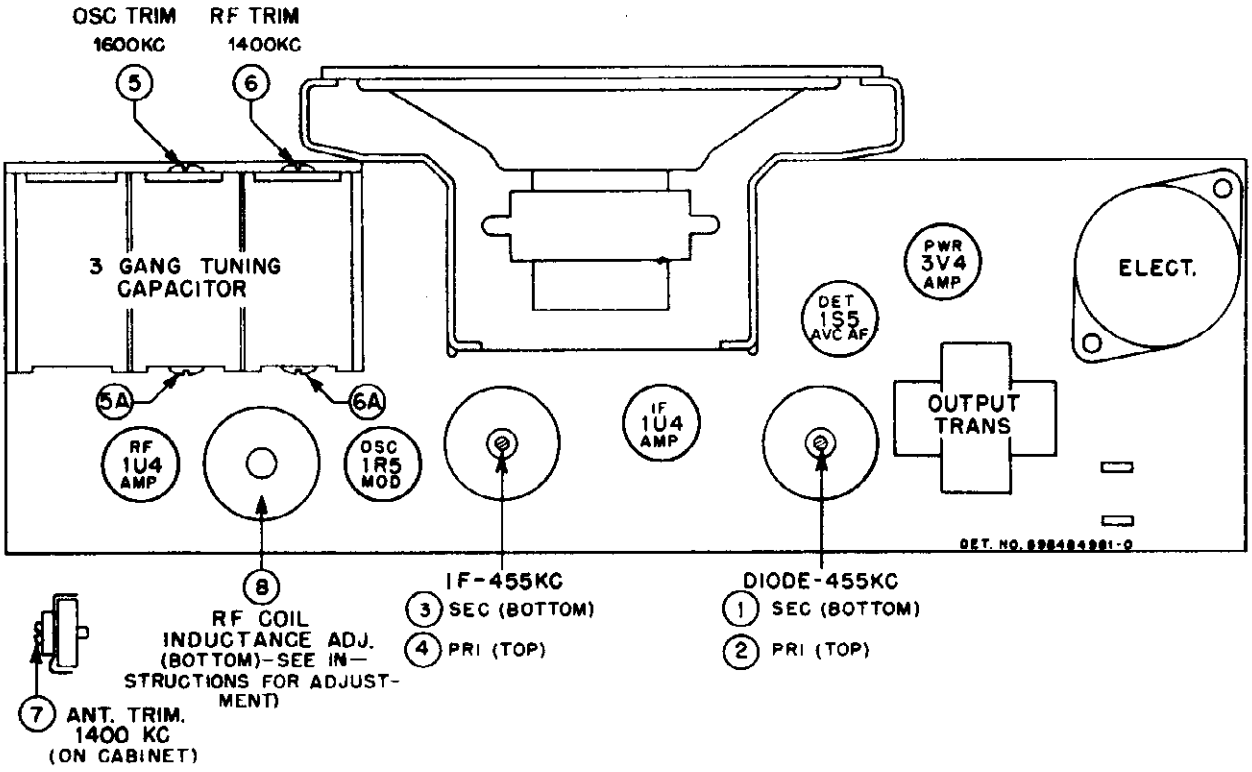




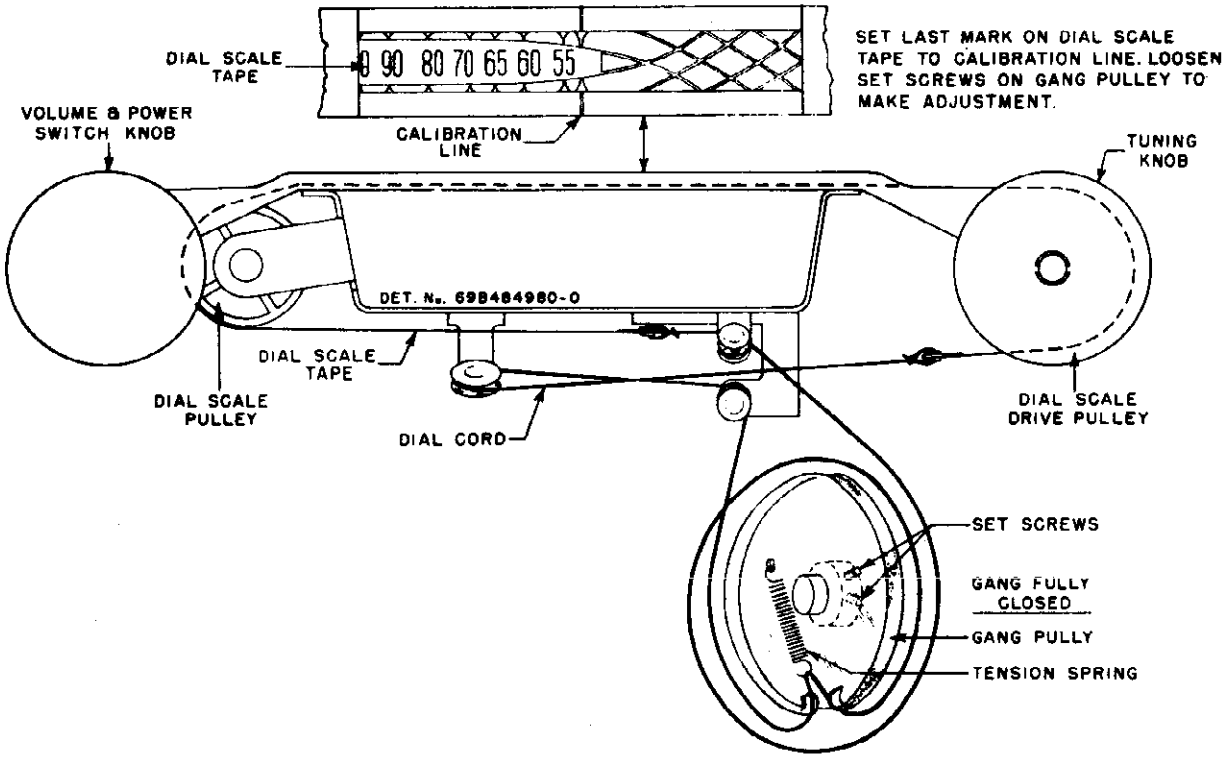
PARTS LOCATIONS - TOP & BOTTOM

MODEL 68L11, CHASSIS HS-119

MOTOROLA INC.

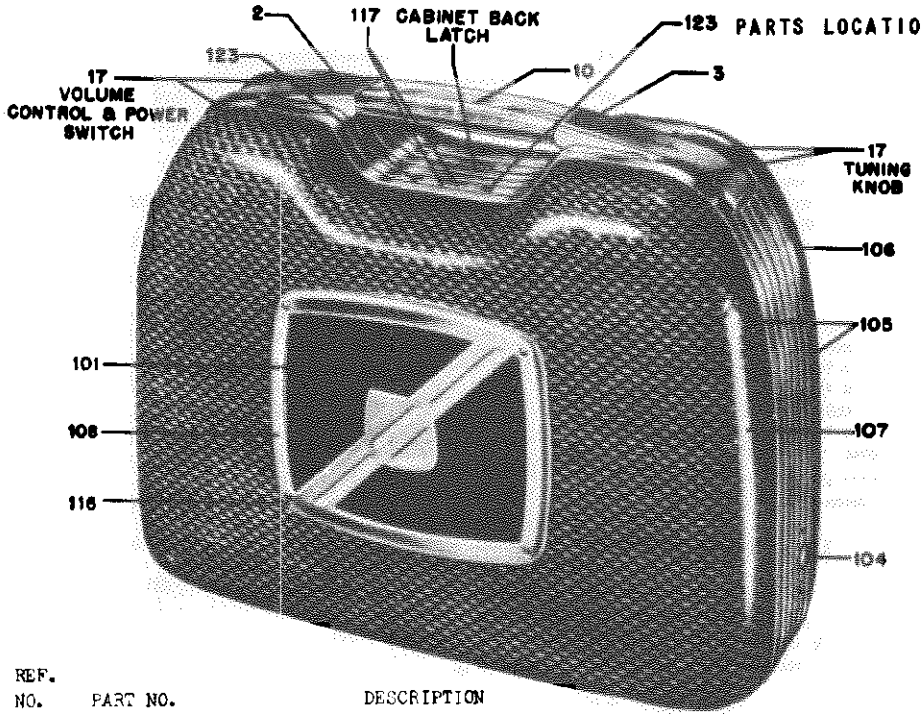


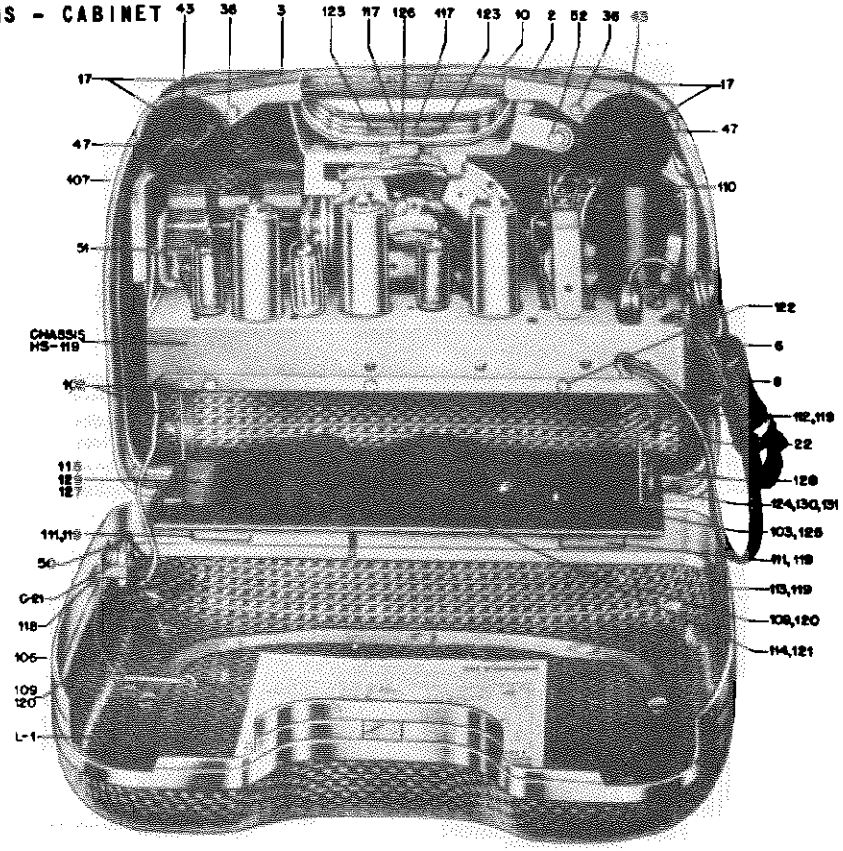
TUBE & ALIGNMENT ADJUSTMENT LOCATIONS



DIAL CORD RESTRINGING DETAIL

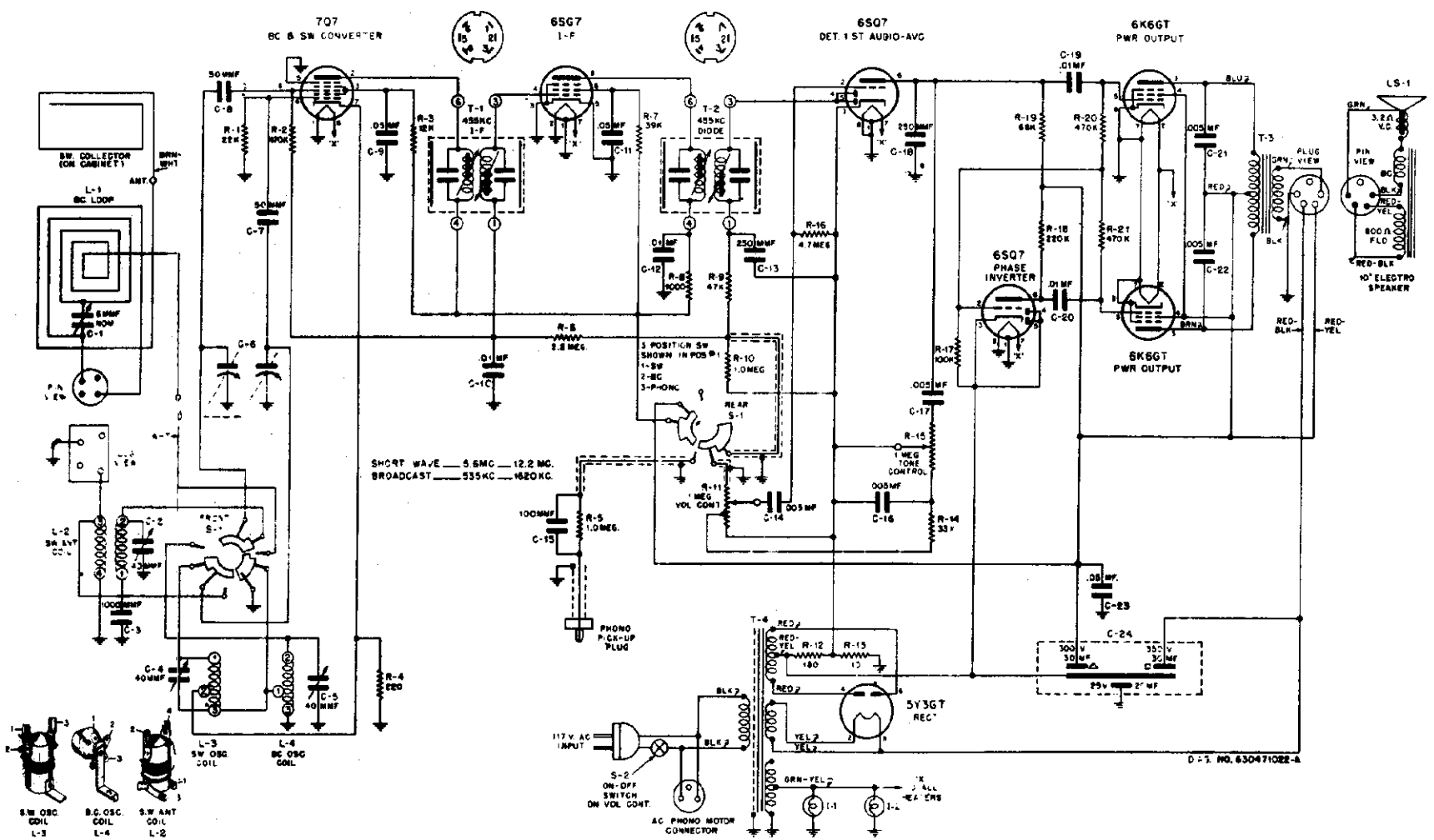
PARTS LOCATIONS - CABINET





REF. NO.	PART NO.	DESCRIPTION
CABINET PARTS		
101	16K481854	Baffle & Grille Cloth Assembly .....
102	1X480192	Bottom Cover, Bracket and Strap Assembly
103	38A480111	Button, battery strap .....
104	38K480170	Button, plug .....
105	16C480183	Cabinet, portable: complete .....
106	1X480191	Cabinet, back section: includes loop and trimmer .....
107	16X480186	Cabinet, front section: includes baffle, escutcheon and cloth .....
108	13C480189	Escutcheon, cabinet .....
109	37K480189	Foot, rubber .....
110	32B484259	Gasket, speaker: rubber .....
111	55K480188	Hinge; cabinet .....
112	14A482140	Insulator, cord outlet (cabinet front)..
113	14A482141	Insulator, cord retainer (cabinet back).
114	64B480188	Panel, cabinet bottom; fibre board .....
115	5S7771	Rivet: .088 x 3/16; steel; nkl pl. (stud & strap mtg) .....
116	5S6841	Rivet: .088 x 1/4; brass; nkl pl (escutcheon mtg) .....
118	5S1883	Rivet: .122 x 3/16; brass; nkl pl (trimmer mtg) .....
119	5S6842	Rivet: .140 x 7/32; steel; nkl pl (hinge & insulator mtg) .....
120	5S8484	Rivet: .140 x 1/4; steel; nkl pl (rubber foot mtg) .....
121	5S2840	Rivet: .140 x 3/8 steel; nkl pl (bottom panel mtg) .....
122	3S2695	Screw: #6 x 3/16 PKZ slotted hex head sheet metal screw; cad pl (chassis bottom cover assembly mtg) .....
123	3S486125	Screw: 6-32 x 3/8 Phillips flat head machine screw cad pl (chassis mtg) .....
124	3S3360	Screw: #8 x 1/2 PKZ plain hex head sheet metal screw cad pl (chassis mtg) .....
125	9A480110	Socket, battery strap .....
126	41A480158	Spring, cabinet latch .....
127	1X480194	Strap and Button Assembly .....

REF. NO.	PART NO.	DESCRIPTION
ELECTRICAL PARTS		
CAPACITORS		
C-1	19B480125	Variable: 3 gang
C-2	8S9805	Paper: .05 mf 100V
C-3	21R5641	Mica: 100 mmf 500V
C-4	8S9805	Paper: .05 mf 100V
C-5	21K77286	Mica: 3.3 mmf; part of T-1
C-6	21B77267	Molded: 1.5 mmf
C-7	8S9805	Paper: .05 mf 100V
C-8	8S9805	Paper: .05 mf 100V
C-9	8S9806	Paper: .1 mf 200V
C-10	21B77286	Ceramic: 100 mmf 500V
C-11	8S9813	Paper: .005 mf 600V
C-12	8S9816	Paper: .05 mf 400V
C-13	23K76985	Electrolytic: 40-40-20-80 mf/150-150-150-150-25V includes cover
C-14	8S9805	Paper: .05 mf 100V
C-15	8S9805	Paper: .05 mf 100V
C-16	8S9805	Paper: .05 mf 100V
C-17	21B77286	Ceramic: 100 mmf 500V
C-18	8S9813	Paper: .005 mf 600V
C-19	8S9824	Paper: .002 mf 400V
C-20	8S9824	Paper: .002 mf 400V
C-21	20A480185	Trimmer, mica: 4 mmf to 20 mmf
CAPACITOR-CHOKE		
E-1	1A77283	Capacitor and Choke Assembly: includes .15 mf 200V paper capacitor & coil
RECTIFIER		
A-2	48B478111	Selenium Rectifier: half-wave
COILS		
L-1	24C480184	Loop Antenna: winding only
L-2	24A76943	Oscillator coil
SPEAKER		
LS-1	50K480198	Speaker: 5"; PM
or	50C76953	Speaker: 5"; PM (used in early sets)
RESISTORS		
NOTE: All resistors are 1/2W, 20% carbon, insulated type unless otherwise specified.		
R-1	6R2118	3.3 meg 1/2W
R-2	6R3927	2.2 meg 1/2W
R-3	6R3965	5.6 meg 10% 1/2W
R-4	6R6004	1 meg 1/2W
R-5	6R6075	100,000 1/2W
R-6	6R3953	220 1/2W
R-7	6R6012	33,000 1/2W
R-8	6R5585	8.2 meg 10% 1/2W
R-9	18A480103	Volume Control: 1 meg; with power switch
R-10	17A76986	150 10% 2-1/2W; wirewound; coated
R-11	6R3987	6.8 meg 1/2W
R-12	17K75249	2060 5% 5W wirewound
R-13	6R2118	3.3 meg 1/2W
R-14	6R6269	820 10% 1/2W
R-15	6R6004	1 meg 1/2W
R-16	6R6015	220,000 1/2W
R-17	6R3927	2.2 meg 1/2W
R-18	6R2068	250 10% 1/2W
R-19	6R5672	500 10% 1/2W
SWITCH		
S-1	40A27114	Slider switch: 3 PDT
TRANSFORMERS		
T-1	24B76988	RF Broadcast: includes coupling capacitor (C-5) but less shield
T-2	24B76990	IF, 455 Kc: includes padding capacitors but less shield
T-3	24B77264	Diode, 455 Kc; includes padding capacitors but less shield
T-4	24B76982	Output Transformer
CHASSIS PARTS - MECHANICAL		
1	37K480147	Band, rubber (on scale tape drive pulley)
2	7B480132	Bracket, knob shaft: left side; marked "ON"
3	7K480133	Bracket, knob shaft: right side; marked "Motorola"
4	7A76939	Bracket, speaker mtg
5	7A480117	Bracket, volume control mtg
6	1X480178	Cable Assembly (battery): includes 9-pin plug
7	11M8944	Cord, dial: 18" black
8	30B20329	Cord, line: with plug 6 ft long
9	46A70023	Core, Iron & Screw (T-1, T-2, T-3 tuning)
10	61B480126	Crystal, dial
11	5A70098	Eyelet, spacer (gang mtg)
12	5A70404	Grommet, rubber (gang mtg)
13	1X480179	Handle and Idler Pulley Bracket Assembly: does not include dial, crystal, scale tape pullies, shafts or volume control mtg bracket; includes cord pullies & chassis insulators
14	14A482729	Insulator, bracket mtg
15	9A22056	Insulator, electrolytic mtg
16	14A470428	Insulator, rectifier: armite paper
17	36B480128	Knob, control
18	32A24815	Lock, line cord: fibre
19	4S7696	Lockwasher: #5 internal; cad pl (rectifier mtg)
20	2S7010	Nut: 5/40 x 1/4 hex; cad pl (rect. mtg).
21	2S7051	Nut: 3/8-32 x 9/16 hex; Palnut; cad pl (volume control mtg)
22	28K77272	Plug, 9 pin (battery connector)
23	49A12646	Pulley, cord: 7/32 groove
24	49A21741	Pulley, cord: 3/8 groove
25	49K480116	Pulley, scale tape: plain
26	49K480115	Pulley, scale tape: tapped for setscrew.
27	1X480174	Pulley and Bushing Assembly: less setscrews (gang drive)
28	5S7771	Rivet: .088 x 3/16 steel; nkl pl (tube socket mtg)
29	5S7707	Rivet: .122 x 5/32 steel; nkl pl (terminal strip mtg)
30	5S7701	Rivet: .122 x 3/16; steel; nkl pl (electrolytic insulator mtg and insulator bracket mtg)
31	5S7708	Rivet: .122 x 9/32; steel; nkl pl (line cord lock mtg)
32	5A71246	Rivet, shoulder: .187" long; nkl pl
33	34B480127	Scale, dial: flexible tape
34	3S2974	Screw: 4-40 x 5/16; Phillips head machine screw; cad pl (speaker mtg)
35	3S7311	Screw: 5-40 x 7/8 slotted hex head machine screw; cad pl (rectifier mtg)
36	3S2695	Screw: #6 x 3/16 PKZ plain hex head sheet metal screw; cad pl (slider switch mtg and knob shaft bracket mtg)
37	4S3376	Screw: #6 x 1/4 PKZ slotted hex head sheet metal screw; cad pl (handle assembly mtg & volume control bracket mtg)
38	3S7506	Screw: #6 x 1/4 PKZ plain hex head sheet metal screw steel; cad pl (osc coil mtg)
39	3S2294	Screw: 6-32 x 1/2 plain hex head binding type machine screw; cad pl (gang)
40	3S7113	Setscrew: 8-32 x 1/4 slab head machine screw; (gang pulley mtg)
41	3S2654	Setscrew: 8-32 x 3/8 Allenhead; cad pl (scale tape pulley retainer)
42	47A480113	Shaft, idler pulley
43	47A480124	Shaft, volume and tuning
44	2B70107	Shield, coil (for T-1)
45	1A71049	Shield and Sleeve Assembly (for T-2 & T-3)
46	9A472534	Socket, tube: miniature 7-prong
47	41A480151	Spring, knob retainer
48	41A14244	Spring, tension coil (dial drive)
49	31A84796	Strip, terminal: 2 insulated lugs, #1 mtg
50	29R5419	Terminal, plain pin: small
51	29A5400	Terminal, plain pin: large
52	4K24124	Washer "C": shaft retainer
53	4S1719	Washer: 3/8 x .140 x .030 (line cord lock mtg)



TYPE - 7 tube combination AM radio-phonograph with loop antenna.

TUBE COMPLEMENT - 7Q7 BC and SW Converter, 6SG7 IF Amplifier, 6SQ7 Det-AVC-1st audio. 6SQ7 Phase Inverter, (2) 6K6GT Power Output and 5Y3GT Rectifier.

POWER SUPPLY - 117 Volts - AC, 60 cycles; 110 watts.

TUNING RANGE - 2 Bands BC 535-1620 Kc. **IF FREQUENCY** - 455 Kc
SW 5.6-12.2 Mc.

MODEL 75F21, CHASSIS HS-91 MOTOROLA INC.

ALIGNMENT

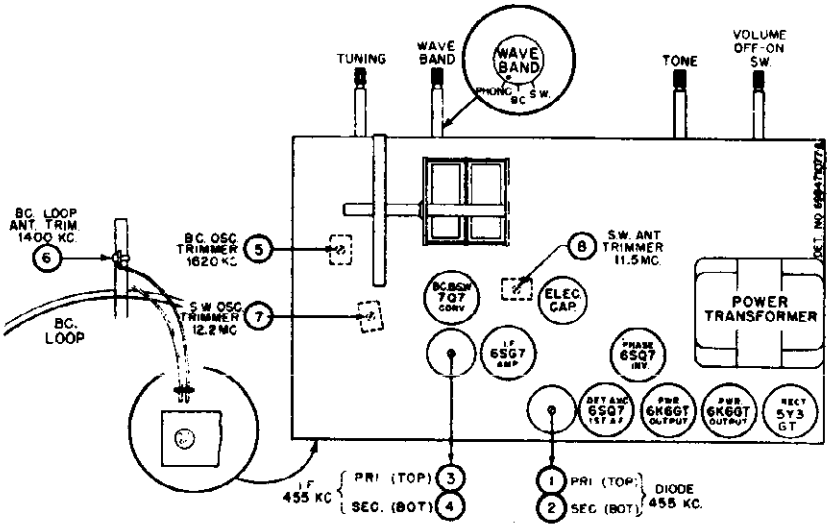
Refer to Figure 2 for location of adjustment trimmers and cores. Connect a low range output meter across speaker voice coil. Volume control should be set at maximum for all operations.

The signal generator used, should possess good frequency stability and should be of the modulated type. For greatest accuracy, keep the receiver output at approximately 50 milliwatts (.38V on output meter) during alignment. Vary signal generator output (not receiver volume control) to maintain this output during alignment.

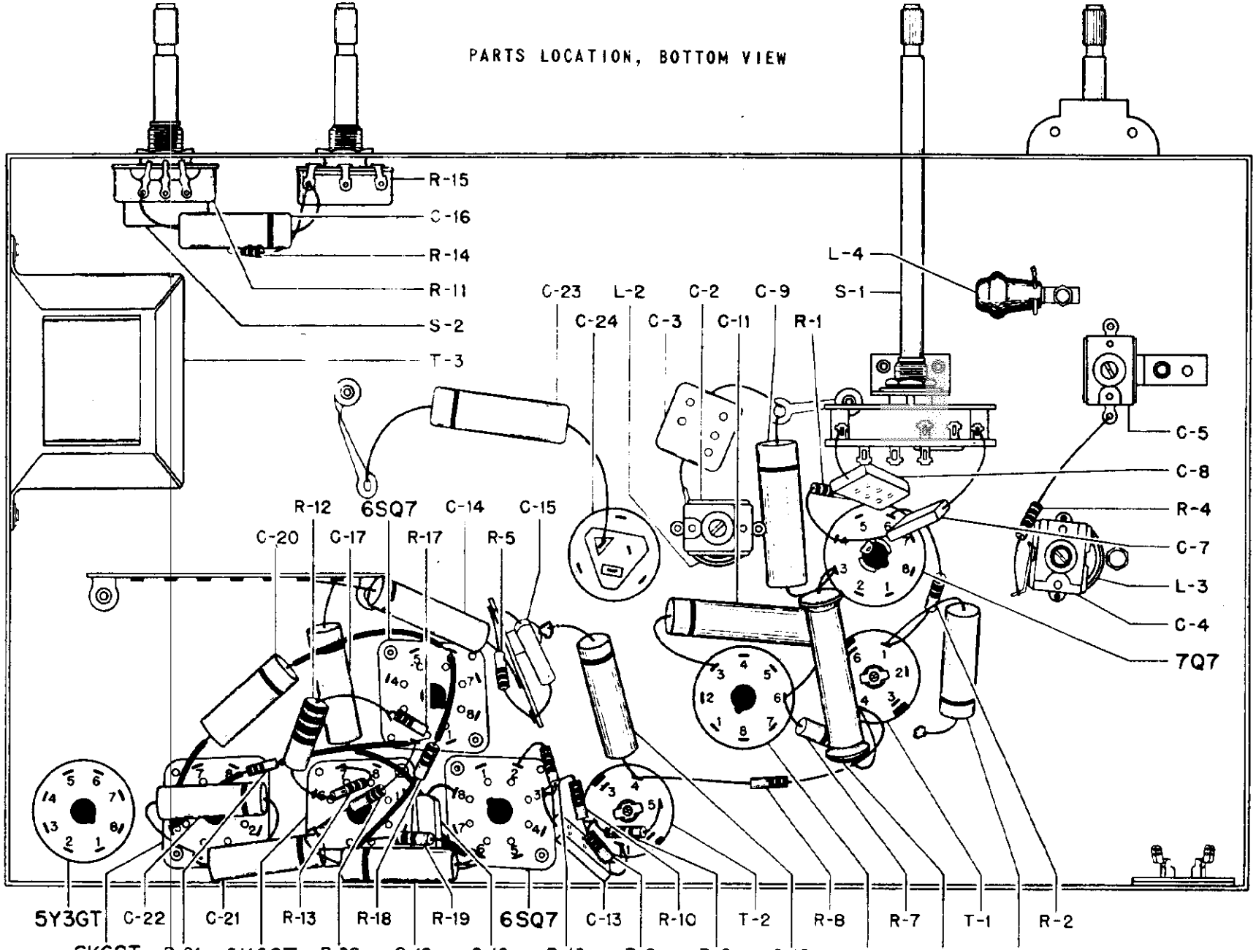
Step	Gang Setting	Band	Dummy	Generator Connected to	Generator Frequency	Trimmer or Core	Remarks
1	Fully opened	B.C	.1mf	Conv. grid & chassis.	455 kc	1, 2, 3, &4	Adjust I.F. & Diode trans. for maximum
2	Fully opened	B.C	-	Radiation loop*	1620 kc	5	This sets osc. to dial scale.
3	1400 KC	B.C	-	Radiation loop*	1400 kc	6 ‡	Tune signal generator for max. on output meter, then peak trimmer.
4	12.2 MC	SW	50mmf	Short wave antenna terminal	12.2 Mc	7	This sets oscillator to dial scale.
5	11.5 MC	SW	50mmf	Short wave antenna terminal	11.5 Mc	8	Tune signal generator for max. on output meter, then peak trimmer.

‡ Repeak after chassis and loop are installed in cabinet.

* Connect output of signal generator to a 5" diameter, 3 turn loop. With volume on full, bring loop close enough to receiver until output of 50 milliwatts is obtained. (.38V on output meter). Vary distance between generator and receiver loops to maintain this output during alignment. Minimum distance between loops should never be less than 12".



TUBE & TRIMMER LOCATIONS


PARTS LOCATION, BOTTOM VIEW
R-15
C-16
R-14
R-11
S-2
T-3
L-4
S-1
C-23
L-2
C-2
C-9
C-24
C-3
C-11
R-1
C-5
C-8
R-4
C-7
L-3
C-4
7Q7
R-12
6SQ7
C-14
C-15
C-20
C-17
R-17
R-5
5Y3GT
C-22
C-21
R-13
R-18
R-19
6SQ7
C-13
R-10
T-2
R-8
R-7
T-1
R-2

MODEL 75F21, CHASSIS HS-91

MOTOROLA INC.

NOTE: ALL MEASUREMENTS MADE WITH A V.T.V.M.

MEASUREMENTS ARE MADE FROM TUBE BASE PIN TERMINALS TO CHASSIS.

RESISTANCE MEASUREMENTS ± 20%.

VOLTAGE MEASUREMENTS ± 10%.

K = 1000 (ONE THOUSAND) OHMS.

BAND SWITCH IN B.C. POSITION.

VOLUME CONTROL & TONE CONTROL FULLY TO RIGHT.

* = RESISTANCE WILL VARY DUE TO ELECTROLYTIC CAPACITOR IN CIRCUIT.

▭ = RESISTANCE MEASUREMENTS.

◡ = VOLTAGE MEASUREMENTS.

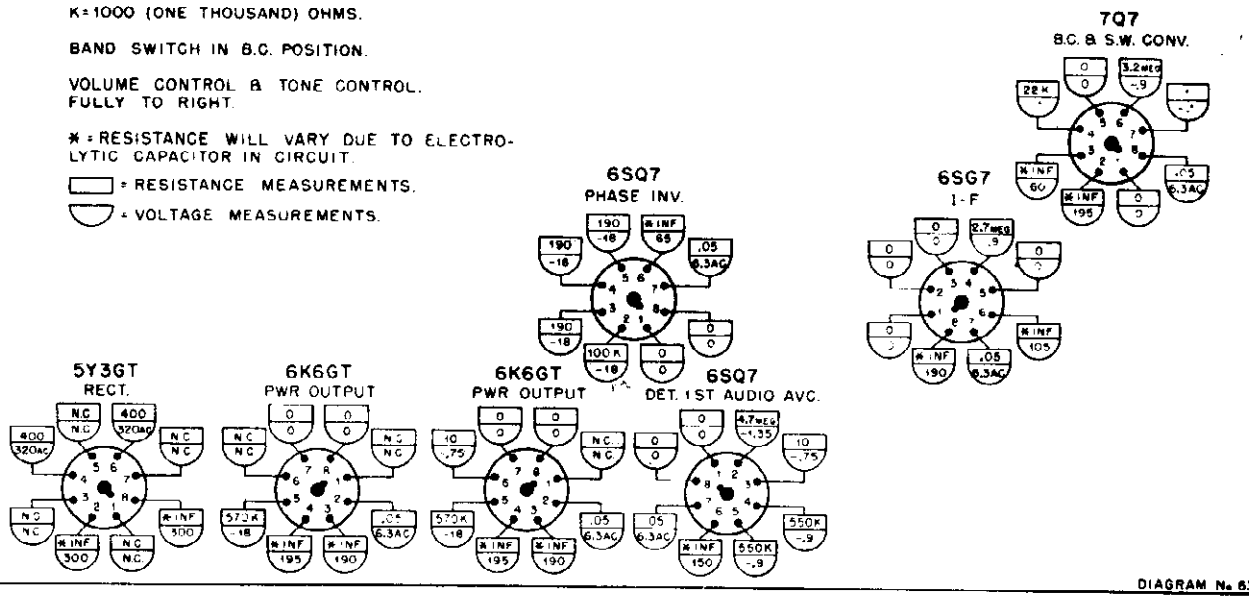
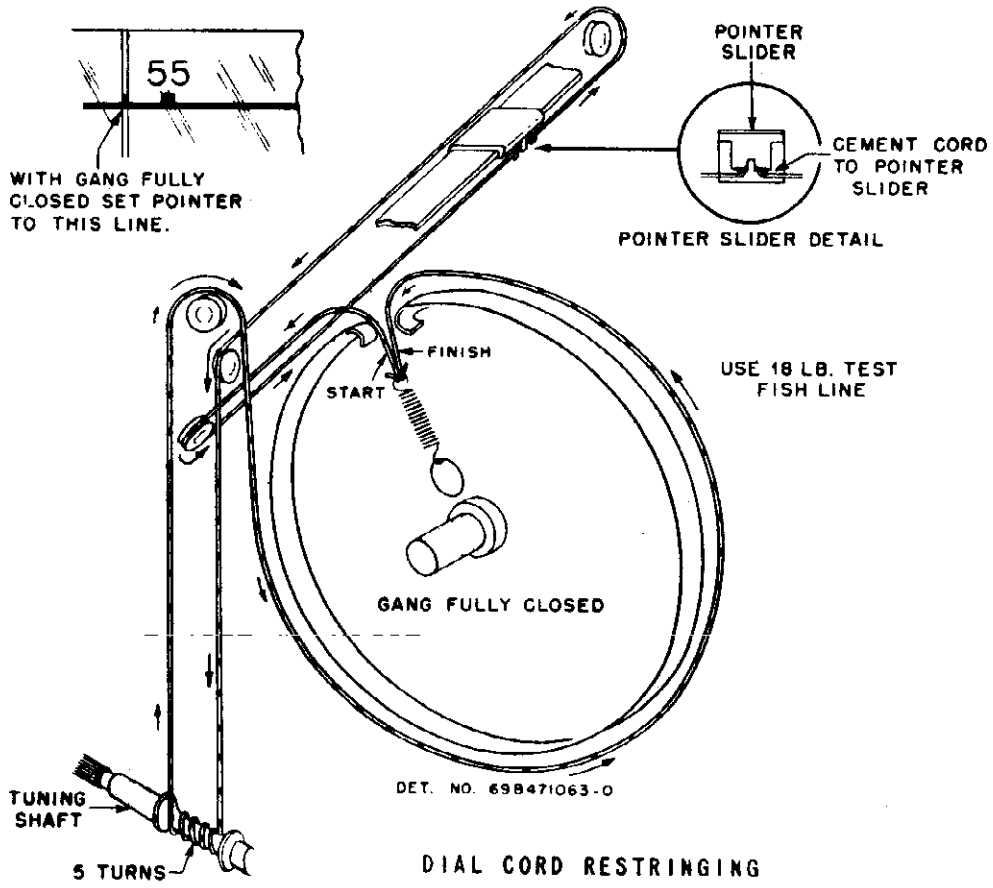


DIAGRAM No. 63C471069-0

VOLTAGE & RESISTANCE DIAGRAM



DIAL CORD RESTRINGING

ELECTRICAL PARTS

REF. NO.	PART NO.	DESCRIPTION
CAPACITORS		
C-1	20A71226	Mica trimmer: 2-12 mmf
C-2	20A71141	Mica trimmer: 10-80 mmf
C-3	21R2724	Mica: 1000 mmf 5% 300V
C-4	20A71141	Mica trimmer: 10-80 mmf
C-5	20A75234	Mica trimmer: 10-80 mmf
C-6	19B72560	Variable: 2 gang
C-7	21R6642	Mica: 50 mmf 500V
C-8	21R6642	Mica: 50 mmf 500V
C-9	8S9816	Paper: .05 mf 400V
C-10	8S9801	Paper: .01 mf 100V
C-11	8S9816	Paper: .05 mf 400V
C-12	8S9809	Paper: .01 mf 400V
C-13	21R6648	Mica: 250 mmf 500V
C-14	9S9813	Paper: .005 mf 600V
C-15	21R6641	Mica: 100 mmf 500V
C-16	8S9813	Paper: .005 mf 600V
C-17	8S9813	Paper: .005 mf 600V
C-18	21R6648	Mica: 250 mmf 500V
C-19	8S9809	Paper: .01 mf 400V
C-20	8S9809	Paper: .01 mf 400V
C-21	8S9813	Paper: .005 mf 600V
C-22	8S9813	Paper: .005 mf 600V
C-23	8S9816	Paper: .05 mf 400V
C-24	23A27718	Electrolytic: 30-30-20 mf 350-300-25V
DIAL LIGHTS		
I-1 & I-2	85X11854	6-8V; tubular bayonet base; #47
COILS		
L-1	24C75532	Loop Antenna: includes trimmer and lead assembly
L-2	24B74822	S.W. Antenna
L-3	24A74820	S.W. Oscillator
L-4	24A84821	B.C. Oscillator: includes mounting bracket
RESISTORS		
Note:	All resistors are fixed insulated carbon type with 20% tolerance unless otherwise specified.	
R-1	6R6028	22,000 1/2W
R-2	6R6032	470,000 1/2W
R-3	6R3967	12,000 10% 3W N.I.
R-4	6R6270	220 10% 1/2W
R-5	6R6004	1 meg 1/2W
R-6	6R6433	2.2 meg 10% 1/2W
R-7	6R5588	39,000 10% 1W
R-8	6R6301	1000 1/2W
R-9	6R6056	47,000 1/2W
R-10	6R6046	1 meg 10% 1/2W
R-11	18K74891	Volume control: carbon; 1 meg; with SPST switch; tapped at 300,000 ohms
R-12	6R3966	180 10% 2W
R-13	6R5621	10 10% 1/2W
R-14	6R6410	33,000 10% 1/2W
R-15	18K77399	Tone Control: carbon; 1 meg
R-16	6R6446	4.7 meg 10% 1/2W
R-17	6R6075	100,000 1/2W
R-18	6R6016	220,000 1/2W
R-19	6R6001	68,000 1/2W
R-20	6R6032	470,000 1/2W
R-21	6R6032	470,000 1/2W
SWITCHES		
S-1	40B74864	Bandswitch: 3 position
S-2	-	ON-OFF (part of volume control)
TRANSFORMERS		
T-1	24B75487	IF: 455 Kc; complete with cores and padding capacitors but less shield
T-2	24B70657	Diode: 455 Kc; complete with cores and padding capacitors but less shield
T-3	25K74706	Output
T-4	25C75489	Power
SPEAKERS		
LS-1	50B72379	Electrodynamic: 10"; 1275 ohm field; 3.2 ohm v.c.

MECHANICAL PARTS

REF. NO.	PART NO.	DESCRIPTION
CHASSIS PARTS		
	11M8944	Cord dial: 18 lb. black
	30K21859	Cord line: 9 ft. long; with plug
	1X77397	Dial Bracket & Slider Assembly; complete includes dial brackets, pullies, pulley mounting brackets, slider rail and pointer slider (does not include dial scale and pointer)
	37K15125	Grommet, rubber, gang cushion
	1X76402	Lead Assembly, phono-pick-up; includes 1 pin plug; 42" long
	1X76404	Lead Assembly, speaker: includes receptacle
	32A24815	Lock, line cord: fibre
	9A12706	Plate, electrolytic capacitor mtg; bakelite
	28K71775	Plug, 1 pin (on phono pick-up lead)
	28K19871	Plug, 4 pin (antenna loop)
	52A71280	Pointer, dial
	49A23960	Pulley, cord: 1/4" groove (cord guide)
	49A21741	Pulley, cord: 5/8" groove (cord guide)
	9A30680	Receptacle: 3 prong (on phono-motor lead)
	9K28049	Receptacle, 4 prong: bakelite (loop antenna receptacle
	1X76352	Shaft Assembly, tuning
	1A71049	Shield & Iron Core Sleeve Assembly: (for IF and Diode transformers)
	9A74416	Socket, pilot light; with mtg. bracket
	9A6788	Socket, tube; octal; plain
	9A70165	Socket, tube: octal; shielded type
	9A70519	Socket, tube: loctal
	41A21332	Spring, tension coil (pointer cord)
	32A27678	Strip, shaft bearing: fibre (for band-switch shaft)
	31A14655	Strip, terminal: 3 insulated lugs; #3 mtg.
	31A75233	Strip, terminal: 7 insulated lugs; #1 & #9 mtg.
	9K14906	Wafer, insulating: armite (electrolytic capacitor insulating)
MISCELLANEOUS CHASSIS HARDWARE		
	5A12105	Eyelet, gang assembly mtg.
	4S7855	Lockwasher: 3/8" internal; cadmium plated (band switch mounting)
	2S1376	Nut: 3/8-32 x 1/2" hex; cadmium plated (band switch mounting)
	2S7051	Nut: 3/8-32 x 9/16" hex Palnut; cadmium plated (volume & tone control mtg)
	5A12814	Rivet, shoulder: 5/32" long; nickel plated (cord pulley mtg)
	3S7481	Screw: #8 x 3/4 PKZ slotted hex head; cadmium plated (gang assem. mtg)
CHASSIS MOUNTING PARTS		
	5A71092	Grommet, rubber: 5/8 x 3/4" diam. (chassis cushion)
	5A71130	Grommet, rubber (chassis retainer)
	5A70098	Eyelet: 25/64 x 7/32 I.D. x 1/2 diameter head
	3S3359	Screw: #8 x 1-5/8 PKA slotted hex head sheet metal screw; cadmium plated
CABINET PARTS		
	16F75821	Cabinet, phono-radio console
	35K72310	Cloth, grille
	1X72769	Dial Scale Assembly: dial scale complete with dial light housings and light shields
	15A72344	Cover, dial light housing
	60A71259	Housing, dial light; plastic
	32A74491	Gasket, light shield; rubber
	5A72771	Grommet, light shield: 1-1/8 O.D. x 3/4" I.D. x 3/8 thk
	42A71258	Ring, light housing retainer: steel
	34C75470	Scale, dial
	15B77386	Cover, push button escutcheon
	13C72362	Escutcheon, dial (lower) plastic
	13B72361	Escutcheon, dial (upper) plastic
	3S1312	Screw: #4 x 1-1/4 Phillips oval head wood screw; bronze finish (escutcheon mtg)
	55A72306	Handle, drawer
	56B72313	Hinge & Stop Combination (phono drawer)
	1X76447	Knob, control: plain
	1X76448	Knob, control: branded
	56X31506	Track, drawer
RECORD CHANGER MOUNTING PARTS		
	36A22210	Button, plug: 3/8"; bronze finish
	3S7396	Screw: 10/32 x 2" slotted hex head machine screw; copper plated
	41A21807	Spring, cushion (bottom)
	41A28190	Spring, cushion (top)
	4S7611	Washer: 1/2 x 7/32 x .048 thick

MODELS 75F31, 75F31A, 75F31B, 76F31, CHASSIS HS-36, HS-36A, HS-98

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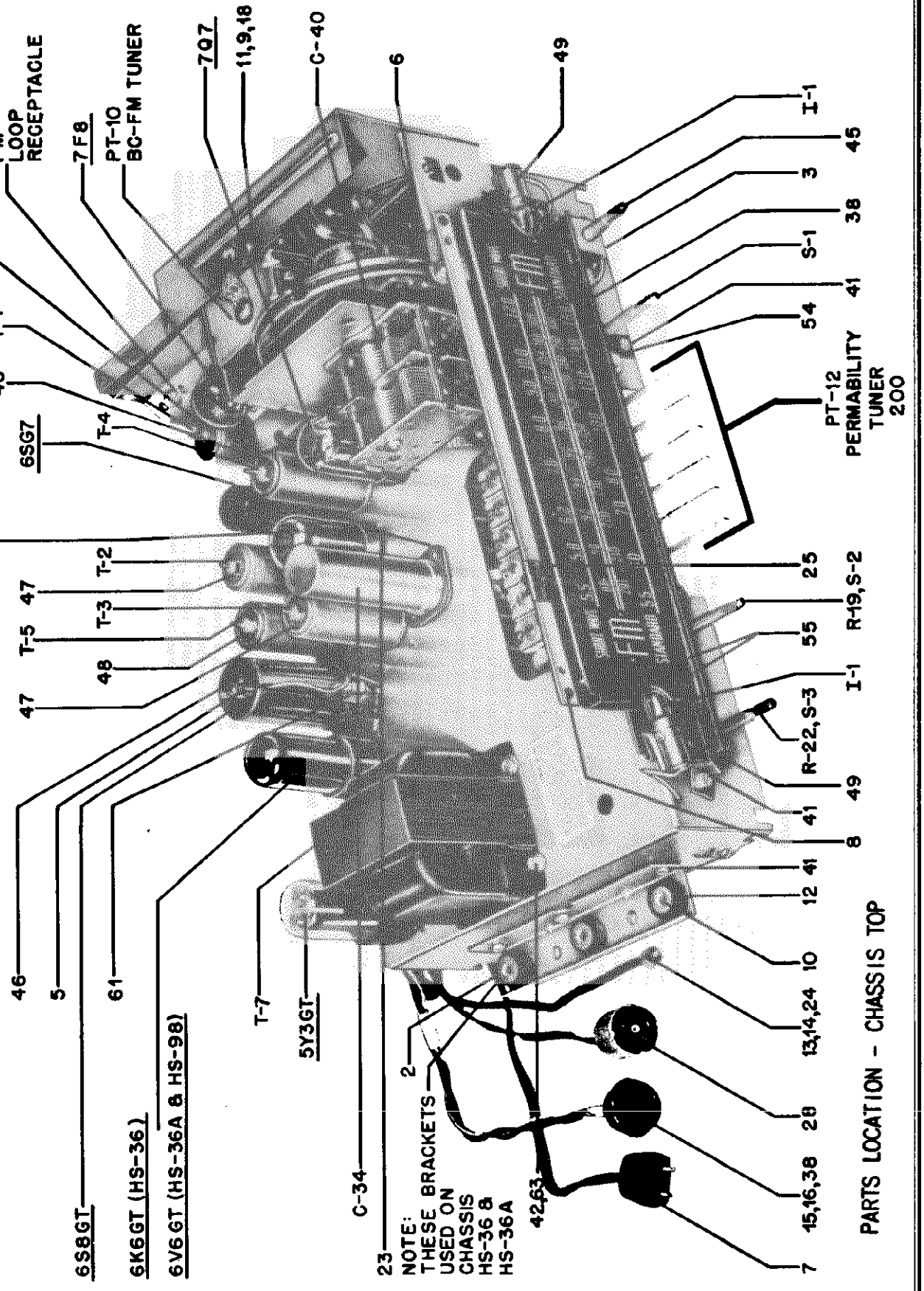
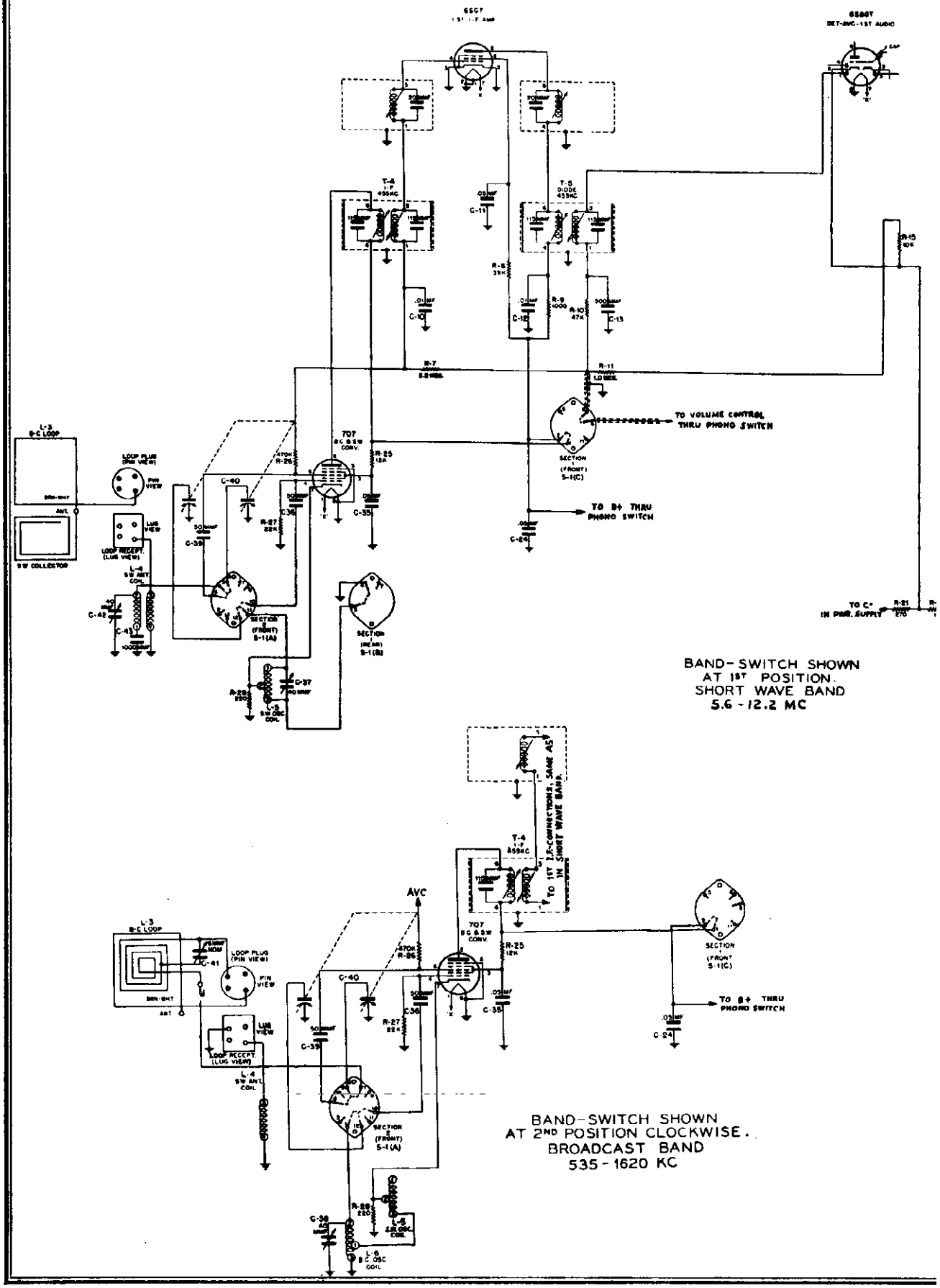
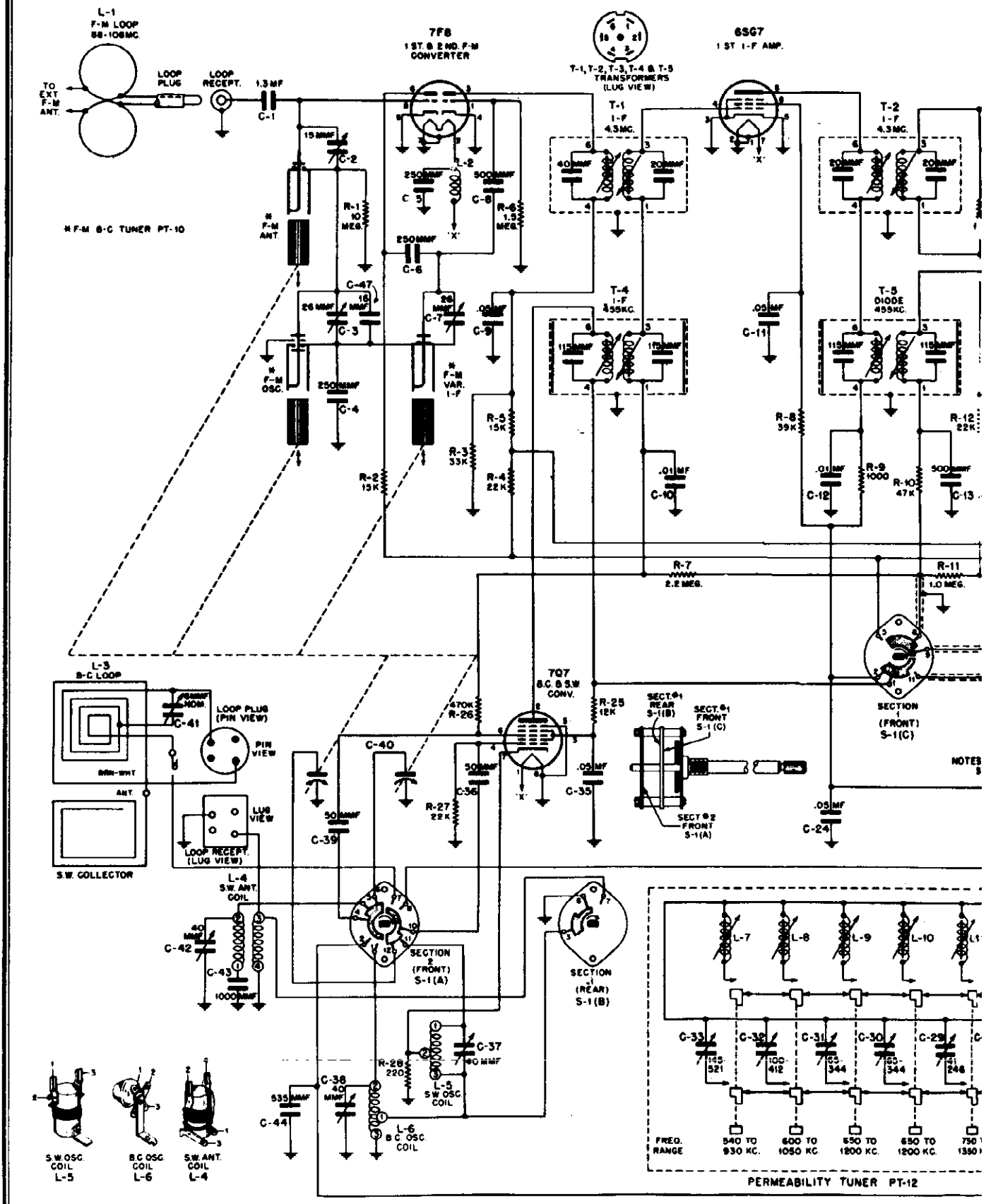


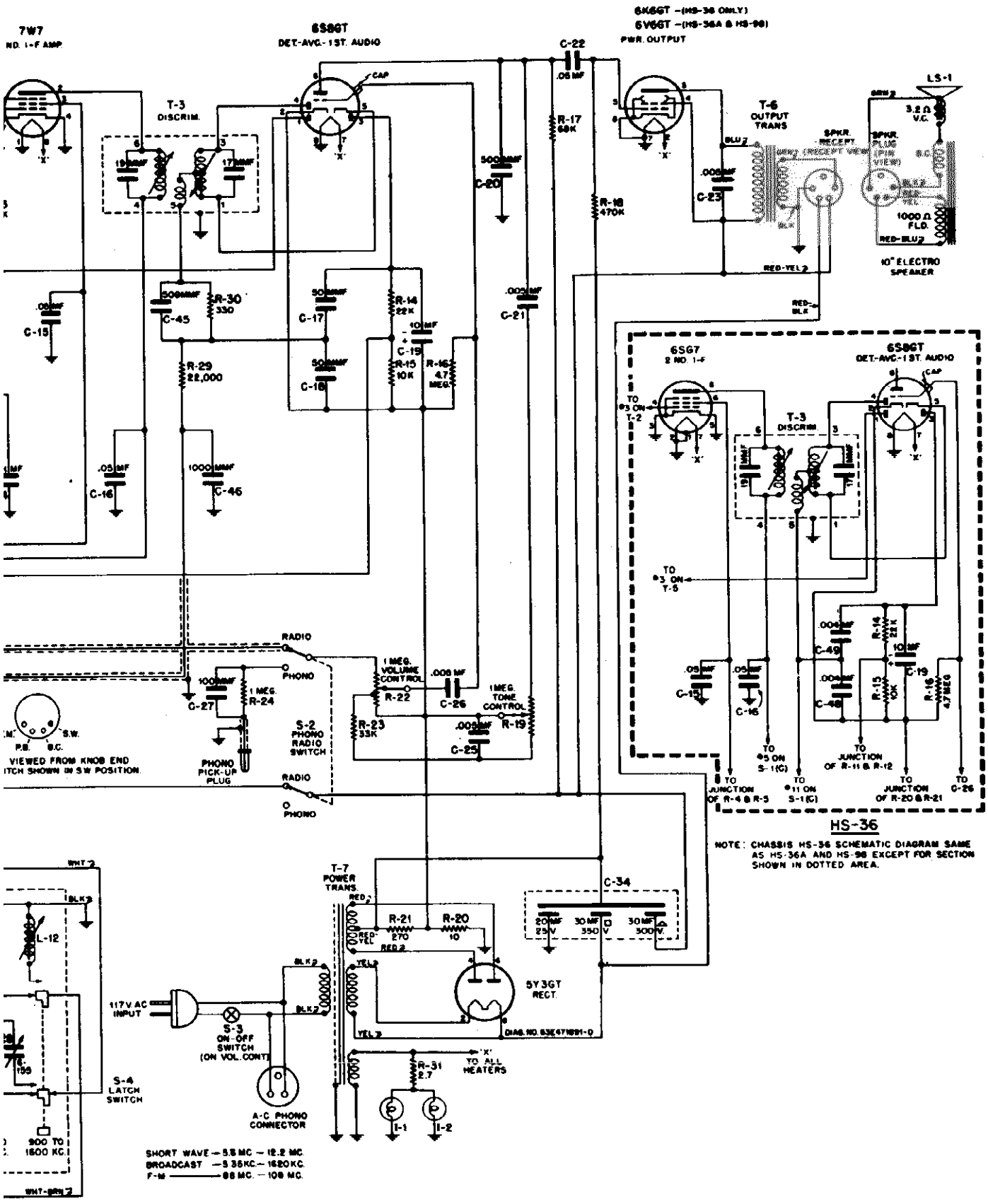
MOTOROLA INC. MODELS 75F31, 75F31A, 75F3
76F31, CHASSIS HS-36, HS-3
HS-98




L-1
F-M LOOP
88-108MC.
TO EXT. F-M ANT.
LOOP PLUG
LOOP RECEPT.
1.3 MF
C-1
7F8
1ST. & 2ND. F-M CONVERTER
T-1, T-2, T-3, T-4 & T-5 TRANSFORMERS (LUG VIEW)
6SG7
1ST I-F AMP.
T-1 I-F 4.3MC.
T-2 I-F 4.3MC.
T-4 I-F 455KC.
T-5 DIODE 455KC.
15 MMF C-2
L-2
250MMF C-5
500MMF C-8
R-1 10 MEG.
R-6 1.5 MEG.
250MMF C-6
C-47 15
C-3 25 MMF
C-7 25 MMF
.05MF C-9
C-11 .05MF
R-5 15K
R-3 33K
R-4 22K
R-2 15K
.01MF C-10
R-8 39K
R-12 22K
.01MF C-12
R-9 1000
R-10 47K
500MMF C-13
R-7 2.2 MEG.
R-11 1.0 MEG.
SECTION 1 (FRONT) S-1(C)
L-3 B-C LOOP
LOOP PLUG (PIN VIEW)
PIN VIEW
C-41 NOM.
BRN-WHT
ANT.
S.W. COLLECTOR
LUG VIEW
LOOP RECEPT. (LUG VIEW)
7Q7 B.C. & S.W. CONV.
470K R-26
R-25 12K
C-40
50MMF C-39
50MMF C-36
R-27 22K
.05MF C-35
SECT.#1 REAR S-1(B)
SECT.#1 FRONT S-1(C)
SECT.#2 FRONT S-1(A)
.05MF C-24
L-4 S.W. ANT. COIL
40 MMF C-42
C-43 1000MMF
SECTION 2 (FRONT) S-1(A)
SECTION 1 (REAR) S-1(B)
C-37 140 MMF
R-28 220
C-38 40 MMF
535MMF C-44
L-5 S.W. OSC. COIL
L-6 B.C. OSC. COIL
S.W. OSC. COIL L-5
B.C. OSC. COIL L-6
S.W. ANT. COIL L-4
L-7
L-8
L-9
L-10
C-33 145 521
C-32 100 412
C-31 65 344
C-30 60 344
C-29 41 246
FREQ. RANGE
540 TO 930 KC.
600 TO 1050 KC.
650 TO 1200 KC.
650 TO 1200 KC.
PERMEABILITY TUNER PT-12

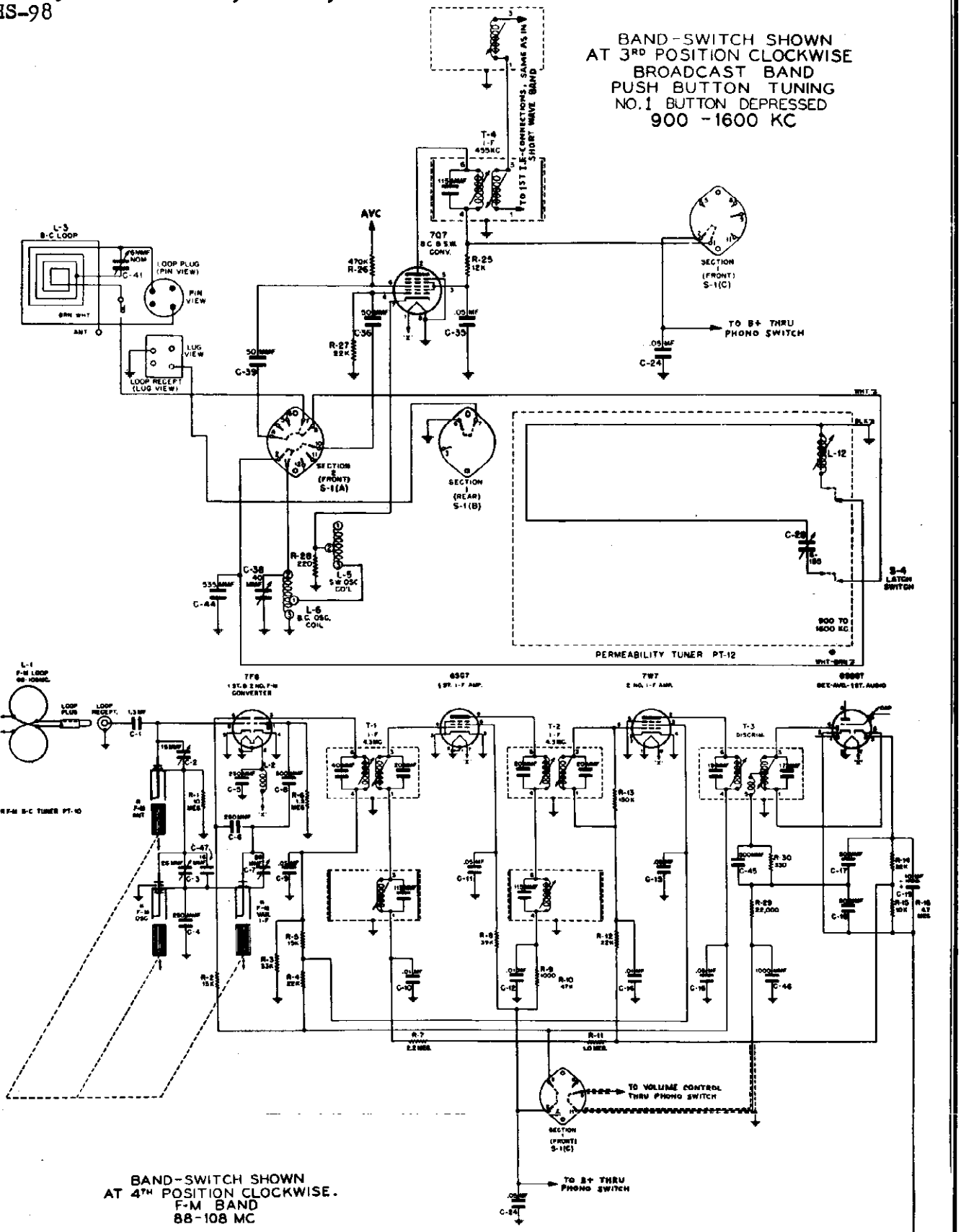
ROLA INC.

MODELS 75F31, 75F31A, 75F31B, 76F31, CHASSIS HS-36, HS-36A, HS-98



MODELS 75F31, 75F31A, 75F31B, 76F31, CHASSIS HS-36, HS-36A, HS-98

MOTOROLA INC.



MOTOROLA INC. MODELS 75F31, 75F31A, 75F31
76F31, CHASSIS HS-36, HS-36
HS-98

ALIGNMENT PROCEDURE WHEN USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

STEP **OPERATION**

455 Kc IF Channel Alignment

1. Same as step 1 in Chart I (Use AM signal generator)

Broadcast Band Alignment

2. Same as steps 2 & 3 in Chart I (Use AM signal generator)

SW Band Alignment

3. Same as steps 4 & 5 in Chart I (Use AM signal generator)

4.3 Mc IF Channel Alignment Using FM Signal Generator & Oscilloscope

4. (A) Discriminator -

   1. Connect the input terminals of the oscilloscope vertical amplifier to the high side of the re ceiver volume control and the chassis.

   2. Connect the FM generator synchronizing voltage output terminals to a phase shifting network consisting of a variable 1/2 megohm resistor in series with a .002 mf capacitor. The input t the oscilloscope horizontal amplifier is connected across the .002 mf capacitor. See Figure 9 (This phase shifting network may not work with every oscilloscope. Different values of R & may be required).

   3. Apply an FM 4.3 Mc signal (125 Kc deviation) through a .01 mf capacitor to the control gr (pin #4) of the 7W7 tube in the second IF amplifier stage.

   4. Screw discriminator secondary core (9) out as far as it will go.

   5. Adjust discriminator primary until the pattern obtained on the scope is symmetrical about th vertical axis. The phase shifting network resistor is adjusted to give only one trace. Th pattern obtained is the resonance curve of the primary, whose maximum response should be a exactly 4.3 Mc. (See Figure 10).

   6. Adjust discriminator secondary until a symmetrical pattern is obtained, with peaks occurrin at about 100 Kc above and below 4.3 Mc and is substantially linear between peaks. The trac should pass through the intersection of the vertical and horizontal axis. The phase shiftin network should be adjusted to give only a single pattern at all times. (See Figure 11).

(B) 4.3 Mc IF Amplifiers -

   1. Apply an FM 4.3 signal (100 Kc deviation) to the control grid (pin #4) of the 6SG7 tube in th 1st IF amplifier stage, through a .001 mf capacitor and adjust both primary and secondar cores (11 & 12) to get a symmetrical pattern as before, with peaks occurring at a slightl lower deviation.

   2. Apply an FM 4.3 signal (100 Kc deviation) to the control grid (pin #1) of the 7F8 tube, an adjust both primary and secondary cores (13 & 14) until a symmetrical pattern substantiall linear between peaks, is obtained.

FM Band Alignment

5. Check the position of the FM oscillator tuning core (18). Set the spacing between the core and the ba lite piece to which it is mounted, to 1/32" by turning tuning core slotted nut.

MODELS 75F31, 75F31A, 75F31B, 76F31, CHASSIS HS-36, HS-36A, HS-98 MOTOROLA INC.

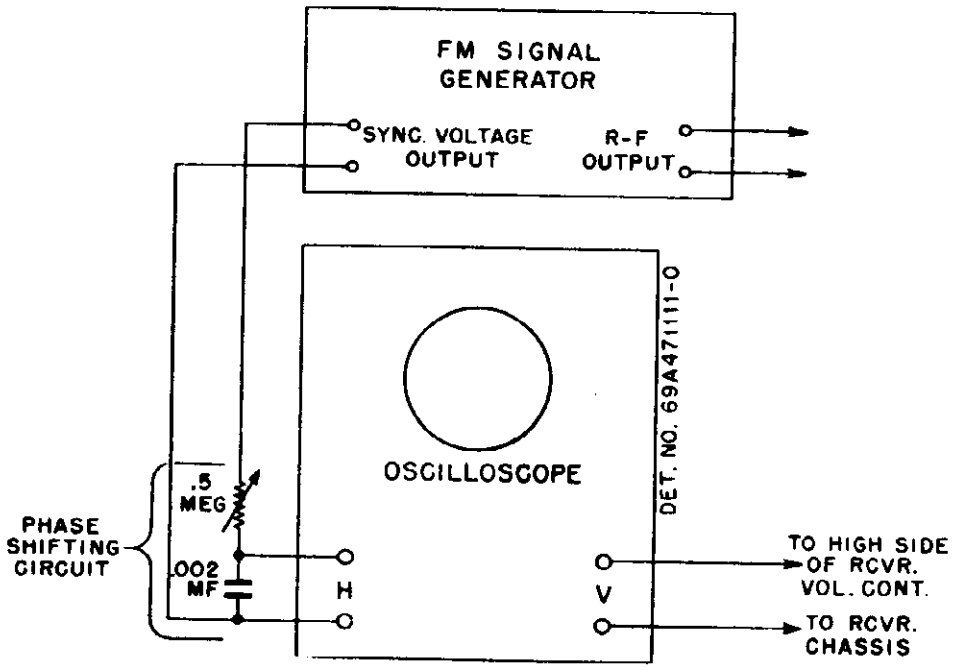
6. Remove the FM loop and connect generator output directly to the receiver FM loop receptacle.

7. Set receiver dial to 90 Mc and also FM signal generator to 90 Mc. (22-1/2 Kc deviation). Adjust FM oscillator, antenna and variable IF trimmers (15, 16 & 17) for maximum indication on output meter. (Output meter should be connected across speaker voice coil).

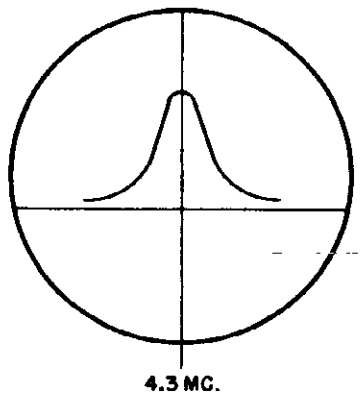
8. Set receiver dial to 105 Mc and also FM signal generator to 105 Mc (22-1/2 Kc deviation). Adjust FM oscillator, antenna and variable IF Cores (18, 19 & 20) for maximum indication on output meter.

9. Repeat steps 7 & 8 several times until further adjustment does not increase the output. Make the final trimmer adjustment at 105 Mc. (i.e. trimmers 15, 16 & 17 at 105 Mc).

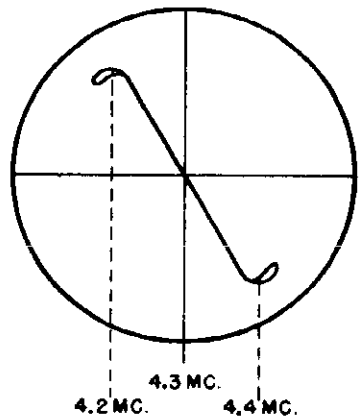
10. Connect FM loop antenna to receiver receptacle. Radiate an FM 105 Mc (22-1/2 Kc deviation) signal into FM loop. Set receiver dial to 105 Mc and adjust trimmer (17) for maximum.



SIGNAL GENERATOR & OSCILLOSCOPE HOOK-UP



PATTERN WITH DISCRIMINATOR PRIMARY (10) CORRECTLY ADJUSTED



PATTERN WITH DISCRIMINATOR SECONDARY (9) CORRECTLY ADJUSTED.

MOTOROLA INC.

MODELS 75F31, 75F31A, 75F31
76F31, CHASSIS HS-36, HS-36
HS-98

ALIGNMENT PROCEDURE WHEN USING AM MODULATED SIGNAL GENERATOR AND STANDARD OUTPUT METER FOR COMPLETE ALIGNMENT

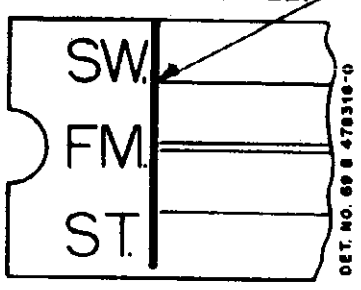
STEP	DIAL SET TO	BAND SW. SET TO	DUMMY	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR SET AT	ADJUST TRIMMER OR CORE	REMARKS
455 Kc IF CHANNEL ALIGNMENT							
1.	1620 Kc (gang fully opened)	BC	.1 mf	7Q7 BC & SW Conv. Grid (Pin #4) & Chassis	455 Kc	1,2,3 & 4	Adjust for maximum output.
BROADCAST BAND ALIGNMENT							
2.	1400 Kc	BC	.1 mf	7Q7 BC & SW Conv. Grid (Pin #4) & Chassis	1400 Kc	5(BC Osc. Trim)	This sets oscillator to dial. With gang fully meshed, pointer should be at last mark on dial; then set to 1400 Kc and set oscillator.
3.	1400 Kc	BC	None	Radiation Loop *	1400 Kc	6(BC Loop Antenna Trim)	Adjust for maximum output
SW. BAND ALIGNMENT							
4.	11.5 Mc	SW	.1 mf	7Q7 BC & SW Conv. Grid (Pin #4) & Chassis	11.5 Mc	7(SW Osc. Trim)	This sets osc. to dial. Make sure osc. is higher in frequency than the signal by checking image response which should occur with the input signal at 12.41 Mc.
5.	11.5 Mc	SW	50 mmf	SW Ant. Terminal and Chassis	11.5 Mc	8(SW Ant. Coil Trim)	BC loop plug should be disconnected. Adj. for maximum output.
4.3 Mc IF CHANNEL ALIGNMENT							
6.						9(Disc. Sec.)	Detune discriminator secondary by screwing core out as far as it will go.
7.	112 Mc	FM	.001 mf	7F8 2nd FM Convertor Grid (#1 Pin) & Chassis	4.3 Mc	10,11, 12,13 & 14 (4.3 Mc IF)	Adjust for maximum output
FM BAND ALIGNMENT							
8.						18(FM Osc. Core)	Check the position of the FM Osc. tuning core 18. Set spacing between the core and bakelite piece to which it is mounted, to 1/32" by turning tuning core slotted nut.
9.	90 Mc	FM	None	FM loop antenna receptacle and chassis; remove FM loop.	90 Mc	15,16 & 17 (FM Osc., Ant. & Variable IF trim)	Adjust for maximum output.

MODELS 75F31, 75F31A, 75F31B, 76F31, CHASSIS HS-36, HS-36A, HS-98

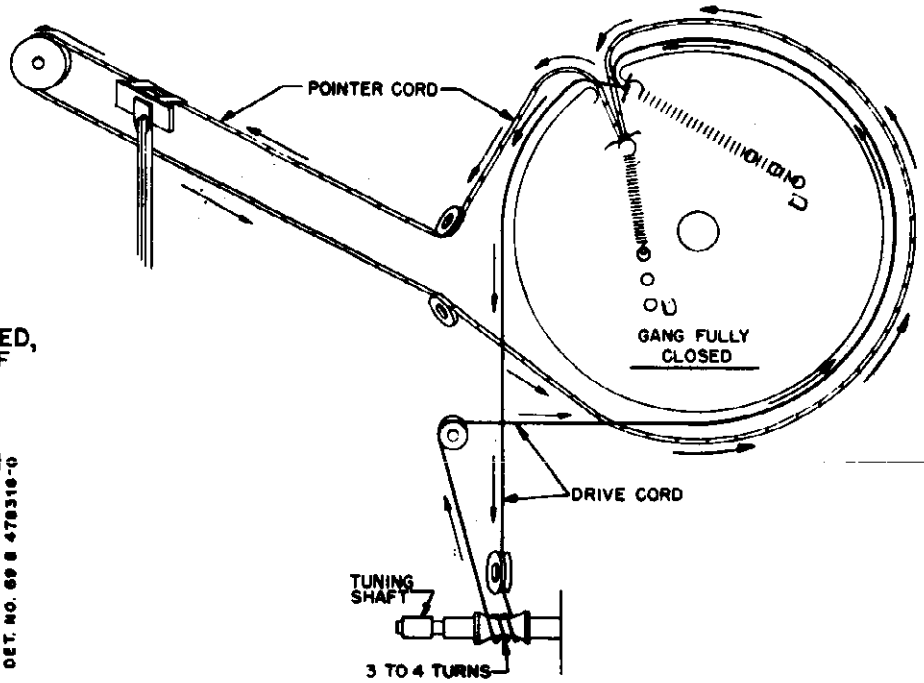
MOTOROLA INC.

STEP	DIAL SET TO	BAND SW. SET TO	DUMMY	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR SET AT	ADJUST TRIMMER OR CORE	REMARKS
10.	105 Mc	FM	None	FM loop antenna receptacle and chassis; remove FM loop.	105 Mc	18, 19 & 20 (FM Osc., Ant. & Variable IF cores)	Adjust for maximum output
11.							Repeat steps 9 and 10 several times until further adjustment does not increase the output. Make the final trimmer adjustment at 105 Mc (i.e., trimmers 15, 16 and 17 at 105 Mc.)
12.	105 Mc	FM	None	Radiation loop *	105 Mc	17 (FM Ant. Trim)	Adjust for maximum output with FM loop antenna connected.
ALIGN DISCRIMINATOR SECONDARY							
13.		FM	.001 mf	7F8 2nd FM Converter Grid (#1 Pin) & Chassis	4.3 Mc	9 (Disc. Sec.)	Adjust discriminator secondary for minimum response. The correct adjustment is the sharply defined minimum response point between the two peaks.

* Connect output of signal generator to a 5" diameter, 3 turn loop & radiate signal into receiver loop. Minimum distance between loops should never be less than 12".



USE 18 LB. TEST FISH LINE.



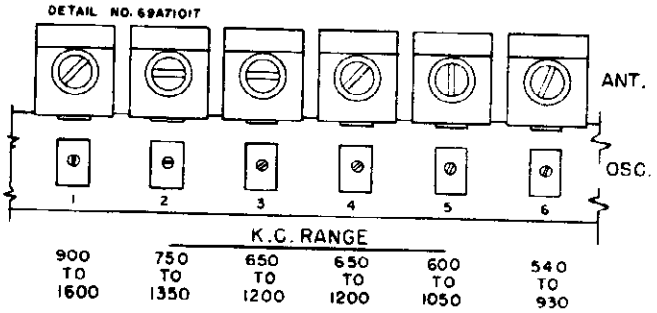
POINTER & DRIVE CORD DETAIL

MOTOROLA INC. MODELS 75F31, 75F31A, 75F31
76F31, CHASSIS HS-36, HS-36
HS-98

INSTRUCTIONS FOR SETTING PUSH BUTTONS

NOTE: Only standard broadcast stations can be set up on pushbuttons.

1. Turn the radio "on" and allow it to warm up for at least fifteen minutes.
2. Make a list of the frequencies of the nearby stations you wish to tune in automatically. It is recommended that you select the most powerful stations.
3. Turn the band switch to "BC" position and carefully tune in the first station to be set up.
4. Adjust a signal generator to zero beat with this station. **NOTE:** While it is advisable to use a signal generator for accuracy, it is not an absolute necessity.
5. Turn the band switch to "PB" position.
6. Push the button to be set up, making sure select a button having the proper freque range to include the station you are setti
7. The tuner adjustment screws are accessible f the back of the radio.
8. Adjust the oscillator screw until the sig from the generator, or station is heard, ca fully adjust the screw to maximum volume.
9. Now adjust the antenna trimmer screw for ma mum volume.
10. Follow the same procedure for the remaini buttons.
11. It is advisable, after all buttons are set u to repeat steps 6, 8 and 9 for maximum perfo mance.



PUSH BUTTON TUNER ADJUSTMENTS

ALIGNMENT

Maximum performance can only be obtained if extreme care is exercised during alignment.

ALIGNMENT PROCEDURE WHEN USING AM MODULATED SIGNAL GENERATOR AND STANDARD OUTPUT METER FOR COMPLETE RECEIVER ALIGNMENT.

An AM (amplitude modulated) signal generator covering the frequencies shown in alignment chart, is used to align the broadcast, short wave and FM bands. A low range output meter, connected across the speaker voice coil is used as an output indicator.

The broadcast and short wave alignment is conventional; full instructions are given in the following alignment chart.

The FM band alignment can be satisfactorily performed by following the instructions in the chart. When properly aligned, the discriminator does not respond to amplitude modulation and since an AM type signal generator is used for aligning the FM circuits, it is necessary to detune the discriminator secondary and leave it that way until a of the FM circuits have been aligned. After co pleting the alignment of the FM circuits, proceed align the discriminator secondary by applying 4.3 Mc AM signal to the control grid of the 7 2nd FM converter tube and adjusting the discrim nator secondary core for minimum audio output. adjustment of the FM circuits should be attempt with AM after the discriminator secondary has be properly aligned.

Use a 30% AM (amplitude modulated) sign throughout entire alignment procedure.

A special wrench for adjusting the slott nuts on the tuner cores will be required. You c easily fabricate one from a Motorola auto se Volume Control Shaft and Coupling Assembly (Pa No. 1B70847, $.30 list) by simply spreading out t forked ends and filing to fit. Solder the assemb together to make it rigid.

Use an insulated screwdriver when adjusting the FM tuner trimmers.

MODELS 75F31, 75F31A, 75F31B, 76F31, CHASSIS HS-36, HS-36A, HS-98

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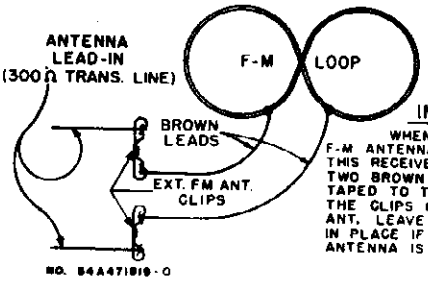
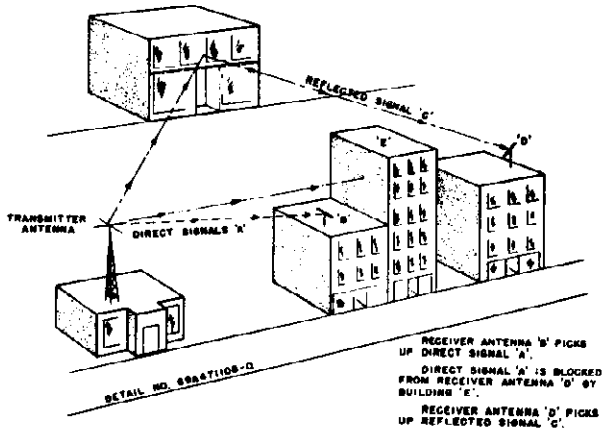


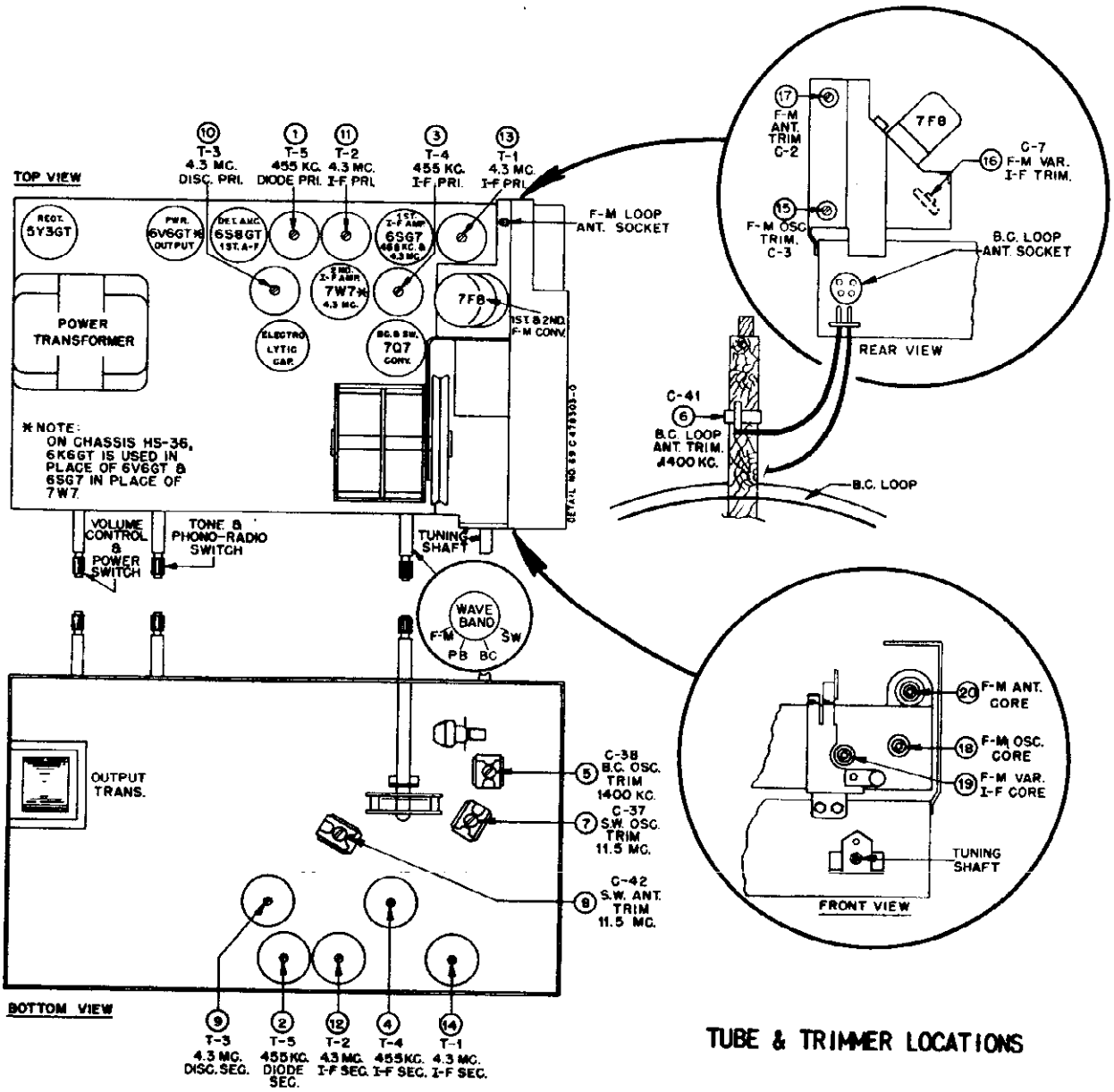
IMPORTANT

WHEN AN EXTERNAL F-M ANTENNA IS USED WITH THIS RECEIVER, CONNECT THE TWO BROWN LEADS WHICH ARE TAPED TO THE F-M LOOP, TO THE CLIPS MARKED EXT. F-M ANT. LEAVE THE LEADS TAPED IN PLACE IF NO EXTERNAL F-M ANTENNA IS REQUIRED.

FM LOOP ANTENNA

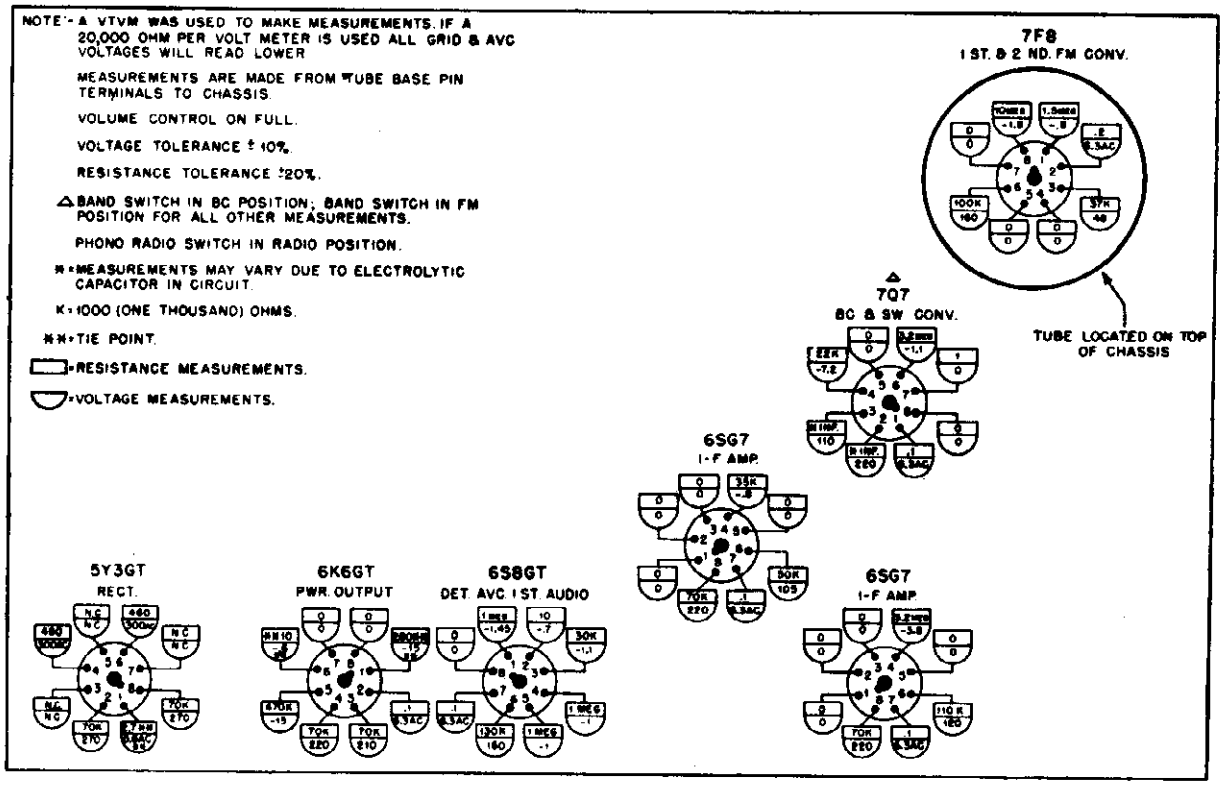


DIRECT & REFLECTED FM RECEPTION PATHS

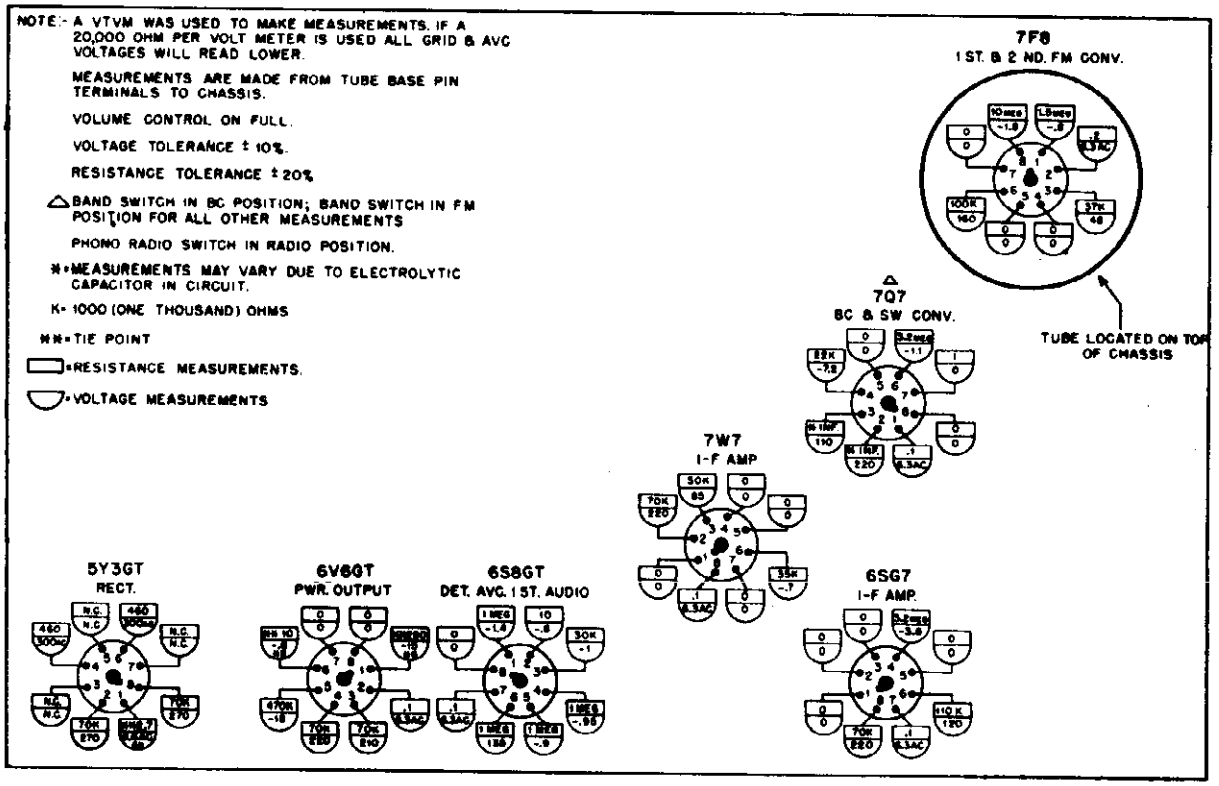


TUBE & TRIMMER LOCATIONS

MOTOROLA INC. MODELS 75F31, 75F31A, 75F31
76F31, CHASSIS HS-36, HS-36
HS-98



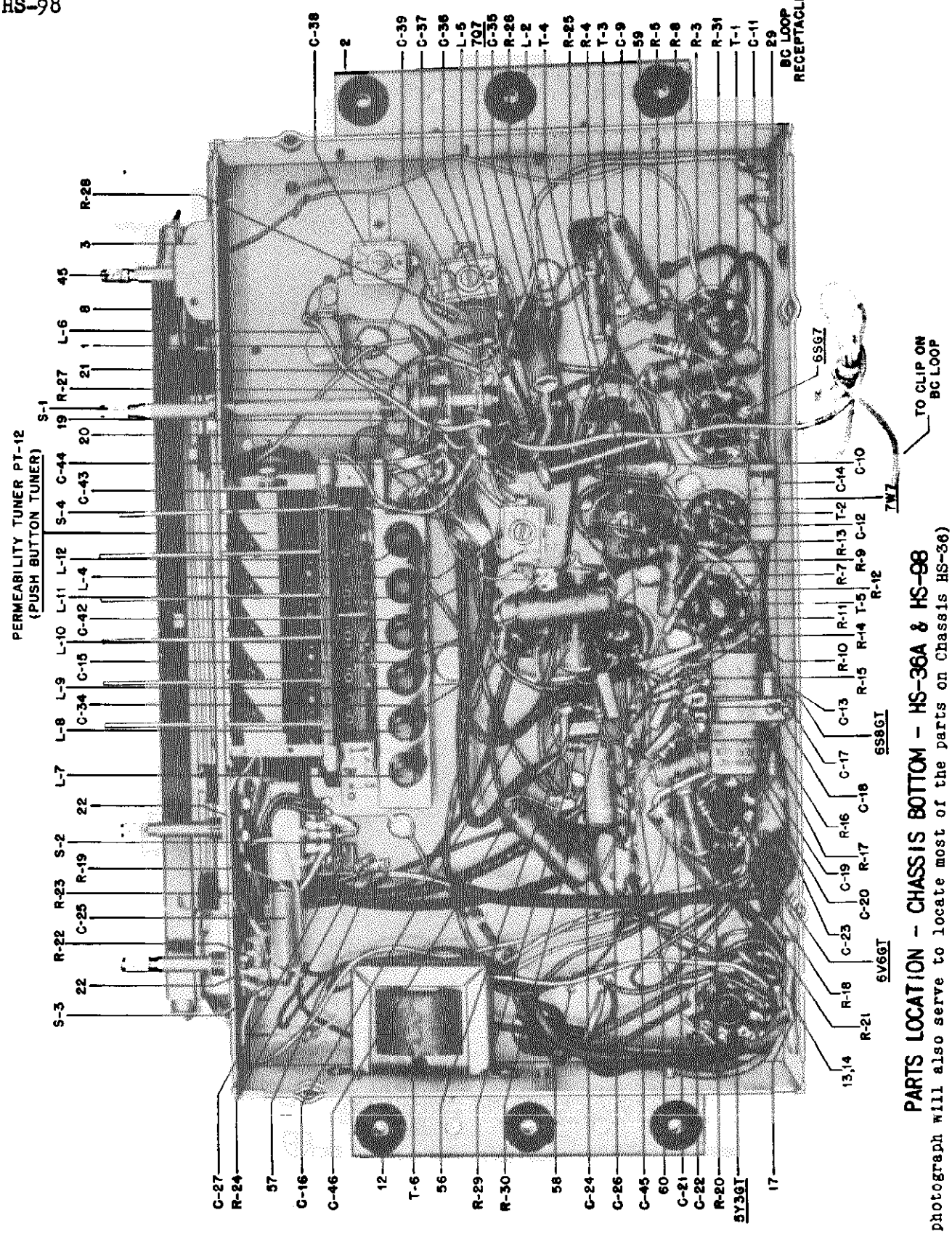
VOLTAGE & RESISTANCE DIAGRAM - CHASSIS HS-36



VOLTAGE & RESISTANCE DIAGRAM CHASSIS HS-36A & HS-98

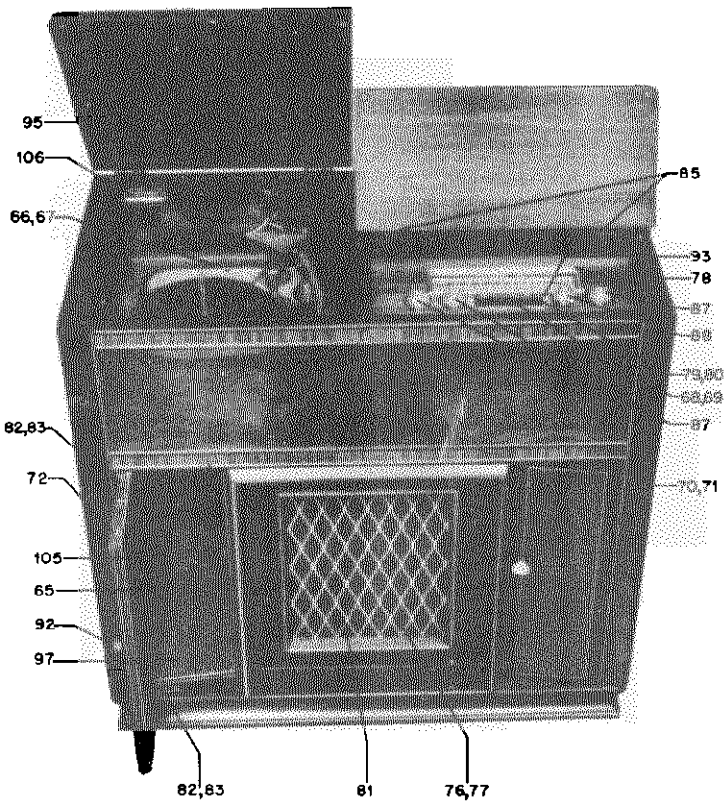
MODELS 75F31, 75F31A, 75F31B, 76F31, CHASSIS HS-36, HS-36A, HS-98

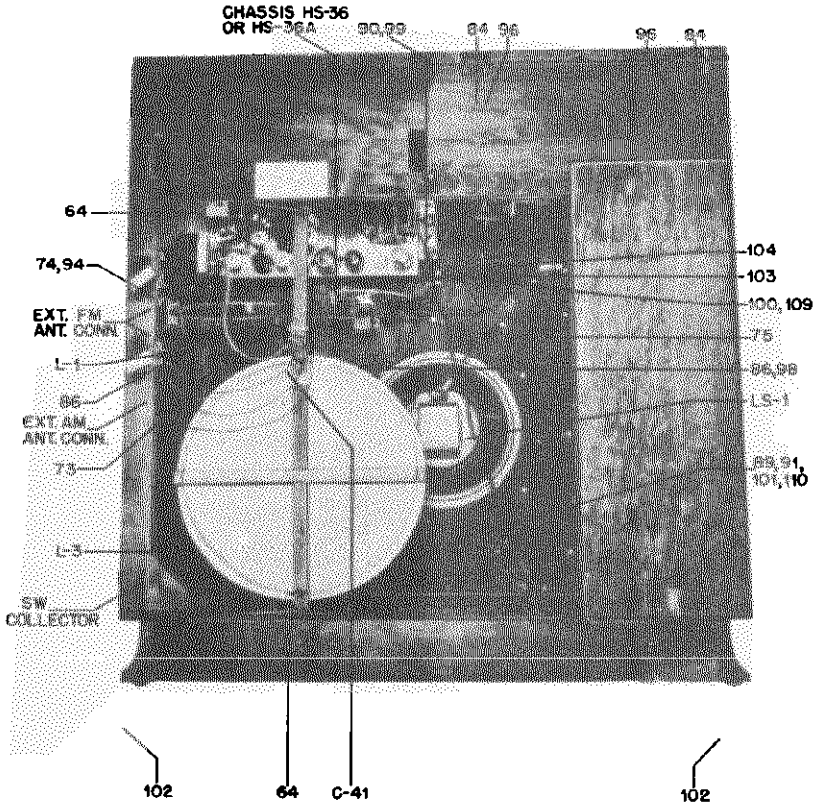
MOTOROLA INC.



PARTS LOCATION - CHASSIS BOTTOM - HS-36A & HS-98

(This photograph will also serve to locate most of the parts on Chassis HS-36)

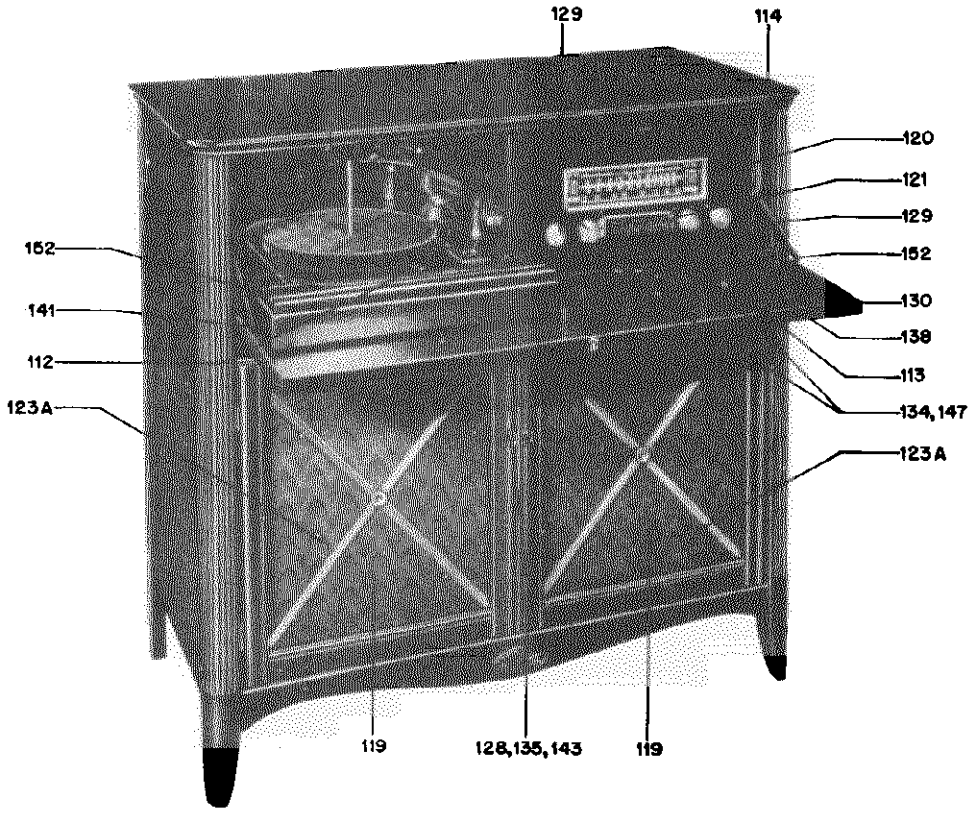


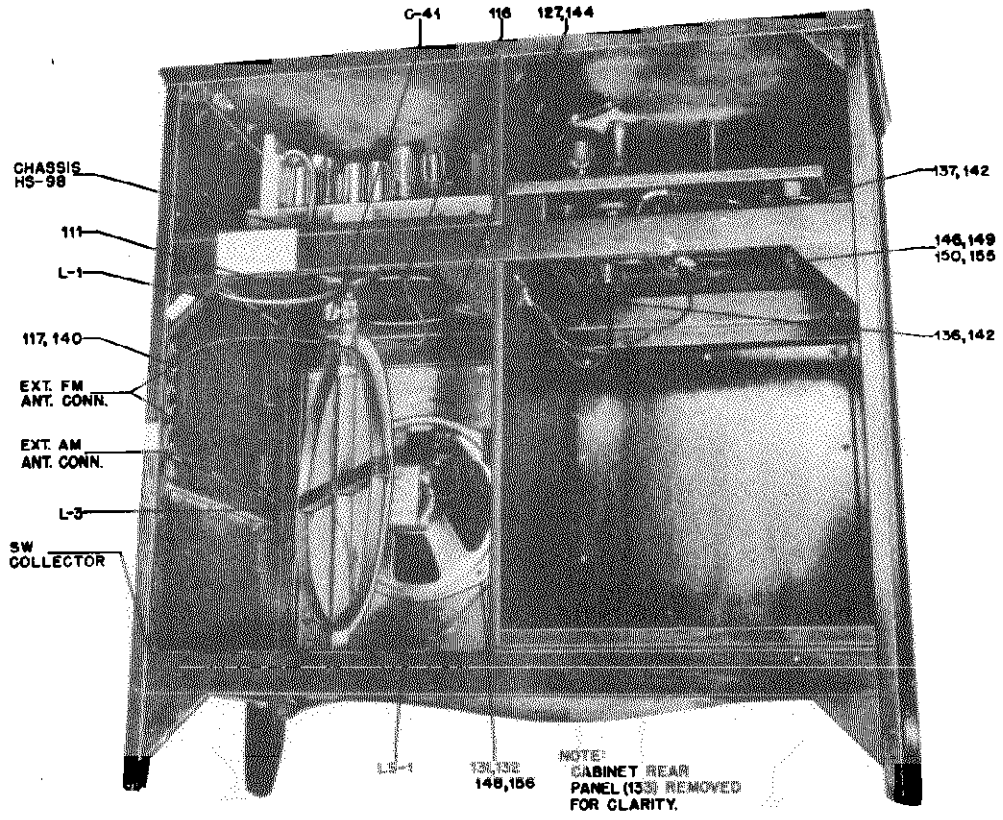


PARTS LOCATION- CABINET-MODELS 75F31, 75F31A & 75F31B

MODEL 76F31

MOTOROLA INC.





PARTS LOCATION - CABINET - 76F31

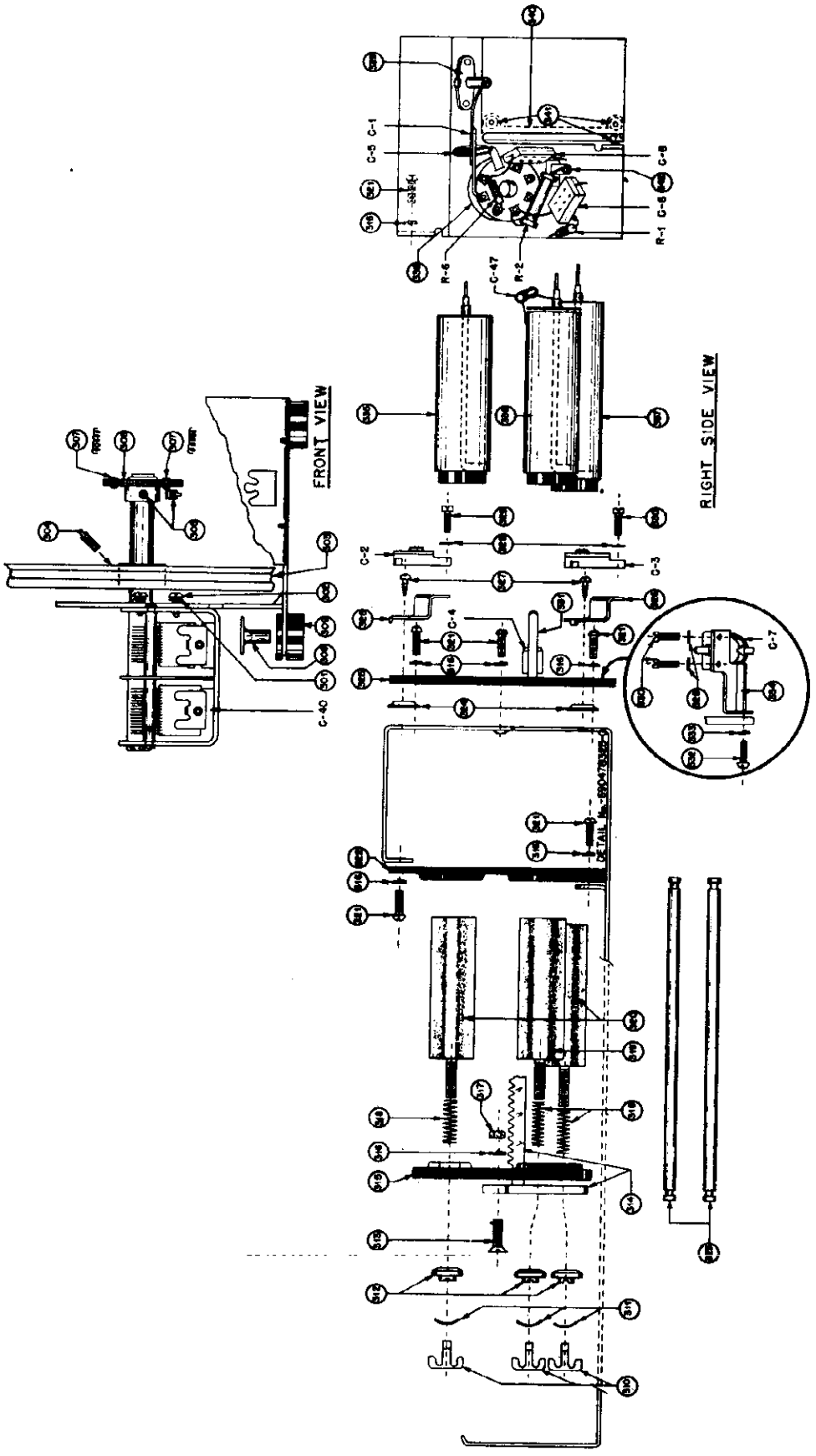
REPLACEMENT PARTS LIST

FM-BC TUNER PT-10

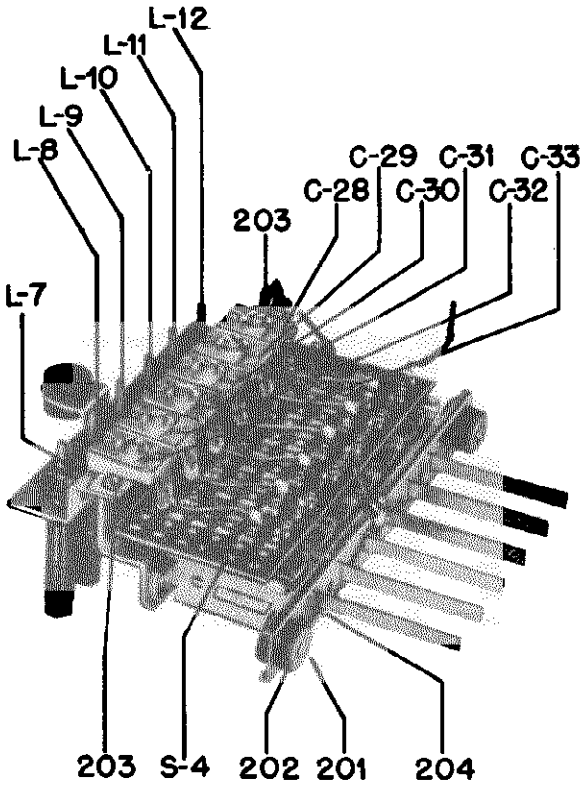
REF. NO.	PART NO.	DESCRIPTION
CAPACITORS		
C-1	21A75479	Special: 1.3 mmf .....
C-2	20A74939	Variable ceramic: 5-25 mmf. .....
C-3	20K74940	Variable ceramic: 7-45 mmf. .....
C-4	21A112247	Silver mica: 250 mmf .....
C-5	21A112247	Silver mica: 250 mmf .....
C-6	21R2729	Mica: 250 mmf 500V .....
C-7	20K74940	Variable ceramic: 7-45 mmf .....
C-8	21R2730	Mica: 500 mmf 500V .....
C-40	19B72560	Variable: 2 gang .....
C-47	21A76320	Ceramic: 16 mmf .....
RESISTORS		
R-1	6R2109	10 meg 1/2W Ins .....
R-2	6R6013	15,000 iW NI .....
R-6	6R3966	1.5 meg 1/2W Ins .....
301	4S7666	Lockwasher: #8 external .....
302	3S7156	Screw: 6-32 x 3/16 slotted binder head machine screw .....
303	1X76416	Pulley and Bushing Assembly .....
304	3S7114	Setscrew: 8-32 x 3/8 slotted slab head..
305	3S7100	Setscrew: 8-32 x 5/16 slab head .....
306	1X76390	Split Gear & Bushing Assembly (small) ..
307	41A76498	Spring, coil .....
308	6A12105	Eyelet, mounting .....
309	37K15125	Grommet, tuner mounting .....
310	42A72725	Clip, swivel nut .....
311	4A74936	Washer, spring .....
312	2A72726	Nut, swivel .....
313	3S7184	Screw: 6-32 x 1/2 slotted flat head machine screw .....
314	44B72706	Rack, drive gear: die cast. .....

REF. NO.	PART NO.	DESCRIPTION
315	64B72707	Plate, core mounting: bakelite .....
316	4S2619	Lockwasher: #6 split .....
317	2S7005	Nut: 6-32 x 1/4 hex .....
318	41A74880	Spring, core tension .....
319	46K76172	Core, iron (with paint dot) (osc.) .....
320	46A71749	Core, iron (ant. & Var. IF) .....
321	3S7185	Screw: 6-32 x 3/8 slotted round head machine screw .....
322	64B72704	Plate, front mounting: bakelite .....
323	47B72712	Rod, guide .....
324	2A74710	Nut, Tinnerman (#4 PKZ) .....
325	1X76388	Rear Mounting Plate & Lug Assembly: bakelite plate with soldering lug .....
326	7A74711	Bracket, trimmer mounting .....
327	3S3356	Screw: #4 x 5/16 PKZ slotted round head sheet metal screw .....
328	4A74684	Washer, trimmer: fibre .....
329	3S2975	Screw: 3-48 x 5/16 slotted fillister head machine screw .....
330	3S1525	Screw: 3-48 x 3/8 slotted fillister head machine screw .....
331	29R3005	Lug, soldering .....
332	3S1937	Screw: 4-40 x 5/16 slotted round head machine screw .....
333	4S8412	Lockwasher: #4 split .....
334	7A74712	Bracket, trimmer mounting .....
335	24C76492	Inductor, VHF (Ant.): 2-1/2" long .....
336	24K76496	Inductor, VHF (Osc.): 2-5/8" long .....
337	24K76494	Inductor, VHF (IF): 2-3/4" long .....
338	9K75544	Socket, tube: loctal .....
339	9A54664	Receptacle, ferrule: 1 prong .....
340	15A74714	Cover, tuner (rear) .....
341	3S8175	Screw: #4 x 3/16 PKZ slotted hex head sheet metal screw .....
342	31A81399	Strip, terminal: 1 insulated lug; #1 mtg .....

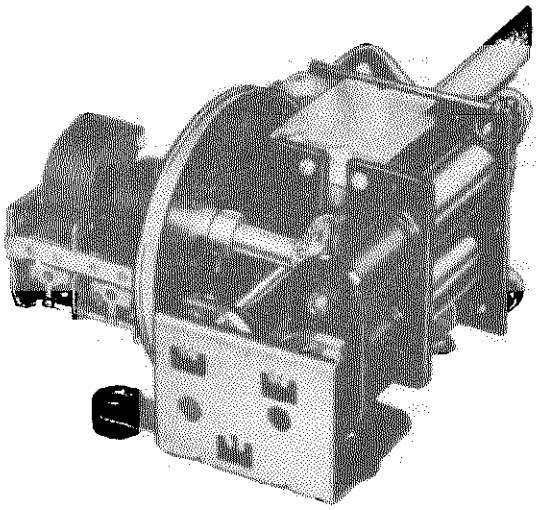
MODEL PT-10 MOTOROLA INC.



PARTS LOCATION - FM-BC TUNER PT-10



PARTS LOCATION -PUSH BUTTON TUNER PT-12



REPLACEMENT PARTS LIST
PUSHBUTTON TUNER PT-12

REF NO.	PART NO.	DESCRIPTION
200	1X76440	Permeability Tuner PT-12: complete .....
C-28 to C-33	20A72336	Trimmers and Mtg Strip Assembly: 6 trimmer capacitors on mtg strip; capacitors not replaceable separately .....
COILS		
L-7	1X72416	Coil, Core and Clip Assembly, push button oscillator: 540 to 930 Kc; brown dot (specify color of dot when ordering) ..
L-8	1X72417	Coil, Core and Clip Assembly, push button oscillator: 800 to 1050 Kc; red dot (specify color of dot when ordering) ..
L-9 and L-10	1X72418	Coil, Core and Clip Assembly, push button oscillator: 650 to 1200 Kc; orange dot (specify color of dot when ordering) ..
L-11	1X72419	Coil, Core and Clip Assembly, push button oscillator; 730 to 1350 Kc; yellow dot (specify color of dot when ordering) ..
L-12	1X72420	Coil, Core and Clip Assembly, push button oscillator: 900 to 1600 Kc; green dot (specify color of dot when ordering)...
SWITCH		
S-4	40K76439	Latch switch, push button .....
MISCELLANEOUS		
201	5A70098	Eyelet, steel (tuner mtg) .....
202	5A70404	Grommet, rubber (tuner mtg) .....
203	3S7506	Screw: #6 x 1/4 PKZ plain hex head; cadmium plated .....
204	41A74429	Spring, tuner wiper .....

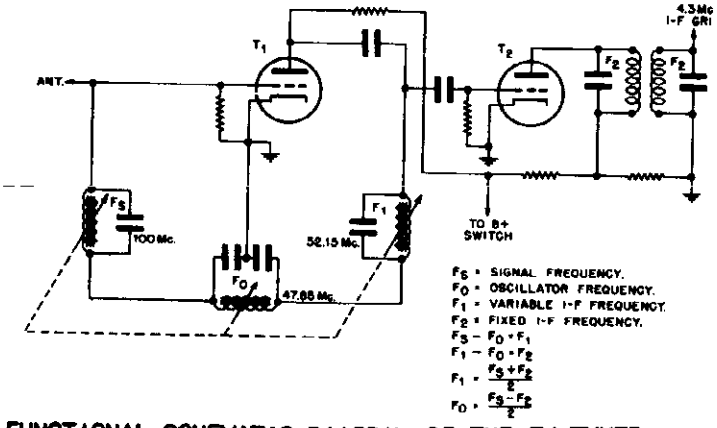
FM-BC TUNER PT-10

THEORY OF THE FM TUNER

Referring to the functional schematic diagram in Fig. 21, the triode T1 serves both as an oscillator and first converter, and triode T2 serves as the second converter. Oscillator voltage injection for the second converter is obtained through the coupling capacitor from the plate of T1. T1 and T2 are sections of the 7F8 twin-triode tube.

The frequency relationships are given in Fig. 21. The oscillator F_0 beats with the incoming signal F_s to produce the first intermediate frequency F_1, which is variable. F_1 then beats with the same oscillator frequency F_0 in the second converter to produce the second intermediate frequency F_2 which is 4.3 mc. With a 100 mc signal the oscillator frequency is 47.85 mc and the variable intermediate frequency is 52.15 mc.

This system of reception permits the oscillator to be resonated with a high capacitance, 250 micromicrofarads in this case. Consequently, changes in the tube characteristics during warm-up do not produce objectionable changes in oscillator frequency. This contributes materially to the stability of the system.



FUNCTIONAL SCHEMATIC DIAGRAM OF THE FM TUNER

MODELS 75F31, 75F31A, 75F31B, 76F31, CHASSIS HS-36, HS-36A, HS-98 — MOTOROLA INC.

CHASSIS HS-36, HS-36A & HS-98

REF. NO.	PART NO.	DESCRIPTION
CAPACITORS		
C-1*	21A75479	Special: 1.3 mf
C-2*	20A74939	Trimmer, ceramic: 5-25 mmf
C-3*	20K74940	Trimmer, ceramic: 7-45 mmf
C-4*	21A112247	Silver Mica: 250 mmf
C-5*	21A112247	Silver Mica: 250 mmf
C-6*	21R2729	Mica: 250 mmf
C-7*	20K74940	Trimmer, ceramic: 7-45 mmf
C-8*	21R2730	Mica: 500 mmf 500V
C-9	8S9816	Paper: .05 mf 400V
C-10	8S9801	Paper: .01 mf 100V
C-11	8S9816	Paper: .05 mf 400V
C-12	8S9809	Paper: .01 mf 400V
C-13	21R6639	Mica: 500 mmf 500V
C-14	8S9801	Paper: .01 mf 100V
C-15	8S9816	Paper: .05 mf 400V
C-16	8S9816	Paper: .05 mf 400V
C-17	21R6642	Mica: 50 mmf 500V
C-18	21R6642	Mica: 50 mmf 500V
C-19	23K77636	Electrolytic: 10 mf 100V
C-20	21R6639	Mica: 500 mmf 500V
C-21	8S9813	Paper: .005 mf 600V
C-22	8S9816	Paper: .05 mf 400V
C-23	8S9813	Paper: .005 mf 600V
C-24	8S9816	Paper .05 mf 400V
C-25	8S9813	Paper: .005 m. 600V
C-26	8S9813	Paper: .005 mf 600V
C-27	21R6641	Mica: 100 mmf 500V
C-28 through C-33		Trimmer: See Permeability Tuner PT-12 Parts List
C-34	23A27718	Electrolytic: 30-30-20 mf/350-300V-25V
C-35	8S9816	Paper: .05 mf 400V
C-36	21R6642	Mica: 50 mmf 500V
C-37	20A71141	Trimmer: mica; 10-80 mmf
C-38	20A75234	Trimmer, mica: 10-80 mmf; with mtg bracket
C-39	21R6642	Mica: 50 mmf 500V
C-40*	19B72560	Tuning gang: 2 section
C-41	20A71226	Trimmer, mica: 2-12 mmf; with mtg bracket (part of BC loop antenna)
C-42	20A71141	Trimmer, mica: 10-80 mmf
C-43	21R2724	Mica: 1000 mmf 5% 300V
C-44	21A26020	Mica: 535 mmf 3%
C-45	21R6639	Mica: 500 mmf 500V
C-46	21R6638	Mica: 1000 mmf 500V
C-47*	21A76320	Ceramic: 16 mmf
C-48	21R6661	Mica: .004 mf 10% 300V
C-49	21R6661	Mica: .004 mf 10% 300V
SPEAKER		
LS-1	50K75592	Electrodynamic: 10"; 3.2 ohm V.C; 1000 ohm field
PILOT LIGHT		
I-1		
I-2	65X11854	Bulb: 6.3V .15A; bayonet base; tubular; #47
COILS		
L-1	1X76326	Loop Assembly, FM Band: complete with leads
	30B75476	Cable, FM Loop Antenna
L-2	24A74989	Filament Choke
L-3	24K76322	Loop Assembly, BC: complete with frame, connecting leads & trimmer (75F31, 75F31A & B
	24K71598	Loop Assembly, BC: complete with frame connecting leads & trimmer (76F31) ... 28K19871 Plug, 4 pin (loop plug)
L-4	24A74822	SW Antenna
L-5	24A74820	SW Oscillator
L-6	24A74821	BC Oscillator: includes mtg bracket
L-7 through L-12		See Permeability Tuner PT-12 Parts List
RESISTORS		
Note: All resistors 20% insulated carbon type unless otherwise specified.		
R-1*	6R2109	10 Meg 1/2 W
R-2*	6R6013	15,000 1W NI
R-3	6R6410	33,000 10% 1/2 W
R-4	6R6313	22,000 10% 1W NI
R-5	6R6477	15,000 10% 1/2 W
R-6*	6R3966	1.5 Meg 1/2 W
R-7	6R6433	2.2 Meg 10% 1/2 W
R-8	6R5588	39,000 10% 1W
R-9	6R6301	1000 1/2 W
R-10	6R6056	47,000 1/2 W
R-11	6R6004	1 Meg 1/2 W
R-12	6R6397	22,000 10% 1/2 W
R-13	6R6398	150,000 10% 1/2 W
R-14	6R6397	22,000 10% 1/2 W
R-15	6R6320	10,000 10% 1/2 W
R-16	6R6446	4.7 Meg 10% 1/2 W
R-17	6R6001	68,000 1/2 W
R-18	6R6032	470,000 1/2 W
R-19	18A28062	Tone Control: 1 Meg; includes Phono-Radio Switch
R-20	6R5621	10 10% 1/2 W
R-21	6R6035	270 10% 1W NI
R-22	18K74891	Volume Control: 1 Meg, includes On-Off Switch
R-23	6R6410	33,000 10% 1/2 W
R-24	6R6004	1 Meg 1/2 W
R-25	6R3967	12,000 10% 3 W NI
R-26	6R6032	470,000 1/2 W
R-27	6R6028	22,000 1/2 W
R-28	6R6270	220 10% 1/2 W
R-29	6R6028	22,000 1/2 W
R-30	6R6010	330 1/2 W
R-31	17K77634	2.7 1/2 W wire wound
SWITCHES		
S-1	40B75236	Bandswitch: 4 position
S-2	-	Phono-Radio Switch (part of tone control)
S-3	-	Power Switch (part of volume control)
S-4	-	Latch Switch (See Permeability Tuner PT-12 Parts List)
TRANSFORMERS		
T-1	24B75481	1st IF, 4.3 Mc: complete with iron cores and padding capacitors but less shield.
T-2	24B75473	2nd IF, 4.3 Mc: complete with iron cores and padding capacitors, but less shield
T-3	24B75456	Discriminator, 4.3 Mc: complete with iron cores and padding capacitors, but less shield
T-4	24B75487	IF, 455 Kc: complete with iron cores and padding capacitors but less shield.
T-5	24B70537	Diode, 455 Kc: complete with iron cores and padding capacitors but less shield.

* Part of PT-10 BC-FM Tuner

MOTOROLA INC.

MODELS 75F31, 75F31A, 75F31
76F31, CHASSIS HS-36, HS-36
HS-98

REF. NO.	PART NO.	DESCRIPTION
T-6	25B75463	Output
T-7	25B70598	Power
1	7A72730	Bracket, band switch mtg
2	7B74671	Bracket, chassis mtg (HS-36 & HS-36A only)
3	7A14684	Bracket, tuning shaft mtg
4	1X76427	Bracket & Pulley Assembly (drive cord guide)
5	42A5460	Clip, grid
6	11M8944	Cord, dial: 18 lb; black
7	30K21869	Cord, line: with plug; 9 ft long
8	1X76428	Dial Plate, Brackets and Pulley Assembly: complete but less pointer and dial scale
9	5S1615	Eyelet, brass (FM Tuner Cover Mtg)
10	5A12105	Eyelet, steel (chassis mtg)
11	37A4163	Grommet, rubber (FM Tuner Cover Mtg)
12	37K15125	Grommet, rubber (chassis mtg)
13	1X76421	Lead Assembly, phono pick-up: with 1 pin plug; 24" long (HS-36 & HS-36A)
14	1X76356	Lead Assembly, phono pick-up: with 1 pin plug; 32" long (HS-98 only)
15	1X76366	Lead Assembly, speaker: includes receptacle 23" long (HS-36 & HS-36A)
16	1X471533	Lead Assembly, speaker: includes receptacle; 37-1/2" long (HS-98 only)
17	32A24815	Lock, line cord: fibre
18	4S7650	Lockwasher: #6 internal; cadmium plated (FM Tuner Cover Mtg)
19	4S7655	Lockwasher: 3/8 internal; cadmium plated (band switch mtg)
20	29R5209	Lug, soldering: dumbell shaped
21	2S1376	Nut: 3/8-32 x 1/2 hex; Cadmium plated (band switch mtg)
22	2S7051	Nut: 3/8-32 x 9/16 hex; Palnut; cadmium plated (volume & tone control mtg).
23	9A12705	Plate, electrolytic mtg: bakelite
24	28K71775	Plug, 1 pin (phono pick-up)
25	52B74418	Pointer, dial
26	49A23960	Pulley, cord: 1/4" groove (cord guide).
27	49A21741	Pulley, cord: 3/8" groove (cord guide).
28	9A30680	Receptacle, 3 prong (on phono motor lead)
29	9K28049	Receptacle, 4 prong (BC loop antenna input connector)
30	9A22367	Receptacle: 5 prong; 4 contacts (speaker receptacle)
31	5A12814	Rivet, shoulder: 5/32" long; nickel plated
32	5A71246	Rivet, shoulder: .187" long; nickel plated
33	5S7707	Rivet: .122 x 5/32; nickel plated (tube socket mtg, terminal strip mtg, electrolytic clip mtg, and pulley bracket mtg)
34	5S7701	Rivet: .122 x 3/16; nickel plated (electrolytic mtg plate mtg, band switch mtg, trimmer capacitor mtg, and transformer mtg)
35	5S7703	Rivet: .122 x 7/32; nickel plated (tube socket)
36	4S7700	Rivet: .122 x 1/4; nickel plated (receptacle mtg)
37	5S7708	Rivet: .122 x 9/32; nickel plated (line cord lock mtg)
38	34B74422	Scale, dial
39	3S7506	Screw: #6 x 1/4 PKZ plain hex head, sheet metal screw; cadmium plated (coil mtg).
40	3S7185	Screw: 6-32 x 3/8 slotted round head machine screw; cadmium plated (FM Tuner Cover Mtg)
41	3S7454	Screw: #8 x 1/4 PKZ plain hex head she metal screw; cadmium plated (shaft be ing mtg, dial bracket assembly mtg, chassis mtg, bracket mtg and FM Tuner Cover mtg)
42	3S7467	Screw: #8 x 3/8 PKZ plain hex head she metal screw; cadmium plated (power transformer mtg)
43	3S7512	Screw: #8 x 1/2 PKZ plain hex head she metal screw; cadmium plated (PT-12 mtg
44	3S7481	Screw: #8 x 3/4 PKZ slotted hex head sh metal screw; cadmium plated (PT-10 mtg
45	1X76352	Shaft Assembly, tuning
46	26A26283	Shield, tube
47	26B70107	Shield, coil (for T-1, T-2 & T-3)
48	1A71049	Shield and Sleeve Assembly (for T-4 & T
49	9A72747	Socket, pilot light
50	9A6788	Socket, tube: molded; octal; plain type
51	9A70165	Socket, tube: molded; shielded type; oct
52	9A471015	Socket, tube: loctal
53	41A14244	Spring, tension coil (drive & pointer cord spring)
54	32A27678	Strip, band switch shaft bearing: fibre
55	37K21114	Strip, channel: rubber; 1" lg (dial sca mounting)
56	31K51251	Strip, terminal: 1 insulated #1 ground.
57	31A15433	Strip, terminal: 1 large insulated lug, #2 mtg
58	31A493	Strip, terminal: 2 insulated #2 mtg
59	31A75232	Strip, terminal: 4 insulated #3 mtg
60	31A75233	Strip, terminal: 7 insulated #1 & 9 mtg.
61	39A24524	Wiper, tube base grounding
62	4S1719	Washer: 3/8 x .140 x .030 thick; cadmiu plated (line cord lock mtg)
63	4S7557	Washer: 3/8 x .171 x .033 thick; cadmiu plated (power transformer mtg)

CABINET PARTS - MODELS 75F31, 75F31A & 75F31

REF. NO.	PART NO.	DESCRIPTION
64	7K71220	Bracket, loop mounting
65	35A75274	Bumper, rubber
66	38A10644	Button, plug: for 1/4 hole; copper oxid finish (for concealing shipping screw holes in record changer)
67	38K471934	Button, plug: for 1/4 hole; painted gre (for concealing shipping screw holes i record changer)
68	1X477001	Button, push: walnut plastic; with inse spring (75F31, 75F31A)
69	38K471946	Button, push: gray plastic; with insert spring (75F31B)
70	16K471769	Cabinet, console: limed walnut (75F31B).
71	16F76436	Cabinet, console: walnut (75F31 & 75F31A
72	55A72307	Catch, bullet
73	42K76724	Clamp, cable (2 used as adjustable taps on FM loop)
74	42K5528	Clip, Fahnestock: double
75	42A75825	Clip, mounting (phono power connector mounting)
76	11M3447	Cloth, grille: 20" x 17" (Dazian #12317) 75F31 & 75F31A
77	35K471909	Cloth, grille: gray; 20" x 17" (Foster #5165) 75F31B
78	13B72750	Escutcheon, dial
79	13B70494	Escutcheon, push button: brown (75F31 & 75F31A)
80	13K471929	Escutcheon, push button: gray plastic (75F31B)
81	13C76461	Grille, metal
82	55K471693	Hinge, door: statuary bronze finish (75F31, 75F31A, 76F31)

* Part of PT-10 BC-FM Tuner

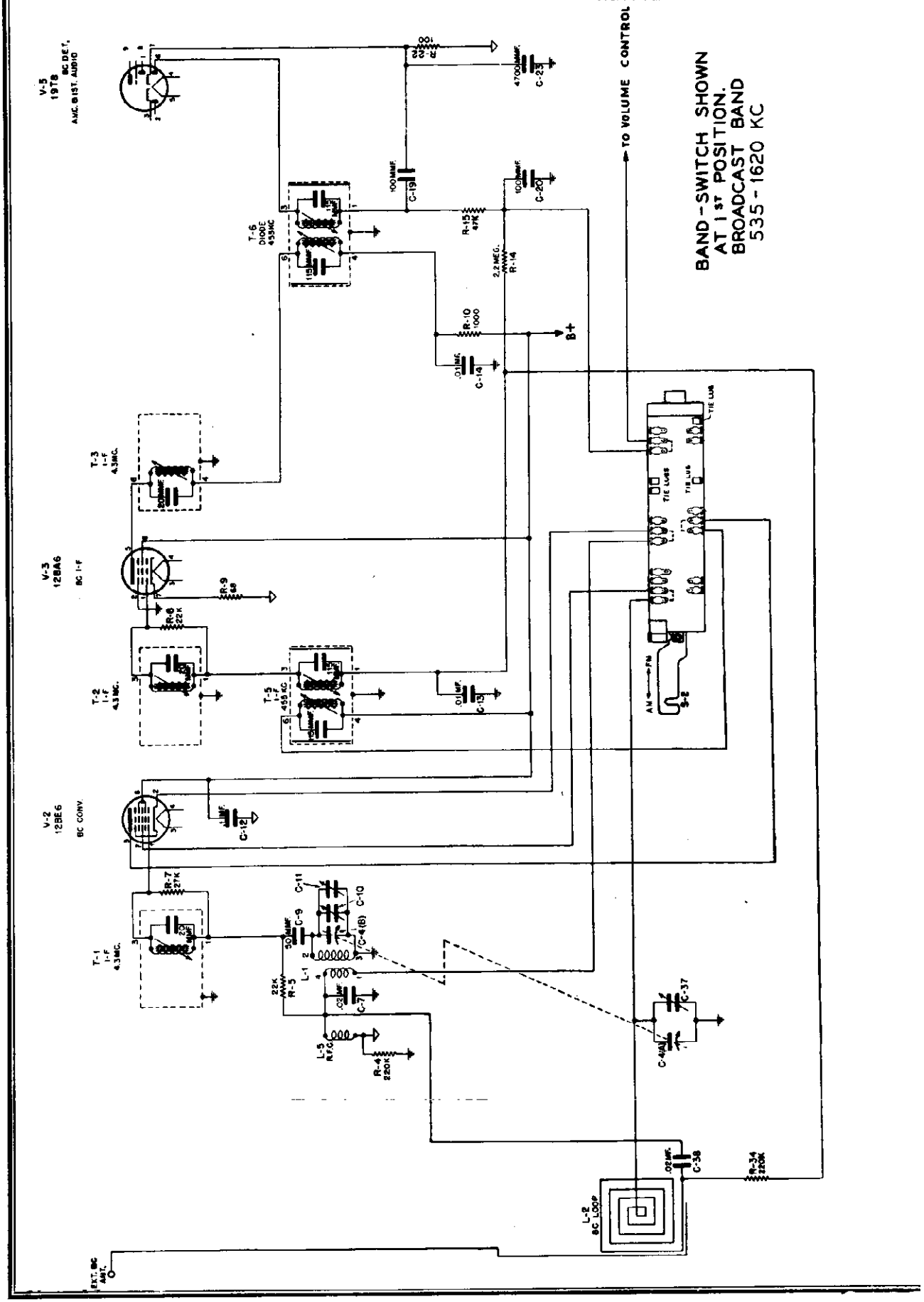
MODELS 75F31, 75F31A, 75F31B, 76F31, CHASSIS HS-36, HS-36A, HS-98 — MOTOROLA INC.

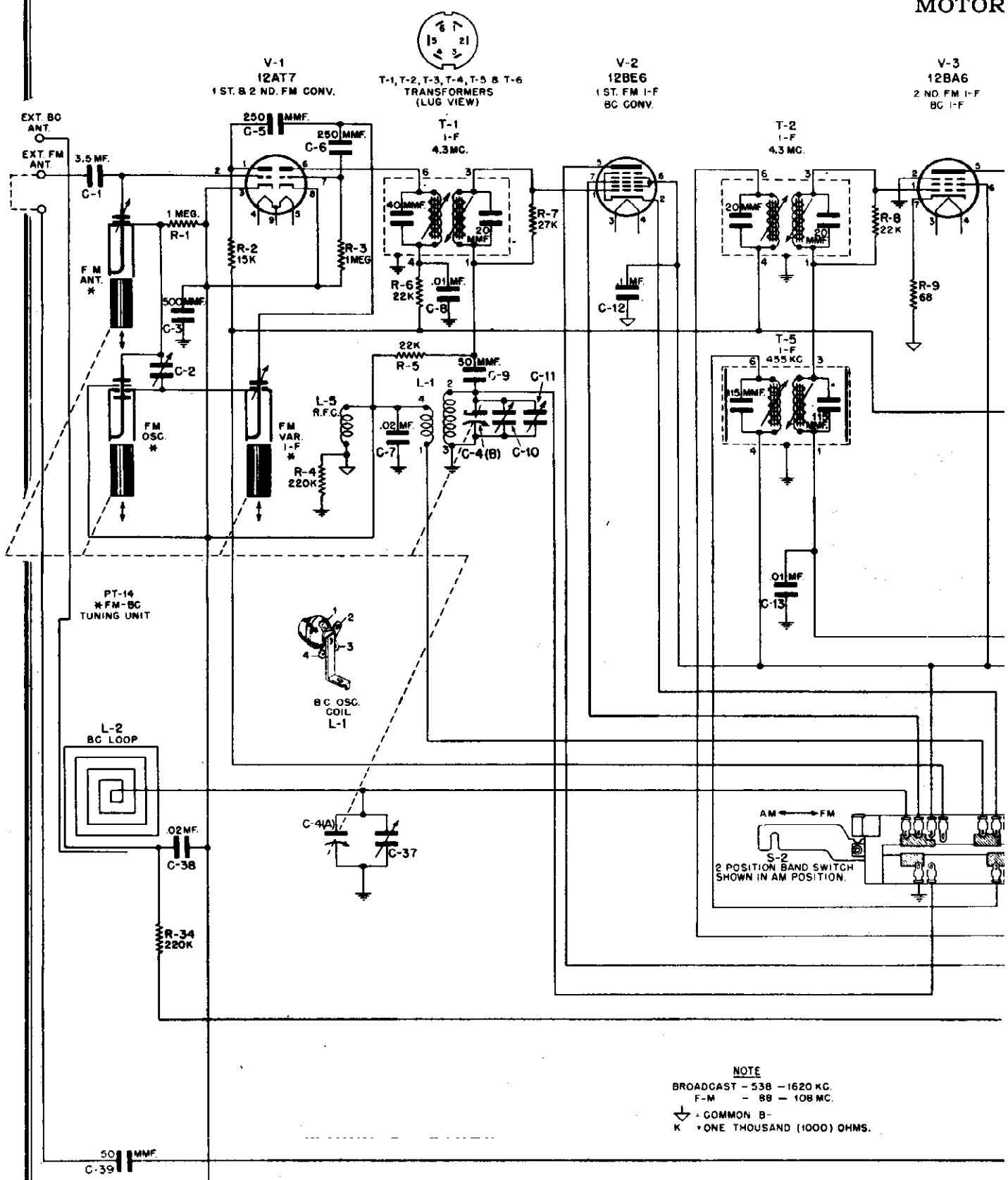
REF NO.	PART NO.	DESCRIPTION
83	55K471692	Hinge, door: brass finish (75F31B)
84	55K76466	Hinge, lid
85	55K76465	Hinge, lid
86	14A75142	Insulator, FM loop mounting: bakelite
87	36K70511	Knob (plain)
88	36K70513	Knob (branded)
89	4S7657	Lockwasher: #8 external (speaker mtg)
90	2A72610	Nut, tee: 8-32 thread (chassis mtg)
91	2S7003	Nut: 8-32 x 5/16 hex; cadmium plated (speaker mtg)
92	55K76464	Pull, door
93	3S1328	Screw: #2 x 3/8 Phillips oval head wood screw; brass plated (push button escutcheon mtg)
94	3S3367	Screw: #5 x 3/8 PKA slotted hex head sheet metal screw; antique copper finish (Fahnestock clip mtg)
95	3S1320	Screw: #6 x 5/8 slotted round head wood screw; statuary bronze finish (lid support mounting)
96	3S1334	Screw: #6 x 1" slotted flat head wood screw; statuary bronze finish (hinge mtg)
97	3S2972	Screw: 8-32 x 15/16 slotted washer round head machine screw; statuary bronze finish (door pull mtg)
98	3S3365	Screw: #8 x 1 PKA slotted hex head wood screw; black finish (FM loop mtg)
99	3S2963	Screw: 8-32 x 1-3/4 slotted hex head machine screw; cadmium plated (chassis mounting)
100	3S7396	Screw: 10-32 x 2" slotted hex head machine screw; copper plated (record changer mounting)
101	3K653	Screw: speaker mounting
102	55X11497	Silencer, dome (cabinet foot)
103	41A21807	Spring, cushion (bottom) (record changer mounting and cushion)
104	41A28190	Spring, cushion (top) (record changer mounting & cushion)
105	55K72308	Strike, bullet
106	55X31509	Support, lid
107	38C70588	Tabs, AM Call Letters & Instructions
108	66A71006	Tool, push button tuner alignment
109	4S7611	Washer: 1/2 x 7/32 x .048 thick; cadmium plated (record changer mtg)
110	4S7629	Washer: 1/2 x 3/16 x .048 thick; cadmium plated (speaker mtg)

CABINET PARTS - MODEL 76F31

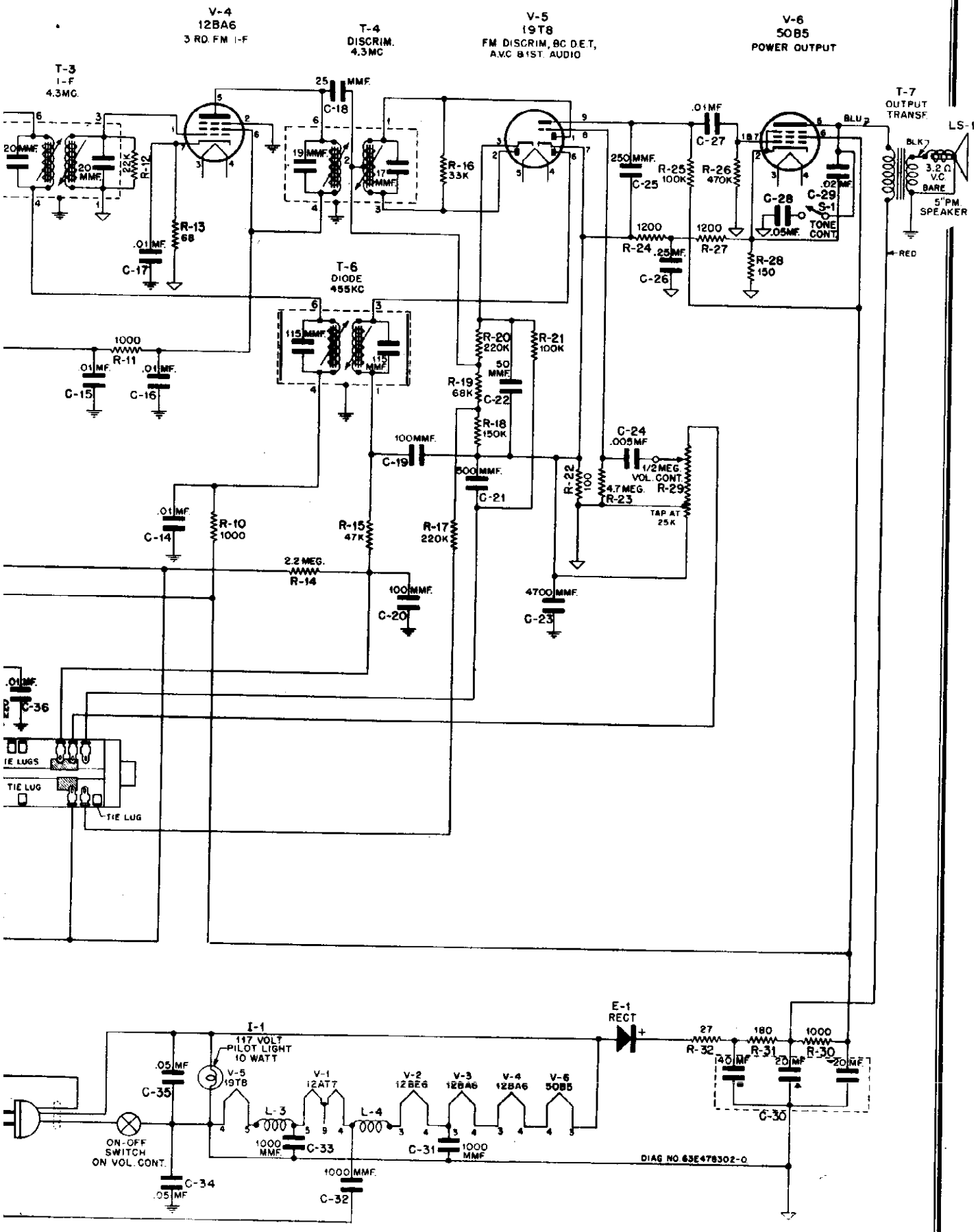
REF NO.	PART NO.	DESCRIPTION
111	7K71220	Bracket, loop mounting
112	38A10544	Button, plug: for 1/4" hole; copper oxide finish (for concealing shipping screw holes in record changer)
113	1X477001	Button, push: walnut plastic; with insert spring
114	16F471547	Cabinet, lowboy console: mahogany (76F31)
115	55A72307	Catch, bullet (on phono compartment door)
116	42K76724	Clamp, cable (2 used as adjustable tap on FM loop)
117	42K5528	Clip, Fahnestock: double
118	42A75825	Clip, mounting (phono power connector mounting
119	13K471549	Clot.., grille: 15"x 17" (Textile Prod #2300-R MAH) (76F31)
120	13B72750	Escutcheon, dial
121	13B70494	Escutcheon, push button: brown
122	5A71081	Eyelet, chassis mounting: 1/4 x 1/4 dia body 1/2 dia head; brass
123	5A70098	Eyelet: 23/64 x 7/32 ID x 1/2 dia head; cadmium plated (Chassis mtg)
123A	13D471904	Grille, cabinet: antique English finish
124	5A71130	Grommet, chassis retainer (used under mtg screw head - bottom)
125	5A71092	Grommet, chassis mounting (chassis cushion - used on top)
126	55K471593	Hinge, plain tip (on drop leaf)
127	14A75142	Insulator, FM loop mounting: bakelite
128	55A471594	Key, escutcheon
129	36K70511	Knob (plain)
130	36K70513	Knob (branded)
131	4S7657	Lockwasher: #8 external; cadmium plated (speaker mtg)
132	4S7003	Nut: 8-32 x 5/16 hex; cadmium plated (speaker mtg)
133	64K471603	Panel, cabinet rear: mahogany
134	55B471551	Pull, drawer: antique copper finish
135	22S1635	Pin, escutcheon: .066 x 3/8; statuary bronze finish (keep key escutcheon from turning)
136	55C74786	Rail, support: right hand (record changer rail)
137	55K74787	Rail, support: left hand (record changer rail)
138	3S1328	Screw: #2 x 3/8 Phillips oval head wood screw; brass plated finish (push button escutcheon mtg)
139	3S3367	Screw: #5 x 3/8 PKA slotted hex head sheet metal screw; statuary bronze finish (phono connector clip mtg)
140	3S3369	Screw: #6 x 3/8 PKA slotted hex head; antique copper finish (Fahnestock clip mounting)
141	3S1344	Screw: #6 x 5/8 slotted flat head wood screw; statuary bronze finish (hinge & fall support mtg)
142	3S1314	Screw: #6 x 3/4 slotted round head wood screw; statuary bronze finish (record changer rail mtg)
143	3K471553	Screw: 8-32 x 5/8 washer head machine screw; antique copper finish (key escutcheon mtg)
144	3S3365	Screw: #8 x 1 PKA slotted hex head sheet metal screw (FM loop mtg)
145	3S3359	Screw: #8 x 1-5/8 PKA slotted hex head sheet metal screw (chassis mtg)
146	3S7396	Screw: 10-32 x 2 slotted hex head machine screw; copper plated (record changer mounting)
147	3A471799	Screw: tri-slot head; statuary bronze finish (drawer pull mounting)
148	3K653	Screw, speaker mounting
149	41A21807	Spring, cushion (bottom) (record changer mounting & cushion)
150	41A28190	Spring, cushion (top) (record changer mounting & cushion)
151	55K72308	Strike, bullet (record compartment door catch)
152	55K471529	Support, fall: statuary bronze finish
153	38C70588	Tabs, AM Call letter & instructions
154	66A71006	Tool, push button tuner alignment
155	4S7611	Washer: 1/2 x 7/32 x .048 thick; antique copper finish (record changer mtg)
156	4S7629	Washer: 1/2 x 3/16 x .048 thick; cadmium plated (speaker mtg)
157	4S7589	Washer: 7/8 x 9/32 x .027 thick; cadmium plated (chassis mtg)

MOTOROLA INC. MODELS 77XM21, 77XM22, 77CC2
CHASSIS HS-102

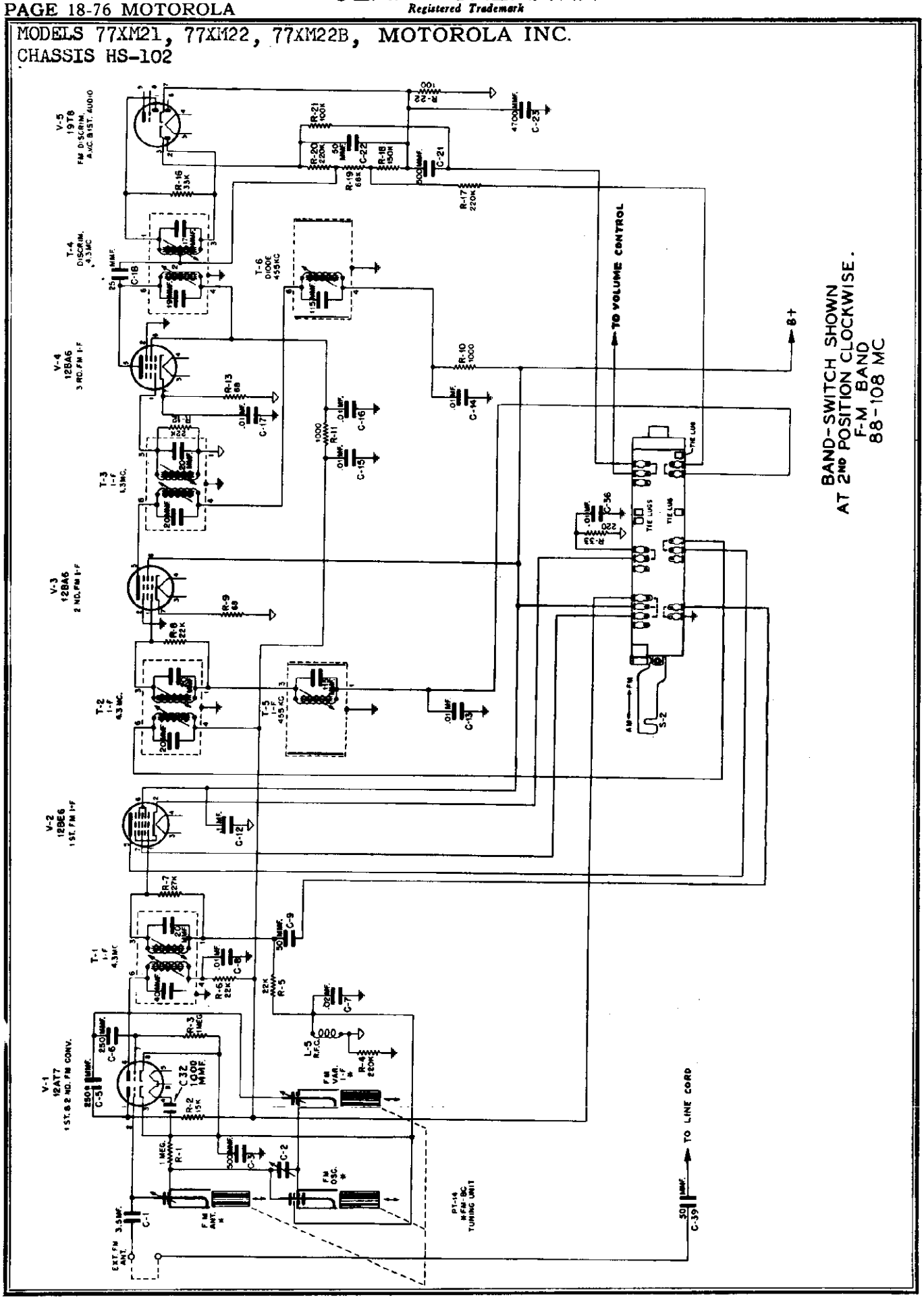



V-1
12AT7
1 ST. & 2 ND. FM CONV.
T-1, T-2, T-3, T-4, T-5 & T-6
TRANSFORMERS
(LUG VIEW)
V-2
12BE6
1 ST. FM I-F
BC CONV.
V-3
12BA6
2 ND. FM I-F
BC I-F
EXT. BC ANT.
EXT. FM ANT.
3.5 MF.
C-1
250 MMF.
C-5
250 MMF.
C-6
T-1
I-F
4.3 MC.
T-2
I-F
4.3 MC.
1 MEG.
R-1
R-2
15K
R-3
1 MEG
R-6
22K
.01 MF.
C-8
R-7
27K
R-8
22K
R-9
68
1 MF.
C-12
F M ANT. *
500 MMF.
C-3
C-2
FM OSC. *
FM VAR. I-F *
22K
R-5
50 MMF.
C-9
C-11
L-1
L-5
R.F.C.
.02 MF.
C-7
R-4
220K
C-4(B)
C-10
T-5
I-F
455 KC
.01 MF.
C-13
PT-14
*FM-BC
TUNING UNIT
BC OSC.
COIL
L-1
L-2
BC LOOP
.02 MF.
C-38
C-4(A)
C-37
R-34
220K
AM ⟷ FM
S-2
2 POSITION BAND SWITCH
SHOWN IN AM POSITION.
50 MMF.
C-39
NOTE
BROADCAST - 538 - 1620 KC.
F-M - 88 - 108 MC.
⏚ = COMMON B-
K = ONE THOUSAND (1000) OHMS.

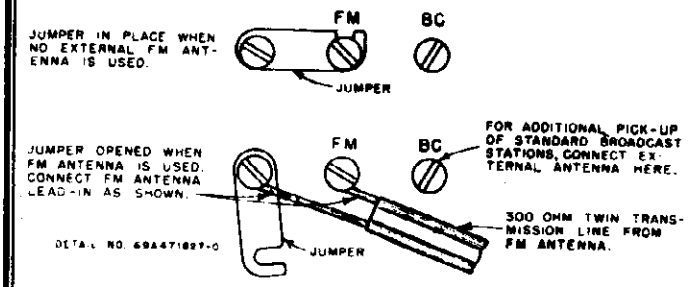
MODELS 77XM21, 77XM22, 77XM22B,
CHASSIS HS-102



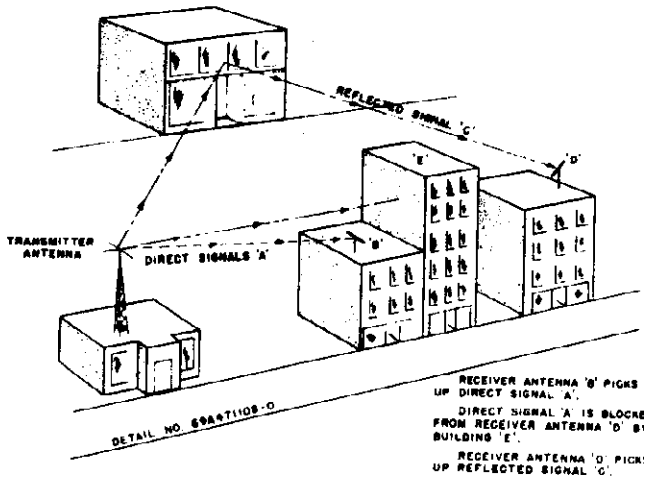
MODELS 77XM21, 77XM22, 77XM22B, MOTOROLA INC.
CHASSIS HS-102



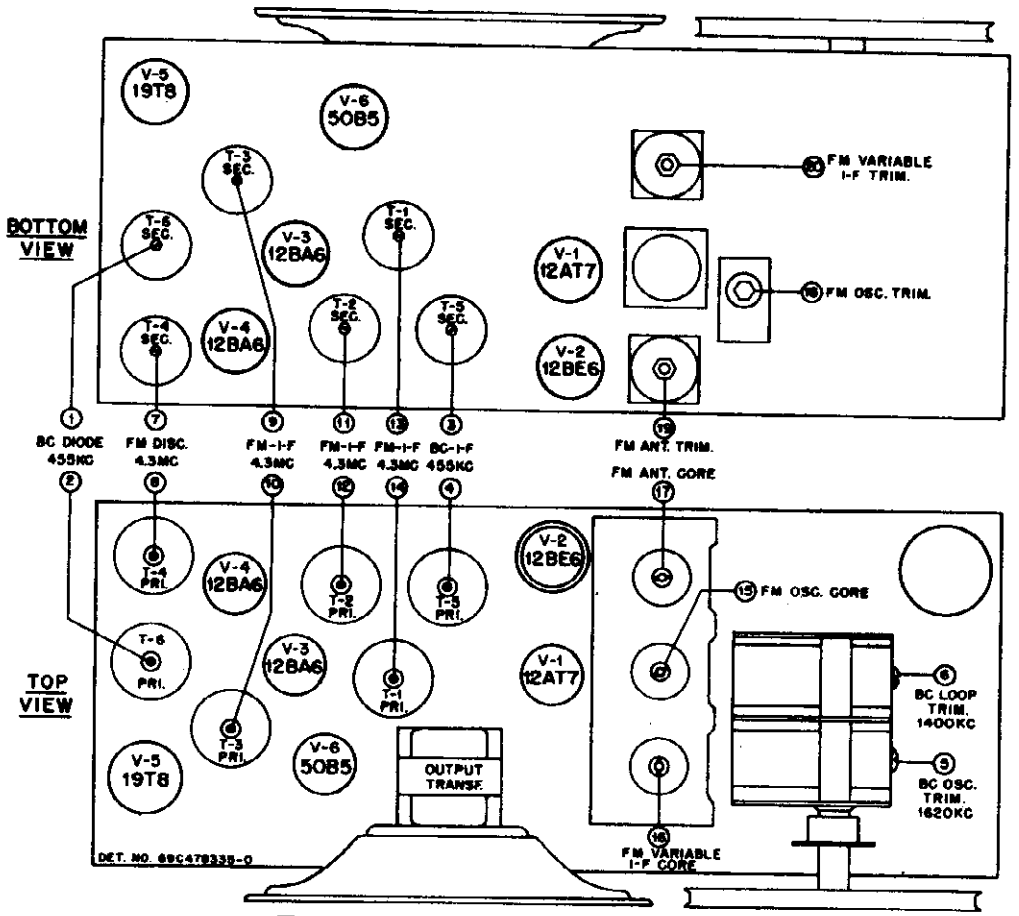
MOTOROLA INC. MODELS 77XM21, 77XM22, 77XM22B
CHASSIS HS-102



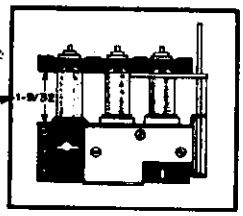
EXTERNAL ANTENNA TERMINALS



DIRECT & REFLECTED FM RECEPTION PATHS



METHOD OF SETTING TUNER TO 98MC.
TURN TUNING SHAFT UNTIL DISTANCE BETWEEN BAKELITE PIECES IS 1-9/32" AS SHOWN IN ILLUSTRATION.



TUBE & TRIMMER LOCATIONS

MOTOROLA INC.

MODELS 77XM21, 77XM22, 77XM22B,
CHASSIS HS-102

ALIGNMENT

Maximum performance can only be obtained if extreme care is exercised during alignment.

It is suggested that an isolation transformer be used between receiver and power line. If no isolation transformer is used and hum is encountered during alignment, connect the ground side of the signal generator output to B- instead of the receiver chassis.

If set oscillates when aligning the broadcast band, connect receiver B- to receiver chassis. **CAUTION: Don't forget to disconnect B- from receiver chassis after alignment.**

Use an insulated wrench when adjusting the FM tuner trimmers. Order Motorola FM Alignment wrench part number 66A471864.

A special wrench for adjusting the slotted nuts on the tuner cores will be required also. You can easily fabricate one from a Motorola auto set Volume Control Shaft and Coupling Assembly (Part Number 1B70847, $.30 list) by simply spreading out the forked ends and filing to fit. Solder the assembly together to make it rigid.

COMPLETE ALIGNMENT PROCEDURE USING AM SIGNAL GENERATOR

An AM (30% amplitude modulated) signal generator covering the frequencies shown in alignment Chart I, is used to align the broadcast and FM bands. A low range output meter, connected across the speaker voice coil, is used as an output indicator.

The broadcast alignment is conventional; instructions are given in the following alignment chart.

The FM band alignment can be satisfactorily performed by following the instructions in the chart. When properly aligned, the discriminator does not respond to amplitude modulation and since an AM type signal generator is used for aligning the FM circuits, it is necessary to detune the discriminator secondary and leave it that way until all of the FM circuits have been aligned. After completing the alignment of the FM circuits, proceed to align the discriminator secondary by applying a 4.3 Mc AM signal to the control grid (pin #7) of the 2nd FM converter tube and adjusting the discriminator secondary core for minimum audio output. No adjustment of the FM circuits should be attempted with AM after the discriminator secondary has been properly aligned.

ALIGNMENT PROCEDURE WHEN USING AM MODULATED SIGNAL GENERATOR AND STANDARD OUTPUT METER FOR COMPLETE RECEIVER ALIGNMENT

STEP	DIAL SET TO	BAND SW. SET TO	DUMMY	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR SET AT	ADJUST TRIMMER OR CORE	REMARKS
455 Kc IF CHANNEL ALIGNMENT							
1.	1620 Kc	BC	.1 mf	12BE6 (V-2) BC Conv. Grid (Pin #1)	455 Kc	1,2,3 & 4	Adjust for maximum output.
BROADCAST BAND ALIGNMENT							
2.	1620 Kc (gang fully opened)	BC	.1 mf	12BE6(V-2) BC Conv. Grid (Pin #1)	1620 Kc	5	This sets oscillator to dial. (Calibrate pointer by fully closing gang and noting position of pointer slider. Pointer slider should be in line with right hand hole in dial background bracket as shown in Figure 7.)
3.	1400 Kc	BC	None	Radiation loop*	1400 Kc	6	Tune in signal with receiver tuning knob, then peak trimmer 6.
4.3 Mc IF CHANNEL ALIGNMENT							
4.	-	-	-	-	-	7	Detune discriminator secondary by screwing core out as far as it will go.
5.	(extreme high frequency end)	FM	.001 mf	12AT7 (V-1) 2nd FM Converter Grid (#7 Pin)	4.3 Mc	8,9,10,11, 12, 13 & 14	Adjust for maximum output.
FM BAND ALIGNMENT							
6.	-	-	-	-	-	15	Check the position of the FM Osc. tuning core 15. Set spacing between the core and bakelite piece to which it is mounted, to two turns from tight by turning tuning core slotted nut.

MOTOROLA INC. MODELS 77XM21, 77XM22, 77XM23
CHASSIS HS-102

ALIGNMENT (cont'd)

STEP	DIAL SET TO	BAND SW. SET TO	DUMMY	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR SET AT	ADJUST TRIMMER OR CORE	REMARKS
7.	98 Mc	FM	None	FM Ant. terminal	98 Mc	18	Tuner is set to 98 Mc by moving cores out with tuning shaft until spacing between bakelite pieces is 1-9/32". See illustration. Peak 18 for maximum output
8.	90 Mc	FM	None	FM Ant. terminal	90 Mc	19 & 20	Tune in signal with receiver tuning knob, then adjust 19 and 20 for maximum output.
9.	105 Mc	FM	None	FM Ant. terminal	105 Mc	16 & 17	Tune in signal with receiver tuning knob, then adjust 16 and 17 for maximum output.
10.	-	-	-	-	-	-	Repeat steps 8 & 9 several times until further adjustment does not increase the output. Make the final trimmer adjustment at 105 Mc. (i.e., trimmers 19 & 20 at 105 Mc.)
11.	105 Mc	FM	None	Radiate signal (or use station after performing Step 12)	105 Mc	19	Adjust for maximum output with built-in antenna connected.
ALIGN DISCRIMINATOR SECONDARY							
12.	-	FM	.001 mf	12AT7 (V-1) 2nd FM Converter Grid (Pin #7)	4.3 Mc	7	Adjust discriminator secondary for minimum response. The correct adjustment is sharply defined minimum response point between the two peaks.

* Connect output of signal generator to a 5" diameter, 3 turn loop and radiate signal into receiver loop. Minimum distance between loops should never be less than 12".

ALIGNMENT PROCEDURE WHEN USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

STEP OPERATION

455 Kc IF Channel Alignment

1. Same as Step 1 in Chart I (Use AM signal generator)

Broadcast Band Alignment

2. Same as Steps 2 & 3 in Chart I (Use AM signal generator)

4.3 Mc IF Channel Alignment-Use FM Signal Generator & Oscilloscope

3. (A) Discriminator

1. Connect the input terminals of the oscilloscope vertical amplifier to the high side of the receiver volume control and B-.

2. Connect the FM generator synchronizing voltage output terminals to a phase shifting network, consisting of a variable 1/2 megohm resistor in series with a .002 mf capacitor. The input to the oscilloscope horizontal amplifier is connected across the .002 mf capacitor. See Figure 5. (This phase shifting network may not work with every oscilloscope. Different values of R & C may be required.

3. Apply an FM 4.3 Mc signal (125 Kc deviation) through a .001 mf capacitor to the control grid (pin #1) of tube V-4 in the third FM IF Amplifier stage.

4. Adjust discriminator primary (8) for maximum amplitude. The phase shifting network resistor is adjusted to give only one trace.

5. Adjust discriminator secondary (7) until a symmetrical pattern is obtained, with peaks occurring at about 100 Kc above and below 4.3 Mc and is substantially linear between peaks. The trace should pass through the intersection of the vertical and horizontal axis. The phase shifting network should be adjusted to give only a single pattern at all times. See Figure 6. It will be necessary to go over discriminator primary (8) and secondary (7) adjustments several times before a pattern of maximum amplitude and correct symmetry is obtained.

(B) 4.3 Mc IF Amplifiers

1. Apply an FM 4.3 Mc signal (100 Kc deviation) to the control grid (pin #1) of tube V-3 in the 2nd FM IF amplifier stage, through a .001 mf capacitor and adjust both primary and secondary cores (9 & 10) to get a symmetrical pattern as before, with peaks occurring at a slightly lower deviation.

2. Apply an FM 4.3 Mc signal (100 Kc deviation) to the control grid (pin #1) of tube V-2 and adjust both primary and secondary cores (11 & 12) until a symmetrical pattern substantially linear between peaks, is obtained.

3. Apply an FM 4.3 Mc signal (100 Kc deviation) to the FM antenna terminal and adjust both primary and secondary cores (13 & 14) until a symmetrical pattern substantially linear between peaks, is obtained.

FM Band Alignment - Use FM Signal Generator & Output Meter

4. Check the position of the FM oscillator tuning core (15). Set the spacing between the core and the bakelite piece to two turns from tight by turning tuning core slotted nut.

5. Connect generator output directly to the receiver FM antenna terminal.

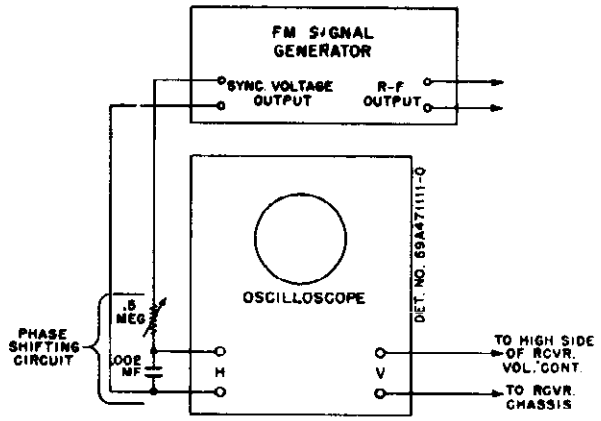
6. Set receiver tuner to 98 Mc by moving cores out with tuning shaft until spacing between bakelite pieces is 1-9/32". See Figure 4. Also set FM signal generator to 98 Mc. (22-1/2 Kc deviation). Adjust FM oscillator trimmer (18) for maximum output.

7. Set FM signal generator to 90 Mc (22-1/2 Kc deviation). Tune in signal with receiver tuning knob and then adjust FM variable IF & FM antenna trimmers (19 & 20) for maximum output.

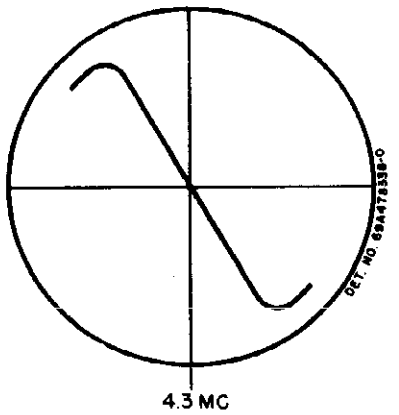
8. Set FM signal generator to 105 Mc (22-1/2 Kc deviation). Tune in signal with receiver tuning knob and then adjust variable IF and antenna cores (16 & 17) for maximum indication on output meter.

   Repeat steps 7 & 8 several times until further adjustment does not increase the output. Make the final trimmer adjustment at 105 Mc. (i.e., trimmers 19 & 20 at 105 Mc.)

9. Close FM antenna link on loop panel. Radiate an FM 105 Mc (22-1/2 Kc deviation) signal into FM antenna (line cord). Tune in signal with receiver tuning knob and then repeak FM antenna trimmer (19).

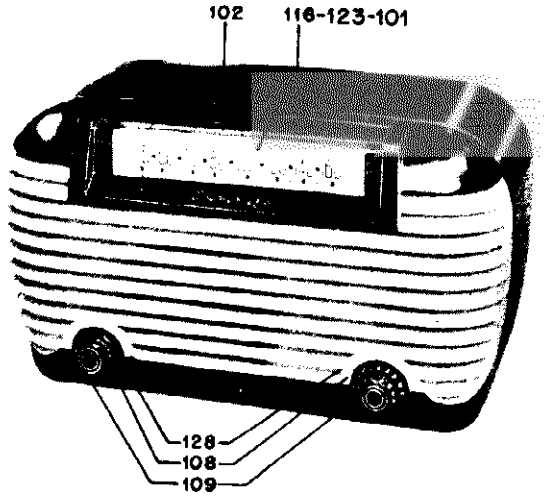


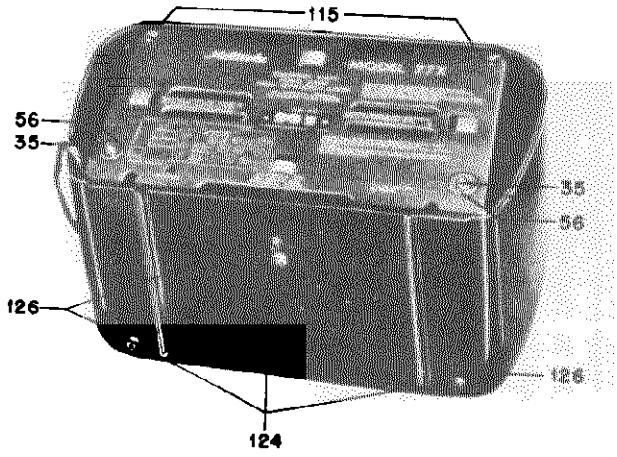
SIGNAL GENERATOR & OSCILLOSCOPE HOOK-UP



OSCILLOSCOPE PATTERN

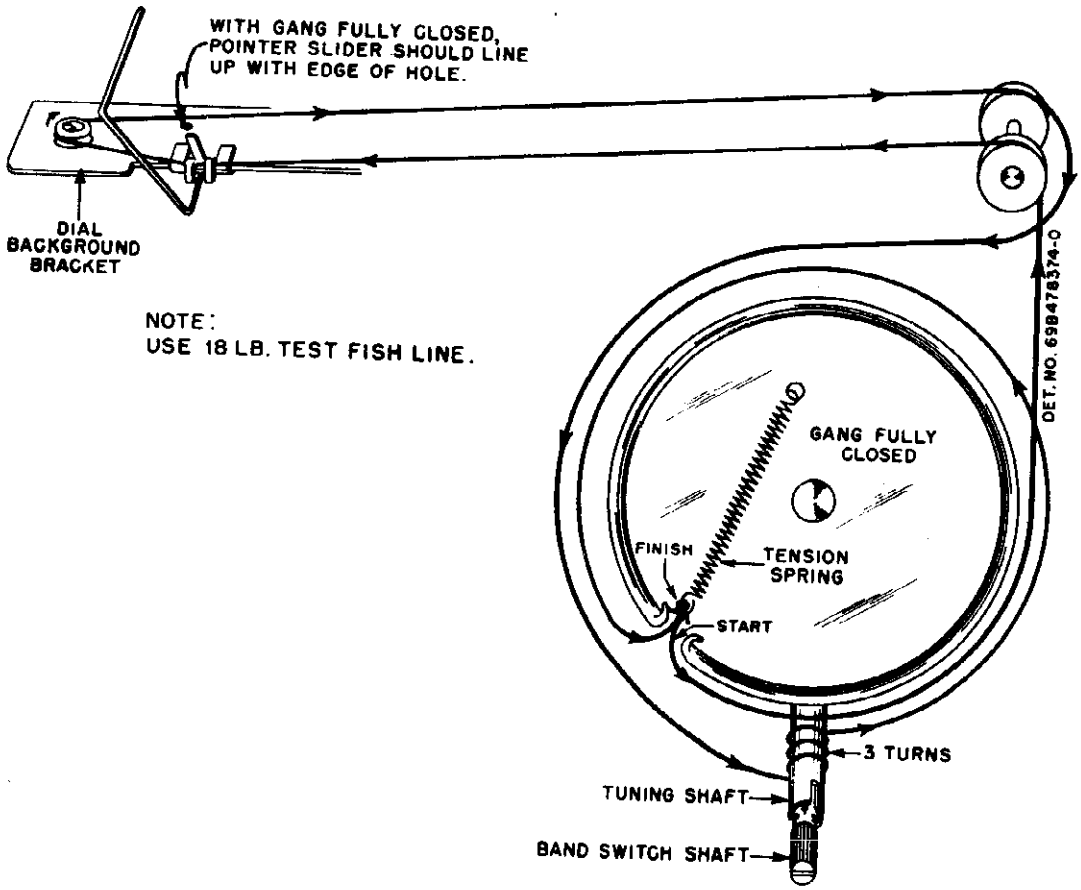
MOTOROLA INC. MODELS 77XM21, 77XM22, 77XM2
CHASSIS HS-102





77XM21 (PLASTIC-WALNUT)

PARTS LOCATION - CABINET

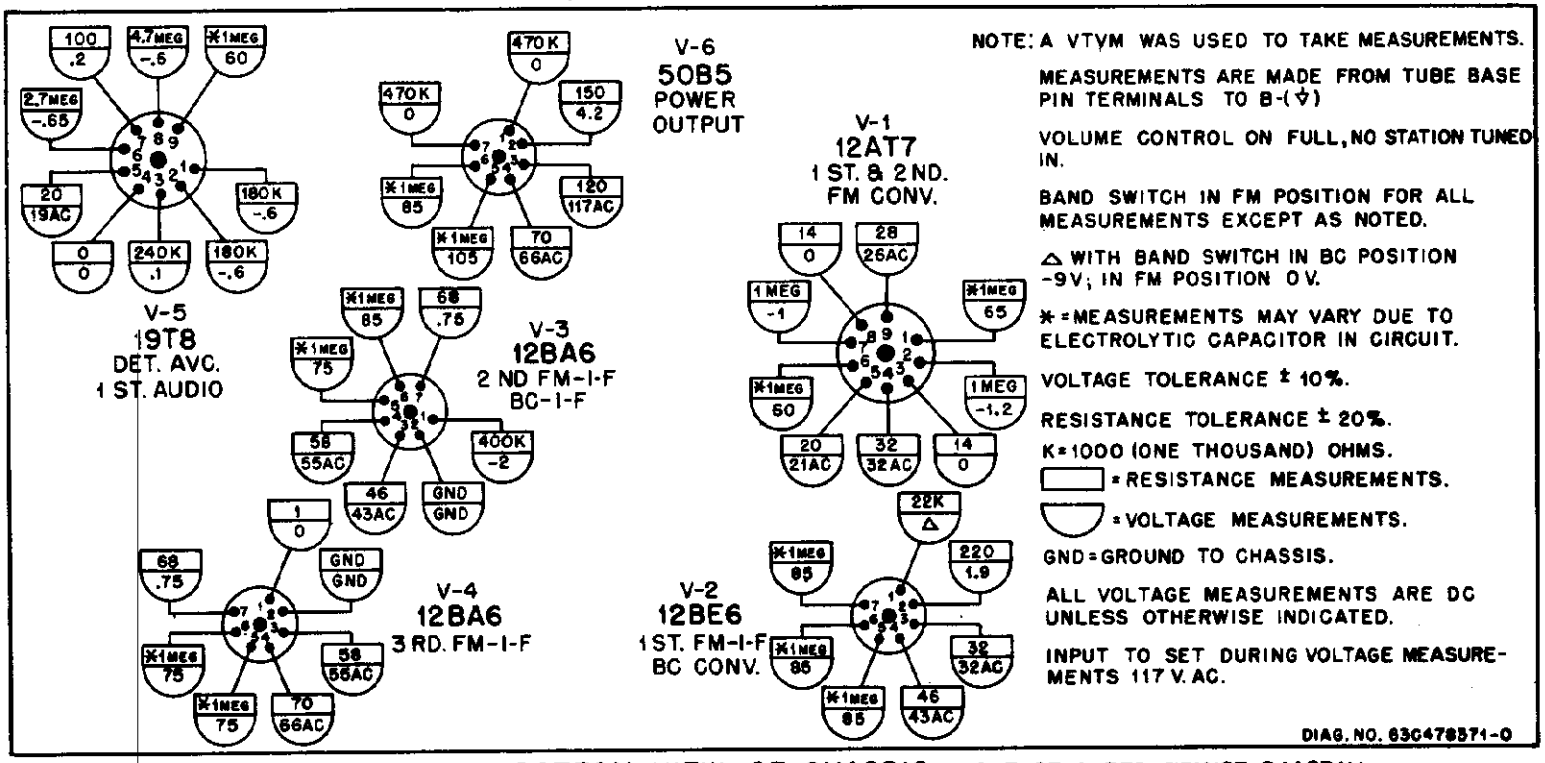


NOTE:
USE 18 LB. TEST FISH LINE.

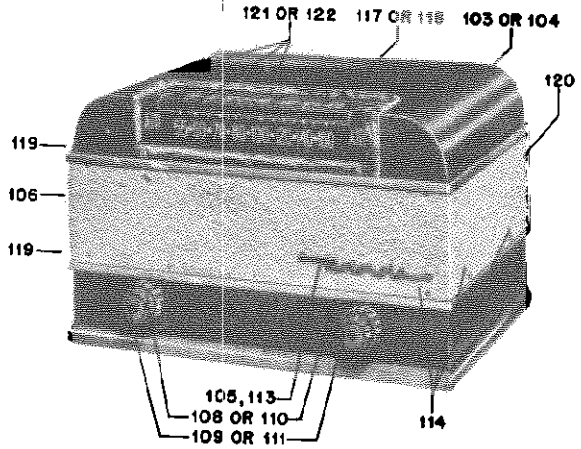
STRING DRIVE

POWER SUPPLY - 105-125 Volts AC-DC, 35 watts

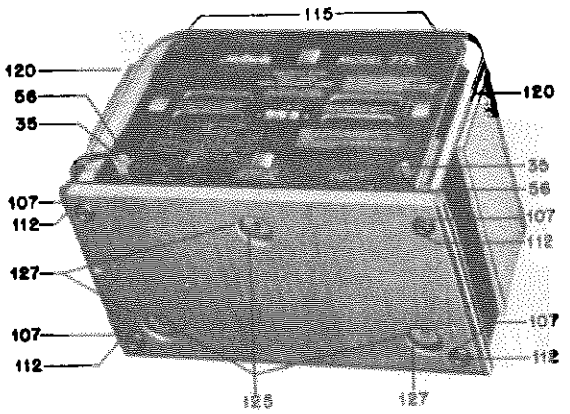
(FRONT OF CHASSIS)

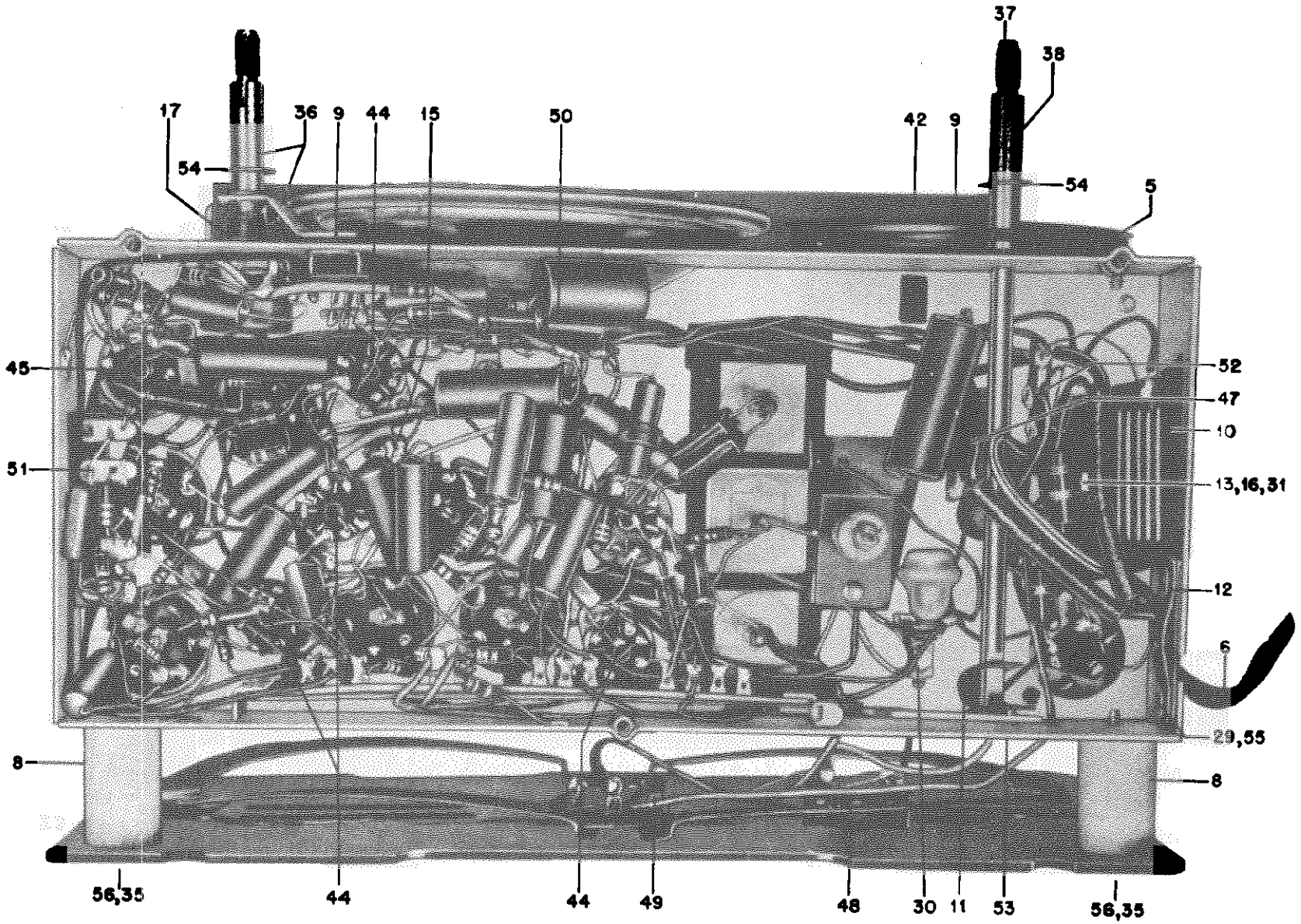


BOTTOM VIEW OF CHASSIS VOLTAGE & RESISTANCE DIAGRAM



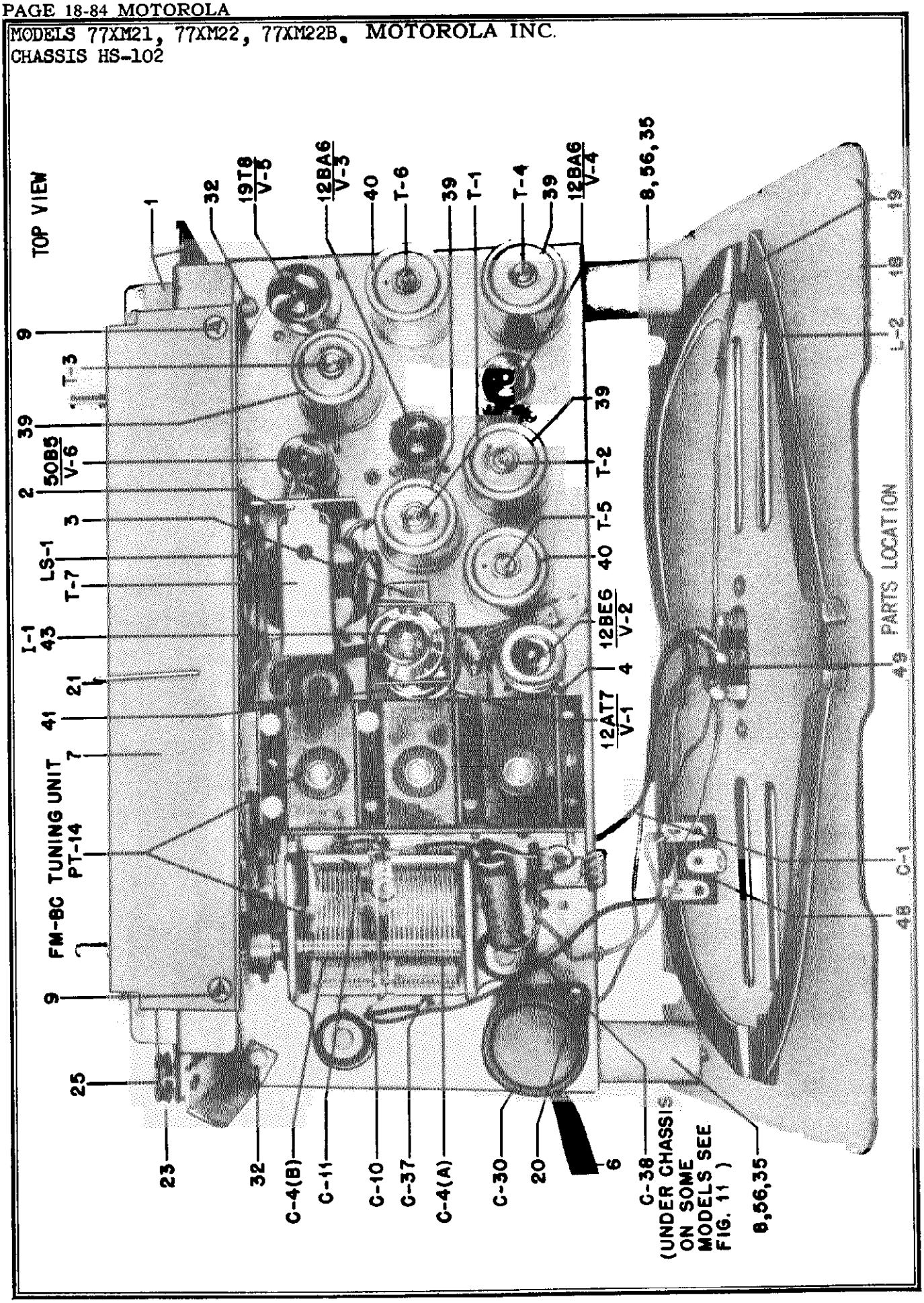
77XM22 (WOOD-WALNUT)
77XM22B (WOOD-BLONDE)

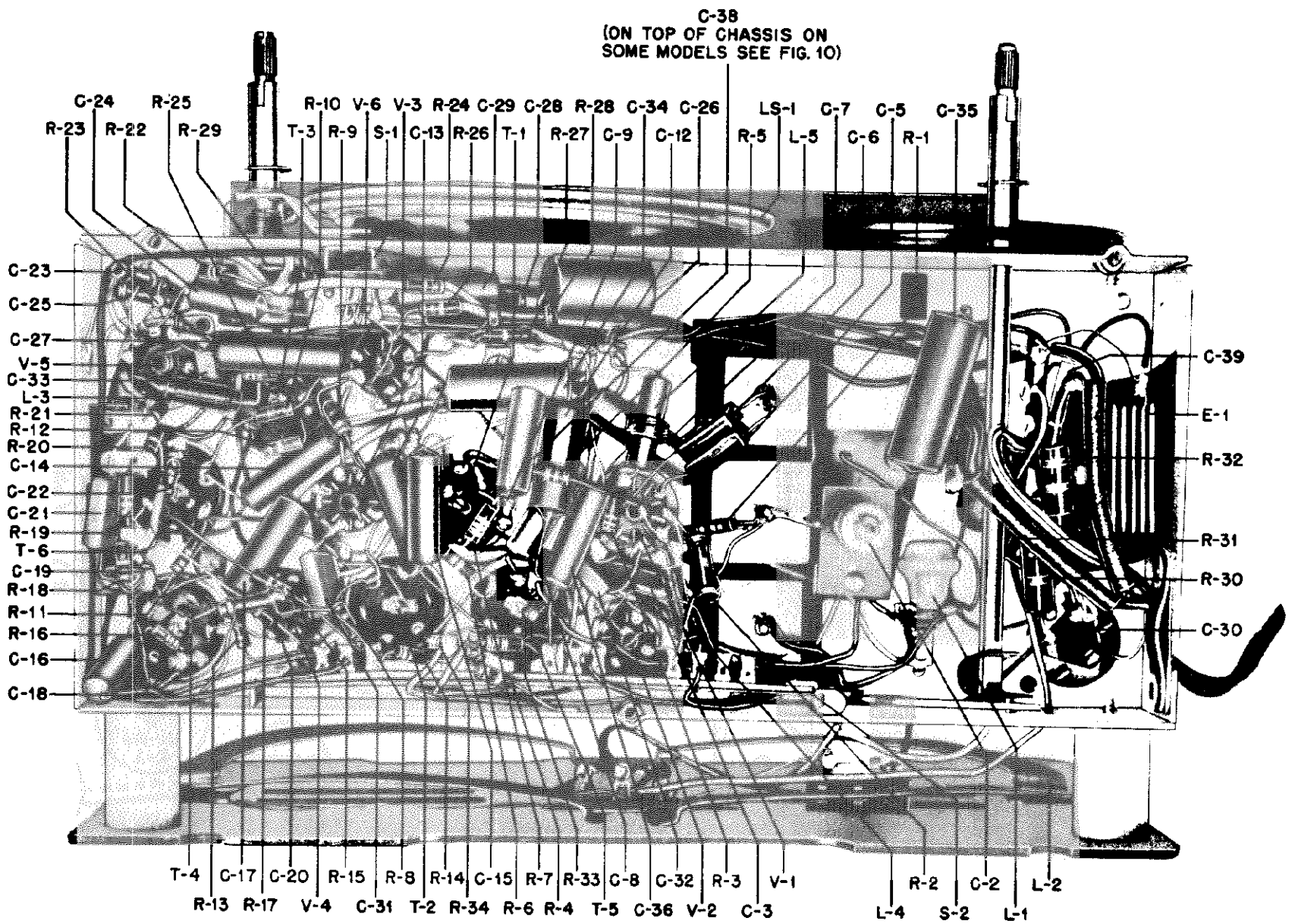




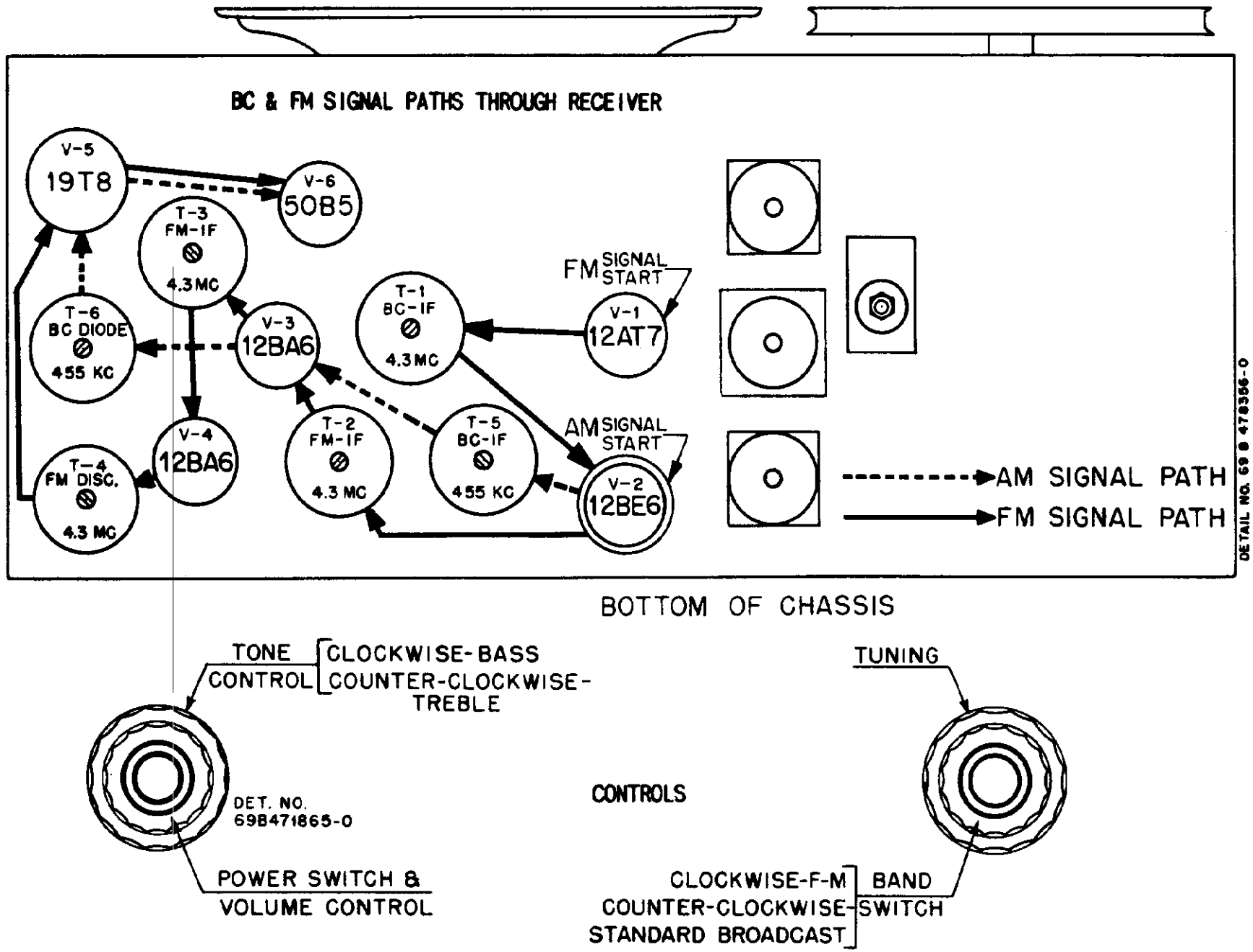
PARTS LOCATION - CHASSIS HS-102 - BOTTOM VIEW
(MISCELLANEOUS PARTS)

MODELS 77XM21, 77XM22, 77XM22B. MOTOROLA INC.
CHASSIS HS-102





PARTS LOCATION - CHASSIS HS-102 - BOTTOM VIEW
(CAPACITORS, RESISTORS, COILS, TRANSFORMERS, SWITCHES)


BC & FM SIGNAL PATHS THROUGH RECEIVER
V-5
19T8
V-6
5085
T-3
FM-IF
4.3MC
T-6
BC DIODE
455 KC
V-3
12BA6
T-1
BC-IF
4.3MC
FM SIGNAL START
V-1
12AT7
V-4
12BA6
T-2
FM-IF
4.3 MC
T-5
BC-IF
455 KC
AM SIGNAL START
T-4
FM DISC.
4.3 MC
V-2
12BE6
AM SIGNAL PATH
FM SIGNAL PATH
DETAIL NO. 69 B 478566-O
BOTTOM OF CHASSIS
TONE CONTROL
CLOCKWISE-BASS
COUNTER-CLOCKWISE-TREBLE
TUNING
DET. NO. 698471865-0
CONTROLS
POWER SWITCH & VOLUME CONTROL
CLOCKWISE-F-M
COUNTER-CLOCKWISE-STANDARD BROADCAST
BAND SWITCH

MOTOROLA INC. MODELS 77XM21, 77XM22, 77XM2
CHASSIS HS-102

REF. NO.	PART NO.	DESCRIPTION
		CHASSIS PARTS HS-102
		CAPACITORS
C-1	21K470578	Special: 3.5 mmf .....
C-2	19A470426	Trimmer: variable air; 2.5 mmf to 30 mmf
C-3	21R2730	Silver Mica: 500 mmf 500V .....
C-4	19K75415	Variable: 2 gang; cut oscillator plates; with trimmers C-10, C-11 & C-37 .....
C-5	21R2729	Silver Mica: 250 mmf 500V .....
C-6	21R2729	Silver Mica: 250 mmf 500V .....
C-7	8S9802	Paper: .02 mf 400V .....
C-8	8S9825	Paper: .01 mf 200V .....
C-9	21K77373	Ceramic: 50 mmf 500V .....
C-10	-	Trimmer: Part of gang capacitor C-4 ....
C-11	-	Trimmer: Part of gang capacitor C-4 ....
C-12	8K471636	Paper: .1 mf 200V .....
C-13	8S9801	Paper: .01 mf 100V .....
C-14	8S9825	Paper: .01 mf 200V .....
C-15	8S9825	Paper: .01 mf 200V .....
C-16	8S9825	Paper: .01 mf 200V .....
C-17	8S9801	Paper: .01 mf 100V .....
C-18	21K26816	Ceramic: 25 mmf 500V .....
C-19	21B77286	Ceramic: 100 mmf 500V .....
C-20	21B77286	Ceramic: 100 mmf 500V .....
C-21	21R6639	Mica: 500 mmf 500V .....
C-22	21K77373	Ceramic: 50 mmf 500V .....
C-23	21B470567	Ceramic: 4700 mmf 500V .....
C-24	8A24966	Paper: .005 mf 100V .....
C-25	21K77375	Ceramic: 250 mmf 500V .....
C-26	8A470504	Paper: .25 mf 50V .....
C-27	8S9809	Paper: .01 mf 400V .....
C-28	8K471635	Paper: .05 mf 400V .....
C-29	8A471019	Paper: .02 mf 400V.....
C-30	23B470429	Electrolytic: 40 mf 200V, 20-20 mf 150V; includes insulating tube .....
C-31	21R6638	Mica: 1000 mmf 500V .....
C-32	21R6638	Mica: 1000 mmf 500V .....
C-33	21R6638	Mica: 1000 mmf 500V .....
C-34	8A471623	Paper: .05 mf 200V .....
C-35	8S9816	Paper: .05 mf 400V .....
C-36	8S9801	Paper: .01 mf 100V .....
C-37	-	Trimmer; Part of gang capacitor C-4 ....
C-38	8S9802	Paper: .02 mf 400V .....
C-39	21R6642	Mica: 50 mmf 500V .....
		RECTIFIER
E-1	48B90140	Selenium type: half wave .....
		DIAL LIGHT
I-1	65A470930	Lamp, incandescent: 117V, 10 watts; clear
		COILS
L-1	24A470556	BC Oscillator .....
L-2	24K470598	Loop Antenna: winding only .....
L-3	24A74989	Filament choke .....
L-4	24A74989	Filament choke .....
L-5	24A470505	RF Choke .....
		SPEAKER
LS-1	50K471004	5" PM; 3.2 ohm voice coil ..... Exchange
		RESISTORS
Note:	All resistors are 1/2 watt ± 20% insulated type, unless otherwise specified.	
R-1	6R6004	1 meg .....
R-2	6R3996	15,000 not insulated .....
R-3	6R6046	1 meg 10% .....
R-4	6R6015	220,000 .....

REF. NO.	PART NO.	DESCRIPTION
R-5	6R6028	22,000 .....
R-6	6R6028	22,000 .....
R-7	6R6434	27,000 10% .....
R-8	6R6028	22,000 .....
R-9	6R2039	68 10% .....
R-10	6R6301	1000 .....
R-11	6R6301	1000 .....
R-12	6R6028	22,000 .....
R-13	6R2039	68 10% .....
R-14	6R3927	2.2 meg .....
R-15	6R6056	47,000 .....
R-16	6R6410	33,000 10% .....
R-17	6R6015	220,000 .....
R-18	6R6182	150,000 .....
R-19	6R6001	68,000 .....
R-20	6R6015	220,000 .....
R-21	6R6075	100,000 .....
R-22	6R6018	100 .....
R-23	6R2122	4.7 meg .....
R-24	6R6393	1200 10% .....
R-25	6R6075	100,000 .....
R-26	6R6062	470,000 .....
R-27	6R6393	1200 10% .....
R-28	6R6293	150 not insulated .....
R-29	18A47042	Volume Control: .5 meg; tapped at 25, ohms; with SPST switch; grooved shaf
R-30	6R476004	1000 2 watt .....
R-31	6R3968	180 10% 2 watt .....
R-32	6R3994	27 10% 2 watt .....
R-33	6R3933	220 .....
R-34	6R6015	220,000 .....
		SWITCHES
S-1	40K21758	Slider switch: SPDT .....
S-2	40B470432	Bandswitch .....
		TRANSFORMERS
T-1	24B471668	1st IF, 4.3 Mc; complete with iron co and padding capacitors, but less shi
T-2	24B471670	2nd IF, 4.3 Mc; complete with iron co and padding capacitors, but less shi
T-3	24B471672	3rd IF, 4.3 Mc; complete with iron co and padding capacitors, but less shi
T-4	24B471674	Discriminator, 4.3 Mc; complete with cores and padding capacitors, but les shield .....
T-5	24B75487	IF, 455 Kc: complete with iron cores a padding capacitors, but less shield .
T-6	24B471666	Diode: 455 Kc: complete with iron core and padding capacitors, but less shie
T-7	25K471947	Output .....
		MISC. CHASSIS PARTS
1	1X77345	Background Support & Pulleys Assembly
2	7A471005	Bracket, output transformer mtg .....
3	7K470917	Bracket, pilot light mounting .....
4	26A24869	Base, tube shield .....
5	11M8944	Cord, dial: 18 lb; black .....
6	30K31258	Cord, line and plug: 3 conductor .....
7	35B77311	Dial Background: tan plastic; with reinforcing strip .....
8	57K470568	Dowel, back mounting: wood, 1-3/16" lo
9	5S7805	Eyelet, snap-in (dial background mtg)
10	14A470428	Insulator, rectifier: armite .....
11	1X470545	Lever & Rivet Assembly (on band switch

MODELS 77XM21, 77XM22, 77XM22B, MOTOROLA INC.
CHASSIS HS-102

REF. NO.	PART NO.	DESCRIPTION
12	32K31259	Lock, line cord: fibre .....
13	4S7650	Lockwasher: #6 internal (rectifier mtg).
14	4S7657	Lockwasher: #8 external (speaker & output transformer bracket mtg) .....
15	29R5227	Lug, soldering: #6L; hot-tinned .....
16	2S7002	Nut: 6-32 x 5/16 hex; cadmium plated (rectifier mtg) .....
17	2S7051	Nut: 3/8-32 x 9/16-hex Palnut; cadmium plated (volume control mtg) .....
18	1X471711	Panel Assembly, cabinet back: less loop winding, but includes 3 screw terminal strip and 2 lug terminal strip .....
19	24K471696	Panel & Loop Assembly, cabinet back: complete cabinet back panel, including loop winding .....
20	9A12705	Plate, electrolytic mounting: bakelite .
21	52A77307	Pointer & Slider Assembly: painted red..
22	49A12646	Pulley, cord: 1/4 groove .....
23	49A21552	Pulley, cord: 1/2 groove .....
24	5A71246	Rivet, shoulder: .187 long (cord pulley mounting) .....
25	5A15045	Rivet, shoulder: .437 long (cord pulley mounting) .....
26	5S8497	Rivet: .088 x 1/8 steel; nickel plated (socket mtg) .....
27	5S7707	Rivet: .122 x 6/32 steel: nickel plated (tone sw & pilot light bracket mtg) ...
28	5S7701	Rivet: .122 x 3/16 steel; nickel plated (electrolytic plate mtg) .....
29	5S7708	Rivet: .122 x 9/32 steel; nickel plated (line cord lock mtg) .....
30	3S7506	Screw: #6 x 1/4 PKZ plain hex head sheet metal screw; cadmium plated (BC Osc coil mtg) .....
31	3S2927	Screw: 6-32 x 7/8 slotted hex head machine screw; cadmium plated (rectifier mtg) .....
32	3S7454	Screw: #8 x 1/4 PKZ plain hex head sheet metal screw; cadmium plated (background support bracket mtg) .....
33	3S7163	Screw: 8-32 x 1/4 slotted hex head machine screw; cadmium plated (speaker output trans. brkt. mtg) .....
34	3S7481	Screw: #8 x 3/4 PKZ slotted hex head sheet metal screw; cadmium plated (tuner mtg) .....
35	3S7530	Screw: #8 x 1-1/2 PKZ slotted hex head sheet metal screw; cadmium plated (back panel mtg) .....
36	1X470546	Shaft & Arm Assembly (tone control shaft)
37	47A470406	Shaft, band switch: grooved .....
38	47A470404	Shaft, tuning: brass .....
39	26B70107	Shield, coil (shield for T-1, T-2, T-3 and T-4) .....
40	1X71049	Shield & Sleeve Assembly (shield for T-5 and T-6) .....
41	26A478109	Shield, light & static (used behind dial light) .....
42	26A470805	Shield, speaker baffle & light: fibre...
43	9A470407	Socket, dial light & bracket .....
44	9A470506	Socket, tube: miniature, 7 prong; black bakelite .....
45	9K470425	Socket, tube: noval,9 prong; black bakelite .....
46	41A14244	Spring, tension coil (drive cord spring) .....
47	31K83993	Strip, terminal: 2 insulated lugs, #1 mtg
48	31K15026	Strip, terminal: 2 insulated lugs, #2 mtg (on rear panel) .....
49	31A470403	Strip, terminal: 3 screw; with jumper (Ext Ant. terminals) .....
50	31A471913	Strip, terminal: 4 insulated lugs, #2 ground .....
51	31K75232	Strip, terminal: 4 insulated lugs, #3 mtg
52	31K22174	Strip, terminal: 4 insulated lugs, #4 mtg
53	4A70015	Washer, "C" (band sw shaft retainer) ...
54	4A73639	Washer, "C" (tuning & tone shaft retainer) .....
55	4S1719	Washer: 3/8 x .140 x .030 thick; steel; cadmium plated (line cord lock mtg) ...
56	4S7613	Washer: 3/4 x 13/64 x .027 thick; steel; antique copper finish (back panel mtg).
	CABINET PARTS - MODELS 77XM21, 22 & 22B	
101	7A77382	Bracket, dial scale mounting (77XM21) ..
102	16K471767	Cabinet, table model: molded; walnut plastic (77XM21) .....
103	1X470901	Cabinet Assembly, table model: wood; walnut (77XM22) .....
104	1X478163	Cabinet Assembly, table model: wood; blonde finish (77XM22B) .....
105	42A71091	Clip, speed (logotype overlay mtg - 77XM22 & 22B) .....
106	36B470687	Cloth, grille: mounted on cardboard strip (77XM22 & 22B) .....
107	37K15841	Foot, rubber (77XM22 & 22B) .....
108	36A470602	Knob, control (large): walnut plastic (77XM21 & 22) .....
109	36A470604	Knob, control (small): walnut plastic (77XM21 & 22) .....
110	36K471712	Knob, control (large): mottled tan plastic (77XM22B) .....
111	36K471713	Knob, control (small): mottled tan plastic (77XM22B) .....
112	22S7953	Nail, wire: .080 x 5/8 steel (cabinet foot mtg - 77XM22 & 22B) .....
113	62K76926	Overlay, logotype (77XM22 & 22B) .....
114	22S1633	Pin, escutcheon: brass, .066 x 3/8 (grille cloth mtg) .....
115	38A25507	Plug, split: 5/8 long (for holding back panel to cabinet) .....
116	34C470601	Scale, dial (77XM21) .....
117	34K470663	Scale, dial & escutcheon (77XM22) .....
118	34K471638	Scale, dial & escutcheon (77XM22B) ....
119	64B470690	Strip, trim: long; brushed brass finish (77XM22 & 22B) .....
120	64K471774	Strip, trim: end piece; brushed brass finish (77XM22 & 22B) .....
121	3S1317	Screw: #2 x 3/8 Phillips ovalhead wood screw; statuary bronze finish (escutcheon mtg - 77XM22) .....
122	3S1328	Screw: #2 x 3/8 Phillips ovalhead wood screw; brass plated (escutcheon mtg - 77XM22B) .....
123	3S7155	Screw: 6-32 x 3/16 slotted hex head machine screw; cadmium plated (77XM21 dial scale mtg) .....
124	3S8117	Screw: #8 x 1 PKZ slotted hex head sheet metal screw; antique copper finish (77XM21 chassis mtg) .....
125	3S7526	Screw: #8 x 1-1/8 PKA slotted hex head sheet metal screw; cadmium plated (chassis mtg 77XM22 & 22B) .....
126	32A20575	Washer: paper; 3/8 x .171 x .062 thick (used under 77XM21 chassis mtg screws to prevent cracking bakelite cabinet) ...
127	4S8204	Washer: 1" x .203 x .067 steel; copper plated (chassis mtg 77XM22 & 22B) ....
128	4K77702	Washer: paper; 1" x 1/2 x 1/32 thick; dark brown (used under control knobs on 77XM21)

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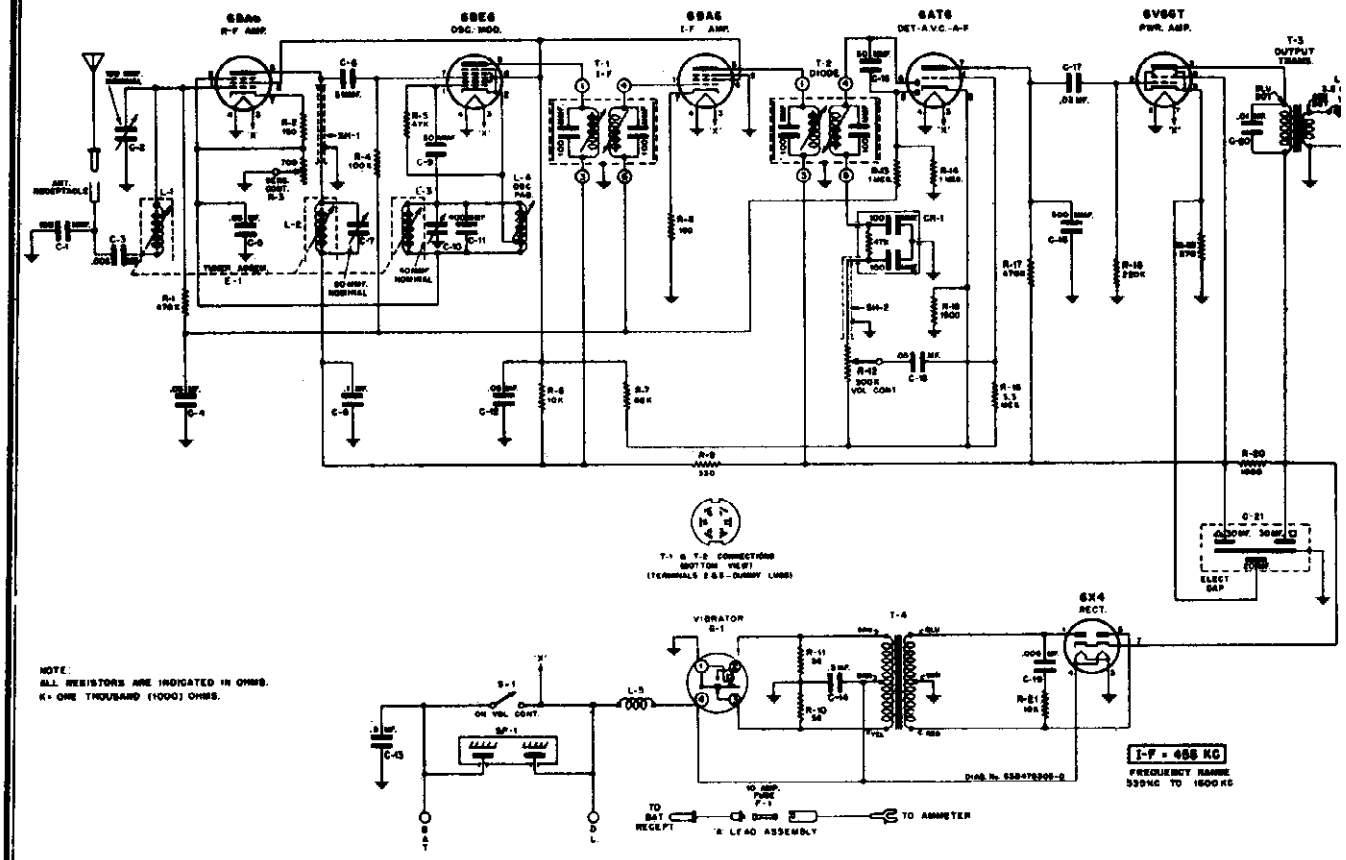
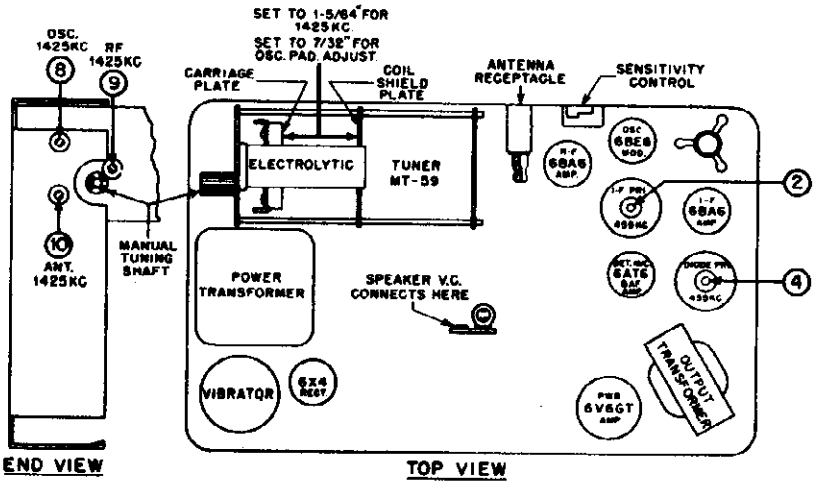
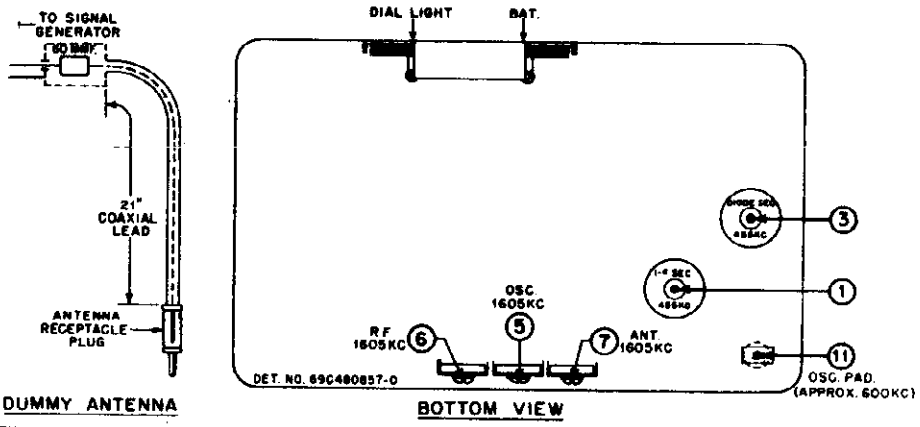


NOTE:
ALL RESISTORS ARE INDICATED IN OHMS.
K = ONE THOUSAND (1000) OHMS.





ALIGNMENT

EQUIPMENT REQUIRED

1. A special tool for adjusting the tuner cores. Use Alignment Tool, Motorola Part No. 66A76278.
2. A small screwdriver for IF & RF alignment.
3. An accurately calibrated AM modulated signal generator.
4. A low range output meter.
5. A special dummy antenna for RF alignment. Construct dummy antenna as shown in Figure 1. The 21" coaxial lead needed in its construction is the same type as used for lead-in on Motorola car antenna.

PROCEDURE

1. Remove the front and rear housings. All adjustments are now exposed.
2. Connect a PM speaker (3.2 ohm VC) to VC terminal and chassis of receiver and connect the output meter across the voice coil. If the receiver internal speaker is used, ground receiver front housing to chassis.
3. Connect a 6 volt storage battery to chassis and BATT terminal of receiver; turn receiver on and allow it to warm up for a few minutes. Set receiver volume control at maximum.
4. SENSITIVITY CONTROL - This control must be set to provide 2 ± 1/2 volts bias on the RF tubes before alignment is started. Measure this voltage between sensitivity control terminal and chassis.
5. For greatest accuracy, keep output of receiver at approximately 1 watt (1 watt = 1.79 volts on output meter) throughout alignment by reducing generator output (not receiver volume control) as stages are brought into alignment.
6. IF ALIGNMENT
   A. Connect high side of signal generator through .1 mf capacitor to 6BE6 grid (pin #7) and the low side to chassis. Set generator to 455 Kc and peak adjustments (1, 2, 3 & 4), in this order, for maximum output.
   B. Check alignment by repeating procedure.
7. RF ALIGNMENT
   A. Connect signal generator to antenna receptacle through special dummy antenna (60 mmf capacitor in series with 21" coax lead).
   B. Move carriage plate (by turning manual tuning shaft) to extreme high frequency position and screw coil cores out so that at least 1-1/8" of all three cores shall be outside of the coil shield can. Set signal generator to 1605 Kc and peak trimmers (5, 6 and 7), in this order.
   C. Move the carriage plate (by turning manual shaft) so carriage plate is spaced exactly 1-5/64" from coil shield plate. Set signal generator to 1425 Kc and adjust coil cores (8, 9 & 10), in this order, for maximum output.
   D. Move carriage plate (by turning manual tuning shaft) so carriage plate is spaced approximately 7/32" from coil shield plate. Leave signal generator connected but turn signal generator power off. Peak oscillator padder core (11) for maximum noise. If the padder core must be moved more than 1/2 turn from its original position, the carriage plate should be moved to extreme high frequency position, the coil cores (8, 9 & 10) should be screwed out so that 1-1/8" of each core is exposed and steps 7A, B, C & D repeated until it is necessary to move the padder core less than 1/2 turn in this step.

IMPORTANT: Do not push in on the alignment tool when adjusting the tuner cores. The slightest inward pressure on the alignment tool may move the tuner carriage and result in inaccurate alignment.

8. SETTING THE SENSITIVITY CONTROL - After alignment is completed, set signal generator to 600 Kc and adjust its output to 1.3 microvolts. Adjust the sensitivity control to provide 1 watt output (1 watt = 1.79 volts on output meter).
9. ANTENNA TRIMMER ADJUSTMENT - Once steps 7A, B, C, D & 8 have been satisfactorily performed, no further adjustment of any alignment screws should be made except to align the antenna trimmer (7) to car antenna after receiver is installed in car. This adjustment should be made with antenna fully extended and receiver set to approximately 1400 Kc. Peak the trimmer for maximum volume of a weak station or background noise between stations.

MODEL 408

HOUSING PARTS

13D472890	Escutcheon (complete) .....
1X472751	Housing, front: includes 2 grounding wipers; less escutcheon .....
15D472547	Housing, rear .....
5S7730	Rivet: .122 x 1/8 steel; antique copper finish (grounding wiper mtg) .....
3S3394	Screw: #8 x 1/4 slotted hex head thread cutting type: cad. pl. (escutch.mtg) ..
3S7456	Screw: #8 x 1/4 PKA slotted acorn head sheet metal screw; antique copper finish (housing screws) .....
3S2696	Screw: #10 x 3/8 PKA plain hex washer head sheet metal screw; cad. pl. (spkr.mtg)
39K470032	Wiper, grounding .....

ACCESSORIES

3A51494	Bolt, "J" (receiver mtg) .....
8A4491	Capacitor, generator .....
1X74340	Lead Assembly, dial light: complete with bulb
9B473111	Lead Assembly, fuse: complete with 10 amp fuse
4S7653	Lockwasher: 5/16 int-ext; cadmium plated (receiver mtg) .....
3S2863	Nut: 5/16-18 x 9/16 hex; cad.pl (receiver mounting) .....
1K75148	Shaft, flexible: with hsng; 24" long ...
6X4141	Suppressor, distributor .....

REF. NO.	PART NO.	DESCRIPTION
CHASSIS PARTS - ELECTRICAL		
CAPACITORS		
C-1	21B77562	Ceramic: 100 mmf 500V
C-2	20B472549	Trimmer, variable mica: range 50 to 180 mmf (on same bracket as C7 & C10 and sold only as assembly)
C-3	8A4529	Paper: .006 mf 100V
C-4	8A13514	Paper: .05 mf 100V
C-5	8A13514	Paper: .05 mf 100V
C-6	21K70720	Molded: 5mmf 500V
C-7	20B472549	Trimmer, variable mica: range 50 to 180 mmf (on same bracket as C2 & C10 and sold only as assembly)
C-8	8K13166	Paper: .1 mf 400V
C-9	21R6513	Mica: 50 mmf 300V
or	21K74661	Ceramic: 50 mmf 300V
C-10	20B472549	Trimmer, variable mica: range 30 to 60 mmf (on same bracket as C2 & C7 and sold only as assembly)
C-11	21A71872	Ceramic: 400 mmf 5% 500V
C-12	8A14791	Paper: .05 mf 400V
C-13	8A17028	Paper: .5 mf 100V
C-14	8A19133	Paper: .5 mf 100V
C-15	8A13514	Paper: .05 mf 100V
C-16	21R6513	Mica: 50 mmf 300V
or	21K74661	Ceramic: 50 mmf 300V
C-17	8A71911	Paper: .03 mf 400V
C-18	21R6639	Mica: 500 mmf 500V
C-19	8A12840	Paper: .006 mf 1600V
C-20	8K23690	Paper: .01 mf 400V
C-21	23A473015	Electrolytic: 30-30-20 mf/350-300-25V
CAPACITOR-RESISTOR		
CR-1	21A473040	Capacitor-Resistor: 100 mmf 47,000 ohms, 100 mmf
FUSE		
F-1	65A10266	10 Amp (3AG)
VIBRATOR		
G-1	48B3333	Non-sync: 4 pin
COILS		
L-1 &		
L-2*	24B71881	RF & Antenna Coil: (Specify color of paint dots on old coil when ordering)
L-3*	24B71879	Oscillator Coil (Specify color of paint dot on old coil when ordering)
L-4	24B70227	Oscillator padder coil: complete with iron tuning core
L-5	24A472535	Choke, hash
SPEAKER		
LS-1	50B76582 or 50B473955	5-1/4" PM; 3.2 ohm VC
RESISTORS		
Note: All resistors are 1/2W, 20% insulated carbon type, unless otherwise specified.		
R-1	6R6032	470,000
R-2	6R3992	150
R-3	18K77552	Sensitivity Control: 700 ohms
R-4	6R6075	100,000
R-5	6R6056	47,000
R-6	6R476060	10,000 2W
R-7	6R6001	68,000
R-8	6R3992	150
R-9	6R6010	330
R-10	6R5614	56 10%
R-11	6R5614	56 10%
R-12	18A480773	Volume Control: 500,000; with SPST switch
R-13	6R6004	1 Meg
R-14	6R6004	1 Meg
R-15	6R6161	1,500
R-16	6R2118	3.3 Meg
R-17	6R6032	470,000
R-18	6R6015	220,000
R-19	6R6336	270 10% 1W
R-20	6R476004	1,000 2W
R-21	6R6054	10,000
SWITCHES		
S-1		Power Switch (Part of volume control)
SHIELD		
SH-1 & SH-2	30K472998	Cable, shielded: 5" long, single conductor
SPARK PLATE		
SP-1	1X472741	Spark Plate Assembly
TRANSFORMERS		
T-1 & T-2	24B76553	Diode or IF, 455 Kc: complete with padding capacitors and tuning iron cores, but less shield
T-3	25B70171	Output
T-4	25B472533	Power
TUNER		
	1X472702	Manual Tuner MT-59

CHASSIS PARTS - MECHANICAL

42A4215	Clip, vibrator grounding
58A480774	Coupling, tinnerman shaft (on vol. contro
1X70646	Receptacle, antenna
5S7771	Rivet: .088 x 3/16 steel; nickel plated (tube socket mtg)
5S7706	Rivet: .122 x 1/8 steel; nickel plated (terminal strip mtg and sensitivity control mtg)
5S7707	Rivet: .122 x 5/32 steel; nickel plated (tube socket mtg)
5S7701	Rivet: .122 x 3/16 steel; nickel plated (vibrator grounding clip mtg and output transformer mtg)
3S8140	Screw: #8 x 3/16 PKZ plain hex head sheet metal screw; cadmium plated (tuner mtg).
3S7454	Screw: #8 x 1/4 PKZ plain hex head sheet metal screw; cadmium plated (spark plate assembly & capacitor assembly mtg)
3S3397	Screw: #8 x 5/16 PKZ plain hex head sheet metal screw; cad. pl. (pwr.transf.mtg).
26A472747	Shield, hash
1A71049	Shield and Sleeve Assembly (for T-1 & T-2)
9A70208	Socket, tube: 4 prong (for vibrator)
9A472534	Socket, tube: miniature; 7 prong
9A6788	Socket, tube: octal
31K37504	Strip, terminal: 1 insulated lug, #1 mtg
31K86126	Strip, terminal: 2 insulated lugs, #2 mtg
31A472573	Strip, terminal: 2 insulated lugs, #2 mtg
7A472614	Support, vol. cont. shaft alignment
4S7555	Washer: 1/4 x .128 x .033 thick; cadmium plated (output transf. mtg)

*Part of Tuner MT-59

MODEL 508 MOTOROLA INC.

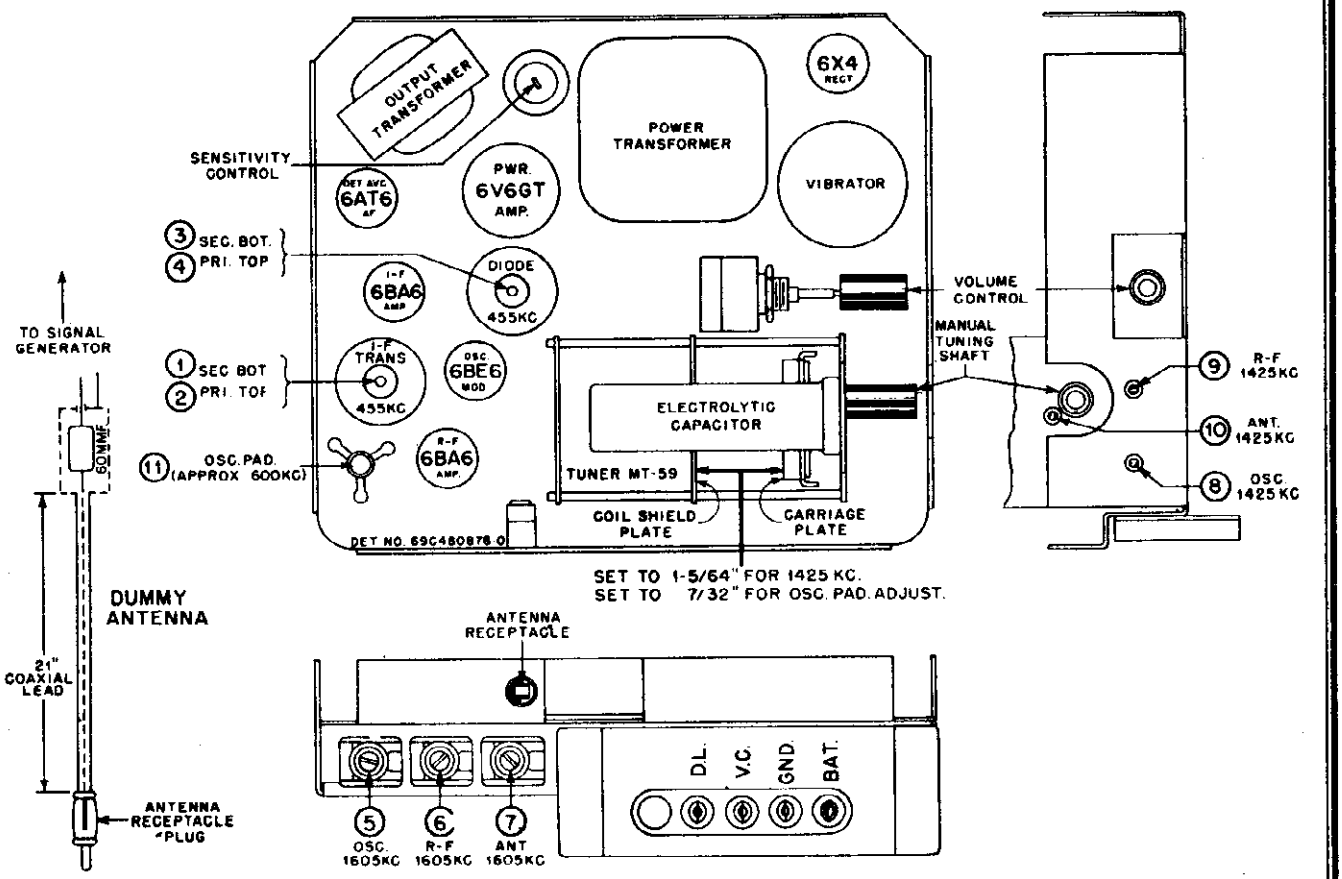


FIGURE 1. TUBE & TRIMMER LOCATIONS

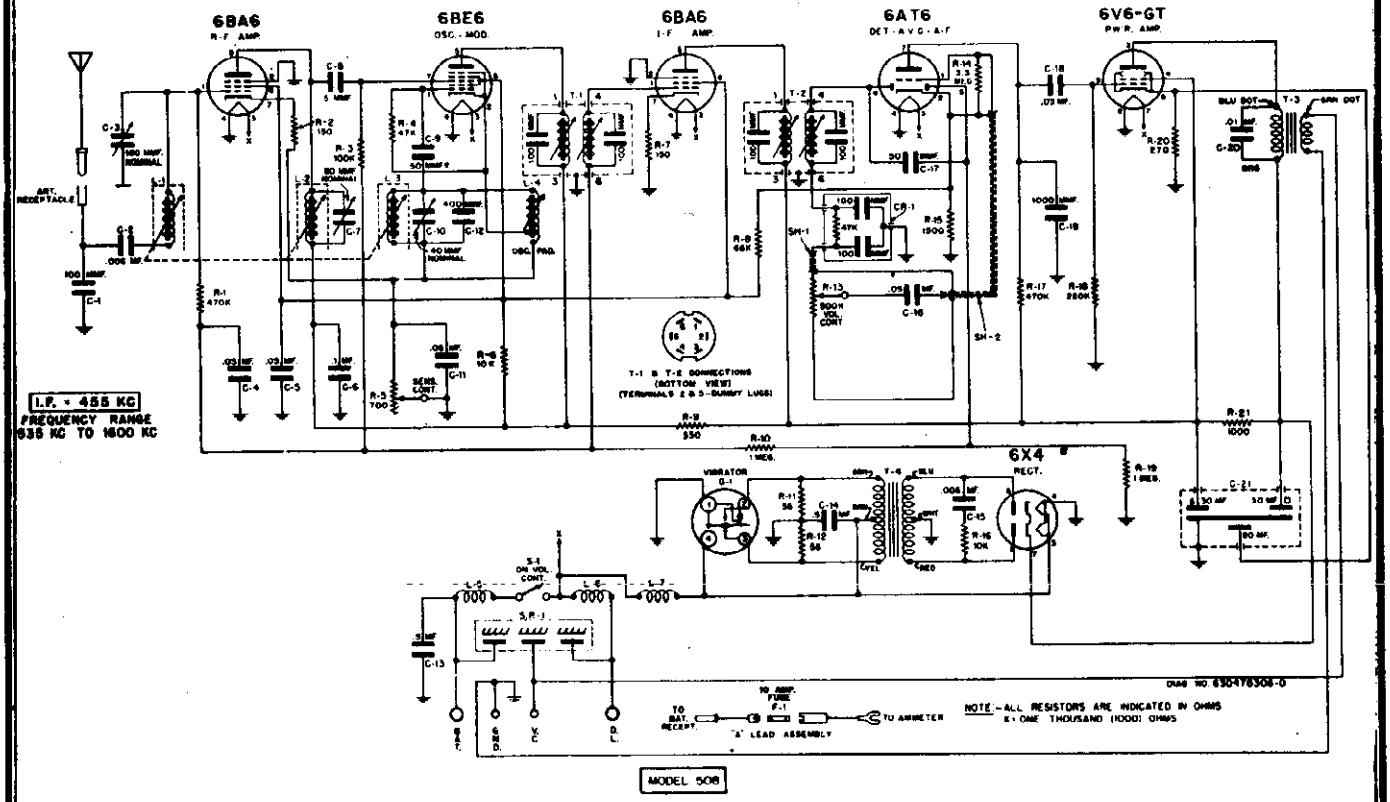


FIGURE 2. SCHEMATIC DIAGRAM

CHASSIS PARTS - ELECTRICAL

CAPACITORS

C-1	21B77562	Ceramic: 100 mmf 500V
C-2	8A4529	Paper: .006 mf 100V
C-3	20B77538	Trimmer, variable: 50 to 180 mmf; on same bracket as C-7 and C-10 (sold only as assembly)
C-4	8A13514	Paper: .05 mf 100V
C-5	8A14791	Paper: .05 mf 400V
C-6	8K13186	Paper: .1 mf 400V
C-7	20B77538	Trimmer, variable: 50 to 180 mmf; on same bracket as C-2 and C-10 (sold only as assembly)
C-8	21K70720	Molded: 5 mmf 500V
C-9	21R6513	Mica: 50 mmf 300V
or	21K74661	Ceramic: 50 mmf 300V
C-10	20B77538	Trimmer, variable: 30 to 60 mmf; on same bracket as C-2 and C-7 (sold only as assembly)
C-11	8A13514	Paper: .05 mf 100V
C-12	21A71872	Ceramic: 400 mmf 5% 500V
C-13	8A17028	Paper: .5 mf 100V
C-14	8A17028	Paper: .5 mf 100V
C-15	8A12840	Paper: .006 mf 1600V
C-16	8A13514	Paper: .05 mf 100V
C-17	21R6513	Mica: 50 mmf 300V
or	21K74661	Ceramic: 50 mmf 300V
C-18	8A71911	Paper: .03 mf 400V
C-19	21K478410	Ceramic: 1000 mmf 500V
C-20	8K23890	Paper: .01 mf 400V
C-21	23A473015	Electrolytic: 30-30-20 mf/350-300-25V

CAPACITOR-RESISTOR

CR-1	21A472571	Capacitor-Resistor: 100 mmf - 47,000 ohms 100 mmf

FUSE

F-1	65A10266	10 Amp (3AG)

VIBRATOR

G-1	48B3333	Non-sync: 4 pin

COILS

*L-1,2	24B71881	RF & Antenna Coil (specify color of paint dots on old coil when ordering)
*L-3	24B71879	Oscillator Coil (specify color of paint dots on old coil when ordering)
L-4	24B70227	Oscillator Padder Coil:complete with iron tuning core
L-5,6	24K78026	Choke
L-7	24A472535	Choke, hash

RESISTORS

Note; All resistors are 1/2W 20% carbon insulated type unless otherwise specified.

R-1	6R6032	470,000
R-2	6R3992	150
R-3	6R6075	100,000
R-4	6R6056	47,000
R-5	18K77552	Sensitivity Control: 700 ohms
R-6	6R476060	10,000 2W
R-7	6R3992	150
R-8	6R6001	68,000
R-9	6R6010	330
R-10	6R6004	1 Meg
R-11	6R5614	56 10%
R-12	6R5614	56 10%
R-13	1A472531	Volume Control: 500,000 ohms; includes SPST switch
R-14	6R2118	3.3 Meg
R-15	6R6161	1,500
R-16	6R6054	10,000
R-17	6R6032	470,000
R-18	6R6015	220,000
R-19	6R6004	1 Meg
R-20	6R6336	270 10% 1W
R-21	6R476004	1,000 2W

SWITCHES

S-1	-	Power (part of volume control)

SHIELD

SH-1	30A77553	Cable, shield: 5" long
SH-2	30K472991	Cable, shield 10" long

SPARK PLATE

SP-1	1X78041	Spark Plate Assembly: mtg. brkt. included

31A472573	Strip, terminal: 2 insulated lugs, #2 mtg	
31K16330	Strip, terminal: 3 insulated lugs, #3 mtg	

HOUSING PARTS

42A472033	Clip, chassis retainer .....
13C472812	Escutcheon, plastic .....
1X78020	Housing and Bushing Assembly, rear .....
15C77560	Housing, front: less escutcheon .....
3S3394	Screw: #8 x 1/4 slotted hex head thread cutting screw; cad. pl. (escutcheon mounting) .....
3S7456	Screw: #8 x 1/4 PKA slotted acorn head sheet metal screw; antique copper finish (housing screws) .....

ACCESSORIES

65X4151	Bulb, pilot light: 6-8V; clear; bayonet base
8A4491	Capacitor, generator .....
9B473111	Lead Assembly, fuse: complete with 10 amp fuse .....
1X74340	Lead Assembly, dial light: complete with bulb
1X76859	Lead Assembly, speaker: 2 conductor, 36" long, with pin terminals on one end ...
4S7653	Lockwasher: 5/16 int-ext; cad. pl. (receiver mounting) .....
2S2863	Nut: 5/16-18 x 9/16 hex; cadmium plated (receiver mtg) .....
1K75148	Shaft, flexible: with housing; 24" long
50B473118	or
50B473119	or
50B473696	or
50B473697	or
50B473783	Speaker: 6" PM; 3.2 ohm V.C; less speaker lead ..... Exchange
3A77542	Stud, receiver mtg .....
6X4141	Suppressor, distributor .....

TRANSFORMERS

T-1 & T-2	24B76553	Diode or IF, 456 Kc: complete with padding capacitors and tuning iron cores, but less shield .....
T-3	25B70171	Output Transformer .....
T-4	25B472533	Power Transformer .....

TUNER

1X472702	Manual Tuner MT-59 .....

CHASSIS PARTS - MECHANICAL

42A13177	Clip, center post grounding .....
42A4215	Clip, vibrator grounding .....
1X70646	Receptacle, antenna .....
5S7771	Rivet: .088 x 3/16 steel; nickel plated (tube socket mtg) .....
5S7706	Rivet: .122 x 1/8 steel; nickel plated (terminal strip mtg, sensitivity control and center post ground clip mtg .....
5S7707	Rivet: .122 x 5/32 steel; nickel plated (tube socket mtg) .....
5S7701	Rivet: .122 x 3/16 steel; nickel plated (vibrator grounding clip and output transformer mtg) .....
3S8140	Screw: #8 x 3/16 PKZ plain hex head sheet metal screw; cad. pl. (tuner, capacitor bracket assembly and spark plate mtg) .
3S3397	Screw: #8 x 5/16 PKZ plain hex head sheet metal screw; cad. pl. (power transformer mtg) .....
1A71049	Shield and Sleeve Assembly (for T-1 & T-2)
9A70208	Socket, tube: 4 pin; with grounding lug (vibrator socket) .....
9A472534	Socket, tube: miniature; 7 prong .....
9A6788	Socket, tube: octal .....
3104079	Strip, terminal; 1 insulated lug, end mtg.

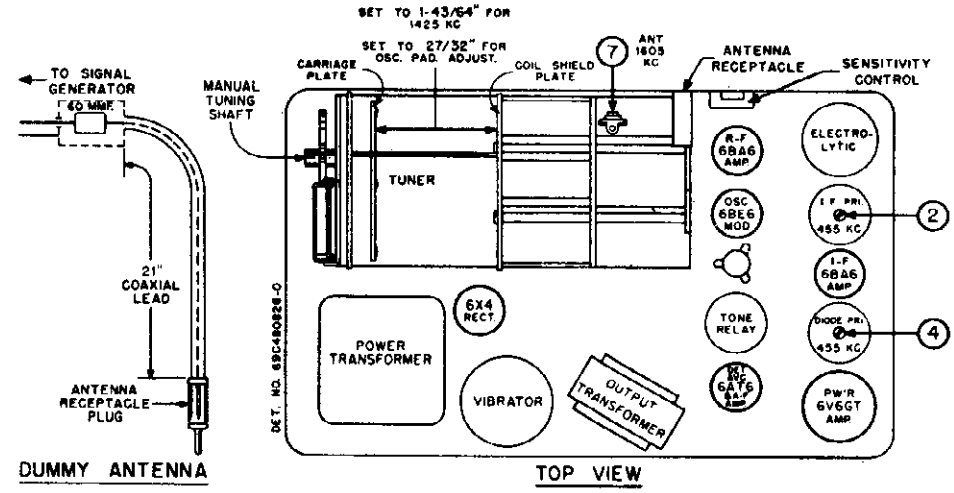
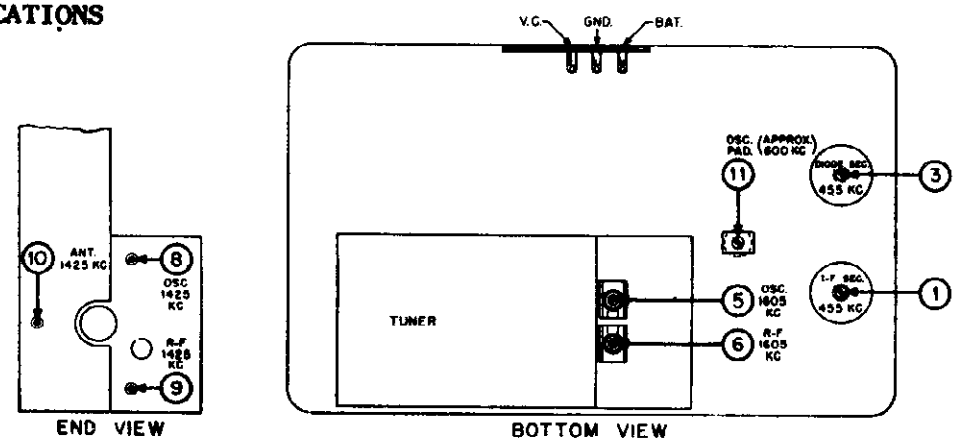


FIGURE 1.

TUBE & TRIMMER LOCATIONS



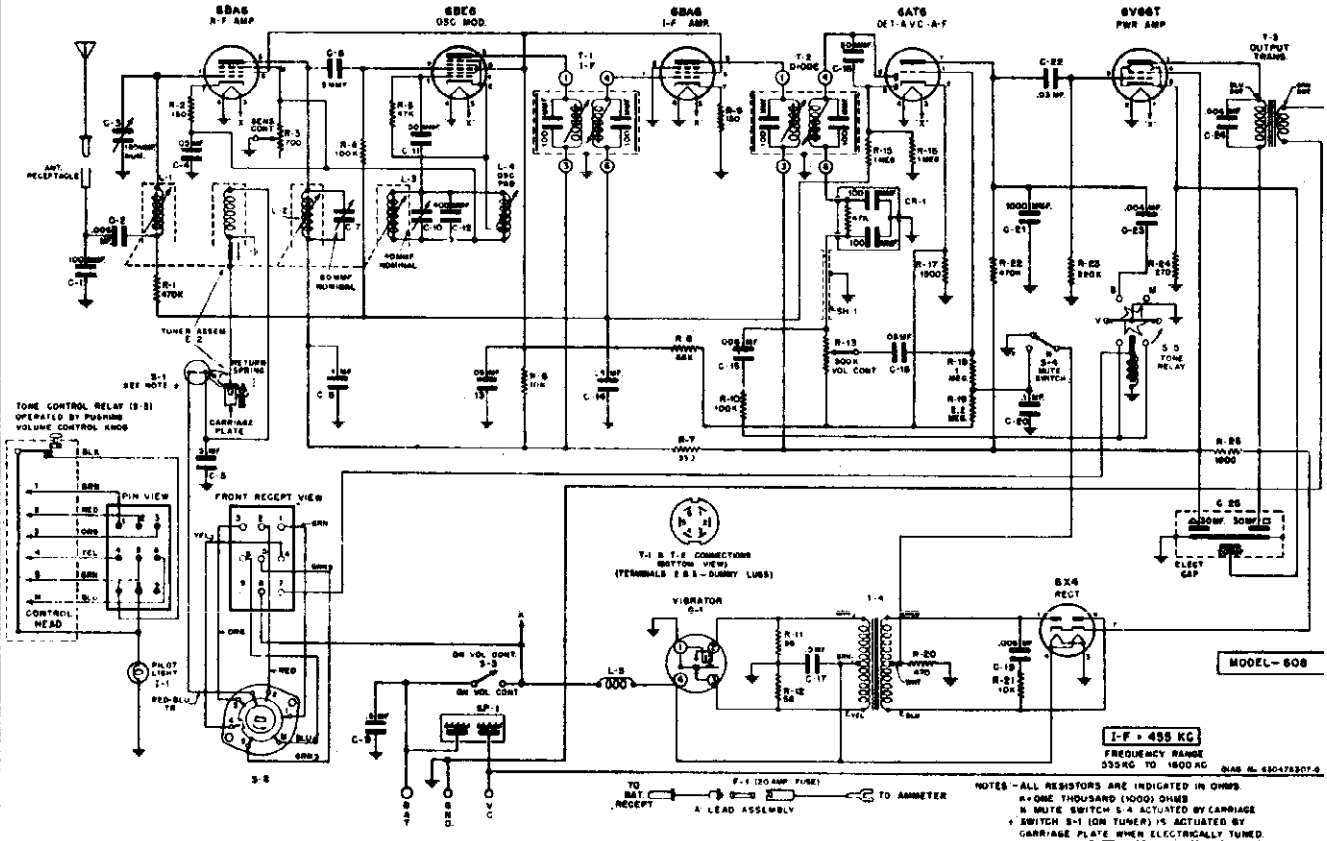


FIGURE 2. SCHEMATIC DIAGRAM

ELECTRICAL CHASSIS PARTS

CAPACITORS

C-1	21B77562	Ceramic: 100 mmf 500V .....
C-2	8A4529	Paper: .006 mf 100V .....
C-3*	20K472613	Trimmer, variable mica: range 50 to 180 mmf; with bracket .....
C-4	8A13514	Paper: .05 mf 100V .....
C-5	8A19133	Paper: .5 mf 100V .....
C-6	21K70720	Molded: 5 mmf 500V .....
C-7*	20K472613	Trimmer, variable mica: range 50-180 mmf; with bracket .....
C-8	8K13166	Paper: .1 mf 400V .....
C-9	8A17028	Paper: .5 mf 100V .....
C-10*	20K472612	Trimmer, variable mica: range 30 to 60 mmf; with bracket .....
C-11	21R6513	Mica: 50 mmf 300V .....
C-12	21A71872	Ceramic: 400 mmf 5% 500V .....
C-13	8A14791	Paper: .05 mf 400V .....
C-14	8A13514	Paper: .05 mf 100V .....
C-15	8A71910	Paper: .006 mf 400V .....
C-16	21R6513	Mica: 50 mmf 300V .....
C-17	8A19133	Paper: .5 mf 100V .....
C-18	8A13514	Paper: .05 mf 100V .....
C-19	8A12840	Paper: .006 mf 1600V .....
C-20	8A472035	Paper: .1 mf 100V .....
C-21	21K478410	Ceramic: 1000 mmf 500V .....
C-22	8A71911	Paper: .03 mf 400V .....
C-23	8A71909	Paper: .004 mf 400V .....
C-24	8A71910	Paper: .006 mf 400V .....
C-25	23A473015	Electrolytic: 30-30-20 mf/350-300-25V ..

CAPACITOR-RESISTOR

CR-1	21A472571	Capacitor-Resistor: 100 mmf-47,000 ohms-100 mmf .....

FUSE

F-1	65K4637	Fuse: 20 Amp (3AG) .....

VIBRATOR

G-1	48B3333	Vibrator, non-sync: 4 pin .....

COILS

L-1 & L-2*	24B71881	RF & Antenna coil (specify color of paint dots on old coil when ordering) .....
L-3*	24B71879	Oscillator Coil (specify color of paint dots on old coil when ordering) .....
L-4	24B70227	Osc. padder coil: complete with iron tuning core .....
L-5	24A472535	Choke, hash .....

RESISTORS

NOTE: All resistors are 1/2 watt, 20% insulated, carbon type unless otherwise specified.

R-1	6R6032	470,000 .....
R-2	6R3992	150 .....
R-3	18K77552	Control, sensitivity: 700 ohm .....
R-4	6R6075	100,000 .....
R-5	6R6056	47,000 .....
R-6	6R476060	10,000 2W .....
R-7	6R6010	330 .....
R-8	6R6001	68,000 .....
R-9	6R3992	150 .....
R-10	6R6075	100,000 .....
R-11	6R5614	56 10% .....
R-12	6R5614	56 10% .....
R-13	18A480773	Volume Control: 500,000; with SPST switch
R-15	6R6004	1 meg .....
R-16	6R6004	1 meg .....
R-17	6R6161	1500 .....
R-18	6R6004	1 meg .....
R-19	6R3927	2.2 meg .....
R-20	6R3949	470 .....
R-21	6R6054	10,000 .....
R-22	6R6032	470,000 .....
R-23	6R6015	220,000 .....
R-24	6R6336	270 10% 1W .....
R-25	6R476004	1,000 2W .....

SWITCHES

S-1*	1B70944	Solenoid Switch: with mtg plate .....
S-2*	40B70962	Selector switch .....
S-3	-	Power Switch (part of volume control)...
S-4*	40A472644	Mute Switch .....
S-5	1X78040	Type MR6 Tone Relay .....

*Part of Tuner ST-60

SHIELD

SH-1	30K472998	Cable. volume control: 5" lg; single cond.

SPARK PLATE

SP-1	1X472624	Spark Plate Assembly .....

TRANSFORMERS

T-1 & T-2	24B76553	Diode or IF, 455 Kc: complete with padding capacitors and tuning iron cores, but less shield .....
T-3	25B70171	Output .....
T-4	25B472533	Power .....

TUNER

	1X472634	Tuner: ST-60 ..... Exch.

MECHANICAL CHASSIS PARTS

42A4215	Clip, vibrator grounding .....
58A480774	Coupling, tinnerman shaft (on volume control)
14A76865	Insulator, contact: fibre .....
4S7650	Lockwasher: #6 internal; cadmium plated.
4S7657	Lockwasher: #8 external; cad. pl. (tone relay mtg) .....
2S7007	Nut: 8-32 x 1/4 hex; cad. plated .....
2S7051	Nut: 3/8-32 x 9/16 hex; cad. pl. (volume control mtg) .....
1X70646	Receptacle, antenna lead-in .....
5S7771	Rivet: .088 x 3/16 steel; nickel plated (miniature tube socket mtg) .....
5S7706	Rivet: .122 x 1/8 steel; nkl plated ...
5S7707	Rivet: .122 x 5/32 steel; nickel plated.
5S7701	Rivet: .122 x 3/16 steel; nickel plated (vib. socket mtg) .....
3S8140	Screw: #8 x 3/16 PKZ plain hex head sheet metal screw; cad. pl. (tuner mtg & on vol. control shaft coupling setscrew) .....
3S7454	Screw: #8 x 1/4 PKZ plain hex head sheet metal screw; cad. pl. (tuner mtg) .....
3S3397	Screw: #8 x 5/16 PKZ plain hex head sheet metal screw; cad. pl.(pwr. trans.mtg)..
47B480768	Shaft & Coupling Assembly (for vol.cont)
1A71049	Shield & Sleeve Assembly (for T-1 & T-2)
9A70208	Socket, tube: 4 prong (for vibrator) ...
9A472534	Socket, tube: miniature 7 prong .....
9A6788	Socket, tube: octal .....
31A472573	Strip, terminal: 2 insulated lugs, #2 mtg.
31K14656	Strip, terminal: 3 insulated lugs, #3 mtg .....
7A472576	Support, volume cont. shaft alignment ..
5S7555	Washer: 1/4 x .128 x .033 thick; cad pl (output trans. mtg) .....

HOUSING PARTS

13D472779	Escutcheon (complete) .....
1X472616	Housing, front: includes 2 grounding wipers; less escutcheon .....
15D472579	Housing,rear .....
38A71874	Knob (automatic tuner station set-up); plastic; with clamp spring .....
5S7730	Rivet: .122 x 1/8 steel; antique copper finish (grounding wiper mtg) .....
3S3394	Screw: #8 x 1/4 slotted hex head thread cutting type; cad. pl. (escutch. mtg)..
3S7456	Screw: #8 x 1/4 PKA slotted acorn head sheet metal screw; ant. cop. finish) housing screws) .....
39K470032	Wiper, grounding .....

ACCESSORIES

3A51494	Bolt, "J" (receiver mtg) .....
8A4491	Capacitor, generator .....
9K473161	Lead Assembly, fuse: comp. with 20 amp fuse
1X76859	Lead Assembly, speaker; 2 conductor; 36" lg; with pin terminals on one end .....
4S7653	Lockwasher: 5/16 int-ext; cad. plated (receiver mtg) .....
2S2863	Nut: 5/16-18 x 9/16 hex; cad. pl. (receiver mtg) .....
1K75148	Shaft, flexible: with hsng; 24" long ...
50B473763 or	
50B473696 or	
50B473697 or	
50B473118 or	
50B473119	Speaker: 6" PM; 3.2 ohm V.C.; less spkr.lead Exchange
6X4141	Suppressor, distributor .....

MODEL 708 MOTOROLA INC.

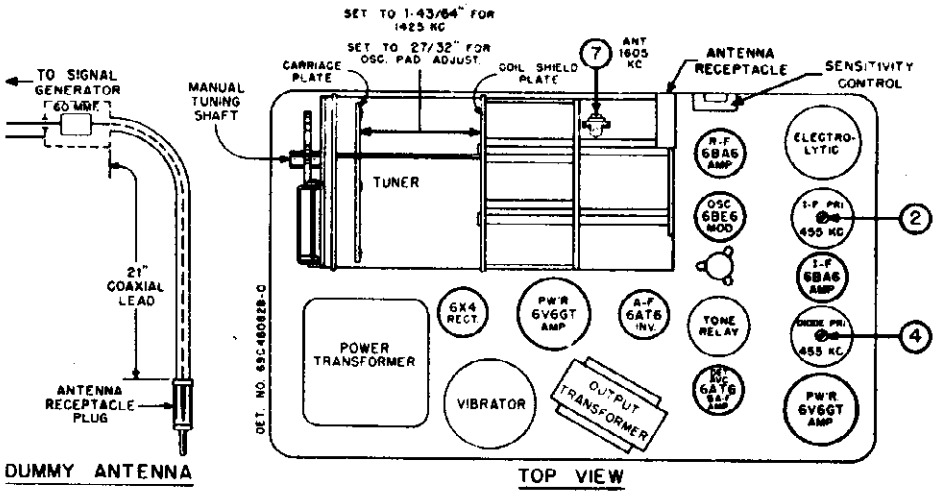
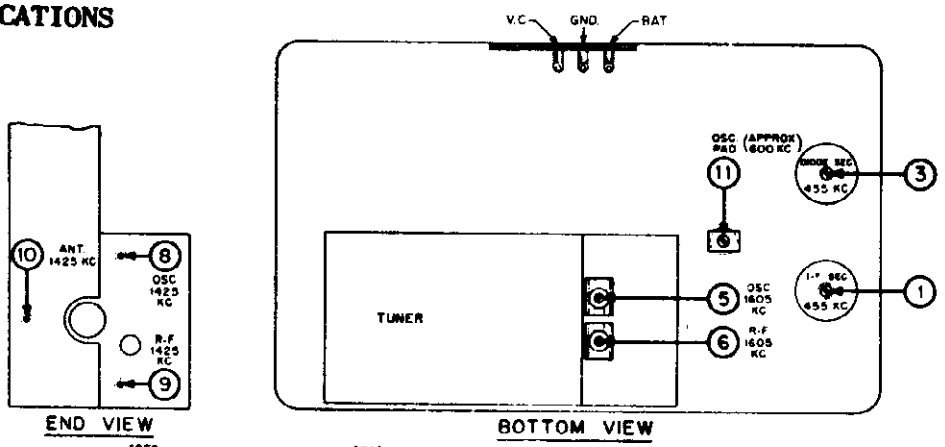


FIGURE 1.

TUBE & TRIMMER LOCATIONS



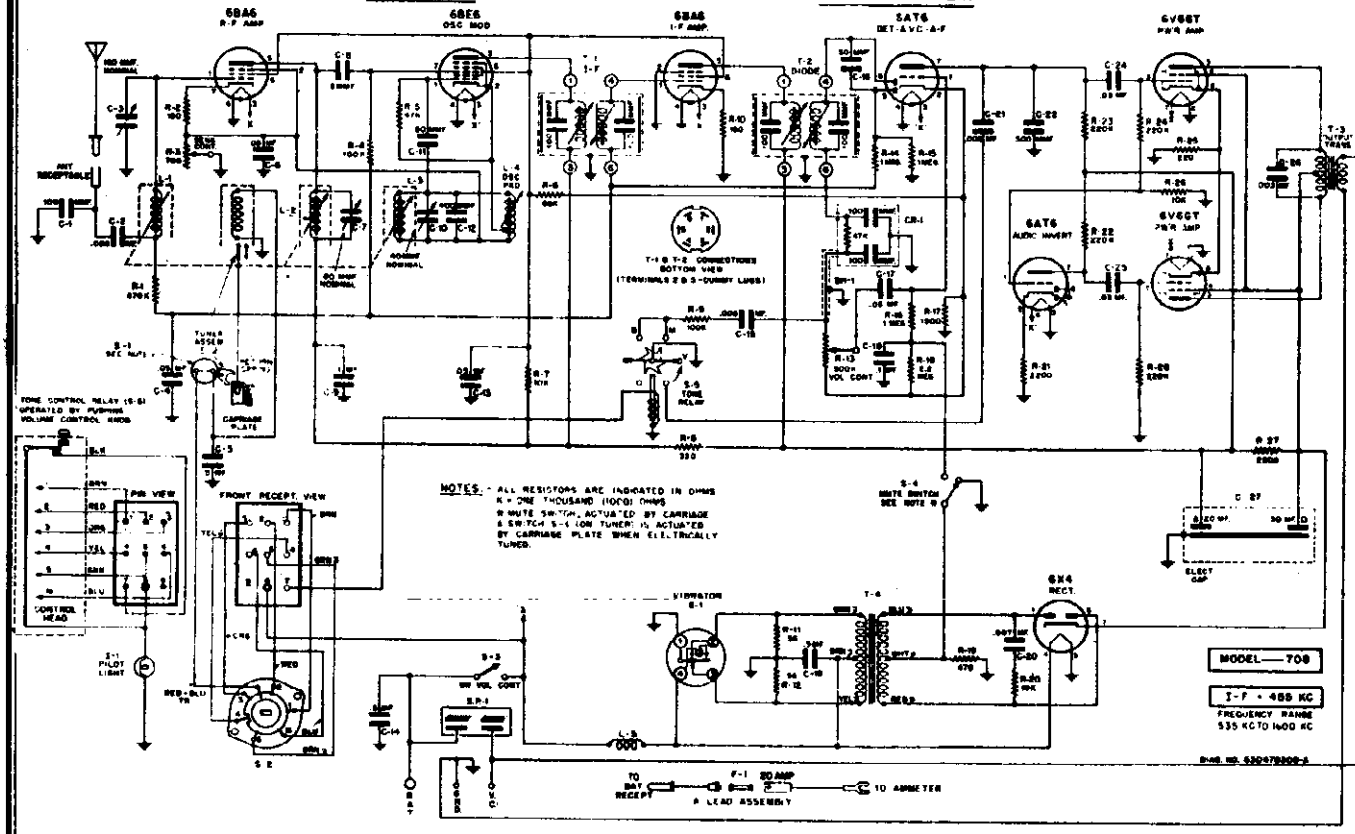


FIGURE 2. SCHEMATIC DIAGRAM

REF. NO.	PART NO.	DESCRIPTION
CHASSIS PARTS - ELECTRICAL		
CAPACITORS		
C-1	21B77562	Ceramic: 100 mmf 500V
C-2*	8A4529	Paper: .006 mf 100V
C-3*	20K472613	Trimmer, variable mica: 50 to 180 mmf; includes mounting bracket
C-4	8A13514	Paper: .05 mf 100V
C-5*	8A19133	Paper: .5 mf 100V
C-6	8A13514	Paper: .05 mf 100V
C-7*	20K472613	Trimmer, variable: mica: 50 to 180 mmf; includes mounting bracket
C-8	21K70720	Molded: 5 mmf 500V
C-9	8K13166	Paper: .1 mf 400V
C-10*	20K472612	Trimmer, variable mica: 30 to 60 mmf; includes mounting bracket
C-11	21R6513 or 21K74661	Mica: 50 mmf 300V Ceramic: 50 mmf 300V
C-12	21A71872	Ceramic: 400 mmf 5% 500V
C-13	8A14791	Paper: .05 mf 400V
C-14	8A17028	Paper: .5 mf 100V
C-15	8A4529	Paper: .006 mf 100V
C-16	21R6513 or 21K74661	Mica: 50 mmf 300V Ceramic: 50 mmf 300V
C-17	8A13514	Paper: .05 mf 100V
C-18	8A472035	Paper: .1 mf 100V
C-19	8A19133	Paper: .5 mf 100V
C-20	8K15166	Paper: .007 mf 1600V
C-21	8A4736	Paper: .002 mf 400V
C-22	21R6639	Mica: 500 mmf 500V
C-24	8K71911	Paper: .03 mf 400V
C-25	8K71911	Paper: .03 mf 400V
C-26	8K13165	Paper: .003 mf 1000V
C-27	23A472570	Electrolytic: 30-20 mf/400-350V
CAPACITOR-RESISTOR		
CR-1	21A472571	Capacitor-Resistor: 100 mmf - 47,000 ohms 100 mmf
FUSE		
F-1	65K4637	Fuse: 20 Amp (3AG)
VIBRATOR		
[illegible]	[illegible]	Vibrator, non-synced 4 pin
PILOT LIGHT		
I-1	65X4151	Bulb: 6-8V; bayonet base; type #51
COILS		
L-1 & L-2*	24B71881	RF & Antenna Coil (Specify color of paint dots on old coil when ordering)
L-3*	24B71879	Oscillator coil (Specify color of paint dots on old coil when ordering)
L-4	24B70227	Oscillator padder coil: complete with iron tuning core
L-5	24C473954	Choke, hash
RESISTORS		
Note: All resistors are 1/2 watt, 20%, insulated carbon type, unless otherwise specified.		
R-1	6R6032	470,000
R-2	6R3992	150
R-3	18K77552	Sensitivity Control: 700 ohms
R-4	6R6075	100,000
R-5	6R6056	47,000
R-6	6R6001	68,000
R-7	6R476060	10,000 2W
R-8	6R6010	330
R-9	6R6075	100,000
R-10	6R3992	150
R-11	6R5614	56 10%
R-12	6R5614	56 10%
R-13	18A480773	Volume Control: 500,000 ohms; with SPST Sw.
R-14	6R6004	1 Meg
R-15	6R6004	1 Meg
R-16	6R6004	1 Meg
R-17	6R6161	1500
R-18	6R3927	2.2 Meg
R-19	6R3949	470
R-20	6R6054	10,000
R-21	6R6069	2,200 10%
R-22	6R6015	220,000
R-23	6R6015	220,000
R-24	6R6015	220,000
R-25	6R6389	220 10% 1W
R-26	6R6320	10,000 10%
R-27	6R476130	2,200 2W
R-28	6R6015	220,000

SWITCHES

S-1*	1B70944	Solenoid Switch .....
S-2*	40B70952	Selector Switch .....
S-3	-	Power Switch (part of volume control)
S-4*	40A472644	Mute Switch .....
S-5	1X76040	Type MR6 Tone Relay .....

SHIELD

SH-1	30K472998	Cable, volume control: 5" long; single cond.

SPARK PLATE

SP-1	1X472624	Spark Plate Assembly .....

TRANSFORMERS

T-1 & T-2	24B76553	Diode or IF, 455 Kc: complete with padding capacitors and tuning iron cores, but less shield .....
T-3	25B472558	Output .....
T-4	25C472586	Power .....

TUNER

	1X472634	Solenoid Tuner ST-60 ..... Exch.

CHASSIS PARTS - MECHANICAL

42A4215	Clip, vibrator grounding .....
58A480774	Coupling, tinnerman shaft (on volume cont.)
14A76883	Insulator, contact: fibre .....
4S7650	Lockwasher: #6 internal; cadmium plated (terminal strip mtg) .....
4S7657	Lockwasher: #8 external; cadmium plated (tone relay mtg) .....
2S7007	Nut: 8-32 x 1/4 hex; cadmium plated (tone relay mtg) .....
2S7051	Nut: 3/8-32 x 9/16 hex; cadmium plated; (volume control mtg) .....
1X70646	Receptacle, antenna lead-in .....
5S7771	Rivet: .088 x 3/16; steel; nickel plated (tube socket mtg) .....
5S7706	Rivet: .122 x 1/8; nickel plated (sensitivity control mtg) .....
5S7707	Rivet: .122 x 5/32; steel; nickel plated (tube socket mtg, terminal strip mtg)
5S7701	Rivet: .122 x 3/16; steel; nickel plated (tube socket mtg, output transf. mtg)
3S8140	Screw: #8 x 3/16 PKZ plain hex head sheet metal screw; cad. pl. (tuner mtg & vol. control shaft coupling setscrew) .....
3S7454	Screw: #8 x 1/4 PKZ plain hex head sheet metal screw; cad. pl. (tuner mtg) .....
3S3397	Screw: #8 x 5/16 PKZ plain hex head sheet metal screw; cad. pl. (pwr.transf.mtg) .
47B480768	Shaft & Coupling Assembly (for vol. cont)
1A71049	Shield and Sleeve Assembly (for T-1 & T-2)
9A70208	Socket, tube: 4 prong (for vibrator) ...
9A472534	Socket, tube: miniature; 7 prong .....
9A6788	Socket, tube: octal .....
31X86126	Strip, terminal: 2 insulated lugs, #2 mtg
31A472573	Strip, terminal: 2 insulated lugs, #2 mtg
7A472576	Support, volume control shaft alignment..
4S7555	Washer: 1/4 x .128 x .033; cadmium plated (output transf. mtg) .....

HOUSING PARTS

13D472778	Escutcheon .....
1X472738	Housing, front: includes 2 grounding wipers; less escutcheon .....
15K472584	Housing, rear .....
38A71874	Knob (automatic tuner station set-up): plastic; with clamp spring .....
5S7730	Rivet: .122 x 1/8 steel; antique cop. finish .....
3S3394	Screw: #8 x 1/4 slotted hex head thread cutting type; cad. pl.(escutch.mtg.)...
3S7456	Screw: #8 x 1/4 PKA slotted acorn head sheet metal screw; antique copper finish (housing screws) .....
39K470032	Wiper, grounding .....

ACCESSORIES

3A51494	Bolt, "J" (recvr mtg) .....
8A4491	Capacitor, generator .....
9K473161	Lead Assembly, fuse: complete with 20 amp fuse .....
1X76859	Lead Assembly, speaker: 2 conductor; 36" long; with pin terminals on one end ...
4S7653	Lockwasher: 5/16 int-ext; cad. plated (receiver mtg) .....
2S2863	Nut: 5/16-18 x 9/16 hex; cad. plated (receiver mtg) .....
1K75148	Shaft, flexible: with hsng; 24" long ...
50B473118 or	
50B473696 or	
50B473697 or	
50B473783	Speaker: 6" PM; 3.2 ohm VC; less spkr.lead Exch.
6X4141	Suppressor, distributor .....

*Part of Tuner ST-60

SECTION 1. DESCRIPTION

1-1. *General*

The NC-57 is a superhetrodyne Radio Receiver, having a complement of seven tubes plus a voltage regulator and rectifier, with a continuous frequency coverage of from 540 kilocycles to 55 megacycles. This Receiver is designed to provide reception of amplitude modulated voice or music and code telegraph signals throughout its entire frequency range. Operational controls mounted on the front panel are held to a minimum consistent with good operation and full utilization of the circuit features contained in the NC-57. The separate bandspread control knob and dial scale makes possible fine, vernier-type tuning for any portion of the frequency spectrum covered by the Receiver. The usefulness of this feature will be outstanding on crowded bands such as the amateur or foreign broadcast bands. The NC-57 employes a voltage regulator tube to assure a high order of stability in the high frequency and beat frequency oscillator circuits.

1-2. *Circuit*

A stage outline of the circuit employed in the NC-57 is given below together with the tube associated with each stage.

R.F. Amplifier.....6SG7
Converter.....6SB7-Y
First I.F. Amplifier.....6SG7
Second I.F. Amplifier.....6SG7
Second Det. - A.V.C. - A.N.L.....6H6
First Audio - C.W.O.....6SN7GT/G
Audio Output.....6V6GT/G
Voltage Regulator.....OD3/VR-150
Rectifier.....5Y3GT/G

1-3. *Tuning System*

The three-gang main tuning capacitor, the panel-mounted Trimmer control and five sets of coils are used to tune the frequency range of the Receiver in five tuning bands as shown on the following table. The main tuning capacitor and bandspread capacitor are connected in parallel on all bands.

BAND	FREQUENCY COVERAGE
A	35.0 - 55.0 Mc.
B	13.5 - 35.0 Mc.
C	4.65 - 13.5 Mc.
D	1.6 - 4.65 Mc.
E	0.54 - 1.6 Mc.

It will be noted that Band E encompasses the entire Standard Broadcast Band.

The Amateur bands tuneable by the NC-57 are listed below with their respective receiver band locations and are spread on the bandspread dial by means of the bandspread capacitor approximately as follows:

BAND	AMATEUR BAND	FREQUENCY	DIVISIONS
A	6	50.0 - 54.0 Mc.	37
B	10, 11	27.16- 29.7 Mc.	44
	15	21.0 - 21.5 Mc.	28
	20	14.0 - 14.4 Mc.	65
C	40	7.0 - 7.3 Mc.	47
D	80	3.5 - 4.0 Mc.	60

The main dial has five scales accurately calibrated directly in megacycles. The respective scales are marked with heavy black scorings to clearly locate for the operator such short-wave features as the Amateur, Police and Foreign Broadcast bands. These locating markers are identified by letters AM, P and F, respectively.

1-4. *Audio Output*

Two audio output circuits are provided:

(1) The loudspeaker in the NC-57 is a 5 inch PM type capable of faithfully reproducing the ample audio volume delivered by the Receiver. An output transformer is mounted on the loudspeaker to match the impedance of the output tube.

(2) A Phones jack is mounted on the front panel and is wired so as to silence the loudspeaker when headphones are used. The headphone load impedance is not critical permitting a wide range of headphones types, including crystal, to be used.

1-5. *Power Supply*

The NC-57 Receiver is designed for operation from a 105/130 volt, 50/60 cycle, source of supply. Normal power consumption is approximately 84 watts. The built-in power supply provides all voltages required by the heater and B supply circuits - 2.7 amperes at 6.3 volts and 100 milliamperes at 250 volts, respectively.

The NC-57 is readily adaptable to battery operation and instructions for using batteries are given in detail in Section 2.

1-6. *Accessory Connector Socket*

An octal type socket is mounted at the rear of the NC-57 to permit convenient connection of external accessories. The Tuning Meter, SM-57, which is available for use with the NC-57, is fitted with a cable and plug to connect directly to this socket. Varied accessories such as a crystal calibrator or record player are readily connected to the socket. When a record player is connected to the NC-57, the R.F. GAIN control should be set at the extreme counterclockwise position. The drawing of the Accessory Connector Socket on the Schematic Diagram shows the various connections made to the pins of the socket and the voltages available. As will be noted B plus and filament voltages are available at pins 2 and 3, respectively.

SECTION 2. INSTALLATION

2-1. *Installation Procedure*

Carefully unpack the Receiver from its packing crate and procede as follows:

(1) Make sure A.C. jumper plug, P-1, (at rear of Receiver) and all tubes are seated firmly in their sockets.

(2) Connect a good external ground to the terminal labeled G on the antenna ground strip at the rear of the Receiver. This connection is not absolutely required but in certain localities considerable reduction in interfering noise can be achieved by such a connection.

(3) Connect the antenna as recommended in Section 2-3.

(4) Connect the power cord, P-2, to a 105/130 volt, 50/60 cycle, A.C. source of supply.

(5) Set controls as recommended in Section 3 for the reception of signals.

NOTE

Where the Receiver is located in the field of a transmitting station, as would be the case when the NC-57 is used as the Receiver in a transmitting station, it is advisable to provide some means of preventing damage to the receiver antenna coil. If a separate receiving antenna is used, a means for disconnecting the antenna from the Receiver or grounding the antenna during transmission periods should be provided.

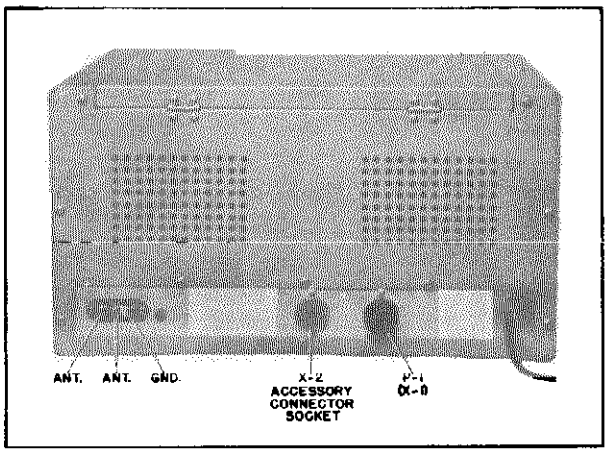


Figure No. 1. Rear View of Receiver

2-2. *Battery Operation*

The NC-57 Receiver is readily adaptable to portable or emergency service by connecting batteries to the terminals of the power socket, X-1, at the rear of the Receiver. The A.C. jumper plug, P-1, may be rewired for battery connection or if changeover operation is desired another octal plug should be obtained. Do not use the A.C. jumper plug, P-1, for battery operation without first removing the jumper wires. The battery plug used should be wired in accordance with the drawing shown on the schematic diagram. The voltage regulator tube should be removed during battery operation. A 6 volt heater supply (storage battery) should be connected to terminals 3 and 5 and 180 to 250 volt "B" supply connected to terminals 1 and 8. Current drain is approximately 70 milliamperes and 2.65 amperes at 180 and 6 volts, respectively. A suggested refinement is to include a switch in the A+ lead so that the tube heaters may be turned off when the Receiver is not in use without the necessity of removing the battery plug. The Send-Receive switch on the Receiver is operative with battery operation the same as for A.C. operation. The A.C. line switch on the front panel does not render the Receiver inoperative during battery operation.

The recommendations of Section 3, Operation, apply to the battery powered NC-57.

2-3. *Antenna Recommendations*

The antenna input circuit of the NC-57 is arranged for operation from either a single-wire type, doublet type antenna or other types having impedances of 70 ohms or more. The input impedance of the antenna circuit is approximately 300 ohms.

The most practical antenna for use in installations where the Receiver is to be used over a wide range of frequencies is the single-wire type. An antenna length of 50 to 100 feet is recommended although the length is not critical and any length between 25 and 200 feet may be used. In installations where the Receiver is tuned to one frequency or narrow band of frequencies optimum results will be obtained by designing the antenna for the operating frequency. In an installation where the Receiver is to be used as the receiving unit, in a transmitting station, the most efficient operation will usually result from use of the transmitting antenna as a receiving antenna also. For switching the antenna from transmitter to receiver, an antenna change-over relay with good high frequency insulation is recommended.

The method of connecting the various types of antennae to the antenna terminal strip at the rear of the Receiver is as follows:

(1) Single-wire type -- Connect antenna to terminal A at the left of the strip and ground the unused A terminal by means of the metal link.

(2) Doublet type -- Connect the antenna feeders to the two terminals marked A; the metal link is not used.

(3) Concentric transmission line type -- Connect the inner conductor to terminal A at the left of the strip and the outer conductor to the other A terminal which, in turn, should be connected to the metal link.

SECTION 3. OPERATION

3-1. *Controls*

This section on controls is presented prior to the actual operating instructions to give the operator of an NC-57 an understanding of the function of each control on the Receiver. All controls are clearly identified by front panel markings and are arranged in a manner to facilitate operation.

The R.F. GAIN control adjusts the sensitivity (ability to receive weak and distant stations) of the Receiver from a minimum at the extreme counterclockwise position of the knob to a maximum at the extreme clockwise position. This is accomplished by adjustment of the amplification of the R.F. and I.F. amplifier stages.

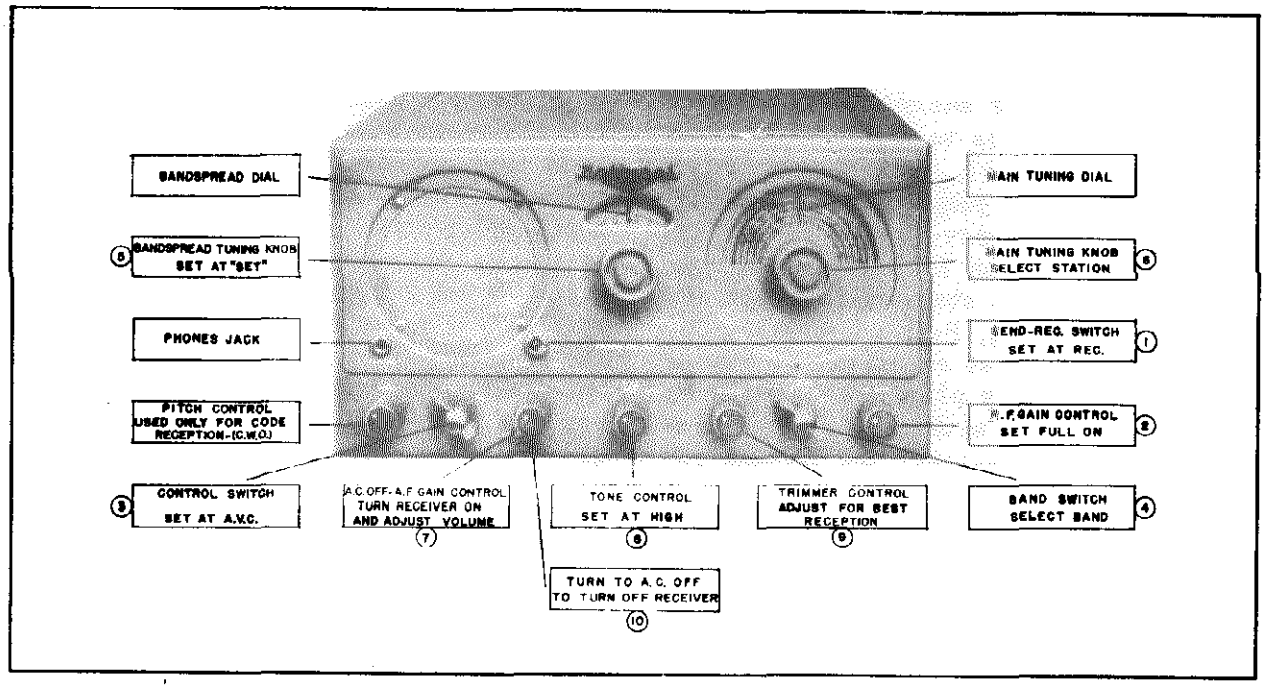


Figure No. 2. Simplified Operating Instructions

The BAND switch has five positions and serves to select the band of frequencies to be tuned by the Receiver. The five positions are marked with identifying band designations which correspond to the markings which appear on the main tuning dial.

The TRIMMER control operates a tuning capacitor trimmer which is connected across the first R.F. amplifier main tuning capacitor section. The trimmer control is used to tune the R.F. amplifier stage properly under a wide variety of antenna loading conditions.

The TONE control adjusts the tonal value of the audio output of the Receiver. The three positions select a tonal output as follows: High--normal receiver reproduction in which an average tonal output is achieved; Med--reproduction in which the higher tones are moderately attenuated; Low--in this position the higher tones are subdued emphasizing the lower tones.

The A.F. GAIN-A.C. OFF control is a dual purpose type. In the A.C. OFF position the Receiver is turned off; when the control knob is turned clockwise the A.C. line switch is closed, thus turning on the Receiver. The other function of this control is to adjust the audio output volume of the Receiver. Audio volume is progressively increased to a maximum when the knob is turned to the extreme clockwise position.

The control switch labeled C.W.O., M.V.C., A.V.C. and A.N.L. has four functions corresponding to the switch markings. In the A.V.C. position the automatic volume circuit is switched into the circuit to compensate for fluctuating volume due to fading. In the A.N.L. position the automatic noise limiter is switched on to effectively reduce interference caused by static, automobile ignition noise etc. Limiting action automatically takes place at a relatively high percentage modulation. The automatic volume control circuit remains operative in the A.N.L. position of the control switch. The M.V.C. position disables the A.V.C., C.W.O. and A.N.L. circuits. The C.W.O. position switches into the circuit the C.W. oscillator to permit reception of code telegraph signals.

The PITCH control is used in conjunction with the C.W.O. position of the control switch and has no effect on receiver performance with any other control switch setting. The PITCH control is used to adjust the beat note of the incoming code signal to an audio tone pleasing

to the operator. The C.W. oscillator is tuned to the Receiver's intermediate frequency mid-scale on the control knob. The range of the PITCH control is approximately ±3,000 cycles.

The SEND-RECEIVE switch is used to quiet the Receiver during transmission periods or other times when it is desirable to be able to resume reception immediately after a period of silence (i.e. not having to wait for the tubes to warm up). The SEND-RECEIVE switch should not be used to shut off the Receiver. The Receiver should be turned off by turning the A.F. GAIN control to A.C. OFF position. The function of the SEND-RECEIVE switch may be duplicated at an external (remote) position by connecting a switch or relay to terminals 5 and 8 of the A.C. jumper plug (P-1). This is a parallel arrangement permitting the panel-mounted SEND-RECEIVE switch to remain operative.

The main tuning control knob and dial scale are used to tune the frequency range of the Receiver. The band of frequencies tuned at any one time is determined by the BAND switch setting. To maintain correct calibration when using the main tuning knob the bandspread dial pointer must be at the "set" mark (located at 100 on the bandspread dial scale).

The bandspread control knob and dial scale are used to spread out over a wide range any small portion of the frequency range of the Receiver. Bandspread tuning is accomplished by setting the main tuning dial pointer at the high-frequency limit of the band of frequencies to be spread (for example: to tune the amateur 10 meter band set the pointer at 29.7 megacycles on the B band) and rotate the bandspread knob in a clockwise direction.

3-2. *Voice or Music Reception*

After the NC-57 Receiver is properly installed, as outlined in Section 2, it is placed in operation by adjusting the receiver controls as follows:

1. Set the SEND-RECEIVE switch at Receive.
2. Turn the R.F. GAIN control to the extreme clockwise position.
3. Set the control switch at A.V.C.
4. Set the BAND switch at the band of frequencies to be tuned. The Standard Broadcast Band is band E.
5. Set the bandspread dial pointer at the "Set" mark.
6. Set the main tuning dial pointer at the desired frequency.
7. Turn the A.F. GAIN-A.C. OFF control from the A.C. OFF position to the point providing the desired audio volume. Reset main tuning dial pointer if necessary.
8. Set the TONE control at High.
9. Set the TRIMMER control for maximum response. Maximum response is clearly indicated by use of the SM-57 Tuning Meter; the correct setting of the TRIMMER control is indicated by maximum deflection of SM-57 meter pointer. In order to secure a good aural indication of the correct TRIMMER setting, if the SM-57 is not used, it is recommended that the control switch be set at M.V.C. temporarily to adjust the TRIMMER control. In this case it may be necessary to retard the R.F. GAIN control if overload of the Receiver occurs, as will be indicated by excessive distortion. In the absence of signals the trimmer control may be "peaked" by setting it for maximum receiver background noise.

The settings given above are for the reception of signals of average strength. An improvement in the reception of exceptionally weak signals or signals accompanied by interfering noise pulses may be realized by modification of the above settings.

For improvement in the reception of weak signals set the control switch at M.V.C. and modify the other control settings as follows:

1. Set the A.F. GAIN control at approximately three-quarters rotation.
2. Adjust the audio volume by means of the R.F. GAIN control.

When a signal is accompanied by static peaks or noise pulses of high intensity and short duration, optimum noise-free reception will be had by setting the control switch at A.N.L. The resulting automatic limiting action will greatly reduce the interfering noise without noticeably affecting the signal. Best limiting action will be realized with the R.F. GAIN control.

fully advanced; the audio volume should be adjusted by means of the A.F. GAIN control. A further improvement in noise reduction will be realized by setting the TONE switch at Med. or Low depending on the degree of noise.

3-3. *Code Telegraphy Reception*

The adjustment of the receiver controls for code reception is the same as that for voice or music except for the following:

1. Set the control switch at C.W.O.
2. Set the A.F. GAIN control at three-quarters rotation.
3. Adjust the audio volume by means of the R.F. GAIN control.
4. Adjust the PITCH control to secure an audio tone pleasing to copy.

The action of the TONE control is the same as that described in Section 3-2.

SECTION 4. MAINTENANCE AND TEST DATA

4-1. *General Maintenance Data*

The NC-57 is designed and constructed to assure a long period of uninterrupted service. A few service hints are given below to aid in locating individual components which, due to age or weakness, cause faulty operation of the Receiver.

Vacuum tube failure may be evidenced by reduction in sensitivity, intermittent operation or an inoperative Receiver. Tubes may be checked in suitable tube testing equipment, or by replacement with tubes of proven quality. Care must be taken that tubes removed for checking are returned to their original sockets. Tubes of the same type will vary slightly in their individual characteristics and this fact should be borne in mind if replacement of the R.F. oscillator tube becomes necessary. A check of the dial calibration should be made if this tube is replaced to determine whether or not realignment is necessary.

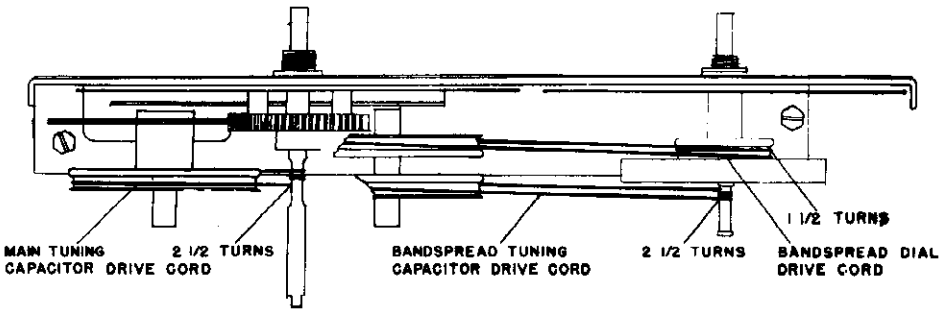
Bypass or filter capacitors which become open may cause decreased sensitivity, oscillation, poor stability or complete failure of the Receiver. The defective unit can be located by temporarily connecting a good capacitor in parallel with each suspected capacitor. Leaky or short-circuited capacitors can be detected by an ohmmeter check; a zero resistance reading of the ohmmeter will indicate a shorted capacitor.

Defective resistors, sometimes caused by capacitor failure in associated circuits, can be definitely located by measuring the resistance of each resistor. The Schematic Diagram should be consulted to ascertain that any particular resistor under test is not connected in parallel with some other circuit element which might produce a false measurement. An overloaded resistor may be located by visual inspection if the surface of the resistor becomes scorched due to excessive heating.

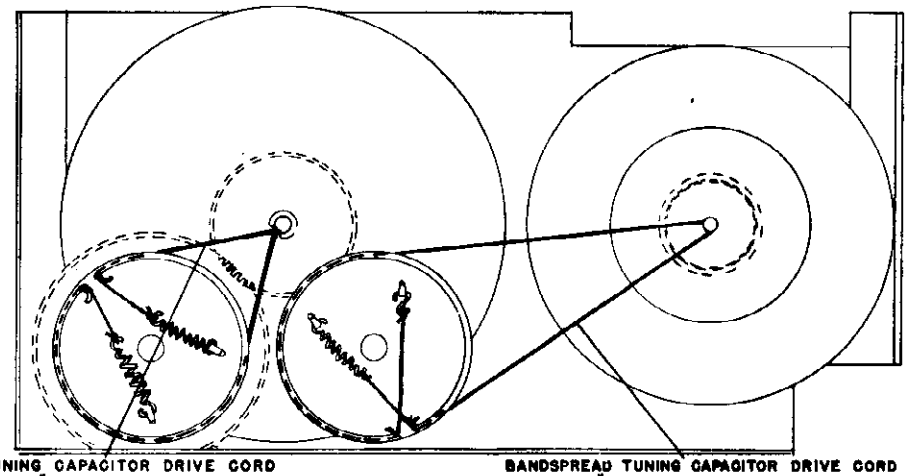
4-2. *Dial Cord Replacement*

The dial cords used on the NC-57 are a twisted type with a tensile strength of 5 2 lbs. and will give enduring service. There are three separate lengths of cord used and if replacement of any one of the three becomes necessary it is not necessary to disassemble the other dial cords. Complete instructions for the stringing of the dial cords are given on the following drawing. The two cords driving the main tuning and bandspread tuning capacitors, respectively, can be strung from the top inside of the cabinet. It is, however, necessary to remove the cabinet from the chassis in order to string the dial cord which drives the bandspread dial. Instructions for removing the cabinet are as follows:

1. Remove the top and back piece of the cabinet by releasing the ten drive screws at the back which fasten the piece to the chassis and cabinet wrap around.
2. Remove the bottom cover of the Receiver which is held in place by four drive screws.
3. Remove the four mounting feet at the bottom of the Receiver. These feet are fastened by means of a screw and speed nut arrangement.
4. Unsolder the two loudspeaker leads to the output tube (6V6GT/G). A red lead



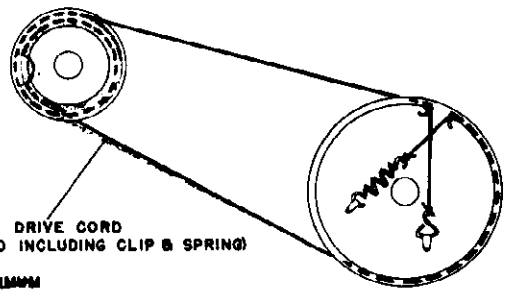
TOP VIEW OF DIAL ASSEMBLY



MAIN TUNING CAPACITOR DRIVE CORD
LENGTH: 11 3/4" (MEASURED INCLUDING BOTH SPRINGS
STRING AS FOLLOWS:
1. FASTEN ONE END TO PULLEY
2. WIND 2 1/2 TURNS COUNTERCLOCKWISE AROUND CAPSTAN
3. FASTEN OTHER END TO PULLEY

BANDSPREAD TUNING CAPACITOR DRIVE CORD
LENGTH: 15" (MEASURED INCLUDING CLIP & SPRING)
STRING AS FOLLOWS:
1. FASTEN CLIP END TO PULLEY
2. WIND 2 1/2 TURNS CLOCKWISE AROUND CAPSTAN
3. FASTEN SPRING END TO PULLEY

REAR VIEW OF DIAL ASSEMBLY



BANDSPREAD DIAL SCALE DRIVE CORD
LENGTH: 18 5/8" (MEASURED INCLUDING CLIP & SPRING)
STRING AS FOLLOWS:
1. SET CAPACITOR AT MINIMUM
2. FASTEN CLIP END TO PULLEY
3. SET SMALL PULLEY WITH CUTOUT AT TOP
4. WIND ONE TURN AROUND PULLEY & PASS CORD UNDER CUTOUT
5. SET DIAL AT SET MARK WITH COUNTERCLOCKWISE ROTATION
6. BRING CORD TO LARGE PULLEY & FASTEN SPRING END

FRONT VIEW OF BAND SPREAD DIAL DRIVE ASSEMBLY

Figure No. 3. Dial Cord Stringing Instructions

is soldered to pin 4 and a blue lead to pin 3.

5. Remove all knobs from the front of the Receiver. All knobs, with the exception of the main tuning and bandspread tuning knobs, are mounted on flatted shafts by clip springs. A notch in the knobs permits the insertion of a screwdriver, which, pressed on the spring releases the knob.

6. Remove the retaining nuts on the control switch, BAND switch, bandspread tuning control, main tuning control and the SEND-REC switch.

After completing the six steps above, the chassis can be withdrawn from the cabinet. After the dial cord has been strung, reassembly of the Receiver can be accomplished by following the disassembly procedure in reverse order.

4-3. *Voltage Tabulation*

The measurements of voltage shown on the following table are tabulated using a high-impedance vacuum tube voltmeter with a line voltage of 115 volts. The control settings to be observed are as follows:

1. R.F. GAIN full on. (extreme clockwise position)
2. BAND switch at E.
3. Main tuning dial pointer at 1.5 mc.
4. Control switch at M.V.C. except as noted.

All voltages are measured between specified terminal and chassis.

TUBE TERMINAL	PIN	VOLTS ±15%
R.F. Amp. Cathode	3&5	1.6
R.F. Amp. Screen	6	145
R.F. Amp. Plate	8	225
H.F. Osc. Plate	3	250
First Det. Grid	4	100
H.F. Osc. Grid	5	-13.5
First I.F. Amp. Cathode	3&5	1.8
First I.F. Amp. Screen	6	60
First I.F. Amp. Plate	8	250
Second I.F. Amp. Cathode	3&5	2
Second I.F. Amp. Screen	6	140
Second I.F. Amp. Plate	8	250
Limiter Plate	3	.1*
Limiter Cathode	4	.4*
Second Detector Plate	5	-.4
First Audio Plate	2	200
First Audio Cathode	3	4
C.W. Oscillator Grid	4	-5.8**
C.W. Oscillator Plate	5	100**
Audio Output Plate	3	225
Audio Output Screen	4	250
Audio Output Cathode	8	14
Rectifier Fil.	2	280
Rectifier Plate	4	310 A.C.
Rectifier Plate	6	310 A.C.
Rectifier Fil.	8	280
Voltage Regulator Anode	5	150

* Control Switch at A.N.L.
** Control Switch at C.W.O.

SECTION 5. ALIGNMENT DATA

5-1. *General*

The alignment of the NC-57 may be divided into two steps:

1. Intermediate Frequency Amplifier Alignment.
2. General Coverage Alignment.
   a. H.F. Oscillator
   b. First Detector and R.F. Amplifier.

The necessity for any realignment may be determined by checking the performance of the Receiver against its normal operation, as outlined in Section 3, and the dial calibration. It is recommended that, if tests indicate realignment is required, the instructions given in this section are thoroughly read and understood before realignment is attempted. For alignment purposes the Receiver should be set up as specified in Section 2-1 except that the antenna should be disconnected. An output meter with a resistive load of 8 ohms should be connected to the Phones jack on the front panel of the Receiver.

5-2. *I.F. Amplifier Alignment*

The intermediate frequency of the NC-57 Receiver is 455 kilocycles. The two I.F. transformers and the detector input transformer have permeability tuned iron-core inductors with screw adjustments for

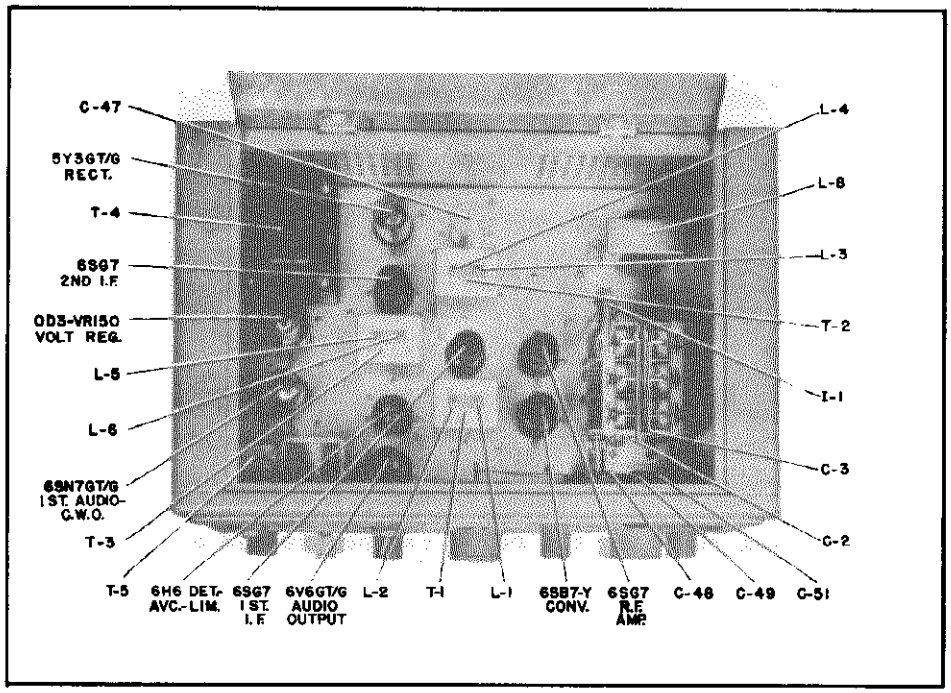


Figure No. 4. Top View of Receiver

alignment purposes. These adjustments are accessible from the top inside of the cabinet as shown on Figure No. 4.

The Alignment procedure is as follows:

1. Connect the "high" output lead of an accurately calibrated signal generator to the stator of the detector portion of the main tuning capacitor, C-2B, and the grounded lead to any convenient grounded point on the chassis. This is a direct connection, no dummy antenna being required. Set the signal generator at 455 kilocycles and turn the modulation on.

2. Set the control switch at M.V.C.

3. Set the R.F. GAIN control full on.

4. Set the TONE switch at High.

5. Set the A.F. GAIN full on.

6. Adjust the output attenuator of the signal generator to provide a signal of approximately 100 microvolts. While making I.F. amplifier adjustments, it will be necessary to retard the attenuator of the signal generator if I.F. amplifier gain increases to a point where overload occurs.

7. Adjust the I.F. tuned inductors L-1 through L-6 for maximum gain, as indicated on the output meter. The order in which these adjustments are made is not important.

At the conclusion of the I.F. amplifier alignment the tuning of the C.W. oscillator may be checked by turning the modulation of the signal generator off and setting the control switch at C.W.O. With this setting zero beat with the test signal should occur with the PITCH control set at mid-scale. If the above test indicates realignment of the C.W. oscillator is required procede as follows:

1. Remove the bottom cover of the Receiver.

2. Loosen the set screw on the collar of the C.W. oscillator transformer shaft.

3. Without loosening the PITCH control knob on its shaft withdraw the knob and shaft from the cabinet.

4. The screw driver adjustment on the C.W. oscillator inductor, L-7, will then be accessible through the shaft opening in the cabinet. Adjust L-7 for zero beat with the test signal.

5. Replace the PITCH control knob and shaft so that the white dot on the knob is at mid-scale.

6. Position the collar so that the set screw is directly opposite (180°) from the stop and tighten the set screw making

sure that the position of the PITCH control knob does not change from mid-scale.

5-3. *General Coverage Alignment*

General coverabe alignment and bandspread alignment are accomplished simultaneously, since the main tuning and bandspread tuning capacitors are connected in parallel on all bands. The Receiver should be set up as specified in Section 2-1 except that the antenna should be disconnected. Adjustment of the H.F. oscillator trimmers of the A, B and C bands can be made from the top inside of the cabinet as shown on Figure No. 4. All other trimmer and padder adjustments can be made through the holes in the bottom cover of the Receiver after removal of the small cover plate as shown on Figure No. 6. The preliminary alignment procedure is as follows:

1. Connect an accurate signal source (signal generator or crystal oscillator) to the antenna input terminals through a standard dummy antenna of 300 ohms.
2. Connect an output meter with a resistive load of 8 ohms to the Phones jack.
3. Set the control switch at M.V.C.
4. Turn the R.F. GAIN control to full on.
5. Set the bandspread dial at the set mark.

The Alignment Chart in this section outlines the procedure for alignment of the H.F. oscillator, first detector and R.F. amplifier stages.

(a) H.F. Oscillator

Care should be taken when aligning the H.F. oscillator of any band to insure that the oscillator is aligned to the fundamental frequency and not the image. This can be checked by tuning the Receiver to the image frequency. On the A and B bands the image should appear 910 kilocycles above the fundamental signal. On the C, D and E bands the image should appear 910 kilocycles below the fundamental signal. If the image does not appear at its correct setting the H. F. oscillator trimmer should be adjusted for the correct calibration.

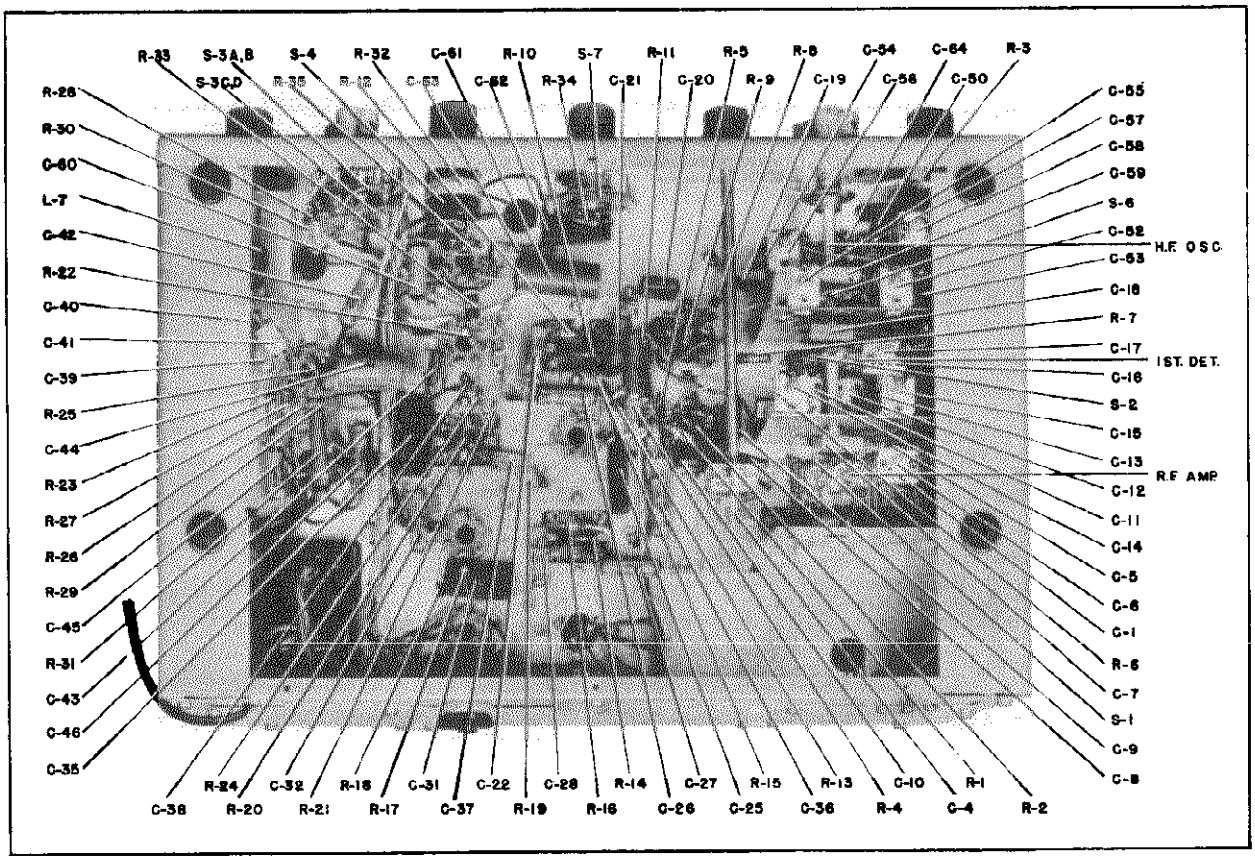


Figure No. 5. Bottom View of Receiver

ALIGNMENT CHART

(The bandspread dial must be at the Set mark)

Step	Band	Adjust Signal Source To:	Set Main Tun. Dial At:	Adjust To Receive Test Signal	Adjust For Maximum Output
1	A	54.0 Mc.	54.0 Mc.	C-48	C-11, C-4
2	A	36.0 Mc.	36.0 Mc.	C-58	C-17, C-6
3	A	54.0 Mc.	54.0 Mc.		Check Step 1. Repeat Steps 1, 2 and 3 if necessary.
1	B	34.0 Mc.	34.0 Mc.	C-49	C-12, C-4
1	C	13.0 Mc.	13.0 Mc.	C-51	C-13, C-4
1	D	4.4 Mc.	4.4 Mc.	C-52	C-14, C-4
1	E	1.5 Mc.	1.5 Mc.	C-55	C-15, C-4
2	E	0.6 Mc.	0.6 Mc.	C-56	
3	E	1.5 Mc.	1.5 Mc.		Check Step 1. Repeat Steps 1, 2 and 3 if necessary.

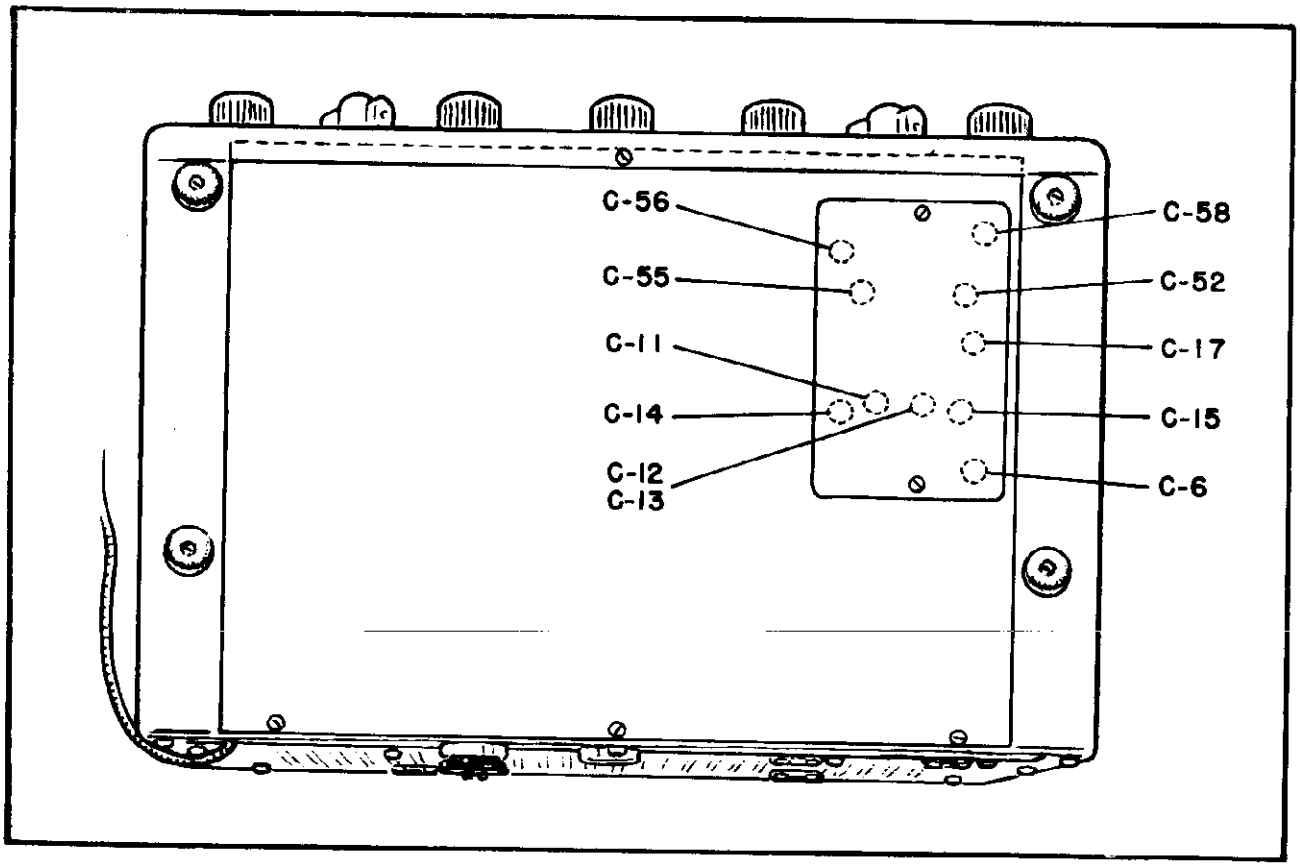


Figure No. 6. Alignment Trimmer Locations

SECTION 6. SM-57 TUNING METER

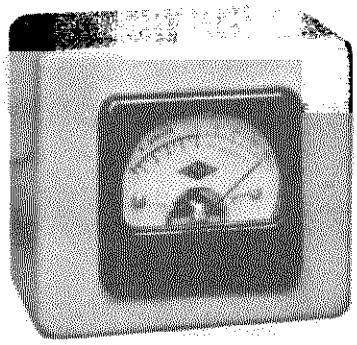


Figure No. 7. SM-57 Tuning Meter

6-1. *General*

The SM-57 Tuning Meter is available as an accessory for use with the NC-57 as a tuning indicator and relative signal strength indicator. The SM-57 is fitted with a cable and plug for connection to the Accessory Connector Socket at the rear of the NC-57 and is contained in a metal case finished to match the Receiver.

To utilize the SM-57 the following receiver control settings must be observed:

1. Control switch at A.V.C. or A.N.L.

2. R.F. GAIN control full on. (Retarding the R.F. GAIN control will reduce the sensitivity of the meter.)

The correct dial setting for any specific station on the dial is that setting which provides maximum deflection of the meter pointer.

6-2. *Meter Adjustment*

Two adjustments are provided on the SM-57; one mechanical and the other electrical.

1. Mechanical -- With the Receiver turned off, the meter pointer should read 40 db. (the last scale marking). If it does not, correction is effected by the screw adjustment on the front of the meter.

2. Electrical -- With the Receiver turned on and controls adjusted for meter operation, the meter pointer should read zero (the first scale marking). This test must be made with no signal input to the Receiver. Correction of the zero setting, if required, is made by means of the screwdriver adjustment (R-101) at the rear of the meter case.

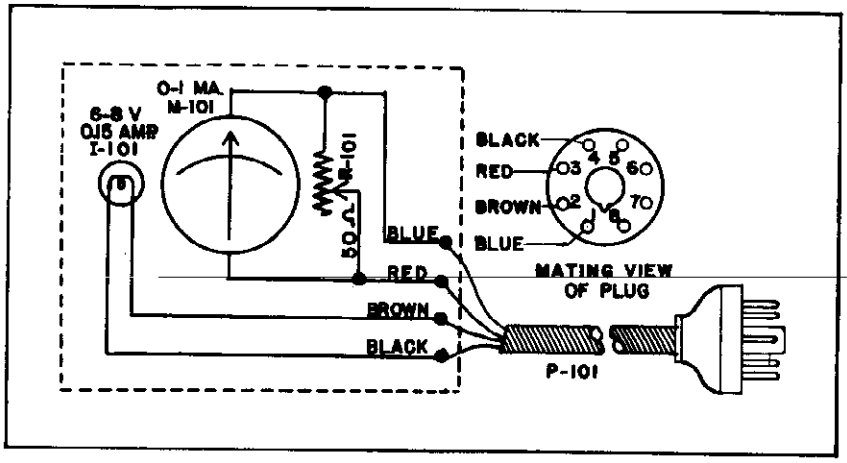


Figure No. 8. Schematic Diagram--SM-57 Tuning Meter

SECTION 7. **PARTS LIST**

Symbol	*Function*	*Type*	*Rating*
	CAPACITORS		
C-1	Antenna Coupling	Ceramic	100 Mmf., 500 VDCW
C-2	Bandspread Tuning	Air	Variable
C-2A	R.F. Bandspread Tuning	Air	Part of C-2
C-2B	1st. Det. Bandspread Tuning	Air	Part of C-2
C-2C	H.F. Osc. Bandspread Tuning	Air	Part of C-2
C-3	Main Tuning	Air	Variable
C-3A	R.F. Tuning	Air	Part of C-3
C-3B	1st. Det. Tuning	Air	Part of C-3
C-3C	H.F. Osc. Tuning	Air	Part of C-3
C-4	Trimmer Control	Air	Variable
C-5	A Band R.F. Amp. Padder	Ceramic	68 Mmf., 500 VDCW
C-6	A Band R.F. Amp. Padder	Mica	Variable
C-7	B Band R.F. Amp. Padder	Mica	0.0016 Mfd., 500 VDCW
C-8	R.F. Amp. Grid Coupling	Mica	100 Mmf., 500 VDCW
C-9	R.F. Amp. Cathode Bypass	Paper	0.01 Mfd., 400 VDCW
C-10	R.F. Amp. Screen Bypass	Paper	0.01 Mfd., 600 VDCW
C-11	A Band 1st. Det. Trimmer	Ceramic	Variable
C-12	B Band 1st. Det. Trimmer	Ceramic	Variable
C-13	C Band 1st. Det. Trimmer	Ceramic	Variable
C-14	D Band 1st. Det. Trimmer	Mica	Variable
C-15	E Band 1st. Det. Trimmer	Mica	Variable
C-16	A Band 1st. Det. Padder	Ceramic	68 Mmf., 500 VDCW
C-17	A Band 1st. Det. Padder	Mica	Variable
C-18	B Band 1st. Det. Padder	Mica	0.0013 Mfd., 500 VDCW
C-19	H.F. Osc. Grid Coupling	Mica	100 Mmf., 500 VDCW
C-20	1st. Det. Screen Bypass	Paper	0.01 Mfd., 400 VDCW
C-21	1st. Det. Plate Filter	Paper	0.01 Mfd., 600 VDCW
C-22	1st. I.F. Amp. Grid Filter	Paper	0.01 Mfd., 400 VDCW
C-23	T-1 Pri. Tuning	Mica	510 Mmf., 500 VDCW
C-24	T-1 Sec. Tuning	Mica	510 Mmf., 500 VDCW
C-25	1st. I.F. Amp. Cathode Bypass	Paper	0.1 Mfd., 400 VDCW
C-26	1st. I.F. Amp. Screen Bypass	Paper	0.01 Mfd., 600 VDCW
C-27	1st. I.F. Amp. Plate Filter	Paper	0.01 Mfd., 600 VDCW
C-28	2nd. I.F. Grid Filter	Paper	0.01 Mfd., 400 VDCW
C-29	T-2 Pri. Tuning	Mica	510 Mmf., 500 VDCW
C-30	T-2 Sec. Tuning	Mica	510 Mmf., 500 VDCW
C-31	2nd. I.F. Amp. Cathode Bypass	Paper	0.1 Mfd., 400 VDCW
C-32	2nd. I.F. Amp. Screen Bypass	Paper	0.01 Mfd., 400 VDCW
C-33	T-3 Pri. Tuning	Mica	510 Mmf., 500 VDCW
C-34	T-3 Sec. Tuning	Mica	510 Mmf., 500 VDCW
C-35	Limiter Cathode Filter	Paper	0.1 Mfd., 400 VDCW
C-36	A.V.C. Filter	Paper	0.01 Mfd., 400 VDCW
C-37	2nd. Det. Load	Mica	100 Mmf., 500 VDCW
C-38	C.W.O. Coupling		3 Turns Cov. Wire
C-39	C.W.O. Plate Coupling	Paper	0.01 Mfd., 600 VDCW
C-40	C.W.O. Tuning	Mica	220 Mmf., 500 VDCW
C-41	C.W.O. Grid Coupling	Mica	270 Mmf., 500 VDCW
C-42	Audio Coupling	Paper	0.01 Mfd., 600 VDCW
C-43	1st. Audio Plate Filter	Paper	250 Mmf., 600 VDCW

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PARTS LIST (Continued)

Symbol	*Function*	*Type*	*Rating*
	CAPACITORS (Continued)		
C-44	1st. Audio Cathode Bypass	Elect.	10 Mfd., 50 VDCW
C-45	A.C. Line Bypass	Paper	0.01 Mfd., 600 VDCW
C-46	B Supply Filter	Paper	0.01 Mfd., 400 VDCW
C-47	Power Supply Filter	Elect.	10+10 Mfd., 450 VDCW
C-47A	Power Supply Filter	Elect.	Part of C-47
C-47B	Power Supply Filter	Elect.	Part of C-47
C-48	A Band H.F. Osc. Trimmer	Ceramic	Variable
C-49	B Band H.F. Osc. Trimmer	Ceramic	Variable
C-50	C Band H.F. Osc. Padder	Mica	0.0038 Mfd., 300 VDCW
C-51	C Band H.F. Osc. Trimmer	Ceramic	Variable
C-52	D Band H.F. Osc. Trimmer	Mica	Variable
C-53	D Band H.F. Osc. Padder	Mica	0.0018 Mfd., 500 VDCW
C-54	E Band H.F. Osc. Padder	Mica	515 Mmf., 500 VDCW
C-55	E Band H.F. Osc. Trimmer	Mica	Variable
C-56	E Band H.F. Osc. Padder	Mica	Variable
C-57	A Band H.F. Osc. Padder	Ceramic	68 Mmf., 500 VDCW
C-58	A Band H.F. Osc. Padder	Mica	Variable
C-59	B Band H.F. Osc. Padder	Mica	0.0018 Mfd., 500 VDCW
C-60	Audio Coupling	Paper	0.001 Mfd., 600 VDCW
C-61	Audio Output Cathode Bypass	Elect.	25 Mfd., 50 VDCW
C-62	Tone	Paper	0.1 Mfd., 400 VDCW
C-63	Audio Compensating	Paper	0.0022 Mfd., 400 VDCW
C-64	B Band H.F. Osc. Trimmer	Ceramic	10 Mmf., 500 VDCW
	RESISTORS		
R-1	R.F. Amp. Grid Filter	Fixed	470,000 Ohms, 1/2 W.
R-2	R.F. Amp. Cathode	Fixed	100 Ohms, 1/2 W.
R-3	R.F. Gain Control	Variable	10,000 Ohms, 2 W.
R-4	B plus Bleeder	Fixed	58,000 Ohms, 2 W.
R-5	R.F. Amp. Screen Filter	Fixed	1,000 Ohms, 1/2 W.
R-6	R.F. Amp. Plate Filter	Fixed	4,700 Ohms, 1/2 W.
R-7	1st. Det. Grid	Fixed	15 Ohms, 1/2 W.
R-8	H.F. Osc. Grid	Fixed	33 Ohms, 1/2 W.
R-9	H.F. Osc. Grid Leak	Fixed	47,000 Ohms, 1/2 W.
R-10	1st. Det. Plate Filter	Fixed	1,000 Ohms, 1/2 W.
R-11	1st. Det. Screen Filter	Fixed	3,900 Ohms, 1/2 W.
R-12	1st. I.F. Amp. Grid Filter	Fixed	470,000 Ohms, 1/2 W.
R-13	1st. I.F. Amp. Cathode	Fixed	330/2,200 Ohms, 1/2 W.
R-14	1st. I.F. Amp. Plate Filter	Fixed	1,000 Ohms, 1/2 W.
R-15	1st. I.F. Amp. Screen Filter	Fixed	470,000 Ohms, 1/2 W.
R-16	2nd. I.F. Grid Filter	Fixed	470,000 Ohms, 1/2 W.
R-17	2nd. I.F. Amp. Cathode	Fixed	220 Ohms, 1/2 W.
R-18	2nd. I.F. Amp. Screen Filter	Fixed	2,200 Ohms, 1/2 W.
R-19	A.V.C. Filter	Fixed	2,200,000 Ohms, 1/2 W.
R-20	Limiter Filter	Fixed	1,000,000 Ohms, 1/2 W.
R-21	2nd. Det. Load	Fixed	33,000 Ohms, 1/2 W.
R-22	2nd. Det. Load	Fixed	47,000 Ohms, 1/2 W.
R-23	C.W.O. Plate Filter	Fixed	10,000 Ohms, 1/2 W.
R-24	Limiter Cathode	Fixed	1,000,000 Ohms, 1/2 W.
R-25	1st. Audio Grid	Fixed	470,000 Ohms, 1/2 W.
R-26	1st. Audio Cathode	Fixed	2,700 Ohms, 1/2 W.

NATIONAL COMPANY, INC. MODEL NC-

PARTS LIST (Continued)

Symbol	*Function*	*Type*	*Rating*
	RESISTORS (Continued)		
R-27	C.W.O. Grid	Fixed	22,000 Ohms, 1/2 W.
R-28	S-Meter Dropping	Fixed	2,200 Ohms, 1/2 W.
R-29	1st. Audio Plate Filter	Fixed	100,000 Ohms, 1/2 W.
R-30	A.V.C. Bleeder	Fixed	220 Ohms, 1/2 W.
R-31	B plus Dropping	Fixed	3,900 Ohms, 2 W.
R-32	Audio Gain Control	Variable	500,000 Ohms
R-33	Audio Output Cathode	Fixed	330 Ohms, 2 W.
R-34	Tone	Fixed	4,700 Ohms, 1/2 W.
R-35	Audio Output Plate Load	Fixed	47,000 Ohms, 1/2 W.
	MISCELLANEOUS		
I-1	Dial Lamp		0.15 Amp., 6-8 Volts
J-1	Phones Jack		Closed Circuit
L-1	T-1 Input Tuning	Variable	Iron-Core Inductor
L-2	T-1 Output Tuning	Variable	Iron-Core Inductor
L-3	T-2 Input Tuning	Variable	Iron-Core Inductor
L-4	T-2 Output Tuning	Variable	Iron-Core Inductor
L-5	T-3 Input Tuning	Variable	Iron-Core Inductor
L-6	T-3 Output Tuning	Variable	Iron-Core Inductor
L-7	C.W. Osc. Tuning	Variable	Iron-Core Inductor
L-8	Filter Choke		10 Henries
P-1	A.C. Jumper Plug	Octal	
P-2	A.C. Line Cord. & Plug		
S-1	R.F. Transformer Band Switch	Rotary	
S-1A		Part of S-1	D.P. 5 Position
S-1B		Part of S-1	S.P. 5 Position
S-1C		Part of S-1	S.P. 5 Position
S-2	1st. Det. Transformer Band Switch		
S-2A		Part of S-2	D.P. 5 Position
S-2B		Part of S-2	SP. 5 Position
S-2C		Part of S-2	S.P. 5 Position
S-3	Control Switch	Rotary	
S-3A	C.W.O. Switch	Part of S-3	S.P. 4 Position
S-3B	Limiter Switch	Part of S-3	S.P. 4 Position
S-3C	S-Meter Switch	Part of S-3	S.P. 4 Position
S-3D	A.V.C. Switch	Part of S-3	S.P. 4 Position
S-4	A.C. Line Switch	Part of R-32	S.P.S.T.
S-5	Send-Rec. Switch	Toggle	S.P.S.T.
S-6	H.F. Osc. Transformer Band Switch	Rotary	
S-6A		Part of S-6	D.P. 5 Position
S-6B		Part of S-6	S.P. 5 Position
S-6C		Part of S-6	S.P. 5 Position
S-7	Tone Switch	Rotary	S.P. 3 Position
T-1	1st. I.F. Transformer		455 Kc.
T-2	2nd. I.F. Transformer		455 Kc.
T-3	Det. Input Transformer		455 Kc.
T-4	Power Transformer		115 Volts, 50/60 Cycles
T-5	Audio Output Transformer		5000/4 Ohms
X-1	Power Socket	Octal	
X-2	Accessory Connector Socket	Octal	
LS-1	Loudspeaker		5" P.M.

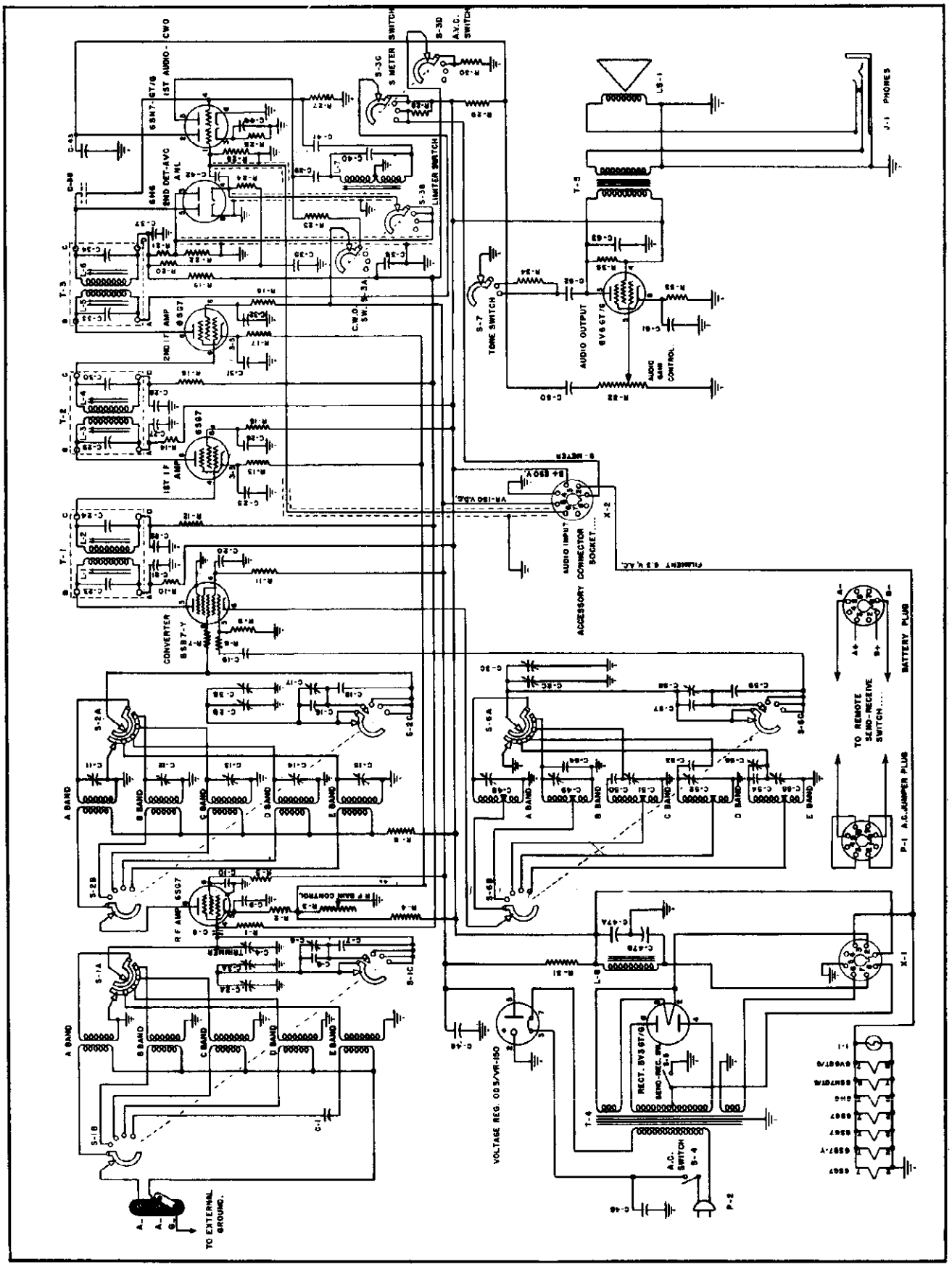


Figure No. 9. Schematic Diagram NC-57 Receiver

INSTALLATION

INSTALLING THE OUTSIDE ANTENNA

The built in loop antenna on your CO-OP Radio is highly efficient for the reception of local or nearby stations on the broadcast band. Short-wave reception will require some sort of an antenna connected to the set — 5 to 15 ft. of wire stretched on the floor and connected to one of the antenna clips.

However, in locations where reception with the built in loop antenna is not satisfactory, a good outside antenna should be installed. The total length of the outside antenna, including the lead-in, should be from 50 to 80 ft. for good operation, and it should be as high as possible. Keep the antenna away from metallic objects such as other wires, guttering, grounded fire escapes, etc.

When the antenna is connected to a receiver, the antenna trimmer on the back of the chassis base must be readjusted. To do this, connect the antenna to one of the antenna terminals in the rear of the set; tune in a weak station near 600 kc. (60 on the dial); and adjust the trimmer screw with a screw driver until the signal is loudest. Antennas shorter than about 30 ft. should be connected to the SHORT ANT clip; those much longer than this will need to be connected to the LONG ANT clip. If in doubt which to use, try both adjusting the trimmer for each, and use the connection which gives the best performance.

A good ground connection should always be provided when an outside antenna is used, and sometimes it is useful in reducing noise even when no antenna is connected to the set. Connect a wire from the GND clip in the rear of the receiver to a convenient water pipe, radiator, or conduit. If none of these are available, a wire may be run to a metal stake or pipe driven into the ground to a distance of 4 to 6 ft.

PREPARING RECORD CHANGER FOR OPERATION

The record changer has been mounted tightly to the cabinet shelf (or drawer bottom in the Console Model) to prevent damage in shipping. A string tied around the needle arm post holds the drawe closed in the Console Model. Cut this string BEFORE trying to oper the drawer. Before attempting to use the phonograph, loosen the three mounting bolt nuts on the UNDER SIDE of the shelf or drawer until the record changer is floating on its spring shock absorbers. (These mounting bolts are located on top of the rectangular base.) Now, remove the two rubber bands that hold the pickup arm secure and remove the cardboard holder. Remove the cardboard disc from the turntable. Finally, remove the needle guard from the pick-up arm by grasping the guard with your thumb and forefinger at the rounded ends and pulling firmly but gently downward

OPERATION

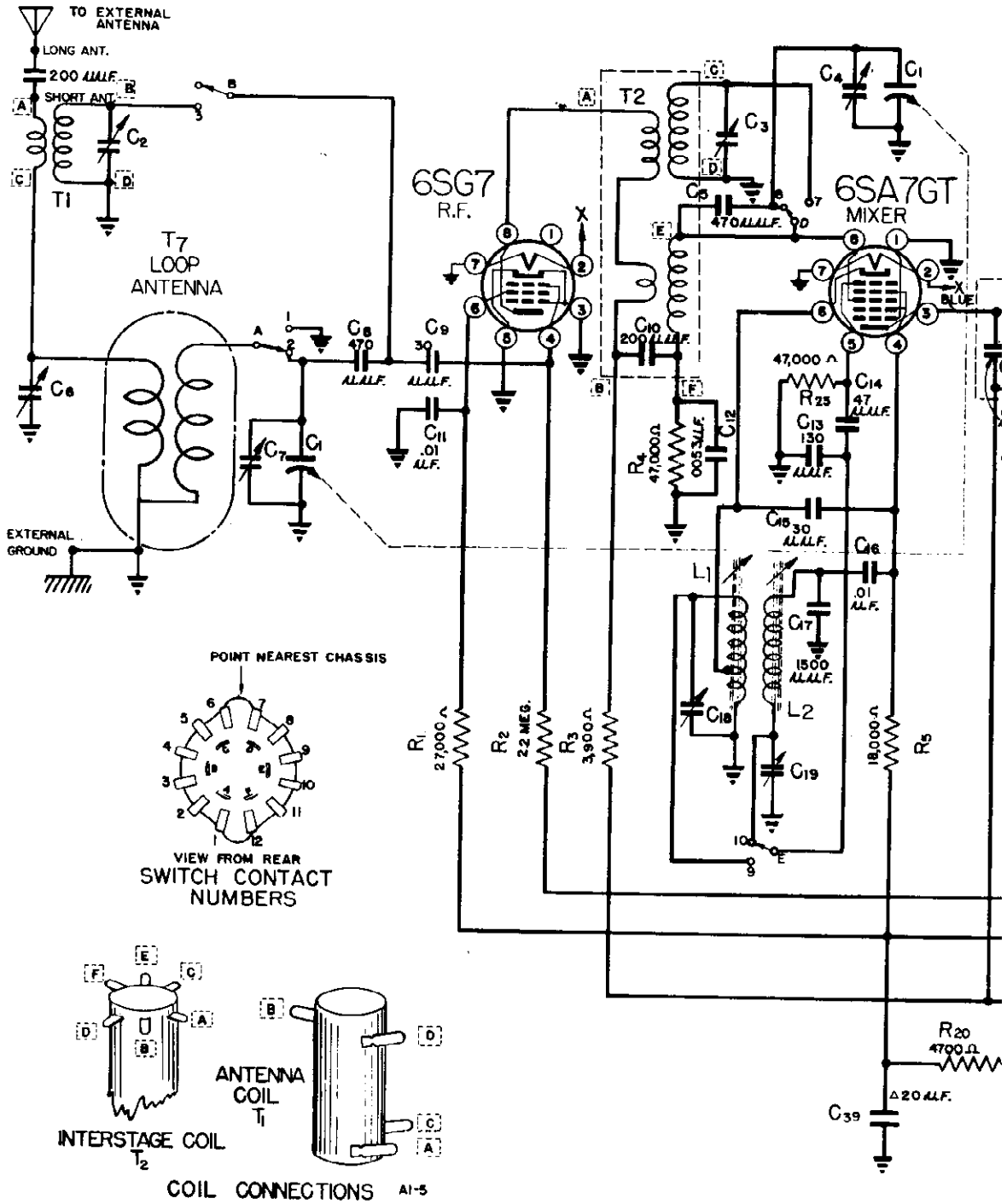
Broadcast Band (535 - 1620 Kilo cycles): The broadcast band is cal brated in channel numbers. Add zero to the dial number to get th kilocycle number.

Short-Wave Band (9 to 15.6 Mega cycles): The short-wave band i calibrated in megacycles.

On-Off Switch and Volume Control Turn on the radio by turning the vo lume knob to the right--a click wil be heard. Wait about thirty second for the tubes to warm up. Continuin to turn the knob to the right wil increase the volume. Turn off b turning the knob to the left until click is heard.

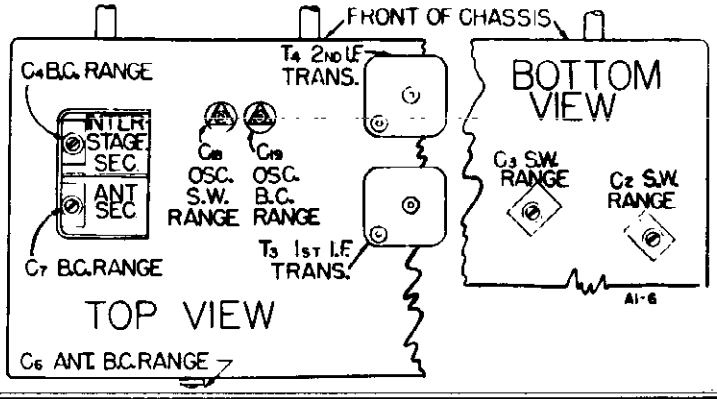
Tuning Knob: Turn the tuning kno until the desired station is heard Then slowly rotate the knob back an forth until the signal is clearest If, at the clearest point, the sig nal is too strong, reduce it by mean of the VOLUME CONTROL--NOT by usin the tuning knob.

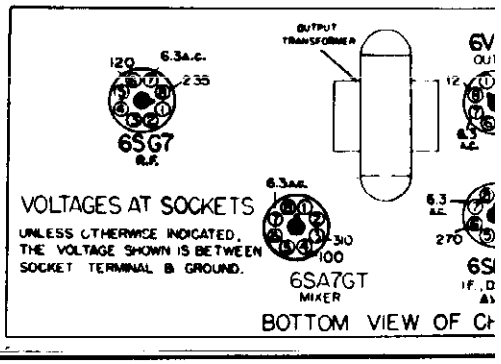
Tone Control and Phono-Radio Switch Adjust the tone knob to desired ton AFTER the program is tuned in. Th most natural and intelligible re ception is obtained as the tone con trol is turned to the right. Turn ing the knob toward the left firs increases the bass notes and the cuts the high treble notes as th left hand end is approached. Th proper adjustments, in any case will be determined by the amount o noise present and your persona preference.



SWITCH CONTACT NUMBERS

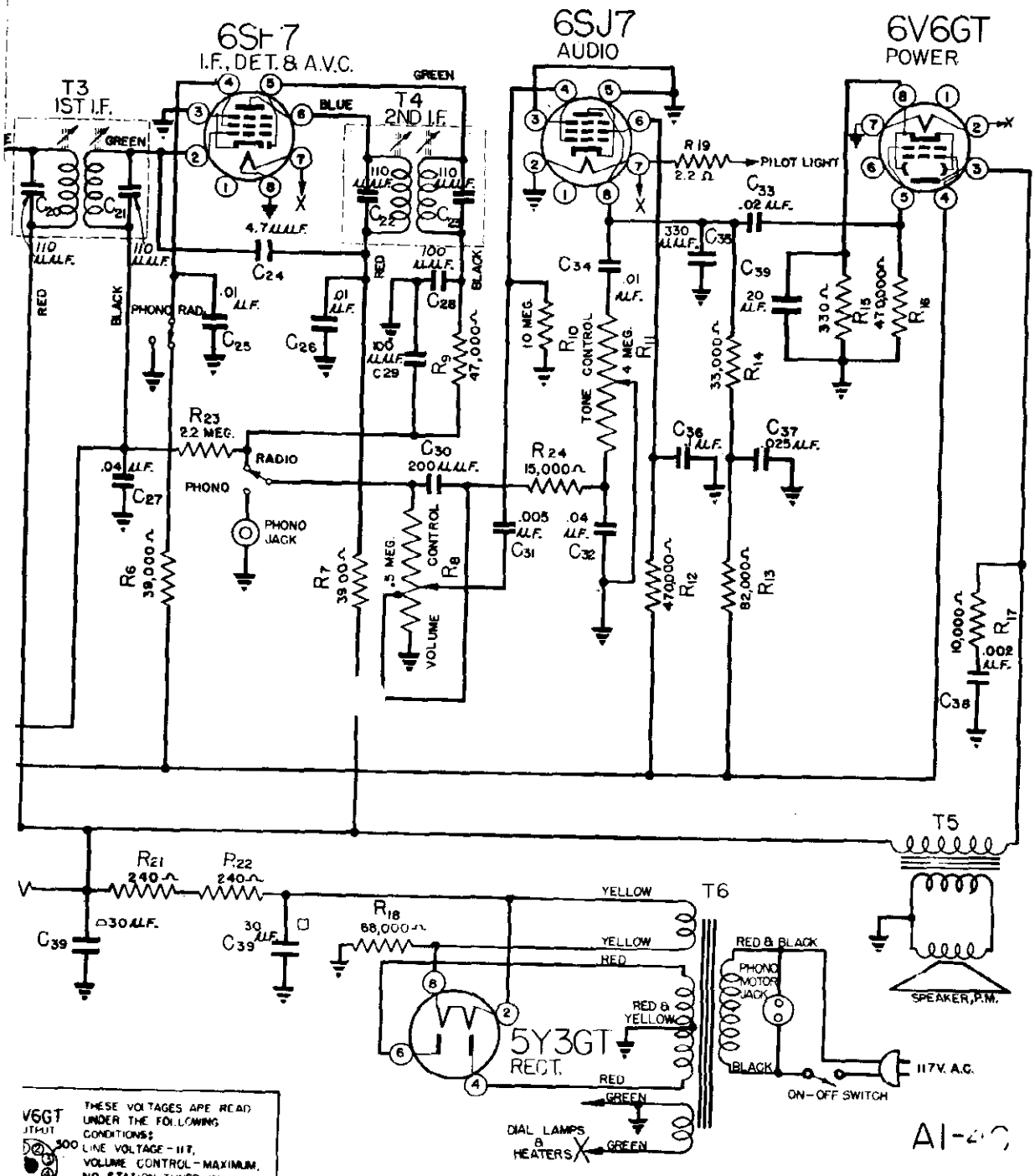
COIL CONNECTIONS A1-5





COOPERATIVES, INC.

MODELS 6A47WT, 6A47WTR, 6A47WTC, 6AWC2, 6AWC3, 6AFMT, 6AMM



THESE VOLTAGES ARE READ UNDER THE FOLLOWING CONDITIONS: LINE VOLTAGE - 117, VOLUME CONTROL - MAXIMUM, NO STATION TUNED IN, READINGS TAKEN WITH 1000 OHM-PER-VOLT METER. PLATE & SCREEN VOLTAGES ARE READ ON 500 VOLT

MODELS 6A47WT,WTR,WTC; 6AWC2,C3;6AFMT;6AMM

NATIONAL COOPERATIVES, INC.

Turning the knob all the way to the right throws a switch which cuts out radio reception and connects the phone-jack on the rear of the chassis base. Phonograph records may then be played through Model 6A47WT by connecting any record player to this jack. To restore radio reception, turn the tone knob all the way to the left to throw the switch back to the radio portion.

Band Switch: This knob has two positions. The position to the right (SW) switches the tuning to the short-wave band. The position to the left (BC) provides reception on the regular broadcast band.

CONDITIONS AFFECTING RADIO RECEPTION

It is not always possible to obtain perfect reception from your radio. Often this is due to conditions entirely external to the receiver such as:

Atmospheric Static

Local Interference caused by sparking in all kinds of electrical apparatus. This can be reduced by keeping the antenna's lead-in as far away from the electrical apparatus as possible, and by shielding and filtering the electrical apparatus causing the disturbance. It may, however, be necessary to call in your CO-OP Service Man or get in touch with your local power company if their apparatus is the cause.

Fading is a phenomenon that is noticeable when a distant station is being received. It manifests itself as a periodic change of signal strength and also as a periodic "mushing" or distortion of the signal. The automatic volume control incorporated in your CO-OP Radio tends to overcome the change of signal strength. However, change of signal strength may also be caused by a faulty antenna system or poor tubes.

The A.C. Line Voltage changes during the day and evening in some communities, particularly during peak load hours. This condition may reduce the life of some parts of any radio. Therefore, if this condition is prevalent, it is advisable to consult your local power company. If your electric lights flicker or vary, it may be an indication of this fluctuation of line voltage.

CARE

If your radio does not operate satisfactorily, proceed as follows:

1. Be sure there is power at the outlet by connecting a lamp to the same outlet to which the radio is connected. Frequently it is necessary to bend the prongs of the plug if it does not fit properly into the outlet.

2. Be sure the tubes are in the correct sockets as shown in the diagram on the back of your radio chassis base. Also be sure the tubes are operating — glass tubes will light very dimly and metal tubes will be hot to the touch.

When it is necessary to replace a tube in your set, proceed as follows: If there is a back panel on your set (as on Model 6A47WT), pull out the studs around the edge of the panel and remove this panel first. Loosen and remove the four mounting screws on the under side of the board supporting the chassis. Pull off the dial knobs at the front of the cabinet and disconnect the phono-plugs. These plugs go into the sockets on the rear of the chassis base— one is a circular metal plug with three prongs and the other is a single-prong plug in the center of the rear panel of the chassis base. Remove the speaker plug-it is a single-prong plug located on top of the chassis base and next to the 6SG7 metal-covered tube. Now, slide the chassis out of the cabinet and replace any tubes that are not operating.

To remove the tubes in the 6A47WTR model it is necessary to remove the record changer first. To do this, remove the three mounting screws in the base of the changer. Disconnect all "plug-ins" as described. Lift the record changer out of the cabinet. Next, remove the three screws holding the metal cover in front of the changer and remove this cover. The tubes should now be easily accessible without removing the set from the cabinet. If not, proceed as described in the preceeding paragraph and remove the chassis from the cabinet.

3. Check the antenna and ground If an external antenna is being used, inspect the antenna system to be sure that it is not grounded at any point, and that all connections are in good condition.

NATIONAL COOPERATIVES, INC. MODELS 6A47WT,WTR,WT 6AWC2,C3;6AFMT;6AMM

REPLACEMENT PARTS PRICE LIST

CONDENSERS

Code No.	Specifications		Tolerances
C24	4.7 mmf.	600 v.	.5%
C15, C4	30 mmf.	600 v.	10%
C14	47 mmf.	600 v.	10%
C13	130 mmf.	600 v.	5%
C10, C30	200 mmf.	600 v.	20%
C35	330 mmf.	600 v.	20%
C5, C8	470 mmf.	600 v.	3%
C17	1500 mmf.	600 v.	10%
C38	0.002 mfd.	600 v.	25%
C12	0.005 mfd.	400 v.	10%
C31	0.0053 mfd.	400 v.	5%
C11, C16, C25, C34	0.01 mfd.	400 v.	20%
C33	0.02 mfd.	400 v.	20%
C37	0.025 mfd.	400 v.	20%
C27, C32	0.04 mfd.	200 v.	20%
C36	0.01 mfd.	400 v.	20%
C26	0.01 mfd.	600 v.	20%
C39	4 sect. electrolytic		
	30 mfd.	450 v.	+50%
	30 mfd.	450 v.	-10%
	20 mfd.	450 v.	
	20 mfd.	25 v.	

TRANSFORMERS & COILS

Part No.	Code No.	Description
TRX101	T6	Power Transformer
TRX102	T5	Output Transformer
TRX103	T3	1st I.F. Transformer
TRX104	T4	2nd I.F. Transformer
CLA102	T2	R.F. Interstage Coil
CLA101	T1	S.W. Antenna Coil
CLA107		Loop Antenna Assembly for 6A47WT
CLA115		Loop Antenna Assembly for 6A47WTR
CLA116		Loop Antenna Assembly for 6AWC2 & 6AWC3

KNOBS & CONTROLS

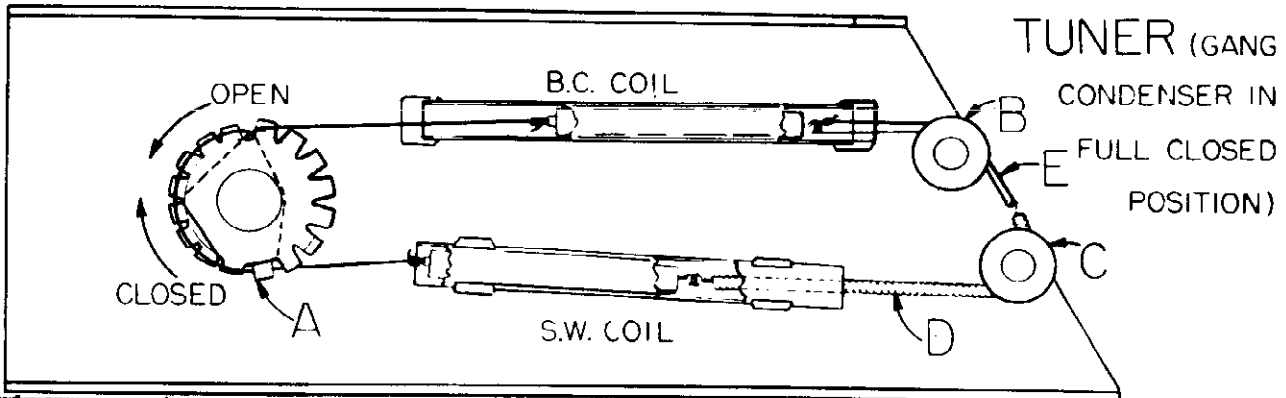
Part No.	Description
SWX101	Band Switch Assembly
KNX101A	Band Switch
KNX102	Tuning Knob
KNX103	Volume Control Knob
KNX104	Tone Control Knob
SHX100C	Tuning Shaft Assembly
PHX100A	Volume Control Assembly
PHX101	Tone Control Assembly

Part No.	Description
BEX103	Mounting Sleeve
BRA118	Tuner Assembly Complete
BRA123	Dial and Bracket Assembly Complete
DNX100	Glass Dial Plate
FHX101	A.C. Line Cord Lock
FSA100	Mounting Parts Assembly
PHA103	Complete Dial and Cord
PHA105	Speaker Assembly Complete - 6A47WT Model
PHA106	Speaker Assembly Complete - 6A47WTR Model
PHX102	Speaker - 6A47WT Model

Part No.	Description
PHX103	Speaker - 6A47WTR Model
PHX104	Speaker - 6AWC2 and 6AWC3 Models
RCX101	Aero-Record Changer - Model E
RIX105	Grommet for Mounting
RIX107	Washer for Mounting
RIX117	Mounting Screw
SMX146	Speaker Cover - 6A47WTR Model
SMX163	Loop Shield - 6AWC2 and 6AWC3 Models
SOX100	Socket - Octal
SOX103	Phono-Motor Socket - 3 Prong
SPX115	Dial Cord Spring
WCA103	Dial and Cord Assembly
WCX101	A.C. Line Cord with Plug
WCX102	Dial Cord

RESISTORS

Code No.	Specifications	Tolerances	
R10	10 meg.	1/2 w.	20%
R2, R23	2.2 meg.	1/2 w.	10%
R12			
R16	470,000 ohms	1/2 w.	10%
R13	82,000 ohms	1/2 w.	10%
R18	68,000 ohms	2 w.	20%
R9, R4	47,000 ohms	1/2 w.	10%
R6	39,000 ohms	1/2 w.	10%
R14	33,000 ohms	1/2 w.	10%
R1	27,000 ohms	1/2 w.	10%
R5	18,000 ohms	2 w.	10%
R24	15,000 ohms	1/2 w.	20%
R17	10,000 ohms	1/2 w.	10%
R20	4,700 ohms	2 w.	20%
R7, R3	3,900 ohms	1/2 w.	10%
R15	330 ohms	1 w.	10%
R21, R22	240 ohms	2 w.	10%
R19	2.2 ohms	1/2 w.	10%

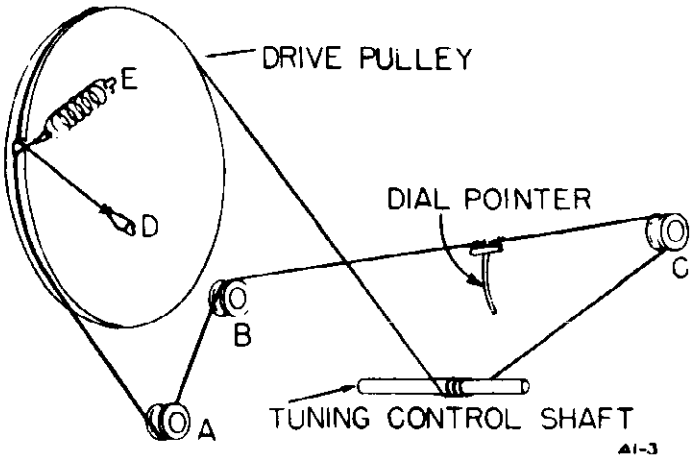


MODELS 6A47WT, 6A47WTR, NATIONAL COOPERATIVES, INC.
6A47WTC, 6AWC2, 6AWC3,
6AFMT, 6AMM

SERVICE DATA

STRINGING THE DIAL DRUM

1. Turn the gang condenser to FULL CLOSED position.
2. Attach the looped end of the line cord assembly (Part #WCA103) to lug "D" as shown in the diagram.
3. String the cord through the opening on the rim of the pulley, upward and around the top of the pulley, down behind the dial and under the tuning shaft.
4. Take four turns around the shaft in a clockwise direction as viewed from the front of the chassis, progressing outward from the chassis. (Check to be sure that none of the turns lie on top of one another to avoid sloppy tuning.)
5. Continue stringing the cord from the tuning shaft up to and around the small pulley "C" at the upper left hand corner of the dial bracket (as viewed from the front of the chassis). In going from the shaft to pulley "C", be sure to lead the cord between the bracket mounting leg and the tone control shaft.
6. Now, string the cord along the upper edge of the dial bracket to pulley "B" at the upper right hand corner of the bracket. (As the cord passes along the top of the dial, be sure to thread it through the opened prongs on the dial pointer.)



A1-3

7. String the cord over pulley "B", downward around pulley "A" (at the lower right hand corner of the chassis as viewed from the front), up through the opening on the rim of the dial pulley, and hook to the tension spring which has been hooked over lug "E" on the pulley.

The stringing is now completed. To fasten the pointer to the cord:

1. With the gang condenser still in CLOSED POSITION, slide the pointer to the last dot at the left hand end of the BC band (as viewed from the front of the chassis).
2. Pull the cord out from the prongs in the pointer and wrap a small piece of 1/4" tape around it at the point where the pointer prongs come.
3. Re-insert, and bend the two end prongs backward over the tape and middle prong forward. This fastens the pointer securely to the cord in the correct position, completing the stringing of the dial.

STRINGING THE TUNER

In order to string the tuner, remove tuner assembly from the chassis and remove the dial drum from the condenser shaft with a soldering iron. In doing this, it is important to note the position of the dial drum relative to the condenser plates, in order to reassemble properly.

Part #WCA102--cord and core assembly is used for stringing the tuner. Proceed as follows:

1. Remove the S.W. coil from the fuse clip brackets.
2. Insert the S.W. core as shown in the diagram, attaching the tuner spring to loop "E", and allowing the spring to lie loose until it is to be stretched around the pulleys and connected to the right hand hook of the P.C. core.
3. Replace the S.W. coil in the fuse clips in the approximate position shown in the diagram.

4. Rotate the gang condenser to FULL OPEN position (counterclockwise looking from above as in the diagram).

5. Pull the core by means of the cord fastened to the left hand hook, until the left end of the core is exactly 1/4" from the first tooth on the larger radius of the cam (tooth "A" with cam rotated 180° from position shown on the diagram).

6. Proceed with the stringing as shown in the diagram, making sure that the cord is not unduly stretched or left loose between any of the teeth on the cam.

When the stringing has been completed around the cam:

7. Lay the B.C. core, which has been attached to the other end of the cord, on the bracket and remove the BC coil from the clips that hold it.

8. Insert the B.C. core in the coil form and push it through (with a small wire) until the bare hook comes into view at the other end.

9. Replace the B.C. coil in the approximate position shown on the diagram.

10. Recheck the gang--it should be in FULL OPEN position.

11. Grasp the tuner shaft firmly to prevent it from rotating. String the cord loop with the spring attached, from the right end of the S.W. core, around pulley "B" only. Hook the spring to the right hand hook on the B.C. core. (The spring should be barely accessible at the right end of the B.C. coil.)

12. Release the gang condenser (being sure it is still in FULL OPEN position), and stretch the spring around the second pulley "C". Be careful not to damage the spring during this operation.

13. Adjust the B.C. coil to its correct position by sliding the coil to a point 1¼" from the right-hand end of the B.C. core to the beginning of the coil winding. The tuner is now strung and ready for adjustment of the S.W. coil position:

Turn the gang condenser to its FULL CLOSED position. Insert a piece of wire which has been marked 5/8" from one end into the coil form until it hits the S.W. core. The distance from the left end of the coil form to the left end of the core should be 5/8". If this measure is not within 1/32", there has been some error made during the stringing procedure or the parts are defective. Carefully review the steps taken. If no apparent error is in evidence and the measure does not fall within this tolerance, get in touch with your local CO-OP dealer who will furnish you a complete tuner subassembly already strung.

If the final measure was within the tolerance, the tuner is properly strung and ready to be replaced on the chassis base. Solder the dial drum back on, making sure that you replace it in the same position with respect to the gang plates as it originally was.

WARNING: When removing the B.C. and S.W. coils from the fuse clips, be careful not to break the fine wires or loosen any soldered connections.

NOTE: The S.W. core is distinguished from the B.C. core in that the S.W. core has a somewhat lighter color and a more satiny surface.

ALIGNMENT PROCEDURE

I.F. ALIGNMENT

Whenever one or both I.F. transformers (T3 and T4) are changed, or the wiring associated with these transformers or with the 6SA7 or 6SF7 tubes is disturbed, it is imperative to realign the I.F. transformers. Proceed as follows:

1. Connect an output meter, a.c. voltmeter, or other suitable instrument across either primary or secondary of the output transformer, T5.

2. Turn the volume control to its maximum (clockwise); and turn the bandswitch to BC (counterclockwise).

3. Connect a signal generator from the input grid (pin 8) of the 6SA7 tube to ground, and feed in a modulated signal at 455 kc., using as small an input signal as possible yet maintaining a convenient deflection on the output meter.

4. Adjust each of the 4 screws on top the I.F. transformers for maximum output, at the same time decreasing the input from the signal generator to be sure to get a true maximum reading.

When this is completed, the I.F. transformers are in alignment.

MODELS 6A47WT, 6A47WTR, 6A47WTC, 6AWC2, 6AWC3, 6AFMT, 6AMM

NATIONAL COOPERATIVES, INC.

R. F. ALIGNMENT

When service operations of any sort have been performed on the antenna coil, interstage coils (T1, T2), loop antenna, gang condenser-oscillator assembly, 6SG7 tube, or circuits associated with any of these, it is important to realign the R.F. circuits for best performances.

Shortened Alignment Procedure--If the service operations have not involved the gang condenser-oscillator assembly or its associated capacitors (C18, C19, C13, C14), a shortened procedure may be used, as follows:

1. Connect the output meter and check the I.F. alignment.
2. Using broadcast stations as a guide, check the calibration of the broadcast and short-wave bands. (If no stations are available, use a signal generator--it is less likely to be accurate however, WWV time signals on 10 mc. and 15 mc. can sometimes be used to check the short-wave band calibrations). If the calibration is not reasonably close, the complete alignment procedure will be necessary. If satisfactory, proceed to connect the signal generator or multivibrator from GND terminal to the LONG ANT terminal on the loop frame.
3. Turn the band switch to BC, and set the dial to about 600 kc.
4. If a multivibrator is used, adjust the loop trimmer C6 for maximum output. If a signal generator is used, tune in the signal at about 600 kc. and adjust C6 for maximum output.
5. Turn to 1500 kc. and tune in a signal.
6. Adjust trimmers C7 and C4 for maximum outnut.
7. Go back to 600 kc. and disconnect the signal generator or multivibrator from the LONG ANT terminal, but leave the wire from the signal source in the vicinity of the antenna terminals. Turn up the signal source outnut so that the signal can be heard and readjust C6 for maximum outnut.
8. Reconnect the lead from the signal source to the SHORT ANT terminal through a 600 ohm resistor.
9. Turn the band switch to SW and the dial to 15 mc. Tune in a signal from the signal source at this noint. (Be sure you have the correct signal and not an image.)
10. Adjust trimmers C2 and C3 for maximum output, "rocking" the tuning control as you do so.

The receiver is now in alignment for reception with the loop antenna. If an external antenna is used, the loop trimmer C6 must be realigned with the actual antenna connected as described in the installation instructions.

Complete R.F. Alignment Procedure: It is strongly recommended that the receiver be returned to the factory for any repairs involving replacement or any adjustment of the gang condenser-oscillator assembly (tuner assembly) other than adjustment of trimmers C4 and C7. If, however, it has been necessary to replace the gang condenser-oscillator assembly or capacitors C18, C19, C13, or C14 in the field, the alignment procedure is as follows:

1. Set the dial pointer so that it lines up exactly with the left hand and mark when the gang is fully closed.
2. Connect the output meter. Turn the volume control to its maximum and the bandswitch to BC. Feed in the signal generator on the grid of the 6SA7 (pin 8 to ground).
3. Check the I.F. alignment. Set the signal generator to 1000 kc. and check the generator calibration against a broadcast signal in place of the generator. Adjust C19 so that the receiver is on calibration at this point.
4. Throw the bandswitch to SW. Set the signal generator to 12 mc. and adjust C18 so that the correct signal (the one which comes in at the higher frequency on the receiver dial) is right on the 12 mc. mark.
5. From here on, follow the shortened procedure until the alignment of the receiver is complete.

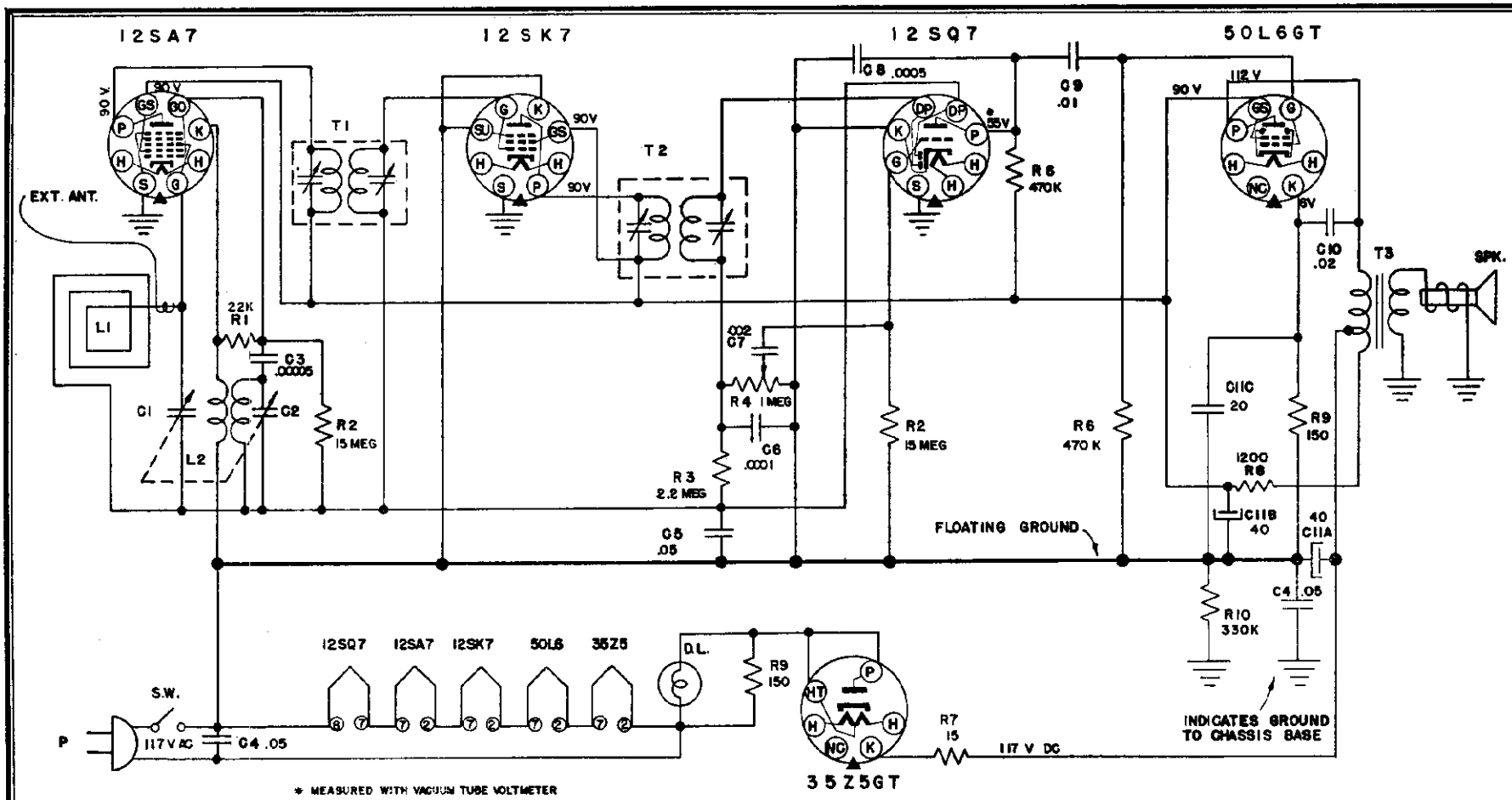
SUPPLEMENT FM OPERATION

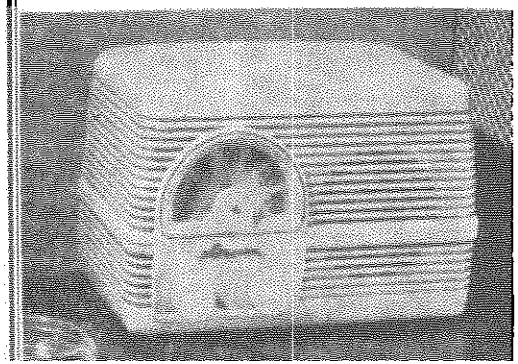
FM Band -- 88 to 108 megacycles: Turn the radio on by turning the volume control knob to the right. Turn the Frequency Modulation tuner on by turning the "FM On-Off" switch to the right. Wait a few seconds for the tubes to heat. Turn the tone control knob clockwise until a click is heard. The receiver will now be set for FM reception.

FM Tuning Knob: Turn the FM tuning knob until the station is heard. Rotate the knob slowly back and forth across the station desired. The station may be heard in three positions -- the correct position is the center one in which the signal is the clearest and strongest. If the signal is too strong, reduce it by means of the VOLUME CONTROL.

Antenna: For reception of distant stations, and improved results in locations unfavorable to FM reception, install an outside FM dipole antenna, equipped with a 300 ohm flat lead-in. Disconnect the built-in antenna by removing the wires from terminals #1 and #3 on the tuner chassis. Connect the lead-in wires of the outside antenna to the same terminals.

FM Tuner: If your radio does not have an FM band, an FM tuner may be installed.





SPECIFICATIONS

FREQUENCY RANGE

Broadcast	540-1600 kc
IF	455 kc

TUBES AND FUNCTIONS

12SA7	Mixer-oscillator
12SK7	IF Amp.
12SQ7	DET-AVC AF Amp.
50L6	Output
35Z5GT	Rectifier

POWER SUPPLY

105-125 Volts, AC-DC, 35 Watts

POWER OUTPUT

Undistorted	.8 Watts
Maximum	2.5 Watts
Plate load	2000 Ohms

LOUD SPEAKER

Type: Permanent magnet

Size; 4 Inch

NOBLITT-SPARKS INDUSTRIES, INC.

MODELS 1527, 153

CHASSIS RE-233

ARVIN PAGE

MODELS 152T,153T
CHASSIS RE-233

NOBLITT-SPARKS INDUSTRIES, INC.

ALIGNMENT PROCEDURE

PRELIMINARY:

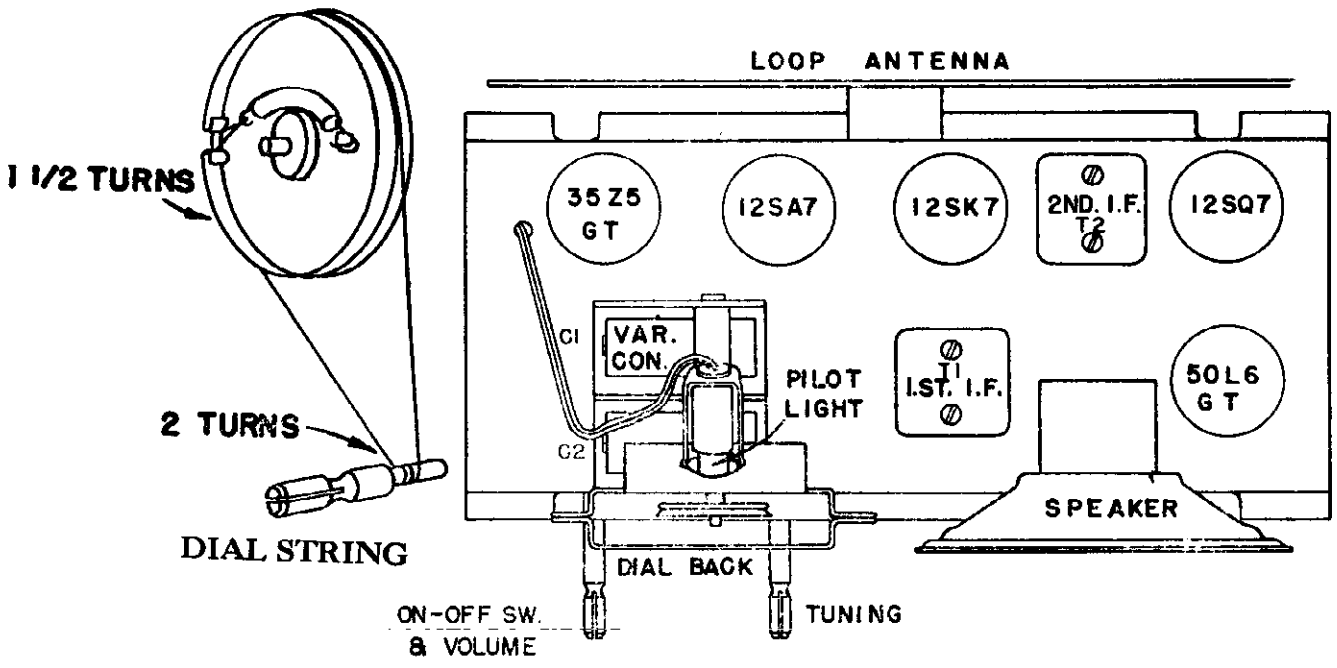
Output meter connection	Across loudspeaker voice coil
Output meter reading to indicate 200 milliwatts (standard output)	.8 volts
Dummy antenna value to be used in series with generator output	See chart below
Connection of generator output lead	See chart below
Connection of generator ground lead	Floating ground
Generator modulation	30% 400 cycles
Position of volume control	Fully clockwise
Position of dial pointer with variable fully closed	Last mark at left end of dial

Position of Variable	Frequency of Generator	Dummy Antenna	Generator Output Connection	Trimmers Adjusted in Order Shown for Maximum Output	Function of Trimmer
Open	455	.05 mfd.	12SA7 Grid (Stator of C1)	Top of 2nd & 1st IF trans. T2 & T1	IF
1400	1400		*Test Loop	C2; C1, Trimmers on Variable Condenser	Osc. Ant.
600	600		*Test Loop	Check Point	

*Standard Hazeltine Test Loop Model 1150 or 3 turns of wire about 6" in diameter, placed about one foot from the set loop.

The alignment procedure should be repeated in the original order for greatest accuracy. Always keep the output from the signal generator at its lowest possible value to make the AVC action of the receiver ineffective.

TUBE LAYOUT



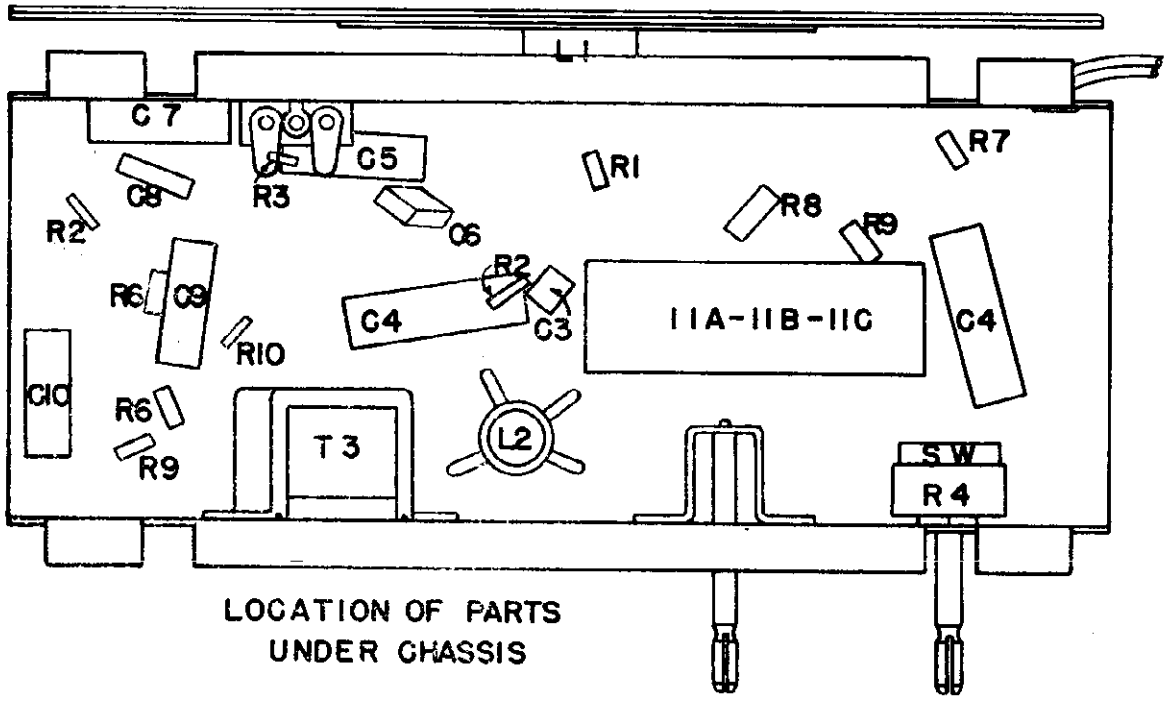
This receiver is designed to operate without a ground connection and no attempt should be made to use one.

Models 152-T and 153-T are identical except for cabinets. Model 152-T is in a walnut cabinet. Model 153-T is in an ivory cabinet.

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
R1	C20060-223	Resistor, 22,000 ohm, ¼ watt
R2	C20060-156	Resistor, 15 megohm, ¼ watt
R3	C20060-225	Resistor, 2.2 megohm, ¼ watt
R4	C21511	Volume Control and Switch, 1 megohm
R6	C20060-474	Resistor, 470 K ohm, ¼ watt
R7	C20060-150	Resistor, 15 ohm, ¼ watt
R8	C20070-122	Resistor, 1200 ohm, 1 watt
R9	C20060-151	Resistor, 150 ohm, ¼ watt
R10	C20060-334	Resistor, 330 K ohm, ¼ watt
C1-C2	C21481	Variable Condenser & Pulley Assembly
C3	A21643	Capacitor, .00005, 350V
C4	C20068-503	Condenser, .05, 400V
C5	C20067-503	Condenser, .05, 200V
C6	C20065-101	Condenser, .0001, 500V (Mica)
C7	C20068-202	Condenser, .002, 600V
C8	C20065-501	Condenser, .0005, 500V (Mica)
C9	C20068-103	Condenser, .01, 400V
C10	C20068-203	Condenser, .02, 400V
C11	A21499	Electrolytic Condenser, 40-20 mfd., 150V, 20 mfd., 25V
L1	A21521-1	Antenna Loop Assembly
L2	AC21492-1	Oscillator Coil Assembly
T1	AC21495-1	1st I. F. Coil Assembly
T2	AC21496-1	2nd I. F. Coil Assembly
T3	AC21497-1	Output Transformer Assembly
Spk	C21517	Speaker Assembly
P	B20138-5	Line Cord and Plug Assembly
DL	A19351	Dial Light Bulb
	AA21877	Cabinet Assembly (Walnut)
	AA21878	Cabinet Assembly (Ivory)
	A21485	Dial Crystal
	A21501-1	Knob (Walnut)
	A21501-2	Knob (Ivory)
	AC21696-1	Cabinet Rear Cover Assembly (152-T)
	AC21696-2	Cabinet Rear Cover Assembly (153-T)

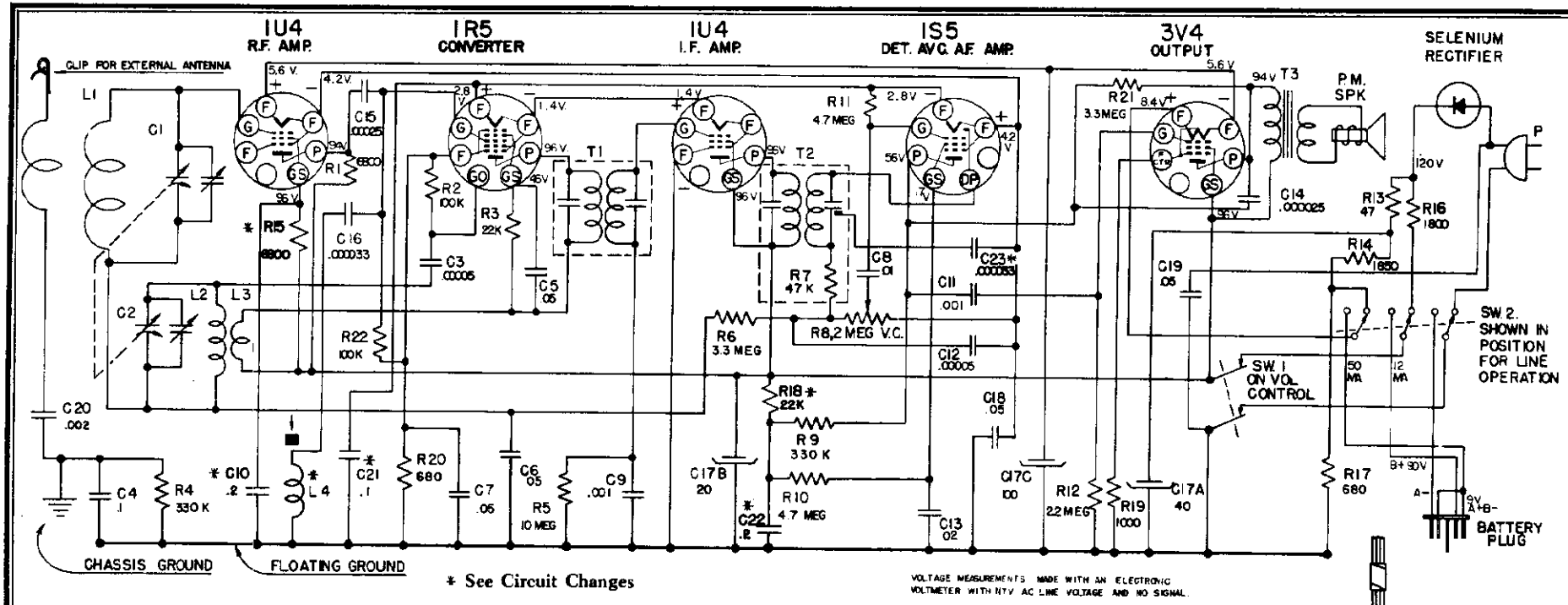
REF. NO.	PART NO.	DESCRIPTION
	A20072-8Z	Rivet, for Mounting Dial Crystal (25)
	A20222-1C	Speed Nut—for Mounting Dial Crystal (15)
	A20216-1C	Speed Nut—for Mounting Name Plate (25)
	A19124	Snap-on Button—for Rear Cover (10)
	A21504	Carton with Fillers
	A21482	Tuning Shaft
	C19926	Dial Scale
	A20077-3	Grommet—Under Variable Condenser
	A19361	Hair Pin Clip
	A19132	Dial Drive Cord
	A19133	Spring—Dial Drive Cord
	A19138-3	Spacer Eyelet
	A19138-1	Spacer Eyelet—for Mounting Variable Condenser
	A19141	Terminal Strip
	A19205-3	Cap Mounting Clip
	A21346-1	Socket—Dial Light
	A19233-1	Socket—Tube
	A18254-1	Socket—Tube
	AA21542-1	Dial Pointer Assembly
	A21330	Name Plate



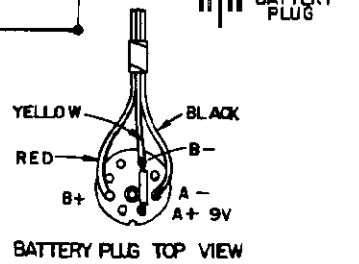
LOCATION OF PARTS UNDER CHASSIS

CIRCUIT CHANGES

Some sets were made with a 330 Ohm instead of a 150 Ohm resistor in shunt with the dial light, and th 15 ohm resistor R7 in the plate circuit of the 35Z5 tube instead of the Cathode Circuit.



On battery operation, the B+ voltage measured to floating ground should be the sum of the A & B battery voltages or approximately 99 Volts with new batteries.



BATTERY PLUG TOP VIEW

SERVICE HINTS AND CIRCUITS CHANGES:

*Any of the following battery packs can be used: General 60A-6F6-5; Eveready 753; Ray-O-Vac AB994; Burgess F6A60.

The following changes were made after a pilot run of 100 sets. The schematic and parts location drawing in this bulletin are for the sets produced after the changes were made:

1. R15 – Resistor, 680 Ohms, 1/4 Watt, added in series with B+ lead to converter and RF Amp. tubes (across lugs 3 & 4 on RF Amp. socket).
2. C10 – Condenser, .1 uf., 400 Volts added from B+ to floating ground.
3. C21 – Condenser, 10 uf., 150 Volts added from RF Amp. B+ to floating ground.
4. L4 – Connection changed from AVC to floating ground.
5. R22 – Resistor connection changed from AVC to filament lug of 1R5 tube socket.

The folliwing changes were made to reduce hum and hum modulation after a quantity of sets had been produced:

1. C10 – .2 uf., 200 V. connected from the screen grid of RF amplifier tube to floating ground, was .1 uf., 400 V. and was connected from B+ to floating ground.
2. C21 – .1 uf., 400 V. connected from positive side of filament of converter tube to floating ground was 10., 150 V. connected from B Supply of RF and converter tubes to floating ground.
3. R 15 – 6800 ohm resistor connected from screen grid of RF amplifier tube to B Supply was 680 ohms connected in B supply to RF amp. and converter tubes.
4. R18 – 22,000 ohm resistor and C22, .2 uf., 200 V. condenser; were added in the audio amplifier circuit.

At the same time, C23, .000033 uf., 500 V. condenser was added in the diode filter circuit to improve the high frequency response.

SPECIFICATIONS

POWER SUPPLY
115 Volts, AC-DC, 16 Watts (or)
*90V, B, 9V, A, Battery Pack
Approx. Current Drain 12 MA "B" 50 MA "A"

POWER OUTPUT
Undistorted ..... .25 Watts
Maximum ..... .32 Watts
Plate load ..... 10,000 Ohms

FREQUENCY RANGE
Broadcast ..... 540-1600 kc
IF ..... 455 kc

LOUD SPEAKER
Type: Permanent magnet
Size: 5 Inch
Voice coil impedance ..... 3.2 Ohms

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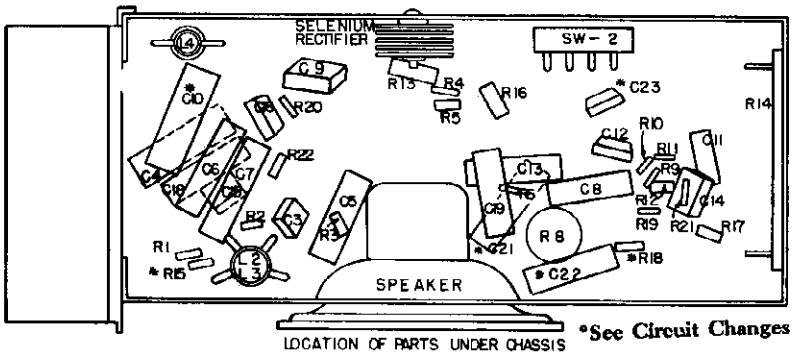
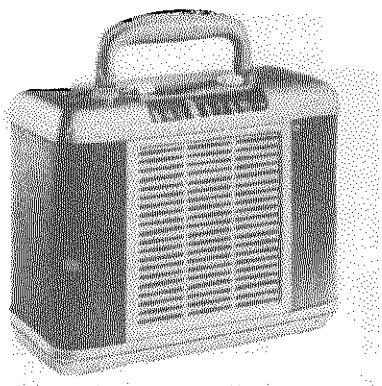
MODEL 250P
CHASSIS RE-2



*See Circuit Changes



ALIGNMENT.

A. Connect to 117 V., AC line and turn set on with volume control at full volume.

B. With variable condenser closed, set pointer to end mark on dial.

C. Connect signal generator high side through .05 uf or larger condenser to high side of loop or variabl condenser. Connect low side of signal generator to floating ground. Connect output meter across speake voice coil.

D. Open variable condenser.

E. With signal generator set at 455 Kc, increase output of generator until output is heard in speaker. Adj st all (4) IF trimmers until maximum output meter reading is obtained, reducing signal generator output a adjustment progresses so that final adjustment is made with lowest input consistent with good signal t noise ratio.

NOTE: If no signal can be heard with signal generator connected as at C above, connect high generato lead to terminal 6 of IR5 tube, through condenser asat C, and proceed as before.

E. With signal generator at 455 Kc and connected as in C above, adjust I. F. trap until output mete reading is a minimum. Final adjustment is to be made with high signal input so that an accurate adjust ment can be made.

F. With signal generator connected to radiating loop and set to 1620 Kc adjust oscillator trimmers (C2) o variable condenser until output is maximum. Variable Condenser is to be fully opened during this adjust- ment.

G. Set signal generator to 1400 Kc and rotate variable condenser until output is maximum. Adjust R. F. trimmer (C1) on variable condenser until output increases to a new maximum. Rotate variable condenser slightly to obtain another maximum output. Re-adjust trimmer until output is again a maximum. Repeat this cycle until no further increase in output can be obtained. Final adjustment to be made with a signal generator output at lowest level consistent with good signal to noise ratio.

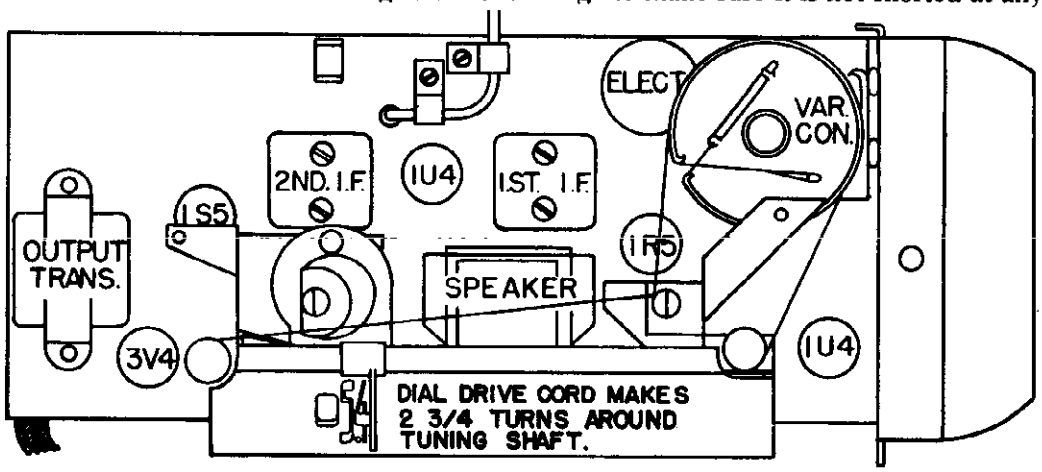
H. Set signal generator to 1000 Kc and tune radio to maximum output. Adjust variable condenser plate for maximum output.

I. Set signal generator to 600 Kc and proceed as in H above.

J. Set signal generator to 540 Kc and make sure that radio will tune to maximum output slightly befor variable condenser is fully closed.

K. Recheck alignment and calibration at 1400, 1000, and 600 Kc, making any necessary readjustments.

L. Tune the variable Condenser through its entire range to make sure it is not shorted at any point.



TUBE LAYOUT

MODEL 250P, CHASSIS RE-248

MODEL 240P, CHASSIS RE-243

NOBLITT-SPARKS INDUSTRIES, INC.

MODEL 250P

PARTS LIST

Schematic Location	Part Number	Description
R1	C20060-682	Resistor, 6800 Ohms, 1/4 W
R2, R22	C20060-104	Resistor, 100,000 Ohms, 1/4 W
R3	C20060-223	Resistor, 22,000 Ohms, 1/4 W
R4, R9	C20060-334	Resistor, 330,000 Ohms, 1/4 W
R5	C20060-106	Resistor, 10 Megohm, 1/4 W
R6, R21	C20060-335	Resistor, 3.3 Megohm, 1/4 W
R8	C21879	Volume Control & Switch, 2 Megohm, 2 Pole Switch
R10, R11	C20060-475	Resistor, 4.7 Megohm, 1/4 W
R12	C20060-225	Resistor, 2.2 Megohm, 1/4 W
R13	C20070-470	Resistor, 47 Ohms, 1 W
R14	A21816	Resistor, 1850 Ohms, 10 W., + or − 10 %
R15	C20060-682	Resistor, 6800 Ohms, 1/4 W
R16	C20070-182	Resistor, 1800 Ohms, 1 W., + or − 10 %
R17, R20	C20060-681	Resistor, 680 Ohms, 1/4 W
R18	C20060-223	Resistor, 22,000 Ohms, 1/4 W
R19	C20060-102	Resistor, 1000 Ohms, 1/4 W
C1, C2	C19822	Variable Condenser, 2 Gang
C3, C12	C20065-500	Condenser, .00005 uf., 500 V., Mica
C4, C21	C20068-104	Condenser, .1 uf., 400 V., P. T.
C5, C6, C7 C18, C19	C20068-503	Condenser, .05 uf., 400 V., P. T.
C8	C20068-103	Condenser, .01 uf., 400 V., P. T.
C9	C20128-102	Condenser, .001 uf., 500 V., Mica
C10, C22	C20067-204	Condenser, .2 uf., V., P. T.
C11	C20069-102	Condenser, .001 uf., 600 V.
C13	C20068-203	Condenser, .02 ufd., 400 V., P.T.
C14	C20065-250	Condenser, .000025 uf., 500 V., Mica
C15	C20065-251	Condenser, .00025 uf., 500 V., Mica
C16, C23	C20065-330	Condenser, .000033 uf., 500 V., Mica
C17A, C17B C17C	A21815	Condenser, Electrolytic, 40-20 uf., 150 V., 100 uf., 10 V.
C21 Early Production	A21811	Condenser, Electrolytic, 10 uf., 150 V.
L1	AD21912-1	Antenna Loop Assy.
L2, L3	AC20155-1	Oscillator Coil Assy.
L4	AC21813-1	IF trap Assembly

Schematic Location	Part No.	Description
T1	AC21810-1	1st IF Coil Assy.
T2	AC21812-1	2nd IF Coil Assy.
T3	AC21893-1	Output Transformer Assy.
C	AC21814-1	Battery Cable Assy.
P	B20169-1	Line Cord Assy.
Spk.	C21113	Speaker Assy.
Sw-2	A21051	Slide Switch
	°°A21965	Cabinet Wrap Around Assy.
	°E21823	Cabinet Top Cover
	°C19932	Handle Mtg. Clip
	AD21881	Cabinet Bootom Cover Assy.
	C20098-43	Eyelet, #SE-95
	E21824	Cabinet Wrap Around
	°AA21966	Handle Assy., Including Loops
	A21330	Nameplate with Speed Nuts
	A21190-1	Control Knob
	°C21210	Dial Crystal
	A21828	Carton, Complete with Fillers
	D21196	On-Off Indicator
	C21808	Dial Scale
	D21809	Dial Pointer
	A21205	Tuning Shaft
	A19361	Hair Pin Clip for Tuning Shaft
	A21916	Hair Pin Clip for Indicator Spindle
	A19132	Dial Drive Cord
	A19295	Spring, Dial Cord
	A20132-1	Socket, Tube
	A20132-2	Socket, Tube
	A20207-1	Selenium Rectifier, 75 ma.
	A21852	Mounting Wafer for Electrolytic Condenser
	A19344-1	Idler Pulley
	A16695	Idler Pulley Stud
	A21358	Cam for On-Off Indicator
	AA21967	Antenna Terminal, Strip Assy.
	A21347	Spring for On-Off Indicator
	A19139	Terminal Strip
	A20227	Speed Clip, Tinnerman C-3382-022-1, on Vol. Control
	A19138-1	Spacer Eyelet for Mounting Variable Condenser
	A20077-3	Grommet, for Mounting Variable Condenser

°Two eyelets, Parts # 20098-43 are required to replace these parts. These eyelets should be ordered separately, as they are not included with the parts.

MODEL 240P

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
R1	C20060-124	Resistor, 100,000 ohm, ¼ watt
R2	C20060-225	Resistor, 2.2 megohm, ¼ watt
R3	C21782	Volume Control & Switch, 1 megohm
R4	C20060-106	Resistor, 10 megohm, ¼ watt
R5	C20060-475	Resistor, 4.7 megohm, ¼ watt
R6	C20060-105	Resistor, 1 megohm, ¼ watt
R7	C20245-751	Resistor, 750,000 ohm, ¼ watt, − 5%
C1, C2	C19822	Condenser, variable
C3	C20067-503	Condenser, .05 uf., P. T., 200 volts
C4	C20065-101	Condenser, .0001 uf., Mica, 500 volts
C5	C20069-202	Condenser, .002 uf., P. T., 600 volts
C6	C20068-103	Condenser, .01 uf., P. T., 400 volts
C7	C20065-500	Condenser, .00005 uf., 500 volts, Mica
C8	C20069-502	Condenser, .005 uf., P. T., 600 volts
C9	A21811	Condenser, Electrolytic, 10 mf., 90 volts
C10	C20069-102	Condenser, .001 uf., P. T., 600 volts
L1	AD21795-1	Cabinet Back Assembly, with Loop
L2	AC21796-1	Oscillator Coil Assembly
T1	C21797-1	1st I. F. Coil Assembly
T2	C21797-2	2nd I. F. Coil Assembly
T3	AC21798-1	Output Transformer Assembly
Spk	C21768	Speaker, 4" P. M.
AP	A21861	"A" Battery Cable Terminal Strip
BP	A21842	"B" Battery Cable & Terminal Strip

REF. NO.	PART NO.	DESCRIPTION
	E21761-1	Cabinet, Front Sec. with Grille Cloths & Latch
	C21766	Handle
	A21764-1	Knob
	A21798	Handle Reinforcement
	A21802	Spring, Hinge
	C21767	Spring Latch
	A21803	Mounting Stud for Handle
	A20241-1A	Speed Nut for Mounting Handle (Set of two)
	A21838	Carton (Complete with Fillers)
	A21785	Tuning Shaft
	A20077-3	Grommet, Variable Condenseer Mounting
	A19138-1	Eyelet, Spacer, Variable Condenser Mtg.
	A19361	Hair Pin Clip for Tuning Shaft
	A19132	Dial Drive Cord
	A21783-1	Pointer, Plastic
	A21792	Spring Clip, IF Coil Mounting
	A19133	Spring, Dial Cord
	A20243-3	Socket, Miniature, Shielded
	A20243-1	Socket, Miniature, Unshielded
	A21351-1	Socket, Loctal
	AC21791-1	Battery Clip Assembly

NOTE: When ordering cabinets, parts for cabinets, dial backing plates, and pointers be sure to specify the color.

NOBLITT-SPARKS INDUSTRIES, INC.

MODEL 240P
CHASSIS RE-24

ALIGNMENT PROCEDURE

PRELIMINARY:

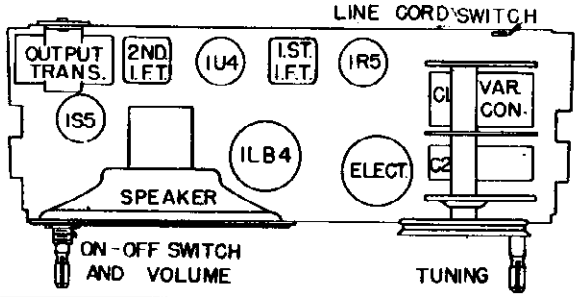
Output meter connection ---------- Across loudspeaker voice coil
Output meter reading to indicate 50 MW (Standard Output) ---------- .4 volt
Dummy antenna value to be used in series with generator output ---------- See chart below
Connection of generator output lead ---------- See chart below
Connection of generator ground lead ---------- Floating ground
Generator modulation ---------- 30% 400 cycles
Position of volume control ---------- Fully clockwise

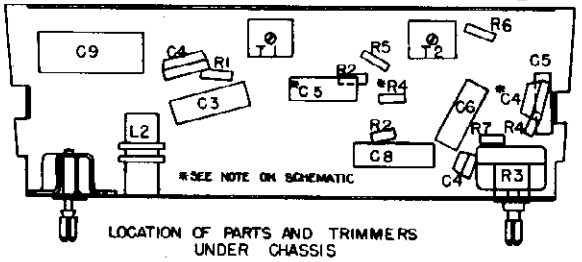
With variable condeser closed, place top edge of pointer across center of top hole on dial backing plate.
When adjusting C1, place the set loop the same distance from and in the same position with respect to the chassis and batteries as it would be when mounted in the cabinet.

Position of Variable	Frequency of Generator	Dummy Antenna	Generator Output Connection	Trimmers Adjusted in Order Shown for Maximum Output	Function of Trimmer
Open	455	.05 mfd.	1R5 Grid (Stator of C1)	Top & Bottom of IF Trans. T2 & T1.	IF
1400	1400		*Test Loop	C2; C1, Trimmers on Variable Condenser	Oscillator Antenna
600	600		*Test Loop	**Check Point	

* Standard Hazeltine Test Loop Model 1150 or 3 turns of wire about 6" diameter, placed about one foot from the set loop.
**If weak, adjust variable condenser plates for maximum output.

The alignment procedure should be repeated in the original order for greatest accuracy. Always keep the output from the signal generator at its lowest possible value to make the AVC action of the receiver ineffective.





LOCATION OF PARTS AND TRIMMERS UNDER CHASSIS

FREQUENCY RANGE

Broadcast ---------- 540-1600 kc
IF ---------- 455 kc

TUBES AND FUNCTIONS

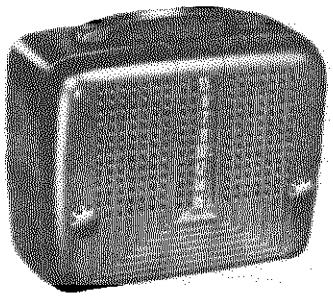
1R5 ---------- Mixer-oscillator
1U4 ---------- IF Amp.
1S5 ---------- DET-AVC AF Amp.
1LB4 ---------- Output

POWER SUPPLY

1. 67½ V. B Battery, Eveready Minimax, No. 467 or Equal.
3. 1½ V. D Size Flashlight Cells

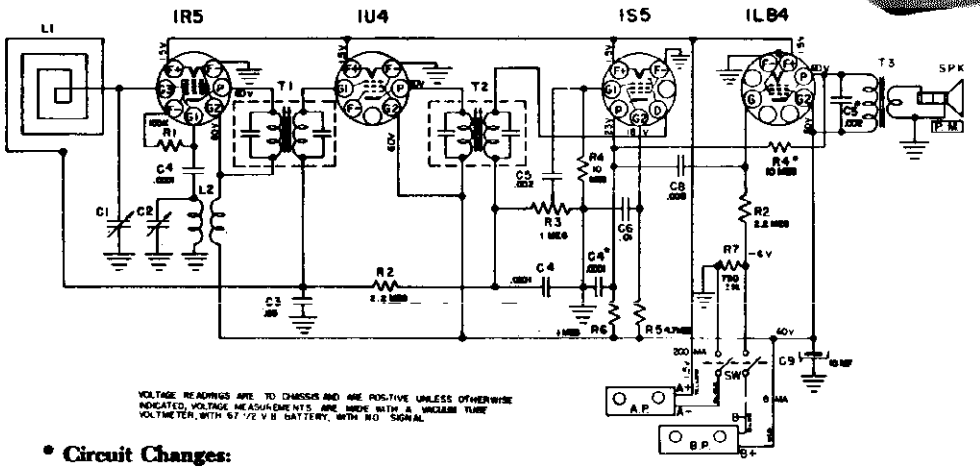
POWER OUTPUT

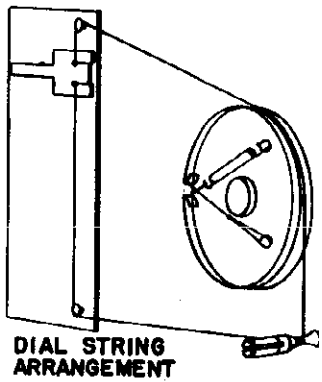
Undistorted ---------- .05 Watts
Maximum ---------- .1 Watts
Plate Load ---------- 14,000 ohms



LOUD SPEAKER

Type: Permanent magnet ---------- .68 Oz.
Size: 4 Inch
Voice coil impedance ---------- 3.2 Ohms



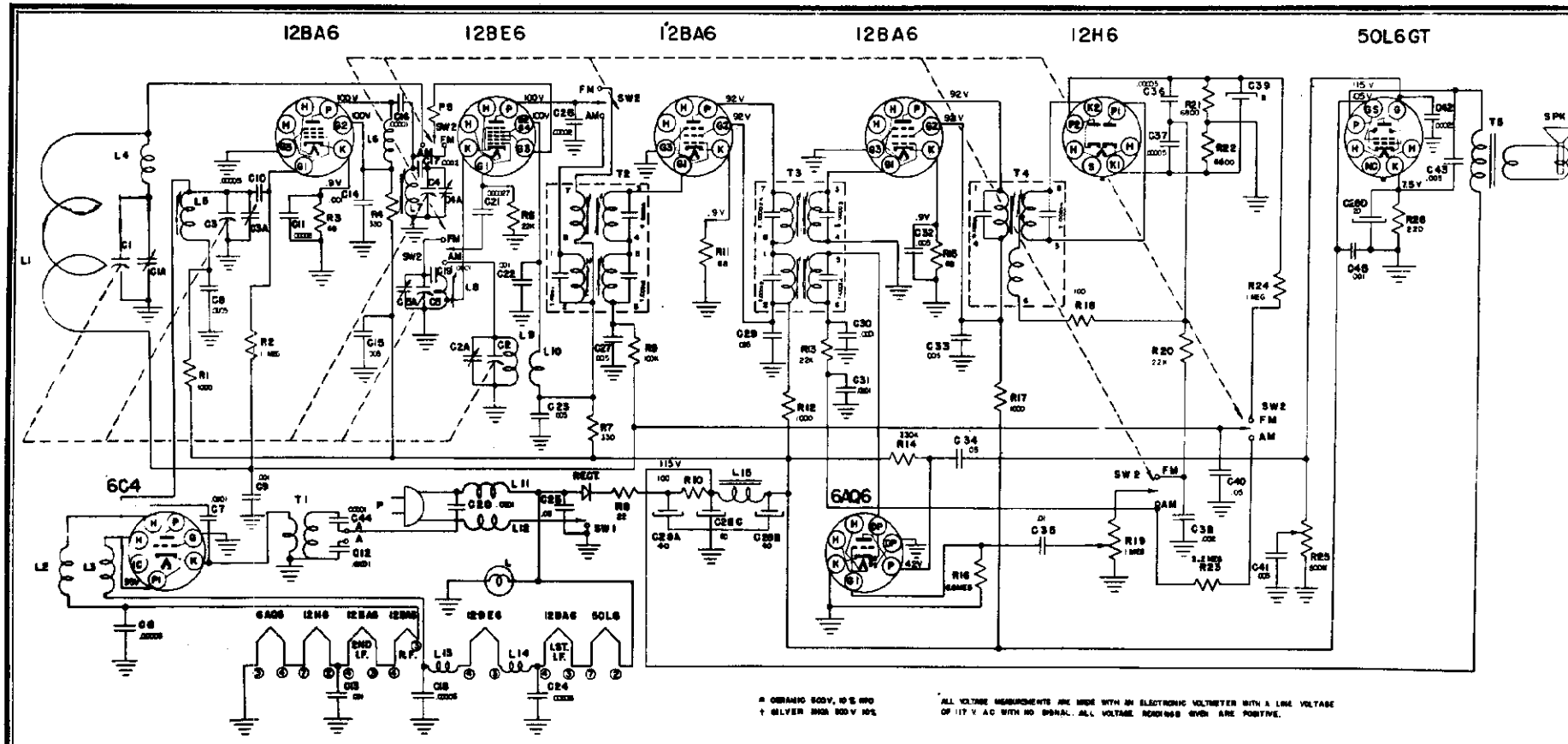


DIAL STRING ARRANGEMENT

* **Circuit Changes:**

The following circuit changes were made to improve the tone quality, after the first 7,000 sets were produced

1. **C4 Condenser, .0001 uf., from the plate of the 1S5 tube to ground was C7, .00005 uf.**
2. **C5 Condenser, .002 uf from plate to screen grid of the 1LB4 tube was C10, .001 uf.**
3. **R4 Resistor, 10 megohm, was added from the plate of the 1LB4 tube to the plate of the 1S5 tube.**



DIFFERENCE IN MODELS

280TFM has a Mahogany cabinet, 281TFM has a bleached Mahogany cabinet.

THE ANTENNA

This set has a loop antenna for AM Broadcast reception. For local FM reception, a built-in (line cord) antenna is provided. An external antenna connection is provided for areas where reception is difficult. To connect the external antenna, remove the green wire from the antenna terminal on the back of the set, and connect a dipole antenna to the antenna terminals. When the line cord antenna is used, the green wire must be connected to the outside terminal on the antenna terminal board.

GROUND

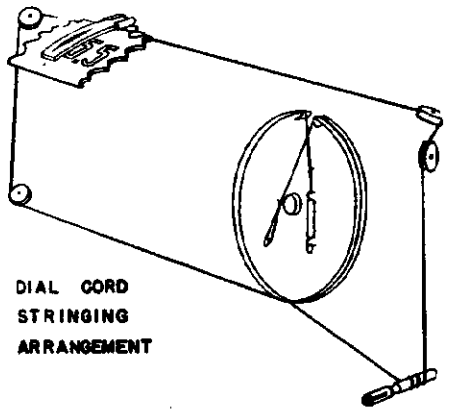
This set is designed to operate without a ground connection and no attempt should be made to use one.

CAUTION

The chassis of this receiver is connected to one side of the power line. Therefore, to prevent a shock hazard, all control shafts, mounting screws and exposed rivets have been insulated from the chassis. When servicing this set and replacing parts, be sure all the necessary insulators are in place to isolate the chassis from all exposed metal parts.

IF & DETECTOR TRANSFORMER REPLACEMENTS

To insure properly matched units for best performance, it is recommended that the IF transformers and FM detector transformer be replaced as complete assemblies, rather than attempt to repair or replace parts of these assemblies.



DIAL CORD STRINGING ARRANGEMENT

ALIGNMENT PROCEDURE

A—IF ALIGNMENT—AM

1. Turn the band switch to AM (To the left).
2. Connect the signal generator output lead to the converter grid, with an .05 uf. dummy and the generator ground lead to the receiver chassis.
3. Connect output meter across the speaker voice coil.
4. Tune the signal generator to 455 KC and adjust 455 KC IF slugs (1)-(2)-(3)-(4) for maximum output.

B—IF ALIGNMENT—FM

1. Turn the band switch to FM (To the right).
*2. Connect 10.7 megacycle FM signal generator output lead to 2nd IF grid and the generator ground lead to receiver chassis.
3. Connect a D. C. vacuum tube volt meter to the A. V. C. line and adjust slug no. (5) (primary, bottom of detector transformer) for maximum A. V. C. Voltage.
4. Connect the D. C. V. T. V. M. to the audio output of detector (high side of volume control) and adjust slug no. (6) (secondary, top of detector transformer), for zero voltage
5. Connect 10.7 megacycle FM signal generator to the converter grid.
6. Connect D. C. V. T. V. M. to the A. V. C. line and adjust the 10.7 IF slugs (7)-(8)-(9)-(10) for maximum A. V. C. voltage.

C—RF ALIGNMENT—AM

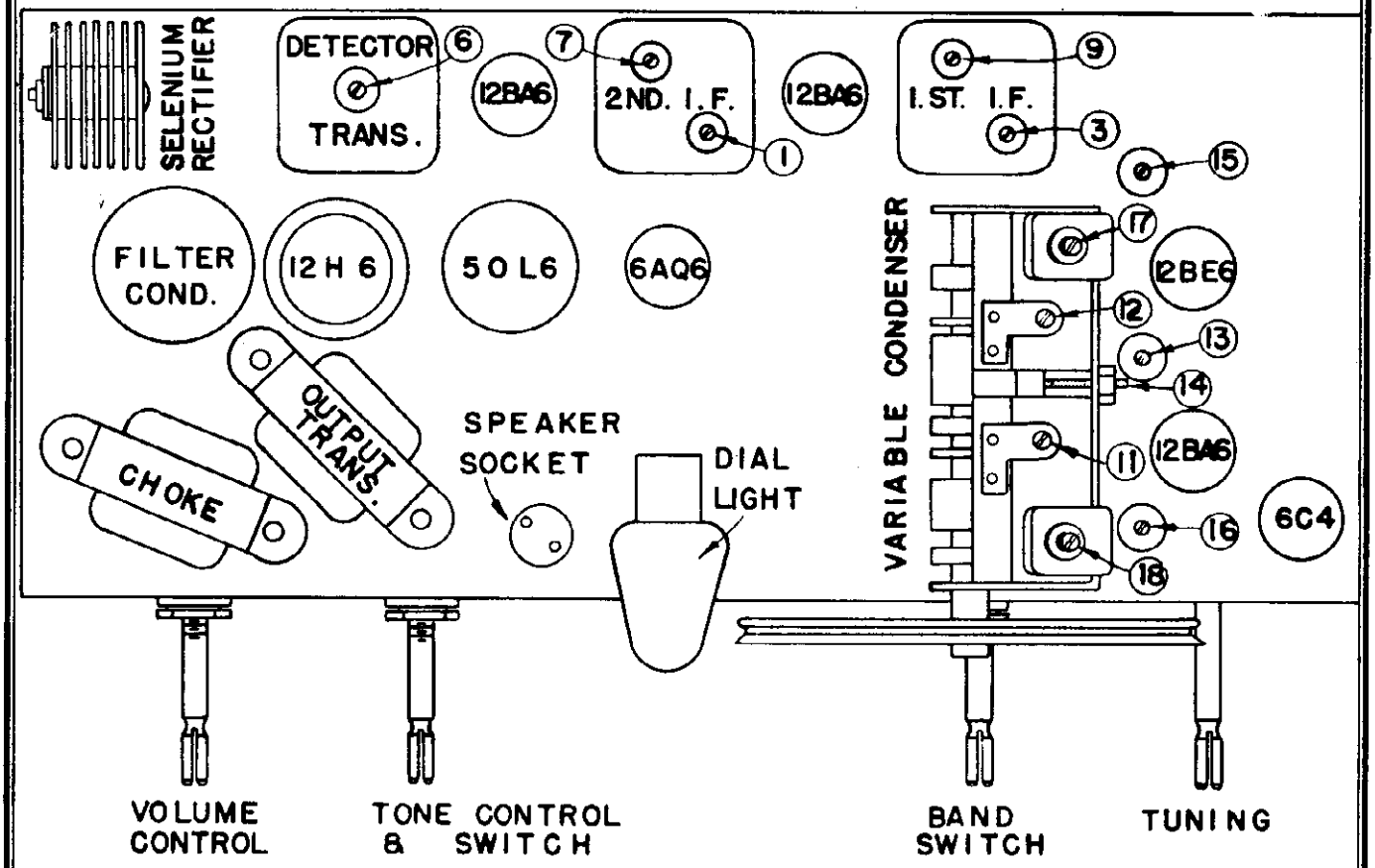
1. Turn band switch to AM (To the left).
2. Connect signal generator to a standard Hazeltine test loop, Model 1150, placed 2' from the set loop, or three turns of wire about six inches in diameter placed about one foot from the set loop.
3. Tune the generator to 1620 KC and tune the receiver to the high frequency end of the dial.
4. Connect output meter across the speaker voice coil.
5. Adjust oscillator trimmer (11) on variable condenser for maximum output.
6. Tune signal generator to 1400 KC, and tune receiver to pick up this signal.
7. Adjust antenna trimmer (12) on variable condenser for maximum output.
8. Check tracking at 1000 KC and 600 KC.

D—RF ALIGNMENT—FM

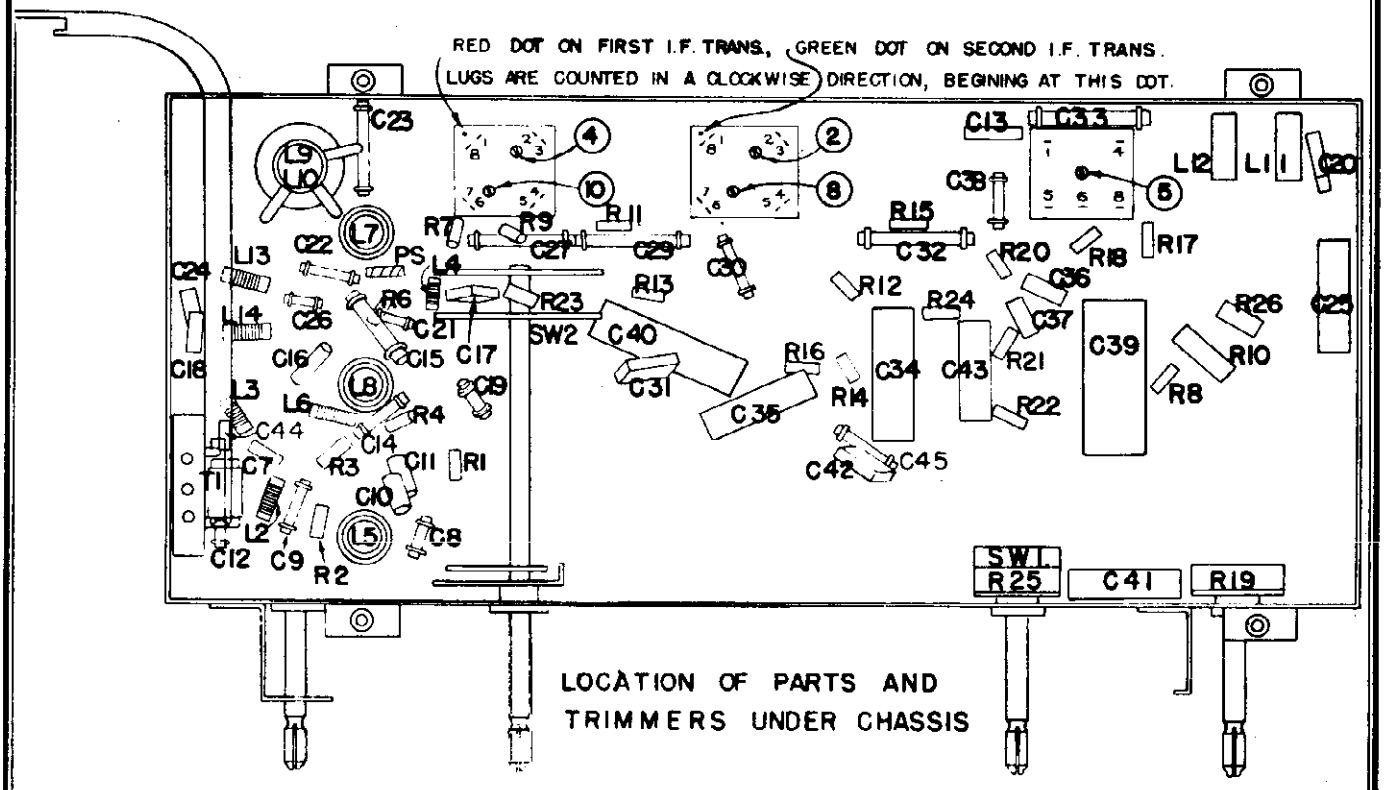
1. Turn band switch to FM (To the right).
2. Connect FM signal generator to FM antenna terminals through a 220 ohm dummy.
3. Set signal generator to 88 megacycles, using 23 KC deviation.
4. Set receiver dial to 88 megacycles.
5. Adjust FM oscillator slug (13) for maximum signal.
6. Set signal generator to 108 M. C.
7. Set receiver dial to 108 M. C.
8. Adjust the FM oscillator trimmer (14) for maximum signal.
9. Repeat 3 to 8; check and recheck until proper coverage is obtained.
10. Set signal generator to 91 M. C., and adjust RF slugs (15) & (16) for maximum signal.
11. Set signal generator to 105 M. C. and adjust RF trimmers (17) & (18) for maximum signal.
12. Repeat 10 & 11 until proper tracking is obtained.

*If a 10.7 MC.-F. M. generator is not available, an unmodulated signal of 10.7 M. C. from an accurately calibrated conventional AM type generator may be used.

MODELS 280TFM, 281TFM NOBLITT-SPARKS INDUSTRIES, INC.
CHASSIS RE-253



TUBE LAYOUT AND LOCATION OF TRIMMERS ON TOP OF CHASSIS.



LOCATION OF PARTS AND TRIMMERS UNDER CHASSIS

NOBLITT-SPARKS INDUSTRIES, INC. MODELS 280TFM, 281TF
CHASSIS RE-253

APPROXIMATE VOLTAGE AND RESISTANCE MEASUREMENTS
TUBE SOCKET LUGS TO CHASSIS GROUND

Tube	Function	Band Switch	VOLTAGE Plate	Screen	Cathode	Grid	RESISTANCE 1	2	3	4	5	6	7	8
6C4	1st RF Amp	FM-AM	95	—	0	0	*	Inf.	51	46	*	0	0	
12BA6	2nd RF Amp	FM	100	100	.9	0	2meg	0	45	35	*	*	68	
		AM	100	100	.9	0	4meg	0	45	35	*	*	68	
12BE6	Oscillator Converter	FM	100	100	0	**	22 K	0	52	62	*	*	0	
		AM	100	100	0	***	22 K	0	52	62	*	*	3meg	
12BA6	1st IF Amp	FM	92	92	.9	0	1meg	0	62	72	*	*	68	
		AM	92	92	.9	0	3.2meg	0	62	72	*	*	68	
12BA6	2nd IF Amp	FM-AM	92	92	.9	0	.9	0	35	24	*	*	68	
6AQ6	AF Amp	FM	42	—	0	-0.6	6.8meg	0	0	10	Inf.	0	*	
	Det, AVC, AF Amp	AM	42	—	0	-0.6	6.8meg	0	0	10	1meg	0	*	
12H6	Det, AVC	FM	—	—	—	—	0	24	6800	1meg	1meg	*	10	6800
		AM	—	—	—	—	0	24	6800	Inf.	Inf.	*	10	6800
50L6	AF Output	FM-AM	115	105	7.5	0	Inf.	72	*	*	500K	1meg	100	220

All voltage readings are positive unless otherwise indicated.

All voltage measurements are made with an electronic voltmeter with a line voltage of 117V. AC.

*No reading given here, due to the wide variations in readings which would be obtained, due to the electrolytic condensers in the B+ circuit.

**G3,0; G1 Varies from approx. -1.5V to -4V, depending on the setting of the variable condenser, variations in tubes coils, etc.

***G3,0; G1, Voltage varies from approx. -5V with variable condenser closed to approx. -7.5V with variable condenser open.

APPROXIMATE DC RESISTANCE OF COILS AND TRANSFORMERS

L1	Loop Antenna		.6 ohms	T2,3	IF	FM Pri Lugs 7 to 8	.9 ohms
L2,3,4	RF Chokes		.6 ohms		Trans-	AM Pri Lugs 1 to 2	15 ohms
6,13,14					formers	FM Sec. Lugs 3 to 4	.9 ohms
L11,12	RF Chokes		.2 ohms			AM Sec. Lugs 5 to 6	15 ohms
L9,10	AM Osc Coil	L9	5 ohms				
		L10	.5 ohms	T4	Detector	Pri Lugs 1 to 4	1 ohm
L15	B+ Filter Choke		220 ohms		Trans-	Sec Lugs 8 to 5	.1 ohm
					former	Lugs 8 to 6	.3 ohm
T5	Output Transformer	(Pri)	110 ohms			Lugs 5 to 6	.3 ohm
		(Sec.)	.3 ohms				

All resistance measurements of coils were made with the coils wired in the circuit.

All coils and transformers not listed have a resistance too low to be measured with an ohmmeter.

FREQUENCY RANGE
- Broadcast Band ..... 540-1600 KC
- AM-IF ..... 455 KC
- FM Band ..... 88-108 MC
- FM-IF ..... 10.7 MC

TUBES & FUNCTIONS
- 6C4 ..... 1st RF Amp FM
- 12BA6 ..... 2nd RF Amp FM
- 12BE6 ..... Oscillator Converter AM-FM
- 12BA6 ..... 1st IF Amp AM-FM
- 12BA6 ..... 2nd IF Amp FM
- 6AQ6 ..... Det. AVC. AF Amp AM
- ..... AF Amp FM
- 12H6 ..... Detector, AVC. FM
- 50L6 ..... AF Output AM-FM

POWER OUTPUT
- Undistorted ..... 1.4 Watts
- Maximum ..... 2.5 Watts
- Plate Load ..... 2000 Ohms

POWER SUPPLY
- 105-125 Volts, AC-DC ..... 45 Watts

SPEAKER
- Cone Size ..... 5¼"
- Cone Resonance in Air-Approx. ..... 197 Cycles
- Type ..... Permanent Magnet
- Magnet Size ..... 1.47 oz. Alnico V
- Voice Coil Impedance ..... 3.2 Ohms

OPERATING CONTROLS
- Extreme Left Knob ..... Volume
- Left Center ..... On-Off Switch, Tone Control
- Right Center ..... AM-FM Band Switch
- Extreme Right ..... Tuning

PHYSICAL DIMENSIONS
- Length ..... 14'
- Heighth ..... 8½'
- Depth ..... 8 5/16'

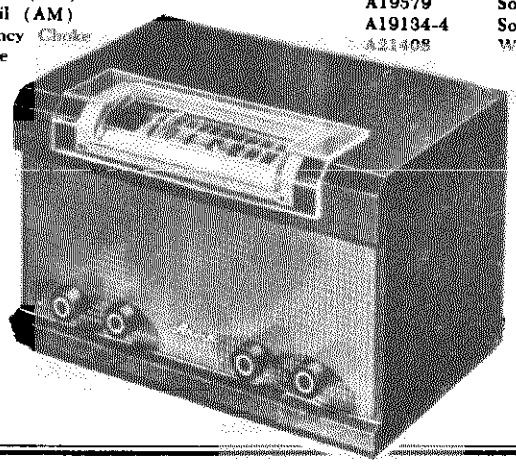
APPROX. SENSITIVITIES
- FM Converter Grid 10.7 M. C. ..... 300 uv
- FM Antenna Terminals 105 MC (23KC Deviation) ..... 40 uv
- AM Converter Grid 455 KC ..... 150 uv
- AM Loop 1400 KC ..... 240 uv/m

MODELS 280TFM, 281TFM NOBLITT-SPARKS INDUSTRIES, INC.
CHASSIS RE-253

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
R1-12-17	C20060-102	Resistor, 1000 ohm, ¼ W
R2-24	C20060-105	Resistor, 1 megohm, ¼ W
R3-11-15	C20060-680	Resistor, 68 ohm, ¼ W
R4-7	C20060-331	Resistor, 330 ohm, ¼ W
R6-13-20	C20060-223	Resistor, 22,000 ohm, ¼
R8	C20060-220	Resistor, 22 ohm, ¼ W
R9	C20060-104	Resistor, 100,000 ohm, ¼ W
R10	C20103-101	Resistor, 100 ohm, 1 W
R14	C20060-334	Resistor, 300,000 ohm, ¼ w
R16	C20060-685	Resistor, 6.8 megohm, ¼ W
R18	C20060-101	Resistor, 100 ohm, ¼ W
R19	C21404-1	Volume Control, 1 megohm
R21-22	C20120-682	Resisor, 6800 ohm, ¼ W
R23	C20060-225	Resistor, 2.2 megohm, ¼ W
R25	C21405-1	Tone Control and Switch, 500,000 ohm
R26	C20060-221	Resistor, 220 ohm, ¼ W
C1-C1A) C2-C2A) C3-C3A) C4-C4A) C5-C5A)	AC21401-1	Variable Condenser (With Trimmers)
	D21409	Variable Condenser (Less Trimmers)
C3A-4A	A21440	Trimmer Condenser, 1.6-19 uuf. Compression Type
C5A	A21439	Trimmer Condenser, 1-8 uuf, Glass
C6-11-18-24	C20204-500	Condenser, .00005 uf, 500 V, Ceramic
C7-20-30-31	C20204-101	Condenser, .0001 uf, 500 V, Ceramic
C8--10	C20226-501	Condenser, .0005 uf., 350 V, Ceramic
C9-13-14-22-45	C20226-102	Condenser, .001 uf., 350 V, Ceramic
C12-16-44	C20204-100	Condenser, .00001 uf., 500 V, Ceramic
C15-23-27-29-32-33	C20226-502	Condenser, .005 uf., 350 V, Ceramic
C17	C20206-201	Condenser, .0002 uf., 500 V., Mica
C19	C20205-2	Condenser, .0001 uf., 500., Ceramic
C21	C20204-270	Condenser, .000027 uf., 500 V., Ceremaic
C25-34	C20249-503	Condenser, .05 uf., 400 V, P. T.
C26	C20205-3	Condenser, .00002 uf., 500 V., Ceramic
C28A-B-C-D	A21402	Condenser, Electrolytic, 40-40-80 uf, 150 V, 20 uf., 25 V.
C35	C20249-103	Condenser, .01 uf., 400 V., P. T.
C36-37	C20205-5	Condenser, .00005 uf., 500 V., Ceramic 10%, N750
C38	C20203-202	Condenser, .002 uf., 350 V, Ceramic
C39	A21403	Condenser, Electrolytic, 8 uf., 50 V
C40	C20250-503	Condenser, .05 uf., 200 V, P. T.
C41	C20250-502	Condenser, .005 uf., 200 V., P. T.
C42	C20065-251	Condenser, .00025 uf., 500 V., Mica
C43	C20248-502	Condenser, .005 uf., 600V., P. T.
L1	AE21395-1	Antenna Loop, Rear Cover & Line Cord Assy.
L2-3-4-6-13-14	AA21445-1	High Frequency Choke
L5	AC21399-1	1st R. F. Coil (FM)
L7	AC21400-1	2nd R. F. Coil (FM)
L8	AC21397-1	Oscillator Coil (FM)
L9-10	AC21396-1	Oscillator Coil (AM)
L11-12	AA21444-1	High Frequency Choke
L15	AC21394-1	B Filter Choke

REF. NO.	PART NO.	DESCRIPTION
T1	AA21398-1	Antenna Coupling Transformer
T2	AC21390-1	1st I. F. Coil
T3	AD21391-1	2nd I. F. Coil
T4	AD21392-1	Detector Transformer
T5	AC21393-1	Output Transformer
Sw-2	C21406	Band Switch
Spk.	C21331	Speaker, 5¼" P. M.
Rect.	A20207-3	Rectifier, Selenium 150 MA
P	B20064-5	Line Cord & Plug Assy.
L	A19135	Dial Lamp, Mazda C7
	R21379	Cabinet Assy., Mahogany
	R21379-2	Cabinet Assy., Bleached Mahogany
	A21330	Name Plate, Brass
	D21365	Escutcheon, Clear Lucite
	C21428	Knob, Tuning
	C21427	Knob, Volume
	C21430	Knob, Tone
	C21429	Knob, AM-FM Switch
	A21431	Carton Complete with Fillers
	C21426	Speaker Grille
	C21498	Grille Felt, on Front Cabinet Baffle
	A20217	Socket, Antenna Loop
	D21372	Dial Scale Backing Plate
	A21382	Tuning Shaft Insulator Rear Phenolic) (Qty. of 5)
	A20196-2	Rivet, Tubular Shoulder (For Mtg. Idler Pulley) (Qty. of 5)
	A20196-4	Rivet, Tubular Shoulder (For Mtg. Idler Pulley) (Qty. of 5)
	A20202-2	Idler Pulley, ⅜" x ⅛" x ½" (Qty. of 5)
	A21422	Tuning Shaft
	D21389	Dial Scale, .050 Clear Acetate
	A19132	Cord, Dial Drive
	A19361	Hairpin Clip (On Tuning Shaft)
	A19295	Spring, Dial Drive Cord
	A21384	Terminal Strip, Double, L. H.
	A19141	Terminal Strip, Double, Center Mtg.
	A19140	Terminal Strip, Single, L. H.
	A21385	Terminal Strip, Triple with Center Lug Grounded
	C21899	Ieoid Insulator for Bottom of Cabinet
	A19236	Terminal Strip, Triple with Separate Mtg. Lug
	A21457	Insulator (Chassis Fibre, Mtg. Screw)
	A20077-3	Grommet, Rubber (Under Variable Condenser)
	A19138-1	Eyelet, Spacer (Under Variable Condenser)
	A20218	Plug, 2-Prong (Chassis Back Flange-Interlock)
	AC21377-1	Dial Pointer Assy.
	A21189	Terminal, Female (Qty. of 10)
	A21388	Control Shaft Insulator, Phenolic
	A21443	Tuning Shaft Insulator, Front, Phenolic (Qty of 5)
	A21225	Antenna Lead Insulator, Phenolic (Qty. of 5)
	A20118-1	Socket, Tube, Miniature. Molded Black)
	A20197-1	Socket, Tube, Miniature, Molded (Low Loss Bakelite)
	A18254-1	Socket, Tube, Plain, Wafer
	A19579	Socket, Speaker
	A19134-4	Socket, Dial Lamp
	A21408	Washer, Insulating, ⅜" I.D. x ¾" O.D. Phenolic (Qty. of 5)



NORTHERN RADIO CO. TYPE N600, MODELS AJ BJ, CJ, EDJ

TYPE N600 TWO BAND COMMUNICATIONS RECEIVERS

DESCRIPTION OF EQUIPMENT

Type N600 Receivers of the J Series are available in four different models for either direct or alternating current operation. Model AJ - 6 Volt DC Receiver and Model BJ - 12 Volt DC Receiver are designed for operation from storage batteries, where other sources of power are not available. Model CJ - 32 Volt DC Receiver is designed especially for operation from a ship's battery without the use of a built-in power supply. Model EDJ - 115 Volt AC-DC Receiver is designed for operation from either source, as implied, and is equally suited for marine or land installations.

The characteristics of the four models are similar, with the exception of the audio frequency system and power supply. The radio frequency components and controls are identical, thus the operation, alignment, servicing, etc., are the same. The following data is pertinent to the four models, describing them collectively where they are similar and individually where they are at variance.

One radio frequency stage of amplification employing a 6K7 eliminates the image frequency signal and insures an effective signal to noise ratio.

A separate oscillator employing a 6J5 reduces frequency drift to a minimum and improves the general stability of the receiver.

A 6L7 mixer converts the incoming signal to the intermediate frequency, where it is amplified by a second 6K7. By the use of iron core intermediate transformers sufficient gain and selectivity are obtained with a single stage.

Detection is accomplished by means of the diode in a type 6Q7 The rectified voltage is filtered and applied to the grids of the previous stages to provide automatic volume control.

The triode section of the 6Q7 amplifies the diode output, functioning as the first audio stage. In the Model AJ - 6 Volt DC Receiver and the Model BJ - 12 Volt DC Receiver the power amplifier is a 6F6G, which is driven directly by the first audio stage. The Model CJ - 32 Volt DC Receiver incorporates a 25L6G driver stage. This driver is excited by the first audio stage and, in turn, excites the power amplifier which consists of four 25L6G's connected in push-pull parallel. A single 25L6G power amplifier, driven directly by the first audio stage, is used in the Model EDJ - 115 Volt AC-DC Receiver.

A power output of approximately 2½ watts is obtained from the 6F6G power amplifier in the Model AJ - 6 Volt DC Receiver and the Model BJ - 12 Volt DC Receiver. The 25L6G push-pull parallel power amplifier in the Model CJ - 32 Volt DC Receiver has an output of approximately ½ watt, which provides ample volume from the built-in speaker. In the EDJ - 115 Volt AC-DC Receiver, an output of approximately 2 watts is obtained from the 25L6G power amplifier. The built-in speaker is of the permanent magnet dynamic type.

Plate power for the Model AJ - 6 Volt DC Receiver and the Model BJ - 12 Volt DC Receiver is obtained from a built-in power supply of the vibrator type. The Model CJ - 32 Volt DC Receiver has no built-in power supply, all power being obtained directly from the ship's battery. In the Model EDJ - 115 Volt AC-DC Receiver, plate power is obtained from a half-wave rectifier - filter system using a 25Z6G tube.

Controls

(1) Power switch marked "POWER". This switch functions as the Off-On control for the receiver.

(2) Band switch marked "BAND A-B". In position "A" the receiver is tuneable over the range between 1550 and 4200 kilocycles. In position "B" the receiver is tuneable between 550 and 1600 kilocycles.

(3) Receiver tuning. A semi-circular dial with a five-to-one reduction drive mechanism is employed as the tuning control. The band A scale is calibrated in kilocycles and the band B scale in megacycles. The dial is illuminated from the rear. A vernier dial with 100 divisions is provided for accurate station logging.

(4) Radio frequency gain control marked "SENSITIVITY". This control serves to limit the maximum sensitivity of the receiver.

(5) Audio frequency gain control marked "VOLUME". This controls the audio amplification after detection and functions as the volume control for the receiver.

(6) Tone control marked "TONE". This control reduces the high frequency response of the audio system and is used in receiving thru sharp high pitched noise.

(7) Speaker - handset switch marked "SPEAKER" and "HANDSET". This switch connects the audio output of the receiver to the built-in speaker or to the receiver portion of the handset, as indicated.

(8) Headphone jack marked "PHONES". When the phones are plugged into the jack, the built-in speaker is disconnected from the circuit.

(9) Dial light switch marked "LIGHTS". This switch functions as the Off-On control for the dial lights, and is provided so that the lights may be turned off when it is necessary to darken the pilot house

TYPE N600;MODELS AJ, BJ,CJ,EDJ

NORTHERN RADIO CO.

INSTALLATION

The receiver is usually mounted in the transmitter cabinet, or housed in a separate cabinet which is bolted to the transmitter to form a compact communication unit. When separately housed, the receiver may be mounted in any desired location.

Connections

(1) Power & Control. Power for the receiver is obtained thru the cable or cables at the rear of the chassis. When used in conjunction with a transmitter the proper cables are provided for connection to the power and receiver control circuits in that particular transmitter. If the receiver is used separately, wires may be connected to the cable terminal points for power and external control. If external control is not required, the plate supply line "B break" circuit must be closed and the voice coil line returned to ground on the panel. Refer to drawings for circuit data.

(2) Ground. The receiver is grounded in the usual installation thru connection to the transmitter and between cabinets. If used separately the ground should be connected to the cabinet. The receiver chassis is insulated from the panel and cabinet to permit a positive or negative ground in the D.C. Models, consequently a direct ground must not be connected to the chassis.

(3) Antenna. The regular receiver antenna connection is made thru the control cable and transmitter. If the receiver is used separately, connection may be made to the cable terminal marked "ANT". Refer to drawings for circuit data.

OPERATION

The operation of the receiver is similar to any regular communications receiver with similar capabilities. The following suggestions will aid in obtaining the most satisfactory results.

Place the receiver in operating condition as follows: Throw the POWER switch to the On (up) position. Set the BAND switch to the band A or B position in which the desired frequency is located. Throw the SPEAKER-HANDSET switch to the SPEAKER position. Throw the LIGHTS switch to the On (up) position. Set the SENSITIVITY control for maximum sensitivity by turning in a clockwise direction to the end of the 270 degree rotation. Then adjust the VOLUME control until some noise is heard. The receiver is now ready for operation.

General Procedure

When tuning for a station it is necessary to tune slowly past the point where the station is expected. After having found the station tune on both sides of the best point in order to make sure its location. Operation to one side of the correct spot will result in distorted signals.

During periods when no phone signals are being received the AVC (Automatic Volume Control) will increase the volume to maximum (if the SENSITIVITY control is full on) and some noise will result. The incoming signal, however, reduces the amplification through the AVC action and consequently the noise level. If the prevailing noise level is high the SENSITIVITY control may be turned down to limit the maximum sensitivity of the receiver, or it may be similarly used to prevent very strong local signals from blocking the receiver.

The control to use for setting the signal volume at a comfortable room level is the VOLUME control. If the SENSITIVITY control is used for this purpose the AVC will not function properly.

Note: Data relative to the operation of any controls not mentioned in this section will be found under "Controls".

MAINTENANCE

Receiver Alignment

(1) Before proceeding with the alignment, the #6 pin on the 7 prong control cable socket or plug must be connected to the panel to complete the voice coil circuit. It will also be necessary to provide a connection between the #4 and #5 pins to close the B break circuit.

(2) A signal generator set to 456 kilocycles should be used in aligning the intermediate frequency amplifier. Remove the grid clip from the 6L7 and connect the signal generator between grid and ground. If a signal generator is not available, tune in some convenient signal that is not too strong.

(3) For indication of correct tuning, an output meter or high resistance a.c. voltmeter should be connected between the power amplifier plate and chassis. A blocking condenser (.1 uf. or more) must be connected in series with the hot lead to the plate. If a low range meter (15 v. or less) is available, it may be plugged into the phone jack.

(4) Tune the trimmers on top of the I.F. transformers for maximum output meter deflection. It will be found best to experiment with the input level which gives the best indication.

(5) After having tuned the intermediate amplifier, the grid clip should be replaced on the 6L7, the band switch set for band A and a signal of approximately 3500 kilocycles applied to the antenna input. This can be the signal from a distant station or a standard signal generator. Adjust the oscillator trimmer (top right hole in osc. shield can) so the signal is properly tuned in. Then adjust the R.F. and Detector trimmers for maximum signal. These are accessible through the top right holes in the next two shield cans. Refer to drawings for parts location.

(6) The above procedure should be followed with the band switch set for band B and an input signal of 1400 kilocycles applied to the antenna input. The trimmers for this band are located in the bottom right side of the shield cans directly below the band A trimmers.

(7) The signal should now be set to 1800 kilocycles for band A or 600 kilocycles for band B and the receiver tuned to this frequency. The padding condenser for the band being aligned should be adjusted to give maximum output while rocking the tuning condenser slightly to locate the most favorable position. It is advisable to return to the aligning point and repeat the adjustments given for best results. Refer to drawings for parts location.

Servicing

Complete schematic circuit and parts layout drawings are included at the end of this circular, together with a parts list which corresponds with the drawings. Thus the function, location and value of any part may be readily found.

When the receiver has been removed from the cabinet for servicing, the #6 pin on the 7 pin control cable socket or plug must be connected to the panel to complete the voice coil circuit. It will also be necessary to provide a connection between the #4 and #5 pins to close the B break circuit.

First the power source should be checked to make sure that all tubes are receiving correct filament and plate voltages, then the tubes should be suspected and replaced with the spares one at a time as a check on their operation.

After checking tubes, testing should progress from the receiver output to the input stage by stage eliminating each as it is found to operate properly. Listening in the loud speaker while testing will help greatly. The usual voltmeter and/or ohmmeter tests should be used in isolating the trouble. It is always best to test each stage in a logical definite order, in order to determine the location of the defect. After having found the location of the trouble, it can be quickly eliminated.

CAUTION: The negative side of the power line is common to the chassis in the D.C. Models, but the chassis is insulated from ground (panel and cabinet) to permit operation from a power source with either a negative or positive ground. Consequently, if the positive side of the power line is grounded, the chassis becomes Hot to ground and care must be used when removing same to avoid contact with the cabinet or a blown receiver fuse (F1) will result. Opening both sides of the incoming power line before removing the chassis will prevent this. In this connection it should be noted that all control shafts have an insulating washer between shaft, knob and panel which must not be removed in the event of knob replacement. If the negative side of the power line is grounded, no care need be used. Refer to drawings for circuit data.

Type N600 Receiver

Test Readings

Model BJ -12 Volts, DC

The following test readings indicate average normal operating conditions:

Stage	Tubes	Plate Volts	Screen Volts	Grid Volts	Cath. Volts	Fil. Volts
R.F.A.	6K7	185	145	*Var.	1.1	6
Mixer	6L7	184	145	x10 av.	1.6	6
Osc.	6J5	148	---	x19 av.	0	6
I.F.A.	6K7	168	145	*Var.	1.3	6
Det. &	6Q7	*Var.	---	---	0	6
1st A.F.	Same	50	---	0	0	Same
A.F.P.A.	6V6GT	171	185	0	8.0	6

Input voltage during test - 12 Volts.
Total filament and vibrapack current - 2.6 Amps.
Total plate current - 60 Ma.

*Variable - dependent on signal and avc voltage. This also applied to the mixer (detector) control grid not listed above.

xAverage - mixer injection and oscillator grid voltages read with a VTVM having a d.c. input resistance of 11 megohms. These voltages vary over the frequency range.

Note: Normal readings may vary plus or minus 6% from the values given. The maximum variation should not exceed 10%. Readings are taken with the vibrapack voltage change switch set in the No. 1 (normal) position and with the SENSITIVITY (r.f. gain) control set at maximum. All voltages, except filament, are read between the circuit points and chassis. The meter should have a resistance of 1000 ohms per volt and a 300 volt (or higher) scale should be used where there is much resistance in the circuit, if comparative readings are to be obtained. Current values may be computed by dividing the voltage across resistors by their resistance. Refer to drawings and "Parts List" for data.

PARTS LIST N600BJ

Type N600 Receiver
Model BJ - 12 Volts, D.C.

Condensers:

C1	Antenna isolating	C-D 1W-3D5 .005 uf. 500 v.
C2.1	R.F. Amp. tuning	RCC Type RC Mdl 317 3 gang 365 uuf.
C2.2	Detector tuning	Part of C2.1 assembly - 365 uuf.
C2.3	Oscillator tuning	Part of C2.1 assembly - 365 uuf.
C3.1	Out. trimmer - band A	Part of L1.1 assembly
C3.2	Out. trimmer - band B	Part of L1.2 assembly
C4	R.F. Amp. grid filter	C-D DT-4S5 .05 uf. 400 v.
C5	R.F. Amp. cathode bypass	C-D DT-4P1 .1 uf. 400 v.
C6	Screen bypass	C-D DT-4P25 .25 uf. 400 v.
C7.1	R.F. trimmer - band A	Part of L2.1 assembly
C7.2	R.F. trimmer - band B	Part of L2.2 assembly
C8	Detector grid filter	C-D DT-4S5 .05 uf. 400 v.
C9	Mixer cathode bypass	C-D DT-4P1 .1 uf. 400 v.
C10	Plate bypass	C-D DT-4P1 .1 uf. 400 v.
C11.1	Osc. trimmer - band A	Part of L3.1 assembly
C11.2	Osc. trimmer - band B	Part of L3.2 assembly
C12.1	Osc. padding - band A	Miller #160A 360 - 1000 uuf.
C12.2	Osc. padding - band A	C-D 1W-5T5 .0005 uf. 500 v.
C12.3	Osc. padding - band B	Miller #160A 360 - 1000 uuf.
C13	Osc. grid blocking	C-D 5W-5Q5 .00005 uf. 500 v.
C14	Osc. plate bypass	C-D DT-4S2 .02 uf. 400 v.
C15	Osc. Mixer coupling	C-D 5W-5T1 .0001 uf. 500 v.
C16.1	First I.F.T. pri. tuning	Part of T1 assembly
C16.2	First I.F.T. sec. tuning	Part of T1 assembly
C17	I.F. Amp. grid filter	C-D DT-4P1 .1 uf. 400 v.
C18	I.F. Amp. cathode bypass	C-D DT-4P1 .1 uf. 400 v.
C19	I.F. Amp. plate filter	C-D DT-4P1 .1 uf. 400 v.
C20.1	Second I.F.T. pri. tuning	Part of T2 assembly
C20.2	Second I.F.T. sec. tuning	Part of T2 assembly
C21	Diode Det. r.f. bypass	C-D 5W-5T2 .0002 uf. 500 v.
C22	Diode Det. r.f. filter	C-D 5W-5T2 .0002 uf. 500 v.
C23	A.V.C. filter	C-D DT-4P1 .1 uf. 400 v.
C24	First A.F. plate bypass	C-D 5W-5T5 .0005uf 500v
C25	First A.F. grid coupling	C-D DT-4S5 .05 uf. 400 v.
C26	Pwr. Amp. grid coupling	C-D DT-4S5 .05 uf. 400 v.
C27	Pwr. Amp.-cathode bypass	C-D BR-105A 10 uf. 25 v.
C28	Tone control	C-D DT-6S5 .05 uf. 600 v.
C29	Plate pwr. filter	Mallory WB-71 8 uf. 450 v.
C30	Plate pwr. filter	Mallory WB-71 8 uf. 450 v.
C31	Pwr. Amp. plate bypass	C-D 1D-5D6 .006uf. 500v
C32	Output circuit bypass	C-D DT-4P1 .01uf. 400v

Inductances:

L1.1	Ant. coil - band A	Miller #3996 ANT.
L1.2	Ant. coil - band B	Part of L1.1 assembly
L2.1	R.F. coil - band A	Miller #3996 R.F.
L2.2	R.F. coil - band B	Part of L2.1 assembly
L3.1	Osc. coil - band A	Miller #3996 OSC.
L3.2	Osc. coil - band B	Part of L3.1 assembly
L4	Plate power filter ch.	Thermador D-2a 12H. 125 Ma.

Resistors:

R1	Sensitivity (R.F.) control	Centralab AF-110 10000 ohm pot.
R2	R.F. Amp. grid filter	IRC BT½ .1 megohm ½ w.
R3	R.F. Amp. cathode bias	IRC BW½ 350 ohms ½ w.
R4	Detector grid filter	IRC BT½ .1 megohm ½ w.
R5	Mixer cathode bias	IRC BW½ 350 ohms ½ w.
R6	Mixer grid leak	IRC BT½ 50000 ohms ½ w.
R7	Oscillator grid leak	IRC BT½ 50000 ohms ½ w
R8	Oscillator plate dropping	IRC BT½ 5000 ohms ½ w.
R9	I.F. Amp. grid filter	IRC BT½ .1 megohm ½ w.
R10	I.F. Amp. cathode	IRC BW½ 350 ohms ½ w.
R11	I.F. Amp. plate filter	IRC BT½ 3000 ohms ½ w.
R12	Screen dropping	IRC BT1 10000 ohms 1 w.
R13	Diode Det. r.f. filter	IRC BT½ 30000 ohms ½ w.
R14	A.V.C. filter	IRC BT½ .5 megohm ½ w.
R16	Volume (A.F) control	Centralab A-130 .5 meg. pot.
R17	First A.F. grid coupling	IRC BT½ 1. megohm ½ w.
R18	First A.F. plate coupling	IRC BT½ .25 megohm ½ w.
R19	Pwr. Amp. grid coupling	IRC BT½ .4 megohm ½ w.
R20	Pwr. Amp. cathode bias	IRC BT2 250 ohms 2 w.
R21	Tone control	Centralab AF-115 25000 ohm pot.
R22	Handset - receiver shunt	IRC BW1 10 ohms 1w.
R23	Headphone shunt	IRC BW1 10 ohms 1w.
R24	6Q7 filament shunt	Ohmite BD 40 ohms 10 w.
R25	Pilot light dropping	Ohmite BD 40 ohms 10 w.

Switches:

S1.1	Ant. coils - primary	Centralab Part D 3P. 3 pos.
S1.2	Ant. coils - secondary	Part of S1.1 assembly
S2.1	R.F. coils - primary	Centralab Part D 3P. 3 pos.
S2.2	R.F. coils - secondary	Part of S2.1 assembly
S3.1	Osc. coils - plate	Centralab Part D 3P. 3 pos.
S3.2	Osc. coils - grid	Part of S3.1 assembly
S4	Power - 12 v. line	H&H #20902-Z D.P.S.T. 3A. tog.
S5	Speaker - Handset	H&H #21189 S.P.D.T. 3A. tog.
S6	Lights - dial	H&H #20992 S.P.S.T. 3A. tog.

Transformers:

T1	I.F. Amp. input	Miller #612-C1 input
T2	I.F. Amp. output	Miller #612-C4 output - diode
T3	A.F. Pwr. Amp. output	Jensen ZP-1021 adjust. imped.

Tubes:

6K7	R.F. Amplifier	Sylvania or equiv. type 6K7
6L7	Mixer	Sylvania or equiv. type 6L7
6J5	Oscillator	Sylvania or equiv. type 6J5
6K7	I.F. Amplifier	Sylvania or equiv. type 6K7
6Q7	Diode Det.-AVC - First A.F.	Sylvania or equiv. type 6Q7
6V6GT	A.F. Power Amplifier	Sylvania or equiv. type 6V6GT See "Note" re metal tubes

Miscellaneous:

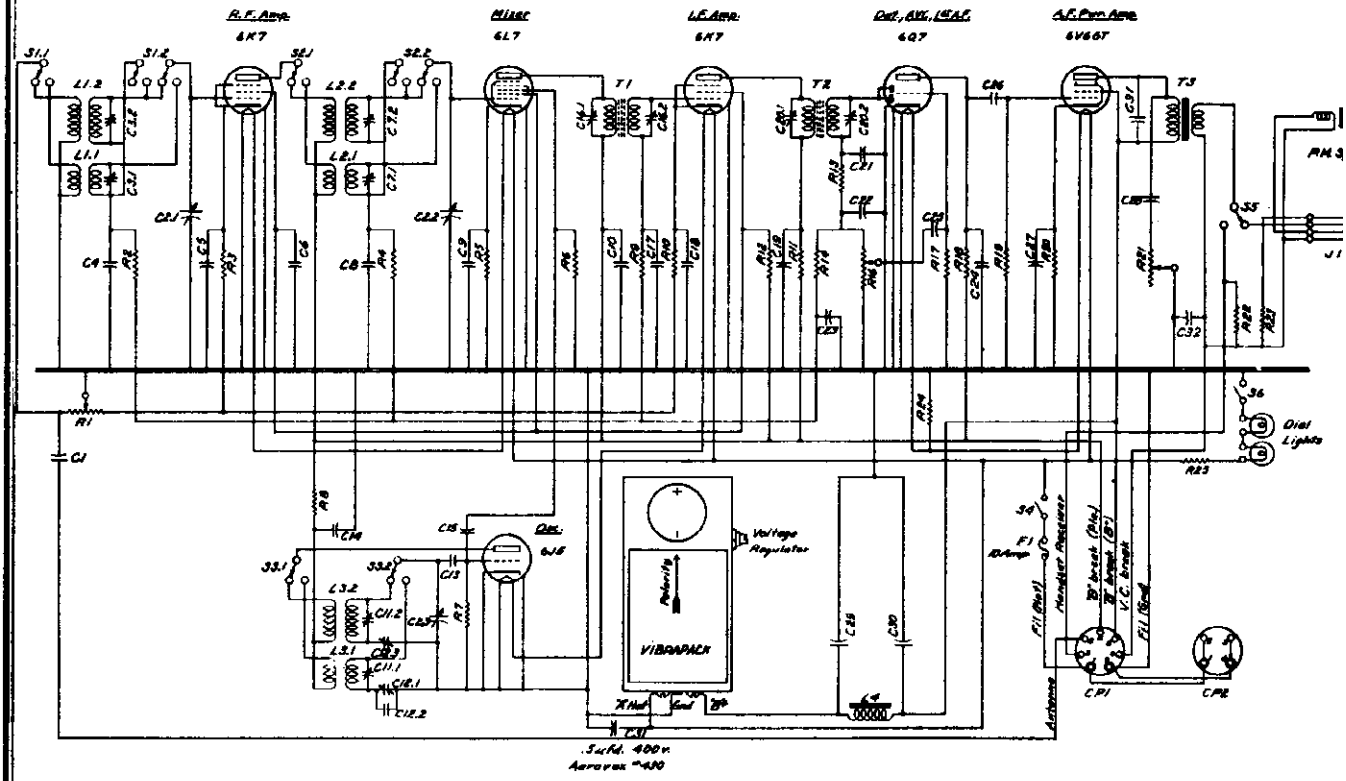
Dynamic speaker	Jensen ST-445 or Utah 6P 6" PM
Dial lights	Sylvania S-47 6-8 V. 150 Ma. m.b.b.
Dial light sockets	Drake #2060E dial lig. bkts.
12 V. line fuse	Killark or equiv. 3AG 10 Amp.
Fuse holder	Littelfuse #341001 extractor post
Headphone jack J1	Mallory #703A Junior
Band switch knob	Crowe #6144 1-1/8" rd. blk. pointer
Control knobs	Crowe #6132 1-1/8" rd. blk.
Control cable plug CP1	Amphenol 61-CP7S 7 prong
Control cable plugs	Amphenol PF7S & PM7S 7 prong
*Power cable plug CP2	Amphenol 61-CP4 4 prong
Tube sockets	Amphenol S8 8 prong
Tuning dial mechanism	Bud D-1729 vernier dial
Tuning dial scale	NRC #915-10 std. 2 band

*Used only where power is not obtained thru the control cable.

Note: Metal tubes may be replaced with GT tubes, if necessary

NORTHERN RADIO CO.

TYPE N600; MODEL B

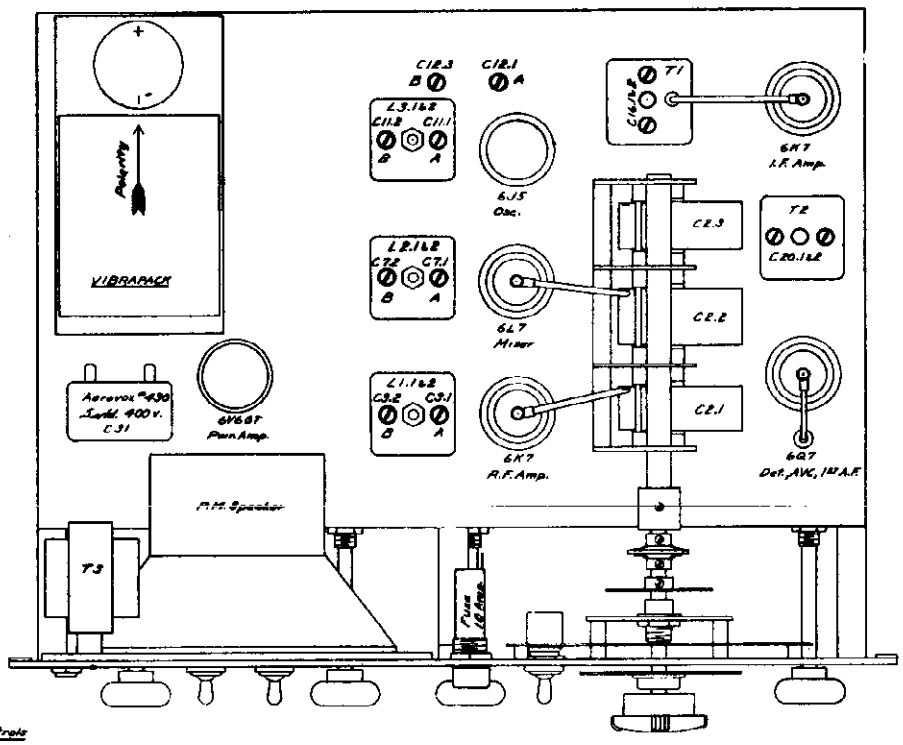


Band A 1530 to 4200 Kc.
Band B 530 to 1600 Kc.

Intermediate Freq. 456 Kc.

Note:
All band switches shown in Band B position.

Note:
Reverse Vibrator for operation from power source with positive ground.



Position of Controls

Phones	Tone	Power	Handset	Sensitivity	Band	Lights	Tuning	Volume

TYPE N600;MODEL CJ NORTHERN RADIO CO.

Type N600 Receiver

Model CJ - 32 Volts, DC

Test Readings

The following test readings indicate average normal operating conditions:

Stage	Tubes	Plate Volts	Screen Volts	Grid Volts	Cath. Volts	°Fil. Volts
R.F.A.	6K7	30.0	30.0	*Var.	0.6	6
Mixer	6L7	29.5	30.0	x1.5 av.	0.1	6
Osc.	6J5	30.0	--	x2.8 av.	0	6
I.F.A.	6K7	29.5	30.0	*Var.	0.6	6
Det. &	6Q7	*Var.	--	--	0	6
1st A.F.	Same	5.5	--	0	0	Same
2nd A.F.	25L6GT	22.5	30.5	0	3.0	24
A.F.P.A.	4-25L6GT	30.5	32.0	0	2.8	24

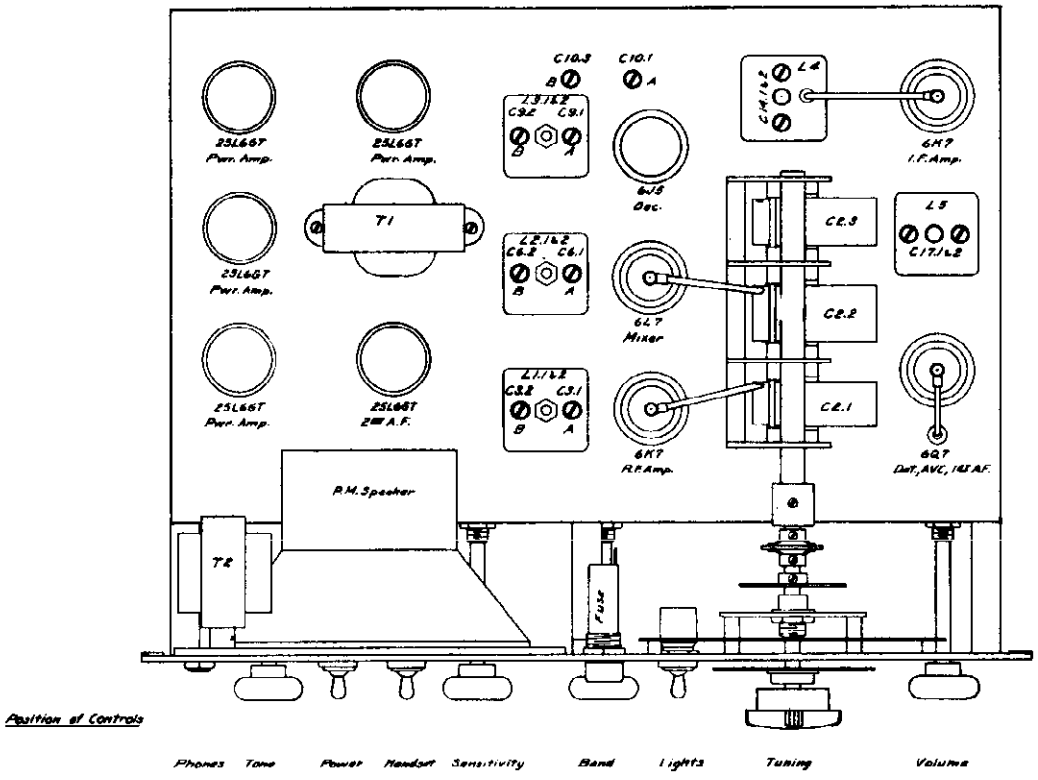
Input voltage during test - 32 volts
Total filament current - 1.7 Amps.
Total plate current - 36 Ma.

*Variable - dependent on signal and avc voltage. This also applies to the mixer (detector) control grid not listed above.

xAverage - mixer injection and oscillator grid voltages read with a VTVM having a d.c. input resistance of 11 megohms. These voltages vary over the frequency range.

°Filament voltage readings taken with dropping resistor R23 adjusted for 30 volts across the series - parallel filament circuit.

Note: Normal readings may vary plus or minus 6% from the values given. The maximum variation should not exceed 10%. Readings are taken with the SENSITIVITY (r.f. gain) control set at maximum. All voltages, except filament, are read between the circuit points and chassis. The meter should have a resistance of 1000 ohms per volt and a 50 or 60 volt scale should be used, if comparative readings are to be obtained. Current values may be computed by dividing the voltage across resistors by their resistance. Refer to drawings and "Parts List" for data.



PARTS LIST N600CJ

Type N600 Receiver
Model CJ - 32 Volts D.C.

Condensers:

C1	Antenna isolating	C-D 1W-3D5 .005 uf. 300 v.
C2.1	R.F. Amp. tuning	R.C.C. Type RC Md1 317 3 gang 365 uuf.
C2.2	Detector tuning	Part of C2.1 assembly - 365 uuf.
C2.3	Oscillator tuning	Part of C2.1 assembly - 365 uuf.
C3.1	Ant. trimmer - band A	Part of L1.1 assembly
C3.2	Ant. trimmer - band B	Part of L1.2 assembly
C4	R.F. Amp. grid filter	C-D DT-4S5 .05 uf. 400 v.
C5	R.F. Amp. cathode bypass	C-D DT-4P1 .1 uf. 400 v.
C6.1	R.F. trimmer - band A	Part of L2.1 assembly
C6.2	R.F. trimmer - band B	Part of L2.2 assembly
C7	Det. grid filter	C-D DT-4S5 .05 uf. 400 v.
C8	Mixer cathode bypass	C-D DT-4P1 .1 uf. 400 v.
C9.1	Osc. trimmer - band A	Part of L3.1 assembly
C9.2	Osc. trimmer - band B	Part of L3.2 assembly
C10.1	Osc. padding - band A	Miller #160A 360 - 1000 uuf.
C10.2	Osc. padding - band A	C-D 5W-5T5 .0005 uf. 500 v.
C10.3	Osc. padding - band B	Miller #160A 360 - 1000 uuf.
C11	Osc. grid blocking	C-D 5W-5Q5 .00005 uf. 500 v.
C12	Osc. mixer coupling	C-D 5W-5T1 .0001 uf. 500 v.
C13	Plate & screen bypass	C-D DT-4P1 .1 uf. 400 v.
C14.1	First I.F.T. pri. tuning	Part of L4 assembly
C14.2	First I.F.T. sec. tuning	Part of L4 assembly
C15	I.F. Amp. grid filter	C-D DT-4P1 .1 uf. 400 v.
C16	I.F. Amp. cathode bypass	C-D DT-4P1 .1 uf. 400 v.
C17.1	Second I.F.T. pri. tuning	Part of L5 assembly
C17.2	Second I.F.T. sec. tuning	Part of L5 assembly
C18	Diode Det. r.f. bypass	C-D 5W-5T2 .0002 uf. 500 v.
C19	Diode Det. r.f. filter	C-D 5W-5T2 .0002 uf. 500 v.
C20	A.V.C. filter	C-D DT-4P1 .1 uf. 400 v.
C22	First A.F. grid coupling	C-D DT-4S5 .05 uf. 400 v.
C23	Second A.F. grid coupling	C-D DT-4S5 .05 uf. 400 v.
C24	Second A.F. cathode bypass	C-D BR-102A 10 uf. 25 v.
C25	Tone control	C-D DT-4S5 .05 uf. 400 v.
C26	A.F. Pwr. Amp. grid bypass	C-D 1W-5D1 .001 uf. 500 v.
C27	Plate power filter - out	Mallory WB-39 50 uf. 50 v.
C28	Plate power filter - in	C-D DT-4W1 1 uf. 400 v.
C29	32 Volt line bypass	C-D DT-4P1 .1 uf. 400 v.
C30	Pwr. Amp. plate bypass	C-D DT-4S1 .01 uf. 400v
C31	Output circuit bypass	C-D DT-4S5 .05 uf. 400vv

Inductances:

L1.1	Ant. coil - band A	Miller #3996 ANT.
L1.2	Ant. coil - band B	Part of L1.1 assembly
L2.1	R.F. coil - band A	Miller #3996 R.F.
L2.2	R.F. coil - band B	Part of L2.1 assembly
L3.1	Osc. coil - band A	Miller #3996 OSC.
L3.2	Osc. coil - band B	Part of L3.1 assembly
L4	First I.F. transformer	Miller #612-C1
L5	Second I.F. transformer	Miller #612-C4
L6	Plate power filter	Thermador D-9 2H. 125 Ma.

Resistors:

R1	Sensitivity (R.F.) control	Centralab AF-110 10000 ohm pot.
R2	R.F. Amp. grid filter	IRC BT½ .1 megohm ½ w.
R3	R.F. Amp. cathode bias	IRC BW½ 100 ohms ½ w.
R4	Det. grid filter	IRC BT½ .1 megohm ½ w.
R5	Mixer cathode bias	IRC BW½ 100 ohms ½ w.
R6	Mixer grid leak	IRC BT½ 50000 ohms ½ w.
R7	Osc. grid leak	IRC BT½ 50000 ohms ½ w.
R9	I.F. Amp. cath. bias	IRC BW½ 100 ohms ½ w.
R10	A.V.C. filter	IRC BT½ .5 megohm ½ w.
R12	Diode Det. r.f. filter	IRC BT½ 30000 ohms ½ w.
R13	Volume (A.F.) control	Centralab A-130 .5 meg. pot.
R14	First A.F. grid coupling	IRC BT½ 1. megohm ½ w.
R15	First A.F. plate coupling	IRC BT½ .25 megohm ½ w.
R16	Second A.F. grid coupling	IRC BT½ .4 megohm ½ w.
R17	Second A.F. cathode bias	IRC BT½ 600 ohms ½ w.
R18	Tone control	Centralab AF-115 25000 ohm pot.
R19.1	A.F. Pwr. grid stabilizer	IRC BT½ 600 ohms ½ w.
R19.2	A.F. Pwr. grid stabilizer	IRC BT½ 600 ohms ½ w.
R20	A.F. Pwr. cathode bias	IRC BW1 100 ohms 1 w.
R21	Handset-receiver shunt	IRC BW1 10 ohms 1w.
R22	Headphone shunt	IRC BW1 10 ohms 1w.
R23	Filament dropping	Ohmite #0361 3 ohms 25 w.
R24	Plate power filter	IRC BW1 150 ohms 1 w.
R25	Dial light dropping	Ohmite BD 250 ohms 10 w.

Switches:

S1.1	Ant. coils - primary	Centralab Part D 3P. 3 position
S1.2	Ant. coils - secondary	Part of S1.1 assembly
S2.1	R.F. coils - primary	Centralab Part D 3P. 3 position
S2.2	R.F. coils - secondary	Part of S2.1 assembly
S3.1	Osc. coils - plate	Centralab Part D 3P. 3 position
S3.2	Osc. coils - grid	Part of S3.1 assembly
S4	Power - 32 V. line	H&H #20902 D.P.S.T. 3A. tog.
S5	Speaker-Handset	H&H #21189 S.P.D.T. 3A. tog.
S6	Lights - dial	H&H #20992 S.P.S.T. 3A. tog.

Transformers:

T1	A.F. Pwr. Amp. input	Thermador G-26 driver 1.33:1
T2	A.F. Pwr. Amp. output	NRC 600C-10-1 output 23:1

Tubes:

6K7	R.F. Amplifier	Sylvania or equiv. type 6K7
6L7	Mixer	Sylvania or equiv. type 6L7
6J5	Oscillator	Sylvania or equiv. type 6J5
6K7	I.F. Amplifier	Sylvania or equiv. type 6K7
6Q7	Diode Det.- AVC - First A.F.	Sylvania or equiv. type 6Q7
25L6GT	Second A.F. Amplifier	Sylvania or equiv. type 25L6GT
25L6GT	A.F. Power amplifier	Sylvania or equiv. type 25L6GT See "Note" re metal tubes

Miscellaneous:

Dynamic speaker	Jensen ST-445 or Utah 6P 6" PM
Dial lights	Sylvania S47 6-8 V. 150 Ma. m.b.b.
Dial light sockets	Drake #206CE dial light bkt.
32 Volt line fuse F1	Killark or equiv. 3AG 5 Amp.
Fuse holder	Littelfuse #341001 extractor post
Headphone jack J1	Mallory #703A Junior
Control knobs	Crowe #6132 1-1/8" black
Control cable plug CP1	Amphenol #61-CP7S 7 prong
*Power cable plug CP2	Amphenol #61-CP4 4 prong
Tube sockets	Amphenol S8 8 prong
Tuning dial mechanism	Bud D-1729 vernier dial
Tuning dial scale	NRC #915-10 std. 2 band

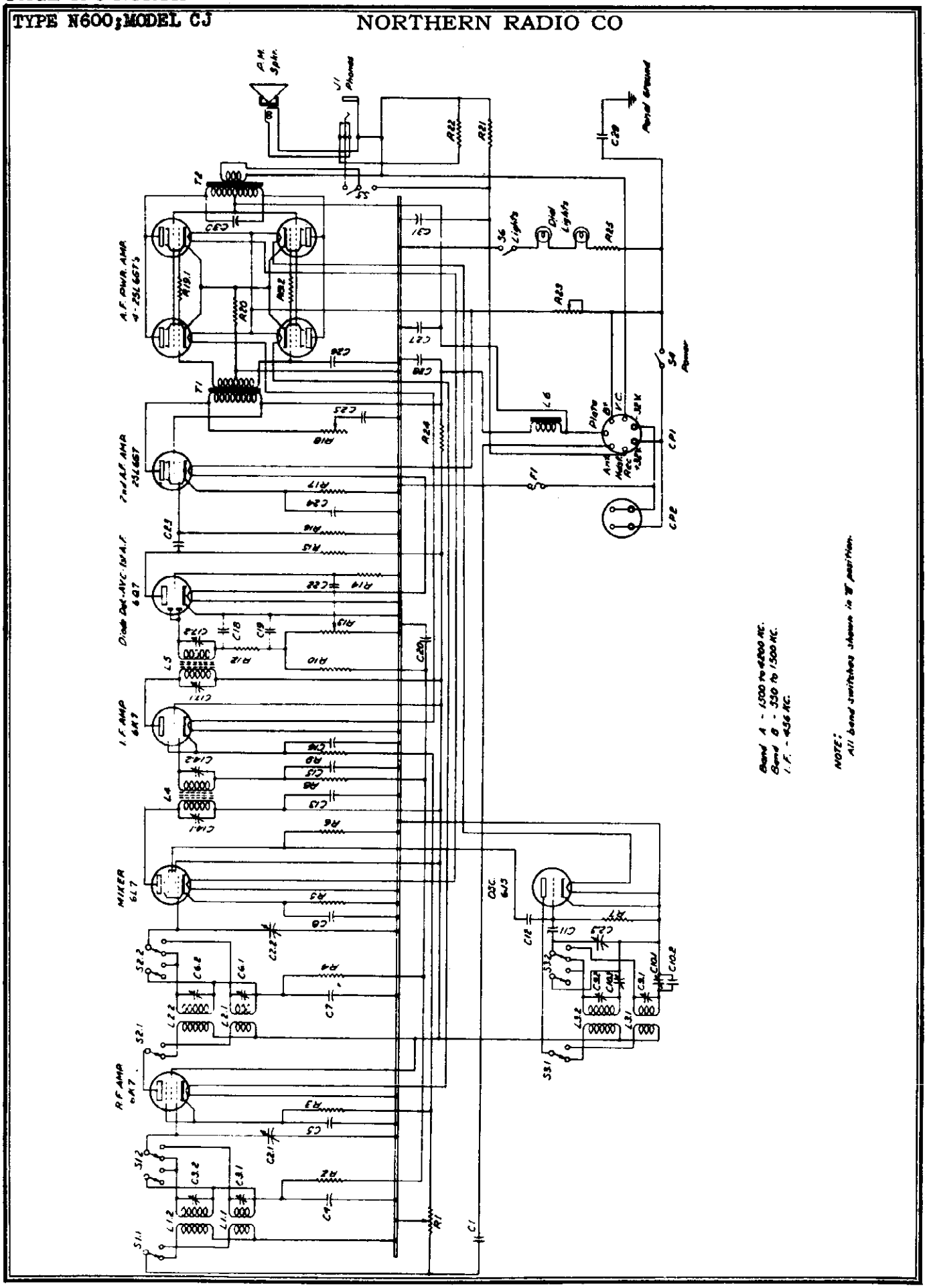
*Used only where power is not obtained thru the control cable.

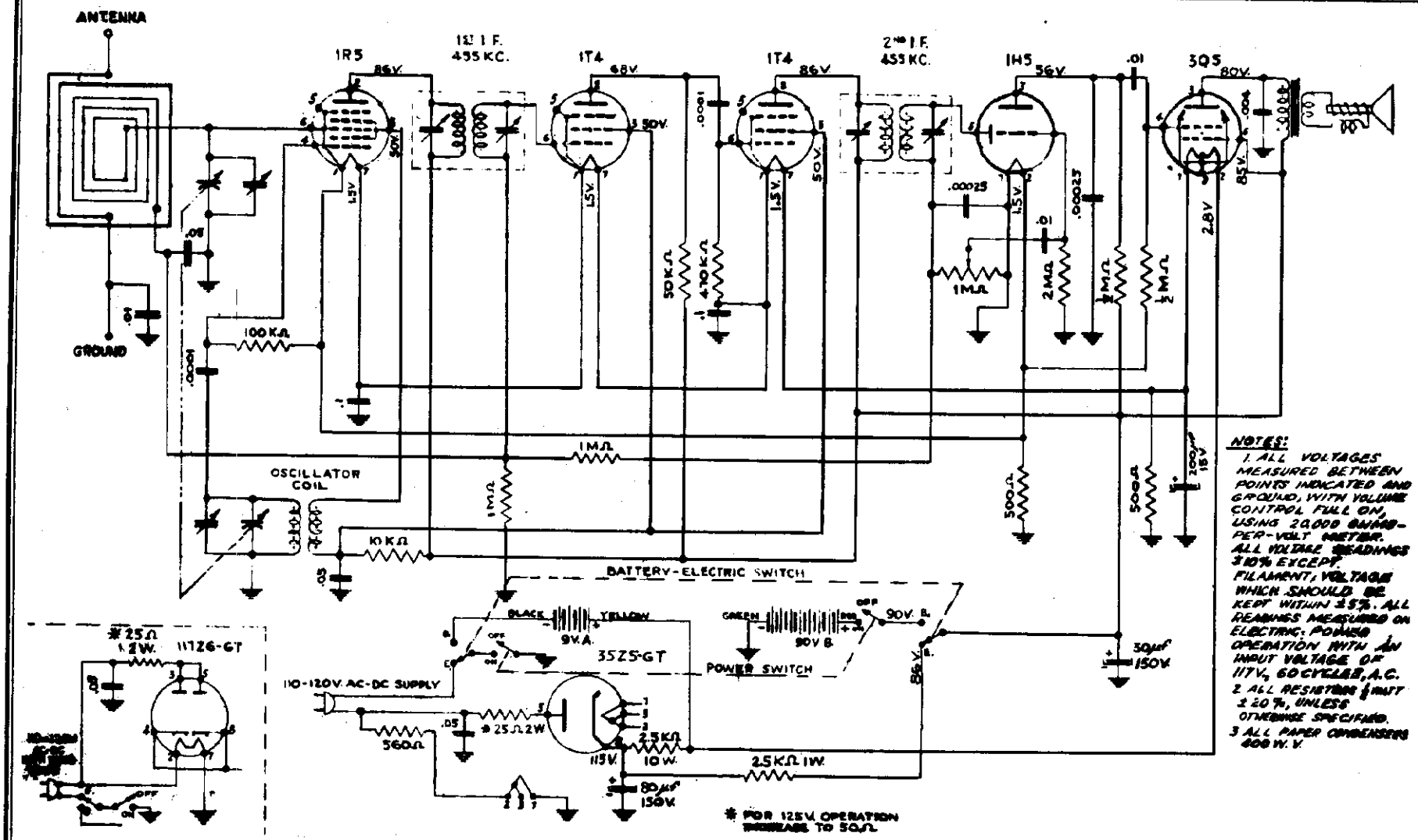
NORTHERN RADIO CO. TYPE N600;MODEL C

NORTHERN PAGE 1

TYPE N600; MODEL CJ

NORTHERN RADIO CO





NOTES:
1. ALL VOLTAGES MEASURED BETWEEN POINTS INDICATED AND GROUND, WITH VOLUME CONTROL FULL ON, USING 20,000 OHMS-PER-VOLT METER. ALL VOLTAGE READINGS ±10% EXCEPT FILAMENT VOLTAGE WHICH SHOULD BE KEPT WITHIN ±5%. ALL READINGS MEASURED ON ELECTRIC POWER OPERATION WITH AN INPUT VOLTAGE OF 117V, 60 CYCLES, A.C.
2. ALL RESISTORS ½ WATT ±20%, UNLESS OTHERWISE SPECIFIED.
3. ALL PAPER CONDENSERS 400 W.V.

This portable receiver is designed for AC, DC or battery operation, and is provided with a self-contained loop which permits reception without the use of an external aerial. It will operate on 10[illegible]-125 volts 40-60 cycles AC or DC or on 9 V A and 90 V B battery supply.

The line cord used with this receiver is of special construction and should not under any condition be shortened, lengthened, or tampered with. Should this cord at any time be too short to reach the line receptacle it may be extended with an ordinary extension cord. While in operation on electric power, the cord will get warm. This is a normal characteristic, and in order to dissipate the heat into the surroundings, it is advisable to stretch out the cord to its entire length.

MODEL PQ61 OLYMPIC RADIO & TELEV. INC.
MODELS 7-421V, 7-421W, 7-421X

MODEL PQ61

The intermediate frequency of this receiver is 455KC and should re-alignment be required, it will be necessary to slide the shelf (holding the chassis) partly out of the cabinet so that the trimmer screws can be reached. To do so, remove the two "push-on" type of knobs at the front and the two wood screws holding the shelf to the corner glueblocks.

Alignment: Set the signal generator to 455 kilocycles and connect the output via a .05 condenser to the grid of the 1R5 tube (connecting to the grid connection at the RF section of the variable will be found more convenient) and via a similar condenser to the chassis. Feed in this signal and adjust the four trimmer screws at the top of the IF transformers until maximum output is obtained, which may be indicated by an output meter connected directly across the voice coil.

Before aligning the antenna and oscillator trimmers rotate the station selector knob clockwise and when the condenser is at maximum capacity, note that the pointer is in a horizontal position.

Now couple the output of the signal generator to the terminals of a dummy loop about 6" dia. consisting of one turn of wire and placed about one foot away from the receiver loop and feeda 1500 KC signal from the generator. Adjust both the oscillator trimmer and antenna trimmer until maximum signal is obtained with minimum input of generator signal. During this alignment the volume control should be at maximum volume position.

ELECTRIC OPERATION:
When operating this receiver on electric power it will be necessary to remove the plug from its battery operating position on the chassis and insert same into the electric socket receptacle. This disconnects the receiver from its battery position and automatically adjusts all internal connections for electric operation.

BATTERIES:
The batteries recommended for this receiver are two #746 Eveready 4-1/2V and two 462 Eveready #45V batteries.

Before replacing batteries remove the loop by unscrewing the round head screw holding the loop to the receiver bracket.

ANTENNA:

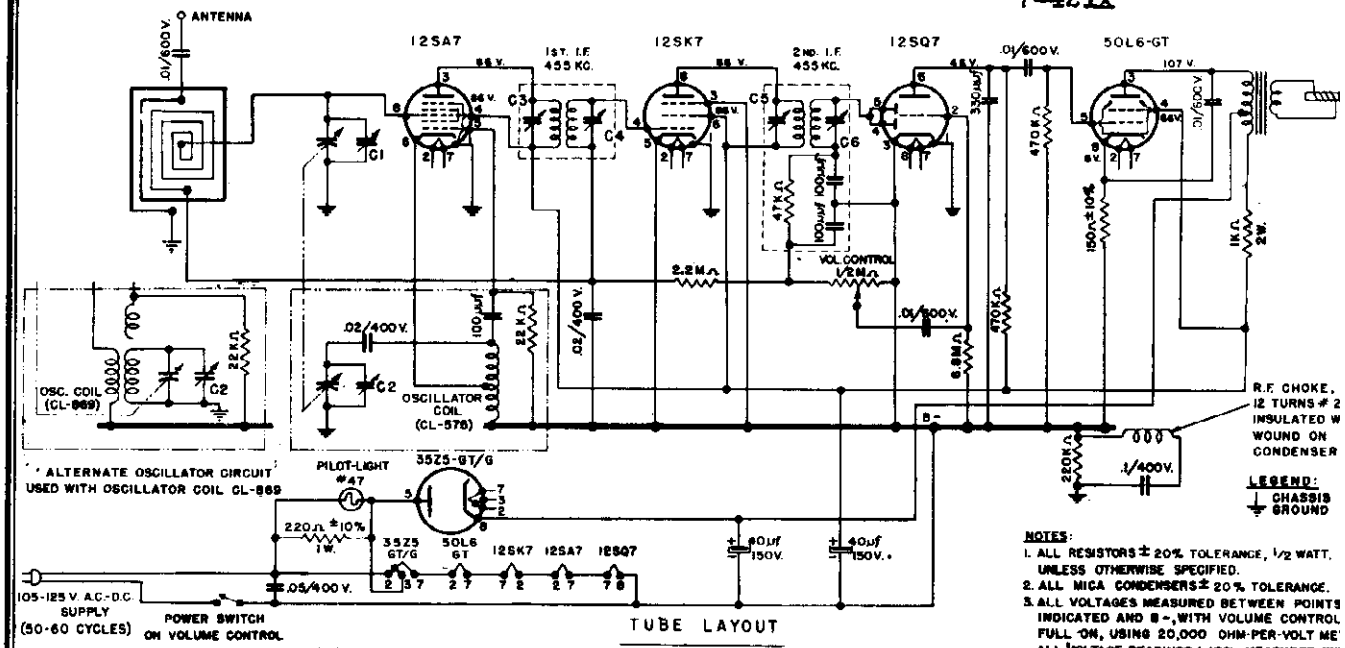
This receiver will operate satisfactorily in most locations without an aerial. However, in certain remote locations it may be necessary to provide additional pickup by connecting an aerial and ground to the two short leads soldered to the loop.

MODELS 7-421V, 7-421W, 7-421X

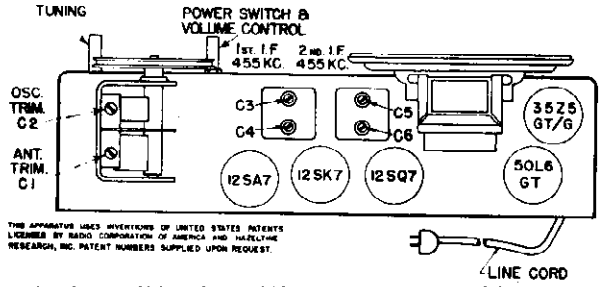
REPLACEMENT PARTS LIST

Part No.	Description
BU-187	Bulb—#47 Mazda pilot light bulb
CA-327W	Cabinet—walnut bakelite cabinet
CA-327V	Cabinet—ivory bakelite cabinet
CL-575	Coil—oscillator coil
CO-107	Condenser—40/40/150 W.V. electrolytic condenser
CV-801	Condenser—2 section variable condenser
DL-457-1	Dial—molded lucite dial
KN-352	Knob—walnut knob
KN-353	Knob—ivory knob
LP-163-1	Loop—loop antenna
PO-259-V	Pointer—ivory pointer
PO-259-W	Pointer—walnut pointer
PT-102	Control—1/2 megohm volume control
RCM20A101M	Condenser—100 mmfd ± 20% mica condenser
RCM20A331M	Condenser—330 mmfd ± 20% mica condenser
RCP10W4104L	Condenser—.1/400 W.V. tubular paper condenser
RCP10W4203A	Condenser—.02/400 W.V. tubular paper condenser
RCP10W4503A	Condenser—.05/400 W.V. tubular paper condenser
RCP10W6103A	Condenser—.01/600 W.V. tubular paper condenser
REB-151K	Resistor—150 ohms ± 10% 1/2 watt resistor
REB-223M	Resistor—22,000 ohms ± 20% 1/2 watt resistor
REB-224M	Resistor—220,000 ohms ± 20% 1/2 watt resistor
REB-225M	Resistor—2.2 megohms ± 20% 1/2 watt resistor
REB-474M	Resistor—470,000 ohms ± 20% 1/2 watt resistor
REB-685M	Resistor—6.8 megohms ± 20% 1/2 watt resistor
REC-221K	Resistor—220 ohms ± 10% 1 watt resistor
RED-102M	Resistor—1000 ohms ± 20% 2 watt resistor
SK-838	Speaker—5" p.m. speaker
SP-191	Spring—drive shaft retaining spring
SP-295	Spring—dial drive spring
ST-255-1	Back—cardboard back
TR-707	Transformer—455 k-c input I.F. transformer
TR-708	Transformer—455 k-c output I.F. transformer

OLYMPIC RADIO & TELEV. INC. MODELS 7-421V, 7-421W 7-421X



TUBE LAYOUT



Note:

In case of dial light failure, replace the lamp (Mazda #47) as soon as possible to prevent damage to the 35Z5 tube

ALIGNMENT PROCEDURE CHART

STEP	CONNECT HIGH SIDE OF SIGNAL GENERATOR TO -	SET SIGNAL GENERATOR TO -	TURN RECEIVER DIAL TO -	ADJUST THE FOLLOWING FOR MAXIMUM OUTPUT (KEEP SIGNAL FROM SIGNAL GENERATOR AS LOW AS POSSIBLE)
1	ANTENNA SECTION TUNING CONDENSER IN SERIES WITH .1 MFD. COND.	455 KC.	FULL CLOCKWISE POSITION. (CONDENSER PLATES FULLY OPEN)	C6, C5, C4, C3 AND REPEAT IN SAME ORDER (1ST. AND 2ND. I.F. TRANSFORMERS)
2	ANTENNA TERMINAL OF ANTENNA LOOP IN SERIES WITH 50 MMFD. COND.	1700 KC.	1700 KC. (170 ON DIAL)	C 2 (OSCILLATOR)
3		1400 KC.	MAXIMUM SIGNAL (APPROX. 140 ON DIAL)	C1 (ANTENNA)
4		REPEAT STEPS 2 AND 3		

ALIGNMENT INSTRUCTIONS

Equipment Required:

Modulated R.F. signal generator; output meter; insulated screw-driver; two .1 mfd 400 volt condensers.

To insure proper alignment a radiated signal will be required during part of the alignment procedure. To radiate a signal connect a loop of about 6" to 8" diameter (one turn of #14 or #12 wire) across the output of the signal generator and place this loop parallel to the loop of the receiver to be aligned at a distance of about 8" or 10".

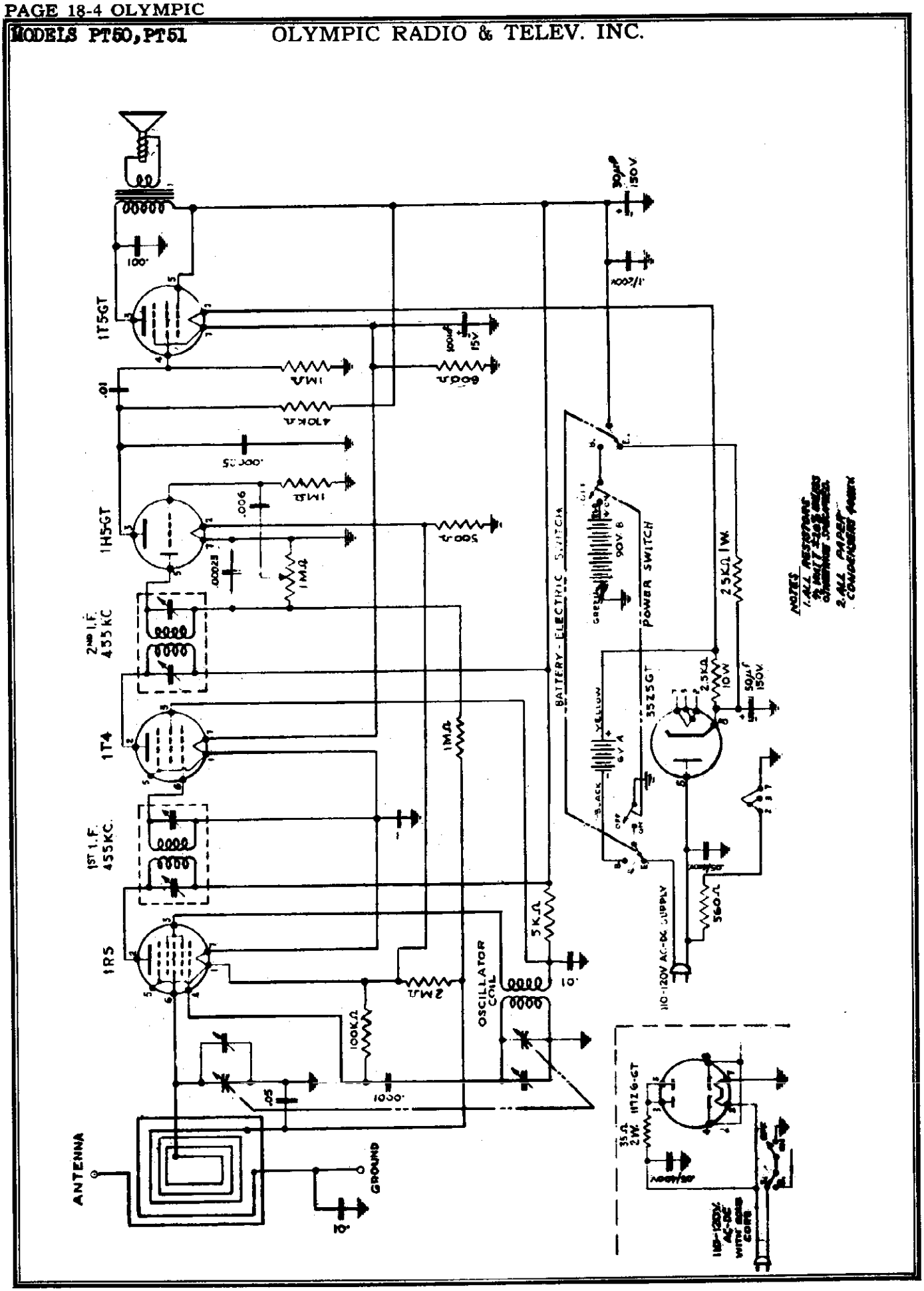
To align the receiver it is necessary to remove the chassis from the cabinet, check that the pointer is horizontal and coincides with the two horizontal reference lines on the dial. In this position the condenser should be completely closed. Connect the output meter and signal generator as follows:

Output meter — Connect across voice coil and turn volume control to maximum.
Signal generator — Connect the low side of the signal generator to the common B-bus thru a .1 mfd condenser and keep the output as low as possible, then proceed in the sequence shown on the alignment chart.

Models 7-421 W (Walnut), 7-421 V (Ivory), 7-421 X (Black)

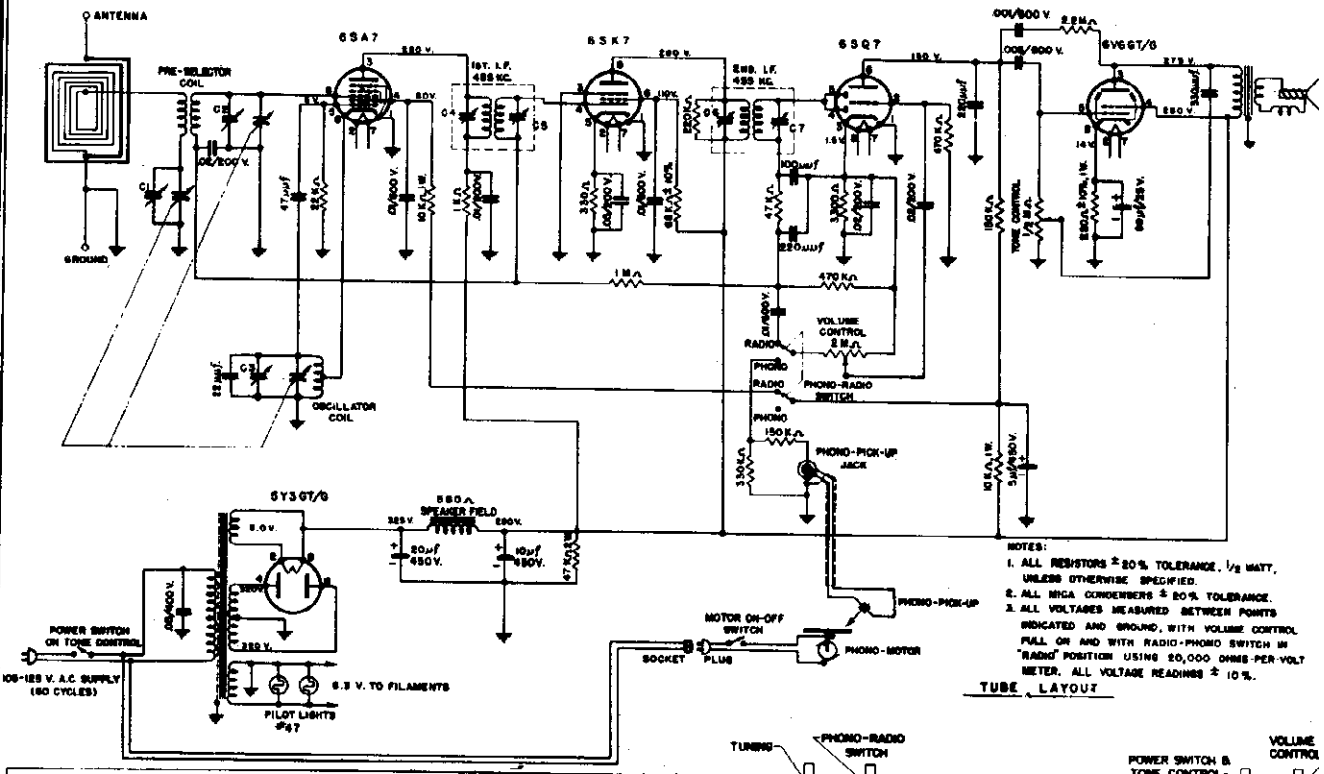
Frequency Range 535 — 1700 K.C.
Power Requirement 105 — 125 volts alternating current 50-60 cycles or 105 — 125 volts direct current
Power Consumption 30 watts

MODELS PT50, PT51 OLYMPIC RADIO & TELEV. INC.

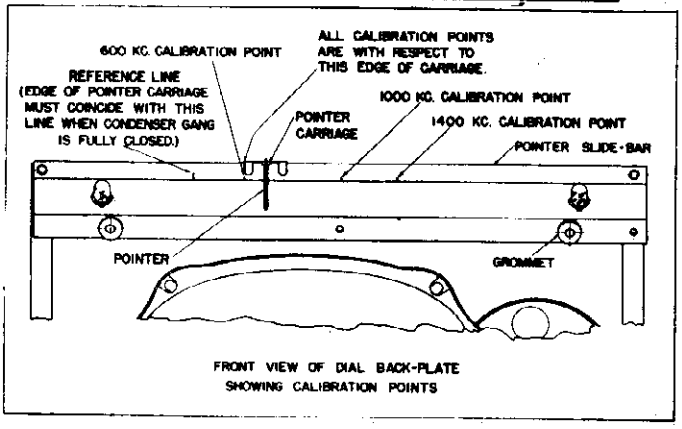


OLYMPIC RADIO & TELEV. INC.

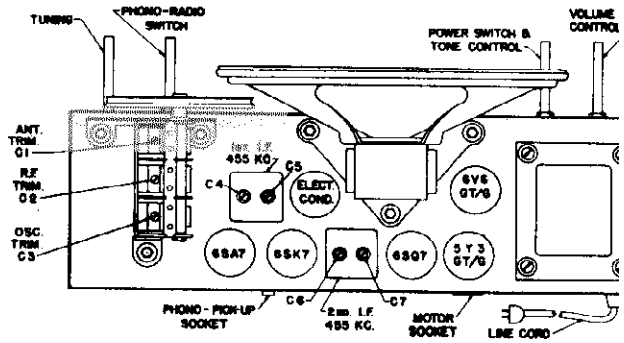
MODEL 6-5

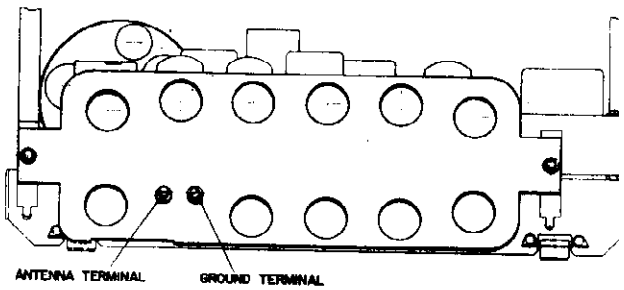


TUBE LAYOUT



FRONT VIEW OF DIAL BACK-PLATE SHOWING CALIBRATION POINTS





REAR VIEW OF RECEIVER CHASSIS WITH CABINET BACK REMOVED

Frequency Range: 530 — 1700 K.C.

Power Requirement: 105 — 125 volts a-c 60 cycles

Power Consumption: Receiver 65 Watts
Receiver with Record-Changer 70 Watts

ALIGNMENT PROCEDURE CHART

STEP	CONNECT HIGH SIDE OF SIGNAL GENERATOR TO -	SET SIGNAL GENERATOR TO -	TURN POINTER TO -	ADJUST THE FOLLOWING FOR MAXIMUM OUTPUT. (KEEP SIGNAL FROM SIGNAL GENERATOR AS LOW AS POSSIBLE.)
1	R.F. SECTION OF THE VARIABLE CONDENSER.	455 KC.	EXTREME RIGHTHAND POSITION. (CONDENSER PLATES FULLY OPEN.)	C7, C6, C5, C4 AND REPEAT IN SAME ORDER (1ST. AND 2ND. I.F. TRANSFORMERS.)
2	ANTENNA TERMINAL OF ANTENNA LOOP IN SERIES WITH 50 MMFD. COND.	1400 KC.	1400 KC. CALIBRATION POINT.	C3, C2, C1.
3		600 KC.	RESONANCE	CHECK THAT POINTER EDGE AT RESONANCE COINCIDES WITH 600 KC. CALIBRATION POINT. IF DEVIATION IS TOO LARGE REPEAT STEP 2.

MODEL 6-507 OLYMPIC RADIO & TELEV INC.

SERVICE AND ALIGNMENT INSTRUCTIONS

To service this receiver it is first necessary to remove the motorboard with the record changer and then remove the chassis through the top opening of the cabinet. To lift the entire motorboard with the changer, unfasten the six screws holding the motorboard in place, disconnect motor and pick-up plugs from chassis, and lift up. It is unnecessary to remove the screws holding the metal-shield in front. CAUTION: WHEN REMOVING THE CHANGER BE SURE TO PLACE IT IN A POSITION WHEREBY THE CHANGER MECHANISM WILL NOT BE DAMAGED.

ALIGNMENT

Equipment Required: Modulated r-f signal generator; output meter; insulated screw driver; one .1 mfd 400 volts and one 50 mmfd 400 volts condenser.

With the receiver removed from the cabinet, connect output meter across voice coil. Connect ground side of the signal generator to chassis; turn volume control fully on, and keeping the output of the signal generator as low as possible, proceed in the sequence as shown on the alignment chart.

To facilitate alignment of the receiver when removed from cabinet, calibration points are provided on the pointer slide bar (see drawing).

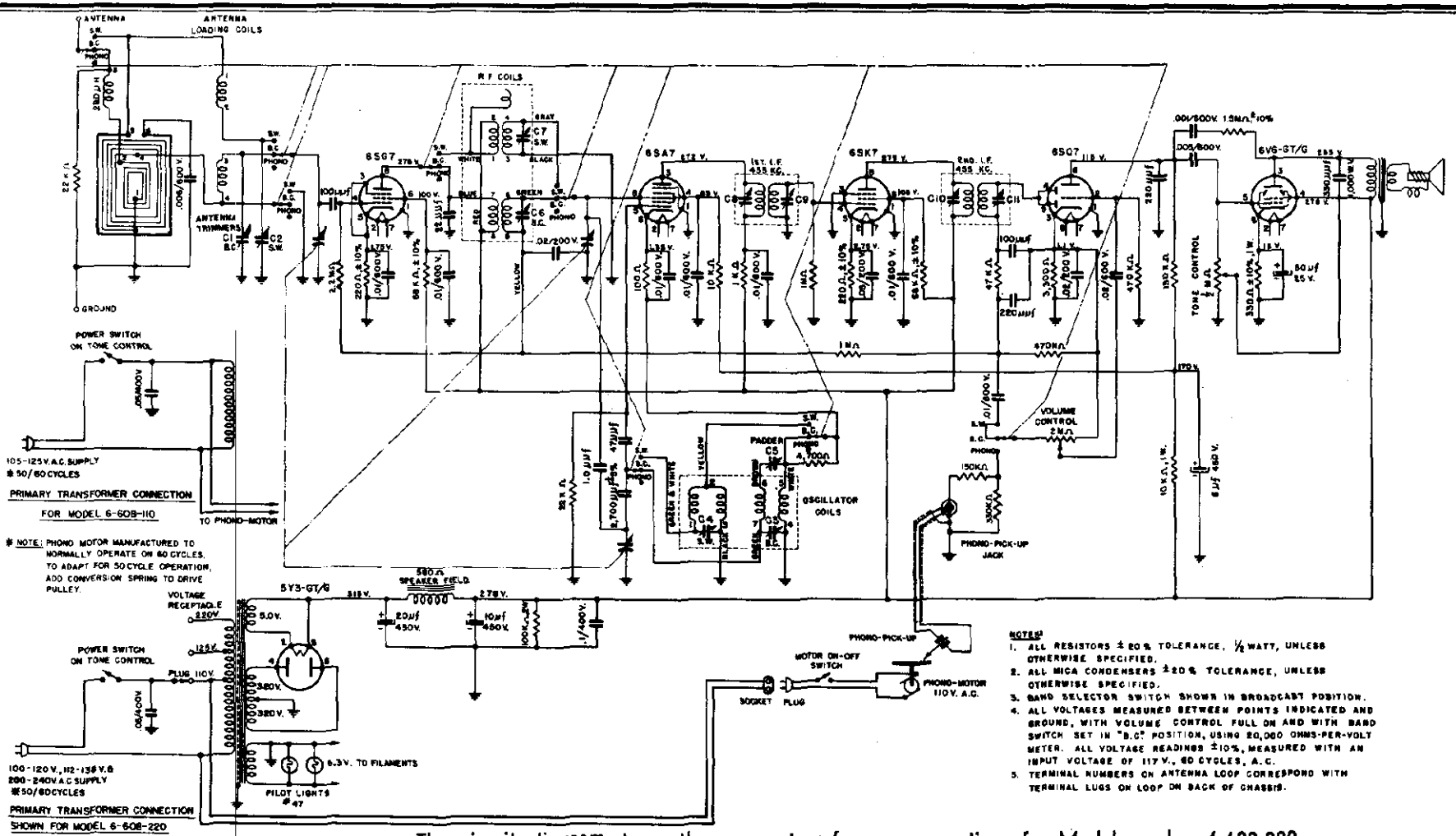
Before aligning, close the variable condenser fully counterclockwise (plates fully closed) and check that pointer carriage coincides with the "reference line" on the pointer slide bar.

REPLACEMENT PARTS

Part No.	Description
BU-187	#47 pilot light bulb 6.3^{V} (#47 Mazda)
CL-160	Coil—preselector coil
CL-210	Coil—oscillator coil
CO-158	Condenser—20/10/5 450 WV & 50/25WV electrolytic condenser
CV-145	Condenser—3-gang variable condenser
DL-366	Dial—glass dial scale
KN-418	Knob—Walnut knob marked "VOLUME"
KN-419	Knob—Walnut knob marked "OFF-ON-TONE"
KN-420	Knob—Walnut knob marked "PHONO-RADIO"
KN-421	Knob—Walnut knob marked "TUNING"
LP-179	Loop
PO-181	Pointer
PT-105	Control—2 megohm volume control
PT-106	Control—1/2 megohm tone control with power switch
RCM20A220M	Condenser— 22 mmfd ±20% mica condenser
RCM20A101M	Condenser—100 mmfd ±20% mica condenser
RCM20A221M	Condenser—220 mmfd ±20% mica condenser
RCM20A331M	Condenser—330 mmfd ±20% mica condenser
RCM20A470M	Condenser— 47 mmfd ±20% mica condenser
RCP10W2203A	Condenser—.02/200WV tubular paper condenser
RCP10W2503A	Condenser—.05/200WV tubular paper condenser
RCP10W4503A	Condenser—.05/400WV tubular paper condenser
RCP10W6102A	Condenser—.001/600WV tubular paper condenser
RCP10W6103A	Condenser—.01/600WV tubular paper condenser
RCP10W6502A	Condenser—.005/600WV tubular paper condenser
REB102M	Resistor—1000 ohms±20% 1/2 watt resistor
REB105M	Resistor—1 megohm±20% 1/2 watt resistor
REB154M	Resistor—150 kilo-ohms±20% 1/2 watt resistor
REB223M	Resistor— 22 kilo-ohms±20% 1/2 watt resistor
REB224M	Resistor— 220 kilo-ohms±20% 1/2 watt
REB225M	Resistor—2.2 megohm±20% 1/2 watt resistor
REB331M	Resistor—330 ohms±20% 1/2 watt resistor
REB332M	Resistor—3300 ohms±20% 1/2 watt resistor
REB334M	Resistor—330 kilo-ohms±20% 1/2 watt condenser
REB473M	Resistor— 47 kilo-ohms±20% 1/2 watt resistor
REB474M	Resistor—470 kilo-ohms±20% 1/2 watt resistor
REB683K	Resistor— 68 kilo-ohms±10% 1/2 watt resistor
REC103M	Resistor— 10 kilo-ohms±20% 1 watt resistor
REC221K	Resistor—220 ohms±10% 1 watt resistor
RED473M	Resistor— 47 kilo-ohms±20% 2 watt resistor
SK-325	Speaker—6" x 9" oval dynamic speaker 580 ohms field coil
SP-191	Spring—drive shaft retaining spring
SP-218	Spring—7/8" lg. pointer drive spring
ST-369	Back—cardboard back, printed
SW-141	Switch—phono-radio switch
TR-112	Transformer—power transformer
TR-118	Transformer—I.F. transformer. 1st & 2nd

Note: Dial lights may, in case of failure, be replaced without removing chassis from cabinet. Remove the three bronze plated screws which hold the metal-front-shield to the motorboard and lift the shield. The two sockets holding the pilot lights will then be accessible for replacement of the bulbs.

The pick-up is of the low pressure crystal type and is equipped with a permanent type needle which will give about 4,000 playings before requiring replacement. When first used a pronounced needle scratch will be heard which will be greatly reduced after about twenty playings. This "breaking-in-period" is essential on all needles of the permanent type in order to permit the point to become polished.



The circuit diagram shows the power transformer connections for Model number 6-608-220. A separate drawing shows transformer connections for model number 6-608-110. The taps on the transformer drawing correspond to the various points on the voltage connector socket as shown.

Be sure your voltage selector socket connection corresponds to the prevailing line voltage before servicing.
To insure proper alignment, it is suggested to use a radiated signal. To radiate a signal connect a loop of about 6" to 8"" diameter 1 turn of #14 or #12 wire across the output of the signal generator and place this loop parallel to the loop of the receiver to be aligned at a distance of about 8" or 10".

To service this receiver it is first necessary to remove the motorboard with the record changer and then remove the chassis through the top opening of the cabinet. To lift the entire motorboard with the changer, unfasten the six screws holding the motorboard in place, disconnect motor and pick-up plugs from chassis, and lift up. It is unnecessary to remove the

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MODELS 6-608-110, 6-608-220

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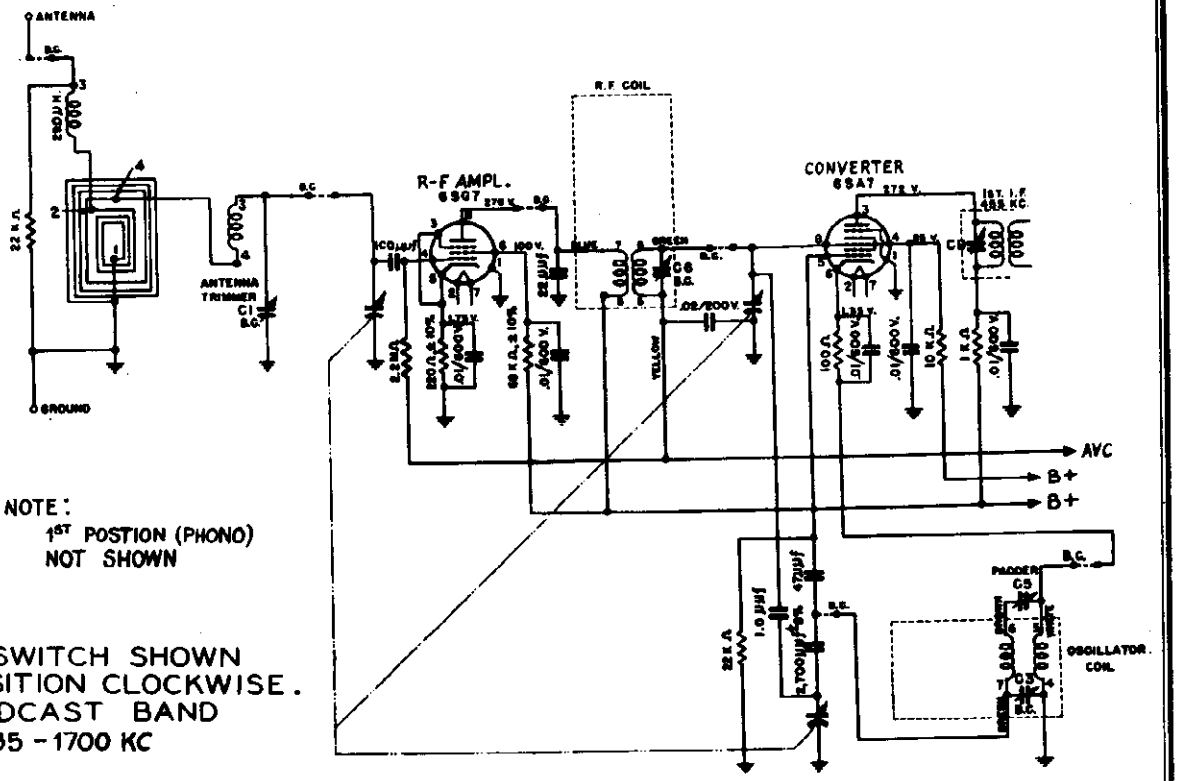
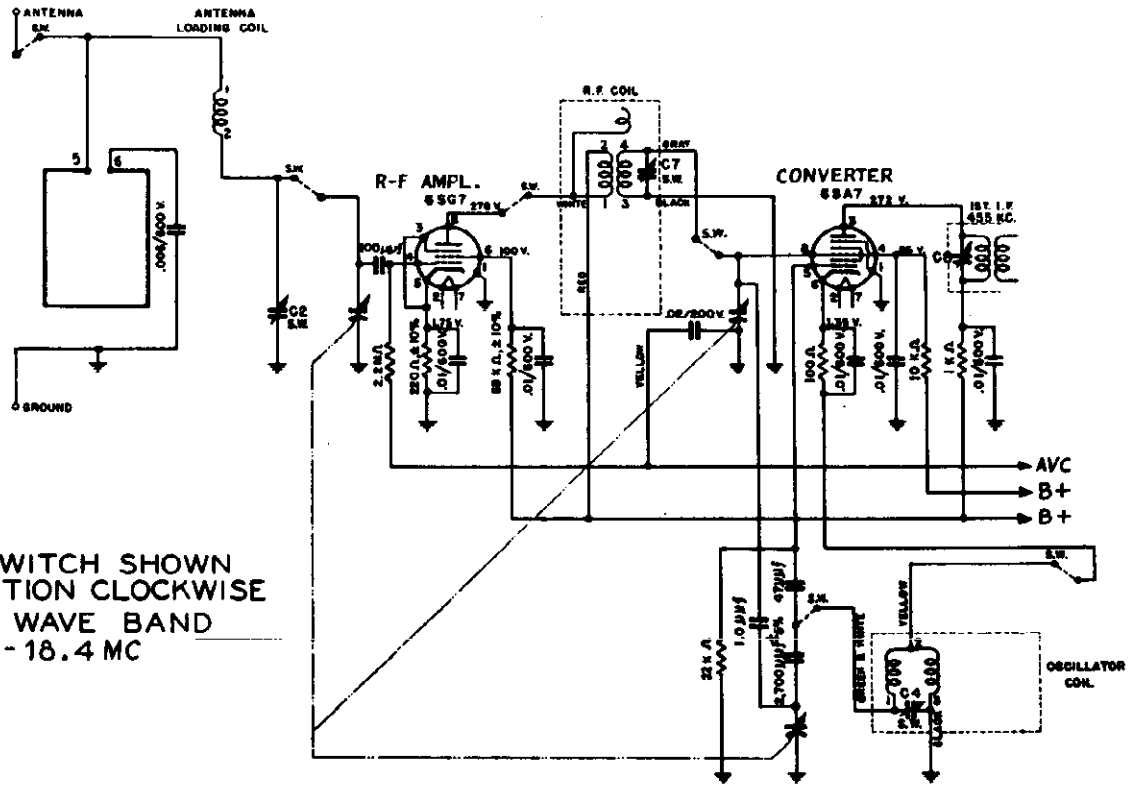


NOTE:
1ST POSTION (PHONO)
NOT SHOWN

BAND-SWITCH SHOWN
AT 2ND POSITION CLOCKWISE.
BROADCAST BAND
535 - 1700 KC



BAND-SWITCH SHOWN
AT 3RD POSITION CLOCKWISE
SHORT WAVE BAND
5.7 - 18.4 MC

OLYMPIC RADIO & TELEV. INC.

MODELS 6-608-1
6-608-220

REPLACEMENT PARTS LIST

Part No.	Description
BU 187	Pilot light bulb 6.3V (#47 Mazda)
CL 211	Coil—Antenna loading coil
CL 212	Coil—Shielded oscillator coil
CL 224	Coil—Shielded r-f coil (BC & SW)
CO 158	Condenser—20/10/5/450 W.V. & 50/25 W.V. electrolytic condenser
CO 311	Condenser—1.0 mmfd ±20% fixed condenser
CT 389	Trimmer—dual 3-35 mmfd condenser
CT 440	Padder—350-780 mmfd condenser
CV 144	Condenser—3 gang variable condenser (with pulley)
DL 718	Dial—Olympic glass dial scale
KN 418	Knob—Walnut knob marked "VOLUME"
KN 419	Knob—Walnut knob marked "OFF-ON-TONE"
KN 421	Knob—Walnut knob marked "TUNING"
KN 736	Knob—Walnut knob marked "SW-BC-PH"
LP 213	Loop—Antenna
NE 322	Needle—Permanent needle
PO 181	Pointer
PT 105	Control—Volume control
PT 106	Control—Tone control & power switch
RCM20A101M	Condenser—100 mmfd ±20% mica condenser
RCM20A220M	Condenser—22 mmfd ±20% mica condenser
RCM20A221M	Condenser—220 mmfd ±20% mica condenser
RCM20A470M	Condenser—47 mmfd ±20% mica condenser
RCM30B272J	Condenser—2700 mmfd ±5% mica condenser
RCM40A331M	Condenser—330 mmfd ±20% 1000 W.V. mica condens
RCP10W2203A	Condenser—.02/200 W.V. tubular paper condenser
RCP10W2503A	Condenser—.05/200 W.V. tubular paper condenser
RCP10W4104L	Condenser—.1/400 W.V. tubular paper condenser
RCP10W4503A	Condenser—.05/400 W.V. tubular paper condenser
RCP10W6102A	Condenser—.001/600 W.V. tubular paper condenser
RCP10W6103A	Condenser—.01/600 W.V. tubular paper condenser
RCP10W6203A	Condenser—.02/600 W.V. tubular paper condenser
RCP10W6502A	Condenser—.005/600 W.V. tubular paper condenser
RCP10W6602K	Condenser—.006/600 W.V. tubular paper condenser
REB 101M	Resistor—100 ohms ±20% ½ watt resistor
REB 102M	Resistor—1000 ohms ±20% ½ watt resistor
REB 103M	Resistor—10,000 ohms ±20% ½ watt resistor
REB 105M	Resistor—1 megohm ±20% ½ watt resistor
REB 154M	Resistor—150,000 ohms ±20% ½ watt resistor
REB 155K	Resistor—1.5 megohms ±10% ½ watt resistor
REB 221K	Resistor—220 ohms ±10% ½ watt resistor
REB 223M	Resistor—22,000 ohms ±20% ½ watt resistor
REB 225M	Resistor—2.2 megohms ±20% ½ watt resistor
REB 332M	Resistor—3300 ohms ±20% ½ watt resistor
REB 334M	Resistor—330,000 ohms ±20% ½ watt resistor
REB 472M	Resistor—4700 ohms ±20% ½ watt resistor
REB 473M	Resistor—47,000 ohms ±20% ½ watt resistor
REB 474M	Resistor—470,000 ohms ±20% ½ watt resistor
REB 683K	Resistor—68,000 ohms ±10% ½ watt resistor
REC 103M	Resistor—10,000 ohms ±20% 1 watt resistor
REC 331K	Resistor—330 ohms ±10% 1 watt resistor
RED 104M	Resistor—100,000 ohms ±20% 2 watt resistor
SK 325	Speaker—6" x 9" oval dynamic speaker
SP 191	Spring—drive shaft retaining spring
SP 218	Spring—⅞" long pointer drive spring
SP 633	Spring—conversion spring 60 to 50 cycles for motor K228250
SP 634	Spring—conversion spring 60 to 50 cycles for motor K228131
ST 369	Back—masonite back
SW 140	Switch—Band/Phono switch
TR 112	Transformer—Power transformer (for 6-608-110 only)
TR 523	Transformer—Power transformer (for 6-608-220 only)
TR 118	Transformer—1st & 2nd I.F. transformer (455 k-c)

ALIGNMENT

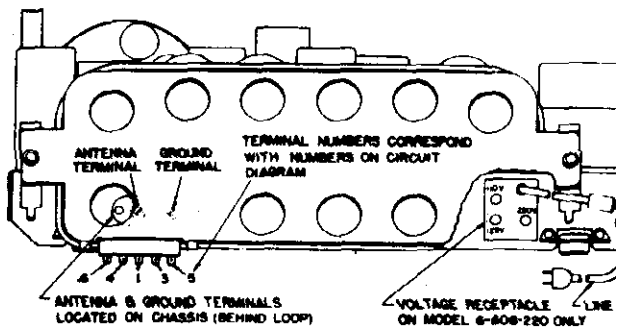
Equipment Required: Modulated r-f signal generator; output meter; insulated screwdriver; one .1 mfd 400 volts and one 50 mmfd 400 volts condenser.

With the receiver removed from the cabinet, connect output meter across voice coil. Connect ground side of the signal generator to chassis; turn volume control fully on and keeping the output of the signal generator as low as possible, proceed in the sequence as shown on the alignment chart.

To facilitate alignment of the receiver when removed from cabinet, calibration points are provided on the pointer slide bar (see drawing).

Before aligning, close the variable condenser fully counterclockwise (plates fully closed) and check that pointer carriage coincides with the "reference line" on the pointer slide bar.

REAR VIEW OF RECEIVER CHASSIS WITH CABINET BACK REMOVED



Frequency Range: 535-1700 kc and 5.7 18.4

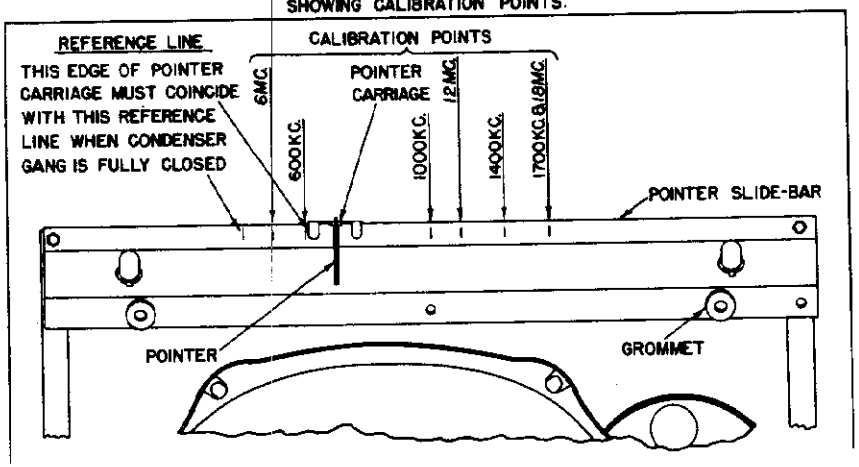
Power Requirement: for Model 6-608-11
105-125 Volts a-c 50 or 60 cycle
for Model 6-608-220 100-120 Vol
or 112-130 Volts or 200-240 Volts a-c 50 or 60 cy

Power Consumption: Receiver 70 Watts
Record Changer 85 Watts

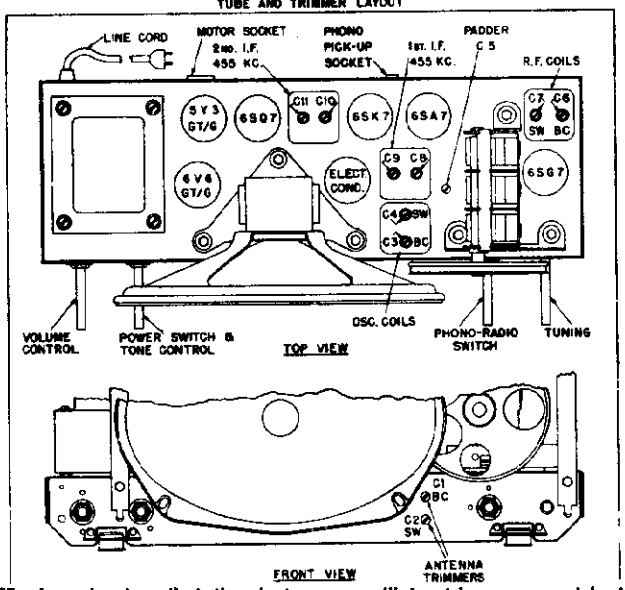
ALIGNMENT PROCEDURE CHART

STEP	SET BAND SWITCH ON	CONNECT HIGH SIDE OF SIGNAL GENERATOR TO-	SET SIGNAL GENERATOR TO-	TURN POINTER TO-	ADJUST THE FOLLOWING FOR MAXIMUM OUTPUT. (KEEP SIGNAL FROM SIGNAL GENERATOR AS LOW AS POSSIBLE).
1	B.C.	R.F. SECTION OF VARIABLE CONDENSER OR PIN 4 OF THE 6SK7 TUBE IN SERIES WITH A .1 MFD, 400 VOLT CONDENSER.	455 KC.	EXTREME RIGHT HAND POSITION. (CONDENSER PLATES FULLY OPEN).	C11 AND C10 (2nd. I.F. TRANSFORMER)
2	B.C.	R.F. SECTION OF VARIABLE CONDENSER OR PIN 8 OF THE 6SA7 TUBE IN SERIES WITH A .1 MFD, 400 VOLT CONDENSER.	455 KC.	EXTREME RIGHT HAND POSITION. (CONDENSER PLATES FULLY OPEN).	C9 AND C8 (1st. I.F. TRANSFORMER)
3	B.C.	REPEAT STEPS 1 AND 2			
4	B.C.	USE RADIATED SIGNAL (CONNECT BOTH SIDES OF SIGNAL GENERATOR TO RADIATION LOOP).	1700 KC.	1700 KC. CALIBRATION POINT ON DIFFUSER PLATE.	C3 (OSCILLATOR TRIMMER)
5	B.C.		1400 KC.	RESONANCE, APPROXIMATELY 1400 KC. CALIBRATION POINT ON DIFFUSER PLATE.	C6 AND C1 (R.F. AND ANTENNA TRIMMERS)
6	B.C.		600 KC.	RESONANCE, APPROXIMATELY 600 KC. CALIBRATION POINT ON DIFFUSER PLATE.	C5 (PADDER) ROCK VARIABLE FOR MAXIMUM SIGNAL
7	B.C.	REPEAT STEPS 4, 5 AND 6			
8	S.W.		18 MC.	18 MC. CALIBRATION POINT ON DIFFUSER PLATE	C4 (OSCILLATOR TRIMMER) SECOND PEAK FROM TIGHT POSITION. C7 (R.F. TRIMMER) FIRST PEAK FROM TIGHT POSITION. C2 (ANTENNA TRIMMER)
9	S.W.		6 MC.	RESONANCE	CHECK THAT POINTER (AT RESONANCE) COINCIDES WITH 6 MC. CALIBRATION POINT. IF NOT REPEAT STEP 8.
10	S.W.	REPEAT STEPS 8 AND 9			

FRONT VIEW OF DIAL BACK-PLATE SHOWING CALIBRATION POINTS.



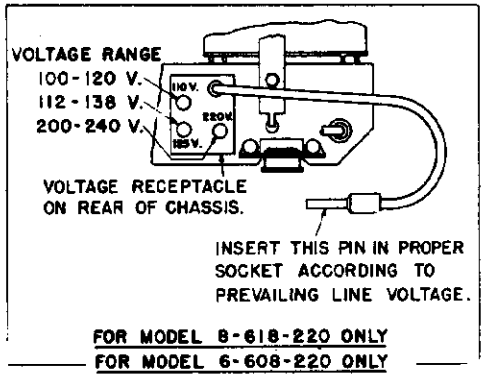
TUBE AND TRIMMER LAYOUT



NOTE: In order to adjust the short wave oscillator trimmer accurately to the fundamental frequency and not to the image signal, turn the trimmer first to the maximum capacity position (fully tight). From this position loosen the trimmer through one peak indication on the output meter until a second peak is obtained. Adjust for maximum output on this second peak.

To check whether this procedure has been accurately performed, ascertain that an image signal can be received (much weaker) by tuning the signal generator to a frequency 910 kilocycles above the alignment frequency.

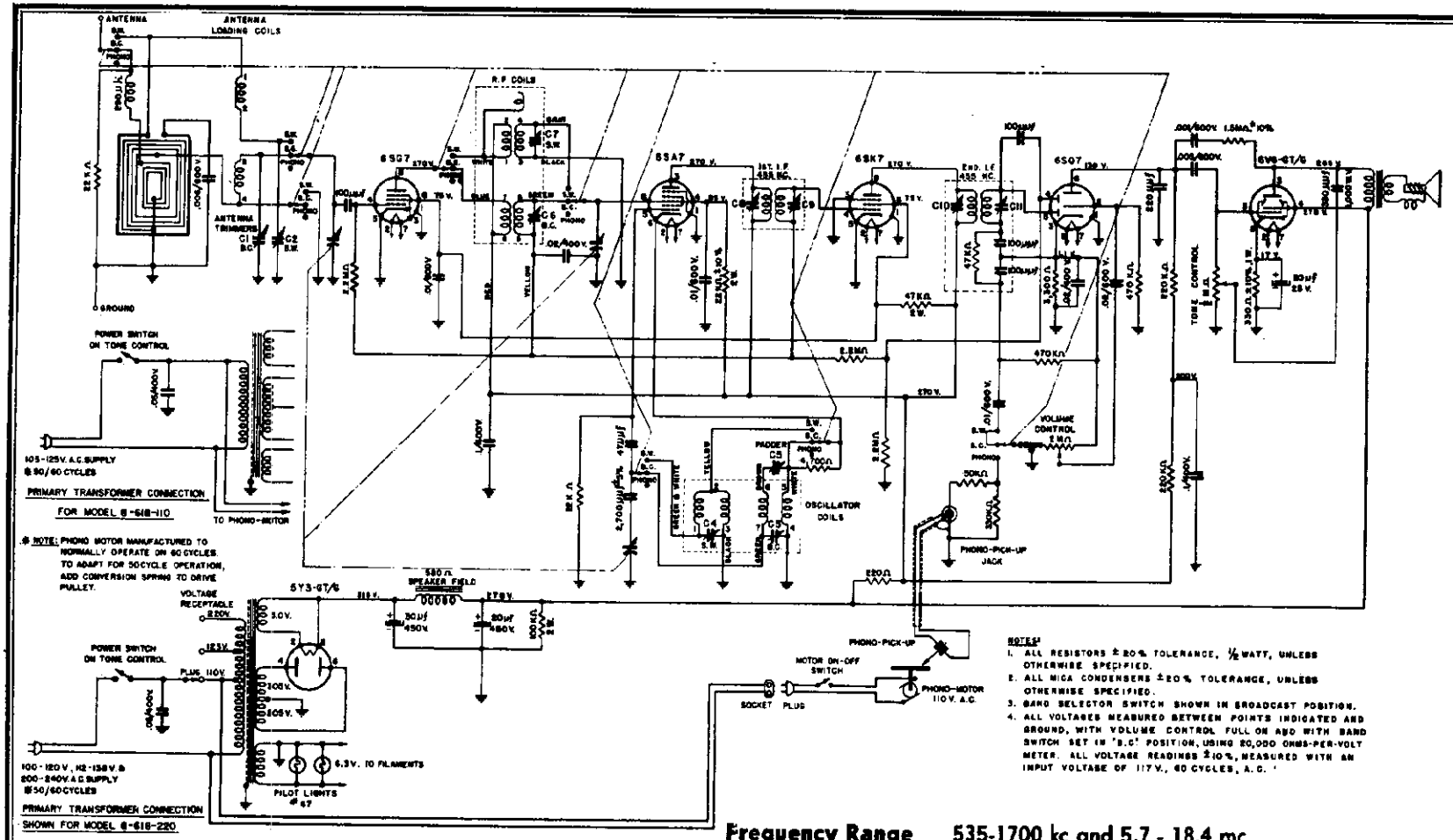
REAR VIEW OF CHASSIS SHOWING VOLTAGE RECEPTACLE



FOR MODEL 8-618-220 ONLY
FOR MODEL 6-608-220 ONLY

Note: Dial lights may, in case of failure, be replaced without removing chassis from cabinet. Remove the three bronze plated screws which hold the metal-front-shield to the motorboard and lift the shield. The two sockets holding the pilot lights will then be accessible for replacement of the bulbs.

The pick-up is of the low pressure crystal type and is equipped with a permanent type needle which will give about 4,000 playings before requiring replacement. When first used a pronounced needle scratch will be heard which will be greatly reduced after about twenty playings. This "breaking in period" is essential on all needles of the permanent type in order to permit the point to become polished.



NOTES:
1. ALL RESISTORS ±20% TOLERANCE, ½ WATT, UNLESS OTHERWISE SPECIFIED.
2. ALL MICA CONDENSERS ±20% TOLERANCE, UNLESS OTHERWISE SPECIFIED.
3. BAND SELECTOR SWITCH SHOWN IN BROADCAST POSITION.
4. ALL VOLTAGES MEASURED BETWEEN POINTS INDICATED AND GROUND, WITH VOLUME CONTROL FULL ON AND WITH BAND SWITCH SET IN "B.C." POSITION, USING 20,000 OHMS-PER-VOLT METER. ALL VOLTAGE READINGS ±10%, MEASURED WITH AN INPUT VOLTAGE OF 117 V., 60 CYCLES, A.C.

Frequency Range 535-1700 kc and 5.7 - 18.4 mc.

Power Requirement 105-125 volts 60 cycles a-c.

Power Consumption Receiver—70 watts. Receiver with Record Changer—85 watts.

ALIGNMENT

Equipment Required: Modulated r-f signal generator; output meter; insulated screw driver; one .1 mfd 400 volt condenser; one 400 ohm resistor, and one radiation loop.

With the receiver removed from the cabinet, connect output meter across voice coil. Connect ground side of the signal generator to chassis; turn volume control fully on, and keeping the output of the signal generator as low as possible, proceed in the sequence as shown on the alignment chart.

To facilitate alignment of the receiver when removed from cabinet, calibration points are provided on the pointer slide bar (see drawing).

Before aligning, close the variable condenser fully counterclockwise (plates fully closed) and check that pointer carriage

REPLACEMENT PARTS LIST

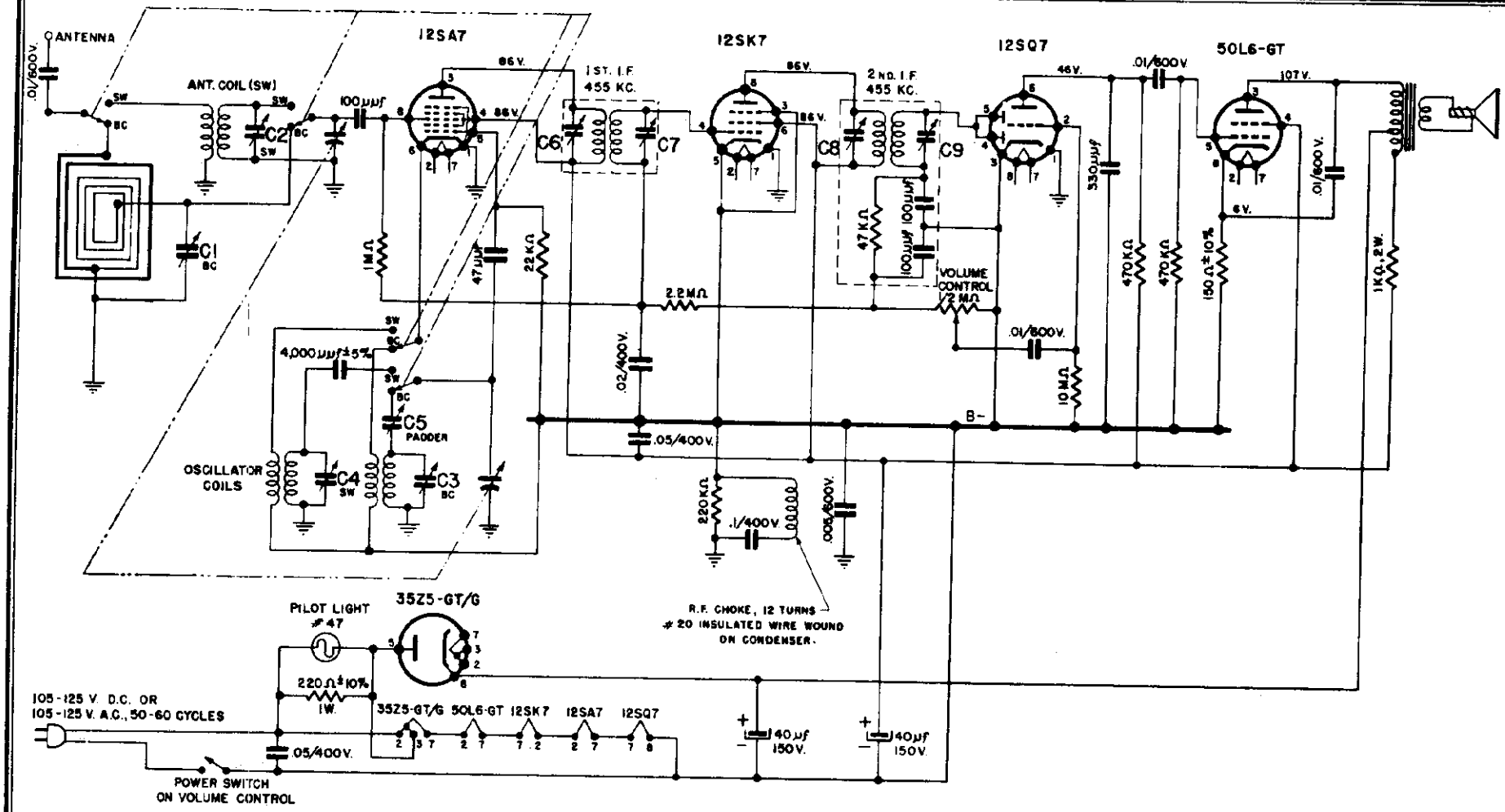
PART NUMBER	DESCRIPTION
BU-187	Bulb—#47 6.3 volt pilot light bulb
CA-865	Cabinet—
CL-211	Coil—antenna loading coil
CL-212	Coil—oscillator coil
CL-224	Coil—r-f coil
CO-715	Condenser—.05/400 W.V. molded paper condenser
CO-768	Condenser—30+20/450 W.V. & 20/25 W.V. electrolytic cond.
CT-389	Condenser—3-35 mmfd dual trimmer condenser
CT-440	Condenser—350-780 mmfd padder condenser
CV-144	Condenser—3 section variable condenser gang
DL-718	Dial—glass dial scale
KN-418	Knob—walnut knob marked "Volume"
KN-419	Knob—walnut knob marked "Off-On-Tone"
KN-421	Knob—walnut knob marked "Tuning"
KN-736	Knob—walnut knob marked "SW-BC-PH"
LP-213	Loop—loop-antenna
PO-181	Pointer—
PT-105	Control—2 megohm volume control
PT-106	Control—½ megohm tone control with Off-On switch
RCM20A101M	Condenser—100 mmfd ±20% mica condenser
RCM20A221M	Condenser—220 mmfd ±20% mica condenser
RCM20A470M	Condenser—47 mmfd ±20% mica condenser
RCM30B272J	Condenser—2700 mmfd ±5% mica condenser
RCM40A331M	Condenser—330 mmfd ±20% mica condenser (1000 W.V.)
RCP10W4104L	Condenser—.1/400 W.V. tubular paper condenser
RCP10W4203A	Condenser—.02/400 W.V. tubular paper condenser
RCP10W6102A	Condenser—.001/600 W.V. tubular paper condenser
RCP10W6103A	Condenser—.01/600 W.V. tubular paper condenser
RCP10W6203A	Condenser—.02/600 W.V. tubular paper condenser
RCP10W6502A	Condenser—.005/600 W.V. tubular paper condenser
RCP10W6602K	Condenser—.006/600 W.V. tubular paper condenser
REB-154M	Resistor—150,000 ohms ±20% ½ watt resistor
REB-155K	Resistor—1.5 megohms ±10% ½ watt resistor
REB-221M	Resistor—220 ohms ±20% ½ watt resistor
REB-223M	Resistor—22,000 ohms ±20% ½ watt resistor
REB-224M	Resistor—220,000 ohms ±20% ½ watt resistor
REB-225M	Resistor—2.2 megohms ±20% ½ watt resistor
REB-332M	Resistor—3300 ohms ±20% ½ watt resistor
REB-334M	Resistor—330,000 ohms ±20% ½ watt resistor
REB-472M	Resistor—4700 ohms ±20% ½ watt resistor
REB-474M	Resistor—470,000 ohms ±20% ½ watt resistor
REC-331K	Resistor—330 ohms ±10% 1/watt resistor
RED-104M	Resistor—100,000 ohms ±20% 2 watt resistor
RED-223K	Resistor—22,000 ohms ±10% 2 watt resistor
RED-473M	Resistor—47,000 ohms ±20% 2 watt resistor
SK-325	Speaker—6"x9" oval electrodynamic speaker
SO-189	Socket—pilot light socket assembly
SP-191	Spring—drive shaft retaining spring
SP-218	Spring—pointer drive spring
ST-369	Back—masonite back
SW-140	Switch—band switch
TR-112	Transformer—95 mils power transformer for 110 V. operation
TR-523	Transformer—power transformer for 220 V. operation
TR-781	Transformer—455 kc input I.F. transformer
TR-782	Transformer—455 kc output I.F. transformer

SERVICE AND ALIGNMENT INSTRUCTIONS

To insure proper alignment a radiated signal will be required during part of the alignment procedure. To radiate a signal connect a loop of about 6" to 8" diameter 1 turn of #14 or #12 wire across the output of the signal generator and place this loop parallel to the loop of the receiver to be aligned at a distance of about 8" or 10".

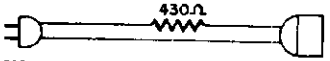
To service this receiver it is first necessary to remove the motorboard with the record changer and then remove the chassis through the top opening of the cabinet. To lift the entire motorboard with the changer, unfasten the six screws holding the motorboard in place, disconnect motor and pick-up plugs from chassis, and lift up.

CAUTION: WHEN REMOVING THE CHANGER BE SURE TO PLACE IT IN A POSITION WHEREBY THE CHANGER MECHANISM WILL NOT BE DAMAGED.



LEGEND

⏚ CHASSIS GROUND



FOR 230 V. D.C. OR 230 V. 50-60 CYCLES A.C. OPERATION, USE LINE ADAPTER CORD, PART LC-550.

NOTES:

1. ALL RESISTORS ± 20% TOLERANCE, 1/2 WATT, UNLESS OTHERWISE SPECIFIED.
2. ALL MICA CONDENSERS ± 20% TOLERANCE, UNLESS OTHERWISE SPECIFIED.
3. ALL VOLTAGES MEASURED BETWEEN POINTS INDICATED AND B-, WITH VOLUME CONTROL FULL ON, AND WITH BAND SWITCH SET IN "BC" POSITION, USING 20,000 OHMS-PER-VOLT METER. ALL READINGS ± 10%, MEASURED WITH INPUT VOLTAGE OF 117 V., 60 CYCLES A.C.

MODELS 7-435W (Walnut)—7-435V (Ivory)

Frequency Range Broadcast 540 k-c to 1610 k-c—Shortwave 4.75 m-c to 16.1 m-c

Power Requirement 105-125 Volts d-c or 50 to 60 cycles a-c

Power Consumption 30 watts

ALIGNMENT PROCEDURE CHART

STEP	SET BAND SWITCH ON	CONNECT HIGH SIDE OF SIGNAL GENERATOR TO—	SET SIGNAL GENERATOR TO—	TURN RECEIVER DIAL TO—	ADJUST THE FOLLOWING FOR MAXIMUM OUTPUT. (KEEP SIGNAL FROM SIGNAL GENERATOR AS LOW AS POSSIBLE).
1	B.C.	R.F. SECTION OF VARIABLE CONDENSER OR PIN 4 OF THE 12SK7 TUBE IN SERIES WITH A .1 MFD. 400 VOLT CONDENSER.	455 KC.	FULL CLOCKWISE POSITION (CONDENSER PLATES FULLY OPEN)	C8 AND C9 (2nd. I.F. TRANSFORMER)
2	B.C.	R.F. SECTION OF VARIABLE CONDENSER OR PIN 6 OF THE 12SA7 TUBE IN SERIES WITH A .1MFD. 400 VOLT CONDENSER.	455 KC.	FULL CLOCKWISE POSITION (CONDENSER PLATES FULLY OPEN).	C6 AND C7 (1st. I.F. TRANSFORMER)
3	B.C.	REPEAT STEPS 1 AND 2			
4	B.C.	USE RADIATED SIGNAL (CONNECT BOTH SIDES OF SIGNAL GENERATOR TO RADIATION LOOP).	1600 KC.	1600 KC. (160 ON DIAL)	C3 (OSCILLATOR TRIMMER)
5	B.C.		1400 KC.	MAXIMUM SIGNAL (APPROX. 140 ON DIAL)	C1 (ANTENNA TRIMMER)
6	B.C.		600 KC.	MAXIMUM SIGNAL (APPROX. 60 ON DIAL)	C5 (PADDER) ROCK VARIABLE FOR MAXIMUM SIGNAL
7	B.C.	REPEAT STEPS 4, 5, AND 6			
8	S.W.	ANTENNA WIRE ON LOOP IN SERIES WITH A 400 OHM RESISTOR.	15 MC.	15 MC. (APPROX. 15 ON DIAL)	C4 (OSCILLATOR TRIMMER) SECOND PEAK FROM TIGHT POSITION C2 (ANTENNA TRIMMER)
9	S.W.		5.5 MC.	RESONANCE (APPROX. 5.5 ON DIAL)	CHECK THAT POINTER (AT RESONANCE) COINCIDES WITH 5.5 MC. CALIBRATION POINT ON DIAL. IF NOT REPEAT STEP 8.

ALIGNMENT INSTRUCTIONS

Equipment required: Modulated r-f signal generator, output meter, insulated screw driver, two .1mfd. 400 V. Condensers, one 400 ohms resistor.

To align the receiver it is necessary to remove the chassis from the cabinet, check that the pointer is horizontal and coincides with the two horizontal reference lines on the dial. In this position the condenser should be completely closed. Turn volume control to maximum and connect the output meter across the voice coil.

Then connect the low side of the signal generator to the receiver chassis through a .1 mfd. condenser and keeping the output as low as possible proceed in the sequence as shown on the alignment chart.

To insure alignment a radiated signal will be required during part of the alignment procedure. To radiate a signal connect a loop of about 6" to 8" diameter, (one turn of #14 or #12 wire) across the output of the signal generator and place this loop parallel to the loop of the receiver to be aligned, at a distance of about 8" or 10".

OLYMPIC RADIO & TELEV. INC. MODELS 7-435V, 7-4

REPLACEMENT PARTS

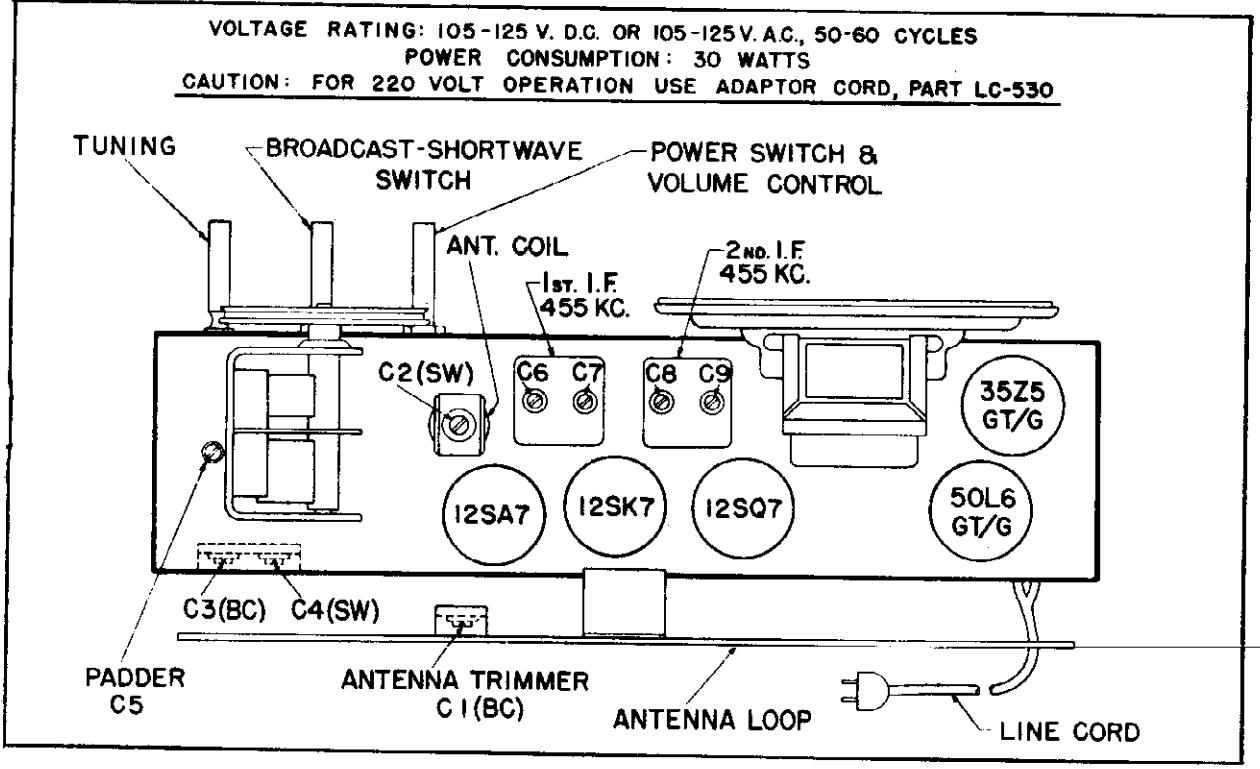
Part No.	Description
BU-187	Bulb—#47 Mazda pilot light bulb
CA-327W	Cabinet—walnut bakelite cabinet
CA-327V	Cabinet—ivory bakelite cabinet
CL-933	Coil—broadcast and shortwave oscillator coil
CL-940	Coil—shortwave antenna coil
CO-107	Condenser—40/40/150 W.V. electrolytic condenser
CT-389	Condenser—3-35 mmfd. dual trimmer condenser
CT-440	Condenser—350-780 mmfd. padder condenser
CT-939	Condenser—3-35 mmfd. trimmer condenser
CV-772	Condenser—2 section ganged variable condenser
DL-934	Dial— dial scale
KN-1077	Knob—walnut knob marked "Off-On-Volume"
KN-1078	Knob—walnut knob marked "Tuning"
KN-1085	Knob—walnut knob marked "BC-SW"
KN-1103	Knob—ivory knob marked "Off-On-Volume"
KN-1104	Knob—ivory knob marked "Tuning"
KN-1105	Knob—ivory knob marked "BC-SW"
LP-937	Loop—loop antenna
PO-259W	Pointer—moulded pointer walnut
PO-259V	Pointer—molded pointer ivory
PT-102	Control—1/2 megohm volume control with off-on switch
RCM20A101M	Condenser—100 mmfd. ±20% mica condenser
RCM20A331M	Condenser—330 mmfd. ±20% mica condenser
RCM20A470M	Condenser—47 mmfd. ±20% mica condenser

*When ordering be sure to specify with r-f choke

Part No.	Description
RCM30B402J	Condenser—4000 mmfd. ±5% mica con ser
RCP10W4104L	Condenser—.1/400 W.V. tubular paper denser*
RCP10W4203A	Condenser—.02/400 W.V. tubular paper denser
RCP10W4503A	Condenser—.05/400 W.V. tubular paper denser
RCP10W6103A	Condenser—.01/600 W.V. tubular paper denser
RCP10W6502A	Condenser—.005/600 W.V. tubular paper denser
REB-105M	Resistor—1 megohm ±20% 1/2 watt resist
REB-106M	Resistor—10 megohms ±20% 1/2 watt resi
REB-151K	Resistor—150 ohms ±10% 1/2 watt resistor
REB-223M	Resistor—22,000 ohms ±20% 1/2 watt resi
REB-224M	Resistor—220,000 ohms ±20% 1/2 watt sistor
REB-225M	Resistor—2.2 megohms ±20% 1/2 watt sistor
REB-474M	Resistor—470,000 ohms ±20% 1/2 watt sistor
REC-221K	Resistor—220 ohms ±10% 1 watt resistor
RED-102M	Resistor—1000 ohms ±20% 2 watt resistor
SK-838	Speaker—5" p.m. speaker
SP-191	Spring—drive shaft retaining spring
SP-295	Spring—dial drive spring
ST-255-1	Back—cardboard back
SW-839	Switch—4 P.D.T. band switch
TR-707	Transformer—455 k-c I.F. input transformer
TR-708	Transformer—455 k-c I.F. output transforme

TUBE LAYOUT

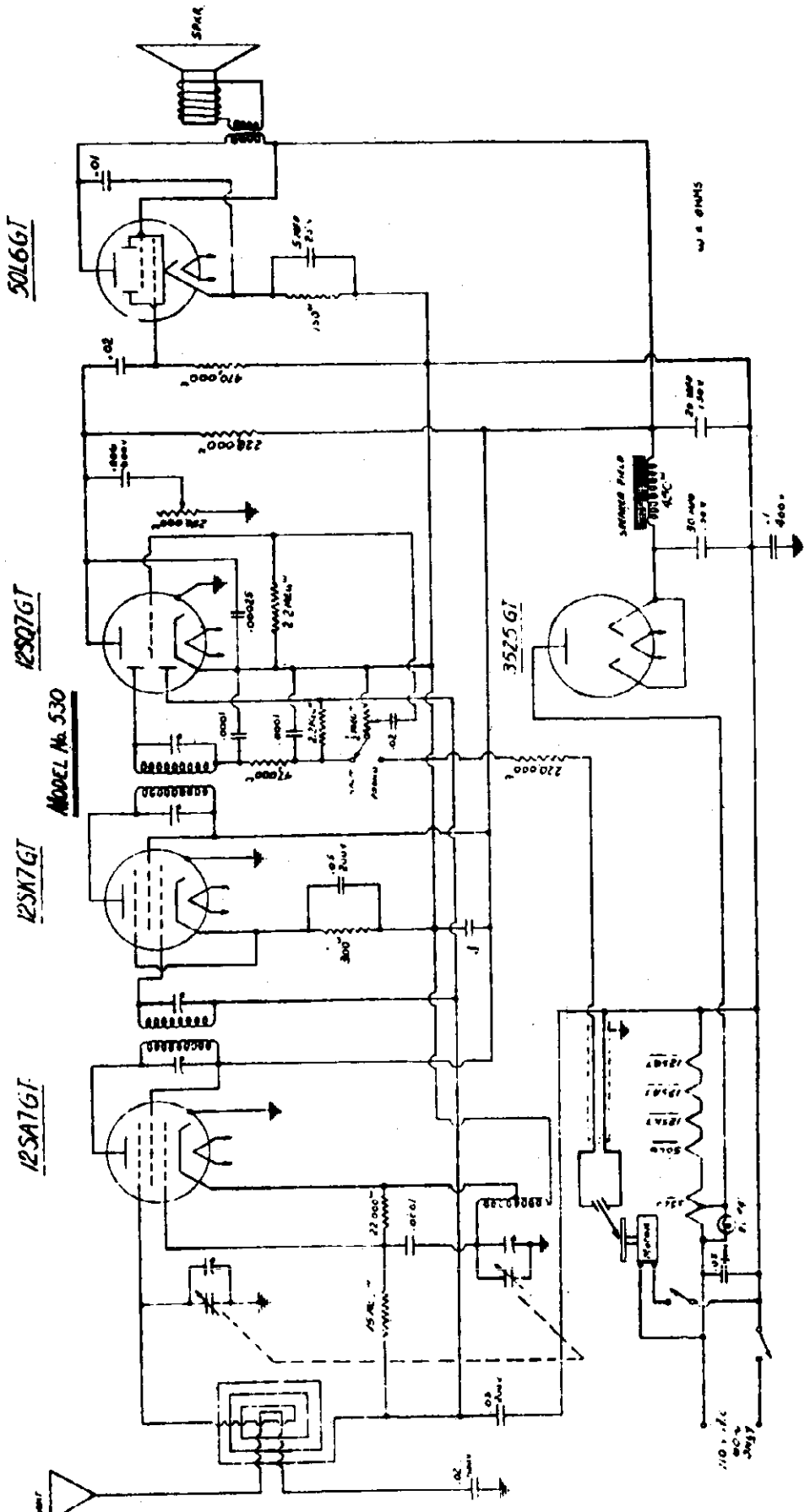
VOLTAGE RATING: 105-125 V. D.C. OR 105-125 V. A.C., 50-60 CYCLES
POWER CONSUMPTION: 30 WATTS
CAUTION: FOR 220 VOLT OPERATION USE ADAPTOR CORD, PART LC-530

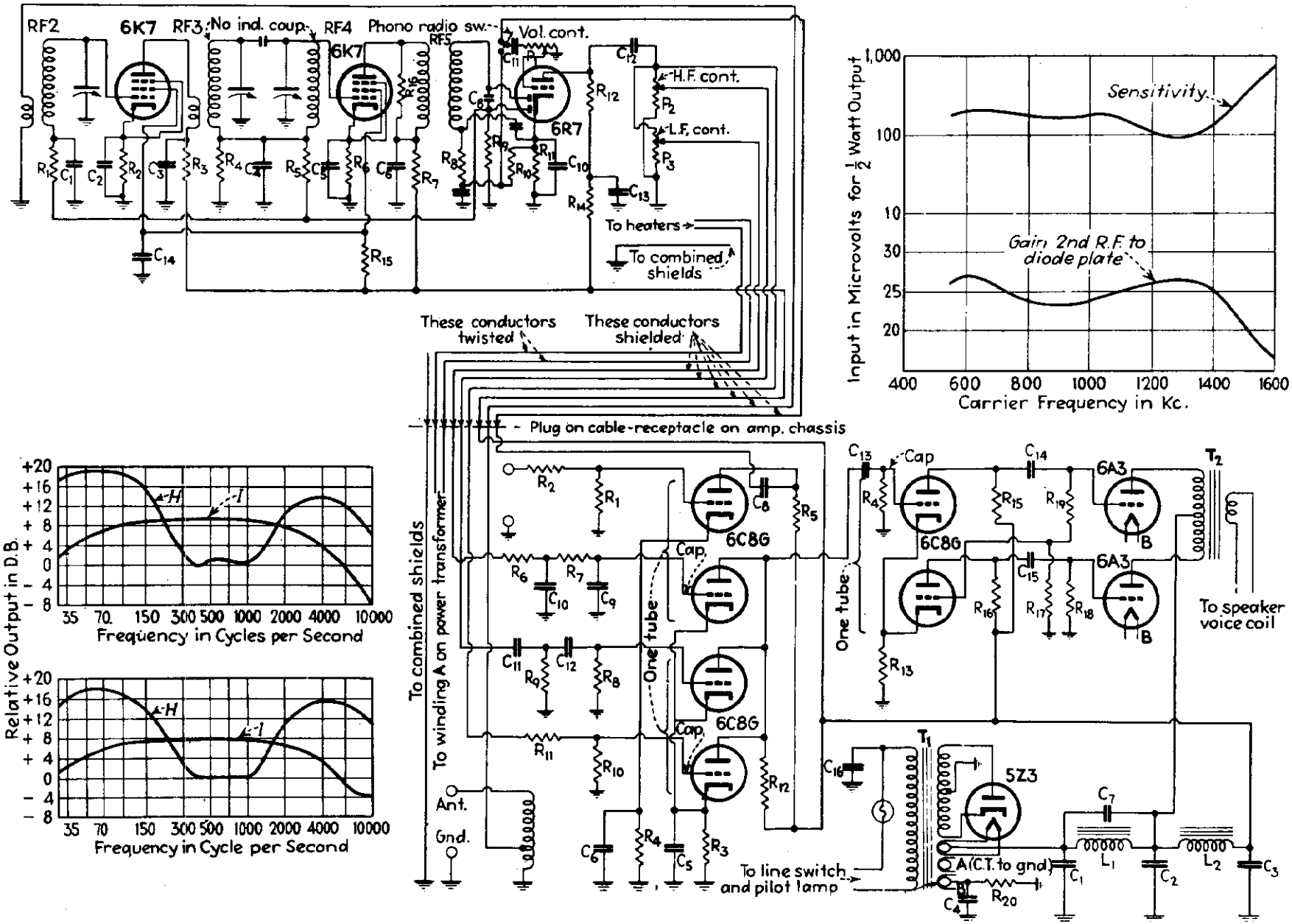


TUNING

To place this receiver in operation insert the line plug into a suitable electric outlet of 105-125 volts d-c or 50-60 cycle a-c. *For operation on 220 volts d-c or 50-60 a-c an adapter cord* our part number LC 530 *must be inserted* between the line plu and the electric outlet.

MODEL 530 OLYMPIC RADIO & TELEV. INC.



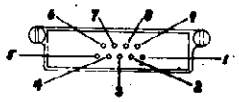


PACENT ENGINEERING CORP.

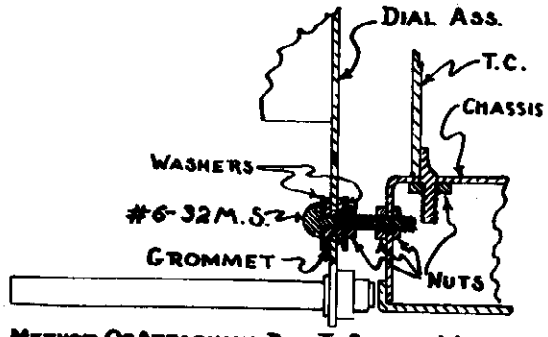
MODEL 9

MODEL 9-R

PACENT ENGINEERING CORP.

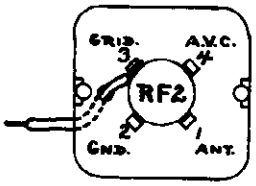


TUNER SOCKET CONNECTIONS	
1	HEATER
2	GROUND
3	HIGH FREQ.
4	B +
5	PHONO OUT
6	ANTENNA
7	MIDDLE FREQ.
8	LOW FREQ.
9	HEATER

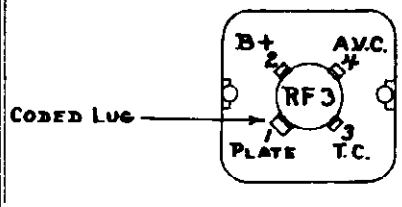


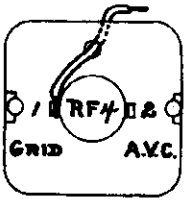
METHOD OF ATTACHING DIAL TO CHASSIS WHICH AVOIDS BINDING TUNING CONDENSER SHAFT

ANTENNA COIL

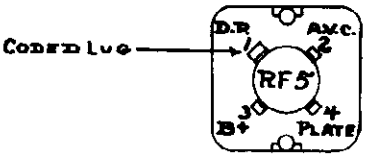


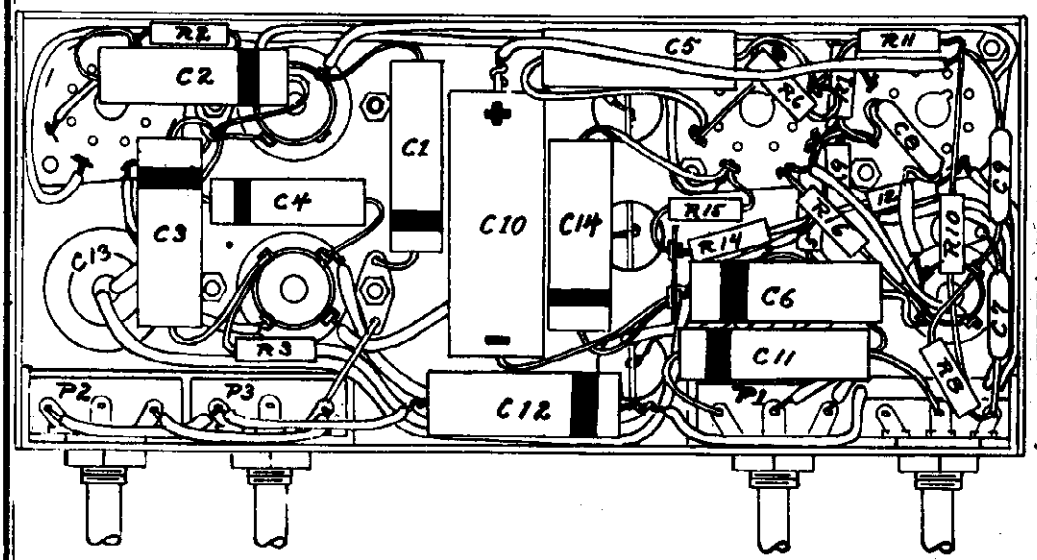
BAND PASS INTER STAGE COILS





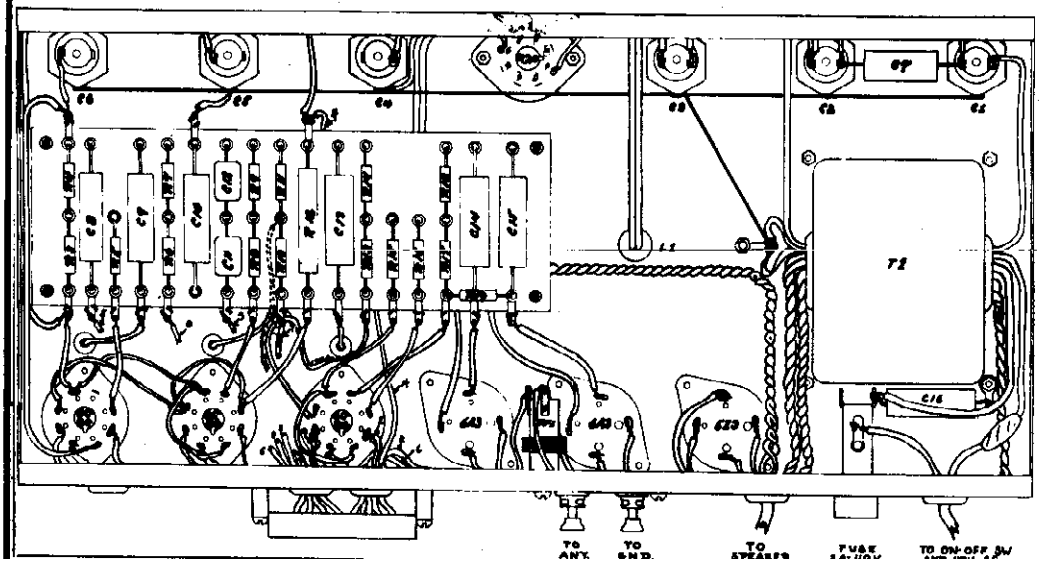
BROAD BAND TRANS.





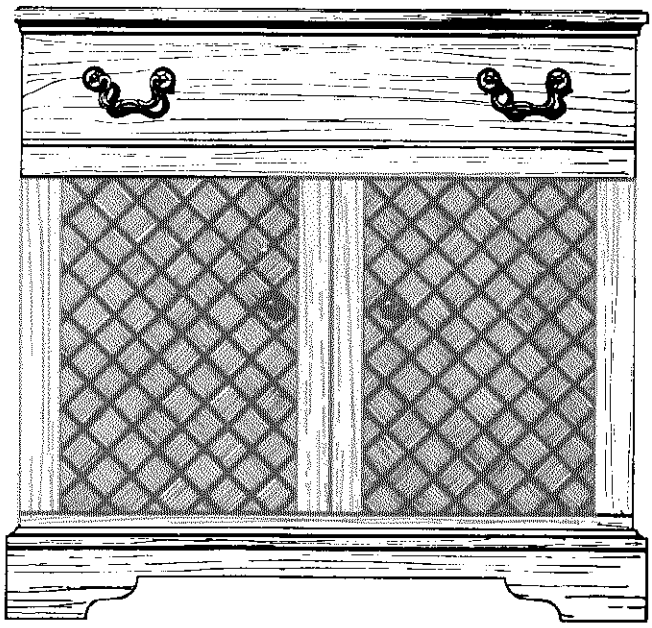
TUNER CONSTANTS

R1	1 M ½W	C1	.005MFD 600V
R2	400 "	C2	0.05 " 200V
R3	10K "	C3	0.05 " 400V
R4	0.25M "	C4	0.05 " 200V
R5	1 M "	C5	0.05 " 200V
R6	400 "	C6	0.05 " 400V
R7	10K "	C7	FILAMENT FILTER
R8	25K "	C8	.05 " "
R9	1 M "	C9	.05 " "
R10	0.25M "	C10	1 MFD 25V
R11	4K "	C11	0.05 " 400V
R12	20K "	C12	0.05 " 400V
R13	50K "	C13	4 " 25V
R14	50K "	C14	0.05 " 400V
R15	50K "		
R16	20K "		
P1	0.5M "		
P2	0.5M "		
P3	0.5M "		



AMPLIFIER CONSTANTS

R1	0.1M ½W	C1	0.MFD 600V
R2	0.5M "	C2	20 " 350V
R3	600 "	C4	24 " 350V
R4	1750 "	C5	10 " 12 V
R5	50K "	C6	50 " 12 V
R6	50K "	C7	0.25 " 400 V
R7	50K "	C8	0.01 " 600 V
R8	0.25M "	C9	0.05 " 200 V
R9	0.25M "	C10	0.05 " 200V
R10	0.125M "	C11	0.000 MICA
R11	5K "	C12	0.0001 MICA
R12	50K 2 W	C13	0.03 " 600V
R13	1.5K ½W	C14	0.03 " 600V
R14	0.5M "	C15	0.03 " 600V
R15	0.1M "	C16	0.02 " 1000V
R16	0.1M "	C3	20 " 500V
R17	17K "		
R18	0.5M "		
R19	0.5M "		
R20	750 40W		
R21	10K 20W		



CABINET

Electrical Rating:
Line Voltage . . . . . 110–120 volts, 50–60 cycles, A.C.
Power Consumption . . . 67 watts

Tuning Frequency Range:
540 to 1620 KC

Intermediate Frequency:
455 KC

Electrical Power Output:
Undistorted . . . . . 3.0 watts
Maximum . . . . . 5.0 watts

Loudspeaker:
Type . . . . . Permanent Magnet
Outside Cone Diameter . . 10"
Voice Coil Impedance . . 3.2 ohms at 400 cycles
Magnet Rating . . . . . 4.64 Oz. Alnico V

Tubes:

Tube	No.	Function
6SK7	V-1	R.F. Amplifier
6SA7	V-2	Frequency Converter
6SK7	V-3	I.F. Amplifier
6J5	V-4	Oscillator
6SK7	V-5	A. F. Amplifier
6V6/GT	V-6	Power Amplifier
6J5	V-7	Detector
5Y3/GT	V-8	Rectifier

GENERAL INFORMATION

This model is a console radio-phonograph combination with a Webster model 56 changer and a Shure P-30 "Silentronic" crystal pickup. The set is housed in a bleached modern, walnut or mahogany period cabinet.

SPECIAL SERVICE INFORMATION

Stage Gain Measurements:

Measurements taken with volume and tone controls ma mum. Switch in Radio position. AVC shorted out.
Standard Output . . . . . 50.0 milliwatts
Dummy Antenna . . . . . 200.0 Mmf.

Antenna to R.F. Grid . . . . . 6X at 1000 KC
R.F. Grid to Converter Grid . . . 7X at 1000 KC
Converter Grid to 1st I.F. Grid . . 46X at 455 KC
1st I.F. Grid to 2nd Detector . . . 62X at 455 KC
Overall Audio Gain . . . 320X at 0.5 watts, 400 cycle

Oscillator Cathode Voltages:

Measured at 117 volts A.C. line voltage with an A.C. ty vacuum tube voltmeter, input impedance above 10 megohm
1500 KC . . . . . 1.0 volts A.C.
1000 KC . . . . . 1.0 volts A.C.
800 KC . . . . . 1.1 volts A.C.
600 KC . . . . . 1.1 volts A.C.

D.C. Resistance Measurements:

1st and 2nd I.F. Coils
Primary . . . . . 17.0 ohms
Secondary . . . . . 17.0 ohms*

*NOTE: To obtain the true reading of the secondary of t second I.F. coil, it is necessary to remove it from t can. This is due to the 47K resistor inside the ca

Oscillator Coil
Primary . . . . . 1.0 ohms
Secondary . . . . . 6.0 ohms

Antenna Coils
Start to Finish . 12.2 ohms
Start to Tap . 10.5 ohms

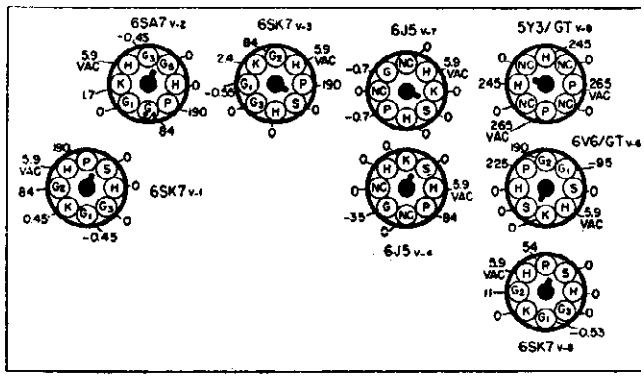
R.F. Coil
Primary . . . . . 58.0 ohms
Secondary . . . . . 4.2 ohms

NOTE: Due to the variation in winding methods, the D.C. r sistance on all coils is subject to a 20% tolerance.

Socket Voltages:

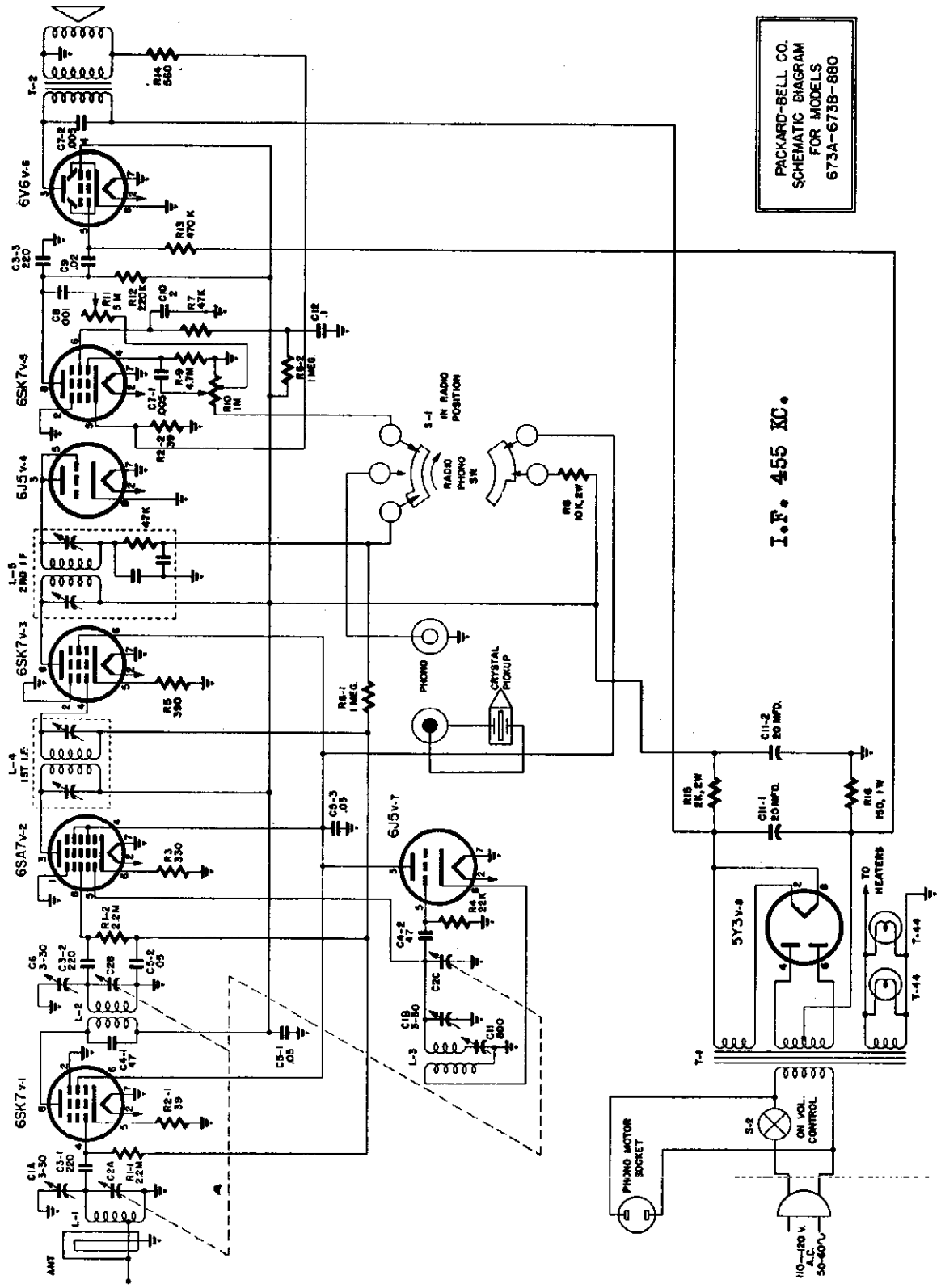
All D.C. voltages measured with a vacuum tube voltmet from socket contacts to chassis.—A.C. voltages measured wi a 1000 ohms per volt A.C. meter from socket contacts to chassi Volume and tone controls maximum.—Switch in Radio pos tion.—No signal.—117 volts A.C. line.

All voltages shown are positive D.C. unless otherwise note



SOCKET VOLTAGES

MODELS 673A, 673B, 880 PACKARD-BELL COMPANY



ALIGNMENT PROCEDURE

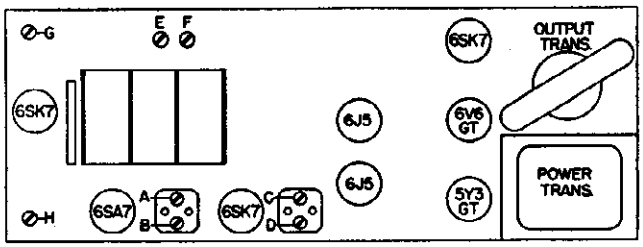
Alignment procedure consists of the steps outlined in the Alignment Chart.

Connect the test oscillator leads to the mixer grid and ground in series with an .01 Mfd. capacitor (dummy load) for step No. 1, I.F. Alignment. Upon completion of this step, "Rock" the variable condenser to assure that the I.F.'s have been aligned to the correct frequency, not the image frequency.

Use the Hazeltine Standard Test Loop No. 1150, or a reasonable substitute for the balance of the alignment. Place the test loop about two feet from the receiver loop in a vertical position.

It will be noted that all trimmers are accessable without removing the chassis from the cabinet.

IMPORTANT NOTICE: Make certain that each alignment step is done with a minimum input signal.



TRIMMER LOCATIONS

A—I.F. Trimmer	E—Osc. Trimmer
B—I.F. Trimmer	F—R.F. Trimmer
C—I.F. Trimmer	G—Ant. Trimmer
D—I.F. Trimmer	H—600 KC Padder

ALIGNMENT CHART

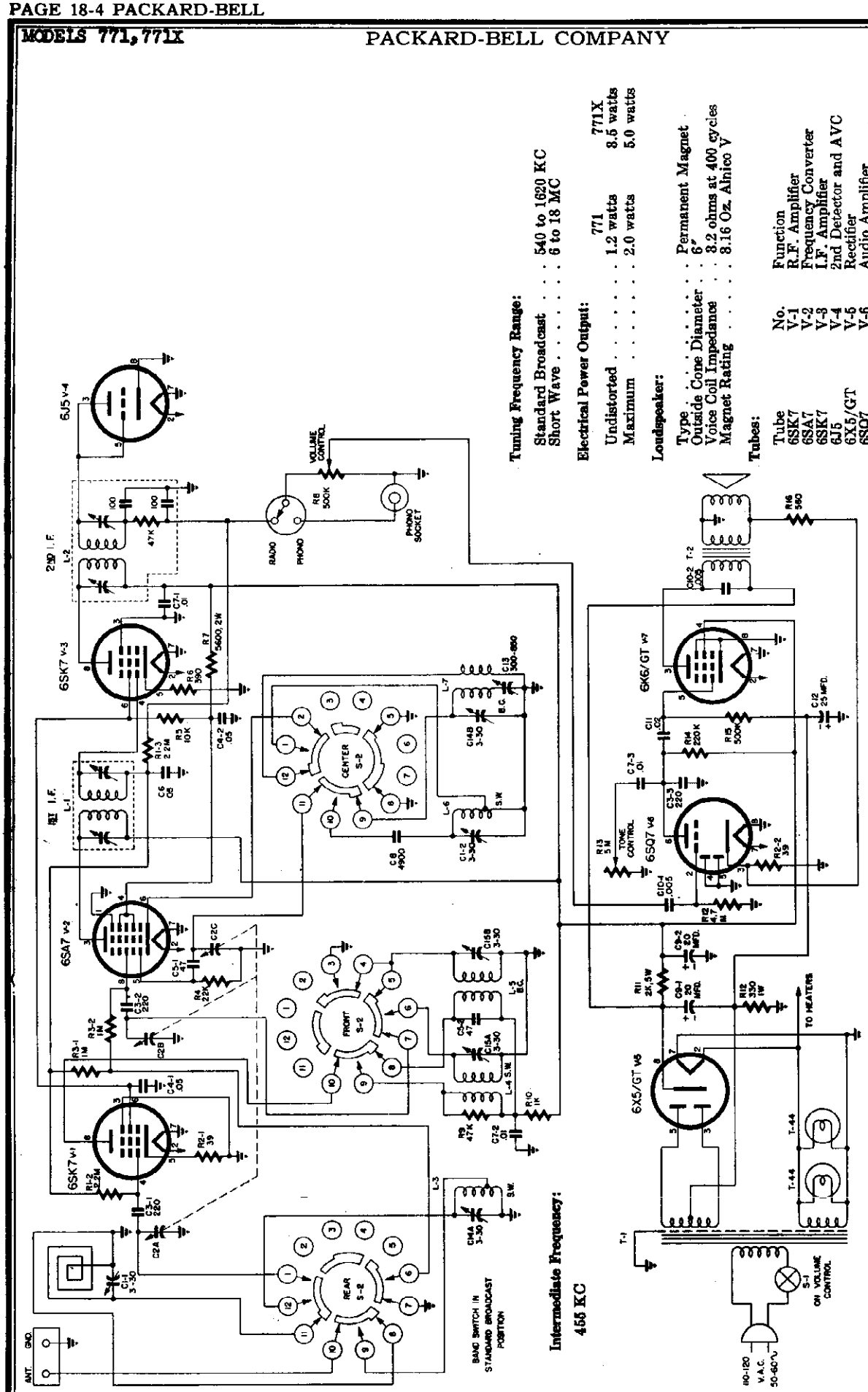
STEP	CONNECT TEST OSC. TO	TEST OSC. SETTING	POINTER SETTING	ADJUST FOR MAX. OUTPUT
1	Mixer Grid & Grd. (.01 Mfd. Cap.)	455 KC	540 KC	Trimmers A, B, C & D
2	Standard Test Loop*	1620 KC	1620 KC	Trimmer E to 1620 KC
3	Standard Test Loop*	600 KC	Rock Variable	Trimmer H to 600 KC
4	Standard Test Loop*	1500 KC	1500 KC	Trimmers F & G
5	Repeat Steps 2, 3 & 4			

*NOTE: Hazeltine Test Loop No. 1150 (or a reasonable substitute).

TABLE OF REPLACEABLE PARTS

PART NO.	REF. SYMBOL	DESCRIPTION
21065		Cabinet—880
21053D		Cabinet—673-A
21053-1		Cabinet left back
21053-2		Cabinet right back
23401	C1 A,B	Capacitor, trimmer, dual 3-30 Mmf.
23520	C2 A,B,C	Capacitor, variable
23915	C3-1 to 4	Capacitor, ceramic, 220 Mmf. 20%
23912	C4-1 to 2	Capacitor, ceramic, 47 Mmf. 20%
23009	C5-1 to 3	Capacitor, tubular, .05 Mf. 400 V.
23406	C6	Capacitor, trimmer, single 3-30 Mmf
23004	C7-1 to 2	Capacitor, tubular, .005 Mf. 600 V.
23001	C8	Capacitor, tubular, .001 Mf. 600 V.
23007	C9	Capacitor, tubular, .02 Mf. 600 V.
23020	C10	Capacitor, tubular, .2 Mf. 400 V.
24003	C11-1 to 2	Capacitor, electrolytic, 20 Mf. 350 V
23011	C12	Capacitor, tubular, .1 Mf. 400 V.
29400B	L1	Coil, antenna
29102F	L2	Coil, R.F.
29205C	L3	Coil, Oscillator
29004E	L4	Coil, 1st I.F.
29007	L5	Coil, 2nd I.F.
32003G		Cord, A.C.
34002D		Cover, volume control
38088		Dial, stationized
38089		Dial, eastern
40003		Cord, drive
52015C		Knob
54001		Lamp, dial (.25 amp.) T44
58022A		Changer assembly
59001		Needle, pickup
63026		Pickup cartridge, Shure P-30
69006A		Pulley, variable
73055	R1-1 to 2	Resistor, 2.2 megohms, ½w, 20%
73008	R2-1 to 2	Resistor, 39 ohms, ½w, 10%
73019	R3	Resistor, 330 ohms, ½w, 10%
73041	R4	Resistor, 22,000 ohms ½w, 20%
73020	R5	Resistor, 390 ohms, ½w, 10%
73053	R6-1 to 2	Resistor, 1 megohm, ½w, 20%
73045	R7	Resistor, 47,000 ohms, ½w, 10%
73125	R8	Resistor, 10,000 ohms, 2w, 10%
73057	R9	Resistor, 4.7 megohm, ½w, 20%
25010B	R10	Control, volume, 1 megohm
25506C	R11	Control tone, 5 megohm
73049	R12	Resistor, 220,000 ohms, ½w, 20%
73051	13	Resistor, 470,000 ohms, ½w, 20%
73022	R14	Resistor, 560 ohms, ½w, 10%
73214	R15	Resistor, 2,000 ohms, 2w, 10%
73081	R16	Resistor, 150 ohms, 1w, 10%
79002		Socket, tube
79005		Socket, pickup
79007		Socket, A.C.
79010B		Socket, lamp
83705		Speaker, 10" P.M.
86008	S1	Switch, radio-phono
89016	T1	Transformer, power
89405E	T2	Transformer, output (5,000 ohm to 3.2)

MODELS 771, 771X PACKARD-BELL COMPANY



Intermediate Frequency:

455 KC

Tuning Frequency Range:

Standard Broadcast	540 to 1620 KC
Short Wave	6 to 18 MC

Electrical Power Output:

	771	771X
Undistorted	1.2 watts	3.5 watts
Maximum	2.0 watts	5.0 watts

Loudspeaker:

Type	Permanent Magnet
Outside Cone Diameter	6"
Voice Coil Impedance	3.2 ohms at 400 cycles
Magnet Rating	3.16 Oz. Alnico V

Tubes:

Tube	No.	Function
6SK7	V-1	R.F. Amplifier
6SA7	V-2	Frequency Converter
6SK7	V-3	I.F. Amplifier
6J5	V-4	2nd Detector and AVC
6X5/GT	V-5	Rectifier
6SQ7	V-6	Audio Amplifier
6K6/GT	V-7	Power Amplifier
5Y3/GT	(V-5)	Rectifier, 771X
6V6/GT	(V-7)	Power Amplifier

Electrical Rating:

Line Voltage	110–120 volts, 50–60 cycle A.C.
Power Consumption	56 watts

GENERAL INFORMATION

Model 771 is a table model, two band superheterodyne receiver. This model employs six tubes, plus a rectifier and a permanent magnet speaker. Listed below are the features contained in this set.

1. Two bands; Standard Broadcast and Short Wave.
2. Export version (771X) may be used on either 120 or 240 volts A.C. by the removal of a plate and manipulating a switch on the back of the chassis.
3. Built-in high impedance loop antenna which gives excellent signal pickup while rejecting a large part of the noise.

ALIGNMENT PROCEDURE

Alignment consists of the steps outlined in the Alignment Procedure Chart.

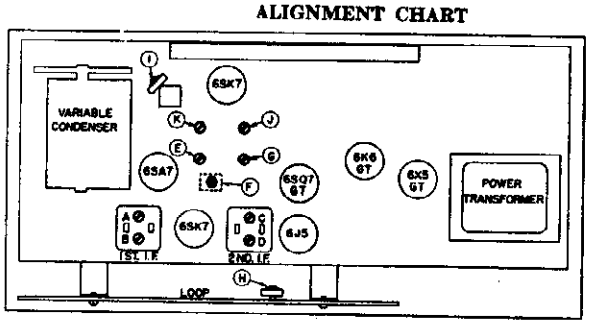
Connect the test oscillator leads to the mixer grid and ground, in series with an .01 Mfd. capacitor (dummy load) for step No. 1, I.F. Alignment. Upon completion of this step, "Rock" the variable condenser to assure that the I.F.'s have been aligned to the correct frequency, not the image frequency.

Use a Hazeltine Standard Test Loop No. 1150, or a reasonable substitute for the balance of the alignment. Place the test loop about two feet from the receiver loop in a vertical position.

IMPORTANT NOTICE: Make certain that each alignment step is done with a minimum input signal.

STEP	CONNECT TEST OSC. TO	TEST OSC. SETTING	POINTER SETTING	ADJUST FOR MAX. OUTPUT
1	Mixer Grid & Grd. (.01 Mfd Cap.)	455 KC	540 KC	Trimmers A, B, C, D
2	Standard Test Loop	1620 KC	1620 KC	Trimmer E to 1620 KC
3	Standard Test Loop	600 KC	600 KC	Trimmer F to 600 KC
4	Standard Test Loop	1500 KC	1500 KC	Trimmers G & H
5	Repeat Steps 2, 3, 4.			
6	Standard Test Loop	18 MC	18 MC	Trimmer I to 18 MC
7	Standard Test Loop	15 MC	15 MC	Trimmers J & K

ALIGNMENT CHART



TRIMMER LOCATIONS

A, B, C, D—I.F. Trimmers
E—Broadcast Osc. Trimmer
F—Broadcast Osc. Padder
G—Broadcast R.F. Trimmer
H—Broadcast Antenna Trimmer
I—Short Wave Osc. Trimmer
J—Short Wave R.F. Trimmer
K—Short Wave Antenna Trimmer

SPECIAL SERVICE INFORMATION

Stage Gain Measurements—Broadcast Band:

Measurements taken with volume and tone controls maximum. Switch in Broadcast position. AVC shorted out.

Standard Output	50.0 milliwatts
Dummy Antenna	200.0 Mmf.
Antenna to R.F. Grid	10X at 1000 KC
R.F. Grid to Converter Grid	5X at 1000 KC
Converter Grid to 1st I.F. Grid	50X at 455 KC
1st I.F. Grid to 2nd Detector	60X at 455 KC
Overall Audio Gain	0.1 volt audio input for 1.0 watt, 400 cycles

Stage Gain Measurements—Short Wave Band:

Measurements taken with volume and tone controls maximum. Switch in Short Wave position. AVC shorted out.

Standard Output	50.0 milliwatts
Dummy Antenna	400 ohms
Antenna to R.F. Grid	2.0X at 10.0 MC
R.F. Grid at Converter Grid	4.0X at 10.0 MC
Converter Grid to I.F. Grid	45.0X at 10.0 MC

Oscillator Cathode Voltages—Broadcast Band:

Measured at 117 volts A.C. line voltage with an A.C. type Vacuum Tube Voltmeter, input impedance above 10 megohms.

1500 KC	5.8 volts A.C.
1000 KC	4.9 volts A.C.
600 KC	4.2 volts A.C.

Oscillator Cathode Voltages—Short Wave Band:

Measured at 117 volts A.C. line voltage with an A.C. type Vacuum Tube. Voltmeter, input impedance above 10 megohms.

16.0 MC	6.8 volts A.C.
10.0 MC	4.5 volts A.C.
6.0 MC	1.9 volts A.C.

D.C. Resistance Measurements:

1st and 2nd I.F. Coils
Primary . . . 17 ohms
Secondary . . 17 ohms*

*NOTE: To obtain the true reading of the secondary of the 2nd I.F. coil, it must be removed from the can. This is due to the 47K resistor inside the can.

Oscillator Coils

Broadcast		Short Wave	
Primary	1.0 ohms	Start to Finish	4.0 ohms
Secondary	6.0 ohms	Start to Tap	2.0 ohms

Antenna Coils

Broadcast		Short Wave	
Start to Finish	12.2 ohms	Start to Finish	0.25 ohms
Start to Tap	10.5 ohms	Start to Tap	0.20 ohms

R.F. Coils

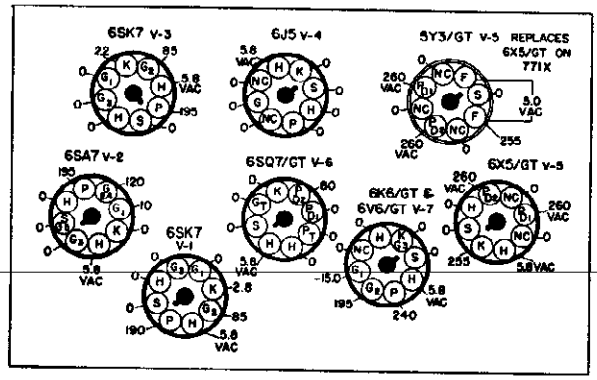
Broadcast		Short Wave	
Primary	75.0 ohms	Primary	5.5 ohms
Secondary	6.5 ohms	Secondary	0.2 ohms

NOTE: Due to a variation in winding methods, the D.C. resistance on all coils is subject to a 20% tolerance.

Socket Voltages:

All D.C. voltages measured with a vacuum tube voltmeter from socket contacts to chassis.—A.C. voltages measured with a 1000 ohms per volt A.C. meter from socket contacts to chassis.

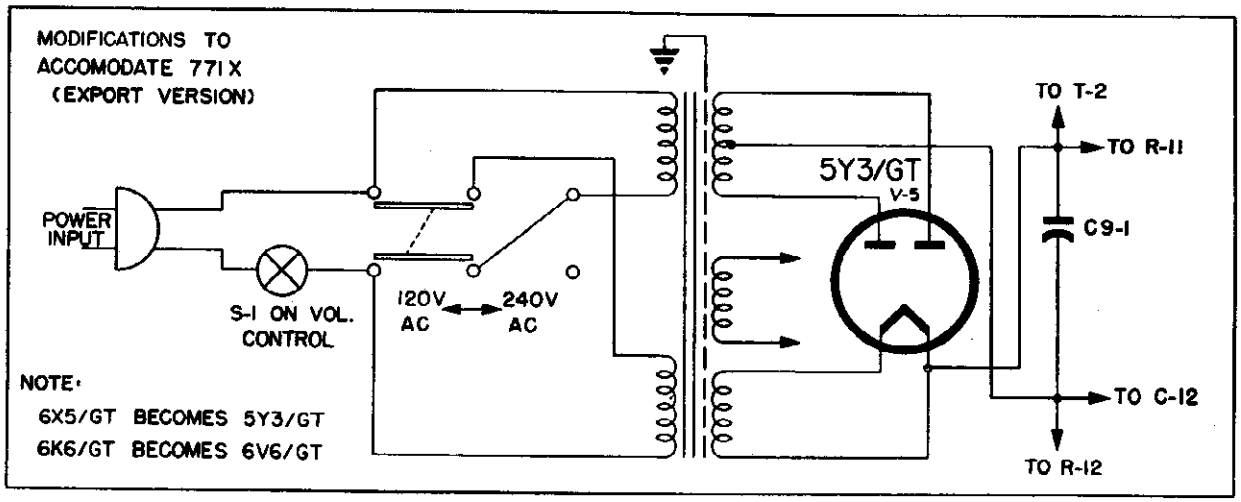
Volume and tone controls maximum.—Switch in Broadcast position.—No signal. 117 volts A.C. line. All voltages shown are positive D.C. unless otherwise noted.



SOCKET VOLTAGES

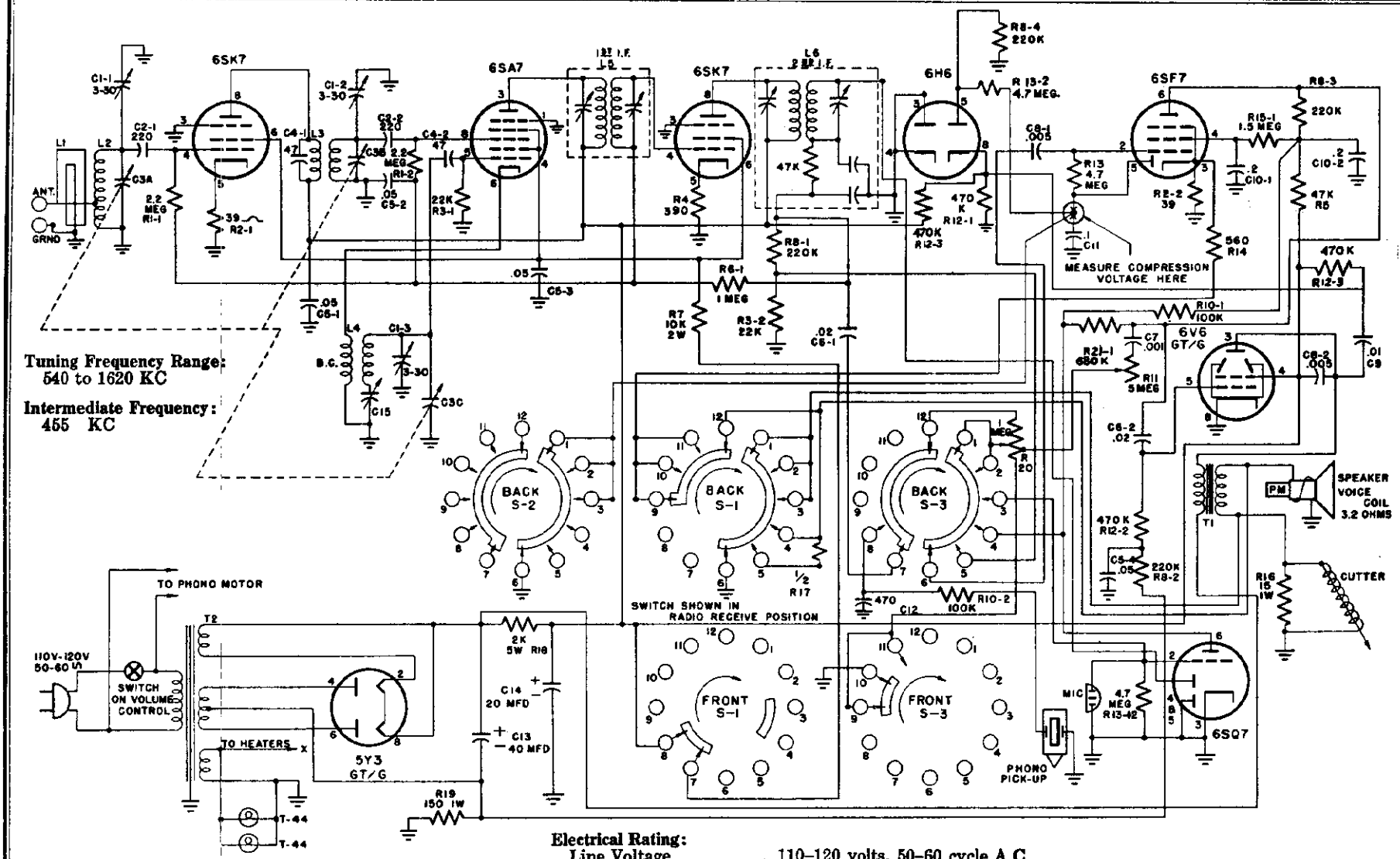
MODELS 771, 771X

PACKARD-BELL COMPANY



PART NO.	REF. SYMBOL	DESCRIPTION
21052A		Cabinet
23406	C1-1 to 2	Capacitor, trimmer, single 3-30 Mmf.
23500C	C2 A,B,C	Capacitor, variable, 3 gang
23206-1	C3-1 to 3	Capacitor, ceramic, 220 Mmf. 20%
23009	C4-1 to 2	Capacitor, tubular, .05 Mf. 400 V.
23912	C5-1 to 2	Capacitor, ceramic, 47 Mmf. 20%
23017	C6	Capacitor, tubular, .05 Mf. 200 V.
23028	C7-1 to 2	Capacitor, tubular, .01 Mf. 500 V.
23207	C8	Capacitor, ceramic, 4900 Mmf. 20%
24003	C9-1 to 2	Capacitor, electrolytic, 20 Mf. 350 V.
23004	C10-1 to 2	Capacitor, tubular, .005 Mf. 600 V.
23007	C11	Capacitor, tubular, .02 Mf. 600 V.
24006	C12	Capacitor, electrolytic, 25 Mf. 25 V.
23404A	C13	Capacitor, trimmer, single 300-850 Mmf.
23401	C14 A,B	Capacitor, trimmer, dual, 3-30 Mmf.
23401	C15 A,B	Capacitor, trimmer, dual, 3-30 Mmf.
29004E	L1	Coil, 1st I.F.
29001	L2	Coil, 2nd I.F.
29401	L3	Coil, S.W. Antenna
29101B	L4	Coil, S.W. R.F.
29102F	L5	Coil, B.C. R.F.
29201A	L6	Coil, S.W. Oscillator
29205C	L7	Coil, B.C. Oscillator
29318-A		Loop Antenna
32012		Cord, A.C. 6'
34018B		Cover, back
38056		Dial, stationized
38058		Dial, eastern
40003		Cord, dial drive
40114		Drive, planetary
AB52015-C		Knob, brown (3)
AL52015		Knob, ivory (3)
AB52032		Knob, brown (1)
AL52032		Knob, ivory (1)
54001		Lamp, dial (0.25 amp.)
67022		Pointer assembly
63038		Decal, broadcast—short wave
68042		Decal, volume
68043		Decal, tone
68045		Decal, tuning
69003C		Pulley, variable
73055	R1-2 to 3	Resistor, 2.2 megohm ½w, 20%
73008	R2-1 to 2	Resistor, 39 ohms ½w, 10%
73053	R3-1 to 2	Resistor, 1 megohm ½w, 20%
73041	R4	Resistor, 22,000 ohm, ½w, 10%
73037-1	R5	Resistor, 10,000 ohm, ¼w, 10%
73020-1	R6	Resistor, 390 ohm, 1w, 10%
73127	R7	Resistor, 5600 ohms, 2w, 10%
25003B	R8	Control, volume, 500,000 ohm
73045	R9	Resistor, 47,000 ohm, ½w, 10%
73025-1	R10	Resistor, 1,000 ohm, ¼w, 10%
73902	R11	Resistor, 2,000 ohm, 5w, wire wound
73070	R12	Resistor, 330 ohm, 1w, 10%
*25509	R13	Control, tone, 3 megohm
73049	R14	Resistor, 220,000 ohm, ½w, 20%
73051	R15	Resistor, 500,000 ohm (470,000 ohm, ½w, 20%)
73022	R16	Resistor, 560 ohm, ½w, 10%
79002		Socket, tube
79010B		Socket, lamp
79005		Socket, pickup
83103		Speaker, 6" x 9" oval
83302		Speaker, 6" round
86001A	S2	Switch, band
86704		Switch, radio-phono
89003C	T1	Transformer, power, 771
89018A	T1	Transformer, power, 771X
89402	T2	Transformer, output, 771 (8,000 ohm to 3.2)
89410B	T2	Transformer, output, 771 (8,000 ohm to 3.2)
89405F	T2	Transformer, output, 771X (5,000 ohm to 3.2)
86703		Switch, slide, 771X
65047D		Plate, switch, 771X

*R-13 is shown on schematic as 5 megohms. 3 megohm is proper control.



Tuning Frequency Range:
540 to 1620 KC

Intermediate Frequency:
455 KC

GENERAL INFORMATION

Model 881 is a PhonOcord console employing 8 tubes and a ten-inch permanent magnet speaker.

Listed below are features contained in this model.

1. Superheterodyne receiver.
2. Automatic Home Recording with Public Address System.
3. Phonograph with automatic record changer.
4. Specially designed low impedance loop antenna.

To service tubes, reach through the hole in left back

Electrical Rating:

Line Voltage	110–120 volts, 50–60 cycle A.C.
Power Consumption	80 Watts

Electrical Power Output:

Undistorted	3 Watts
Maximum	5 Watts

Loudspeaker

Type	Permanent Magnet
Outside Cone Diameter	10"
Voice Coil Impedance	3.2 ohms at 400 cycles

Tubes:

Tube	Function
6SK7	R.F. Amplifier
6SA7	Frequency Converter
6SK7	I.F. Amplifier
6SF7	1st Audio Amplifier
6V6-GT/G	Power Amplifier
5Y3-GT/G	Rectifier
6H6	Compressor Rectifier

ALIGNMENT PROCEDURE

Alignment Procedure consists of the 5 steps outlined in the Alignment Chart.

Connect the test oscillator leads to the mixer grid and ground in series with an .01 Mfd. capacitor (dummy load) for step No. 1, I.F. Alignment. Upon completion of this step "Rock" the variable condenser to assure that the I.F.'s have been aligned to the correct frequency. Output should remain constant for any setting of the variable condenser.

Use the Hazeltine Test Loop No. 1150 or a reasonable substitute for the balance of the alignment. Place the test loop about two feet from the receiver loop in a vertical position.

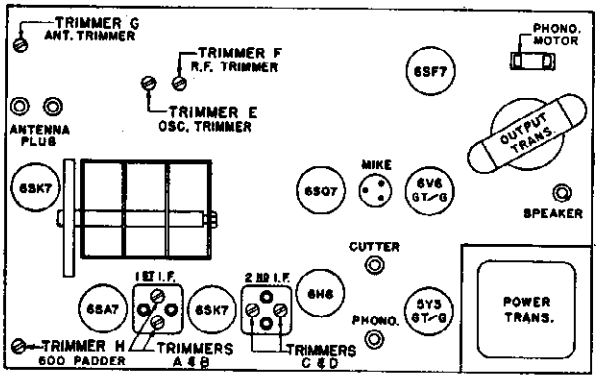
It will be noted that all alignment trimmers are accessible without removing the chassis from the cabinet.

IMPORTANT NOTICE: Make certain that each alignment step is done with a minimum input signal.

ALIGNMENT CHART

STEP	CONNECT TEST OSC. TO	TEST OSC. SETTING	POINTER SETTING	ADJUST FOR MAX. OUTPUT
1	Mixer Grid & Grd. (.01 Mfd Cap.)	455 KC	540 KC	Trimmers A, B, C, & D
2	Standard Test Loop*	1620 KC	1620 KC	Trimmer E to 1620 KC
3	Standard Test Loop*	600 KC	Rock Variable	Trimmer H to 600 KC
4	Standard Test Loop*	1500 KC	1500 KC	Trimmers F & H
5	Repeat Steps 2, 3 & 4			

*NOTE: Hazeltine Test Loop No. 1150 (or reasonable substitute).



TRIMMER LOCATION

RECORDING HEAD PRESSURE

The proper recording head pressure is 1¼ oz. Adjustment of this pressure is made by turning the small screw on the top of the recording arm. This adjustment is very critical and should be made in quarter turns. TURN THE SCREW CLOCKWISE TO INCREASE THE CUTTING DEPTH and COUNTERCLOCKWISE TO DECREASE THE CUTTING DEPTH.

This adjustment is made at the factory with an ordinary postal scale, consequently, field adjustments should be made in a like manner.

HOW TO CHECK COMPRESSION VOLTAGE

Turn the Selector Switch to Radio Record position. Feed a 1 volt (RMS) 1000 cycle signal into the diode return of the 2nd I.F. (brown lead). Connect the leads of a vacuum tube voltmeter to the point indicated on Figure 4, Schematic Diagram, and ground. The voltage at this point should be approximately a minus 2.25 volts.

BRIEF DESCRIPTION OF COMPRESSION CIRCUIT

One diode section of the 6H6 serves as the compressor rectifier. The compression system is automatic, and is in the circuit on both record positions. A portion of the output voltage is rectified by the 6H6 and varies grid bias of the first audio, 6SF7.

SPECIAL SERVICE INFORMATION

Stage Gain Measurements:

Measurements taken with volume and tone controls maximum.—AVC shorted out.

Standard Output . . . 50 milliwatts
Dummy Antenna . . . 200 Mmf.

Antenna post to R.F. grid	7X at 1000 KC
R.F. grid to Converter grid	7.5X at 1000 KC
Converter grid to 1st I.F. grid	56X at 455 KC
1st I.F. grid to 2nd Detector	57X at 455 KC
Overall Audio Gain	320X at .5 watts 400 cycles

OSCILLATOR CATHODE VOLTAGES:

Measured at 117 volts AC line voltage with AC vacuum tube voltmeter, input loading above 10 megohms.

1600 KC . . . . . 2.15 volts AC
1000 KC . . . . . 2.0 volts AC
600 KC . . . . . 2.2 volts AC

D.C. RESISTANCE MEASUREMENTS:

1st and 2nd I.F. Coils:
Primary . . . . . 17 ohms
Secondary . . . . . 17 ohms*

*NOTE: To obtain the true reading of the secondary of the 2nd I.F. Coil, it must be removed from the can. This is because of the 47K resistor inside the can.

Oscillator Coil:
Primary . . . . . 1 ohm
Secondary . . . . . 6 ohms

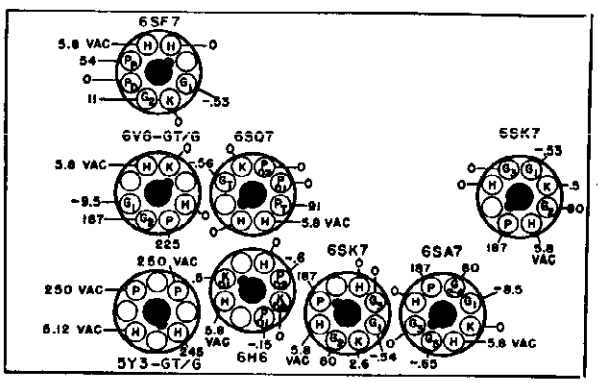
Antenna Coil:
Start to finish . . . . 12.2 ohms
Start to tap . . . . . 10.5 ohms

R.F. Coil:
Primary . . . . . 58 ohms
Secondary . . . . . 4.2 ohms

NOTICE: The D.C. Resistance measurements on all coils are subject to a 20% tolerance due to the variation of winding methods.

SOCKET VOLTAGES

All D.C. voltages measured with a vacuum tube voltmeter from socket contacts to chassis.—A.C. voltages measured with a 1000 ohms per volt A.C. meter from socket contacts to chassis. —Volume and tone controls maximum.—Switch in Radio Receive position. No signal. 117 volts A.C. line. All voltages shown are positive D.C. unless otherwise noted.

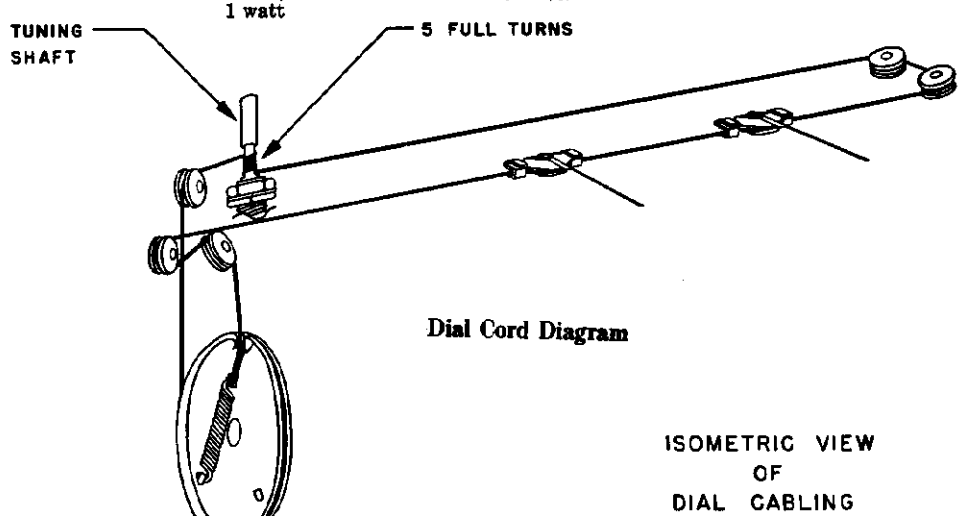


SOCKET VOLTAGES

PART NO.	REF. SYMBOL	DESCRIPTION
21060		Cabinet
23400	C1-1 C1-2	Capacitor, Trimmer: 3-30 mmf.
23406	C1-3	Capacitor Trimmer
23915	C2-1 C2-2	Capacitor, ceramic: 220 mmf. 20%
23521	C3A, B, & C	Capacitor, variable ass'y.
23912	C4-1 C4-2	Capacitor, ceramic or mica: 47 mmf., 20%
23009	C5-1 C5-2 C5-3 C5-4	Capacitor, paper: .05 mfd., 400 volt
23007	C6-1 C6-2	Capacitor, paper: .02 mfd., 600 volt
23001	C7	Capacitor, paper: .001 mfd., 600 volt
23004	C8-1 C8-2	Capacitor, paper: .005 mfd., 600 volt
23006	C9	Capacitor, paper: .01 mfd., 500 volt
23020	C10-1 C10-2	Capacitor, paper: 0.2 mfd., 400 volt
23019	C11	Capacitor, paper: 0.1 mfd. 200 volt
24004B	C13	Capacitor, electrolytic: 40 mfd., 450 volt
24003	C14	Capacitor, electrolytic: 20 mfd., 350 volt
23402	C15	Capacitor, padder: 300–800 mmf.
92194	L1	Loop, Antenna: (19.5 feet of 300 ohm twin lead)
29400B	L2	Coil, antenna
29102F	L3	Coil, R.F.
29205C	L4	Coil, oscillator
29004E	L5	Coil, 1st I.F.: 455 KC
29007	L6	Coil, 2nd I.F.: 455 KC
32003-1		Cord, AC: 8'
34002D		Cover, volume control
36024		Cutter, cartridge
38082		Dial, glass: stationized
38083		Dial, glass: export
40003		Dial drive cord
52016BG		Knob, plastic: bar type, Brown
52015BG		Knob, plastic: round type, Brown

PART NO.	REF. SYMBOL	DESCRIPTION
54001		Dial Lamp .250 Amp.
57004		Microphone with cable
57005		Microphone handle
57006		Microphone base
58004E		Automatic Record Changer
59002		Needle, cutter
63026		Phono Crystal, Shure Bros. #P-30
65069		Plate, dial
66004		Plug, pin type: Speaker, phono & antenna
66013		Plug, microphone
67026A		Pointer slide Ass'y.
68169		Instruction book
69001		Pulley, dial
69003C		Pulley, dial
73055	R1-1	Resistor, carbon: 2.2 Megohm, 20%, ½ watt
	R1-2	
	R13-3	
73022	R14	Resistor, carbon: 560 ohms, 10%, ½ watt
73054	R15-1	Resistor, carbon: 1.5 megohms, 20%, ½ watt
73903	R16	Resistor, wire wound: 15 ohms, 10%, 1 watt

PART NO.	REF. SYMBOL	DESCRIPTION
73910	R17	Resistor, wire wound: ½ ohm, 10%, 1 watt
73902	R18	Resistor, wire wound: 2,000 ohms, 10%, 5 watt
73081	R19	Resistor, carbon: 150 ohms, 10%, 1 watt
25010B	R20	Control, volume: 1 megohm, tapped at 200,000 ohms, with A.C. switch
73052	R21	Resistor, carbon: 680,000 ohms, 20%, ½ watt
77016A		Shaft, dial
78008		Shield, microphone plug
79002		Socket, tube: 8 prong octal, wafer type
79004		Socket, microphone
79005		Socket, phonograph
79007		Socket, phono motor
79010B		Socket, dial lamp: bayonet base
83703		Speaker, permanent magnet: 10"
84003A		Spring, knob
84028		Spring, dial cord
86009A	S1	Switch, rotary, 3 deck
89409D	T1	Transformer, output (5000 ohm to 3.2)
89016B	T2	Transformer, power

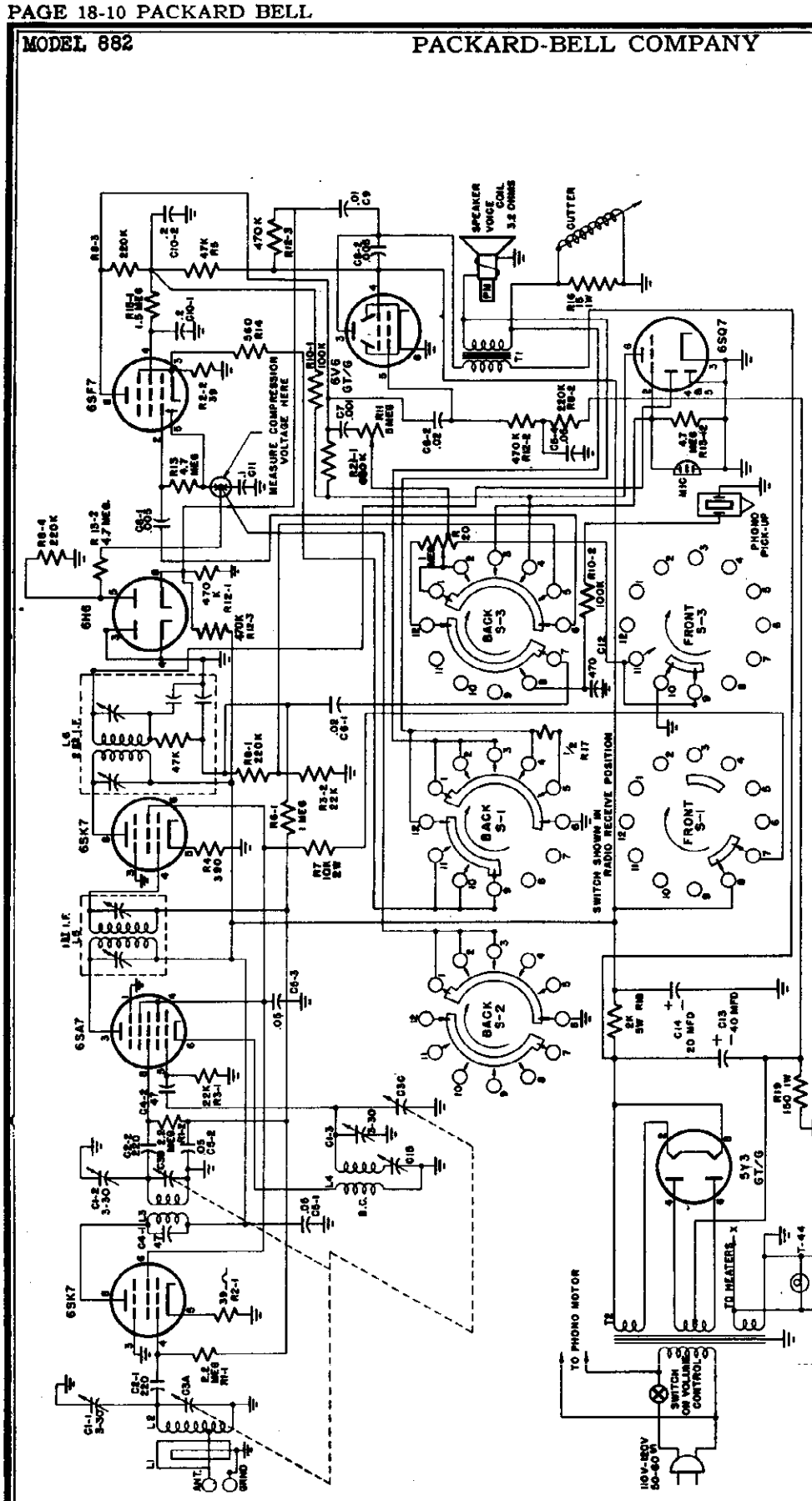


Dial Cord Diagram

ISOMETRIC VIEW OF DIAL CABLING

MODEL 882

PACKARD-BELL COMPANY



Loudspeaker

Type	Permanent Magnet
Outside Cone Diameter	12"
Voice Coil Impedance	3.2 ohms at 400 cycles
Magnet Rating	6.8 Oz. Alnico V

Tubes:

Tube	Function
6SK7	R.F. Amplifier
6SA7	Frequency Converter
6SK7	I.F. Amplifier
6SF7	1st Audio Amplifier
6V6-GT/G	Power Amplifier
5Y3-GT/G	Rectifier
6H6	Compressor Rectifier
6SQ7	Microphone Amplifier, 2nd Detector

Electrical Rating:

Line Voltage	110–120 volts, 50–60 cycle A.C.
Power Consumption	80 Watts

Tuning Frequency Range:
540 to 1620 KC

Intermediate Frequency:
455 KC

Electrical Power Output:

Undistorted	3 Watts
Maximum	5 Watts

GENERAL INFORMATION

Model 882 is a PhonOcord console employing 8 tubes and a twelve-inch permanent magnet speaker.
Listed below are features contained in this model.

1. Superheterodyne receiver.
2. Automatic Home Recording with Public Address System.
3. Phonograph with automatic record changer.
4. Specially designed low impedance loop antenna.

To service tubes, remove plate in record changer compartment.

ALIGNMENT PROCEDURE

Alignment Procedure consists of the 5 steps outlined in the Alignment Chart.

Connect the test oscillator leads to the mixer grid and ground in series with an .01 Mfd. capacitor (dummy load) for step No. 1, I.F. Alignment. Upon completion of this step "Rock" the variable condenser to assure that the I.F.'s have been aligned to the correct frequency. Output should remain constant for any setting of the variable condenser.

Use the Hazeltine Test Loop No. 1150 or a reasonable substitute for the balance of the alignment. Place the test loop about two feet from the receiver loop in a vertical position.

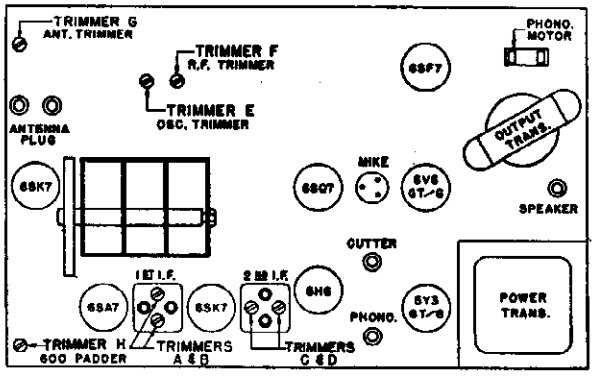
It will be noted that all alignment trimmers are accessible without removing the chassis from the cabinet.

IMPORTANT NOTICE: Make certain that each alignment step is done with a minimum input signal.

ALIGNMENT CHART

STEP	CONNECT TEST OSC. TO	TEST OSC. SETTING	POINTER SETTING	ADJUST FOR MAX. OUTPUT
1	Mixer Grid & Grd. (.01 Mfd Cap.)	455 KC	540 KC	Trimmers A, B, C, & D
2	Standard Test Loop*	1620 KC	1620 KC	Trimmer E to 1620 KC
3	Standard Test Loop*	600 KC	Rock Variable	Trimmer H to 600 KC
4	Standard Test Loop*	1500 KC	1500 KC	Trimmers F & H
5	Repeat Steps 2, 3 & 4			

*NOTE: Hazeltine Test Loop No. 1150 (or reasonable substitute).



TRIMMER LOCATION

RECORDING HEAD PRESSURE

The proper recording head pressure is 1¼ oz. Adjustment of this pressure is made by turning the small screw on the top of the recording arm. This adjustment is very critical and should be made in quarter turns. TURN THE SCREW CLOCKWISE TO INCREASE THE CUTTING DEPTH and COUNTERCLOCKWISE TO DECREASE THE CUTTING DEPTH.

This adjustment is made at the factory with an ordinary postal scale, consequently, field adjustments should be made in a like manner.

BRIEF DESCRIPTION OF COMPRESSION CIRCUIT

One diode section of the 6H6 serves as the compressor rectifier. The compression system is automatic, and is in the circuit on both record positions. A portion of the output voltage is rectified by the 6H6 and varies grid bias of the first audio, 6SF7.

HOW TO CHECK COMPRESSION VOLTAGE

Turn the Selector Switch to Radio Record position. Feed a 1 volt (RMS) 1000 cycle signal into the diode return of the 2nd I.F. (brown lead). Connect the leads of a vacuum tube voltmeter to the point indicated on Figure 4, Schematic Diagram, and ground. The voltage at this point should be approximately a minus 2.25 volts.

SPECIAL SERVICE INFORMATION

Stage Gain Measurements:

Measurements taken with volume and tone controls maximum.—AVC shorted out.

Standard Output . . . 50 milliwatts
Dummy Antenna . . . 200 Mmf.

Antenna post to R.F. grid	7X at 1000 KC
R.F. grid to Converter grid	7.5X at 1000 KC
Converter grid to 1st I.F. grid	56X at 455 KC
1st I.F. grid to 2nd Detector	57X at 455 KC
Overall Audio Gain	320X at 0.5 watt 400 cycles

OSCILLATOR CATHODE VOLTAGES:

Measured at 117 volts AC line voltage with AC vacuum tube voltmeter, input loading above 10 megohms.

1600 KC . . . . . 2.15 volts AC
1000 KC . . . . . 2.0 volts AC
600 KC . . . . . 2.2 volts AC

D.C. RESISTANCE MEASUREMENTS:

1st and 2nd I.F. Coils:
Primary . . . . . 17 ohms
Secondary . . . . . 17 ohms*

*NOTE: To obtain the true reading of the secondary of the 2nd I.F. Coil, it must be removed from the can. This is because of the 47K resistor inside the can.

Oscillator Coil:
Primary . . . . . 1 ohm
Secondary . . . . . 6 ohms

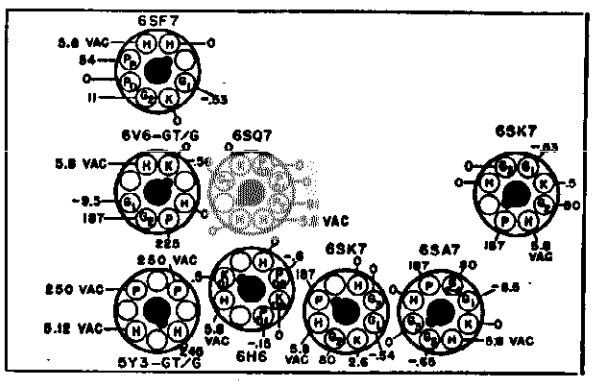
Antenna Coil:
Start to finish . . . . 12.2 ohms
Start to tap . . . . . 10.5 ohms

R.F. Coil:
Primary . . . . . 58 ohms
Secondary . . . . . 4.2 ohms

NOTICE: The D.C. Resistance measurements on all coils are subject to a 20% tolerance due to the variation of winding methods.

SOCKET VOLTAGES

All D.C. voltages measured with a vacuum tube voltmeter from socket contacts to chassis.—A.C. voltages measured with a 1000 ohms per volt A.C. meter from socket contacts to chassis. —Volume and tone controls maximum.—Switch in Radio Receive position. No signal. 117 volts A.C. line. All voltages shown are positive D.C. unless otherwise noted.

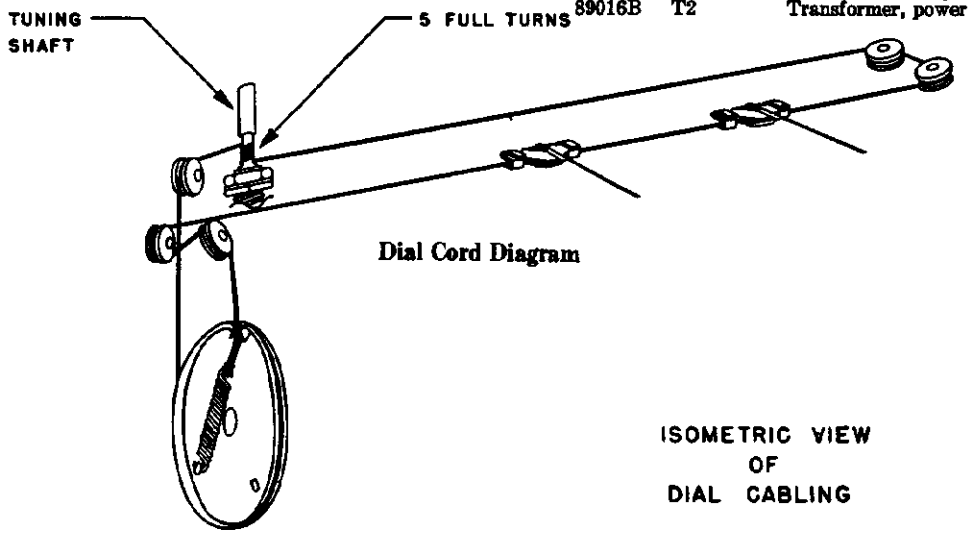


-SOCKET VOLTAGES

PART NO.	REF. SYMBOL	DESCRIPTION
21058		Cabinet
23400	C1-1 C1-2	Capacitor, Trimmer: 3-30 mmf.
23406	C1-3	Capacitor Trimmer
23915	C2-1 C2-2	Capacitor, ceramic: 220 mmf. 20%
23521	C3A, B, & C	Capacitor, variable ass'y.
23912	C4-1 C4-2	Capacitor, ceramic or mica: 47 mmf., 20%
23009	C5-1 C5-2 C5-3 C5-4	Capacitor, paper: .05 mfd., 400 volt
23007	C6-1 C6-2	Capacitor, paper: .02 mfd., 600 volt
23001	C7	Capacitor, paper: .001 mfd., 600 volt
23004	C8-1 C8-2	Capacitor, paper: .005 mfd., 600 volt
23006	C9	Capacitor, paper: .01 mfd., 500 volt
23020	C10-1 C10-2	Capacitor, paper: 0.2 mfd., 400 volt
23019	C11	Capacitor, paper: 0.1 mfd. 200 volt
24004B	C13	Capacitor, electrolytic: 40 mfd., 450 volt
24003	C14	Capacitor, electrolytic: 20 mfd., 350 volt
23402	C15	Capacitor, padder: 300–800 mmf.
92199	L1	Loop, Antenna.
29400B	L2	Coil, antenna
29102F	L3	Coil, R.F.
29205C	L4	Coil, oscillator
29004E	L5	Coil, 1st I.F.: 455 KC
29007	L6	Coil, 2nd I.F.: 455 KC
32003-1		Cord, AC: 8'
34002D		Cover, volume control
36024		Cutter, cartridge
38082		Dial, glass: stationized
38083		Dial, glass: export
40003		Dial drive cord
52016BG		Knob, plastic: bar type, Brown
52015C-BG		Knob, plastic: round type, Brown
54001		Dial Lamp 0.250 Amp.
57004		Microphone with cable
57005		Microphone handle
57006		Microphone base

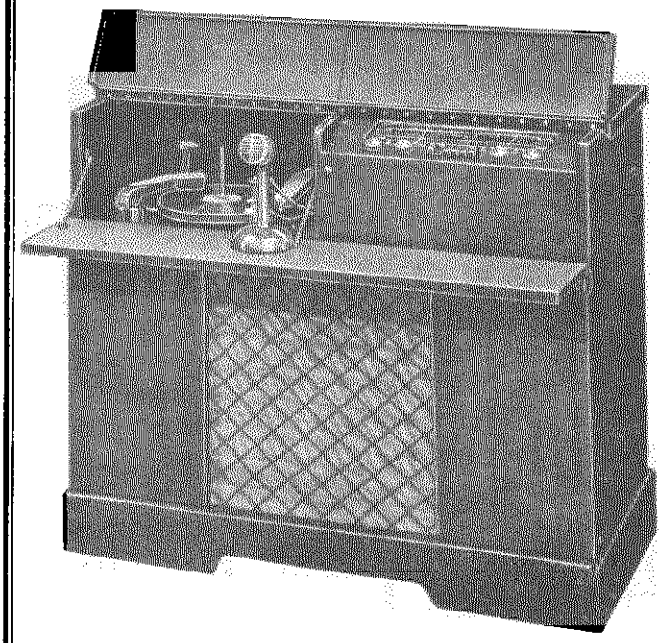
PART NO.	REF. SYMBOL	DESCRIPTION
58004E		Automatic Record Changer
59002		Needle, cutter
63026		Phono Crystal, Shure Bros. #P-30
65069-B		Plate, dial
66004		Plug, pin type: Speaker, phono & antenna
66013		Plug, microphone
67026A		Pointer slide Ass'y.
68169		Instruction book
69001		Pulley, dial
69003C		Pulley, dial
73055	R1-1	Resistor, carbon: 2.2 Megohm, 20%, ½ watt
	R1-2	
73008	R2-1 R2-2	Resistor—carbon: 39 ohms, 10% ½ watt
73041	R3-1	Resistor—carbon: 22,000 ohms 10% ½ watt
	F3-2	
73020	R4	Resistor—carbon: 390 ohms, 10% ½ watt
73045	R5	Resistor—carbon: 47,000, 10% ½ watt
73053	R6-1	Resistor—carbon: 1 megohm 20%, ½ watt
73125	R7	Resistor—carbon: 10,000 ohms, 10% 2 watt
73049	R8-1	Resistor—carbon: 220,000 ohms, 20% ½ watt
	R8-2	
	R8-3	
	R8-4	
73047	R10-1	Resistor—carbon: 100,000 ohms, 20% ½ watt
	R10-2	

PART NO.	REF. SYMBOL	DESCRIPTION
25506C	R11	Control—tone: 5 megohms
73051	R12-1	Resistor—carbon: 470,000 ohms 20%, ½ watt
	R12-2	
	R12-3	
73057	R13-1	Resistor—carbon: 4.7 megohms, 20% ½ watt
	R13-2	
	R13-3	
73022	R14	Resistor, carbon: 560 ohms, 10%, ½ watt
73054	R15-1	Resistor, carbon: 1.5 megohms, 20%, ½ watt
73903	R16	Resistor, wire wound: 15 ohms, 10%, 1 watt
73910	R17	Resistor, wire wound: ½ ohm, 10%, 1 watt
73902	R18	Resistor, wire wound: 2,000 ohms, 10%, 5 watt
73081	R19	Resistor, carbon: 150 ohms, 10%, 1 watt
25010B	R20	Control, volume: 1 megohm, tapped at 200,000 ohms, with A.C. switch
73052	R21	Resistor, carbon: 680,000 ohms, 20%, ½ watt
77016A		Shaft, dial
78008		Shield, microphone plug
79002		Socket, tube: 8 prong octal, wafer type
79004		Socket, microphone
79005		Socket, phonograph
79007		Socket, phono motor
79010B		Socket, dial lamp: bayonet base
83802		Speaker, permanent magnet: 12"
84003A		Spring, knob
84028		Spring, dial cord
86009A	S1	Switch, rotary, 3 deck
89409D	T1	Transformer, output (5000 ohm to 8.2)
89016B	T2	Transformer, power



Dial Cord Diagram

ISOMETRIC VIEW OF DIAL CABLING



GENERAL INFORMATION

Model 1063 is a PhoOcord console with a two band superheterodyne receiver. This model employs ten tubes and a permanent magnet speaker.

Listed below are some of the features contained in this Model PhonOcord.

1. Two band superheterodyne receiver.
2. Automatic Home Recording with Public Address System.
3. Phonograph with automatic record changer.
4. Volume Expansion.
5. Volume Compression for Home Recording.
6. Low Level Dynamic Bass Boost.

The output of the microphone and radio on Mixed Program Record may be regulated by varying the controls on the top of the chassis. (See Figure 2, Trimmer Location).

An early run of this model utilized a 20 Mfd. filter (C18) in the input voltage instead of a 40 Mfd.

Electrical Rating:

Line Voltage . . . 110-120 volts 50-60 cycle AC
Power Consumption . . . 106 watts

Tuning Frequency Range:

Standard Broadcast . . . 540 to 1620 KC
Short Wave . . . 6 to 18 MC

Intermediate Frequency:

455 KC

Electrical Power Output:

Undistorted . . . 3.5 watts
Maximum . . . 6 watts

Loudspeaker:

Type . . . Permanent Magnet
Outside Cone Diameter . . . 10"
Voice Coil Impedance . . . 3.2 ohms at 400 cycles
Magnet Rating . . . 6.8 Oz. Alnico 5

Tubes:

Tube	Function
6SK7	R.F. Amplifier
6SA7	Frequency Converter
6SK7	I.F. Amplifier
6SF7	2nd Detector & Expansion Amplifier
6H6	Expansion Rectifier & Delayed Auc AVC
6SQ7	Microphone Amplifier
6SF7	1st Audio Amplifier
6H6	Compression Rectifier
6V6-GT/G	Power Amplifier
5Y3-GT/G	Rectifier

SPECIAL SERVICE INFORMATION

STAGE GAIN MEASUREMENTS:

Measurements taken with volume and tone controls ma imum. — Band Switch in Standard Broadcast positio — Push Button Switch in Radio Receive position. — AV shorted out.

Standard Output . . . 50 milliwatts
Dummy Antenna . . . 200 Mmf.
Antenna Grid to R.F. Grid . . 6X at 1000 KC
R.F. Grid to Converter Grid . . . 12.5X at 1000 K
Converter Grid to 1st I.F. Grid . . . 61X at 455 K
1st .F. Grid to 2nd Detector . . . 120X at 455 KC
Overall Audio Gain . . . 620X at 1 watt 400 cycles

OSCILLATOR CATHODE VOLTAGES:

Measured at 117 Volts AC line voltage with AC vacuu tube voltmeter input loading above 10 megohms.

1620 KC . . . 3.4 volts AC
1300 KC . . . 3.2 volts AC
750 KC . . . 3.2 volts AC
550 KC . . . 3.7 volts AC

D.C. RESISTANCE MEASUREMENTS:

I.F. COILS

1st I.F.		2nd I.F.	
Primary	. . . 17 ohms	Primary	. . . 17 ohms
Secondary	. . . 17 ohms	Secondary	. . 17 ohms

*NOTE: To obtain the true reading of the secondary the 2nd I.F. coil it must be removed from the ca This is so because of the 56,000 ohm resistor series with the AVC lead inside the can.

OSCILLATOR COILS

Broadcast		Short Wave	
Primary	. . . 1 ohm	Start to Finish	. . 4 ohm
Secondary	. . . 6 ohms	Start to Tap	. . . 2 ohm

ANTENNA COILS

Broadcast		Short Wave	
Start to Finish	. . 12.2 ohms	Start to Finish	. . .25 ohm
Start to Tap	. . . 10.5 ohms	Start to Tap	. . . . .20 ohm

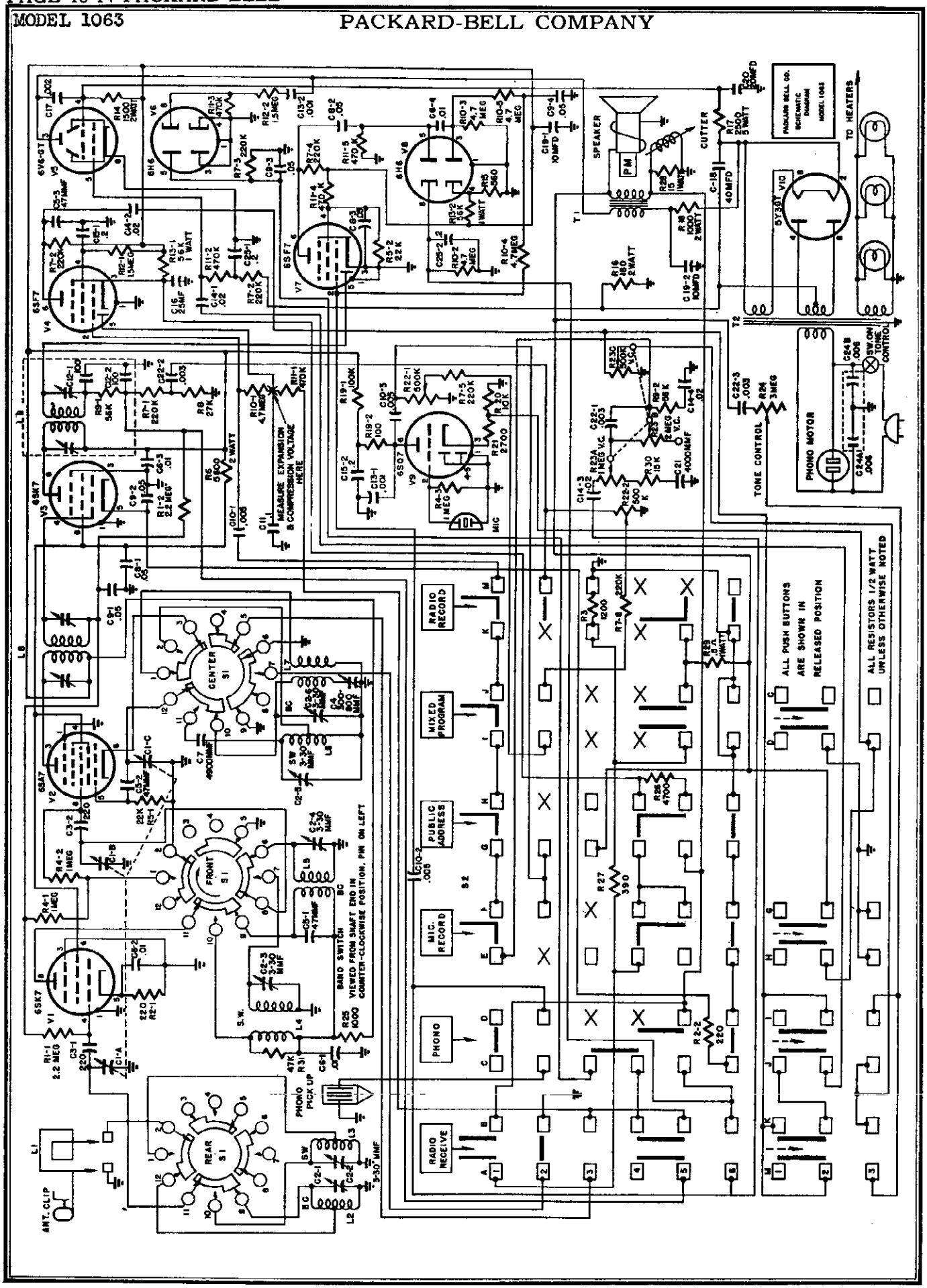
R.F. COILS

Broadcast		Short Wave	
Primary	. . . 5 8 ohms	Primary	. . . 5.5 ohm
Secondary	. . . 4.2 ohms	Secondary	. . . .2 ohm

NOTE: Due to the variation of winding methods, the D.C resistance on all coils is subject to a 20% tolerance.

MODEL 1063

PACKARD-BELL COMPANY



ALIGNMENT PROCEDURE

Alignment procedure consists of the 7 steps outlined in the Alignment Procedure Chart.

Connect the test oscillator leads to the mixer grid and ground in series with an .01 Mfd. capacitor (dummy load) for step No. 1, I.F. Alignment. Upon completing this step "Rock" the variable condenser to assure that the I.F.s have been aligned to the correct frequency. Output should remain constant at any setting of the variable condenser.

Use the Hazeltine Test Loop or a reasonable substitute for the balance of the alignment. Place the test loop about two feet from the receiver loop in a vertical position.

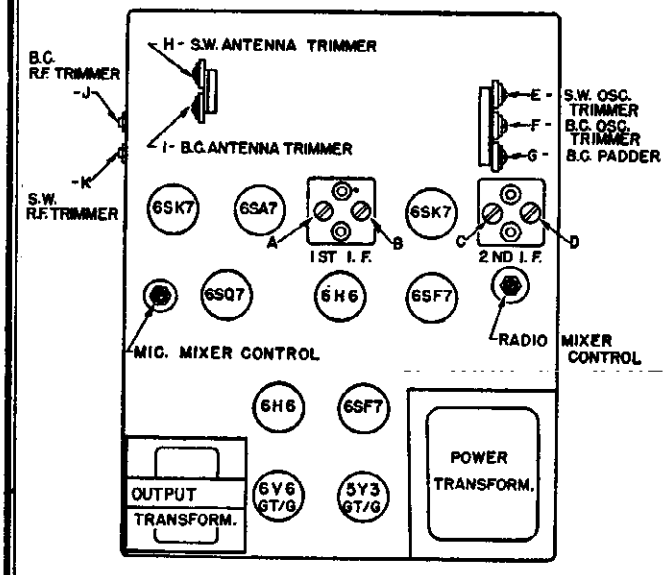
It will be noted that all trimmers are accessable without removing the chassis from the cabinet.

IMPORTANT NOTICE: Make certain that each alignment step is done with a minimum input signal.

ALIGNMENT CHART

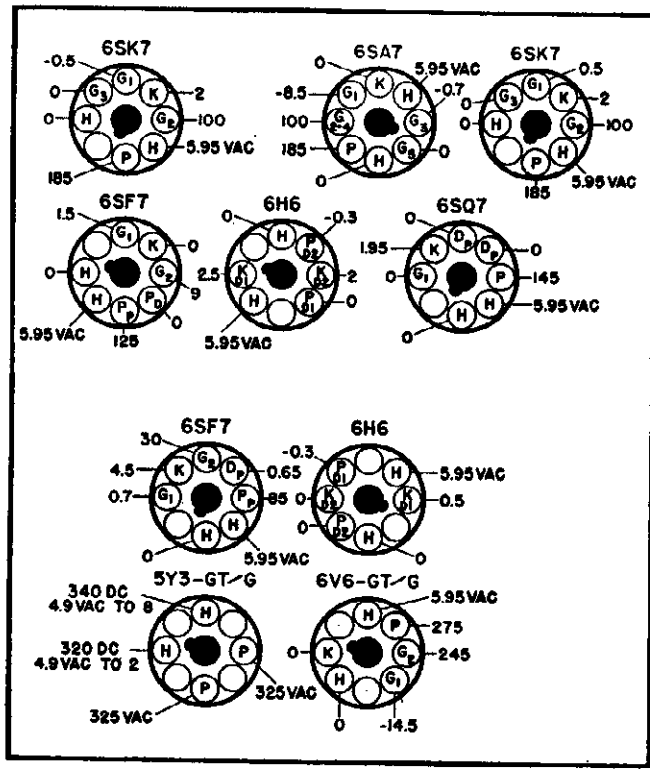
	CONNECT TEST OSC. TO	TEST OSC. SETTING	POINTER SETTING	ADJUST FOR MAX. OUTPUT
STEP 1	Mixer Grid & Grd.	455 KC	540 KC	Trimmers A, B, C & D
2	Standard* Test Loop	1620 KC	1620 KC	Trimmer F to 1620 KC
3	Standard* Test Loop	600 KC	600 KC	Trimmer G to 600 KC
4	Standard* Test Loop	1500 KC	1500 KC	Trimmers I & J
5	REPEAT STEPS 2, 3, & 4			
6	Standard* Test Loop	18 MC	18 MC	Trimmer E to 18 MC
7	Standard* Test Loop	15 MC	15 MC	Trimmers K & H

*NOTE: Hazeltine Standard Test Loop No. 1150 or a reasonable substitute.



Trimmer Location

No signal.
117 volts A.C. line voltage.
Band switch in standard broadcast position.
All voltages shown are positive D.C. unless otherwis noted.
All voltages measured from socket contacts to chassis D.C. voltages measured with a vacuum tube voltmeter A.C. voltages measured with a 1000 ohm per volt A.C meter.
Volume and tone controls maximum.



Socket Voltages

BRIEF DESCRIPTON OF EXPANDER AND COMPRESSOR CIRCUITS:

V7, 6SF7 and V6, 6H6 embrace the expansion circuit Referring to Figure 3, Schematic Diagram, it will be noted that expansion is in the circuit only when the "Phono" o "Radio Receive" buttons are depressed. V7, 6SF7, serves as the 2nd detector and expansion amplifier. V6, 6H functions as the expansion rectifier in one diode section and furnishes delayed audio AVC in the other diode section V8, 6H6, functions as the compressor rectifier.

HOW TO CHECK EXPANSION VOLTAGE:

Feed a 1 volt (RMS) 400 cycle signal into the phono input plug. Make certain the Phono Button is depressed Connect the leads of a vacuum tube voltmeter* to the location indicated on Figure 3, Schematic Diagram, and ground. The voltage at this point should be between 3 and 4 volts positive D.C. As a cross check measure the cathode voltage of V4, 6SF, which should read about 5 volts D.C The expansion voltage should be about 1 volt less.

HOW TO CHECK COMPRESSION VOLTAGE:

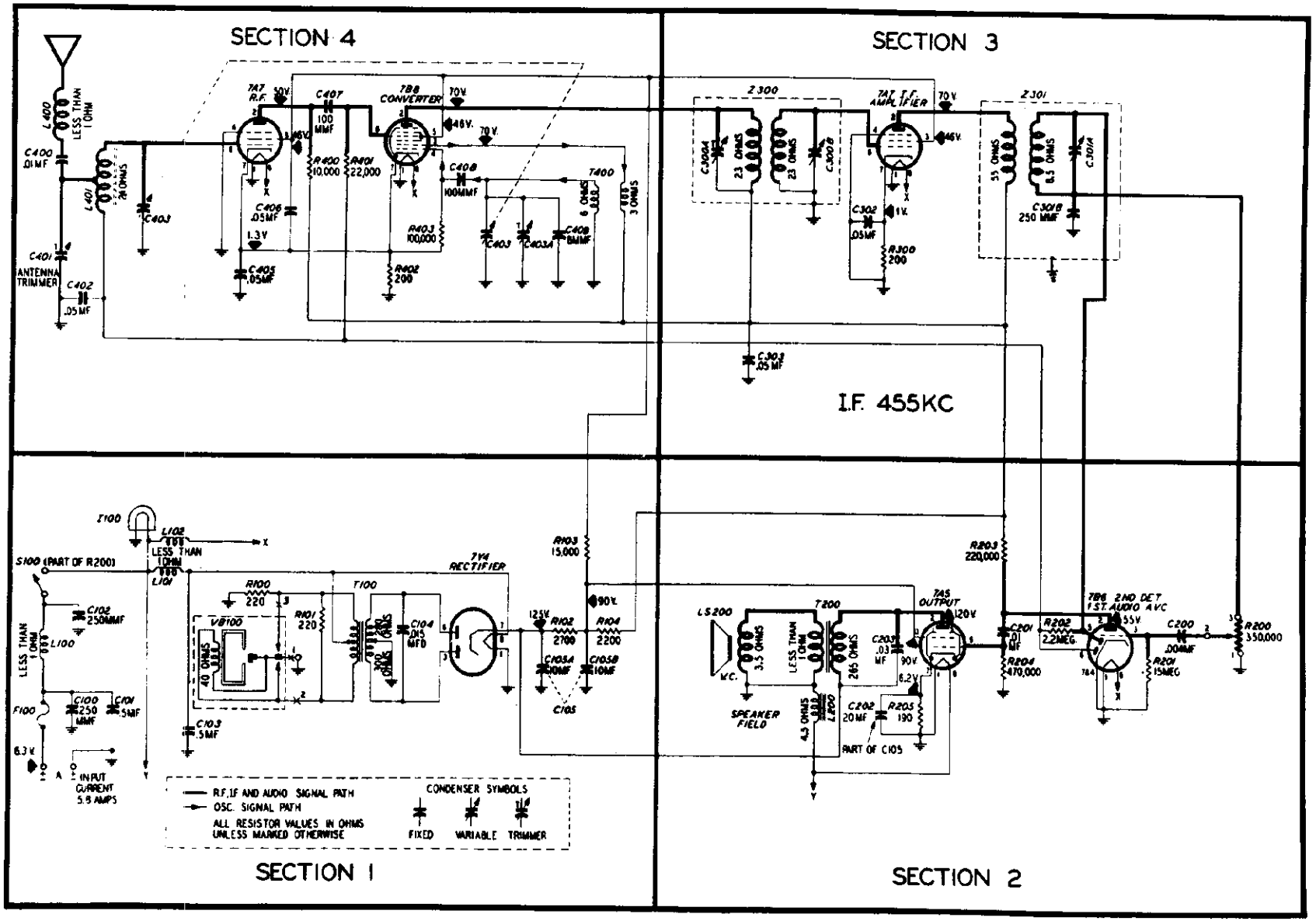
Depress the "Radio Record" button. Feed a 1 volt (RMS) 400 cycle signal into the diode return of the 2nd I.F. (brown lead). In the same manner outlined in the preceeding paragraph, measure the compression voltage, which should be a minus 2 to 3 volts.

*VTVM: Input loading above 10 megohms.

MODEL 1063 PACKARD-BELL COMPANY

PART NO.	REF. SYMBOL	DESCRIPTON
10505A		Assembly, switch arm
10506B		Assembly, pointer
10512		Assembly Kit, chassis
10513		Assembly Kit, record changer
11013A		Arm, switch
11014		Arm, stop
18032A		Bracket, compartment light
18081		Bracket, reject stop
18039A		Bracket, planetary
18043C		Bracket, dial
18068		Bracket, changer shipping
21045-1		Cabinet Back, right
21045-2		Cabinet Back, left
CU-21045		Cabinet, radio: natural mahogany
BN-21045		Cabinet, radio: dark mahogany
BG-21045		Cabinet, radio: walnut
23500C	C1A, B & C	Capacitor, variable: 3 gang with pulley
23400A	C2-1	Capacitor, trimmer: dual 30 Mmf.
	C2-2	
	C2-3	
	C2-4	
	C2-5	
	C2-6	
23228	C3-1	Capacitor, mica: 220 Mmf. 20%
	C3-2	
23402	C4	Capacitor, padder: 300 to 800 Mmf.
23225	C5-1	Capacitor, mica: 47 Mmf. 20%
	C5-2	
	C5-3	
23006	C6-1	Capacitor, paper: .01 Mfd. 200 volt
	C6-2	
	C6-3	
	C6-4	
23207A	C7	Capaictor, mica: 4900 Mmf. 5%
23018	C8-1	Capacitor, paper: .05 Mfd. 600 volt
	C8-2	
	C8-3	
23017	C9-1	Capacitor, paper: .05 Mfd. 200 volt
	C9-2	
	C9-3	
	C9-4	
23004	C10-1	Capacitor, paper: .005 Mfd. 600 volt
	C10-2	
	C10-3	
23019	C11	Capacitor, paper: .1 Mfd. 200 volt
	C12-1	Capacitor, mica: 100 Mmf. (Part of 2nd I.F. assembly)
	C12-2	
23001	C13-1	Capacitor, paper: .001 Mfd. 600 volt
	C13-2	
23007	C14-1	Capacitor, paper: .02 Mfd. 600 volt
	C14-2	
	C14-3	
	C14-4	
23020	C15-1	Capacitor, paper: .2 Mfd. 400 volt
	C15-2	
24006	C16	Capacitor, electrolytic: 25 Mfd. 25 WV
23002	C17	Capacitor, paper: .002 Mfd. 600 volt
24030	C18	Capacitor, electrolytic: 40 Mfd. 450 WV
24002	C19-1	Capacitor, electrolytic: 10 Mfd. 450 WV
	C19-2	
24001	C20	Capacitor, electrolytic: 20 Mfd. 450 WV
23208	C21	Capacitor, mica: 400 Mmf. 10%
23016	C22-1	Capacitor, paper: .003 Mfd. 600 volt
	C22-2	
	C22-3	
23901	C24A & B	Capacitor, paper: 2 X .006 Mfd. 600 volt (in metal case)
92194	L1	Loop Antenna, 18' of 300 ohm twin lead
29400A	L2	Coil, antenna: standard broadcast
29401A	L3	Coil, antenna: short wave
29101A	L4	Coil, R.F.: short wave
29102A	L5	Coil, R.F.: standard broadcast
29201A	L6	Coil, oscillator: short wave
29205A	L7	Coil, oscillator: standard broadcast
29004D	L8	Coil, 1st I.F.: 455 KC
29007	L9	Coil, 2nd I.F.: 455 KC
32003C		Cord, A.C.: 8'
32015		Cord, A.C.: 2½'
36024		Cutter cartridge
38042		Dial Scale, stationized
38043		Dial Scale, export
40101C		Drive, planetary
41012-CU		Escutcheon, dial: mahogany
41012-BG		Escutcheon, dial: walnut
41012-BN		Escutcheon, dial: dark mahogany
CU-52019A		Knob, control: natural mahogany
CU-52020A		Knob, control: natural mahogany
BG-52019A		Knob, control: walnut
BG-52020A		Knob, control: walnut
BN-52019A		Knob, control: dark mahogany
BN-52020A		Knob, control: dark mahogany
AB-52023		Knob, push button: brown, (no spring)
AP-52024A		Knob, push button: tan, (no spring)
52026		Knob, automatic stop

PART NO.	REF. SYMBOL	DESCRIPTON
54001		Lamp, dial: bayonet base
57004		Microphone with cable
57005		Microphone handle
57006		Microphone base
58004E		Automatic record changer
59001		Needle, phono: permanent sapphire
59002		Needle, cutter
63026		Pick-up cartridge
64006		Escutcheon pin
65004E		Plate, dial
65028B		Plate, mounting
66001		Plug, pin
66004		Plug, pin
66013		Plug, microphone
67013A		Pointer, cutter stop
68073		PhonOcord playhouse
68142		Decal, push buttons
68144		Instruction sheet, F-M
68109		Instruction Book
69005		Pulley, drive: 60 cycle
69007A		Pulley, drive: 50 cycle
73055	R1-1	Resistor, carbon: 2.2 megohms, 20%, ½ watt
	R1-2	
73017	R2-1	Resistor, carbon: 220 ohms, 10%, ½ watt
	R2-2	
73026	R3	Resistor, carbon: 1200 ohms, 10%, ½ watt
73053	R4-1	Resistor, carbon: 1 megohm, 20%, ½ watt
	R4-2	
	R4-3	
73041	R5-1	Resistor, carbon: 22,000 ohms, 10%, ½ watt
	R5-2	
73127	R6	Resistor, carbon: 5600 ohms, 10%, 2 watt
73049	R7-1	Resistor, carbon: 220,000 ohms, 20%, ½ watt
	R7-2	
	R7-3	
	R7-4	
	R7-5	
	R7-6	
	R7-7	
73042	R8	Resistor, carbon: 27,000 ohms, 10%, ½ watt
73060	R9-1	Resistor, carbon: 56,000, 10%, ½ watt
	R9-2	
73057	R10-1	Resistor, carbon: 4.7 megohms, 20%, ½ watt
	R10-2	
	R10-3	
	R10-4	
	R10-5	
73051	R11-1	Resistor, carbon: 47,000 ohms, 20%, ½ watt
	R11-2	
	R11-3	
	R11-4	
	R11-5	
73054	R12-1	Resistor, carbon: 1.5 megohms, 20%, ½ watt
	R12-2	
73076	R13-1	Resistor, carbon: 56,000 ohms, 10%, 1 watt
	R13-2	
73126	R14	Resistor, carbon: 1500 ohms, 10%, 2 watt
73022	R15	Resistor, carbon: 560 ohms: 10%, ½ watt
73077	R16	Resistor, carbon: 180 ohms, 10%, 2 watt
73907	R17	Resistor, wire wound: 2500 ohms, 10%, 5 watt
73120	R18	Resistor, carbon: 1000 ohms, 10%, 2 watt
73047	R19-1	Resistor, carbon: 100,000 ohms, 20%, ½ watt
	R19-2	
73037	R20	Resistor, carbon: 10,000 ohms, 10%, ½ watt
73030	R21	Resistor, carbon: 2700 ohms, 10%, ½ watt
25800	R22-1	Control, mixer: 500,000 ohms
	R22-2	
25500A	R23A, B & C	Control, volume: 3 section; section A-1 megohm, Section B-2 megohms, Section C-500,000 ohms
25507	R24	Control, tone: 3 megohms, with AC switch
73025	R25	Resistor, carbon: 1000 ohms, 10%, ½ watt
73033	R26	Resistor, carbon: 4700 ohms, 10%, ½ watt
73020	R27	Resistor, carbon: 390 ohms, 10%, ½ watt
73903	R28	Resistor, wire wound: 15 ohms, 10%, 1 watt
73910	R29	Resistor, wire wound: .5 ohm, 10%, 1 watt
73039	R30	Resistor, carbon: 15,000 ohms, 10%, ½ watt
73045	R31	Resistor, carbon: 47,000 ohms, 10%, ½ watt
77013B		Shaft, switch arm
78008A		Shield, microphone plug
78031A		Shield, compartment lamp
79002		Socket, tube: 8 prong octal, wafer type
79004		Socket, microphone
79005		Socket, speaker & cutter
79007		Socket, phono motor
79010B		Socket, dial lamp: bayonet base
79023		Socket, loop leads
79033		Socket, compartment lamp
83701A		Speaker, 10" permanent magnet
84001		Spring, push button knob
84028		Spring, dial cord
86001A	S1	Switch, rotary: 3 section, band switch
86301	S2	Switch, push button
86802A		Switch, micro: (part of automatic cutter stop)
89409D	T1	Transformer, output
89006E	T2	Transformer, power
89015		Transformer, step down



NOTE: All voltage, capacity, and resistance values shown are average. The voltages were measured between the points indicated and the receiver chassis (B–), using a 20,000-ohms-per-volt meter, with 6.3 volts d-c input to the receiver power supply; the volume control was set at minimum, and the tuning condenser at 550 kc.

ALIGNMENT PROCEDURE

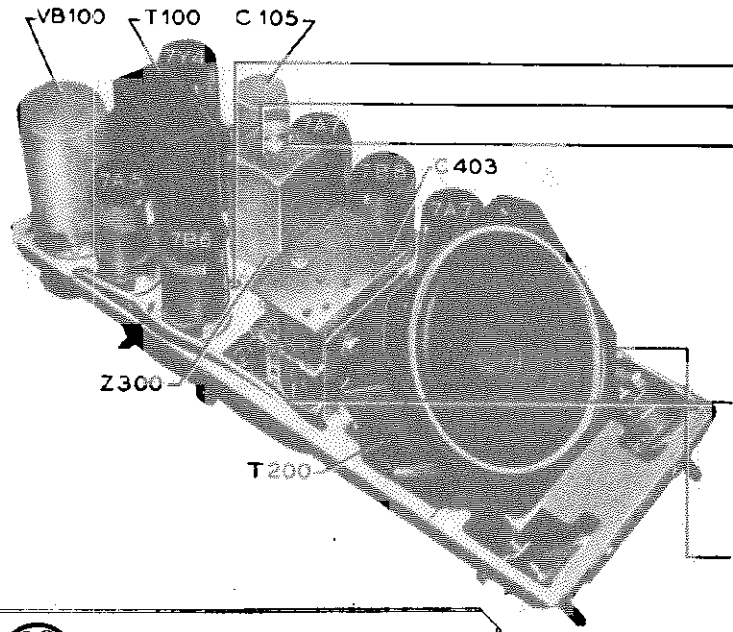
CONNECT THE SIGNAL-GENERATOR output lead as follows:

For the i-f alignment (steps 1 and 2 in the chart), apply the modulated r-f signal through a .05-mf. condenser to the aerial receptacle.

For the r-f alignment (steps 3 and 4), inject the modulated r-f signal through a 30-mmf. condenser in series with an aerial lead (Part No. 95-0185) plugged into the aerial receptacle. If an aerial lead is not available, inject the signal through the 30-mmf. condenser alone, and connect a second 30-mmf. condenser from the aerial receptacle to the receiver chassis.

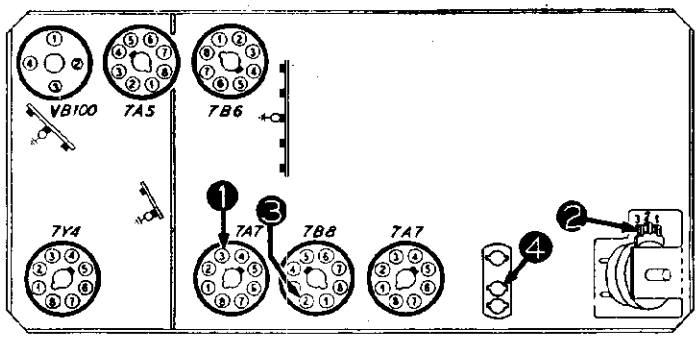
CONNECT THE OUTPUT METER across the speaker voice-coil terminals. **SET THE DIAL POINTER** to coincide with the index dot at the low-frequency end of the scale, when the tuning-condenser plates are fully meshed.

SET THE RECEIVER VOLUME CONTROL at maximum. Using the lowest range on the output meter, adjust the signal-generator output, as alignment progresses, to keep the meter needle near center scale.

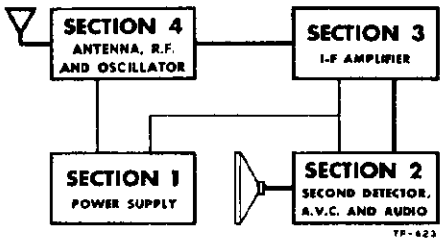


Top view, showing trimmer-condenser locations.

ADJUST IN ORDER	SPECIAL INSTRUCTIONS	DIAL SETTINGS SIG. GEN.	DIAL SETTINGS RECEIVER
C301A C300B C300A	1. Ground the oscillator grid (pin 4) of the 7B8 converter. Adjust the i-f trimmers for maximum in the order listed.	455 kc.	550 kc.
	2. Repeat step 1. Then remove the ground from pin 4 of the 7B8.		
C403A	3. Adjust for maximum.	1600 kc.	1600 kc.
C401	4. Adjust for maximum. Final adjustment to be made after the receiver has been reinstalled in the car, with the aerial connected.	1400 kc.	1400 kc.



Bottom view, showing test points.



Block diagram (Heavy lines indicate signal path.)

TROUBLE-SHOOTING PROCEDURE

In this manual, the receiver circuit is divided into four sections, as shown in figure 1. One test point is designated for each section, as shown in figure 2. Normal indications, secured when checking these points, eliminate the section under test as a source of trouble. Isolation of the faulty part is accomplished by testing in the order shown in the sectional test charts. A high-quality signal generator and volt-ohmmeter and a 6.3-volt d-c power source are required. The voltage readings shown were taken with a 20,000-ohms-per-volt meter.

To localize trouble, connect the receiver to the 6.3-volt d-c power source, and turn the receiver volume control to maximum; see that all tube filaments are lighted; then proceed in the order given in the following chart. When abnormal indications appear, make voltage and resistance checks of the circuit under test. Remedy any defect encountered before proceeding with the next step.

IMPORTANT

The aerial and aerial lead-in form part of the r-f tuning circuit. When testing or aligning this receiver on the bench it is important that an aerial dummy load of equal capacity be used.

TESTS TO LOCALIZE TROUBLE TO ONE SECTION

SECTION	TEST	NORMAL RESULTS
1	Measure voltage between point 1 and chassis (B—).	46 volts.
2	Apply audio signal between point 2 and chassis, through a condenser (.01 to .25 mf.).	Loud, clear signal from speaker.
3	Apply a modulated r-f signal (455 kc.) between point 3 and chassis, through a condenser (.01 to .25 mf.).	Loud, clear signal.
4	Turn tuning condenser to half-meshed position. Apply a modulated r-f signal between point 4 and chassis, through a condenser (.01 to .25 mf.). Tune signal generator until the signal is heard in the speaker.	Loud, clear signal.

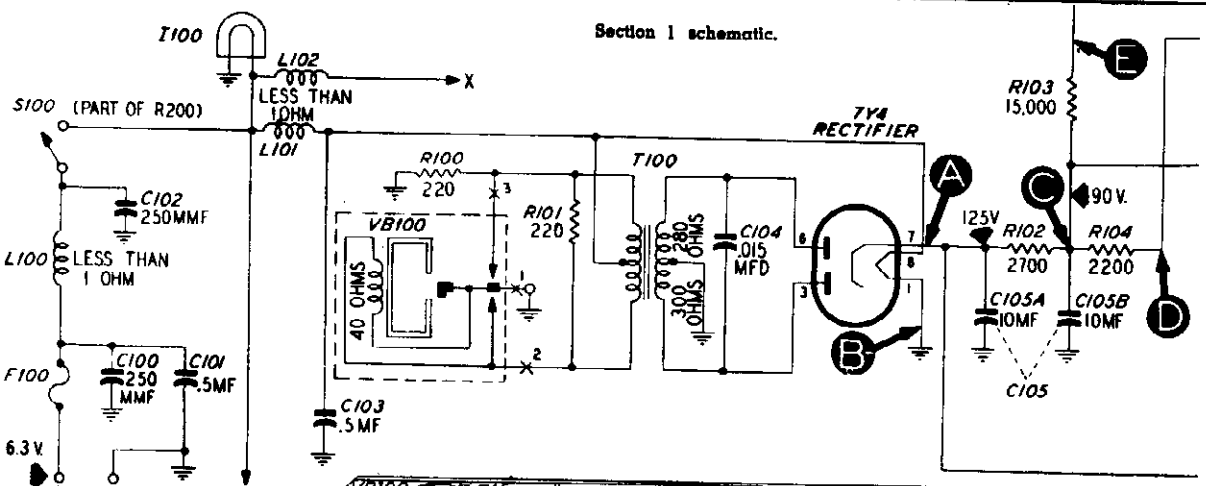
TESTS TO ISOLATE TROUBLE WITHIN SECTION 1

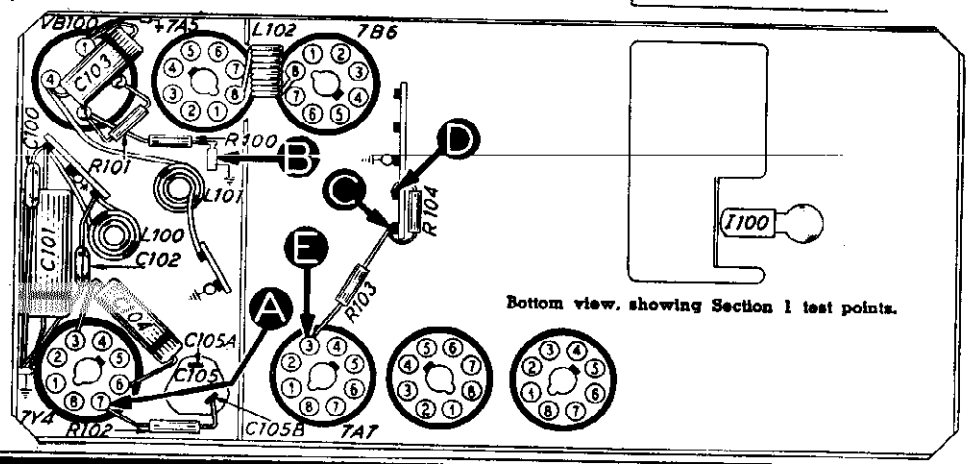
Make all measurements for this section with a volt-ohmmeter, using the applicable d-c range. All voltages given in this manual are average, and were taken with 6.3 volts d-c input to the power supply; the volume control was set at minimum, and the tuning-condenser plates were fully meshed.

WARNING: If the 7Y4 rectifier is found to be defective, check the main filter condenser, C105, for shorts before inserting a new tube. If the vibrator is found to be defective, check C104 for a short before inserting a new vibrator.

TEST POINTS	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
A to B—	125 volts	Defective 7Y4, VB100, T100, C104, or C105A.
C to B—	90 volts	Defective C105B or R102.
D to B—	70 volts	Defective R104 or C303 (shown in Section 3).
E to B—	46 volts	Defective R103 or C406 (shown in Section 4).

Section 1 schematic.



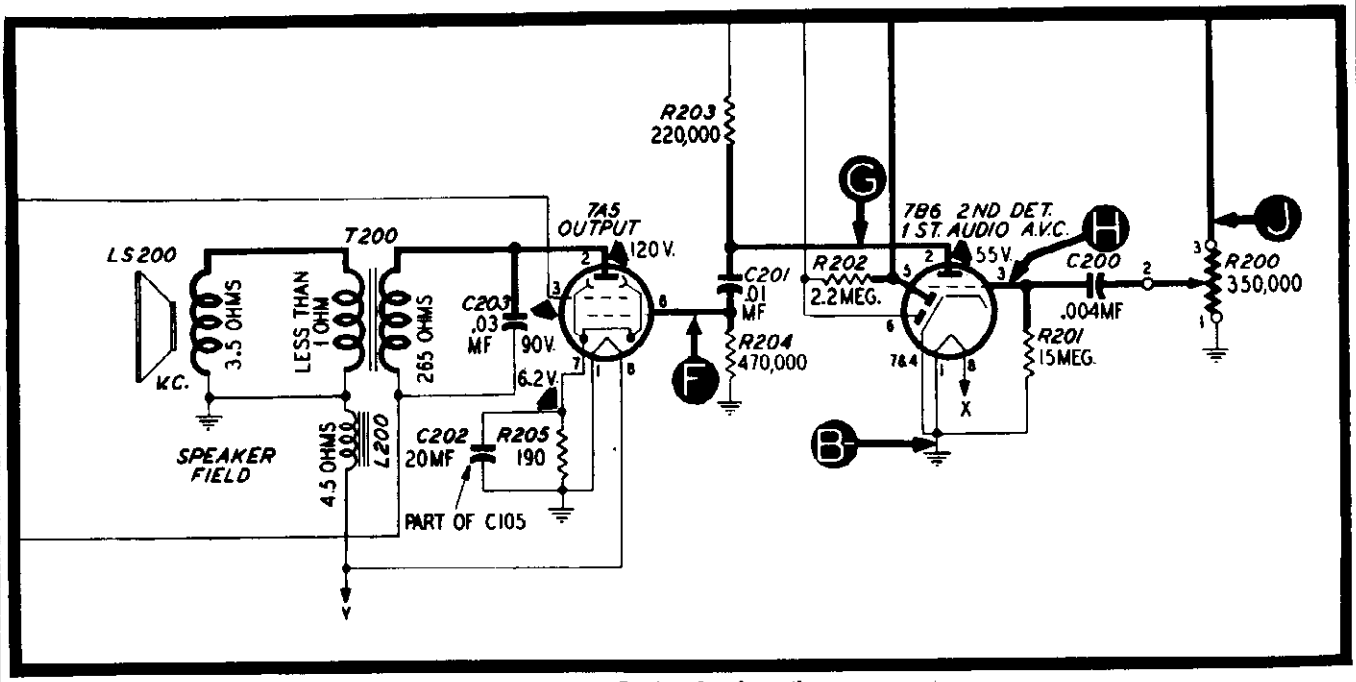


Bottom view, showing Section 1 test points.

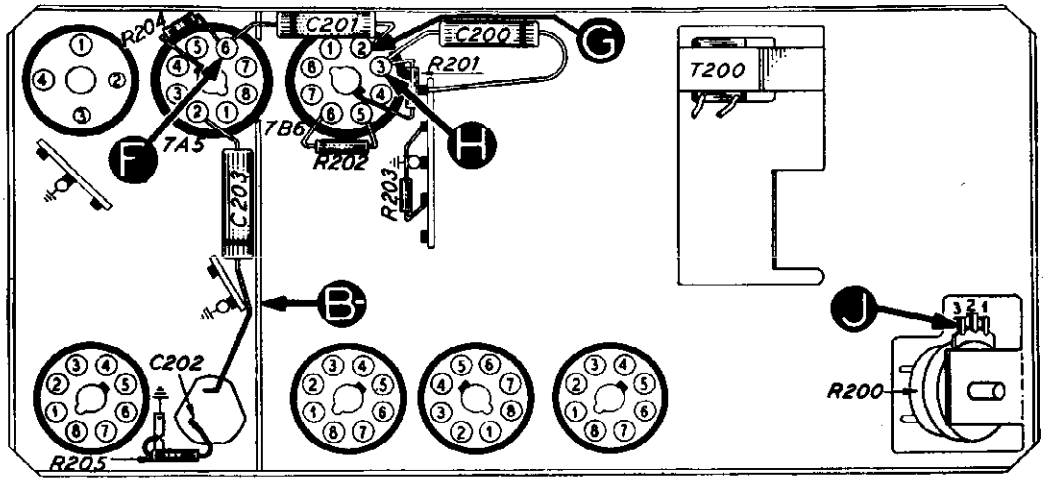
TESTS TO ISOLATE TROUBLE WITHIN SECTION 2

For all tests in this section, use an audio signal. Connect the generator output lead through a condenser (.01 to .25 mf.) to the test points indicated; connect the ground lead to the receiver chassis (B—). Set the receiver volume control at maximum, and adjust the signal-generator output for a loud, clear signal.

TEST POINTS	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
F to B—	Loud, clear signal.	Defective 7A5, T200, LS200, C201, C202, C203, R204, or R205.
G to B—	Loud, clear signal.	Open C201.
H to B—	Clear signal, much louder than preceding test.	Defective 7B6, R201, or R203.
J to B—	Loud, clear signal.	Defective C200, R200 (rotate R200 through its entire range for complete check) or Z301 (shown in section 3).



Section 2 schematic.

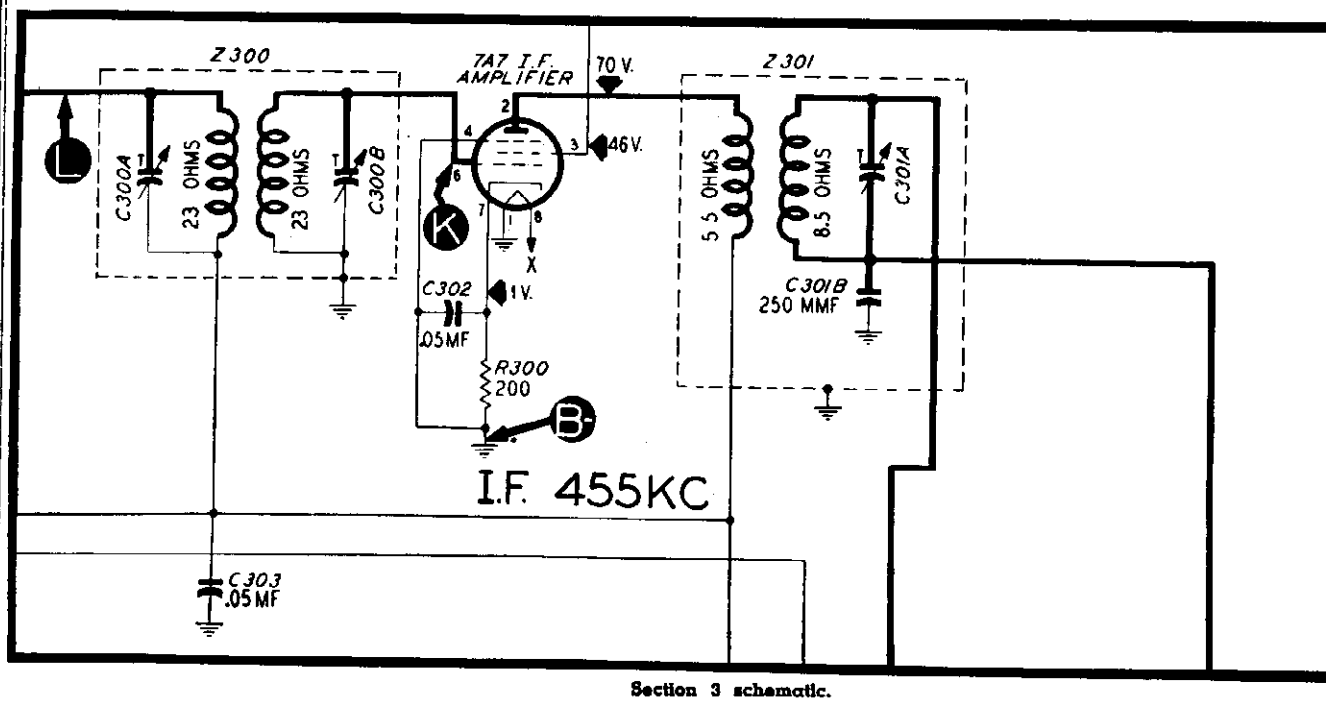


Bottom view, showing Section 2 test points.

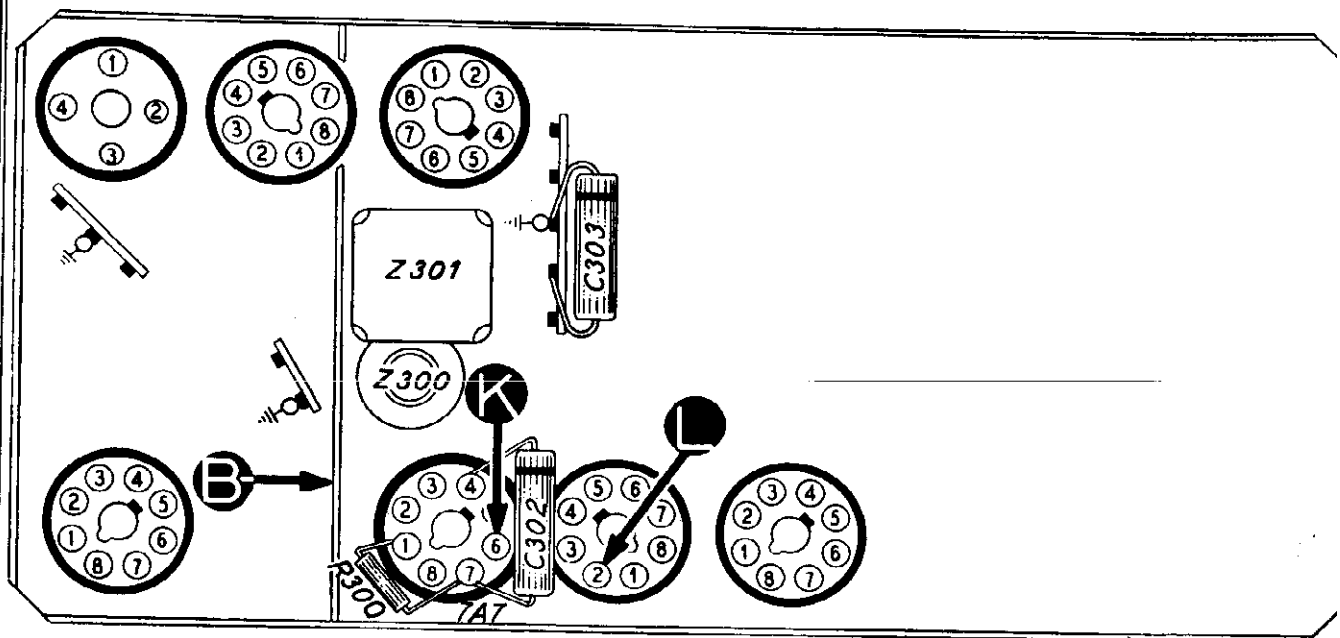
TESTS TO ISOLATE TROUBLE WITHIN SECTION 3

For all tests in this section, use a modulated 455-kc. signal. Connect the generator output lead through a condenser (.01 to mf.) to the points indicated; connect the ground lead to the receiver chassis (B–). Set the receiver volume control at maximum. adjust the signal-generator output for a loud, clear signal.

TEST POINTS	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
K to B–	Loud, clear signal.	Defective 7A7, Z301, C302, R300, or C406 (shown in Section 4).
L to B–	Loud, clear signal.	Defective or misaligned Z300.



Section 3 schematic.



Bottom view, showing Section 3 test points.

TP1275D

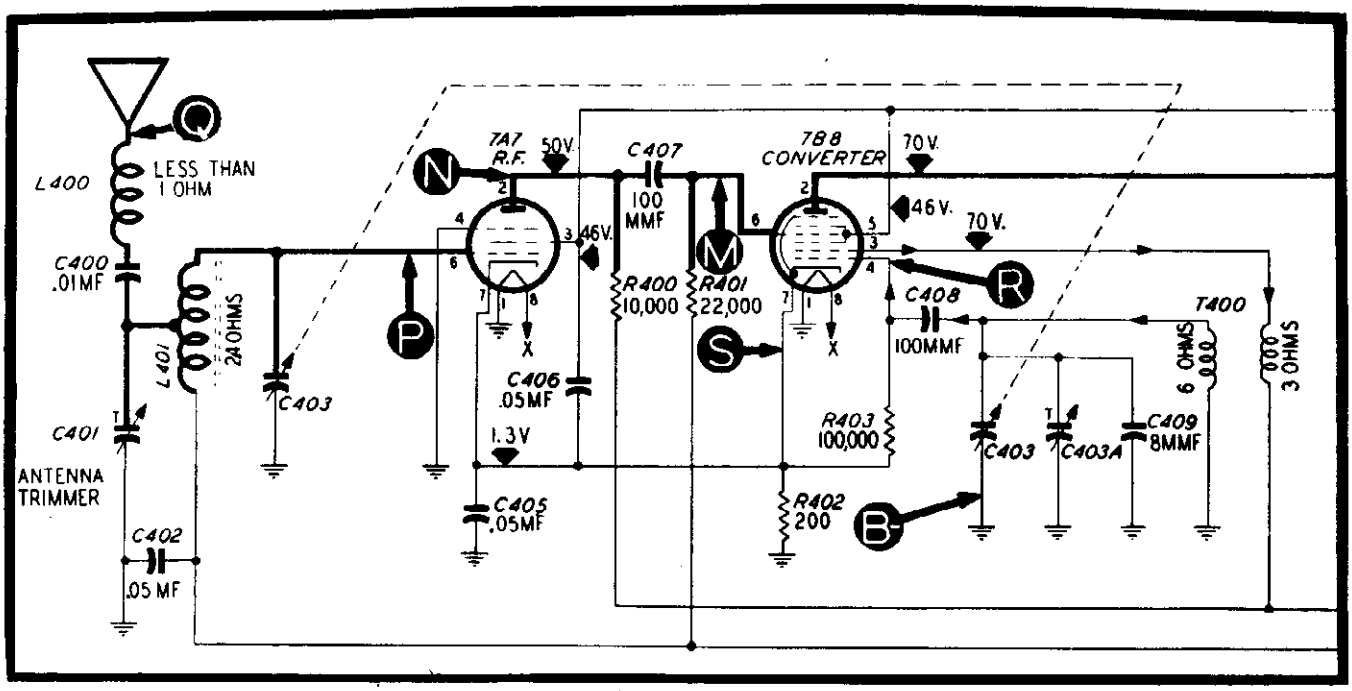
TESTS TO ISOLATE TROUBLE WITHIN SECTION 4

1. Set the volume control at maximum. Rotate the tuning condenser through its entire range. Any scraping noise from the speaker indicates bent plates, or dirt between plates or on wiper contacts. Remedy such conditions before proceeding further.

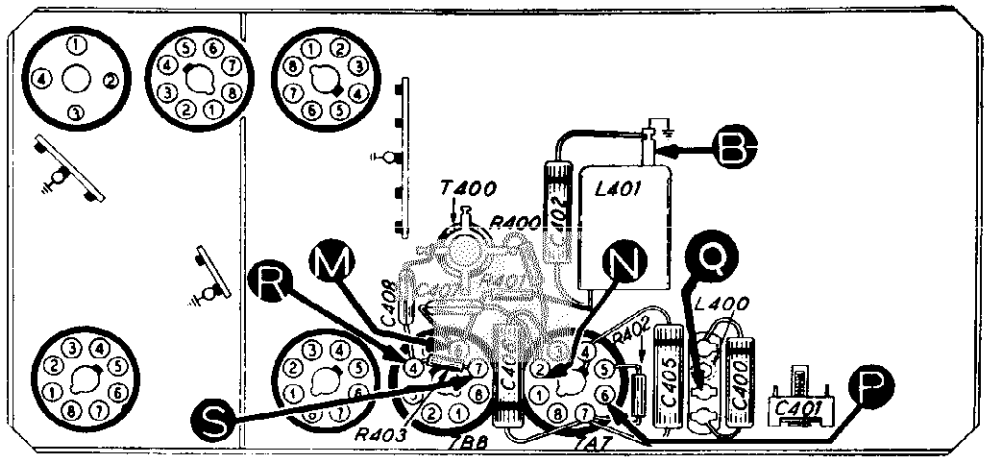
2. Attach the positive lead of a 20,000-ohms-per-volt meter to point S, and the prod end of the negative lead through a 50,000-ohm resistor to point R. Set the meter on a 10-volt or similar range, and rotate the tuning condenser through its entire range. Absence of voltage at any point indicates that the oscillator is not functioning. If this is the case, check the components listed in the first test below.

3. Connect the signal-generator output lead through a condenser (.01 to .25 mf.) to the points indicated; connect the ground lead to the receiver chassis. Using a modulated signal, tune the generator and receiver to 1000-kc., and proceed as below.

TEST POINTS	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
M to B—	Loud, clear signal.	Defective 7B8, T400, C403, C403A, C405, C407, C408, C409, R401, R402, or R403.
N to B—	Loud, clear signal.	Open C407.
P to B—	Clear signal, louder than preceding test.	Defective 7A7, L401, C403, or R400.
Q to B—	Loud, clear signal.	Defective L400, L401, C400, C401, or C402.



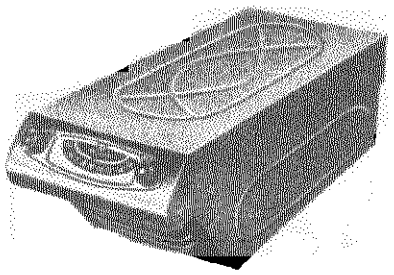
Section 4 schematic.



Bottom view, showing Section 4 test points.

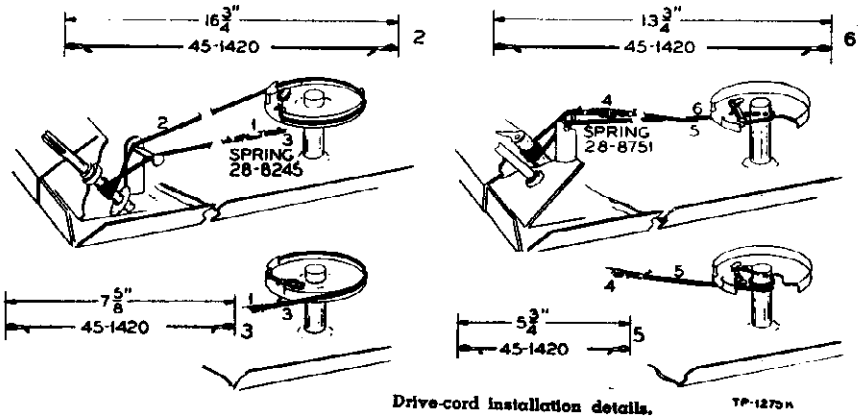
PHILCO CORP.

MODEL UN6-1



SPECIFICATIONS

CIRCUIT	Six-tube, superheterodyne
FREQUENCY RANGE	550 to 1600 kc.
INTERMEDIATE FREQUENCY	455 kc.
POWER INPUT	6.3 volts, 5.8 amperes, d.c.
PHILCO TUBES USED	7A7(2), 7B8, 7B6, 7A5, 7Y4
AERIAL	Philco universal auto radio type



Drive-cord installation details. TP-1270-A

Symbol designations used in the schematics and parts list are as follows:

C—condenser
F—fuse
I—pilot lamp
L—choke or coil
LS—loud speaker
R—resistor
S—switch
T—transformer
VB—vibrator
Z—electrical assembly

NOTE: Parts marked with an asterisk (*) are general replacement items, and the part numbers will not be identical with those used on factory assemblies. Use only the "Service Part No." shown in the parts list when ordering replacements.

REPLACEMENT PARTS LIST

SECTION 1

Reference No.	Description	Service Part No.
C100	Condenser, 250 mmf.	60-10245307*
C101	Condenser, .5 mf.	61-0137*
C102	Condenser, 250 mmf.	60-10245307*
C103	Condenser, .5 mf.	61-0137*
C104	Condenser, .015 mf.	61-0138*
C105	Condenser, electrolytic, 10-10-20 mf.	61-0068*
	C105A: condenser, 10 mf.	Part of C105
	C105B: condenser, 10 mf.	Part of C105
F100	Fuse	45-2559*
I100	Lamp, pilot	34-2039*
L100	Choke, "A"	32-2477
L101	Choke, vibrator	65-0204
L102	Choke, "A"	32-2477
R100	Resistor, 220 ohms	66-1224340*
R101	Resistor, 220 ohms	66-1224340*
R102	Resistor, 2,700 ohms	66-2274340*
R103	Resistor, 15,000 ohms	66-3153340*
R104	Resistor, 2,200 ohms	66-2223340*
S100	Switch	Part of R200
T100	Transformer, power	65-0404*
VB100	Vibrator	83-0026*

SECTION 2

C200	Condenser, .004 mf.	61-0179*
C201	Condenser, .01 mf.	61-0120*
C202	Condenser, 20 mf.	Part of C105
C203	Condenser, .03 mf.	61-0119*
L200	Speaker, field	Part of LS200
LS200	Speaker	73-0027*
R200	Control, volume, 350,000 ohms	67-0020*
R201	Resistor, 15 megs.	66-6154340*
R202	Resistor, 2.2 megs.	66-5224340*
R203	Resistor, 220,000 ohms	66-4223340*
R204	Resistor, 470,000 ohms	66-4474340*
R205	Resistor, 190 ohms	66-1193340*
T200	Transformer, output	Part of LS200

SECTION 3

C302	Condenser, .05 mf.	61-0122*
C303	Condenser, .05 mf.	61-0122*
R300	Resistor, 200 ohms	66-1203340*
Z300	Transformer, 1st i-f	65-0191
	C300A: condenser, trimmer	Part of Z300
	C300B: condenser, trimmer	Part of Z300
Z301	Transformer, 2nd i-f	65-0192
	C301A: condenser, trimmer	Part of Z301
	C301B: condenser, 250 mmf.	Part of Z301

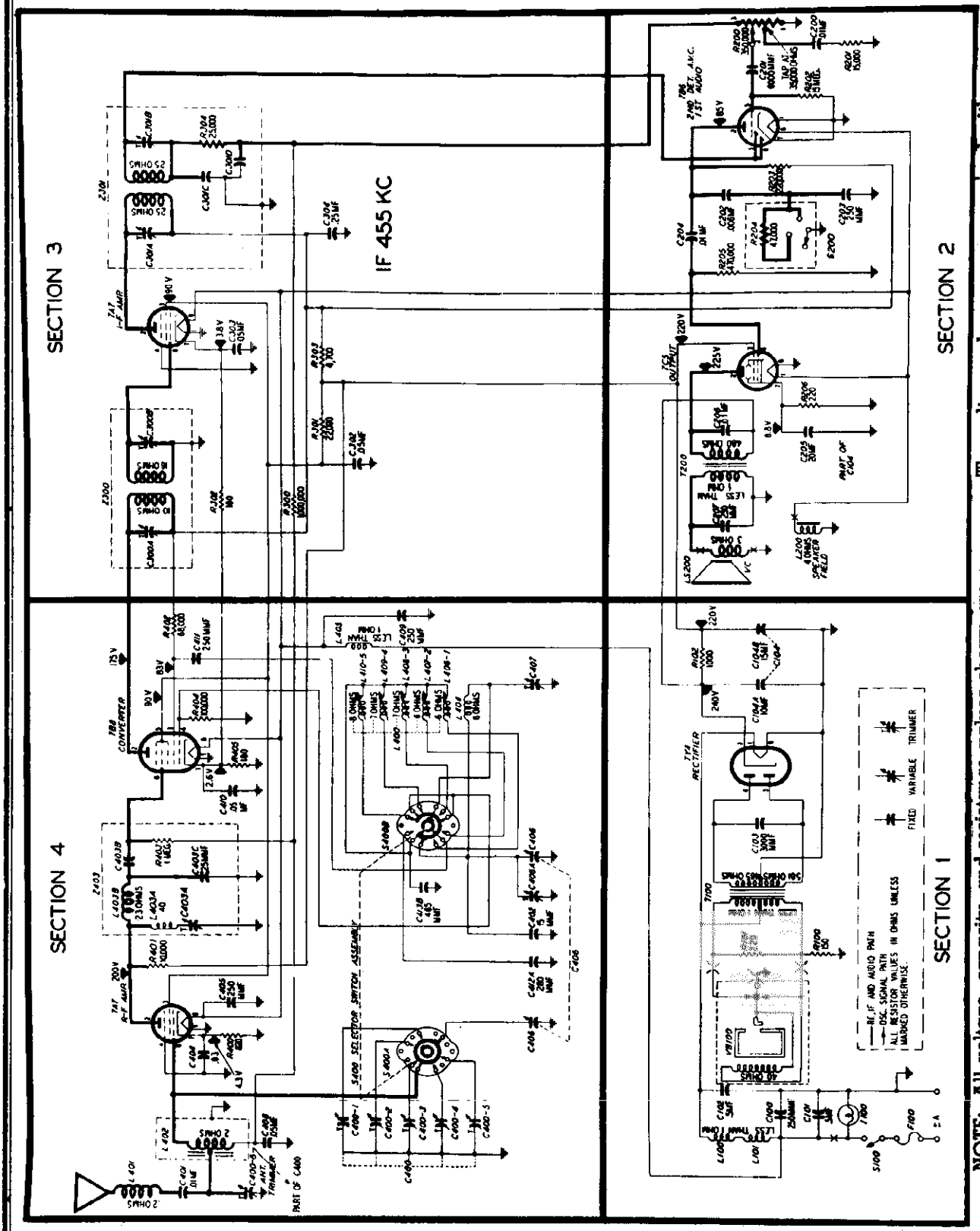
SECTION 4

C400	Condenser, .01 mf.	61-0120*
C401	Condenser, trimmer	63-0030*
C402	Condenser, .05 mf.	61-0122*
C403	Condenser, tuning	63-0028
	C403A: condenser, trimmer	Part of C403
C405	Condenser, .05 mf.	61-0122*
C406	Condenser, .05 mf.	61-0122*
C407	Condenser, 100 mmf.	60-10105407*
C408	Condenser, 100 mmf.	60-10105407*
C409	Condenser, 8 mmf.	60-00105407*
L400	Coil, antenna choke assembly	65-0168
L401	Coil, antenna	65-0196
R400	Resistor, 10,000 ohms	66-3103340*
R401	Resistor, 22,000 ohms	66-3223340*
R402	Resistor, 200 ohms	66-1203340*
R403	Resistor, 100,000 ohms	66-4103340*
T400	Transformer, oscillator	65-0194

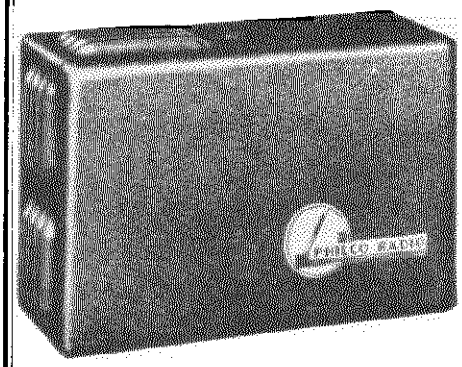
MISCELLANEOUS

Description	Service Part No.
"A"-lead assembly	77-0217
Bushing, pointer	57-2671FA3
Clamp, vibrator	57-1637FA3
Clip, coil mounting (oscillator)	28-5002FA1
Cord, drive (25-foot spool)	45-1420
Dial window parts	
Clip, brass	28-3445
Rivet	1W36671FA4
Window, glass	55-0501
Dial and frame assembly	
Dial	55-1200
Frame	57-1399FA3
Fuse lead assembly	77-0235
Grommet, tuning condenser mounting	27-4596
Housing assembly	
Connector, aerial	57-0591FA3
Cover, tube side	76-1702
Cover assembly, wiring side	77-0561FJ22
Screw, front cover	1W21813FA3
Screw, side cover	W1586FA3
Knob, tuning control and volume control	77-0765
Mounting parts kit	
Bolt, bracket-to-cap	1W16117FA3
Bracket, set mounting	57-0812FJ22
Lockwasher, bracket-to-set	1W57223FA1
Lockwasher, bracket-to-set	1W24516FA1
Lockwasher, bracket-to-set	1W32403FA1
Nut, bracket-to-set	1W21291FA3
Nut, front mounting	W1532FA3
Screw, bracket-to-set	1W11510FA3
Screw, front mounting	1W13212FA3
Pilot lead assembly	76-1703
Pointer	57-1940FCP
Screw, speaker mounting	1W12922FA3
Shaft, tuning	57-0802FA3
Socket, tube	27-6128*
Socket, vibrator	27-6153*
Socket assembly, pilot lamp	77-0342FA3
Spring, drive cord (music wire)	28-8245
Spring, drive cord (spring wire)	28-8751
Spring, pilot lamp (music wire)	57-0701
Strap, back	28-5998FA3
Suppression kit	
Condenser, interference filter	30-4007
Resistor, distributor	33-1196
Washer, tuning shaft	1W52353FA3

MODEL UN6-550 PHILCO CORP.

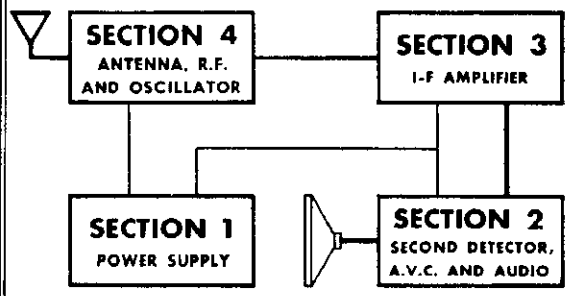


NOTE: All voltage, capacity, and resistance values shown are average. The voltages shown were measured with a 20,000-ohms-per-volt meter between the indicated test points and chassis (C), with 6.3 volts d-c input to the receiver power supply.

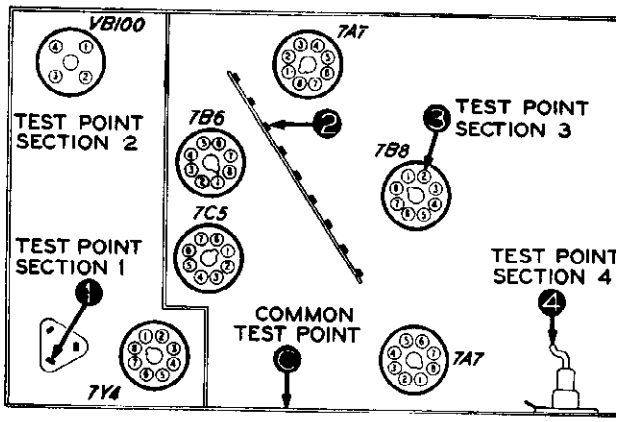


SPECIFICATIONS

CIRCUIT ..... Six-tube, superheterody
FREQUENCY RANGE ..... 550 to 1580
INTERMEDIATE FREQUENCY 455
POWER INPUT ..... 6.3 volts, 8.3 amperes, d.c. (with speaker connect
PHILCO TUBES USED ..... 7A7(2), 7B8, 7B6, 7C5, 7
AERIAL ..... Philco universal auto-radio ty



Block diagram
(Heavy lines indicate signal path)



Bottom view, showing test points.

TROUBLE-SHOOTING PROCEDURE

In this manual, the receiver circuit is divided into four sections, as shown in figure 1. One test point is designated for each section, as shown in figure 2. Normal indications, secured when checking at these points, eliminate the section under test as a source of trouble. Isolation of the faulty part is accomplished by testing in the order shown in the sectional test charts. A high-quality signal generator, volt-ohmmeter, ammeter (0 to 30 amps., d.c.), and a source of 6.3 volts d.c. are required. The voltage readings shown were taken with a 20,000-ohms-per-volt meter.

To localize trouble, connect the receiver to the power supply; turn the receiver volume control to maximum; see that all tube filaments are lighted; then proceed in the order given in following chart. Remedy any defect encountered before proce ing to next check.

When using the signal generator, always connect a conden (.01 to .25 mf.) in series with the output lead.

IMPORTANT

The aerial and aerial lead-in form part of the r-f tuning circ When testing or aligning this receiver on the bench it is import that an aerial dummy load of equal capacity be used.

TESTS TO LOCALIZE TROUBLE TO ONE SECTION

SECTION	TEST	NORMAL RESUL
1	Place ammeter in series with power source, and measure current drain of set. Measure voltage between test point 1 and chassis (C).	Approx. 8.3 am 220 volts
2	Apply audio signal between point 2 and chassis (C).	Loud, clear sign from speaker.
3	Apply weak, modulated 455-kc. signal between point 3 and C.	Loud, clear sign
4	Apply weak, modulated, r-f signal (approx. 1000 kc.) between point 4 and C. Set selector switch to "DIAL".* and tuning cond. to half-meshed; tune sig. gen. until a signal is heard. Test also in "AUTOMATIC" positions 1—5 inclusive.	Loud, clear sign

*To set the selector switch in "DIAL" position, unscrew the locking screw (see figure 11, page 6) until it protrudes ½" from the outside of the case. Then rotate the selector switch until it locks. This will be the "DIAL" position, and the "AUTOMATIC" positions 1 to 5 may be found by releasing the lock and rot the switch clockwise, while watching the rotor arm contac the rear of the switch wafer nearest the side of the chassis.

MODEL UN6-550 PHILCO CORP.

ALIGNMENT PROCEDURE

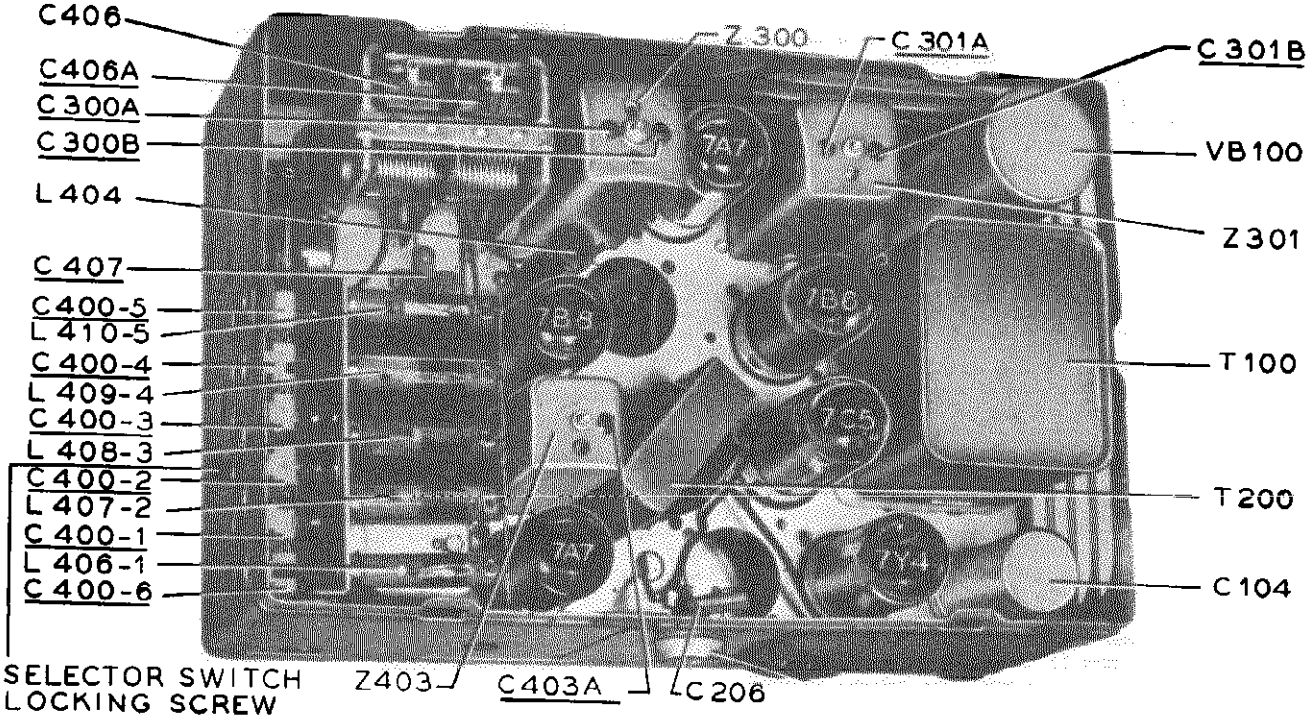
OUTPUT METER: Connect to the voice-coil lugs on the speaker. **SIGNAL GENERATOR:** Connect the output lead as indicated in the chart below; connect the ground lead to the receiver chassis. Set the receiver volume control at maximum. Then adjust the signal-generator output to give a readable deflection on the output meter, using the meter range that best indicates small changes in output. Reduce the signal-generator output as alignment progresses, to prevent the meter needle from going off scale.

DIAL CALIBRATION: When the radio is re-installed in the car, the dial pointer must be set to coincide with the index dot at the low-frequency end of the dial, with the tuning condenser fully meshed.

NOTE: Instructions for setting up the automatic push-button tuning control may be found in the UN6-550 Operating and Installation Instructions, Philco Part No. 39-7882.

ALIGNMENT CHART

SIGNAL GENERATOR			RECEIVER		
	Connections to Receiver	Dial Setting	Tuning-Condenser Setting	Special Instructions	Adjust Trimmers
1	Through .05 mf. to the antenna receptacle.	455 kc.	Fully meshed.	Preset C403A fully tight.	C403A (fully tight)
				Lock station-selector switch in "DIAL" position (see instructions at bottom of page 1); ground stator of oscillator section of gang. Adjust for maximum in given order; then repeat procedure.	C301B C301A C300B C300A
2	Same as 1.	455 kc.	Fully meshed.	Adjust for minimum; then remove ground from oscillator section of gang.	C403A
3	Through 30 mmf. in series with antenna lead, Philco Part No. 85-0185 to the antenna receptacle.	1580 kc.	Fully open.	Adjust for maximum.	C406A
4	Same as 3.	1400 kc.	Tune to maximum signal.	Adjust for maximum. Final adjustment must be made after radio has been re-installed in car with antenna connected.	C400-6
5	Same as 3.	580 kc.	Tune to maximum signal.	Adjust while rocking tuning gang.	C407
6	Same as 3.			Repeat steps 3, 4, and 5.	



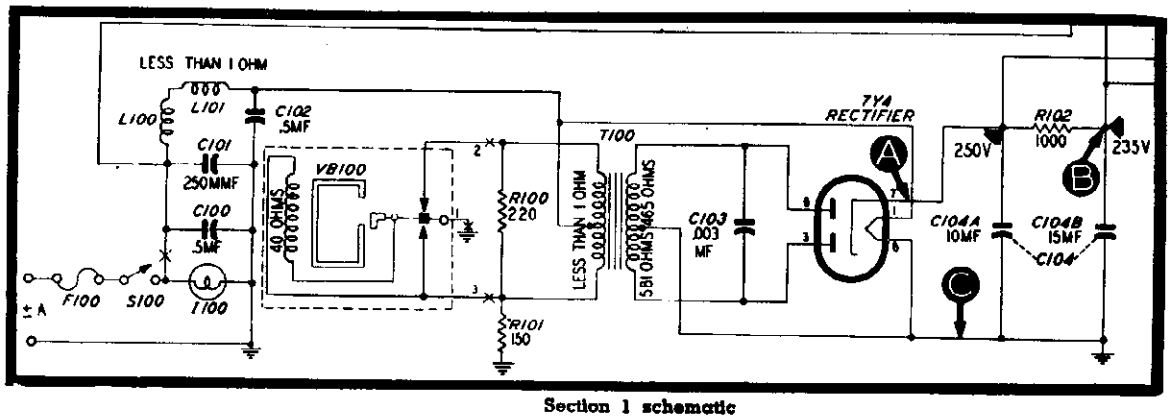
Top view, showing trimmer-condenser locations.

TESTS TO ISOLATE TROUBLE WITHIN SECTION 1

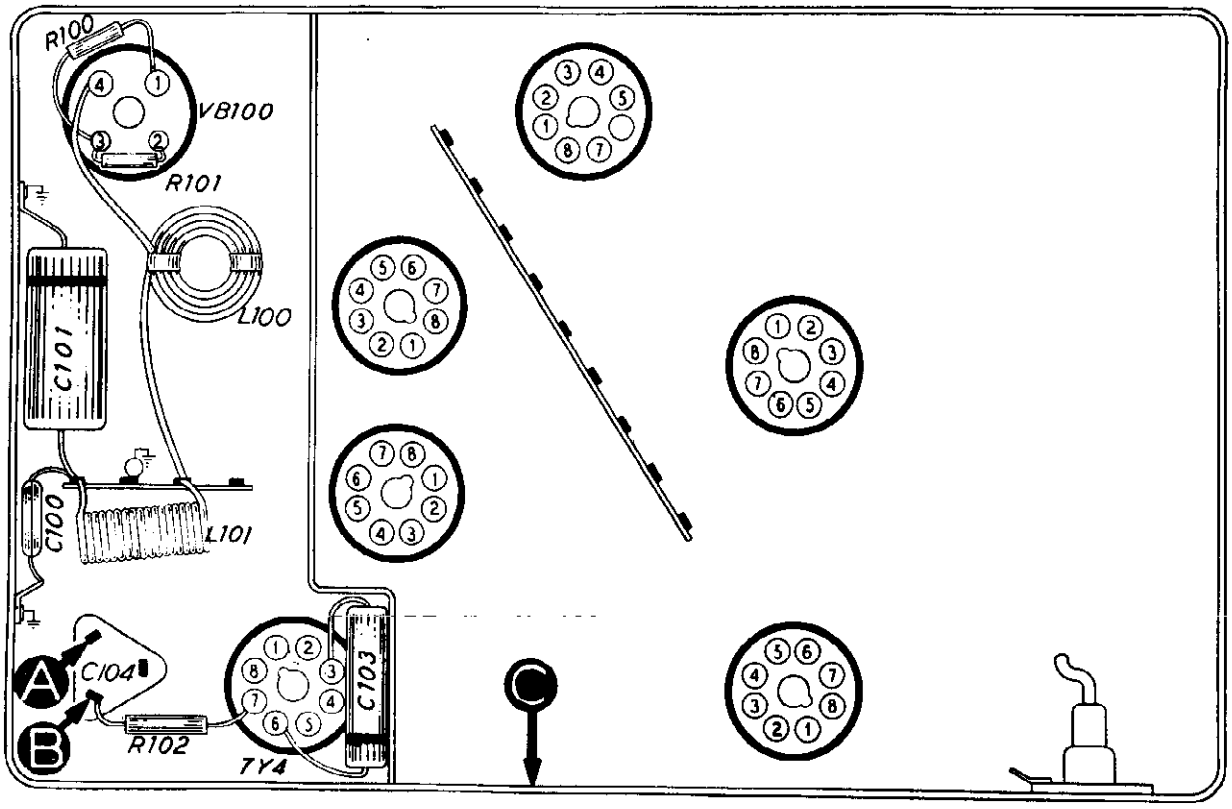
With the exception of the first test, all measurements in this section should be made with a volt-ohmmeter, using the applicable d-c range. The voltages given were measured with the volume control at minimum, and with 6.3 volts d-c input to the receiver power supply.

NOTE: If the 7Y4 is found to be defective, check C104A C104B for shorts before inserting a new tube. If the vibrato found to be defective, check C103 for a short before insertin new vibrator.

TEST POINTS	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
Ammeter in series with power source.	8.3 amps.	Excessively high or low current indicates defective VB100, T100, C103, or 7Y4
A to C	240 volts	Defective 7Y4, C104A, or C104B.
B to C	220 volts	Defective R102, C104B, C302, or C304 (see Section 3 for location).



Section 1 schematic



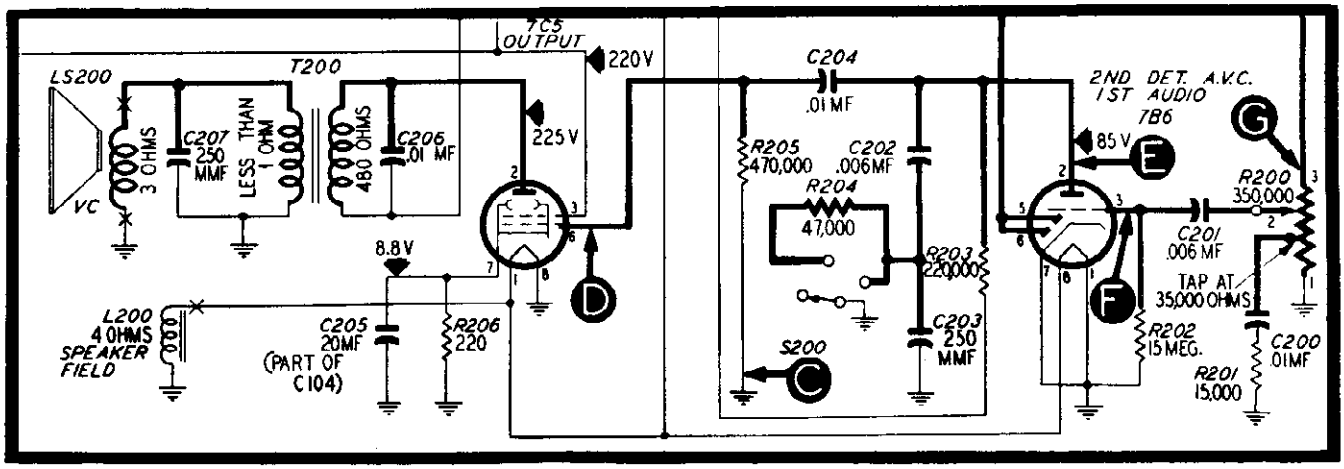
Bottom view, showing Section 1 test points.

MODEL UN6-550 PHILCO CORP.

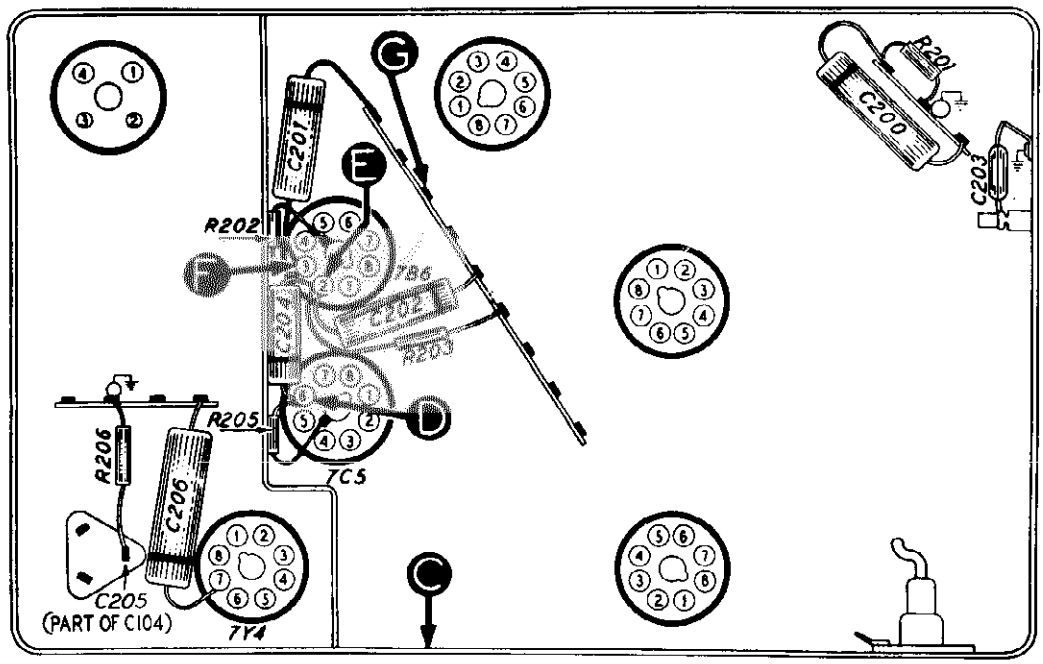
TESTS TO ISOLATE TROUBLE WITHIN SECTION 2

For all tests in this section, use an audio signal. Connect the signal-generator output lead through a condenser (.01 to .25 mf.) to the test points indicated; connect the ground lead to the receiver chassis (C). Set the receiver volume control at maximum, and adjust the signal-generator output for a loud, clear signal.

TEST POINTS	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
D to C	Loud, clear signal from speaker.	Defective 7C5, T200, LS200, C204, C205, C206, C207, or R206.
E to C	Loud, clear signal.	Open C204.
F to C (Short out C203)	Clear signal, noticeably louder than preceding test.	Defective 7B6, open R202, R203, R303, or shorted C202.
G to C (Remove short from C203)	Loud, clear signal.	Defective C201 or R200 (Rotate R200 through its entire range for complete check).



Section 2 schematic.

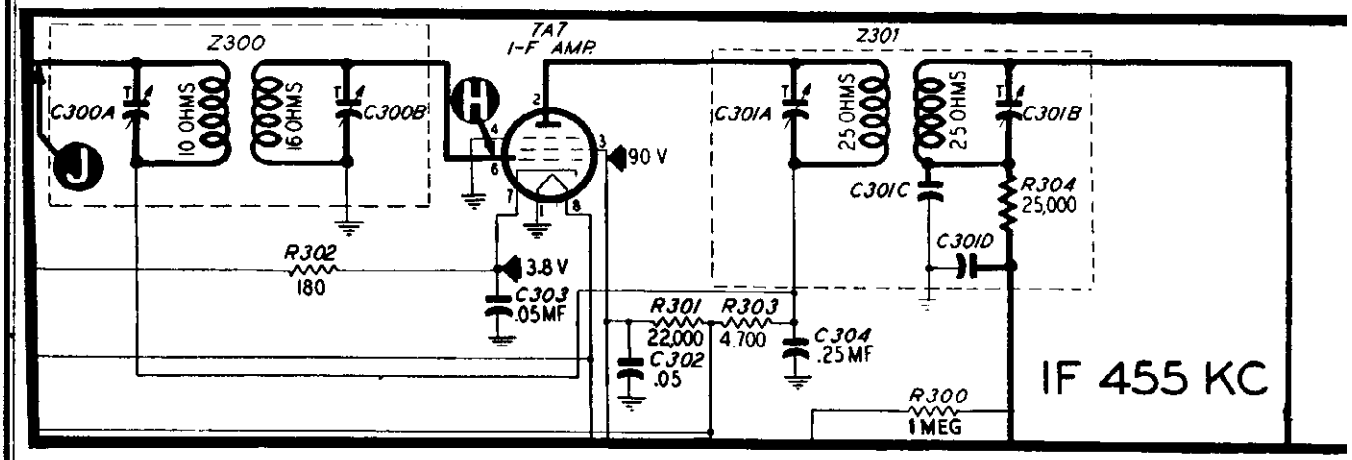


Bottom view, showing Section 2 test points.

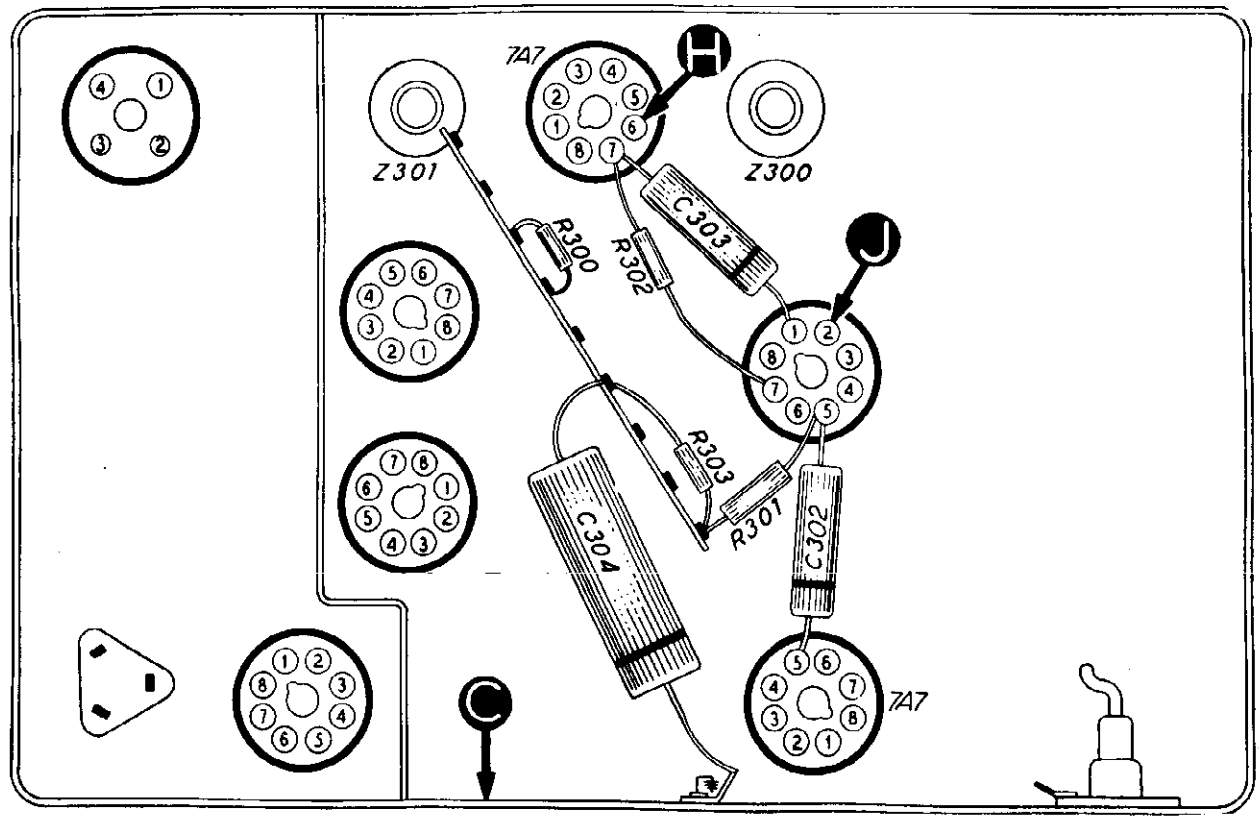
TESTS TO ISOLATE TROUBLE WITHIN SECTION 3

For all tests in this section, set the signal generator at 455 kc., with modulation on. Connect the generator output lead through condenser (.01 to .25 mf.) to the points indicated; connect the generator ground lead to the receiver chassis (C). Set the receiver volu control at maximum, and adjust the signal-generator output for a loud, clear signal.

TEST POINTS	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
H to C	Loud, clear signal from speaker.	Defective 7A7, Z301, C302, C303, C304, R301, R302, R303, or R405 (see Section 4 for location).
J to C	Loud, clear signal.	Defective Z300.



Section 3 schematic.



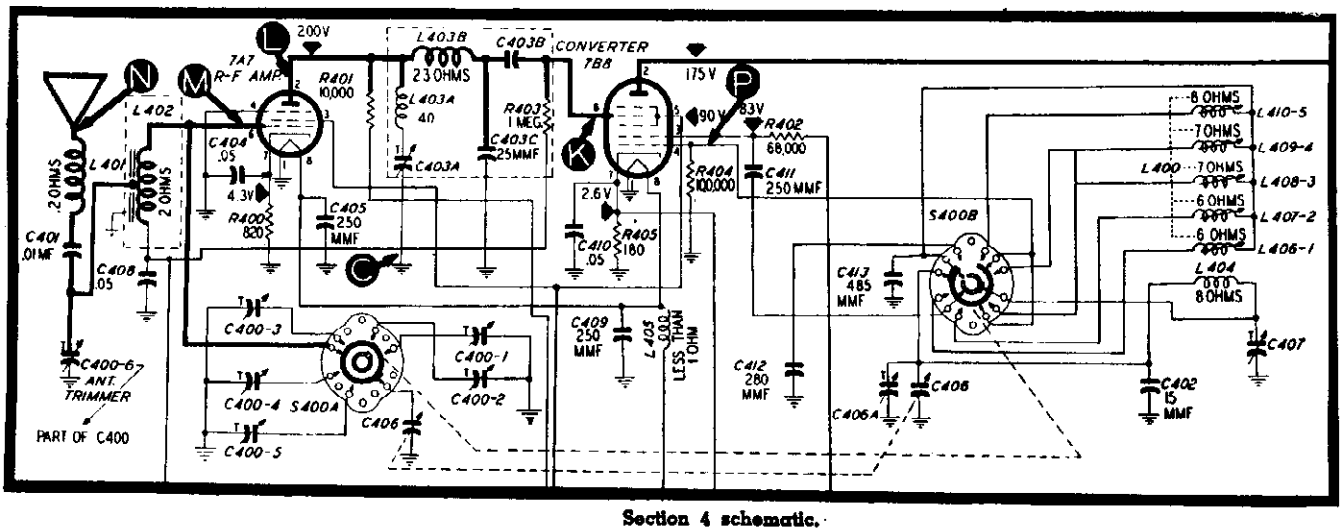
Bottom view, showing Section 3 test points.

TESTS TO ISOLATE TROUBLE WITHIN SECTION 4

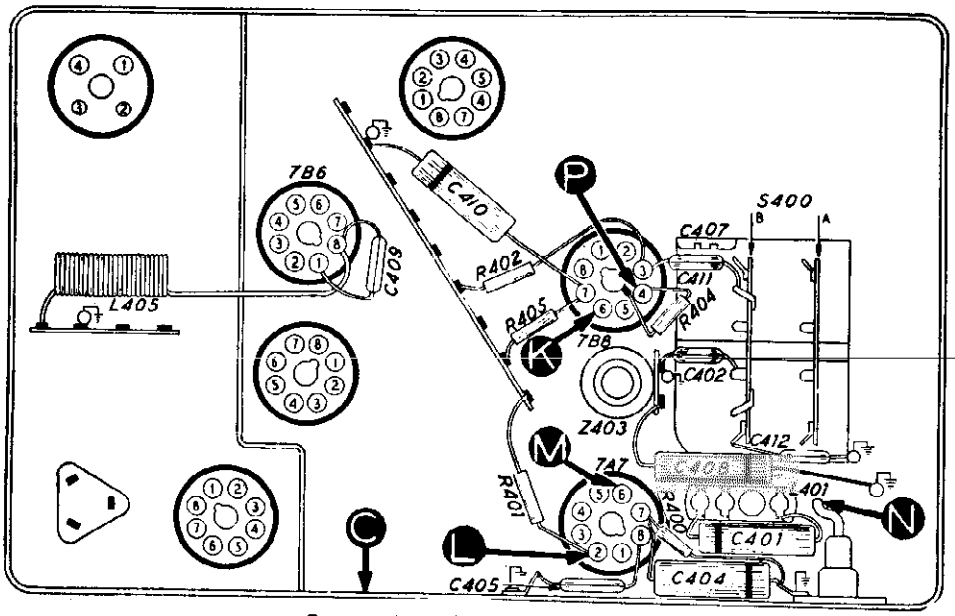
1. Attach the positive lead of a 20,000-ohms-per-volt meter to the receiver chassis, and the prod end of the negative lead through a 50,000-ohm-resistor to point P. Set the meter on a 10-volt or similar range, and rotate the tuning condenser through its entire range on each position of the band switch. Absence of voltage indicates that the oscillator is not functioning. If this is the case, check the components indicated in column 3 of the first test below, in the order listed.

2. Connect the signal-generator output lead through a condenser (.01 to .25 mf.) to the test points indicated. Connect the ground lead to the receiver chassis, set the receiver volume control at maximum, and proceed as below. The normal indication in each case will be a loud, clear signal, when the signal generator is tuned to the same frequency as the receiver, with modulation on.

1. TEST POINTS	2. SELECTOR SWITCH	3. POSSIBLE CAUSE OF ABNORMAL INDICATION
K to C (chassis)	Dial (see note, bottom of page 1).	Defective 7B8, R402, R405, C402, C406, C406A, C407, C410, C411, L404, or S400B.
K to C	Automatic Positions 1—5.	Defective L406-1, L407-2, L408-3, L409-4, L410-5, or S400B.
L to C	Dial	Defective Z403 (shown in Figure 11, page 6).
M to C	Dial	Defective 7A7, R400, R401, C404, C406, or S400A.
N to C	Dial	Defective L401, L402, or C401.
N to C	Automatic Positions 1—5.	Defective C400-1, C400-2, C400-3, C400-4, C400-5, or S400A.



Section 4 schematic.



Bottom view, showing Section 4 test points.

REPLACEMENT PARTS LIST

Symbol designations used in the schematics and parts list are as follows:

C—condenser
F—fuse
I—pilot lamp
L—choke or coil
LS—loud speaker
R—resistor
S—switch
T—transformer
VB—vibrator
Z—electrical assembly

NOTE: All parts marked with an asterisk (*) are general replacement items, and the part numbers will not be identical with those used on factory assemblies. Use only the "Service Part No." shown in this parts list when ordering replacements

SECTION 1

Reference	Description	Service Part No.
C100	Condenser, 250 mmf.	60-10245307*
C101	Condenser, .5 mf.	61-0137*
C102	Condenser, .5 mf.	61-0137*
C103	Condenser, .003 mf.	61-0115*
C104	Condenser, electrolytic, 10-15-20 mf.	61-0089*
	C104A: condenser, 10 mf.	Part of C104
	C104B: condenser, 15 mf.	Part of C104
F100	Fuse	45-2559*
I100	Lamp, pilot	34-2039*
L100	Choke, vibrator	65-0433
L101	Choke, "A"	65-0037
R100	Resistor, 150 ohms	66-1153340*
R101	Resistor, 220 ohms	66-1223340*
R102	Resistor, 1,000 ohms	66-2104340*
S100	Switch, power	85-0112*
T100	Transformer, power	65-0234*
VB100	Vibrator	83-0026*

SECTION 2

C200	Condenser, .01 mf.	61-0120*
C201	Condenser, .006 mf.	45-3500-7*
C202	Condenser, .006 mf.	45-3500-7*
C203	Condenser, 250 mmf.	60-10245307*
C204	Condenser, .01 mf.	61-0120*
C205	Condenser, 20 mf.	Part of C104
C206	Condenser, .01 mf.	61-0124*
C207	Condenser, 250 mmf.	60-10245307*
L200	Field, speaker	Part of LS200
LS200	Speaker	73-0047*
R200	Control, volume, 350,000 ohms	67-0032*
R201	Resistor, 15,000 ohms	66-3153340*
R202	Resistor, 15 megs.	66-6153340*
R203	Resistor, 220,000 ohms	66-4223340*
R204	Resistor, 47,000 ohms	66-3473340*
R205	Resistor, 470,000 ohms	66-4473340*
R206	Resistor, 220 ohms	66-1224340*
S200	Switch, tone-control	77-0733*
T200	Transformer, output	65-0408*

SECTION 3

C302	Condenser, .05 mf.	61-0122*
C303	Condenser, .05 mf.	61-0122*
C304	Condenser, .25 mf.	61-0125*
R300	Resistor, 1 meg.	66-5103340*
R301	Resistor, 22,000 ohms	66-3224340*
R302	Resistor, 180 ohms	66-1183340*
R303	Resistor, 4,700 ohms	66-2473340*
R304	Resistor, 25,000 ohms	66-3253340*
Z300	Transformer, 1st i-f	65-0319
	C300A: condenser, trimmer	Part of Z300
	C300B: condenser, trimmer	Part of Z300
Z301	Transformer, 2nd i-f	65-0320
	C301A: condenser, trimmer	Part of Z301
	C301B: condenser, trimmer	Part of Z301
	C301C: condenser	Part of Z301
	C301D: condenser	Part of Z301
	R304: resistor, 25,000 ohms (Part of Z301)	66-3253340*

SECTION 4

C400	Trimmer-condenser assembly	77-1187
	C400-1: condenser, push-button trimmer	Part of C400
	C400-2: condenser, push-button trimmer	Part of C400
	C400-3: condenser, push-button trimmer	Part of C400
	C400-4: condenser, push-button trimmer	Part of C400
	C400-5: condenser, push-button trimmer	Part of C400
	C400-6: condenser, antenna-trimmer	Part of C400
C401	Condenser, .01 mf.	61-0120*
C402	Condenser, 15 mmf.	60-00155407*
C404	Condenser, .05 mf.	61-0122*
C405	Condenser, 250 mmf.	60-10245307*
C406	Condenser, tuning	63-0077
	C406A: condenser, oscillator-trimmer	Part of C406
C407	Condenser, oscillator-padder	63-0048
C408	Condenser, .05 mf.	61-0122*
C409	Condenser, 250 mmf.	60-10245307*
C410	Condenser, .05 mf.	61-0122*
C411	Condenser, 250 mmf.	60-10245307*
C412	Condenser, 280 mmf.	30-1220-8*
C413	Condenser, 485 mmf.	30-1220-23*

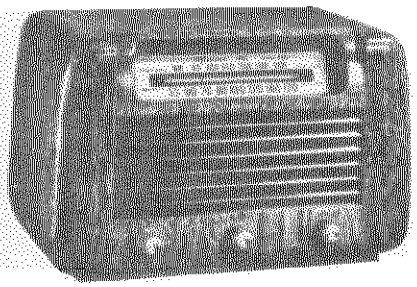
SECTION 4 (Continued)

Reference	Description	Service Part
L401	Choke, antenna	65-01
L402	Coil, antenna	65-03
L404	Coil, manual-oscillator	65-04
L405	Choke, "A"	65-04
L406-1	Coil, push-button oscillator	65-04
L407-2	Coil, push-button oscillator	65-04
L408-3	Coil, push-button oscillator	65-04
L409-4	Coil, push-button oscillator	65-04
L410-5	Coil, push-button oscillator	65-04
R400	Resistor, 820 ohms	66-18233
R401	Resistor, 10,000 ohms	66-31033
R402	Resistor, 68,000 ohms	66-36833
R404	Resistor, 100,000 ohms	66-41033
R405	Resistor, 180 ohms	66-11833
S400	Switch, selector	76-24
	Wafer switch shaft	77-09
Z403	Transformer, r-f	65-03
	C403A: condenser, r-f trimmer	Part of Z4
	C403B: condenser, coupling	Part of Z4
	C403C: condenser, 25 mmf.	Part of Z4
	L403A: coil, r-f	Part of Z4
	L403B: coil, r-f	Part of Z4
	R403: resistor, 1 meg. (Part of Z403)	66-51033

MISCELLANEOUS

Control assembly	42-58
Case	56-31
Cord, drive (25-foot spool)	45-14
Cover	56-31
Dial	55-11
Drum assembly	77-07
Lead, "A" (control to set)	38-82
Lead, "A" (control to fuse)	41-33
Lead, "A" (control to ammeter)	77-02
Lead, tone-control	95-01
Pilot-lamp assembly	77-05
Plate, dial-background	57-18
Pointer	57-18
Shaft assembly, volume control	57-13
Sleeve, knob	57-1324F
Station-indicator-shaft assembly, push-button	57-13
Tuning-shaft assembly, manual	57-13
Housing	77-0694FJ
Cover, tube-side	76-16
Cover, wiring-side	57-1345FJ
Screw, tube-side-cover mounting	1W21813FA
Set mounting hardware	
Bolt, hook, set-mounting	57-1340F
Lockwasher, set-mounting	1W57223F
Nut, set-mounting	1W21291F
Speaker unit	
Baffle, speaker	55-09
Bolt, bracket-to-bracket	97-0061F
Bolt, bracket-to-instrument-panel	1W17331F
Bracket, speaker	57-1461F
Bracket, "U"	57-2162F
Gasket and screen	55-13
Lockwasher, bracket-to-instrument-panel	1W35032F
Lockwasher, bracket-to-bracket and bracket-to-instrument-panel	1W24260F
Lockwasher, speaker-mounting and speaker-to-bracket	1W24257F
Nut, speaker-to-bracket	1W19988F
Nut, bracket-to-bracket and bracket-to-instrument-panel	1W21291F
Screw, speaker-to-bracket	1W10638F
Spacer, cardboard	55-04
Washer, speaker-to-bracket	1W52353F
Suppressor kit	
Condenser, interference	30-40
Resistor, distributor	33-11
"A" lead	95-02
Clamp, vibrator	57-1637F
Clip, coil-mounting	28-5002F
Connector, antenna	57-0591F
Cup, core	W20
Grommet, "A" lead	27-46
Grommet, tuning-condenser-mounting	27-45
Screw and core assembly	57-1744F
Shield, power	57-1744F
Socket, speaker	55-13
Socket, tube	27-61
Socket, vibrator	27-61

MODEL 46-427 PHILCO CORP.



Model 46-427

SPECIFICATIONS

CABINET	Model 46-427 (Wood, walnut finish)
CIRCUIT	Six-tube superheterodyne
FREQUENCY RANGE	Broadcast—540 to 1700 kc. Short-wave—9.5 to 15.0 mc.
POWER INPUT	105 to 120 volts—A.C. or D.C.
POWER CONSUMPTION	32 watts
ANTENNA	Built-in loop or external
INTERMEDIATE FREQUENCY	455 kc.
PHILCO TUBES USED	14AF7/XXD, 7B7 (2), 7C6, 50L6GT, 35Z5GT/G
PILOT LAMP	6 to 8-volt, bayonet base, brown bead, Part No. 34-2068

PHILCO TROUBLE-SHOOTING PROCEDURE

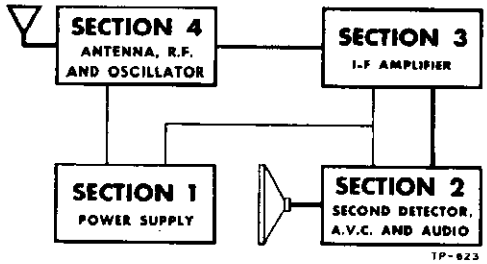


Figure 1. Block diagram (Heavy lines indicate signal path).

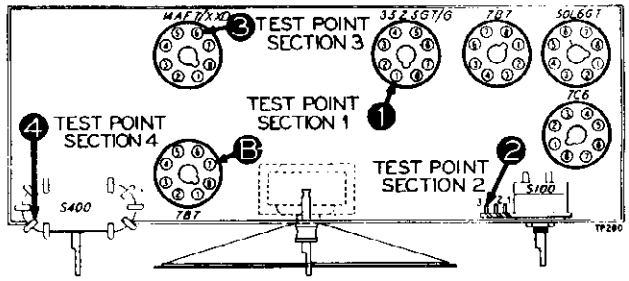


Figure 2. Bottom view, showing test points.

In this manual, the receiver circuit is divided into four sections, as shown in figure 1. One test point is designated for each section, as shown in figure 2. Abnormal indications, secured when checking at these test points, localize trouble to the section under test. After localization, isolation of the faulty part is accomplished by testing in the order shown in the sectional test charts. A high-quality signal generator and a volt-ohmmeter are required. Voltage readings shown were taken with a 20,000-ohms-per-volt meter. To localize trouble, connect the receiver to the power line; turn receiver volume control full on; see that all tube filaments are lighted; then proceed in the order given in the following chart. When applying a signal, connect the signal-generator output lead through a condenser (.01 to .25 mf.). Remedy any defect encountered before proceeding to the next check.

TESTS TO ISOLATE TROUBLE TO ONE SECTION

SECTION	TEST	NORMAL RESULTS
1	Measure voltage between point 1 (+) and B–.	*85 volts
2	Apply an audio signal through a condenser (.01 to .25 mf.) between point 2 and B–.	Loud, clear signal
3	Apply a weak modulated r-f signal (455 kc.) through a condenser (.01 to .25 mf.) between point 3 and B–.	Loud, clear signal
4	Apply a weak modulated r-f signal (1,000 kc.) through a condenser (.01 to .25 mf.) between point 4 and B–. (Band switch in "Broadcast" position.) Repeat this test at 12.0 mc. with band switch in "Shortwave" position.	Loud, clear signal

* For 117-volt a-c input. When operating on d-c line and no voltage can be measured, reverse power plug.

TESTS TO ISOLATE TROUBLE WITHIN SECTION 1

Make all tests for this section with a volt-ohmmeter, using the 0-250v. d-c range. See figures 3 and 4 for location of test points.

TESTS POINTS	NORMAL READING	POSSIBLE CAUSE OF ABNORMAL READING
A to B–	112v.	No voltage indicates defective 35Z5, or shorted C-101. Low voltage indicates defective 35Z5, leaky or open C-101, or shorted C-200. (Refer to Section 2 for location.)
C to B–	85v.	No voltage indicates open speaker field. Low voltage indicates leaky C-101 or C-200. (Refer to Section 2 for location.)

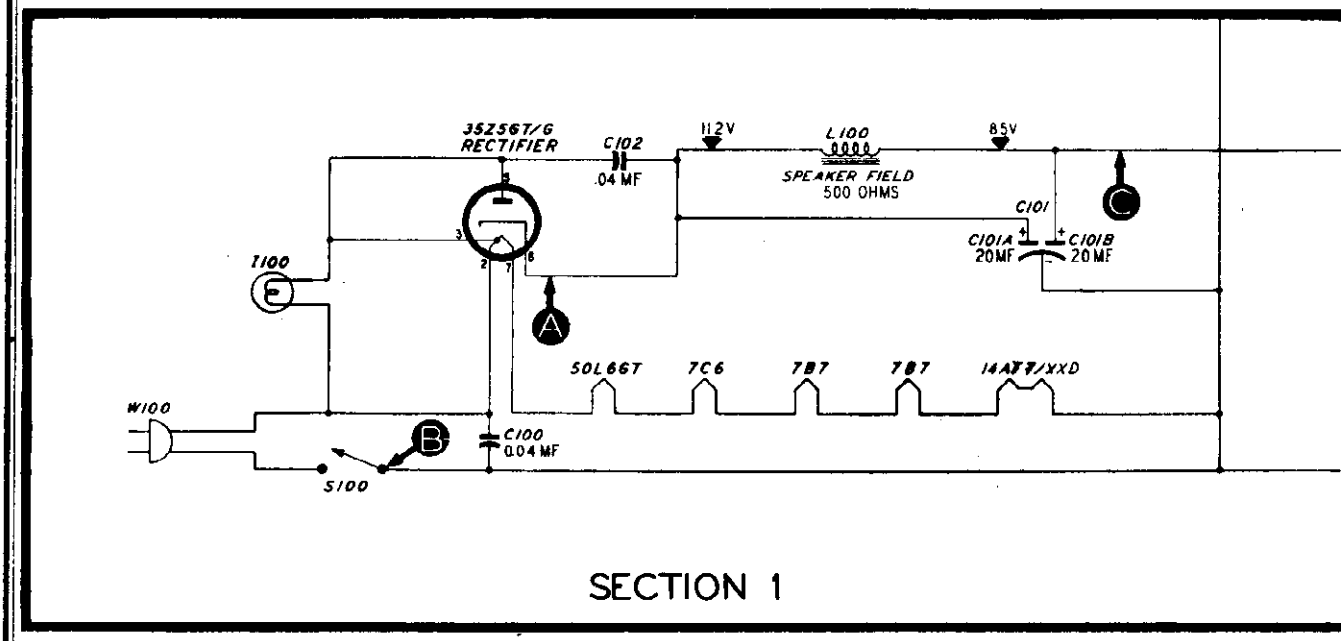


Figure 3. Section 1 schematic.

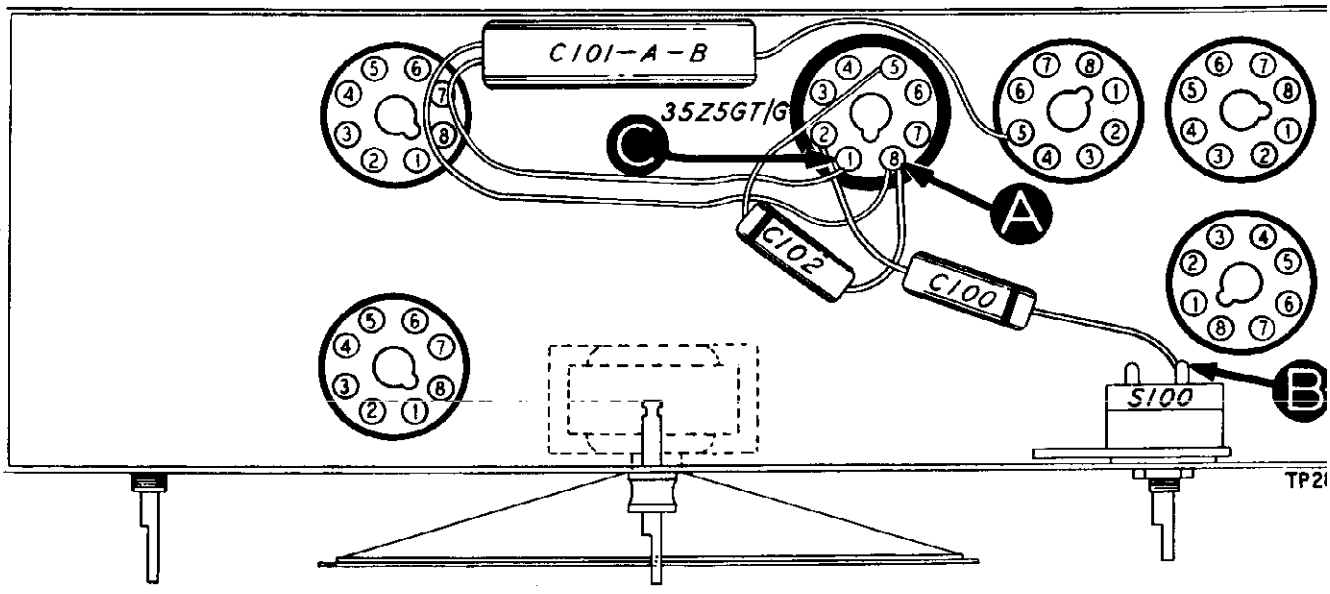


Figure 4. Bottom view, showing section 1 test points.

MODEL 46-427 PHILCO CORP.

TESTS TO ISOLATE TROUBLE WITHIN SECTION 2

For all tests in this section, use the audio range of the signal generator. Connect the output lead through a condenser (.01 to .25 mf.) to the point indicated, and the ground lead to B–. Adjust signal generator output for a clear, audible signal.

TEST POINTS	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
D to B–	Clear, audible signal from speaker.	No signal, weak, or distorted signal indicates defective 50L6, output transformer T-200, or speaker LS-200, shorted condenser C-201, leaky condenser C-202, or open resistor R-204.
E to B–	Clear, audible signal, same as preceding test.	No signal indicates open condenser C-202.
F to B–	Clear, audible signal, noticeably louder than preceding test.	No signal, or weak signal, indicates defective 7C6, or open resistor R-202.
G to B–	Clear, audible signal, same as preceding test.	No signal indicates open condenser C-203. Hum, noise, or distortion indicates defective volume control.*

* In making this test, the volume control should be rotated throughout its range. Noise, or distortion indicates a defective control.

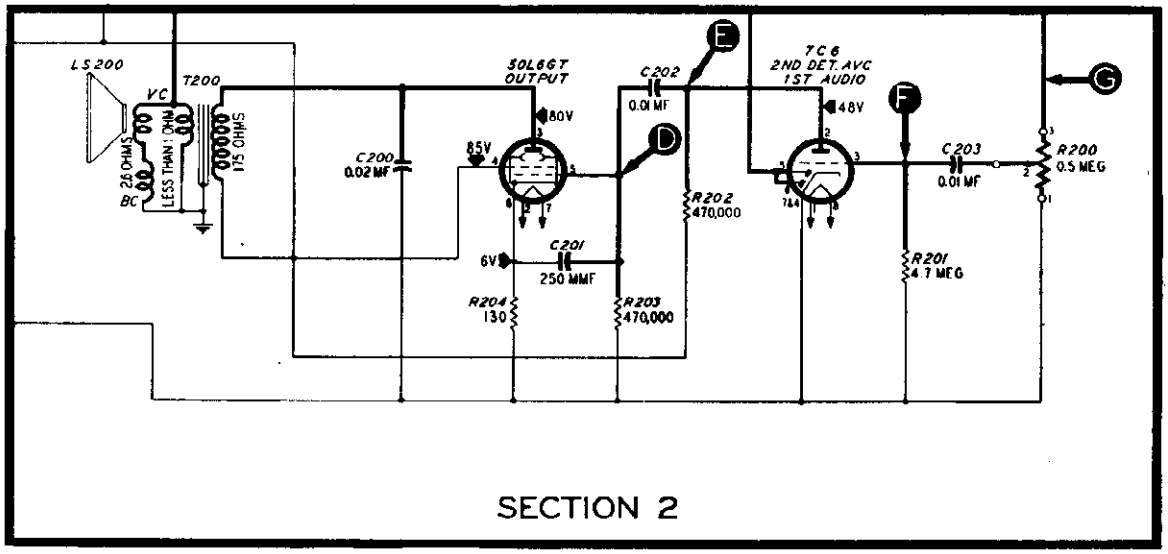


Figure 5. Section 2 schematic.

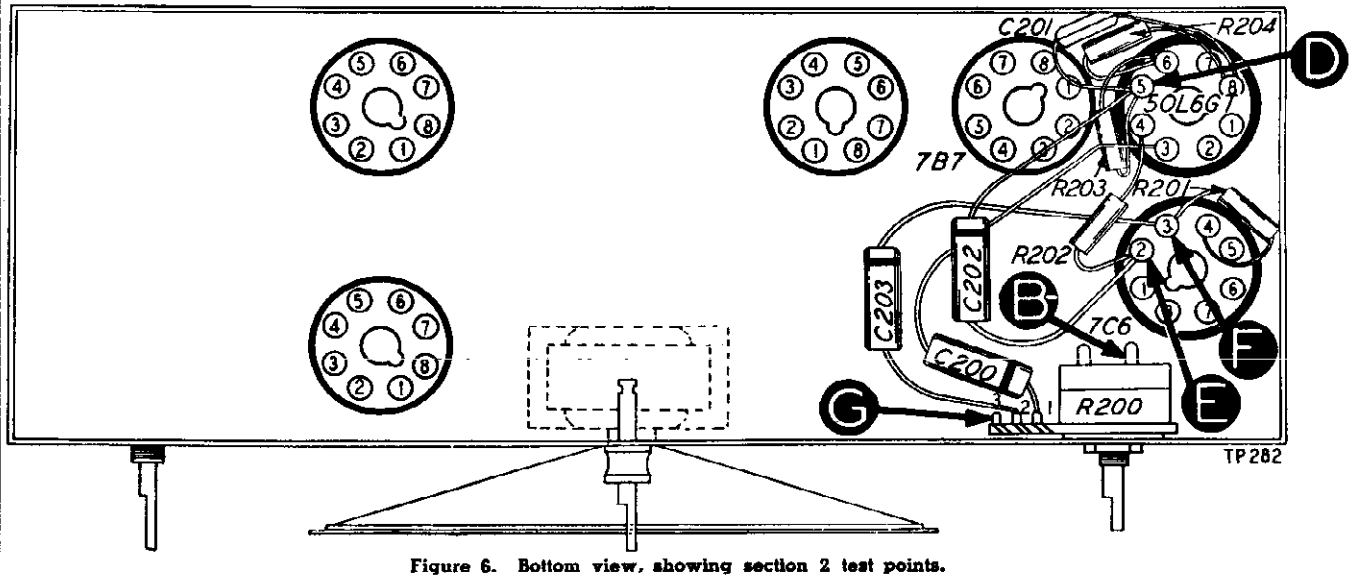


Figure 6. Bottom view, showing section 2 test points.

TESTS TO ISOLATE TROUBLE WITHIN SECTION 3

For all tests in this section, set signal generator at 455 kc., modulation ON. Connect output lead through a condenser (.01 to mfd.) to point indicated, and ground lead to point B–. Adjust signal generator output for clear, audible signal.

TEST POINTS	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
H to B–	Audible signal from speaker.	No signal indicates defective 7B7, i-f transformer Z-302, shorted condenser C-303 open resistor R-301, or defective diode section of 7C6 (Section 2).
J to B–	Audible signal from speaker, louder than preceding test.	No signal indicates defective 7B7, or i-f transformer Z-301.
K to B–	Audible signal from speaker, same as preceding test.	No signal indicates defective i-f transformer Z-300, or open resistor R-300.

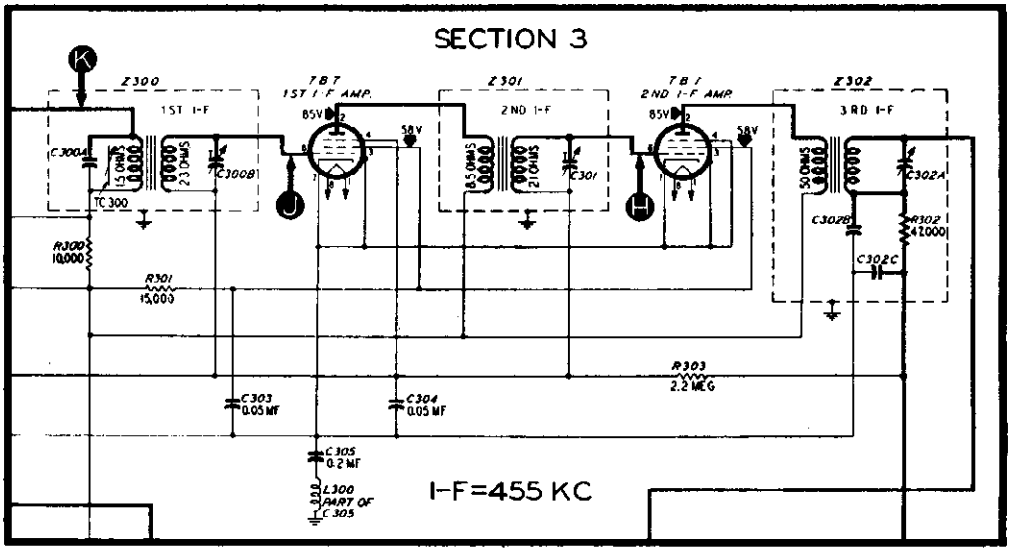


Figure 7. Section 3 schematic.

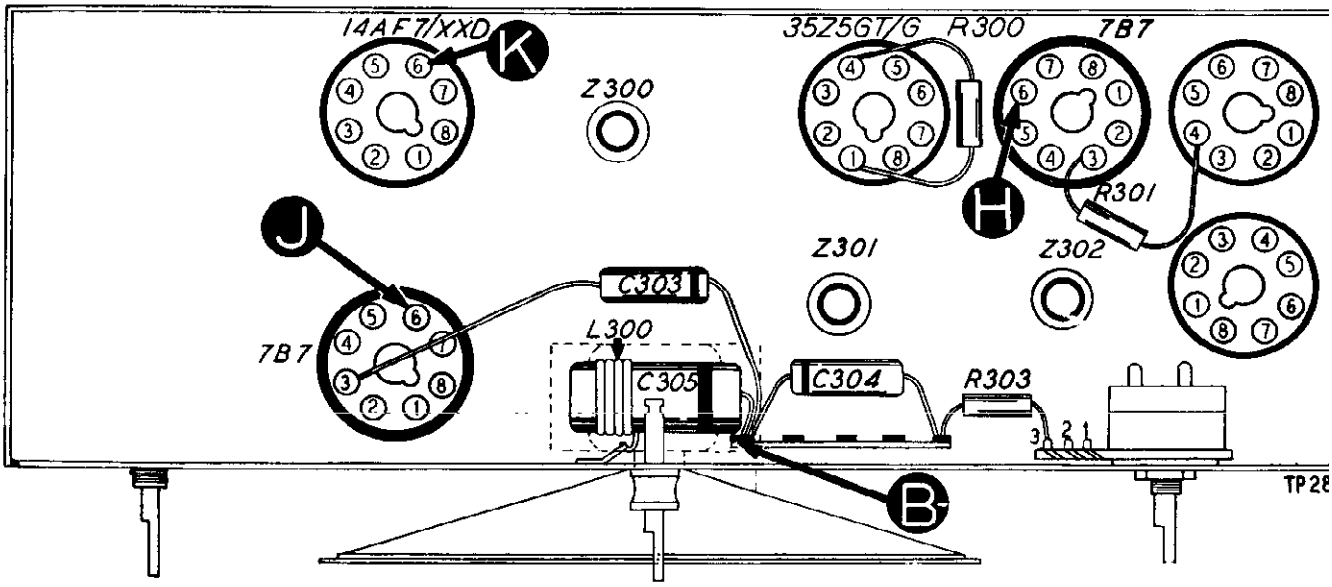


Figure 8. Bottom view, showing section 3 test points.

TESTS TO ISOLATE TROUBLE WITHIN SECTION 4

NOTE: As a preliminary test, the tuning control should be rotated throughout its range. Any scraping noise heard in the speaker indicates bent plates, dirty wiper contacts, or dirt between the plates.

To fully check this section, all tests should first be made with the receiver and signal generator set at 540 kc., and then repeated at 1700 kc.

This procedure should also be followed in testing the short-wave band, with the receiver and signal generator set at 9.5 mc.; and then at 15 mc.

Connect the signal-generator output through a condenser (.01 to .25 mfd.) to the point indicated, and the ground lead to B–. Adjust the signal-generator output control for a clear, audible signal.

TEST POINTS	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
L to B–	Clear, audible signal from speaker.	No signal indicates defective 14AF7 or transformer T-401, open resistor R-402, or shorted condenser C-409. †(For supplementary oscillator test see footnote below.)
M to B–	Clear, audible signal from speaker.	No signal indicates defective coil L-400 (Broadcast) or T-400 (Short-wave).

OSCILLATOR GRID BIAS VOLTAGE

† Attach the positive lead of a 20,000-ohms-per-volt meter to point P, and the prod end of the negative lead, through a 50,000-ohm resistor, to point N. Set the meter on 10-volt or similar range and rotate the tuning condenser through its entire range on each position of the band switch. Absence of voltage at any point indicates that the oscillator is not functioning. If so, check the components listed in the first test in the chart above.

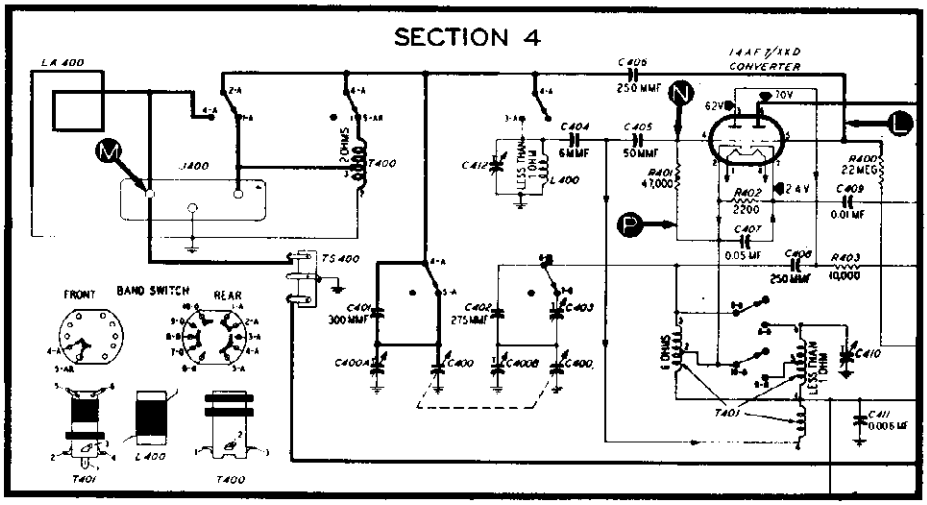


Figure 9. Section 4 schematic.

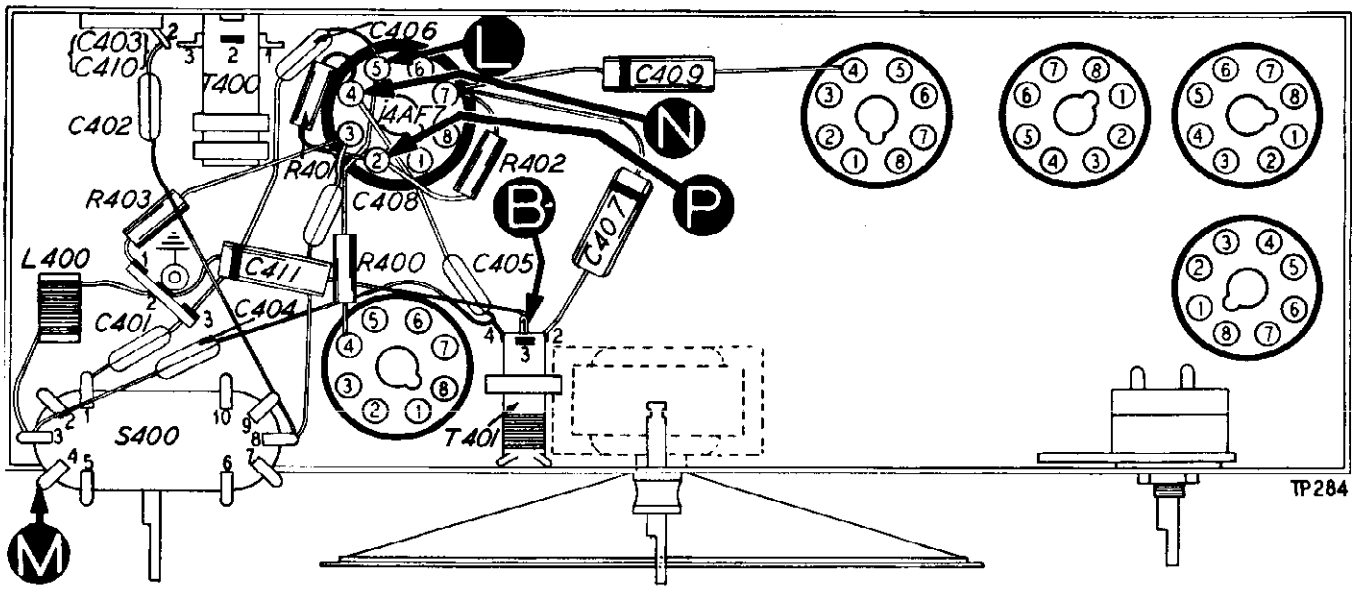


Figure 10. Bottom view, showing section 4 test points.

CONNECTING ALIGNING EQUIPMENT

Output Meter: Connect between output (left hand) and ground (center) lugs of terminal strip TS-400 on rear of chassis, shown in figure 11.

Signal Generator: Connect output lead through a .05 mfd. condenser to indicated test point and ground lead to B–.

Adjust generator output to give a readable deflection on the output meter, using meter range that best indicates small changes in output. Reduce generator output as alignment progresses to prevent meter needle from going off scale.

Turn receiver volume control to maximum and adjust all trimmers, in the order listed, for maximum output.

ALIGNMENT CHART

SIGNAL GENERATOR			RECEIVER			
	Connections to Receiver	Dial Setting Kc.	Band Switch Position	Dial Setting Kc.	Special Instructions	Adjust Trimmers in Order Given
1	Stator terminal of antenna section of tuning condenser.	455	Broadcast	Plates fully meshed	Set pointer to index mark on back plate. Preset C-300-B by turning down tight; then adjust all 4 i-f trimmers for maximum, in the order listed.	C-302 C-301 TC-300 C-300B
2	Antenna connection of TS-400.	1700	Broadcast	1700	Preset C-403 by turning down tight, then backing off 1/3 turn.	C-400B
3	Same as 2	1500	Broadcast		Tune receiver to signal generator.	C-400A
4	Same as 2	1700	Broadcast	1700		C-400B
5	Same as 2	1500	Broadcast		Repeat adjustment in step 3.	C-400A
6	Same as 2	15.0 mc.	Short Wave	15.0 mc.		C-410 C-412
7	Same as 2	9.5 mc.	Short Wave	9.5 mc.		C-403

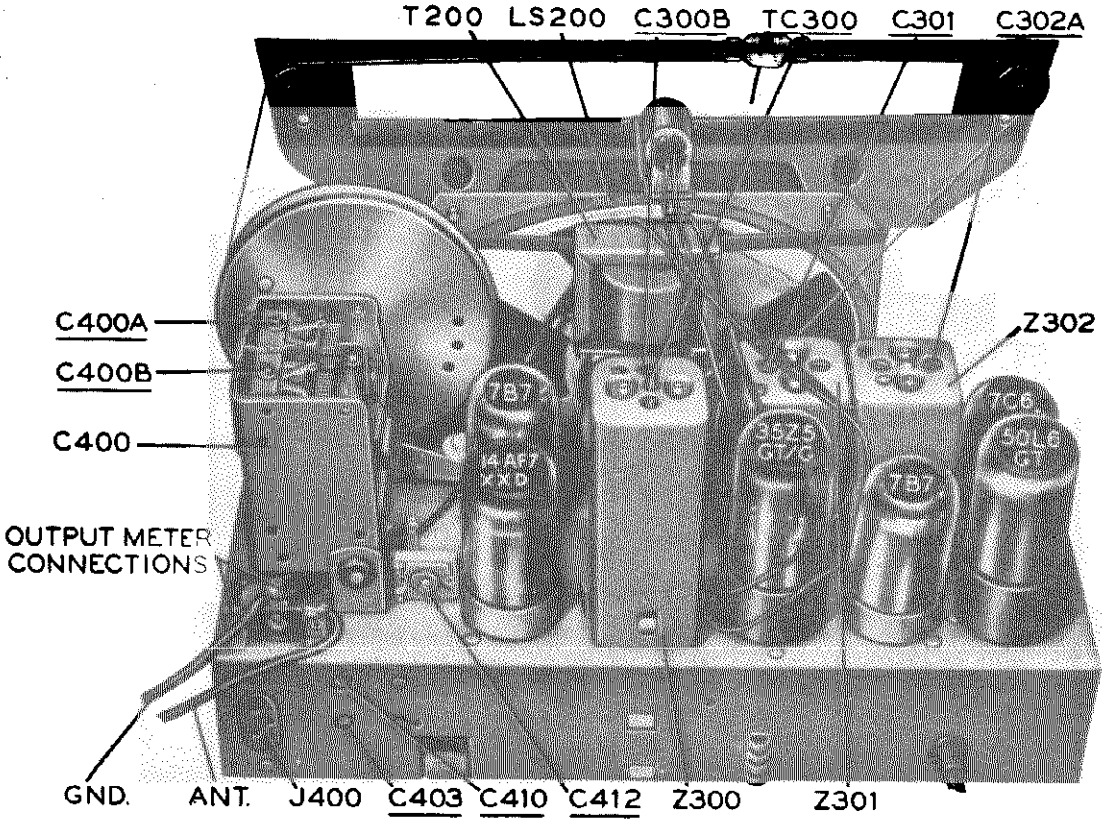


Figure 11. Top view, showing trimmer condenser locations.

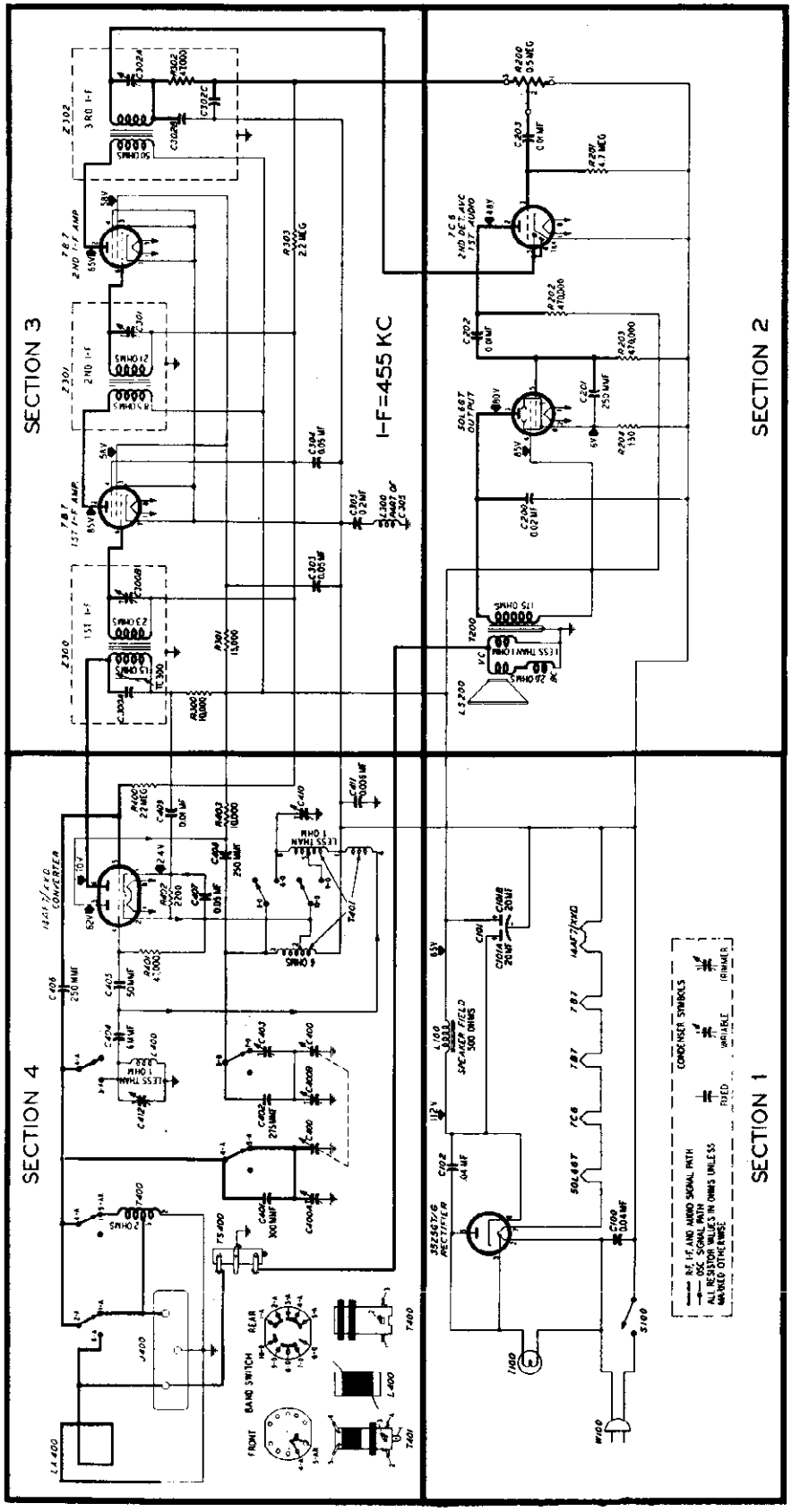


Figure 12. Complete Schematic.

NOTE: All voltage, capacity, and resistance values shown are average. The voltages shown were measured with a 20,000-ohms-per-volt meter between the indicated test points and B– (negative return of power supply).

Symbol designations used in the schematics and parts list are as follows:

C—condenser
I—pilot lamp
LA—loop antenna
LS—loudspeaker
R—resistor
S—switch
T—transformer
W—power cord and plug
Z—i-f transformer assembly

NOTE: Parts marked with an asterisk (*) are general replacement items, and the part numbers will not be identical with those used on factory assemblies. Use only the "Service Part No." shown below when ordering replacements.

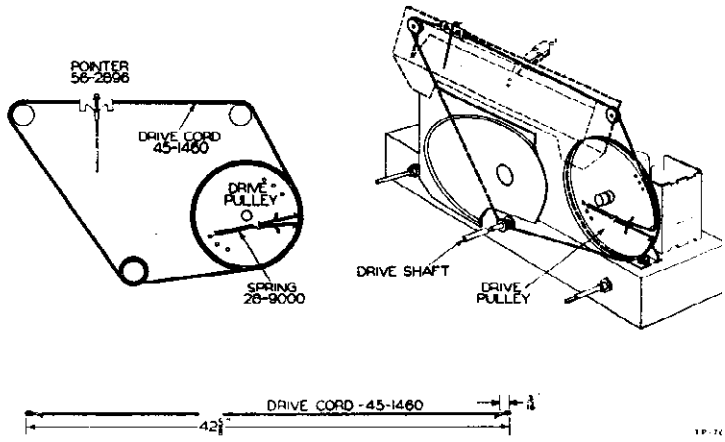


Figure 13. Drive cord installation details.

REPLACEMENT PARTS LIST

SECTION 1

Reference Number	Description	Service Part No.
C100	Condenser, .04 mf.	30-4119
C101	Condenser, electrolytic, 20-20 mf.	30-2541
C101A	Condenser, 20 mf.	Part of C101
C101B	Condenser, 20 mf.	Part of C101
C102	Condenser, .04 mf.	30-4119
I100	Lamp, pilot	34-2068
L100	Coil, field	Part of LS200
S100	Switch, a-c	Part of R200
W100	Cord, line	L3199

SECTION 2

C200	Condenser, .02 mf.	30-4599*
C201	Condenser, 250 mmf.	60-10245407*
C202	Condenser, .01 mf.	61-0120*
C203	Condenser, .01 mf.	61-0120*
LS200	Speaker	36-1533*
R200	Volume control, .5 meg.	33-5458
R201	Resistor, 4.7 megs.	66-5473340*
R202	Resistor, 470,000 ohms	66-4473340*
R203	Resistor, 470,000 ohms	66-4473540*
R204	Resistor, 130 ohms	66-1133340*
T200	Transformer, output (mounted on speaker)	Part of LS200

SECTION 3

C300A	Condenser	Part of Z300
C300B	Condenser, trimmer	Part of Z300
C301	Condenser, trimmer	Part of Z301
C302A	Condenser, trimmer	Part of Z302
C302B	Condenser	Part of Z302
C302C	Condenser	Part of Z302
C303	Condenser, .05 mf.	30-4518*
C304	Condenser, .05 mf.	30-4518*
C305	Condenser-and-choke assembly	76-1161
L300	Choke	Part of C305
R300	Resistor, 10,000 ohms	66-3103340*
R301	Resistor, 15,000 ohms	66-3153340
R302	Resistor, 47,000 ohms	Part of Z302
R303	Resistor, 2.2 megs.	66-5223340*
Z300	Transformer, 1st i-f	32-3956
Z301	Transformer, 2nd i-f	32-3957
Z302	Transformer, 3rd i-f	32-3958

SECTION 4

C400	Condenser, tuning	31-2555
C400A	Condenser, trimmer	Part of C400
C400B	Condenser, trimmer	Part of C400
C401	Condenser, 300 mmf.	60-10305307
C402	Condenser, 275 mmf.	30-1220-7
C403	Condenser bc. oscillator trimmer	Part of C-410
C404	Condenser, 6 mmf.	60-90505007*

SECTION 4 (Cont.)

Reference Number	Description	Service Part N
C405	Condenser, 50 mmf.	60-00515307
C406	Condenser, 250 mmf.	60-10245407
C407	Condenser, .05 mf.	30-4518
C408	Condenser, 250 mmf.	60-10245407
C409	Condenser, .01 mf.	61-0120
C410	Condenser, s-w oscillator-trimmer	31-6453
C411	Condenser, .006 mf.	30-4504
C412	Condenser, s-w antenna-trimmer	31-6428
J400	Socket, antenna	27-6145
LA400	Loop assembly	76-1279
L400	Coil, antenna, s-w shunt	32-3716
R400	Resistor, 2.2 megs.	66-5223340
R401	Resistor, 47,000 ohms	66-3473340
R402	Resistor, 2200 ohms	66-2223340
R403	Resistor, 10,000 ohms	66-3103340
S400	Switch, band	42-1772
T400	Coil, antenna	32-4008
T401	Coil, oscillator	32-3991
TS400	Wiring-panel assembly	12W45654

MISCELLANEOUS

Bands, rubber, scale-mounting	54-4176
Cabinet	10650
Clamp, electrolytic-condenser-mounting	56-1466FA5
Clip, antenna-coil	28-5002FA3
Dial, back-plate assembly	76-1585
Drive-shaft assembly	76-1323
Drive cord (25 ft. spools)	45-1460
Feet, felt	W2190
Grill-cloth assembly	40-6774
Grommet, rubber, tuning-condenser front mounting	27-4598
Grommet, tuning-condenser rear mounting	54-4020
Knob assembly	54-4311
Pointer	56-2896
Reflector, light	27-5730
Rivets	1W36671FA5
Scale, dial	27-5895
Screw and lockwasher, scale-mounting	1W32228FA3
Screw and lockwasher, speaker-mounting	1W32228FA3
Screw, gang-mounting	W758-FA3
Sleeve, tuning-condenser	28-5665FA3
Socket—Loktal	27-6138
Socket—octal	27-6195
Socket assembly, pilot-light	76-1392
Spring, drive-cord	28-9000
Strap, scale-mounting	56-2068
Washer, chassis-mounting	1W37654FA3
Washer, gang-mounting	1W52353FA3
Wiring panel, 3 lugs	76-2148
Wiring panel, 5 lugs	12W45672

MODELS 48-141, 48-145 PHILCO CORP.

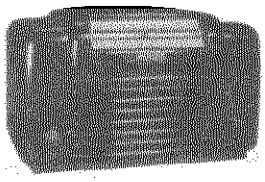
Circuit Description

Philco Models 48-141 and 48-145 are four-tube, battery-operated superheterodynes, providing reception on the standard broadcast band, 540–1720 kc. Manual tuning is employed. Both models are identical except for the cabinets, knobs, and dial scales, as indicated in the parts list. A 100-foot (over-all), outdoor aerial, such as Philco Part No. 45-1469, is recommended.

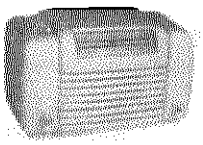
The converter stage employs a type 1LA6 pentagrid converter tube; in this tube, the oscillator signal is fed to the mixer section through the electron stream within the tube.

A type 1LN5 pentode tube is used in the i-f amplifier stage. The diode section of the 1LH4 tube provides detection and a-v-c voltage, and the triode section functions as the first audio amplifier.

The first audio stage is resistance-coupled to the type 3LF4 output tube, which drives the permanent-magnet dynamic loud-speaker.



MODEL 48-141



MODEL 48-145

SPECIFICATIONS

CABINET	
Model 48-141	Plastic, walnut finish
Model 48-145	Plastic, ivory finish
CIRCUIT	Four-tube superheterodyne
FREQUENCY RANGE	540–1720 kc.
AUDIO OUTPUT	220 mw.
POWER SUPPLY	Battery pack, Philco P-60B-6L
PLATE VOLTAGE AND CURRENT	90 volts, 10 ma.
FILAMENT VOLTAGE AND CURRENT,	1.5 volts, .25 amp.
POWER CONSUMPTION (total, plate and filament)	1 watt
AERIAL	External, Philco Part No. 45-1469
INTERMEDIATE FREQUENCY	455 kc.
PHILCO TUBES (4)	1LA6, 1LN5, 1LH4, 3LF4

TP-3128 & TP-933

Philco TROUBLE-SHOOTING *Procedure*

For rapid trouble shooting, the radio circuit is divided into four sections, with test points specified for each section; these sections and test points are indicated in the schematic diagram. The trouble-shooting procedure given for each section includes a simplified test chart and a bottom view of the chassis showing the locations of the test points and the components of that section.

In each chart, the first step is a master check for determining whether trouble exists in that section, without going through the entire test procedure.

Failure to obtain "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

Preliminary Checks

The following preliminary checks should be made before turning on the radio:

1. Carefully inspect the top and bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, or other obvious sources of trouble.

2. Disconnect the battery, and measure the resistance between B+ (red lead of battery plug) and chassis, with the ohmmeter polarity such that the highest resistance reading is obtained. If this reading is lower than 10,000 ohms, check condensers C100, C203, and C404 for leakage or shorts.

TROUBLE SHOOTING

Section 1

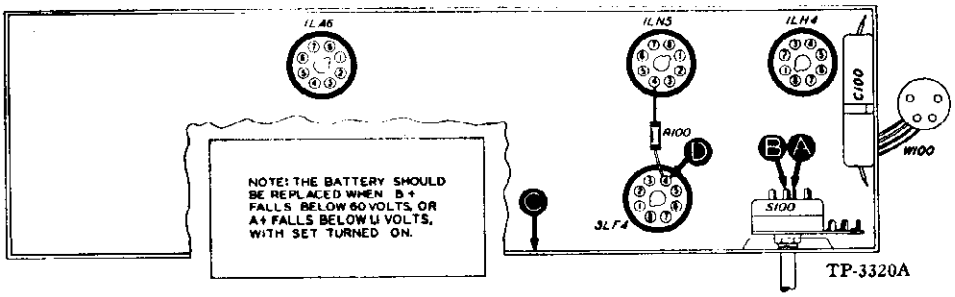


Figure 1. Bottom View, Showing Section 1 Test Points

For the tests in this section, use a d-c voltmeter, connecting the leads between the chassis, test point C, and the test points indicated in the chart. The voltages indicated were obtained from a fresh battery pack, and were measured with a 20,000-ohms-per-volt meter, with the radio turned on.

If the "NORMAL INDICATION" is obtained in the first step, proceed with the tests for Section 2; if not, isolate and correct the trouble in this section.

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A B D	85 volts 1.5 volts Negative 5 volts		Trouble within this section. Isolate by the following tests.
2	A	85 volts	No voltage Low voltage	Open battery cable. Defective S100. Open R100. Shorted C100. Weak battery. Change in value of R100. Leaky C100. Excessive current drain in Sections 2, 3, or 4.
3	B	1.5 volts	No voltage Low voltage	Open battery cable. Defective S100. Weak battery.
4	D	Negative 5 volts		Change in value of R100. Open R100. Excessive current drain in Sections 2, 3, or 4.

TROUBLE SHOOTING

Section 2

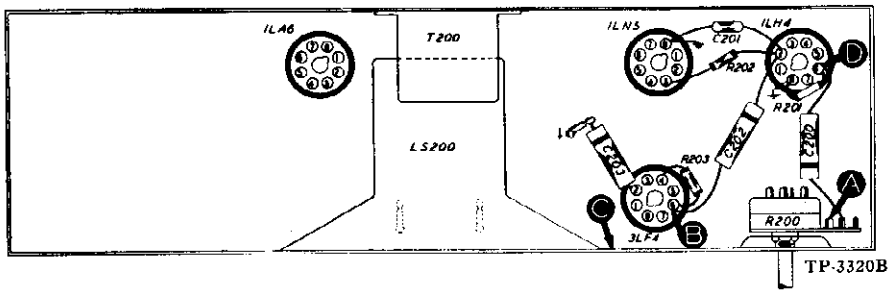


Figure 2. Bottom View, Showing Section 2 Test Points

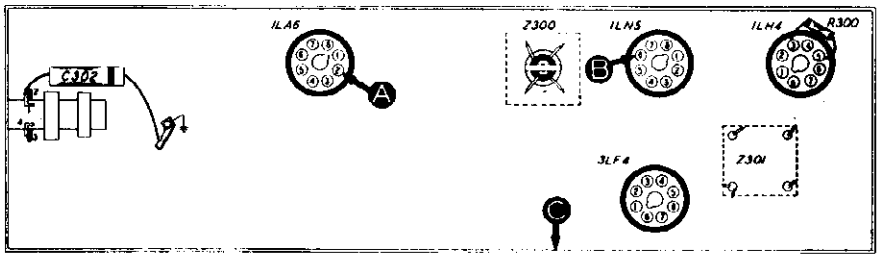
For the tests in this section, use an audio signal. Connect the signal-generator ground lead to the radio chassis, test point C; connect the output lead through .1-mf. condenser to the test point indicated in the chart. Set the radio volume control to maximum.

If the "NORMAL INDICATION" is obtained in the first step, proceed with the tests for Section 3; if not, isolate and correct the trouble in this section.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with moderate signal input.	Trouble within this section. Isolate by the following tests.
2	B	Normal, clear signal with strong signal input.	Defective 3LF4 tube, T200, or LS200. Shorted or leaky C203 or C201.
3	D	Loud, clear signal with moderate signal input.	Defective 1LH4 tube. Open R202 or C202.
4	A	Loud, clear signal with moderate signal input.	Defective R200. Shorted C301D. Open C200.

Listening Test: Distortion may be caused by leaky C201, C202, C203, or C200, or by open R203 or R201.

TROUBLE SHOOTING *Section 3*



TP-3320C

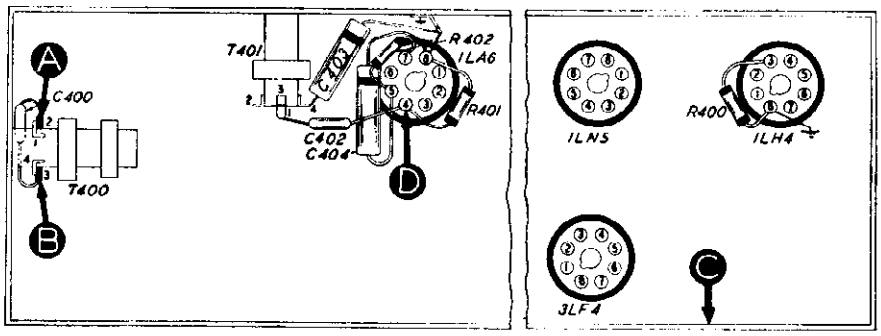
Figure 3. Bottom View, Showing Section 3 Test Points

For the tests in this section, use an r-f signal generator with frequency set at 455 kc. (modulated output). Connect the generator ground lead to the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart. Set the radio volume control to maximum.

If the "NORMAL INDICATION" is obtained in the first step, proceed with the tests for Section 4; if not, isolate and correct the trouble in this section.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with moderate signal input.	Trouble within this section. Isolate by the following tests.
2	B	Loud, clear signal with moderate signal input.	Defective 1LN5 or 1LH4 (diode section) tube. Defective or misaligned Z301. Open C302.
3	A	Loud, clear signal with moderate signal input.	Defective or misaligned Z300.

TROUBLE SHOOTING *Section 4*



TP-3320D

Figure 4. Bottom View, Showing Section 4 Test Points

For the tests in this section, use an r-f signal generator with modulated output. Connect the generator ground lead to the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart. Set the generator and radio dials as noted in the chart.

Inspect the tuning condensers for bent plates, dirt, or poor wiper contacts; any of these conditions will cause noise.

If the "NORMAL INDICATION" is not obtained in the first step, isolate the trouble by following the remaining steps.

STEP	TEST POINT	DIAL SETTINGS		NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
		SIG. GEN.	RADIO		
1	A	540 kc.	540 kc.	Loud, clear signal with low signal input.	Trouble within this section. Isolate by the following tests.
2	B	540 kc.	540 kc.	Loud, clear signal with moderate signal input.	Defective 1LA6 tube, C401, C401A, or oscillator circuit. Shorted C404. Misaligned Z300.
3	D Osc. test (See Note below.)		540 to 1720 kc.	Negative voltage (at least 1.5 volts) over complete range.	Defective 1LA6 tube, T401, C401, or C401B. Open R401, R402, C402, or C403. Shorted or leaky C402 or C403.
4	A	540 kc.	540 kc.	Loud, clear signal with low signal input.	Defective T400 or C401.

NOTE: Connect positive lead of 20,000-ohms-per-volt meter to the chassis, test point C; connect prod end of negative lead through 100,000-ohm isolating resistor to test point D (oscillator grid, pin 4 of 1LA6 tube).

MODELS 48-141, 48-145

ALIGNME

TURN ON RADIO POWER,

DIAL—Alignment points should be marked on the dial backplate. Measurements for these points are shown in the composite dial-and-backplate photo, figure 8. With tuning condensers fully meshed, set dial pointer to index mark.

OUTPUT METER—Connect across speaker voic

STEP	SIGNAL GENERATOR		RADIO	
	CONNECTIONS TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS
1	Through .1-mf. condenser to stator of aerial tuning condenser.	455 kc.	Tuning condenser fully meshed.	Adjust trimmers, in order given, for maximum output.
2	Through 200-mmf. condenser to external aerial connector.	1700 kc.	1700 kc.	Adjust for maximum output.
3	Same as Step 2.	1500 kc.	1500 kc. (approx.)	Tune radio to generator signal, and adjust trimmer for maximum output.

SYMBOLIZATION AND TERMINOLOGY

All components in the radio circuit are symbolized and located as follows:

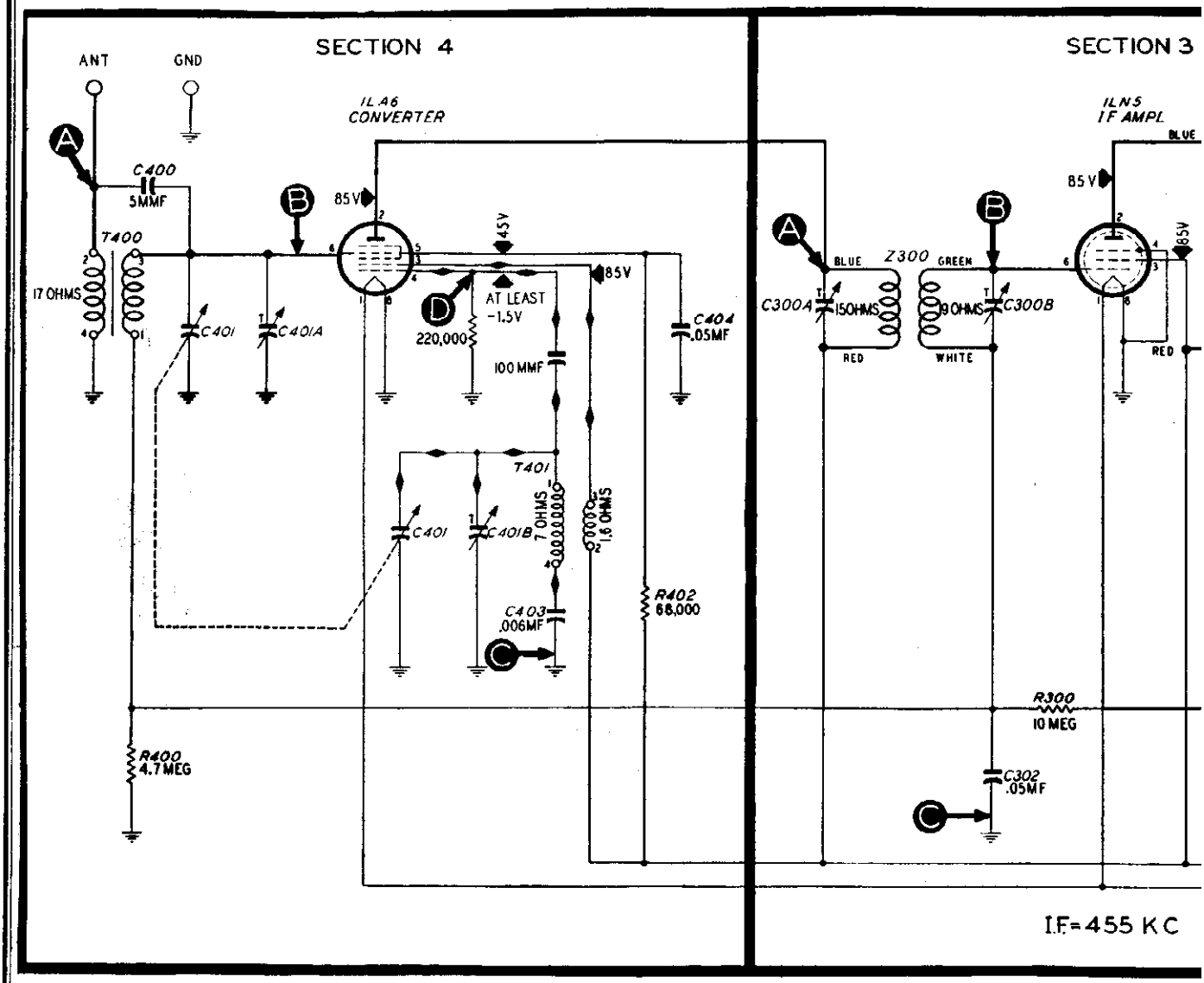
C—condenser
I—pilot lamp
L—choke or coil
LA—loop aerial
LS—loud-speaker
R—resistor
S—switch
T—transformer
Z—electrical assembly

100-series components are in Section 1—the power supply.

200-series components are in Section 2—the audio amplifier.

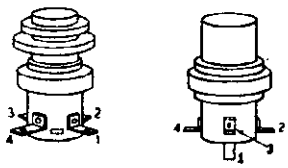
300-series components are in Section 3—the i-f amplifier, detector, and a-v-c circuits.

400-series components are in Section 4—the aerial and oscillator circuits.



NOTE: THE VOLTAGES INDICATED ON THE SCHEMATIC DIAGRAM ARE AVERAGE VALUES. THE VOLTAGES WERE MEASURED BETWEEN THE POINTS INDICATED AND THE CHASSIS, USING A 20,000-OHMS PER-VOLT METER, WITH A FRESH BATTERY.

OSCILLATOR GRID VOLTAGE WAS MEASURED BETWEEN THE CHASSIS AND OSC. GRID (PIN 4) OF THE 1LA6 TUBE, USING A 100,000-OHM ISOLATING RESISTOR IN SERIES WITH THE PROD END OF THE NEGATIVE VOLTMETER LEAD.



T400 ANT

T401 OSC

R-F, I-F, AND AUDIO SIGNAL PATH

OSC. SIGNAL PATH

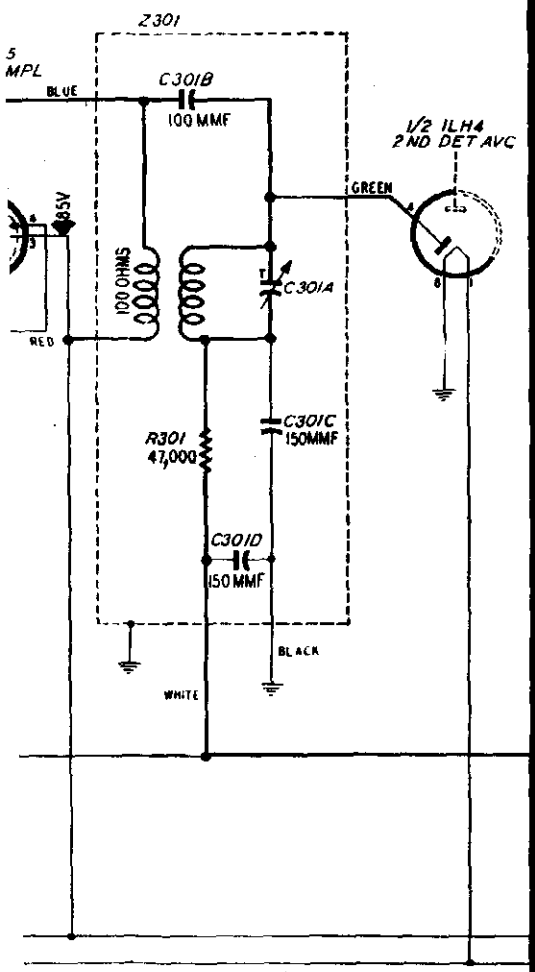
ALL RESISTOR VALUES IN OHMS UNLESS MARKED OTHERWISE

CONDENSER SYMBOLS

FIXED VARIABLE TRIMMER ELECTROLYTIC

FIGURE 5. PHILCO RADIO MODELS 48-141 AND 48-145, CON

ION 3



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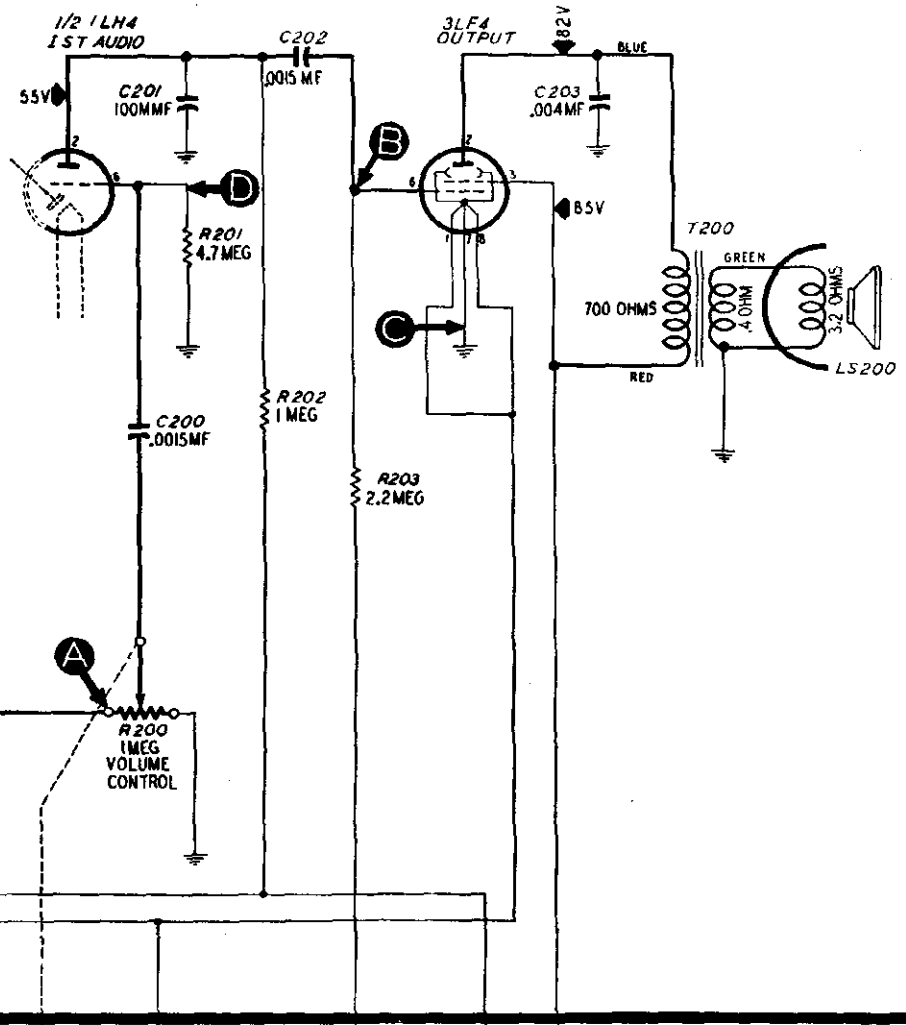
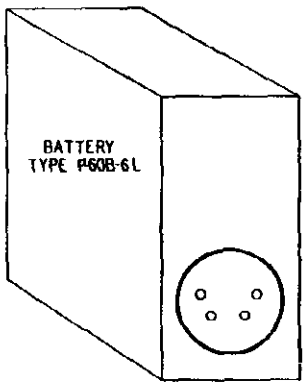
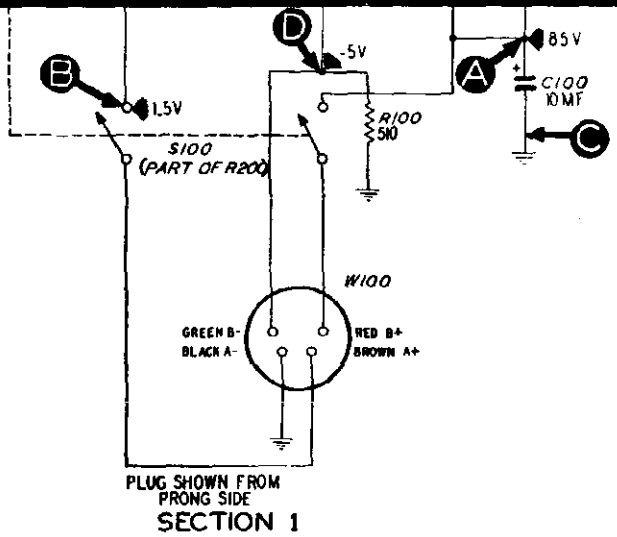
SECTION 2







SECTION 1

TP-3320

COMPLETE SECTIONALIZED SCHEMATIC, SHOWING ALL TEST POINTS

PROCEDURE

ıET VOLUME CONTROL TO MAXIMUM

SIGNAL GENERATOR—Connect ground lead to chassis; connect output lead as indicated in chart.

OUTPUT LEVEL—During alignment, adjust signal-generator output to maintain output-meter indication below 1 volt.

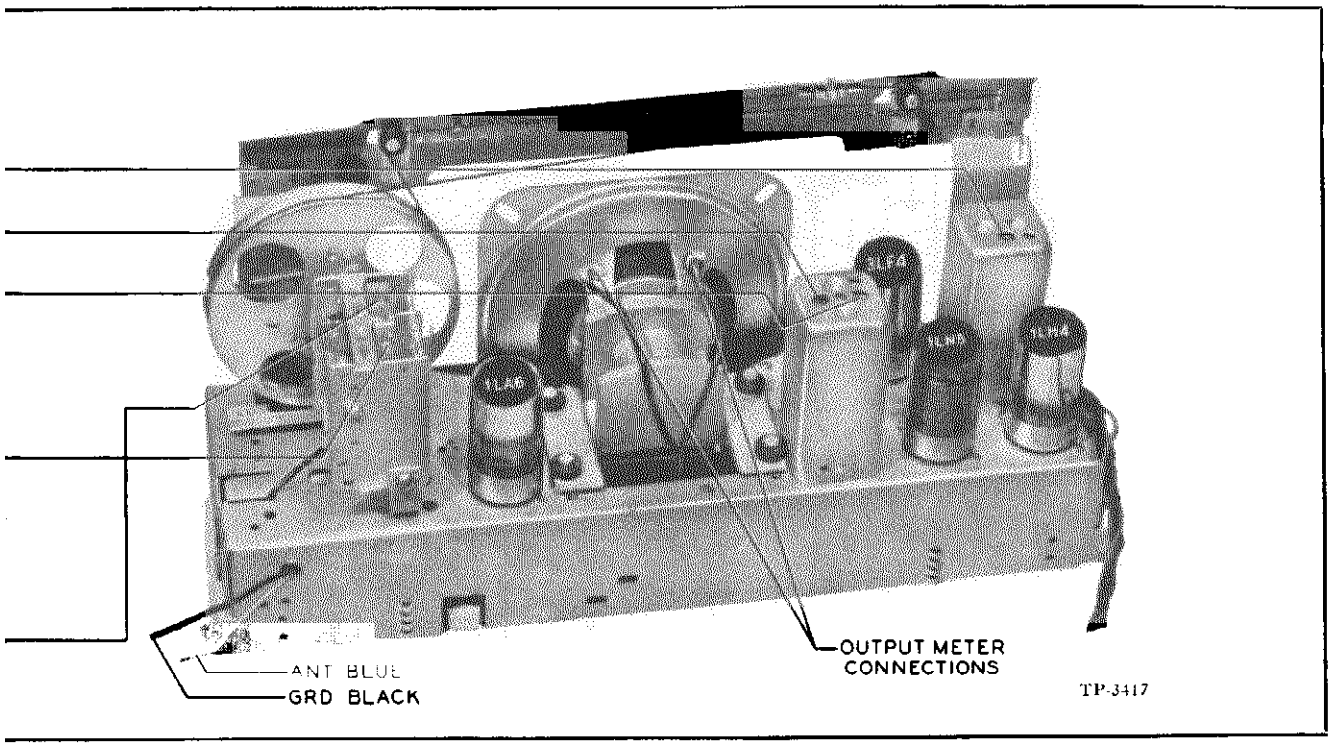


Figure 6. Top View, Showing Trimmer Locations

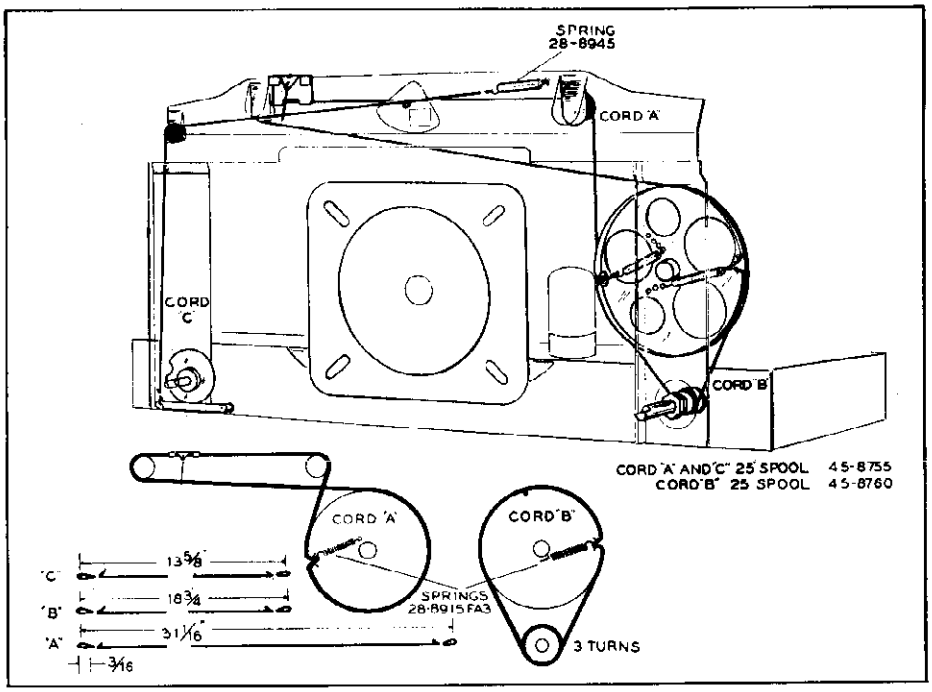


Figure 7. Drive-Cord Installation Details

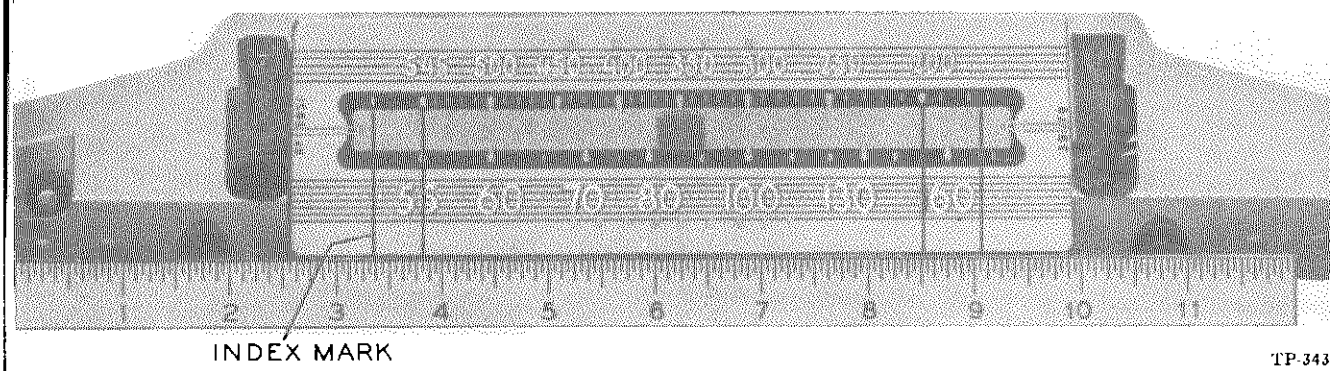


Figure 8. Composite Dial and Backplate, Calibration Details

REPLACEMENT PARTS LIST

NOTE: Part numbers marked with an asterisk (*) in the following parts list are general replacement items. These numbers may not be identical with those on factory assemblies; also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

SECTION 1

Reference Symbol	Description	Service Part No.
BA100	Battery pack	P-60B-6L
C100	Condenser, electrolytic, 10 mf., a-f and r-f by-pass	30-2540*
R100	Resistor, 510 ohms, bias	66-1513340*
S100	Switch, power	Part of R200
W100	Battery-cable assembly	41-3477-1

SECTION 2

C200	Condenser, .0015 mf., d-c blocking	45-3500-6*
C201	Condenser, 100 mmf., r-f by-pass	60-10105407*
C202	Condenser, .0015 mf., d-c blocking	45-3500-6*
C203	Condenser, .004 mf., tone compensation	61-0179*
LS200	Speaker	36-1507-3
R200	Volume control, 1 megohm	33-5554
R201	Resistor, 4.7 megohms, d-c grid return	66-5473340*
R202	Resistor, 1 megohm, plate load	66-5103340*
R203	Resistor, 2.2 megohms, d-c grid return	66-5223340*
T200	Output transformer	32-8323

SECTION 3

C300A	Condenser, trimmer	Part of Z300
C300B	Condenser, trimmer	Part of Z300
C301A	Condenser, trimmer	Part of Z301
C301B	Not used	
C301C	Condenser, 150 mmf., i-f filter	Part of Z301
C301D	Condenser, 150 mmf., i-f filter	Part of Z301
C302	Condenser, .05 mf., a-v-c filter	61-0122*
C303	Condenser, 100 mmf., coupling, part of Z301	60-10105407*
R300	Resistor, 10 megohms, a-v-c filter	66-6103340*
R301	Resistor, 47,000 ohms, i-f filter, part of Z301	66-3473340*
Z300	Transformer, 1st i-f, includes C300A and C300B	32-3949-1
Z301	Transformer, 2nd i-f, includes C301A, C301C, C301D, C303, and R301	32-3897

SECTION 4

C400	Condenser, 5 mmf., coupling	30-1221-5
C401	Condenser, main tuning	31-2721
C401A	Condenser, trimmer, aerial coil	Part of C401
C401B	Condenser, trimmer, osc. coil	Part of C401
C402	Condenser, 100 mmf., osc. grid	60-10105407*

SECTION 4 (Continued)

Reference Symbol	Description	Service Part No.
C403	Condenser, .006 mf., osc. tracking	45-3500-7
C404	Condenser, .05 mf., r-f by-pass	61-0122
R400	Resistor, 4.7 megohms, a-v-c voltage divider	66-5473340
R401	Resistor, 220,000 ohms, osc. grid leak	66-4223340
R402	Resistor, 68,000 ohms, screen dropping	66-3683340
T400	Transformer, aerial	32-3919-2
T401	Transformer, oscillator	32-3885-2

MISCELLANEOUS

Description	Service Part No.
Cabinet, Less Dial Scale	
Model 48-141	10618A
Model 48-145	10618D
Cabinet Hardware	
Baffle and cloth assembly	40-6910
Dial Scale	
Model 48-141	27-5951
Model 48-145	27-5951-1
Dial-Scale Hardware	
Band, rubber, dial scale	54-4025
Screw, strap mtg.	1W23129FA5
Strap, scale mtg., r.h.	56-2672FA3
Strap, scale mtg., l.h.	56-2671FA3
Knob	
Model 48-141	54-4323
Model 48-145	54-4375
Stud, baffle mtg.	W2235-2FA5
Scale Plate, Flag and Upright Assembly	76-3131
Cord, drive (25-ft. spool), for flag	45-8755
Cord, drive (25-ft. spool), for pointer	45-8755
Pointer	56-2896
Spring, flag drive	28-9011FA3
Spring, cam plate, flag drive	57-0701FA1
Spring, retaining	57-1468FA1
Transfer-lever assembly	76-1655-1
Socket, Loktal	27-6133
Tuning-Condenser Hardware	
Cord, drive (25-ft. spool), for tuning condenser	45-8760
Drum, drive assembly	76-2483
Mounts, rubber, tuning condenser	27-4590
Spring, tuning-condenser drive	28-8913FA3
Tuning-shaft assembly	31-2640

MODEL 48-150 PHILCO CORP.

Circuit Description

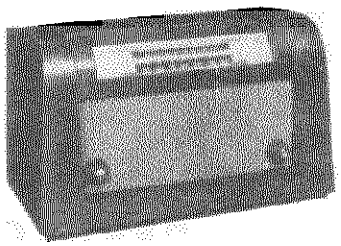
Philco Model 48-150 is a five-tube, battery-operated, superheterodyne radio providing reception on the standard broadcast band, 540 to 1720 kc. For best performance, the radio should be operated with an external aerial, such as Philco Part No. 45-1469.

A type 1LG5 pentode is used as the r-f amplifier and a type 1LA6 pentagrid converter as the mixer and oscillator, to provide high sensitivity and high signal-to-noise ratio. The r-f stage is coupled to the mixer by a transformer, and the oscillator is coupled to the mixer by the electron stream within the converter tube.

The 455-kc., i-f amplifier stage employs a type 1LN5 pentode. This stage is coupled to the output of the mixer by a double-tuned i-f transformer, and is coupled to the detector-diode section of the 1LH4 diode-triode by a single-tuned i-f transformer. The diode circuit of the 1LH4 rectifies the i-f signal and produces the audio signal and a-v-c voltage.

Two a-v-c filter circuits are used; one circuit couples the a-v-c voltage to the r-f amplifier; the other couples the a-v-c voltage to the mixer.

The audio output of the detector is resistance-coupled to the triode section of the 1LH4, which, in turn, is resistance-coupled to the type 3LF4 beam-tetrode output stage. Fixed bias is supplied to the output stage from a resistor in series with the negative return to the battery plug. The permanent-magnet, dynamic loud-speaker is transformer-coupled to the output stage.



MODEL 48-150

SPECIFICATIONS

CABINET	Wood
CIRCUIT	Five-tube superheterodyne
FREQUENCY RANGE	540 to 1720 kc.
AUDIO OUTPUT	220 mw.
POWER INPUT	Battery pack, Philco Type P-60D-11L: plate supply, 12 ma. at 90 volts; filament supply, 300 ma. at 1.5 volts; total power consumption, 1.4 watts
AERIAL	External, Philco Part No. 45-1469
INTERMEDIATE FREQUENCY	455 kc.
PHILCO TUBES (5),	1LA6, 1LG5, 1LH4, 1LN5, 3LF4

TP-3411A

Philco TROUBLE-SHOOTING Procedure

For rapid trouble-shooting, the radio circuit is divided into four sections, with test points specified for each section; these sections and test points are indicated in the schematic diagram. The trouble-shooting procedure given for each section includes a simplified test chart and a bottom view of the chassis, showing the locations of the test points and the components of that section.

In each chart, the first step is a master check for determining whether trouble exists in that section, without going through the entire test procedure. Failure to obtain "NORMAL INDICATION" in any given step indicates trouble within the circuit under test. After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

Preliminary Checks

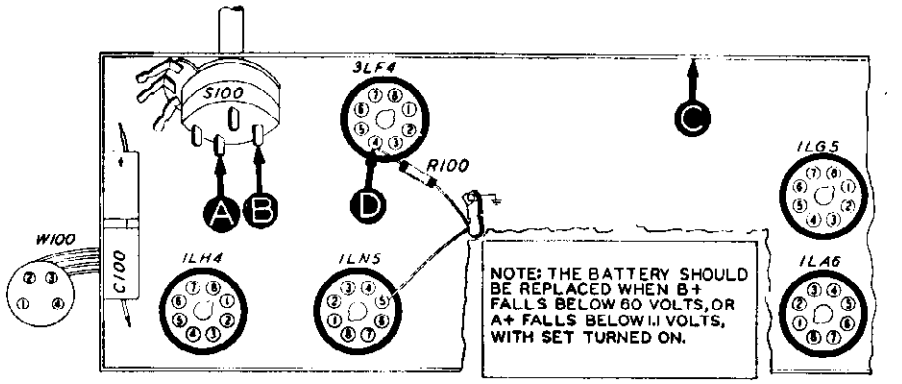
The following preliminary checks should be made before turning on the radio:

1. Carefully inspect the top and bottom of the chassis. Be sure that all tubes are securely mounted in the proper sockets. Look for bad connections burned resistors, or other obvious signs of trouble.

2. Disconnect the battery and measure the resistance between B+ (red lead of battery plug) and chassis. Use the ohmmeter polarity that gives the highest reading. If the resistance is lower than 10,000 ohms, check condensers C100, C203, C201, and C403 for leakage or shorts.

TROUBLE SHOOTING

Section



TP-3363A

Figure 1. Bottom View, Showing Section 1 Test Points

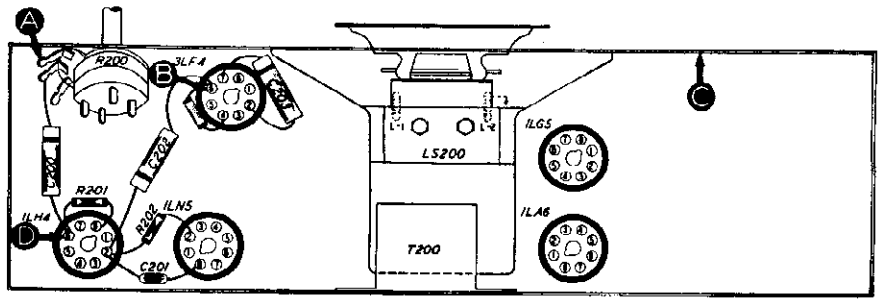
Make the tests for this sectio with a d-c voltmeter. The vol ages indicated in the chart we measured with a 20,000-ohm per-volt meter, with a fresh ba tery pack installed, and with th radio turned on. Set the volum control to minimum and the di pointer to 540 kc. Connect th meter between the radio chass test point C, and the test poin indicated in the chart.

If the "NORMAL INDICA TION" is obtained in step 1, pr ceed with the tests for Section if not, isolate and correct th trouble within this section.

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A B D	85 volts 1.5 volts Negative 5.5 volts		Trouble within this section; isolate by the following tests.
2	A	85 volts	No voltage Low voltage	Open battery cable or R100. Defective S100. Shorted C100. Weak battery. Change in value of R100. Leaky C100. Excessive current drain in Sections 2, 3, or 4.
3	B	1.5 volts	No voltage Low voltage	Open battery cable. Defective S100. Weak battery.
4	D	Negative 5.5 volts		Change in value of R100. Open R100. Excessive current drain in Sections 2, 3, or 4.

TROUBLE SHOOTING

Section



TP-3363B

Figure 2. Bottom View, Showing Section 2 Test Points

Make the tests for this sectio with an audio-frequency signa generator. Connect the groun lead to the radio chassis, test poir C, and the output lead through .1-mf. condenser to the test point indicated in the chart. Set th volume control to maximum. the "NORMAL INDICATION is obtained in step 1, procee with the tests for Section 3; if no isolate and correct the troubl within this section.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with moderate signal input.	Trouble in this section; isolate by the following tests.
2	B	Moderate, clear signal with strong signal input.	Defective 3LF4, T200, or LS200. Shorted C203 or C201. Leaky C203 or C201.
3	D	Same as step 1.	Defective 1LH4. Open R202 or C202.
4	A	Same as step 1.	Open C200. Defective R200.
Listening Test: Distortion may be caused by leaky C201, C202, C203 or C200, or by open R203.			

MODEL 48-150 PHILCO CORP.

TROUBLE SHOOTING *Section 3*

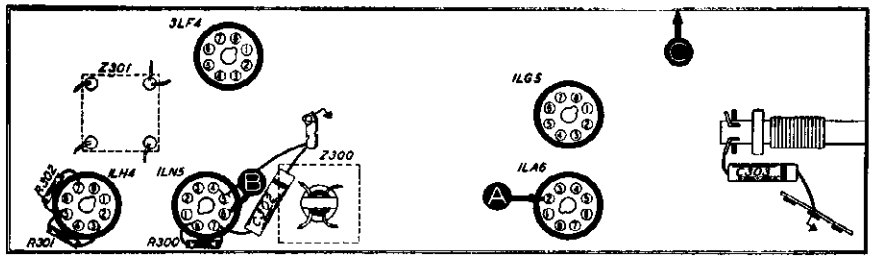


Figure 3. Bottom View, Showing Section 3 Test Points

Make the tests for this section with an r-f signal generator (modulated output); set the generator to 455 kc. Connect the ground lead to the radio chassis, test point C, and the output lead through a .1-mf. condenser to the test points indicated in the chart. Set the volume control to maximum. If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 4; if not, isolate and correct the trouble within this section.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with moderate signal input.	Trouble in this section; isolate by the following tests.
2	B	Same as step 1.	Defective 1LN5 or 1LH4 (diode section). Defective or misaligned Z301.
3	A	Same as step 1.	Defective or misaligned Z300.

TROUBLE SHOOTING *Section 4*

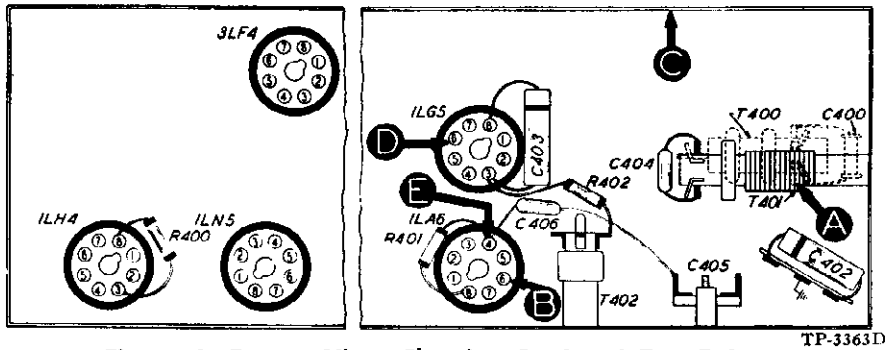


Figure 4. Bottom View, Showing Section 4 Test Points

Make the tests for this section with an r-f signal generator (modulated output); set the frequency as noted in the chart. Connect the generator ground lead to the radio chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Inspect the tuning condensers for bent plates, dirt, or poor wiper contacts; any of these conditions will cause noise. If the "NORMAL INDICATION" is not obtained in step 1, isolate and correct the trouble within this section.

STEP	TEST POINT	DIAL SETTINGS		NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
		SIG. GEN.	RADIO		
1	A	540 kc.	540 kc.	Loud, clear signal with low signal input.	Trouble in this section; isolate by the following tests.
2	E Osc. test (See note below.)		540 to 1720 kc.	Negative voltage (at least 1.5 volts) over complete range.	Defective 1LA6, T402, R401, R402 or C405. Shorted C403 or osc. section of C401.
3	B	540 kc.	540 kc.	Same as step 1.	Same as step 2.
4	D	540 kc.	540 kc.	Same as step 1.	Defective 1LG5 or T401. Shorted ant. or r-f section of C401.
5	A	540 kc.	540 kc.	Same as step 1.	Defective T400. Open C402.

NOTE: Connect positive lead of a 20,000-ohms-per-volt meter to radio chassis, test point C; connect prod end of negative lead through a 100,000-ohm isolating resistor to test point E (osc. grid, pin 4 of 1LA6).

ALIGNME

TURN ON RADIO ANI

DIAL—Alignment points should be marked on the dial backplate as shown in figure 8. Turn tuning gang until fully meshed, and set dial pointer to index mark.

OUTPUT METER—Connect meter to voice-coil l loud-speaker. Set meter to 2.5-volt or similar

STEP	SIGNAL GENERATOR		RADIO	
	CONNECTIONS TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS
1	Through .1-mf. condenser to stator of aerial tuning condenser.	455 kc.	Tuning condenser fully meshed.	Turn C300B fully clockwise. Adjust trimmers, in order given, for maximum output.
2	Through 200-mmf. condenser to aerial lead.	600 kc.	600 kc.	Adjust for maximum output.
3	Same as step 2.	1700 kc.	1700 kc.	Same as step 2.
4	Same as step 2.	1500 kc.	1500 kc. (approx.)	Tune radio to generator signal and adjust trimmers for maximum output.
5	Same as step 2.	600 kc.	600 kc. (approx.)	Adjust trimmers for maximum output while rocking tuning control.
6	Repeat steps 3 and 5 until no further increase in output is noted.			

SYMBOLIZATION AND TERMINOLOGY

All components in the radio circuit are symbolized and located as follows:

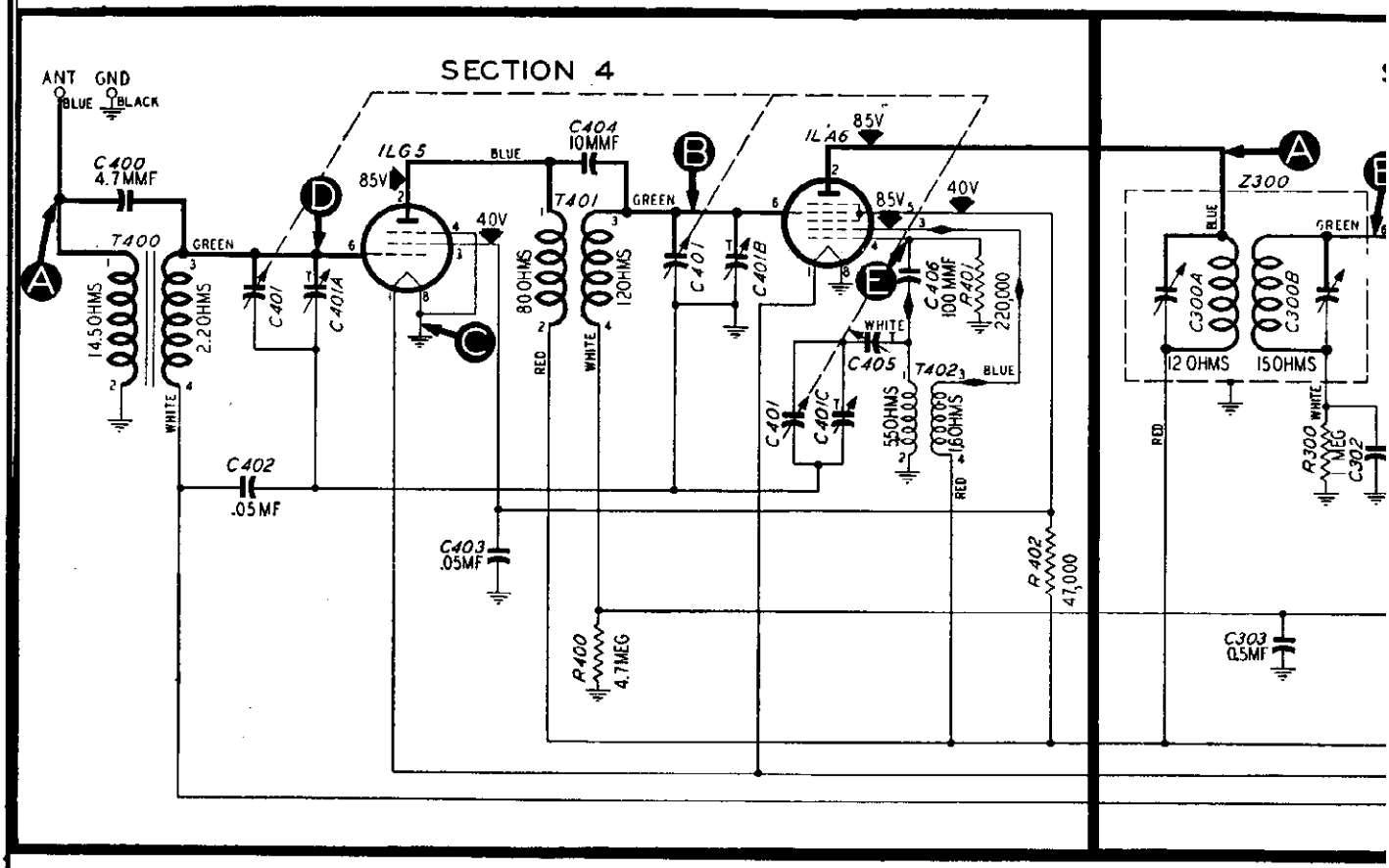
C—condenser
I—pilot lamp
L—choke or coil
LA—loop aerial
LS—loud-speaker
R—resistor
S—switch
T—transformer
Z—electrical assembly

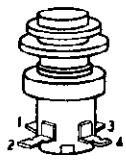
100-series components are in Section 1—the power supply.

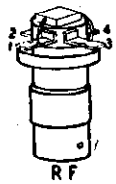
200-series components are in Section 2—the audio amplifier.

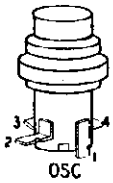
300-series components are in Section 3—the i-f amplifier, detector, and a-v-c circuits.

400-series components are in Section 4—the aerial, r-f, and oscillator circuits.




ANT
T400


RF
T401


OSC
T402

RF, IF AND AUDIO SIGNAL PATH

OSC SIGNAL PATH

ALL RESISTOR VALUES IN OHMS UNLESS MARKED OTHERWISE.

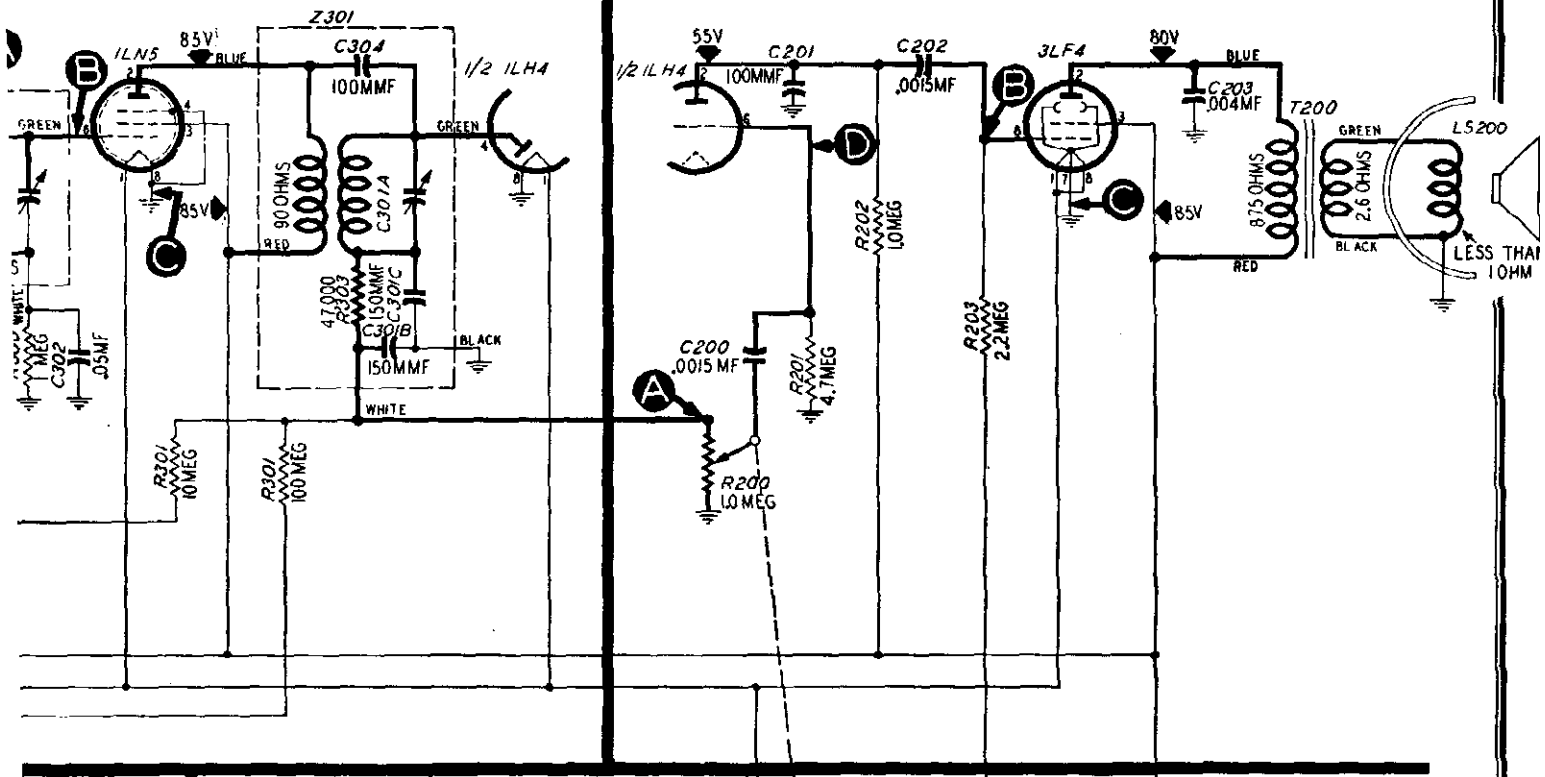
CONDENSER SYMBOLS

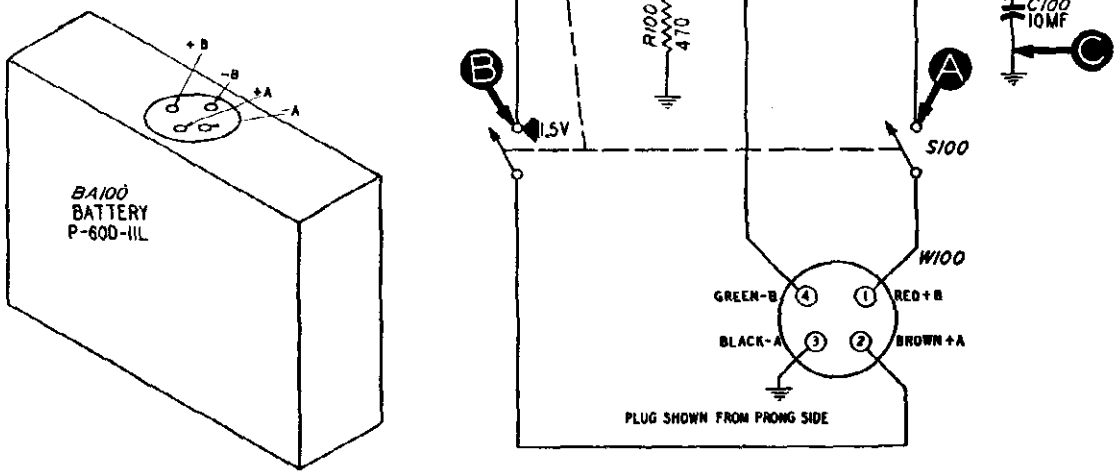

FIXED VARIABLE TRIMMER ELECTROLYTIC

FIGURE 5. PHILCO RADIO MODEL 48-150, SECTIONALIZ

SECTION 3

SECTION 2





SECTION 1

ALIZED SCHEMATIC, SHOWING TEST POINTS

PROCEDURE

VOLUME CONTROL FULLY ON

SIGNAL GENERATOR—Connect ground lead to radio chassis; connect output lead as indicated in chart.

OUTPUT LEVEL—During alignment, adjust signal-generator output to maintain output-meter indication below 1 volt.

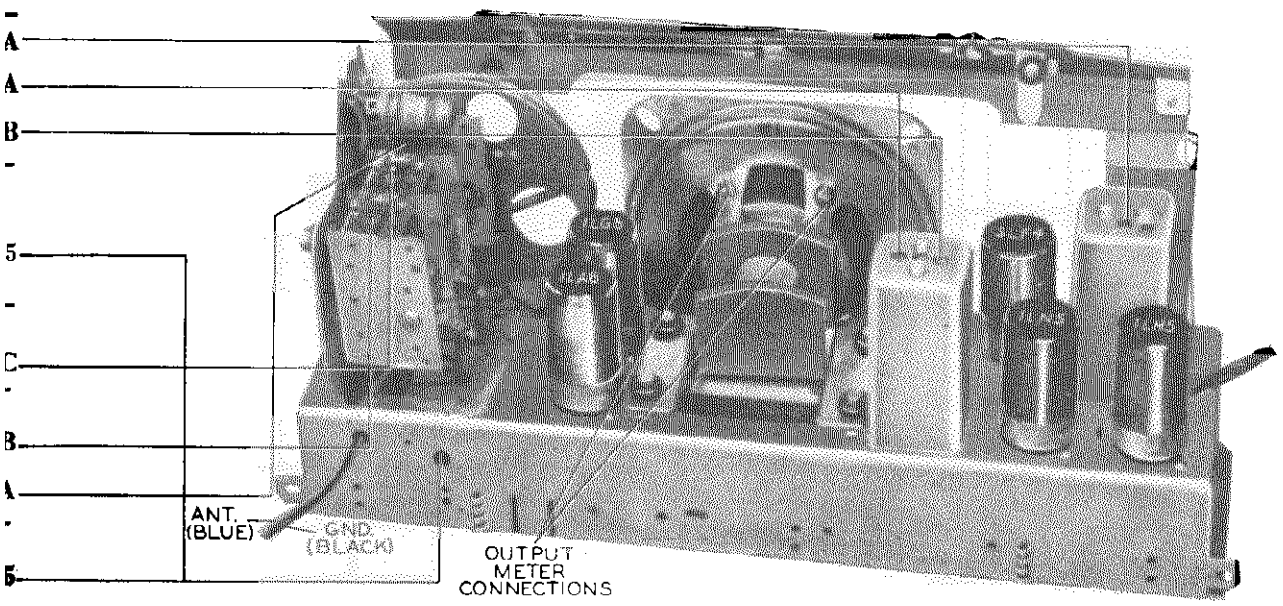
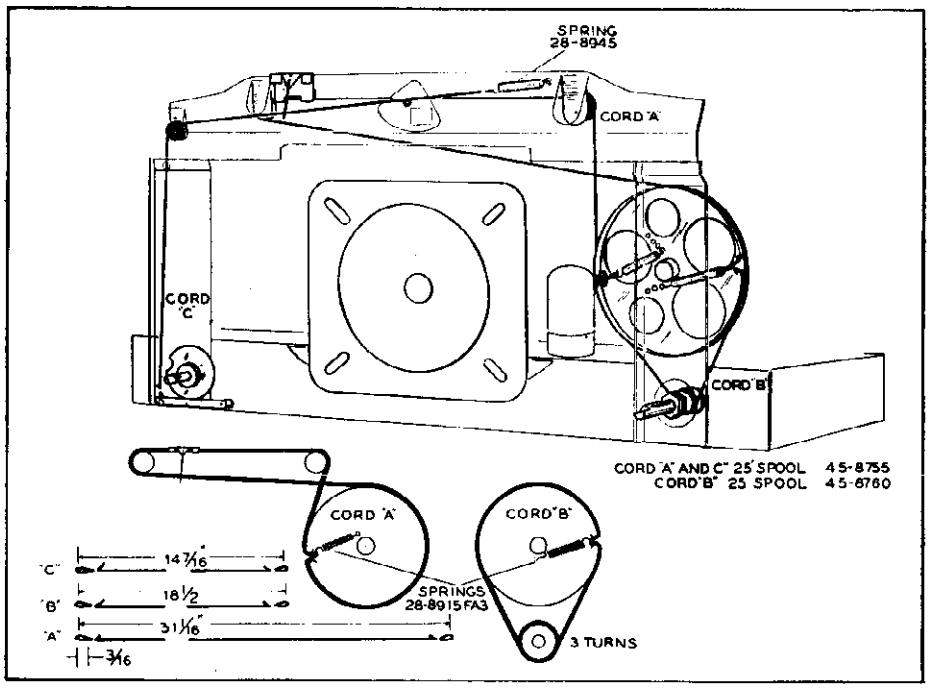


Figure 6. Top View, Showing Trimmer Locations

TP-3413



TP-3320E

Figure 7. Drive-Cord Installation Details

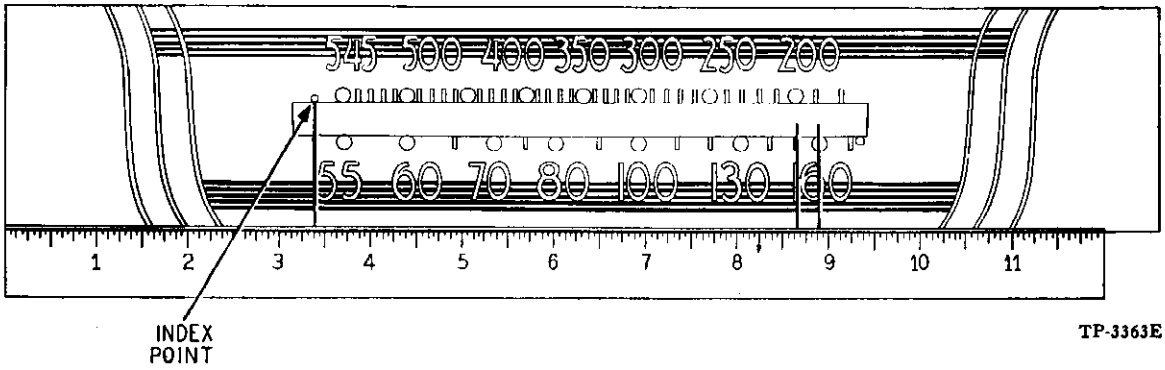


Figure 8. Composite Dial and Backplate, Calibration Details

REPLACEMENT PARTS LIST

NOTE: Part numbers marked with an asterisk (*) in the following parts list are general replacement items. These numbers may not be identical with those on factory assemblies; also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

SECTION 1

Reference Symbol	Description	Service Part No.
BA100	Battery pack	P-60D-11L
C100	Condenser, electrolytic, 10 mf.	30-2540*
R100	Resistor, bias, 470 ohms	66-1473340*
S100	Power switch	Part of R200
W100	Battery-cable assembly	41-3710

SECTION 2

C200	Condenser, d-c blocking, .0015 mf.	45-3500-6*
C201	Condenser, r-f by-pass, 100 mmf.	60-10105407*
C202	Condenser, d-c blocking, .0015 mf.	45-3500-6*
C203	Condenser, tone compensation, .004 mf.	61-0179*
LS200	Loud-speaker	36-1507-3
R200	Volume control (with power switch), 1 megohm	33-5554
R201	Resistor, grid return, 4.7 megohms.	66-5473340*
R202	Resistor, plate load, 1 megohm	66-5103340*
R203	Resistor, grid return, 2.2 megohms.	66-5223340*
T200	Output transformer	32-3823

SECTION 3

C300A	Condenser, trimmer	Part of Z300
C300B	Condenser, trimmer	Part of Z300
C301A	Condenser, trimmer	Part of Z301
C301B	Condenser, i-f filter, 150 mmf.	Part of Z301
C301C	Condenser, i-f filter, 150 mmf.	Part of Z301
C302	Condenser, r-f by-pass, .05 mf.	61-0122*
C303	Condenser, a-v-c filter, .05 mf.	61-0122*
C304	Condenser, coupling, 100 mmf., part of Z301	60-10105407*
R300	Resistor, grid return, 1 megohm	66-5103340*
R301	Resistor, a-v-c filter, 10 megohms.	66-6103340*
R302	Resistor, a-v-c filter, 10 megohms.	66-6103340*
R303	Resistor, i-f filter, 47,000 ohms, part of Z301	66-3473340*
Z300	Transformer, 1st i.f., includes C300A and C300B	32-3949-1
Z301	Transformer, 2nd i.f., includes C301A, C301B, C301C, C304, and R303.	32-3897-2

SECTION 4

Reference Symbol	Description	Service Part No.
C400	Condenser, coupling, 4.7 mmf.	30-1221-
C401	Condenser, three-section tuning	31-272
C401A	Condenser, trimmer	Part of C40
C401B	Condenser, trimmer	Part of C40
C401C	Condenser, trimmer	Part of C40
C402	Condenser, a-v-c filter, .05 mf.	61-012
C403	Condenser, r-f by-pass, .05 mf.	61-012
C404	Condenser, coupling, 10 mmf.	Part of T40
C405	Condenser, oscillator trimmer	31-6473-
C406	Condenser, oscillator coupling, 100 mmf.	60-1010540
R400	Resistor, a-v-c filter, 4.7 megohms.	66-547334
R401	Resistor, grid return, 220,000 ohms.	66-422334
R402	Resistor, screen dropping, 47,000 ohms	66-347334
T400	Transformer, aerial	32-3919-
T401	Transformer, r-f	32-3974-
T402	Transformer, oscillator	32-3385-

MISCELLANEOUS

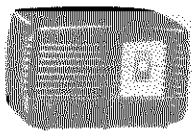
Description	Service Part N
Cabinet, less accessories	1067
Baffle-and-felt assembly	40-691
Felt foot	W219
Knob	76-305
Scale, dial	27-596
Scale strap	56-475
Scale plate, flag-and-upright assembly	76-313
Cam plate	56-2700-1FA
Drive cord, flag and pointer (25-foot spool)	45-875
Drive cord, tuning gang (25-foot spool)	45-876
Lever assembly	76-1655-
Pointer	56-289
Spring, gang and pointer drive	28-8913FA
Spring, flag drive	28-894
Spring, cam plate	57-0701FA
Spring, retaining	57-1468FA
Socket, Loktal	27-613
Tuning Shaft	31-2484-

MODELS 48-200, 48-200-I, 48-214, PHILCO CORP.
Code 125

Codes 121 of these models use oscillator transformer part number 32-3880. Codes 122 use oscillator transformer part number 32-4263.

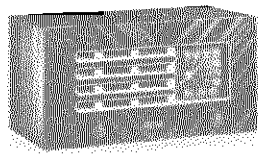
Code 121 of each of these three models is identical to Code 125 of each model, with the following exceptions:

1. The type 35Y4 rectifier tube was replaced by a type 35Z5GT tube.
2. The type 50L6GT output tube was replaced by a type 50A5 tube.



MODEL 48-200 (Walnut)
MODEL 48-200-I (Ivory)

MODEL 48-214



Circuit Description

The Philco Models 48-200, 48-200-I and 48-214 are 5-tube, table-model superheterodyne radios, providing reception in the standard broadcast band. The three models, which started in factory production as Code 125, are identical, except for cabinet and dial parts, as indicated in the parts list.

The high-impedance loop aerial normally provides adequate signal pickup. An external aerial may be connected, if desired, by detaching the aerial lead (shown in figure 6) from the chassis, and connecting the lead to an external aerial lead-in. Do not use a ground.

The loop is coupled to the 7A8 converter tube. Variable-condenser tuning is employed, the oscillator rotor-section plates being shaped to obtain tracking, thus eliminating the necessity for a series padding condenser.

The 7A8 is transformer coupled to the 14A7 i-f amplifier, which is also transformer coupled to the diodes of the 14B6 second detector—first audio-frequency amplifier. A-v-c voltage is applied to the control grids of both the i-f and converter tubes.

The triode section of the 14B6 is the first audio stage, and is resistance coupled to the 50L6GT output tube. The output tube is transformer coupled to a permanent-magnet dynamic speaker.

D-c operating voltages are obtained from a 35Y4 half-wave rectifier, the output of which is filtered by a two-section resistor—condenser filter.

Condenser C304 in Section 3, figures 3 and 5, is a special condenser, inductively wound to form a series-tuned circuit, resonant at the intermediate frequency. This special condenser offers less impedance at this frequency than a conventional condenser, thus permitting higher i-f gain, with no tendency toward instability. Since the tuning gang is connected to the chassis, by-passing at broadcast and short-wave frequencies is adequate. The inductive effect is negligible at audio frequencies.

The 150,000-ohm resistor, R100, in Section 1, prevents hum which might otherwise occur under conditions of high humidity.

SPECIFICATIONS

CABINET:
Models 48-200 and 48-200-I ..... Bakelite
Model 48-214 ..... Wood
CIRCUIT ..... Five-tube superheterodyne
FREQUENCY RANGE ..... 540 to 1620 kc.
OPERATING VOLTAGE .. 105 to 120 volts, a.c. or d.c.
POWER CONSUMPTION ..... 30 watts
AERIAL .... Loop fastened to cabinet; terminal also provided for outside aerial
INTERMEDIATE FREQUENCY ..... 455 kc
PHILCO TUBES (5), 7A8, 14A7, 14B6, 50L6GT, 35Y4
PANEL LAMP, 6—8-volt, bayonet base, Part No. 34-2068

Philco TROUBLE-SHOOTING Procedure

In this manual, the schematic diagram is divided into four sections, with a chassis layout for each section, showing components and test points for each section. The test points are also indicated on the schematic diagram in the corresponding section. A simplified trouble-shooting procedure is given in a chart for each section. The first step in each chart is a master check, indicating whether trouble exists in that section. Failure to obtain the "NORMAL INDICATION" in a given step indicates trouble, which should be located by voltage, resistance, or capacitance checks of parts indicated in the step, and remedied before testing further.

Preliminary Checks

The following preliminary checks are recommended before turning on the radio:

1. Carefully inspect both top and bottom of the chassis. Make sure that all tubes are secure in the proper sockets (see figure 6), and look for bad connections, burnt resistors, or other obvious sources of trouble.

2. Measure the resistance between B plus and B minus (test points C and B— in figure 1), using the ohmmeter polarity giving the highest resistance reading; if the reading is lower than 50,000 ohms, check C101A, C101B, and C101C, for leakage or shorts.

TROUBLE SHOOTING

Section

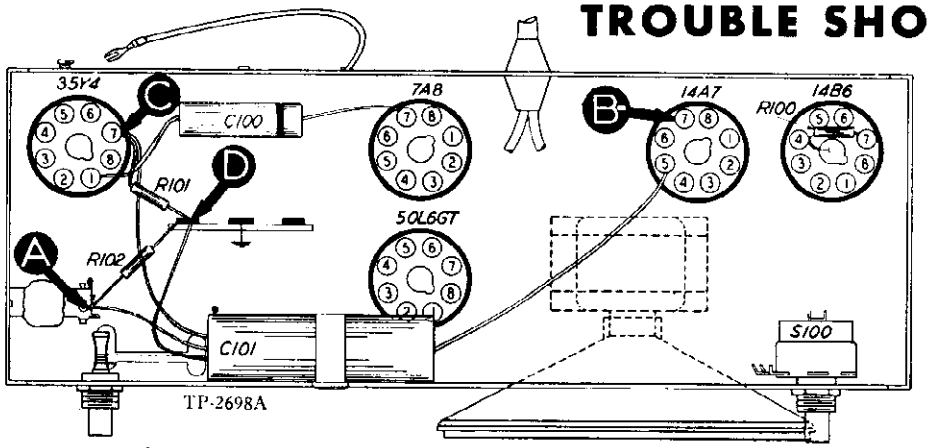


Figure 1. Bottom View, Showing Section 1 Test Points

Make the tests for this sectic with a d-c voltmeter, connecti the leads to the test points ind cated in the chart. The voltag shown were taken with a 20,00 ohms-per-volt meter at a line vol age of 117 volts, 60 cycles.

Turn the volume control minimum, and set the dial point at 540 kc.

Follow steps in sequence. "NORMAL INDICATION" is ol tained in step 1, proceed wi tests for Section 2; if not, isola and correct t..e trouble within th section.

STEP	TEST POINTS	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A to B—	90v		Trouble within this section; isolate by the following tests.
2	C to B—	115v	No voltage	Defective 35Y4 tube. Shorted C101A.
			Low voltage	Defective 35Y4 tube. Open C101A or 1100. Leaky C101A.
			High voltage	Open R101.
3	D to B—	105v	No voltage	Shorted C101B.
			Low voltage	Open C101B. Leaky C'01B or C203.
			High voltage	Open R102, T200, or R204.
4	A to B—	90v	No voltage	Shorted C101C.
			Low voltage	Leaky C101C.
			High voltage	Open R204.

Listening Test: Abnormal hum may be caused by open C101A, C101B, or C101C.

TROUBLE SHOOTING

Section 2

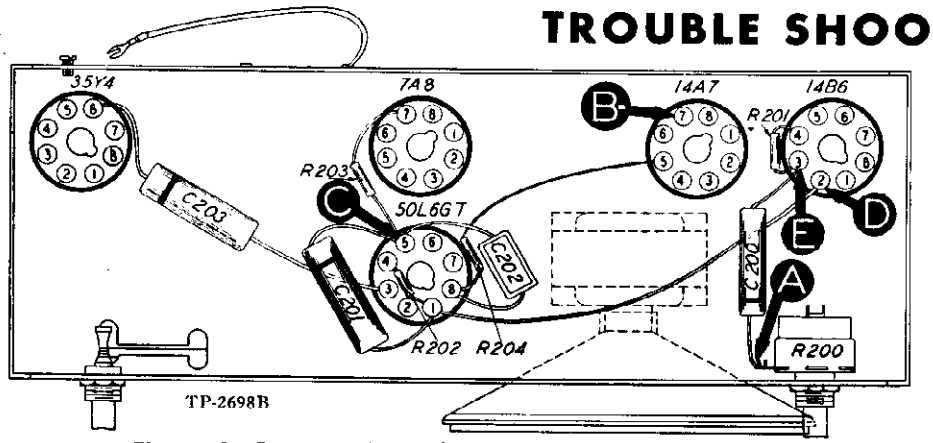


Figure 2. Bottom View, Showing Section 2 Test Points

Make tests for this section b using an audio signal. Connec ground lead of signal generator t B—; connect output lead throug a .1-mf condenser to the te points indicated in the chart. Se the volume control at maximun If "NORMAL INDICATION" obtained in step 1, proceed wit tests for Section 3; if not, isolat and correct the trouble withi this section.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with low signal-generator output	Trouble within this section; isolate by the following tests.
2	C	Clear signal with high signal-generator output	No signal: Open or shorted LS200 or T200. Shorted C203. Open R204. Defective 50L6GT tube. Weak or distorted signal: Defective 50L6GT tube, or LS200. Leaky C202 or C201. Open R203. Shorted R204.
3	D	Same as step 2	No signal: Open C201. Weak or distorted signal: Leaky C201.
4	E	Same as step 1	No signal: Open R202. Defective 14B6 tube. Weak or distorted signal: Shorted C200. Open R201. Defective 14B6 tube.
5	A	Same as step 1 Note: Rotate R200 through range	No signal: Open C200. Shorted C300D. Weak or distorted signal: Defective R200.

MODELS 48-200, 48-200-I, 48-214, PHILCO CORP
Codes 121, 122, 125

TROUBLE SHOOTING — Section 3

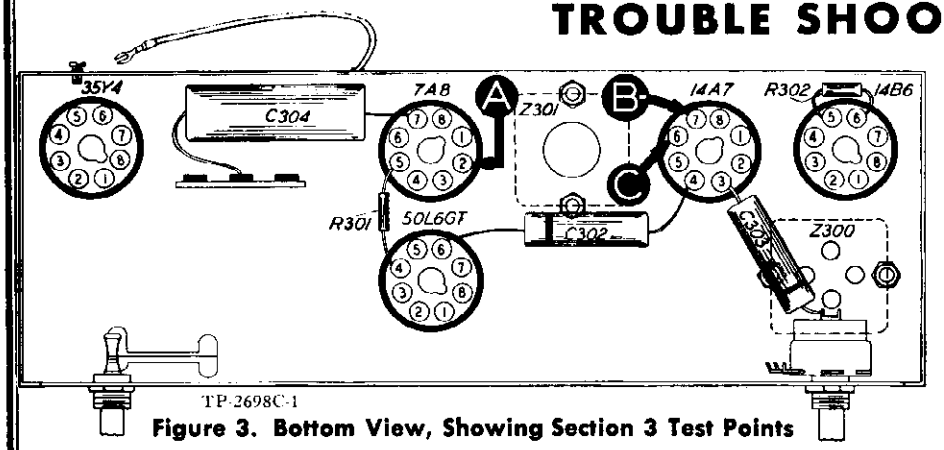


Figure 3. Bottom View, Showing Section 3 Test Points

Make tests for this section by using an r-f signal generator with modulated output. Set generator frequency to 455 kc. Connect ground lead of signal generator to B—; connect output lead through a .1-mf condenser to the test points indicated in the chart. Set the volume control at maximum. If "NORMAL INDICATION" is obtained in step 1, proceed with tests for Section 4; if not, isolate and correct the trouble within this section.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Clear signal with low signal-generator output	Trouble within this section; isolate by the following tests.
2	C	Same as step 1	No signal: Open or shorted Z300. Defective 14B6 or 14A7 tube. Open R301. Shorted C303. Weak or distorted signal: Leaky C303. Open C303 or C304. Defective 14B6 or 14A7 tube. Misaligned Z300. Leaky or open C302.
3	A	Same as step 1	No signal: Open or shorted Z301. Weak or distorted signal: Misaligned Z301.

TROUBLE SHOOTING — Section 4

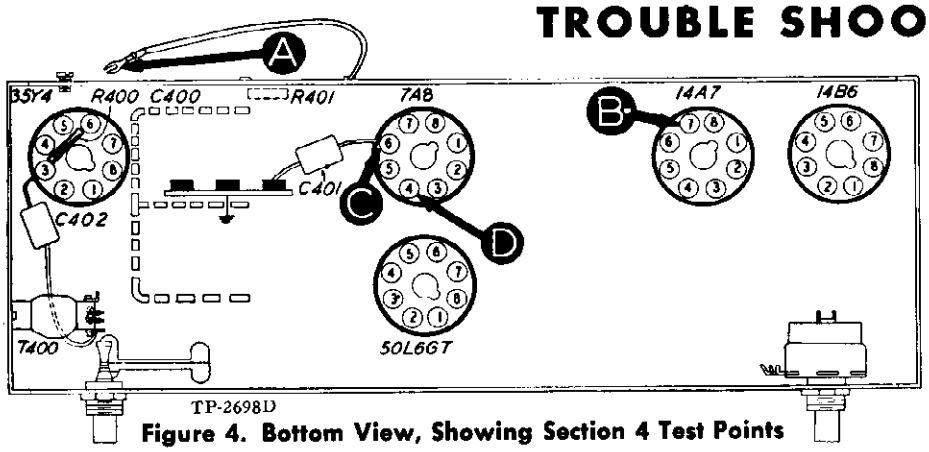


Figure 4. Bottom View, Showing Section 4 Test Points

Make tests for this section by using an r-f signal generator with modulated output. Set frequency as noted in chart. Connect generator ground lead to B—; connect output lead through a .1-mf condenser to the test points indicated in the chart.

Inspect tuning condensers for bent plates, dirt, or poor wiper contacts; any or all of these will cause noise. If "NORMAL INDICATION" is not obtained in step 1, isolate trouble by following the remaining steps.

STEP	TEST POINT	DIAL SETTINGS		NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
		SIG. GEN.	RADIO		
1	A	540 kc	540 kc	Clear signal with low signal-generator output	Trouble within this section; isolate by the following tests.
2	Osc. Test (see Note below)		540 to 1620 kc	Negative voltage	Open or shorted T400, C402, or R400. Shorted C400 or C400B. Defective 7A8 tube.
3	C	540 kc	540 kc	Same as step 1	No signal: Open or shorted Z301. Shorted C400 or C400A. Defective 7A8 tube. Weak or distorted signal: Shorted or open LA400. Defective 7A8 tube.
4	A	540 kc	540 kc	Same as step 1	Weak signal: Open C401.

NOTE: Oscillator test.—Connect positive lead of a 20,000-ohms-per-volt meter to B—; prod end of negative lead through a 100,000-ohm isolating resistor to test point D. Proper operation of oscillator is indicated by a negative voltage of 9 to 12 volts throughout range of tuning condenser.

ALIGNMEN

TURN ON THE RADIO POWER, A

DIAL POINTER—Turn tuning condensers to full-mesh position. Set dial pointer to index dot, located to the left of "55."

OUTPUT METER—Connect to left (output) l and center (chassis) lug of terminal pan shown in figure 6.

STEP	SIGNAL GENERATOR		RADIO	
	CONNECTIONS TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS
1				Turn C301B (copper screw) down tight.
2	Through .1-mf. condenser to test-point C of Section 4.	455 kc.	540 kc.	Adjust trimmers, in the order given, for maximum output.
3	Through 100-mmf. condenser to external aerial connector.	1600 kc.	1600 kc.	Disconnect external aerial lug from chassis. Adjust trimmer for maximum output.
4	Same.	1500 kc.	1500 kc.	Adjust for maximum output.

SYMBOLIZATION AND TERMINOLOGY

All components in the radio circuits are symbolized and located as follows:

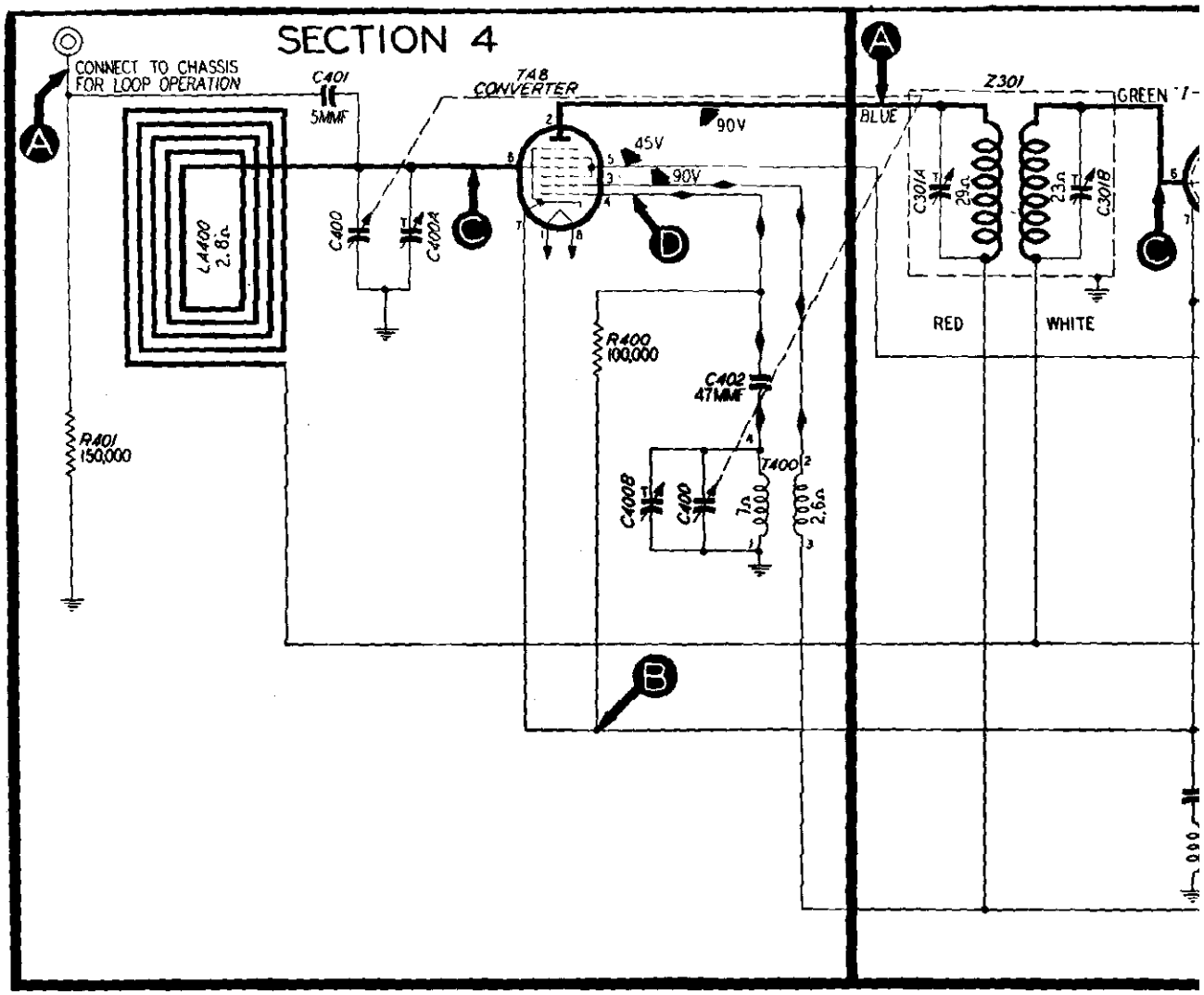
C—condenser	LA—loop aerial	S—switch
I—pilot lamp	LS—loudspeaker	T—transformer
L—choke or coil	R—resistor	Z—electrical assembly

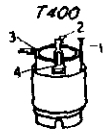
100-series components are in Section 1—the power supply.

200-series components are in Section 2—the second detector, a-v-c, and audio circuits.

300-series components are in Section 3—the i-f amplifier.

400-series components are in Section 4—the aerial, r-f, and oscillator circuits.





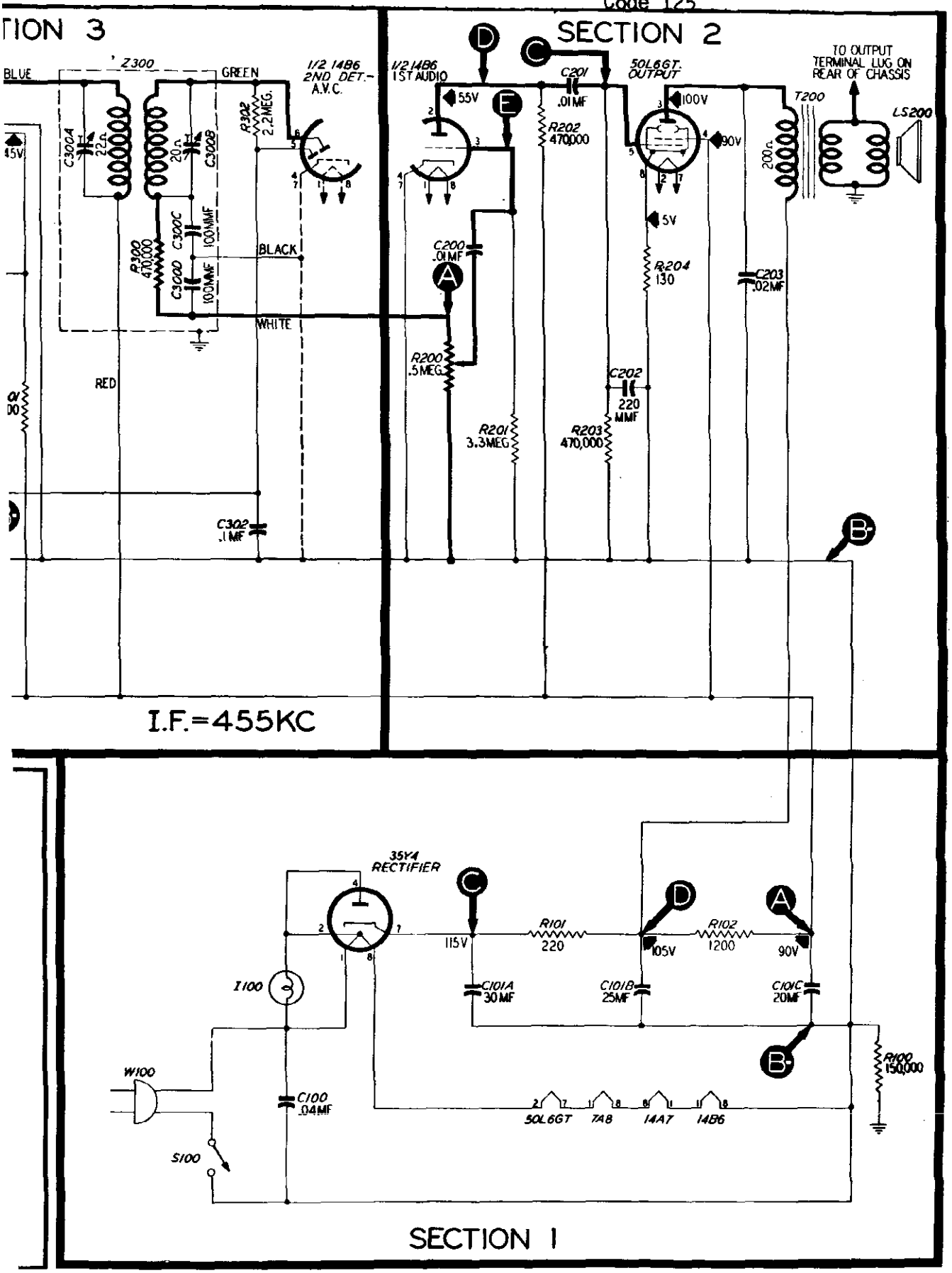
R-F, I-F AND AUDIO SIGNAL PATH
OSC. SIGNAL PATH
ALL RESISTOR VALUES IN OHMS UNLESS MARKED OTHERWISE

CONDENSER SYMBOLS

NOTE: ALL VOLTAGES AND CAPACITY AND RESISTANCE VALUES SHOWN ARE AVERAGE. THE VOLTAGES BETWEEN TEST POINT B- AND OTHER POINTS INDICATED WERE MEASURED WITH A 20,000-OHMS-PER-VOLT METER; VOLUME CONTROL AT MINIMUM AND TUNING CONDENSER PLATES FULLY MESHED.

ORP

MODELS 48-200, 48-200-I, 48-214,
Code 125



TP-2698-1

CODE 125; COMPLETE SECTIONALIZED SCHEMATIC, SHOWING ALL TEST POINTS

PROCEDURE

T THE VOLUME CONTROL FULL ON

SIGNAL GENERATOR—Connect ground lead to B—; connect output lead as indicated in the chart.

OUTPUT LEVEL—During alignment, adjust the signal-generator output to maintain an output-meter indication below 1.25 volts.

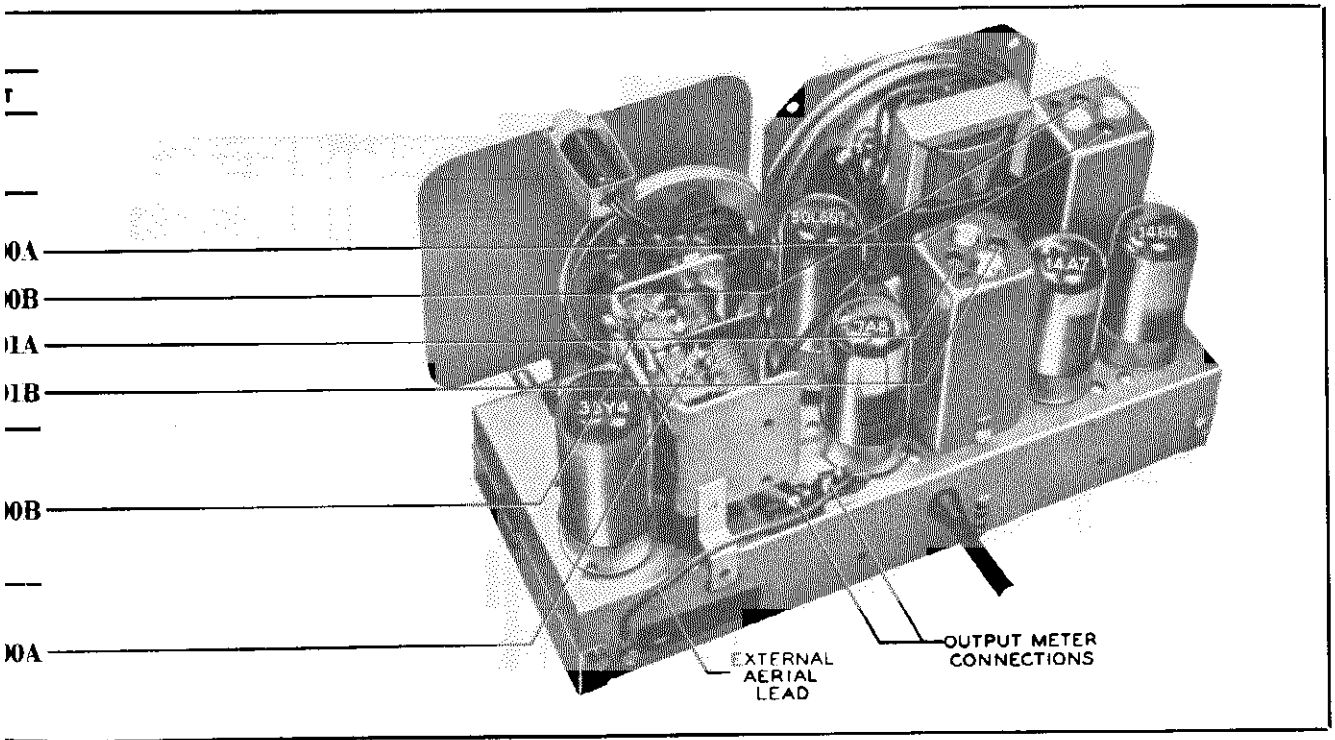


Figure 6. Chassis View, Showing Trimmer Locations TP-3126

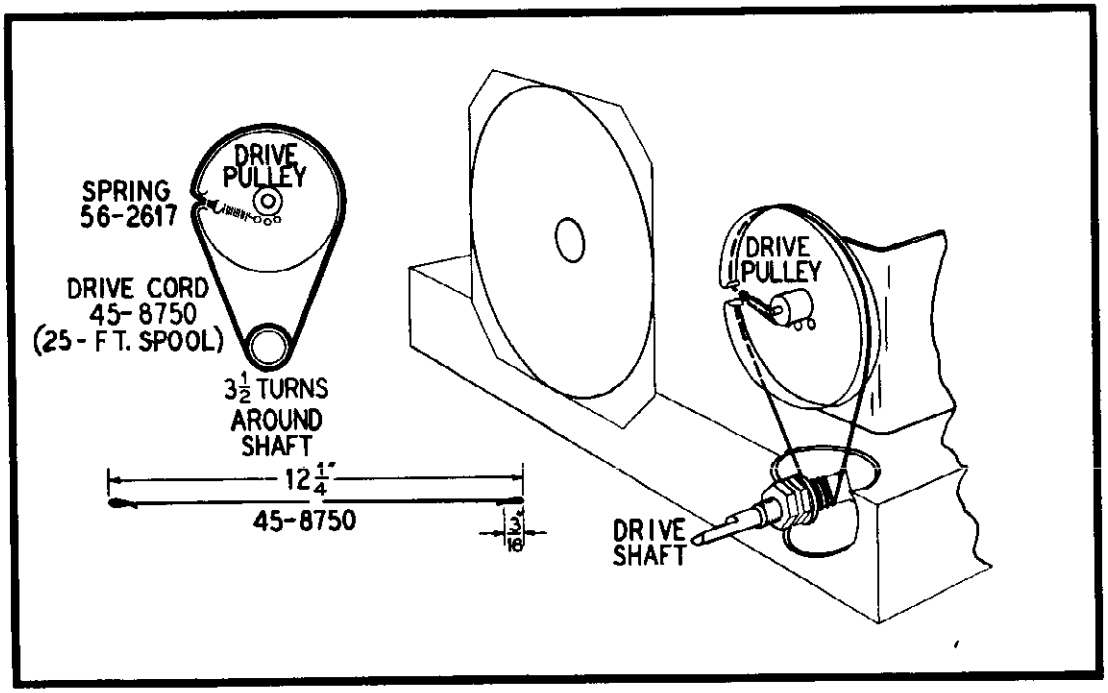


Figure 7. Drive-Cord Installation Details TP-2698E

REPLACEMENT PARTS LIST

NOTE: Parts marked with an asterisk (*) are general replacement items, and the numbers listed may not be identical with those on factory assemblies; also, the electrical values of some replacement items furnished may differ from the values indicated in the schematic and parts list. The values substituted in any case are so chosen that the operation of the instrument will be either unchanged or improved. When ordering replacements, use only the "Service Part No." in this parts list.

SECTION 1

Symbol	Description	Service Part No.
C100	Condenser, line filter, .04 mf	45-3500-2*
C101	Condenser, electrolytic, 3-section filter	30-2573
C101A:	Condenser, electrolytic, 30 mf	Part of C101
C101B:	Condenser, electrolytic, 25 mf	Part of C101
C101C:	Condenser, electrolytic, 20 mf	Part of C101
R100	Resistor, leakage, 150,000 ohms	66-4153340*
R101	Resistor, filter, 220 ohms	66-1224340*
R102	Resistor, filter, 1200 ohms	66-2123340*
S100	Switch, power	Part of R200
W100	Power cord and plug	LS363
I100	Panel lamp	34-2068

SECTION 2

C200	Condenser, coupling, .01 mf	61-0120*
C201	Condenser, coupling, .01 mf	61-0120*
C202	Condenser, by-pass, 220 mmf	60-10205307*
C203	Condenser, by-pass, .02 mf	61-0108*
R200	Volume control (with power switch), 500,000 ohms	33-5429
R201	Resistor, grid load, 3.3 megohms	66-5333340*
R202	Resistor, plate load, 470,000 ohms	66-4473340*
R203	Resistor, grid load, 470,000 ohms	66-4473340*
R204	Resistor, bias, 130 ohms	66-1123340*
LS200	Speaker	36-1614
T200	Output transformer	Part of LS200

SECTION 3

C302	Condenser, a-v-c by-pass, .1 mf	61-0113*
C303	Condenser, screen by-pass, .05 mf	61-0122*
C304	Condenser, special i-f by-pass, .2 mf	30-4644
R300	Resistor, diode load, 47,000 ohms	Part of Z300
R301	Resistor, screen, 27,000 ohms	66-3273340*
R302	Resistor, a-v-c, 2.2 megohms	66-5223340*
Z300	Transformer, 2nd i-f	32-3952
C300A:	Condenser, trimmer	Part of Z300
C300B:	Condenser, trimmer	Part of Z300
C300C:	Condenser, by-pass, 100 mmf	Part of Z300
C300D:	Condenser, by-pass, 100 mmf	Part of Z300
Z301	Transformer, 1st i-f	32-3967
C301A:	Condenser, trimmer	Part of Z301
C301B:	Condenser, trimmer	Part of Z301

SECTION 4

Symbol	Description	Service Part No
C400	Condenser, tuning, 2-section	31-2527-2
C400A:	Condenser, trimmer	Part of C400
C400B:	Condenser, trimmer	Part of C400
C401	Condenser, coupling, 5 mmf	60-90505007
C402	Condenser, isolating, 47 mmf	60-00515307
R400	Resistor, osc., grid, 100,000 ohms	66-4103340
R401	Resistor, aerial discharge, 150,000 ohms	66-4153340
T400	Transformer, oscillator	32-3880
LA400	Loop aerial:	
	Models 48-200, 200-I	32-4052-5
	Model 48-214	32-4052-6

MISCELLANEOUS

Description	Service Part No
Cabinet	
Model 48-200	10542D
Model 48-200-I	10542E
Model 48-214	10621
Cabinet Hardware	
Back	
Model 48-200	27-9879
Model 48-200-I	27-9922
Model 48-214	54-7080
Foot, felt	W2190
Knob	
Model 48-200	27-4820
Model 48-200-I	54-4118
Model 48-214	54-4154
Window, acetate	
Models 48-200, 200-I	54-4088
Model 48-214	54-4212
Clip, coil mounting	28-5002FA1
Dial-Scale Hardware	
Cord, drive (25-ft. spool)	45-8750
Pointer	
Models 48-200, 200-I	27-4891-
Model 48-214	54-4148-2
Scale, dial	
Model 48-200	27-596
Model 48-200-I	27-5965-
Model 48-214	27-583
Screw, scale mounting	1W19674FA
Spring, drive cord	56-261
Washer, scale mounting	2W54094
Panel, terminal, loop aerial	76-2148
Panel, lamp assembly	76-1472
Shaft, drive assembly	31-271
Socket, Loktal	27-613
Socket, octal	27-617

MODELS 48-250, 48-251, PHILCO CORP.
Codes 121, 122, 126

CODE 121

Model 48-250, Code 121, is identical to Model 48-250, Code 126, with the following exceptions:

1. The type 50B5 output tube was replaced by a type 50A5 tube. The 50B5 miniature socket, Part No. 27-6226, was replaced by an octal socket, Part No. 27-6199.
2. The type 35Y4 rectifier tube was replaced by a type 35Z5GT tube.

CODE 122

Model 48-250, Code 122, is identical to Model 48-250, Code 121, with the following exceptions:

1. The permanent-magnet speaker (LS200), Part No. 36-1615, was replaced by an electrodynamic speaker, Part No. 36-1591.
2. Resistor R101 was removed.
3. Resistor R102 was removed.
4. Condenser C101 was replaced by a 2-section electrolytic condenser, 20-20 mf., Part No. 30-2547.*
5. Resistors R101 and R102 were replaced by the 500-ohm field coil of the speaker.

Circuit Description

The Philco Radio, Model 48-250, is a five-tube, table-model superheterodyne, providing reception in the standard-broadcast band.

The high-impedance loop aerial normally provides adequate signal pickup. Provisions are made for the connection of an external aerial.

The loop is coupled to the 7A8 converter. Variable condenser tuning is employed; the oscillator rotor-section plates are properly shaped to obtain tracking, thus eliminating the necessary for a series padding condenser.

The 7A8 is transformer-coupled to the 14A7 i-f amplifier, which is also transformer-coupled to the diodes of the 14B6 second detector—first audio-frequency amplifier. A-v-c voltage is applied to the control grids of both the i-f and converter tubes.

The triode section of the 14B6 is the first audio stage, and is resistance-coupled to the 50B5 output stage. The output tube is transformer-coupled to the permanent-magnet dynamic speaker.

D-c operating voltages are obtained from the 35Y4 half-wave rectifier, the output of which is filtered by a two-section resistor-condenser filter.

Condenser C302 in Section 3 is a special condenser, inductively wound with wire to form a series-tuned circuit, resonant at the intermediate frequency. This special condenser offers less impedance at this frequency than a conventional condenser, thus permitting higher i-f gain, with no tendency towards instability. The inductive effect at audio frequencies is negligible. Since the tuning gang is connected to the chassis, by-passing at broadcast frequencies is adequate.

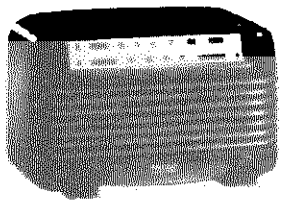
Resistor R100, the 150,000-ohm resistor in Section 1, prevents hum which might otherwise occur under conditions of high humidity.

Philco TROUBLE-SHOOTING *Procedure*

For rapid trouble shooting, the radio circuit is divided into four sections, with test points specified for each section; these sections and test points are indicated in the schematic diagram. The trouble-shooting procedure given for each section includes a simplified test chart and a bottom view of the chassis showing the locations of the test points and the components of that section.

In each chart, the first step is a master check for determining whether trouble exists in that section without going through the entire test procedure.

Failure to obtain "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.



MODEL 48-250 (Walnut)
MODEL 48-250-I (Ivory)

SPECIFICATIONS

CABINET	Plastic (ivory or walnut)
CIRCUIT	Five-tube superheterodyne
FREQUENCY RANGE	540—1620 kc.
OPERATING VOLTAGE	105—120 volts, a.c. or d.c.
POWER CONSUMPTION	30 watts
AERIAL	Loop fastened to cabinet; terminal also provided for outside aerial
INTERMEDIATE FREQUENCY	455 kc.
PHILCO TUBES (5)	7A8, 14A7, 14B6, 50B5, 35Y4

TP-2670

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube-electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before turning on the power.

1. Inspect the top and bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, or other obvious sources of trouble.
2. Measure the resistance between B+ (pin 7 of the 35Y4 rectifier) and B— (test point B). When the ohmmeter test leads are connected in the proper polarity, the highest resistance reading will be obtained. If the reading is lower than 1500 ohms, check condenser C101A, C101B, and C101C for leakage or shorts.

The resistance value, which is must lower than normal, is not intended as a quality check of these condensers; the value given is the lowest at which the rectifier will operate safely while the voltage tests of Section 1 are performed.

Section 1 TROUBLE SHOOTING

For the tests in this section, use a d-c voltmeter. Connect the negative lead to B—, test point B; connect the positive lead to the test points indicated in the chart. The voltage readings given were taken with a 20,000-ohm-per-volt meter, at a line voltage of 117 volts, a-c.

Turn on the power, and set the volume control to minimum.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2; if not, isolate and correct the trouble in this section.

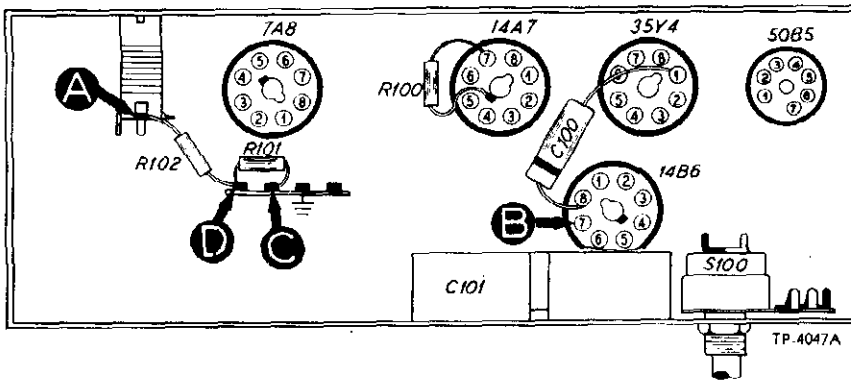


FIGURE 1. BOTTOM VIEW, SHOWING SECTION 1 TEST POINTS

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	107v		Trouble within this section. Isolate by the following tests.
2	C	130v	No voltage Low voltage High voltage	Defective: 35Y4, S100, W100. Shorted: C101A. Defective: 35Y4. Open: C101A, I100. Leaky: C101A. Open: R101, R102, R203*, T200*.
3	D	120v	No voltage Low voltage High voltage	Shorted: C101B. Open: R101. Shorted: C203*. Leaky: C101B, C203*. Open: R102, R203*, T200*.
4	A	107v	No voltage Low voltage High voltage	Shorted: C101C. Leaky: C101C. Open: R203*.
Listening Test: Abnormal hum may be caused by open C101B, C101C, or R100.				

* This part, located in another section, may cause abnormal indication in this section.

Section 2 TROUBLE SHOOTING

For the tests in this section, use an audio signal generator. Connect the ground lead of the generator to B—, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the radio volume control to maximum.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 3. If not, isolate and correct the trouble in this section.

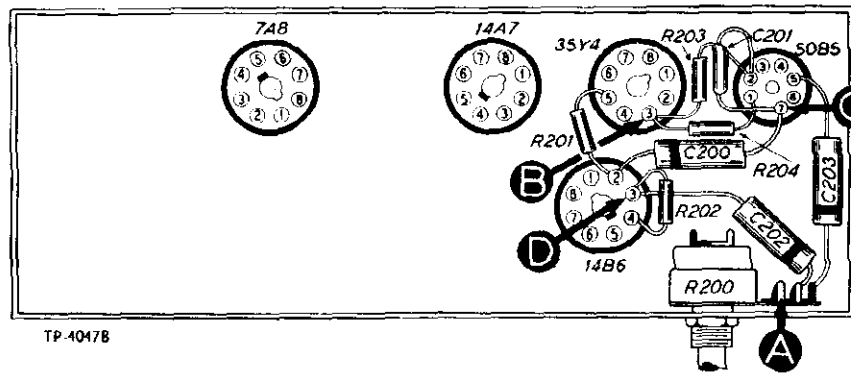


FIGURE 2. BOTTOM VIEW, SHOWING SECTION 2 TEST POINTS

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble within this section. Isolate by the following tests.
2	C	Clear signal with strong signal input.	No signal—Open or shorted: LS200, T200. Shorted: C201, C203. Open: R203. Defective: 50B5.
3	D	Same as step 1.	Open: R201, R202, R204. Open, shorted, or leaky: C200. Defective: 14B6.
4	A	Same as step 1.	Defective: R200((rotate through entire range). Open, shorted or leaky: C202. Shorted: C301D*

* This part, located in another section, may cause trouble in this section.

Section 3 TROUBLE SHOOTING

For the tests in this section use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to B—, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests in Section 4; if not, isolate and correct the trouble in this section.

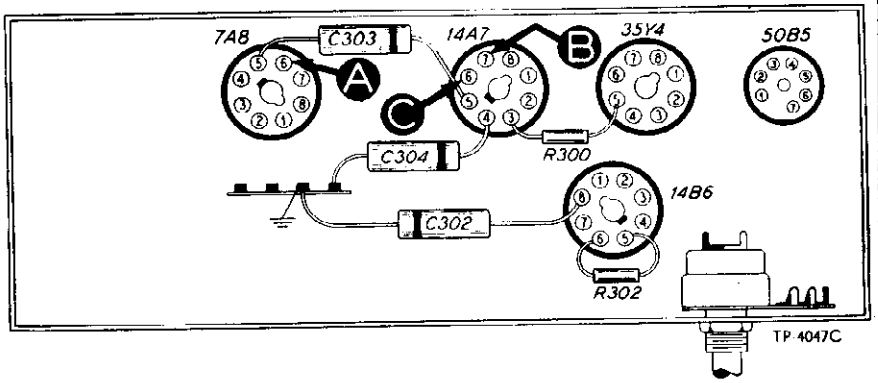


FIGURE 3. BOTTOM VIEW, SHOWING SECTION 3 TEST POINTS

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Clear signal with weak signal input.	Trouble within this section. Isolate by the following tests.
2	C	Clear signal with moderate signal input.	Defective or misaligned: Z301. Defective: 14B6 (diode section), 14A7. Open: R300, C302. Shorted, leaky, or open: C303.
3	A	Same as step 1.	Defective or misaligned: Z300. Defective: 7A8*. Open: C302, LA400*.

* This part, located in another section, may cause trouble in this section.

Section 4 TROUBLE SHOOTING

For the tests in this section, with the exception of the oscillator test, use an r-f signal generator with modulated output. Connect the generator ground lead to B—, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the radio volume control to maximum.

Set the radio and signal-generator dials as indicated in the chart.

If the "NORMAL INDICATION" is not obtained in step 1, isolate and correct the trouble in this section.

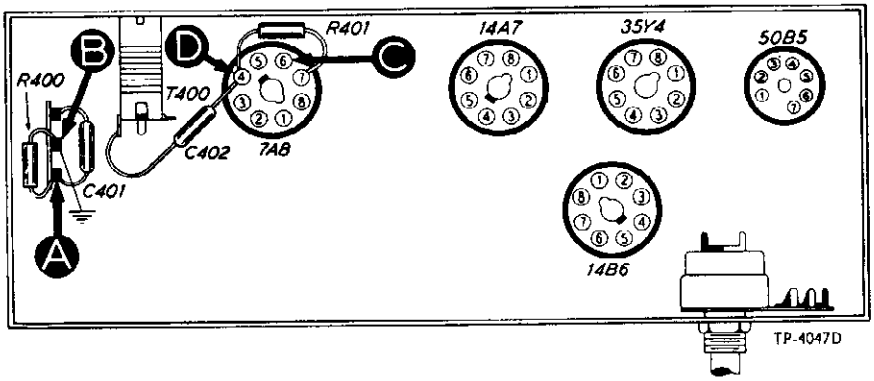


FIGURE 4. BOTTOM VIEW, SHOWING SECTION 4 TEST POINTS

STEP	TEST POINT	DIAL SETTINGS		NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
		SIG. GEN.	RADIO		
1	A	540 kc.	540 kc.	Clear signal with weak signal input.	Trouble within this section. Isolate by the following tests.
2	C	540 kc.	540 kc.	Same as step 1.	Shorted: C400, C400A. Defective: 7A8. Trouble in oscillator section.
3	Oscillator Test (see Note below)		540 to 1620 kc.	Negative 7 to 11 volts.	Defective: T400, 7A8. Open or shorted: C402. Shorted: C400, C400B.
4	A	540 kc.	540 kc.	Same as step 1.	Defective: LA400. Open: C401.

OSCILLATOR-TEST NOTE: Connect positive lead of high-resistance voltmeter to B—, test point B; connect prod end of negative lead through a 100,000-ohm isolating resistor to the 7A8 oscillator grid, test point D. Use suitable meter range, such as 0—50 volts. Proper operation of oscillator is indicated by negative voltage of 7 to 11 volts (measured with a 20,000-ohms-per-volt meter) throughout range of tuning control.

MODELS 48-250, 48-251,
Codes 121, 122, 126

ALIGNM

TURN ON THE RADIO, AND

DIAL—Turn tuning condensers to full-mesh position. Set dial pointer to coincide with index mark, located to the left of "550."

OUTPUT METER—Connect to left (output) lug center (chassis) lug of terminal panel, shown in ure 6.

STEP	SIGNAL GENERATOR		RADIO		ADJ
	CONNECTIONS TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Ground lead to B—; output lead through a .1-mf. condenser to test point C of Section 4.	455 kc.	540 kc.	Turn C300B (copper screw) fully tight, then adjust trimmers, in order given, for maximum output.	
2	Radiating loop (see note below).	1600 kc.	1600 kc.	Adjust for maximum.	
3	Same as step 2.	1500 kc.	1500 kc.	Adjust for maximum.	

NOTE: Make up a six-to-eight-turn, 6-inch-diameter loop, using insulated wire; connect to signal-generator leads and place near radio loop.

SYMBOLIZATION

The components in the radio circuit are symbolized according to the types of parts and the sections of the radio in which the parts are located. The prefix letter of the symbol designates the type of part, as follows:

C—condenser	LA—loop aerial	S—switch
I—pilot lamp	LS—loud-speaker	T—transformer
L—choke or coil	R—resistor	Z—electrical assembly

The number of the symbol designates the section in which the part is located, as follows:

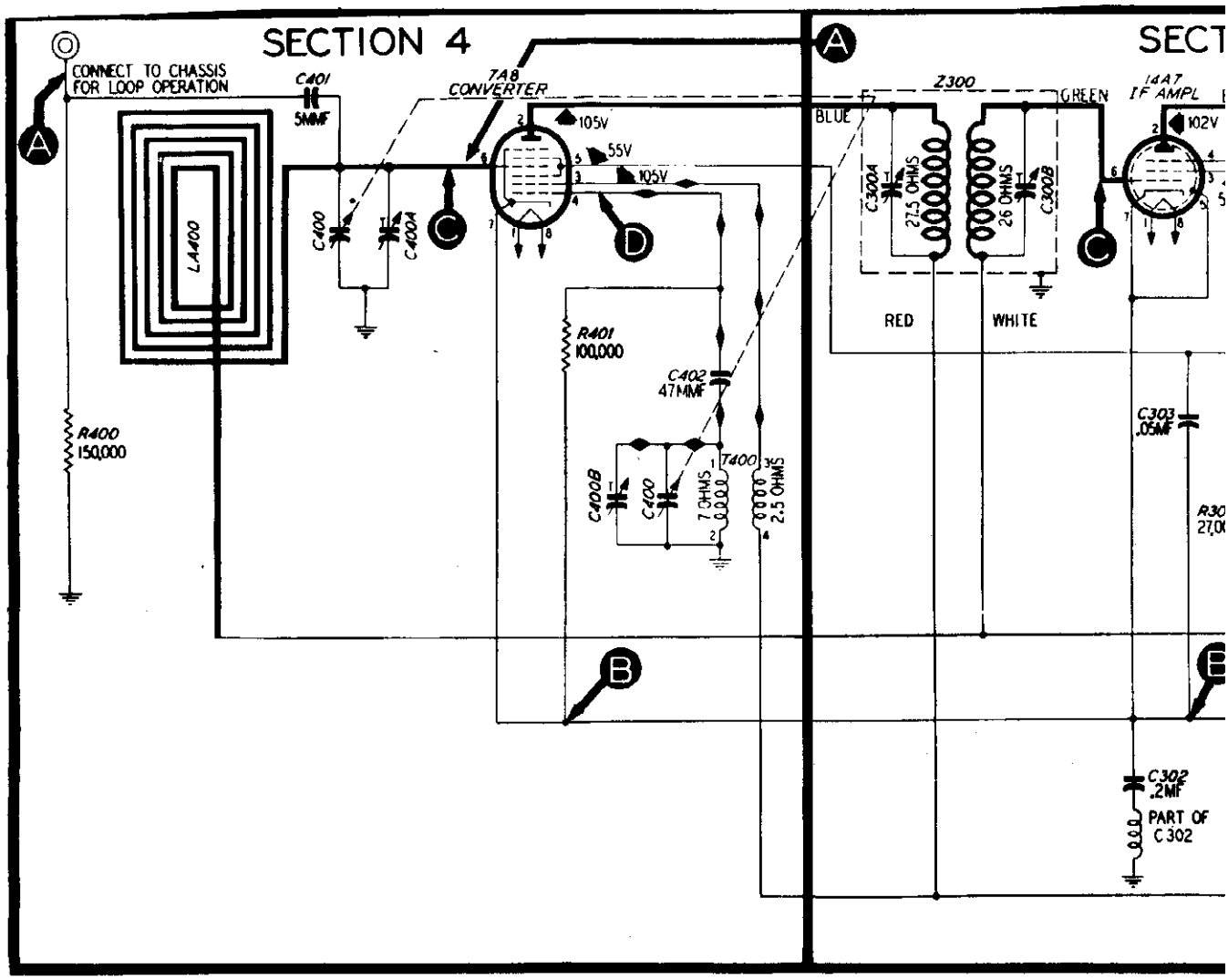
100-series components are in Section 1—the power supply.

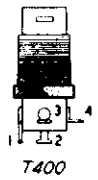
200-series components are in Section 2—the audio circuits.

300-series components are in Section 3—the i-f amplifier, detector, and a-v-c circuits.

400-series components are in Section 4—the aerial, r-f, and oscillator circuits.

A suffix letter identifies the part as a non-replaceable component of the assembly which bears an identical number without a suffix letter, and with perhaps a different prefix letter.



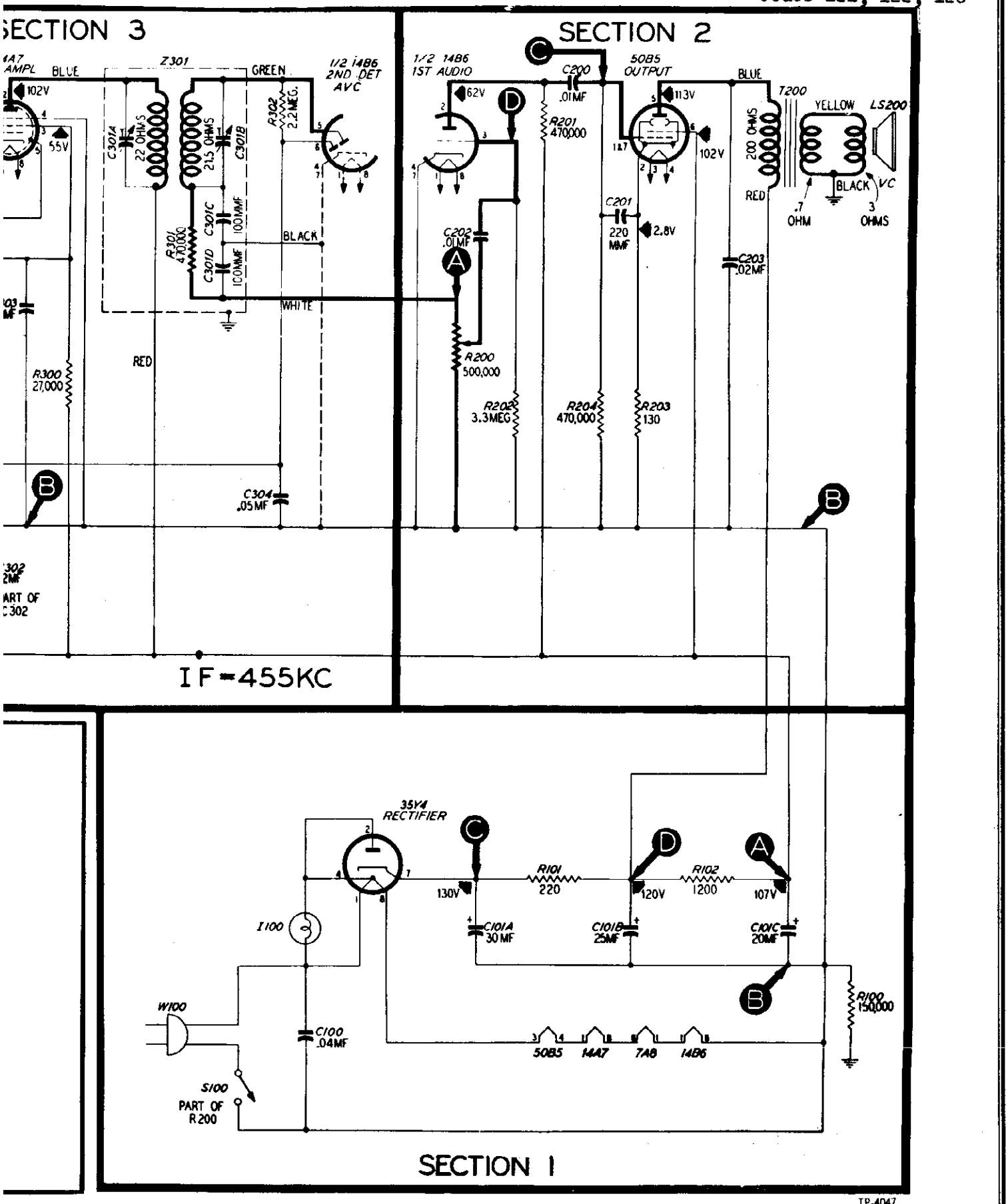


RF, I F, AND AUDIO SIGNAL PATH
OSC SIGNAL PATH
ALL RESISTOR VALUES IN OHMS UNLESS MARKED OTHERWISE

CONDENSER SYMBOLS

FIXED VARIABLE TRIMMER ELECTROLYTIC

FIGURE 5. PHILCO RADIO MODELS 48-250 AND 48-250-I, SEC



TP-4047

-I, SECTIONALIZED SCHEMATIC DIAGRAM, SHOWING TEST POINTS

T PROCEDURE

THE VOLUME CONTROL TO MAXIMUM.

SIGNAL GENERATOR—Connect as indicated in chart. Use modulated output.

OUTPUT LEVEL—During alignment, adjust signal-generator output to maintain output-meter indication below 1.25 volts.

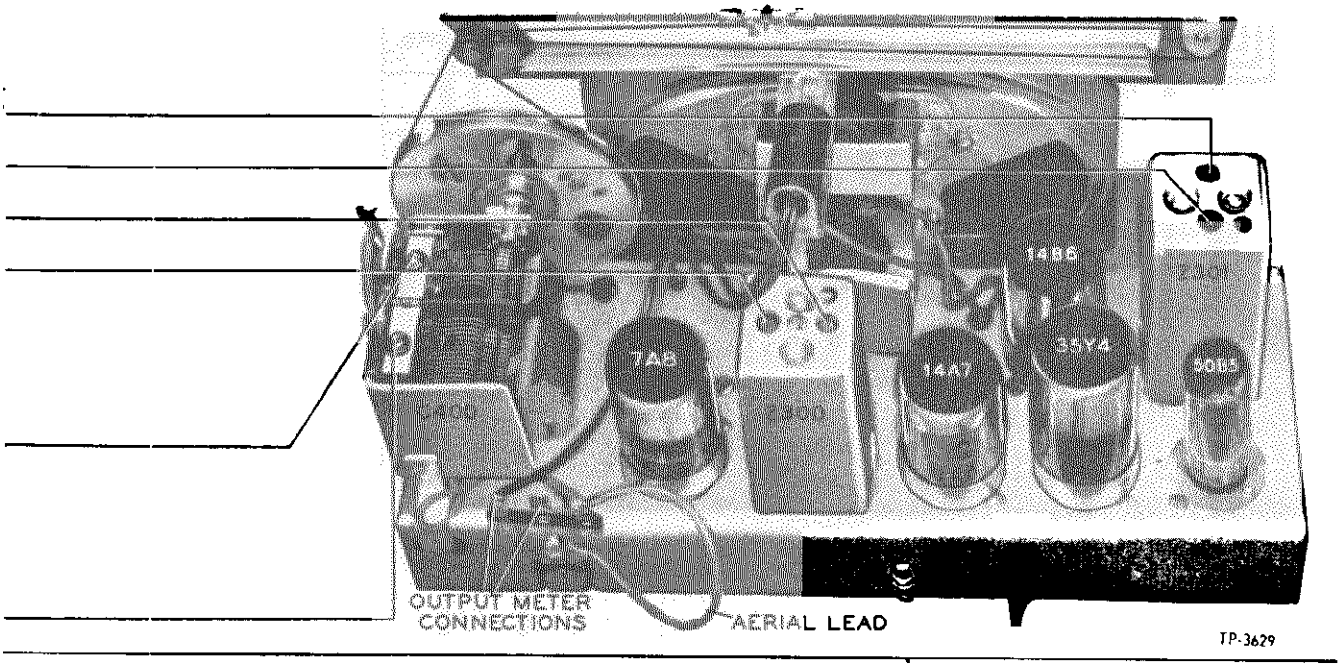


FIGURE 6. TOP VIEW, SHOWING TRIMMER LOCATIONS

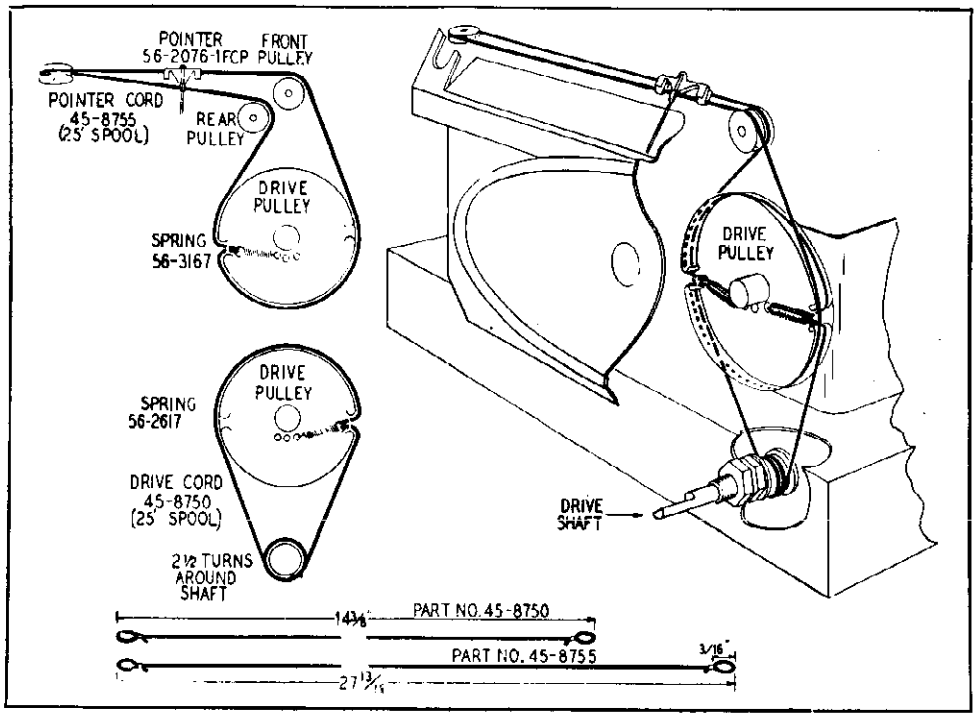


FIGURE 7. DRIVE-CORD INSTALLATION DETAILS

REPLACEMENT PARTS LIST

NOTE: Part numbers marked with an asterisk (*) are general replacement items. These numbers may not be identical with those on factory assemblies; also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

SECTION 1

Reference Symbol	Description	Service Part No.
C100	Condenser, line filter, .04 mf.	45-3500-2*
C101	Condenser, electrolytic, 3-section	30-2573*
C101A:	Condenser, filter, 30 mf.	Part of C101
C101B:	Condenser, filter, 25 mf.	Part of C101
C101C:	Condenser, filter, 20 mf.	Part of C101
I100	Lamp, pilot	34-2068
R100	Resistor, leakage, 150,000 ohms	66-4153340*
R101	Resistor, filter, 220 ohms	66-1224340
R102	Resistor, filter, 1200 ohms	66-2123340
S100	Switch, power	Part of R200
W100	Power cord and plug	L-3199

SECTION 2

C200	Condenser, blocking, .01 mf.	61-0120*
C201	Condenser, by-pass, 220 mmf.	62-122001001*
C202	Condenser, blocking, .01 mf.	61-0120*
C203	Condenser, tone compensating, .02 mf.	61-0108*
LS200	Speaker	36-1615
R200	Volume control, .5 megohm	45-5007*
R201	Resistor, plate load, 470,000 ohms	66-4473340*
R202	Resistor, grid load, 3.3 megohms	66-5333340*
R203	Resistor, bias, 130 ohms	66-1123340*
R204	Resistor, grid load, 470,000 ohms	66-4473340*
T200	Transformer, output	Part of LS200

SECTION 3

C300A	Condenser, trimmer	Part of Z300
C300B	Condenser, trimmer	Part of Z300
C301A	Condenser, trimmer	Part of Z301
C301B	Condenser, trimmer	Part of Z301
C301C	Condenser, by-pass	Part of Z301
C301D	Condenser, by-pass	Part of Z301
C302	Condenser and choke assembly, i-f by-pass, .2 mf.	30-4644
C303	Condenser, screen by-pass, .05 mf.	61-0122*
C304	Condenser, a-v-c filter, .05 mf.	61-0122*
R300	Resistor, screen dropping, 27,000 ohms	66-3273340
R301	Resistor, i-f filter, 47,000 ohms	Part of Z301
R302	Resistor, a-v-c filter, 2.2 megohms	66-5223340*
Z300	Transformer, 1st i-f, including C300A and B300B	32-3968
Z301	Transformer, 2nd i-f, including C301A, C301B, C301C, C301D, and R301	32-3674*

SECTION 4

C400	Condenser, tuning, 2-section	31-2727-1
C400A:	Condenser, trimmer	Part of C400
C400B:	Condenser, trimmer	Part of C400

SECTION 4 (Continued)

Reference Symbol	Description	Service Part
C401	Condenser, coupling, 5 mmf.	60-905050
C402	Condenser, isolating, 47 mmf.	60-005153
LA400	Loop aerial	32-405
R400	Resistor, aerial discharge, 150,000 ohms	66-41533
R401	Resistor, oscillator grid, 100,000 ohms	66-41033
T400	Transformer, oscillator	32-38

MISCELLANEOUS

Description	Service Part
Cabinet	
Model 48-250 (less scale)	1052
Model 48-250-I (less scale)	1052
Cabinet Hardware	
Back	
Model 48-250	27-98
Model 48-250-I	27-98
Knob assembly	
Model 48-250	54-40
Model 48-250-I	27-48
Scale, dial	
Model 48-250	27-59
Model 48-250-I	27-59
Scale strap	56-2059F
Screw	1W23129F
Stud, back mounting	W2235F
Dial Backplate and Associated Hardware	
Cord, drive (pointer)	45-87
Cord, drive (gang)	45-87
Diffusing panel, Model 48-250-I	54-43
Light reflector, Model 48-250	27-981
Pointer	56-2076-1F
Pulley	11W287
Rubber band	54-40
Screw and lock washer	1W32228F
Spring	
Gang drive cord	56-26
Pointer drive cord	56-31
Spring clip, diffusing screen, Model 48-250-I	56-35
Panel, wiring	76-21
Panel, wiring	12W458
Pilot lamp socket assembly	76-19
Shaft, assembly	31-28
Socket, tube	
Loktal	27-61
Miniature	27-62

Circuit Description

Philco Model 48-300 is a 5-tube, portable superheterodyne radio, designed to operate on a self-contained battery or a standard source of a.c. or d.c. The frequency range is 540—1620 kc. The built-in loop (high impedance) is adequate in most localities; however, where signal strength is low, an external aerial may be used.

The converter stage employs a type 1R5. The i-f stage, using a 1T4, operates at 455 kc. A 3-mmf. condenser (C305) and the socket capacity of the 1T4 socket are used to neutralize the inter-electrode capacitance of the 1T4, thus preventing oscillation.

The diode section of the 1U5 provides detection and a.v.c. The pentode section functions as the first audio stage; this stage is resistance-coupled to the 3V4 output amplifier.

For a-c or d-c power-line operation, plate, screen, and filament power is supplied through the 117Z3 rectifier.

By leaving the cathode bias resistor (R207) unbypassed, degeneration is developed in the output stage to improve the frequency response.

The 150,000-ohm leakage resistor (R102) prevents hum under conditions of high humidity.

Philco TROUBLE-SHOOTING Procedure

For rapid trouble shooting, the radio circuit is divided into four sections, as follows:

Section 1—the power supply
Section 2—the audio circuits
Section 3—the i-f, detector, and a-v-c circuits
Section 4—the r-f and converter circuits

Test points are specified for each section, and are indicated on the sectionalized schematic diagram. The trouble-shooting procedure given for each section includes a simplified test chart and a bottom view of the chassis showing the location of the test points and the components of that section.

In each chart, the first step is a master check for determining whether trouble exists in that section, without going through the entire test procedure.

Failure to obtain the "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before connecting the radio to a source of power:

MODEL 48-300

SPECIFICATIONS

CABINET	Leatherette-covered wood
CIRCUIT	Five-tube superheterodyne
FREQUENCY RANGE	540—1620 kc.
AUDIO OUTPUT	160 milliwatts
OPERATING VOLTAGES	Battery pack: "B", 90 volts; "A", 7.5 volts A.c./d.c.: 105—120 volts
POWER CONSUMPTION	Battery: "B", 13ma. at 90 volts; "A", 50 ma. at 7.5 volts A.c./d.c.: 25 watts
AERIAL	Built-in loop; terminal also provided for external aerial
INTERMEDIATE FREQUENCY	455 kc.
PHILCO TUBES (5)	1R5, 1T4, 1U5, 3V4, 117Z3
BATTERY TYPE	Philco P-841A

TP-3980

1. Inspect both the top and the bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, or other obvious sources of trouble.

2. Check the total filament resistance, with the power switch turned on, the plug disconnected from the battery, and the change-over switch in the battery position (power cord plug inserted in receptacle on rear of chassis). If the resistance between the A+ and A- pins on the battery-cable plug is higher than 100 ohms, one of the tube filaments is probably open. NOTE: If the 3V4 filament is open, check C101D before replacing with a new tube.

3. Measure the resistance between B+ (pin 6 of the 117Z3 rectifier tube) and B-, test point B (see figure 1). When the ohmmeter test leads are connected in the correct polarity, the highest resistance reading will be obtained. If the reading is lower than 1040 ohms, check condensers C101A and C101B for leakage or shorts.

The resistance value above, which is much lower than normal, is not intended as a quality check of these condensers; the value given is the lowest at which the rectifier will operate safely while the voltage tests of Section 1 are performed.

Section 1

POWER SUPPLY

Make the tests in this section with a d-c voltmeter connecting the leads between B–, test point B, and the test points indicated in the chart. The voltage readings given were taken with a 20,000-ohms-per-volt meter, at a line voltage of 117 volts, a.c.

With the power-cord plug connected to a source of power (a.c. or d.c.), turn on the power, and set the volume control to minimum (clockwise).

Follow the steps in the order given. If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2 (audio circuits); if not, isolate and correct the trouble in this section.

TROUBLE SHOOTIN

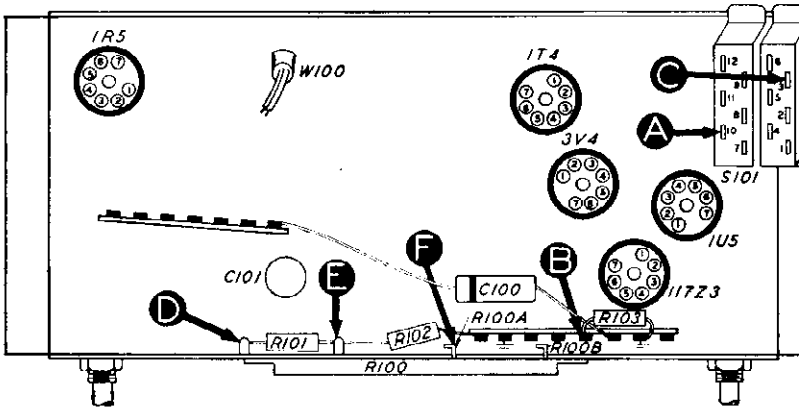


FIGURE 1. BOTTOM VIEW, SHOWING SECTION 1 TEST POINTS TP-4099

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A C	7.5v 80v		Trouble in this section. Isolate by the following tests.
2	D	107v	Low voltage No voltage	Defective: 117Z3. Open C101A. Defective: 117Z3. Open: S100, S101.
3	E	103v	Low voltage No voltage	Changed Resistance: R101. Leaky: G101A. Open: R101. Shorted: C101A.
4	F	55v	Low voltage No voltage	Changed Resistance: R100A. Leaky: C101B. Open: R100A. Shorted: C101B.
5	A	7.5v	Low voltage High voltage No voltage	Changed Resistance: R100A. Open: filament of one or more tubes. Open: R100A.
6	C	80v	Low voltage High voltage No voltage	Changed Resistance: R102. Leaky: C101C. Open: R207*, T200*. Open: R102. Shorted: C101C.
Listening Test: Hum may be caused by open C101B, C101C, C100, or R103.				

* This part, located in another section, may cause abnormal indication in this section.

BATTERY VOLTAGE: Replace battery when (with radio turned on) "B" voltage falls below 66 volts, or "A" voltage falls below 6 volts.

Section 2

AUDIO CIRCUITS

For the tests in this section, use an audio-frequency signal generator. Connect the generator ground lead to B–, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

With the power-cord plug connected to a source of power (a.c. or d.c.), set the volume control to maximum (counterclockwise). Adjust the signal-generator output as required for each step.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 3 (i-f, detector, and a-v-c circuits); if not, isolate and correct the trouble in this section.

TROUBLE SHOOTIN

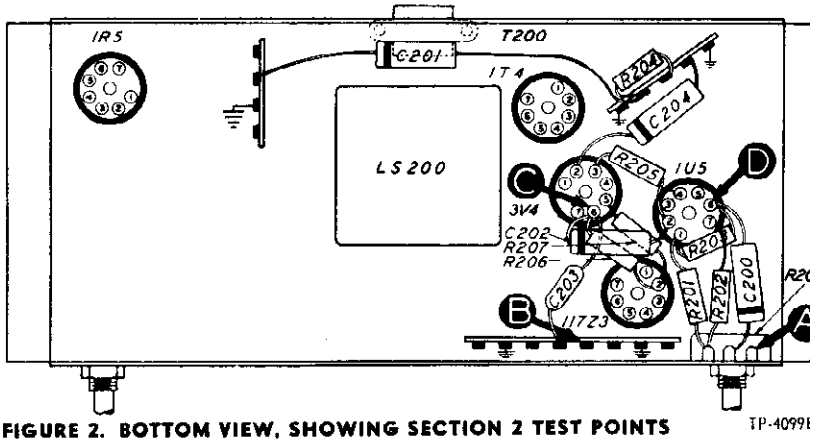


FIGURE 2. BOTTOM VIEW, SHOWING SECTION 2 TEST POINTS TP-4099

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	C	Clear signal with strong signal input.	Defective: 3V4, LS200. Open: R206, R207, T200. Shorted or leaky: C202, C203, C204, T200.
3	D	Same as step 1.	Defective: 1U5. Open: R204, R205. Shorted or leaky: C201, C203.
4	A	Same as step 1.	Open: R200 (rotate through range), R201, R202, C200, R203, C304*.
Listening Test: If speech or music is distorted (with section 1 operating normally), check R203, R201, and R202 for opens, and C200 for leakage.			

* This part located in another section, may cause abnormal indication in this section.

TROUBLE SHOOTING

Section 3

I-F, DETECTOR, AND A-V-C CIRCUITS

For the tests in this section, use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to B–, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

With the power-cord plug connected to a source of power (a.c. or d.c.), set the volume control to maximum (counterclockwise).

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 4 (r-f and converter circuits); if not, isolate and correct the trouble in this section.

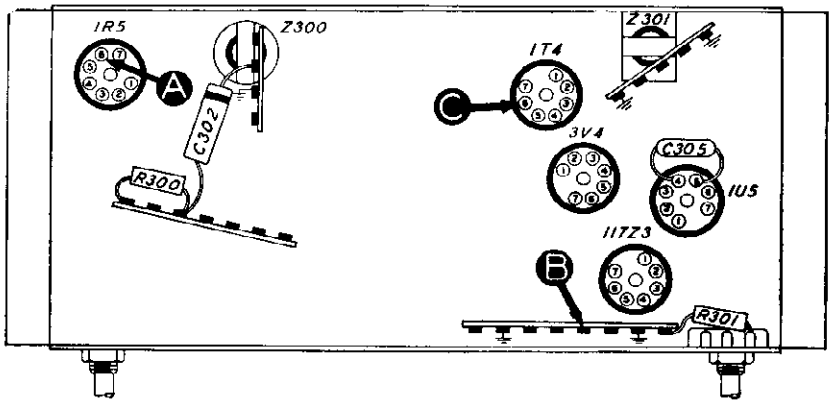


FIGURE 3. BOTTOM VIEW, SHOWING SECTION 3 TEST POINTS TP-4099C

Since the circuit location of test point A for this section is the same as that of test point C for section 4, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in section 4; these parts are listed below under "POSSIBLE CAUSE OF ABNORMAL INDICATION."

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	C	Loud, clear signal with moderate signal input.	Defective: 1T4. Open: R300, Z301 pri. or sec., R302. Shorted: C300B, C301A, C303, C302.
3	A	Same as step 1.	Defective: 1R5*. Shorted: C400*, C400A*, C300A, C300B. Open: Z300* pri. or sec., T400*.
Listening Test: Oscillation or instability may be caused by open C305.			

* This part located in another section, may cause abnormal indication in this section.

TROUBLE SHOOTING

Section 4

R-F AND CONVERTER CIRCUITS

For the tests in this section, with the exception of the oscillator test, use an r-f signal generator, with modulated output. Connect the generator ground lead to B–, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum (counterclockwise).

Set the tuning control and signal-generator frequency as indicated in the chart.

If the "NORMAL INDICATION" is not obtained in step 1, isolate the trouble by following the remaining steps.

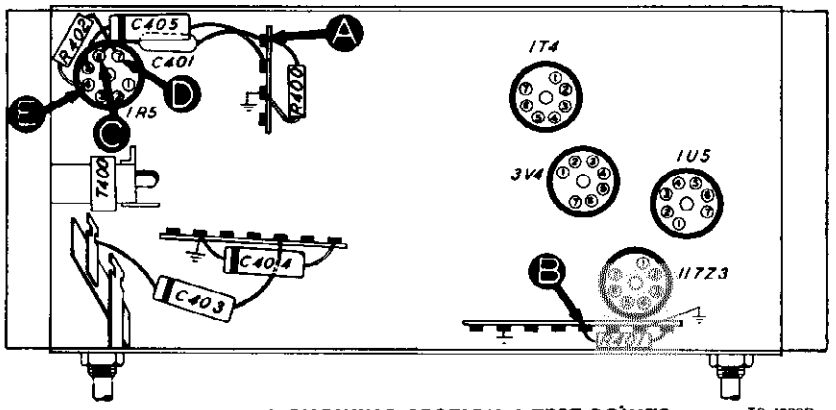


FIGURE 4. BOTTOM VIEW, SHOWING SECTION 4 TEST POINTS TP-4099D

STEP	TEST POINT	SIG. GEN. FREQ.	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	1000 kc.	Tune to signal.	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	C	1000 kc.	Tune to signal.	Same as step 1.	Shorted: C400, C400A, C405, C402. Trouble in oscillator circuit (step 3).
3	E to D (Osc. test; see note below.)		Rotate through range.	Negative 7 to 9 volts.	Defective: 1R5. Open: R402, T400. Shorted: C400, C400B.
4	A	1000 kc.	Tune to signal.	Same as step 1.	Open: C401, L400, LA400, R401.

OSCILLATOR TEST: Connect the positive lead of a high-resistance voltmeter to the 1R5 positive filament terminal, pin 7 (test point D); connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the 1R5 oscillator grid, pin 4 (test point E). Use a suitable meter range, such as 0—10 volts. Absence of negative grid voltage throughout the tuning range indicates that the oscillator is not operating. The normal grid voltage given in the chart was measured with a 20,000-ohms-per-volt meter.

ALIGNMENT

OUTPUT METER—Connect between chassis and voice-coil terminal of output transformer T200.

VOLUME CONTROL—Set to maximum (counterclockwise).

OUTPUT LEVEL—Input signal should be attenuated, as alignment progresses, to hold output-meter readi low 1 volt.

SIGNAL GENERATOR—Connect as indicated in chart.

STEP	SIGNAL GENERATOR		RADIO		AI
	CONNECTIONS TO RADIO	DIAL	DIAL	SPECIAL INSTRUCTIONS	
1	Ground lead to B-; output to external aerial lead (disconnected from chassis).	455 kc.	Gang fully meshed.	Adjust trimmers, in order given, for maximum output (chassis out of cabinet).	C301A- C300B- C300A-
2	Install chassis in cabinet, and adjust dial pointer.				
3	Radiating loop (see note below).	1600 kc.	1600 kc.	Adjust for maximum.	C400B-
4	Same as step 3.	1600 kc.	1600 kc.	Adjust for maximum.	C400A-

RADIATING LOOP: Make up a coil of insulated wire, consisting of 6 to 8 turns, about 6" in diameter. Connect coil to signal-generator leads, and suspend coil near radio loop.

SYMBOLIZATION

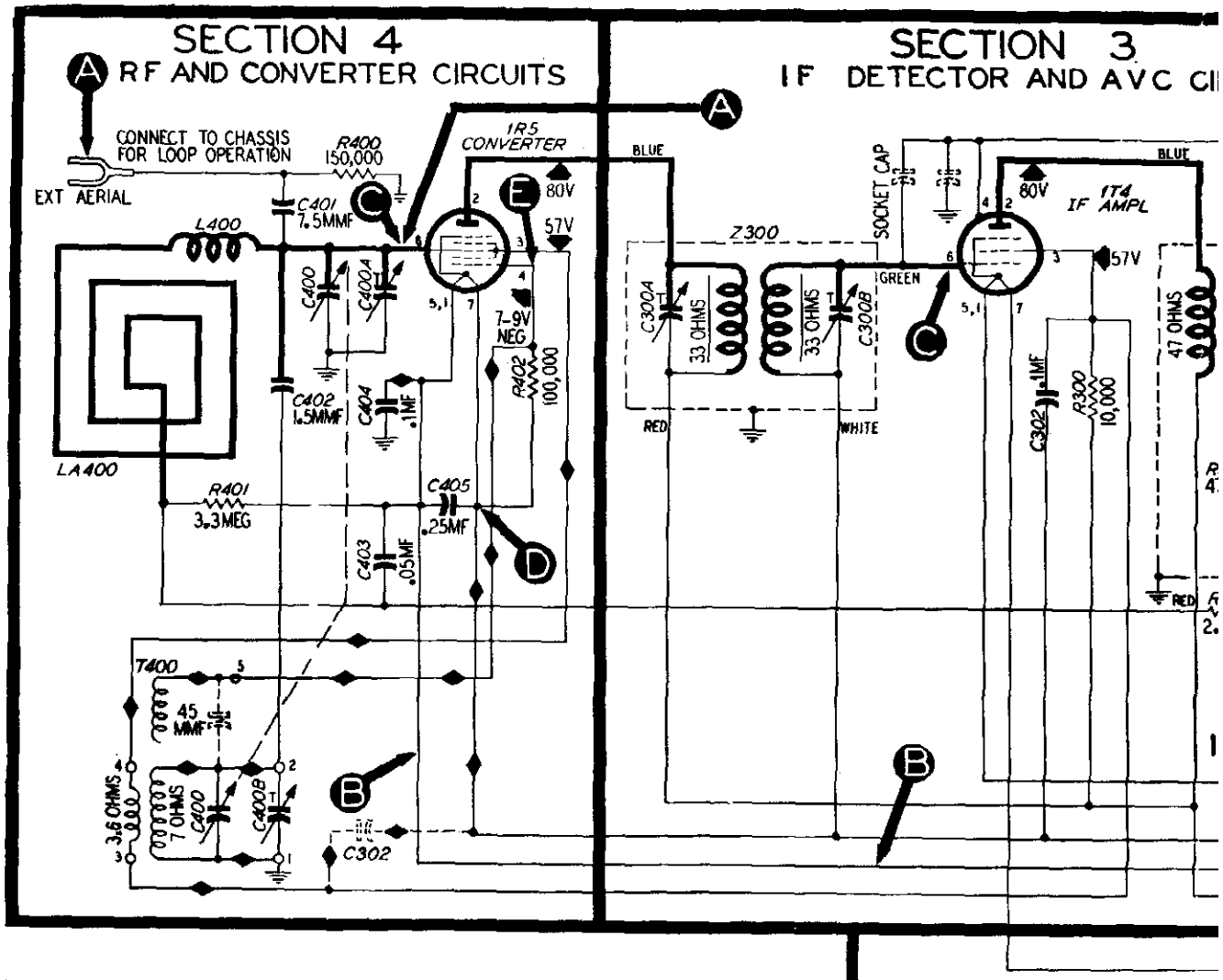
The components in the radio circuit are symbolized according to the types of parts and the section of the radio in which the parts are located. The prefix letter of the symbol designates the type of part, as follows:

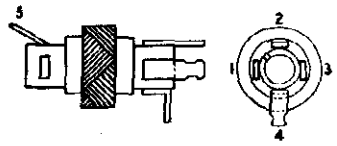
C—condenser	LA—loop aerial	S—switch
I—pilot lamp	LS—loud-speaker	T—transformer
L—choke or coil	R—resistor	Z—electrical assembly

The number of the symbol designates the section in which the part is located, as follows:

100-series components are in Section 1—the power supply.
200-series components are in Section 2—the audio circuits.
300-series components are in Section 3—the i-f amplifier, detector, and a-v-c circuits.
400-series components are in Section 4—the r-f and converter circuits.

A suffix letter identifies the part as a component of the assembly which bears an identical number without a suffix letter, and with perhaps a different prefix letter.



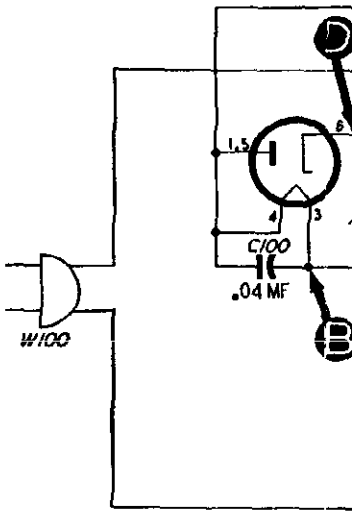


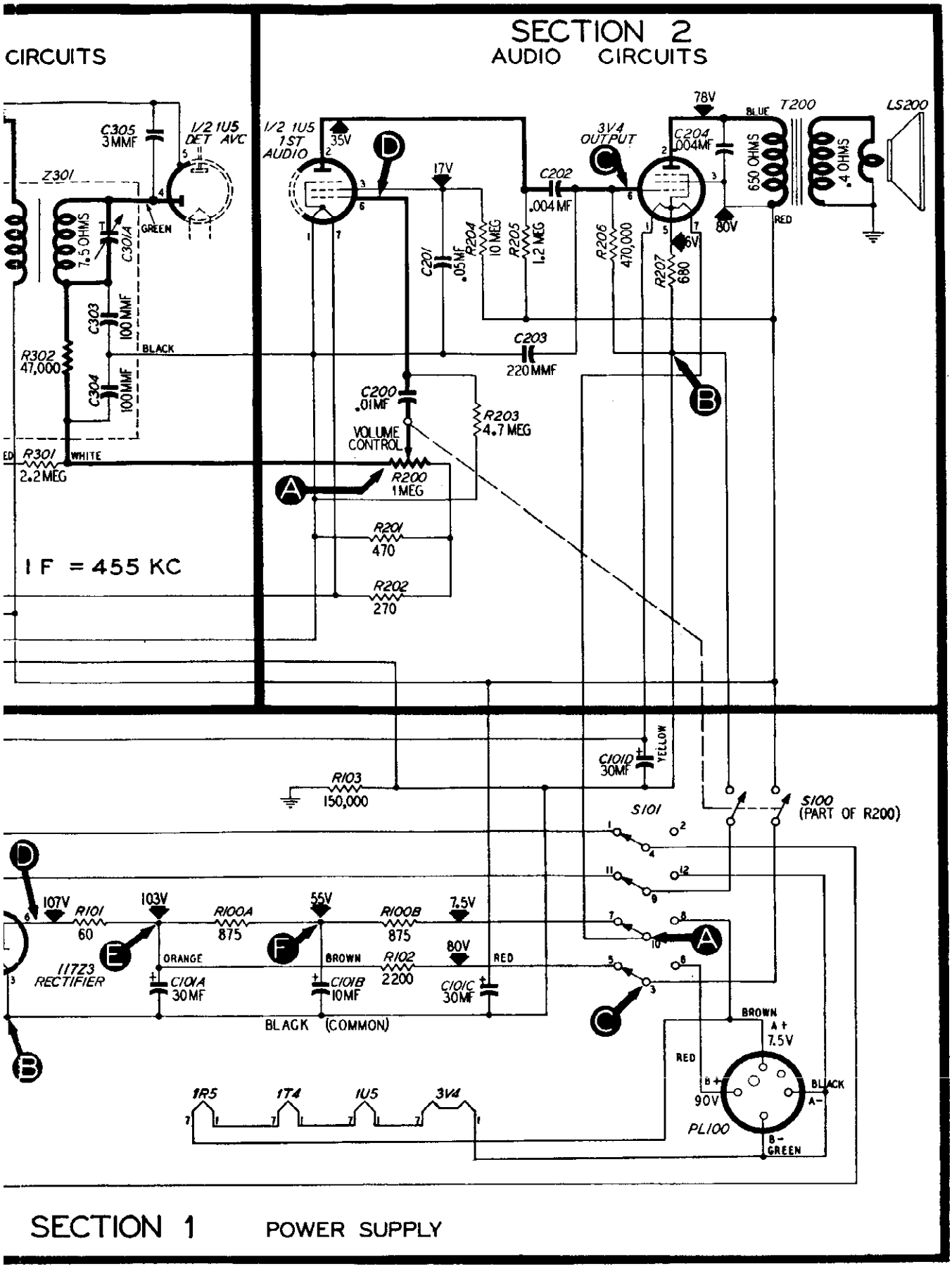
CONDENSER SYMBOLS

FIXED VARIABLE ELECTRO-LYTIC TRIMMER

OSC SIGNAL PATH

RF IF AND AUDIO SIGNAL PATH




CIRCUITS
SECTION 2
AUDIO CIRCUITS
C305 3MMF
1/2 1U5 DET AVC
Z301
C301A 7.5 OHMS
GREEN
C303 100 MMF
C304 100MMF
R302 47,000
BLACK
R301 2.2MEG
WHITE
I F = 455 KC
1/2 1U5 1ST AUDIO
35V
17V
C201 .05MF
R204 10 MEG
R205 1.2 MEG
C202 .004 MF
3V4 OUTPUT
78V
C204 .004MF
T200
BLUE
650 OHMS
.4 OHMS
LS200
80V
RED
R206 470,000
R207 680
6V
C203 220 MMF
C200 .01MF
VOLUME CONTROL
R200 1MEG
R203 4.7 MEG
R201 470
R202 270
C101D 30MF
YELLOW
R103 150,000
S101
S100 (PART OF R200)
107V
R101 60
103V
R100A 875
55V
R100B 875
7.5V
80V
R102 2200
ORANGE
BROWN
RED
117Z3 RECTIFIER
C101A 30MF
C101B 10MF
C101C 30MF
BLACK (COMMON)
BROWN A+ 7.5V
RED B+ 90V
BLACK A-
B- GREEN
PL100
1R5
1T4
1U5
3V4
SECTION 1 POWER SUPPLY

PROCEDURE

I-F ALIGNMENT—I-f alignment should be made with chassis out of cabinet.

R-F ALIGNMENT—R-f alignment should be made with chassis in cabinet, built-in loop connected, and external aerial lead connected to chassis.

DIAL POINTER—With tuning condensers fully meshed, adjust dial pointer to coincide with index mark at low-frequency end of dial scale.

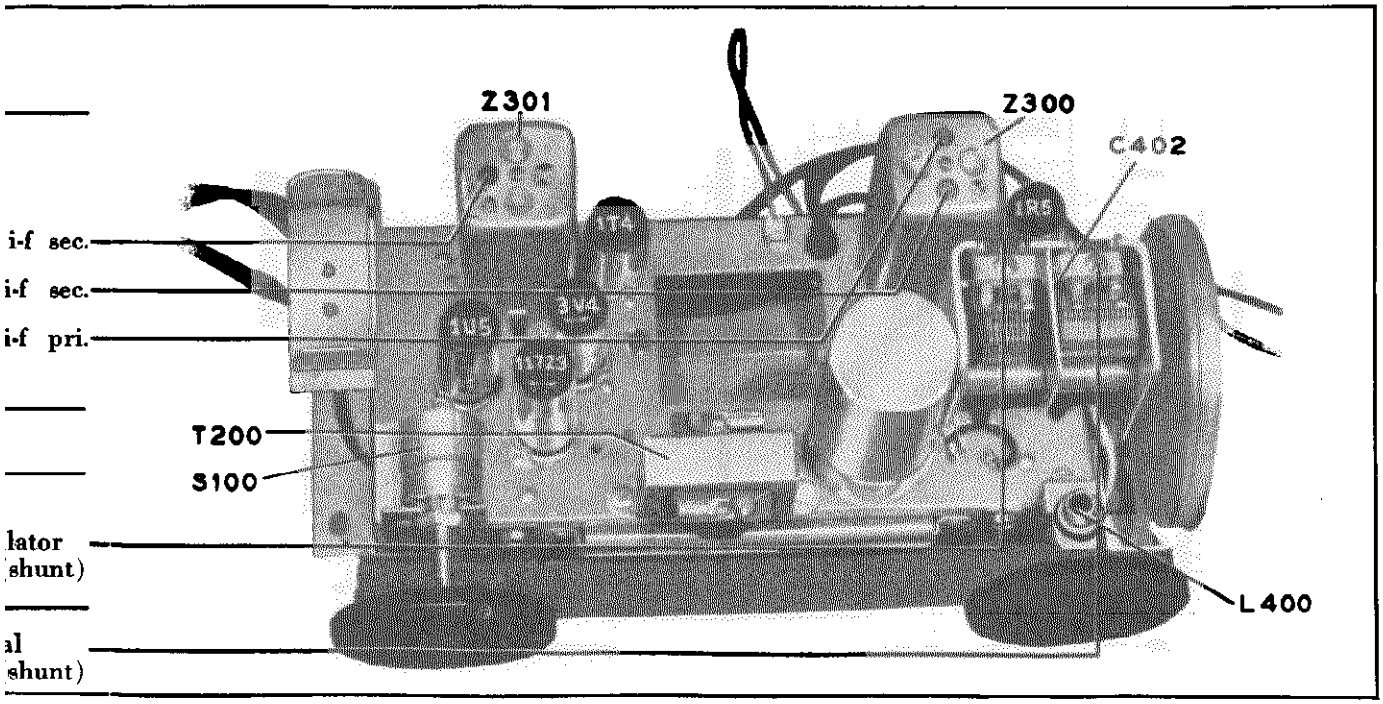


FIGURE 6. TOP VIEW, SHOWING TRIMMER LOCATIONS TP-4185

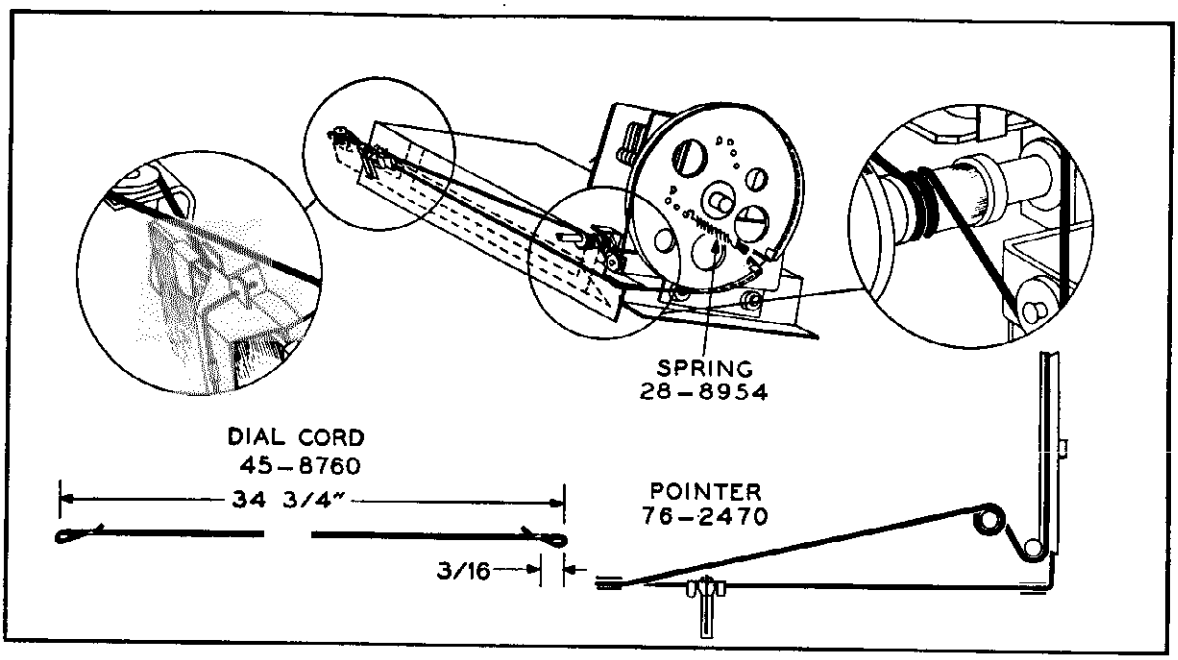


FIGURE 7. DRIVE-CORD INSTALLATION DETAILS TP-4099E

REPLACEMENT PARTS LIST

NOTE: Part numbers marked with an asterisk (*) are general replacement items. These numbers may not be identical with those on factory assemblies: also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

SECTION 1
POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, line filter, .04 mf.	45-3500-2*
C101	Condenser, electrolytic, 4-section	30-2560*
C101A	Condenser, filter, 30 mf., 150v	Part of C101
C101B	Condenser, filter, 10 mf., 150v	Part of C101
C101C	Condenser, filter, 30 mf., 150v	Part of C101
C101D	Condenser, filter, 30 mf., 25v	Part of C101
PL100	Plug-and-cable assembly	41-3712-2
R100	Resistor, 2-section	33-3431-4
R100A	Resistor, filament dropping, 875 ohms	Part of R100
R100B	Resistor, filament dropping, 875 ohms	Part of R100
R101	Resistor, limiting, 60 ohms	34-1334
R102	Resistor, dropping, 2200 ohms	66-2223340*
R103	Resistor, leakage, 150,000 ohms	66-4153340*
S100	Switch, on-off	Part of R200
S101	Switch, battery—a.c./d.c.	42-1821
W100	Power cord and plug	41-3755-17

SECTION 2
AUDIO CIRCUITS

C200	Condenser, d-c blocking, .01mf.	61-0120*
C201	Condenser, screen by-pass, .05 mf.	61-0122*
C202	Condenser, d-c blocking, .004 mf.	61-0179*
C203	Condenser, r-f by-pass, 220 mmf.	30-1227-9*
C204	Condenser, tone compensating, .004 mf.	61-0179*
LS200	Speaker	36-1598
R200	Volume control (with on-off switch), 1 megohm	33-5526
R201	Resistor, diode return, 470 ohms	66-1473340*
R202	Resistor, diode return, 270 ohms	66-1473340*
R203	Resistor, grid return, 4.7 megohms	66-5473340*
R204	Resistor, screen dropping, 10 megohms	66-6103340*
R205	Resistor, plate load, 1.2 megohms	66-5123340*
R206	Resistor, grid return, 470,000 ohms	66-4473340*
R207	Resistor, cathode bias, 680 ohms	66-1683340*
T200	Transformer, output	32-8259

SECTION 3
I-F, DETECTOR, AND A-V-C CIRCUITS

C300A	Condenser, trimmer	Part of Z300
C300B	Condenser, trimmer	Part of Z300
C301A	Condenser, trimmer	Part of Z301
C302	Condenser, screen by-pass, .1 mf.	61-0113*
C303	Condenser, i-f by-pass (part of Z301), 100 mmf.	30-1225-2*

SECTION 3 (Continued)

Reference Symbol	Description	Service Part
C304	Condenser, i-f by-pass (part of Z301), 100 mmf.	30-1
C305	Condenser, neutralizing, 3 mmf.	30-
R300	Resistor, screen dropping, 10,000 ohms	66-310
R301	Resistor, a-v-c filter, 2.2 megohms	66-522
R302	Resistor, i-f filter (part of Z301), 47,000 ohms	66-347
Z300	Transformer, 1st i-f	32-3
Z301	Transformer, 2nd i-f	32-3

SECTION 4
R-F AND CONVERTER CIRCUITS

C400	Condenser, tuning gang	31-
C400A	Condenser, aerial trimmer	Part of
C400B	Condenser, oscillator trimmer	Part of
C401	Condenser, isolating, 7.5 mmf.	30-1
C402	Condenser, neutralizing, 1.5 mmf.	30-1
C403	Condenser, a-v-c filter, .05 mf.	61-
C404	Condenser, filament by-pass, .1 mf.	61-
C405	Condenser, filament by-pass, .25 mf.	61-
L400	Coil, aerial loading	32-
LA400	Loop aerial	32-40
R400	Resistor, discharge, 150,000 ohms	66-415
R401	Resistor, a-v-c filter, 3.3 megohms	66-533
R402	Resistor, oscillator grid bias, 100,000 ohms	66-410
T400	Transformer, oscillator	32-4

MISCELLANEOUS

Description	Service Part
Cabinet	1
Back-catch assembly	76-
Foot	45-
Handle	54-7
Handle loop	56-
Scale	27-
Scale strap	56-
Cord, drive (25-ft. spool)	45-
Dial-backplate assembly	76-
Pulley (small)	11W2
Knob	54-4
Pointer	76-
Pully (large)	11W29743
Shaft and pulley	76-
Socket (miniature)	27-
Spring, drive-cord	28-
Stud (pulley)	1W29752
Switch plunger	76-

MODEL 48-360 PHILCO CORP.

Circuit Description

Philco Model 48-360 is a six-tube, portable, superheterodyne radio, operating on a self-contained battery or a standard power source of a.c. or d.c. High sensitivity, selectivity, and power output are outstanding features. The frequency range is 540—1600 kc. The built-in loop aerial is adequate in most localities. Where signal strength is low, an external aerial may be used.

The tuned r-f stage, using a 1T4, provides a high signal-to-noise ratio. The converter employs a type 1R5 pentagrid converter.

The i-f stage, using another 1T4, has double-tuned transformers operating at 265 kc.; the voltage gain of this stage is increased considerably by positive screen feedback taken from the tertiary winding of the second i-f transformer.

The diode section of the 1U5 provides detection and a-v-c voltage. The pentode section functions as the first audio stage; this stage is resistance-coupled to the 3LF4 output amplifier. The speaker is a permanent-magnet dynamic type.

For a-c or d-c power-line operation, plate, screen, and filament power is supplied through the 117Z3 rectifier.

Philco TROUBLE-SHOOTING Procedure

For rapid trouble shooting, the radio circuit is divided into four sections, with test points specified for each section; these sections and test points are indicated in the schematic diagram. The trouble-shooting procedure given for each section includes a simplified test chart and a bottom view of the chassis showing the locations of the test points and components of that section.

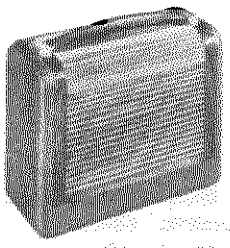
In each chart, the first step is a master check for determining whether trouble exists in that section, without going through the entire test procedure.

Failure to obtain the "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before turning on the power:



MODEL 48-360

SPECIFICATIONS

CABINET	Fabrikoid finish, wood trim
CIRCUIT	Six-tube superheterodyne
FREQUENCY RANGE	540—1600 kc.
AUDIO OUTPUT	160 milliwatts
OPERATING VOLTAGES	Battery: "B," 90 volts; "A," 9 volts. A.c./d.c.: 105—120 volts
POWER CONSUMPTION	Battery: "B," 12 ma. at 90 volts; "A," 50 ma. at 9 volts. A.c./d.c.: 25 watts
AERIAL	Built-in loop; terminal also provided for external aerial
INTERMEDIATE FREQUENCY	265 kc.
PHILCO TUBES (6)	1T4 (2), 1R5, 1U5, 3LF4, 117Z3
BATTERY TYPE	Philco P-841A

TP-1584

1. Inspect the top and bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, or other obvious sources of trouble.

2. Check the total filament resistance by measuring between the A+ and A− pins on the battery-cable plug (disconnected from battery) while holding down the change-over switch, S100. If the resistance is higher than 100 ohms, one of the tube filaments is probably open.

3. With the change-over switch in the a.c./d.c. position, measure the resistance between B+ (pin 6 of the 117Z3 rectifier) and B−, test point B. When the ohmmeter test leads are connected in the proper polarity, the highest resistance reading will be obtained. If the reading is lower than 1100 ohms, check condensers C100A, C100B, and C100C for leakage or shorts.

The resistance value above, which is much lower than normal, is not intended as a quality check of these condensers; the value given is the lowest at which the rectifier will operate safely while the voltage tests of Section 1 are performed.

Section 1 TROUBLE SHOOTING

For the tests in this section, use a d-c voltmeter. Connect the negative lead to B—, test point B; connect the positive lead to the test points indicated in the chart. The voltage readings given were taken with a 20,000-ohms-per-volt meter, at a line voltage of 117 volts, a.c.•

Turn on the power, and set the volume control to minimum.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2; if not, isolate and correct the trouble in this section.

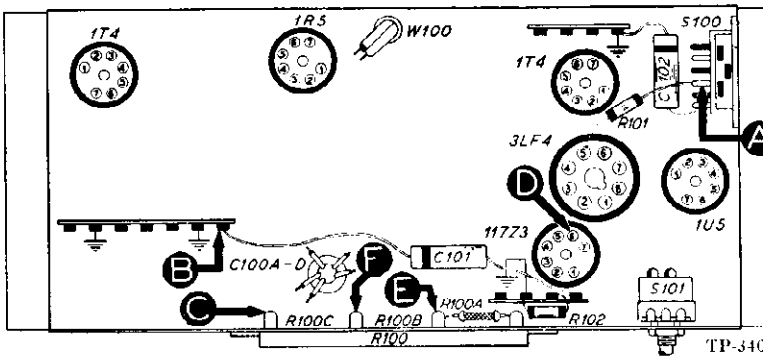


Figure 1. Bottom View, Showing Section 1 Test Points

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A C	80 volts 8.5 volts		Trouble in this section. Isolate by the following tests.
2	D	105 volts	High voltage Low voltage No voltage	Open: R100A, R100B, R100C, R101, T200*. Defective: S100, S101. Defective: 117Z3. Leaky: C100A. Leaky or shorted: C100B, C100C, C100D. Defective: 117Z3, S100, S101, W100.
3	E	99 volts	Low voltage No voltage	Defective: R100A. Leaky: C100A. Shorted: C100B, C100C, C100D. Open: R100A. Shorted: C100A.
4	F	55 volts	Low voltage No voltage	Defective: R100B. Shorted: C100C, C100D. Leaky: C100B Open: R100B. Shorted: C100B.
5	A	80 volts	Low voltage No voltage	Defective: R101. Leaky: C100C. Open: R101. Shorted: C100C.
6	C	8.5 volts	High voltage Low voltage No voltage	Defective: Any tube, R207*, S100, S101. Leaky: C100D. Defective: R100C. Open: R100C. Shorted: C100D.
Listening Test: Distortion or abnormal hum may be caused by open C100B, C100C, or C100D.				
*This part, located in another section, may cause abnormal indication in this section.				
BATTERY VOLTAGE: Replace battery when (with radio turned on) "B" voltage falls below 60 volts, or "A" voltag falls below 7.2 volts.				

Section 2 TROUBLE SHOOTING

For the tests in this section, use an audio-frequency signal generator. Connect the generator ground lead to B—, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the radio volume control to maximum. Adjust the signal-generator output as required for each step.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 3; if not, isolate and correct the trouble in this section.

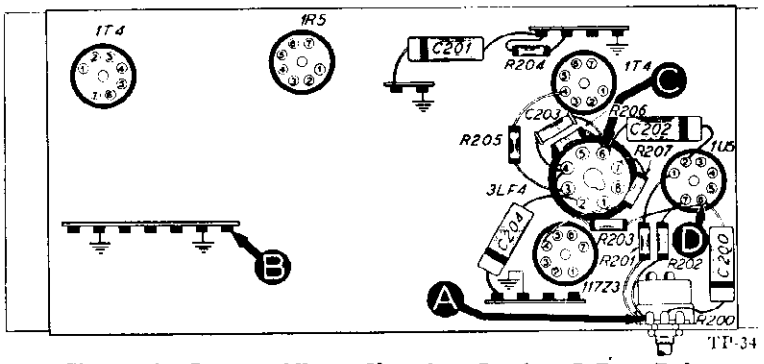


Figure 2. Bottom View, Showing Section 2 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	C	Clear signal with strong signal input.	Defective: 3LF4, LS200, T200. Shorted: C203, C204.
3	D	Loud, clear signal with weak signal input.	Defective: 1U5. Open: C202, C201, R205, R204. Shorted or leaky: C202, C201.
4	A	Loud, clear signal with weak signal input.	Defective: R200. Open: C200, R201, R202.
Listening Test: Distortion on strong signals may be caused by shorted or leaky C200.			

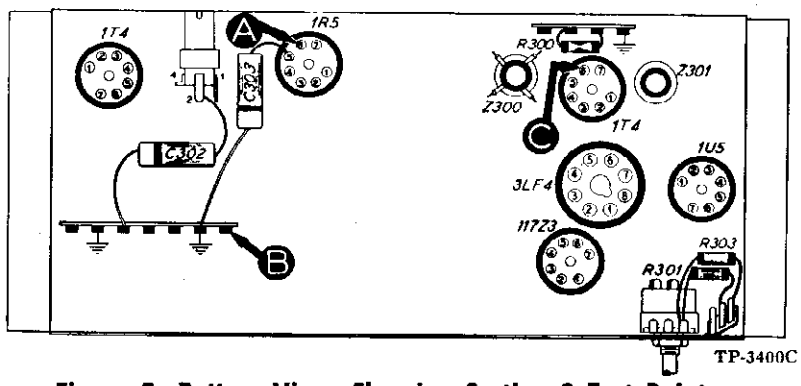
Section 3 TROUBLE SHOOTING

For the tests in this section, use an r-f signal generator, with modulated output, set at 265 kc. Connect the generator ground lead to B−, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the radio volume control to maximum.

If the "NORMAL INDICATION" is obtained in the first step, proceed with the tests for Section 4; if not, isolate and correct the trouble in this section.

Since the circuit location of test point A for this section is the same as that of test point C for Section 4, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in Section 4; these parts are listed below under "POSSIBLE CAUSE OF ABNORMAL INDICATION."



TP-3400C

Figure 3. Bottom View, Showing Section 3 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	C	Clear signal with strong signal input.	Defective: 1T4, Z301. Misaligned: Z301. Open: R300, C302. Shorted or leaky: C302.
3	A	Loud, clear signal with weak signal input.	Defective: 1R5*, Z300. Misaligned: Z300. Shorted: C406*.

* This part, located in another section, may cause abnormal indication in this section.

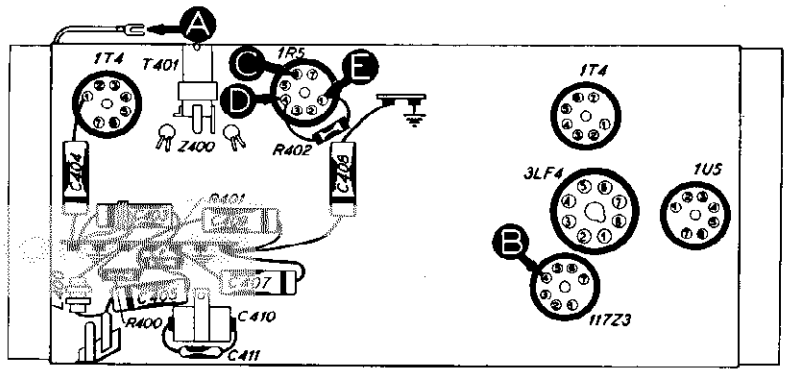
Section 4 TROUBLE SHOOTING

For the tests in this section, with the exception of the oscillator test, use an r-f signal generator with modulated output. Connect the generator ground lead to B−, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the radio volume control to maximum.

Set the radio and signal-generator dials as indicated in the chart.

If the "NORMAL INDICATION" is not obtained in step 1, isolate the trouble by following the remaining steps.



TP-3400D

Figure 4. Bottom View, Showing Section 4 Test Points (Locations of C402 and T400 shown in figure 6.)

STEP	TEST POINT	DIAL SETTINGS		NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
		SIG. GEN.	RADIO		
1	A	1000 kc.	1000 kc.	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	C	1000 kc.	1000 kc.	Clear signal with strong signal input.	Defective: 1R5. Open: C407, C408. Trouble in oscillator circuit.
3	E to D (Osc. test; see note below.)		Rotate tuning control	Negative 2 to 4 volts.	Defective: 1R5 (osc. section), T401. Open: R402. Shorted: C410, C410A, C400, C400C.
4	A	1000 kc.	1000 kc.	Loud, clear signal with weak signal input.	Defective: 1T4, T400, Z400. Shorted: C400, C400A, C400B. Open: R400, R401.

OSCILLATOR-TEST NOTE: Connect positive lead of high-resistance voltmeter to 1R5 filament, test point E; connect prod end of negative lead through 100,000-ohm isolating resistor to 1R5 oscillator grid, test point D. Use suitable meter range, such as 0—10 volts. Proper operation of oscillator is indicated by negative voltage of 2 to 4 volts (measured with 20,000-ohms-per-volt meter) throughout range of tuning control.

ALIGNMEN

THE ALIGNMENT SHOULD BE MADE WITH THE RADIO

DIAL—Turn tuning condensers to full-mesh position. Set dial pointer to coincide with index mark at low-frequency end of dial.

OUTPUT METER—Connect between chassis and coil terminal on output transformer, T200.

STEP	SIGNAL GENERATOR		RADIO		ADJ
	CONNECTIONS TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Ground lead to lug on T400 (see figure 6); output lead to ext. aerial lug.	265 kc.	Set at index mark.	Turn C300B fully tight, then adjust trimmers, in order given, for maximum output.	C3 C3 C3 C3
2	Radiating loop (see Note below).	1600 kc.	1600 kc.	Adjust for maximum.	C40
3	Same as step 2.	580 kc.	580 kc.	Adjust for maximum while rocking tuning control.	C4
4	Same as step 2.	1600 kc.	1600 kc.	Adjust for maximum.	C40
5	Same as step 2.	1500 kc.	1500 kc.	Adjust for maximum.	C400
6	Same as step 2.	1500 kc.	1500 kc.	Adjust for maximum.	C400
7	Repeat steps 3, 4, 5, and 6 until no further improvement is obtained.				

NOTE: Make up a six-to-eight-turn, 6-inch-diameter loop, using insulated wire; connect to signal-generator leads and l near radio loop.

SYMBOLIZATION

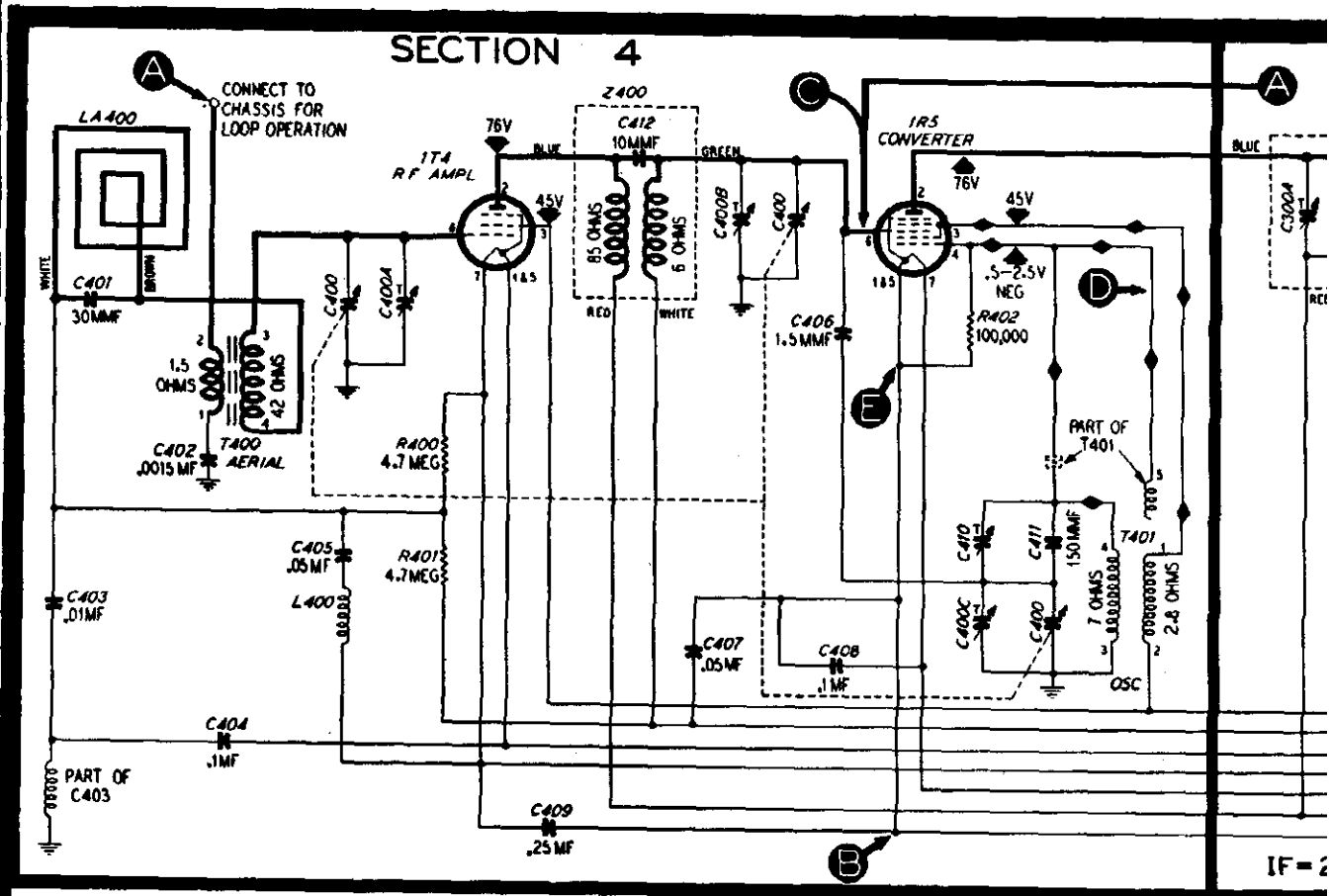
The components in the radio circuit are symbolized according to the types of parts and the sections of the radio in which the parts are located. The prefix letter of the symbol designates the type of part, as follows:

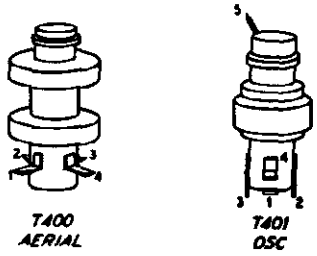
C—condenser
I—pilot lamp
L—choke or coil
LA—loop aerial
LS—loud-speaker
R—resistor
S—switch
T—transformer
Z—electrical assembly

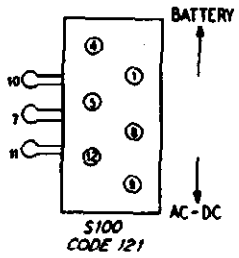
The number of the symbol designates the section in which the part is located, as follows:

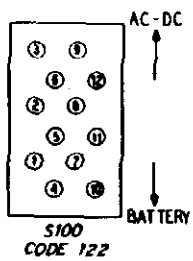
100-series components are in Section 1—the power supply.
200-series components are in Section 2—the audio circuits.
300-series components are in Section 3—the i-f amplifier, detector and a-v-c circuits.
400-series components are in Section 4—the aerial, r-f, and oscillator circuits.

A suffix letter identifies the part as a non-replaceable component of the assembly which bears an identical number without a suffix letter, and with perhaps a different prefix letter.









CODES 121 AND 122 ARE FUNDAMENTALLY THE SAME. THE MAIN EXCEPTION BEING THE POWER CHANGE-OVER SWITCH, S100 WHICH IS 3 POLE FOR CODE 121 AND 4 POLE FOR CODE 122. THE TERMINAL LAYOUT OF EACH SWITCH IS SHOWN IN THE SKETCH ABOVE. CONNECTIONS PECULIAR TO CODE 122 ARE SHOWN BY DOTTED LINES IN SECTION 1 OF THE SCHEMATIC.

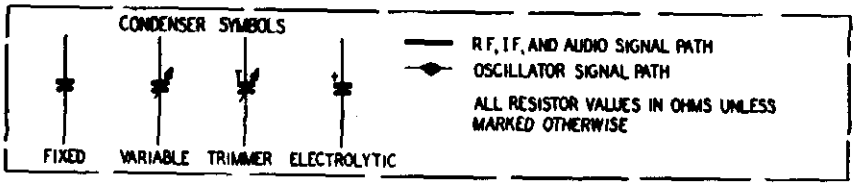
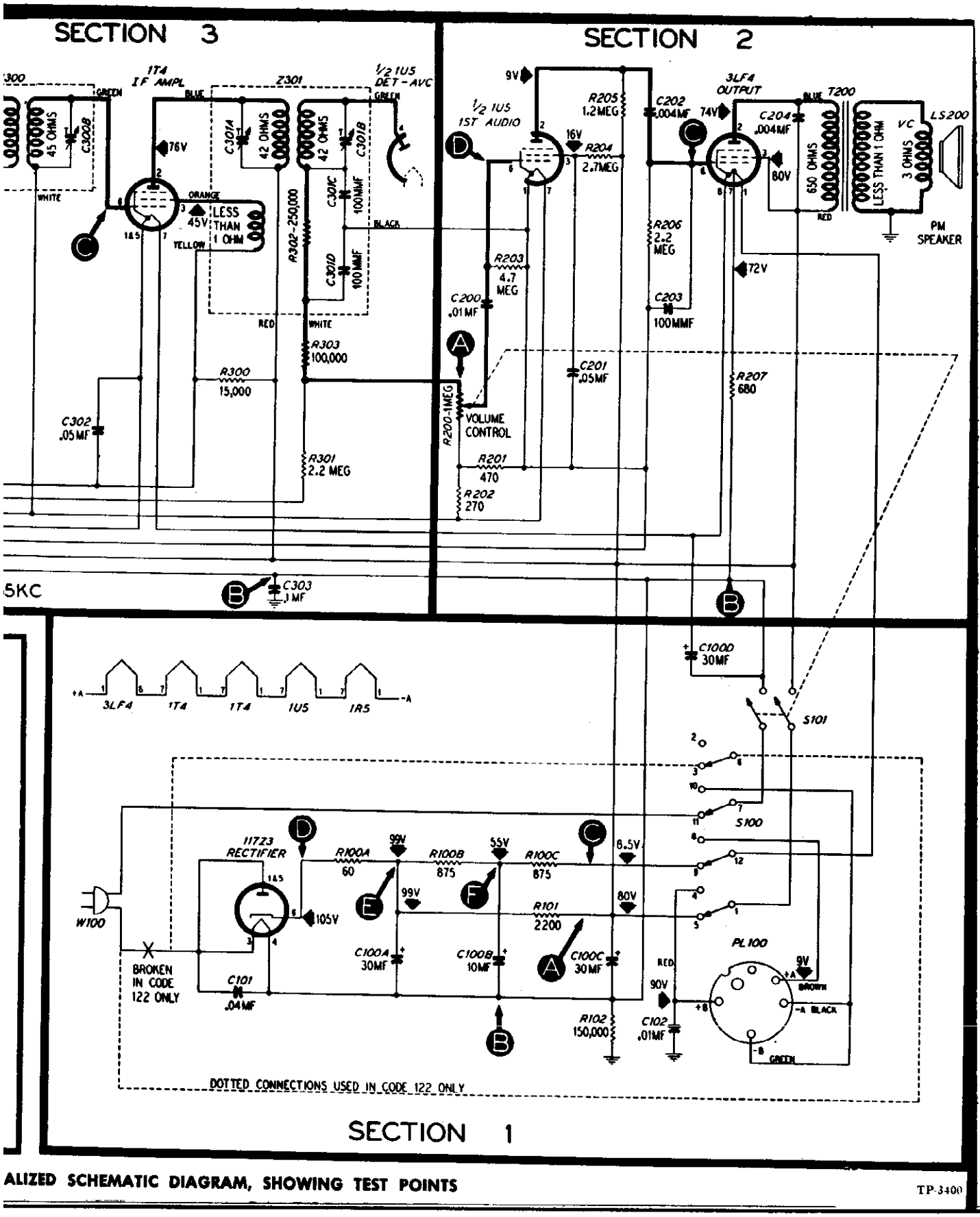


FIGURE 5. PHILCO RADIO, MODEL 48-360, SECTIC



ALIZED SCHEMATIC DIAGRAM, SHOWING TEST POINTS

TP-3400

PROCEDURE

ALLED IN THE CABINET AND THE LOOP CONNECTED

· **SIGNAL GENERATOR** (modulated)—Connect as indicated in chart.

OUTPUT LEVEL—During alignment, adjust signal-generator output to maintain output-meter indication below .4 volt.

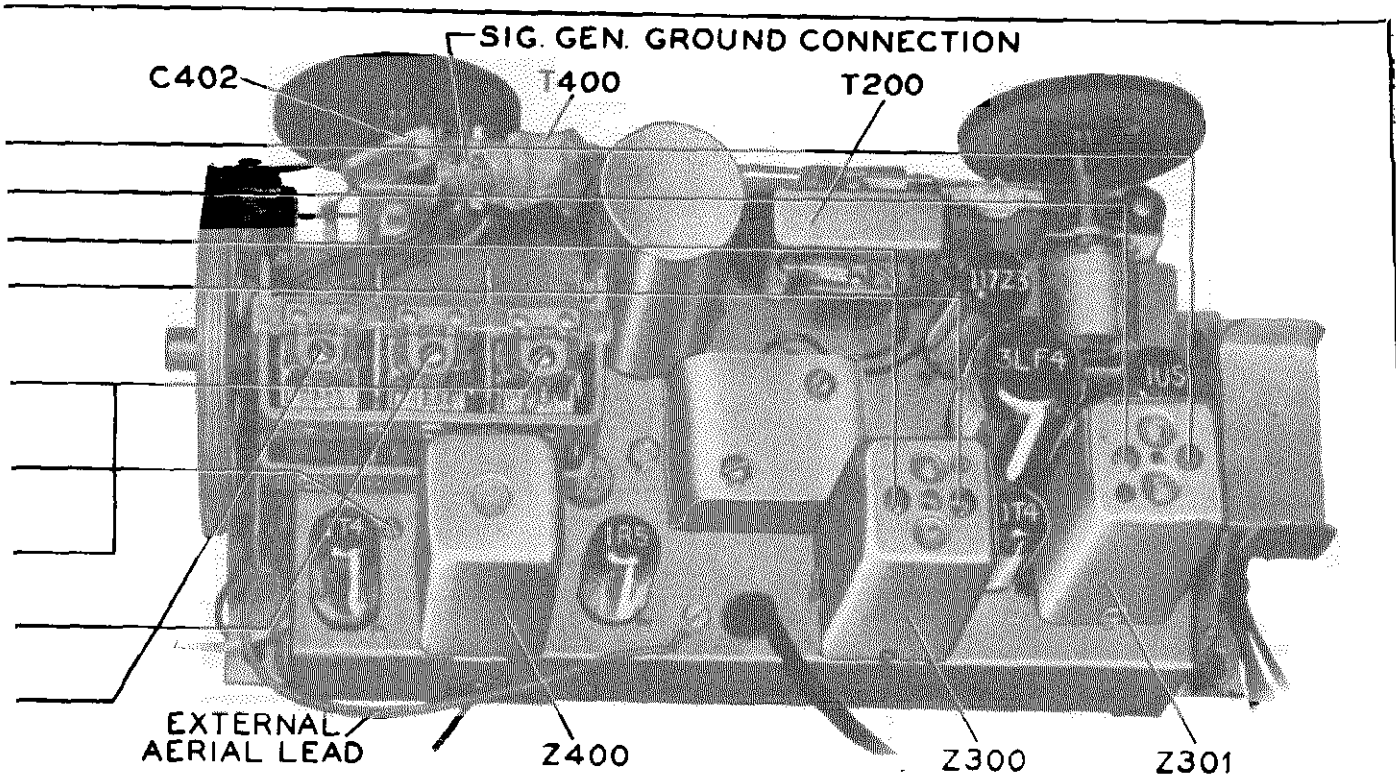
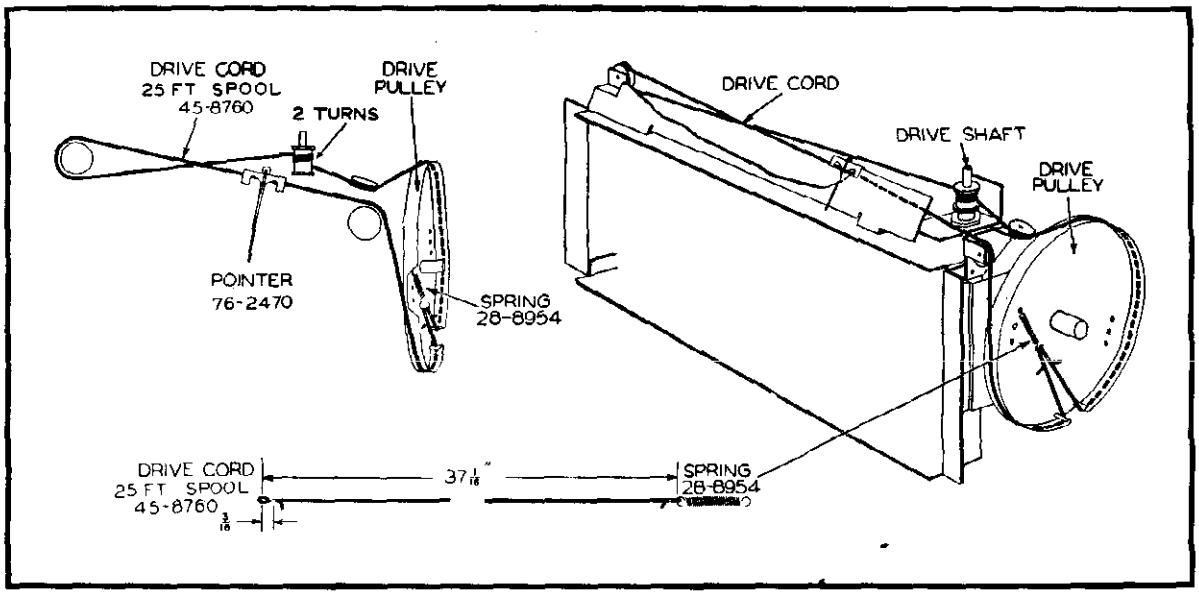


Figure 6. Top View, Showing Trimmer Locations

TP-3627



TP-708

Figure 7. Drive-Cord Installation Details

REPLACEMENT PARTS LIST

NOTE

Part numbers marked with an asterisk (*) are general replacement items. These numbers may not be identical with those on factory assemblies; also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

SECTION 1

Reference Symbol	Description	Service Part No.
C100	Condenser, electrolytic, 4-section	30-2560
C100A	Condenser, filter, 30 mf.	Part of C100
C100B	Condenser, filter, 10 mf.	Part of C100
C100C	Condenser, filter, 30 mf.	Part of C100
C100D	Condenser, bias-resistor by-pass, 30 mf.	Part of C100
C101	Condenser, line filter, .04 mf.	30-4119
C102	Condenser, by-pass, .01 mf.	61-0120*
PL100	Plug, battery cable	54-4272
R100	Resistor, 3-section	33-3431-4
R100A	Resistor, filament dropping, 60 ohms	Part of R100
R100B	Resistor, filament dropping, 875 ohms	Part of R100
R100C	Resistor, filament dropping, 875 ohms	Part of R100
R101	Resistor, plate dropping, 2200 ohms	66-2223340*
R102	Resistor, leakage, 150,000 ohms	66-4153340*
S100	Switch, change-over (code 121)	42-1553-1
S100	Switch, change-over (code 122)	42-1821
S101	Switch, on-off	Part of R200
W100	Power cord and plug (code 121)	L-3339
W100	Power cord and plug (code 122)	41-3755-17

SECTION 2

C200	Condenser, coupling, .01 mf.	61-0120*
C201	Condenser, screen by-pass, .05 mf.	61-0122*
C202	Condenser, d-c blocking, .004 mf.	61-0179*
C203	Condenser, r-f by-pass, 100 mmf.	62-110009001*
C204	Condenser, tone compensating, .004 mf.	61-0179
LS200	Speaker	36-1598
R200	Volume control, 1 megohm	33-5526
R201	Resistor, grid return, 470 ohms	66-1473340*
R202	Resistor, grid return, 270 ohms	66-1273340*
R203	Resistor, grid return, 4.7 megohms	66-5473340*
R204	Resistor, screen dropping, 2.7 megohms	66-5273340*
R205	Resistor, plate load, 1.2 megohms	66-5123340*
R206	Resistor, grid return, 2.2 megohms	66-5223340*
R207	Resistor, bias, 680 ohms	66-1683340*
T200	Output transformer	32-8259

SECTION 3

C300A	Condenser, trimmer, primary	Part of Z300
C300B	Condenser, trimmer, secondary	Part of Z300
C301A	Condenser, trimmer, primary	Part of Z301
C301B	Condenser, trimmer, secondary	Part of Z301
C301C	Condenser, i-f filter, 100 mmf.	Part of Z301
C301D	Condenser, i-f filter, 100 mmf.	Part of Z301
C302	Condenser, screen by-pass, .05 mf.	61-0122*
C303	Condenser, i-f by-pass, .1 mf.	61-0113*
R300	Resistor, screen dropping, 15,000 ohms	66-3153340*
R301	Resistor, a-v-c filter, 2.2 megohms	66-5223340*
R302	Resistor, filter, 25,000 ohms	Part of Z301
R303	Resistor, a-v-c filter, 100,000 ohms	66-4103340
Z300	Transformer, 1st i-f, including C300A and C300B	32-3970
Z301	Transformer, 2nd i-f, including C301A, C301B, C301C, and C301D	32-3971-2

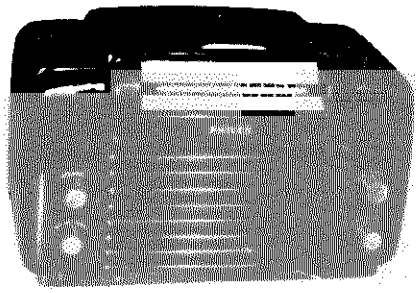
SECTION 4

Reference Symbol	Description	Service Part
C400	Condenser, tuning, 3-section	31-26
C400A	Condenser, aerial trimmer	Part of C4
C400B	Condenser, r-f trimmer	Part of C4
C400C	Condenser, oscillator trimmer	Part of C4
C401	Condenser, compensating, 30 mmf.	60-003053
C402	Condenser, aerial blocking, .0015 mf.	45-3500
C403	Condenser-and choke-assembly, i-f by-pass, .01 mf.	76-22
C404	Condenser, by-pass, .1 mf.	61-01
C405	Condenser, by-pass, .05 mf.	61-01
C406	Condenser, neutralizing, 1.5 mmf.	30-1221
C407	Condenser, by-pass, .05 mf.	61-01
C408	Condenser, by-pass, .1 mf.	61-01
C409	Condenser, by-pass, .25 mf.	61-01
C410	Condenser, oscillator series padder	31-64
C411	Condenser, tracking, 150 mmf.	60-101554
C412	Condenser, coupling, 10 mmf. (part of Z400)	62-0100090
LA400	Loop aerial	32-40
L400	Choke	32-40
R400	Resistor, grid return, 4.7 megohms	66-54733
R401	Resistor, a-v-c filter, 4.7 megohms	66-54733
T400	Aerial transformer	32-39
T401	Oscillator transformer	32-4095
Z400	R-f transformer (code 121), including C412	32-39
Z400	R-f transformer (code 122), including C412	32-421

MISCELLANEOUS

Description	Service Part
Bolt, speaker mounting	W2022FA
Cabinet (less scale)	10647
Back, cabinet (code 122)	45-63
Back-catch assembly	76-61
Foot	45-60
Grille, metal front	56-3351-
Handle loop	56-39
Handle shield	54-43
Hinge (code 121)	45-61
Scale, dial	27-58
Scale strap	56-38
Clip, coil mounting	28-5002FA
Dial-backing-and-pulley assembly	76-20
Cord, drive (25-ft. spool)	45-87
Pointer	76-24
Pulley-and-bracket assembly	76-20
Spring, drive cord	28-89
Cover switch (volume control)	56-32
Grommet, tuning-condenser mounting	27-45
Knob	54-42
Shaft and pulley	76-20
Socket, Loktal	27-61
Socket, miniature	27-62
Switch-plunger assembly	
Code 121	76-20
Code 122	76-30

MODEL 48-464 PHILCO CORP.



MODEL 48-464

SPECIFICATIONS

CABINET	Bakelite, brown
CIRCUIT	Six-tube superheterodyne
FREQUENCY RANGES	
Broadcast	540 — 1720 kc
Short wave	9 — 15.5 mc
AUDIO OUTPUT	1 watt
OPERATING VOLTAGE	115 volts, a.c. or d.c.
POWER CONSUMPTION	30 watts
AERIAL	Built-in loop; terminal also provided for external aerial
INTERMEDIATE FREQUENCY	455 kc
SPEAKER	Dynamic, permanent magnet, 4" x 6"; voice-coil impedance, 3.4 ohms
PHILCO TUBES (6)	14AF7, 7B7 (2), 7C6, 50A5, 35Y4

Circuit Description

Philco Model 48-464 is a six-tube, manually tuned superheterodyne radio, providing reception in the standard-broadcast band, 540—1720 kc, and the short-wave range between 9 mc and 15.5 mc. A low-impedance loop within the cabinet provides adequate signal pickup in most areas. Where additional pickup is required, an external aerial may be used. Do not use a ground. The tube complement is as follows: 14AF7, converter; two 7B7's, i-f amplifiers; 7C6, det. — a.v.c. — 1st audio; 50A5, output; 35Y4, rectifier.

The choke-and-condenser combinations C305/L300 and C306/L301 form series-tuned circuits, resonant at frequencies relative to the i.f. The former is resonant at 455 kc; the latter is resonant at 910 kc (i-f second harmonic); the combination formed by all the above components is resonant at 1365 kc (i-f third harmonic). The impedance of any of these combinations at resonance is much lower than that of a conventional by-pass condenser at the same frequency. By providing high-efficiency by-passing between the chassis and B–, these combinations function to prevent instability of the high-gain i-f amplifiers and to minimize signal interference and beat notes.

Philco TROUBLE-SHOOTING *Procedure*

For rapid trouble shooting, the radio circuit is divided into four sections, with test points specified for each section; these sections and test points are indicated in the schematic diagram. The trouble-shooting procedure given for each section includes a simplified test chart and a bottom view of the chassis showing the locations of the test points and the components of that section.

In each chart, the first step is a master check for determining whether trouble exists in that section, without going through the entire test procedure. Failure to obtain the "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

Preliminary Checks

The following preliminary checks should be made before turning on the radio:

1. Carefully inspect both the top and bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, or other obvious sources of trouble.

2. Measure the resistance between B+ (pin 7 of 35Y4 rectifier) and B–. When the ohmmeter test leads are connected in the proper polarity, the highest resistance reading will be obtained. If the reading is lower than 1500 ohms, check condensers C101, C102A, C102B, C102C, and C203 for leakage or shorts.

Section 1 TROUBLE SHOOTING

Make tests for this section with d-c voltmeter; connect negative lead to test point B–, and positive lead to test points indicated in chart. The voltage readings given were taken with a 20,000-ohms-per-volt meter at a line voltage of 117 volts, a.c.

Set wafer switch to broadcast position; turn volume control to minimum, and tone control to nearly "off" position.

Follow steps in sequence; if the "NORMAL INDICATION" is obtained in step 1, proceed with tests for Section 2; if not, isolate and correct the trouble in this section.

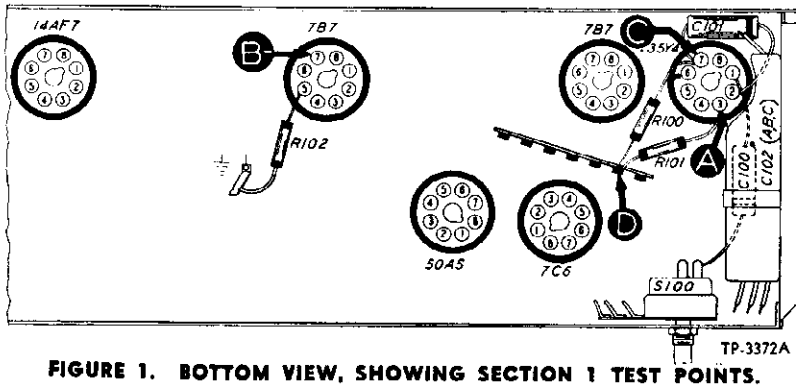


FIGURE 1. BOTTOM VIEW, SHOWING SECTION 1 TEST POINTS.

It will be noted that certain parts in other sections of the radio are listed under "POSSIBLE CAUSE OF ABNORMAL INDICATION", since th may cause abnormal voltage readings in this section.

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	92v		Trouble in this section. Isolate by the following tests.
2	C	128v	No Voltage Low Voltage High Voltage	Defective 35Y4, S100, or W100. Shorted C101, C102A, or C100. Defective 35Y4. Leaky C101, C102A, C102B, or C102C. Open R100 or C102A. Open R100.
3	D	110v	No Voltage Low Voltage High Voltage	Open R100. Shorted C102B. Defective R100. Leaky C102B or C102C. Shorted or leaky C203. Open R101, T200, or R204.
4	A	92v	No Voltage Low Voltage	Defective R101. Shorted C102C. Defective R101. Leaky C102C.

Section 2 TROUBLE SHOOTING

For the tests in this section, use an audio-frequency signal generator. Connect generator ground lead to test point B–; connect output lead through .1-mf condenser to test points indicated in chart.

Set radio volume control to maximum, and tone control to nearly "off" position. Adjust signal-generator output as required for each step.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 3; if not, isolate and correct the trouble in this section.

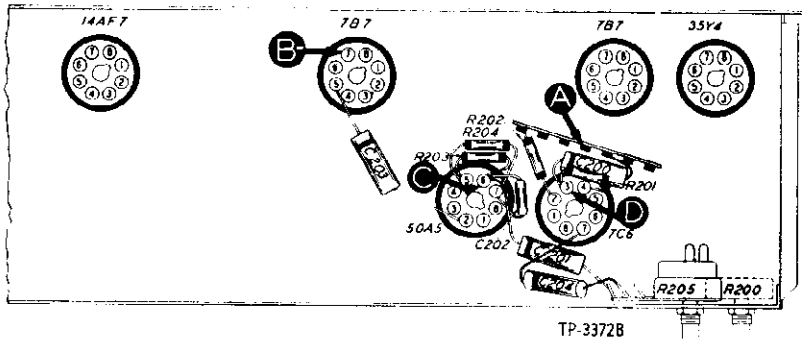


FIGURE 2. BOTTOM VIEW, SHOWING SECTION 2 TEST POINTS.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	C	Moderate, clear signal with strong signal input.	Defective 50A5, T200, LS200, R203, or R204. Shorted or leaky C203 or C202.
3	D	Loud, clear signal with weak signal input.	Defective 7C6. Open R202. Shorted C201 or C204 (rotate tone control).
4	A	Loud, clear signal with weak signal input.	Defective R200, C200, or R201.
Listening Test: Distortion may be caused by leaky C200, C201, or C202; hum may be caused by open R201 or R203.			

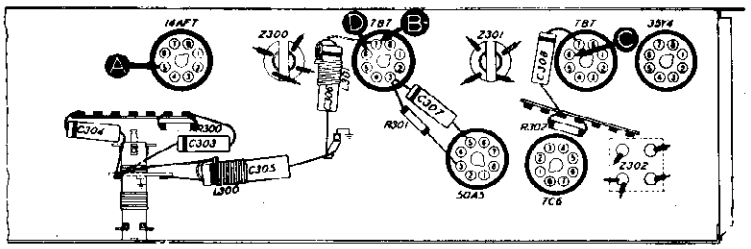
Section 3 TROUBLE SHOOTING

For the tests in this section, use an r-f signal generator with modulated output, set at 455 kc. Connect generator ground lead to test point B–; connect output lead through .1-mf condenser to test points indicated in chart.

Set wafer switch to broadcast position.

Set radio volume control to maximum, and tone control to nearly "off" position.

If the "NORMAL INDICATION" is obtained in the first step, proceed with the tests for Section 4; if not, isolate and correct the trouble in this section.



TP-3572C

FIGURE 3. BOTTOM VIEW, SHOWING SECTION 3 TEST POINTS.

It will be noted that for this section the circuit location of the test point for step 1 (the master check), and also for step 4, is the same as for test point C in Section 4; therefore, certain components in Section 4 may cause an abnormal indication. These components are listed under "POSSIBLE CAUSE OF ABNORMAL INDICATION".

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	C	Loud, clear signal with strong signal input.	Defective 7C6 or 7B7 (2nd i.f.). Open R301 or R302. Shorted C307. Defective or misaligned Z302.
3	D	Loud, clear signal with moderate signal input.	Defective 7B7 (1st i.f.). Defective or misaligned Z301.
4	A	Loud, clear signal with weak signal input.	Defective 14AF7. Open R401, R403, or R300. Shorted C303. Defective or misaligned Z300.

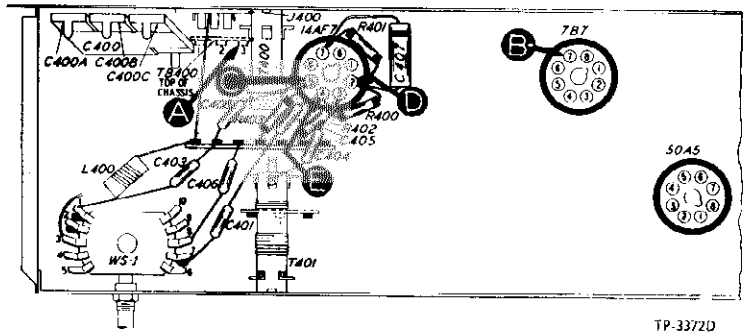
Section 4 TROUBLE SHOOTING

For the tests in this section, with the exception of the oscillator tests (steps 3 and 6), use an r-f signal generator with modulated output. Connect generator ground lead to test point B–; connect output lead through .1-mf condenser to test points indicated in chart.

Set radio volume control to maximum, and tone control to nearly "off" position.

Set wafer switch, tuning control, and signal-generator frequency as indicated in chart.

If the "NORMAL INDICATION" is not obtained in step 1, isolate the trouble by proceeding with the remaining steps.



TP-3372D

FIGURE 4. BOTTOM VIEW, SHOWING SECTION 4 TEST POINTS.

STEP	TEST POINT	SIG. GEN. DIAL SETTING	WAFER SWITCH	RADIO DIAL SETTING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	1000 kc	BC	1000 kc	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	C	1000 kc	BC	1000 kc	Loud, clear signal with weak signal input.	Open C407. Trouble in oscillator circuit.
3	E to D (Osc. test; see Note below.)		BC	Turn tuning control through range.	Negative 1 to 2 volts.	Defective 14AF7, T401, or WS1 (R). Open or shorted C404 or C405. Open R400, R402, or C400. Shorted plates of tuning condenser (osc. section).
4	A	1000 kc	BC	1000 kc	Loud, clear signal with weak signal input.	Open C408. Defective WS1 or T400.
5	A	15 mc	SW	15 mc	Loud, clear signal with weak signal input.	Defective 14AF7 or WS1. Open C403, L400, or C401. Shorted C400A.
6	E to D Osc. test (see Note below.)		SW	Turn tuning control through range.	Negative 1 to 2 volts.	Defective 14AF7, T401, or WS1 (R). Open C406.

NOTE: For oscillator tests (BC in step 3 and SW in step 6), connect positive lead of high-resistance, d-c voltmeter to test point D (14AF7 osc. cathode); connect prod end of negative lead through 100,000-ohm isolating resistor to test point E (14AF7 osc. grid). Use suitable meter range, such as 0—10 volts. Proper operation of oscillator is indicated by negative voltage throughout range of tuning condenser.

ALIGNMI

NOTE: Make ali

DIAL — Alignment points should be marked on the dial backplate. Measurements for these points are shown in the composite dial-and-backplate photo, figure 6. With tuning condensers fully meshed, set dial pointer to index mark.

OUTPUT METER — Connect to terminals in figure 7.

SIGNAL GENERATOR			RADIO		
STEP	CONNECTIONS TO RADIO	DIAL SETTING	WAFER SWITCH	DIAL SETTING	SPECIAL INSTRUCTIONS
1	Ground lead to B–; output lead through .1-mf condenser to tuning-condenser stator (ant. section).	455 kc	BC	540 kc	Adjust trimmers once only, in or given, for maximum output.
2	Radiating loop (see Note below).	580 kc	BC	580 kc	Adjust for maximum.
3	Same as step 2.	1700 kc	BC	1700 kc	Adjust for maximum.
4	Same as step 2.	1500 kc	BC	1500 kc	Adjust for maximum.
5	Same as step 2.	580 kc	BC	580 kc	Adjust for maximum while rock tuning control.
6	Same as step 2.				Repeat steps 3, 4, and 5 until further improvement is noted; t repeat step 3.
7	Same as step 2.	15 mc	SW	15 mc	Adjust for maximum on first p from loose position. Check image with sig. gen. at 14.1
8	Same as step 2.	15 mc	SW	15 mc	Adjust for maximum while rock tuning control.

NOTE: Make up a six-to-eight-turn, 6-inch diameter loop, using insulated wire; connect to sign leads and place near radio loop.

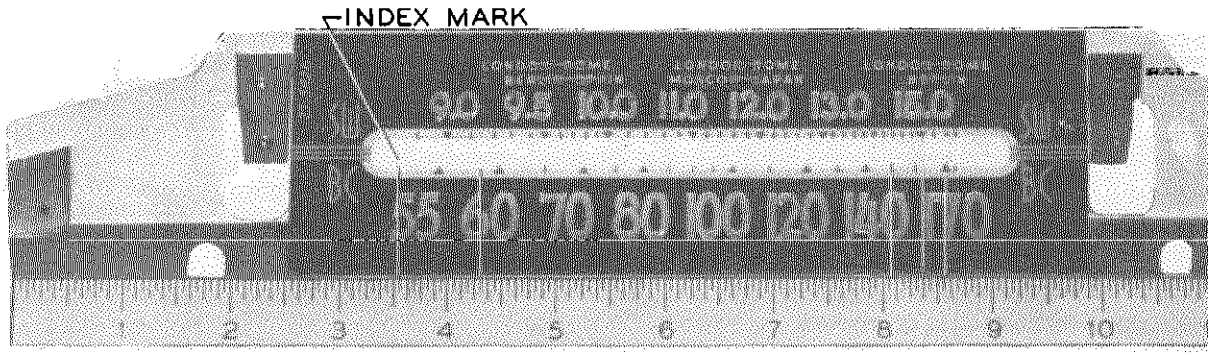
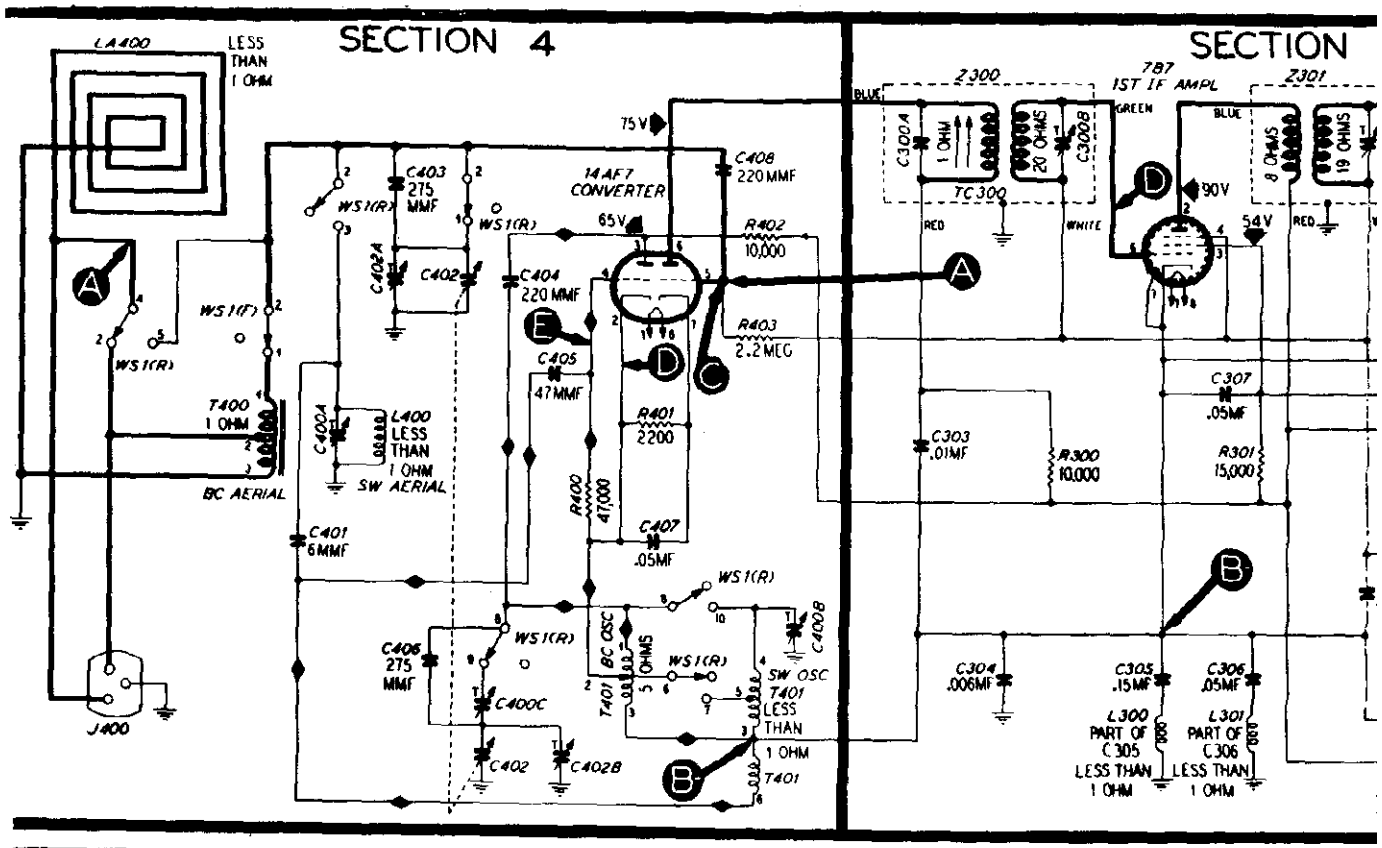
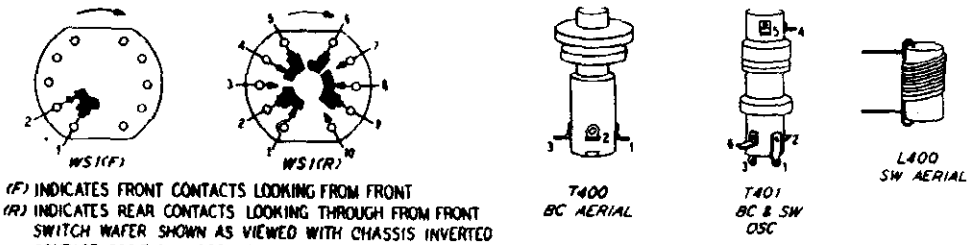


FIGURE 6. COMPOSITE DIAL AND BACKPLATE, CALIBRATION DETAILS.





(F) INDICATES FRONT CONTACTS LOOKING FROM FRONT
(R) INDICATES REAR CONTACTS LOOKING THROUGH FROM FRONT
SWITCH WAFER SHOWN AS VIEWED WITH CHASSIS INVERTED
CONTACT POSITION - BROADCAST

SYMBOLIZATION

THE PREFIX LETTER OF THE SYMBOL DE
OF PART, AS FOLLOWS:

C - CONDENSER	R
I - PANEL LAMP	S
L - CHOKE OR COIL	T
LA - LOOP AERIAL	W
LS - LOUD-SPEAKER	Z

THE NUMBER OF THE SYMBOL DESIGNAT
WHICH THE PART IS LOCATED, AS FOLLO
100-SERIES COMPONENTS ARE IN SECT
200-SERIES COMPONENTS ARE IN SEC
300-SERIES COMPONENTS ARE IN SEC
DETECTOR, AND AVC CIRCUITS
400-SERIES COMPONENTS ARE IN SEC
OSCILLATOR CIRCUITS.

A SUFFIX LETTER IDENTIFIES THE PART
COMPONENT OF THE ASSEMBLY WHICH
WITHOUT A SUFFIX LETTER, AND WITH A
LETTER.

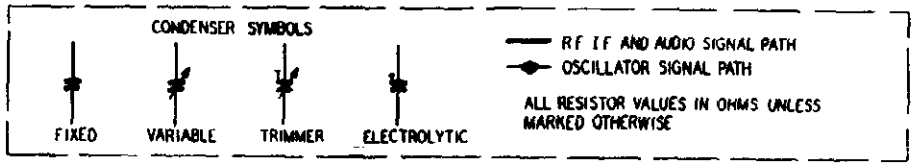
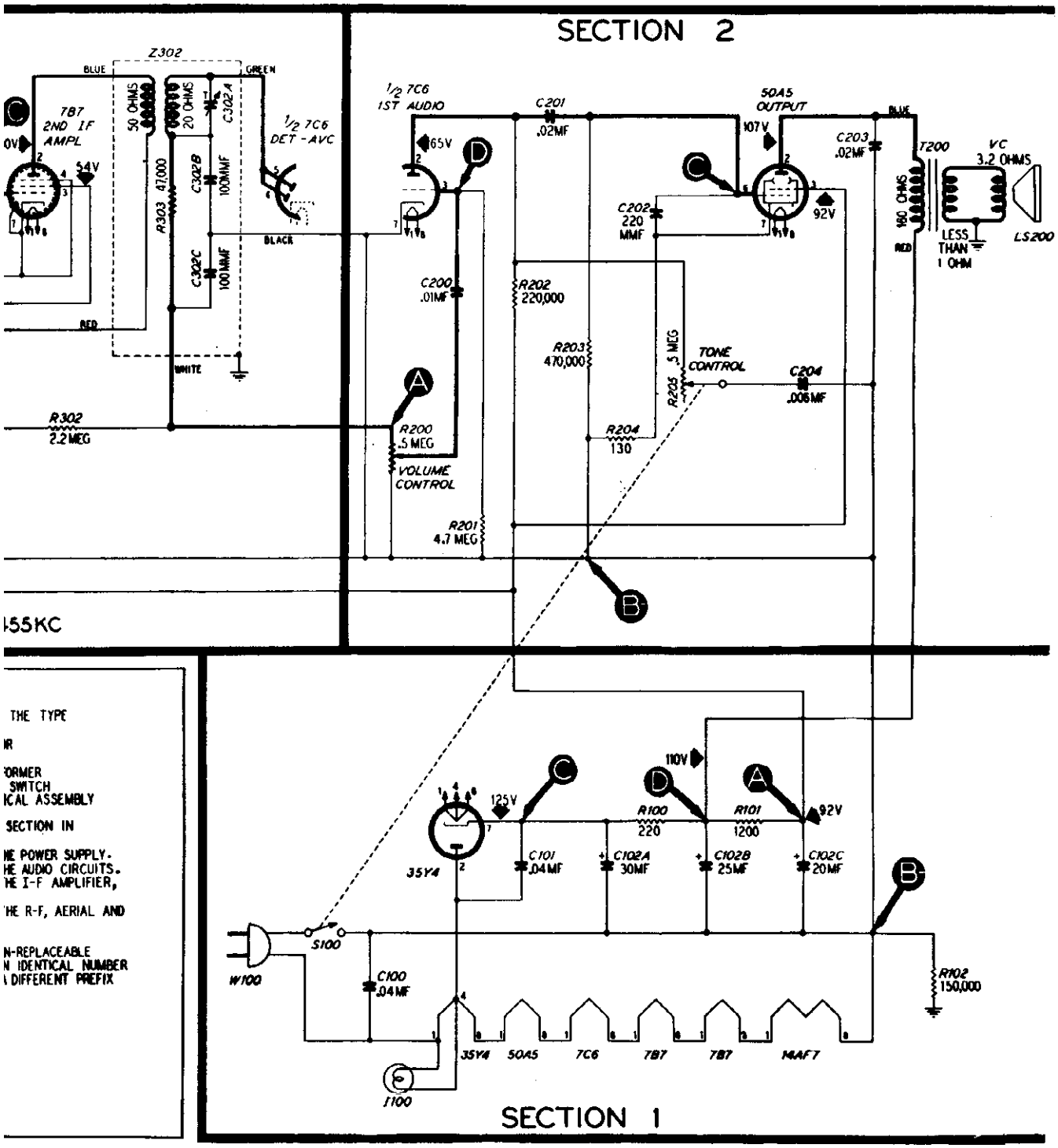


FIGURE 5. PHILCO RADIO MODEL 48-464, SECT



IZED SCHEMATIC, SHOWING TEST POINTS.

O CORP.

PROCEDURE

with loop connected to radio.

d CONTROLS — Set volume control to maximum, tone control nearly "off", and wafer switch as indicated in chart.

SIGNAL GENERATOR—Connect as indicated in chart.

OUTPUT LEVEL — During alignment, adjust signal-generator output to maintain output-meter indication below 1.25 volts.

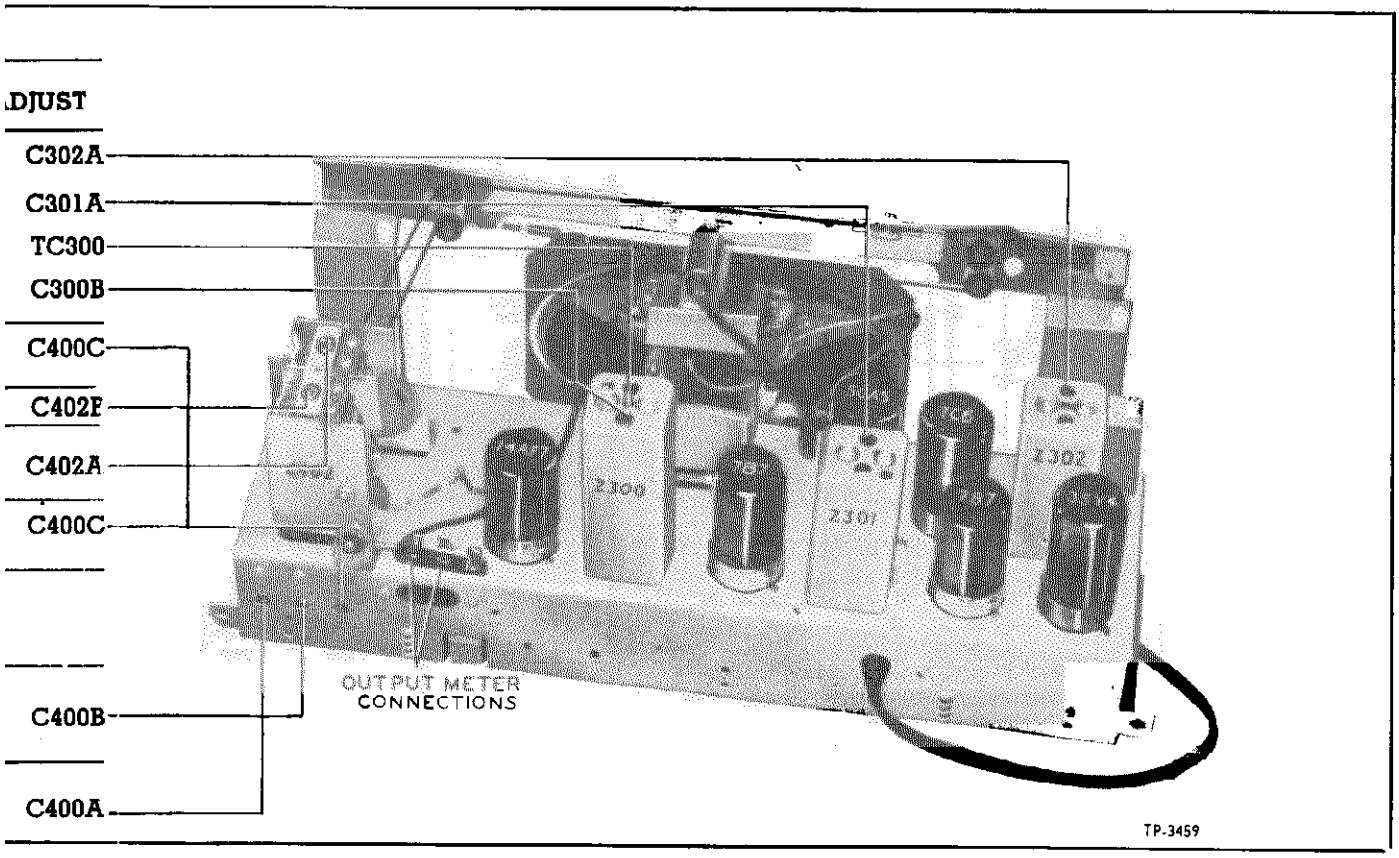


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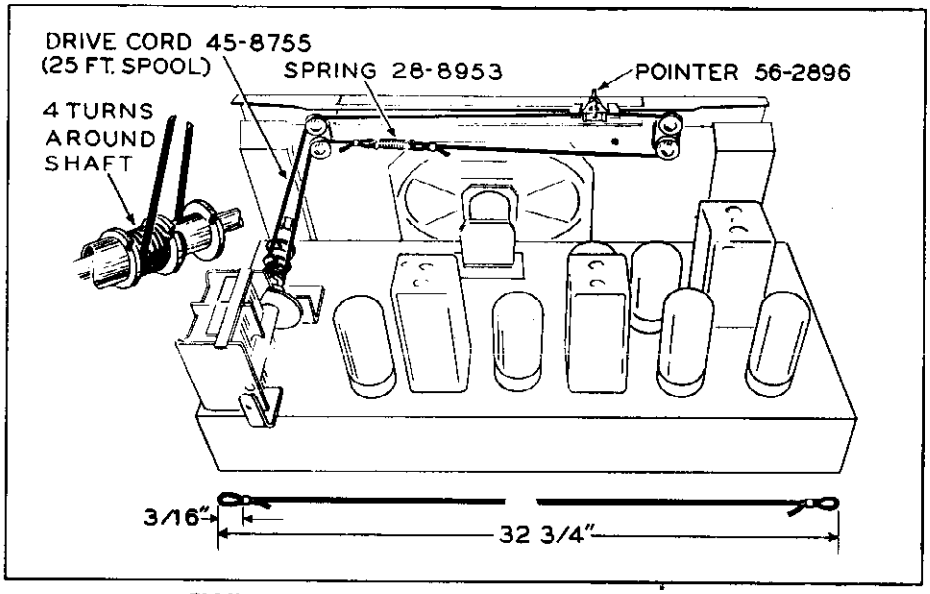
FIGURE 7. TOP VIEW, SHOWING TRIMMER LOCATIONS.



TP-3454

FIGURE 8. DRIVE-CORD INSTALLATION DETAILS. TP-3372E

REPLACEMENT PARTS LIST

NOTE: Part numbers marked with an asterisk (*) are general replacement items. These numbers may not be identical with those on factory assemblies; also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No.".

SECTION 1

Reference Symbol	Description	Service Part No.
C100	Condenser, by-pass, .04 mf	45-3500-2*
C101	Condenser, by-pass, .04 mf	45-3500-2*
C102	Condenser, electrolytic, 3-section	30-2573*
C102A:	Condenser, filter, 30 mf	Part of C102
C102B:	Condenser, filter, 25 mf	Part of C102
C102C:	Condenser, filter, 20 mf	Part of C102
I100	Panel lamp	34-2068
R100	Resistor, 1st B+ filter, 220 ohms	66-1224340
R101	Resistor, 2nd B+ filter, 1200 ohms	66-2123340
R102	Resistor, leakage, 150,000 ohms	66-4153340*
S100	Switch, a-c power	Part of R205
W100	Line cord	L3199

SECTION 2

C200	Condenser, coupling, .01 mf	61-0120*
C201	Condenser, coupling, .02 mf	61-0108*
C202	Condenser, r-f by-pass, 220 mmf	60-122001001*
C203	Condenser, tone compensation, .02 mf	61-0108*
C204	Condenser, tone compensation, .008 mf	45-3500-7*
LS200	Loud-speaker	36-1615-1
R200	Volume control, .5 megohm	33-5539-11
R201	Resistor, grid return, 4.7 megohms	66-5473340
R202	Resistor, plate load, 220,000 ohms	66-4223340
R203	Resistor, grid return, 470,000 ohms	66-4473340
R204	Resistor, cathode bias, 130 ohms	66-1123340
R205	Tone control, .5 megohm	33-5538-14
T200	Output transformer	Part of LS200

SECTION 3

C300A	Condenser, fixed, primary	Part of Z300
C300B	Condenser, trimmer, secondary	Part of Z300
C301A	Condenser, trimmer, secondary	Part of Z301
C302A	Condenser, trimmer, secondary	Part of Z302
C302B	Condenser, i-f filter, 100 mmf	Part of Z302
C302C	Condenser, i-f filter, 100 mmf	Part of Z302
C303	Condenser, r-f by-pass, .01 mf	61-0120*
C304	Condenser, r-f by-pass, .006 mf	45-3500-7*
C305	Condenser-and-choke assembly, by-pass, .15 mf	38-9851-2
C306	Condenser-and-choke assembly, by-pass, .05 mf	76-2362
C307	Condenser, screen r-f by-pass, .05 mf	61-0122*
C308	Condenser, a-v-c filter, .05 mf	61-0122*
L300	Choke	Part of C305
L301	Choke	Part of C306
R300	Resistor, plate load, 10,000 ohms	66-3103340*
R301	Resistor, screen dropping, 15,000 ohms	66-3153340*
R302	Resistor, a-v-c filter, 2.2 megohms	66-5223340*
R303	Resistor, i-f filter, 47,000 ohms	Part of Z302
Z300	Transformer, 1st i-f, 455 kc, including C300A and C300B	32-3956-2
Z301	Transformer, 2nd i-f, 455 kc, including C301A	32-3957-2
Z302	Transformer, 3rd i-f, 455 kc, including C302A, C302B, C302C, and R303	32-3955-2

SECTION 4

Reference Symbol	Description	Service Part N
C400	Condenser strip, trimmer, 3-section	31-6477-
C400A:	Condenser, shunt trimmer, s-w aerial	Part of C40
C400B:	Condenser, shunt trimmer, s-w oscillator	Part of C40
C400C:	Condenser, series padder, bc. oscillator	Part of C40
C401	Condenser, feedback, 6 mmf	60-9050500
C402	Condenser, main tuning gang	31-271
C402A:	Condenser, shunt trimmer, bc. aerial	Part of C40
C402B:	Condenser, shunt trimmer, bc. oscillator	Part of C40
C403	Condenser, spread tuning, s-w aerial, 275 mmf	30-1220-
C404	Condenser, plate feedback, 220 mmf	60-12200100
C405	Condenser, oscillator grid, 47 mmf	60-0051530
C406	Condenser, spread tuning, s-w oscillator, 275 mmf	30-1220-
C407	Condenser, cathode coupling, .05 mf	61-012
C408	Condenser, grid coupling, 220 mmf	60-12200100
J400	Aerial socket	27-614
L400	Coil, shunt, s-w aerial	32-3517-
LA400	Loop-aerial assembly	76-243
R400	Resistor, oscillator grid, 47,000 ohms	66-347334
R401	Resistor, cathode bias, 2200 ohms	66-222334
R402	Resistor, plate load, 10,000 ohms	66-310334
R403	Resistor, grid return, 2.2 megohms	66-522334
T400	Coil, bc. aerial	32-3846-
T401	Coils, bc. and s-w oscillator	32-3715-
WS1	Wafer (band) switch	42-179
WS1(F):	Front contacts, wafer switch	Part of WS
WS1(R):	Rear contacts, wafer switch	Part of WS

MISCELLANEOUS

Description	Service Part N
Cabinet	10618
Back	54-723
Baffle-and-cloth assembly	40-882
Dial scale	27-592
Band, rubber, scale mtg.	54-402
Strap, scale mtg., l.h.	56-2671FA
Strap, scale mtg., r.h.	56-2672FA
Knob	56-437
Stud, loop mtg.	W-2436FA
Dial-backplate assembly	76-239
Bracket, dial backplate	56-2681FA
Cord, drive (25-ft. spool)	45-875
Light reflector	27-9816-
Pilot-lamp-socket assembly	76-214
Pointer	56-289
Spring, drive cord	28-695
Socket, Loktal	27-613

Circuit Description

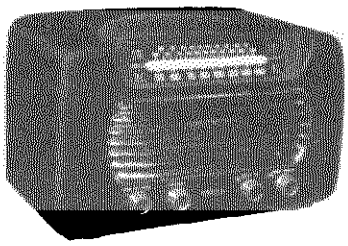
Philco Radio Model 48-472, Code 122, is an eight-tube superheterodyne, which provides reception on the standard-broadcast band and on the FM band. A built-in high-impedance loop is used as the aerial on the broadcast band and the line cord is used as the aerial on the FM band. These aerials normally provide adequate signal pickup; if additional pickup is required, Philco Dipole Aerial, Part No. 45-1462 may be used. When connecting the dipole aerial, disconnect the black lead from terminal 2 of TB400, and attach it to pin 1 of the dipole-aerial plug which fits into J400. No additional coupler is required.

To eliminate complicated switching and to provide greater stability and gain on both bands, separate converter tubes are used for broadcast and FM reception. A 12AU6 high-gain pentode is used as a tuned r-f amplifier on the FM band. The output of this stage is fed to a 14F8 dual triode which functions as the converter for the FM signal. A 12AU7 dual triode is used as the converter for the broadcast signal. Band switching is accomplished by means of a single-wafer switch, which connects the B+ voltage to the proper mixer plate.

6BJ6 type tubes are used in the two i-f-amplifier stages. Two sets of i-f transformers are used; one set is tuned to 455 kc. for standard broadcast, and the other set is turned to 9.1 mc. for FM. The use of two sets of transformers makes better shielding possible, so that undesirable beat signals and interaction between transformers are eliminated.

Two diode sections of the 19T8 triple-diode-triode are used in a ratio detector circuit for detection of FM signals. The other diode section is used in a half-wave rectifier circuit for detection of standard-broadcast signals and to provide a-v-c voltage.

The triode section of the 19T8 is employed as the first audio amplifier, and is resistance-coupled to the 50A5 output tube, which supplies an audio output of approximately one watt to the permanent-magnet dynamic speaker.



MODEL 48-472

SPECIFICATIONS

CABINET	Plastic, walnut finish
CIRCUIT	Eight-tube superheterodyne
FREQUENCY RANGES	
Broadcast	540—1620 kc.
FM	88—108 mc.
AUDIO OUTPUT	1 watt
OPERATING VOLTAGES	105—120 volts, a.c. or d.c.
POWER CONSUMPTION	40 watts
AERIALS	Built-in loop and FM line cord; provisions for connection of external aerial
INTERMEDIATE FREQUENCIES	
AM	455 kc.
FM	9.1 mc.
PHILCO TUBES (8)	12AU6, 12AU7, 14F8, 6BJ6-(2), 19T8, 50A5, 117Z3

TP-4880

Philco TROUBLE-SHOOTING *Procedure*

For rapid trouble shooting, the radio circuit is divided into four sections, as follows:

Section 1—the power supply
Section 2—the audio circuits
Section 3—the i-f, detector, and a-v-c circuits
Section 4—the r-f and converter circuits

Test points are specified for each section, and are indicated in the sectionalized schematic diagram. The trouble-shooting procedure given for each section includes a simplified test chart and a bottom view of the chassis showing the locations of the test points and the components of that section.

In each chart, the first step is a master check for determining whether trouble exists in that section, without going through the entire chart.

Failure to obtain the "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before turning on the power:

1. Inspect both the top and the bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, or other obvious sources of trouble.

2. Measure the resistance between the B+, pin 6 of the 117Z3, and B–, test point B. When the ohmmeter leads are connected in the proper polarity, the highe resistance reading will be obtained. If the reading lower than 1250 ohms, check condensers C102, C103A C103B, and C103C for leakage or shorts. This resi tance value, which is much lower than normal, do not represent a quality check of these condensers; it the lowest value which will permit the rectifier to ope ate safely while the voltage checks of Section 1 (pow supply) are performed.

3. If the 50A5 tube or the 6BJ6 (2nd i-f amplifie tube is burned out, check condenser C314 for a sho before installing a new tube.

Important!

To avoid altering FM operation, special care should be used in replacing any part. Replacement parts should be placed in the same physical positions as the original parts; connections should be of the same length, and should be soldered to the same points. The placement or length of leads should not be changed.

Section 1 TROUBLE SHOOTING

POWER SUPPLY

Make the tests for this section with a d-c voltmeter. Connect the negative lead to B–, test point B; connect the positive lead to the test points indicated in the chart. The voltage readings given were taken with a 20,000-ohms-per-volt meter, at a line voltage of 117 volts, a.c.

Set the volume control to minimum, turn the tone control fully clockwise, and set the band switch to the broadcast position.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2 (audio circuits); if not, isolate and correct the trouble in this section.

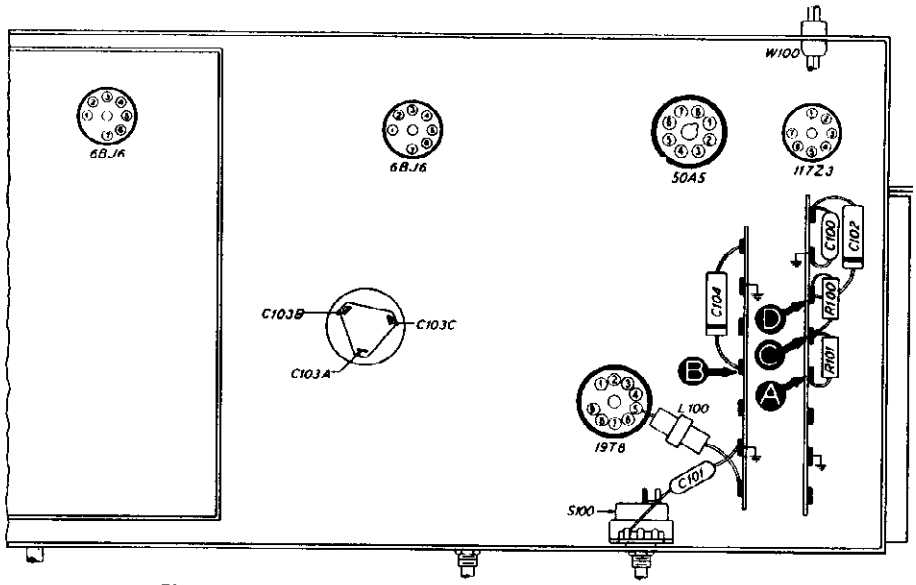


Figure 1. Bottom View, Showing Section 1 Test Points TP-5398A

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	95v		Trouble in this section. Isolate by the following tests.
2	C	100v	No voltage	Defective: 117Z3. Open: W100, S100. Shorted: C103A, C103B, C102.
			Low voltage	Defective: 117Z3. Leaky: C103A, C103B, C103C. Shorted: C103C.
			High Voltage	Open: R100, R101, T200*, R204*.
3	D	118v	No voltage	Open: R100. Shorted: C103B.
			Low voltage	Increased value: R100. Leaky: C103B. Shorted: C103C.
			High Voltage	Open: R101, T200*, R204*.
4	A	95v	No voltage	Open: R101. Shorted: C103C.
			Low voltage	Leaky: C103C. Increased value: R101. Shorted: C312*, C311*, C317*, C419*, C406*, C315*, C318*, C411*.
Listening Test: Abnormal hum may be caused by open C103A, C103B, or C103C.				

This part, located in another section, may cause abnormal indication in this section.

Section 2 TROUBLE SHOOTING

AUDIO CIRCUITS

For the tests in this section. use an audio-frequency signal generator. Connect the generator ground lead to B–, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, and turn the tone control fully counterclockwise.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 3 (i-f, detector, and a-v-c circuits); if not, isolate and correct the trouble in this section.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with moderate generator input.	Trouble in this section. Isolate by the following tests.
2	C	Loud, clear output with strong input.	Defective: 50A5. Shorted: LS200, T200. Open: R203, R204, C205, LS200, T200. Shorted or leaky: C202, C204, C205, C206, C207.
3	D	Loud, clear output with moderate input.	Defective: 19T8. Open: R205, R202, C202. Shorted or leaky: C202, C203 (rotate R201 through range).
4	A	Loud, clear output with moderate input.	Open: R200 (rotate through range), C200, C201. Shorted or leaky: C200, C201.
Listening Test: Distortion may be caused by leaky C200, C201, or C202.			

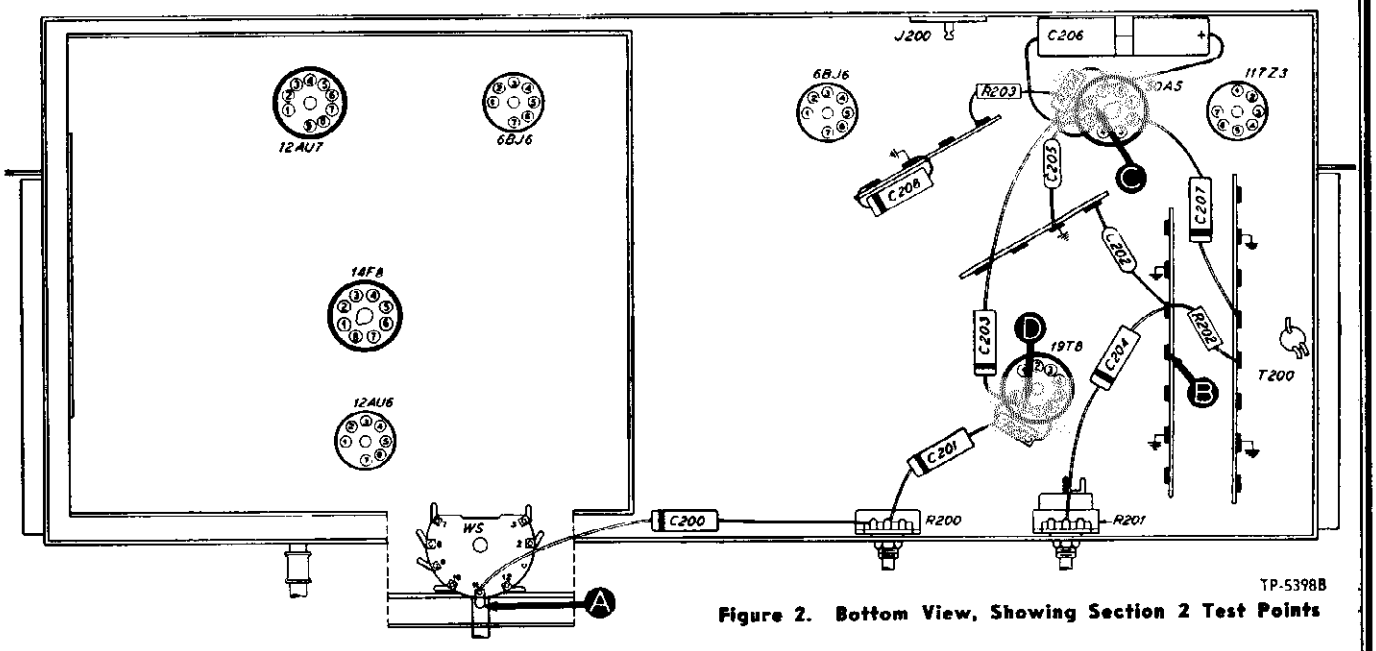


Figure 2. Bottom View, Showing Section 2 Test Points

Section 3 TROUBLE SHOOTING

I-F, DETECTOR, AND A-V-C CIRCUITS

AM Circuits

For the tests of the AM circuits, use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to B–, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, and turn the tone control fully counterclockwise. Set the band switch to the broadcast position, and rotate the tuning control until the tuning gang is fully meshed.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for the FM circuits; if not, isolate and correct the trouble in the AM circuits.

Since test point A for the AM circuits is placed at the grid of the 12AU7 mixer in Section 4, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in Section 4. These parts are listed below under "POSSIBLE CAUSE OF ABNORMAL INDICATION."

Section 3—Cont. TROUBLE SHOOTING

AM Chart

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with weak generator input.	Trouble in AM circuits. Isolate by the following tests.
2	D	Loud, clear output with moderately strong input.	Defective: 19T8, 6BJ6 (2nd i-f amplifier). Open: R307, R308, R309, R311, R312, L305B, C317, L305A, L304A, WS. Shorted or leaky: C316, C317, C315. Shorted: L305A, L305B, WS.
3	E	Loud, clear output with moderate input.	Defective: 6BJ6 (1st i-f amplifier). Open: R301, R302, R303, R304, R305, R306, C311, C313, L302A, L302B, L303A, L303B. Shorted or leaky: C311, C312, C313, C308. Shorted: L303A, L303B.
4	A	Loud, clear output with weak input.	Defective: 12AU7*. Open: R411*, R413*, R409*, L300A, L300B, L301A, L301B, WS. Shorted or leaky: C424*, C410*. Shorted: L301A, L301B, L301C, WS.
Listening Test: Hum and distortion may be caused by shorted or leaky C309, C310, C314, C321, C320, C307, C420*, C421*, C422*, C423*, C100*, C101*.			

* This part, located in another section, may cause abnormal indication in this section.

FM Circuits

For the tests of the FM circuits, use an r-f signal generator, set at 9.1 mc. Connect the generator ground lead to B–, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart. Detune the generator frequency to one side or the other until a satisfactory test signal is obtained.

Set the band switch to the FM position; set the other radio controls as directed under AM CIRCUITS.

The parts which were found to be satisfactory for AM operation, with the exception of those indicated in the chart, will usually be satisfactory for FM operation.

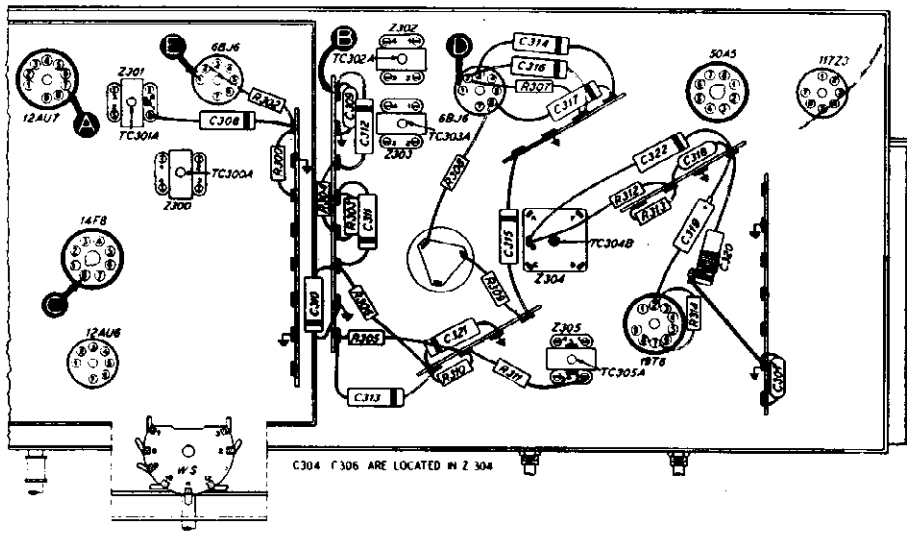


Figure 3. Bottom View, Showing Section 3 Test Points TP-5398C

The best indication of satisfactory FM-detector operation is the ability of this circuit to take the alignment properly (see page 10).

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 4 (r-f and converter circuits); if not, isolate and correct the trouble in the FM circuits of this section.

Since test point C for the FM circuits is placed at the grid of the 14F8 mixer in Section 4, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in Section 4. These parts are listed below under "POSSIBLE CAUSE OF ABNORMAL INDICATION."

FM Chart

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	C	Loud, clear speaker output with weak generator input.	Trouble in FM circuits. Isolate by the following tests.
2	D	Loud, clear output with strong input.	Defective: 6BJ6 (2nd i-f amplifier), Z304, 19T8, WS. Misaligned: Z304. Open: R312, R313, R314, C320, C319, C318, C304, C306. Shorted or leaky: C319, C320, C304, C306.
3	E	Loud, clear output with moderate input.	Defective: 6BJ6 (1st i-f amplifier). Misaligned: Z302. Shorted: L302A, L302B.
4	C	Loud, clear output with weak input.	Defective: 14F8*. Open: R300, R406, R407*, R405*, L404*, L300A, WS. Shorted or leaky: C418*, C419*. Shorted: L300A, L300B, WS.

* This part, located in another section, may cause abnormal indication in this section.

MODEL 48-472, Code 122 PHILCO CORP.

Section 4 TROUBLE SHOOTING

R-F AND CONVERTER CIRCUITS

AM Circuits

For the tests of the AM circuits, use an r-f signal generator, with modulated output. Connect the generator ground lead to B–, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, turn the tone control fully counterclockwise, and set the band switch to the broadcast position.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for the FM circuits; if not, isolate and correct the trouble in the AM circuits.

FM Circuits

Before proceeding with the tests for the FM circuits, set the band switch to the FM position.

If the "NORMAL INDICATION" is obtained in step 1, further tests should be unnecessary; if not, isolate and correct the trouble in the FM circuits. If the trouble is not revealed by the tests for the FM circuits, check the alignment.

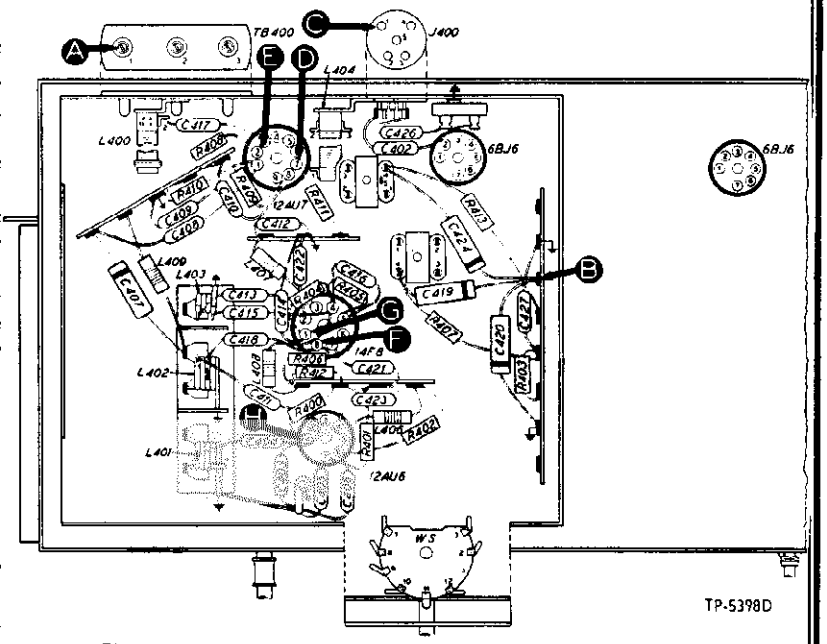


Figure 4. Bottom View, Showing Section 4 Test Points

AM Chart

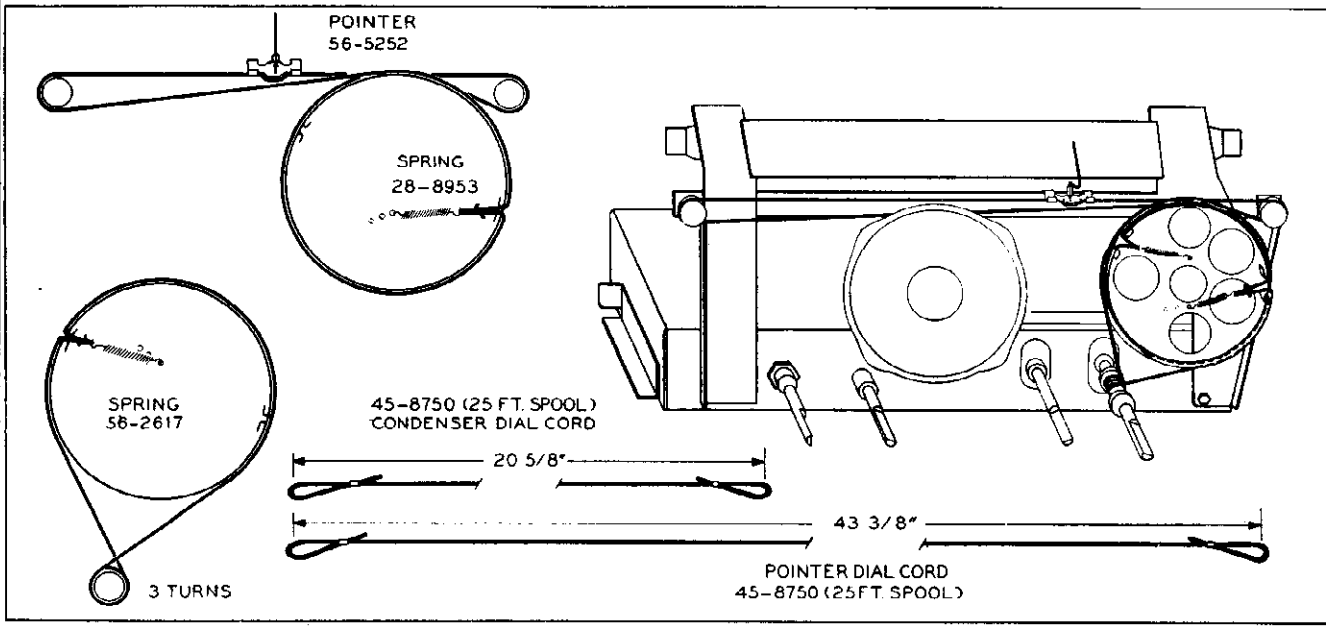
STEP	TEST POINT	SIG. GEN. FREQUENCY	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	1000 kc.	1000 kc.	Loud, clear speaker output with weak generator input.	Trouble in this section. Isolate by the following tests.
2	D	1000 kc.	1000 kc.	Loud, clear output with moderate input.	Defective: 12AU7, oscillator circuits. Shorted: C424, C410, WS. Open: R409, R411, R413, WS.
3	E to B (Osc. test; see note below.)		Rotate through range.	Negative 2 to 4 volts.	Defective: 12AU7. Open: R408, L404, C408, R410, C407. Shorted or leaky: C408, C409, C400, C401B.
4	A	1000 kc.	1000 kc.	Same as step 1.	Open: L400, C417, L405. Shorted: C400, C401A, C425.

OSCILLATOR TEST: Connect the positive lead of a high-resistance voltmeter to B–, test point B; connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the oscillator grid (pin 2 of 12AU7), test point E. Use a suitable meter range, such as 0—10 volts. Proper operation of the oscillator is indicated by negative voltage within the range given in the chart (measured with a 20,000-ohms-per-volt meter) throughout the tuning range.

FM Chart

STEP	TEST POINT	SIG. GEN. FREQUENCY	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	C	95 mc.	Tune to signal.	Loud, clear speaker output with weak generator input.	Trouble in FM circuits. Isolate by the following tests.
2	F	95 mc.	Tune to signal.	Loud, clear output with moderate input.	Defective: oscillator circuits, 14F8. Open: C418, R406, R407, R405, L408, L402. Shorted: C418, C400, C400B, C419, C416, L402.
3	G to B (Osc. test; see note below.)		Tune through range.	Negative 1 to 2.5 volts.	Defective: 14F8. Open: R404, L408, L407, R403, C413, C415, L403. Shorted: C400, C400C, C413, C415, C414, C412, L403, L407.
4	H	95 mc.	Tune to signal.	Loud, clear output with weak input.	Defective: 12AU6. Open: L406, R402, R401, R400, C411, C406, C418, R412, L402. Shorted: C405, C406, C411, C400, C400B, C404, L402.
5	C	95 mc.	Tune to signal.	Loud, clear output with weak input.	Open: C402, C404, R412, L402. Shorted: C404, C400, C400A, L402.

OSCILLATOR TEST: Connect the positive lead of a high-resistance voltmeter to B–, test point B; connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the oscillator grid (pin 1 of 14F8), test point G. Use a suitable meter range, such as 0—10 volts. Proper operation of the oscillator is indicated by negative voltage within the range given in the chart (measured with a 20,000-ohms-per-volt meter) throughout the tuning range.



TP-5398-E

Figure 5. Drive-Cord Installation Details

REPLACEMENT PARTS LIST

NOTE: Parts marked with an asterisk (*) are general replacement items. These numbers may not be identical with those on factory assemblies; also, the electrical values of some replacement items may differ from the values indicated in the schematic and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

SECTION 1
POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, r-f by-pass, 100 mmf.	62-110009001
C101	Condenser, r-f by-pass, 100 mmf.	62-110009001
C102	Condenser, r-f by-pass, .01 mf.	61-0120*
C103	Condenser, electrolytic, 3-section	30-2568-10
C103A	Condenser, filter, 40 mf.	Part of C103
C103B	Condenser, filter, 70 mf.	Part of C103
C103C	Condenser, filter, 40 mf.	Part of C103
C104	Condenser, line filter, .04 mf.	45-3500*
I100	Panel lamp, 110v, screw base	34-2477
L100	Choke, filament, 100 millihenries	32-4143-4
R100	Resistor, filter, 220 ohms	66-1224340
R101	Resistor, filter, 470 ohms	66-1474340
S100	Switch, power	Part of R201
W100	Line cord and plug (incl. FM line aerial)	L-2183*

SECTION 2
AUDIO CIRCUITS

C200	Condenser, d-c blocking, .006 mf.	45-3500-7*
C201	Condenser, d-c blocking, .006 mf.	45-3500-7*
C202	Condenser, plate by-pass, 100 mmf.	62-110009001
C203	Condenser, d-c blocking, .002 mf.	30-4579*
C204	Condenser, tone compensation, .01 mf.	61-0120*
C205	Condenser, r-f by-pass, 100 mmf.	62-110009001
C206	Condenser, cathode by-pass, 25 mf.	45-3001*
C207	Condenser, tone compensation, .02 mf.	61-0108*
C208	Condenser, r-f by-pass, .01 mf.	61-0120*
J200	Socket, FM test	27-6180
LS200	Loud-speaker, permanent magnet	36-1625
R200	Volume control, 2 megohms	33-5539-19
R201	Tone control, 500,000 ohms	33-5538-11
R202	Resistor, plate load, 470,000 ohms	66-4473340*
R203	Resistor, grid return, 470,000 ohms	66-4473340*

SECTION 2 (Continued)
AUDIO CIRCUITS

Reference Symbol	Description	Service Part N
R204	Resistor, cathode bias, 120 ohms	66-112434
R205	Resistor, grid return, 10 megohms	66-610334
T200	Output transformer	32-8296

SECTION 3
I-F, DETECTOR, AND A-V-C CIRCUITS

C300A	Condenser, shunt	Part of Z30
C300B	Condenser, shunt	Part of Z30
C301A	Condenser, shunt	Part of Z30
C301B	Condenser, shunt	Part of Z30
C302A	Condenser, shunt	Part of Z30
C302B	Condenser, shunt	Part of Z30
C303A	Condenser, shunt	Part of Z30
C303B	Condenser, shunt	Part of Z30
C304	Condenser, shunt, 68 mmf.	Part of Z30
C305A	Condenser, shunt	Part of Z30
C305B	Condenser, shunt	Part of Z30
C305C	Condenser, a-v-c filter	Part of Z30
C305D	Condenser, a-v-c filter	Part of Z30
C306	Condenser, shunt, (part of Z304), 5 mmf	30-1224
C307	Condenser, r-f by-pass, 100 mmf.	62-1100090
C308	Condenser, a-v-c by-pass, .01 mf.	61-012
C309	Condenser, r-f by-pass, 100 mmf.	62-1100090
C310	Condenser, r-f by-pass, .05 mf.	61-012
C311	Condenser, screen by-pass, .01 mf.	61-012
C312	Condenser, plate by-pass, .01 mf.	61-012
C313	Condenser, a-v-c by-pass, .01 mf.	61-012
C314	Condenser, r-f by-pass, .01 mf.	61-012
C315	Condenser, plate by-pass, .01 mf.	61-012
C316	Condenser, cathode by-pass, .01 mf.	61-012
C317	Condenser, screen by-pass, .01 mf.	61-012
C318	Condenser, decoupling, 1500 mmf.	62-21500100

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REPLACEMENT PARTS LIST (Continued)

SECTION 3 (Continued)
I-F, DETECTOR, AND A-V-C CIRCUITS

Reference Symbol	Description	Service Part No.
C319	Condenser, electrolytic, filter, FM detector, 2 mf.	30-2417-7
C320	Condenser-and-choke assy., by-pass, .05 mf.	38-9851-6
C321	Condenser, r-f by-pass, .01 mf.	61-0120*
C322	Condenser, compensating, .01 mf.	61-0120*
L300A	Primary coil, 1st FM i-f transformer	Part of Z300
L300B	Secondary coil, 1st FM i-f transformer	Part of Z300
L301A	Primary coil, 1st AM i-f transformer	Part of Z301
L301B	Secondary coil, 1st AM i-f transformer	Part of Z301
L301C	Tertiary coil, 1st AM i-f transformer	Part of Z301
L302A	Primary coil, 2nd FM i-f transformer	Part of Z302
L302B	Secondary coil, 2nd FM i-f transformer	Part of Z302
L303A	Primary coil, 2nd AM i-f transformer	Part of Z303
L303B	Secondary coil, 2nd AM i-f transformer	Part of Z303
L304A	Primary coil, 3rd FM i-f transformer	Part of Z304
L304B	Secondary coil, 3rd FM i-f transformer	Part of Z304
L304C	Tertiary coil, 3rd FM i-f transformer	Part of Z304
L305A	Primary coil, 3rd AM i-f transformer	Part of Z305
L305B	Secondary coil, 3rd AM i-f transformer	Part of Z305
R300	Resistor, decoupling, 68 ohms	66-0683340*
R301	Resistor, grid return, 1 megohm	66-5103340*
R302	Resistor, cathode bias, 47 ohms	66-0473340*
R303	Resistor, screen dropping, 1000 ohms	66-2103340*
R304	Resistor, plate decoupling, 1000 ohms	66-2103340*
R305	Resistor, a-v-c filter, 3.3 megohms	66-5333340*
R306	Resistor, r-f decoupling, 68 ohms	66-0683340*
R307	Resistor, cathode bias, 47 ohms	66-0473340*
R308	Resistor, screen dropping, 1000 ohms	66-2103340*
R309	Resistor, plate decoupling, 1000 ohms	66-2103340*
R310	Resistor, diode load, 330,000 ohms	66-4333340*
R311	Resistor, diode load, 47,000 ohms	66-3473340*
R312	Resistor, decoupling, 47,000 ohms	66-3473340*
R313	Resistor, decoupling, 100,000 ohms	66-4103340*
R314	Resistor, FM-detector load, 47,000 ohms	66-3473340*
TC300A	Primary tuning core, 1st FM i-f trans.	Part of Z300
TC300B	Secondary tuning core, 1st FM i-f trans.	Part of Z300
TC301A	Primary tuning core, 1st AM i-f trans.	Part of Z301
TC301B	Secondary tuning core, 1st AM i-f trans.	Part of Z301
TC302A	Primary tuning core, 2nd FM i-f trans.	Part of Z302
TC302B	Secondary tuning core, 2nd FM i-f trans.	Part of Z302
TC303A	Primary tuning core, 2nd AM i-f trans.	Part of Z303
TC303B	Secondary tuning core, 2nd AM i-f trans.	Part of Z303
TC304A	Primary tuning core, 3rd FM i-f trans.	Part of Z304
TC304B	Secondary tuning core, 3rd FM i-f trans.	Part of Z304
TC305A	Primary tuning core, 3rd AM i-f trans.	Part of Z305
TC305B	Secondary tuning core, 3rd AM i-f trans.	Part of Z305
WS-B	Switch-wafer section	Part of 42-1834†
Z300	Transformer, 1st FM i-f	32-4257
Z301	Transformer, 1st AM i-f	32-4258
Z302	Transformer, 2nd FM i-f	32-4257-1
Z303	Transformer, 2nd AM i-f	32-4160-3
Z304	Transformer, 3rd FM i-f	32-4261
Z305	Transformer, 3rd AM i-f	32-4240-2

SECTION 4
R-F AND CONVERTER CIRCUITS

C400	Condenser, tuning gang	31-2724-1
C400A	Condenser, trimmer, FM aerial	Part of C400
C400B	Condenser, trimmer, FM r-f	Part of C400
C400C	Condenser, trimmer, FM oscillator	Part of C400
C401	Condenser, trimmer, 2-section	31-6476-13
C401A	Condenser, trimmer, BC aerial	Part of C401
C401B	Condenser, trimmer, BC oscillator	Part of C401
C402	Condenser, aerial coupling, 100 mmf.	62-110009001
C403	Condenser, r-f by-pass, 100 mmf.	62-110009001
C404	Condenser, blocking, 51 mmf.	30-1224-2*
C405	Condenser, cathode by-pass, 33 mmf.	30-1224*
C406	Condenser, screen by-pass, 100 mmf.	62-110009001
C407	Condenser, isolating, .01 mf.	61-0120*
C408	Condenser, blocking, 100 mmf.	62-110009001
C409	Condenser, r-f by-pass, 220 mmf.	62-122001001

SECTION 4 (Continued)
R-F AND CONVERTER CIRCUITS

Reference Symbol	Description	Service Part No.
C410	Condenser, cathode by-pass, 1500 mmf.	62-215001001
C411	Condenser, d-c blocking, 100 mmf.	62-110009001
C412	Condenser, r-f by-pass, 1500 mmf.	62-215001001
C413	Condenser, d-c blocking, 220 mmf.	62-122001001
C414	Condenser, r-f by-pass, 100 mmf.	62-110009001
C415	Condenser, d-c blocking, 220 mmf.	62-122001001
C416	Condenser, cathode by-pass, 100 mmf.	62-110009001
C417	Condenser, isolating, 100 mmf.	62-110009001
C418	Condenser, isolating, 100 mmf.	62-110009001
C419	Condenser, plate decoupling, .01 mf.	61-0120*
C420	Condenser, r-f by-pass, .03 mf.	45-3500-1*
C421	Condenser, r-f by-pass, 100 mmf.	62-110009001
C422	Condenser, r-f by-pass, 100 mmf.	62-110009001
C423	Condenser, r-f by-pass, 100 mmf.	62-110009001
C424	Condenser, plate decoupling, .01 mf.	61-0120*
C425	Condenser, aerial coupling, 10 mmf.	62-010009001
C426	Condenser, aerial coupling, 100 mmf.	62-110009001
C427	Condenser, r-f by-pass, 1500 mmf.	62-215001001
J400	Aerial socket	27-6214
L400	Coil, BC aerial	32-4217-1
L401	Coil, FM aerial	32-4158-1
L402	Coil, FM r-f	32-4159-1
L403	Coil, FM oscillator	32-4018-5
L404	Coil, BC oscillator	32-4221-1
L405	Coil, r-f choke	32-4061-2
L406	Coil, FM r-f plate load	32-4061-2
L407	Coil, FM oscillator plate load	32-4061-2
L408	Coil, r-f choke	32-4061-2
L409	Coil, r-f choke	32-4061-2
LA400	Loop aerial	32-4052-16
PL400	Plug, FM aerial	Part of W100
R400	Resistor, grid return, 1 megohm	66-5106340*
R401	Resistor, cathode bias, 68 ohms	66-0683340*
R402	Resistor, screen dropping, 1000 ohms	66-2103340*
R403	Resistor, plate decoupling, 4700 ohms	66-2473340*
R404	Resistor, grid return, 15,000 ohms	66-3153340*
R405	Resistor, cathode bias, 1500 ohms	66-2153340*
R406	Resistor, grid return, 10,000 ohms	66-3103340*
R407	Resistor, plate decoupling, 33,000 ohms	66-3333340*
R408	Resistor, grid return, 15,000 ohms	66-3153340*
R409	Resistor, cathode bias, 2200 ohms	66-2223340*
R410	Resistor, plate load, 15,000 ohms	66-3153340*
R411	Resistor, grid return, 1 megohm	66-5103340*
R412	Resistor, r-f decoupling, 68 ohms	66-0683340*
R413	Resistor, plate decoupling, 33,000 ohms	66-3333340*
TB400	Aerial terminal panel	38-9942
WS-A	Switch-wafer section	Part of 42-1834†

MISCELLANEOUS

Description	Service Part No.
Cabinet (less scale)	10666
Baffle-and-cloth assembly	40-6965
Cabinet back	54-7465-1
Clip, baffle mounting	28-4279FA1
Dial scale	27-5954-2
Strap, scale mounting (L.H.)	56-4032
Strap, scale mounting (R.H.)	56-4031
Dial-Backplate Assembly	
Dial cord (25-ft. spool)	45-8750*
Diffusing panel	54-7506
Pointer	56-5252
Spring, pointer	28-8953
Spring, gang	56-2617
Upright assembly	76-3461
Dial drive shaft	76-3479
Knob	54-4376
Rubber mount, r-f chassis	54-4295
Socket, 9-pin miniature	27-6203-5
Socket, 8-pin Loktal	27-6138*
Socket, 7-pin miniature	27-6226

†42-1834 is WS, wafer switch, single wafer (includes WS-A and WS-B).

MODEL 48-472, Code 122

AM ALIGNMENT CHART

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Groud lead to B–, test point B; output lead through .1-mf. condenser to terminal 1 of TB400.	455 kc.	540 kc.	Adjust each trimmer, in order given, for maximum output. Do not repeat adjustments.	TC305B—3rd TC305A—3r TC303B—2n TC303A—2n TC301B—1s TC301A—1s
2	Loosely coupled with loop. See note below.	1600 kc.	1600 kc.	Adjust for maximum output.	C401B—
3	Same as step 2.	1500 kc.	1500 kc.	Adjust for maximum output.	C401A—I

NOTE: Make up a six-to-eight-turn, 6-inch-diameter loop, using insulated wire; connect to the signal-generator leads and place radio loop.

FM ALIGNMENT CHART

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Through .1-mf. condenser to pin 1 of 6BJ6, 1st i-f amplifier.	9.1 mc.	88 mc.	Adjust for maximum reading on alignment indicator. Attenuate signal generator to maintain reading of approximately 10 volts. Repeat adjustments until no further improvement is noted. After this step, do not disturb any of these trimmers except as directed in step 3.	TC304B—3r TC304A—3 TC302B—2r TC302A—2
2	Through .1-mf. condenser to pin 8 of 14F8.	9.1 mc.	88 mc.	Adjust for maximum reading on alignment indicator. Repeat adjustments until no further improvement is noted. Do not disturb these trimmers after this step.	TC300B—1 TC300A—1
3	Same as step 2.	9.1 mc.	88 mc.	Adjust for minimum reading on output meter. This adjustment is critical; repeat to make sure it is correct.	TC304B—3
4	To terminal 2 of J400.	105 mc.	105 mc.	Adjust for maximum reading on alignment indicator.	C400C
5	Same as step 4.	105 mc.	105 mc.	Same as step 4. Rock tuning control.	C400
6	Same as step 4.	105 mc.	105 mc.	Same as step 4.	C400A—
7	Same as step 4.	92 mc.	92 mc.	Same as step 4. See note page 10.	L403—FM osc.
8	Same as step 4.	92 mc.	92 mc.	Same as step 7.	L402—FM r-f
9	Same as step 4.	92 mc.	92 mc.	Same as step 7.	L401—FM aerial
10	Repeat steps 4 through 9 until no further improvement is obtained.				

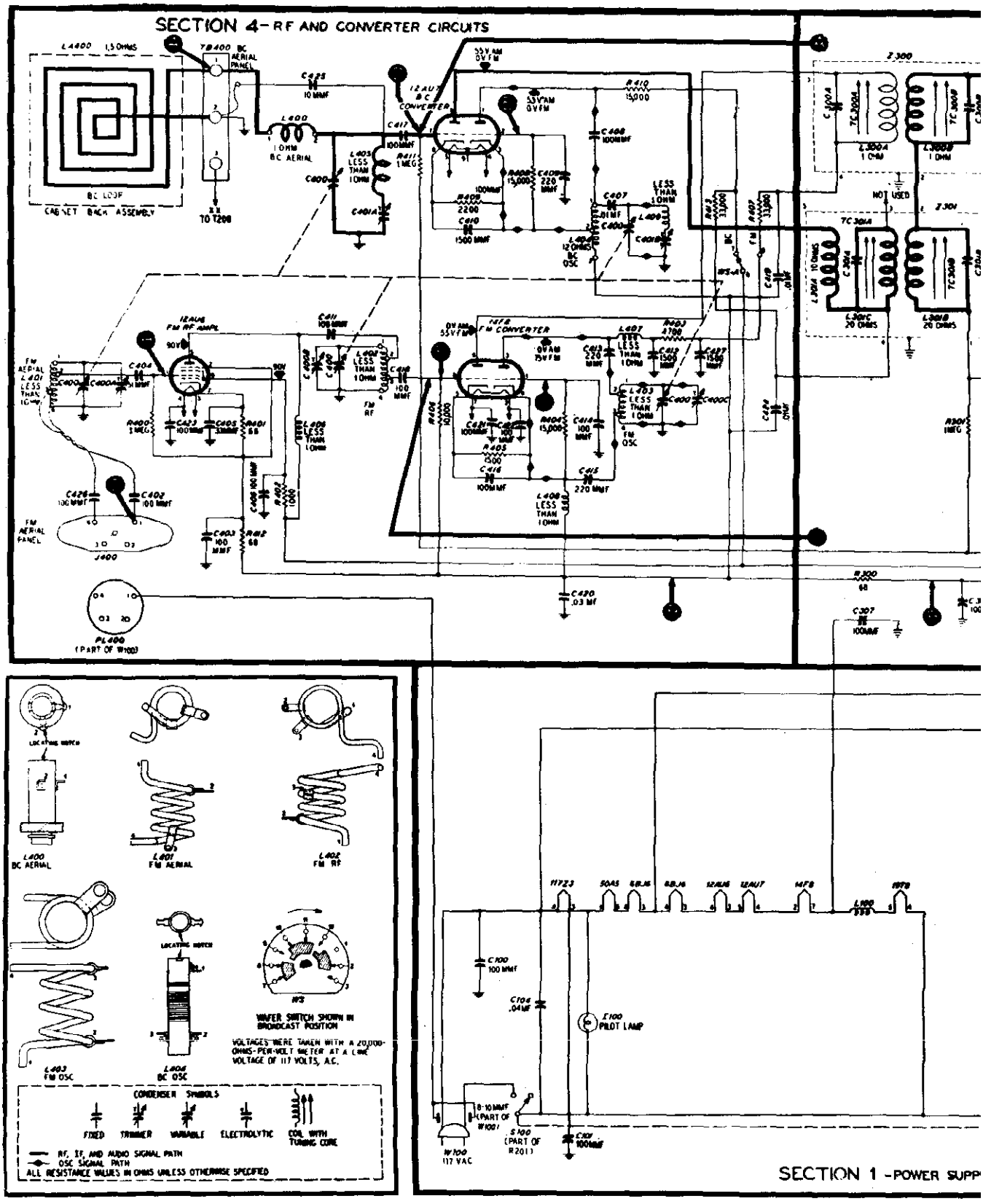
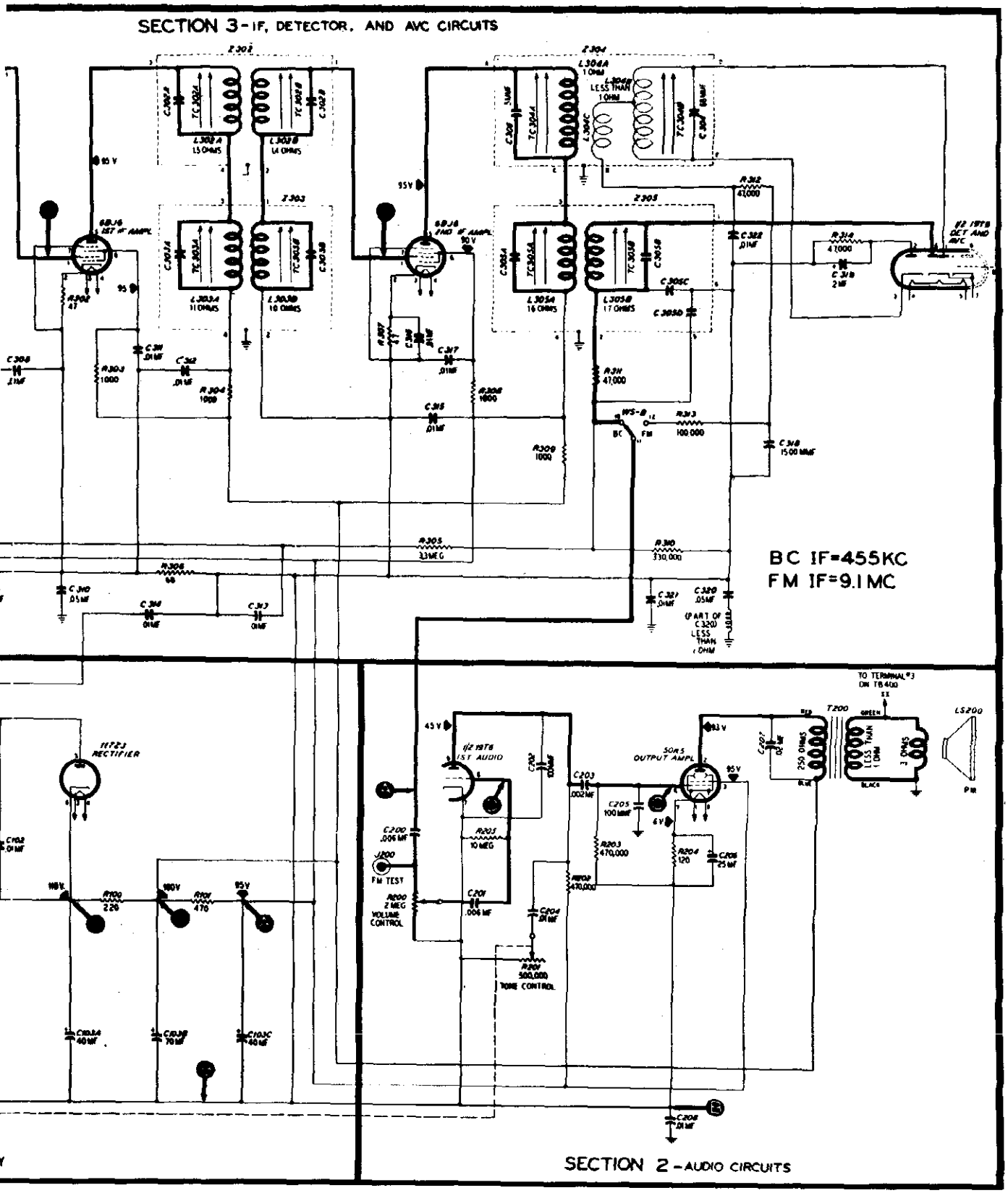


Figure 6. Philco Radio Model 48-472, Code 122,



Sectionalized Schematic Diagram, Showing Test Points

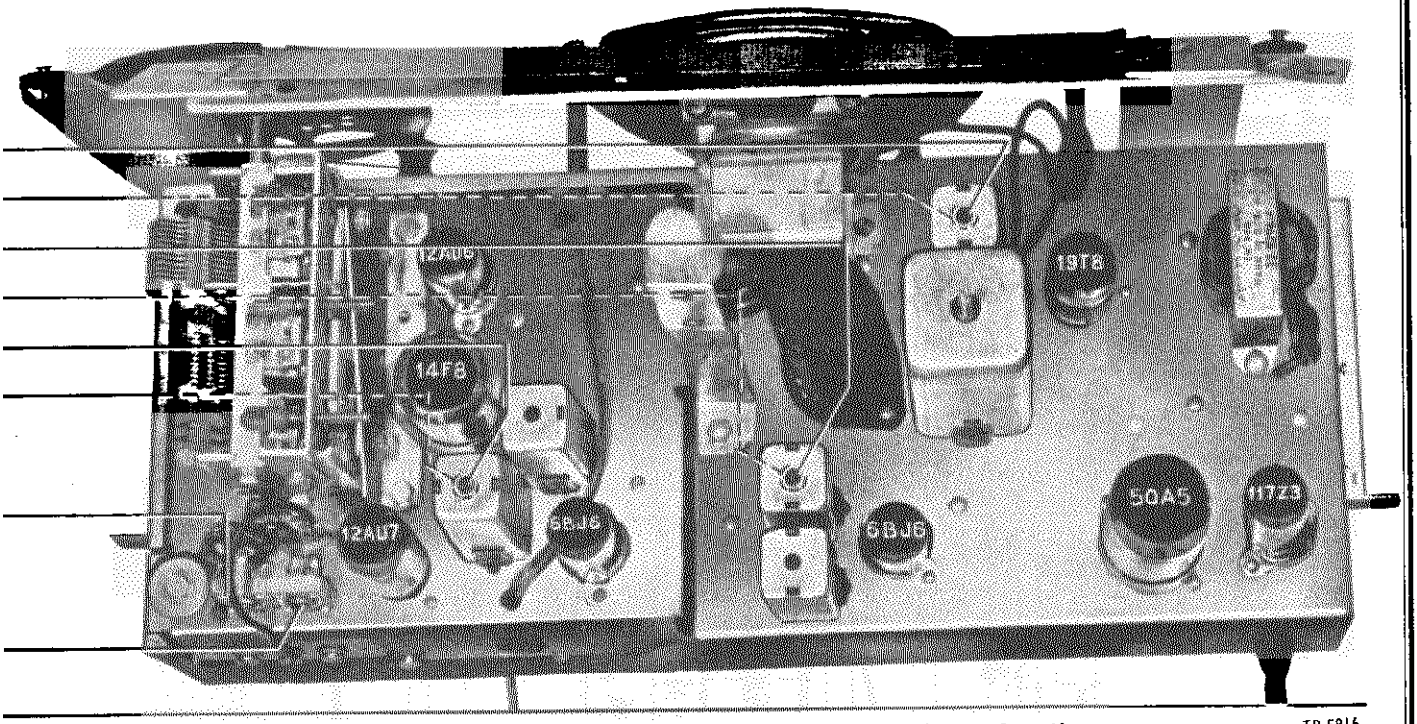


Figure 8. Top View, Showing AM Trimmer Locations

TP 5816

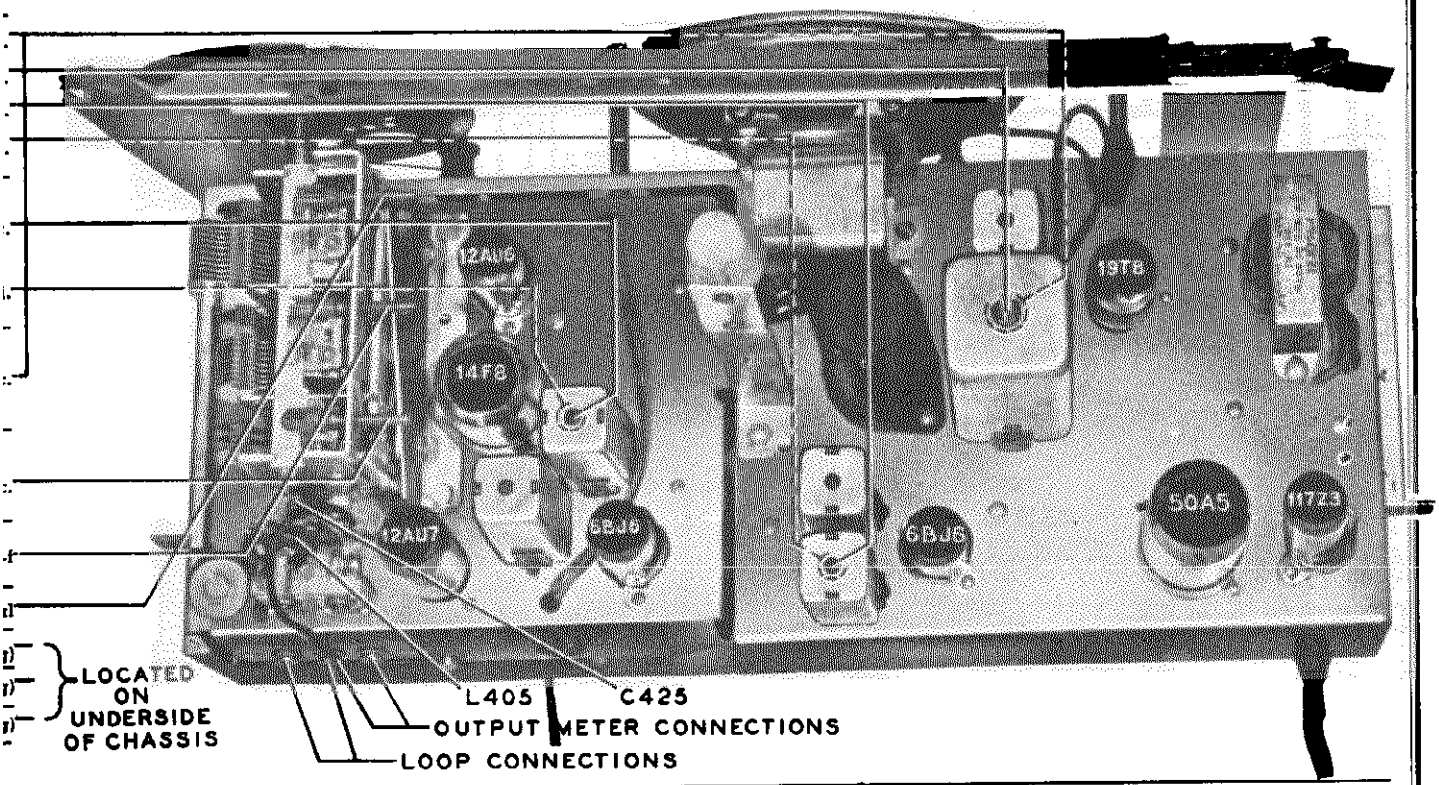


Figure 9. Top View, Showing FM Trimmer Locations

TP-5816

ALIGNMENT OF AM CIRCUITS

Make alignment with loop aerial connected to radio. The AM alignment should be completed before the FM alignmer is made.

DIAL POINTER—With tuning condenser fully meshed, adjust dial pointer to coincide with index mark at low-frequency en of dial. See "CALIBRATING DIAL BACKPLATE" for method of measuring backplate for index and calibration marks.

OUTPUT METER—Connect between terminal 3 (voice-coil connection) of aerial terminal panel and TB400 and chassis.

AM SIGNAL GENERATOR—Connect as indicated in chart. Use modulated output.

OUTPUT LEVEL—During alignment, signal-generator output must be attenuated to maintain radio output below 1.25 volts, read on output meter.

CONTROLS—Set volume control to maximum, turn tone control fully counterclockwise, and set band switch to broadcast positio

ALIGNMENT OF FM CIRCUITS

Align the AM Circuits first

OUTPUT METER—Connect between terminal 3 (voice-coil connection) of aerial terminal panel TB400 and chassis.

ALIGNMENT INDICATOR—Connect negative lead of a 20,000-ohms-per-volt, d-c voltmeter to pin 2 of 19T8 tube; conne positive lead to B–, test point B in Section 2. Use 10-volt range.

AM SIGNAL GENERATOR—Generator must have sufficient output to give a reading of at least 8.5 volts on alignment indicato Connect generator ground lead to B–, test point B; connect output lead as indicated in chart. Use modulated output.

CONTROLS—Same as for alignment of AM circuits, except set band switch to FM position. Allow radio and signal generat to warm up for at least 15 minutes before making alignment.

NOTE: Check resonance of coils L401, L402, and L403 by inserting each end of a powdered-iron tuning core, such as Phil Part No. 56-6100, in the coils. If the signal strength increases when the iron end is inserted, compress the turns slightly. If t signal strength increases when the threaded brass end is inserted, spread the turns slightly. If the signal strength decreases wh either the iron or the brass end is inserted, no further adjustment is necessary. Do not spread or compress turns of coil e cessively; only a small change is required at these high frequencies.

SYMBOLIZATION

The components in the radio circuit are symbolized according to the types of parts and the sections of the radio in which the parts are located. The prefix letter of the symbol designates the type of part as follows:

C —condenser	LS—loud-speaker	W —line cord
I —pilot lamp	R —resistor	WS—wafer switch
J —socket	S —switch	Z —electrical assembly
L —choke or coil	T —transformer	
LA—loop aerial	TB—terminal panel	

The number of the symbol, except when the number is less than 100, designates the section in which the part is located, as follows:

100-series components are in Section 1, the power supply
200-series components are in Section 2, the audio circuits
300-series components are in Section 3, the i-f, detector, and a-v-c circuits
400-series components are in Section 4, the r-f and converter circuits

CALIBRATING DIAL BACKPLATE

When the radio chassis has been removed from the cabinet, dial calibration and alignment points may be marked on the dial backplate below the pointer.

The method of measuring for these points is illustrated in figure 7. Hold a ruler against the dial backplate, with the start of the ruler at the reference line shown, and mark pen dots at the proper points for the required frequency setting

After installation of the chassis in the cabinet, the d pointer should be moved to coincide with the index mark the dial. Coincidence of the pointer and index mark shou occur with the tuning condenser fully meshed.

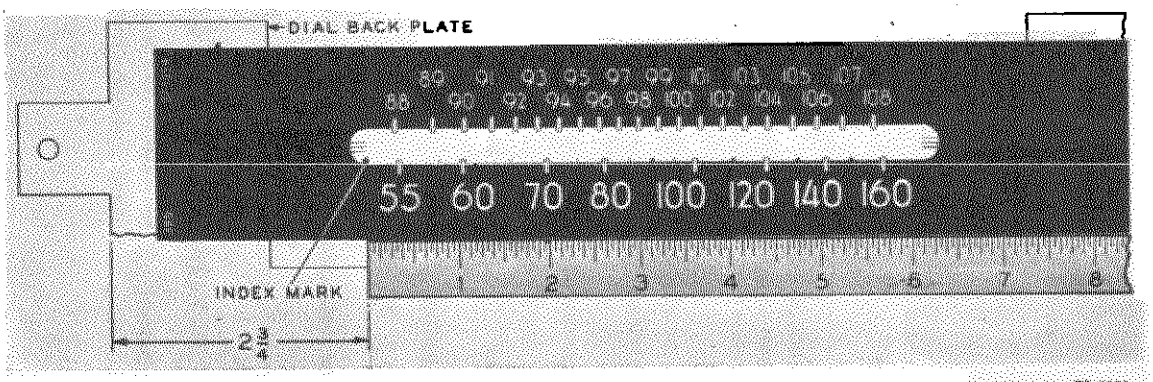
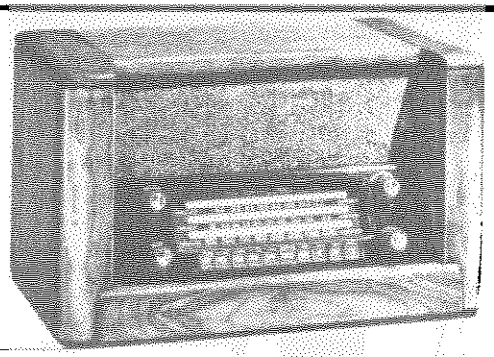


Figure 7. Dial-Backplate Calibration Measurements



CABINET	Walnut-finish table model
CIRCUIT	Nine-tube superheterodyne
FREQUENCY RANGES	
Broadcast	540 — 1720 kc
Short wave	9.3 — 15.5 mc
FM	88 — 108 mc
POWER OUTPUT	3 watts
PUSH BUTTONS	Ten: One for OFF, six for broadcast-station selection, and three for band selection.
OPERATING VOLTAGE	105 to 120 volts, 60 cycles, A.C.
POWER CONSUMPTION	80 watts
AERIALS	Built-in cabinet loop, a-c line aerial (FM), or external aerial.
INTERMEDIATE FREQUENCIES	
AM	455 kc
FM	9.1 mc
PHILCO TUBES USED (9)	7W7, 7F8, 7H7 (2), 7B7, 6SQ7GT, FM1000, 6V6GT, 5Y3GT
PILOT LAMPS (2)	6—8-volt, Part No. 34-2040

PRELIMINARY CHECKS

Before starting the trouble-shooting procedure, the following steps are recommended:

1. Before connecting the radio to a source of power, inspect both top and bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, or other obvious sources of trouble.

2. Measure the resistance between B+ (pin No. 2 of 5Y3GT rectifier tube) and the radio chassis. When the ohmmeter test leads are connected in the proper polarity, the highest resistance reading will be obtained. If this reading is lower than 50,000 ohms, check condensers C104, C102C, C105, C102A, C102B, C103, and C416 for leakage or shorts.

SETTING PUSH BUTTONS

1. Connect the output meter between terminal No. 3 on aerial terminal panel and radio chassis.

2. Turn the radio volume control about halfway on, bass tone control fully counterclockwise, and treble tone control fully clockwise.

3. Couple the signal generator loosely through a coil of wire to the radio loop aerial (see NOTE under AM alignment chart).

4. Turn on the power, and allow the radio to warm up for 15 minutes before starting the adjustments.

5. Starting with the lowest frequency desired, set the signal generator (modulation on) to the desired frequency, push the left-hand station-selector button, and adjust the associated oscillator tuning core and aerial trimmer condenser (marked on rear of chassis) for maximum indication on the output meter. Reset the signal-generator frequency, and repeat the procedure for each remaining station-selector button.

6. Turn off the signal generator and make a final adjustment of all tuning cores and trimmer condensers while listening to the stations for which the adjustments are being made.

CIRCUIT DESCRIPTION

Philco Radio, Model 48-482, is a nine-tube superheterodyne radio, providing reception on the standard-broadcast band, 540 to 1720 kc., the short-wave range between 9.3 and 15.5 mc., and the FM band, 88 to 108 mc.

There are ten push buttons; six for instant tuning of stations in the standard-broadcast band, three for selecting standard broadcast, short wave, or FM band, and one for power OFF (any one of the other nine buttons turns on the radio power).

A low-impedance loop within the cabinet is used for the standard-broadcast and short-wave bands, and a built-in a-c-line aerial is provided for the FM band. In areas where FM signals are weak, an outdoor dipole aerial (Philco Part No. 45-1462) will provide additional pickup.

A tuned r-f amplifier stage, using a type 7W7 high-frequency pentode tube, is provided for FM reception. A 7F8 high-frequency double-triode tube is employed as a converter.

Three transformer-coupled i-f stages are used. The first, third, and fourth i-f transformers have two sets of windings; one set is tuned to 455 kc. for AM operation, and the other to 9.1 mc. for FM operation. The second i-f transformer uses an untuned-primary, tuned-secondary combination for AM operation, to prevent instability; the single primary winding is tuned to 9.1 mc., one secondary is tuned to 9.1 mc., and the other to 455 kc. Switching of the windings, to attenuate undesired beat-frequencies, is necessary only in the first i-f transformer. One 7B7 and two 7H7 high-transconductance pentodes are used in the i-f stages.

The new Philco advanced FM detector circuit, employing the new FM1000 tube of special design, is used for FM reception.

One diode of the 6SQ7GT tube provides detection and a-v-c action for AM reception; the other diode develops a-v-c voltage for FM operation. The high-mu-triode section of this tube functions as the first audio stage; this stage is resistance-coupled to the 6V6GT beam-pentode output tube. The output stage is transformer-coupled to a five-by-seven inch, oval, electrodynamic speaker. Inverse feedback is obtained by connecting the secondary of the output transformer through resistor R208 to the junction of the volume control, R200, and the 4.7-ohm resistor R201.

SECTION 1 – TROUBLE SHOOTING

CAUTION

Do not turn on radio power with speaker disconnected, as this will cause damage to the set.

With the BC push button depressed, check the voltage between the chassis (test point C) and each of the remaining test points indicated in the chart. The voltages given were measured with a 20,000-ohms-per-volt meter, using a power source of 117 volts, 60 cycles, a.c. Any voltage may be considered normal if it is within ±10% of the indicated value.

STEP	TEST POINTS	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	B to C D to C E to C F to C	200 volts 187 volts Negative 13 volts Negative 1.1 volts	Error greater than 10%	Trouble within this section. Isolate by following tests.
2	A to C	250 volts	No voltage Low voltage High voltage	Defective 5Y3GT tube or T100. Shorted C104, C102C, C103, C105, or C416. Defective 5Y3GT tube or T100. Leaky C104, C102C, C103, C105, or C416. Shorted C102A, C102B, or C106. Open L100. Shorted L100. Open R103, R104, or T200.
3	B to C	200 volts	No voltage Low voltage High voltage	Shorted C102A. Open R100. Leaky C102A. Off-value R100. Off-value R100.
4	D to C	187 volts	No voltage Low voltage High voltage	Shorted C102B. Open R101. Leaky C102B. Off-value R101. Off-value R101.
5	E to C	Negative 13 volts	Error greater than 10%	Shorted or leaky C106. Open or off-value R102, R103, or R104. Open, shorted, or partially shorted L100.
6	F to C	Negative 1.1 volts	Error greater than 10%	Open or off-value R104.

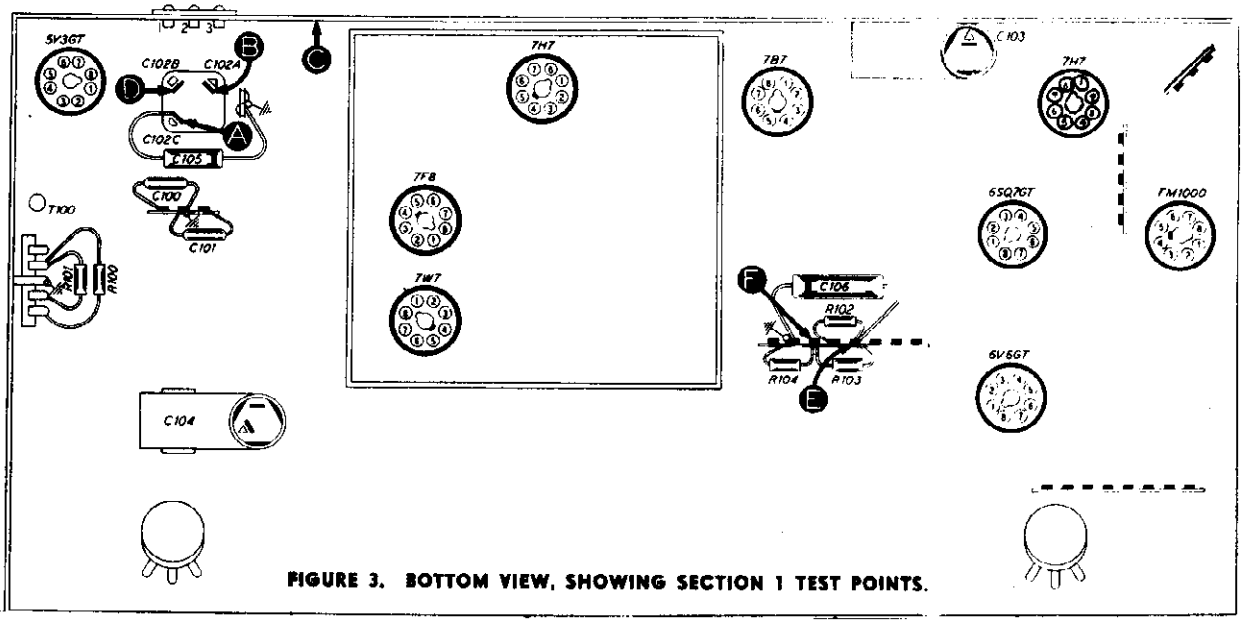


FIGURE 3. BOTTOM VIEW, SHOWING SECTION 1 TEST POINTS.

SECTION 2 – TROUBLE SHOOTING

For all tests in this section, use an audio-frequency signal generator. Connect the generator ground lead to the radio chassis, test point C; connect the output lead through a .1-mf condenser to the test points indicated.

Set the volume control at maximum, treble tone control clockwise, and bass tone control counterclockwise; depress the BC push button. Adjust the signal-generator output as required for each step.

If the "NORMAL INDICATION" is obtained in the first step, proceed to the tests in Section 3; if not, isolate and remedy the trouble in this section.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	D	Loud, clear signal with weak signal input	Trouble within this section. Isolate by following tests.
2	A	Loud, clear signal with strong signal input	Defective 6V6GT tube or LS200. Shorted or leaky C205. Open or shorted T200. Open R205 or C204. Shorted or leaky C200 or C201.
3	B	Loud, clear signal with weak signal input	Defective 6SQ7GT (triode section). Open R204 or R202. Leaky or shorted C200.
4	D	Same as step 3	Open or off-value R200. Open C202.

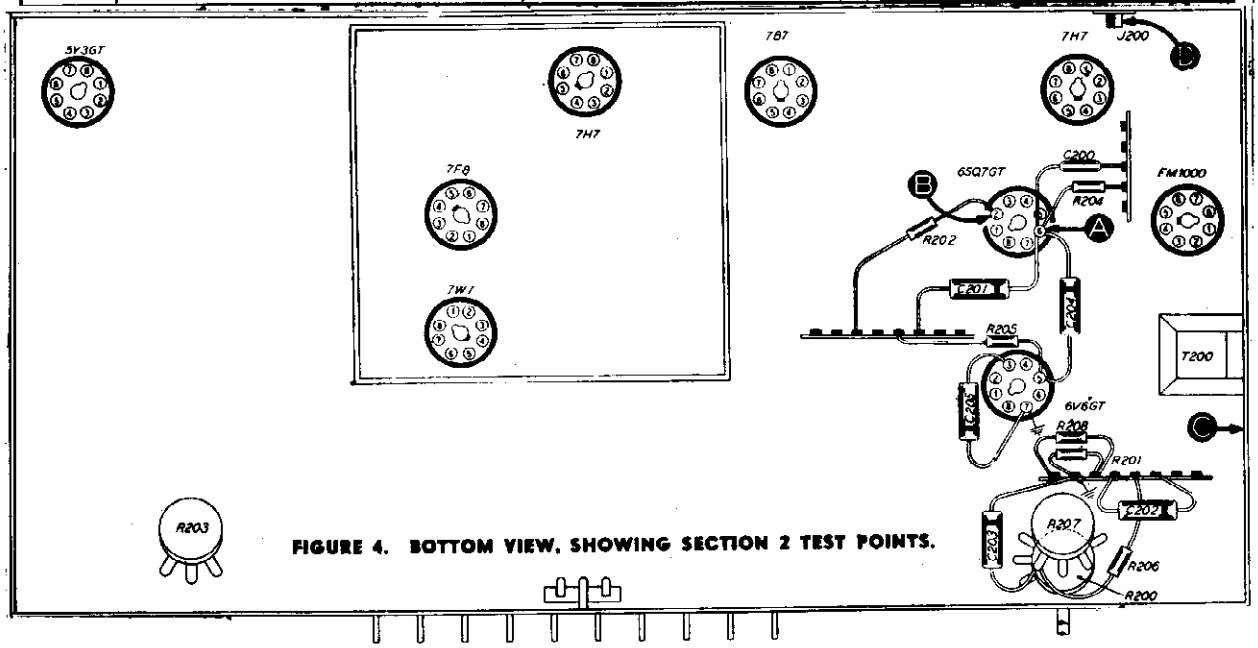


FIGURE 4. BOTTOM VIEW, SHOWING SECTION 2 TEST POINTS.

SECTION 3 – TROUBLE SHOOTING (FM DETECTOR)

The tests in this section are made with an audio-frequency generator, an AM r-f signal generator, and a 20,000-ohms-per-volt voltmeter. Use a .1-mf condenser in series with the output lead of each generator.

In Step 1, unmodulated r-f signals, together with d-c voltage readings, are used to check the response of the detector circuit to FM by observing the voltage drops across the audio-load resistor R302 for different input frequencies within the i-f range of the detector. In Step 3, the oscillator section of the FM detector is made inoperative, thereby converting the circuit to an AM detector, and making it possible to check certain components with an AM signal.

The tests in this section will not indicate the condition of alignment of the detector unless the circuit is extremely misaligned.

NOTE: In Steps 1 and 3, the AM signal-generator output must be at least .5 volt. If the output is below this value, instead of connecting to test point D, the generator lead may be connected in Section 4, to test point A or B, depending upon the maximum output of the generator used. The tests made from these points will be effective if the last i-f stages are trouble free. If abnormal indications are obtained in BOTH Steps 1 and 3, the i-f stages may be at fault.

Set the radio controls as follows: Volume control at maximum; bass control fully counterclockwise; treble control fully clockwise; FM push button depressed.

If the "NORMAL INDICATION" is obtained in the first test, proceed to the tests for Section 4; if not, isolate and remedy the trouble in this section.

SECTION 3 – (Continued)

STEP	PROCEDURE	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	Connect positive d-c voltmeter lead to test point A, negative lead to test point B, with meter on 50-volt range. Connect AM generator to test point D; turn off modulation and adjust generator output to approximately .5 volt (see NOTE above). Swing generator frequency from approximately 80 kc above to 80 kc below 9.1 mc.	Approximately 15 volts for 9.1-mc signal (or no signal); 8 volts for 80 kc above 9.1 mc; 23 volts for 80 kc below 9.1 mc.	Trouble within this section. Isolate by the following tests.
2	Connect audio-signal generator to test point E; adjust for high generator output.	Loud, clear signal output from radio.	Defective Z300, FM1000, or PB 10. Shorted C305. Open C304 or R303.
3	Short test point F (pin No. 2, FM1000) to chassis. Connect r-f generator output to test point D (see NOTE above). Use modulated signal. Set generator for 9.1 mc and maximum output.	Loud, clear signal output from radio.	Defective FM1000 tube. Shorted or leaky C306 or C307. Open R304, L300, or R302.
4	Remove short from test point F. Connect negative lead of d-c voltmeter to test point F through a 50,000-ohm isolating resistor; connect positive lead to test point C (chassis). Set meter to 10-volt range.	Approximately 2.5 volts negative (osc. grid voltage).	Defective FM1000 tube, or Z300. Open L300 or C301. Shorted or leaky C303. Open R306. Open or off-value R305 or R301.

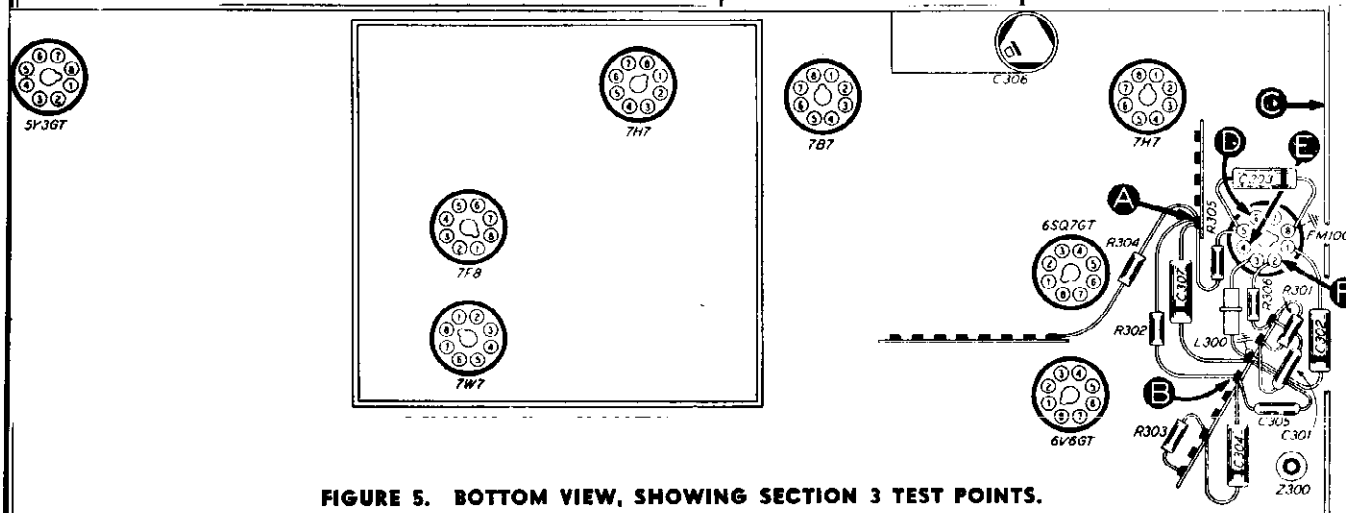


FIGURE 5. BOTTOM VIEW, SHOWING SECTION 3 TEST POINTS.

SECTION 4 – TROUBLE SHOOTING

AM CIRCUITS

For the AM circuit tests in this section, use an AM r-f signal generator with frequency set to 455 kc. Connect the signal-generator ground lead to the radio chassis, test point C; connect the output lead through a .1-mf condenser to the test points indicated. Depress the BC push button (PB 8), set the radio volume control at maximum, the bass tone control fully counterclockwise, and the treble control fully clockwise. Adjust the signal-generator output as required for each step.

If the "NORMAL INDICATION" is obtained in the first step, proceed to the tests for FM CIRCUITS in this section, or to Section 5; if not, isolate and remedy the trouble in this section.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	E	Clear signal with weak signal input.	Trouble within this section. Isolate by the following tests.
2	A	Clear signal with strong signal input.	Defective or misaligned Z403. Open R416, R418, R419, R411, R414, R415, or C424. Defective 6SQ7GT or 7H7 tube. Shorted, open, or leaky C418, C419 or C420. Shorted C425.
3	B	Clear signal, louder than step 2.	Defective or misaligned Z402. Defective 7B7 tube. Open R405, R406, R409, or R410. Shorted C411 or C414. Shorted, leaky or open C413 or C415.
4	D	Clear signal, louder than step 3.	Defective or misaligned Z401. Defective 7H7 tube. Open R402, R403, R404, or R407. Shorted C407. Shorted, open or leaky C408 or C409.
5	E	Clear signal, approx. same as step 4.	Defective or misaligned Z400. Open R401.

FM CIRCUITS

For the FM circuit tests in this section, short test point F, in Section 3, to the radio chassis, to permit use of an AM signal. Connect the AM signal-generator ground lead to the radio chassis, test point C; connect the output lead through a .1-mf condenser to the test points indicated in the chart. With the exception of the i-f switch, tubes, and transformers (all of which may function properly at 455 kc but not at 9.1 mc) and the parts specified in the chart, the parts in this section which are normal on AM will be normal on FM.

Set the r-f signal generator to 9.1 mc, with modulation ON. Depress the FM push button (PB 10). Set the radio volume control at maximum, the bass tone control fully counterclockwise, and the treble control fully clockwise. Adjust the signal-generator output as required for each step.

SECTION 4 — (Continued)

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	E	Loud, clear signal with weak signal input.	Trouble within this section. Isolate by the following tests.
2	A	Clear signal with strong signal input.	Defective or misaligned Z403. Defective 7H7 or 6SQ7GT (diode section) tube. Shorted or open C423.
3	B	Loud, clear signal with moderate signal input.	Defective or misaligned Z402. Defective 7B7 tube, or PB 10. Open C414.
4	D	Loud, clear signal with weak signal input.	Defective or misaligned Z401. Defective 7H7 tube. Open C407.
5	E	Loud, clear signal with weak signal input.	Defective or misaligned Z400.

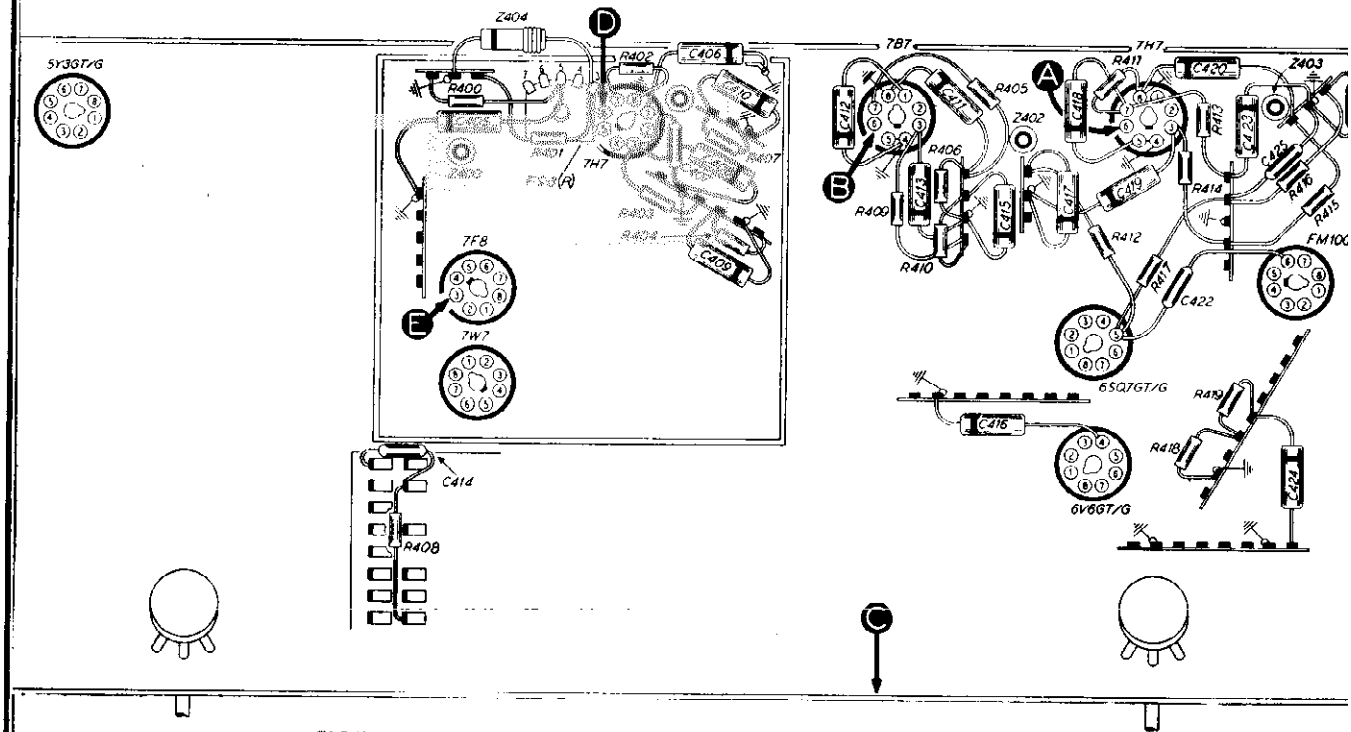


FIGURE 6. BOTTOM VIEW, SHOWING SECTION 4 TEST POINTS.

SECTION 5 – TROUBLE SHOOTING AM CIRCUITS

For the signal tests, use an r-f signal generator with amplitude-modulated output. Connect the signal-generator ground lead to the radio chassis, test point C; connect the output lead through a .1-mf condenser to the test points indicated. Turn the radio volume control to maximum, treble tone control fully clockwise, and bass tone control fully counterclockwise. Set the signal generator for weak generator output.

OSCILLATOR TESTS

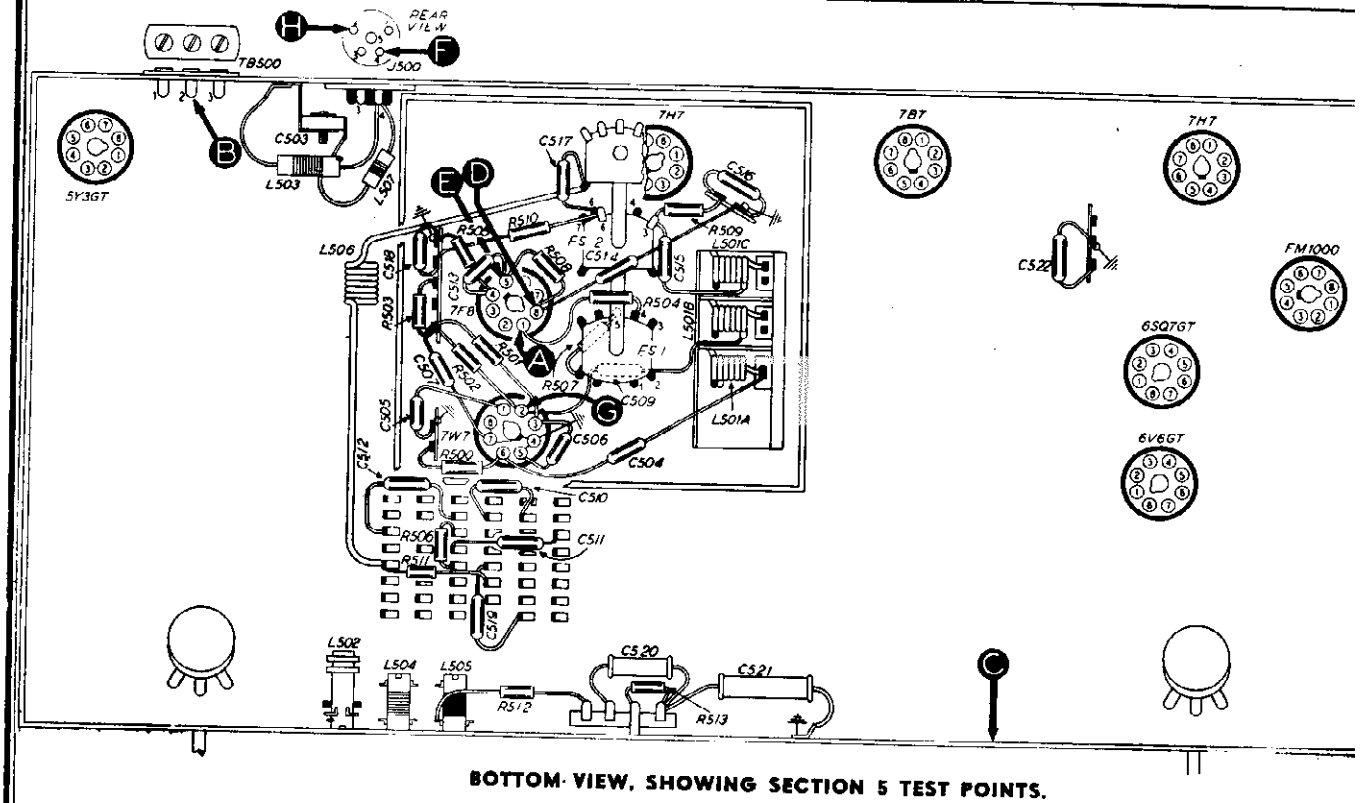
For steps 5, 8, and 10, connect the positive lead of a 20,000-ohms-per-volt meter to test point E, and the prod end of the negative lead through a 100,000-ohm isolating resistor to test point D. Read the voltage on the 10-volt range. Absence of negative voltage at any dial or band position indicates that the oscillator is not functioning properly; check the parts listed in the chart for the oscillator tests.

STEP	TEST POINT	SIGNAL-GEN. SETTING	PUSH BUTTON OR TUNING CONTROL	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	B	Vary through range of each button	Depress, in order, PB 2 to PB 7	Loud, clear signal when each button is depressed	Trouble within push-button band. Isolate by steps 4, 5, and 6.
2	B	1000 kc	Depress BC push button (PB 8). Tune radio to signal	Loud, clear signal	Trouble within BC band. Isolate by steps 7 and 8.
3	F	12 mc	Depress SW push button (PB 9). Tune radio to signal	Loud, clear signal	Trouble in short-wave section. Isolate by steps 9 and 10.
4	A	Adjust to frequency of push button	Depress PB 7	Loud, clear signal	Defective 7F8 tube or FS 1 (F). Open R505, R400, or C513. Shorted C405.
5	D to E (see OSC. TESTS)		Depress, in order, PB 2 to PB 7	Negative voltage	No voltage for any one push button: Defective coil (L500A to L500F) or push button. No voltage for all push buttons: Defective 7F8 tube, FS 2, PB 9, or PB 8. Open C517, C520, C521, or C514. Open R508, R510, R513, L506, or R511. Shorted C515, C516, C518, or C522.
6	B	Vary through range of each button	Depress, in order, PB 2 to PB 7	Loud, clear signal	Defective L502. Shorted C502A, C500A to C500F. Open C511, R504, or R507.
7	B	1000 kc	Depress BC push button PB 8. Tune to signal from generator	Loud, clear signal	Defective C501, or PB 8.
8	D to E (see OSC. TESTS)		Depress BC push button PB 8. Rotate radio tuning control through entire range	Negative voltage over entire tuning range	Defective L505. Open R512.
9	F	12 mc	Depress SW push button PB 9. Tune to signal from generator	Loud, clear signal	Defective L503 or L507. Shorted C503. Open C510.
10	D to E (see OSC. TESTS)		Depress SW push button PB 9. Rotate tuning control through entire range	Negative voltage over entire tuning range	Defective 7F8 tube, or L504. Shorted C502C. Open C519.

FM CIRCUITS

Before proceeding with the FM circuit tests, connect test point F, in Section 3, to the radio chassis. Follow the same general procedure gi for AM tests.

STEP	TEST POINT	SIGNAL-GEN. SETTING	PUSH BUTTON OR TUNING CONTROL	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	H	100 mc	Depress FM push button PB 10. Tune to signal	Loud, clear signal	Trouble in FM band. Isolate b following tests.
2	D to E (See OSC. TESTS under AM CIRCUITS)		Depress FM push button PB 10. Rotate tuning control through entire range	Negative voltage over entire range	Defective 7F8 tube, FS 2 (F), L501C C501, or PB 10. Open R509. Shor ed C515 or C501C.
3	G	100 mc	Depress FM push button PB 10. Tune to signal	Loud, clear signal	Defective L501B, C501, or FS 1 (F Open or shorted C509. Shorte C501B.
4	H	Same	Same	Loud, clear signal	Defective 7W7 tube, L501A, C501 Open R500, R502, or R503. Shorte C506, C501A, or C507.



BOTTOM VIEW, SHOWING SECTION 5 TEST POINTS.

CALIBRATING DIAL BACKPLATE

When the radio chassis has been removed from the cabinet, dial calibration and alignment points may be marked on the dial backplate below the pointer. The proper locations for the points may be determined as follows:

1. Hold a rule against the dial backplate as shown in figure 1.

2. Mark pencil dots at the proper points fo the index mark and the desired frequency set tings.

With the tuning gang fully meshed, the dia pointer on the drive cord should be adjusted t coincide with the index mark.

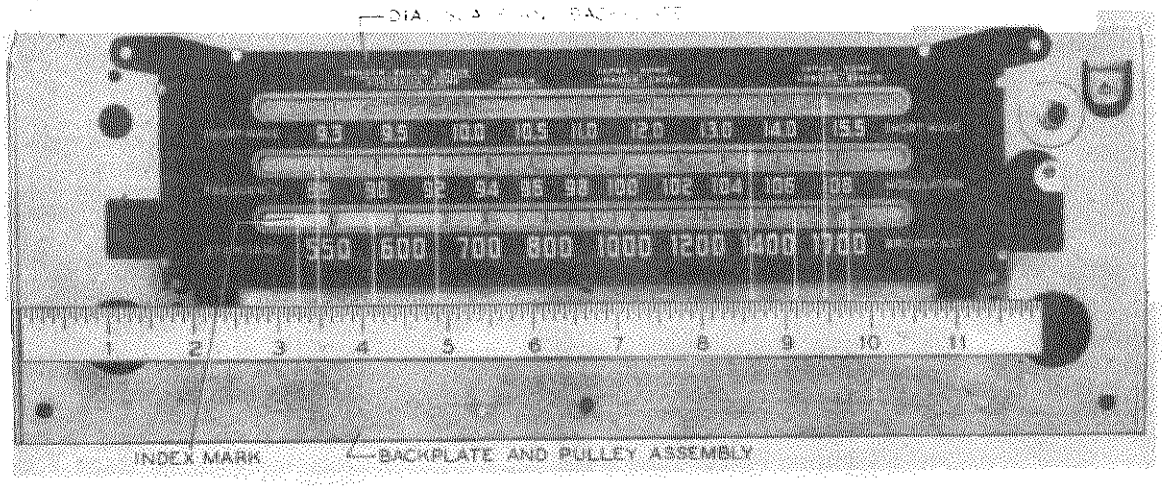


FIGURE 1. DIAL BACKPLATE CALIBRATION MEASUREMENTS. TP-2826

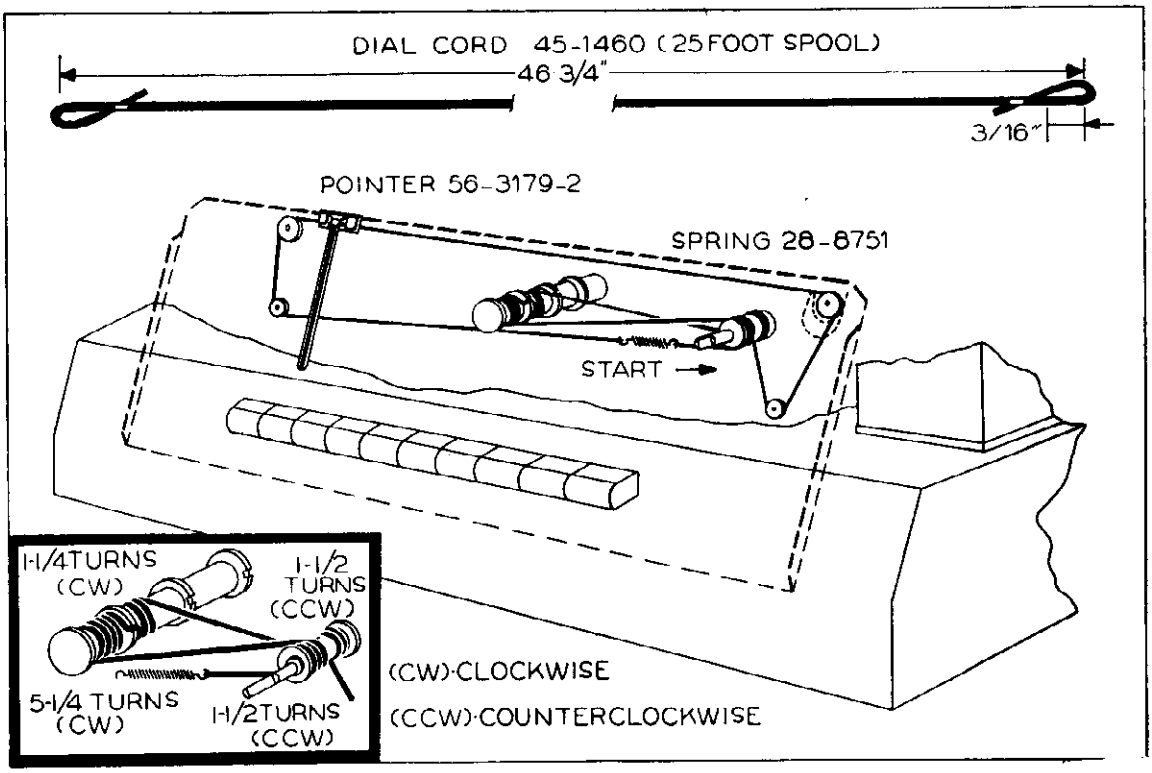


FIGURE 2. DRIVE-CORD INSTALLATION DETAILS.

ALIGNMENT PROCEDURE

ALIGNMENT OF AM CIRCUITS

When the complete AM and FM alignment is to be made, the AM alignment should be made FIRST; however, if FM alignment is not required, the AM alignment alone may be made.

OUTPUT METER: Connect between terminal No. 3 (voice-coil connection) of aerial terminal panel and chassis.

AM SIGNAL GENERATOR: Connect ground lead to radio chassis, and output lead as indicated in chart.

DIAL POINTER: With tuning condenser fully closed, the dial pointer must coincide with the index mark at the low-frequency end of the scale. See CALIBRATING DIAL BACKPLATE, page 3.

CONTROLS: Set volume control at maximum, bass tone control fully counterclockwise, and treble tone control fully clockwise; set the radio band push button, radio dial, and signal-generator dial as indicated in the chart.

OUTPUT LEVEL: During alignment, the signal-generator output must be attenuated to maintain the radio output below 1.5 volts, as indicated by the output meter.

AM ALIGNMENT CHART

SIGNAL GENERATOR			RADIO			
STEP	CONNECTIONS TO RADIO	DIAL SETTING	BAND PUSH BUTTON	DIAL SETTING	SPECIAL INSTRUCTIONS	AD TRI
1	Through .1-mf condenser to stator of ant. section of tuning gang	455 kc	BC	1700 kc	Adjust each trimmer, in order, for maximum output. Do not repeat adjustments.	
2	Loosely coupled with loop (see Note below)	15 mc	SW	15 mc	Adjust for maximum output. Check for image at 14.1 mc.	
3	Same	15 mc	SW	15 mc	Adjust for maximum output (rock tuning control).	
4	Same	1700 kc	BC	1700 kc	Adjust for maximum output.	
5	Same	1500 kc	BC	1500 kc	Adjust for maximum output.	
6	Same	580 kc	BC	580 kc	Adjust for maximum output (rock tuning control).	
7	Repeat steps 4, 5 and 6 in order until no further increase is noted. Then repeat step 4.					

NOTE: Make up a six-to-eight-turn, 6-inch diameter loop, using insulated wire: connect to the signal-generator leads and place near the radio loop.

FM ALIGNMENT CHART

SIGNAL GENERATOR			RADIO		
STEP	CONNECTIONS TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	AL TRI
1	To terminal 3 of L501B (figure 10)	9.1mc (Mod. on)	Gang fully closed	Connect jumper between pin No. 2 of FM1000 tube and chassis (Note 1). Connect loading network (Note 2) between top of padder C403B and chassis (Note 3).	
2	Same	Same	Same	Connect loading network between pin No. 2 (blue lead) of third i-f tube and chassis.	
3	Same	Same	Same	Connect loading network between pin No. 6 (green lead) of third i-f tube and chassis.	
4	Same	Same	Same	Connect loading network between pin No. 2 (blue lead) of second i-f tube and chassis.	
5	Same	Same	Same	Connect loading network between pin No. 6 (green lead) of second i-f tube and chassis.	
6	Same	Same	Same	Connect loading network between pin No. 2 (blue lead) of first i-f tube and chassis.	
7	Same	Same	Same	Leave loading network connected as in step 6.	
8	To grid (pin No. 6) of third i-f amplifier	9.1 mc (Mod. off)	Same	Remove loading network, and remove jumper from pin No. 2 of FM1000 tube and chassis. Connect jumper between pin No. 4 (blue lead) of FM1000 tube and junction of R302 and red lead of Z300. Adjust trimmer for zero beat.	
9	Same as step 8	Same	Same	Remove jumper used in step 8. Adjust trimmer for zero beat (see Note 4).	
10	To terminal No. 2 of J500 (see Note 5)	105 mc (Mod. on)	105 mc	Connect jumper between pin No. 2 of FM1000 tube and chassis. Adjust for maximum output.	
11	Same as step 10	88 mc	88 mc	Adjust coil L501C for maximum output (Note 6).	
12	Repeat steps 10 and 11 until no further improvement is noted.				
13	Same as step 10	105 mc	105 mc	Adjust for maximum output (rock tuning control).	
14	See Note 7	105 mc	105 mc	Adjust for maximum output.	
15	Same as step 14	92 mc	92 mc	Adjust coil L501B, then L501A, for maximum output.	
16	Repeat steps 13, 14 and 15 until no further improvement in sensitivity can be obtained.				

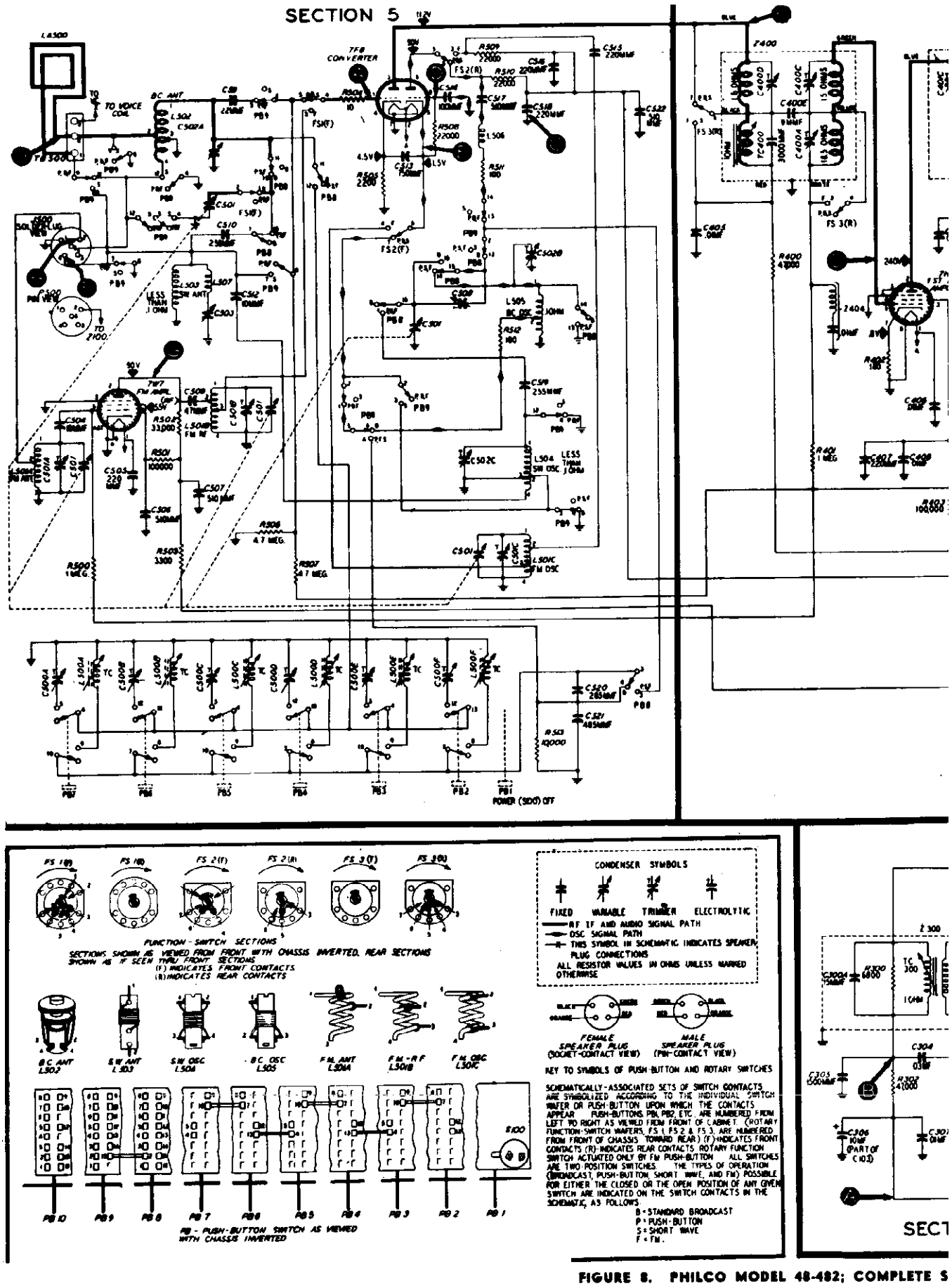
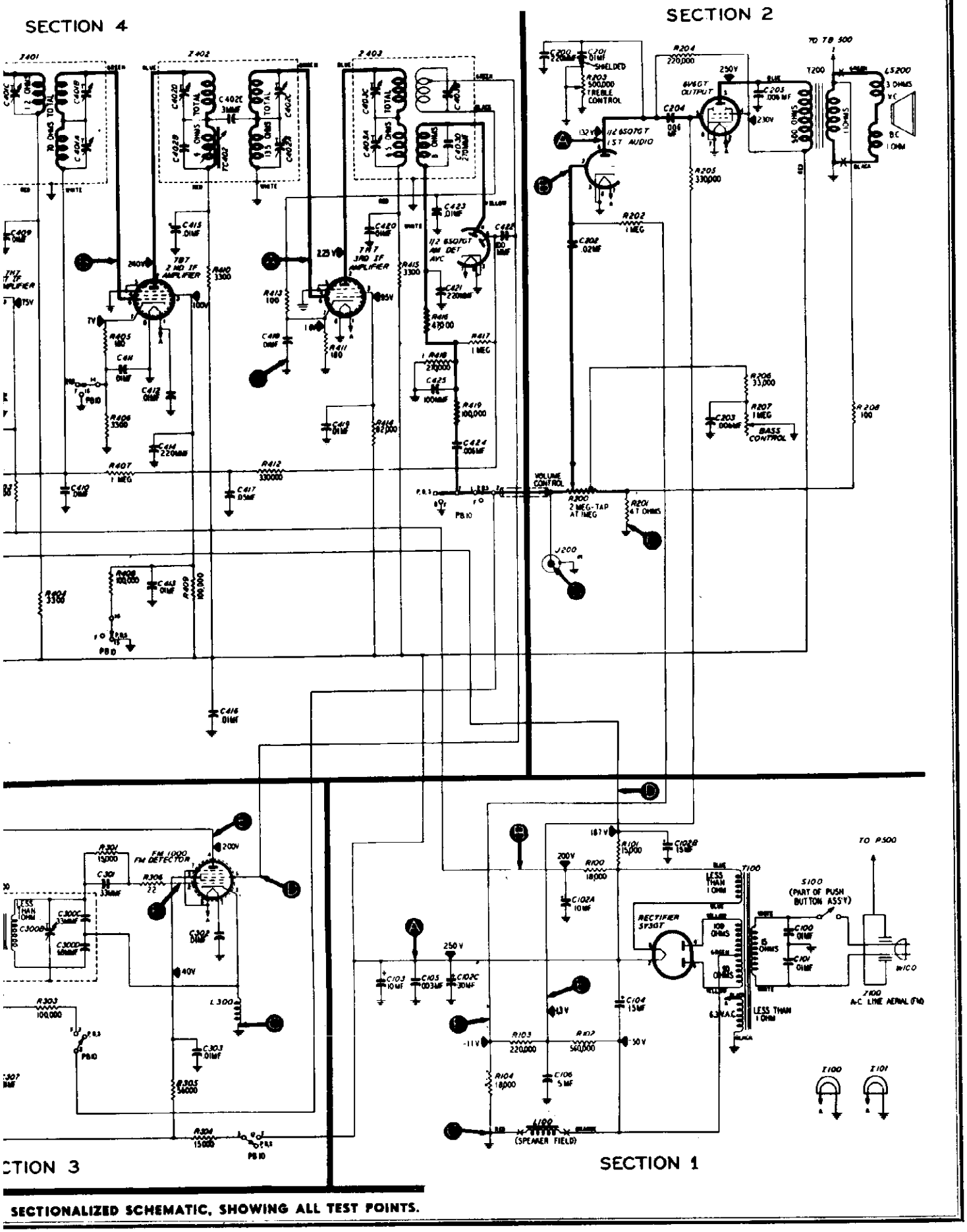


FIGURE 8. PHILCO MODEL 48-482; COMPLETE S

CO CORP. MODEL 48-482



SECTIONALIZED SCHEMATIC, SHOWING ALL TEST POINTS.

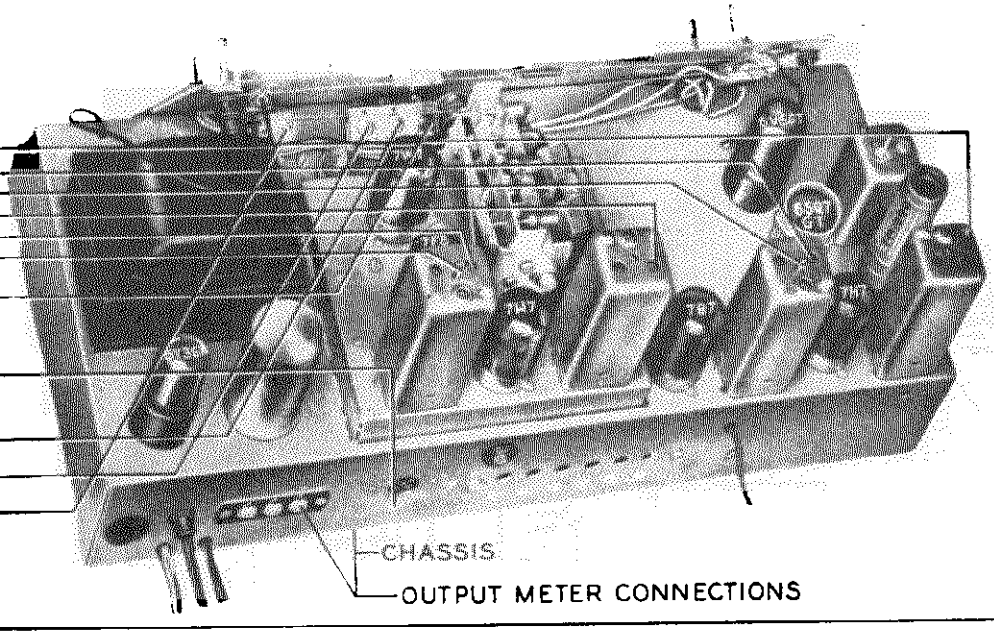


FIGURE 9. CHASSIS VIEW, SHOWING AM TRIMMER LOCATIONS.

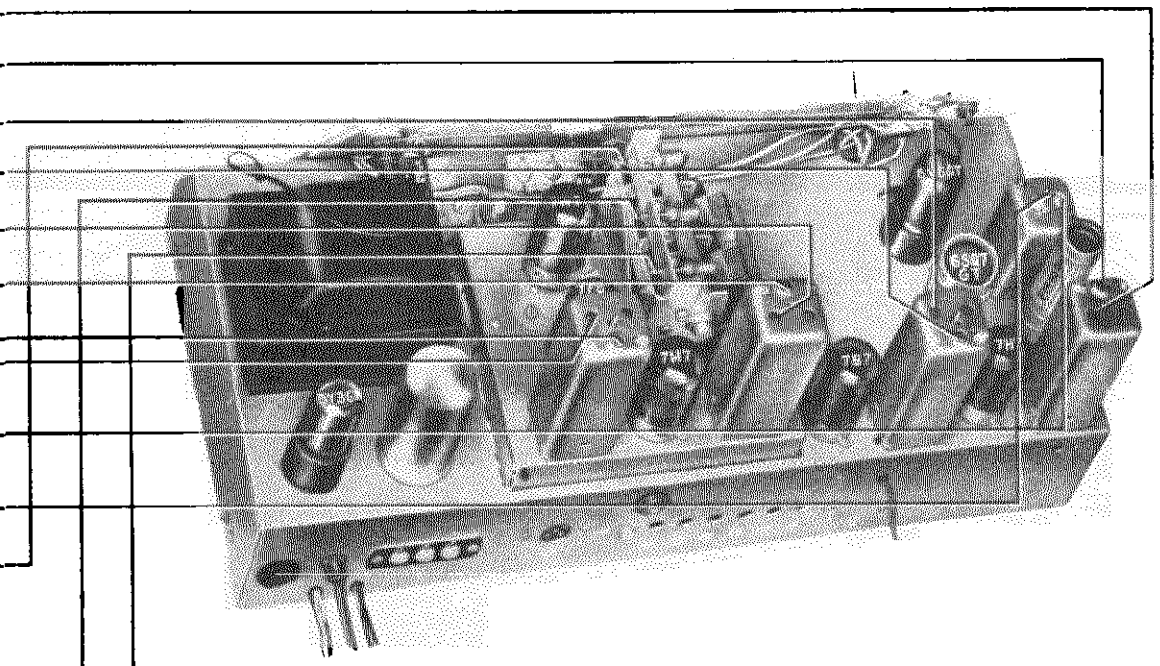


FIGURE 10. CHASSIS VIEW, SHOWING FM TRIMMER LOCATIONS.

ALIGNMENT OF FM CIRCUITS

Align the AM circuits first.

AM SIGNAL GENERATOR: Connect the generator ground lead to the radio chassis; connect the output lead through a .1-mf condenser to the points specified in the chart.

OUTPUT METER: Connect the output meter between terminal No. 3 of the aerial terminal panel and the radio chassis.

CONTROLS: Set volume control at maximum, t tone control fully counterclockwise, and treble tone c trol fully clockwise. Depress FM push button.

LOCATION OF FM COILS: For the location of c L501A, L501B, and L501C (steps 11 and 15), refe the base layout of Section 5, figure 7.

FM ALIGNMENT NOTES

1. When pin No. 2 of the FM1000 tube is connected to the chassis, the oscillator section of the tube is made inoperative, thereby converting the circuit from an FM to an AM detector.

2. Make the loading network by connecting a 4700-ohm resistor and a .1-mf condenser in series. Attach an alligator clip to each free end of the network. When this network is connected across the primary or secondary circuit of an i-f transformer, the network loads the circuit so that the transformer is effectively below critical coupling; the unloaded winding may then be correctly peaked at the intermediate frequency.

3. The top of padder C403B can be reached only from the top of the shield can. Slide a length of flattened solder or wire down between the ceramic form and the edge of the trimmer plate. Attach the loading network between this connection and the chassis.

4. It is essential that the output from the generator be kept below the point where the detector-oscillator locks in, otherwise an erroneous zero-beat will be obtained. When a single very sharp zero-beat point is obtained, the adjustment is correct.

5. The use of a signal generator for steps 10 to 16 is recommended only if the available generator is sufficiently accurate to insure correct frequency settings. Otherwise, an alternate procedure employing FM br cast station signals in place of a signal generato recommended. For adjustment at the high-frequ end of the band, use the station nearest 105 mc; the low-frequency adjustments, use the stations nea 88 and 92 mc. If the radio is greatly misaligne may be necessary to adjust the padders and coils maximum noise at each end of the band before sta signals can be heard. The oscillator section of the detector must be made inoperative, as given in ste of FM circuit alignment.

6. Check all coil adjustments with a tuning w If inserting the brass end in or near the coil incre the output-meter reading, spread the turns; if the p dered-iron end increases the output reading, comp the turns. If both ends cause a decrease in output, coil is correctly tuned. Do not change the coils e sively, since only a small adjustment is require these frequencies.

7. Make two simple dipole aerials to feed sig from the signal generator to the radio. Each dipole a may consist of two 30-inch lengths of rubber-cov wire. Connect one dipole aerial to terminal No and 2 on the radio FM aerial socket J500. Connect other dipole to the output of the signal gener Space the two dipoles several feet apart.

REPLACEMENT PARTS LIST

NOTE: Parts marked with an asterisk (*) are general replacement items, and the part numbers may not be identical with those on the original parts; also, the electrical values of some replacement items furnished may differ from the values indicated in the schematic and parts list. The values substituted in any case are so chosen that the operation of the instrument will be either unchanged or improved. When ordering replacements, use only the "Service Part No." in this parts list.

Reference No.	Description	Service Part No.
C100	Condenser, .01 mf, line filter	61-0120*
C101	Condenser, .01 mf, line filter	61-0120*
C102	Condenser, electrolytic, 3 section	30-2570-1*
	C102A: Condenser, 10 mf, isolating filter	Part of C102
	C102B: Condenser, 15 mf, isolating filter	Part of C102
	C102C: Condenser, 30 mf, high-voltage filter	Part of C102
C103	Condenser, electrolytic, 2 section	30-2552*
	C103: Condenser, 10-mf section, high-voltage filter	Part of C103
	C306: Condenser, 15-mf section (see Section 3)	Part of C103
C104	Condenser, elec., 15 mf, high-voltage filter	30-25
C105	Condenser, .003 mf, r-f by-pass	61-(
C106	Condenser, .5 mf, bias filter	61-(
I100	Lamp, pilot	34-2
I101	Lamp, pilot	34-2
L100	Field, speaker	Part of LS
R100	Resistor, 18,000 ohms, voltage dropping	66-318
R101	Resistor, 15,000 ohms, voltage dropping	66-315
R102	Resistor, 560,000 ohms, bias divider	66-456
R103	Resistor, 220,000 ohms, bias divider	66-422
R104	Resistor, 18,000 ohms, bias divider	66-318
S100	Switch, a-c power (on push-button assembly)	42-1
T100	Transformer, power	32-1
W100	Cord, line	L-2

SECTION 2

C200	Condenser, 220 mmf, r-f by-pass	60-10245307*
C201	Condenser, .01 mf, treble control	61-0120*
C202	Condenser, .02 mf, audio coupling	61-0108*
C203	Condenser, .006 mf, bass compensation	45-3500-7*
C204	Condenser, .006 mf, audio coupling	45-3500-7*
C205	Condenser, .006 mf, high a-f by-pass	61-0153
J200	Socket, single prong, FM test point	27-6180
LS200	Speaker	36-1608
R200	Potentiometer, 2 meg (tap at 1 meg), vol. cont.	33-5535-3
R201	Resistor, 4.7 ohms, divider, inverse feedback	66-9474360*
R202	Resistor, 1 meg, 1st-audio grid	66-5103340*
R203	Potentiometer, 500,000 ohms, treble control	33-5538-3
R204	Resistor, 220,000 ohms, plate loading	66-4223340*
R205	Resistor, 330,000 ohms, output-tube grid	66-4333340*
R206	Resistor, 33,000 ohms, divider, bass compensation	66-3333340*
R207	Potentiometer, 1 meg, bass control	33-5539-4*

Reference No.	Description	Service Part No.
R208	Resistor, 100 ohms, divider, inverse feedback	66-1103340*
T200	Transformer, output	32-8249*

SECTION 3

C301	Condenser, 33 mmf, osc. grid (FM det.)	66-00365307*
C302	Condenser, .01 mf, fil. by-pass	61-0120*
C303	Condenser, .01 mf, r-f by-pass	61-0120*
C304	Condenser, .03 mf, audio coupling	45-3500-1*
C305	Condenser, 1500 mmf, r-f by-pass	60-20155404*
C306	Condenser, elec., 15 mf, filter	Part of C103
C307	Condenser, .01 mf, r-f by-pass	61-0120*
L300	Choke, r-f osc. cathode (FM det.)	32-3352
R301	Resistor, 15,000 ohms, osc. grid leak (FM det.)	66-3153340*
R302	Resistor, 47,000 ohms, audio load (FM det.)	66-3473340*
R303	Resistor, 100,000 ohms, r-f choke	66-4103340*
R304	Resistor, 15,000 ohms, voltage dropping	66-3153340*
R305	Resistor, 56,000 ohms, voltage dropping	66-3563340*
R306	Resistor, 22 ohms, parasitic suppressor	60-0223340*
Z300	Transformer, FM detector	32-4004
	C300A: Condenser, fixed, 15 mf	Part of Z300
	C300B: Condenser, trimmer (9.1 mc), FM det.	Part of Z300
	C300C: Condenser, 33 mmf, r-f voltage divider	Part of Z300
	C300D: Condenser, 68 mmf, r-f voltage divider	Part of Z300
	R300A: Resistor, 6800 ohms, damping	Part of Z300
	TC300: Core, tuning (9.1 mc), FM det.	Part of Z300

SECTION 4

C405	Condenser, .01 mf, r-f by-pass	61-0120*
C406	Condenser, .01 mf, fil. by-pass	61-0120*
C407	Condenser, 220 mmf, r-f by-pass	60-10245307*
C408	Condenser, .01 mf, r-f by-pass	61-0120*
C409	Condenser, .01 mf, r-f by-pass	61-0120*
C410	Condenser, .01 mf, r-f by-pass	61-0120*
C411	Condenser, .01 mf, r-f by-pass	61-0120*
C412	Condenser, .01 mf, fil. by-pass	61-0120*
C413	Condenser, .01 mf, r-f by-pass	61-0120*
C414	Condenser, 220 mmf, r-f by-pass	60-10245307*
C415	Condenser, .01 mf, r-f by-pass	61-0120*
C416	Condenser, .01 mf, B+ by-pass	61-0120*
C417	Condenser, .05 mf, a-v-c filter	61-0122*
C418	Condenser, .01 mf, r-f by-pass	61-0120*
C419	Condenser, .01 mf, r-f by-pass	61-0120*

SECTION 4 (Continued)

Reference No.	Description	Service Part No.
C420	Condenser, .01 mf, r-f by-pass	61-0120*
C421	Condenser, 220 mmf, r-f by-pass	60-10245307*
C422	Condenser, 100 mmf, a-v-c diode coupling (FM)	60-10105407*
C423	Condenser, .01 mf, r-f by-pass	61-0120*
C424	Condenser, .006 mf, audio coupling	45-3500-7*
C425	Condenser, 100 mmf, r-f by-pass	60-10105407*
FS3 (R)	Switch, shorting, 1st i-f	Part of FS
R400	Resistor, 47,000 ohms, voltage dropping	66-3473340*
R401	Resistor, 1 meg, decoupling	66-5103340*
R402	Resistor, 180 ohms, degeneration	66-1183340*
R403	Resistor, 100,000 ohms, voltage dropping	66-4103340*
R404	Resistor, 3300 ohms, decoupling	66-2333340*
R405	Resistor, 180 ohms, degeneration	66-1183340*
R406	Resistor, 3300 ohms, bias (bc, sw)	66-2333340*
R407	Resistor, 1 meg, decoupling	66-5103340*
R408	Resistor, 100,000 ohms, bleeder (bc, sw), 7B7 screen	66-4103340*
R409	Resistor, 100,000 ohms, voltage dropping	66-4103340*
R410	Resistor, 3300 ohms, decoupling	66-2333340*
R411	Resistor, 180 ohms, degeneration	66-1183340*
R412	Resistor, 330,000 ohms, a-v-c filter	66-4333340*
R413	Resistor, 100 ohms, decoupling (FM)	66-1103340*
R414	Resistor, 82,000 ohms, voltage dropping	66-3823340*
R415	Resistor, 3300 ohms, decoupling	66-2333340*
R416	Resistor, 47,000 ohms, decoupling	66-3473340*
R417	Resistor, 1 meg, a-v-c filter	66-5103340*
R418	Resistor, 270,000 ohms, diode lead	66-4273340*
R419	Resistor, 100,000 ohms, r-f choke	66-4105340*
Z400	Transformer, 1st i-f	32-4020-1
	C400A: Condenser, trimmer (455 kc)	Part of Z400
	C400B: Condenser, fixed, 3000 mmf	Part of Z400
	C400C: Condenser, trimmer (9.1 mc)	Part of Z400
	C400D: Condenser, trimmer (9.1 mc)	Part of Z400
	C400E: Condenser, fixed, 9 mmf	Part of Z400
	TC400: Core, tuning (455 kc)	Part of Z400
Z401	Transformer, 2nd i-f	32-4001
	C401A: Condenser, trimmer (455 kc)	Part of Z401
	C401B: Condenser, trimmer (9.1 mc)	Part of Z401
	C401C: Condenser, trimmer (9.1 mc)	Part of Z401
Z402	Transformer, 3rd i-f	32-4002
	C402A: Condenser, trimmer (455 kc)	Part of Z402
	C402B: Condenser, fixed, 330 mmf	Part of Z402
	C402C: Condenser, trimmer (9.1 mc)	Part of Z402
	C402D: Condenser, trimmer (9.1 mc)	Part of Z402
	C402E: Condenser, fixed, 3 mmf	Part of Z402
	TC402: Core, tuning (455 kc)	Part of Z402
Z403	Transformer, 4th i-f	32-4003-2
	C403A: Condenser, trimmer (455 kc)	Part of Z403
	C403B: Condenser, trimmer (9.1 mc)	Part of Z403
	C403C: Condenser, trimmer (9.1 mc)	Part of Z403
	C403D: Condenser, fixed, 270 mmf	Part of Z403
Z404	Condenser (.01 mf) and choke assembly, i-f by-pass	38-9851-3

SECTION 5

C501	Condenser, main tuning gang	31-2694
	C501A: Condenser, FM aerial-coil trimmer	Part of C501
	C501B: Condenser, FM r-f-coil trimmer	Part of C501
	C501C: Condenser, FM osc. coil trimmer	Part of C501
C502	Condenser, 3-section, trimmer assembly	31-647
	C502A: Condenser, shunt trimmer, bc aerial	Part of C502

REPLACEMENT PARTS LIST — Continued

SECTION 5 (Continued)

Reference No.	Description	Service Part No.
	C502B: Condenser, shunt trimmer, bc osc.	Part of C502
	C502C: Condenser, shunt trimmer, s-w osc.	Part of C502
C503	Condenser, shunt trimmer, s-w aerial	31-6473-2
C504	Condenser, 10 mmf, coupling, r-f tube grid (FM)	60-00105407*
C505	Condenser, 220 mmf, fil. r-f by-pass	60-10245307*
C506	Condenser, 510 mmf, r-f by-pass	60-10515307*
C507	Condenser, 510 mmf, r-f by-pass	60-10515307*
C508	Condenser, series trimmer, bc osc.	31-6473-3
C509	Condenser, 47 mmf, output coupling (FM r-f)	60-00515307*
C510	Condenser, 255 mmf, spread tuning, s-w aerial coil	60-10255307*
C511	Condenser, 22 mmf, coupling (bc), mixer grid	60-00205307*
C512	Condenser, 10 mmf, mixer neutralizing (sw)	60-00105407*
C513	Condenser, 750 mmf, oscillator-to-mixer coupling	60-10755301*
C514	Condenser, 100 mmf, osc. grid feedback	60-10105407*
C515	Condenser, 220 mmf, osc. plate feedback (FM)	60-10245307*
C516	Condenser, 220 mmf, r-f filter, osc. plate circuit	60-10245307*
C517	Condenser, 510 mmf, osc. plate feedback (bc, sw)	60-10515307*
C518	Condenser, 220 mmf, r-f filter, osc. plate circuit	60-10245307*
C519	Condenser, 255 mmf, spread tuning, s-w osc. coil	60-10255307*
C520	Condenser, 285 mmf, r-f voltage divider, osc. (pb)	30-1224-14
C521	Condenser, 485 mmf, r-f voltage divider, osc. (pb)	30-1224-15
C522	Condenser, 510 mmf, r-f B+ by-pass	60-10515307*
FS	Rotary function switch, 3-section	76-2211
	FS 1: switch section	Part of FS
	FS 2: switch section	Part of FS
	FS 3: switch section	Part of FS
J500	Socket, aerial	27-6214-1
L501A	Coil, FM aerial	32-3993
L501B	Coil, FM r-f	32-3992
L501C	Coil, FM oscillator	32-3994
L502	Coil, bc aerial	32-4049
L503	Coil, s-w aerial	32-4050
L504	Coil, s-w oscillator	32-3996
L505	Coil, bc oscillator	32-4019-2
L506	Choke, r-f, parasitic suppressor, osc. plate (bc, sw)	32-4089
L507	Choke, r-f, s-w aerial trimmer	32-4111
LA500	Loop, bc	76-2237
P500	Plug, a-c line aerial (FM) connector	27-4788
PB	Push-button switch assembly (including a-c switch)	42-1774
	C500: Push-button padder-strip assembly (C500A to C500F)	
	L500: Push-button coils (L500A to L500F)	
	L500A, L500B, L500C: coils, push button	32-4059
	L500D, L500E, L500F: coils, push button	32-4059-1
R500	Resistor, 1 meg, grid isolating, r-f stage	66-5103340*
R501	Resistor, 100,000 ohms, voltage dropping	66-4103340*
R502	Resistor, 33,000 ohms, plate loading	66-3333340*
R503	Resistor, 3300 ohms, decoupling, r-f plate	66-2333340*
R504	Resistor, 10 ohms, parasitic suppressor	66-0103340*
R505	Resistor, 2200 ohms, mixer cathode	66-222340*
R506	Resistor, 4.7 meg, a-v-c divider (converter)	66-5473340*
R507	Resistor, 4.7 meg, a-v-c divider (converter)	66-5473340*
R508	Resistor, 22,000 ohms, osc. grid leak	66-3223340*
R509	Resistor, 22,000 ohms, osc. plate dropping (FM)	66-3223340*
R510	Resistor, 22,000 ohms, osc. plate dropping (bc, sw)	66-3223340*
R511	Resistor, 100 ohms, parasitic suppressor osc. (bc, sw)	66-1103340*
R512	Resistor, 180 ohms, degeneration (bc osc.)	66-1183340*
R513	Resistor, 10,000 ohms, osc. (push-button) cathode choke	66-3103340*
TB500	Terminal panel, loop aerial	38-9942

MISCELLANEOUS

Cabinet, complete	10651A
Cabinet Parts and Hardware	
Nut, (4) speaker mtg.	1W19988FA3
Baffle and grille cloth assembly	40-6783
Dial scale-and-backplate assembly	76-2267
Bolt (2) speaker mtg.	W1895
Bolt (2) speaker mtg.	W2123FA3
Cable and plug, speaker	41-3734
Chassis Mounting Hardware	
Screw (4)	1W17323FA3
Washer (4)	1W52540FA3
Clip, bc ant. coil mtg.	28-5002FA1
Dial-Scale Hardware	
Backplate and pulley assembly	76-2254
Drive-cord (25-ft. spool, with clips)	45-1460
Pointer	56-3179-2
Screw (5) backplate mtg.	1W19670FA3
Shaft, tuning drive	76-2258
Spring, drive cord	28-8751
Function-Switch Hardware	
Fulcrum assembly	76-2206
Fasteners (2), mtg. switch to fulcrum	28-4279FA1
Link, switch to fulcrum	54-7169
Screw (2), fulcrum mtg.	1W19644FA3
Knob (4), control	54-4227
Knob (10), push button	54-4282
Push-Button-Assembly Hardware	
Cap (10), push button	54-4294
Clip (6), coil holding	56-2250
Core (6), tuning	56-6100
Grommet (2), rubber, p-b switch mtg.	27-4596
Screw (2), p-b switch mtg.	1W19674FA3
Spring (6) tension	56-2249
Switch assembly, push button (including a-c switch)	42-1774
Tab kit assembly (call letters)	40-6766
Tab, BC	54-4318
Tab, FM	54-4320
Tab, OFF	54-4317
Tab, SW	54-4319
Trimmer condenser and bracket assembly	31-6449-1
R-F Unit Mounting Hardware	
Grommet (3), rubber	54-4295
Screw (3)	1W19674FA3
Spacer (3)	1W29158FA3
Washer (3)	1W52224FA3
Shield, FM 1000 tube	56-2731
Shield, 6SQ7GT	56-3358
Socket assembly, dial light	76-2109
Socket assembly (3½" lead), dial lamp	76-2109-1
Socket (3), Loktal, main chassis	27-6138
Socket (3), octal, main chassis	27-6174
Socket (2), Loktal, r-f unit	27-6213
Socket, Loktal, r-f unit	27-6138

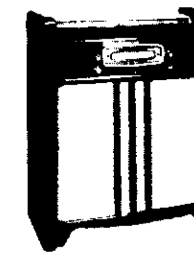
MODEL 48-485 PHILCO CORP.

Circuit Description

Philco Radio Model 48-485 is a six-tube superheterodyne, which provides reception in the standard-broadcast band. The circuit includes a 14AF7 converter, a 7B7 1st i-f amplifier, a 7B7 2nd i-f amplifier, a 7C6 detector, a.v.c., and 1st audio amplifier, and a 35L6GT output amplifier. The power supply employs a 50X6 rectifier in a voltage-doubling circuit.

A low-impedance loop aerial, located within the cabinet, normally provides adequate signal pickup. If greater signal pickup is required, the jumper should be disconnected from the terminal at the rear of the chassis and an external aerial connected to the terminal.

Two series-resonant circuits, consisting of condensers C302 and C303 together with the coils wound on these condensers, function as traps to prevent feedback of the intermediate frequency and the second harmonic of the intermediate frequency through the B– lead. One circuit is resonant at 455 kc., and the other at 910 kc. Each circuit offers a very low impedance to the resonant frequency, and, therefore, shunts it to the chassis.



MODEL 48-485

SPECIFICATIONS

CABINET	Wood, mahogany
CIRCUIT	Six-tube superheterodyne
FREQUENCY RANGE	540—1620 kc.
INTERMEDIATE FREQUENCY	455 kc.
AUDIO OUTPUT	2.5 watts
OPERATING VOLTAGE	105—120 volts, 60 cycles, a.c.
POWER CONSUMPTION	40 watts
AERIAL	Built-in low-impedance loop; provisions for external aerial.
PHILCO TUBES (6)	14AF7, 7B7(2), 7C6, 35L6GT, 50X6

Philco TROUBLE-SHOOTING *Procedure*

For rapid trouble shooting, the radio circuit is divided into four sections, as follows:

Section 1—the power supply
Section 2—the audio circuits
Section 3—the i-f, detector, and a-v-c circuits
Section 4—the r-f and converter circuits

Test points are specified for each section, and are indicated in the sectionalized schematic diagram. The trouble-shooting procedure given for each section includes a simplified test chart and a bottom view of the chassis showing the locations of the test points and the components of that section.

In each chart, the first step is a master check for determining whether trouble exists in that section, without going through the entire test procedure.

Failure to obtain the "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before connecting the radio to a source of power.

1. Inspect both the top and the bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, or other obvious indications of trouble.
2. Measure the resistance between B+ (pin 7 of 50X6 rectifier) and B–. When the ohmmeter leads are connected in the proper polarity, the highest reading will be obtained. If the reading is lower than 3000 ohms, check condensers C101, C102, C103A, and C207 for leakage or shorts.

NOTE: The resistance value above, which is much lower than normal, does not represent a quality check of these condensers; the value given is the lowest at which the rectifier will operate safely while the voltage tests of Section 1 (power supply) are performed.

TROUBLE SHOOTING

Section 1—Power Supply

Make the tests for this section with a d-c voltmeter; connect the leads between B–, test point B, and the test points indicated in the chart.

The voltage readings given were taken with a 20,000-ohms-per-volt meter, at a line voltage of 117 volts.

Set the volume control to minimum, and the tone control fully clockwise.

Follow the steps in the order given. If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2 (audio circuits); if not, isolate and correct the trouble in this section.

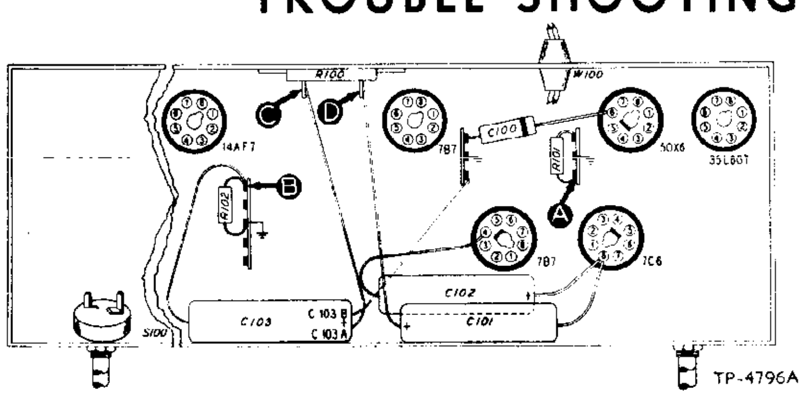


Figure 1. Bottom View, Showing Section 1 Test Points

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	107v		Trouble in this section. Isolate by the following tests.
2	D	225v	No voltage	Defective: 50X6, S100, W100, PL100. Shorted: C101 and C102.
			Low voltage	Defective: 50X6. Open: C101, C102. Leaky: C101, C102, C1 C103B.
			High voltage	Open: R100, R101.
3	C	190v	No voltage	Shorted: C103A. Open: R100.
			Low voltage	Changed resistance: R100. Shorted: C207*, C103B. Leaky: C1
			High voltage	Open: R101, T200*, R207*.
4	A	107v	No voltage	Shorted: C103B. Open: R101.
			Low voltage	Leaky: C103B.
			High voltage	Open: R207*, T200*.

Listening Test: Abnormal hum may be caused by open C100, C103A, C103B, or R102.

* This part, located in another section, may cause abnormal indication in this section.

Section 2—Audio Circuits

TROUBLE SHOOTING

For the tests in this section, use an audio-frequency signal generator. Connect the generator ground lead to B–, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, and the tone control fully clockwise.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 3 (i-f, detector, and a-v-c circuits); if not, isolate and correct the trouble in this section.

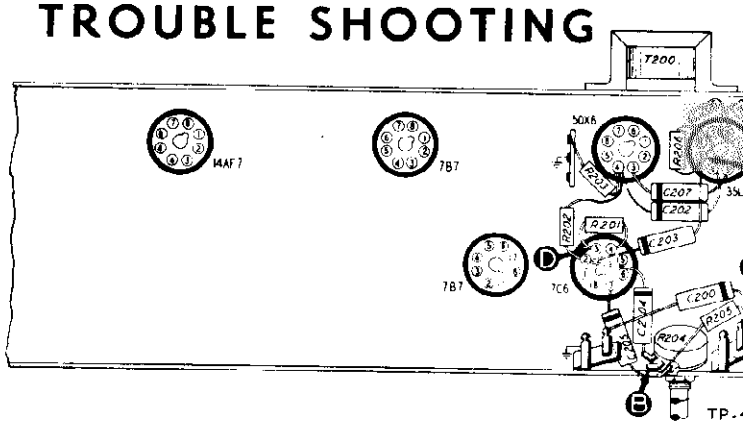


Figure 2. Bottom View, Showing Section 2 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	C	Clear signal with strong signal input.	Open: T200, R207. Shorted: C203, C206, C207, C205. Leaky: C2 Defective: 35L6GT, LS200.
3	D	Same as step 1.	Open: R202, R203, C203. Shorted: C202, C204. Defective: 7C6 (ode section).
4	A	Same as step 1.	Open: C200, C201, R200 (rotate through range). Shorted: C30 C301D*.

Listening Test: Distortion may be caused by open R201 or R206, or by shorted or leaky C200 or C201.

Section 3—I-F, Detector, and A-V-C Circuits

TROUBLE SHOOTIN

For the tests in this section, use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to B–, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, and the tone control fully clockwise. Rotate the tuning control until the tuning condenser is fully meshed.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 4 (r-f and converter circuits); if not, isolate and correct the trouble in this section.

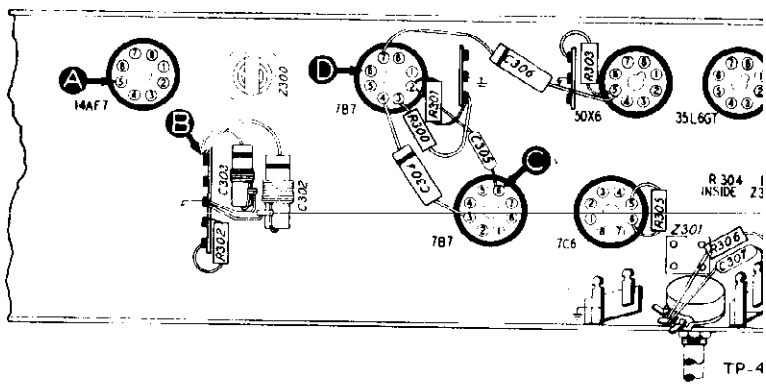


Figure 3. Bottom View, Showing Section 3 Test Points

Since the circuit location of test point A for this section is in Section 4, the effectiveness of step 1 as a ma check is dependent upon the condition of certain parts in Section 4; these parts are listed below under "P SIBLE CAUSE OF ABNORMAL INDICATION."

MODEL 48-485 PHILCO CORP.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	C	Loud, clear signal with moderate signal input.	Defective: 7B7 (2nd i-f amplifier), 7C6 (diode section). Open: L301A, L301B, R306, R304, R303, R300. Shorted: C305, C301A, C301B, C306, C304, C301C, L301A, L301B. Leaky: C305.
3	D	Same as step 1.	Defective: 7B7 (1st i-f amplifier). Open: C305, R301, R302. Shorted: C300B, L300B.
4	A	Same as step 1.	Defective: 14AF7. Open: R402*, L401*, L300A, C300A, L300B. Shorted: C300A, L300A.

NOTE: Voltage on the chassis may be caused by shorted C302 or C303. Oscillation may be caused by open C302 or C303.

* This part, located in another section, may cause abnormal indication in this section.

Section 4—R-F and Converter Circuits

TROUBLE SHOOTING

For the tests in this section, with the exception of the oscillator test, use an r-f signal generator with modulated output. Connect the generator ground lead to B–, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, and the tone control fully clockwise. Set the radio tuning control and signal-generator frequency as indicated in the chart.

If the "NORMAL INDICATION" is not obtained in step 1, isolate and correct the trouble in this section.

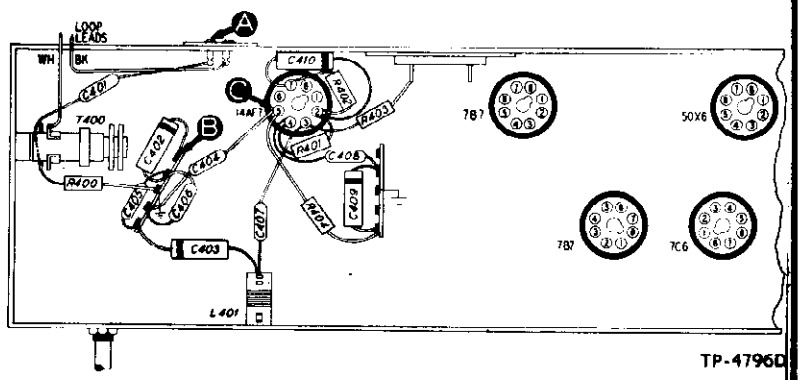


Figure 4. Bottom View, Showing Section 4 Test Points

STEP	TEST POINT	SIG. GEN. FREQ.	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	1000 kc.	Tune to signal.	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	C (Osc. test; see note below.)		Rotate through range.	Negative 3.5 to 5 volts.	Defective: 14AF7. Open C403, C407, C408, L401, R401. Shorted: C405, C400A, C400C, C408, C407. Leaky: C407, C408.
3	A	1000 kc.	Tune to signal.	Same as step 1.	Open: C401, C404, T400. Shorted: C400B, C400D, C406.

Listening Test: Distortion and hum may be caused by open C409 or R404.

OSCILLATOR TEST: Connect the positive lead of a high-resistance voltmeter to B–, test point B; connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the oscillator grid (pin 4 of the 14AF7), test point C. Proper operation of the oscillator is indicated by negative voltages of approximately the values given in the chart (measured with 20,000-ohms-per-volt meter) throughout the tuning range.

REPLACEMENT PARTS LIST

NOTE: Part numbers marked with an asterisk (*) are general replacement items. These numbers may not be identical with those on factory assemblies; also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

SECTION 1 POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, line filter, .05 mf.	61-0122*
C101	Condenser, filter, 15 mf., 200v	30-2575-11
C102	Condenser, filter, 15 mf., 200v	30-2575-11
C103	Condenser, electrolytic, 2-section	30-2575-17
C103A	Condenser, filter, 75 mf., 250v	Part of C103
C103B	Condenser, filter, 10 mf., 250v	Part of C103
I100	Pilot lamp	34-2477*
R100	Resistor, filter, 500 ohms	33-3435-3
R101	Resistor, filter, 8200 ohms	66-2824340
R102	Resistor, leakage, 150,000 ohms	66-4153340*
S100	Switch, on-off	42-1837
W100	Power cord	41-3755-13
PL100	A-c plug	Part of W100

SECTION 2 AUDIO CIRCUITS

C200	Condenser, d-c blocking, .006 mf.	30-4504*
C201	Condenser, d-c blocking, .01 mf.	61-0120*
C202	Condenser, plate decoupling, .25 mf.	61-0125*
C203	Condenser, d-c blocking, .01 mf.	61-0120*
C204	Condenser, tone control, .004 mf.	30-4623*
C205	Condenser, tone compensation, .004 mf.	30-4623*
C206	Condenser, r-f by-pass, 220 mmf.	60-10205307*
C207	Condenser, tone compensation, .006 mf.	30-4504*
LS200	Speaker, 8" p-m	36-1626-1
R200	Volume control, 2 megohms (center-tapped)	33-5535-15
R201	Resistor, grid return, 10 megohms	66-6103340*
R202	Resistor, plate load, 100,000 ohms	66-4103340*
R203	Resistor, plate dropping, 220,000 ohms	66-4223340*
R204	Tone control, 5 megohms	33-5539-33
R205	Resistor, tone compensation, 33,000 ohms	66-3333340*
R206	Resistor, grid return, 470,000 ohms	66-4473340*
R207	Resistor, cathode bias, 130 ohms	66-1123340*
T200	Transformer, output	32-8242-3

ALIGNM

DIAL—Calibration and pointer-index measurements are shown in figure 6. With tuning gang fully meshed, set pointer to index mark.

OUTPUT METER—Connect to voice-coil tern

SIGNAL GENERATOR—Connect as indic chart. Use modulated output.

STEP	SIGNAL GENERATOR		RADIO		
	CONNECTIONS TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	ADJ
1				Turn trimmer fully tight.	C300B—
2	Through .1-mf. condenser to mixer grid (pin 5 of 14AF7).	455 kc.	Tuning gang fully meshed.	Adjust trimmers, in order given, for maximum output.	C301B— C301A— C300B— C300A—
3	Radiating loop (see note below).	1600 kc.	1600 kc.	Adjust trimmer for maximum output.	C4
4	Same as step 3.	1500 kc.	1500 kc.	Adjust trimmer for maximum output.	C400

RADIATING-LOOP NOTE: Make up a 6—8 turn, 6-inch-diameter loop, using insulated wire; c signal-generator leads and place near radio loop aerial. Make certain that radio loop aerial is co radio.

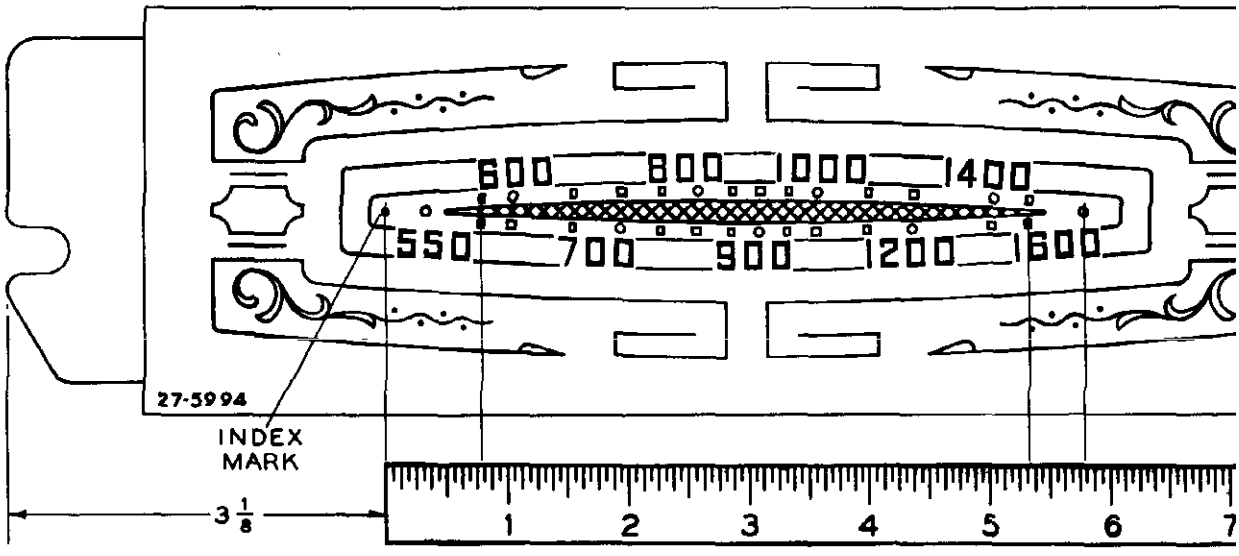
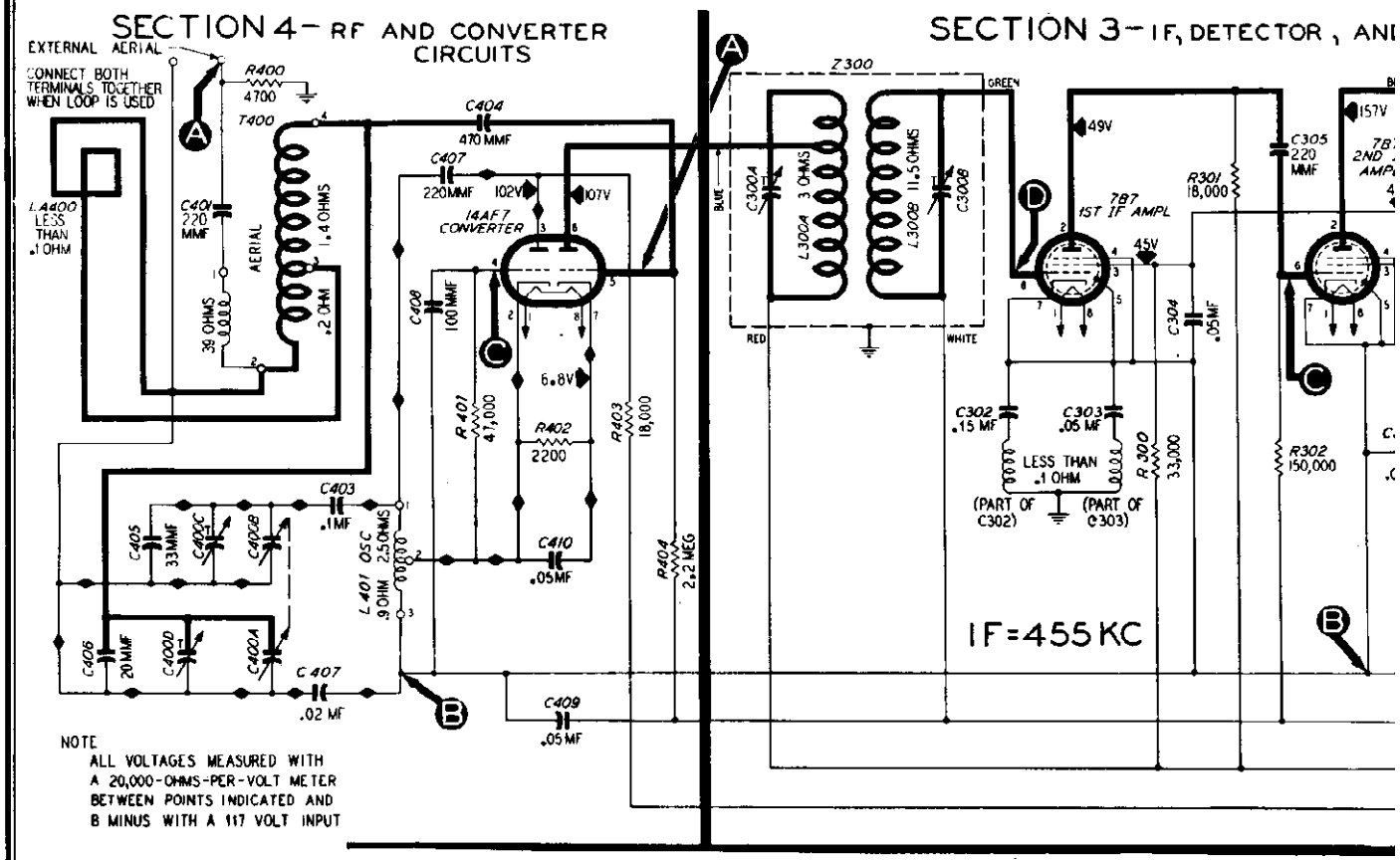
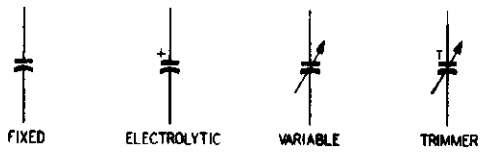


Figure 6. Calibration Measurements for Dial Backplate



CONDENSER SYMBOLS

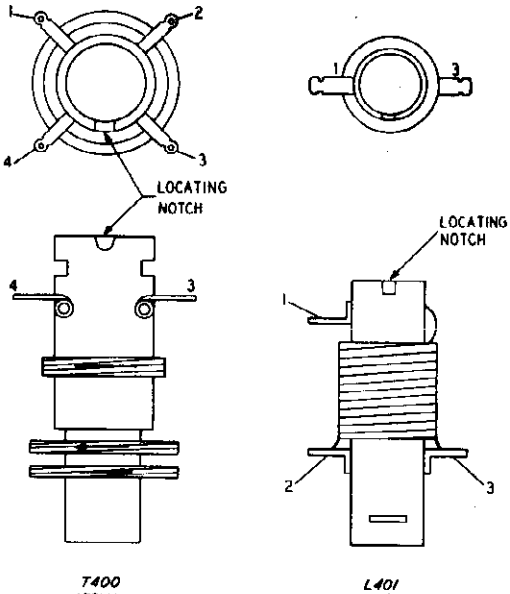


RF, IF, AND AUDIO SIGNAL PATH

OSC SIGNAL PATH

SPEAKER CONNECTION

ALL RESISTANCE VALUES IN OHMS UNLESS MARKED OTHERWISE



SECTION 3
I-F, DETECTOR, AND A-V-C CIRCUITS

C300A	Condenser, trimmer	Part of Z300
C300B	Condenser, trimmer	Part of Z300
C301A	Condenser, trimmer	Part of Z301
C301B	Condenser, trimmer	Part of Z301
C301C	Condenser, a-v-c filter, 100 mmf.	Part of Z301
C301D	Condenser, a-v-c filter, 100 mmf.	Part of Z301
C302	Condenser-and-choke assembly, i-f filter, .15 mf.	38-9851-8
C303	Condenser-and-choke assembly, i-f filter, .05 mf.	38-9851-4
C304	Condenser, screen by-pass, .05 mf.	61-0122*
C305	Condenser, d-c blocking, 200 mmf.	60-10205307*
C306	Condenser, plate by-pass, .003 mf.	30-4582
C307	Condenser, r-f by-pass, 100 mmf.	60-10105407*
L300A	Transformer primary, 1st i-f	Part of Z300
L300B	Transformer secondary, 1st i-f	Part of Z300
L301A	Transformer primary, 2nd i-f	Part of Z301

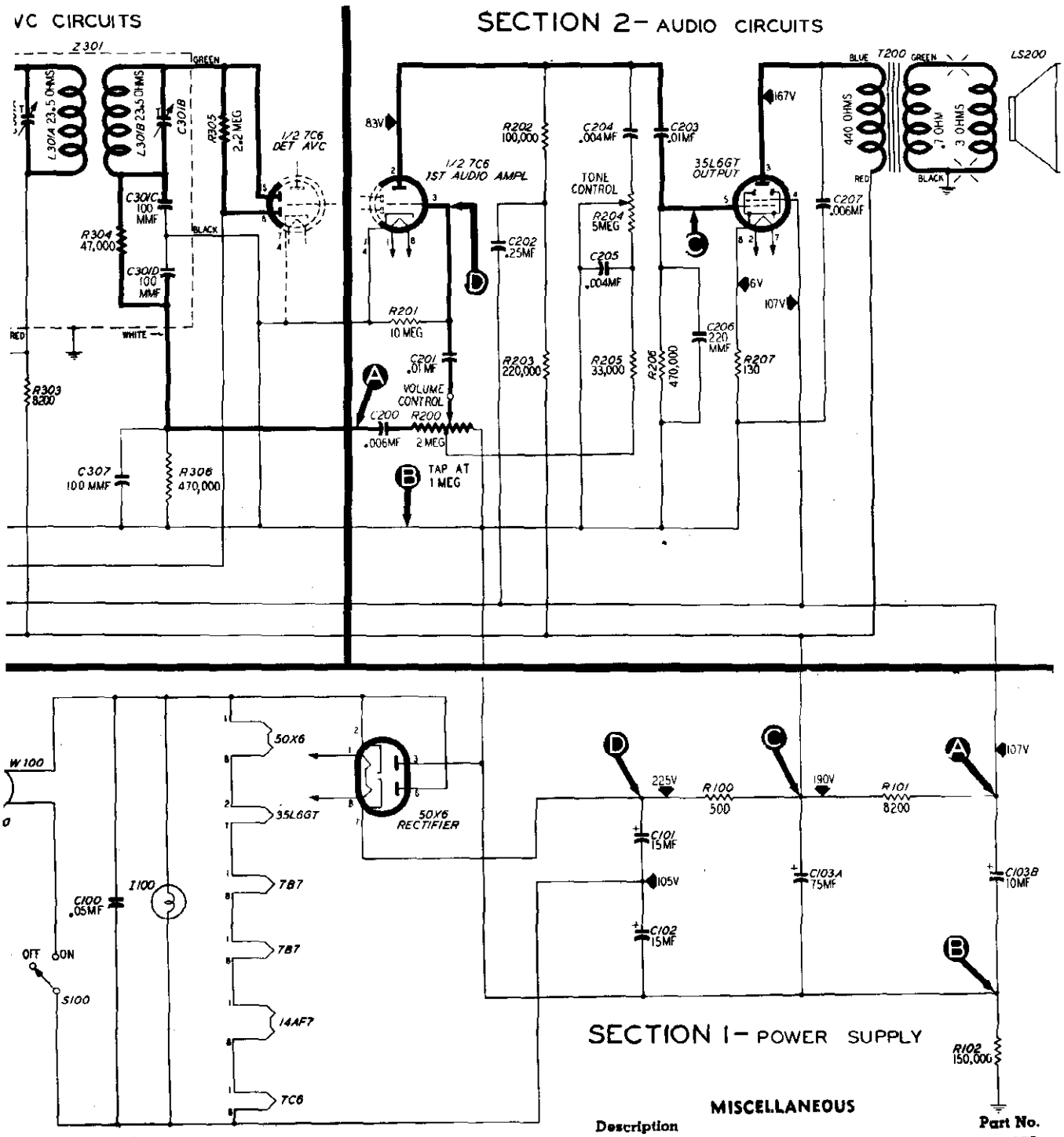
SECTION 3 (Continued)
I-F, DETECTOR, AND A-V-C CIRCUITS

Reference Symbol	Description	Service Part No.
L301B	Transformer secondary, 2nd i-f	Part of Z301
R300	Resistor, screen dropping, 33,000 ohms	66-3333340*
R301	Resistor, plate load, 18,000 ohms	66-3183340*
R302	Resistor, grid return, 150,000 ohms	66-4153340*
R303	Resistor, plate decoupling, 8200 ohms	66-2823340*
R304	Resistor, i-f filter, 47,000 ohms	Part of Z301
R305	Resistor, a-v-c filter, 2.2 megohms	66-5223340*
R306	Resistor, diode load, 470,000 ohms	66-4473340*
Z300	Transformer, 1st i-f	32-4151-1
Z301	Transformer, 2nd i-f	32-3948-9

SECTION 4
R-F AND CONVERTER CIRCUITS

C400	Condenser, tuning gang	31-2715-1
C400A	Condenser, oscillator tuning	Part of C400
C400B	Condenser, aerial tuning	Part of C400
C400C	Condenser, oscillator trimmer	Part of C400
C400D	Condenser, aerial trimmer	Part of C400
C401	Condenser, aerial isolating, 220 mmf.	60-10205307*
C402	Condenser, r-f by-pass, .02 mf.	61-0108*
C403	Condenser, isolating, .1 mf.	30-4527

CO CORP. MODEL 48-485



Description	Part No.
Condenser, d-c blocking, 470 mmf.	60-10515307*
Condenser, shunt, 33 mmf.	60-00305307*
Condenser, shunt, 20 mmf.	60-00205307*
Condenser, d-c blocking, 220 mmf.	60-10205307*
Condenser, osc. grid, 100 mmf.	60-10105407*
Condenser, a-v-c filter, .05 mf.	61-0122*
Condenser, cathode by-pass, .05 mf.	61-0122*
Coil, oscillator	32-4019-6
Loop aerial	76-3583
Resistor, aerial discharge, 4700 ohms	66-2473340*
Resistor, grid return, 47,000 ohms	66-3473340*
Resistor, cathode bias, 2200 ohms	66-2223340*
Resistor, plate feed, 18,000 ohms	66-3183340*
Resistor, grid return, 2.2 megohms	66-5223340*
Transformer, aerial	32-4023-1

MISCELLANEOUS

Description	Part No.
Bracket-and-clip assembly, pilot lamp	76-3177
Cabinet (less scale)	10701
Baffle and cloth	40-6981
Baffle, wood	219102
Bezel	56-5287
Dial scale	27-5994
Dome	45-6190
Scale strap	56-4756
Dial-backplate assembly	76-3713
Cord, drive (25-ft. spool)	45-8750*
Pointer	58-3583-3FCP
Spring	28-8953
Knob	54-4486
Pilot-lamp-socket assembly	27-6233
Socket, Loktal	27-6138*
Socket, octal	27-6174

Figure 5. Philco Radio Model 48-485, Sectionalized Schematic Diagram, Showing Test Points

PROCEDURE

RADIO CONTROLS—Set volume control to maximum, and tone control fully counterclockwise.

OUTPUT LEVEL—During alignment, adjust signal-generator output to maintain output-meter indication below 1.25 volts.

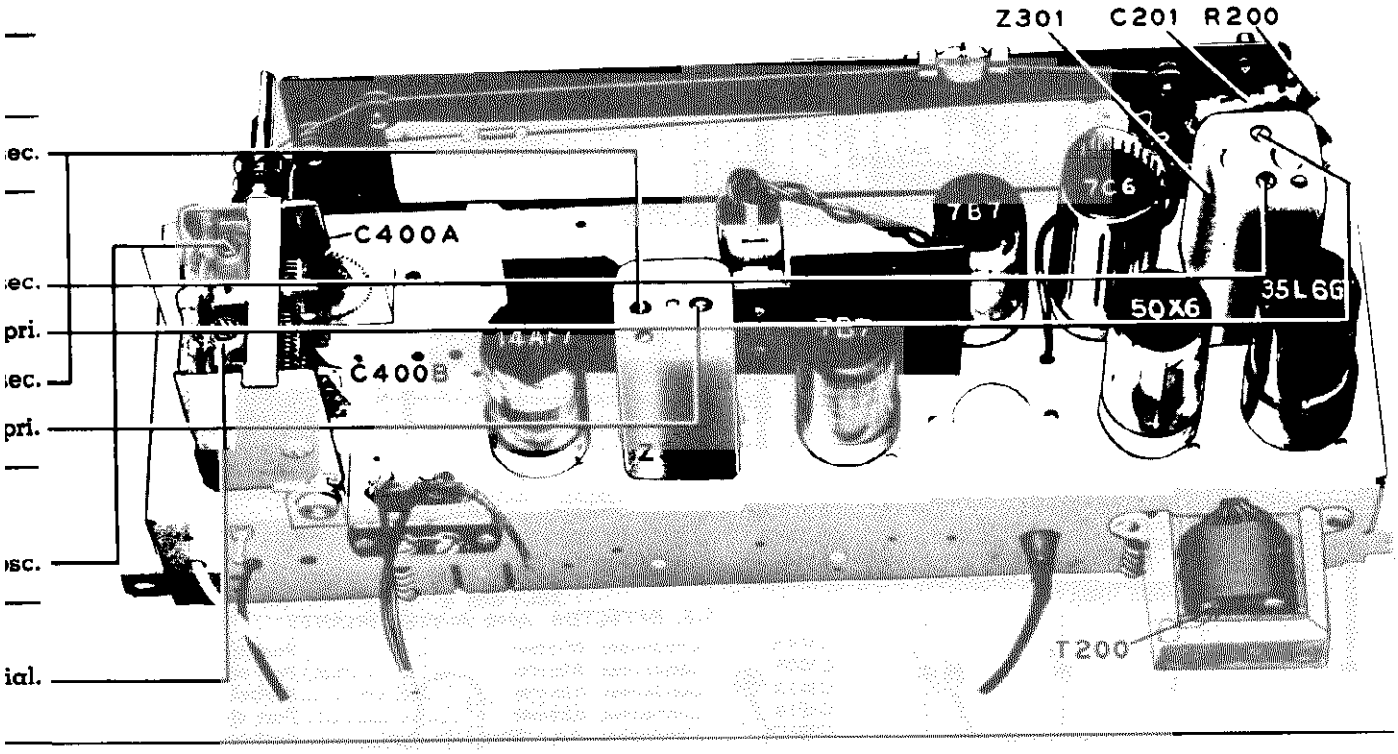


Figure 7. Top View, Showing Trimmer Locations

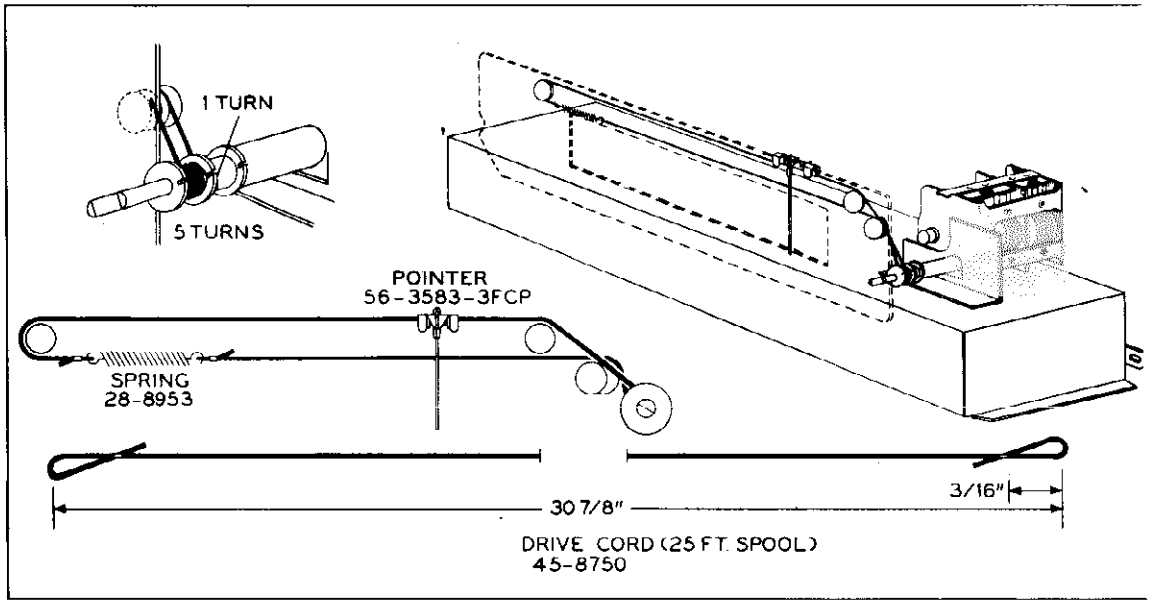


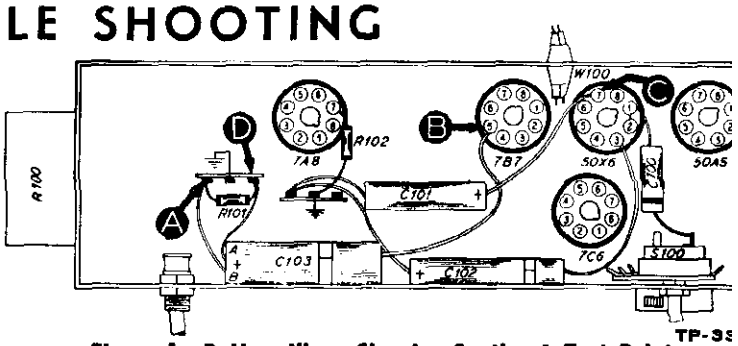
Figure 8. Drive-Cord Installation Details

TROUBLE SHOOTING

For the tests in this section, use a d-c voltmeter. Connect the negative lead to the B— bus, test point B; connect the positive lead to the test points indicated in the chart. The voltage readings given were taken with a 20,000-ohms-per-volt meter at a line voltage of 117 volts, a.c.

With the radio-phono switch set to the radio position, turn the volume control to minimum.

Follow the steps in sequence; if the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2; if not, isolate and correct the trouble in this section.



TP-3

Figure 1. Bottom View, Showing Section 1 Test Points

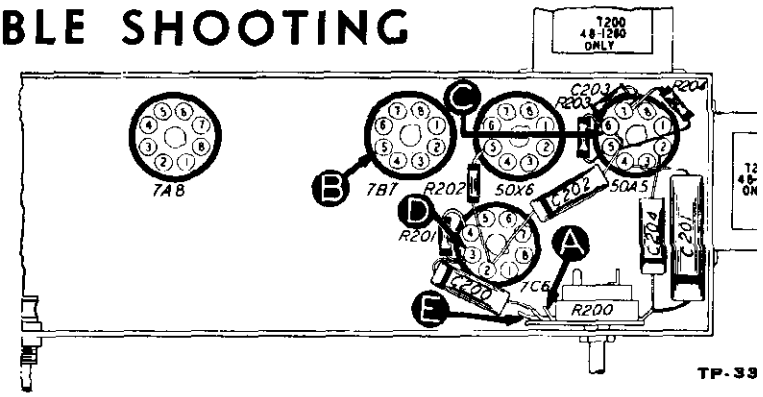
STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	90v		Trouble within this section. Isolate by the following tes
2	C	215v	No voltage Low voltage High voltage	Defective: 50X6, S100, W100. Shorted: C101, C102, C1 Defective: 50X6. Open: C101, C102. Leaky: C101, C1 C103A. Open: R100, R204,* T200.*
3	D	185v	No voltage Low voltage High voltage	Open: R100. Shorted: C103A. Shorted: C103B. Leaky: C103A. Open: R101, R204,* T200.*
4	A	90v	No voltage Low voltage	Open: R101. Shorted: C103B. Leaky: C103B.
Listening Test: Abnormal hum or garbled speech may be caused by open C100, C101, C102, C103A, C103B, or R102				

* This part, located in another section, may cause abnormal indication in this section.

Section 2 TROUBLE SHOOTING

For the tests in this section, use an audio-frequency signal generator. Connect the generator ground lead to the B— bus, test point B; connect the generator output lead through a .1-mf. condenser to the test points indicated in the chart.

In steps 1 and 4, set the volume control to maximum in the radio position when testing at test point A, and to maximum in the phono position when testing at test point E. Adjust the signal-generator output as required for each step.



TP-3

Figure 2. Bottom View, Showing Section 2 Test Points

If the "NORMAL INDICATION" is obtained for both test points A and E in step 1, proceed with the tests for Section 3. If the "NORMAL INDICATION" is obtained at one test point not at the other, the volume control is defective. If the "NORMAL INDICATION" is not obtained at ei test point, isolate and correct the trouble within this section.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A E	Loud, clear signal with weak signal input.	Trouble within this section. Isolate by the following tests.
2	C	Loud, clear signal with strong signal input.	Defective: 50A5, LS200. Shorted: C203, C204, T200. Open: R2 T200.
3	D	Loud, clear signal with weak signal input.	Defective: 7C6. Open: C202, R202, R203. Shorted: C202. Leaky: C202.
4	A E	Loud, clear signal with weak signal input.	Defective: R200. Open: C200. Shorted: C305.* Leaky: C305.*
Listenting Test: Distortion on strong signals may be caused by open-circuited R201 or by short-circuited or leaky C200. Hum modulation on phonograph operation may be caused by open-circuited C201.			

Section 3 TROUBLE SHOOTING

For the tests in this section, use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to the B— bus, test point B; connect the generator output lead through a .1-mf. condenser to the test points indicated in the chart.

Turn the volume control to maximum in the radio position.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 4; if not, isolate and correct the trouble in this section.

NOTE: Since the circuit location of test point A for this section is the same as that of test point C for Section 4, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in Section 4; these parts are listed below under "POSSIBLE CAUSE OF ABNORMAL INDICATION."

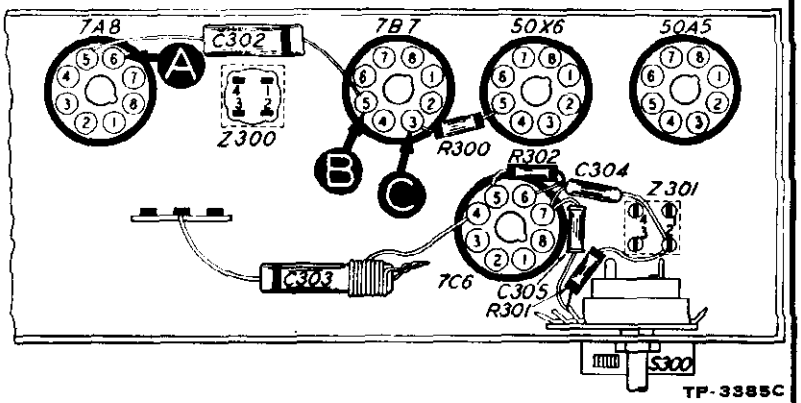


Figure 3. Bottom View, Showing Section 3 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble within this section. Isolate by the following tests.
2	C	Loud, clear signal with strong signal input.	Defective: 7B7, 7C6, Z301. Open: C302, R300, R301, R302. Shorted: C302, C304, C305.
3	A	Loud, clear signal with weak signal input.	Defective: 7A8,* Z300. Misaligned: Z300.

* This part, located in another section, may cause abnormal indication in this section.

Section 4 TROUBLE SHOOTING

For the tests in this section (with the exception of the oscillator test), use an r-f signal generator with modulated output. Connect the generator ground lead to the B— bus, test point B; connect the generator output lead through a .1-mf. condenser to the test points indicated in the chart.

Turn the volume control to maximum in the radio position.

Except as noted for the oscillator test, set the radio and signal-generator dials to 1000 kc.

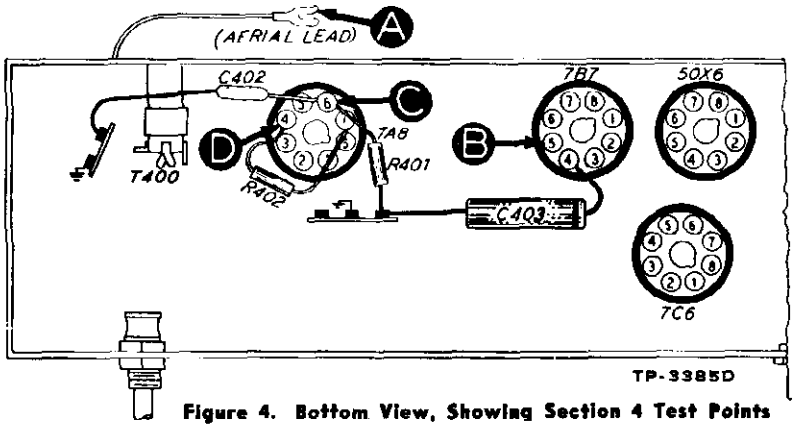


Figure 4. Bottom View, Showing Section 4 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble within this section. Isolate by the following tests.
2	C	Loud, clear signal with moderate signal input.	Defective: 7A8, osc. circuit. Misaligned: osc. circuit. Open: C403, R401.
3	D (Osc. test; see note below.)	Negative 4—8 volts.	Defective: 7A8, T400. Shorted: C400, C400B. Open: R402.
4	A	Loud, clear signal with weak signal input.	Defective: LA400. Shorted: C400, C400A. Open: C401, C402.

OSCILLATOR-TEST NOTE: Connect positive lead of high-resistance d-c voltmeter to B— bus, test point B; connect prod end of negative lead through 100,000-ohm isolating resistor to oscillator grid, test point D. Use suitable meter range, such as 0—10 volts. Proper operation of oscillator is indicated by negative voltage of 4 to 8 volts (measured with 20,000-ohms-per-volt meter) throughout range of tuning control.

ALIGNM

TURN VOLUME CONTROL

NOTE: Make alignment with loop connected to radio.

OUTPUT METER—Connect to terminals indicated in figure 7.

DIAL—Calibration and pointer-index measurement shown in figure 8. With tuning gang fully me set pointer to index mark.

STEP	SIGNAL GENERATOR		RADIO		AD
	CONNECTIONS TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Through .1-mf. condenser to ext. aerial lead.	455 kc.	Gang fully meshed.	Adjust trimmers for maximum output in order given.	
2	Through 100-mmf. condenser to ext. aerial lead.	1600 kc.	1600 kc.	Adjust trimmer for maximum output.	
3	Same as step 1.	1500 kc.	1500 kc.	Adjust trimmer for maximum output.	
4	Repeat steps 2 and 3.				

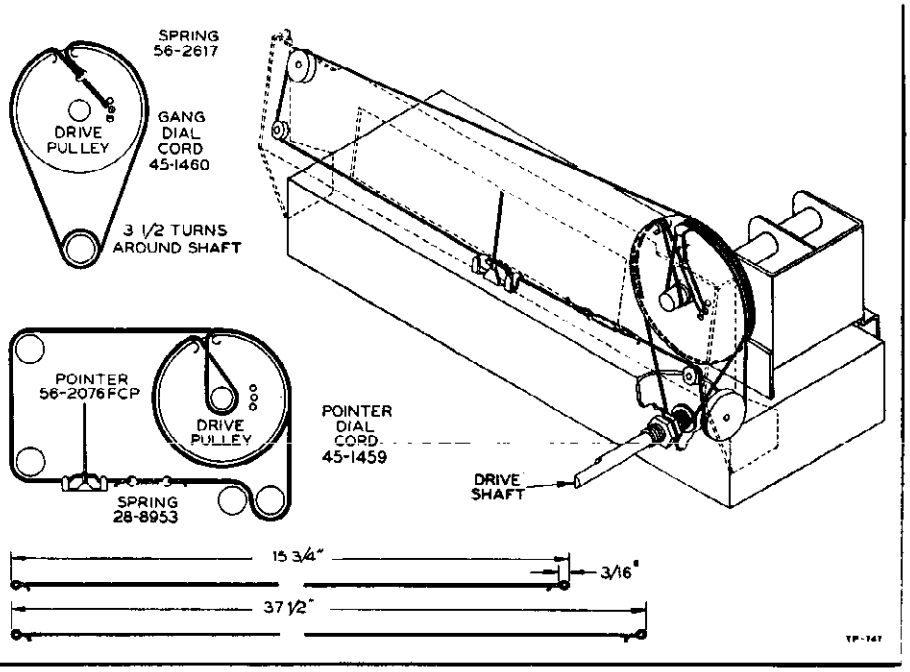
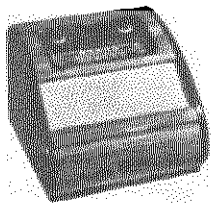
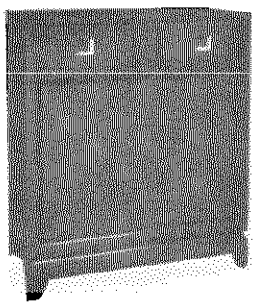


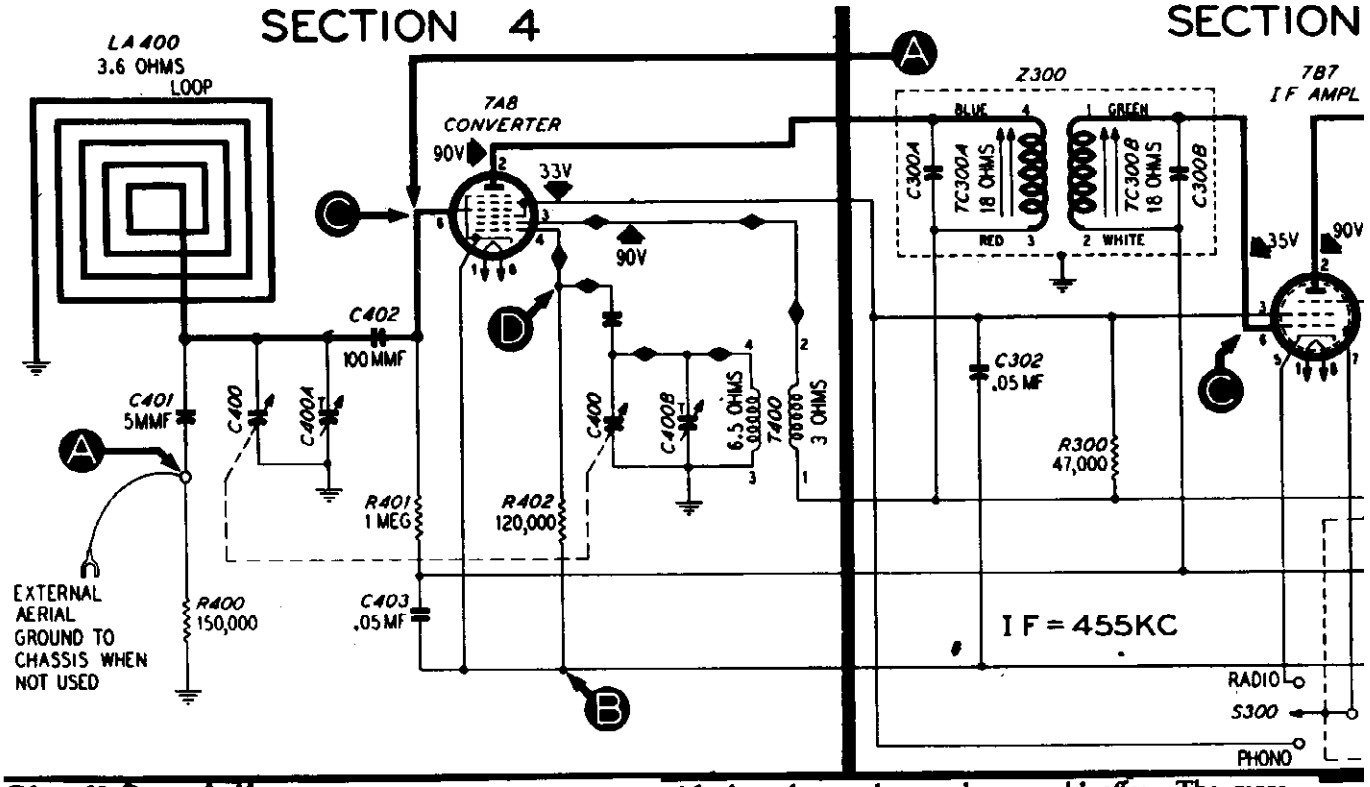
Figure 6. Drive-Cord Installation Details



MODEL 48-1201



MODEL 48-1260



Circuit Description

Philco Radio-Phonographs, Models 48-1201 and 48-1260 are identical electrically. The radio is a five-tube superheterodyne with a built-in loop aerial and provisions for connecting an external aerial.

The loop aerial feeds into the mixer section of a 7A8 pentagrid converter. The aerial and oscillator circuits are tuned by ganged, variable tuning condensers, and the oscillator-section rotor plates are shaped to provide proper tracking without the use of a series padding condenser.

The output of the 7A8 converter is transformer-coupled to the 7B7 i-f amplifier which, in turn, is transformer-coupled to the diode section of the 7C6 diode-triode. Each of the i-f coupling transformers has permeability-tuned primary and secondary windings.

One diode functions as the 2nd detector; the other diode develops the a-v-c voltage, which is applied to the mixer section of the converter and to the i-f amplifier. The output of the 2nd detector is resistance-coupled to the triode section of the 7C6 which, in turn, is resistance-coupled to the 50A5 beam-power output tube. The output tube is transformer-coupled to the permanent-magnet dynamic loud-speaker, to which it supplies approximately 1.8 watts of audio power.

D-c operating voltages are supplied from a voltage-doubler power supply employing a 50X6 full-wave rectifier and a resistor-condenser filter network.

A 120,000-ohm resistor, R102, is connected between B— and the chassis to prevent hum under conditions of high humidity. A series-tuned circuit consisting of a condenser, C303, and a choke is also connected between B— and the chassis. This combination is resonant at 455 kc. and, therefore, offers a lower impedance at the i.f. than the condenser alone would offer. The more effective grounding of the i-f circuits improves the stability of the high-gain i-f stages.

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before it is turned on:

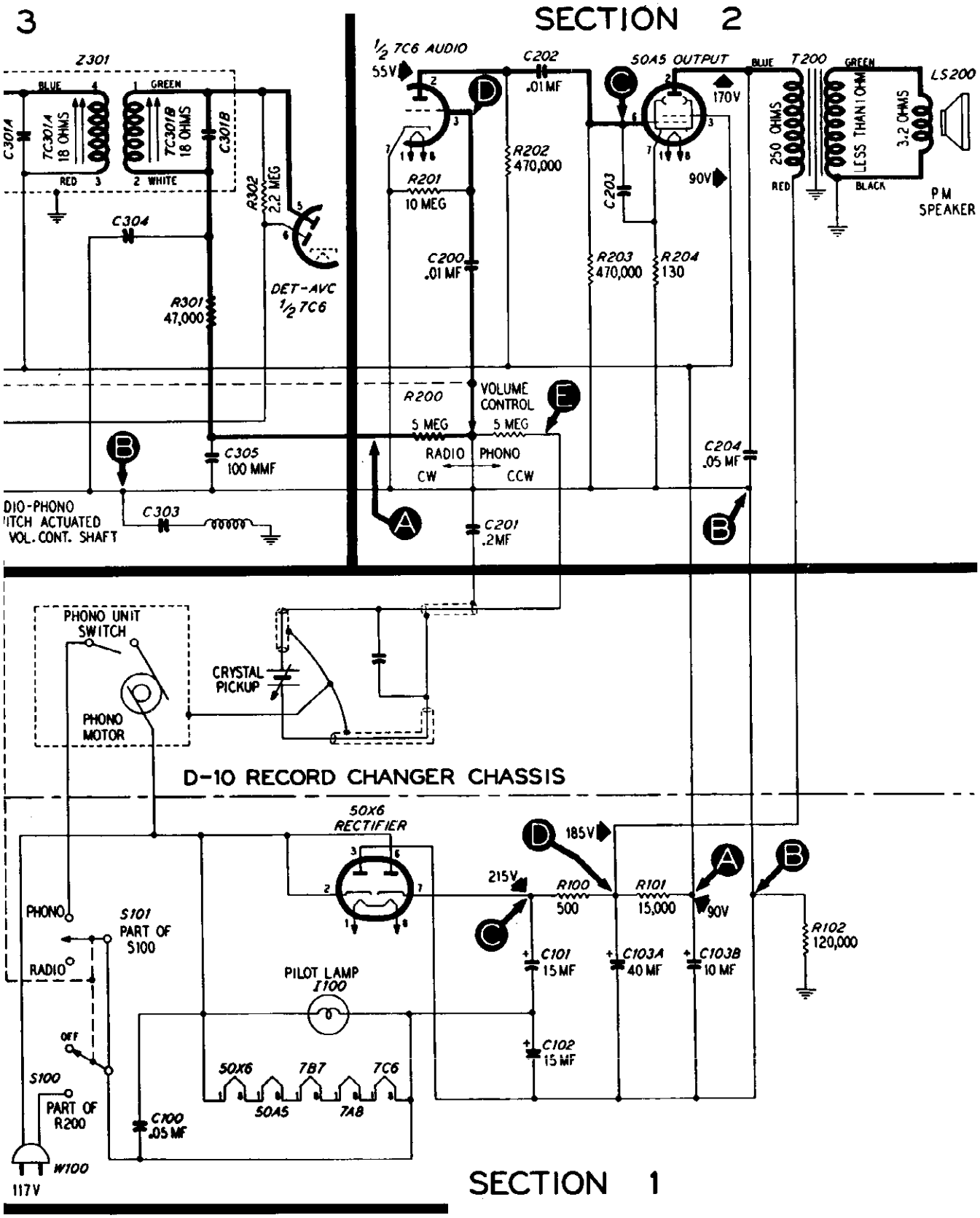
1. Carefully inspect both top and bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for broken or shorted connections, burned resistors, or other obvious sources of trouble.

2. Measure the resistance between B+ (pin 7 of the 50X6 rectifier) and the B— bus, test point B. When the ohmmeter leads are connected in proper polarity, the highest resistance reading will be obtained. This reading should be not lower than 4000 ohms. If it is lower, check condensers C101, C102, C103A, C103B, and C204 for leakage or shorts.

SPECIFICATIONS

CABINET
Model 48-1201; wood, mahogany finish, harvest (L)
Model 48-1260; wood, Philcote finish
CIRCUIT ..... Five-tube superheterodyne
FREQUENCY RANGE ..... 540 to 1600 kc.
AUDIO OUTPUT ..... 1.8 watts
OPERATING VOLTAGE
105—120 volts, 60 cycles, a.c.
POWER CONSUMPTION
Radio, 45 watts; Phonograph, 60 watts
AERIAL ..... Built-in loop; terminal also provided for external aerial
INTERMEDIATE FREQUENCY ..... 455 kc.
PHILCO TUBES (5) 7A8, 7B7, 7C6, 50A5, 50X6
PHONOGRAPH

Figure 5. Philco Radio-Phonograph Models 48-1201 and 48



60. Sectionalized Schematic Diagram, Showing Test Points

PROCEDURE

IAXIMUM IN THE RADIO POSITION

SIGNAL GENERATOR—Connect ground lead to B— bus; connect output lead as indicated in chart. Use modulated output.

OUTPUT LEVEL—During alignment, adjust signal-generator output to maintain output-meter indication below 1.25 volts.

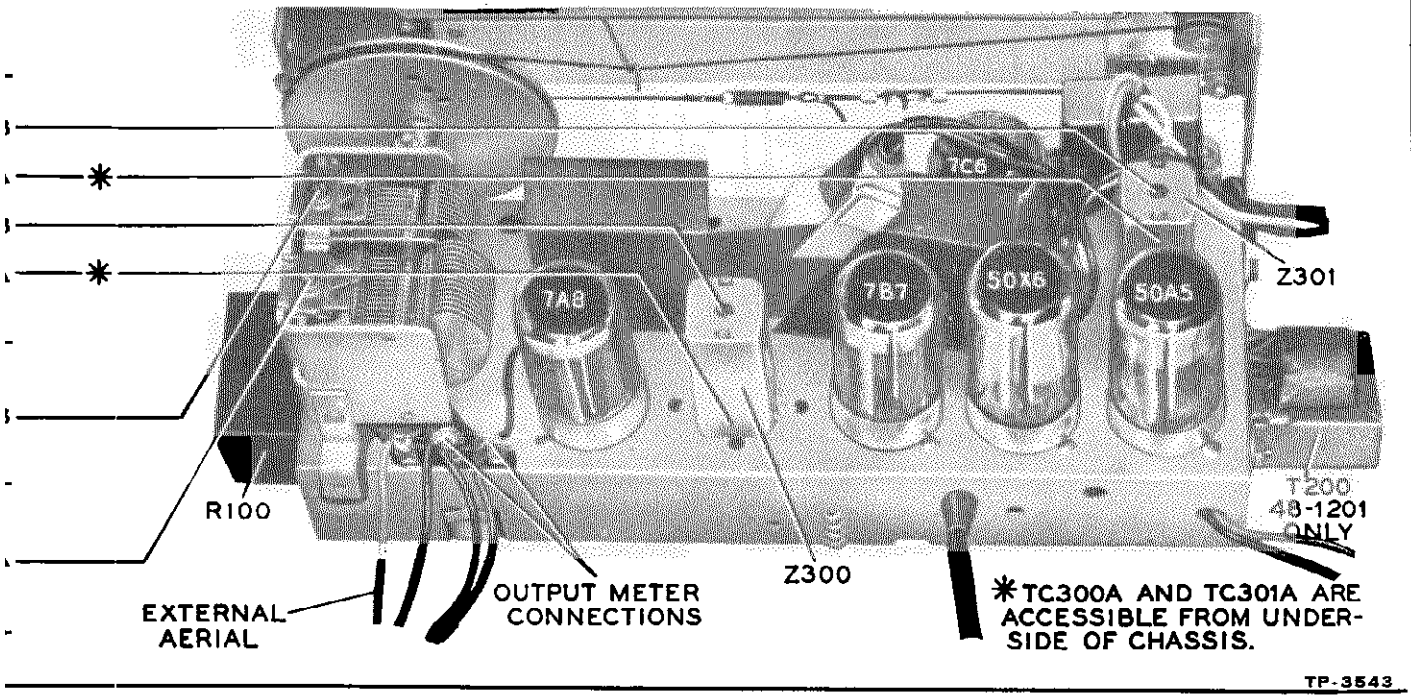


Figure 7. Top View, Showing Trimmer Locations

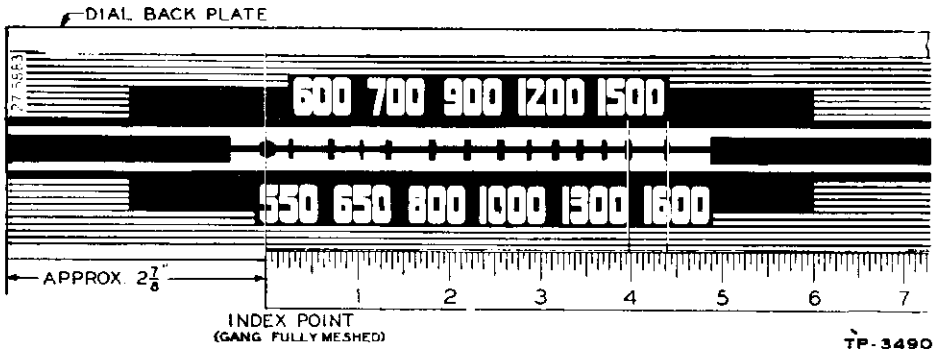


Figure 8. Calibration Measurements for Dial Backplate

REPLACEMENT PARTS LIST

NOTE: Part numbers marked with an asterisk (*) are general replacement items. These numbers may not be identical with those on factory assemblies; also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

Section 1

Reference Symbol	*Description*	*Service Part No.*
C100	Condenser, line filter, .05 mf.	61-0122*
C101	Condenser, electrolytic, filter, 15 mf.	45-3015-18*

Section 1 (Continued)

Reference Symbol	*Description*	*Service Part No.*
C102	Condenser, electrolytic, filter, 15 mf.	45-3018-18*
C103	Condenser, dual electrolytic	30-2575-12*

REPLACEMENT PARTS LIST (Continued)

Section 1 (Continued)

Reference Symbol	Description	Service Part No.
C103A	Condenser, electrolytic, filter 40 mf.	Part of C103
C103B	Condenser, electrolytic, filter, 10 mf.	Part of C103
I100	Panel lamp	34-2477
R100	Resistor, filter, 500 ohms	33-3435-3
R101	Resistor, filter, 15,000 ohms	66-3154340
R102	Resistor, leakage, 150,000 ohms	66-4123340*
S100	Switch, off-on, power	Part of R200
S101	Switch, radio-phono	42-1736
W100	A-c power cord	L-3199

Section 2

C200	Condenser, blocking, .01 mf.	61-0120*
C201	Condenser, audio by-pass, .2 mf.	45-3500-3*
C202	Condenser, blocking, .01 mf.	61-0120*
C203	Condenser, by-pass, 240 mmf.	60-10245307*
C204	Condenser, tone compensation, .05 mf.	61-0122*
R200	Volume control, center-tapped, 1 megohm	33-5519
R201	Resistor, grid leak, 10 megohms	66-6103340*
R202	Resistor, plate load, 470,000 ohms	66-4473340*
R203	Resistor, grid leak, 470,000 ohms	66-4473340*
R204	Resistor, cathode bias, 130 ohms	66-1133340*
LS200	Loud-speaker	
	Model 48-1201	36-1617-Z
	Model 48-1260	36-1626
T200	Output transformer	
	Model 48-1201	32-8310
	Model 48-1260	32-8310-1

Section 3

C300A	Condenser, fixed, primary	Part of Z300
C300B	Condenser, fixed, secondary	Part of Z300
C301A	Condenser, fixed, primary	Part of Z301
C301B	Condenser, fixed, secondary	Part of Z301
C302	Condenser, screen by-pass, .05 mf.	61-0122*
C303	Condenser-and-choke assembly, by-pass, .2 mf.	76-1161
C304	Condenser, i-f by-pass, 100 mmf.	60-10105407*
C305	Condenser, i-f by-pass, 100 mmf.	60-10105407*
R300	Resistor, screen dropping, 47,000 ohms	66-3473340*
R301	Resistor, filter, 47,000 ohms	66-3473340*
R302	Resistor, a-v-c filter, 2.2 megohms	66-5223340*
S300	Switch, phono-radio	Part of S101
Z300	Transformer, 1st i.f., 455 kc., includes C300A and C300B	32-4160
Z301	Transformer, 2nd i.f., 455 kc., includes C301A and C301B	32-4161

Section 4

C400	Condenser, tuning gang	31-2527-2
C400A	Condenser, aerial trimmer	Part of C400
C400B	Condenser, oscillator trimmer	Part of C400
C401	Condenser, coupling, 5 mmf.	60-90505007*
C402	Condenser, coupling, 100 mmf.	60-10105407*
C403	Condenser, a-v-c filter, .05 mf.	61-0122*
LA400	Loop aerial	
	Model 48-1201	76-2127-3
	Model 48-1260	76-2127-4
R400	Resistor, ext. aerial loading, 150,000 ohms	66-4153340*
R401	Resistor, grid leak, 1 megohm	66-6103340*
R402	Resistor, grid leak, 120,000 ohms	66-4123340*
T400	Oscillator transformer	32-4095-2

Miscellaneous — Model 48-1201

Description	Service Part No.
Aerial-lead assembly	76-1472
Cabinet (less scale)	10664B
Baffle and cloth	40-6827
Bar-and-clip assembly	76-2111
Bottom cover	54-7243
Button (2 required)	56-3920
Button, springs (2 required)	56-3919
Door	21-9058
Frame and base	76-2499
Hinge (2 required)	56-3910

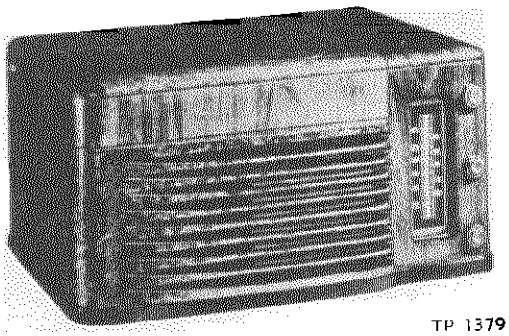
Miscellaneous — Model 48-1201 (Continued)

Description	Service Part No.
Knob (2 required)	54-425
Rubber foot (4 required)	54-437
Rubber mount	27-461
Snap fastener (4 required)	28-4279FA
Scale	27-5883-
Scale strap	56-226
Wooden baffle	21-905
Dial backplate	76-194
Cam assembly	76-163
Drive cord, gang drive (25-foot spool)	45-874
Drive cord, pointer (25-foot spool)	45-875
Pointer	56-2076-
Shaft assembly	31-268
Spring, gang drive	56-261
Spring, pointer	28-895
Hardware	
Bolt, speaker mounting (4 required)	W-212
Clamp, electrolytic mounting	56-146
Clip, coil mounting	28-5002FA
Retainer (2 required)	56-391
Screw, backplate mtg.	1W19670FA
Screw (4 required)	1W22285FA
Spring retainer	28-865
Pickup cable	41-370
Socket, Loktal (5 required)	27-613
Socket, pilot lamp	27-623
Speaker cable	41-375
Switch-lever assembly	76-164

Miscellaneous — Models 48-1260M (Mahogany and 48-1260L (Light)

Description	Service Part No.
Cabinet (L)	10677
(M)	10677
Bar and clip assembly	76-211
Baffle and cloth (L)	40-692
(M)	40-6927-
Bezel	56-495
Bullet catch (L)	45-6002-
(M)	45-600
Door	56-4921FJ3
Door spring	56-5027FA3
Door pull (2 required) (L)	56-479
(M)	56-4796-
Dome (4 required)	45-619
Knife hinge (2 required)	56-405
Knob (2 required) (L)	54-4214-
(M)	54-421
Rail (2 required)	56-4797FA
Scale	27-588
Scale strap (2 required)	56-226
Washer, scale strap (2 required)	1W5193
Snap fastener (4 required)	28-4279FA
Strike plate (L)	45-6003-
(M)	45-600
Wood baffle	21-908
Wood screw (12 required)	1W2522
Dial backplate assembly	76-317
Bracket (4 required)	56-499
Cam assembly	76-163
Drive cord, pointer and gang drive (25-foot spool)	45-875
Frame and bracket	76-2468-1FJ3
Pointer	56-2076-
Shaft assembly	31-286
Spring, pointer	28-895
Spring, gang drive	56-261
Screw, backplate mtg. (4 required)	1W19670FA
Hardware	
Bolt, speaker mtg. (4 required)	W-169
Clamp, electrolytic mtg.	56-145
Clip, coil mtg.	28-5002FA
Eye screw	56-499
Nut (4 required)	1W19988FA
Rubber mount, gang mtg.	27-461
Screw, R. H. (4 required)	1W2498
Speed nut (4 required)	1W6010
Spring retainer	28-865
Pickup cable	41-3735-10
Socket, Loktal (5 required)	27-613
Socket, pilot lamp	27-623
Switch-lever assembly	76-164

MODEL 48-1256 PHILCO CORP.



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MODEL 48-1256

SPECIFICATIONS

CABINET	Wood, walnut or mahogany finish
CIRCUIT	Six-tube superheterodyne
FREQUENCY RANGE	540—1620 kc.
OPERATING VOLTAGE	105—120 volts, 60 cycles, a.c.
POWER CONSUMPTION	60 watts
AERIAL	Built-in loop; terminal provided for external aerial
INTERMEDIATE FREQUENCY	455 kc.
PHILCO TUBES (6)	7C7, 7A8, 14A7, 7C6, 35L6GT, 50X6
RECORD CHANGER	Philco Automatic Record Changer, Model D-10 *(For service information, see manual PR-1156.)*

Circuit Description

Philco Model 48-1256 is a table-model radio-phonograph combination consisting of a six-tube, a-c, superheterodyne radio and a Philco Model D-10 Automatic Record Changer. The tuning range is 540—1620 kc. The built-in, high-impedance loop is usually adequate, although an external aerial may be used where additional signal pickup is required. The tube complement is as follows: 7C7, r-f amplifier; 7A8, converter; 14A7, i-f amplifier; 7C6, detector-a.v.c.-1st audio; 35L6GT, output amplifier; 50X6, rectifier.

A series-resonant, i-f by-pass, C304 (with choke), is connected between the chassis and B–; this combination functions as an r-f by-pass at broadcast frequencies. If short-wave interference originating near 14—28 mc. is encountered, install a .01-mf. by-pass condenser between the chassis and B– (the choke wound on C304 has appreciable impedance at these frequencies).

The d-c operating voltages are obtained from a voltage-doubler circuit using a 50X6 rectifier; a resistance-capacitance network is used for filtering. The radio operates on a.c. only.

The radio-phono switch, which is mechanically connected to the volume-control shaft, is operated by turning the control to either side of center—clockwise for radio and counterclockwise for phonograph.

Preliminary Checks

The following preliminary checks should be made before turning on the radio:

1. Carefully inspect both top and bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for broken or shorted connections, burned resistors, or other obvious sources of trouble.

2. Measure the resistance between B+ (pin 7 of the 50X6 rectifier) and B–, test point B; use the ohmmeter polarity that gives the highest resistance reading. If the reading is lower than 3000 ohms, check condensers C101, C102, C103A, and C103B for leakage or shorts.

The resistance value above, which is much lower than normal, is not intended as a quality check of these condensers; the value given is the lowest at which the rectifier will operate safely while the voltage tests for Section 1 are performed.

Philco TROUBLE-SHOOTING *Procedure*

For rapid trouble shooting, the radio circuit is divided into four sections, with test points specified for each section; these sections and test points are indicated in the schematic diagram. The trouble-shooting procedure given for each section includes a simplified test chart and a bottom view of the chassis showing the locations of the test points and the components of that section.

In each chart, the first step is a master check for determining whether trouble exists in that section, without going through the entire test procedure. Failure to obtain the "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

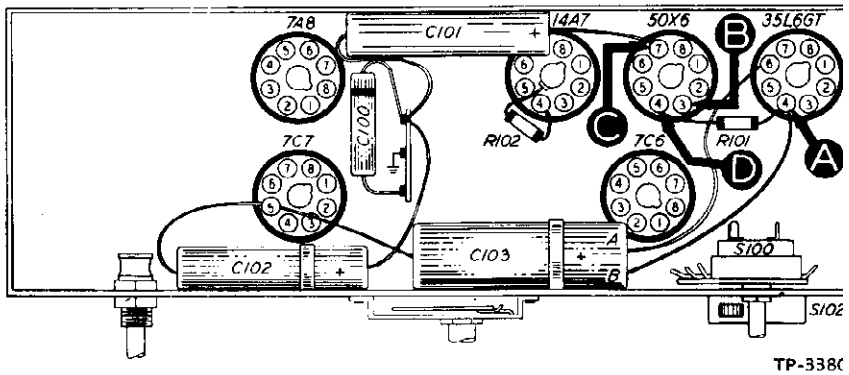
After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

Section 1 TROUBLE SHOOTING

For the tests in this section, use a d-c voltmeter. Connect the negative lead to B–, test point B; connect the positive lead to the test points indicated in the chart. The voltage readings given were taken with a 20,000-ohms-per-volt meter at a line voltage of 117 volts, a.c.

Turn the power on; set the volume control to minimum for radio, and the tone control counterclockwise.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2; if not, isolate and correct the trouble in this section.



TP-338C

Figure 1. Bottom View, Showing Section 1 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	140v	Trouble within this section. Isolate by the following tests.
2	C	215v	Defective: 50X6. Open: W100, S100, C101, C102. Shorted leaky: C101, C102, C103A, C103B, C204*, C205*.
3	D	200v	Change in value: R100. Leaky: C103A.
4	A	140v	Change in value: R101. Leaky: C103B.
Listening Test: Abnormal hum may be due to loss of capacitance in C101, C102, C103A, or C103B; test by substituting good condensers.			

* This part, located in another section, may cause abnormal indication in this section.

Section 2 TROUBLE SHOOTING

For the tests in this section, use an audio-frequency signal generator. Connect the generator ground lead to B–, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Turn the volume control to maximum for radio, and the tone control counterclockwise. Adjust the signal-generator output as required for each step.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 3; if not, isolate and correct the trouble in this section.

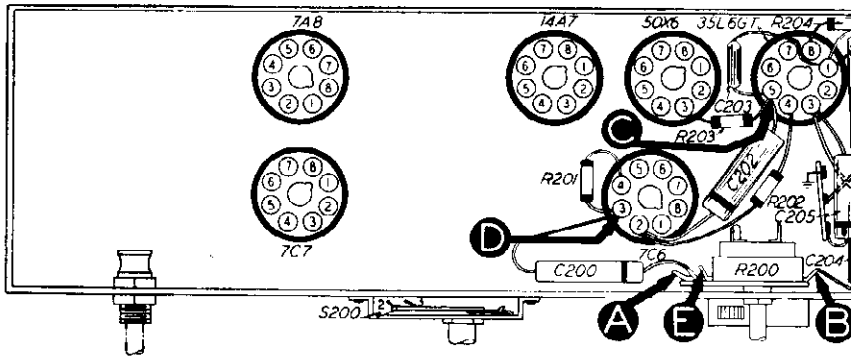


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Figure 2. Bottom View, Showing Section 2 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with moderate signal input.	Trouble within this section. Isolate by the following tests.
2	C	Moderate, clear signal with strong signal input.	Defective: 35L6GT. Open: LS200 voice coil, T200 pri. or sec R204. Shorted: C202, C203, C204, C205, LS200 voice co T200 pri. or sec.
3	D	Loud, clear signal with moderate signal input.	Defective: 7C6. Open: C202, C203, R202.
4	A	Loud, clear signal with moderate signal input.	Open: C200, R200. Shorted: C303*.
5	E	Volume control at maximum for phono. Loud, clear signal with moderate signal input.	Open: R200. Shorted: crystal pickup, shielded pickup cable.
Listening Test: Distortion or hum may be due to defective 7C6 or 35L6GT (test by substituting good tubes). Distortion may also result from open R201, or shorted or leaky C200.			

* This part, located in another section, may cause abnormal indication in this section.

Section 3 TROUBLE SHOOTING

For the tests in this section, use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to B–, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Turn the volume control to maximum for radio, and the tone control counterclockwise.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 4; if not, isolate and correct the trouble in this section.

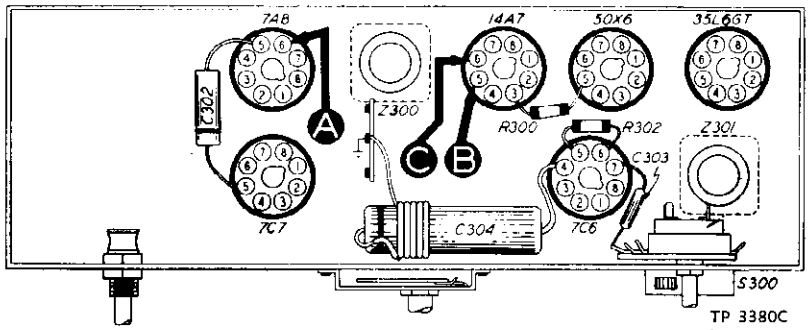


Figure 3. Bottom View, Showing Section 3 Test Points

Since the circuit location of test point A for this section is the same as that of test point C for Section 4, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in Section 4; these parts are listed below under "POSSIBLE CAUSE OF ABNORMAL INDICATION."

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with moderate signal input.	Trouble within this section. Isolate by the following tests.
2	C	Loud, clear signal with strong signal input.	Defective: 14A7, 7C6 (diode section). Misaligned: Z301. Open: Z301 pri. or sec., C301A, C301B, C303, R300, R301. Shorted: Z301 pri. or sec., C301A, C301B, C301C, C301D, C300B, C302.
3	A	Loud, clear signal with moderate signal input.	Defective: 7A8*. Misaligned: Z300. Open: Z300 pri. or sec., C300A, C300B, C302, R300, S300, R403*. Shorted: Z300 pri. or sec., C300A, C300B, C302, T400* sec.
Listening Test: Instability or whistles may be due to shorted coil on C304, or by open C302.			

* This part, located in another section, may cause abnormal indication in this section.

Section 4 TROUBLE SHOOTING

For the tests in this section (with the exception of the oscillator test), use an r-f signal generator with modulated output. Connect the generator ground lead to B–, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Turn the volume control to maximum for radio, and the tone control counterclockwise.

Set the tuning control and signal-generator frequency as indicated in the chart.

If the "NORMAL INDICATION" is not obtained in step 1, isolate the trouble by following the remaining steps.

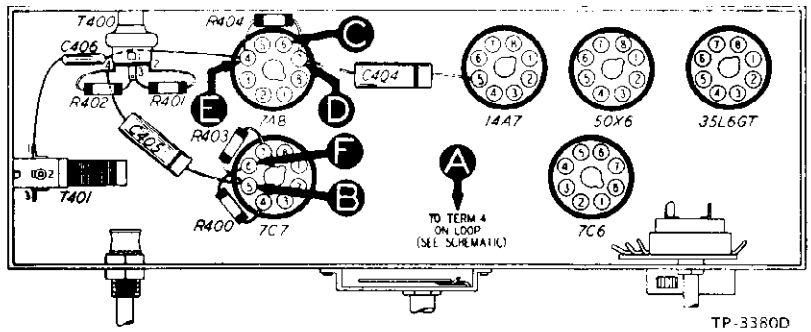


Figure 4. Bottom View, Showing Section 4 Test Points (Locations of C400, C401, C403, and C407 are shown in figure 7.)

STEP	TEST POINT	DIAL SETTINGS		NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
		SIG. GEN.	RADIO		
1	A	1000 kc.	1000 kc.	Loud, clear signal with weak signal input.	Trouble within this section. Isolate by the following tests.
2	C	1000 kc.	1000 kc.	Clear signal with moderate signal input.	Oscillator trouble (see oscillator test below) Defective: 7A8. Misaligned: T401. Open: T401 pri. or sec., C406, R404. Shorted: C402B, C402D, C407.
3	F	1000 kc.	1000 kc.	Loud, clear signal with weak signal input.	Defective: 7C7. Open: T400 pri. or sec., C405, C404.
4	A	1000 kc.	1000 kc.	Somewhat louder signal than in step 3.	Misaligned: C402C. Open: LA400, C400, C403. Shorted: LA400, C401.

Listening Test: Distortion may be due to open R400.

OSCILLATOR TEST: Connect positive lead of high-resistance, d-c voltmeter to test point D; connect the prod end of the negative lead through 100,000-ohm isolating resistor to oscillator grid (pin 4 of 7A8), test point E. Use suitable meter range, such as 0—10 volts. Proper operation of oscillator is indicated by negative voltage throughout range of tuning condenser.

ALIGNMEI

TURN THE VOLUME CON

DIAL—Calibration and pointer-index measurements are shown in figure 6. With the tuning condensers fully meshed, set the pointer to the index mark.

OUTPUT METER—Connect to the right-hand (put) lug and center (chassis) lug of the term panel, shown in figure 7.

STEP	SIGNAL GENERATOR		RADIO		AI
	CONNECTIONS TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1				Turn C300B (copper screw) down tight.	
2	Through .1-mf. condenser to test point C of Section 4.	455 kc.	540 kc.	Adjust, in order given, for maximum output.	C C C C
3	Through 200-mmf. condenser to external aerial connector.	1600 kc.	1600 kc.	Adjust for maximum output.	C
4	Same as step 3.	1500 kc.	1500 kc.	Adjust for maximum output.	C

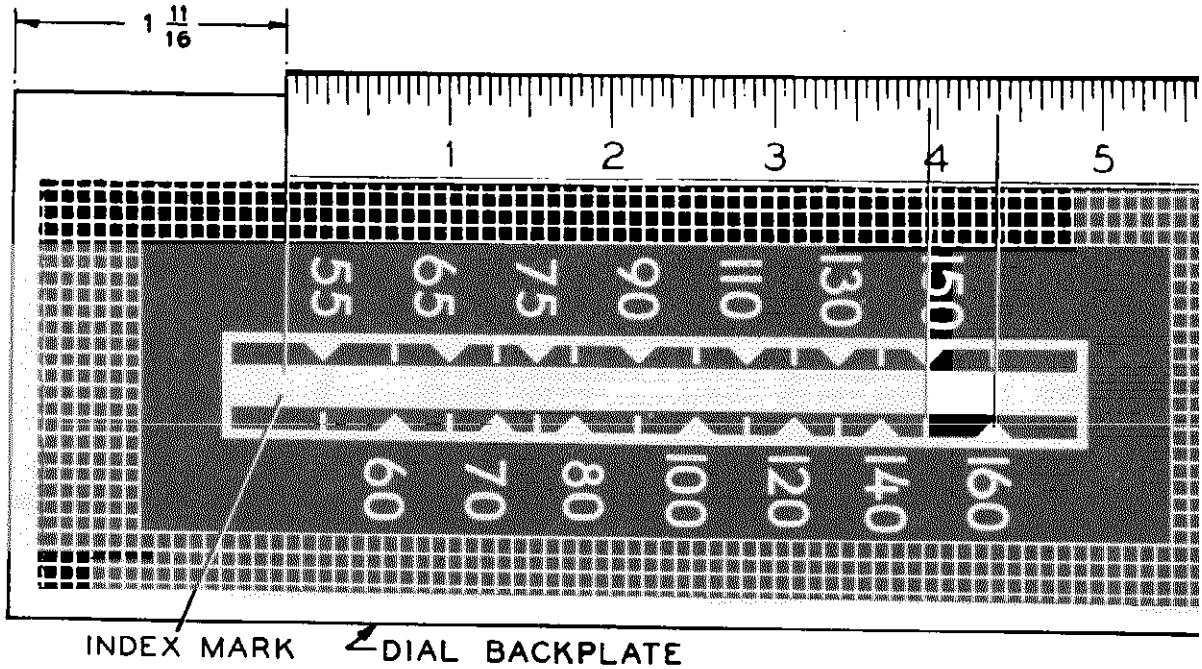
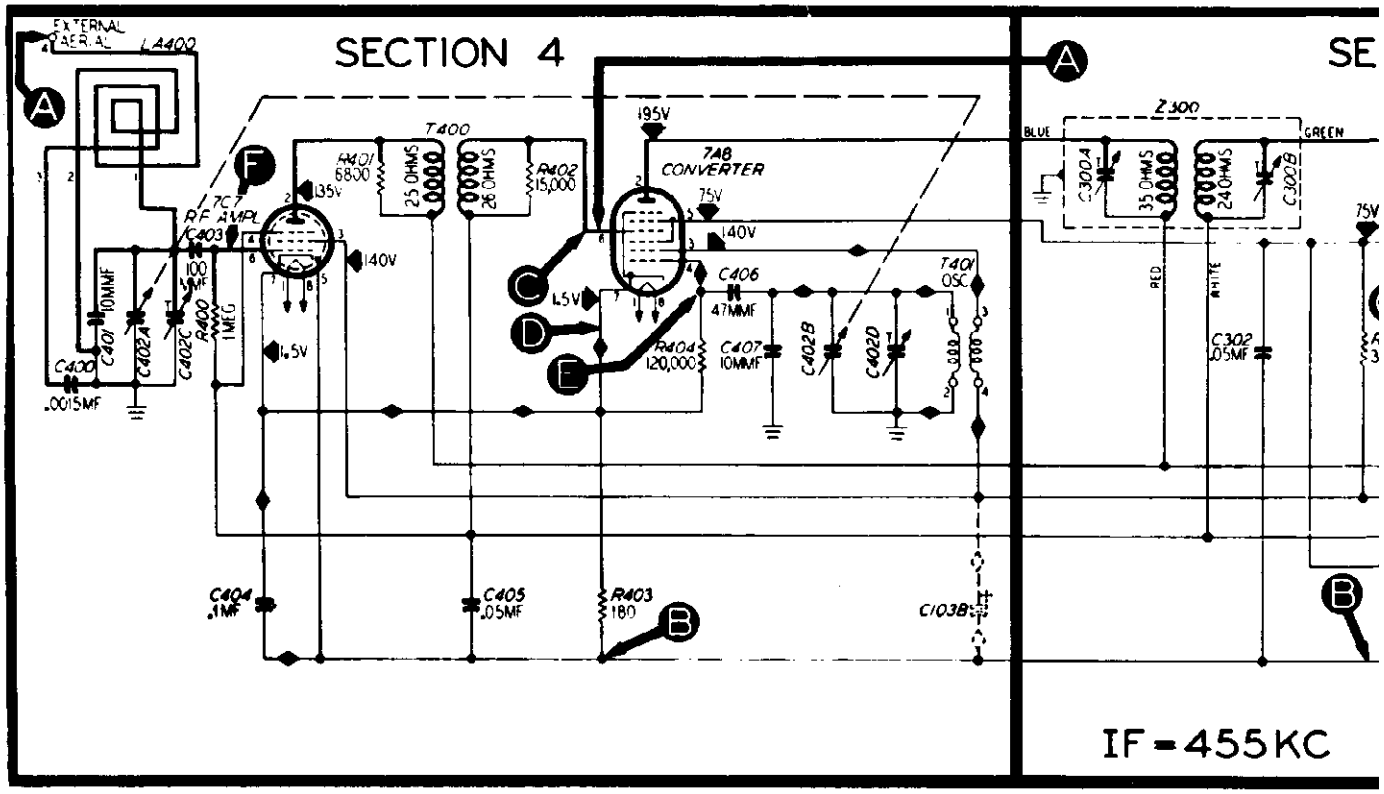
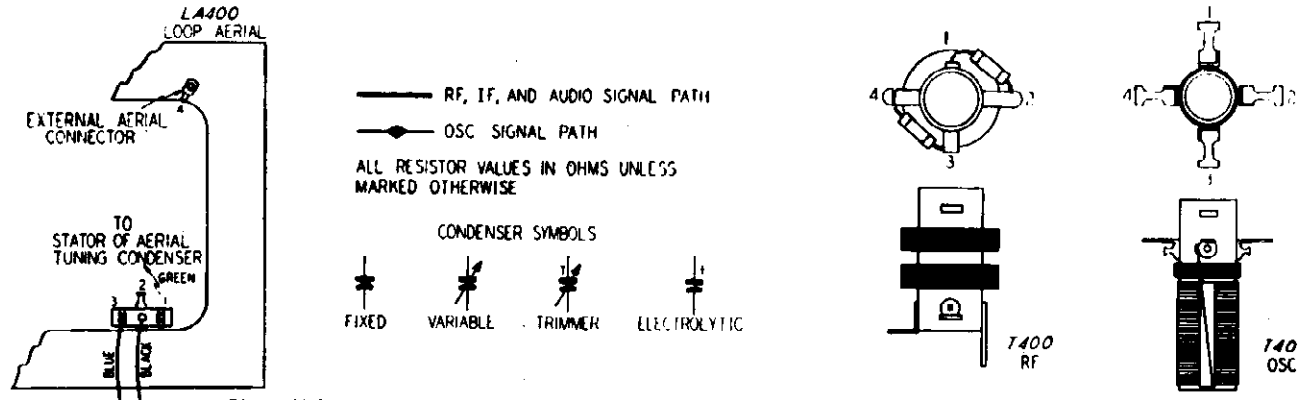


Figure 6. Calibration Measurements for Dial Backplate





SYMBOLIZATION AND TERMINOLOGY

The components in the radio circuit are symbolized according to the types of parts and th of the radio in which the parts are located. The prefix letter of the symbol designates the typ as follows:

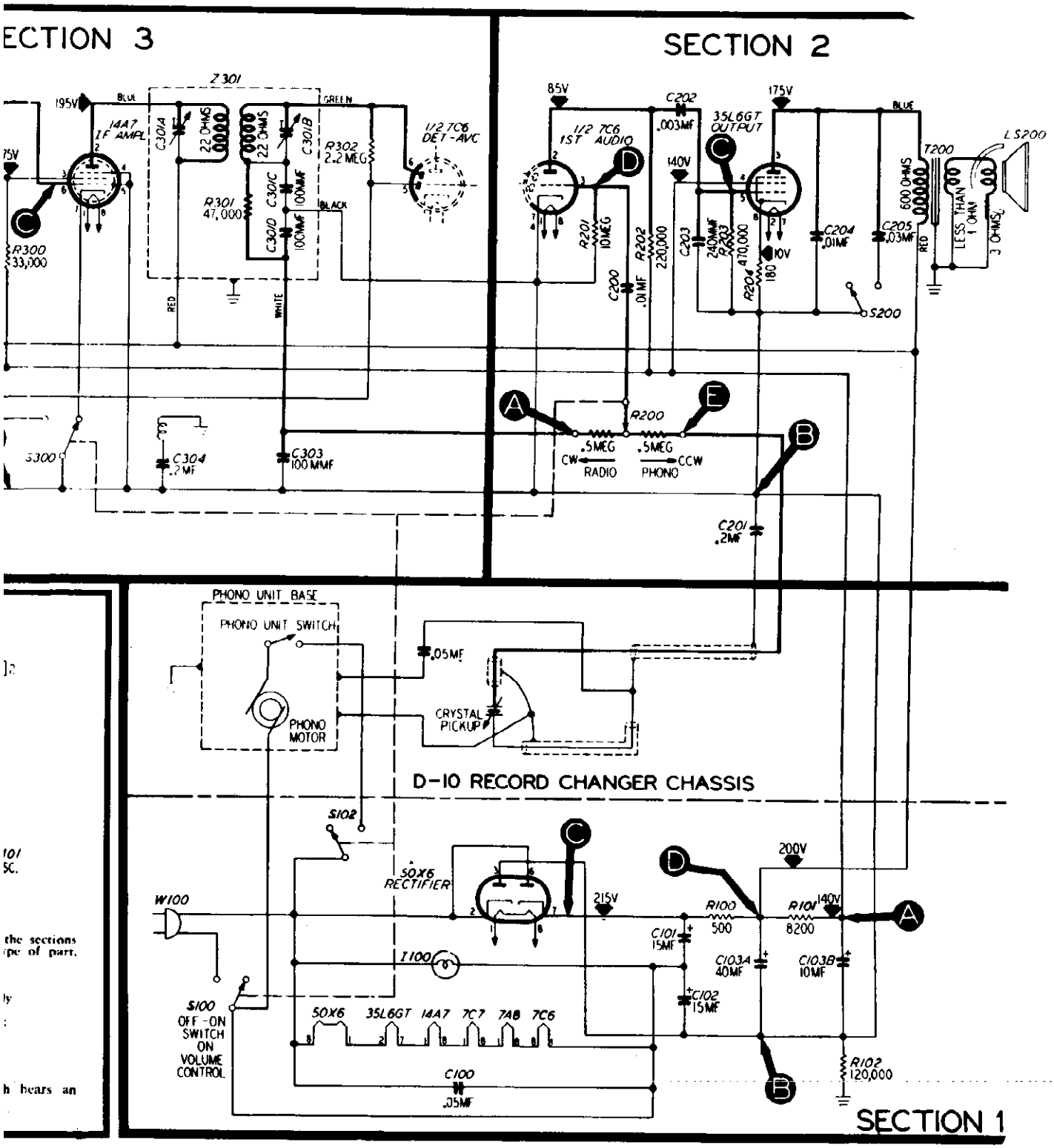
C—condenser	LA—loop aerial	S—switch
I—pilot lamp	LS—loud-speaker	T—transformer
L—choke or coil	R—resistor	Z—electrical assembly

The number of the symbol designates the section in which the part is located, as follows:

100-series components are in Section 1—the power supply.
200-series components are in Section 2—the audio circuits.
300-series components are in Section 3—the i-f amplifier, detector, and a-v-c circuits.
400-series components are in Section 4—the aerial, r-f, and oscillator circuits.

A suffix letter identifies the part as a non-replaceable component of the assembly which identical number without a suffix letter, and with perhaps a different prefix letter.

Figure 5. Philco Radio-Phonograph, Model 48-1



1256, Sectionalized Schematic, Showing Test Points

PROCEDURE

I. FOR RADIO TO MAXIMUM.

SIGNAL GENERATOR—Connect the ground lead to B–; connect the output lead as indicated in the chart. Use modulated output.

OUTPUT LEVEL—During alignment, adjust the signal-generator output to maintain an output-meter indication below 1.25 volts.

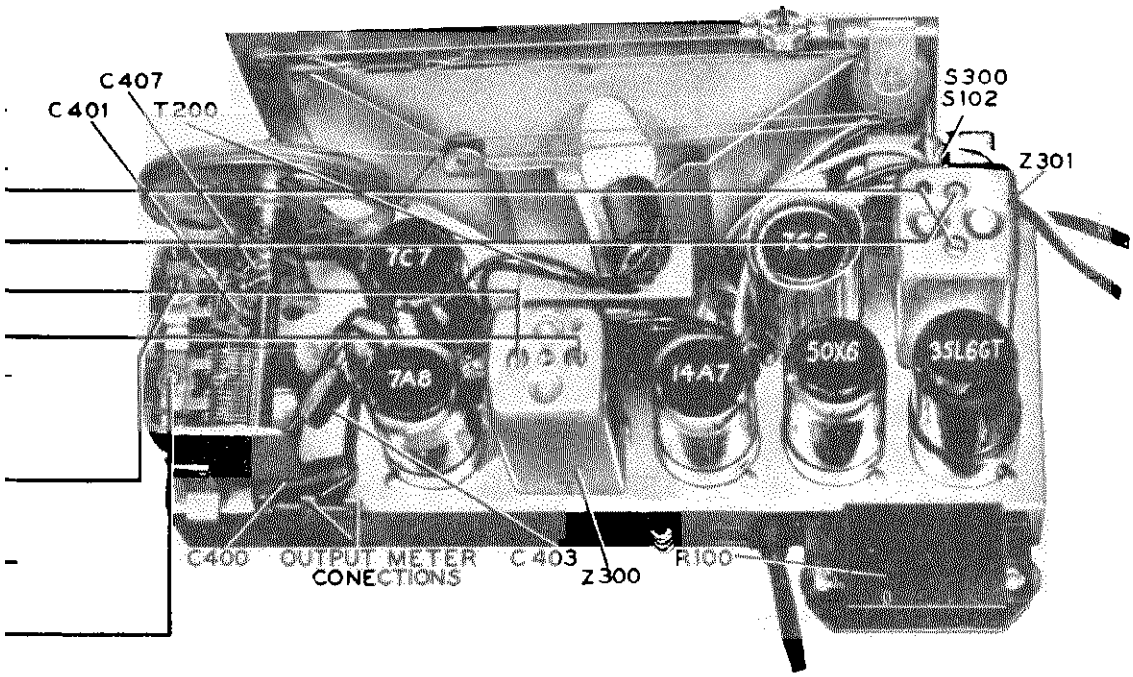


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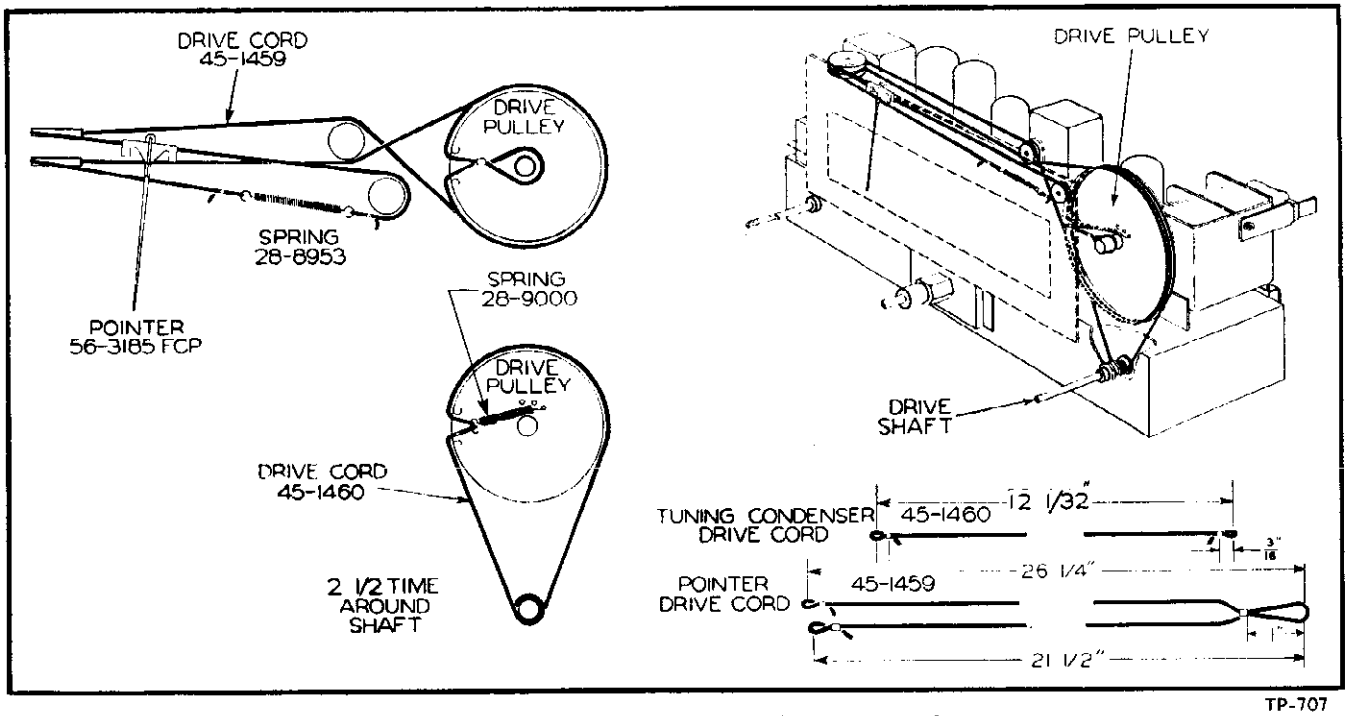
Figure 7. Top View, Showing Trimmer Locations



TP-707

Figure 8. Drive-Cord Installation Details

REPLACEMENT PARTS LIST

NOTE

Part numbers marked with an asterisk (*) are general replacement items. These numbers may not be identical with those on factory assemblies; also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

SECTION 1

Reference Symbol	Description	Service Part No.
C100	Condenser, power-line by-pass, .05 mf.	61-0122
C101	Condenser, electrolytic, filter, 15 mf.	30-2575-11
C102	Condenser, electrolytic, filter, 15 mf.	30-2575-11
C103	Condenser, electrolytic, 2-section	30-2575-12
C103A	Condenser, filter, 40 mf.	Part of C103
C103B	Condenser, filter, 10 mf.	Part of C103
I100	Lamp, panel, 110 volts, 6 watts	34-2477
R100	Resistor, filter, 500 ohms	33-3435-3
R101	Resistor, filter, 8200 ohms	66-2824340*
R102	Resistor, a-c leakage, 120,000 ohms	66-4123340*
S100	Switch, a-c power	Part of R200
S102	Switch, phono-motor power	Part of 42-1736

SECTION 2

Reference Symbol	Description	Service Part No.
C200	Condenser, d-c blocking, .01 mf.	61-0120*
C201	Condenser, a-c isolation, .2 mf.	45-3500-3*
C202	Condenser, d-c blocking, .003 mf.	61-0109*
C203	Condenser, r-f by-pass, 240 mmf.	60-10245307*
C204	Condenser, tone compensating, .01 mf.	61-0120*
C205	Condenser, tone control, .03 mf.	45-3500-1*
LS200	Speaker	36-1613
R200	Control, volume, .5 megohm each side of center tap	33-5503
R201	Resistor, grid return, 10 megohms	66-6103340*
R202	Resistor, plate load, 220,000 ohms	66-4223340*
R203	Resistor, grid return, 470,000 ohms	66-4473340*
R204	Resistor, cathode bias, negative feedback, 180 ohms	66-1183340*
S200	Switch, tone control	42-1770
T200	Transformer, audio output	32-8242

SECTION 3

Reference Symbol	Description	Service Part No.
C300A	Condenser, trimmer	Part of Z300
C300B	Condenser, trimmer	Part of Z300
C301A	Condenser, trimmer	Part of Z301
C301B	Condenser, trimmer	Part of Z301
C301C	Condenser, r-f by-pass	Part of Z301
C301D	Condenser, r-f by-pass	Part of Z301
C302	Condenser, r-f by-pass, .05 mf.	61-0122*
C303	Condenser, r-f by-pass, 100 mmf.	60-10105407*
C304	Condenser-and-choke assembly, resonant at 455 kc.	76-1198
R300	Resistor, screen dropping, 33,000 ohms	66-3333340*
R301	Resistor, r-f filter	Part of Z301
R302	Resistor, a-v-c decoupling, 2.2 megohms	66-6103340*
S300	Switch (combined with S102), radio disabling	Part of 42-1736
Z300	Transformer, 1st i-f, 455 kc., including C300A and C300B	32-3962
Z301	Transformer, 2nd i-f, 455 kc., including C301A, C301B, C301C, C301D, and R301	32-4005

SECTION 4

Reference Symbol	Description	Servi Part
C400	Condenser, aerial isolating, .0015 mf.	45-3500
C401	Condenser, fixed circuit capacitance, 10 mmf.	60-001054
C402	Condenser, tuning gang	31-2527
C402A	Condenser, aerial tuning	Part of C4
C402B	Condenser, oscillator tuning	Part of C4
C402C	Condenser, aerial trimmer	Part of C4
C402D	Condenser, oscillator trimmer	Part of C4
C403	Condenser, d-c blocking, 100 mmf.	60-101054
C404	Condenser, cathode r-f by-pass, .1 mf.	61-01
C405	Condenser, a-v-c filter, .05 mf.	61-01
C406	Condenser, d-c blocking, 47 mmf.	60-102552
C407	Condenser (ceramic), fixed circuit capacitance, 10 mmf.	62-0100090
LA400	Loop-aerial assembly	76-30
R400	Resistor, grid return, 1 megohm	66-51033
R401	Resistor, 6800 ohms	Part of T4
R402	Resistor, 15,000 ohms	Part of T4
R403	Resistor, cathode bias, 180 ohms	66-11833
R404	Resistor, oscillator grid leak, 120,000 ohms	66-41233
T400	Transformer, r-f band-pass, including R401 and R402	32-35
T401	Transformer, oscillator	32-41

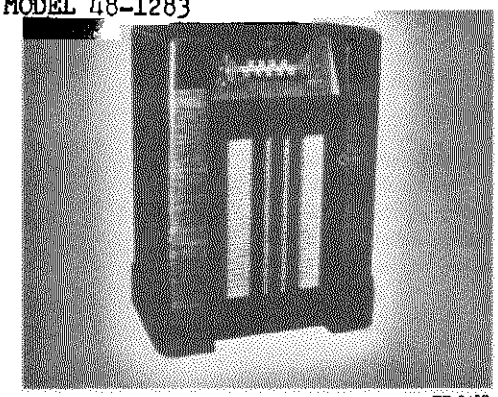
MISCELLANEOUS

Description	Servi Part
Backplate assembly, dial	76-31
Cabinet (less scale), mahogany	10641
Cabinet (less scale), walnut	10641
Baffle-and-cloth assembly	40-67
Band, rubber, scale mounting	54-41
Grommet, for corner plate	54-43
Hinge, butt	45-63
Hinge, lid support	45-63
Knob	54-44
Plate, corner, record-changer mounting	56-31
Scale, dial	27-58
Screw, chassis-board mounting	1W15471FA
Screw, chassis mounting	1W13210FA
Strap, dial mounting	56-22
Washer, cupped, for 1W15471FA9 screw	1W42303FA
Cable, pickup	41-37
Cam assembly, phono-radio switch	76-16
Clamp, electrolytic-condenser mounting	56-14
Clip, coil mounting (oscillator, r.f.)	28-5002FA
Cord, tuning-condenser drive (25-ft. spool)	45-87
Cord, pointer drive (25-ft. spool)	45-87
Diffusing panel	54-42
Grommet, tuning-condenser mounting	27-46
Lever assembly, phono-radio switch	76-16
Plate, backing, tuning condenser	56-21
Pointer, dial	56-31
Pulley, dial	11W297
Shaft, tuning-condenser drive	76-17
Socket, Loktal	27-61
Socket, octal	27-61
Spring, tuning-condenser drive	56-26
Spring, retaining, switch-lever assembly	28-86
Spring, pointer drive	28-89
Stud, switch lever	56-29

Change of parts list:
Z300 Transformer, first IF 32-4160

MODEL 48-1262, Code 121,
MODEL 48-1283

PHILCO CORP.



TP-3457

MODEL 48-1262

SPECIFICATIONS

CABINET	Wood, walnut finish
CIRCUIT	Six-tube superheterodyne
FREQUENCY RANGE	540 to 1620 kc.
AUDIO OUTPUT	2.5 watts
OPERATING VOLTAGE	105 to 120 volts, 60-cycle, a.c. only
POWER CONSUMPTION	Radio, 40 watts; Phonograph, 20 watts
AERIAL	Built-in loop; terminal also provided for external aerial
INTERMEDIATE FREQUENCY	455 kc.
PHILCO TUBES (6)	7B7(2), 7C6, 14AF7, 35L6GT, 50X6
PHONOGRAPH	Philco Automatic Record Changer, Model D-10

Circuit Description

Philco Model 48-1262 is a console combination of a Philco Model D-10 Automatic Record Changer and a six-tube superheterodyne radio which provides reception within the Standard Broadcast Band.

The loop aerial normally provides adequate signal pickup. If greater pickup is required, an external aerial may be connected.

The loop works into a 14AF7 converter, and variable-condenser tuning is used. The two i-f stages employ 7B7 high-transconductance tubes. To obtain good stability, resistance coupling is employed between the first and second i-f tubes. The diodes of the 7C6 provide detection and a-v-c voltage. The triode section of this tube functions as the first audio amplifier, and is resistance-coupled to the 35L6GT output tube. The loud-speaker is a permanent-magnet dynamic type. The power supply employs a 50X6 full-wave voltage-doubling rectifier and a resistor-condenser filter network.

The 120,000-ohm resistor, R102, is connected between B— and the chassis to prevent hum under conditions of high humidity.

The two series-resonant circuits, C304 and C305, function as by-passes of exceptionally low impedance; one is resonant at the i.f., 455 kc., while the other is resonant at the second harmonic of the i.f., 910 kc.

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before it is turned on:

1. Carefully inspect both top and bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for broken or shorted connections, burned resistors, or other obvious sources of trouble.

2. Measure the resistance between B+ (pin 7 of the 50X6 rectifier) and the B— bus, test point B. When the ohmmeter leads are connected in the proper polarity, the highest resistance reading will be obtained. This reading should be not lower than 3000 ohms. If it is lower, check condensers C101, C102, C103A, and C204 for leakage or shorts.

The above resistance value is not intended as a quality check for these condensers. It is the lowest value at which the rectifier will operate safely while the voltage tests of Section 1 are being performed.

For service information concerning Model 48-1283

Model 48-1283 is similar to Model 48-1262, Code 121, with the exceptions given in this supplement. The radio-phonograph is contained in a cabinet which has two record shelves. The aerial loop is mounted on rails at the back of the cabinet. Automatic Record Changer Model M-8 is used, and the isolating condenser and the load resistor for the crystal pickup are mounted on a terminal strip located on the speaker baffle.

SCHEMATIC DIAGRAM

Section 1

The .05-mf. condenser between the phono chassis and the phono-cable shield is removed, and is connected between the phono chassis and the radio chassis. This condenser is located on a terminal strip attached to the cabinet.

A 1-megohm resistor is connected across the crystal pickup.

A .01-mf. condenser is connected between the low side of the crystal pickup and the phono-cable shield.

R102 is 150,000 ohms.

Section 2

C200 is removed and the cable shield is connected directly to B —.

C205 is .03 mf.

Section 3

R302 is 150,000 ohms.

Section 4

R400 is 150,000 ohms.

LA400 is 3.5 ohms.

REPLACEMENT PARTS LIST

Section 1

R102 is 150,000 ohms, Service Part No. 66-4153340*.

Section 2

C200 is removed.

C205 is .03 mf., Service Part No. 45-3500-1*.

LS200 is Service Part No. 36-1626-1.

Section 3

C304 is .15 mf., Service Part No. 38-9851-5.

C305 is .05 mf., Service Part No. 38-9851-4.

R302 is 150,000 ohms, Service Part No. 66-4153340*.

Section 4

C400 is Service Part No. 31-2715-1.

LA400 is Service Part No. 32-4273.

R400 is 150,000 ohms, Service Part No. 66-4153340*.

Section 1 TROUBLE SHOOTING

For the tests in this section, use a d-c voltmeter. Connect the negative lead to the B— bus, test point B; connect the positive lead to the test points indicated in the chart. The voltage readings given were taken with a 20,000-ohms-per-volt meter, at a line voltage of 117 volts, a.c.

With the radio-phono switch set to the radio position, turn the volume control to minimum and turn the tone control fully clockwise.

Follow the steps in sequence; if the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2; if not, isolate and correct th trouble in this section.

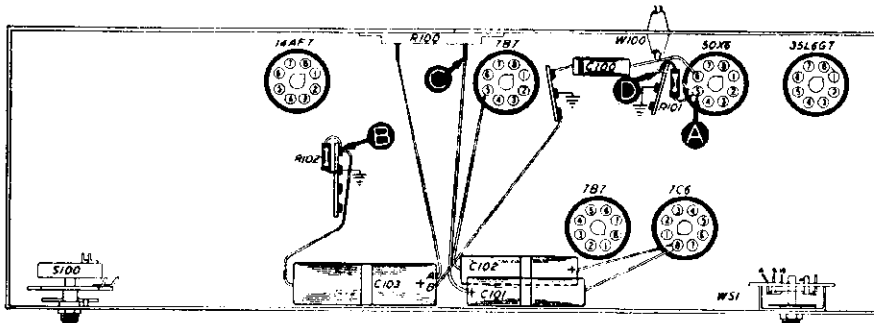


Figure 1. Bottom View, Showing Section 1 Test Points TP-3395

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	167 v.		Trouble within this section. Isolate by the following tests.
2	C	214 v.	No voltage.	Defective: 50X6, S100, W100. Shorted: C101, C102.
			Low voltage.	Defective: 50X6. Open: C101, C102. Leaky: C101, C102, C103A, C103B.
			High voltage.	Open: R100, T200,* R204.*
3	D	181 v.	No voltage.	Shorted: C103A.
			Low voltage.	Open: C103A. Leaky: C103A, C204.*
			High voltage.	Open: R101, R204,* T200.*
4	A	167 v.	No voltage.	Shorted: C103B.
			Low voltage.	Leaky: C103B.
			High voltage.	Open: R204,* T200.*

Listening Test: Abnormal hum may be caused by open C103A, C103B, or R102.

* This part, located in another section, may cause abnormal indication in this section.

Section 2 TROUBLE SHOOTING

For the tests in this section, use an audio-frequency signal generator. Connect the generator ground lead to the B— bus, test point B; connect the generator output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, and the tone control fully clockwise. Adjust the signal-generator output as required for each step.

If the "NORMAL INDICATION" is obtained in step 1, proceed to the tests in Section 3; if not, isolate and correct the trouble in this section.

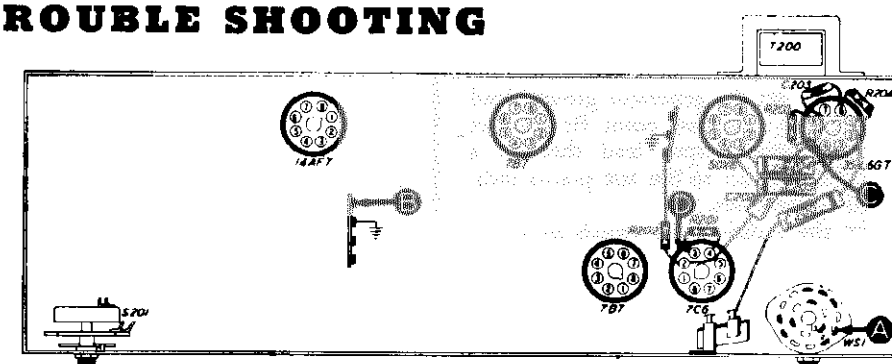


Figure 2. Bottom View, Showing Section 2 Test Points TP-3395

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble within this section. Isolate by the following tests.
2	C	Loud, clear signal with strong signal input.	Defective: 35L6GT, LS200, T200. Shorted: C202, C203, C204, C205. Leaky: C202, C203, C204, C205. Open: R203, R204.
3	D	Loud, clear signal with weak signal input.	Defective: 7C6. Open: C202, R202, R201. Leaky: C202.
4	A	Loud, clear signal with weak signal input. (Rotate R200 through its range.)	Defective: WS1, R200. Open: C201. Shorted: C301D.*

Listening Test: Distortion on strong signals may be caused by short-circuited or leaky C201, or open-circuited R201.

* This part, located in another section, may cause abnormal indication in this section.

MODEL 48-1262, Code 121 PHILCO CORP.

Section 3 TROUBLE SHOOTING

For the tests in this section, use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to the B— bus, test point B; connect the generator output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the radio-phono switch to radio, turn the volume control to maximum, and set the tone control fully clockwise.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 4; if not, isolate and correct the trouble in this section.

NOTE: Since the circuit location of test point A for this section is the same as that of test point C for Section 4, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in Section 4; these parts are listed below under "POSSIBLE CAUSE OF ABNORMAL INDICATION."

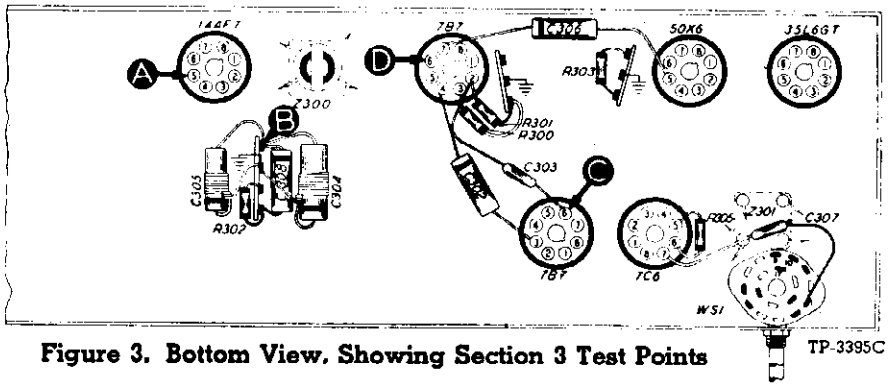


Figure 3. Bottom View, Showing Section 3 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble within this section. Isolate by the following tests.
2	C	Loud, clear signal with strong signal input.	Defective: WS1, 7B7 (2nd i.f.), 7C6, Z301. Open: C302, C306, R300, R302. Shorted: C302, C306. Leaky: C302, C306.
3	D	Loud, clear signal with moderate signal input.	Defective: 7B7 (1st i.f.). Open: C303, C304, C305, C308, R301, R302. Shorted: C303. Leaky: C303.
4	A	Loud, clear signal with weak signal input.	Defective: 14AF7,* Z300. Misaligned: Z300. Open: R402,* R401.*

* This part, located in another section, may cause abnormal indication in this section.

Section 4 TROUBLE SHOOTING

For the tests in this section (with the exception of the oscillator test), use an r-f signal generator with modulated output. Connect the generator ground lead to the B— bus, test point B; connect the generator output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the radio-phono switch to radio, turn the volume control to maximum, and set the tone control fully clockwise.

Except as noted for the oscillator test, set the radio and signal-generator dials to 540 kc.

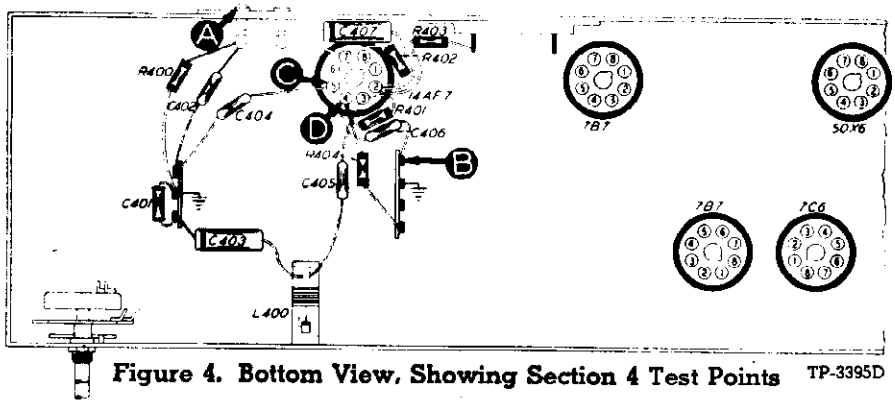


Figure 4. Bottom View, Showing Section 4 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble within this section. Isolate by the following tests.
2	C	Loud, clear signal with weak signal input.	Defective: 14AF7, osc. circuit. Open: C407, R402. Shorted: C407. Leaky: C407.
3	D (Osc. test; see Note below.)	Negative 3.3 to 4.2 volts.	Defective: L400. Open: C403, C405, C406, R401, R403. Shorted: C400, C400A, C401, C403, C405, C406.
4	A	Loud, clear signal with weak signal input.	Defective: LA400. Shorted: C400, C400A, C402, C404. Open: C402, C404. Leaky: C402, C404.

OSCILLATOR-TEST NOTE: Connect positive lead of high-resistance d-c voltmeter to B— bus, test point B; connect prod end of negative lead through 100,000-ohm isolating resistor to oscillator grid, test point D. Use suitable meter range, such as 0—10 volts. Proper operation of oscillator is indicated by negative voltage of 3.3 to 4.2 volts (measured with 20,000-ohms-per-volt meter) throughout range of tuning control.

ALIGNM

SET RADIO-PHONO SWITCH TO RADIO

NOTE: Make alignme

DIAL—Calibration and pointer-index measurements are shown in figure 6. With tuning gang fully meshed, set pointer to index mark.

OUTPUT METER—Connect to terminals indicated figure 7.

STEP	SIGNAL GENERATOR		RADIO		
	CONNECTIONS TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	A
1				Turn C300B down tight.	
2	Through .1-mf. condenser to test point C, Section 4 (pin 5, 14AF7).	455 kc.	540 kc.	Adjust trimmers in order given for maximum output.	
3	Radiating loop (see Note below).	1600 kc.	1600 kc.	Adjust for maximum.	
4	Same as step 3.	1500 kc.	1500 kc.	Adjust for maximum.	

RADIATING-LOOP NOTE: Make up a 6—8-turn, 6-inch-diameter loop, using insulated wire; connect to signal-generat and place near radio loop aerial.

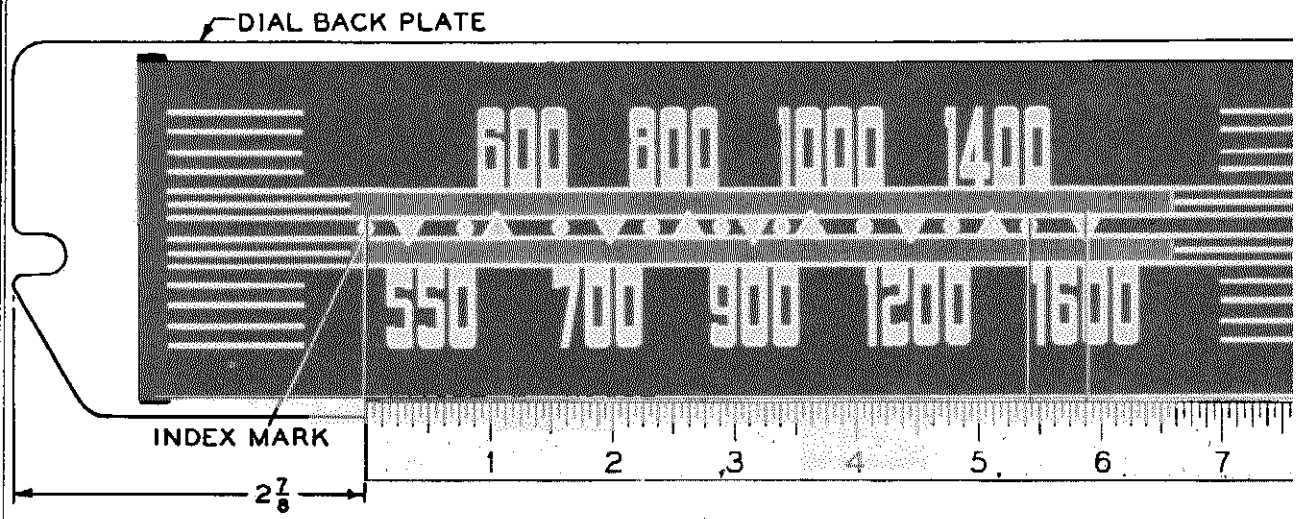
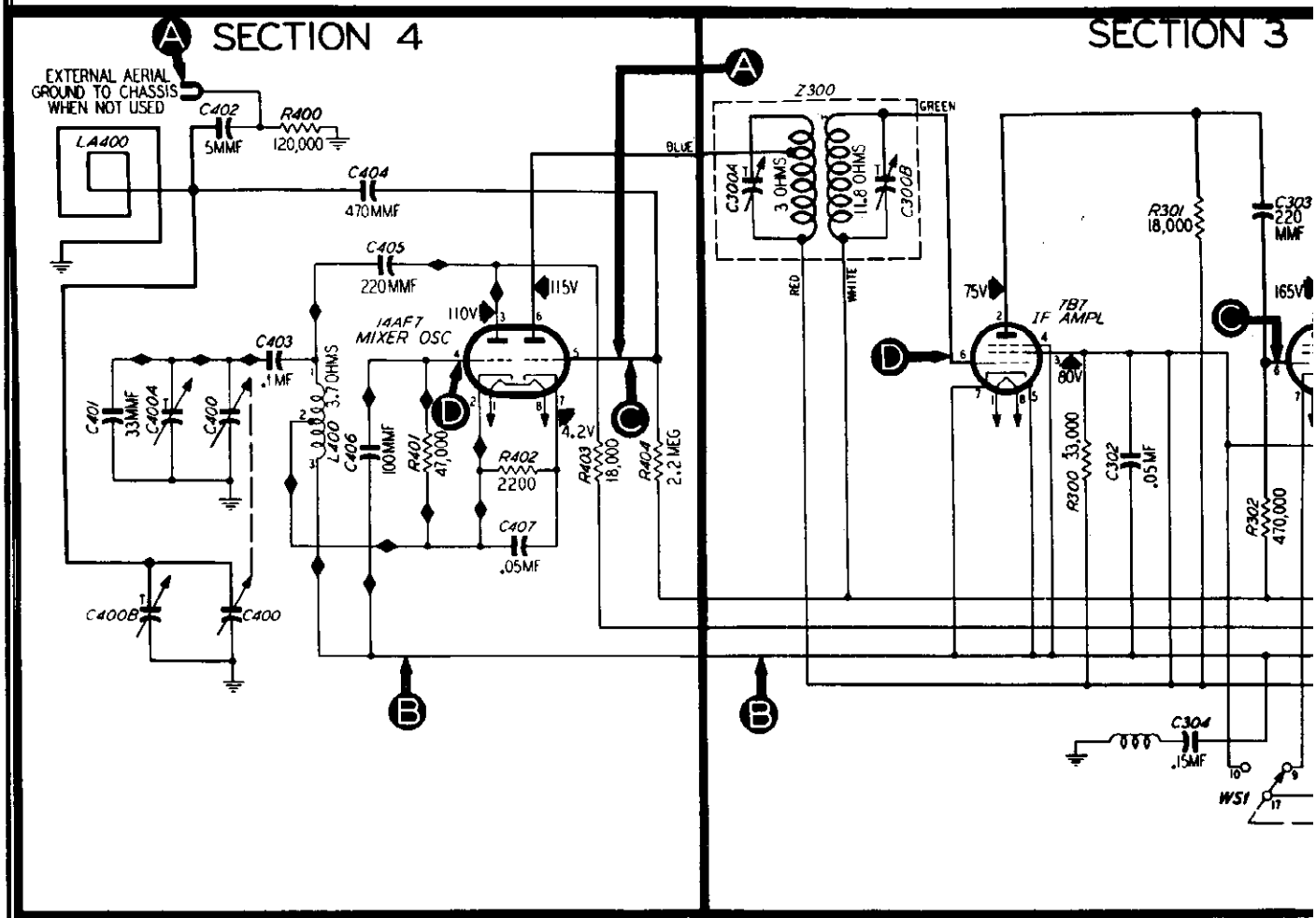


Figure 6. Calibration Measurements for Dial Backplate



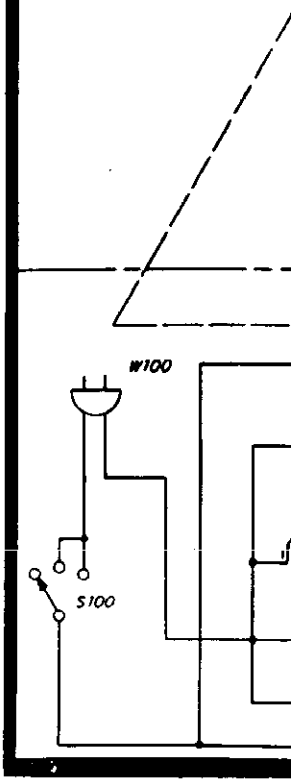
CONDENSER SYMBOLS

FIXED — VARIABLE — TRIMMER — ELECTROLYTIC

RF, IF AND AUDIO SIGNAL PATH

OSCILLATOR PATH

NOTE: ALL RESISTANCE VALUES IN OHMS UNLESS OTHERWISE MARKED.



SYMBOLIZATION

The components in the radio circuit are symbolized according to the types of parts and the sections of the radio in which the parts are located. The prefix letter of the symbol designates the type of part, as follows:

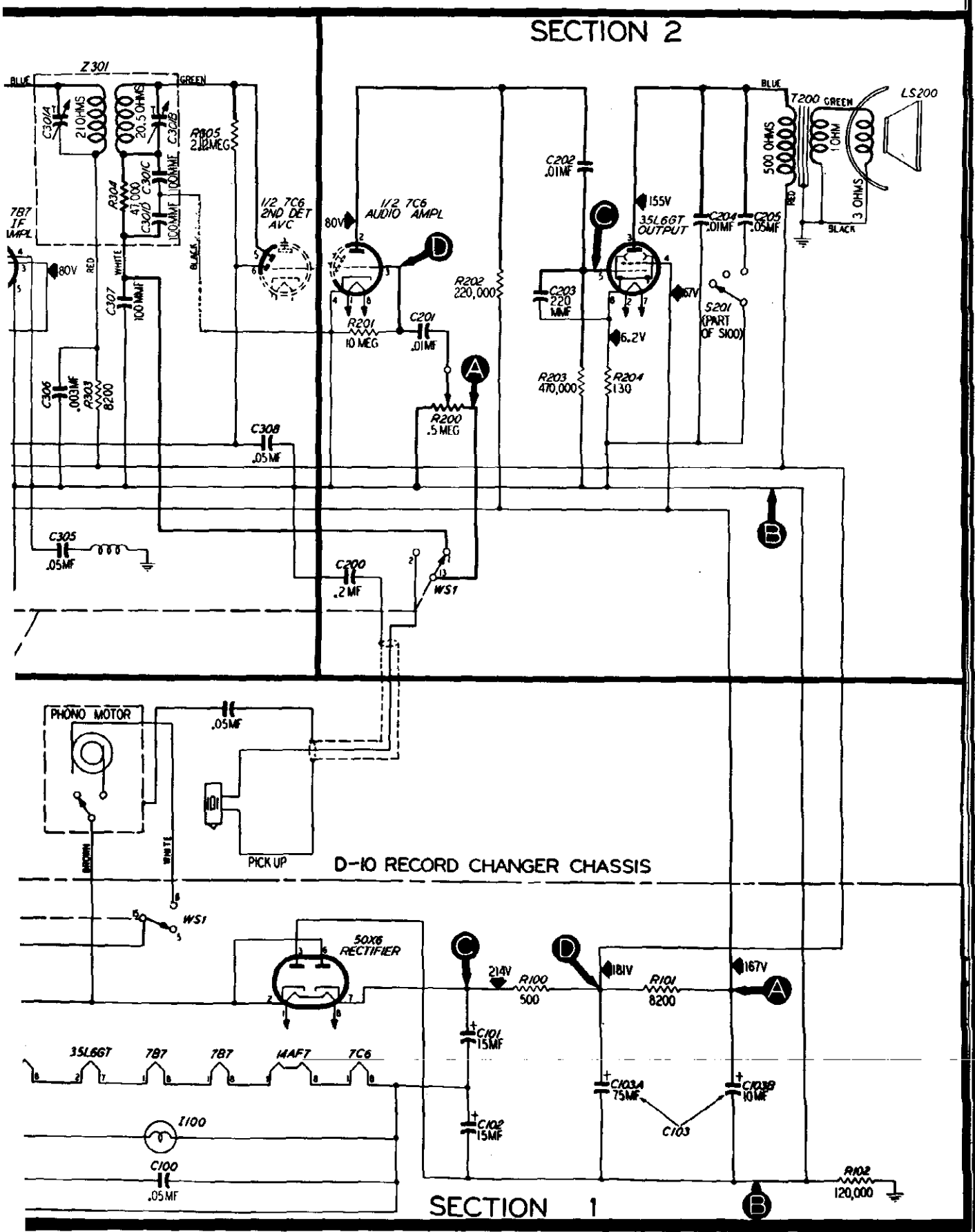
C—condenser	**LA—loop aerial**	**S—switch**	**WS—wafer switch**
I—pilot lamp	**LS—loud-speaker**	**T—transformer**	
L—choke or coil	**R—resistor**	**W—power cord and plug**	**Z—electrical assembly**

The number of the symbol designates the section in which the part is located, as follows:

100-series components are in Section 1, the power supply.
200-series components are in Section 2, the audio circuits.
300-series components are in Section 3, the i-f amplifier, detector, and a-v-c circuits
400-series components are in Section 4, the aerial, r-f, and oscillator circuits.

A suffix letter identifies the part as a non-replaceable component of the assembly which bears an identical number without a suffix letter, and with perhaps a different prefix letter

Figure 5. Philco Radio-Phonograph, Model 48-1262.



tionalized Schematic Diagram, Showing Test Points TP-3395

r PROCEDURE

ION AND TURN VOLUME CONTROL TO MAXIMUM

h loop aerial connected to radio.

SIGNAL GENERATOR (modulated)—Connect as indicated in chart.

OUTPUT LEVEL—During alignment, adjust signal generator output to maintain output-meter indication below 1.25 volts.

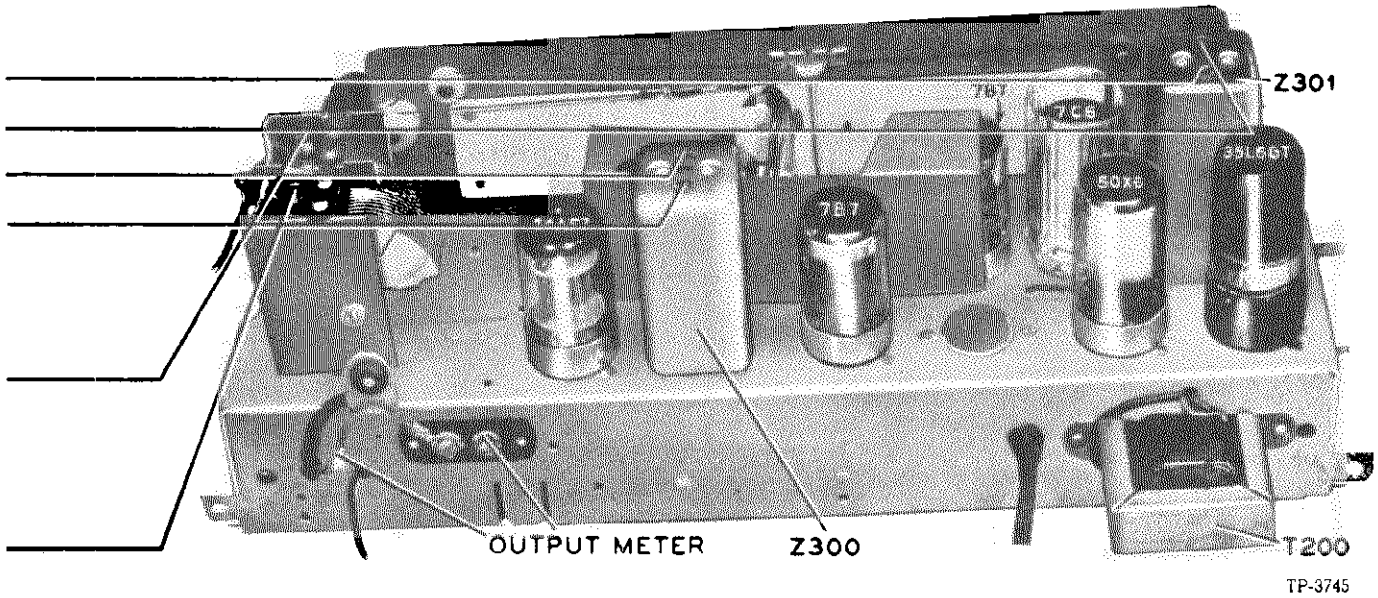


Figure 7. Top View, Showing Trimmer Locations

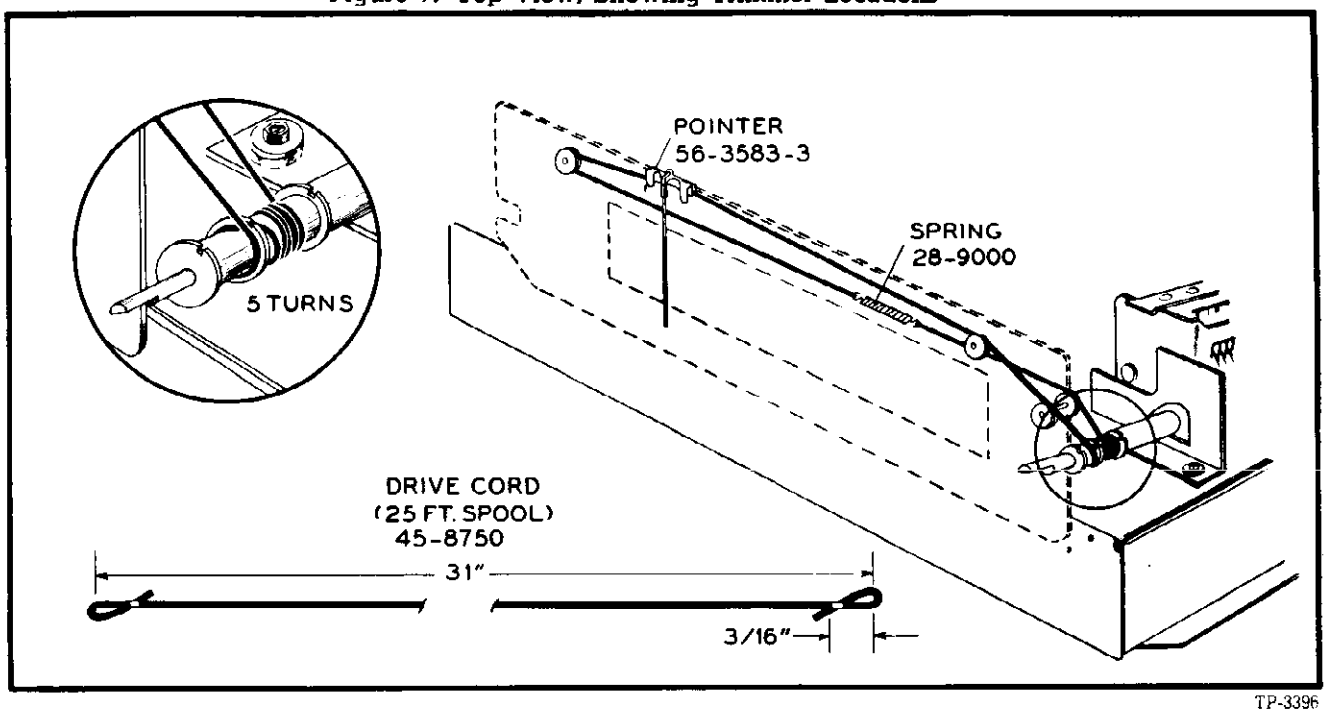


Figure 8. Drive-Cord Installation Details

REPLACEMENT PARTS LIST

NOTE: Part numbers marked with an asterisk (*) are general replacement items. These numbers may not be identical with those on factory assemblies; also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

SECTION 1

Reference Symbol	Description	Service Part No.
C100	Condenser, line filter, .05 mf.	61-0122*
C101	Condenser, electrolytic, filter, 15 mf.	30-2575-11
C102	Condenser, electrolytic, filter, 15 mf.	30-2575-11
C103	Condenser, electrolytic, 2-section filter	30-2575-17
C103A:	Condenser, electrolytic, filter, 75 mf.	Part of C103
C103B:	Condenser, electrolytic, filter, 10 mf.	Part of C103
I100	Panel lamp	34-2477*
R100	Resistor, filter, 500 ohms	33-3435-3
R101	Resistor, filter, 82,000 ohms	66-2824340
R102	Resistor, leakage, 120,000 ohms	66-4123340
S100	Switch, on-off, power	42-1816-1
W100	Line cord	41-3755-13

SECTION 2

C200	Condenser, audio by-pass, .2 mf.	45-3500-3*
C201	Condenser, blocking, .01 mf.	61-0120*
C202	Condenser, blocking, .01 mf.	61-0120*
C203	Condenser, by-pass, 220 mmf.	60-10205307*
C204	Condenser, tone compensator, .01 mf.	61-0120*
C205	Condenser, tone compensator, .05 mf.	61-0122*
LS200	Loud-speaker	36-1626
R200	Volume control, .5 megohm	33-5539-22
R201	Resistor, grid return, 10 megohms	66-6103340*
R202	Resistor, plate load, 220,000 ohms	66-4223340*
R203	Resistor, grid return, 470,000 ohms	66-4473340*
R204	Resistor, cathode bias, 130 ohms	66-1133260
S201	Tone-control switch	Part of S100
T200	Output transformer	32-8242-3
WS1	Wafer switch, radio-phono	42-1824-1

SECTION 3

C300A	Condenser, trimmer	Part of Z300
C300B	Condenser, trimmer	Part of Z300
C301A	Condenser, trimmer	Part of Z301
C301B	Condenser, trimmer	Part of Z301
C301C	Condenser, by-pass	Part of Z301
C301D	Condenser, by-pass	Part of Z301
C302	Condenser, by-pass, .05 mf.	61-0122*
C303	Condenser, coupling, 220 mmf.	60-10205307*
C304	Condenser-and-choke assembly, .05 mf.	38-9851-4
C305	Condenser-and-choke assembly, .15 mf.	38-9851-5
C306	Condenser, by-pass, .003 mf.	61-0109*
C307	Condenser, by-pass, 100 mmf.	60-10105407*
C308	Condenser, a-v-c by-pass, .05 mf.	61-0122*
R300	Resistor, screen dropping, 33,000 ohms	66-3333340*
R301	Resistor, plate load, 18,000 ohms	66-3183340*
R302	Resistor, grid load, 470,000 ohms	66-4473340*
R303	Resistor, plate dropping, 82,000 ohms.	66-2823340*

SECTION 3—Continued

Reference Symbol	Description	Service Part N
R304	Resistor, diode load, 47,000 ohms.	Part of Z301
R305	Resistor, a-v-c filter, 2.2 megohms.	66-5223340
Z300	Transformer, 1st i. f., 455 kc., includes C300A and C300B	32-4151-1
Z301	Transformer, 2nd i. f., 455 kc., includes C301A, C301B, C301C, and C301D.	32-3948-5

SECTION 4

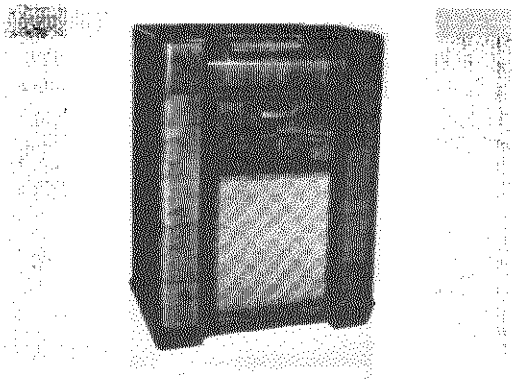
C400	Condenser, tuning gang	33-5539-22
C400A:	Condenser, trimmer	Part of C400
C400B:	Condenser, trimmer	Part of C400
C401	Condenser, compensating, 33 mmf.	60-00305307
C402	Condenser, series blocking, 4.7 mmf.	30-1221-5
C403	Condenser, isloating, .1 mf.	61-0113
C404	Condenser, coupling, 470 mmf.	60-10515307
C405	Condenser, osc. plate, 220 mmf.	60-10205307
C406	Condenser, osc. grid, 100 mmf.	60-10105407
C407	Condenser, by-pass, .05 mf.	61-0122
LA400	Loop aerial	76-3310
R400	Resistor, ext. aerial loading, 120,000 ohms	66-4123340
R401	Resistor, oscillator grid, 47,000 ohms.	66-3473340
R402	Resistor, cathode bias, 2200 ohms.	66-2223340
R403	Resistor, plate dropping, 18,000 ohms.	66-3183340
R404	Resistor, grid return, 2.2 megohms	66-5223340
L400	Coil, oscillator	32-4019-6

MISCELLANEOUS

Description	Service Part No.
Cabinet less scale, Mahogany	10706A
Cabinet less scale, Light Walnut	10706B
Back, cabinet	54-7540-1
Baffle and cloth assembly	219109
Baffle and cloth	40-6991-1
Bezel	56-5367
Bin mechanism (l.h.)	76-3223
Bin mechanism (r.h.)	76-3223-1
Dome	45-6190
Door pull	56-4420-2
Drop door	45-6447
Feet, wood	45-6423
Frame assembly (changer mtg.)	76-3222-1
Hinge	56-4066
Instrument panel	45-6422
Spring, bin mechanism	56-4978
Cable, pickup	41-3837-3
Condenser, crystal isolating, .01 mf.	61-0120*
Dial Scale	27-5999
Backplate	76-3713
Drive cord (25-ft. spool)	45-8750*
Pointer	56-3583-3
Strap	56-4756
Spring, drive cord	28-6953
Knob	54-4486-2
Lamp bracket	56-2332
Pilot-light assembly	27-6233
Resistor, crystal load, 1 megohm	66-5103340*
Socket, octal	27-6174
Socket, Loktal	27-6138*

To reduce phonograph rumble, a 1 megohm resistor, part number 66-5103340, has been added across the crystal pickup.

MODEL 48-1263 PHILCO CORP.



MODEL 48-1263

Circuit Description

Philco Model 48-1263 is a console model radio-phonograph combination consisting of an eight-tube superheterodyne radio and a Philco Model D-10 Automatic Record Changer. The radio provides reception within the standard broadcast band, 540 to 1720 kc., and within the short-wave band, 9.3 to 15.5 mc.

The built-in loop aerial is usually adequate for normal reception, but provision is made for connecting an external aerial if additional pickup is required.

A 7AF7 dual-triode converter is used to provide high signal-to-noise ratio. Oscillator-to-mixer coupling is made by a condenser connected between the cathodes of the mixer and oscillator. On the short-wave band, reverse feedback from the oscillator to the mixer is applied through a 10-mmf. condenser to minimize the reaction on the oscillator frequency caused by adjustment of the aerial trimmer.

Two i-f amplifier stages, operating at 455 kc. and using type 7A7 pentodes, provide high gain and good selectivity. The diode section of the 7C6 dual-diode triode operates as the detector and a-v-c rectifier, while the triode section operates as the first audio amplifier. The type 6J5GT triode functions as a phase inverter and drives the two 6K6GT beam-power output tubes in push-pull operation.

The audio section employs inverse feedback to provide bass compensation and to reduce distortion. The feedback takes place from the secondary of the output transformer to the input of the first audio stage. The tone control is continuously variable, and, when rotated clockwise, provides: first, an increase in bass response, and then, as ro ation is continued, attenuation of the higher audio frequencies. The 12-inch electrodynamic loud-speaker is capable of excellent bass reproduction.

SPECIFICATIONS

CABINET	Wood, walnut finish
CIRCUIT	Eight-tube superheterodyne
FREQUENCY RANGES	Broadcast: 540 to 1720 kc. Short Wave: 9.3 to 15.5 mc.
AUDIO OUTPUT	6 watts
OPERATING VOLTAGE	117 volts, 60-cycle, a.c.
POWER CONSUMPTION	Radio, 110 watts Phonograph, 20 watts
AERIAL	Built-in low-impedance loop
INTERMEDIATE FREQUENCY	455 kc.
PHILCO TUBES (8)	7AF7, 7A7 (2), 7C6, 6J5GT, 6K6GT (2), 5Y3GT
PHONOGRAPH	Philco Automatic Record Changer Model D-10. (For service information, refer to PR-1156.)

Philco TROUBLE-SHOOTING *Procedure*

For rapid trouble shooting, the radio circuit is divided into four sections, with test points specified for each section; these sections and test points are indicated in the schematic diagram. The trouble-shooting procedure given for each section includes a simplified test chart and a bottom view of the chassis showing the locations of the test points and the components of that section.

In each chart, the first step is a master check for determining whether trouble exists in that section without going through the entire test procedure.

Failure to obtain the "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube-electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before it is turned on:

1. Carefully inspect both top and bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for broken or shorted connections, burned resistors, or other obvious sources of trouble.
2. Measure the resistance between B+ (pin 8 of the 5Y3GT rectifier) and the radio chassis, test point C. When the ohmmeter leads are connected in the proper polarity, the highest resistance reading will be obtained. This reading should be not lower than 3400 ohms. If it is lower, check condensers C101 and C102A for leakage or shorts.

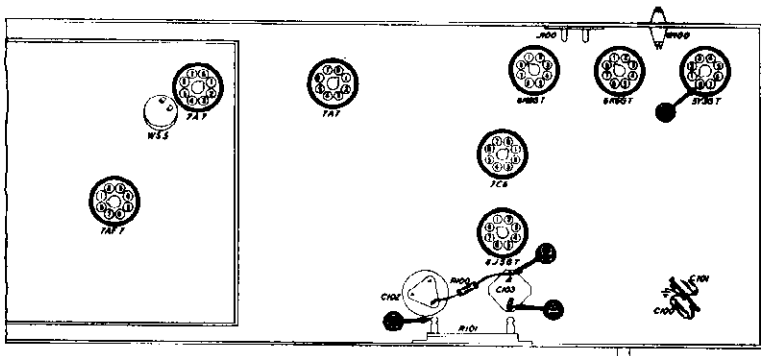
The above resistance value is not intended as a quality check of these condensers. It is the lowest value at which the rectifier will operate safely while the voltage tests of Section 1 are being performed.

Section 1 TROUBLE SHOOTING

For the tests in this section, use a d-c voltmeter. Connect the negative lead to the radio chassis, test point C; connect the positive lead to the test points indicated in the chart. The voltage readings given were taken with a 20,000-ohms-per-volt meter, at a line voltage of 117 volts, a.c.

Set the wafer switch to BC, turn the volume control to minimum, and turn the tone control fully counterclockwise.

Follow the steps in sequence; if the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2; if not, isolate and correct the trouble in this section.



TP-4045-A

Figure 1. Bottom View, Showing Section 1 Test Points

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	235v		Trouble within this section. Isolate by the following tests.
2	D	340v	No voltage	Defective: 5Y3GT, S100, T100. Shorted: C102.
			Low voltage	Defective: 5Y3GT, T100. Open: C102. Leaky: C102. Shorted: C103A, C103B.
			High voltage	Open: L100, R100, T200*.
3	B	235v	No voltage	Open: R100. Shorted: C102A.
			Low voltage	Leaky: C103A. Shorted: C304*, C308*, C407*.
4	A	235v	No voltage	Open: L100, R101. Shorted: C305*.
			Low voltage	Shorted: C309*, C410*. Defective: T200*.
			High voltage	Defective: T200*.
Listening Test: Abnormal hum may be caused by open-circuited C102, C103A, or C103B.				

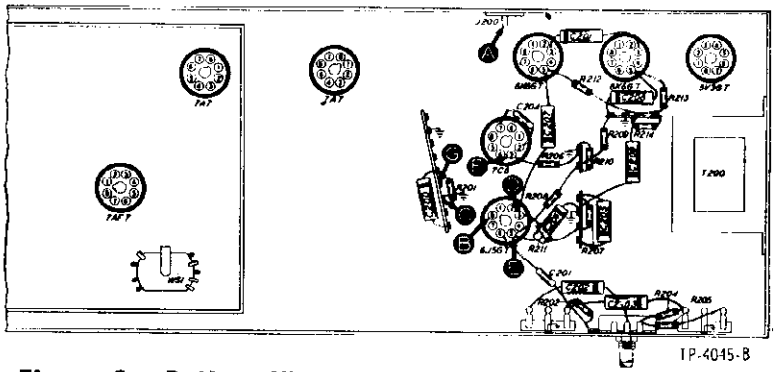
*This part, located in another section, may cause abnormal indication in this section.

Section 2 TROUBLE SHOOTING

For the tests in this section, use an audio-frequency signal generator. Connect the generator ground lead to the radio chassis, test point C; connect the generator output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, turn the tone control fully counterclockwise, and set the wafer switch to BC. Adjust the signal-generator output as required for each step.

If the "NORMAL INDICATION" is obtained in step 1, proceed to the tests in Section 3; if not, isolate and correct the trouble in this section.



TP-4045-B

Figure 2. Bottom View, Showing Section 2 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble within this section. Isolate by the following tests.
2	B	(Remove 6J5GT.) Loud, clear signal with strong signal input.	Defective: 6K6GT, T200, LS200. Open: C208, R213. Shorted: C208. Leaky: C208.
3	D	Same as step 2.	Defective: 6K6GT, T200, LS200. Open: C207, R212. Shorted: C207. Leaky: C207.
4	E	(Replace 6J5GT.) Loud, clear signal with moderate signal input.	Defective: 6J5GT. Open: R209, R210, R211. Shorted: C206. Leaky: C206.
5	F	Loud, clear signal with weak signal input.	Open: C206, R207. (Rotate volume control through its range.) Shorted: C205, C204. Leaky: C204. Defective: 7C6.
6	A	Same as step 5.	Defective: WS1(F), R200. Open: C200, C202, R204, R206.
7	G	Same as step 5. (Set wafer switch to phono.)	Defective: WS1(F), PL200. Open: R201.
Listening Test: Distortion may be caused by leaky C202, C206, C207, C208, C209, or C200, or by shorted C209 or open-circuited R214. Hum will result if C209 is open-circuited.			

Section 3 TROUBLE SHOOTING

For the tests in this section, use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to the radio chassis, test point C; connect the generator output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the wafer switch to BC, turn the volume control to maximum and turn the tone control fully counterclockwise.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 4; if not, isolate and correct the trouble in this section.

NOTE: Since the circuit location for test point A of this section is the same as that for test point B of Section 4, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in Section 4; these parts are listed below under "POSSIBLE CAUSE OF ABNORMAL INDICATION."

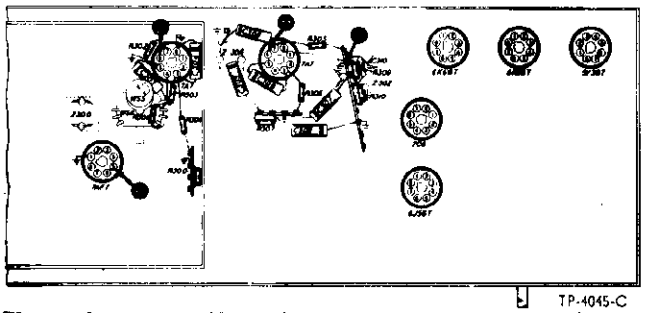


Figure 3. Bottom View, Showing Section 3 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble within this section. Isolate by the following tests.
2	B	Loud, clear signal with moderate signal input.	Defective: 7C6, Z302, 7A7, WS1 (R). Misaligned: Z302. Open: C306, C308, C309, R305, R306, R307, R309. Shorted: C306, C308, C309, C310. Leaky: C306, C308, C309.
3	D	Loud, clear signal with weak signal input.	Defective: 7A7, Z301. Misaligned: Z301. Open: C303, C304, C305, C307, R301, R302, R303, R304. Shorted: C303, C304, C305, C307.
4	A	Loud, clear signal with weak signal input.	Defective: 7AF7*, WS3 (F)*, Z300. Misaligned: Z300. Open: C410*, L402*, R402*.

* This part, located in another section, may cause abnormal indication in this section.

Section 4 TROUBLE SHOOTING

For the tests in this section (with the exception of the oscillator tests), use an r-f signal generator with modulated output. Connect the generator ground lead to the radio chassis, test point C; connect the generator output lead through a .1-mf. condenser to the test points indicated in the chart.

Turn the volume control to maximum and the tone control fully counterclockwise. Set the wafer switch, signal generator dial, and radio dial as indicated in the chart.

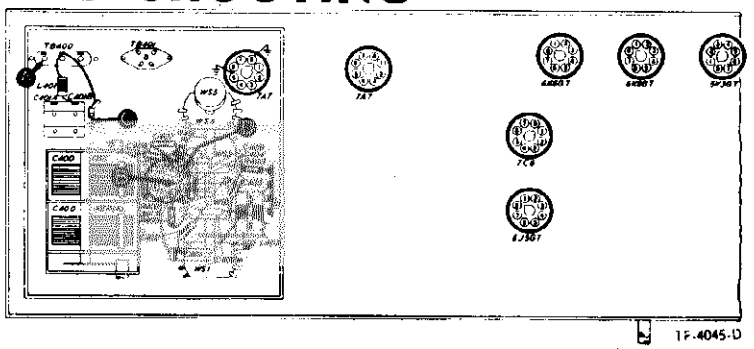


Figure 4. Bottom View, Showing Section 4 Test Points

STEP	TEST POINT	WAFER SWITCH	DIAL SETTINGS		NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
			SIG. GEN.	RADIO		
1A	A	BC	1000 kc.	1000 kc. (tune to signal)	Loud, clear signal with weak signal input.	Trouble within BC circuits. Isolate by performing steps 2, 3, and 4.
1B	A	SW	15 mc.	15 mc. (tune to signal)	Loud, clear signal with weak signal input.	Trouble within SW circuits. Isolate by performing steps 5 and 6.
2	B	BC	1000 kc.	1000 kc. (tune to signal)	Loud, clear signal with moderate signal input.	Defective: 7AF7, Osc. circuit. Open: C409, R400.
3	D (Osc. test; see Note below.)	BC	Not used	Rotate through range	Negative voltage 5 to 7 volts.	Defective: 7AF7, WS3, WS4. Open: R403, R401, L402, C407, C408. Shorted: C400, C402B, C407, C408. Leaky: C407, C408
4	A	BC	1000 kc.	1000 kc. (tune to signal)	Loud, clear signal with weak signal input.	Defective: WS2, WS4, L400. Open: C404. Shorted: C400, C401A, C404. Leaky: C404.
5	D (Osc. test; see Note below.)	SW	Not used	Rotate through range	Negative voltage 2 to 3 volts.	Defective: 7AF7, WS3, WS4, L403. Shorted: C402C, C405. Open: C405.
6	A	SW	15 mc.	15 mc. (tune to signal)	Loud, clear signal with weak signal input.	Defective: 7AF7, WS2, WS4, L401. Shorted: C401B, C403. Open: C404. Leaky: C404.

OSCILLATOR-TEST NOTE: Connect positive lead of high-resistance d-c voltmeter to radio chassis, test point C; connect prod end of negative meter lead through 100,000-ohm isolating resistor to oscillator grid, test point D. Use suitable meter range, such as 0 to 10 volts. Proper operation of oscillator is indicated by negative voltage within limits shown in "NORMAL INDICATION" column throughout range of tuning control. Indicated values were measured with 20,000-ohms-per-volt meter.

MODEL 48-1263

ALIGNME

CAUTION: Do not turn on t

NOTE: Make alignment

DIAL: Calibration and pointer-index measurements are shown in figure 6. With tuning gang fully meshed, set pointer to index mark.

OUTPUT METER: Connect to terminals indicated figure 7.

STEP	SIGNAL GENERATOR		RADIO			
	CONNECTIONS TO RADIO	DIAL SETTING	DIAL SETTING	WS POSITION	SPECIAL INSTRUCTIONS	AD
1	Through .1-mf. condenser to Terminal 1 of TB400.	455 kc.	540 kc.	BC	Adjust for maximum, ONCE only, in order.	
2	Radiating loop (see Note below).	580 kc.	580 kc.	BC	Adjust for maximum.	
3	Same as step 2.	1700 kc.	1700 kc.	BC	Adjust for maximum.	
4	Same as step 2.	1500 kc.	1500 kc.	BC	Adjust for maximum.	
5	Same as step 2.	580 kc.	580 kc. (approx.)	BC	Rock tuning control while adjusting for maximum.	
6	Repeat steps 3, 4, 5, and 3, in order, until no improvement results.					
7	Same as step 2.	15 mc.	15 mc.	SW	Adjust for maximum on FIRST peak from loose position. Image should be heard at 14.1 mc.	
8	Same as step 2.	15 mc.	15 mc.	SW	Adjust for maximum.	

RADIATING-LOOP NOTE: Make up a 6—8-turn, 6-inch-diameter loop, using insulated wire; connect to signal-generato and place near radio loop aerial.

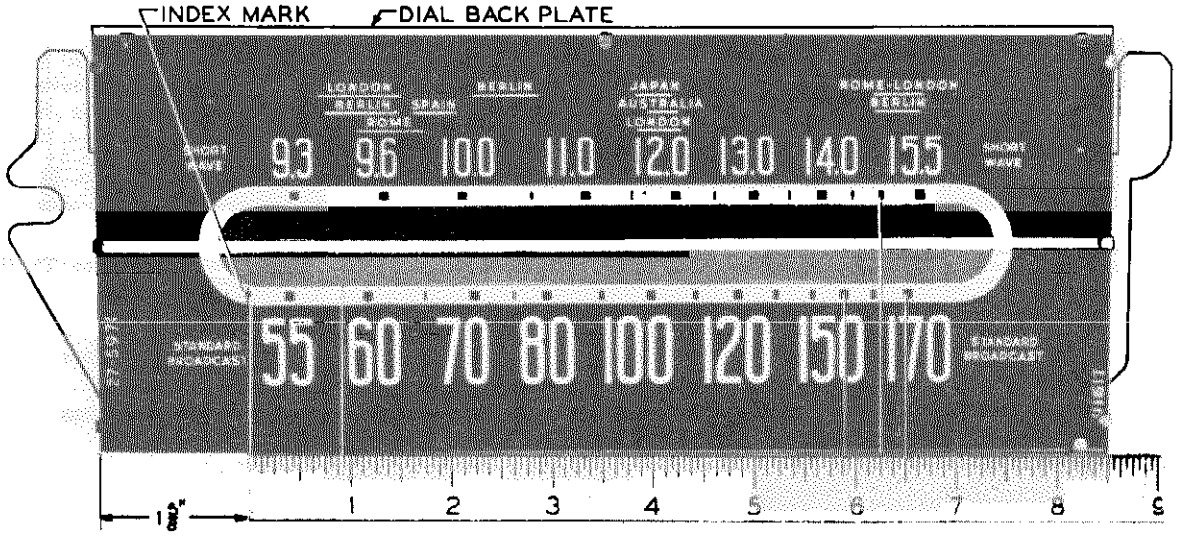
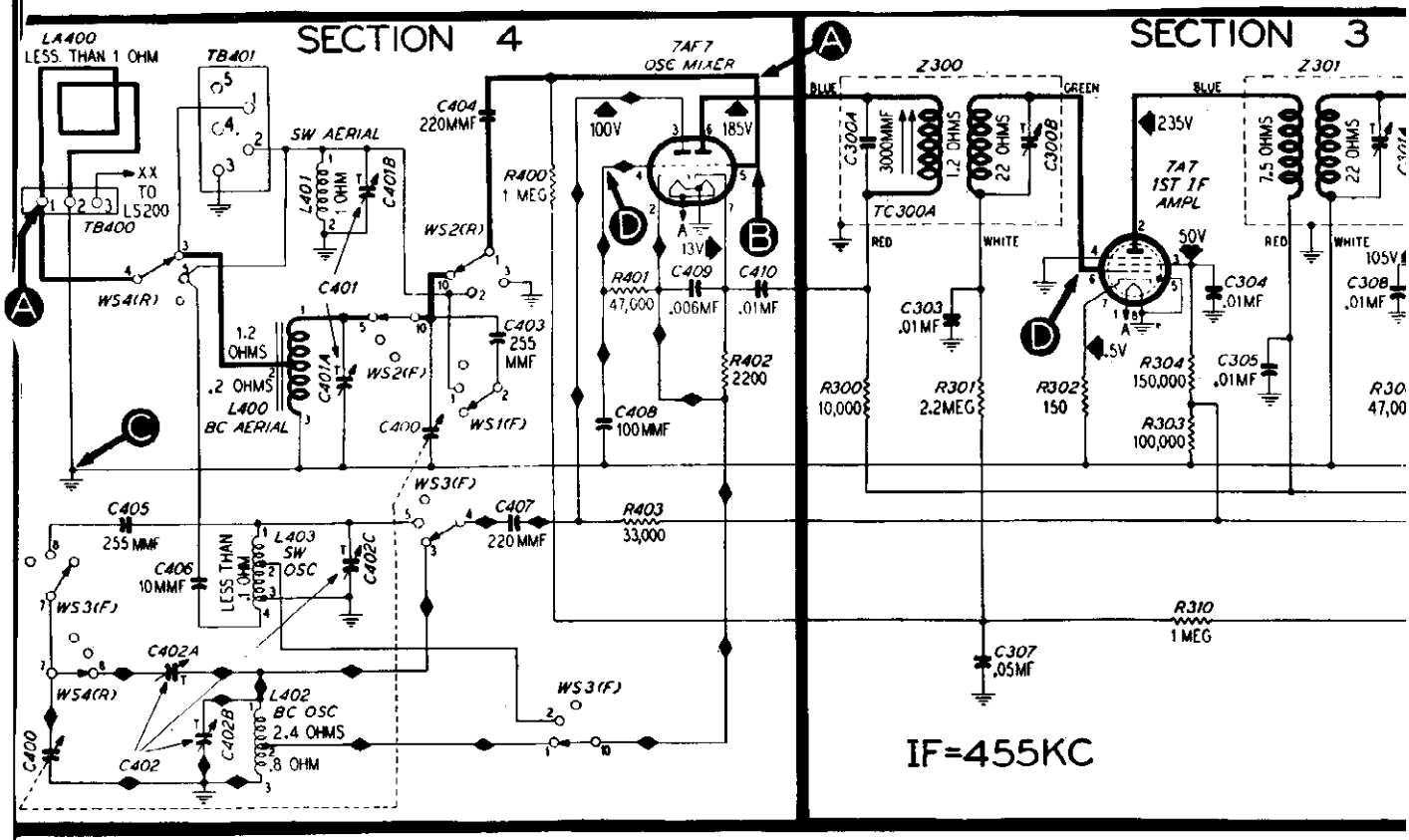
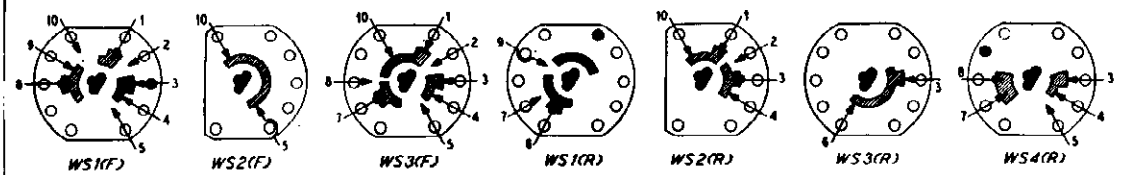


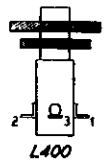
Figure 6. Calibration Measurements for Dial Backplate

TP-2780





WAFER SWITCH SHOWN IN EXTREME COUNTERCLOCKWISE (BROADCAST) POSITION AS VIEWED FROM FRONT UNDERSIDE OF CHASSIS



L400 BC AERIAL

SYMBOLIZATION

The components in the radio circuit are symbolized according to the types of parts and the sections of the radio in which the parts are located. The prefix letter of the symbol designates the type of part, as follows:

C —condenser	LA—loop aerial	S —switch	WS—wafer switch
I —pilot lamp	LS—loud-speaker	T —transformer	Z —electrical assembly
L —choke or coil	R —resistor	W —power cord and plug	

The number of the symbol designates the section in which the part is located, as follows:

100-series components are in Section 1, the power supply.
200-series components are in Section 2, the audio circuits.
300-series components are in Section 3, the i-f amplifier, detector, and a-v-c circuits.
400-series components are in Section 4, the aerial, r-f, and oscillator circuits.

A suffix letter identifies the part as a non-replaceable component of the assembly which bears an identical number without a suffix letter, and with perhaps a different prefix letter.

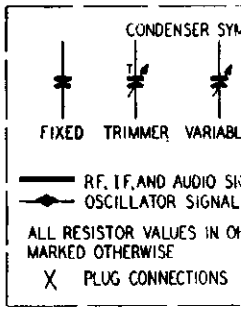
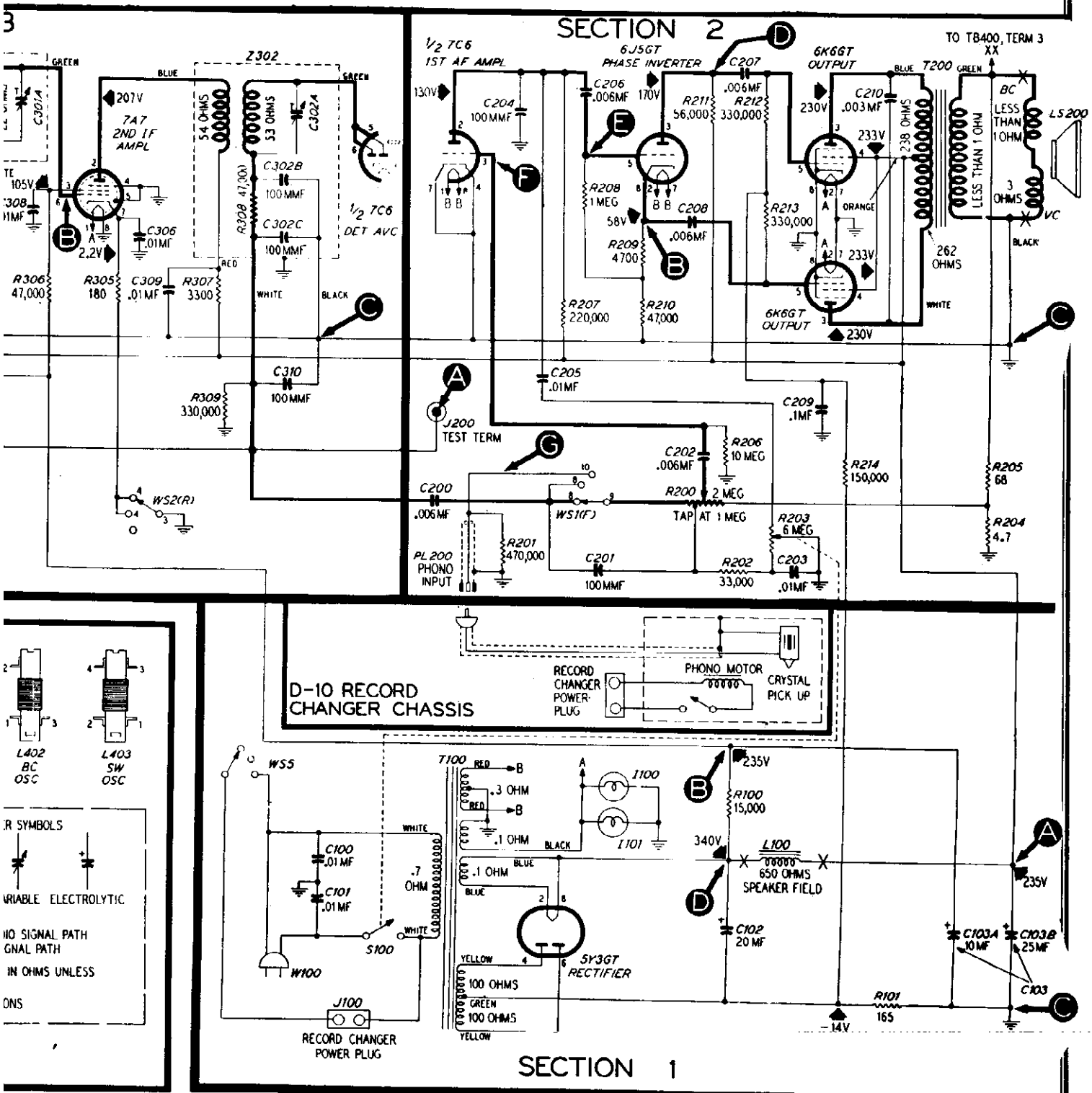


Figure 5. Philco Radio-Phonograph Model 48-1263,



53, Sectionalized Schematic Diagram, Showing Test Points

PROCEDURE

io with the loud-speaker disconnected.

oop cerial connected to the radio.

SIGNAL GENERATOR (modulated): Connect as indicated in chart.

OUTPUT LEVEL: During alignment, adjust signal-generator output to maintain output-meter indication below 1.5 volts. Set volume control fully clockwise and tone control fully counterclockwise.

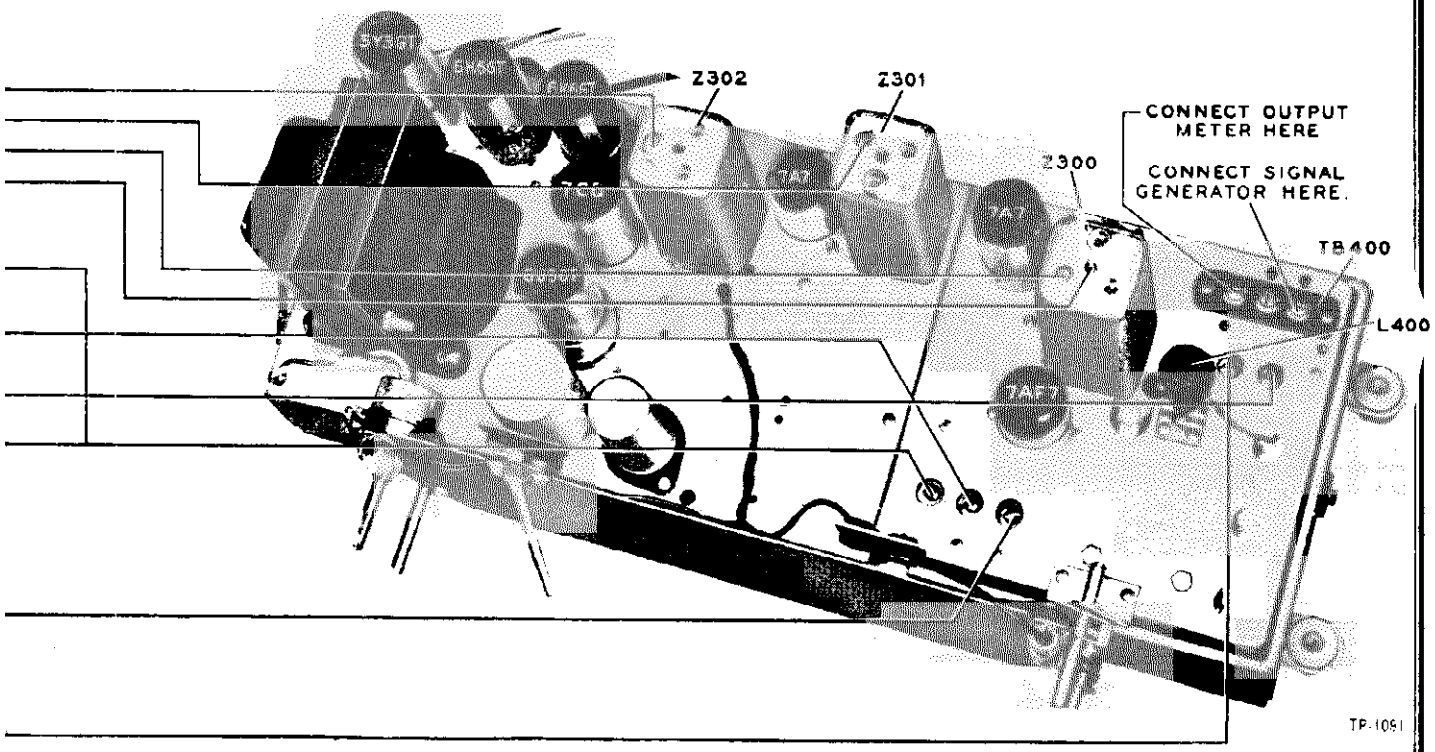


Figure 7. Top View, Showing Trimmer Locations

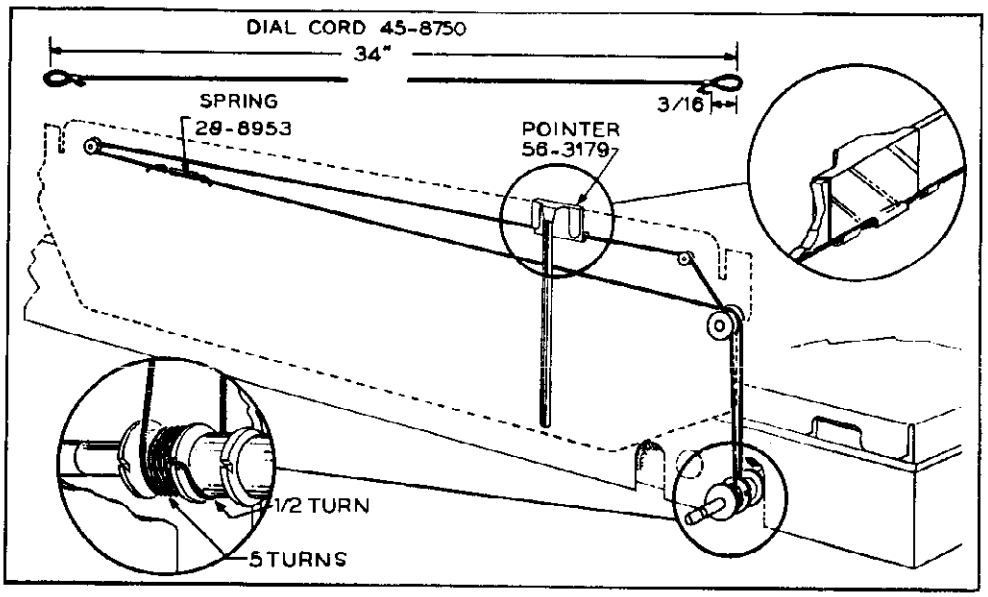


Figure 8. Drive-Cord Installation Details

REPLACEMENT PARTS LIST

NOTE: Part numbers marked with an asterisk (*) are general replacement items. These numbers may not be identical with those on factory assemblies; also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No.".

SECTION 1

Reference Symbol	Description	Service Part No.
C100	Condenser, line filter, .01 mf	61-0120*
C101	Condenser, line filter, .01 mf	61-0120*
C102	Condenser, electrolytic, filter, 20 mf	30-2555
C103	Condenser, two-section, electrolytic	30-2556
C103A	Condenser, filter, 10 mf	Part of C103
C103B	Condenser, filter, 25 mf	Part of C103
I100	Panel lamp	34-2040
I101	Panel lamp	34-2040
J100	Record-changer power socket	27-6200
L100	Speaker, field	Part of LS200
R100	Resistor, screen dropping, 15,000 ohms	66-3155340
R101	Resistor, grid bias, 165 ohms	33-3435-1
S100	Power switch	Part of R203
T100	Power transformer	32-8248
W100	Line cord and plug	L3339
WS5	Wafer switch	Part of WS

SECTION 2

C200	Condenser, d-c blocking, .006 mf	45-3500-7*
C201	Condenser, r-f by-pass, 100 mmf	60-10105407*
C202	Condenser, d-c blocking, .006 mf	45-3500-7*
C203	Condenser, tone compensation, .01 mf	61-0120*
C204	Condenser, r-f by-pass, 100 mmf	60-10105407*
C205	Condenser, tone compensation, .01 mf	61-0120*
C206	Condenser, d-c blocking, .006 mf	45-3500-7*
C207	Condenser, d-c blocking, .006 mf	45-3500-7*
C208	Condenser, d-c blocking, .006 mf	45-3500-7*
C209	Condenser, audio by-pass, .1 mf	61-0113*
C210	Condenser, tone compensation, .003 mf	61-0109*
J200	Test socket	27-6180
LS200	Loud-speaker	36-1595
R200	Volume control, 2 megohms	33-5535-1
R201	Resistor, crystal load, 470,000 ohms	66-4473340*
R202	Resistor, tone compensation, 33,000 ohms	66-3333340*
R203	Tone control, 6 megohms	33-5538-1
R204	Resistor, feedback voltage divider, 4.7 ohms	473340
R205	Resistor, feedback voltage divider, 68 ohms	66-0683340*
R206	Resistor, grid return, 10 megohms	66-6103340*
R207	Resistor, plate load, 220,000 ohms	66-4223340*
R208	Resistor, grid return, 1 megohm	66-5103340*
R209	Resistor, cathode bias, 4700 ohms	66-2473340*
R210	Resistor, cathode load, 47,000 ohms	66-3473340*
R211	Resistor, plate load, 56,000 ohms	66-3563340*
R212	Resistor, grid return, 330,000 ohms	66-4333340*
R213	Resistor, grid return, 330,000 ohms	66-4333340*
R214	Resistor, bias filter, 150,000 ohms	66-4153340*
WS1 (F)	Wafer switch	Part of WS
T200	Output transformer	32-8274

SECTION 3

C300A	Condenser, fixed, 3000 mmf	Part of Z300
C300B	Condenser, trimmer	Part of Z300
C301A	Condenser, trimmer	Part of Z301
C302A	Condenser, trimmer	Part of Z302
C302B	Condenser, r-f by-pass, 100 mmf	Part of Z302
C302C	Condenser, r-f by-pass, 100 mmf	Part of Z302
C303	Condenser, r-f by-pass, .01 mf	61-0120*
C304	Condenser, r-f by-pass, .01 mf	61-0120*
C305	Condenser, r-f by-pass, .01 mf	61-0120*
C306	Condenser, r-f by-pass, .01 mf	61-0120*
C307	Condenser, a-v-c filter, .05 mf	61-0122*
C308	Condenser, r-f by-pass, .01 mf	61-0120*
C309	Condenser, r-f by-pass, .01 mf	61-0120*
C310	Condenser, r-f by-pass, 100 mmf	60-10105407*
R300	Resistor, plate dropping, 10,000 ohms	66-4103340*
R301	Resistor, a-v-c decoupling, 2.2 megohms	66-5223340*
R302	Resistor, cathode bias, 150 ohms	66-1153340*
R303	Resistor, screen voltage divider, 100,000 ohms	66-3103340*
R304	Resistor, screen voltage divider, 150,000 ohms	66-4153340*
R305	Resistor, cathode bias, 180 ohms	66-1183340*

SECTION 3 (Continued)

R306	Resistor, screen dropping, 47,000 ohms	66-3473340
R307	Resistor, plate dropping, 33,000 ohms	66-2333340
R308	Resistor, r-f filter, 47,000 ohms	66-3473340
R309	Resistor, diode load, 330,000 ohms	66-4333340
R310	Resistor, a-v-c filter, 1.0 megohm	66-5103340
WS1 (R)	Wafer switch	Part of WS
Z300	Transformer, 1st i.f., 455 kc., includes C300A and C300B	32-3956-3
Z301	Transformer, 2nd i.f., 455 kc., includes C301A	32-3957-3
Z302	Transformer, 3rd i.f., 455 kc., includes C302A, C302B, and C302C	32-3955-3

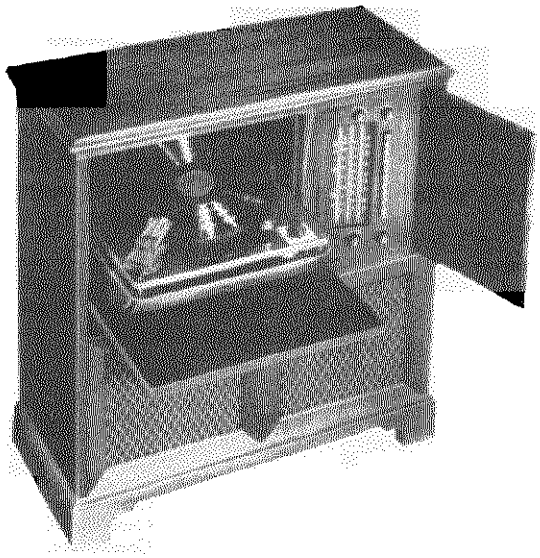
SECTION 4

C400	Condenser, tuning gang	31-2719
C401	Condenser, antenna trimmer, two-section	31-6476-4
C401A	Condenser, trimmer	Part of C401
C401B	Condenser, trimmer	Part of C401
C402	Condenser, osc. trimmer and padder, three-section	31-6464
C402A	Condenser, padder	Part of C402
C402B	Condenser, trimmer	Part of C402
C402C	Condenser, trimmer	Part of C402
C403	Condenser, fixed, 255 mmf	30-1220-24*
C404	Condenser, d-c blocking, 220 mmf	60-10205307*
C405	Condenser, fixed, 225 mmf	30-1220-24
C406	Condenser, feedback, 10 mmf	60-00105407*
C407	Condenser, d-c blocking, 220 mmf	60-10205307*
C408	Condenser, oscillator feedback, 100 mmf	30-1225-2*
C409	Condenser, oscillator coupling, .006 mf	45-3500-7*
C410	Condenser, r-f by-pass, .01 mf	61-0120*
L400	Coil, BC aerial	32-4033-1
L401	Coil, SW aerial	32-4050-6
L402	Coil, BC osc.	32-4019-2
L403	Coil, SW osc.	32-4113
LA400	Loop aerial	76-1989-2
R400	Resistor, grid return, 1 megohm	66-5103340*
R401	Resistor, grid leak, 47,000 ohms	66-3473340*
R402	Resistor, cathode bias, 2200 ohms	66-2223340*
R403	Resistor, plate dropping, 33,000 ohms	66-3333340*
TB400	Terminal panel, aerial	27-6213
TB401	Socket, 5-prong, external aerial	27-6214-1
WS	Switch, wafer, five-section	42-1813

MISCELLANEOUS

Description	Service Part No.
Cabinet (less scale)	10682
Baffle and cloth	40-6933
Bezel	56-4878
Bin mechanism (R.H.)	76-3223-3
Bin mechanism (L.H.)	76-3223-2
Domes	45-6042
Door pull	56-4867
Frame assembly	76-2199
Hinge	45-6200
Scale strap	56-4916
Scale and backplate	76-3187
Speaker grille	56-4920
Wood baffle	219085
Dial backplate assembly	76-2005-3
Drive cord (25-ft. spool)	45-8750*
Pointer	56-3179
Spring, pointer	28-8953
Knob	54-4376
Link assembly (wafer switch)	76-2186-3
Phono cable	41-3735-2
Pilot light assembly	76-2109
Shaft (wafer switch)	56-3298FA11
Shield, cable (7")	47-3754-5
Shield, cable (6")	47-3754-11
Speaker cable	41-3701
Socket, Loktal	27-6138*
Socket, octal	27-6174

MODEL 48-1270 PHILCO CORP.



PHILCO RADIO-PHONOGRAPH
MODEL 48-1270

Circuit Description

Philco Radio-Phonograph, Model 48-1270, contains a 13-tube superheterodyne, providing reception on the standard-broadcast band, 540 to 1720 kc., the short wave range between 9.3 and 15.5 mc., and the FM band 88 to 108 mc.

A low-impedance loop within the cabinet provides adequate signal pickup for the standard-broadcast and short-wave bands. In most locations, the built-in FM dipole aerial provides satisfactory FM reception. In areas where FM signals are weak, an outdoor dipole aerial (Philco Part No. 45-1462) will provide additional pickup.

The r-f stage (FM only), converter stage, and first i-f stage are mounted on a separate chassis to insure reliable performance at high frequencies. A 7W7 high-frequency pentode is used in the r-f stage, and a 7F8 high-frequency double triode is employed as a converter. These stages provide high signal-to-noise ratio, high conversion efficiency, and good image rejection. The FM tuning gang is constructed with copper plates to obtain the high Q required for proper selectivity.

Three transformer-coupled i-f stages are used. The first, third, and fourth i-f transformers have two sets of windings; one set is tuned to 455 kc. for AM operation, and the other to 9.1 mc. for FM operation. The second i-f transformer, having a single primary winding tuned to 9.1 mc., one secondary winding tuned to 9.1 mc., and another secondary winding tuned to 455 kc., provides untuned-primary, tuned-secondary coupling on AM, to prevent instability. All transformers provide tuned-primary, tuned-secondary coupling on FM, to supply the additional gain needed at 9.1 mc. Switching of the windings, to attenuate undesired beat frequencies, is necessary only in the first i-f transformer; the large difference between the two intermediate frequencies makes further switching unnecessary. One 7B7 and two 7H7 high-transconductance pentodes are used in the i-f stages.

The new Philco advanced FM detector circuit, employing the FM1000 tube of special design, is used for FM reception. This circuit has excellent tuning characteristics, and inherently rejects AM and noise. Very briefly, the circuit functions as follows: The first and second grids (pins 2 and 5) of the FM1000 are used as grid and anode, respectively, of a modified Colpitts

SPECIFICATIONS

CABINET	Wood, mahogany or walnut finish
CIRCUIT	13-tube superheterodyne
FREQUENCY RANGES	
Broadcast	540—1720 kc.
Short wave	9.3—15.5 mc.
FM	88—108 mc.
AUDIO OUTPUT	10 watts
PUSH BUTTONS	Ten: One for OFF, five for broadcast-station selection, three for band selection and one for phonograph operation
OPERATING VOLTAGE	105—120 volts, 60 cyles, a.c.
POWER CONSUMPTION	Radio: 110 watts Phonograph: 140 watts
AERIALS	Built-in loop and dipole; external aerial also may be used
INTERMEDIATE FREQUENCY	
AM	455 kc.
FM	9.1 mc.
PHILCO TUBES (13)	7W7, 7F8, 7H7(2), 7B7, FM1000, 7AF7, 6SQ7GT, 6V6GT(2), 7F7, 7E7, 5U4G
RECORD PLAYER	Philco Automatic Record Changer, Model M-4

oscillator, which nominally operates at the intermediate frequency of 9.1 mc. The output of the i-f amplifier stages is fed into the injection grid (pin 6). The reactive coupling between the plate and oscillator circuits causes the oscillator to lock in and follow the frequency variations of the i-f signal. As the oscillator frequency increases, the plate current through R324 decreases, and as the oscillator frequency decreases, the plate current increases. This variation is linear with respect to frequency deviation; the plate current, therefore, produces the same wave shape as the modulation of the FM carrier. This audio signal is fed to the audio amplifier through the decoupling network, C331 and R322.

The high-mu-triode section of a 6SQ7GT is used in the first audio stage, and is biased from the bleeder in the negative return of the power supply. The first audio stage is resistance-coupled to one triode section of a 7AF7 twin-triode. This section functions as a cathode-and-plate-loaded phase inverter, and is resistance-coupled to the audio output stage, which employs two 6V6GT beam pentodes in push-pull combination. The output tubes are transformer-coupled to a twelve-inch electrodynamic speaker, and are biased from the bleeder circuit connected across the speaker field in the negative return of the power supply. Inverse feedback is obtained by connecting the secondary of the output transformer, through the resistor network, R203 and R204, to the volume control. The second triode section of the 7AF7 tube is used as the phonograph preamplifier stage, and is self-biased by cathode resistor R213.

The new Philco scratch-eliminator circuit reduces the high-frequency surface noise during the low-volume passages on a phonograph record, and permits maximum treble response during the high-volume passages. The circuit consists of a reactance tube (pentode section of the 7E7), a two-stage amplifier (7F7), and a half-wave rectifier (diode section of the 7E7). The reactance tube (connected to the plate circuit of the phono amplifier) functions as a variable capacitance which shunts a controlled amount of the surface-noise frequencies to ground. A portion of the audio signal is amplified, rectified, and applied as a bias voltage to the grid of the reactance tube. During the low-volume passages, when the surface noise tends to mask the high frequencies, the low bias voltage increases the capacitance of the reactance tube, and the surface noise is reduced. During the high-volume passages, when the surface noise itself is masked by the volume, the high bias voltage decreases the capacitance of the tube, thus permitting all audio frequencies to pass relatively unaffected.

Philco TROUBLE-SHOOTING *Procedure*

For rapid trouble shooting, the radio circuit is divided into four sections, with test points specified for each section; these sections and test points are indicated in the schematic diagram. The trouble-shooting procedure given for each section includes a simplified test chart and a bottom view of the chassis showing the locations of the test points and components of that section.

In each chart, the first step is a master check fo determining whether trouble exists in that section, with out going through the entire test procedure.

Failure to obtain the "NORMAL INDICATION" i any given step indicates trouble within the circuit und test.

After isolating the trouble to a single stage, th defect is located by: first, testing the tube; secon measuring the tube electrode voltages; third, measurin circuit resistances; fourth, substituting condensers. Th trouble revealed should be corrected before testin further.

Preliminary Checks

To avoid possible damage to the radio, the followin preliminary checks should be made before turning o the power:

1. Inspect the top and bottom of the chassis. Mak sure that all tubes are secure in the proper sockets, an look for any broken or shorted connections, burne resistors, or other obvious sources of trouble.
2. Measure the resistance between B+ (pin 2 of th 5U4G) and the radio chassis (test point C). When th ohmmeter test leads are connected in the proper polar ty, the highest resistance reading will be obtained. I the reading is lower than 1000 ohms, check condense C101A, C101B, C101C, C102, and C103 for leakag or shorts.

This resistance value, which is much lower tha normal, is not intended as a quality check of these co densers; the value given is the lowest at which the re tifier will operate safely while the voltage tests of Se tion 1 are performed.

Symbolization

The components in the radio circuit are symbolize according to the types of parts and the sections of th radio in which the parts are located. The prefix lette of the symbol designates the type of part, as follows:

C—condenser	LS—loud-speaker	W—line cord
I—pilot lamp	PB—push button	TB—terminal board
J—socket	R—resistor	WS—wafer switch
L—choke or coil	S—switch	Z—electrical assembl
LA—loop aerial	T—transformer	

The number of the symbol, except when the numbe is less than 100, designates the section in which th part is located, as follows:

100-series components are in Section 1—the power supply.
200-series components are in Section 2—the audio and scratch eliminator circuits.
300-series components are in Section 3—the i-f amplifier, d tector, & a-v-c circuit
400-series components are in Section 4—the aerial, r-f, and o cillator circuits.

A suffix letter identifies the part as a non-replaceabl component of the assembly which bears an identica number without a suffix letter, and with perhaps a di ferent prefix letter.

Section 1

TROUBLE SHOOTING

CAUTION: Do not turn on the power with the speaker disconnected, or the radio may be damaged.

For the tests in this section, use a d-c voltmeter. Connect the negative lead to the chassis (test point C); connect the positive lead to the test points indicated in the chart. The voltage readings given were taken with a 20,000-ohms-per-volt meter, at a line voltage of 117 volts, a.c.

Depress the BC push button, set the volume control to minimum, and turn both tone controls counterclockwise.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2; if not, isolate and correct the trouble in this section.

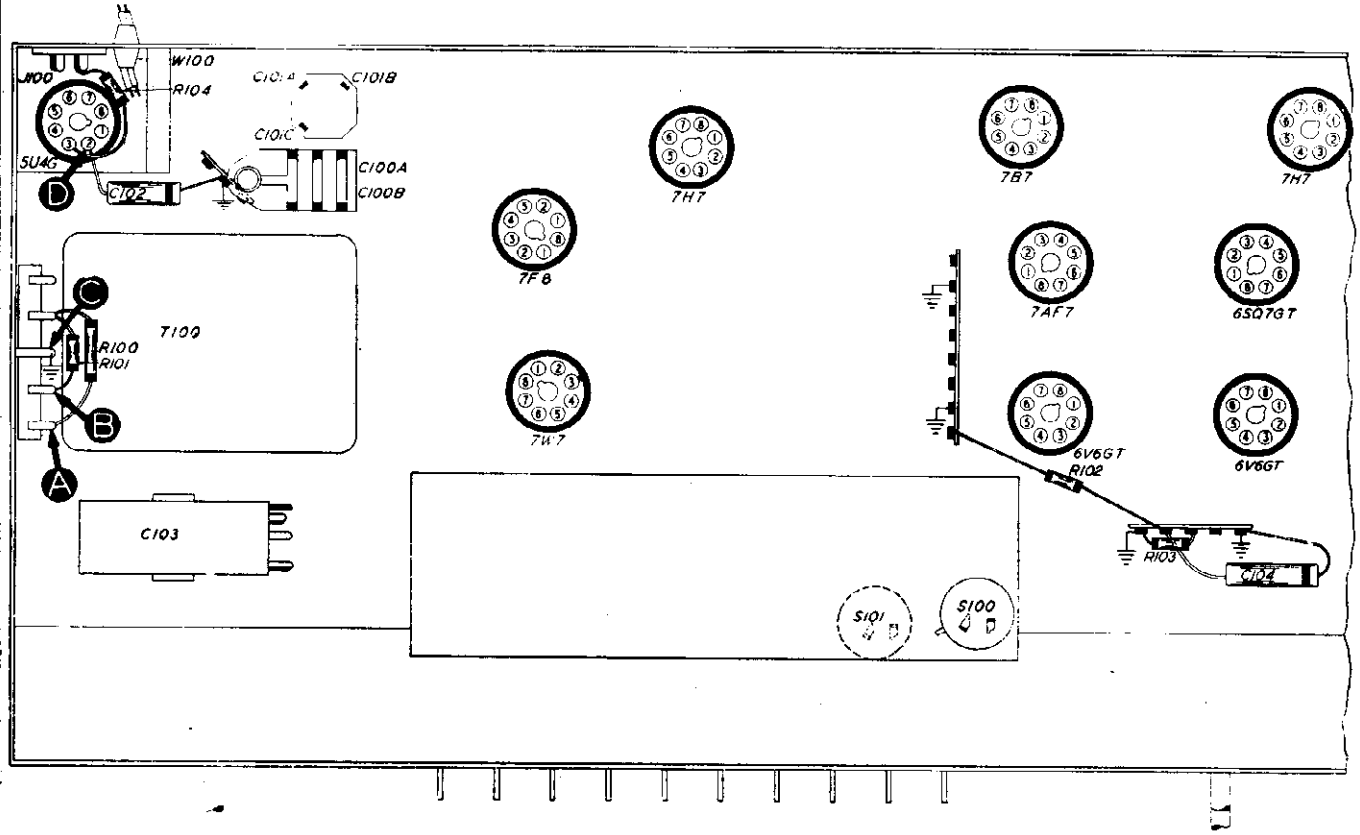


Figure 2. Bottom View, Showing Section 1 Test Points TP-4023A

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A B	220v 200v		†Trouble within this section. Isolate by the following tests.
2	D	250v	No voltage	Defective: 5U4G, T100, W100, S100. Shorted: C101C, C102, C316*, C317*. Open: L100, C316*.
			Low voltage	Defective: 5U4G, T100. Leaky: C101C, C102, C103, C316*, C317*. Open: R102.
			High voltage	Defective: 6V6GT*. Open: R103, T200*.
3	B	200v	No voltage	Open: R101. Shorted: C101B, C417*, C419*, C421*.
			Low voltage	Defective: R101. Leaky: C101B, C417*, C419*, C421*.
			High voltage	Defective: 6V6GT*, T200*.
4	A	220v	No voltage	Open: R100. Shorted: C101A.
			Low voltage	Defective: R100. Leaky: C101A.

Listening Test: Abnormal hum may be caused by open C101A, C101B, C101C, or C103.

*This part, located in another section, may cause abnormal indication in this section.

Section 2

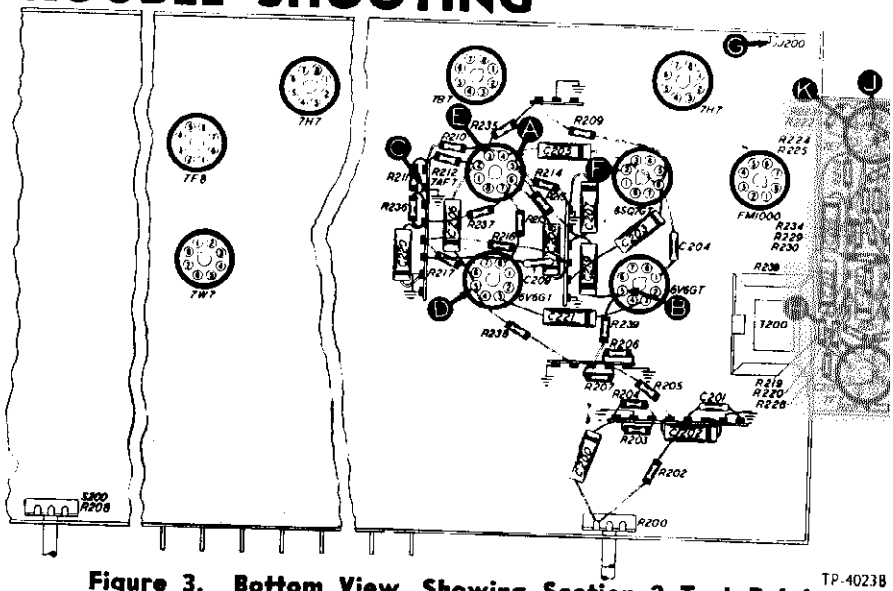
TROUBLE SHOOTING

AUDIO-CIRCUIT TESTS

For the tests in the audio circuit, use an audio signal generator. Connect the ground lead of the generator to the chassis (test point C); connect the output lead through a .1-mf. condenser to the test points indicated.

Set the radio volume control to maximum, turn both tone controls counterclockwise, and depress the phono push button.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the scratch-eliminator-circuit tests. If not, isolate and correct the trouble in the audio circuit.



TP-4023B

Figure 3. Bottom View, Showing Section 2 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in audio circuit. Isolate by the following tests.
2	B D	Loud, clear signal with strong signal input.	Defective: 6V6GT, T200, LS200, R238, R239. Shorted or leaky: C221. Open: C104.
3	E	Loud, clear signal with moderate signal input.	Defective: 7AF7, R211, R212, R235. Open: C206, C219. Shorted or leaky: C206, C219.
4	F	Loud, clear signal with weak signal input.	Defective: 6SQ7GT. Open: R208 (rotate through entire range), R209, R210. Shorted or leaky: C203, C204, C205.
5	G	Same as step 4.	Defective: R200, R203, R205, R206, R207. Shorted or leaky: C202.
6	A	Same as step 4.	Defective: 7AF7, R236, R237, PB9. Shorted or leaky: C220. Open: C208, R216, R217.

SCRATCH-ELIMINATOR-CIRCUIT TESTS

For the tests in the scratch-eliminator circuit, set the volume control to maximum, turn the bass tone control counterclockwise, and depress the phono push button. Set the scratch-eliminator switch, which is operated by the treble-tone-control knob, as directed in the chart.

Connect the output lead of an audio signal generator through a .1-mf. condenser to the test points indicated in the chart. Set the generator for an output frequen of 5000 cycles.

If the "NORMAL INDICATION" is obtained step 1, proceed with the tests for Section 3; if no isolate and correct the trouble in the scratch-eliminat circuit.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A (With scratch eliminator turned off, adjust generator for 2 volts across voice coil)	.8 volt across voice coil, with scratch eliminator turned on.	Trouble in scratch-eliminator circuit. Isolate by the following tests.
2	H (Adjust generator output to approximately .3 volt)	Approximately –6 volts* from J to C, with scratch eliminator turned on.	Defective: 7F7, 7E7 (diode section). Open: R231, R233, R234, C217. Shorted or leaky: C213, C217, C218.
3	A (Reduce generator output to maintain –6 volts* from J to C)	Considerable reduction in generator output required to maintain voltage from J to C at –6 volts.*	Defective: 7F7. Open: R228, C215, R221, R220, R219, C209. Shorted or leaky: C209, C214, C215.
4	A (Generator output reduced as in step 3)	–1.4 volts* from K to C.	Open: R222, R225, R226. Shorted or leaky: C210, C212, C213.
5	A (Generator adjusted as in step 1)	.8 volt across voice coil, with scratch eliminator turned on.	Defective: 7E7 (pentode section). Open: R218, R223, R224, C210, C211. Shorted or leaky: C211.

* Readings taken with 20,000-ohms-per-volt meter on 10-volt range, with 100,000-ohm resistor connected in series with negative lead.

Section 3 TROUBLE SHOOTING

AM CIRCUITS

For the following tests use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to the radio chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Depress the BC push button, set the volume control to maximum, and turn both tone controls counterclockwise.

If the "NORMAL INDICATION" is obtained in the first step, proceed with the tests for the FM circuits. If not, isolate and correct the trouble in this section.

Since the circuit location of test point A for this section is the same as that of test point D for Section 4, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in Section 4; these parts are listed under "POSSIBLE CAUSE OF ABNORMAL INDICATION".

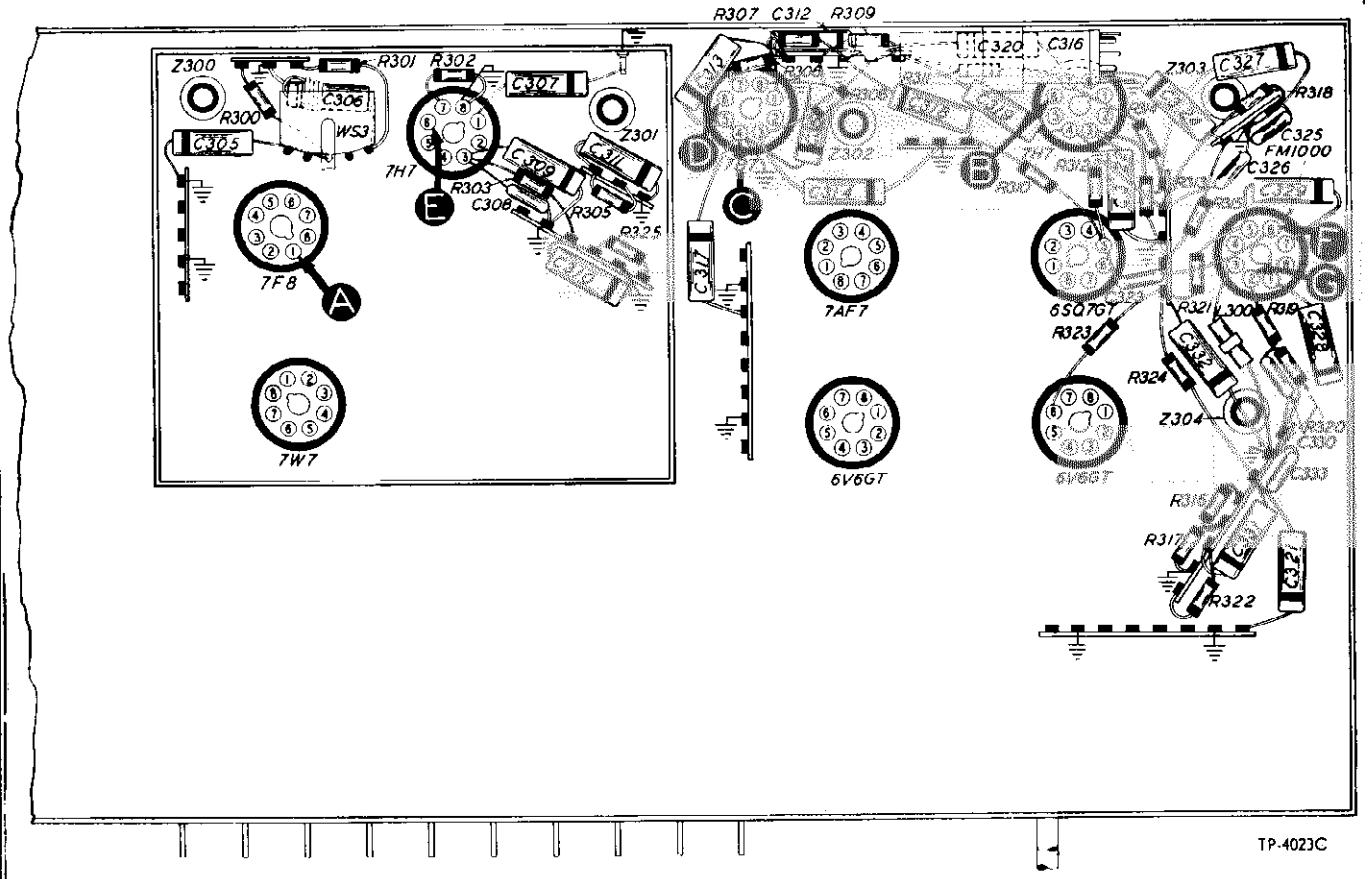


Figure 4. Bottom View, Showing Section 3 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in AM circuits. Isolate by the following tests.
2	B	Loud, clear signal with strong signal input.	Defective: 7H7, 6SQ7GT (diode section), PB1, PB9. Open: R311, R313, R315, R316, R318, C321. Shorted: C320, C322, C324, C325, C326. Defective or misaligned: Z303.
3	D	Loud, clear signal with moderate signal input.	Defective: 7B7, PB1. Open: R305, R306, R307, R308, R309. Shorted: C312, C313, C314, C315, C403*. Defective or misaligned: Z302.
4	E	Loud, clear signal with weak signal input.	Defective: 7H7. Open: R301, R302, R303, R325. Shorted: C306, C307, C308, C309, C310. Defective or misaligned: Z301.
5	A	Loud, clear signal with much weaker signal input.	Defective: 7F8*, WS3(R). Open: R300, R410*. Shorted: C305. Defective or misaligned: Z300.

* This part, located in another section, may cause abnormal indication in this section.

Section 3 (Cont.) TROUBLE SHOOTING

FM CIRCUITS (FM DETECTOR)

The tests in this circuit are made with an audio signal generator, an AM r-f signal generator, and a 20,000-ohms-per-volt meter. Connect a .1-mf. condenser in series with the output lead of each generator.

In step 1, unmodulated r-f signals together with d-c voltage readings are used to check the response of the detector circuit to FM, by observing the voltage drops across the audio-load resistor R324 for different input frequencies within the i-f range of the detector. In step 3, the oscillator section of the detector is made inoperative, thereby converting the circuit to an AM detector and making it possible to check certain components with an AM signal. The tests in this section will not indicate the condition of alignment of the detector unless the circuit is extremely misaligned.

NOTE: In steps 1 and 3, the output of the AM signal generator must be at least .5 volt. If the output is insufficient, the generator lead may be connected t test point B or D in this section, depending upon th maximum output of the generator used. When usin these test points, it is assumed that the last two i- stages are trouble-free. These two i-f stages may be a fault, however, if abnormal indications are obtained i BOTH steps. If doubtful, refer to steps 2 and 3 in th chart for "FM CIRCUITS (I-F Amplifier)" and chec the components listed under "POSSIBLE CAUSE O ABNORMAL INDICATION".

Set the radio volume control to maximum. Turn bot tone controls counterclockwise, and depress the FM push button.

If the "NORMAL INDICATION" is obtained in th first step, proceed with the tests for "FM CIRCUIT (I-F Amplifier)." If not, isolate and remedy the trouble in the FM detector.

STEP	PROCEDURE	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	Connect d-c voltmeter across resistor R324 (positive lead to junction of R324 and R323; negative lead to junction of R324 and C331), with meter on 50-volt range. Connect r-f-generator output to test point F. Turn off modulation and adjust generator output to approximately .5 volt. Swing generator frequency from approximately 80 kc. above to 80 kc. below 9.1 mc.	Approximately 15 to 30 volts across R324 for 9.1-mc. signal or no signal; a swing of approximately ± 12 to 20 volts for a deviation of ± 80 kc.	Trouble in FM detector. Isolate by the following tests.
2	Connect audio signal generator to test point F; adjust for high generator output.	Loud, clear signal.	Defective: Z304, FM1000, PB1. Shorted: C332, C333. Open: C316B, C331, R322, R323, R324, L300.
3	Short test point G (pin 2 of FM1000) to chassis. Connect r-f-generator output to test point F. Use modulated signal. Set generator for maximum output at 9.1 mc.	Loud, clear signal	Defective: FM1000. Shorted: C316B, C332. Open: R323, R324, L300.
4	Remove short from test point G. Connect negative lead (prod end) of d-c voltmeter through 50,000-ohm resistor to test point G; connect positive lead to test point C. Set meter to 10-volt range.	Approximately 2.5 volts negative.	Defective: FM1000, Z304, L300. C330. Shorted: C329. Open: R320, R321.

FM CIRCUITS (I-F AMPLIFIER)

Follow the preliminary instructions for the AM circuits with these exceptions: Depress the FM push button, set the signal-generator frequency to 9.1 mc., and short test point G (pin 2 of FM1000) to the chassis (test point C), to permit the use of an AM signal.

The parts which were found to be satisfactory for AM, with the exception of those indicated in the chart, will usually operate satisfactorily for FM.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 4. If not, isolate and correct the trouble in the FM i-f amplifier.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in FM i-f amplifier. Isolate by the following tests.
2	B	Loud, clear signal with strong signal input.	Defective: 7H7. Shorted or open: C327. Defective or misaligned: Z303.
3	D	Loud, clear signal with moderate signal input.	Defective: 7B7. Defective or misaligned: Z302.
4	E	Loud, clear signal with weak signal input.	Defective: 7H7. Defective or misaligned: Z301.
5	A	Loud, clear signal with weak signal input.	Defective: 7F8, WS3(R). Defective or misaligned: Z300.

Section 4 TROUBLE SHOOTING

For the following tests, with the exception of the oscillator tests, use an r-f signal generator with modulated output. Connect the ground lead to the chassis (test point C); connect the output lead through a .1-mf. condenser to the test points indicated in the chart. Adjust the generator to give a weak input signal.

Set the radio volume control to maximum, and turn both tone controls counterclockwise.

OSCILLATOR TESTS ("AM CIRCUITS" chart, steps 5, 8, and 10; "FM CIRCUITS" chart, step 2): Connect the positive lead of a high-resistance voltmeter to the oscillator cathode (pin 5) of the 7F8, test point E. Connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the oscillator grid (pin 8), test point F. Use a suitable meter range, such as 0—10 volts. Absence of negative voltage with any push button (PB8 through PB4 depressed, or for any dial position (push button PB1, PB2, or PB3 depressed), indicates the oscillator is not functioning.

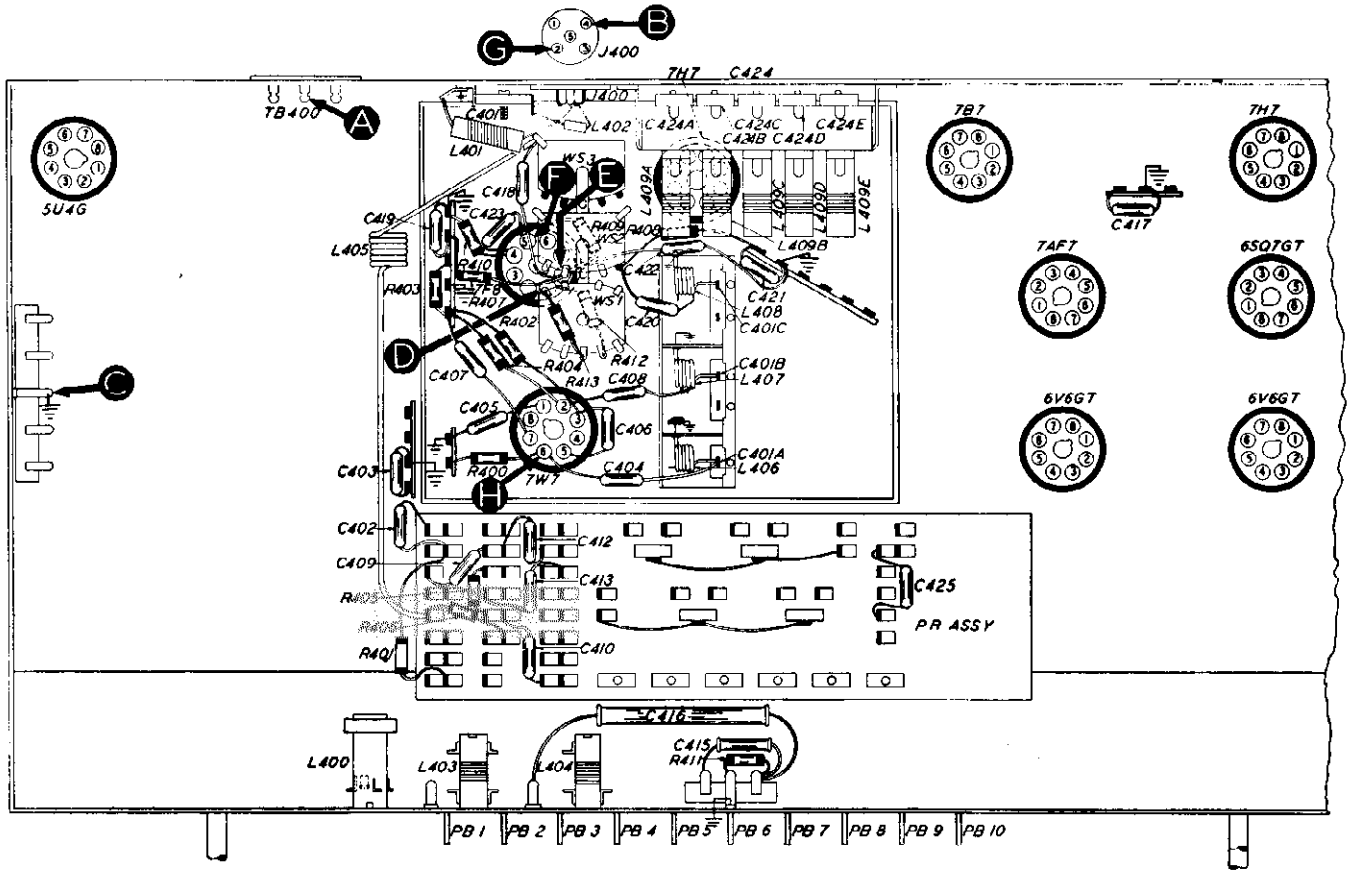


Figure 5. Bottom View, Showing Section 4 Test Points

AM CIRCUITS

STEP	TEST POINT	SIG. GEN. FREQUENCY	PUSH BUTTON OR TUNING CONTROL	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Adjust to frequency of each push-button in sequence.	Depress, in sequence, PB8 through PB4.	Loud, clear signal when each push button is depressed.	Trouble in circuits associated with push-button station selectors. Isolate by tests in steps 4, 5, and 6.
2	A	1000 kc.	Depress BC push button (PB3). Tune in signal with tuning control.	Loud, clear signal.	Trouble in circuits associated with dial tuning (BC band). Isolate by tests in steps 7 and 8.
3	B	12 mc.	Depress SW push button (PB2). Tune in signal with tuning control.	Loud, clear signal.	Trouble in circuits associated with dial tuning (SW band). Isolate by tests in steps 9 and 10.

Section 4 (Cont.) TROUBLE SHOOTING

STEP	TEST POINT	SIG. GEN. FREQUENCY	PUSH BUTTON OR TUNING CONTROL	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
4	D	Adjust to frequency of push button	Depress PB6.	Loud, clear signal.	Defective: 7F8, WS1(F). Open: R41(C423.
5	E to F (Oscil-lator test)		Depress, in sequence, PB8 through PB4.	Negative voltage.	No voltage for any particular pus button—Defective: Coil (L409A throug L409E) or push button. No voltage fo all push buttons—Defective: 7F WS2(F), PB2, PB3, C416. Open: R406 R407, R409, R411, C400, C411B, C41 C418, L404, L405, WS2(F), WS2(R).
6	A	Adjust to frequency of each push button in sequence.	Depress, in sequence, PB8 through PB4.	Loud, clear signal when each push button is depress-ed.	Defective: TB400, L400, C411C, C424 through C424E. Open: R412, R413 C413, PB2, PB3, WS1(F), WS2(F).
7	A	1000 kc.	Depress BC push but-ton (PB3). Tune in signal with tuning control.	Loud, clear signal.	Defective: C400, PB3.
8	E to F (Oscil-lator test)		Depress BC push but-ton (PB3). Rotate tun-ing control through range.	Negative voltage.	Defective: L404.
9	B	12 mc.	Depress SW push button (PB2). Tune in signal with tuning control.	Loud, clear signal.	Defective: J400, L401, L402, C401, C412.
10	E to F (Oscil-lator test)		Depress SW push button (PB2). Rotate tuning control through range.	Negative voltage.	Defective: 7F8, L403, C409, C411A, C410.

FM CIRCUITS

Before proceeding with the tests for the FM circuits, connect test point G in Section 3 to the chassis.

STEP	TEST POINT	SIG. GEN. FREQUENCY	PUSH BUTTON OR TUNING CONTROL	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	G	100 mc.	Depress FM push but-ton (PB1). Tune in signal with tuning control.	Loud, clear signal.	Trouble in FM circuits. Isolate by the following tests.
2	E to F (Oscil-lator test)		Depress FM push but-ton. Rotate tuning control through range.	Negative voltage.	Defective: 7F8, L408, C400, C400C, PB1, WS2(F). Open R408. Shorted: C421.
3	H	100 mc.	Depress FM push but-ton (PB1). Tune in signal with tuning control.	Loud, clear signal.	Defective: 7W7. Open: R400, R402, R403, R404, C408. Shorted: C400, C400B, C405, C406, C407, WS2(F).
4	G	100 mc.	Same as step 3.	Loud, clear signal.	Defective: J400, L406, C400A, C404.

CALIBRATING DIAL BACKPLATE

When the radio chassis has been removed from the cabinet, dial calibration and alignment points may be marked on the dial backplate below the pointer with a pencil.

The method of measuring for these points is illustrated in figure 1. Hold a rule against the dial backplate, with the start of the rule against the inside of the upturned edge of the backplate.

With the tuning gang fully meshed, the pointer should be adjusted on the dial-drive cord to coincide with the index mark.

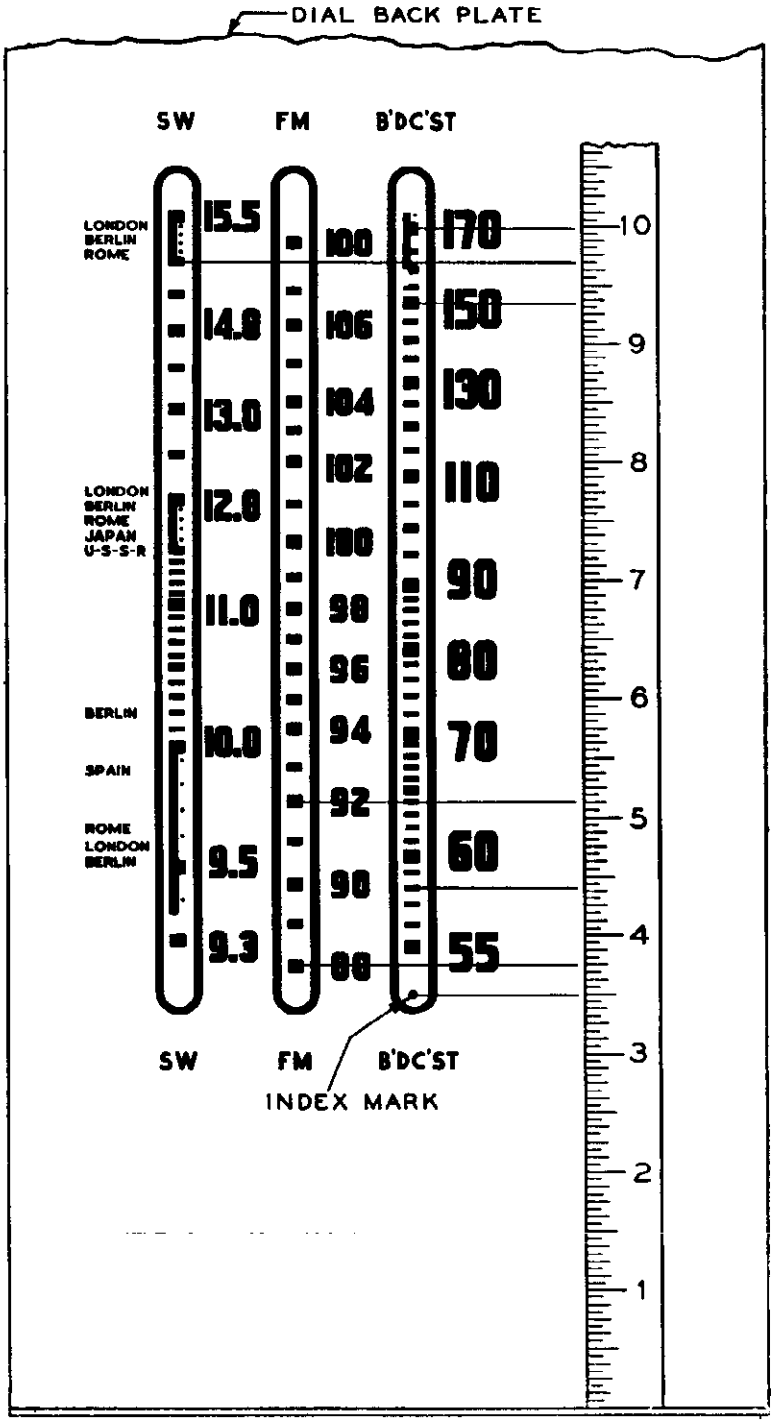
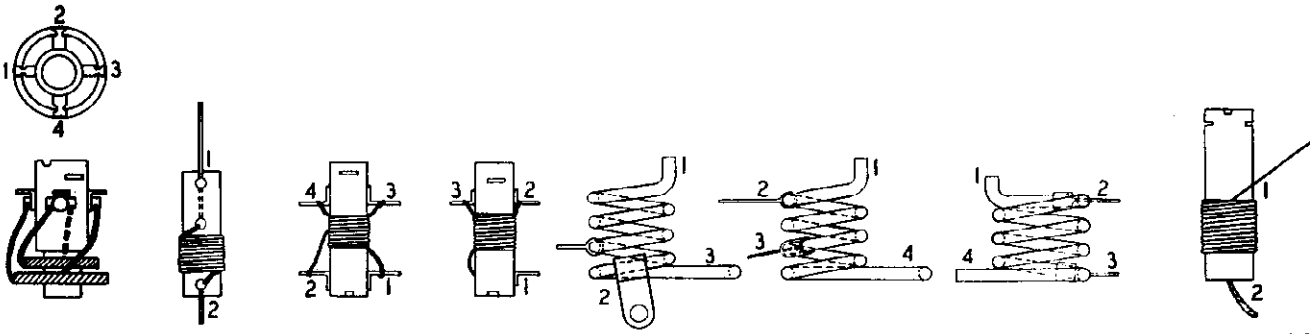
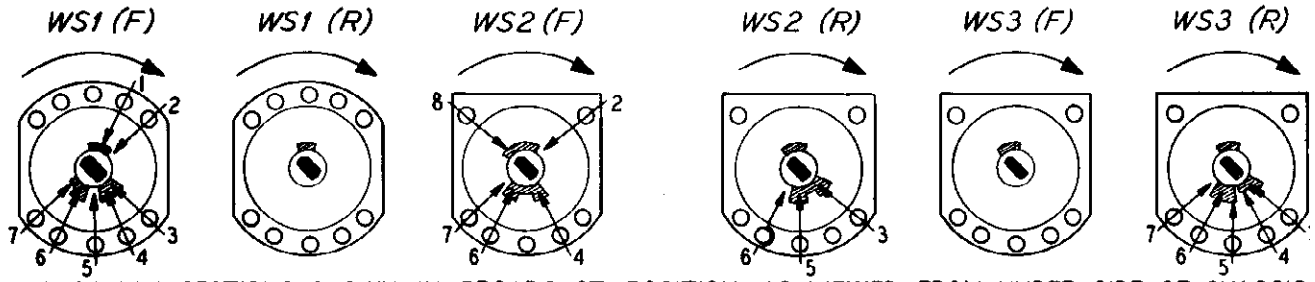


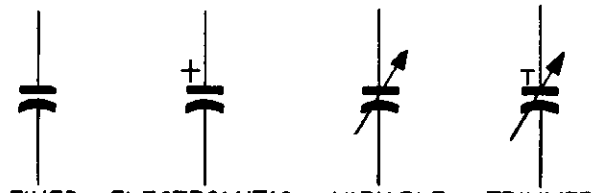
Figure 1. Calibration Measurements for Dial Backplate

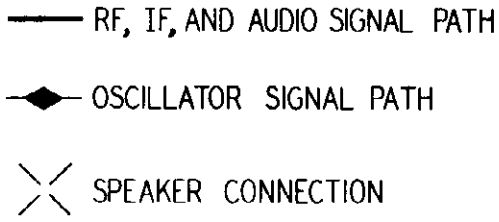




BAND-SWITCH SECTIONS SHOWN IN BROADCAST POSITION AS VIEWED FROM UNDER SIDE OF CHASSIS (F) INDICATES FRONT CONTACTS, LOOKING FROM FRONT. (R) INDICATES REAR CONTACTS, LOOKING THROUGH WAFER.

CONDENSER SYMBOLS





NOTE:

ALL PUSH BUTTONS EXCEPT PB8 ARE SHOWN IN OUT POSITION. ALL ROTARY SWITCHES ARE LINKED TO FM PUSH BUTTON.

ALL RESISTOR VALUES ARE IN OHMS UNLESS MARKED OTHERWISE.

VOLTAGES IN SECTION 1 AND IN AUDIO CIRCUITS OF SECTION 2 WERE TAKEN WITH BC PUSH BUTTON IN. VOLTAGES IN SCRATCH ELIMINATOR CIRCUITS OF SECTION 2 WERE TAKEN WITH PHONO PUSH BUTTON IN AND TREBLE CONTROL SET TO SCRATCH ELIMINATOR POSITION. VOLTAGES IN SECTIONS 3 AND 4 WERE TAKEN WITH FM PUSH BUTTON IN.

ALIGNMENT PROCEDURE

CAUTION: Do not turn on power with speaker disconnected, or the radio may be damaged.

ALIGNMENT OF AM CIRCUITS

When the complete AM and FM alignment is to be made, the AM alignment should be made FIRST; however, if FM alignment is not required, the AM alignment alone may be made.

OUTPUT METER—Connect between No. 3 terminal (voice-coil connection) of the aerial terminal panel and the chassis.

AM SIGNAL GENERATOR—Connect the ground lead to the chassis, and the output lead as indicated in the chart. Use modulated output.

OUTPUT LEVEL—During the alignment, the signal-generator output must be attenuated to maintain the radio output below 1.5 volts, as read on the output meter.

CONTROLS—Set the volume control to maximum, the bass tone control fully counterclockwise, the treble tone control fully clockwise, and the signal-generator dial, radio dial, and radio push buttons as indicated in the chart.

DIAL POINTER—With the tuning condenser fully meshed, the dial pointer must coincide with the index mark at the low-frequency end of the dial. See "CALIBRATING DIAL BACKPLATE" for method of measuring backplate for index and calibration marks.

ALIGNMENT OF FM CIRCUITS

Align the AM circuits first.

OUTPUT METER—Connect the output meter between terminal No. 3 of the aerial terminal panel and the chassis.

AM SIGNAL GENERATOR—Connect the generator ground lead to the radio chassis; connect the output lead through a .1-mf. condenser to the points specified in the chart. Use modulated output.

CONTROLS—Set the treble tone control and the volume control fully clockwise, and the bass tone control fully counterclockwise. Depress the FM push button.

LOCATION OF COILS—For the location of coils L406, L407, and L408 (steps 11 and 15), refer to the base layout of Secton 4, figure 5.

Note 1. When pin 2 of FM1000 is connected to the chassis, the oscillator portion of the FM detector is made inoperative, thereby converting the circuit from an FM to an AM detector.

Note 2. Make the loading network by connecting a 4700-ohm resistor and a .1-mf. condenser in series. Attach an alligator clip to each free end of the network. When this network is connected across the primary or secondary winding of an over-coupled i-f transformer, the network loads the circuit so that the transformer is effectively below critical coupling; the unloaded winding may then be correctly peaked at the intermediate frequency.

Note 3. The top of padder C303D can be reached only from the top of the shield can. Slide a length of flattened solder or wire down between the ceramic form and the edge of the trimmer plate. Attach the loading network between this connection and the chassis.

Note 4. It is essential that the output from the generator be kept below the point where the oscillator of the FM detector locks in, otherwise an erroneous zero beat will be obtained. When a single very sharp zero-beat point is obtained, the adjustment is correct.

Note 5. The use of a signal generator for steps 10 through 16 is recommended only if the available generator is sufficiently accurate to insure correct frequency settings. Otherwise, an alternate procedure employing FM broadcast-station signals in place of a signal generator is recommended. For the adjustments at the high-frequency end of the band, use the station nearest 105 mc.; for the adjustments at the low-frequency end of the band, use the station nearest 88 mc. or 92 mc., as indicated. If the radio is greatly misaligned, it may be necessary to adjust the padders and coils for maximum noise at each end of the band before station signals can be heard. The FM detector must be made inoperative as directed in step 10 of the "FM ALIGNMENT CHART."

Note 6. Check all coil adjustments with a tuning wand. If inserting the brass end in or near the coil increases the output-meter reading, spread the turns; if the powdered-iron end increases the output reading, compress the turns. If both ends cause a decrease in output, the coil is correctly tuned. Do not change the coils excessively, since only a small adjustment is required at these frequencies.

Note 7. Make two simple dipole aerials to feed signals from the signal generator to the radio. Each dipole aerial may consist of two 30-inch lengths of rubber-covered wire. Connect one dipole aerial to terminals 1 and 2 on the FM aerial socket of the radio. Connect the other dipole aerial to the output of the signal generator. Place the two dipoles several feet apart.

MODEL 48-1270

PH

AM ALIGNMENT CHA

STEP	SIGNAL GENERATOR		RADIO		
	CONNECTIONS TO RADIO	DIAL SETTING	PUSH BUTTON	DIAL SETTING	SPECIAL INSTRUCT
1	Through .1-mf. condenser to stator of aerial section of tuning gang.	455 kc.	Depress BC push button (PB3)	1700 kc.	Adjust each trimmer, in order, for maxim adjustments.
2	Loosely coupled with loop. See note below.	15 mc.	Depress SW push button (PB2).	15 mc.	Adjust for maximum output. Check for ima
3	Same as step 2.	15 mc.	Depress SW push button (PB2).	15 mc.	Adjust for maximum output (rock tuning c
4	Same as step 2.	1700 kc.	Depress BC push button (PB3)	1700 kc.	Adjust for maximum output.
5	Same as step 2.	1500 kc.	Depress BC push button (PB3)	1500 kc.	Adjust for maximum output.
6	Same as step 2.	580 kc.	Depress BC push button (PB3)	580 kc.	Adjust for maximum output (rock tuning c
7	Repeat steps 4, 5, and 6 in order until no further increase in output is noted. Then repeat step 4.				

NOTE: Make up a six-to-eight-turn, 6-inch-diameter loop, using insulated wire; connect to the signal-generator leads and place near the radio loop.

FM ALIGNMENT CHA

STEP	SIGNAL GENERATOR		RADIO	
	CONNECTIONS TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS
1	To terminal No. 2 of L407 (see page 15).	9.1 mc.	Gang fully closed	Connect jumper between pin 2 of FM1000 and chassis (see Note (see Note 2) between top of padder C303D and chassis (see
2	Same as step 1.	9.1 mc.	Same as step 1.	Connect loading network between pin 2 (blue lead) of third i-f t
3	Same as step 1.	9.1 mc.	Same as step 1.	Connect loading network between pin 6 (green lead) of third i-f
4	Same as step 1.	9.1 mc.	Same as step 1.	Connect loading network between pin 2 (blue lead) of second i
5	Same as step 1.	9.1 mc.	Same as step 1.	Connect loading network between pin 6 (green lead) of second
6	Same as step 1.	9.1 mc.	Same as step 1.	Connect loading network between pin 2 (blue lead) of first i-f
7	Same as step 1.	9.1 mc.	Same as step 1.	Leave loading network connected as in step 6.
8	To grid (pin 6) of third i-f tube.	9.1 mc. (modulation off)	Same as step 1.	Remove loading network, and remove jumper from pin 2 of FM jumper between pin 4 (blue lead) of FM1000 and junction of R324 trimmer for zero beat.
9	Same as step 8.	9.1 mc. (modulation on)	Same as step 1.	Remove jumper used in step 8. Adjust trimmer for zero beat (see
10	To terminal No. 2 of J400 (see Note 5).	105 mc.	105 mc.	Connect jumper between pin 2 of FM1000 and chassis. Adjust
11	Same as step 10.	88 mc.	88 mc.	Adjust coil L408 for maximum output (see Note 6).
12	Repeat steps 10 and 11 until no further improvement is noted.			
13	Same as step 10.	105 mc.	105 mc.	Adjust for maximum output (rock tuning control).
14	See Note 7.	105 mc.	105 mc.	Adjust for maximum output.
15	Same as step 14.	92 mc.	92 mc.	Adjust coil L407, then L406, for maximum output.
16	Repeat steps 13, 14, and 15 until no further improvement in sensitivity can be obtained.			

SETTING PUSH BUTTONS

1. Connect the output meter between terminal No. 3 on the aerial terminal panel and the chassis.

2. Turn the volume control to maximum, and both tone controls fully counterclockwise.

3. Couple the signal generator loosely t a coil of wire to the loop aerial (se under "AM ALIGNMENT CHART")

4. Turn on the power, and allow the r warm up for 15 minutes before start adjustments.

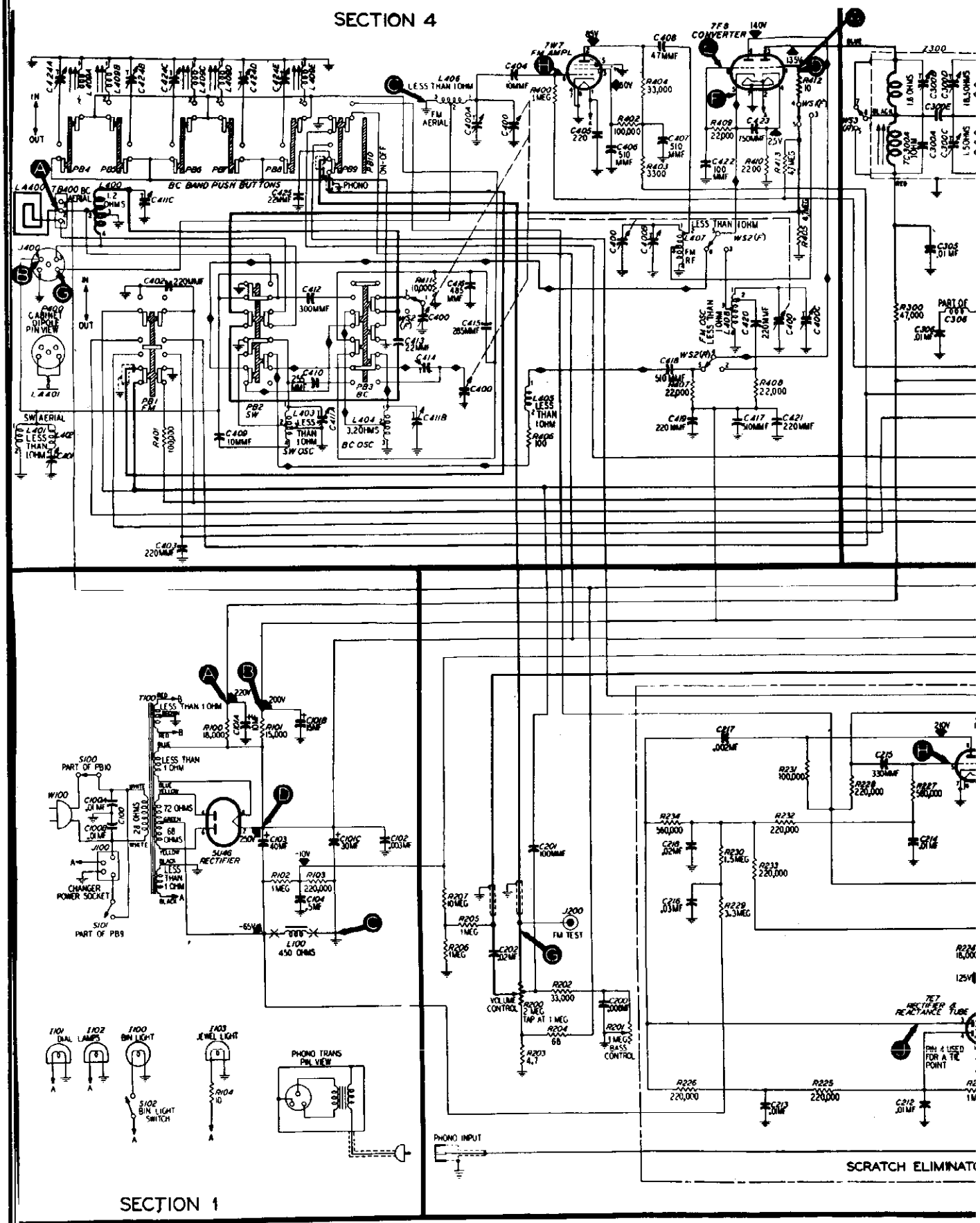
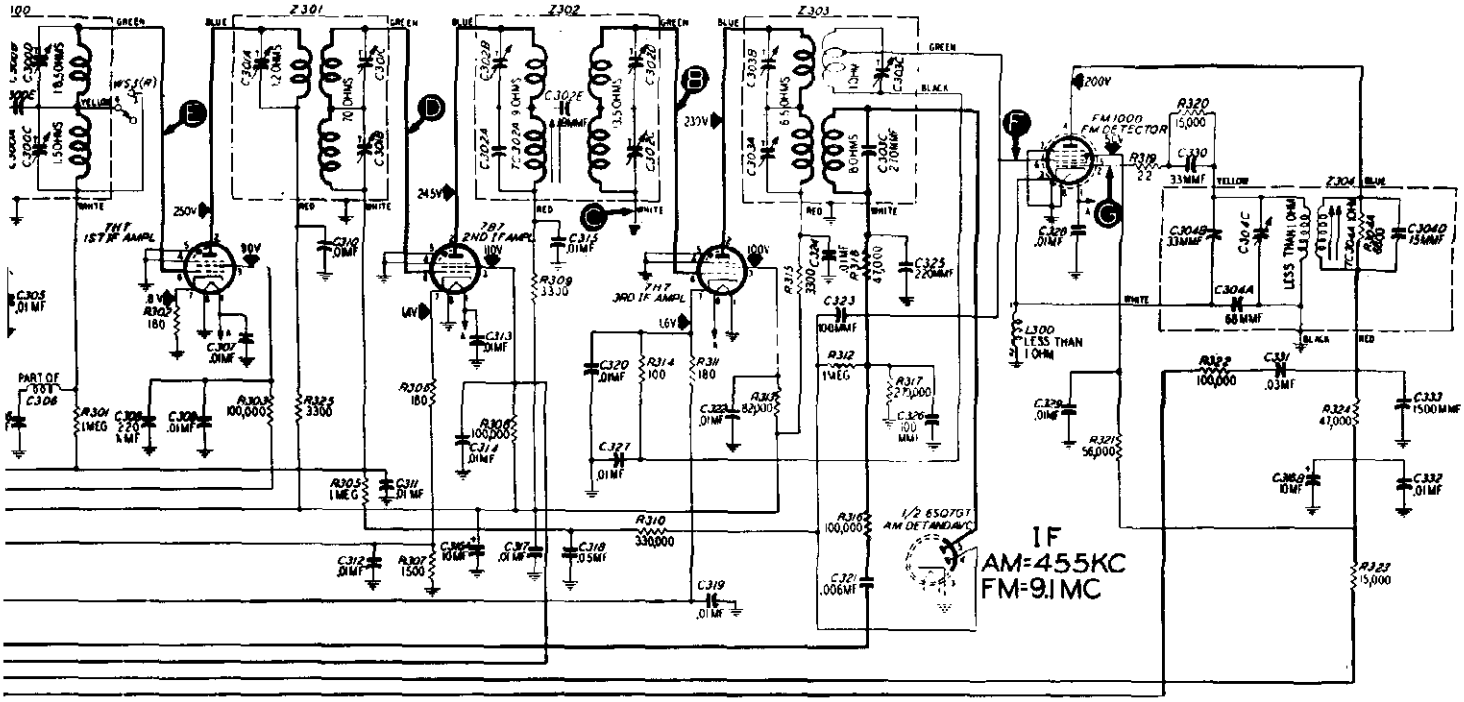
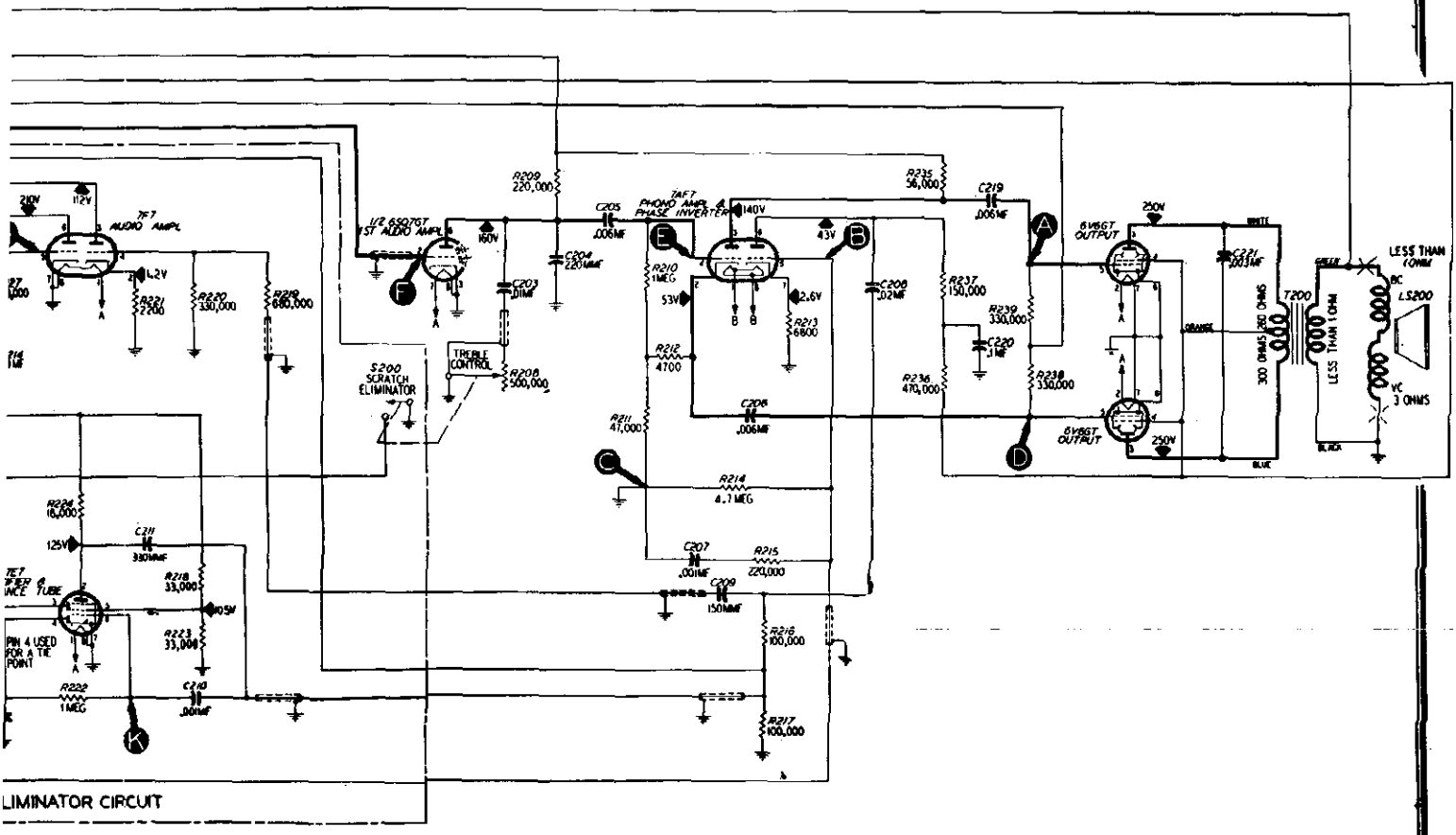


Figure 7. Philco Radio-Phonograph, Model 48-127

SECTION 3





SECTION 2

48-1270, Sectionalized Schematic Diagram, Showing Test Points

	ADJUST TRIMMER
ı. Do not repeat	C303A
	C302C
	TC302A
	C301B
	C300C
	TC300A
ing set to 14.1 mc.	C411A
	C401
	C411B
	C411C
	C414

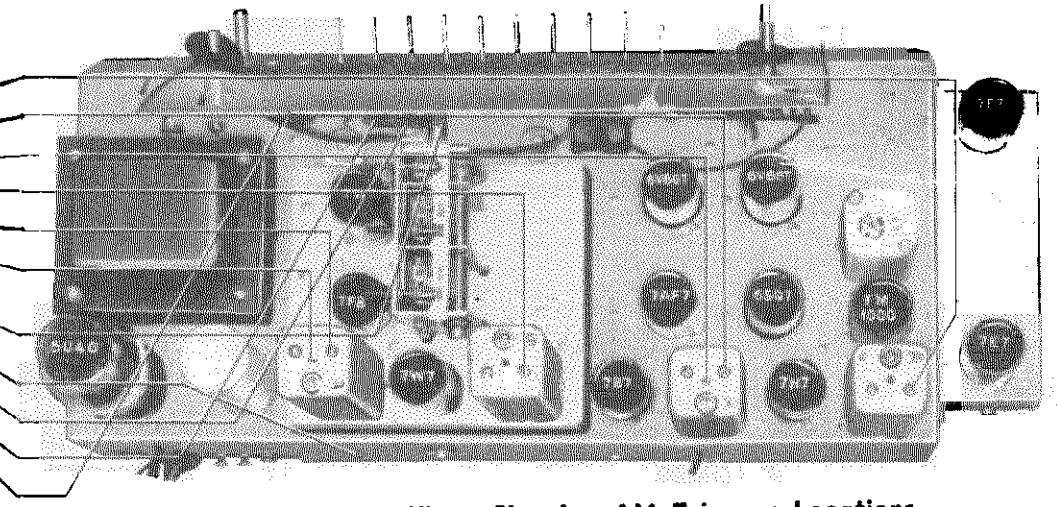


Figure 8. Top View, Showing AM Trimmer Locations

	ADJUST TRIMMER
ict loading network	C303B
	C303D
hassis.	C302B
chassis.	C302D
d chassis.	C301A
d chassis.	C301C
chassis.	C300D
	C300B
chassis. Connect ead of Z304. Adjust	C304C
	TC304A
	C400C
num output.	
	C400B
	C400A

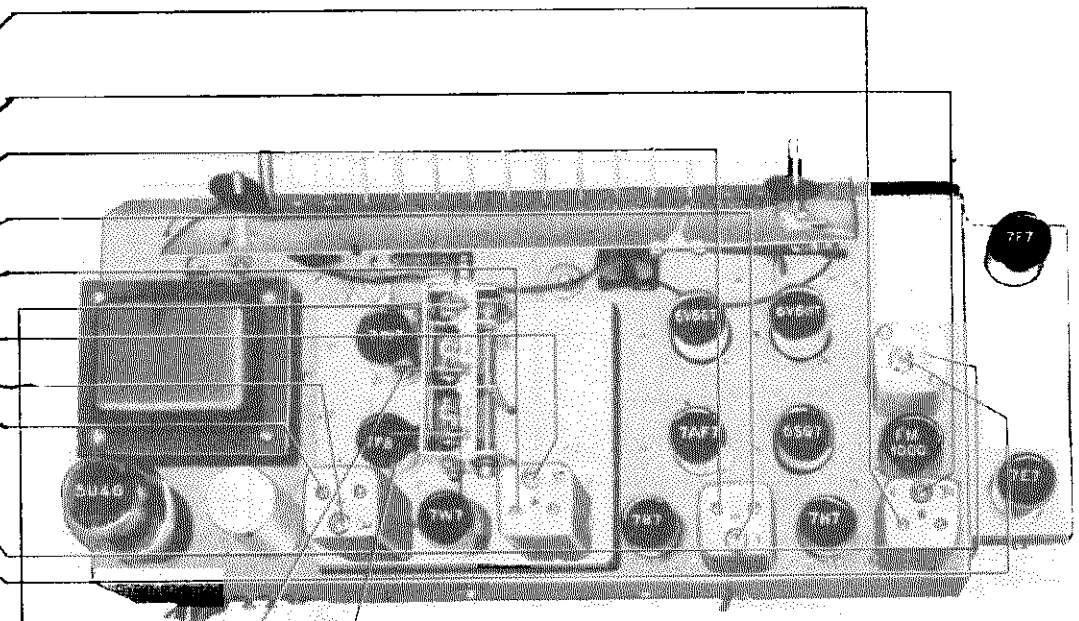


Figure 9. Top View, Showing FM Trimmer Locations

5. Starting with the lowest frequency desired, set the signal generator to the desired frequency (modulation on), push the station-selector push button, and adjust the associated oscillator tuning core and aerial trimmer condenser (marked on rear of chassis) for maximum indication on the output meter. During alignment, the input signal must be attenuated to hold the output-meter reading below 1.5 volts.

6. Reset the signal-generator frequency, and repeat the procedure for each remaining station-selector push button.

7. Turn off the signal generator, and make a final adjustment of all tuning cores and trimmer condensers while listening to the stations for which the adjustments are being made.

REPLACEMENT PARTS LIST

NOTE

Part numbers marked with an asterisk (*) are general replacement items. These numbers may not be identical with those on factory assemblies; also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

SECTION 1

Reference Symbol	Description	Service Part No.
C100	Condenser, two-section	30-1226-1
C100A	Condenser, line filter, .01 mf	Part of C100
C100B	Condenser, line filter, .01 mf	Part of C100
C101	Condenser, electrolytic, three-section	30-2570-1
C101A	Condenser, filter, 10 mf	Part of C101
C101B	Condenser, filter, 15 mf	Part of C101
C101C	Condenser, filter, 30 mf	Part of C101
C102	Condenser, filter, .003 mf	61-0117*
C103	Condenser, filter, 40 mf	30-2568-5
C104	Condenser, bias filter, .5 mf	61-0133*
I100	Lamp, Bin	34-2040
I101	Lamp, dial	34-2040
I102	Lamp, dial	34-2040
I103	Lamp, jewel	34-2040
J100	Socket, phono power	27-6182
L100	Field, speaker	Part of LS200
R100	Resistor, B+ dropping, 18,000 ohms	66-3184340
R101	Resistor, B+ dropping, 15,000 ohms	66-3154340*
R102	Resistor, bias filter, 1 megohm	66-5103340*
R103	Resistor, bias filter, 220,000 ohms	66-4223340*
R104	Resistor, jewel-lamp dropping, 10 ohms	66-0104340
S100	Switch, master power, on—off	Part of PB10
S101	Switch, phono power, on—off	Part of PB9
T100	Transformer, power	32-8282
W100	Line cord	L3199

SECTION 2

C200	Condenser, tone compensating, .006 mf	45-3500-7*
C201	Condenser, by-pass, 100 mmf	30-1224-1*
C202	Condenser, audio coupling, .02 mf	61-0108*
C203	Condenser, tone compensating, .01 mf	61-0120*
C204	Condenser, by-pass, 220 mmf	60-10205307*
C205	Condenser, d-c blocking, .006 mf	45-3500-7*
C206	Condenser, d-c blocking, .006 mf	45-3500-7*
C207	Condenser, tone compensating, .001 mf	45-3500-5*
C208	Condenser, d-c blocking, .02 mf	61-0108*
C209	Condenser, d-c blocking, 150 mmf	60-10155407*
C210	Condenser, d-c blocking, .001 mf	45-3500-5*
C211	Condenser, d-c blocking, 330 mmf	60-10335407*
C212	Condenser, bias filter, .01 mf	61-0120*
C213	Condenser, bias filter, .01 mf	61-0120*
C214	Condenser, bias filter, .01 mf	61-0120*
C215	Condenser, d-c blocking, 330 mmf	60-10335407*
C216	Condenser, bias filter, .03 mf	45-3500-1*
C217	Condenser, d-c blocking, .002 mf	61-0062*
C218	Condenser, bias filter, .02 mf	61-0108*

SECTION 2 (Cont.)

Reference Symbol	Description	Service Part N
C219	Condenser, d-c blocking, .006 mf	45-3500-
C220	Condenser, audio by-pass, .1 mf	61-011
C221	Condenser, tone compensating, .003 mf	61-011
J200	Socket, FM test	27-818
LS200	Speaker	36-160
R200	Volume control, 2 megohms, tapped at 1 megohm	33-5535-
R201	Tone control, bass, 1 megohm	33-5539-
R202	Resistor, tone compensating, 33,000 ohms	66-333334
R203	Resistor, inverse feedback, 4.7 ohms	66-947334
R204	Resistor, inverse feedback, 68 ohms	66-068334
R205	Resistor, grid return, 1 megohm	66-510334
R206	Resistor, bias divider, 1 megohm	66-510334
R207	Resistor, bias divider, 10 megohms	66-610334
R208	Tone control, treble, 500,000 ohms	33-5539-
R209	Resistor, plate load, 220,000 ohms	66-422334
R210	Resistor, grid return, 1 megohm	66-510334
R211	Resistor, cathode load, 47,000 ohms	66-347334
R212	Resistor, cathode bias, 4700 ohms	66-247334
R213	Resistor, cathode bias, 6800 ohms	66-268334
R214	Resistor, grid return, 4.7 megohms	66-547334
R215	Resistor, tone compensating, 220,000 ohms	66-422334
R216	Resistor, voltage divider, 100,000 ohms	66-410334
R217	Resistor, voltage divider, 100,000 ohms	66-410334
R218	Resistor, voltage divider, 33,000 ohms	66-333434
R219	Resistor, tone compensating, 680,000 ohms	66-468334
R220	Resistor, grid return, 330,000 ohms	66-433334
R221	Resistor, cathode bias, 2200 ohms	66-222434
R222	Resistor, grid return, 1 megohm	66-510334
R223	Resistor, voltage divider, 33,000 ohms	66-333434
R224	Resistor, plate load, 18,000 ohms	66-318334
R225	Resistor, bias filter, 220,000 ohms	66-422334
R226	Resistor, bias filter, 220,000 ohms	66-422334
R227	Resistor, grid return, 560,000 ohms	66-456334
R228	Resistor, plate load, 220,000 ohms	66-422334
R229	Resistor, bias filter, 3.3 megohms	66-533334
R230	Resistor, bias filter, 1.5 megohms	66-515334
R231	Resistor, plate load, 100,000 ohms	66-410334
R232	Resistor, bias filter, 220,000 ohms	66-422334
R233	Resistor, voltage divider, 220,000 ohms	66-422334
R234	Resistor, bias filter, 560,000 ohms	66-456334
R235	Resistor, plate load, 56,000 ohms	66-356334
R236	Resistor, plate decoupling, 470,000 ohms	66-447334
R237	Resistor, plate load, 150,000 ohms	66-415334
R238	Resistor, grid return, 330,000 ohms	66-433334
R239	Resistor, grid return, 330,000 ohms	66-433334
S200	Switch, scratch eliminator	Part of R208
T200	Transformer, output	32-8274

REPLACEMENT PARTS LIST

SECTION 3

Reference Symbol	Description	Service Part No.
C300A	Condenser, fixed trimmer, primary	Part of Z300
C300B	Condenser, trimmer, primary	Part of Z300
C300C	Condenser, trimmer, secondary	Part of Z300
C300D	Condenser, trimmer, secondary	Part of Z300
C300E	Condenser, coupling	Part of Z300
C301A	Condenser, trimmer, primary	Part of Z301
C301B	Condenser, trimmer, secondary	Part of Z301
C301C	Condenser, trimmer, secondary	Part of Z301
C302A	Condenser, fixed trimmer, primary	Part of Z302
C302B	Condenser, trimmer, primary	Part of Z302
C302C	Condenser, trimmer, secondary	Part of Z302
C302D	Condenser, trimmer, secondary	Part of Z302
C302E	Condenser, coupling	Part of Z302
C303A	Condenser, trimmer, primary	Part of Z303
C303B	Condenser, trimmer, primary	Part of Z303
C303C	Condenser, r-f by-pass, 270 mmf	Part of Z303
C303D	Condenser, trimmer, secondary	Part of Z303
C304A	Condenser, voltage divider, 68 mmf	Part of Z304
C304B	Condenser, voltage divider, 33 mmf	Part of Z304
C304C	Condenser, trimmer	Part of Z304
C304D	Condenser, fixed trimmer	Part of Z304
C305	Condenser, r-f by-pass, .01 mf	61-0120*
C306	Condenser-and-choke assembly, i-f by-pass, .01 mf	38-9851-3
C307	Condenser, filament by-pass, .01 mf	61-0120*
C308	Condenser, by-pass, 220 mmf	60-10205307*
C309	Condenser, screen by-pass, .01 mf	61-0120*
C310	Condenser, plate by-pass, .01 mf	61-0120*
C311	Condenser, a-v-c by-pass, .01 mf	61-0120*
C312	Condenser, cathode by-pass, .01 mf	61-0120*
C313	Condenser, filament by-pass, .01 mf	61-0120*
C314	Condenser, screen by-pass, .01 mf	61-0120*
C315	Condenser, plate by-pass, .01 mf	61-0120*
C316	Condenser, electrolytic, two-section	30-2552
C316A	Condenser, by-pass, 10 mf	Part of C316
C316B	Condenser, by-pass, 10 mf	Part of C316
C317	Condenser, r-f by-pass, .01 mf	61-0120*
C318	Condenser, a-v-c filter, .05 mf	61-0122*
C319	Condenser, r-f by-pass, .01 mf	61-0120*
C320	Condenser, cathode by-pass, .01 mf	61-0120*
C321	Condenser, d-c blocking, .006 mf	45-3500-7*
C322	Condenser, screen by-pass, .01 mf	61-0120*
C323	Condenser, coupling, 100 mmf	60-10105407*
C324	Condenser, plate by-pass, .01 mf	61-0120*
C325	Condenser, r-f by-pass, 220 mmf	60-10205307*
C326	Condenser, a-v-c by-pass, 100 mmf	30-1224-1*
C327	Condenser, r-f by-pass, .01 mf	61-0120*
C328	Condenser, filament by-pass, .01 mf	61-0120*
C329	Condenser, screen by-pass, .01 mf	61-0120*
C330	Condenser, oscillator coupling, 33 mmf	60-00305307*
C331	Condenser, audio coupling, .03 mf	45-3500-1*
C332	Condenser, r-f by-pass, .01 mf	61-0120*
C333	Condenser, r-f by-pass, 1500 mmf	60-20155404*
L300	Coil, FM detector	32-4007-1
R300	Resistor, plate dropping, 47,000 ohms	66-3473340*
R301	Resistor, a-v-c decoupling, 1 megohm	66-5103340*
R302	Resistor, cathode bias, 180 ohms	66-1183340*
R303	Resistor, screen dropping, 100,000 ohms	66-4103340*
R304A	Resistor, shunt, 6800 ohms	Part of Z304

SECTION 3 (Cont.)

Reference Symbol	Description	Service Part No.
R305	Resistor, a-v-c decoupling, 1 megohm	66-5103340*
R306	Resistor, cathode bias, 180 ohms	66-1183340*
R307	Resistor, cathode bias, 1500 ohms	66-2153340
R308	Resistor, screen dropping, 100,000 ohms	66-4103340*
R309	Resistor, plate dropping, 3300 ohms	66-2333340*
R310	Resistor, a-v-c filter, 330,000 ohms	66-4333340*
R311	Resistor, cathode bias, 180 ohms	66-1183340*
R312	Resistor, diode load, 1 megohm	66-5103340*
R313	Resistor, screen dropping, 82,000 ohms	66-3823340*
R314	Resistor, inverse feedback, 100 ohms	66-1103340*
R315	Resistor, plate dropping, 3300 ohms	66-2333340*
R316	Resistor, audio decoupling, 100,000 ohms	66-4103340*
R317	Resistor, diode load, 270,000 ohms	66-4273340*
R318	Resistor, r-f coupling, 47,000 ohms	66-3473340*
R319	Resistor, parasitic suppressor, 22 ohms	66-0273340*
R320	Resistor, grid leak, 15,000 ohms	66-3153340*
R321	Resistor, screen dropping, 56,000 ohms	66-3563340*
R322	Resistor, audio decoupling, 100,000 ohms	66-4103340*
R323	Resistor, plate dropping, 15,000 ohms	66-3153340
R324	Resistor, plate load, 47,000 ohms	66-3473340*
R325	Resistor, plate dropping, 3300 ohms	66-2333340*
TC300A	Tuning core	Part of Z300
TC302A	Tuning core	Part of Z302
TC304A	Tuning core	Part of Z304
WS3 (R)	Switch, wafer	Part of WS
Z300	Transformer, 1st i.f., including C300A, C300B, C300C, C300D, C300E, and TC300A	32-4020-1
Z301	Transformer, 2nd i.f., including C301A, C301B, and C301C	32-4001
Z302	Transformer, 3rd i.f., including C302A, C302B, C302C, C302D, C302E, and TC302A	32-4002
Z303	Transformer, 4th i.f., including C303A, C303B, C303C, and C303D	32-4003-2
Z304	Transformer, FM detector, including C304A, C304B, C304C, C304D, R304A, and TC304A	32-4004

SECTION 4

C400	Condenser, tuning	31-2694
C400A	Condenser, trimmer	Part of C400
C400B	Condenser, trimmer	Part of C400
C400C	Condenser, trimmer	Part of C400
C401	Condenser, trimmer	31-6473-2
C402	Condenser, r-f by-pass, 220 mmf	60-10205307*
C403	Condenser, r-f by-pass, 220 mmf	60-10205307*
C404	Condenser, coupling, 10 mf	60-00105407*
C405	Condenser, filament by-pass, 220 mmf	60-10205307*
C406	Condenser, screen by-pass, 510 mmf	60-10515307*
C407	Condenser, plate by-pass, 510 mmf	60-10515307*
C408	Condenser, d-c blocking, 47 mmf	60-00515307*
C409	Condenser, neutralizing (s.w.), 10 mmf	60-00105407*
C410	Condenser, oscillator series, 255 mmf	30-1220-24
C411	Condenser, trimmer assembly, three-section	31-6477
C411A	Condenser, trimmer, oscillator shunt (s.w.)	Part of C411
C411B	Condenser, trimmer, oscillator shunt (bc.)	Part of C411
C411C	Condenser, trimmer, aerial shunt (bc.)	Part of C411

REPLACEMENT PARTS LIST

SECTION 4 (Cont.)

Reference Symbol	Description	Service Part No.
C412	Condenser, aerial series (s.w.), 300 mmf	60-10305307*
C413	Condenser, d-c blocking, 22 mmf	60-00205307*
C414	Condenser, trimmer, b-c series	31-6473-3
C415	Condenser, r-f voltage divider, 285 mmf	30-1224-14
C416	Condenser, r-f voltage divider, 485 mmf	30-1224-15
C417	Condenser, r-f by-pass, 510 mmf	60-10515307*
C418	Condenser, d-c blocking, 510 mmf	60-10515307*
C419	Condenser, r-f by-pass, 220 mmf	60-10205307*
C420	Condenser, d-c blocking, 220 mmf	60-10205307*
C421	Condenser, r-f by-pass, 220 mmf	60-10205307*
C422	Condenser, oscillator coupling, 100 mmf	60-10105407*
C423	Condenser, oscillator-to-mixer coupling, 750 mmf	60-10755301*
C424	Condenser, trimmer assembly, five-section	31-6479
C424A	Condenser, trimmer	Part of C424
C424B	Condenser, trimmer	Part of C424
C424C	Condenser, trimmer	Part of C424
C424D	Condenser, trimmer	Part of C424
C424E	Condenser, trimmer	Part of C424
C425	Condenser, r-f by-pass, 22 mmf	60-00205307*
J400	Socket, s-w and FM aerial	27-6214-1
L400	Coil, bc. aerial	32-4049-1
L401	Coil, s-w aerial	32-4050-2
L402	Coil, FM isolation	32-4111
L403	Coil, s-w oscillator	32-3996
L404	Coil, bc. oscillator	32-4019-4
L405	Choke, oscillator isolation	32-4089
L406	Coil, FM aerial	32-3993
L407	Coil, FM r-f	32-3992
L408	Coil, FM oscillator	32-3994
L409A	Coil, push button	32-4059
L409B	Coil, push button	32-4059
L409C	Coil, push button	32-4059-1
L409D	Coil, push button	32-4059-1
L409E	Coil, push button	32-4059-1
LA400	Loop, bc.	76-2262
LA401	Dipole, FM	76-2381-2
PB1—PB10	Push-button switch assembly	42-1777
R400	Resistor, grid return, 1 megohm	66-5103340*
R401	Resistor, voltage divider, 100,000 ohms	66-4103340*
R402	Resistor, screen dropping, 100,000 ohms	66-4103340*
R403	Resistor, plate dropping, 3300 ohms	66-2333340*
R404	Resistor, plate load, 33,000 ohms	66-3333340*
R405	Resistor, voltage divider, 4.7 megohms	66-5473340*
R406	Resistor, parasitic suppressor, 100 ohms	66-1103340*
R407	Resistor, plate load, 22,000 ohms	66-3223340*
R408	Resistor, plate load, 22,000 ohms	66-3223340*
R409	Resistor, grid return, 22,000 ohms	66-3223340*
R410	Resistor, cathode bias, 2200 ohms	66-2223340*
R411	Resistor, cathode bias, 10,000 ohms	66-3103340*
R412	Resistor, parasitic suppressor, 10 ohms	66-0103340*
R413	Resistor, grid return, 4.7 megohms	66-5473340*
WS	Wafer switch, three-section	76-2211
WS1	Switch, wafer	Part of WS
WS2	Switch, wafer	Part of WS

MISCELLANEOUS

Description	Service Part N
Bin-light-socket assembly	27-6233-
Cabinet (L)	10656-L
(M)	10656-M
(W)	10656-W
Cabinet parts and hardware	
Baffle and cloth, R.H. (L)	40-679
(M and W)	40-678
Baffle and cloth, L.H. (L)	40-679
(M and W)	40-678
Baffle, wood (L, M, and W)	21904
Bin mechanism, L.H.	76-236
Bin mechanism, R.H.	76-2174-
Bolt, speaker (4 required)	W-158
Bracket, lamp	56-233
Bracket and cradle	76-220
Brass pull (L) (2 required)	56-340
(M and W) (2 required)	56-324
Bullet catch	45-600
Bullet strike	45-600
Continuous hinge	56-362
Dial-scale-and-backplate assembly (M)	76-2226-
(L and W)	76-2226-
Dome (4 required)	45-604
Doors, cabinet, matched pair (L)	45-155
(M)	45-155
(W)	45-155
Knife hinge	56-406
Panel, instrument (L)	45-638
(M)	45-638
(W)	45-638
Screw, scale mtg. (4 required)	1W24894FE1
Tell-tale jewel	54-430
Wire grille (2 required)	56-325
Cable and plug, phono	41-373
Cable and plug, speaker	41-3734-
Cable assembly, 10 5/8 in. (2 required)	41-3754-
Cable assembly, 5 3/4 in.	41-3754-
Cable assembly, 8 1/4 in.	41-3754-
Cable assembly, 18 in.	41-3754-
Cable assembly	41-3754-1
Chassis mtg. hardware	
Bracket support	56-3616FA
Grommet, foot mtg.	54-412
Lock washer	1W24260FA
Nut	1W19994FA
Rubber mount	54-412
Screw (4 required)	1W17326FA
Screw (4 required)	1W18204FA
Screw, back (12 required)	1W25345FA
"T" nut, foot mtg.	W-250
Washer (2 required)	1W52540FA
Washer, foot mtg.	W-227
Clip, bc. aerial coil	28-5002FA
Cord, drive (25-ft. spool)	45-875
Dial-scale hardware	
Backplate assembly	76-210
Pointer	56-317
Screw (5 required)	1W19670FA
Spring	28-895
Gasket, speaker	54-735

REPLACEMENT PARTS LIST

MISCELLANEOUS (Cont.)

Description	Service Part No.
Knob, control (L) (4 required)	54-4227-1
(M and W) (4 required)	54-4227
Knob, push button (10 required)	54-4292
Loop mtg. hardware	
Spacer (2 required)	1W29184FA3
Washer (6 required)	1W52540FA3
Washer, spring	28-4186
Palnut, volume-control mtg. (3 required)	1W29091FA3
Plug, FM dipole	54-4346
Push-button-assembly hardware	
Cap (10 required)	54-4294
Cover assembly	76-1343
Cap centering (5 required)	28-6936
Rubber mount (2 required)	27-4596
Screw (2 required)	1W19674FA3
Screw, tuning core (5 required)	56-2249
Tab, BC	54-4318
Tab, FM	54-4317-4
Tab kit	40-6943
Tab, OFF	54-4317-1
Tab, PHONO	54 4317-5
Tab, SW	54-4317-3

MISCELLANEOUS (Cont.)

Description	Service Part No.
Terminal strip, coils (5 required)	56-2250FA3
Tuning core (5 required)	56-6100
Record-changer mtg. hardware	
Cover frame	76-2341
Input transformer	32-8256
Rubber mount	54-4313
R-f-unit mtg. hardware	
Grommet (3 required)	54-4295
Screw (3 required)	1W19674FA3
Spacer (3 required)	1W29158FA3
Washer (3 required)	1W52224FA3
Socket, Loktal, r-f unit (2 required)	27-6213
Socket, Loktal, main chassis and r-f unit (7 required)	27-6138*
Socket, octal (4 required)	27-6174
Socket assembly, dial light	76-2109
Socket assembly, dial light, 7-inch lead	76-2109-2
Socket assembly, pilot	41-3737
Tube shield, FM1000	56-2731
Wafer-switch hardware	
Fulcrum assembly	76-2206
Link	54-7169
Tri-mount fasteners	28-4279FA1

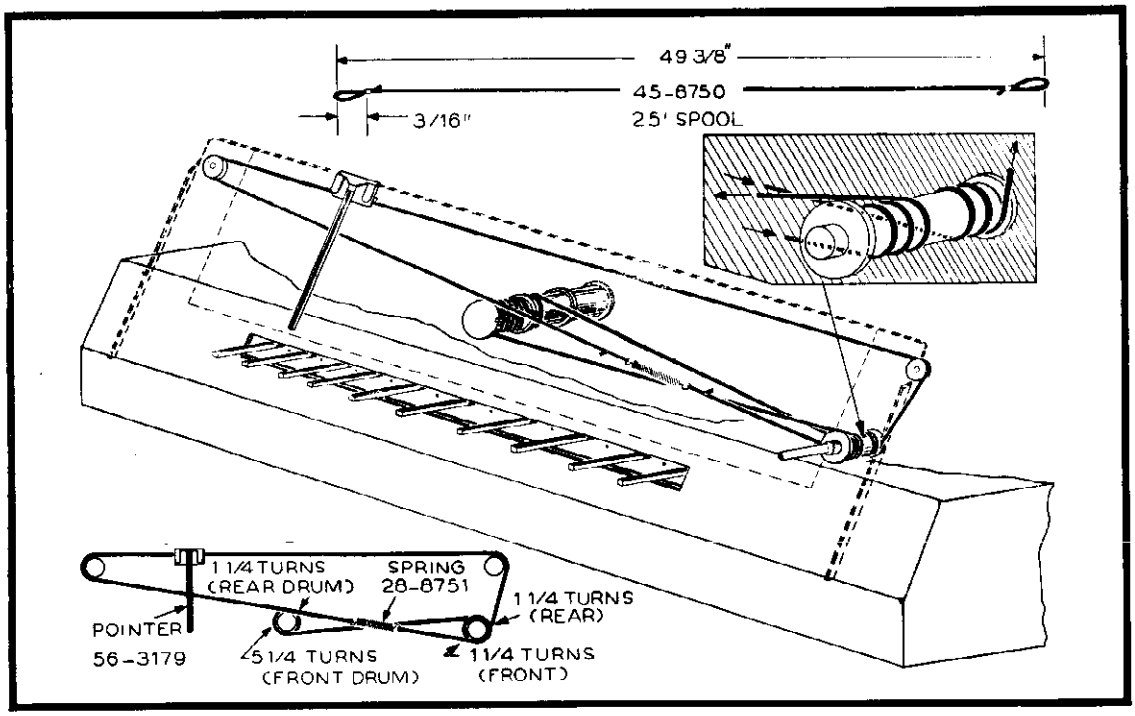


Figure 6. Drive-Cord Installation Details

Circuit Description

Philco Radio-Phonograph Model 48-1286 contains an 11-tube superheterodyne and a Model D-10 Philco Automatic Record Changer.

A low-impedance loop aerial within the cabinet normally provides adequate signal pickup on the standard broadcast band. In most locations, the built-in FM dipole aerial provides satisfactory FM reception. In areas where FM signals are weak, an outdoor dipole aerial (Philco Part No. 45-1462) will provide additional pickup. To increase the pickup on both bands, use the Philco Aerial Coupler, Part No. 76-2353, with the outdoor dipole aerial. For increased pickup on the standard broadcast band only, the coupler may be used with an external aerial of the single-wire type, such as Philco Part No. 45-1494. Information on aerial and coupler connections is given in the external aerial bulletin PR-1200.

The r-f stage (FM only) and converter stage are mounted on a separate chassis, for improved performance at high frequencies. A 6AU6 high-frequency pentode is used in the r-f stage, and a 7F8 high-frequency double triode is employed as a converter.

Two transformer-coupled i-f stages are used. The transformers have two sets of windings; one set is tuned to 455 kc., for AM operation, and the other set is tuned to 9.1 mc., for FM operation. A 6BA6 high-frequency pentode is used in the first i-f stage. The pentode section of a 7R7 duo-diode, pentode functions as the second i-f amplifier; one diode of this tube is used for AM detection, while the other diode provides a.v.c.

The dual-diode section of a 7X7 is employed in the FM ratio-detector circuit; this circuit has good noise-reducing properties and an excellent tuning characteristic.

The triode section of the 7X7 functions as the first audio stage. A 6J5GT triode operates as a plate-and-cathode-loaded phase inverter, driving two 6K6GT output amplifiers, in push-pull operation. Tone fidelity is obtained by the use of inverse feedback in the audio system; feed-back voltage is taken from the secondary of the output transformer.

The Philco Electronic Scratch Eliminator, for phono operation, may be switched on or off, as required. The pentode section of a 7E7 functions as a variable shunt capacitance at the phono-input circuit; at low signal levels, a controlled portion of the higher audio frequencies is by-passed to ground. The grid bias of the reactance tube controls the effective capacitance, which becomes maximum with low bias, and minimum with high bias. This control bias is developed by the audio signal itself; a proportionate amount of the signal is taken from the pickup output, amplified by each triode section of the 7F7, and rectified by the diode section of the 7E7.

Philco TROUBLE-SHOOTING Procedure

For rapid trouble shooting, the radio circuit is divided into four sections, as follows:

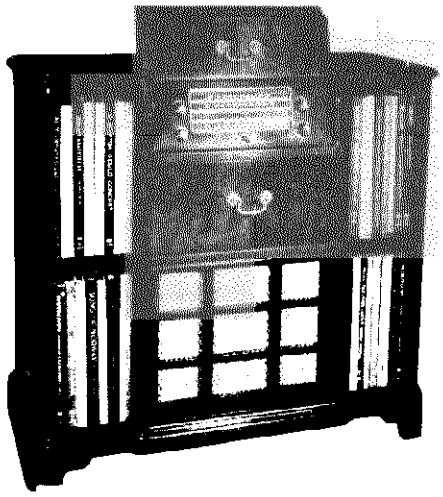
Section 1—the power supply
Section 2—the audio circuits
Section 3—the i-f, detector, and a-v-c circuits
Section 4—the r-f and converter circuits

Test points are specified for each section, and indicated in the sectionalized schematic diagram. trouble-shooting procedure given for each section cludes a simplified test chart and a bottom view of chassis showing the locations of the test points and components of that section.

In each chart, the first step is a master check determining whether trouble exists in that sect without going through the entire chart.

Failure to obtain the "NORMAL INDICATION" any given step indicates trouble within the circuit ur test.

After isolating the trouble to a single stage, the de is located by: first, testing the tube; second, measu tube electrode voltages; third, measuring circuit re ances; fourth, substituting condensers. The trouble vealed should be corrected before testing further.



SPECIFICATIONS

CABINET	Wood, mahogany finish
CIRCUIT	11-tube superheterodyne
FREQUENCY RANGES	
Broadcast	540—1720 kc.
FM	88—108 mc.
AUDIO OUTPUT	6 watts
OPERATING VOLTAGE	105—120 volts, 60 cycles, a.c
POWER CONSUMPTION	
Radio	110 watts
Phonograph	125 watts
AERIALS	Built-in loop and FM cabine dipole; external aerial als may be used
INTERMEDIATE FREQUENCIES	
AM	455 kc.
FM	9.1 mc.
PHILCO TUBES (11)	6AU6, 7F8, 6BA6, 7R7, 7X7 6J5GT, 6K6GT (2), 7E7 7F7, 5AZ4
PHONOGRAPH	Philco Automatic Record Changer, Model D-10

Section 1

TROUBLE SHOOTING

POWER SUPPLY

CAUTION: Do not turn on the power with the speaker disconnected, or the set may be damaged.

Make the tests for this section with a d-c voltmeter, connecting the leads between the chassis, test point C, and the test points indicated in the chart. The voltage readings given were taken with a 20,000-ohms-per-volt meter, at a line voltage of 117 volts, a.c.

Set the volume control to minimum, and the tone control fully counterclockwise. Set the band selector-phono switch to the broadcast position.

Follow the steps in the order given. If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2 (audio circuits); if not, isolate and correct the trouble in this section.

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	195v		Trouble in this section. Isolate by the following tests.
2	B	300v	No voltage. Low voltage. High voltage.	Defective: 5AZ4. Open: S100, T100. Shorted: C102. Defective: 5AZ4. Shorted: C103B, C310*, C411*. Leaky: C102. Open: C102, L100. Shorted: L100. Open: T200*.
3	A	195v	No voltage. Low voltage. High voltage.	Open: R100. Shorted: C103A, C311*. Leaky: C103A, C311*. Changed resistance: R100. Open: T200*.
4	D	Negative 27v	No voltage. High voltage.	Open: R101. Open: R102.
Listening Test: Abnormal hum and instability may be caused by open C103A or C103B.				

* This part, located in another section, may cause abnormal indication in this section.

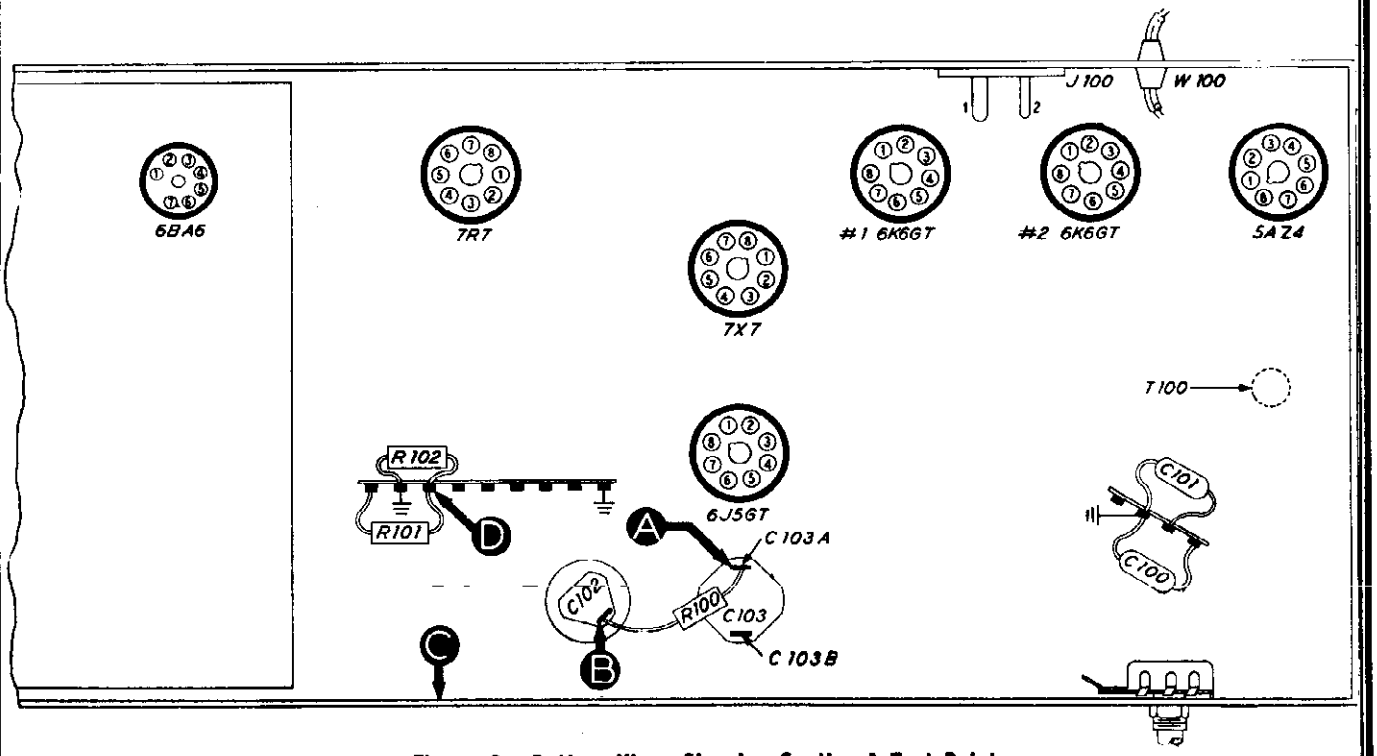


Figure 2. Bottom View, Showing Section 1 Test Points

Section 2

TROUBLE SHOOTING

AUDIO-AMPLIFIER TESTS

AUDIO CIRCUITS

Use an audio-frequency signal generator. Connect the generator ground lead to the chassis, test point C, and connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, and the tone control fully counterclockwise. Set the band (wafer) switch to the broadcast position. Make certain th the scratch-eliminator switch is turned off (two-positic switch turned counterclockwise). If the "NORMA INDICATION" is obtained in steps 1 and 6, proce with the scratch-eliminator tests; if not, isolate ar correct the trouble in the audio-amplifier circuits.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in audio-amplifier circuits. Isolate by the following tests.
2	B (Remove 6J5GT)	Clear signal with strong signal input.	Defective: 6K6GT(#1), LS200. Open: C206, R211, T200. Shorted or leaky: C206, C209.
3	D (6J5GT removed)	Same as step 2.	Defective: 6K6GT(#2). Open: C207, R212. Shorted or leaky: C207.
4	E (Replace 6J5GT)	Loud, clear signal with moderate signal input.	Defective: 6J5GT. Open: R208, R209, R207, R210. Shorted or leaky: C205, C204.
5	A	Same as step 1.	Defective: 7X7. Open: R200 (rotate through range), C202, R205, R206. Shorted: C203.
6*	F	Loud, clear signal with weak signal input.	Open: R230, WS-2(R).
Listening Test: Distortion may be caused by leaky C202, C205, C206, or C207; or by open R205, C207, C211, or C212.			

*For this step, set band (wafer) switch to phono.

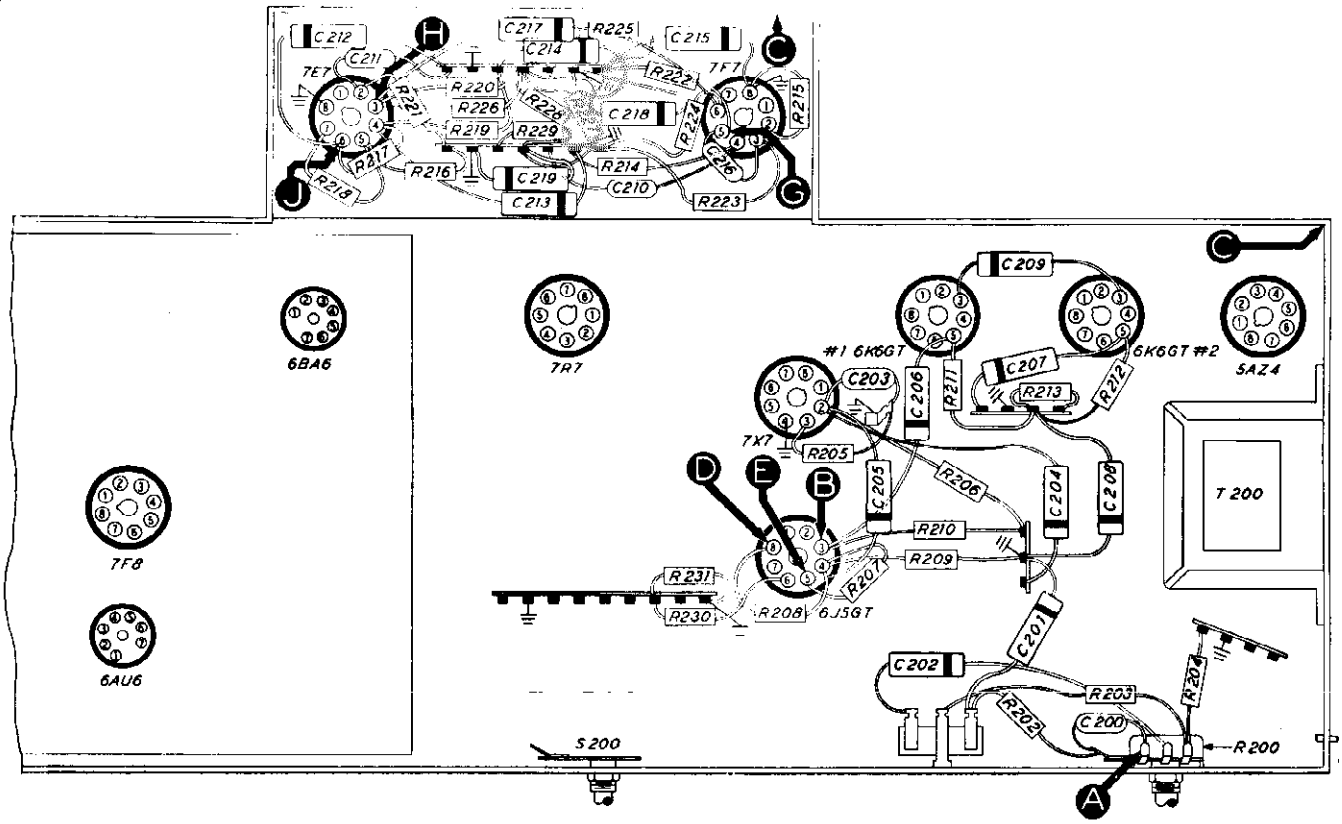


Figure 3. Bottom View, Showing Section 2 Test Points

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Section 2 (Cont.)

TROUBLE SHOOTING

SCRATCH-ELIMINATOR TESTS

Set the tone control fully counterclockwise. Turn the band (wafer) switch to the phono position. For all steps except 1(b), set the volume control to maximum; for this step, adjust the volume control as directed in the chart.

Turn the scratch eliminator on or off as indicated in the chart. (The scratch eliminator is on when the two-position switch is turned clockwise.)

Connect an output meter across the *primary* of the output transformer, T200.

IMPORTANT! For all steps except step 4, use the 0—10-volt output-meter range; for step 4 only, use the 0—50-volt range. If the proper ranges are not used, erroneous readings will result.

Connect the ground lead of an audio signal generator to the chassis, test point C, and connect the output lead through a .1-mf. condenser to the test points indicated in the chart. Set the generator for 5000 cycles. Adjust the generator output as directed in the chart.

If normal operation is indicated by the tests in step 1, (a) and (b), proceed with the tests for Section 3 (i-f, detector, and a-v-c circuits); if not, isolate and correct the trouble in the scratch-eliminator circuits.

NOTE: For steps 2, 3, and 4, connect the positive lead of a 20,000-ohms-per-volt, d-c voltmeter to the chassis, test point C; connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the "VOLTMETER" test points indicated in the chart.

STEP	TEST POINT	SIG. GEN. OUTPUT	VOLT-METER	SPECIAL INSTRUCTIONS	POSSIBLE CAUSE OF ABNORMAL INDICATION
1(a)	F	Adjust for 10v output-meter reading, with scratch-eliminator off.		Turn scratch eliminator on; output voltage should drop to 6.5v (approx.).	
1(b)	F	Same as for 1(a).		Reduce volume control to obtain output-meter reading of 1v. Increase generator output for output-meter reading of 10v. Turn scratch eliminator on; output voltage should not drop below 8.8v (approx.).	Trouble in scratch-eliminator circuits. Isolate by the following tests.
2	G	See SPECIAL INSTRUCTIONS.	H	With scratch eliminator on, increase generator output for voltmeter reading of 8.8v, negative; failure to obtain this value indicates trouble.	Defective: 7F7, 7E7 (diode section), WS-3(R). Open R224, R222, R226, R228, C217, S200.
3	G	Same setting which produced 8.8v reading in step 2, with scratch eliminator on.	J	With scratch eliminator on, voltage at point J should be 2v, negative.	Open: R220, R219, R217. Shorted: C213, C214, C212.
4	F	Same as step 2.	H	With scratch eliminator on, voltage at point H should be approx. 28v, negative.	Defective: 7F7. Open: C210, C216, R214, R215, R223. Shorted or leaky: C216.
5	F	Adjust for 10v output-meter reading, with scratch-eliminator off.		Turn scratch eliminator on; output voltage should drop to 6.5v (approx.).	Defective: 7E7 (pentode section). Open: R221, R216, R218, C211, C212. Shorted: C211, C212.

Section 3

TROUBLE SHOOTING

I-F, DETECTOR, AND A-V-C CIRCUITS

AM CIRCUITS

Use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to the chassis, test point C, and connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, and the tone control fully counterclockwise. Set the band (wafer) switch to the broadcast position. Turn the tuning condensers to full-mesh position.

If the "NORMAL INDICATION" is obtained i step 1, proceed with the tests for the FM circuits, the tests for Section 4 (r-f and converter circuits); not, isolate and correct the trouble in the AM circuit

Since the circuit location of test point A for th section is in Section 4, the effectiveness of step 1 as master check is dependent upon the condition of certai parts in Section 4; these parts are listed below und "POSSIBLE CAUSE OF ABNORMAL INDICATION.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in AM circuits. Isolate by the following tests.
2	B	Loud, clear signal with strong signal input.	Defective: 7R7. Open: R309, R310, R312, L302A, L302C, L302D, R313, R314, R316, C325, C317, WS-3(R). Shorted: C317, C318, C321, C322, C323, C324, C320, C302B. Misaligned: Z302.
3	D	Loud, clear signal with moderate signal input.	Defective: 6BA6. Open: R302, R305, C308, R306, L301A, L301B, L301C, L301D, C301A, C301C, C301D. Shorted: C308, C301C, C301D, C309, C313, L301C, L301D, C300D. Misaligned: Z301.
4	A	Loud, clear signal with weak signal input.	Defective: 7F8*. Open: R406*, R405*, L406*, C300C, L300C, L300D, C300D, R300, WS-4(R), WS-4(F). Shorted: C300C, L300C, C303, C304, L300D. Misaligned: Z300.

*This part, located in another section, may cause abnormal indication in this section.

FM CIRCUITS

These tests are also made with an AM r-f signal generator, using modulated output.

Set the band (wafer) switch to the FM position, and follow the instructions preliminary to the tests for the AM circuits, with these exceptions: set the signal-generator frequency to 9.1 mc., and detune to one side or the other until a satisfactory test signal is obtained.

The best indication of satisfactory FM-detector ope ation is the ability of this circuit to take the alignmer properly (see page 14).

If the "NORMAL INDICATION" is obtained i step 1, proceed with the tests for Section 4 (r-f an converter circuits); if not, isolate and correct the troubl in the FM circuits.

Section 3 (Cont.) TROUBLE SHOOTING

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in FM circuits. Isolate by the following tests.
2	B	Loud, clear signal with strong signal input.	Open: L302B, C302A, C328, C329, R315, R318, C325, R317, WS-3(R). Shorted: L302A, C319, C302A, C328, L302E, C329, C330, C331, C332, C337.
3	D	Loud, clear signal with moderate signal input.	Defective: 6BA6. Open: R302, R305, C308, R306, L301A, L301B, L301C, L301D, C301A, C301C, C301D. Shorted: C308, C301C, C301D, C309, C313, L301C, L301D, C300D. Misaligned: Z301.
4	A	Loud, clear signal with weak signal input.	Open: WS-4(R), WS-4(F).

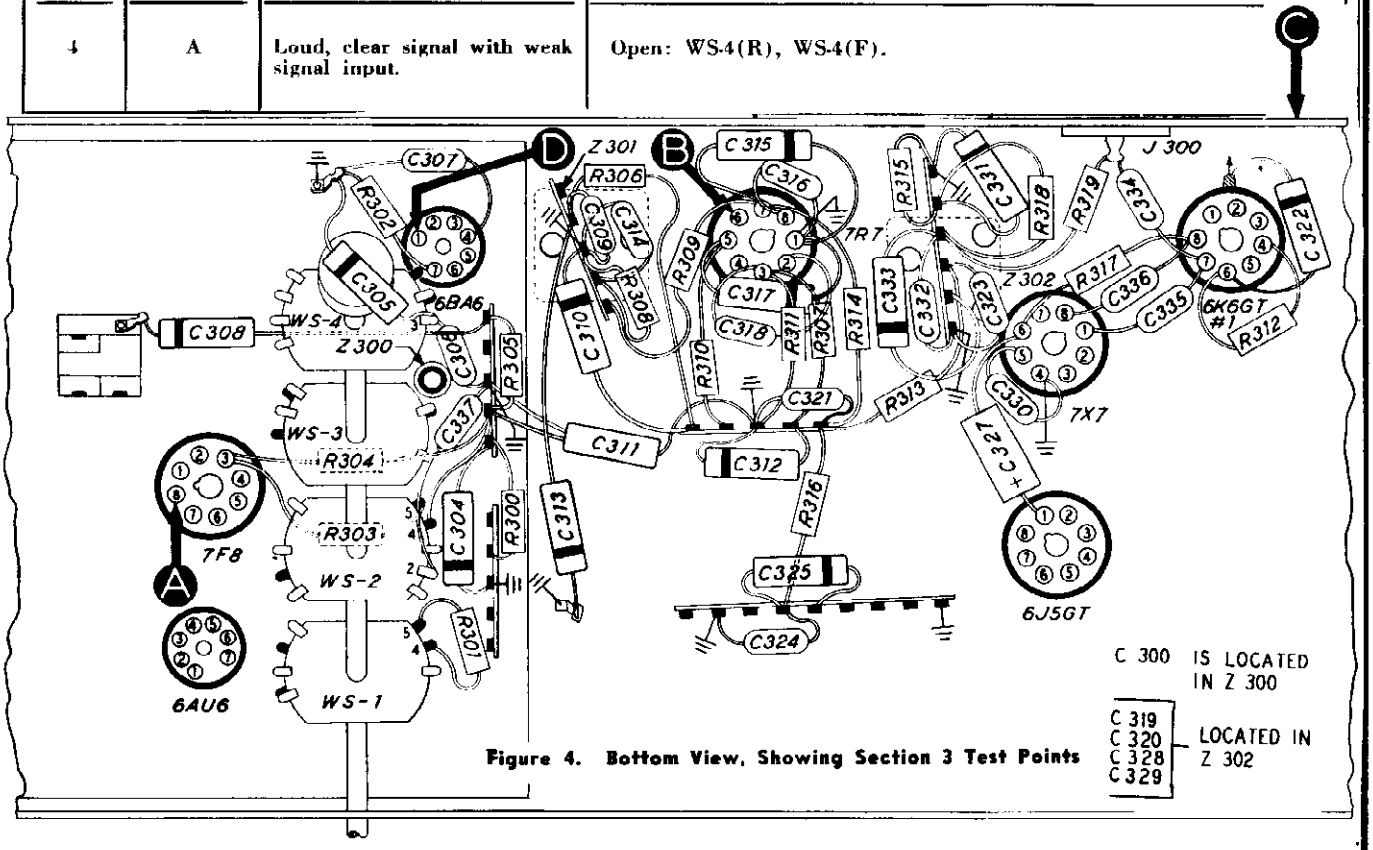


Figure 4. Bottom View, Showing Section 3 Test Points

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before connecting the radio to a source of power:

1. Inspect the top and bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, or other obvious indications of trouble.

2. Measure the resistance across condenser C102 (see figure 2). When the ohmmeter test leads are connected in the proper polarity, the highest resistance reading will be obtained. If the reading is lower than 3500 ohms, check condensers C102 and C103B for leakage or shorts.

The resistance value above, which is much lower than normal, does not represent a quality check of these condensers; the value given is the lowest at which the rectifier will operate safely while the voltage tests of Section 1 (power supply) are performed.

Important!

To avoid altering FM operation, special care should be used in replacing any part. Replacement parts should be placed in the same physical locations as the original parts; connections should be of the same length, and should be soldered to the same points. The placement or length of leads should not be changed.

Section 4

TROUBLE SHOOTING

For the following tests, with the exception of the oscillator tests, use an AM r-f signal generator, with modulated output. Connect the generator ground lead to the chassis, test point C, and connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the radio volume control to maximum, and the tone control fully counterclockwise.

Set the band (wafer) switch, tuning control, and signal-generator frequency as indicated in the chart.

OSCILLATOR TESTS (AM AND FM CIRCUITS): Connect the positive lead of a high-resistance d-c vo meter to the chassis, and connect the negative le through a 100,000-ohm isolating resistor to the 7 oscillator grid (pin 1), test point B. Use a suitab range, such as 0—10 volts. Proper operation of t oscillator is indicated by negative voltages of appro mately the values given in the chart (measured wi 20,000-ohms-per-volt meter), throughout the tunir range.

If the "NORMAL INDICATION" is not obtain in step 1 of both the AM and the FM test charts, isola the trouble by following the remaining steps.

AM CIRCUITS

STEP	TEST POINT	SIG. GEN. FREQ.	BAND SWITCH	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	1000 kc.	Broadcast	Tune to signal.	Loud, clear signal with weak signal input.	Trouble in AM circuits. Isolate by the following tests.
2 (Osc. test; see note above.)	B		Broadcast	Tune through range.	Negative 1.5v to 3.5v.	Defective: 7F8. Open: R304*, C405, C404B, C408, L404, R402, WS-2(F), WS-2(R), WS-1(F), WS-3(F), WS-3(R). Shorted: C405, C404A, C400E, C404B, C408.
3	A	1000 kc.	Broadcast	Tune to signal.	Loud, clear signal with weak signal input.	Open: LA400, R401, L402, C402, C413, WS-1(R) Shorted: L402, C400D, C403.

Listening Test: Distortion may be caused by open R401 or R307*.
Hum and instability may be caused by open C312* or R301*.

*This part, located in another section, may cause abnormal indication in this section.

FM CIRCUITS

Observe the instructions preliminary to the tests for the AM circuits, with the following exception: After tuning the signal generator and the radio to 95 mc., detune one or the other until a satisfactory test signa is obtained.

STEP	TEST POINT	SIG. GEN. FREQ.	BAND SWITCH	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	D	95 mc.	FM	Tune to signal.	Loud, clear signal with weak signal input.	Trouble in FM circuits. Isolate by the following tests.
2 (Osc. test; see note above.)	B		FM	Tune through range.	Negative 1v.	Defective: 7F8. Open: L403, WS-2(F), WS-2(R), WS-1(F), WS-3(F), WS-3(R). Shorted: L403, C400C, C400H.
3	D	95 mc.	FM	Tune to signal.	Loud, clear signal with weak signal input.	Defective: 6AU6. Open: L400, L405, R400, R403, R404, C409, L401, WS-1(R). Shorted: L400, C400A, C400F, C407, C409, C410, C411, L101, C400B, C400G.

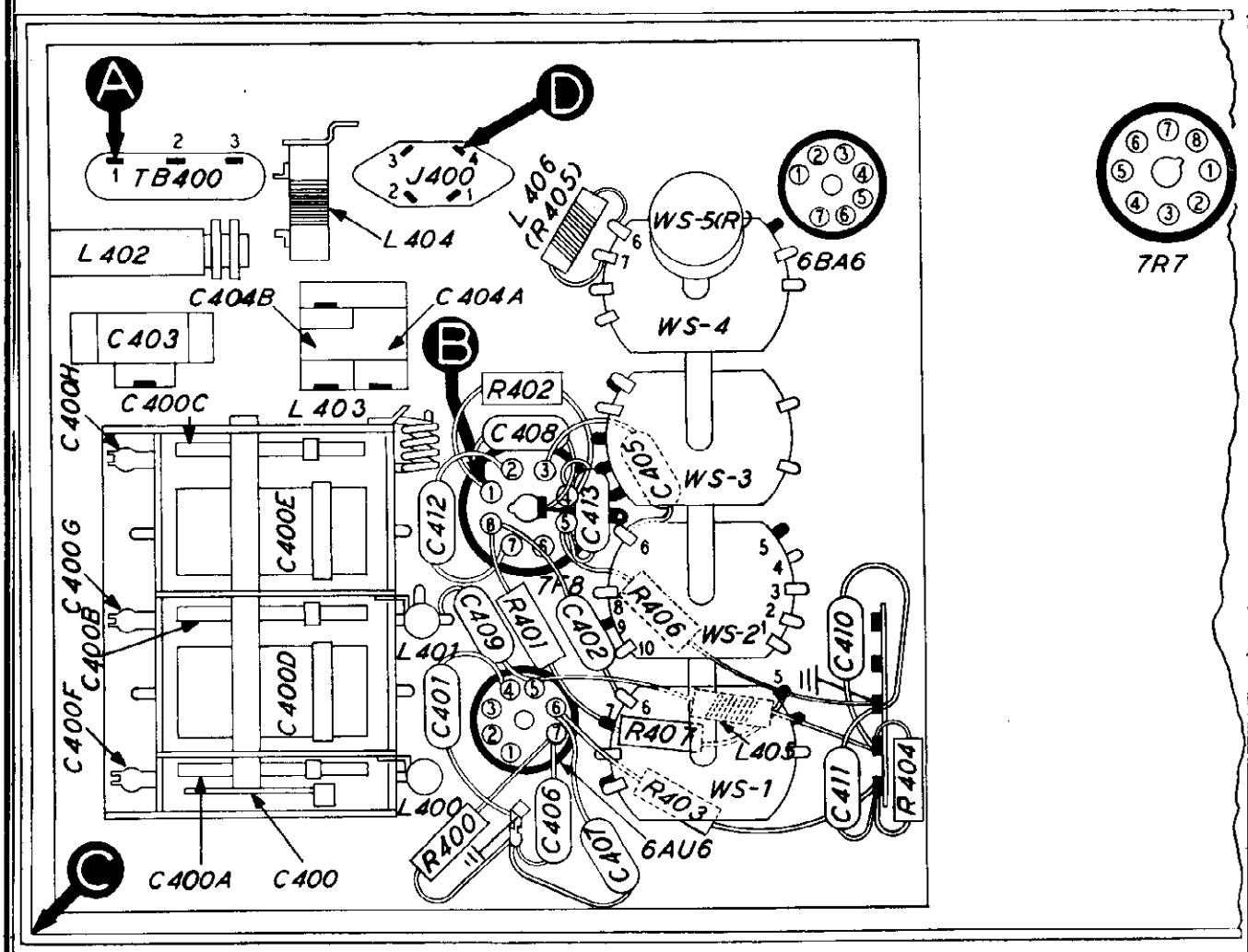


Figure 5. Bottom View, Showing Section 4 Test Points

TP-5328D

CALIBRATING DIAL BACKPLATE

When the radio chassis has been removed from the cabinet, dial calibration and alignment points may be marked on the dial (chassis) backplate at the end of the pointer with a pencil. The method of measuring for these points is illustrated in figure 1.

With the tuning gang fully meshed, the pointer should be adjusted on the dial-drive cord to coincide with the index mark.

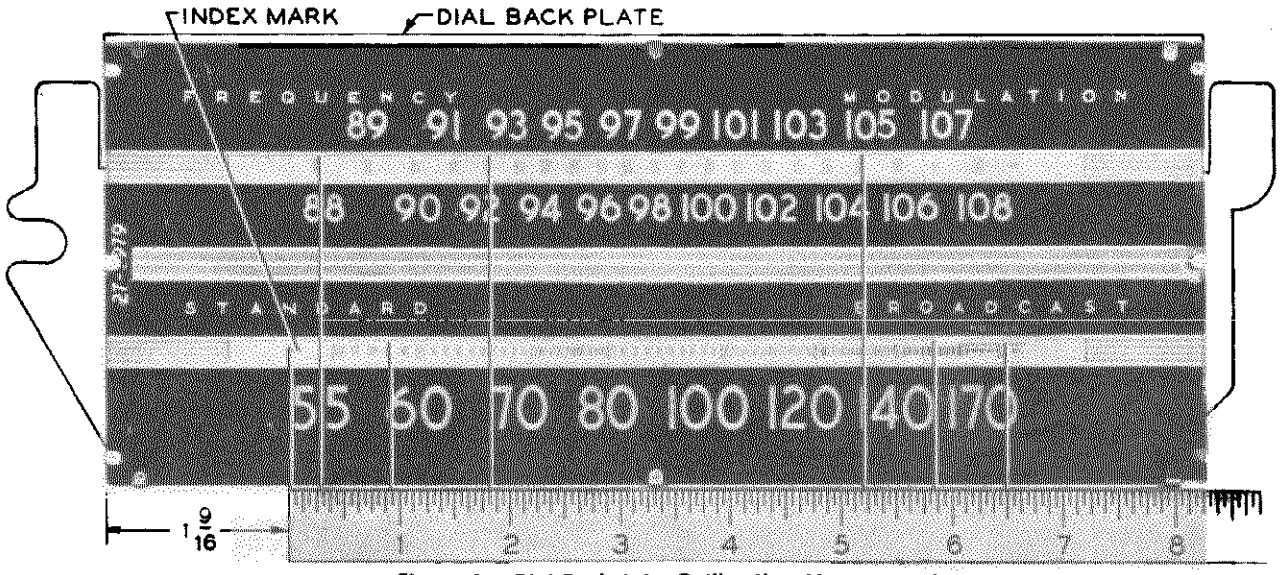


Figure 1. Dial-Backplate Calibration Measurements

AM ALI

STEP	SIGNAL GENERATOR		RADIO		
	CONNECTIONS TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Through .1-mf. condenser to terminal 1 of aerial terminal panel, TB400.	455 kc.	540 kc.	Adjust, in order given, for maximum output.	C3 C3 C3 TC
2	Radiating loop (see note below).	580 kc.	580 kc.	Adjust for maximum while rocking tuning control.	C40
3	Same as step 2.	1700 kc.	1700 kc.	Adjust for maximum.	C40
4	Same as step 2.	1500 kc.	1500 kc.	Adjust for maximum.	
5	Same as step 2.	580 kc.	580 kc.	Adjust for maximum while rocking tuning control.	C40
6	Repeat steps 2, 3, and 4 until no further improvement is obtained.				

RADIATING LOOP: Make up a six-to-eight turn, 6-inch-diameter loop, using insulated wire; connect to signal-generator leads radio loop.

FM ALI

STEP	SIGNAL GENERATOR		RADIO		
	CONNECTIONS TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Through .1-mf. condenser to grid of 1st i-f ampl., 6BA6 (top plate of trimmer C300B*).	9.1 mc.	88 mc.	Adjust for maximum signal strength, as indicated by d-c voltmeter. Repeat until no further increase is obtained. After this step, do not disturb any of these settings except that of C302A, as directed in step 3.	C302A TC C30 C30
2	Through .1-mf. condenser to mixer grid (pin 8) of 7F8.	9.1 mc.	88 mc.	Adjust for maximum. After this step, do not disturb either of these settings.	C30 C30
3	Same as step 2.	9.1 mc.	88 mc.	Double-check the adjustment of C302A to make certain that audio output is at minimum. Use output meter. The setting is critical; adjust carefully.	C302A
4	To FM aerial terminal (terminal 4 of J400).	105 mc.	105 mc.	Adjust for maximum.	
5	Same as step 4.	105 mc.	105 mc.	Adjust for maximum while rocking tuning control.	
6	Same as step 4.	105 mc.	105 mc.	Adjust for maximum.	
7	Same as step 4.	92 mc.	92 mc.	Adjust L403 for maximum (see R-F COIL NOTE above).	L403–
8	Same as step 4.	92 mc.	92 mc.	Adjust L401 for maximum while rocking tuning control (see R-F COIL NOTE above).	L401
9	Same as step 4.	92 mc.	92 mc.	Adjust L400 for maximum (see R-F COIL NOTE above).	L400—(
10	Repeat steps 4 through 9 until no further increase is obtained.				

ake this connection by sliding a piece of flattened wire solder down through alignment slot (see figure 9) in top of i-f tran

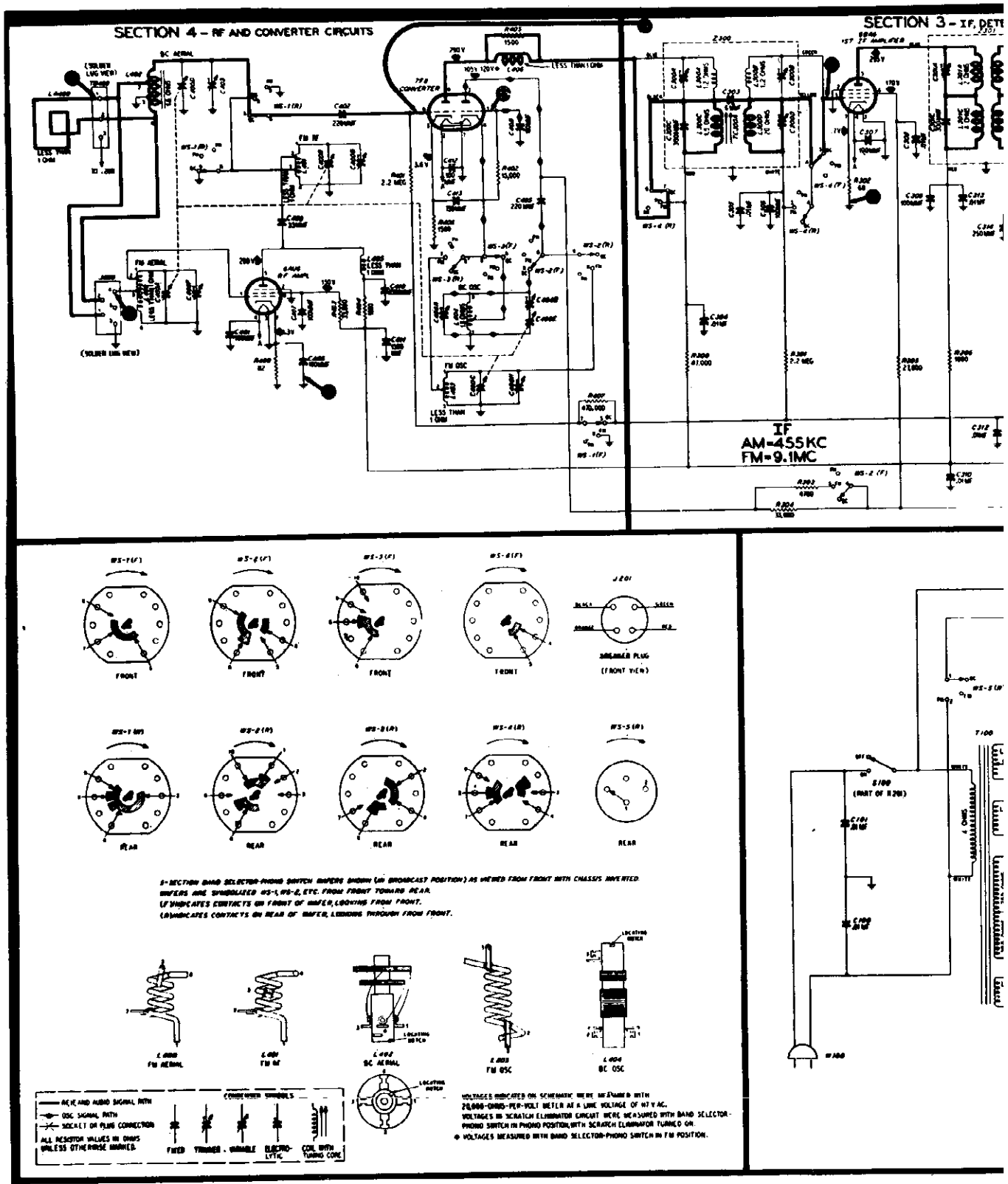
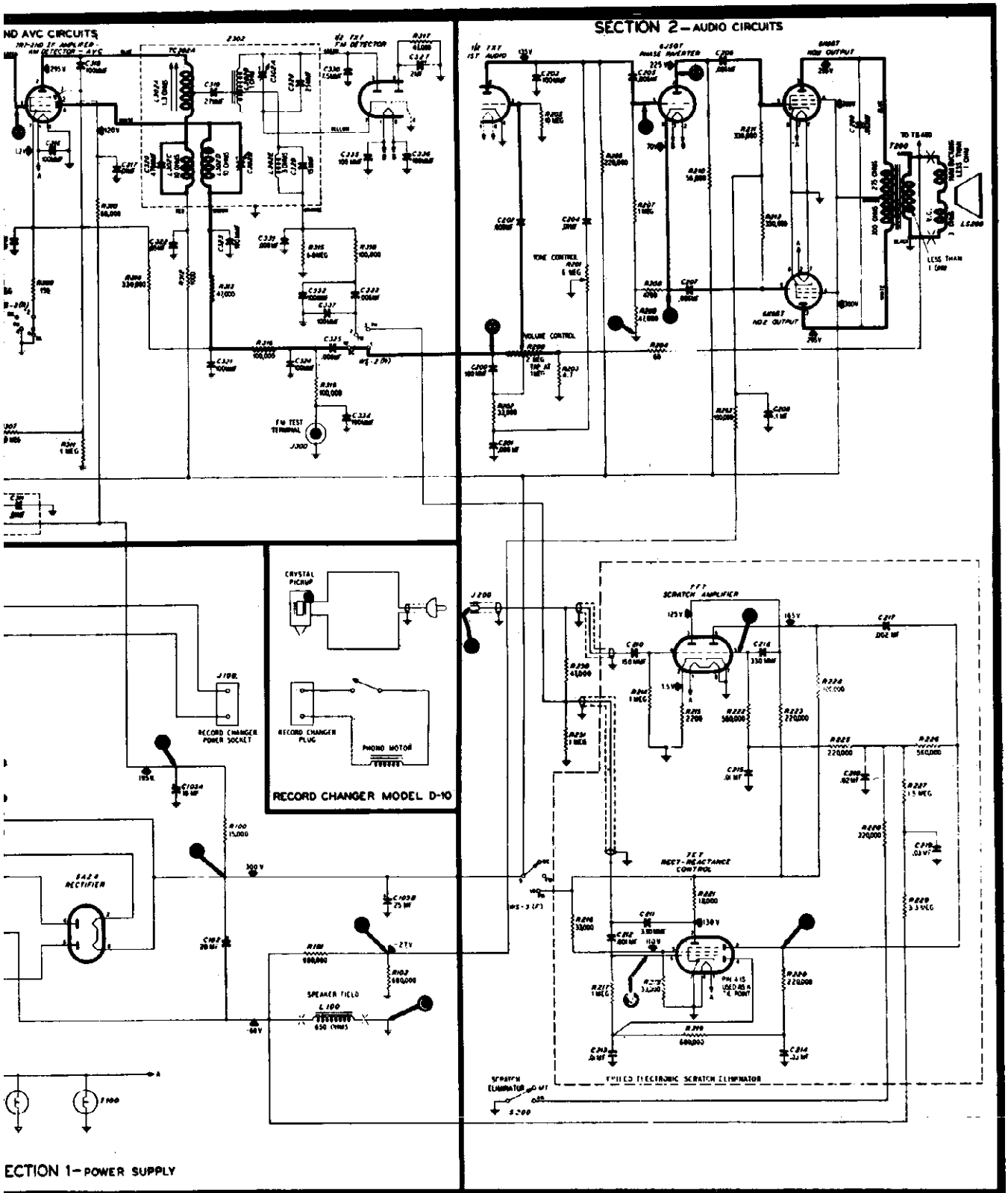


Figure 6. Philco Radio-Phonograph Model 48-1286, Sectional



hematic Diagram, Showing Test Points TP-5328

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MENT CHART

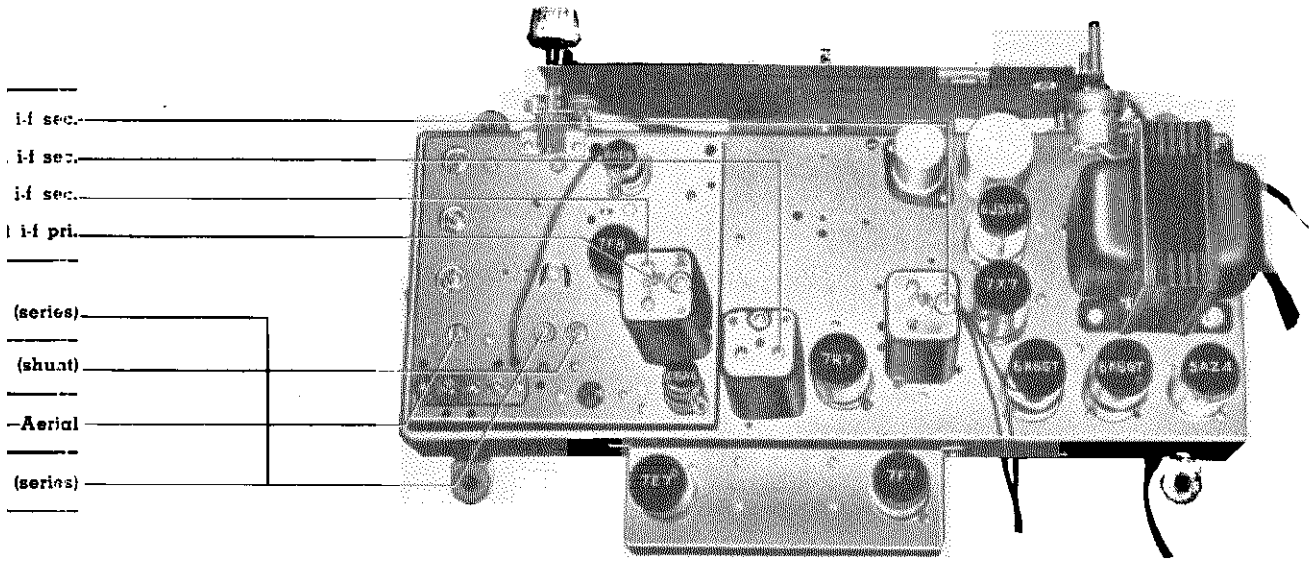

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Figure 8. Top View, Showing AM Trimmer Locations

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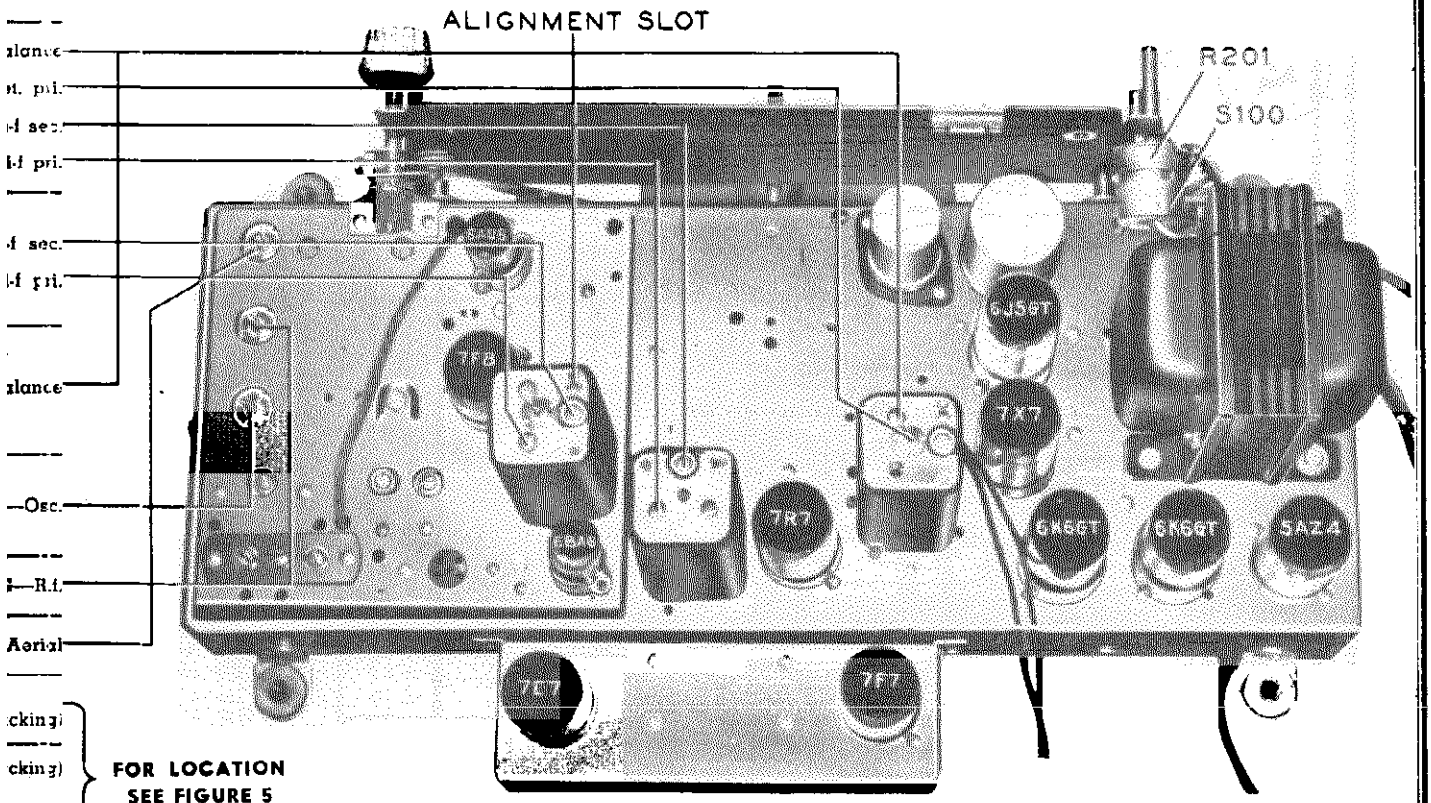

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FOR LOCATION SEE FIGURE 5

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Figure 9. Top View, Showing FM Trimmer Locations

REPLACEMENT PARTS LIST

NOTE: Parts marked with an asterisk (*) are general replacement items. These numb may not be identical with those on factory assemblies; also, the electrical values of so replacement items may differ from the values indicated in the schematic diagram and pc list. The values substituted in any case are so chosen that the operation of the radio v be either unchanged or improved. When ordering replacements, use only the "Serv Part No."

SECTION 1
POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, line filter, .01 mf.	30-1226-1
C101	Condenser, line filter, .01 mf.	30-1226-1
C102	Condenser, electrolytic, input filter, 20 mf., 450v	30-2555
C103	Condenser, electrolytic, 2-section	30-2556
C103A	Condenser, filter, 10 mf., 450v	Part of C103
C103B	Condenser, filter, 25 mf., 450v	Part of C103
I100	Lamp, pilot	34-2064
I101	Lamp, pilot	34-2064
J100	Socket, phono power	27-6200
L100	Speaker, field	Part of LS200
R100	Resistor, filter, 15,000 ohms	66-3155340
R101	Resistor, bias divider, 680,000 ohms	66-4683340*
R102	Resistor, bias divider, 680,000 ohms	66-4683340*
S100	Switch, on-off	Part of R201
T100	Transformer, power	32-8248
W100	Power cord and plug	41-3755-17
WS-5 (R)	Switch-wafer section, phono power	Part of 42-1803-1

SECTION 2
AUDIO CIRCUITS

C200	Condenser, tone compensation, 100 mmf.	60-10105407*
C201	Condenser, tone compensation, .006 mf.	45-3500-7*
C202	Condenser, d-c blocking, .006 mf.	45-3500-7*
C203	Condenser, r-f by-pass, 100 mmf.	60-10105407*
C204	Condenser, tone control, .01 mf.	60-0120*
C205	Condenser, d-c blocking, .006 mf.	45-3500-7*
C206	Condenser, d-c blocking, .006 mf.	45-3500-7*
C207	Condenser, d-c blocking, .006 mf.	45-3500-7*
C208	Condenser, bias filter, .1 mf.	61-0113*
C209	Condenser, tone compensation, .003 mf.	61-0117*
C210	Condenser, high-pass filter, 150 mmf.	60-10155407*
C211	Condenser, reactance-feedback, 330 mmf.	60-10335407*
C212	Condenser, d-c blocking, .001 mf.	30-4620*
C213	Condenser, bias filter, .01 mf.	61-0120*
C214	Condenser, bias filter, .03 mf.	30-4517*
C215	Condenser, bias filter, .01 mf.	61-0120*
C216	Condenser, d-c blocking, 330 mmf.	60-10335407*
C217	Condenser, d-c blocking, .002 mf.	30-4622*
C218	Condenser, bias filter, .01 mf.	61-0108*
C219	Condenser, bias filter, .03 mf.	30-4517*
J200	Phono cable and plug	41-3735-2
J201	Speaker cable and plug	41-3734-9
LS200	Speaker	36-1611-3
R200	Volume control, 2 megohms (tap at 1 megohm)	33-5535-1
R201	Tone control (with on-off switch), 6 megohms	33-5538-1
R202	Resistor, tone compensation, 33,000 ohms	66-3333340*
R203	Resistor, voltage divider, inverse feedback, 4.7 ohms	66-9473340*
R204	Resistor, voltage divider, inverse feedback, 68 ohms	66-0683340*
R205	Resistor, grid return, 10 megohms	66-6103340*
R206	Resistor, plate load, 220,000 ohms	66-4223340*
R207	Resistor, grid return, 1 megohm	66-5103340*
R208	Resistor, cathode bias, 4700 ohms	66-2473340*
R209	Resistor, cathode load, 47,000 ohms	66-3473340*
R210	Resistor, plate load, 56,000 ohms	66-3563340*
R211	Resistor, grid return, 330,000 ohms	66-4333340*
R212	Resistor, grid return, 330,000 ohms	66-4333340*
R213	Resistor, bias filter, 150,000 ohms	66-4153340*
R214	Resistor, grid return, 1 megohm	66-5103340*
R215	Resistor, cathode bias, 2200 ohms	66-2223340*
R216	Resistor, screen voltage divider, 33,000 ohms	66-3333340*
R217	Resistor, grid return, 1 megohm	66-5103340*
R218	Resistor, screen voltage divider, 33,000 ohms	66-3333340*
R219	Resistor, bias filter, 680,000 ohms	66-4683340*
R220	Resistor, bias filter, 220,000 ohms	66-4223340*

SECTION 2 (Continued)
AUDIO CIRCUITS

Reference Symbol	Description	Service Part No.
R221	Resistor, plate load, 18,000 ohms	66-31833
R222	Resistor, grid return, 560,000 ohms	66-45633
R223	Resistor, plate load, 220,000 ohms	66-42233
R224	Resistor, plate load, 100,000 ohms	66-41033
R225	Resistor, bias filter, 220,000 ohms	66-42233
R226	Resistor, diode load, 560,000 ohms	66-45633
R227	Resistor, bias filter, 1.5 megohms	66-51533
R228	Resistor, diode load, 220,000 ohms	66-42233
R229	Resistor, bias filter, 3.3 megohms	66-53333
R230	Resistor, low-pass filter, 47,000 ohms	66-34733
R231	Resistor, voltage divider, 1 megohm	66-51033
S200	Switch, on-off, scratch eliminator	42-18
T200	Transformer, output	32-82
WS-3 (F)	Switch-wafer section	Part of 42-1803

SECTION 3
I-F, DETECTOR, AND A-V-C CIRCUITS

C300A	Condenser, trimmer	Part of Z3
C300B	Condenser, trimmer	Part of Z3
C300C	Condenser, shunt, 3000 mmf.	Part of Z3
C300D	Condenser, trimmer	Part of Z3
C301A	Condenser, trimmer	Part of Z3
C301B	Condenser, trimmer	Part of Z3
C301C	Condenser, shunt, 300 mmf.	Part of Z3
C301D	Condenser, trimmer	Part of Z3
C302A	Condenser, trimmer	Part of Z3
C302B	Condenser, trimmer	Part of Z3
C303	Condenser, d-c blocking, 6 mmf.	Part of Z3
C304	Condenser, plate by-pass, .01 mf.	61-01
C305	Condenser, r-f by-pass, .01 mf.	61-01
C306	Condenser, r-f by-pass, 100 mmf.	62-1100090
C307	Condenser, filament by-pass, 100 mmf.	62-1100090
C308	Condenser, screen by-pass, .01 mf.	61-01
C309	Condenser, plate by-pass, 100 mmf.	62-1100090
C310	Condenser, r-f by-pass, .01 mf.	61-01
C311	Condenser, r-f by-pass, .01 mf.	30-46
C312	Condenser, a-v-c filter, .01 mf.	61-01
C313	Condenser, plate by-pass, .01 mf.	61-01
C314	Condenser, r-f by-pass, 250 mmf.	62-1220010
C315	Condenser, cathode by-pass, .05 mf.	61-01
C316	Condenser, filament by-pass, 100 mmf.	62-1100090
C317	Condenser, screen by-pass, .01 mf.	61-01
C318	Condenser, d-c blocking, 100 mmf.	60-10105
C319	Condenser, d-c blocking, 27 mmf.	Part of Z3
C320	Condenser, shunt, 470 mmf.	Part of Z3
C321	Condenser, r-f by-pass, 100 mmf.	62-1100090
C322	Condenser, plate by-pass, .05 mf.	61-01
C323	Condenser, r-f by-pass, 100 mmf.	60-10105
C324	Condenser, r-f by-pass, 100 mmf.	60-10105
C325	Condenser, d-c blocking, .006 mf.	45-3500
C326	Not used	
C327	Condenser, electrolytic, noise suppressor (FM), 2 mf., 50v	30-2417
C328	Condenser, shunt, 25 mmf.	Part of Z3
C329	Condenser, shunt, 15 mmf.	Part of Z3
C330	Condenser, balancing, 7.5 mmf.	30-1224
C331	Condenser, tone compensation, .008 mf.	30-41
C332	Condenser, r-f by-pass, 100 mmf.	60-10105
C333	Condenser, d-c blocking, .006 mf.	45-3500
C334	Condenser, r-f by-pass, 100 mmf.	60-10105
C335	Condenser, filament by-pass, 100 mmf.	62-1100090
C336	Condenser, filament by-pass, 100 mmf.	62-1100090
C337	Condenser, r-f by-pass, 100 mmf.	62-1100090
J300	Test socket	27-62
L300A	Transformer, primary (FM), 1st i-f	Part of Z3
L300B	Transformer, secondary (FM), 1st i-f	Part of Z3
L300C	Transformer, primary (AM), 1st i-f	Part of Z3
L300D	Transformer, secondary (AM), 1st i-f	Part of Z3
L301A	Transformer, primary (FM), 2nd i-f	Part of Z3
L301B	Transformer, secondary (FM), 2nd i-f	Part of Z3
L301C	Transformer, primary (AM), 2nd i-f	Part of Z3
L301D	Transformer, secondary (AM), 2nd i-f	Part of Z3
L302A	Transformer, primary (FM), 3rd i-f	Part of Z3

MODEL 48-1286 PHILCO CORP.

REPLACEMENT PARTS LIST (Continued)

SECTION 3 (Continued)
I-F, DETECTOR, AND A-V-C CIRCUITS

Reference Symbol	Description	Service Part No.
L302B	Transformer, secondary (FM), 3rd i-f	Part of Z302
L302C	Transformer, primary (AM), 3rd i-f	Part of Z302
L302D	Transformer, secondary (AM), 3rd i-f	Part of Z302
L302E	Transformer winding, isolating, 3rd i-f	Part of Z302
R300	Resistor, plate dropping, 47,000 ohms	66-3473340*
R301	Resistor, a-v-c filter, 2.2 megohms	66-5223340*
R302	Resistor, cathode bias, 68 ohms	66-0683340*
R303	Resistor, plate dropping, 4700 ohms	66-2473340*
R304	Resistor, plate dropping, 33,000 ohms	66-3333340*
R305	Resistor, screen dropping, 27,000 ohms	66-3273340*
R306	Resistor, plate decoupling, 1000 ohms	66-2103340*
R307	Resistor, a-v-c filter, 3.3 megohms	66-5333340*
R308	Resistor, grid return, 2.2 megohms	66-5223340*
R309	Resistor, cathode bias, 150 ohms	66-1153340*
R310	Resistor, screen dropping, 68,000 ohms	66-3683340*
R311	Resistor, a-v-c load, 1 megohm	66-5103340*
R312	Resistor, plate decoupling, 1000 ohms	66-2103340*
R313	Resistor, i-f filter, 47,000 ohms	66-3473340*
R314	Resistor, diode load, 330,000 ohms	66-4333340*
R315	Resistor, FM detector load, 6.8 megohms	66-5683340*
R316	Resistor, isolating, 100,000 ohms	66-4103340*
R317	Resistor, noise suppressor (FM), 47,000 ohms	66-3473340*
R318	Resistor, isolating, 100,000 ohms	66-4103340*
R319	Resistor, isolating, 100,000 ohms	66-4103340*
TC300A	Tuning core	Part of Z300
TC302A	Tuning core	Part of Z302
WS-2 (F)	Switch-wafer section	Part of 42-1803-1†
WS-2 (R)	Switch-wafer section	Part of 42-1803-1†
WS-3 (R)	Switch-wafer section	Part of 42-1803-1†
WS-4 (F)	Switch-wafer section	Part of 42-1803-1†
WS-4 (R)	Switch-wafer section	Part of 42-1803-1†
Z300	Transformer, 1st i-f	32-4146
Z301	Transformer, 2nd i-f	32-4156
Z302	Transformer, 3rd i-f	32-4147

SECTION 4
R-F AND CONVERTER CIRCUITS

C400	Condenser, tuning gang, 5-section	31-2703-2
C400A	Condenser, tuning, FM aerial	Part of C400
C400B	Condenser, tuning, FM r.f.	Part of C400
C400C	Condenser, tuning, FM osc.	Part of C400
C400D	Condenser, tuning, bc. aerial	Part of C400
C400E	Condenser, tuning, bc. osc.	Part of C400
C400F	Condenser, trimmer, FM aerial	Part of C400
C400G	Condenser, trimmer, FM r.f.	Part of C400
C400H	Condenser, trimmer, FM osc.	Part of C400
C401	Condenser, filament by-pass, 100 mmf.	62-110009001*
C402	Condenser, d-c blocking, 220 mmf.	62-122001001*
C403	Condenser, trimmer, bc. aerial	31-6473
C404	Condenser, trimmer assembly, 2-section	31-6476-5
C404A	Condenser, shunt trimmer, bc. osc.	Part of C404
C404B	Condenser, series padder, bc. osc.	Part of C404
C405	Condenser, d-c blocking, 220 mmf.	62-122001001*
C406	Condenser, cathode by-pass, 100 mmf.	62-110009001*
C407	Condenser, screen grid by-pass, 100 mmf.	62-110009001*
C408	Condenser, osc. grid, 100 mmf.	62-110009001*
C409	Condenser, d-c blocking, 33 mmf.	30-1224*
C410	Condenser, r-f by-pass, 1500 mmf.	62-215001011
C411	Condenser, r-f by-pass, 1500 mmf.	62-215001011
C412	Condenser, filament by-pass, 100 mmf.	62-110009001*
C413	Condenser, d-c blocking, 750 mmf.	60-10755301*
J400	Socket, FM aerial	27-6214-1
L400	Coil, FM aerial	32-4158
L401	Coil, FM r.f.	32-4159
L402	Coil, bc. aerial	32-4049-3
L403	Coil, FM osc.	32-4018-2
L404	Coil, bc. osc.	32-4221
L405	Coil, r-f choke (plate of 6AU6)	32-4061

SECTION 4 (Continued)
R-F AND CONVERTER CIRCUITS

Reference Symbol	Description	Service Part No.
L406	Coil (including R405), parasitic suppressor (plate of 7F8)	32-4157
R400	Resistor, cathode bias, 82 ohms	66-0823340*
R401	Resistor, grid return, 2.2 megohms	66-5223340*
R402	Resistor, grid return, 15,000 ohms	66-3153340*
R403	Resistor, screen dropping, 33,000 ohms	66-3333340*
R404	Resistor, plate decoupling, 1000 ohms	66-2103340*
R405	Resistor (with coil L406), parasitic suppressor, 1500 ohms	Part of L406
R406	Resistor, cathode bias, 1500 ohms	66-2153340*
R407	Resistor, a-v-c voltage divider (FM), 470,000 ohms	66-4473340*
TB400	Terminal panel, bc. aerial	38-9942
WS-1 (F)	Switch-wafer section	Part of 42-1803-1†
WS-1 (R)	Switch-wafer section	Part of 42-1803-1†
WS-2 (F)	Switch-wafer section	Part of 42-1803-1†
WS-2 (R)	Switch-wafer section	Part of 42-1803-1†
WS-3 (F)	Switch-wafer section	Part of 42-1803-1†
WS-3 (R)	Switch-wafer section	Part of 42-1803-1†
† 42-1803-1	5-section wafer switch (band selector-phono)	

MISCELLANEOUS

Description	Service Part No.
Cabinet and Cabinet Hardware	
Back (Masonite)	54-7561
Baffle and cloth	40-6999
Baffle, wood	219111
Bezel	56-4878
Bin mechanism, r.h.	76-3223-8
Bin mechanism, l.h.	76-3223-7
Cabinet, less scale	10704
Dome	45-6042
Door, folding	45-6417
Door pull	56-5398
Escutcheon	56-5491FA30
Frame assembly	76-2199
Front, tilt	45-6416
Hinge, lid	45-6036
Hinge, bin	45-6200
Hinge (under lid)	45-6301
Dial Scale and Backplate Hardware	
Backplate-and pulley assembly	76-2005-3
Dial scale	76-3187-1
Pointer	56-3179FCP
Scale strap	56-4916
Spring, pointer drive	28-8953
Drive cord (25-ft. spool)	45-8750*
Knob (4 required)	54-4486
Knob, scratch eliminator on-off	54-4338-1
Lamp-socket assembly, pilot (2 required)	76-2109
Shield, pilot lamp	56-2194
Socket, Loktal	27-6177
Socket, octal	27-6174
Socket, Loktal (7F8 only)	27-6213
Socket, miniature (6AU6)	27-6203-1
Socket, miniature (6BA6)	27-6226
Wafer-Switch Hardware	
Link assembly	76-2186-4
Shaft	56-3298FA11

ALIGNMENT PROCEDURE

When the complete AM and FM alignment is to be made, the AM alignment should be made FIRST; if A alignment is not required, the FM alignment alone may be made.

ALIGNMENT OF AM CIRCUITS

DIAL POINTER: With tuning condensers fully meshed, dial pointer must coincide with index mark at low-fr quency end of dial. (See "CALIBRATING DIAL BACKPLATE," page 2.)

OUTPUT METER: Connect between No. 3 terminal (voice-coil connection) of aerial terminal panel and chassi

AM R-F SIGNAL GENERATOR: Connect ground lead to chassis, and output lead as indicated in chart. U modulated output.

OUTPUT LEVEL: During alignment, signal-generator output must be attenuated to maintain radio output belo 1.5 volts, as read on output meter.

CONTROLS: Set band switch to broadcast position. Set volume control to maximum, and tone control ful counterclockwise. Set signal-generator frequency and radio tuning dial as indicated in chart.

ALIGNMENT OF FM CIRCUITS

Make AM alignment first.

OUTPUT METER: Connect as for AM alignment (this meter is used only in step 3).

D-C METER: Connect 20,000-ohms-per-volt meter across 2-mf. condenser, C327, in FM-detector circuit—negati lead to pin 6 of 7X7 tube, and positive lead to chassis. Use 10-volt range.

AM R-F SIGNAL GENERATOR: Use modulated output for entire alignment. Generator must have sufficier output to give reading of approximately 9 volts on d-c meter, and signal should be attenuated during alignmer to keep meter at this value. Connect generator ground lead to chassis, and output lead as indicated in chart.

VOLUME AND TONE CONTROLS: Same as for AM alignment.

RADIO BAND SWITCH, RADIO DIAL, AND SIGNAL-GENERATOR DIAL: Set as indicated in chart. Allo radio and generator to warm up for 15 minutes before starting alignment.

R-F COIL NOTE: When making the tracking adjustments, the resonance of the circuits using coils L400, L40 and L403 may be checked with a powdered-iron tuning core, such as Part No. 56-6100. If the signal strengt (meter reading) increases when the iron end is placed in, or near, the coil, compress the turns slightly. If th threaded brass end causes an increase in signal strength, spread the turns. Do not compress or spread the turn excessively; only a small change is required at these frequencies.

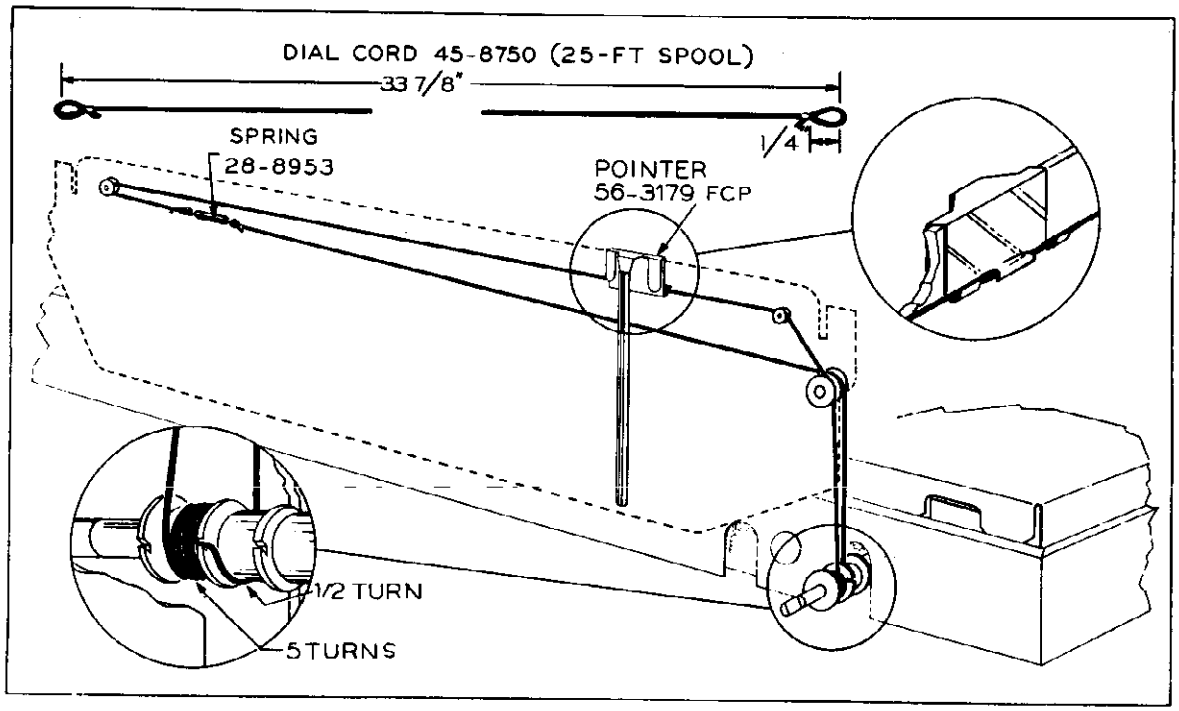


Figure 7. Drive-Cord Installation Details

TP-4058E

Circuit Description

Philco Radio-Phonograph Model 48-1290 contains a 13-tube superheterodyne and a Model D-10A Philco Automatic Record Changer.

A low-impedance loop within the cabinet normally provides adequate signal pickup for the standard-broadcast and short-wave bands. In most locations, the FM a-c line aerial provides satisfactory FM reception. In areas where FM signals are weak, an outdoor dipole aerial (Philco Part No. 45-1462) will provide additional pickup.

To increase the pickup on all three bands, use the Philco Aerial Coupler, Part No. 76-2353, with the outdoor dipole aerial. Information on aerial and coupler connections is given in the external aerial bulletin PR-1200.

The r-f stage (FM only), converter stage, and first i-f stage are mounted on a separate chassis to insure reliable performance at high frequencies. A 6AU6 high-frequency pentode is used in the r-f stage, and a 7F8 high-frequency double triode is employed as a converter

Three transformer-coupled i-f stages are used. The first, third, and fourth i-f transformers have two sets of windings; one set is tuned to 455 kc. for AM operation, and the other to 9.1 mc. for FM operation. The second i-f transformer, having a single primary winding tuned to 9.1 mc., one secondary winding tuned to 9.1 mc., and another secondary winding tuned to 455 kc., provides untuned primary for AM operation, to prevent instability. All transformers provide tuned-primary, tuned-secondary coupling on FM, to supply the additional gain needed at 9.1 mc. Switching of the windings, to attenuate undesired beat frequencies, is necessary only in the first i-f transformer; the large difference between the two intermediate frequencies makes further switching unnecessary. One 7A7 and two 6BA6 high-transconductance pentodes are used in the i-f stages. The wide-band response required for FM reception is obtained by "over-coupled" FM windings in the i-f transformers.

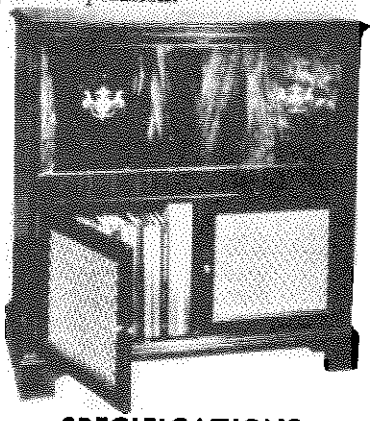
The new Philco advanced FM detector circuit, employing the FM1000 tube of special design, is used for FM reception. This circuit has excellent tuning characteristics, and inherently rejects AM and noise. Very briefly, the circuit functions as follows: The first and second grids (pins 2 and 5) of the FM1000 are used as grid and anode, respectively, of a modified Colpitts oscillator, which normally operates at the intermediate frequency of 9.1 mc. The output of the i-f amplifier stages is fed into the injection grid (pin 6). The reactive coupling between the plate and oscillator circuits causes the oscillator to lock in and follow the frequency variations of the i-f signal. As the oscillator frequency increases, the plate current through R324 decreases, and as the oscillator frequency decreases, the plate current increases. This variation is linear with respect to frequency deviation; the plate current, therefore, produces the same wave shape as the voltage that frequency-modulated the carrier. This audio signal is fed to the audio amplifier through the decoupling network, C331 and R322.

The high-mu-triode section of a 6SQ7GT is used in the first audio stage, and is biased from the bleeder in the negative return of the power supply. The first audio stage is resistance-coupled to one triode section of a 7AF7 twin triode. This section functions as a cathode-and-plate-loaded phase inverter, and is resistance-coupled to the audio output stage, which employs two 6V6GT beam pentodes in push-pull combination. The output tubes are transformer-coupled to a twelve-inch electrodynamic speaker, and are biased from the bleeder circuit connected across the speaker field in the negative return of the power supply. Inverse feedback is obtained by connecting the secondary of the output transformer, through the resistor network, R204 and R203, to the volume control. The second triode section of the 7AF7 tube is used as the phonograph preamplifier stage, and is self-biased by cathode resistor R213.

The Philco Electronic Scratch Eliminator, which is used in phono operation, reduces the high-frequency surface noise during the low-volume passages of a record, and permits maximum treble response during the high-volume passages. The circuit employs a 7F7 double triode as a two-stage audio amplifier and a 7E7 diode, pentode as a half-wave rectifier and reactance tube. The latter functions as a variable capacitance (across the output circuit of the phono preamplifier), which shunts a controlled portion of the higher audio frequencies to ground. The bias on the grid of the reactance tube controls the effective shunt capacitance, which becomes maximum with low bias, and minimum with high bias. The control bias is obtained from the audio signal, of which a definite amount is taken off (at the output circuit of the phono preamplifier), amplified by the 7F7, and rectified by the diode section of the 7E7.

Any push button except the OFF button operates the a-c switch to turn on the power; the OFF button turns off the power.

The treble control, when turned to its maximum clockwise position, actuates switch S200 to place the scratch eliminator in operation; in any other position, the control regulates the treble response in either radio or phono operation.



SPECIFICATIONS

CABINET	Wood, mahogany finish
CIRCUIT	13-tube superheterodyne
FREQUENCY RANGES	
Broadcast	540—1720 kc.
Short wave	9.3—15.5 mc.
FM	88—108 mc.
AUDIO OUTPUT	10 watts
PUSH BUTTONS	Ten: One for OFF, five for broadcast-station selection, three for band selection, and one for phonograph operation
OPERATING VOLTAGE	105—120 volts, 60 cycles, a.c.
POWER CONSUMPTION	Radio: 110 watts Phonograph: 140 watts
AERIALS	Built-in loop and a-c line (FM) aerial; external aerial also may be used
INTERMEDIATE FREQUENCIES	
AM	455 kc.
FM	9.1 mc.
PHILCO TUBES (13)	6AU6, 7F8, 6BA6(2), 7A7, FM1000, 7AF7, 6SQ7GT, 6V6GT(2), 7F7, 7E7, 5U4G
PHONOGRAPH	Philco Automatic Record Changer, Model D-10A

Philco TROUBLE-SHOOTING *Procedure*

For rapid trouble shooting, the radio circuit is divided into four sections, as follows:

Section 1—the power supply
Section 2—the audio circuits
Section 3—the i-f, detector, and a-v-c circuits
Section 4—the r-f and converter circuits

Test points are specified for each section, and are indicated in the sectionalized schematic diagram. The trouble-shooting procedure given for each section includes a simplified test chart and a bottom view of the chassis showing the locations of the test points and the components of that section.

In each chart, the first step is a master check for determining whether trouble exists in that section, without going through the entire chart.

Failure to obtain the "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

Section 1 TROUBLE SHOOTING
POWER SUPPLY

CAUTION: Do not turn on the power with the speaker disconnected, as this may cause damage to the set.

Make the tests for this section with a d-c voltmeter; connect the leads between the chassis, test point C, and the test points indicated in the chart. The voltage readings given were taken with a 20,000-ohms-per-volt meter, at a line voltage of 117 volts, a.c.

Set the volume control to minimum, and the bass and treble controls fully counterclockwise. Depress the BC push button.

Follow the steps in the order given. If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2 (audio circuits); if not, isolate and correct the trouble in this section.

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	200v		Trouble in this section. Isolate by the following tests.
2	B	250v	No voltage	Defective: 5U4G. Open: L100, T100, W100, S100. Shorted: C101B, C102, C103, C317*, C405*.
			Low voltage	Defective: 5U4G, T100. Open: C103. Leaky: C101B, C102, C103, C317*, C405*.
			High voltage	Defective: 6V6GT*. Open: T200*.
3	D	Negative 9.8v	No voltage	Shorted: C104. Open: R101.
			Low voltage	Changed resistance: R101.
			High voltage	Open: R102.
4	A	200v	No voltage	Open: R100. Shorted: C101A, C415*, C417*, C419*.
			Low voltage	Changed resistance: R100. Leaky: C101A, C415*, C417*, C419*.

Listening test: Abnormal hum may be caused by open C101A, C101B, or C104.

* This part, located in another section, may cause abnormal indication in this section.

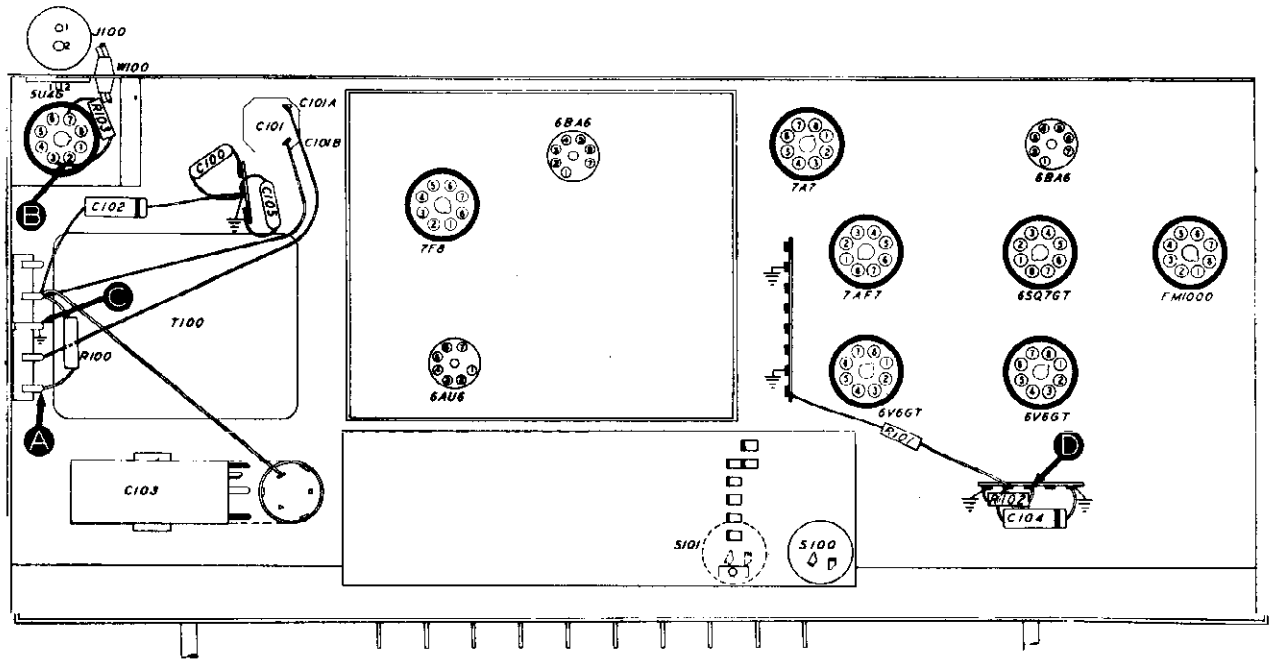


Figure 1. Bottom View, Showing Section 1 Test Points

Section 2

TROUBLE SHOOTING

AUDIO-AMPLIFIER AND PHONO-PREAMPLIFIER TESTS

Use an audio-frequency signal generator. Connect the generator ground lead to the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, and the bass and treble controls fully counterclockwise. Depress the push button indicated in the chart.

If the "NORMAL INDICATION" is obtained in step 1, (a) and (b), proceed with the scratch eliminator tests; if not, isolate the trouble by following the steps as directed in the chart.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1(a)	A	Loud, clear signal with weak signal input (with BC button, PB-3, depressed).	Trouble in audio-amplifier circuits. Isolate by steps 2, 3, 4, 5, and 6.
1(b)	B	Loud, clear signal with weak signal input (with PHONO button, PB-9, depressed).	Trouble in phono-preamplifier circuit. Isolate by step 7.
2	D (Remove 7AF7)	Clear signal with strong signal input (BC button depressed).	Defective: 6V6GT. Open: LS200, T200, R238, C206. Shorted or leaky: C221, C206.
3	E (7AF7 removed)	Clear signal with strong signal input (BC button depressed).	Defective: 6V6GT. Open: C219, R239. Shorted or leaky: C219.
4	F (Replace 7AF7)	Loud, clear signal with moderate signal input (BC button depressed).	Defective: 7AF7. Open: R211, R212, R235, R210. Leaky: C205.
5	G	Loud, clear signal with weak signal input (BC button depressed).	Defective: 6SQ7GT. Open: C205, R209. Shorted or leaky: C222, C204.
6	A	Loud, clear signal with weak signal input (BC button depressed).	Open: R200 (rotate through range), C202, R205, R206.
7	B	Loud, clear signal with weak signal input (PHONO button depressed).	Defective: 7AF7. Open: R236, R237, PB-9, C208, R216, R213. Shorted or leaky: C220.

Listening Test: Distortion may be caused by leaky C202, C205, C206, or C219, open R207.

* This part, located in another section, may cause abnormal indication in this section.

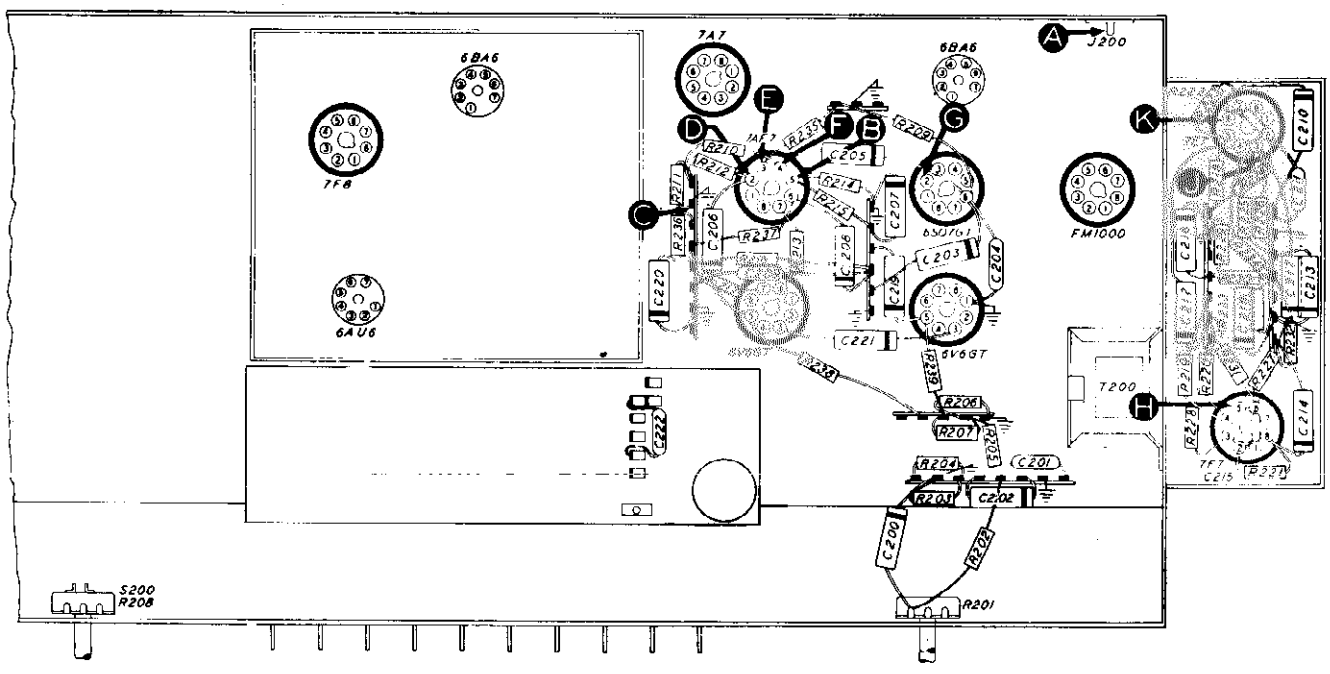


Figure 2. Bottom View Showing Section 2 Test Points (location of R200 shown in figure 8)

Section 2 (Cont.)

TROUBLE SHOOTING

SCRATCH-ELIMINATOR TESTS

Set the bass control fully clockwise. Turn the treble control clockwise as far as possible without turning on the scratch eliminator, except as noted in chart (the scratch eliminator is on when this control is turned fully clockwise until switch S200 is actuated). Depress the PHONO push button, PB-9. For all steps except 1(b), set the volume control to maximum; for this step, adjust the volume control as indicated in the chart.

Connect an output meter between terminal 3 (voice-coil connection) of the aerial terminal panel and the chassis.

Connect the ground lead of an audio signal generator to the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart. Set the generator for 5000 cycles. Adjust the generator output as indicated in the chart.

If normal operation is indicated by the tests in step 1, (a) and (b), proceed with the tests for Section (i-f, detector, and a-v-c circuits); if not, isolate and correct the trouble in the scratch-eliminator circuits.

NOTE: For steps 2, 3, and 4, connect the positive lead of a 20,000-ohms-per-volt, d-c voltmeter to the chassis, test point C; connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the points indicated in the "METER POINT" column of the chart.

STEP	TEST POINT	SIG. GEN. OUTPUT	METER POINT	SPECIAL INSTRUCTIONS	POSSIBLE CAUSE OF ABNORMAL INDICATION
1(a)	A	Adjust for 3v output-meter reading, with scratch eliminator off.		Turn scratch eliminator on; output voltage should drop to 1.2v (approx.).	
1(b)	A	Adjust for 3v output-meter reading, with scratch eliminator off.		Reduce volume control to obtain output meter reading of .5v. Increase generator output to obtain output-meter reading of 3v. Turn scratch eliminator on; output voltage should not drop more than .6v (approx.).	Trouble in scratch-eliminator circuits. Isolate by the following tests.
2	H	See "SPECIAL INSTRUCTIONS" column.	J	With scratch eliminator on, increase generator output to obtain 11v, negative; failure to obtain this value indicates trouble.	Defective: 7F7, 7E7 (diode section). Open: R231, C217, R234, R233. Shorted: C218, C217.
3	H	Same setting which produced 11v reading in step 2, with scratch eliminator on.	K	With scratch eliminator on, voltage at point K should be 5v, negative.	Open: R222, R225, R226. Shorted or leaky: C212, C213, C210.
4	A	Same as step 3.	J	With scratch eliminator on, voltage at point J should be approx. 28v, negative.	Defective: 7F7. Open: R229, C215, R227, R221, R220, R219, C209. Shorted or leaky: C209, C215, C214.
5	A	Adjust for 3v output-meter reading, with scratch eliminator off.		Turn scratch eliminator on; output voltage should drop to 1.2v (approx.).	Defective: 7E7 (pentode section). Open: R224, R218, R223, C210, C211. Shorted or leaky: C211.

Section 3

TROUBLE SHOOTING

I-F, DETECTOR, AND A-V-C CIRCUITS

AM CIRCUITS

Use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Depress the BC push button, PB-3. Set the volume control to maximum, and turn the bass and treble controls fully counterclockwise.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for the FM circuits, or the tests for Section 4 (r-f and converter circuits); if not, isolate and correct the trouble in the AM circuits.

Since the circuit location of test point A for this section is the same as that of test point D for Section 4, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in Section 4; these parts are listed below under "POSSIBLE CAUSE OF ABNORMAL INDICATION."

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in AM circuits. Isolate by the following tests.
2	B	Loud, clear signal with strong signal input.	Defective: 6BA6, 6SQ7GT (diode section). Open: PB-1, PB-9, R311, R313, R315, R316, R317, R318, C321, L303A,. B, D. Shorted: C322, C324, C325, C326, C302C, L303B, D. Misaligned: Z303.
3	D	Loud, clear signal with moderate signal input.	Defective: 7A7. Open: PB-1, R305, R306, R307, R308, R309, L302A, B, C, D. Shorted: C340, C314, C315, C301B, L302B, C. Misaligned: Z302.
4	E	Loud, clear signal with weak signal input.	Defective: 6BA6. Open: R301, R302, R303, R325, L301A, B, C. Shorted: C308, C309, C310, C300B, L301A, B. Misaligned: Z301.
5	A	Loud, clear signal with signal input much weaker than in step 4.	Defective: 7F8*, WS-3(R). Open: R300, R408*, L300B, C, D. Shorted: C338, C305, L300B, D. Misaligned: Z300.

* This part, located in another section, may cause abnormal indication in this section.

FM CIRCUITS

The tests for the FM circuits are made with an AM r-f signal generator and a 20,000-ohms-per-volt, d-c voltmeter.

In steps 1(a), 4, 5, 6, 7, and 8, the oscillator section of the FM detector is made inoperative, thereby converting the circuit to an AM detector; this makes it possible to use an AM signal for testing the i-f amplifiers and the pentode section of the detector.

In step 1(b), an unmodulated r-f signal is used to check FM detection (with the oscillator section operating); the test is made by observing the d-c voltage drops across the audio load resistor (R324) for different input frequencies within the i-f range of the detector.

In steps 2 and 3, d-c voltage and r-f signal tests are used to check the oscillator section of the FM detector.

Set the volume control to maximum, and turn the bass and treble controls fully clockwise. Depress the FM push button, PB-1. Connect the generator ground lead to the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

NOTE: The "TEST POINT" column refers to signal-generator connections in all cases except for step 2, in which the test is made with the voltmeter only.

If the "NORMAL INDICATION" is obtained in step 1, (a) and (b), proceed with the test for Section 4 (r-f and converter circuits); if not, isolate and correct the trouble in the FM circuits.

Since the circuit location of test point A for this section is the same as that of test point D for Section 4, the effectiveness of step 1, (a) and (b), as a master check is dependent upon the condition of certain parts in Section 4; these parts are listed below under "POSSIBLE CAUSE OF ABNORMAL INDICATION."

Section 3 (Cont.) TROUBLE SHOOTING

STEP	TEST POINT	SPECIAL INSTRUCTIONS	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1(a)	A (I-f-ampl. check).	Set generator to 9.1 mc. (mod. on). Short test point G (pin 2 of FM1000) to chassis.	Loud, clear signal with very weak signal input.	Trouble in detector or i-f circuits. Isolate by steps 4, 5, 6, 7, and 8.
1(b)	B (FM-det. check).	Set generator to 9.1 mc. (mod. off), with high output. Remove short from test point G. Connect positive lead of voltmeter to test point J, and negative lead to test point H. Use 50-volt range.	15 to 30 volts for 9.1-mc. signal or no signal. 12 to 20 volts when generator is set at 80 kc. above or 80 kc. below 9.1 mc.	Trouble in FM-detector circuit. Isolate by steps 2 and 3.
2	G (FM-det. osc. check).	Connect positive lead of voltmeter to chassis; connect prod end of negative lead through 100,000-ohm isolating resistor to test point G. Use 10-volt range.	Negative 1.8 volts (approx.)	Defective: FM1000. Open: L305, C330, R321, L304A, B, C342, C341, C343, R319, R320, R304. Shorted: C330, C342, C341, C343, C331, C333, C334, C332, C304A, L304A.
3	B	Using low to moderate output (mod. off), tune generator across 9.1 mc.	Beat signal, with zero beat at 9.1 mc.	Misaligned: Z304. Shorted: L304A, B. Changed capacitance: C342, C343. Open: C331, R322.
4	F	Set generator to 9.1 mc. (mod, on). Short test point G to chassis. Short test point B (for this step only) to chassis.	Clear signal with strong signal input.	Defective: FM1000. Open: R324, R323, PB-1. Shorted or leaky: C329, C333, C334.
5	B	Set generator to 9.1 mc. (mod on). Leave test point G shorted. Remove short from test point B.	Loud, clear signal with strong signal input.	Defective: 6BA6 (3rd i.f.). Shorted or leaky: C303B, C, L303A, C. Open: R314. Misaligned: Z303.
6	D	Set generator to 9.1 mc. (mod. on). Leave test point G shorted.	Loud, clear signal with moderate signal input.	Defective: 7A7 (2nd i.f.). Misaligned: Z302. Shorted: C302A, C302B, L302A, B.
7	E	Set generator to 9.1 mc. (mod. on). Leave test point G shorted.	Loud, clear signal with weak signal input.	Defective: 6BA6 (1st i.f.). Misaligned: Z301. Shorted: C301A, C301C, L301C.
8	A	Set generator to 9.1 mc. (mod. on). Leave test point G shorted.	Loud, clear signal with very weak signal input.	Defective: 7F8*. Misaligned: Z300. Open: L300A, WS-3(R), WS-1(F). Shorted: C300A, C300C, L300A, C.

* This part, located in another section, may cause abnormal indication in this section.

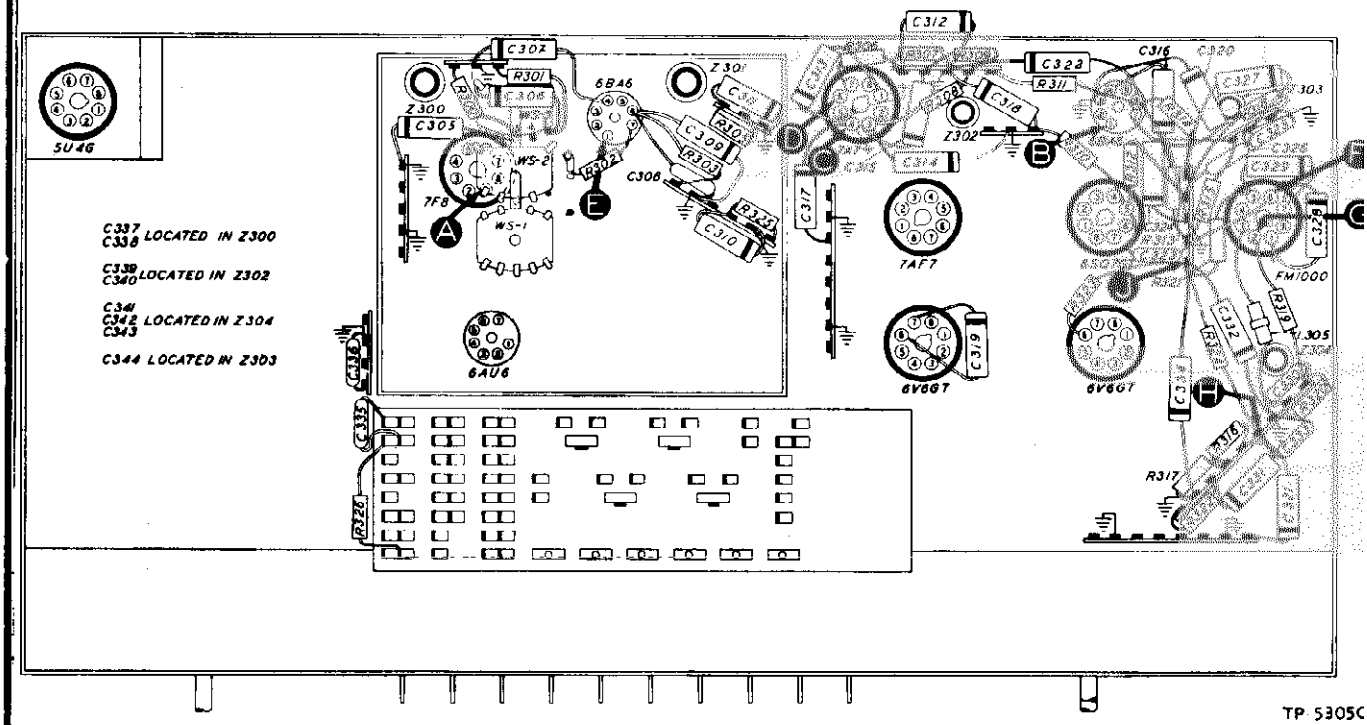


Figure 3. Bottom View, Showing Section 3 Test Points

Section 4

TROUBLE SHOOTING

R-F AND CONVERTER CIRCUITS

For the following tests, with the exception of the oscillator tests, use an r-f signal generator, with modulated output. Connect the generator ground lead to the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart. Adjust the generator to give a weak input signal.

Set the radio volume control to maximum, and turn the bass and treble controls counterclockwise.

OSCILLATOR TESTS (AM and FM CIRCUITS): Connect the positive lead of a high-resistance voltmeter to the oscillator cathode (pin 5) of the 7F8, test point F. Connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the oscillator grid (pin 8), test point E. Use a suitable range, such as 0—10 volts. Absence of negative voltage with any station-selector push button (PB-8 through PB-4) depressed, or for any dial position with push button PB-1, PB-2, or PB-3 depressed, indicates that the oscillator is not functioning.

AM CIRCUITS

PUSH BUTTON

STEP	TEST POINT	SIG. GEN. FREQUENCY	PUSH BUTTON OR TUNING CONTROL	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Adjust to frequency of each push button, in turn.	Depress, in turn, PB-8 through PB-4.	Loud, clear signal when each push button is depressed.	Trouble in circuits associated with push-button station selectors. Isolate by tests in steps 2 and 3.
2	E to F (Oscillator test)		Depress, in turn, PB-8 through PB-4.	Negative voltage.	No voltage for any particular push button — Defective: Coil (L409A through L409E) or push button. No voltage for all push buttons—Defective: 7F8, WS-2(F), PB-2, PB-3. Open: R404, R405, R407, R409, C413, C414, C416, L405, WS-2(F), WS-2(R). Shorted: C415, C417, C419.
3	A	Adjust to frequency of each push button, in turn.	Depress, in turn, PB-8 through PB-4.	Loud, clear signal when each push button is depressed.	Defective: L400, C411, C424A through C424E. Open: R412, R413, C413, PB-2, PB-3, WS-1(F), WS-2(F).

BROADCAST MANUAL

4	A	1000 kc.	Depress BC push button, PB-3. Tune to signal.	Loud, clear signal.	Trouble in broadcast manual-tuning circuits. Isolate by tests in steps 5 and 6.
5	A	1000 kc.	Depress BC push button, PB-3. Tune to signal.	Loud, clear signal.	Open: PB-3, PB-2, C421, C411, WS-1(F). Shorted: C400D, L400.
6	E to F (Oscillator test)		Depress BC push button, PB-3. Rotate tuning control through range.	Negative voltage.	Open: PB-3, L404. Shorted: C409E, L404, C400E

SHORT-WAVE MANUAL

7	B	12 mc.	Depress SW push button, PB-2. Tune to signal.	Loud, clear signal.	Trouble in short-wave circuits. Isolate by tests in steps 8 and 9.
8	B	12 mc.	Depress SW push button, PB-2. Tune to signal.	Loud, clear signal.	Defective: J400, L401, L402, C401 C410. Open: L401, PB-2.
9	E to F (Oscillator test)		Depress SW push button, PB-2. Rotate tuning control through range.	Negative voltage.	Open: L403, C408, C407. Shorted: C409A.

Section 4 (Cont.)

TROUBLE SHOOTING

FM CIRCUITS

Before proceeding with the tests for the FM circuits, connect test point G in Section 3 to the chassis.

STEP	TEST POINT	SIG. GEN. FREQUENCY	PUSH BUTTON OR TUNING CONTROL	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	G	100 mc.	Depress FM push button, PB-1. Tune to signal.	Loud, clear signal.	Trouble in FM circuits. Isolate the following tests.
2	E to F (Oscillator test)		Depress FM push button, PB-1. Rotate tuning control through range.	Negative voltage.	Defective: 7F8. Open: L408, R PB-1, WS-2(F). Shorted: C400H, C4 C419, C418.
3	H	100 mc.	Depress FM push button, PB-1. Tune to signal.	Loud, clear signal.	Defective: 6AU6. Open: L410, R R400, R402, C406. Shorted: C4 WS-2(F), C404, C405.
4	G	100 mc.	Same as step 3.	Loud, clear signal.	Open: L406, C402. Shorted: C40 C400F.

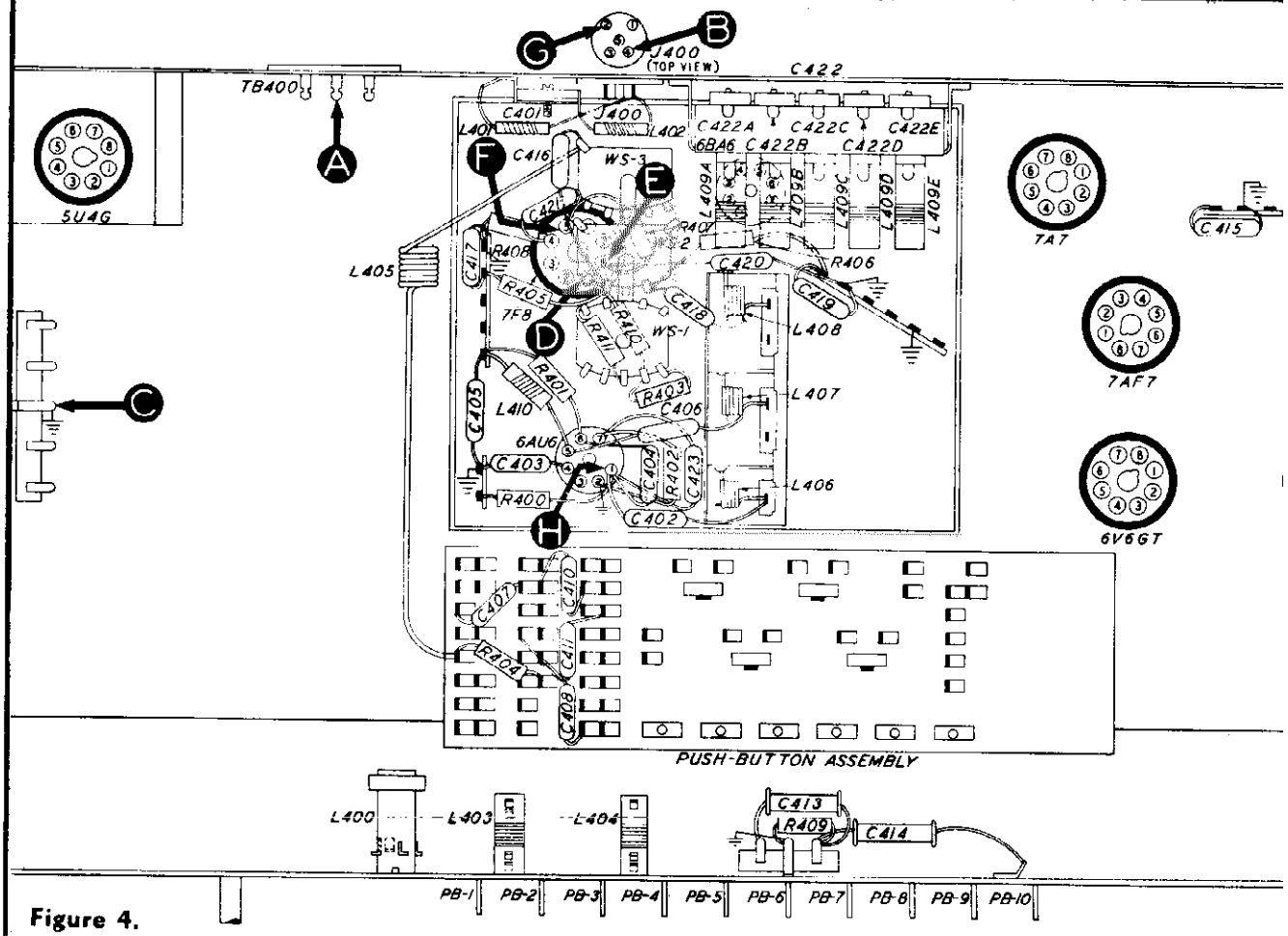


Figure 4.

TP-53

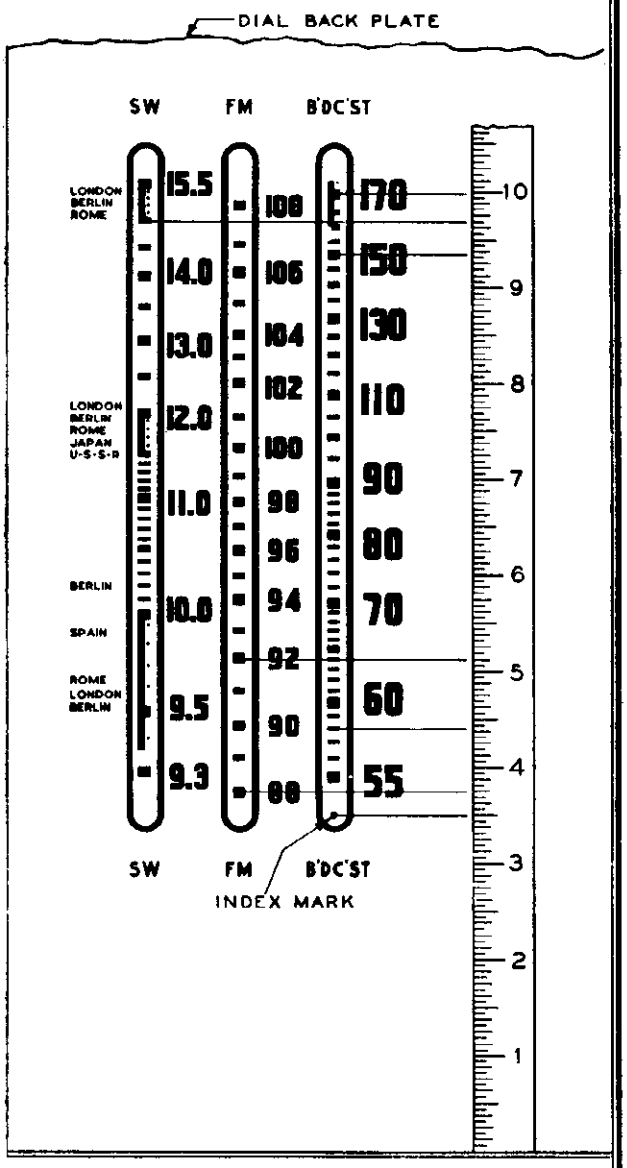
Bottom View, Showing Section 4 Test Points (locations of C409 and C412 shown in figure 8

CABLIBRATING DIAL BACKPLATE

When the radio chassis has been removed from the cabinet, dial calibration and alignment points may be marked, with a pencil, on the dial backplate at the end of the pointer.

The method of measuring for these points is illustrated in figure 5. Hold a rule against the dial backplate, with the start of the rule against the inside of the upturned edge of the backplate.

With the tuning gang fully meshed, the pointer should be adjusted on the dial-drive cord to coincide with the index mark.



TP-1C

Figure 5. Calibration Measurements for Dial Backplate

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before turning on the power:

1. Inspect the top and bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, or other obvious indications of trouble.

2. Measure the resistance between B+ (pin 2 of the 5U4G) and the radio chassis. When the ohmmeter test leads are connected in the proper polarity, the highest resistance reading will be obtained. If the reading is lower than 1000 ohms, check condensers C101B, C102, and C103 for leakage or shorts.

This resistance value, which is much lower than normal, does not represent a quality check of these condensers; the value given is the lowest at which the rectifier will operate safely while the voltage tests of Section 1 are performed.

REPLACEMENT PARTS LIST

NOTE: Part numbers marked with an asterisk (*) are general replacement items. These numbers may not be identical with those on factory assemblies; also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

SECTION 1

POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, line filter, .01 mf.	30-1226-1
C101	Condenser, electrolytic, 2-section	30-2570-19
C101A	Condenser, filter, 10 mf., 450 w. v.	Part of C101
C101B	Condenser, filter, 10 mf., 450 w. v.	Part of C101
C102	Condenser, r-f by-pass, .003 mf.	61-0117*
C103	Condenser, filter, 40 mf., 450 w. v.	30-2568-5

SECTION 1 (Continued)

POWER SUPPLY

Reference Symbol	Description	Service Part No.
C104	Condenser, bias filter, .5 mf.	61-0133*
C105	Condenser, line filter, .01 mf.	30-1226-1
I100	Lamp, bin	34-2040
I101	Lamp, dial	34-2040
I102	Lamp, dial	34-2040
I103	Lamp, telltale	34-2040

REPLACEMENT PARTS LIST (Continued)

SECTION 1 (Continued)

POWER SUPPLY

Reference Symbol	Description	Service Part No.
J100	Socket, phono power	27-6200
L100	Field, speaker	Part of LS200
R100	Resistor, B+ filter, 5600 ohms	66-2564340
R101	Resistor, voltage divider, 1 megohm	66-5103340*
R102	Resistor, voltage divider, 220,000 ohms	66-4223340*
R103	Resistor, telltale-lamp dropping, 10 ohms	66-0103340
S100	Switch, master power, on-off	42-1717
S101	Switch, phono power, on-off	42-1714
T100	Transformer, power	32-8282
W100	Line cord	41-3755-18

SECTION 2

AUDIO CIRCUITS

C200	Condenser, bass control, .006 mf.	45-3500-7*
C201	Condenser, tone compensation, 100 mmf.	30-1224-1*
C202	Condenser, tone compensation, .02 mf.	61-0108*
C203	Condenser, treble control, .01 mf.	61-0120*
C204	Condenser, r-f by-pass, 220 mmf.	60-10205307*
C205	Condenser, d-c blocking, .006 mf.	45-3500-7*
C206	Condenser, d-c blocking, .006 mf.	45-3500-7*
C207	Condenser, tone compensating, .001 mf.	45-3500-5*
C208	Condenser, d-c blocking, .02 mf.	61-0108*
C209	Condenser, high-pass, 150 mmf.	60-10155407*
C210	Condenser, d-c blocking, .001 mf.	45-3500-5*
C211	Condenser, reactance feedback, 330 mmf.	60-10335407*
C212	Condenser, bias filter, .01 mf.	61-0120*
C213	Condenser, bias filter, .01 mf.	61-0120*
C214	Condenser, bias filter, .01 mf.	61-0120*
C215	Condenser, d-c blocking, 330 mmf.	60-10335407*
C216	Condenser, bias filter, .03 mf.	45-3500-1*
C217	Condenser, d-c blocking, .002 mf.	61-0062*
C218	Condenser, bias filter, .02 mf.	61-0108*
C219	Condenser, d-c blocking, .006 mf.	45-3500-7*
C220	Condenser, plate by-pass, .1 mf.	61-0113*
C221	Condenser, tone compensating, .003 mf.	61-0117*
C222	Condenser, r-f by-pass, 22 mmf.	60-00205307*
J200	Socket, FM test	27-6180
LS200	Speaker	36-1606
PB-9	Push button, PHONO	Part of 42-1777†
PL200	Phono plug and cable	41-3735
PL201	Phono plug	Part of T201
R200	Volume control, 2 megohms (tapped at 1 megohm)	33-5535-5
R201	Tone control, bass, 1 megohm	33-5539-7
R202	Resistor, tone compensating, 33,000 ohms	66-3333340*
R203	Resistor, inverse feedback, 4.7 ohms	66-9473340*
R204	Resistor, inverse feedback, 68 ohms	66-0683340
R205	Resistor, grid return, 1 megohm	66-5103340*
R206	Resistor, bias divider, 1 megohm	66-5103340*
R207	Resistor, bias divider, 10 megohms	66-6103340*
R208	Tone control (with scratch-eliminator switch), treble, 500,000 ohms	33-5538-22*
R209	Resistor, plate load, 220,000 ohms	66-4223340*
R210	Resistor, grid return, 1 megohm	66-5103340*
R211	Resistor, cathode load, 47,000 ohms	66-3473340*

† 42-1777 Push-button switch assembly.

SECTION 2 (Continued)

AUDIO CIRCUITS

Reference Symbol	Description	Servi Part I
R212	Resistor, cathode bias, 4700 ohms	66-247334
R213	Resistor, cathode bias, 6800 ohms	66-268334
R214	Resistor, grid return, 4.7 megohms	66-547334
R215	Resistor, tone compensating, 220,000 ohms	66-422334
R216	Resistor, voltage divider, 100,000 ohms	66-410334
R217	Resistor, voltage divider, 100,000 ohms	66-410334
R218	Resistor, voltage divider, 33,000 ohms	66-333434
R219	Resistor, tone compensating, 680,000 ohms	66-468334
R220	Resistor, grid return, 330,000 ohms	66-433334
R221	Resistor, cathode bias, 2200 ohms	66-222434
R222	Resistor, grid return, 1 megohm	66-510334
R223	Resistor, voltage divider, 33,000 ohms	66-333334
R224	Resistor, plate load, 18,000 ohms	66-318334
R225	Resistor, bias filter, 220,000 ohms	66-422334
R226	Resistor, bias filter, 220,000 ohms	66-422334
R227	Resistor, grid return, 560,000 ohms	66-456334
R228	Resistor, plate load, 220,000 ohms	66-422334
R229	Resistor, bias filter, 3.3 megohms	66-533334
R230	Resistor, bias filter, 1.5 megohms	66-515334
R231	Resistor, plate load, 100,000 ohms	66-410334
R232	Resistor, bias filter, 220,000 ohms	66-422334
R233	Resistor, voltage divider, 220,000 ohms	66-422334
R234	Resistor, voltage divider, 560,000 ohms	66-456334
R235	Resistor, plate load, 56,000 ohms	66-356334
R236	Resistor, plate dropping, 470,000 ohms	66-447334
R237	Resistor, plate load, 150,000 ohms	66-415334
R238	Resistor, grid return, 330,000 ohms	66-433334
R239	Resistor, grid return, 330,000 ohms	66-433334
S200	Switch, scratch eliminator	Part of R2
T200	Transformer, output	32-82
T201	Transformer, phono input	32-82

SECTION 3

I-F, DETECTOR, AND A-V-C CIRCUITS

C300A	Condenser, trimmer	Part of Z3
C300B	Condenser, trimmer	Part of Z3
C300C	Condenser, trimmer	Part of Z3
C301A	Condenser, trimmer	Part of Z3
C301B	Condenser, trimmer	Part of Z3
C301C	Condenser, trimmer	Part of Z3
C302A	Condenser, trimmer	Part of Z3
C302B	Condenser, trimmer	Part of Z3
C302C	Condenser, trimmer	Part of Z3
C303A	Condenser, trimmer	Part of Z3
C303B	Condenser, trimmer	Part of Z3
C303C	Condenser, trimmer	Part of Z3
C304A	Condenser, trimmer	Part of Z3
C305	Condenser, r-f by-pass, .01 mf.	61-012
C306	Condenser, i-f by-pass, .01 mf.	61-012
C307	Condenser, filament by-pass, .006 mf.	45-3500-
C308	Condenser, by-pass, 220 mmf.	60-1020530
C309	Condenser, screen by-pass, .01 mf.	61-012
C310	Condenser, plate by-pass, .01 mf.	61-012
C311	Condenser, a-v-c by-pass, .01 mf.	61-012
C312	Condenser, cathode by-pass, .01 mf.	61-012
C313	Condenser, filament by-pass, .006 mf.	45-3500-

REPLACEMENT PARTS LIST (Continued)

SECTION 3 (Continued)

I-F, DETECTOR, AND A-V-C CIRCUITS

Reference Symbol	Description	Service Part No.
C314	Condenser, screen by-pass, .01 mf.	61-0120*
C315	Condenser, plate by-pass, .01 mf.	61-0120*
C316	Condenser, filament by-pass, .006 mf.	45-3500-7*
C317	Condenser, r-f by-pass, .01 mf.	61-0120*
C318	Condenser, a-v-c filter, .05 mf.	61-0122*
C319	Condenser, r-f by-pass, .01 mf.	61-0120*
C320	Condenser, cathode by-pass, .01 mf.	61-0120*
C321	Condenser, d-c blocking, .006 mf.	45-3500-7*
C322	Condenser, screen by-pass, .01 mf.	61-0120*
C323	Condenser, d-c blocking, 100 mmf.	60-10105407*
C324	Condenser, plate by-pass, .01 mf.	61-0120*
C325	Condenser, r-f by-pass, 220 mmf.	60-10205307*
C326	Condenser, r-f by-pass, 100 mmf.	30-1224-1*
C327	Condenser, r-f by-pass, .01 mf.	61-0120*
C328	Condenser, filament by-pass, .006 mf.	45-3500-7*
C329	Condenser, screen by-pass, .01 mf.	61-0120*
C330	Condenser, grid, 33 mmf.	60-00305307*
C331	Condenser, d-c blocking, .03 mf.	45-3500-1
C332	Condenser, r-f by-pass, .01 mf.	61-0120*
C333	Condenser, r-f by-pass, 1500 mmf.	60-20155404*
C334	Condenser, electrolytic, audio by-pass, 10 mf., 450 w. v.	30-2417-6
C335	Condenser, r-f by-pass, 220 mmf.	60-10205307*
C336	Condenser, r-f by-pass, 220 mmf.	60-10205307*
C337	Condenser, fixed trimmer, 3000 mmf., part of Z300	60-20305304
C338	Condenser, coupling, 9 mmf., part of Z300	60-90905417
C339	Condenser, fixed trimmer, 330 mmf., part of Z302	60-10335407
C340	Condenser, coupling, 3.3 mmf., part of Z302	30-1221
C341	Condenser, voltage divider, 68 mmf., part of Z304	60-00683327
C342	Condenser, voltage divider, 33 mmf., part of Z304	60-00333327
C343	Condenser, fixed trimmer, 15 mmf., part of Z304	60-00155327
C344	Condenser, fixed trimmer, 270 mmf., part of Z303	60-10275327
L300A	Primary winding	Part of Z300
L300B	Primary winding	Part of Z300
L300C	Secondary winding	Part of Z300
L300D	Secondary winding	Part of Z300
L301A	Primary winding	Part of Z301
L301B	Secondary winding	Part of Z301
L301C	Secondary winding	Part of Z301
L302A	Primary winding	Part of Z302
L302B	Primary winding	Part of Z302
L302C	Secondary winding	Part of Z302
L302D	Secondary winding	Part of Z302
L303A	Primary winding	Part of Z303
L303B	Primary winding	Part of Z303
L303C	Secondary winding	Part of Z303
L303D	Secondary winding	Part of Z303
L304A	Primary winding	Part of Z304
L304B	Secondary winding	Part of Z304
L305	Coil, FM detector	32-4007-1
PB-1	Push button, FM	Part of 42-1777†
R300	Resistor, plate decoupling, 47,000 ohms	66-3473340

† 42-1777 Push-button switch assembly.

SECTION 3 (Continued)

I-F, DETECTOR, AND A-V-C CIRCUITS

Reference Symbol	Description	Service Part No.
R301	Resistor, a-v-c decoupling, 1 megohm	66-5103340*
R302	Resistor, cathode bias, 68 ohms	66-0683340*
R303	Resistor, screen dropping, 47,000 ohms	66-3473340*
R304	Resistor, shunt, 6800 ohms, part of Z304	66-2683340*
R305	Resistor, a-v-c decoupling, 1 megohm	66-5103340*
R306	Resistor, cathode bias, 180 ohms	66-1183340*
R307	Resistor, cathode bias, 1500 ohms	66-2153340
R308	Resistor, screen dropping, 100,000 ohms	66-4103340*
R309	Resistor, plate decoupling, 3300 ohms	66-2333340*
R310	Resistor, a-v-c filter, 330,000 ohms	66-4333340*
R311	Resistor, cathode bias, 180 ohms	66-1183340*
R312	Resistor, diode load, 1 megohm	66-5103340*
R313	Resistor, screen dropping, 47,000 ohms	66-3473340*
R314	Resistor, inverse feedback, 100 ohms	66-1103340*
R315	Resistor, plate decoupling, 3300 ohms	66-2333340*
R316	Resistor, audio decoupling, 100,000 ohms	66-4103340*
R317	Resistor, diode load, 270,000 ohms	66-4273340*
R318	Resistor, r-f filter, 47,000 ohms	66-3473340*
R319	Resistor, oscillator stabilizing, 27 ohms	66-0273340*
R320	Resistor, grid leak, 15,000 ohms	66-3153340*
R321	Resistor, screen dropping, 56,000 ohms	66-3563340*
R322	Resistor, audio decoupling, 100,000 ohms	66-4103340*
R323	Resistor, plate dropping, 15,000 ohms	66-3153340
R324	Resistor, audio plate load, 47,000 ohms	66-3473340*
R325	Resistor, plate dropping, 3300 ohms	66-2333340*
R326	Resistor, voltage divider, 100,000 ohms	66-4103340*
TC300A	Tuning core	Part of Z300
TC302A	Tuning core	Part of Z302
TC304A	Tuning core	Part of Z304
WS-3(R)	Switch-wafer section	Part of 76-2211‡
Z300	Transformer, 1st i-f, including C300A, C300B, C300C, C337, C338, and TC300A	32-4020-1
Z301	Transformer, 2nd i-f, including C301A, C301B, and C301C	32-4001
Z302	Transformer, 3rd i-f, including C302A, C302B, C302C, C339, C340, and TC302A	32-4002
Z303	Transformer, 4th i-f, including C303A, C303B, C303C, and C344	32-4003-2
Z304	Transformer, FM detector, including C304A, C341, C342, C343, R304, and TC304A	32-4004

SECTION 4

R-F AND CONVERTER CIRCUITS

C400	Condenser, tuning	31-2694
C400A	Condenser, trimmer, FM aerial	Part of C400
C400B	Condenser, trimmer, FM r.f.	Part of C400
C400C	Condenser, trimmer, FM osc.	Part of C400
C400D	Condenser section, tuning, AM aerial	Part of C400
C400E	Condenser section, tuning, AM osc.	Part of C400
C400F	Condenser section, tuning, FM aerial	Part of C400
C400G	Condenser section, tuning, FM r.f.	Part of C400
C400H	Condenser section, tuning, FM osc.	Part of C400
C401	Condenser, trimmer, s-w aerial	31-6473-2
C402	Condenser, d-c blocking, 10 mmf.	60-00105407*
C403	Condenser, filament by-pass, 220 mmf.	60-10205307*
C404	Condenser, screen by-pass, 1500 mmf.	60-20155404*

REPLACEMENT PARTS LIST (Continued)

SECTION 4 (Continued)

R-F AND CONVERTER CIRCUITS

Reference Symbol	Description	Service Part No.
C405	Condenser, plate by-pass, 1500 mmf.	60-20155404*
C406	Condenser, d-c blocking, 33 mmf.	60-00335407*
C407	Condenser, neutralizing (s.w.), 10 mmf.	60-00105407*
C408	Condenser, oscillator series, 255 mmf.	30-1220-24
C409	Condenser, trimmer assembly, 3-section	31-6477
C409A	Condenser, trimmer, oscillator shunt (s.w.)	Part of C409
C409B	Condenser, trimmer, oscillator shunt (bc.)	Part of C409
C409C	Condenser, trimmer, aerial shunt (bc.)	Part of C409
C410	Condenser, aerial series (s.w.), 300 mmf.	60-10305307*
C411	Condenser, d-c blocking, 22 mmf.	60-00205307*
C412	Condenser, trimmer, bc. series	31-6473-3
C413	Condenser, r-f voltage divider, 285 mmf.	30-1224-14
C414	Condenser, r-f voltage divider, 485 mmf.	30-1224-15
C415	Condenser, r-f by-pass, 470 mmf.	60-10475307*
C416	Condenser, d-c blocking, 470 mmf.	60-10475307*
C417	Condenser, r-f by-pass, 220 mmf.	60-10205307*
C418	Condenser, d-c blocking, 220 mmf.	60-10205307*
C419	Condenser, r-f by-pass, 220 mmf.	60-10205307*
C420	Condenser, oscillator grid, 100 mmf.	60-10105407*
C421	Condenser, oscillator-to-mixer coupling, 750 mmf.	60-10755301*
C422	Condenser, trimmer assembly, 5-section, aerial tuning (push button)	31-6479
C422A	Condenser, trimmer	Part of C422
C422B	Condenser, trimmer	Part of C422
C422C	Condenser, trimmer	Part of C422
C422D	Condenser, trimmer	Part of C422
C422E	Condenser, trimmer	Part of C422
C423	Condenser, cathode by-pass, 100 mmf.	60-10105407*
J400	Socket, s-w and FM aerial	27-6214-1
L400	Coil, bc. aerial	32-4049-3
L401	Coil, s-w aerial	32-4050
L402	Coil, FM isolation	32-4111
L403	Coil, s-w osc.	32-3996
L404	Coil, bc. osc.	32-4019-4
L405	Choke, osc. isolation	32-4089
L406	Coil, FM aerial	32-3993
L407	Coil, FM r.f.	32-3992
L408	Coil, FM osc.	32-3994
L409A	Coil, push-button osc.	32-4059
L409B	Coil, push-button osc.	32-4059
L409C	Coil, push-button osc.	32-4059-1
L409D	Coil, push-button osc.	32-4059-1
L409E	Coil, push-button osc.	32-4059-1
L410	Choke, FM plate load	32-4061
LA400	Loop, bc.	76-3530
PB-1 to PB-10	Push-button-switch assembly	42-1777
PL400	Plug assembly, FM a-c-line aerial	41-3791
R400	Resistor, grid return, 1 megohm	66-5103340*
R401	Resistor, screen dropping, 56,000 ohms	66-3563340*
R402	Resistor, cathode bias, 82 ohms	66-0823340*
R403	Resistor, voltage divider, 4.7 megohms	66-5473340*
R404	Resistor, parasitic suppressor, 100 ohms	66-1103340*
R405	Resistor, plate feed, AM, 22,000 ohms	66-2233340*
R406	Resistor, plate feed, FM, 22,000 ohms	66-3223340*
R407	Resistor, grid return, 22,000 ohms	66-3223340*
R408	Resistor, cathode bias, 2200 ohms	66-2223340*
R409	Resistor, cathode bias, 10,000 ohms	66-3103340*
R410	Resistor, parasitic suppressor, 10 ohms	66-0103340*
R411	Resistor, grid return, 4.7 megohms	66-5473340*
WS-1	Switch wafer	Part of 76-2211‡
WS-2	Switch wafer	Part of 76-2211‡

† 42-1777 Push-button switch assembly.
‡ 76-2211 Rotary wafer switch, 3 section.

MISCELLANEOUS

Description	Service Part No.
Bin-lamp-socket assembly	28-6233-
Cabinet (less scale)	1069
Cabinet Parts and Hardware	
Back, cabinet	54-751
Baffle and cloth, l.h.	40-678
Baffle and cloth, r.h.	40-6968-
Baffle, wood	21900
Bin mechanism, l.h.	76-322
Bin mechanism, r.h.	76-3223-
Bolt, speaker (4 req.)	W-158
Bracket, lamp	56-3545-
Catch, bullet (2 req.)	45-600
Cradle assembly	76-322
Dial-scale-and-backplate assembly	76-3187-
Dome (4 req.)	45-604
Door, record album	45-641
Doors (matched pair furnished)	45-155
Grille, wire (2 req.)	56-325
Hinge, continuous	56-362
Hinge, knife	56-488
Hinge, stop	56-5278-
Panel, instrument	45-638
Pull, brass	56-324
Spring, bin mechanism	56-497
Strike, bullet catch (2 req.)	45-600
Telltale jewel	54-430
Top, cabinet	45-641
Cable and plug, speaker	41-3734-
Cord, drive (25-ft. spool)	45-8750
Dial-lamp-socket assembly, 14" lead	76-2109
Dial-lamp-socket assembly, 8" lead	76-2109-2
Dial-Scale Hardware	
Backplate	76-2106
Pointer	56-3179
Scale strap (2 req.)	56-4916
Spring, drive	28-8953
Grommet, r-f-unit mtg. (3 req.)	54-4295
Knob, control (4 req.)	54-4227
Knob, push button (10 req.)	54-4292
Push-Button-Assembly Hardware	
Cap (10 req.)	54-4294
Cap, centering (5 req.)	28-6936
Cover assembly	76-1343
Screw, tuning core (5 req.)	56-2249
Switch assembly, push-button	42-1777
Tab, BC	54-4317-2
Tab, FM	54-4317-4
Tab kit (station call letters)	40-6943
Tab, OFF	54-4317-1
Tab, PHONO	54-4317-5
Tab, SW	54-4317-3
Telltale-lamp-socket assembly	41-3737
Terminal strip, coils (5 req.)	56-2250FA3
Tuning core (5 req.)	56-6100
Shaft, drive (tuning)	76-2107
Socket, aerial (s-w and FM)	27-6214-1
Socket-adapter plate (3 req.)	56-4033-1FA3
Socket, Loktal (3 req.)	27-6138*
Socket, miniature (2 req.)	27-6226
Socket, octal (4 req.)	27-6174
Socket, Loktal, r-f unit (1 req.)	27-6213
Socket, miniature (1 req.)	27-6203-1
Socket, Loktal, scratch eliminator (2 req.)	27-6138*
Wafer-Switch Hardware	
Fulcrum assembly	76-2206
Link, connecting	54-7169

SETTING PUSH BUTTONS

1. Connect the output meter between the No. 3 terminal of the aerial terminal panel and the chassis.
2. Turn the volume control to maximum, and bass and treble controls fully counterclockwise.
3. Couple the signal generator loosely to the loop aerial (see Note under "AM ALIGNMENT CHART").
4. Turn on the power, and allow the radio to warm up for 15 minutes before starting the adjustments.
5. Starting with the lowest frequency desired, set the signal generator to the desired frequency (modulation on), push the station-selector push button, and adjust the associated oscillator tuning core and aerial trimmer condenser (marked on rear of chassis) for maximum indication on the output meter.
6. Reset the signal-generator frequency, and repeat the procedure for each remaining station-selector push button.
7. Turn off the signal generator, and make a final adjustment of all tuning cores and trimmer condensers while listening to the stations for which the adjustments are being made.

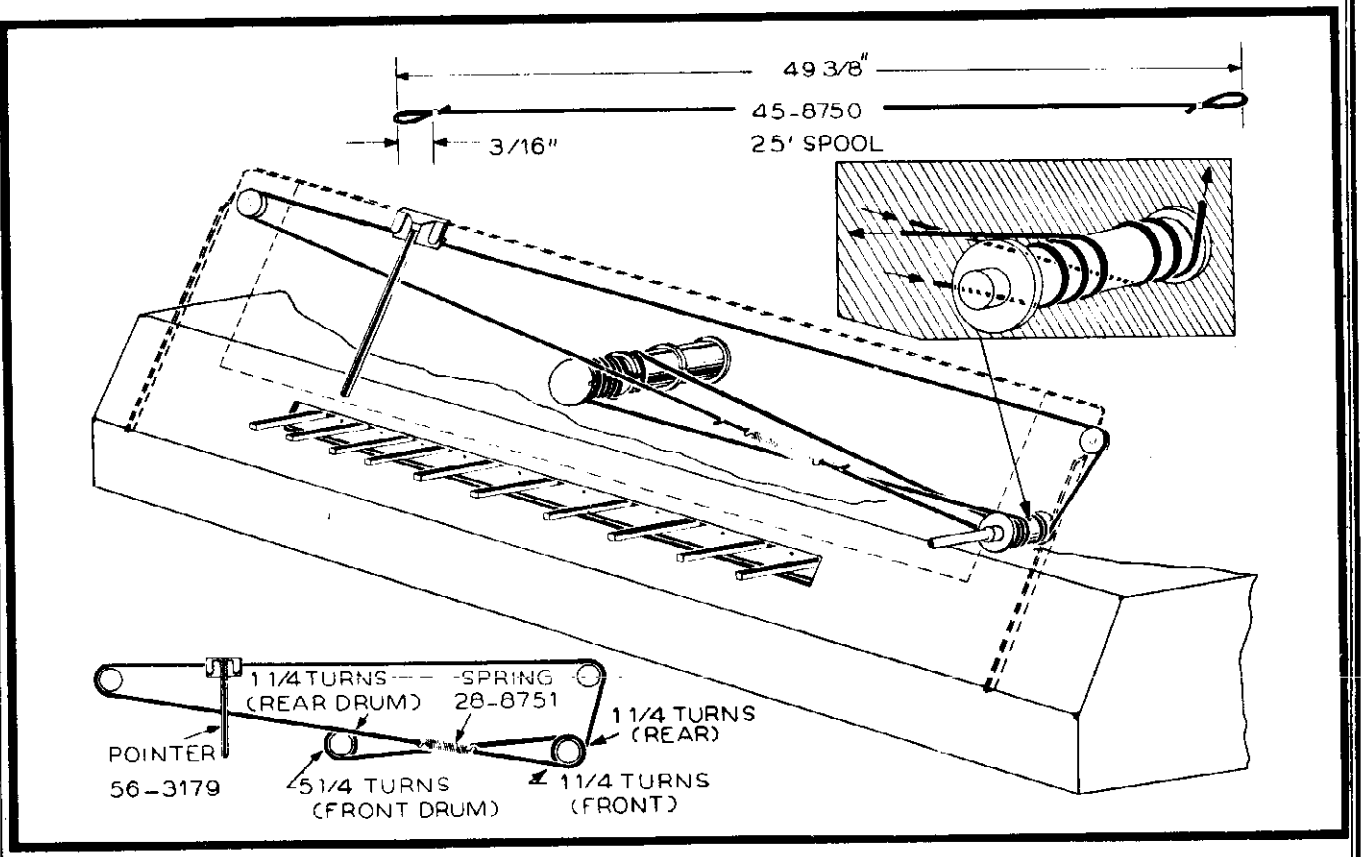


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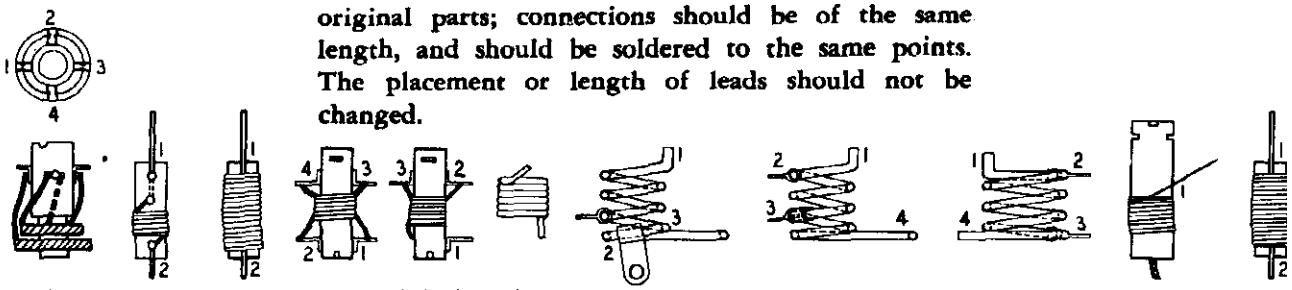
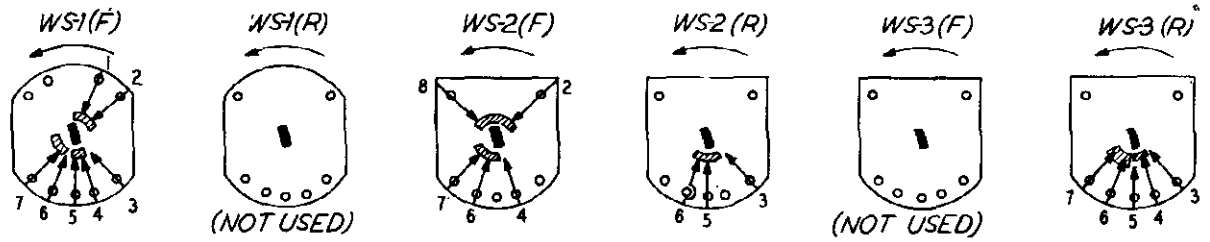
Figure 6. Drive-Cord Installation Details

IMPORTANT!

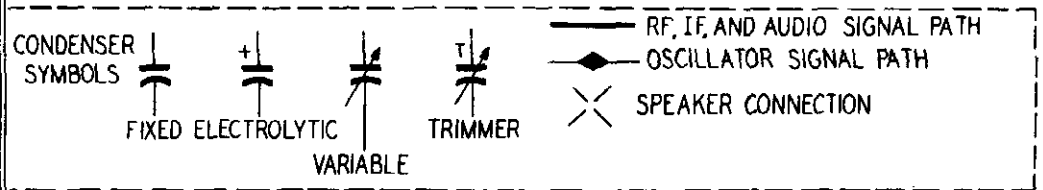
To avoid altering FM operation, special care should be used in replacing any part. Replacement parts should be placed in the same physical positions as the original parts; connections should be of the same length, and should be soldered to the same points. The placement or length of leads should not be changed.

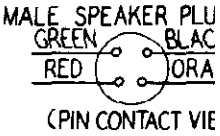


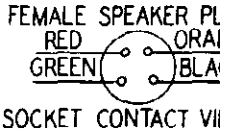
L400 BC AERIAL | L401 SW AERIAL | L402 FM CHOKE | L403 SW OSC | L404 BC OSC | L405 OSC CHOKE | L406 FM AERIAL | L407 FM RF | L408 FM OSC | L409A-L409E PB OSC | L41C FM CHOK



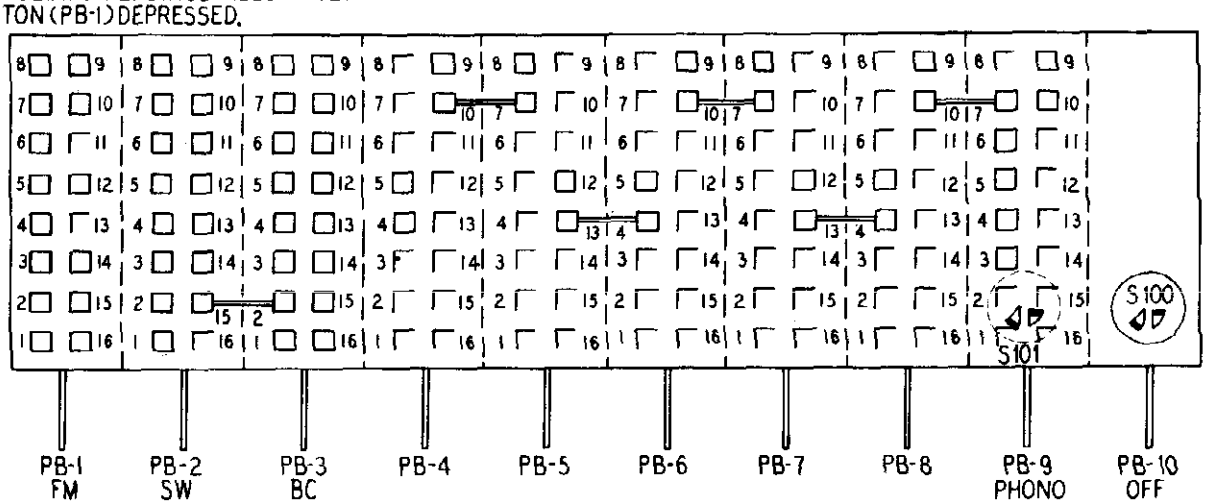
ROTARY WAFER SWITCH SECTIONS ARE SHOWN (AS VIEWED WITH CHASSIS INVERTED) IN THE POSITION FOR BROADCAS SHORT-WAVE, PUSH-BUTTON, OR PHONO OPERATION. THESE SECTIONS ARE THROWN TO THE FM POSITION WHEN ACTUAT BY THE FM PUSH BUTTON. WAFER SECTIONS ARE SYMBOLIZED WS-1, WS-2, WS-3, FROM FRONT OF CHASSIS TOWARD REAR. (F) INDICATES FRONT CONTACTS, LOOKING FROM FRONT. (R) INDICATES REAR CONTACTS, LOOKING THROUGH FROM FRONT.







NOTE:-
VOLTAGE READINGS GIVEN WERE TAKEN WITH A 20,000-OHMS-PER-VOLT METER, AT A LINE VOLTAGE OF 117 V A C.
VOLTAGE READINGS IN SCRATCH ELIMINATOR CIRCUITS OF SECTION 2 WERE TAKEN WITH PHONO PUSH BUTTON (PB-9) DEPRESSED, AND TREBLE CONTROL SET TO SCRATCH ELIMINATOR POSITION.
VOLTAGE READINGS ASSOCIATED WITH FM DETECTOR WERE TAKEN WITH FM PUSH BUTTON (PB-1) DEPRESSED.



PUSH-BUTTON SWITCHES AS VIEWED WITH CHASSIS INVERTED.

ALIGNMENT PROCEDURE

CAUTION: Do no turn on power with speaker disconnected, or the radio may be damaged.

ALIGNMENT OF AM CIRCUITS

When the complete AM and FM alignment is to be made, the AM alignment should be made first; however, if AM alignment is not required, the FM alignment alone may be made.

OUTPUT METER—Connect between No. 3 terminal (voice-coil connection) of aerial terminal panel and chassis.

AM SIGNAL GENERATOR—Connect ground lead to chassis, and output lead as indicated in chart. Use modulated output.

OUTPUT LEVEL—During alignment, signal-generator output must be attenuated to maintain radio output below 1.5 volts, as read on output meter.

CONTROLS—Set volume control to maximum, bass tone control fully counterclockwise, treble tone control fully clockwise (do not turn on scratch eliminator), and signal-generator dial, radio dial, and radio push buttons as indicated in chart.

DIAL POINTER—With tuning condensers fully meshed, dial pointer must coincide with index mark at low-frequency end of dial. See "CALIBRATING DIAL BACKPLATE" for method of measuring backplate for index and calibration marks.

ALIGNMENT OF FM CIRCUITS

OUTPUT METER—Connect between No. 3 terminal (voice-coil connection) of aerial terminal panel and chassis.

AM SIGNAL GENERATOR—Connect ground lead to chassis; connect output lead through .1-mf. condenser to points specified in chart. Use modulated output unless otherwise specified.

OUTPUT LEVEL—During alignment, signal-generator output must be attenuated to maintain radio output below 1.5 volts, as read on output meter. All adjustments are made for maximum output, unless otherwise specified in chart.

CONTROLS—Set volume control to maximum, bass tone control fully counterclockwise, and treble tone control fully clockwise. Depress FM push button, PB-1.

LOCATIONS OF COILS—For the locations of coils L406, L407, and L408 (steps 11 and 15), refer to figure 4.

Note 1. When the oscillator grid (pin 2) of the FM1000 is connected to the chassis, the oscillator section of the FM detector is made inoperative; the circuit is thereby converted from an FM to an AM detector.

Note 2. Make the loading network by connecting a 4700-ohm resistor and a .1-mf. condenser in series. Attach an alligator clip to each free end of the network. When this network is connected across the primary or secondary winding of an overcoupled i-f transformer, the network loads the circuit so that the transformer is effectively below critical coupling; the unloaded winding may then be correctly peaked at the intermediate frequency.

Note 3. The top of padder C303C can be reached only from the top of the shield can. Slide a length of flattened solder or wire down between the ceramic form and the edge of the trimmer plate. Attach the loading network between this connection and the chassis.

Note 4. It is essential that the output of the generator be kept below the level at which the oscillator of the FM detector locks in; otherwise, an erroneous zero beat will be obtained. When a single very sharp zero-beat point is obtained, the adjustment is correct.

Note 5. The use of a signal generator for steps 10 through 16 is recommended only if the available generator is sufficiently accurate to insure correct frequency settings. Otherwise, an alternative procedure employing FM broadcast-station signals is recommended. For the adjustments at the high-frequency end of the band, use the station nearest 105 mc.; for the adjustments at the low-frequency end of the band, use the station nearest 88 mc. or 92 mc., as indicated. If the radio is greatly misaligned, it may be necessary to adjust the trimmers and coils for maximum noise at each end of the band before station signals can be heard. The FM detector must be made inoperative, as directed in step 10 of the "FM ALIGNMENT CHART."

Note 6. Check the tracking of oscillator and r-f circuits with a tuning wand. If placing the brass end in or near the coil increases the output-meter reading, spread the turns; if the powdered-iron end increases the output reading, compress the turns. If both ends cause a decrease in output, the coil is correctly tuned. Do not change the coils excessively, since only a small adjustment is required at these frequencies.

Note 7. Make two simple dipole aerials to feed signals from the signal-generator to the radio. Each dipole aerial may consist of two 30-inch lengths of rubber-covered wire. Connect one dipole aerial to terminals 1 and 2 on the FM aerial socket of the radio. Connect the other dipole aerial to the output leads of the signal generator. Place the two dipoles several feet apart.

MODEL 48-1290

STEP	SIGNAL GENERATOR		RADIO		
	CONNECTIONS TO RADIO	DIAL SETTING	PUSH BUTTON	DIAL SETTING	SPECIAL I
1	Through .1-mf. condenser to stator of aerial section of tuning gang.	455 kc.	Depress BC push button, PB-3.	1700 kc.	Adjust each trimme output. Do not re
2	Loosely coupled with loop. See note below.	15 mc.	Depress SW push button, PB-2.	15 mc.	Adjust for maximu be heard with set
3	Same as step 2.	15 mc.	Depress SW push button, PB-2.	15 mc.	Adjust for maxim control).
4	Same as step 2.	1700 kc.	Depress BC push button, PB-3.	1700 kc.	Adjust for maximu
5	Same as step 2.	1500 kc.	Depress BC push button, PB-3.	1500 kc.	Adjust for maximu
6	Same as step 2.	580 kc.	Depress BC push button, PB-3.	580 kc.	Adjust for maxim control).
7	Repeat steps 4, 5, and 6, in order, until no further increase in output is obtained. Then repeat step 4.				

NOTE: Make up a six-to-eight-turn, 6-inch-diameter loop, using insulated wire; connect to the signal-generator leads and plac

FM ALIGNMENT CHART

STEP	SIGNAL GENERATOR		RADIO	
	CONNECTIONS TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTR
1	To terminal 2 of L407 (see figure 4).	9.1 mc.	Gang fully closed.	Connect jumper between osc. and chassis (see Note 1). Co (see Note 2) between top c chassis (see Note 3).
2	Same as step 1.	9.1 mc.	Same as step 1.	Connect loading network b (blue lead), of third i-f tube
3	Same as step 1.	9.1 mc.	Same as step 1.	Connect loading network l (green lead), of third i-f tube
4	Same as step 1.	9.1 mc.	Same as step 1.	Connect loading network b (blue lead), of second i-f tube
5	Same as step 1.	9.1 mc.	Same as step 1.	Connect loading network l (green lead), of second i-f tu
6	Same as step 1.	9.1 mc.	Same as step 1.	Connect loading network b (blue lead), of first i-f tube a
7	Same as step 1.	9.1 mc.	Same as step 1.	Leave loading network conne
8	To grid (pin 6) of third i-f tube.	9.1 mc. (modulation off)	Same as step 1.	Remove loading network, an pin 2 of FM1000 and chassis, tween plate, pin 4 (blue lead) tion of R324 and red lead of for zero beat.
9	Same as step 8.	9.1 mc.	Same as step 1.	Remove jumper used in step for zero beat (see Note 4).
10	To terminal 2 of J400 (see Note 5).	105 mc.	105 mc.	Connect jumper between pi chassis. Adjust for maximu
11	Same as step 10.	88 mc.	88 mc.	Adjust coil L408 for maximun
12	Repeat steps 10 and 11 until no further improvement is noted.			
13	Same as step 10.	105 mc.	105 mc.	Adjust for maximum output
14	See Note 7.	105 mc.	105 mc.	Adjust for maximum output.
15	Same as step 14.	92 mc.	92 mc.	Adjust coil L407, then L406, (see Note 6).
16	Repeat steps 13, 14, and 15 until no further improvement in sensitivity can be obtained.			

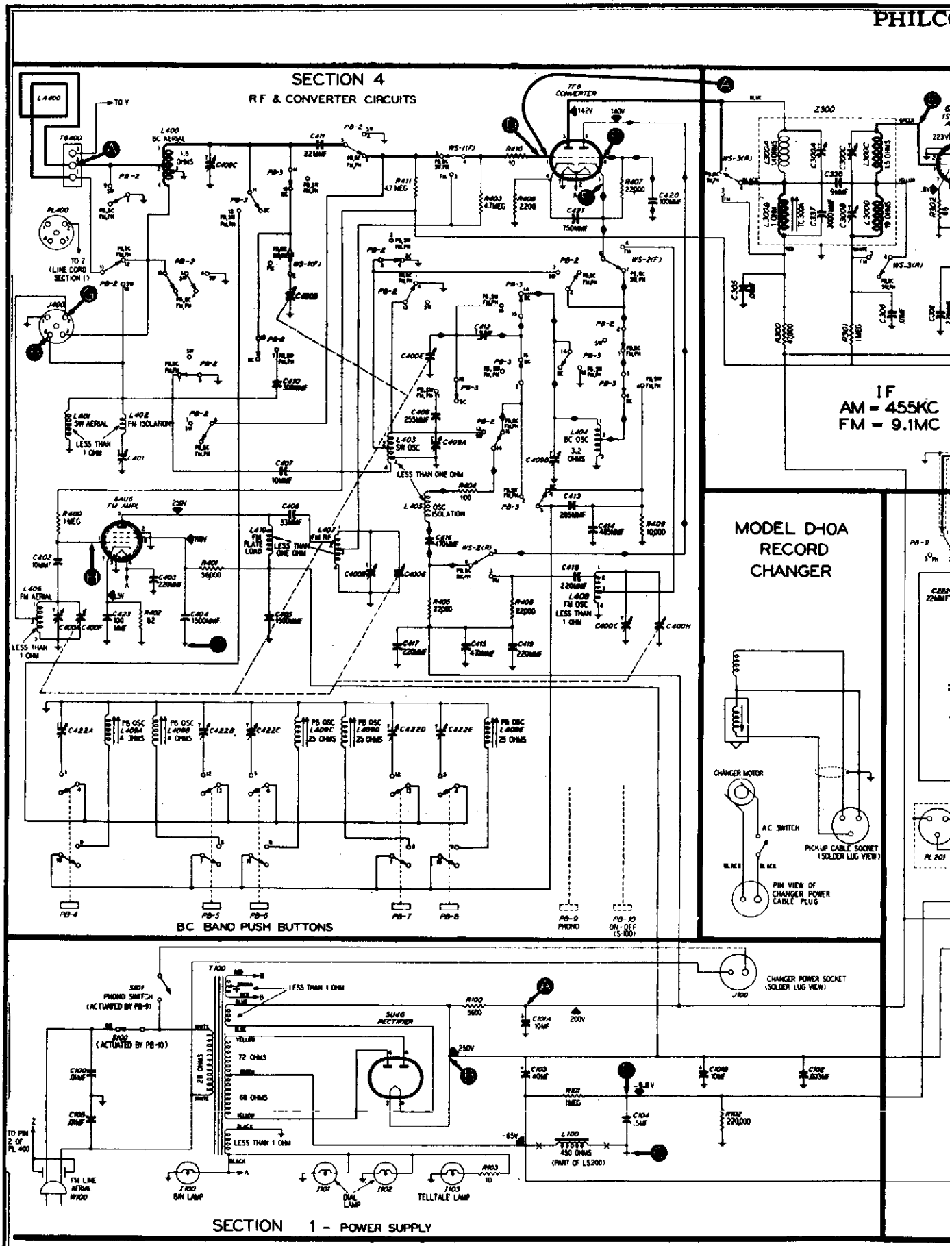
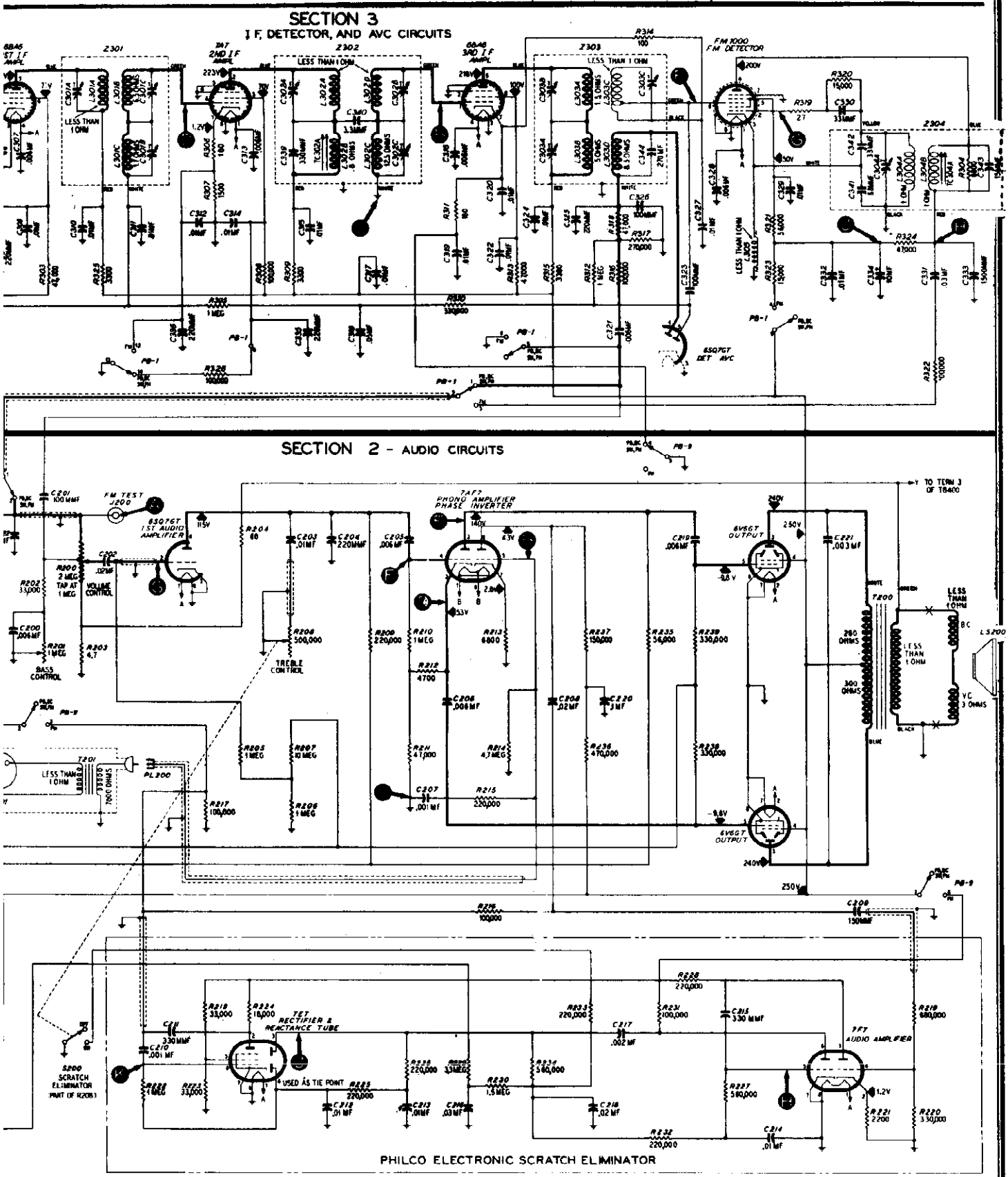


Figure 7. Philco Radio-Phonograph Model 48-129



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90, Sectionalized Schematic Diagram, Showing Test Points

TIONS.	ADJUST
ır, for maximum ıstments.	C303A—4th i-f pri.
	C302C—3rd i-f sec.
	TC302A—3rd i-f pri.
	C301B—2nd i-f sec.
	C300B—1st i-f sec.
	TC300A—1st i-f pri.
Image should › 14.1 mc.	C409A—SW osc.
ıt (rock tuning	C401—SW aerial
	C409B—BC osc. (shunt)
	C409C—BC aerial
ut (rock tuning	C412—BC osc. (series)

ıe radio loop.

AM ALIGNMENT CHART

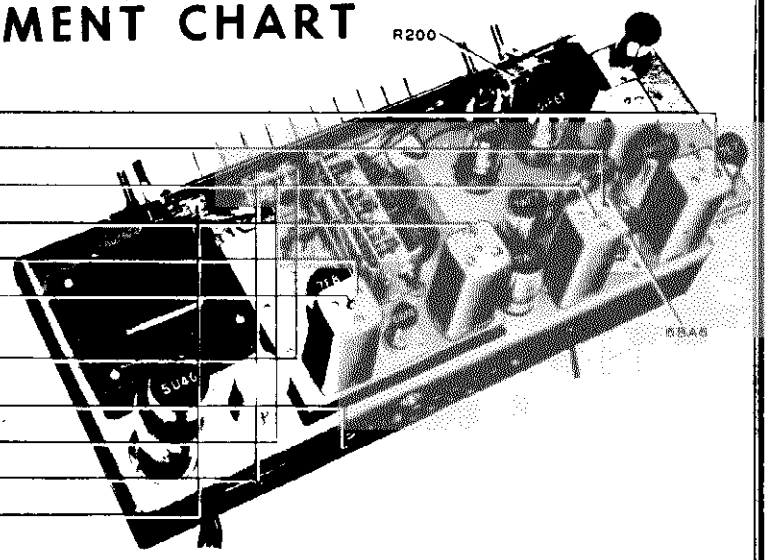


Figure 8. Top View, Showing AM Trimmer Locations

S	ADJUST
2 of FM1000, ding net work r C303C and	C303B—4th i-f pri.
plate pin 2 ıssis.	C303C—4th i-f sec.
grid, pin 6 ıssis.	C302A—3rd i-f pri.
plate, pin 2 ıssis.	C302B—3rd i-f sec.
grid, pin 6 :hassis.	C301A—2nd i-f pri.
plate, pin 2 ıis.	C301C—2nd i-f sec.
n step 6.	C300C—1st i-f sec. C300A—1st i-f pri.
jumper from :t jumper be-)00, and junc- .djust trimmer	C304A—FM det. osc.
ı tuning core	TC304A—FM det. linearity.
FM1000 and	C400C—FM osc.
(see Note 6).	FM osc. tracking.
ıing control).	C400B—FM r-f.
	C400A—FM aerial.
ımum output	FM r-f and aerial tracking.

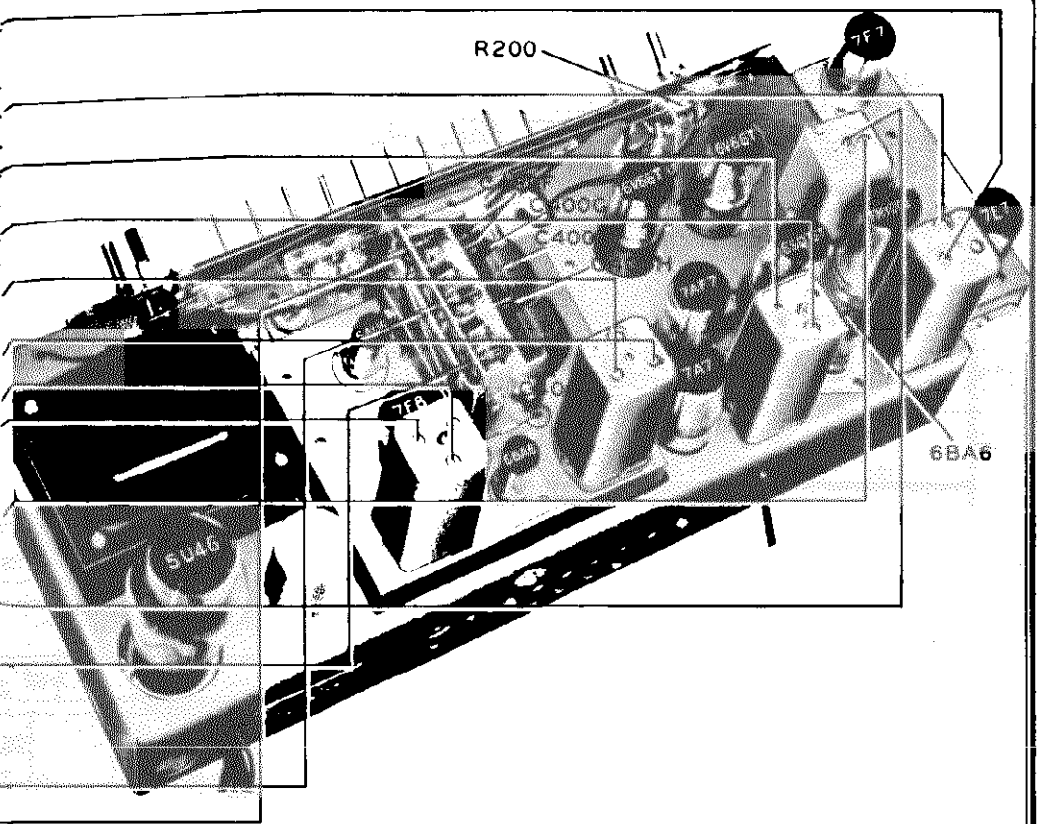


Figure 9. Top View, Showing FM Trimmer Locations

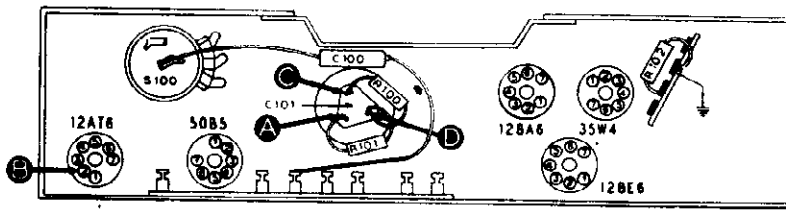
Printed in

Section 1—Power Supply

TROUBLE SHOOTINC

For the tests in this section, use a d-c voltmeter. Connect the negative lead to B–, test point B; connect the positive lead to the test points indicated in the chart. The voltage readings given were taken with a 20,000-ohms-per-volt meter at a line voltage of 117 volts, a.c.

Turn on the power, and set the volume control to minimum.



TP-6923A

Figure 1. Bottom View, Showing Section 1 Test Points

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2 (audio circuits) if not, isolate and correct the trouble in this section.

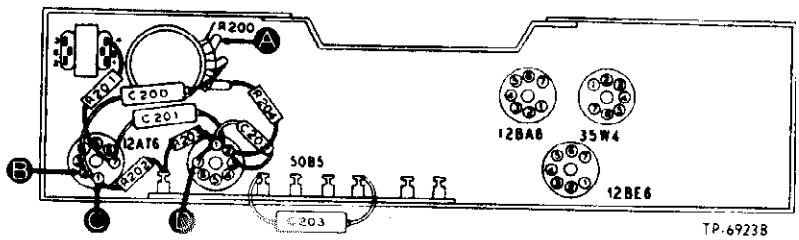
STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	104v		Trouble in this section. Isolate by the following tests.
2	C	133v	No voltage	Defective: 35W4. Open or shorted: C100, C101A, S100, W100.
			Low voltage	Leaky: C101A.
			High voltage	Leaky: C100, C101A.
				Open: R100.
3	D	121v	No voltage	Open or shorted: C101A, C101B. Open: R100.
			Low voltage	Leaky: C101A, C101B.
			High voltage	Open: R101.
4	A	104v	No voltage	Open or shorted: C101C. Open: R101.
			Low voltage	Leaky: C101B.
Listening Test: Abnormal hum may be caused by open or leaky C100, C101A, C101B, C101C.				

Section 2—Audio Circuits

TROUBLE SHOOTINC

For the tests in this section, use an audio-frequency signal generator. Connect the generator ground lead to B–, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum.



TP-6923B

Figure 2. Bottom View, Showing Section 2 Test Points

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 3 (i-f, detector, and a-v-c circuits); if not, isolate and correct the trouble in this section.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with moderate generator input.	Trouble in this section. Isolate by the following tests.
2	D	Same as step 1.	Defective: 50B5, LS200. Shorted: C203, T200. Open: C203, T200, R205.
3	C	Same as step 1.	Defective: 12AT6. Open: C201, R201, R204. Shorted: C202.
4	A	Same as step 1.	Open: C200. Shorted: Z301*.
Listening Test: Distortion may be caused by shorted or leaky C200, C201.			

* This part, located in another section, may cause abnormal indication in this section.

Section 3—I-F, Detector, And A-V-C Circuits

TROUBLE SHOOTING

For the tests in this section, use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to B–, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum.

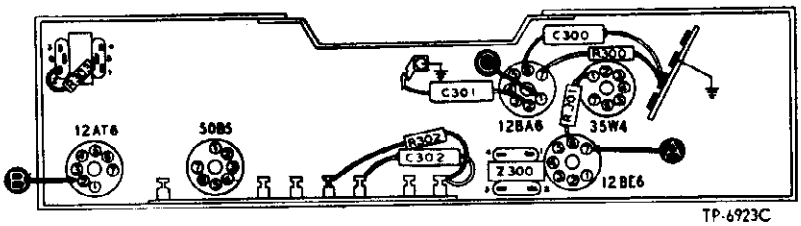


Figure 3. Bottom View, Showing Section 3 Test Points

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 4 (r-f and converter circuits); if not isolate and correct the trouble in this section.

To provide a complete i-f-amplifier check, test point A for this section is placed at the grid of the mixer in Section 4; therefore, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in the mixer circuit. These parts are listed below under the "POSSIBLE CAUSE OF ABNORMAL INDICATION."

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with moderate generator input.	Trouble in this section. Isolate by the following tests.
2	C	Same as step 1.	Defective: 12BA6, 12AT6. Open or shorted: C300, C302, Z301. Open: R301, R304. Misaligned: Z301.
3	A	Same as step 1.	Defective: 12BE6*. Open or shorted: Z300. Misaligned: Z300.

* This part, located in another section, may cause abnormal indication in this section.

Section 4—R-F And Converter Circuits

TROUBLE SHOOTING

For the tests in this section, with the exception of the oscillator test, use an r-f signal generator with modulated output. Connect the generator ground lead to B–, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum. Set the tuning control and the signal-generator frequency as indicated in the chart.

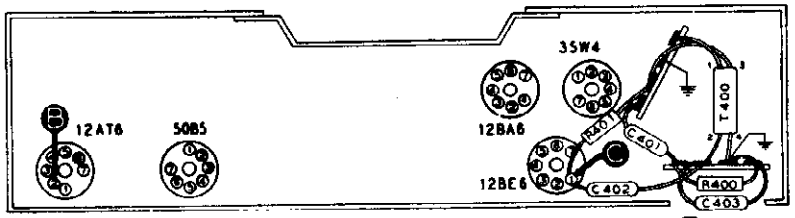
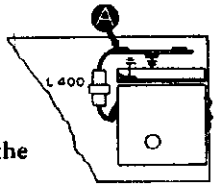


Figure 4. Bottom View, Showing Section 4 Test Points



If the "NORMAL INDICATION" is not obtained in step 1, isolate and correct the trouble in this section. If the trouble is not revealed by the tests for this section, check the alignment.

STEP	TEST POINT	SIG. GEN. FREQ.	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	1000 kc.	1000 kc.	Loud, clear speaker output with weak generator input.	Trouble in this section. Isolate by the following tests.
2	C (Osc. test; see note		Rotate through range.	Negative 3 to 6 volts.	Defective: 12BE6. Open or shorted: C400, C400B, C402, C403, T400.
3	A	1000 kc.	1000 kc.	Same as step 1.	Open: LA400, L400, C401, R400. Shorted: C400, C400A.

OSCILLATOR TEST: Connect the positive lead of a high-resistance voltmeter to B–, test point B; connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the oscillator grid (pin 1 of 12BE6), test point C. Use a suitable meter range, such as 0—10 volts. Proper operation of the oscillator is indicated by negative voltage of approximately the value given in the chart (measured with 20,000-ohms-per-volt meter) throughout the tuning range.

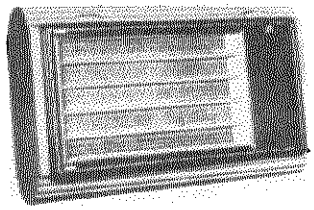
ALIGN

RADIO CONTROLS — Set volume control to maximum. Set tuning control as indicated in chart.

OUTPUT METER — Connect to left-hand terminal on wiring panel and to chassis.

STEP	SIGNAL GENERATOR		RADIO	
	CONNECTION TO RADIO	DIAL	DIAL	SPECIAL INSTRUCTIONS
1	Through .1-mf. condenser to aerial loop.	455 kc.	Tuning condenser fully meshed.	Adjust tuning cores, in order given, for maximum output.
2	Radiating loop. See note below.	1600 kc.	1600 kc.	Adjust trimmer for maximum output.
3	Same as step 2.	1500 kc.	1500 kc.	Adjust trimmer for maximum output.

RADIATING LOOP: Make up a 6—8 turn, 6-inch-diameter loop, using insulated wire; connect to sig leads and place near radio loop aerial. Radio loop aerial must be connected to radio.



MODEL 49-603

SPECIFICATIONS

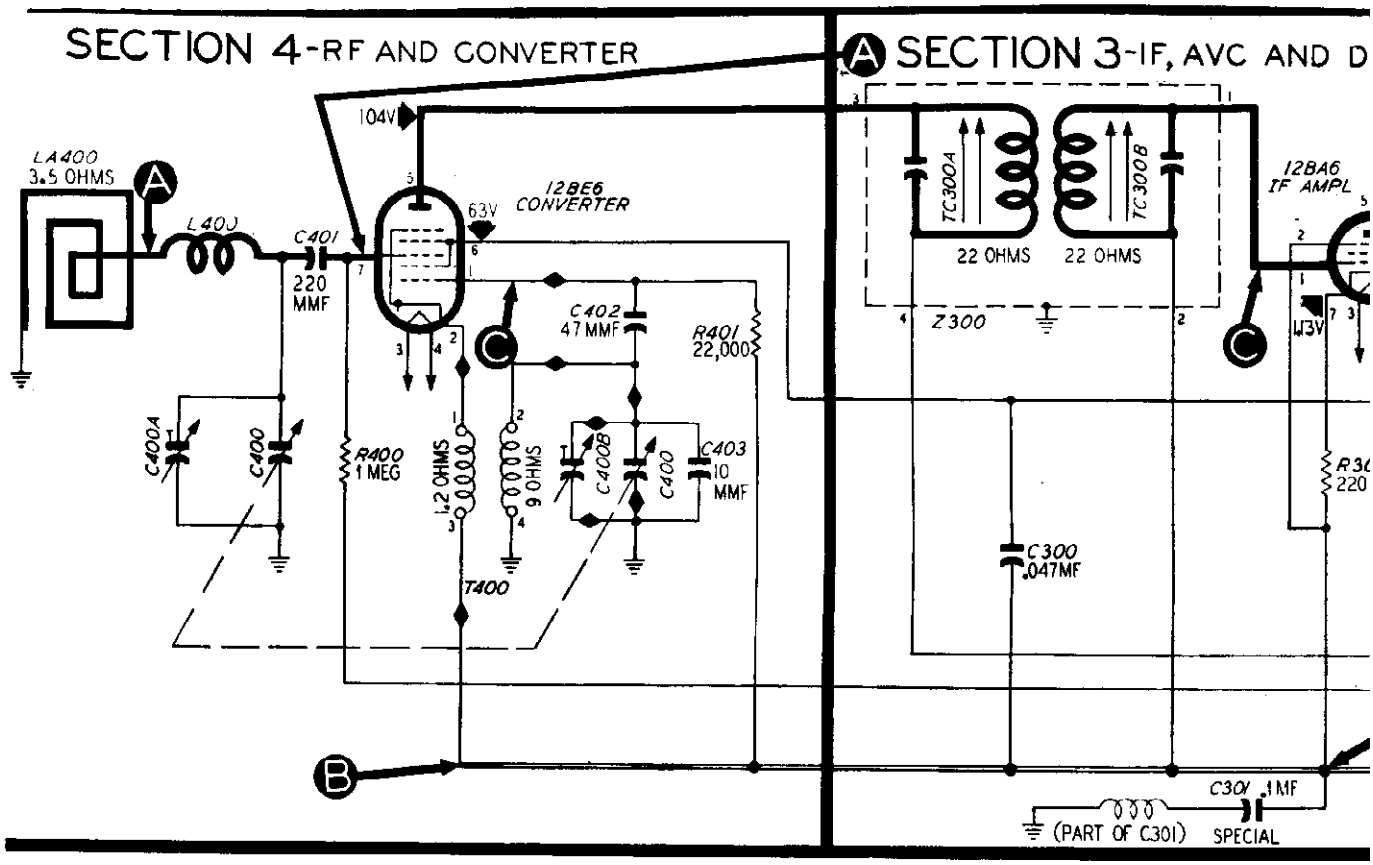
CABINET	Easel style
CIRCUIT	Five-tube superheterodyne
FREQUENCY RANGE	540—1620 kc.
AUDIO OUTPUT	8 watt
OPERATING VOLTAGE	105—120 volts, a.c. or d.c.
POWER CONSUMPTION	30 watts
AERIAL	Built-in high-impedance loop
INTERMEDIATE FREQUENCY	455 kc.
PHILCO TUBES (5)	12BE6, 12BA6, 12AT6, 50B5, 35W4

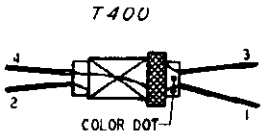
Preliminary Checks

To avoid possible damage to the radio, the followin preliminary checks should be made before it is turne on:

1. Inspect both the top and the bottom of th chassis. Make sure that all tubes are secure in th proper sockets, and look for any broken or shorte connections, burned resistors, or other obvious source of trouble.

2. Measure the resistance between B+ (pin 7 o 35W4) and B– (test point B). When the ohmmete test leads are connected in the proper polarity, the high est resistance reading will be obtained. If the readin is lower than 1000 ohms, check condensers C101A C101B, and C203 for leakage or shorts. The resistanc value given is much lower than normal, and is no intended as a quality check of these condensers; th value given is the lowest at which the rectifier wi operate safely while the voltage checks of Section (power supply) are performed.





RF, IF, AND AUDIO SIGNAL PATH

OSC SIGNAL PATH

ALL RESISTOR VALUES IN OHMS UNLESS MARKED OTHERWISE

INDICATES LESS THAN 1 OHM

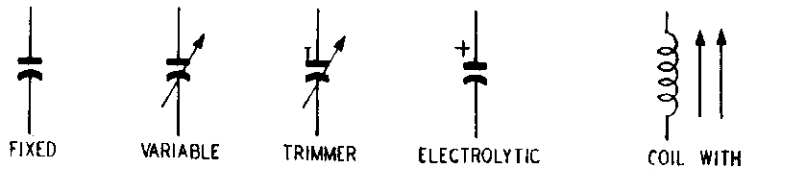
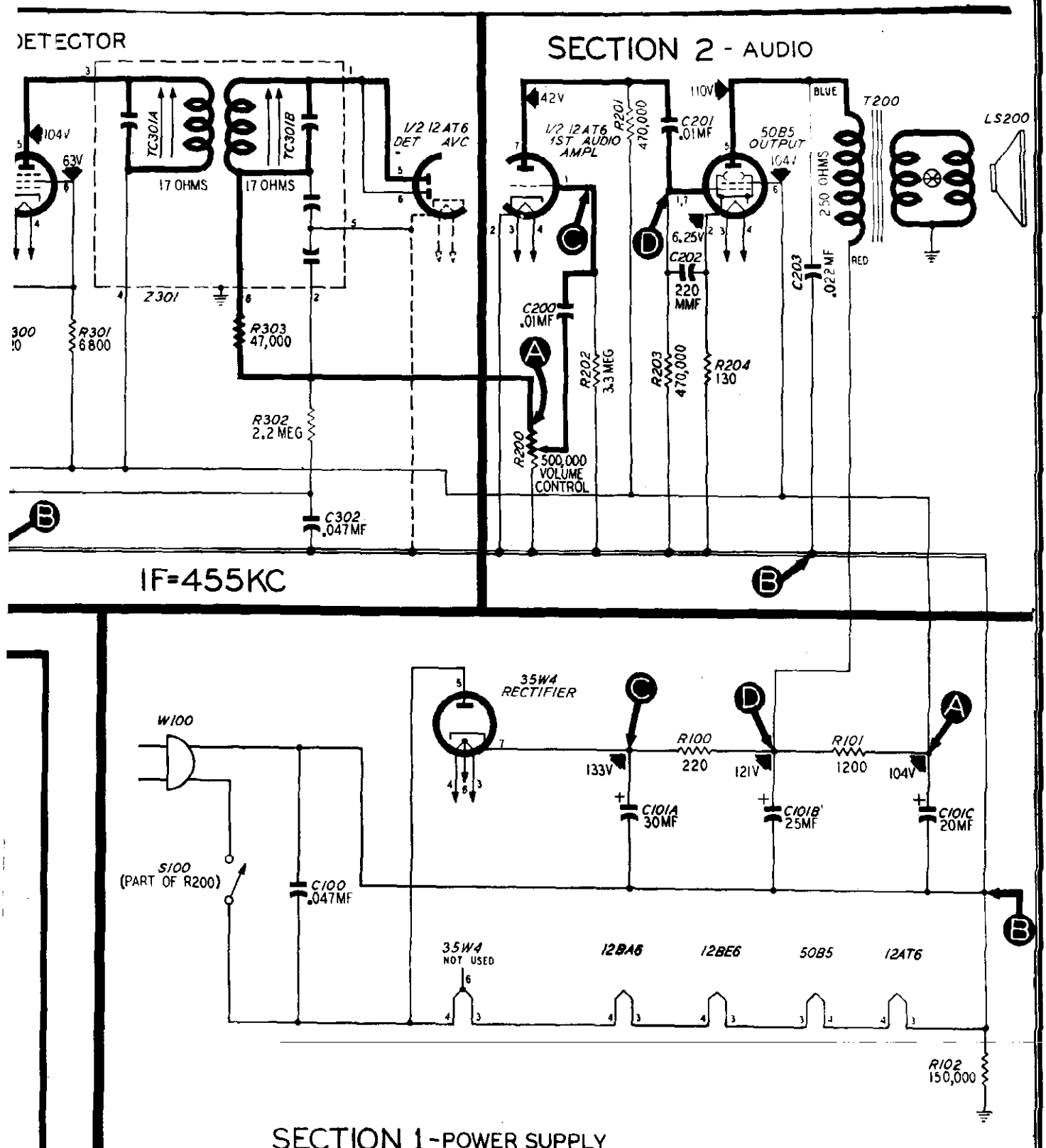


Figure 5. Philco Radio Model 49-603, Sectio

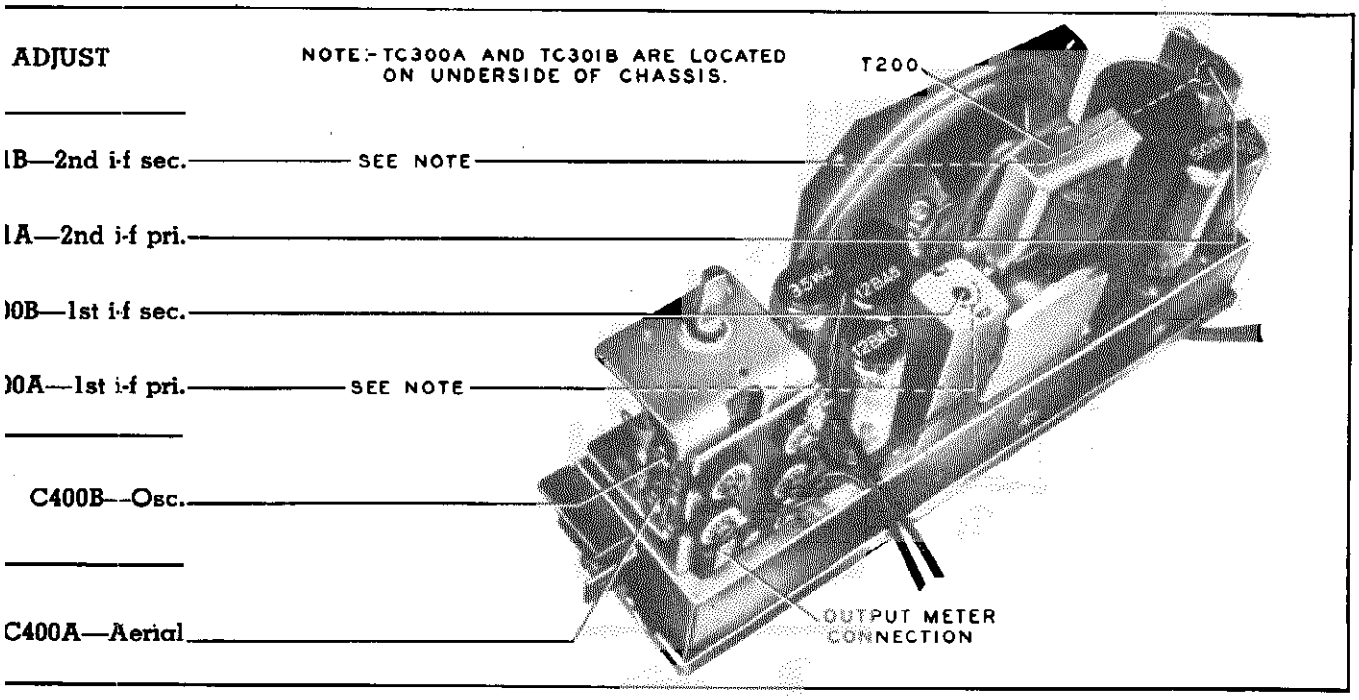


tionalized Schematic Diagram, Showing Test Points

NT PROCEDURE

SIGNAL GENERATOR — Use r-f signal generator, with modulated output. Connect generator and set frequency as indicated in chart.

OUTPUT LEVEL — During alignment, signal-generator output must be attenuated to hold output-meter reading below 1.25 volts.



:nerator

Figure 6. Top View, Showing Trimmer Locations

TP-6620

'cuit Description

'hilco Radio Model 49-603 is a five-tube, manually ed superheterodyne, providing reception on the ıdard broadcast band, 540—1620 kc. A high-im-ance loop within the cabinet normally provides quate signal pickup.

'he converter employs a 12BE6, which provides h-signal-to-noise ratio and high conversion efficiency. : signal from the converter is transformer-coupled ı 12BA6 i-f amplifier. This in turn is transformer-pled to a 12AT6 tube, one-half of which functions the detector and supplies a-v-c voltage. Both i-f ısformers have permeability-tuned primary and sec-ary windings.

'he other half of the type 12AT6 is used as a first io amplifier, which is resistance-coupled to the 50B5 ɔut tube. The 50B5 is transformer-coupled to the l-speaker.

he d-c operating voltages are supplied by a type 74 rectifier through a resistance-condenser network.

150,000-ohm resistor is connected between B– and chassis to prevent hum which might otherwise occur er conditions of high humidity.

C301 is a special condenser, inductively wound to act as a series-resonant circuit at the 455-kc. intermediate frequency. This condenser provides an exceptionally low-impedance i-f by-pass between B– and the chassis.

REPLACEMENT PARTS LIST

NOTE: Part numbers marked with an asterisk (*) are general replacement items. These numbers may not be identical with those on factory assemblies; also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

SECTION 1
POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, line filter, .047 mf.	61-0179*
C101	Condenser, electrolytic, 3-section	30-2573
C101A	Condenser, filter, 30 mf.	Part of C101
C101B	Condenser, filter, 25 mf.	Part of C101
C101C	Condenser, filter, 20 mf.	Part of C101
R100	Resistor, filter, 220 ohms	66-1224340*
R101	Resistor, filter, 1200 ohms	66-2123340*
R102	Resistor, leakage, 150,000 ohms	66-4153340*
S100	Switch, power on-off	Part of R200
W100	Line cord	L2183*

SECTION 2
AUDIO CIRCUITS

C200	Condenser, d-c blocking, .01 mf.	61-0120*
C201	Condenser, d-c blocking, .01 mf.	61-0120*
C202	Condenser, parasitic suppressor, 220 mmf.	30-1224-20*
C203	Condenser, tone compensation, .022 mf.	61-0108*
LS200	Loud-speaker, permanent-magnet type	36-1627-4
R200	Volume control, 500,000 ohms	66-4503340*
R201	Resistor, plate dropping, 470,000 ohms	66-4473340*
R202	Resistor, grid return, 3.3 megohms	66-5333340*
R203	Resistor, grid return, 470,000 ohms	66-4473340*
R204	Resistor, bias, 130 ohms	66-1123340*
T200	Transformer, output	Part of LS200

SECTION 3
I-F, DETECTOR, AND A-V-C CIRCUITS

C300	Condenser, screen by-pass, .047 mf.	61-0179*
C301	Condenser, special i-f by-pass, .1 mf.	30-4644-1
C302	Condenser, r-f by-pass, .047 mf.	61-0179*
R300	Resistor, bias, 220 ohms	66-1223340*
R301	Resistor, screen dropping, 6800 ohms	66-2863340*

SECTION 3 (Continued)
I-F, DETECTOR, AND A-V-C CIRCUITS

Reference Symbol	Description	Service Part No.
R302	Resistor, a-v-c filter, 2.2 megohms	66-5223340
R303	Resistor, diode load, 47,000 ohms	66-3473340
Z300	Transformer, 1st i-f	32-4160-6
Z301	Transformer, 2nd i-f	32-4240

SECTION 4
R-F AND CONVERTER CIRCUITS

C400	Condenser, tuning gang	31-2735
C400A	Condenser, r-f tracking	Part of C400
C400B	Condenser, oscillator tracking	Part of C400
C401	Condenser, blocking, 220 mmf.	30-1224-1
C402	Condenser, isolating, 47 mmf.	30-1224-2
C403	Condenser, r-f by-pass, 10 mmf.	30-1224-26
LA400	Loop, aerial	32-4325
L400	Coil, loading	32-4007-2
R400	Resistor, grid return, 1 megohm	66-5103340
R401	Resistor, oscillator grid, 22,000 ohms	66-3223340
T400	Transformer, oscillator	32-4326

MISCELLANEOUS

Description	Service Part No.
Back-panel assembly	76-4229
Button-and-spring assembly	76-4322
Button-and-spring assembly	76-4322-1
Cabinet (complete)	76-4355
Baffle-and-cloth assembly	40-7589
Front-panel assembly	76-4228
Hinge assembly	46-6450
Screw	W2537-5FA3
Socket, miniature	27-6203
Spring, aerial ground	56-6432
Wiring panel	38-5083-10

Section 1 TROUBLE SHOOTING

For the tests in this section, use a d-c voltmeter. Connect the negative lead to the B– bus, test point B; connect the positive lead to the test points indicated in the chart. The voltage readings given were taken with a 20,000-ohms-per-volt meter, at a line voltage of 117 volts, a.c.

Turn the power switch "on," and set the volume control to minimum.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2; if not, isolate and correct the trouble in this section.

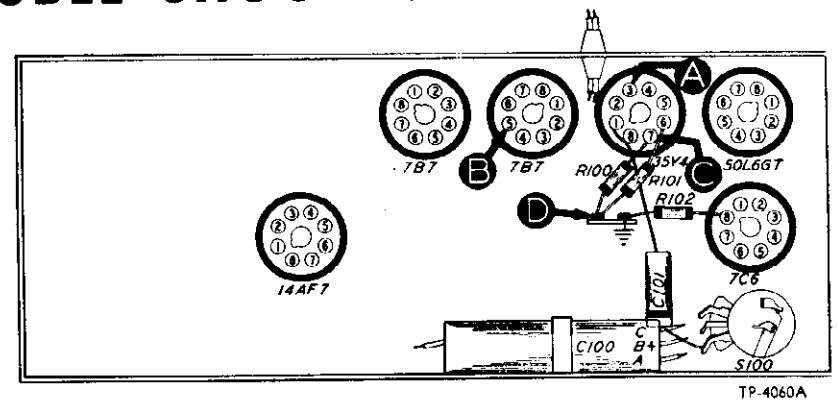


FIGURE 1. BOTTOM VIEW, SHOWING SECTION 1 TEST POINTS

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	98 volts		Trouble within this section. Isolate by the following tests.
2	C	131 volts	No voltage. Low voltage. High voltage.	Defective: 35Y4, W100, S100. Shorted: C100A. Defective: 35Y4. Open: C100A, I100. Leaky: C100A. Open: R100.
3	D	118 volts	No voltage. Low voltage. High voltage.	Shorted: C100B. Leaky: C100B, C100C, C203*. Open: R101, T200*, R204*.
4	A	98 volts	No voltage. Low voltage. High voltage.	Shorted: C100C. Open: R101. Leaky: C100C. Open: R204*.
Listening Test: Abnormal hum may be caused by open C100A, C100B, C100C, or R102.				

* This part, located in another section, may cause abnormal indication in this section.

Section 2 TROUBLE SHOOTING

For the tests in this section, use an audio-frequency signal generator. Connect the generator ground lead to B–, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the radio volume control to maximum. Adjust the signal-generator output as required for each step.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 3. If not, isolate and correct the trouble in this section.

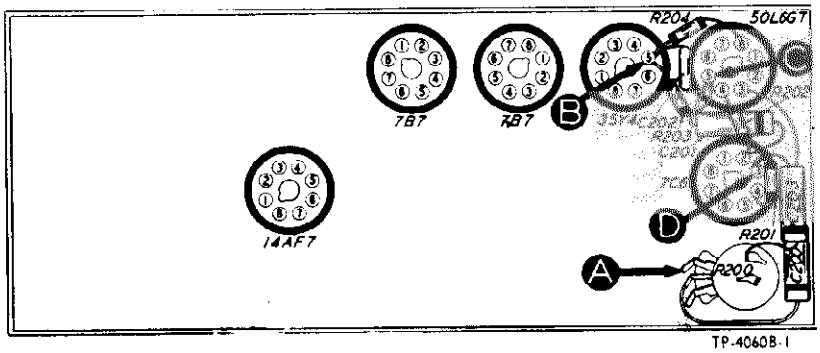


FIGURE 2. BOTTOM VIEW, SHOWING SECTION 2 TEST POINTS

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble within this section. Isolate by the following tests.
2	C	Clear signal with strong signal input.	Defective: 50L6GT, T200, LS200. Shorted or leaky: C203, C202. Open: R204, R203.
3	D	Same as step 1.	Defective: 7C6. Shorted or leaky: C201. Open: R201, R202, C201.
4	A	Same as step 1. Note: Rotate R200 through range.	Defective: R200. Shorted or leaky: C200. Open: R201, C200.
Listening Test: Distortion on strong signals may be caused by leaky C200 or open R201.			

Section 3 TROUBLE SHOOTING

For the tests in this section, use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to B–, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the radio volume control to maximum.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 4; if not, isolate and correct the trouble in this section.

Since the circuit location of test point A for this section is the same as that of test point C for Section 4, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in Section 4; these parts are listed under "POSSIBLE CAUSE OF ABNORMAL INDICATION."

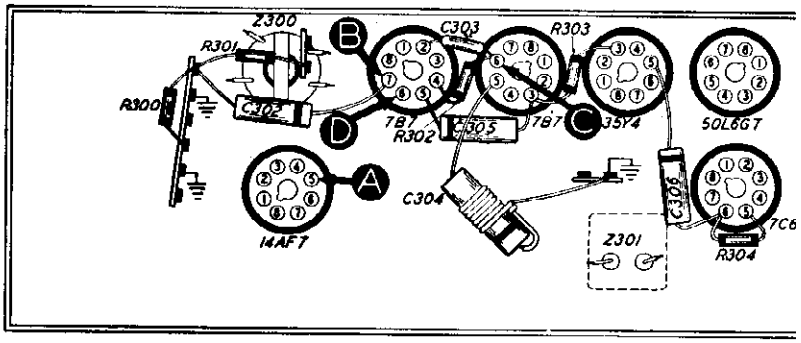


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FIGURE 3. BOTTOM VIEW, SHOWING SECTION 3 TEST POINTS

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble within this section. Isolate by the following tests.
2	C	Loud, clear signal with strong signal input.	Defective: 7B7 (2nd i.f.), 7C6 (diode section), Z301. Shorted or leaky: C305. Open: R303. Misaligned: Z301.
3	D	Loud, clear signal with moderate signal input.	Defective: 7B7 (1st i.f.). Shorted or leaky: C303, C302. Open: R301, R302, R300, C303, C302.
4	A	Loud, clear signal with weak signal input.	Defective: 14AF7*, Z300. Open: R401*, R403*, C306. Shorted or leaky: C306. Misaligned: Z300.

* This part, located in another section, may cause abnormal indication in this section.

Section 4 TROUBLE SHOOTING

For the tests in this section, use an r-f signal generator, with modulated output. Connect the generator ground lead to B–, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the radio volume control to maximum.

If the "NORMAL INDICATION" is not obtained in step 1, isolate the trouble by following the remaining steps.

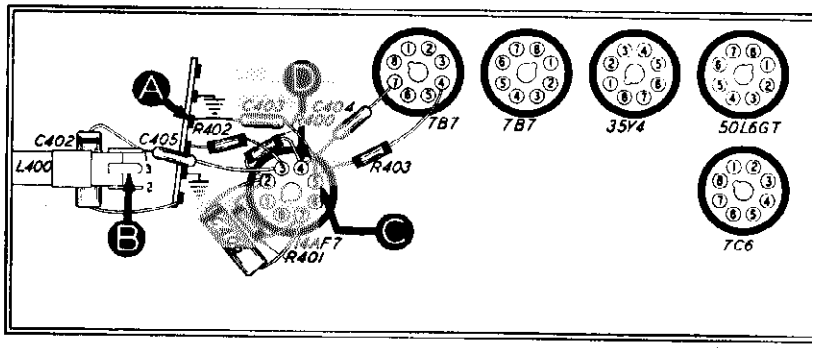

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FIGURE 4. BOTTOM VIEW, SHOWING SECTION 4 TEST POINTS (LOCATION OF C401 SHOWN IN FIGURE 6)

STEP	TEST POINT	DIAL SETTINGS		NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
		SIG. GEN.	RADIO		
1	A	540 kc.	540 kc.	Loud, clear signal with weak signal input.	Trouble within this section. Isolate by the following tests.
2	C	540 kc.	540 kc.	Same as step 1.	Defective: 14AF7. Open: C406, R402. Trouble in oscillator circuit. See step 3.
3	D Osc. Test (See note below.)		540 kc. to 1620 kc.	Negative voltage 1.6 volts to 1.8 volts.	Defective: L400. Open: R400, R402, C405, C404, C400A. Shorted: C402, C400, C405, C404, C400A.
4	A	540 kc.	540 kc.	Same as step 1.	Defective: LA400, C400, C400B. Open or shorted: C403.

OSCILLATOR TEST: Connect positive lead of a high-resistance voltmeter to B–, test point B; connect prod end of negative lea through a 100,000-ohm isolating resistor to 14AF7 oscillator grid, test point D. Use a suitable range, such as 0–10 volts. Prope operation of oscillator is indicated by negative voltage of 1.6v to 1.8v (measured with 20,000-ohms-per-volt meter) throughout rang of tuning condensers.

REPLACEMENT PARTS LIST

NOTE

Part numbers marked with an asterisk (*) are general replacement items. These numbers may not be identical with those on factory assemblies; also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

SECTION 1
POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, electrolytic, 3-section	30-2570-14
C100A	Condenser, filter, 30 mf.	Part of C100
C100B	Condenser, filter, 25 mf.	Part of C100
C100C	Condenser, filter, 20 mf.	Part of C100
C101	Condenser, line filter, .04 mf.	30-4118
I100	Panel lamp	34-2068
R100	Resistor, filter, 220 ohms	66-1224340*
R101	Resistor, filter, 1200 ohms	66-2123340*
R102	Resistor, leakage, 150,000 ohms	66-4153340*
S100	Switch, a-c power	Part of R200
W100	Power cord and plug	L2183*

SECTION 2
AUDIO CIRCUITS

C200	Condenser, coupling, .01 mf.	61-0120*
C201	Condenser, coupling, .01 mf.	61-0120*
C202	Condenser, by-pass, 220 mmf.	62-122001001*
C203	Condenser, plate, .02 mf.	30-4598*
LS200	Loud-speaker	36-1615
R200	Volume control (with a-c power switch), 500,000 ohms	33-5491
R201	Resistor, grid load, 3.3 megohms	66-5333340*
R202	Resistor, plate load, 470,000 ohms	66-4473340*
R203	Resistor, grid leak, 470,000 ohms	66-4473340*
R204	Resistor, bias, 130 ohms	66-1123340*
T200	Transformer, output	Part of LS200

SECTION 3
I-F, DETECTOR, AND A-V-C CIRCUITS

C300A	Condenser, trimmer	Part of Z300
C300B	Condenser, trimmer	Part of Z300
C301A	Condenser, trimmer	Part of Z301
C301B	Condenser, trimmer	Part of Z301
C301C	Condenser, i-f by-pass	Part of Z301
C301D	Condenser, i-f by-pass	Part of Z301
C302	Condenser, by-pass, .003 mf.	30-4582*
C303	Condenser, coupling, 220 mmf.	62-122001001*
C304	Condenser-and-choke assembly, .2 mf.	30-4584
C305	Condenser, screen by-pass, .05 mf.	30-4510*
C306	Condenser, a-v-c by-pass, .05 mf.	30-4510*
R300	Resistor, dropping, 2200 ohms	66-2223340*
R301	Resistor, plate load, 15,000 ohms	66-3153340*
R302	Resistor, grid load, 150,000 ohms	66-4153340*
R303	Resistor, screen, 33,000 ohms	66-3333340*
R304	Resistor, a-v-c, 2.2 megohms	66-5223340*
R305	Resistor, diode load, 47,000 ohms (part of Z301)	66-3473340*

SECTION 3 (Continued)
I-F, DETECTOR, AND A-V-C CIRCUITS

Reference Symbol	Description	Service Part No.
Z300	Transformer, 1st i-f, including C300A and C300B	32-4151
Z301	Transformer, 2nd i-f, including R305, C301A, C301B, C301C and C301D	32-4152

SECTION 4
R-F AND CONVERTER CIRCUITS

C400	Condenser, tuning, 2-section	31-2727
C400A	Condenser, trimmer	Part of C400
C400B	Condenser, trimmer	Part of C400
C401	Condenser, series blocking, .0015 mf.	30-4621*
C402	Condenser, isolating, .04 mf.	45-3500-2*
C403	Condenser, coupling, 470 mmf.	62-147001001*
C404	Condenser, osc. grid, 100 mmf.	30-1225-2
C405	Condenser, osc. plate, 220 mmf.	62-122001001*
C406	Condenser, by-pass, .05 mf.	30-4510*
L400	Coil, oscillator	32-4153
LA400	Loop aerial	32-4052-14
R400	Resistor, oscillator grid, 47,000 ohms	66-3473340*
R401	Resistor, bias, 2200 ohms	66-2223340*
R402	Resistor, dropping, 10,000 ohms	66-3103340*
R403	Resistor, grid, 2.2 megohms	66-5223340*

MISCELLANEOUS

Description	Service Part No.
Cabinet (less scale)	
49-900-E	10629D
49-900-I	10629C
Back, Cabinet	
49-900-E	54-7096
49-900-I	54-7097
Clip, scale mounting	56-3290
Fastener, cabinet back	56-2726FA9
Pointer	54-4253
Pointer bracket and arm assembly	75-1654-2
Spring, pointer bracket	56-3859
Scale, dial	
49-900-E	27-5916-2
49-900-I	27-5916-3
Cord, pointer drive (25-ft. spool)	45-8760*
Cord, tuning-condenser drive (25-ft. spool)	45-8750*
Knob	
49-900-E	54-4218-1
49-900-I	54-4218
Socket assembly, pilot lamp	76-1981
Socket, loktal	27-6177*
Socket, octal	27-6174*
Spring, tuning-condenser drive cord	56-2617
Shaft, tuning	56-3031FA11
Bushing	27-9437
Retaining spring	57-1468FA3

MODELS 49-900E, 49-900I

ALIGNME

SET RADIO

OUTPUT LEVEL—During alignment, adjust signal-generator output to maintain an output-meter indication below 1.25 volts.

SIGNAL GENERATOR—Connect as indicated in Use modulated output.

STEP	SIGNAL GENERATOR		RADIO		A
	CONNECTIONS TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1				Turn C300B down tight.	
2	(Chassis out of cabinet). Ground lead to B–; output lead through .1-mf. condenser to test point C, Section 4.	455 kc.	540 kc.	Adjust trimmers, in the order given for maximum output.	
3	(Chassis in cabinet). Radiating loop. (See note below.)	1600 kc.	1600 kc.	Adjust for maximum output.	
4	Same as step 3.	1500 kc.	1500 kc.	Adjust for maximum output.	

RADIATING LOOP: Make up a six-to-eight-turn, 6-inch-diameter loop, using insulated wire; connect to signal-generator le place near radio loop.

Circuit Description

Philco Models 49-900-E and 49-900-I are six-tube table-model superheterodyne radios, providing reception in the standard broadcast band. The two models are identical except for the cabinets.

The high-impedance loop aerial normally provides adequate signal pickup. If greater pickup is required, an external aerial may be connected.

The loop works into a 14AF7 converter. Variable condenser tuning is used. The two i-f stages employ 7B7 pentode tubes. To obtain good stability, resistance coupling is employed between the first and second i-f tubes. One diode (pin 5) of the 7C6 provides detection and a-v-c voltage. The triode section of this tube functions as the first audio amplifier, and is resistance-coupled to the 50L6GT output tube. The speaker is a permanent-magnet dynamic. The power supply employs a 35Y4, working into a resistance-capacitance filter system.

The 150,000-ohm resistor R102, connected between B– bus and chassis, prevents the hum which might otherwise occur under conditions of high humidity.

The series-resonant circuit, C304, functions as a by-pass of exceptionally low impedance; C304 is resonant at the i.f., 455 kc.

Philco TROUBLE-SHOOTING *Procedure*

For rapid trouble shooting, the radio circuit is divided into four sections, with test points specified for each section; these sections and test points are indicated in the schematic diagram. The trouble-shooting procedure given for each section includes a simplified test chart and a bottom view of the chassis showing the lo tions of the test points and components of that secti

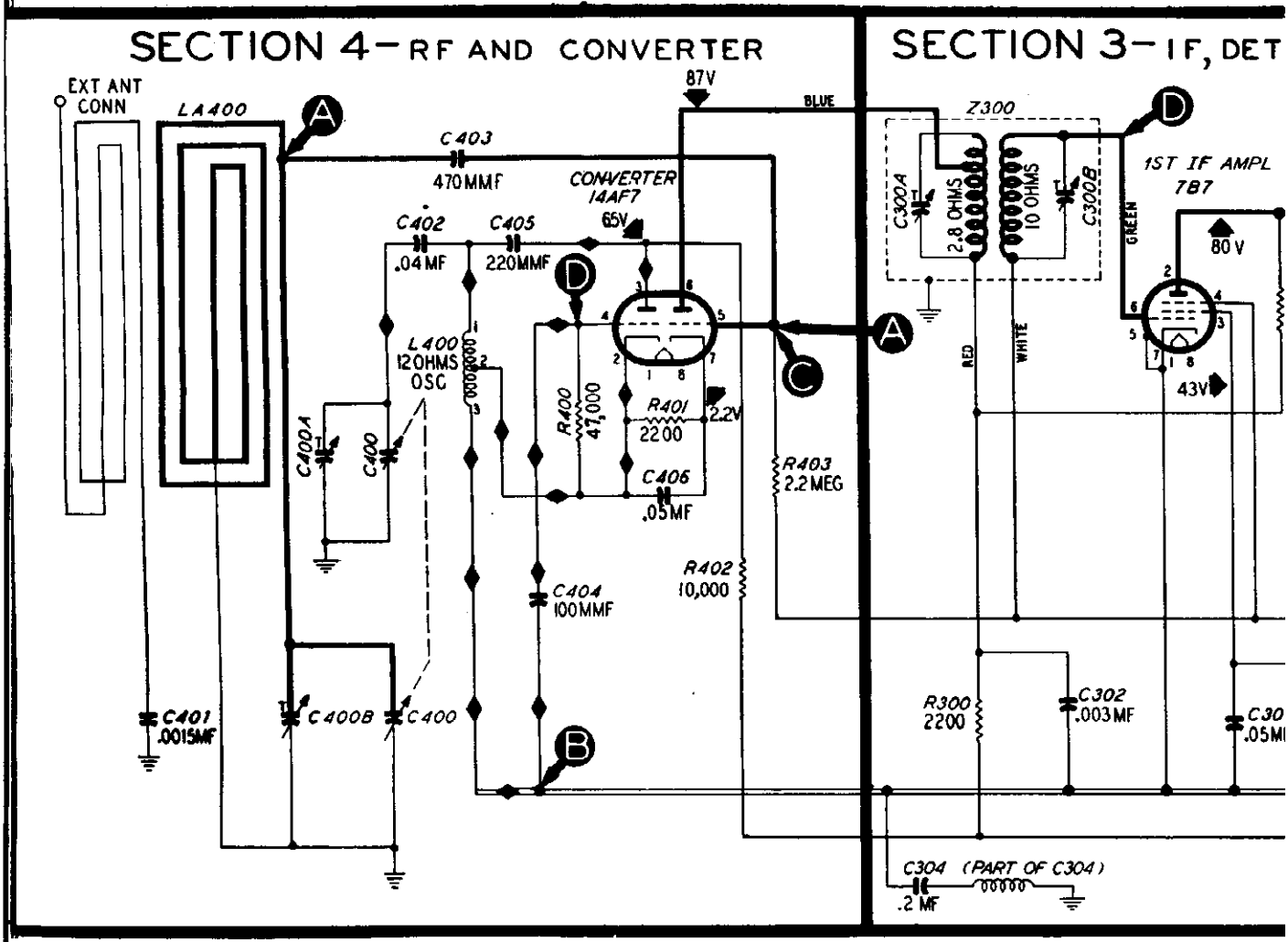
In each chart, the first step is a master check determining whether trouble exists in that section, wi out going through the entire test procedure.

Failure to obtain the "NORMAL INDICATION" any given step indicates trouble within the circuit un test.

After isolating the trouble to a single stage, defect is located by: first, testing the tube; seco measuring the tube-electrode voltages; third, measuri circuit resistances; fourth, substituting condensers. T trouble revealed should be corrected before testing f ther.

SPECIFICATIONS

CABINET	
Model 49-900-E	Plastic, ebony
Model 49-900-I	Plastic, ivory
CIRCUIT	6-tube superheterodyne
FREQUENCY RANGE	540—1620 kc.
AUDIO OUTPUT	1 watt
OPERATING VOLTAGE	105—120 volts, a.c. or d.c.
POWER CONSUMPTION	30 watts
AERIAL	Built-in loop; terminal also provided for external aerial
INTERMEDIATE FREQUENCY	455 kc.
PHILCO TUBES (6)	14AF7, 7B7 (2), 7C6, 50L6GT, 35Y4



Preliminary Checks

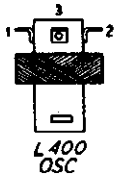
To avoid possible damage to the radio, the following preliminary checks should be made before turning on the power:

1. Inspect both top and bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, or other obvious sources of trouble.

2. Measure the resistance between B+ (pin 7 of 35Y4 rectifier tube) and B– (test point B). When the ohmmeter test leads are connected in proper polarity, the highest resistance reading will be obtained. If the reading is lower than 1500 ohms, check condensers C100A, C100B, and C100C for leakage or shorts.

This resistance value, which is much lower than normal, is not intended as a quality check of these condensers; the value given is the lowest at which the rectifier will operate safely while the voltage tests of Section 1 are performed.

VOLTAGES WERE MEASURED BETWEEN THE POINTS INDICATED AND B-, USING A 20,000-OHMS-PER-VOLT METER WITH AN INPUT OF 117 V A C



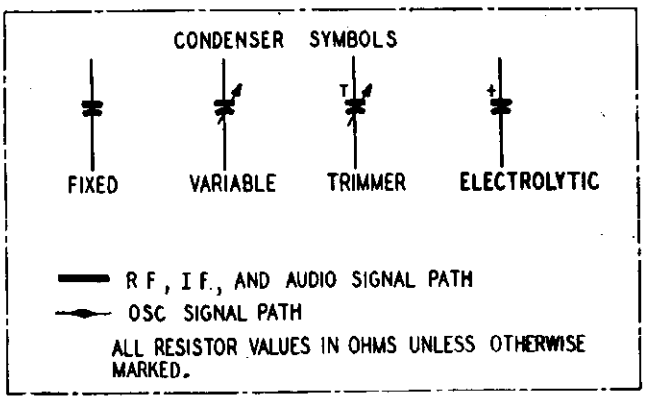
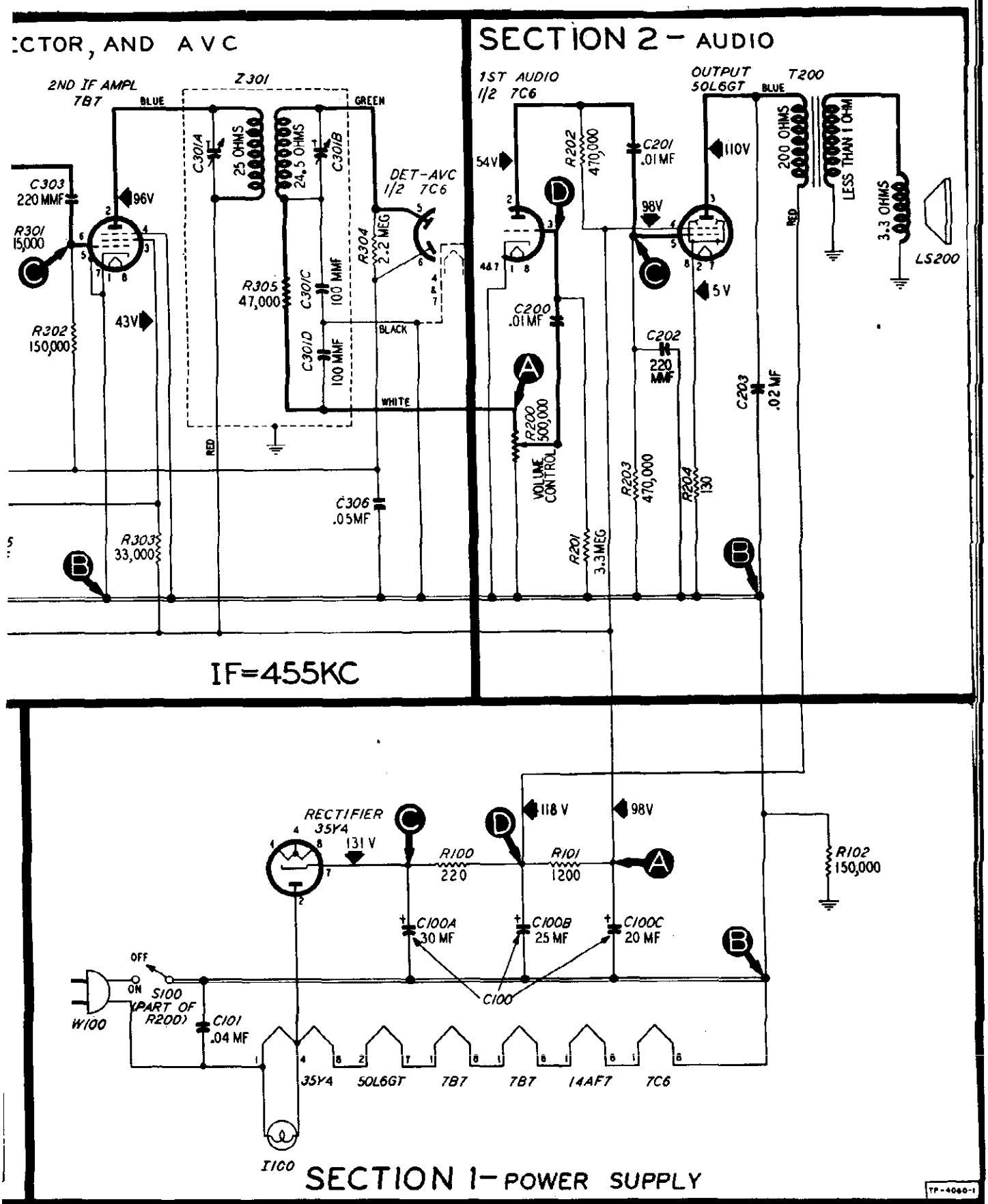


FIGURE 5. PHILCO RADIO, MODELS 49-900-E AND 49-900-I, S



SECTIONALIZED SCHEMATIC DIAGRAM, SHOWING TEST POINTS

PROCEDURE

E CONTROL TO MAXIMUM

DIAL POINTER—Turn tuning condensers to full-mesh position. Adjust dial pointer to coincide with index dot, located to left of "55."

OUTPUT METER—Connect to left-hand (output) and center (chassis) lug of terminal panel, shown in Figure 6.

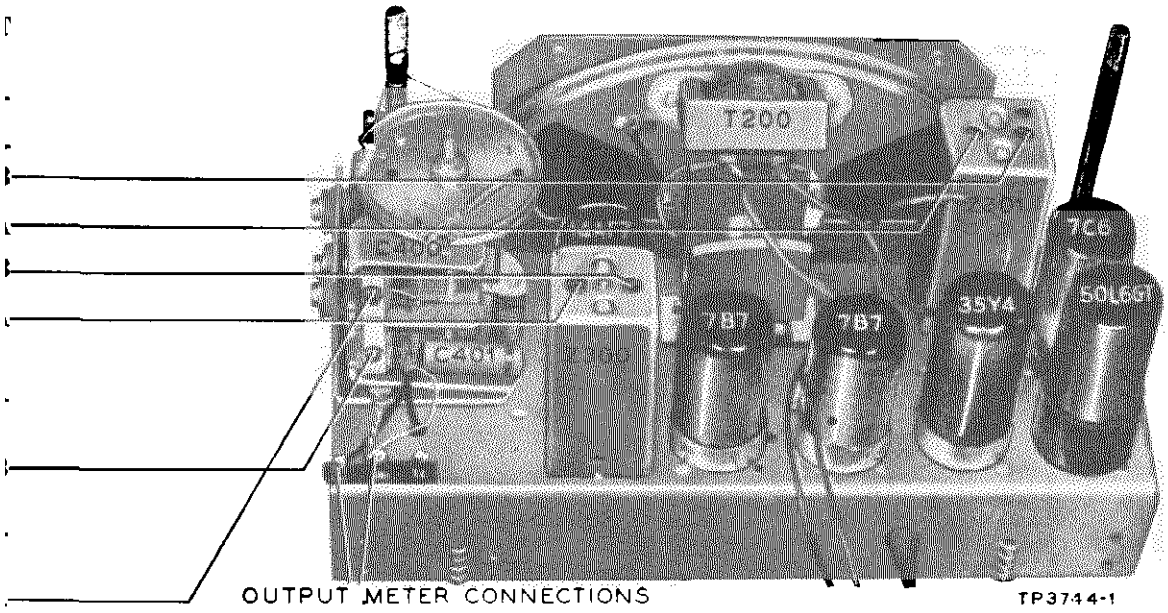


FIGURE 6. TOP VIEW, SHOWING TRIMMER LOCATIONS

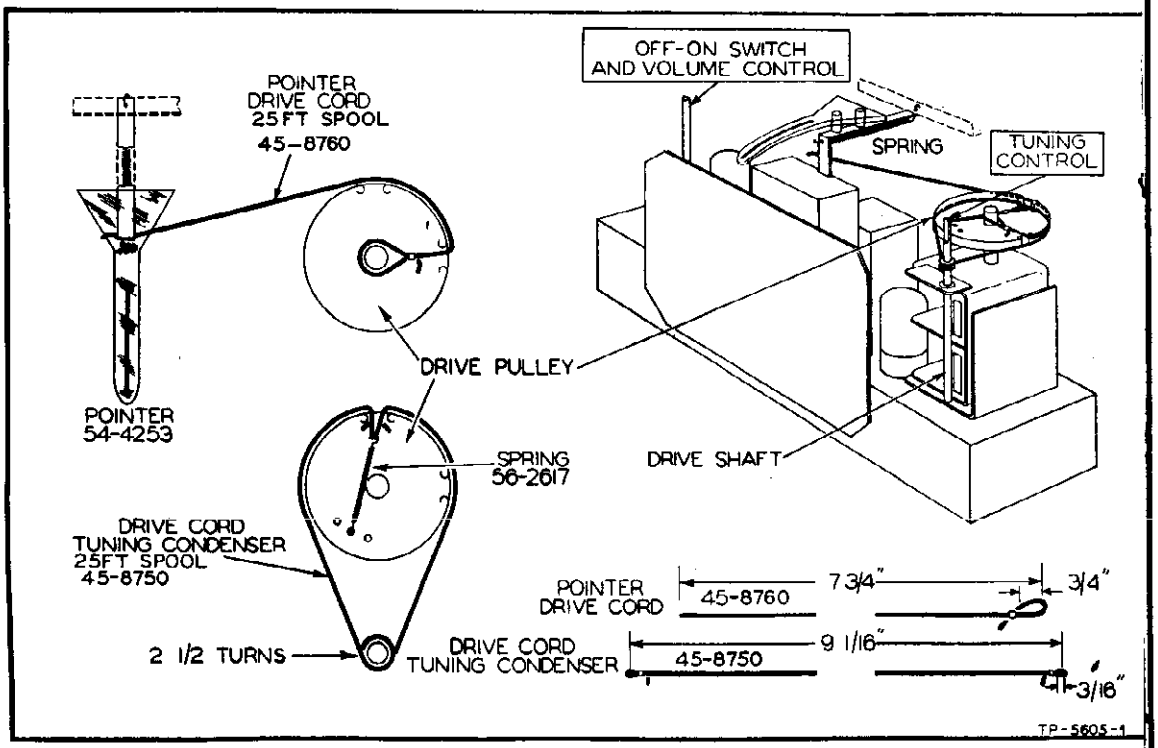


FIGURE 7. DRIVE-CORD INSTALLATION DETAILS

TROUBLE SHOOTING

Section 1

Power Supply

For the tests in this section, use a d-c voltmeter. Connect the negative lead to B—, test point B; connect the positive lead to the test points indicated in the chart. The voltage readings given were taken with a 20,000-ohms-per-volt meter at a line voltage of 117 volts, a.c.

Turn on the power, and set the volume to minimum.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2 (audio circuits); if not, isolate and correct the trouble in this section.

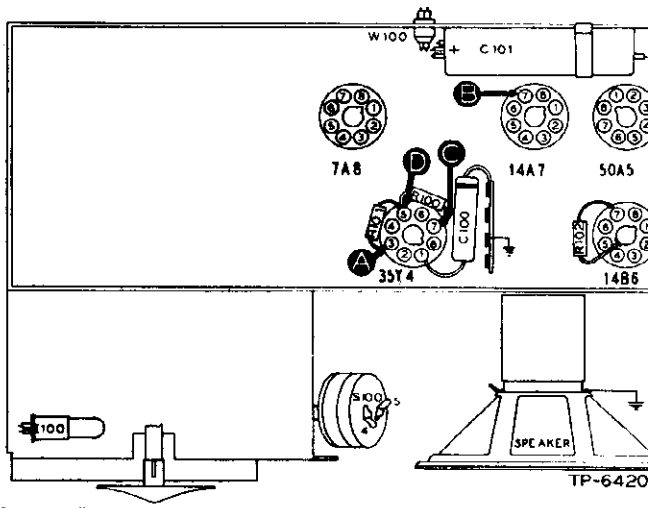


Figure 1. Bottom View, Showing Section 1 Test Poi

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	100 volts		Trouble within this section. Isolate by the following tests.
2	C	124 volts	No voltage	Defective: 35Y4. Open: W100, S100. Shorted: C101A.
			Low voltage	Leaky: C101A. Open: C101A.
			High voltage	Open: R100.
3	D	111 volts	No voltage	Shorted: C101B. Open: R100.
			Low voltage	Leaky: C101A, C101B. Shorted: C203*.
			High voltage	Open: R101, T200*, R204*.
4	A	100 volts	No voltage	Shorted: C101C. Open: R101.
			Low voltage	Leaky: C101C.

Listening Test: Abnormal hum may be caused by open C101A, C101B, or C101C.

* This part, located in another section, may cause abnormal indication in this section.

TROUBLE SHOOTING

Section 2

Audio Circuits

For the tests in this section, use an audio-frequency signal generator. Connect the generator ground lead to B—, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume to maximum.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 3 (i-f, detector, and a-v-c circuits); if not, isolate and correct the trouble in this section.

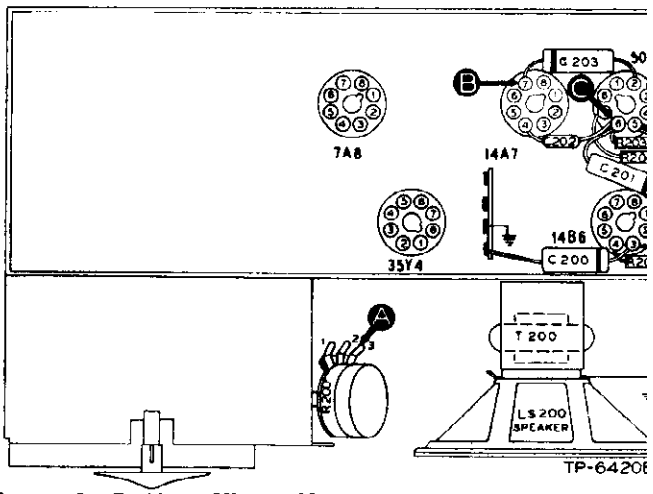


Figure 2. Bottom View, Showing Section 2 Test Poi

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with moderate signal-generator input.	Trouble within this section. Isolate by the following tests.
2	C	Loud, clear output with strong input.	Defective: 50A5, LS200. Shorted: C202, C201, C203. Open: T200, R204.
3	D	Loud, clear output with moderate input.	Defective: 14B6. Open: R202, R201, C201.
4	A	Same as step 3.	Shorted: C200, C301D*. Open: C200, R200 (rotate through range).

Listening Test: Distortion may be caused by shorted or leaky C201.

* This part, located in another section, may cause abnormal indication in this section.

TROUBLE SHOOTING

Section 3

I-F, Detector, and A-v-c Circuits

For the tests in this section, use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to B—, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume to maximum.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 4 (r-f and converter circuits); if not, isolate and correct the trouble in this section.

To provide a complete i-f-amplifier check, test point A for this section is placed at the grid of the mixer in Section 4; therefore, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in the mixer circuit. These parts are listed below under "POSSIBLE CAUSE OF ABNORMAL INDICATION."

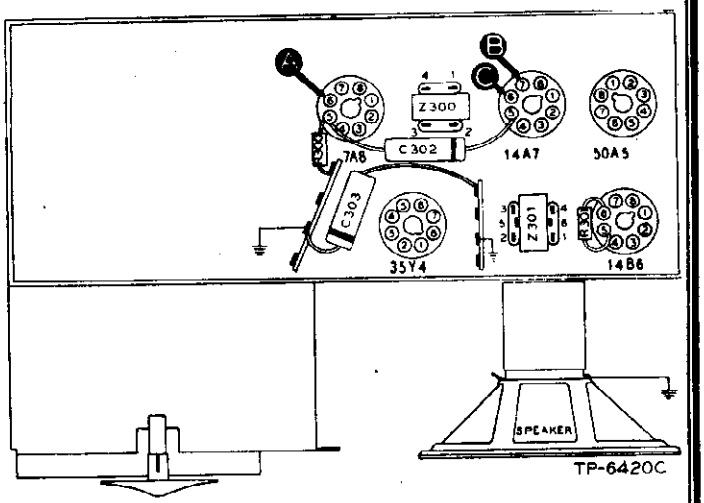


Figure 3. Bottom View, Showing Section 3 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with moderate signal-generator input.	Trouble within this section. Isolate by the following tests.
2	C	Loud, clear output with moderate input.	Defective: 14A7, 14B6 (diode section). Shorted: C302, Z301. Open: Z301, R300, R301, R302. Misaligned: Z301.
3	A	Same as step 2.	Defective: 7A8*. Shorted: Z300. Open: Z300. Misaligned: Z300.

* This part, located in another section, may cause abnormal indication in this section.

TROUBLE SHOOTING

Section 4

R-F and Converter Circuits

For the tests in this section, with the exception of the oscillator test, use an r-f signal generator with modulated output. Connect the generator ground lead to B—, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume to maximum, and set the drum tuner and the signal-generator frequency as indicated in the chart.

If the "NORMAL INDICATION" is not obtained in step 1, isolate and correct the trouble in this section. If the trouble is not revealed by the tests for this section, check the alignment.

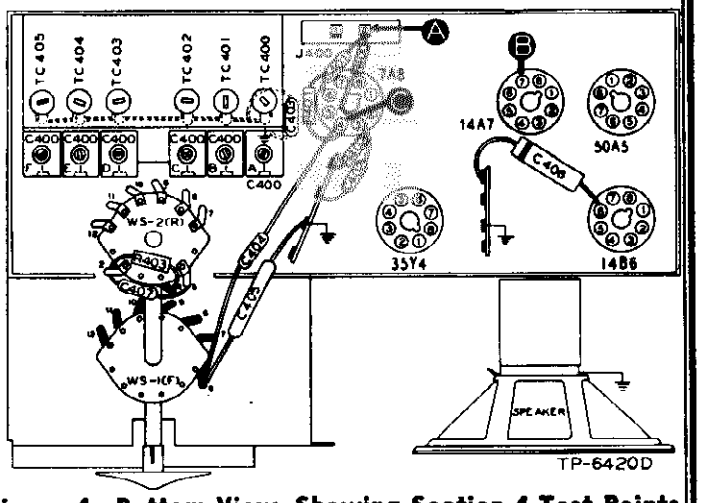


Figure 4. Bottom View, Showing Section 4 Test Points

STEP	TEST POINT	SIG. GEN. FREQ.	DRUM TUNER	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Adjust to frequency of each station setting.	Depress drum tuner for each station setting, in turn.	Loud, clear speaker output with weak signal-generator input.	Trouble in circuits associated with each position of the station-selector drum tuner. Isolate by steps 2 and 3.
2	C to B Osc. Test (see Note below)		Same as step 1.	–3.5v to –4.5v.	No voltage for any station setting—Defective: 7A8. Shorted: C402, C403, C404, C405, L400 to L405, WS-1(F). Open: L400 to L403, C404, C403, R401.
3	A	Same as step 1.	Same as step 1.	Same as step 1.	Shorted: C407, WS-2(R), C400A—F. Open: C401, C407, R403, WS-2(R), C400A—F.

OSCILLATOR TEST: Connect the positive lead of a high-resistance voltmeter to B–, test point B; connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the oscillator grid (pin 4 of 7A8), test point C. Use a suitable meter range, such as 0—10 volts. Proper operation of the oscillator is indicated by negative voltage of approximately the value given in the chart (measured with 20,000-ohms-per-volt meter) throughout the tuning range.

ALIGNM

RADIO CONTROLS—Set volume to maximum.

OUTPUT METER—Connect between left-hand terminal (viewed from rear) of J400 and chassis.

STEP	SIGNAL GENERATOR		RADIO		AD TRI
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Ground lead to B–; output lead through .1-mf. condenser to pin 6 of 7A8 converter.	455 kc.	540 kc.	Adjust trimmers, in order given, for maximum output.	TC301B TC301A TC300 TC300

STATION-SELECTOR ADJUSTMENTS

1. Turn on the power, and set the volume for normal volume level.

2. Couple the signal generator loosely as outlined in Note 1.

3. Allow the radio to warm up for 15 minutes.

4. Starting with the lowest frequency desired, set the signal generator, and depress the drum tuner as indicated in the chart. Adjust the associated oscillator tuning core and aerial trimmer for maximum output.

5. Detune the signal generator, and make a final ment of the tuning core and aerial trimmer while li to the station for which the adjustment is being ma

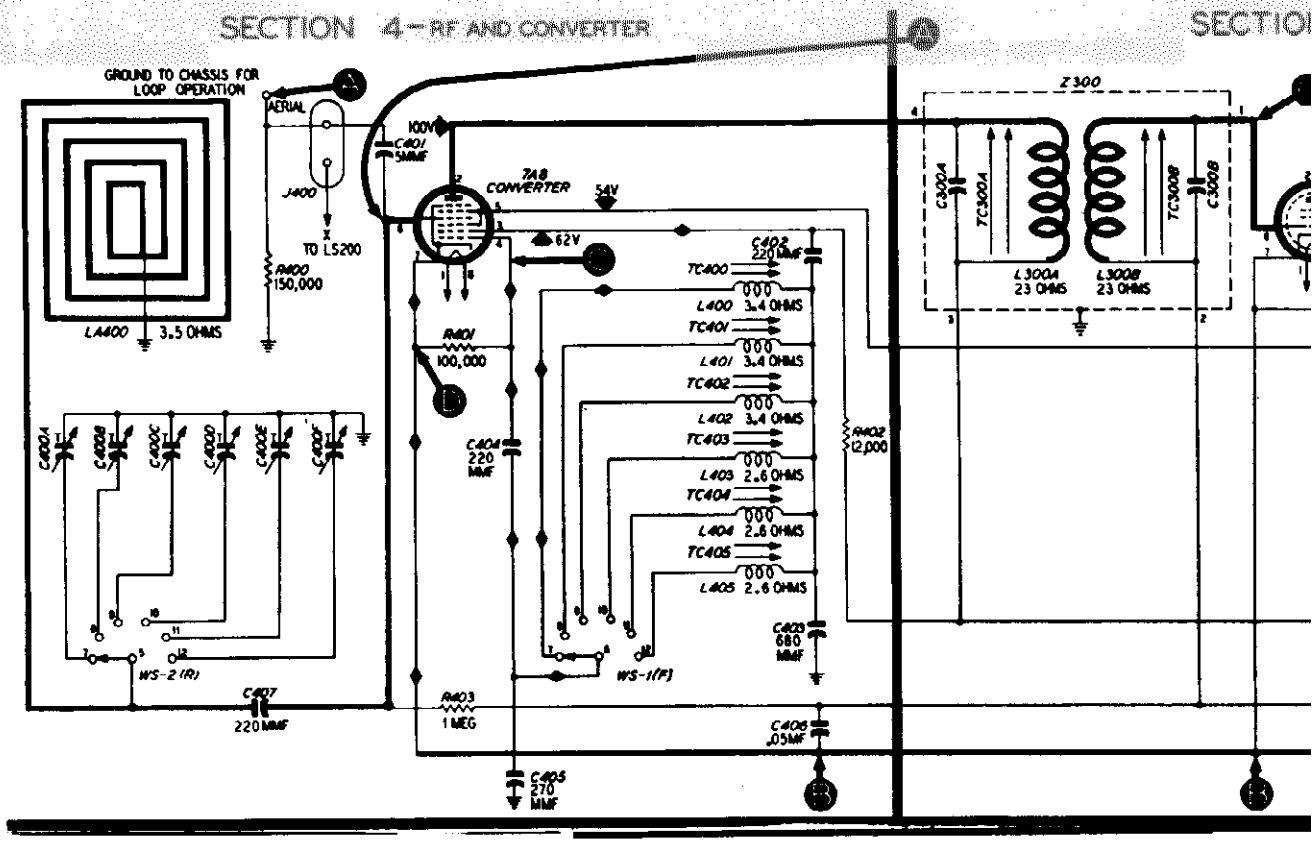
6. Repeat steps 4 and 5 for each remaining station

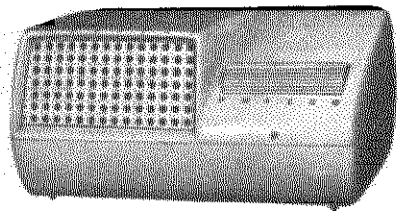
Note 1: Make up a 6-to-8 turn, 6-inch-diamete using insulated wire; connect to generator leads an near radio loop.

Note 2: For a more critical adjustment, a-v-c may be used as a resonance indicator by connec 20,000-ohms-per-volt voltmeter from pin 6 of the 1 test point B. Adjust for maximum.

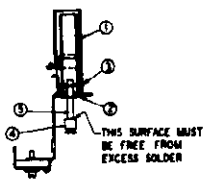
STATION SETTING	FREQUENCY RANGE	OSCILLATOR TUNING CORE	AERIAL TRIMMER
1	540—900 kc.	TC400	C400A
2	600—1100 kc.	TC401	C400B
3	650—1200 kc.	TC402	C400C
4	850—1400 kc.	TC403	C400D
5	900—1600 kc.	TC404	C400E
6	900—1600 kc.	TC405	C400F

SECTION 4—RF AND CONVERTER





INSTRUCTIONS FOR REMOVING OSCILLATOR COILS

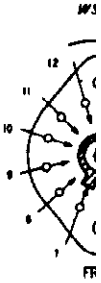


THE FOLLOWING PROCEDURE IS RECOMMENDED FOR REMOVING THE OSCILLATOR COILS:

1. REMOVE ALL WIRE CONNECTIONS AND FIBER SHIELD FROM COILS.
2. HEAT COUPLING (4) WITH SOLDERING IRON AND REMOVE.
3. REMOVE CLIP (2). COIL SHOULD THEN BE REMOVABLE.

REVERSE PROCEDURE FOR REPLACING COILS. WHEN MOUNTING COUPLING, REMOVE ALL EXCESS SOLDER FROM SCREW THREADS.

ALL VOLTAGES WERE MEASURED FROM B- WITH A 20,000 OHMS-PER-VOLT METER AT A LINE VOLTAGE OF 117 V AC.



Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before it is turned on:

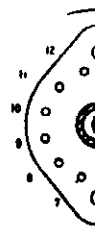
1. Inspect both the top and the bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, or other obvious indications of trouble.

2. Measure the resistance between B+ (pin 7 of 35Y4 rectifier) and B—, test point B. When the ohmmeter test leads are connected in the proper polarity, the highest resistance reading will be obtained. If the reading is lower than 1500 ohms, check condensers C101A, C101B, and C203 for leakage or shorts. The resistance value given is much lower than normal, and is not intended as a quality check of these condensers; the value given is the lowest at which the rectifier will operate safely while the voltage checks of Section 1 (power supply) are performed.

SPECIFICATIONS

CABINET	Phenolic plastic, green or ivory
CIRCUIT	5-tube superheterodyne
FREQUENCY RANGE	540—1620 kc.
AUDIO OUTPUT	1 watt
OPERATING VOLTAGE	105—120 volts, a.c. or d.c.
POWER CONSUMPTION	30 watts
AERIAL	High-impedance loop; provision also for external aerial
INTERMEDIATE FREQUENCY	455 kc.
PHILCO TUBES (5)	7A8, 14A7, 14B6, 50A5, 35Y4

TP-8096A.



SIX POSITION W
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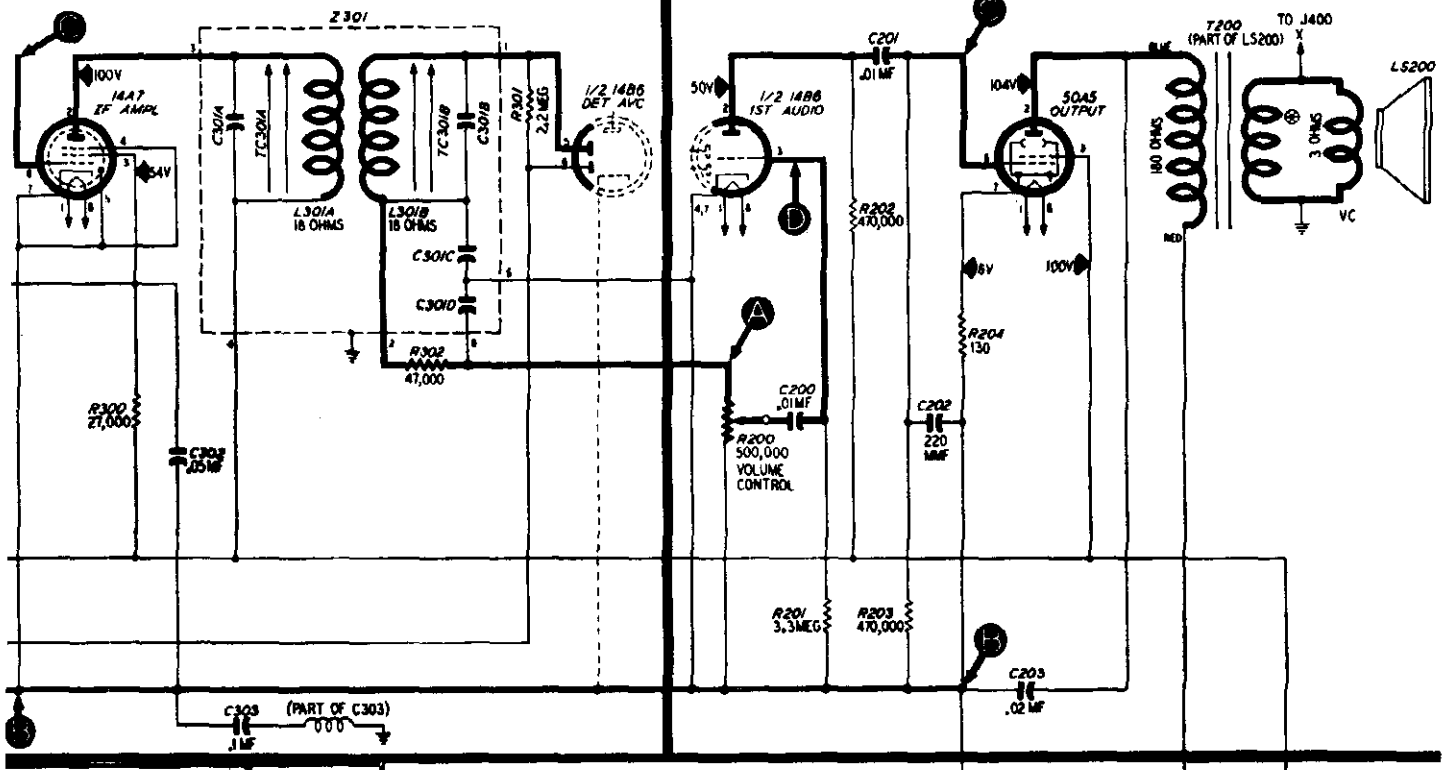
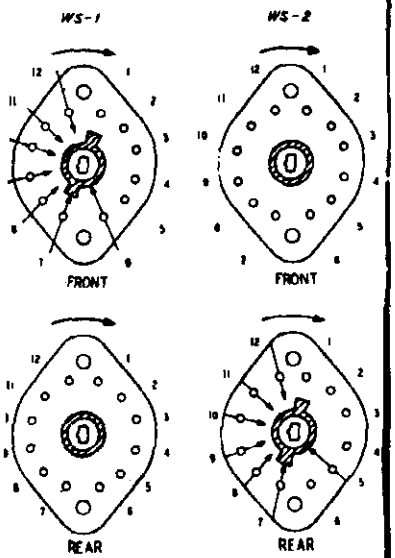
Figure 5. Philco Radio Model 49-901, Sectio

TION 3 – IF, DETECTOR, AND AVC

SECTION 2 – AUDIO





POSITION WAFER SWITCH SHOWN IN BROADCAST
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IDICATES FRONT CONTACTS LOOKING FROM FRONT.
IDICATES REAR CONTACTS LOOKING THROUGH FROM
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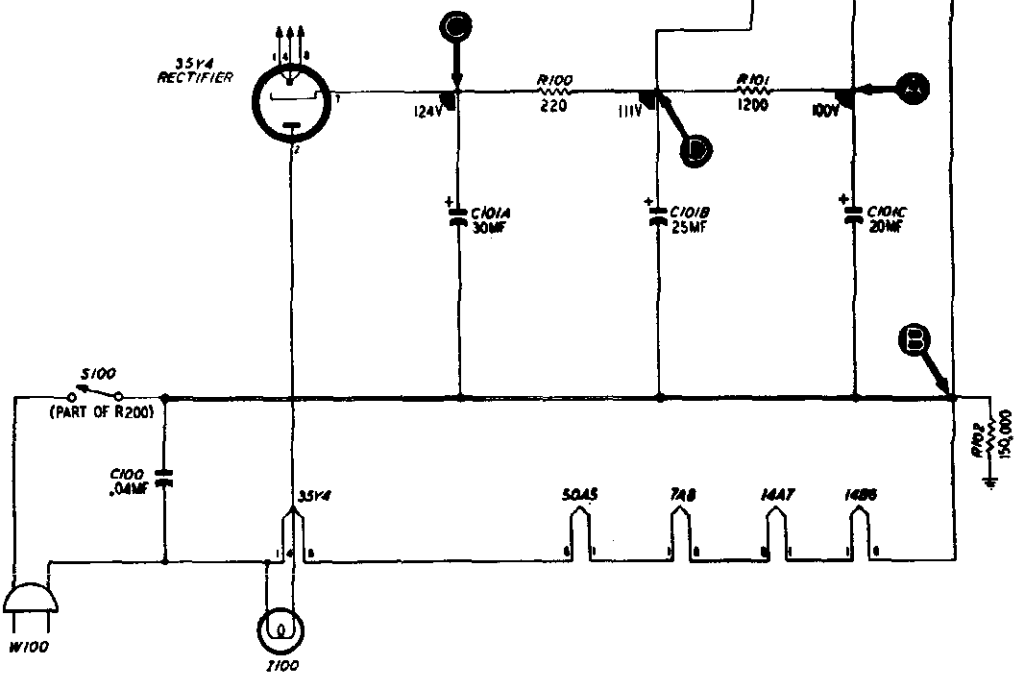

SECTION 1 – POWER SUPPLY

TP-6420

, Sectionalized Schematic Diagram, Showing Test Points

T PROCEDURE

CIRCUITS

SIGNAL GENERATOR—Use AM r-f signal generator, with modulated output. Connect generator and set frequency as indicated in chart.

OUTPUT LEVEL—During alignment, signal-generator output must be attenuated to hold output-meter reading below 1.25 volts.

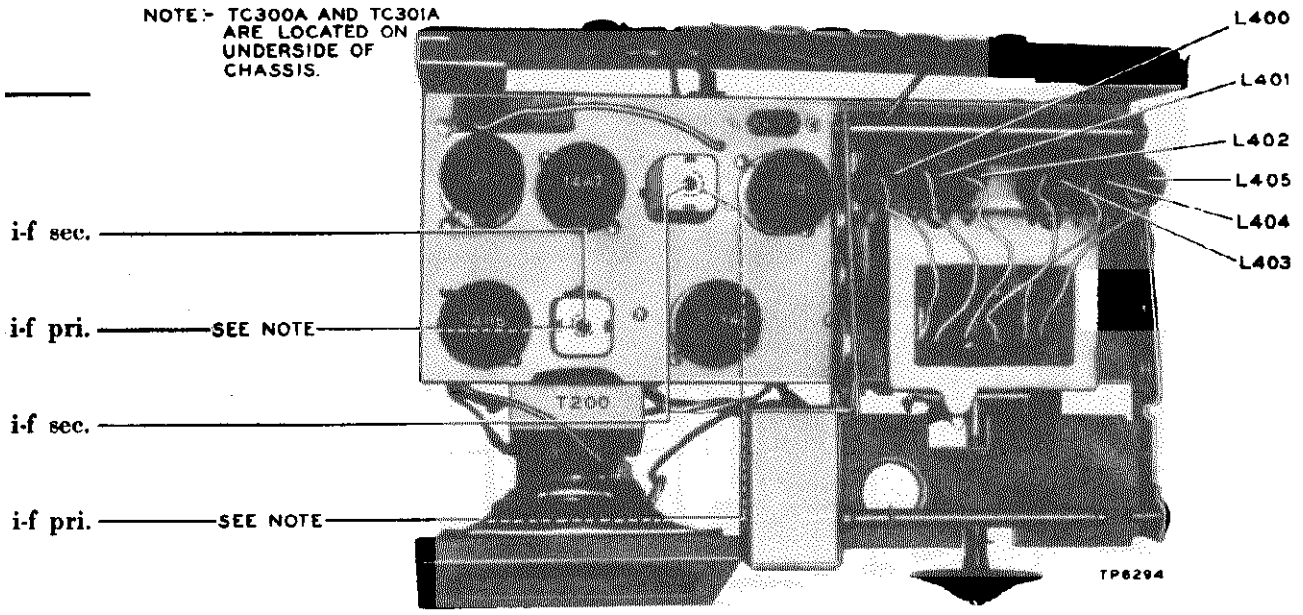

Figure 6. Top View, Showing Trimmer Locations

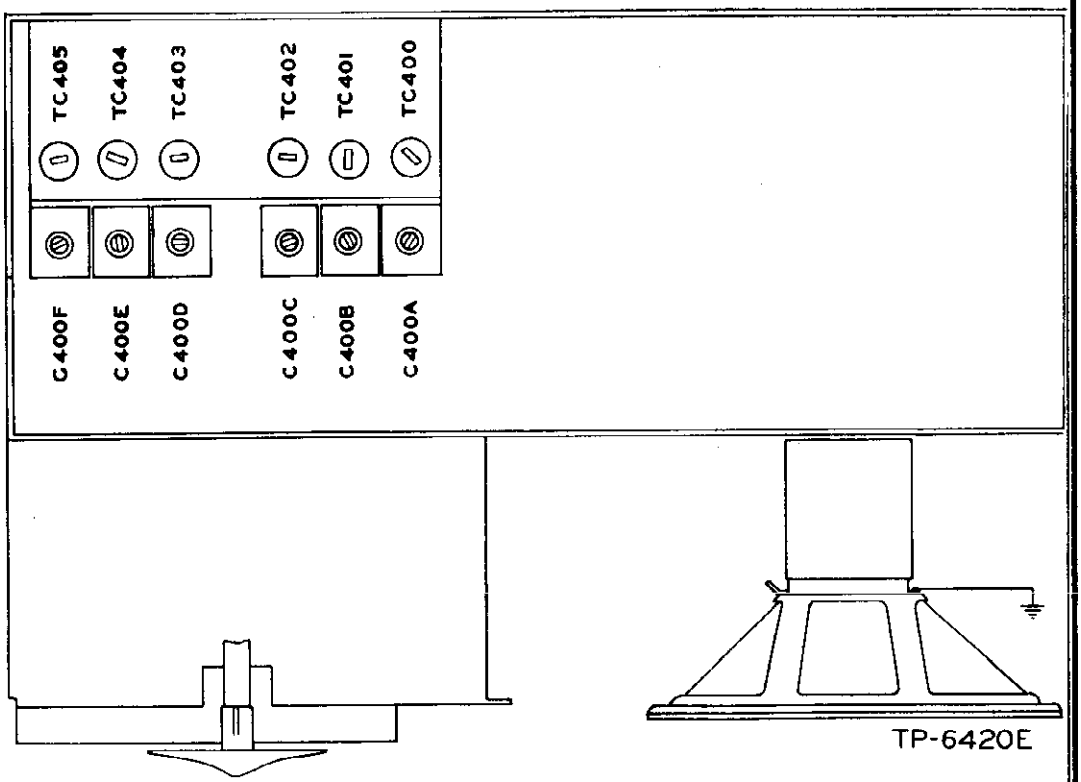

Figure 7. Bottom View, Showing Locations of Station-Selector Adjustments

REPLACEMENT PARTS LIST

NOTE: Part numbers identified by an asterisk (*) indicate general replacement items. These numbers may not be identical with those on factory assemblies; also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and replacement parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

SECTION 1—POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, line filter, .04 mf	45-3500-2*
C101	Condenser, electrolytic, 3-section	30-2570-14*
C101A:	Condenser, filter, 30 mf	Part of C101
C101B:	Condenser, filter, 25 mf	Part of C101
C101C:	Condenser, filter, 20 mf	Part of C101
I100	Lamp, pilot	34-2068*
R100	Resistor, filter, 220 ohms	66-1224340*
R101	Resistor, filter, 1200 ohms	66-2123340*
R102	Resistor, leakage, 150,000 ohms	66-4153340*
S100	Switch, on-off	Part of R200
W100	Line cord and plug	L2183*

SECTION 2—AUDIO CIRCUITS

C200	Condenser, blocking, .01 mf	61-0120*
C201	Condenser, blocking, .01 mf	61-0120*
C202	Condenser, by-pass, 220 mmf	66-122001001*
C203	Condenser, tone compensation, .02 mf	61-0180*
LS200	Speaker	36-1627
R200	Volume control (with on-off switch), 500,000 ohms	33-5556-6*
R201	Resistor, grid return, 3.3 megohms	66-5333340*
R202	Resistor, plate load, 470,000 ohms	66-4473340*
R203	Resistor, grid leak, 470,000 ohms	66-4473340*
R204	Resistor, bias, 130 ohms	66-1123340*
T200	Output transformer	Part of LS200

SECTION 3—I-F, DETECTOR, AND A-V-C CIRCUITS

C300A	Condenser, fixed, 1st i-f primary	Part of Z300
C300B	Condenser, fixed, 1st i-f secondary	Part of Z300
C301A	Condenser, fixed, 2nd i-f primary	Part of Z301
C301B	Condenser, fixed, 2nd i-f secondary	Part of Z301
C301C	Condenser, i-f filter	Part of Z301
C301D	Condenser, i-f filter	Part of Z301
C302	Condenser, screen by-pass, .05 mf	61-0122*
C303	Condenser (inductively wound), i-f by-pass, .1 mf	30-4644-1*
R300	Resistor, screen dropping, 27,000 ohms	66-3273340*
R301	Resistor, a-v-c filter, 2.2 megohms	66-5223340*
R302	Resistor, diode load, 47,000 ohms	66-3473340*
TC300A	Core, tuning, 1st i-f primary	Part of Z300
TC300B	Core, tuning, 1st i-f secondary	Part of Z300
TC301A	Core, tuning, 2nd i-f primary	Part of Z301
TC301B	Core, tuning, 2nd i-f secondary	Part of Z301
Z300	Transformer, 1st i-f	32-4160-6
Z301	Transformer, 2nd i-f	32-4240

SECTION 4—R-F AND CONVERTER CIRCUITS

Reference Symbol	Description	Service Part No.
C400	Condenser assembly, trimmer, 6-section	31-6510
C400A:	Condenser, trimmer, aerial	Part of C400
C400B:	Condenser, trimmer, aerial	Part of C400
C400C:	Condenser, trimmer, aerial	Part of C400
C400D:	Condenser, trimmer, aerial	Part of C400
C400E:	Condenser, trimmer, aerial	Part of C400
C400F:	Condenser, trimmer, aerial	Part of C400
C401	Condenser, blocking, 5 mmf	30-1224-5*
C402	Condenser, d-c blocking, 220 mmf	62-122001001*
C403	Condenser, r-f by-pass, 680 mmf	60-10685331*
C404	Condenser, isolating, 220 mmf	62-122001001*
C405	Condenser, r-f by-pass, 270 mmf	30-1224-14*
C406	Condenser, a-v-c filter, .05 mf	61-0122*
C407	Condenser, blocking, 220 mmf	62-122001001*
J400	Accessory jack	38-9161-7
LA400	Loop aerial	
	49-901 (ivory)	32-4316
	49-901 (green)	32-4315
Tuning coils and trimmer-condenser assembly		76-4082
C400	Aerial trimmer assembly, 6-section	31-6510
L400, L401, or L402	Coil, osc.	32-4059-5*
L403, L404, or L405	Coil, osc.	32-4059-4*
TC400 through TC405	Tuning core, osc.	56-6100*
R400	Resistor, aerial loading, 150,000 ohms	66-4153340*
R401	Resistor, bias, 100,000 ohms	66-4103340*
R402	Resistor, osc. plate load, 12,000 ohms	66-3123340*
R403	Resistor, grid return, 1 megohm	66-5103340*
WS-1(F)	Switch-wafer section	Part of 76-4057†
WS-2(R)	Switch-wafer section	Part of 76-4057†

MISCELLANEOUS

Description	Service Part No.
Cabinet	
49-901 (ivory)	10719
49-901 (green)	10719A
Baffle and cloth	40-7560
Baffle, speaker	54-4636
Light shield	566307FA3
Jewel, telltale	54-4304-1
Wheel assembly	76-4083
Roller-tuning assembly	76-4001
Roller-switch assembly	76-4057
Bracket, mounting, base to top of cabinet	56-6392FA3
Board-and-clamp assembly	76-4079
Tuning-assembly hardware (76-4082)	
Sleeve, adjusting (6)	55-1377
Bushing (12)	54-4610
Ring (6)	57-1684FA3
Link, adjusting (6)	56-4-34FCP
Mounting strip, trimmer	56-2250
Coupling (6)	56-5975
Pilot-lamp assembly	76-1179-7
Socket, Loktal (5)	27-6138*

† 76-4057 Roller switch assembly.

Circuit Description

Philco Model 49-901 is a table-model radio employing a five-tube superheterodyne circuit. The radio is turned on by rotating the drum tuner. Continued rotation adjusts the volume. Any one of six pretuned stations is selected by depressing the drum tuner once for each station. The built-in loop aerial normally provides adequate signal pickup. However, a terminal is provided for connecting an external aerial, if required.

The loop works through a condenser into a 7A8 converter. The 7A8 is transformer-coupled to a 14A7 i-f amplifier, which, in turn, is transformer-coupled to the diode section of a 14B6. Both i-f transformers have permeability-tuned primary and secondary windings, and are tuned to 455 kc. The diode section of the 14B6 provides detection and a-v-c voltage; the a-v-c voltage is applied to the grids of the mixer and i-f amplifier. The 1st audio (triode) section of the 14B6 is resistance-coupled to the 50A5 beam-power output amplifier, which supplies approximately 1 watt of audio power to the PM dynamic speaker.

D-c operating voltages are supplied by a 35Y4 half-wave rectifier and a resistance-capacitance filter. The 150,000-ohm resistor, R102, is connected between B— and the chassis to prevent hum caused by condenser leakage under high-humidity conditions.

Philco TROUBLE-SHOOTING Procedure

For rapid trouble shooting, the radio circuit is divided into four sections, with test points specified for each section; these sections and test points are indicated in the schematic diagram. The trouble-shooting procedure given for each section includes a simplified test chart and a bottom view of the chassis showing the locations of the test points and the components of that section.

In each chart, the first step is a master check for determining whether trouble exists in that section, without going through the entire test procedure.

Failure to obtain the "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube electrode voltages; third, measuring circuit resistance; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

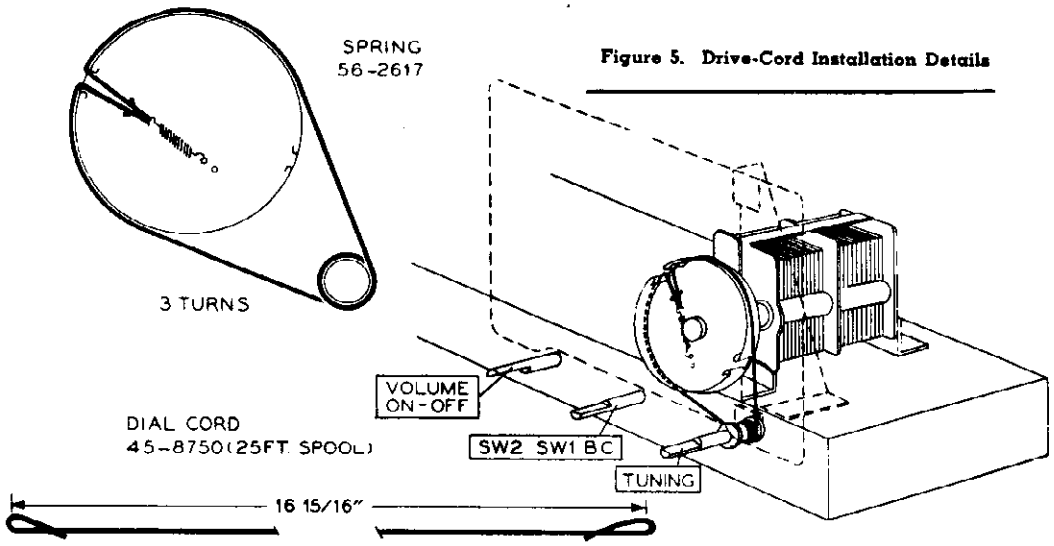

Figure 5. Drive-Cord Installation Details

Circuit Description

Philco Radio Model 49-905 is a six-tube superhetrodyne, which provides reception in the standard-broadcast band and in the FM band. A built-in high-impedance loop is used as the aerial on the broadcast band, and the line cord is used as the aerial on the FM band. These aerials normally provide adequate signal pickup; if additional pickup is required, Philco Dipole Aerial, Part No. 45-1462, may be used. When connecting the dipole aerial, disconnect the blue, external AM aerial lead from the chassis, and attach it to pin 1 of the dipole-aerial plug which fits into J400. No additional coupler is required.

A 12AT7 dual triode is used as the oscillator and mixer for both bands by switching the mixer grid and both the oscillator and mixer cathodes to the proper circuits.

For broadcast reception, the i-f signal is transformer-coupled to a 12AU6 i-f amplifier. The output of this stage is transformer-coupled to a diode section of the 19T8, which provides detection and a-v-c action.

For FM reception, an additional i-f amplifier stage, which employs a 6BH6, is used to provide adequate gain and stability. This stage is coupled into the circuit by applying B+ voltage to the plate and screen grid when the band switch is in the FM position. The 6BH6 is transformer-coupled to both the mixer and the second i-f amplifier. The 12AU6 is also transformer-coupled to two diode sections of the 19T8 in a ratio-detector circuit.

In the i-f circuits, two sets of i-f transformers are used; one set is tuned to 455 kc. for standard broadcast, and the other set is tuned to 9.1 mc. for FM. The use of two sets of transformers makes better shielding possible, so that undesirable beat signals and interaction between transformers are eliminated.

The triode section of the 19T8 is employed as the first audio amplifier, and is resistance-coupled to the 35C5 output tube, which supplies an audio output of approximately one watt to the permanent-magnet dynamic speaker.

The power supply utilizes a 35W4 as a half-wave rectifier, which operates from a line voltage of 105—120 volts, a.c. or d.c

SPECIFICATIONS

CABINET	Plastic, brown finish
CIRCUIT	Six-tube superheterodyne
FREQUENCY RANGES	
Broadcast	540—1620 kc.
FM	88—108 mc.
AUDIO OUTPUT	1 watt
OPERATING VOLTAGE	105—120 volts, a.c./d.c.
POWER CONSUMPTION	30 watts
AERIAL	Built-in high-impedance loop for AM, line cord for FM; provision for connecting external aerial.
INTERMEDIATE FREQUENCY	
AM	455 kc.
FM	9.1 mc.
PHILCO TUBES (6)	35W4, 35C5, 12AU6, 12AT7, 19T8, 6BH6

Philco TROUBLE-SHOOTING *Procedure*

For rapid trouble shooting, the radio circuit is divided into four sections, with test points specified for each section; those sections and test points are indicated in the schematic diagram. The trouble-shooting procedure given for each section includes a simplified test chart and a bottom view of the chassis showing the locations of the test points and the components of that section.

In each chart, the first step is a master check for determining whether trouble exists in that section, without going through the entire test procedure.

Failure to obtain the "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before it is turned on:

1. Inspect both the top and the bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, or other obvious sources of trouble.

2. Measure the resistance between B+ (pin 7 35W4 rectifier) and B–, test point B. When t ohmmeter test leads are connected in the prop polarity, the highest resistance reading will be o tained. If the reading is lower than 1700 ohn check condensers C100A, C100B, C100C, C2C C305, C308, and C310 for leakage or shorts. T resistance value given is much lower than norm and is not intended as a quality check of the condensers; the value given is the lowest at whi the rectifier will operate safely while the volta checks of Section 1 (power supply) are performe

Important!

To avoid altering FM operation, special care should be used in replacing any part. Replacement parts should be placed in the same physical positions as the original parts; connections should be of the same length, and should be soldered to the same points. The placement or length of leads should not be altered.

Section 1 TROUBLE SHOOTING

POWER SUPPLY

For the tests in this section, use a d-c voltmeter. Connect the negative lead to B–, test point B; connect the positive lead to the test points indicated in the chart. The voltage readings given were taken with a 20,000-ohms-per-volt meter at a line voltage of 117 volts, a.c.

Turn on the power, set the volume control to minimum, and set the band switch to the broadcast position.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2 (audio circuits); if not, isolate and correct the trouble in this section.

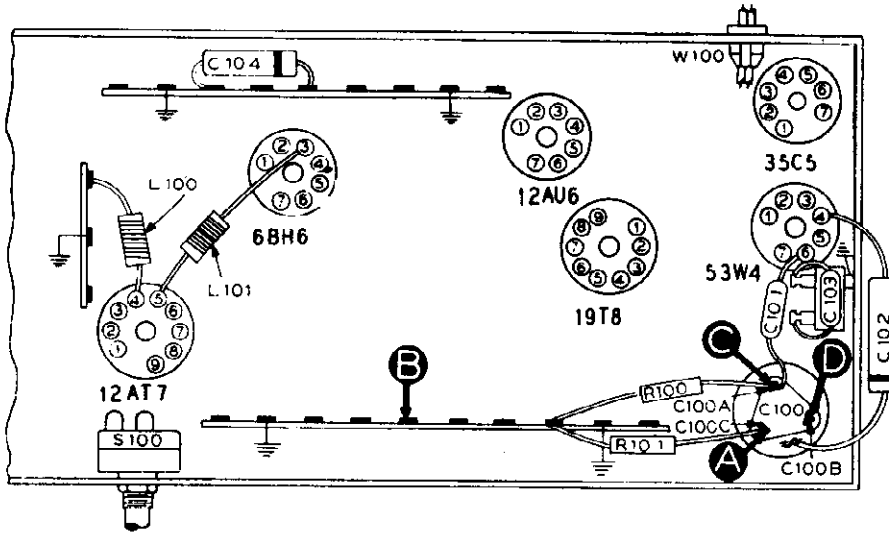

Figure 1. Bottom View, Showing Section 1 Test Points

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	104v		Trouble in this section. Isolate by the following tests.
2	C	125v	No voltage	Defective: 35W4. Open: L100, L101, S100, W100. Shorted: C100A, C101.
			Low voltage	Defective: 35W4. Shorted: C100B. Open: C100A.
			High voltage	Open: R100.
3	D	113v	No voltage	Shorted: C100B. Open: R100.
			Low voltage	Open: C100B. Shorted: C201*. Leaky: C100B, C201*.
			High voltage	Open: R101. T200*, R204*. Defective: 35C5*.
4	A	104v	No voltage	Open: R101. Shorted: C100C.
			Low voltage	Leaky: C100C.
Listening Test: Abnormal hum may be caused by leaky or open C100A, C100B, or C100C.				

* This part, located in another section, may cause abnormal indication in this section.

Section 2 TROUBLE SHOOTING
AUDIO CIRCUITS

For the tests in this section, use an audio-frequency signal generator. Connect the generator ground lead to B–, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum. Set the band switch to the broadcast position for test points A, C, and D, and to the FM position for test point E.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 3 (i-f, detector, and a-v-c circuits); if not, isolate and correct the trouble in this section.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A E	Loud, clear speaker output with weak generator input.	Trouble in this section. Isolate by the following tests.
2	C	Loud, clear output with strong input.	Defective: 35C5. LS200. Open: R204, C200, T200, R203. Shorted: C201, C200, C202. Leaky: C200, C201, C202.
3	D	Same as step 1.	Defective: 19T8 (triode section). Open: R202, C202, R201. Shorted or leaky: C203.
4	A	Same as step 1.	Open: WS, C205, R200 (rotate through range). Shorted: WS-1(F).
5	E	Same as step 1.	Open: WS-1(F). Shorted: WS-1(F).
Listening Test: Distortion may be caused by shorted or leaky C205 or C202.			

* This part, located in another section, may cause abnormal indication in this section.

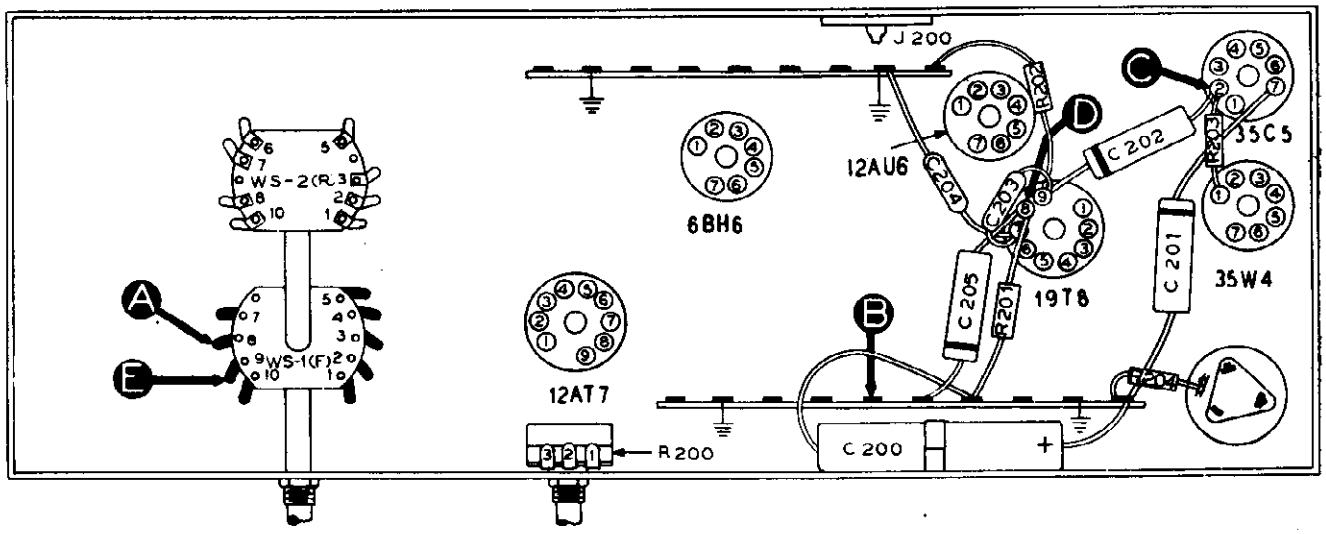

Figure 2. Bottom View, Showing Section 2 Test Points

Section 3 TROUBLE SHOOTING
I-F, DETECTOR, AND A-V-C CIRCUITS
AM Circuits

For the following tests, use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to B–, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, set the band switch to the broadcast position, and rotate the tuning control until the tuning condenser is fully meshed.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for the FM circuits or to the tests for Section 4 (r-f and converter circuits); if not, isolate and correct the trouble in the AM circuits.

To provide a complete i-f amplifier check, test point A for this section is placed at the grid of the mixer in Section 4; therefore, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in the mixer circuit. These parts are listed below under the "POSSIBLE CAUSE OF ABNORMAL INDICATION."

Section 3—Cont. TROUBLE SHOOTING

AM Chart

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with weak generator input.	Trouble in AM circuits. Isolate by the following tests.
2	C	Loud, clear output with strong input.	Defective: 12AU6, 19T8. Open: Z303, Z304, R303, R308. Shorte C310, C312, C304C, Z304, C315, C314.
3	A	Same as step 1.	Open: Z300, Z301, Z302, R302, L300, R402*, R400*, WS-2(R) Shorted: Z301, Z302, C308, C309, C305, C408*. Defectiv 12AT7* (mixer section). Misaligned: Z302.

* This part, located in another section, may cause abnormal indication in this section.

FM Circuits

The following tests are also made with an AM r-f signal generator, using modulated output.

Observe the instructions preliminary to the tests for the AM circuits, with these exceptions: Set the band switch to the FM position. Set the signal-generator frequency to 9.1 mc., and detune to one side or the other until a satisfactory test signal is obtained.

The best indication of satisfactory FM-detector operation is the ability of this circuit to take the alignment properly (see page 11).

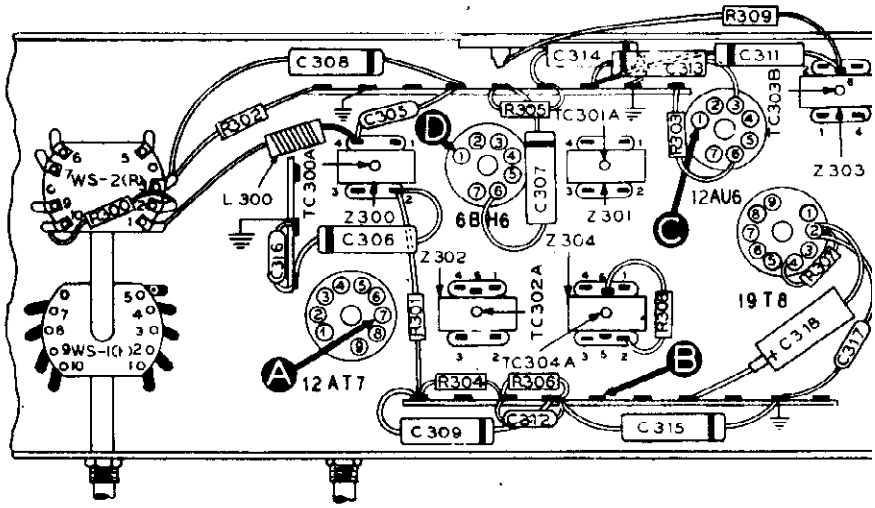

Figure 3. Bottom View, Showing Section 3 Test Points

The parts which were found to be satisfactory for AM operation, with the exception of those ir cated in the chart, will usually be satisfactory for FM operation.

If the "NORMAL INDICATION" is obtained in step 1, proced with the tests for Section 4 (r-f a converter circuits); if not, isolate and correct the trouble in the FM circuits.

FM Chart

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with weak generator input.	Trouble in FM circuits. Isolate by the following tests.
2	C	Loud, clear output with strong input.	Defective: 12AU6, 19T8 (diode section). Open: Z301, Z302 Z303, Z304, R304, R307, R309, C318. Shorted: Z301, Z303, C311 C317, C318.
3	D	Loud, clear output with moderate input.	Defective: 6BH6. Open: Z300, Z301, R300, R301, WS-2(R) Shorted: C307, Z301, C306.
4	A	Same as step 1.	Defective: 12AT7*. Open: Z300, C316, C305, WS-2(R)*, C316 R401*. Shorted: C316, Z300.

This part, located in another section, may cause abnormal indication in this section.

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Section 4 TROUBLE SHOOTING

R-F AND CONVERTER CIRCUITS

AM Circuits

For the tests in this section, with the exception of the oscillator test, use an AM r-f signal generator with modulated output. Connect the generator ground lead to B–, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, set the band switch to the broadcast position, and set the tuning control and the signal-generator frequency as indicated in the chart.

If the "NORMAL INDICATION" is not obtained in step 1, isolate and correct the trouble in the AM circuits. If the trouble is not revealed by the tests for this section, check the alignment.

FM Circuits

The following tests are also made with an AM r-f signal generator, using modulated output. Observe the instructions preliminary to the tests for the AM circuits with the following exceptions:

Set the band switch to the FM position.

If the "NORMAL INDICATION" is not obtained in step 1, isolate and correct the trouble in the FM circuits.

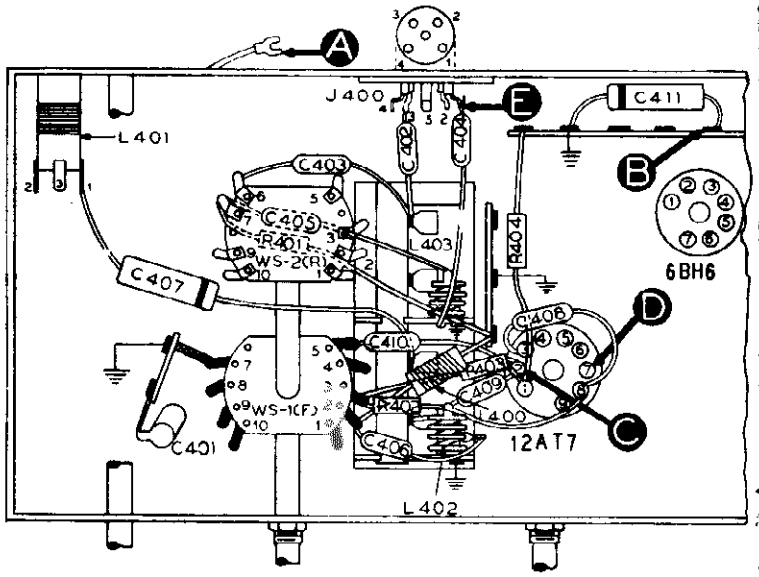


Figure 4. Bottom View, Showing Section 4 Test Points

AM Chart

STEP	TEST POINT	SIG. GEN. FREQUENCY	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	1000 kc.	Tune to signal.	Loud, clear speaker output with weak generator input	Trouble in AM circuits. Isolate by the following tests.
2	C (Osc. test; see note below.)		Tune through range.	Negative 2 to 2.5 volts.	Defective: 12AT7 (osc. section). Open: C410, R404, WS-1(F), R403, L401, C411, C407. Shorted: C409, C410, C407, C411, L401, WS-1(F), C400, C400B.
3	D	1000 kc.	Tune to signal.	Same as step 1.	Defective, 12AT7 (mixer section). Open: R400, R402, WS-2(R). Shorted: WS-2(R), C408.
4	A	1000 kc.	Tune to signal.	Same as step 1.	Open: C402, C403, LA400. Shorted: C400, C400A, LA400.

OSCILLATOR TEST: Connect the positive lead of a high-resistance voltmeter to B-, test point B; connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the oscillator grid (pin 2 of 12AT7), test point C. Use a suitable meter range, such as 0—10 volts. Proper operation of the oscillator is indicated by negative voltage of approximately the value given in the chart (measured with 20,000-ohms-per-volt meter) throughout the tuning range.

FM Chart

STEP	TEST POINT	SIG. GEN. FREQUENCY	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	E	100 mc.	Tune to signal.	Loud, clear speaker output with weak generator input	Trouble in FM circuits. Isolate by the following tests.
2	C (Osc. test; see note above.)		Tune through range.	Negative 1 to 1.5 volts.	Defective: 12AT7 (osc. section). Open: C409, C406, L400, C410, L402, WS-1(F). Shorted: C400, C401, L402, C406, C409, C410, L400, WS-1(F).
3	D	100 mc.	Tune to signal.	Same as step 1.	Open: R401, WS-2(R). Shorted: C408, WS-2(R).
4	E	100 mc.	Tune to signal.	Same as step 1.	Open: C404, L403, C405. Shorted: C404, L403, C400, C400C, C405.

REPLACEMENT PARTS LIST

NOTE: Part numbers identified by an asterisk (*) indicate general replacement items. These numbers may not be identical with those on factory assemblies; also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and replacement parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements use only the "Service Part No."

SECTION 1

POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, electrolytic, 3-section	30-2568-10
C100A	Condenser, filter, 40 mf., 150v	Part of C100
C100B	Condenser, filter, 70 mf., 150v	Part of C100
C100C	Condenser, filter, 40 mf., 150v	Part of C100
C101	Condenser, r-f by-pass, 100 mmf.	62-110001001*
C102	Condenser, line by-pass, .04 mf.	45-3500*
C103	Condenser, r-f by-pass, 100 mmf.	62-110001001*
C104	Condenser, line by-pass, .01 mf.	61-0120*
I100	Lamp, pilot, 110 v	34-2068
L100	Coil, r-f choke	32-4111
L101	Coil, r-f choke	32-4111
R100	Resistor, filter, 220 ohms	66-1224340*
R101	Resistor, filter, 470 ohms	66-1474340*
S100	Switch, on-off	Part of R200
W100	Line-cord-and-plug assembly	L-2183*

SECTION 2

AUDIO CIRCUITS

C200	Condenser, electrolytic, cathode by-pass 25 mf., 25v	45-3001
C201	Condenser, tone compensation, .006 mf.	30-4504*
C202	Condenser, d-c blocking, .006 mf.	30-4504*
C203	Condenser, parasitic suppressor, 680 mmf.	60-10685401
C204	Condenser, r-f by-pass, 100 mmf.	62-110001001
C205	Condenser, d-c blocking, .02 mf.	30-4594*
J200	Jack, FM test	27-6180
LS200	Speaker	36-1614
R200	Volume control (with off-on switch), 500,000 ohms	45-5019*
R201	Resistor, grid return, 10 megohms	66-6103340*
R202	Resistor, plate load, 470,000 ohms	66-4473340*
R203	Resistor, grid return, 470,000 ohms	66-4473340*
R204	Resistor, cathode bias, 150 ohms	66-1153340*
T200	Transformer, output	Part of LS200
WS-1(F)	Switch-wafer section	Part of 42-1870†

SECTION 3

I-F, DETECTOR, AND A-V-C CIRCUITS

C300A	Condenser, fixed trimmer	Part of Z300
C300B	Condenser, fixed trimmer	Part of Z300
C301A	Condenser, fixed trimmer	Part of Z301
C301B	Condenser, fixed trimmer	Part of Z301
C302A	Condenser, fixed trimmer	Part of Z302
C302B	Condenser, fixed trimmer	Part of Z302
C303A	Condenser, fixed trimmer	Part of Z303
C304A	Condenser, fixed trimmer	Part of Z304
C304B	Condenser, fixed trimmer	Part of Z304
C304C	Condenser, i-f filter	Part of Z304
C304D	Condenser, i-f filter	Part of Z304
C305	Condenser, r-f by-pass, 220 mmf.	62-122001001*
C306	Condenser, r-f by-pass, .01 mf.	61-0120*
C307	Condenser, screen by-pass, .003 mf.	30-4582*
C308	Condenser, plate by-pass, .01 mf.	61-0120*
C309	Condenser, r-f by-pass, .01 mf.	61-0120*
C310	Condenser, screen by-pass, .004 mf.	30-4623
C311	Condenser, r-f by-pass, .01 mf.	61-0120*

SECTION 3 (Continued)

I-F, DETECTOR, AND A-V-C CIRCUITS

Description	Servi Part
C312 Condenser, r-f by-pass, 100 mmf.	62-110001(
C313 Condenser, filament r-f by-pass, .01 mf.	61-01
C314 Condenser, i-f by-pass, .01 mf.	61-01
C315 Condenser, i-f by-pass, .05 mf.	30-4
C316 Condenser, r-f by-pass, 100 mmf.	62-110001(
C317 Condenser, r-f by-pass, 100 mmf.	62-110001(
C318 Condenser, electrolytic, filter, 2 mf., 50v	30-241
L300 Coil, r-f choke	32-4
R300 Resistor, screen dropping, 1000 ohms	66-2103
R301 Resistor, grid return, 1 megohm	66-5103
R302 Resistor, plate load, 1000 ohms	66-2103
R303 Resistor, screen dropping, 1000 ohms	66-2103
R304 Resistor, a-v-c filter, 1 megohm	66-5103
R305 Resistor, isolating, 68 ohms	66-0683
R306 Resistor, a-v-c return, 1 megohm	66-5103
R307 Resistor, FM-detector load, 47,000 ohms	66-3473
R308 Resistor, diode load, 47,000 ohms	66-3473
R309 Resistor, isolating, 47,000 ohms	66-3473
TC300A Tuning core, FM 1st i-f primary	Part of Z
TC300B Tuning core, FM 1st i-f secondary	Part of Z
TC301A Tuning core, FM 2nd i-f primary	Part of Z
TC301B Tuning core, FM 2nd i-f secondary	Part of Z
TC302A Tuning core, AM 1st i-f primary	Part of Z
TC302B Tuning core, AM 1st i-f secondary	Part of Z
TC303A Tuning core, FM 3rd i-f primary	Part of Z
TC303B Tuning core, FM 3rd i-f secondary	Part of Z
TC304A Tuning core, AM 2nd i-f primary	Part of Z
TC304B Tuning core, AM 2nd i-f secondary	Part of Z
WS-2(R) Switch-wafer section	Part of 42-1
Z300 Transformer, FM 1st i-f	32-4
Z301 Transformer, FM 2nd i-f	32-425
Z302 Transformer, AM 1st i-f	32-4
Z303 Transformer, FM 3rd i-f	32-4
Z304 Transformer, AM 2nd i-f	32-4

SECTION 4

R-F AND CONVERTER CIRCUITS

C400	Condenser, tuning gang	31-2
C400A	Condenser, trimmer, AM aerial	Part of C
C400B	Condenser, trimmer, AM osc.	Part of C
C400C	Condenser, trimmer, FM aerial	Part of C
C401	Condenser, trimmer, FM osc.	31-64
C402	Condenser, aerial isolating, 10 mmf.	62-010090

REPLACEMENT PARTS LIST (Continued)

SECTION 4 (Continued)

R-F AND CONVERTER CIRCUITS

	Description	Service Part No.
C403	Condenser, isolating, 220 mmf.	62-122001001*
C404	Condenser, isolating, FM aerial, 100 mmf.	62-110001001*
C405	Condenser, d-c blocking, 220 mmf.	62-122001001*
C406	Condenser, d-c blocking, 100 mmf.	62-110001001*
C407	Condenser, d-c blocking, .01 mf.	61-0120*
C408	Condenser, r-f by-pass, 680 mmf.	60-10685401*
C409	Condenser, d-c blocking, 220 mmf.	62-122001001*
C410	Condenser, d-c blocking, 100 mmf.	62-110001001*
C411	Condenser, r-f by-pass, .01 mf.	61-0120*
J400	Jack, FM aerial	27-6214
L400	Coil, r-f choke	32-4111
L401	Coil, AM osc.	32-4153-1
L402	Coil, FM osc.	32-4016-7
L403	Coil, FM aerial	32-4016-8
LA400	Loop aerial	32-4052-21
PL400	Plug, line-cord FM aerial	Part of W100
R400	Resistor, grid return, 1 megohm	66-5103340*
R401	Resistor, grid return, 22,000 ohms	66-3223340*
R402	Resistor, cathode bias, 1500 ohms	66-2153340*
R403	Resistor, grid return, 22,000 ohms	66-3223340
R404	Resistor; plate load, 8200 ohms	66-2823340
WS-1(F)	Switch-wafer section	Part of 42-1870†
WS-2(R)	Switch-wafer section	Part of 42-1870†

MISCELLANEOUS

Description	Service Part No.
Baffle-and-cloth assembly	40-7535
Cabinet	10714
Back, cabinet	54-7630
Cord, drive (25-ft. spool)	45-8750*
Drive-shaft assembly	76-4034
Knob, tuning	54-4527-1
Knob, band switch	54-4527-4
Knob, volume-on-off	54-4527
Pilot-lamp assembly	76-1179-6
Pointer	54-4599
Scale, dial	54-5011
Socket, miniature (4 required)	27-6226
Socket, 9-pin miniature (2 required)	27-6203-6
Spring, gang drive	56-2617
Window, acetate	54-4595

† 42-1870 is a two-section wafer switch (band switch).

AM ALIGNMENT PROCEDURE

Make alignment with loop aerial connected to radio. The AM alignment should be completed before the FM alignment is made.

DIAL POINTER—With tuning-condenser plates fully meshed, adjust dial pointer to coincide with index mark at low-frequency end of dial.

OUTPUT METER—Connect across voice-coil terminals.

AM R-F SIGNAL GENERATOR—Connect as indicated in chart. Use modulated output.

RADIO CONTROLS—Set volume control to maximum, and set band switch to broadcast position.

OUTPUT LEVEL—During alignment, adjust signal-generator output to maintain output-meter indication below 1.25 volts.

FM ALIGNMENT PROCEDURE

Make AM Alignment First

OUTPUT METER—Connect across voice-coil terminals.

ALIGNMENT INDICATOR—Connect negative lead of 20,000-ohms-per-volt meter to pin 2 of 19T8 tube; connect positive lead to B–, test point B, in Section 2. Use 10-volt range.

AM R-F SIGNAL GENERATOR—Generator must have sufficient output to give a reading of 8.5 volts on alignment indicator. Connect ground lead to B–; connect output lead as indicated in chart. Use modulated output.

RADIO CONTROLS—Set volume control to maximum, and set band switch to FM position. Allow radio and signal generator to operate for at least 15 minutes before making alignment.

NOTE: Check resonance of coils L402 and L403 by inserting each end of a powdered-iron tuning core, such as Philco Part No. 56-6100, into the coils. If the signal strength increases when the iron end is inserted, compress the turns slightly. If the signal strength increases when the brass end is inserted, spread the turns slightly. If the signal strength decreases when either the iron or the brass end is inserted, no further adjustment is necessary. Do not spread or compress turns of coil excessively; only a small change is required at these high frequencies.

MODEL 49-905

AM AL

STEP	SIGNAL GENERATOR		RADIO		AD
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Ground lead to B-, test point B; output lead through .1-mf. condenser to mixer grid (pin 7 of 12AT7).	455 kc.	540 kc.	Adjust tuning cores, in order given, for maximum output. Do not repeat adjustments.	TC304B—AI TC304A—A TC302B—AI TC302A—A
2	Radiating loop (See note below.)	1600 kc.	1600 kc.	Adjust trimmer for maximum output.	C4
3	Same as step 2.	1500 kc.	1500 kc.	Adjust trimmer for maximum output.	C4(

NOTE: Make up a six-to-eight-turn, 6-inch-diameter loop from insulated wire; connect to signal-generator leads and pla radio loop aerial. Make certain that loop aerial is connected to radio.

FM ALIGNMENT CHART

STEP	SIGNAL GENERATOR		RADIO		
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Through .1-mf. condenser to pin 1 of 6BH6.	9.1 mc.	88 mc.	Adjust tuning cores for maximum reading on alignment indicator. Attenuate signal generator to maintain reading of approximately 10 volts. Repeat adjustments until no further improvement is noted. After this step, do not disturb any of these tuning cores, except as directed in step 3.	TC303B—d TC303A—d TC301E TC301A
2	Through .1-mf. condenser to pin 7 of 12AT7.	9.1 mc.	88 mc.	Adjust tuning cores for maximum reading on alignment indicator. Repeat adjustments until no further improvement is noted. Do not disturb these tuning cores after this step.	TC300 TC300
3	Same as step 2.	9.1 mc.	88 mc.	Adjust tuning core for minimum reading on output meter. This adjustment is critical; repeat to make sure it is correct.	TC303B—d
4	To terminal 1 of J400.	105 mc.	105 mc.	Adjust trimmer for maximum reading on alignment indicator.	
5	Same as step 4.	105 mc.	105 mc.	Same as step 4.	C
6	Same as step 4.	92 mc.	92 mc.	Same as step 4.	L402—F
7	Same as step 4.	92 mc.	92 mc.	Same as step 4.	L403—FM
8	Repeat steps 4 through 7 until no further improvement is noted.				

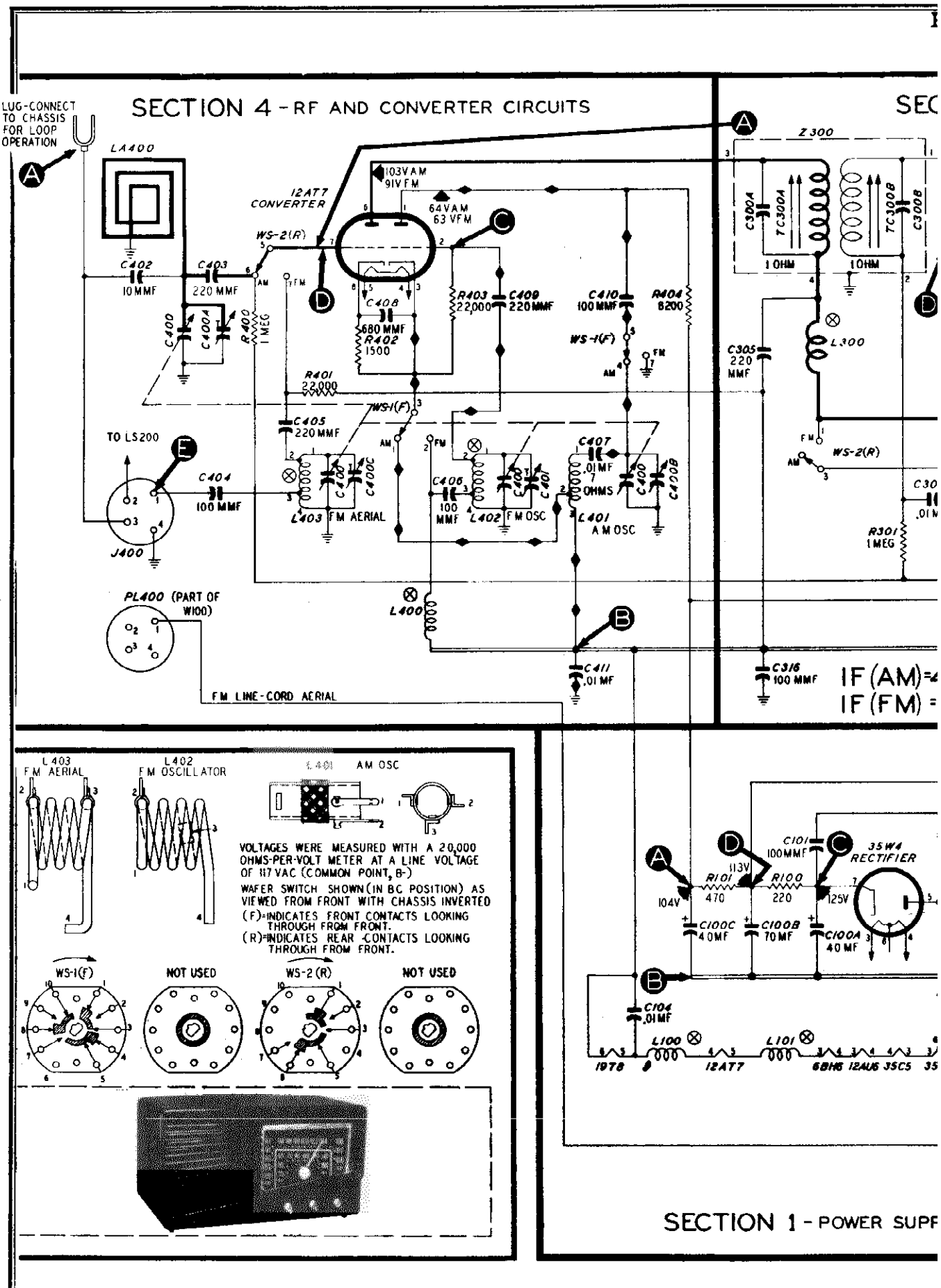
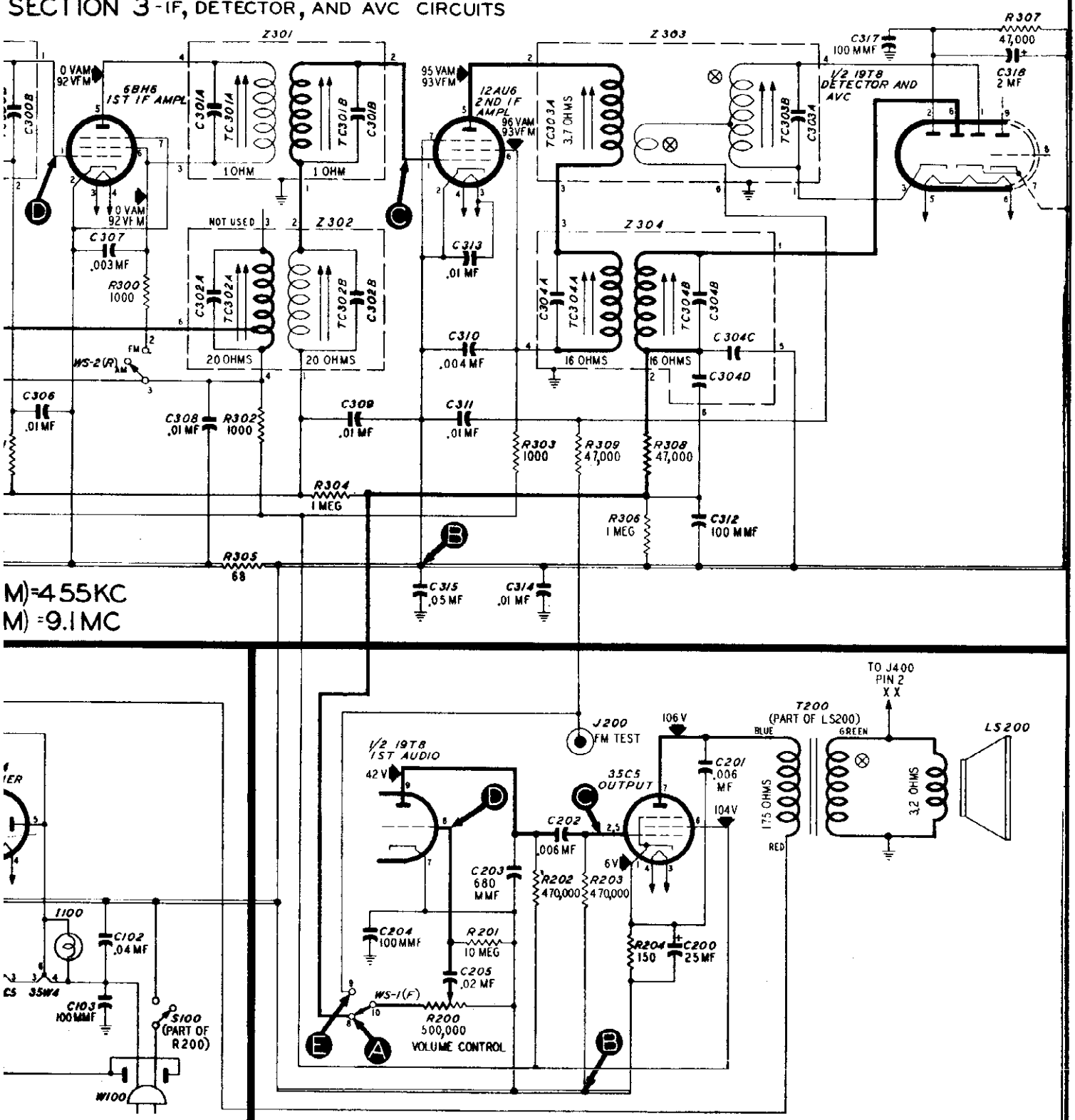


Figure 6. Philco Radio Model 49-905, S



105. Sectionalized Schematic Diagram, Showing Test Points

NMENT CHART

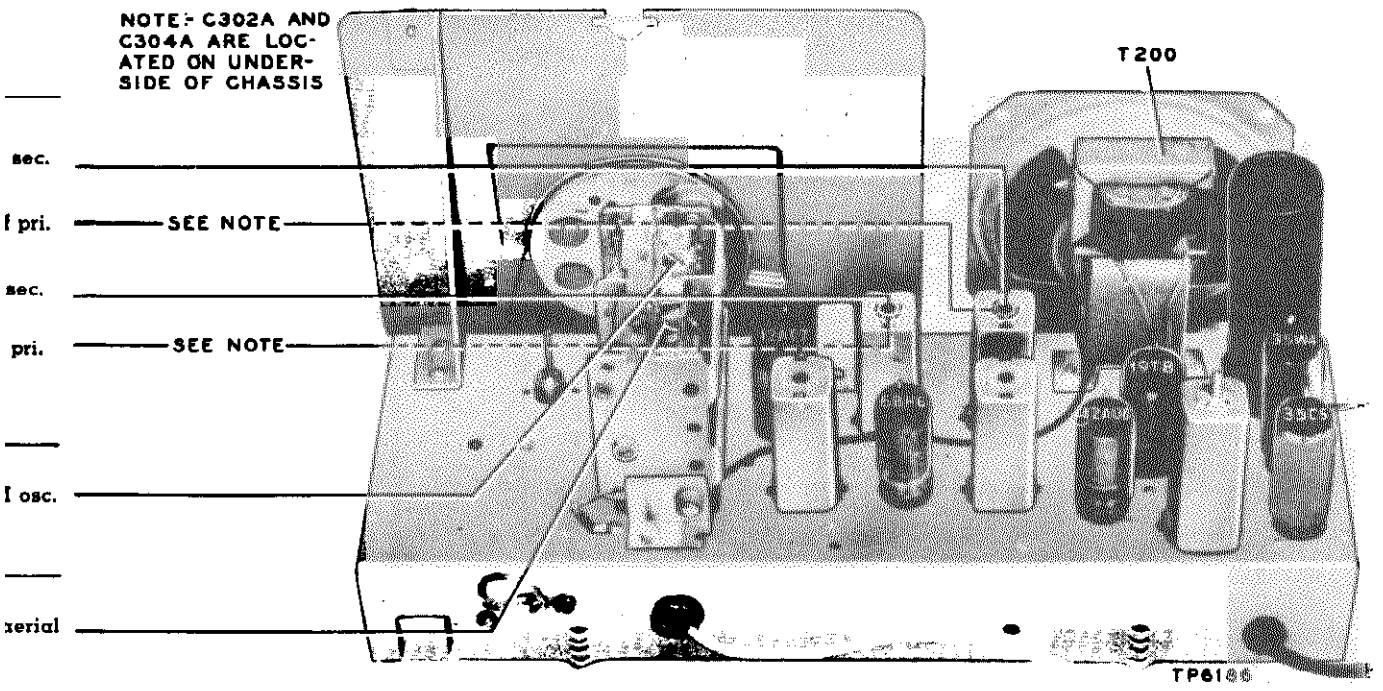


Figure 7. Top View, Showing AM Trimmer Locations

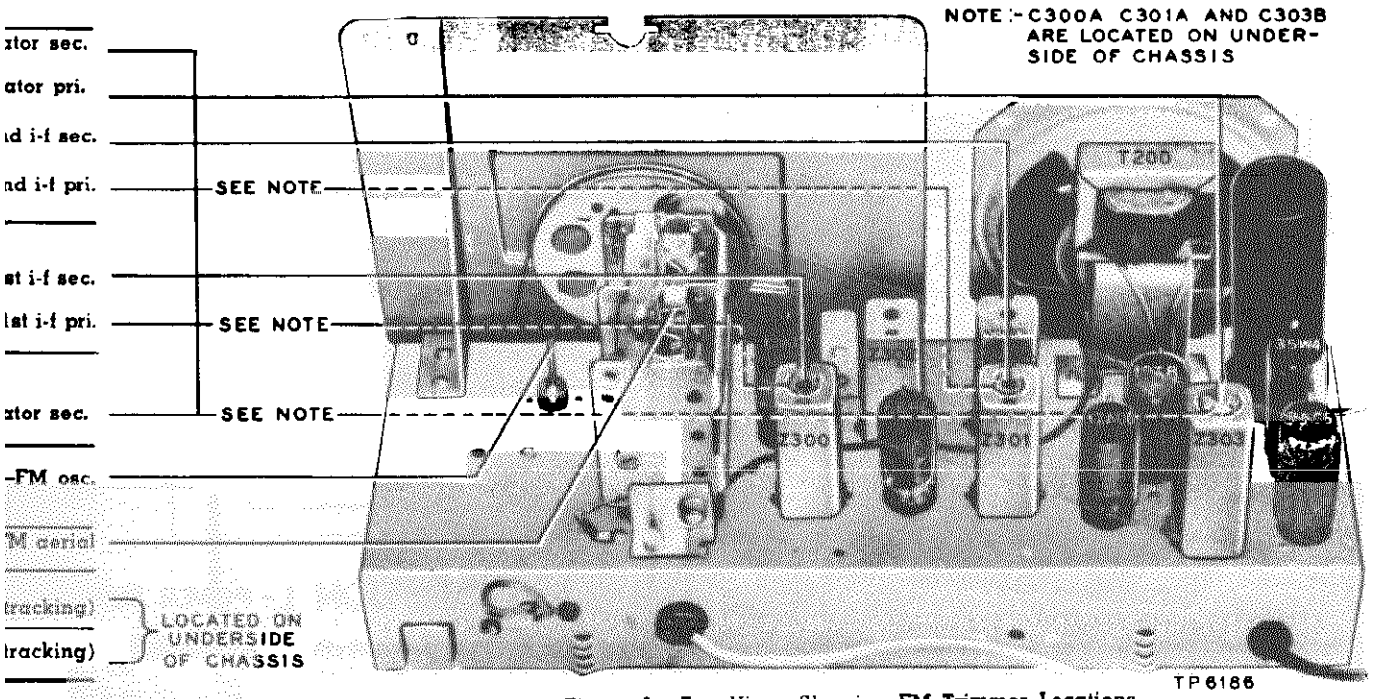


Figure 8. Top View, Showing FM Trimmer Locations

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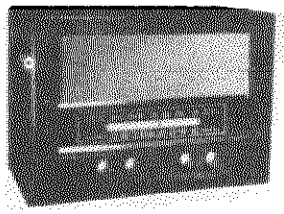
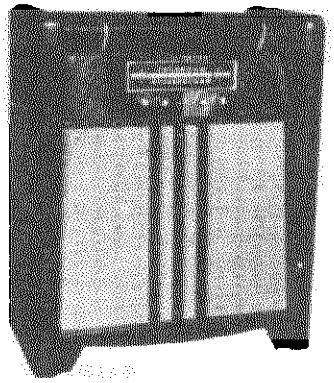
MODEL 49-90
49-1101



Circuit Description

Both models are 9-tube superheterodynes designed to provide reception on the standard broadcast band and the FM band. The only electrical difference between the two models is in the broadcast loop aerial; Model 49-909 has a semi-high-impedance loop and a series aerial coil; Model 49-1101 has a low-impedance loop and an aerial transformer. Any other minor differences are indicated in the schematic diagram and the replacement parts list. A built-in line-cord aerial is used for FM reception.



These aerials normally provide adequate signal pickup; if additional pickup is required, Philco Dipole Aerial, Part No. 45-1462, may be used. When connecting the dipole aerial, disconnect the black lead from terminal 2 of TB400, and attach it to pin 1 of the dipole-aerial plug which fits into J400. No additional coupler is required.

To eliminate complicated switching and to provide greater stability and gain on both bands, separate converter tubes are used for broadcast and FM reception. A 12AU6 high-gain pentode is used as a tuned-r-f amplifier on the FM band. The output of this stage is fed to a 14F8 dual triode, which functions as the converter for the FM signal. A 12AU7 dual triode is used as the converter for the broadcast signal. Band-switching is accomplished by means of a single-wafer switch, which connects the B+ voltage to the proper mixer plate.

6BJ6 tubes are used in the two i-f-amplifier stages. Two sets of i-f transformers are used; one set is tuned to 455 kc. for standard broadcast, and the other set is tuned to 9.1 mc. for FM. The use of two sets of transformers makes better shielding possible, so that undesirable beat signals and interaction between transformers are eliminated.

Two diode sections of the 19T8 triple-diode-triode are used in a ratio-detector circuit for the detection of FM signals. The other diode section is used in a half-wave rectifier circuit for detection of standard-broadcast signals and to provide a-v-c voltage.

The triode section of the 19T8 is employed as the first audio amplifier, and is resistance-coupled to the 50L6GT output tube, which supplies an audio output of approximately three watts to the PM dynamic speaker.

The d-c operating voltages are provided by two 117Z3 rectifier tubes in a half-wave doubler circuit. The output is filtered by a resistance-capacitance network.

SPECIFICATIONS

CABINET	
Model 49-909	Table model, wood, mahogany
Model 49-1101	Console, wood, mahogany
CIRCUIT	9-tube superheterodyne
FREQUENCY RANGES	
Broadcast	540—1620 kc.
FM	88—108 mc.
AUDIO OUTPUT	3 watts
OPERATING VOLTAGE	105—120 volts, 50/60 cycles, a.c.
POWER CONSUMPTION	45 watts
AERIALS	Built-in loop (semi-high-impedance for Model 49-909; low-impedance for Model 49-1101); FM line-cord aerial; provision for external aerial
INTERMEDIATE FREQUENCY	
AM	455 kc.
FM	9.1 mc.
PHILCO TUBES (9)	12AU6, 12AU7, 14F8, 6BJ6(2), 19T8, 50L6GT, 117Z3(2)
PANEL LAMP	110-volt, screw-base, Part No. 34-2477

TP-5856 & TP-6234A

MODEL 49-909, 49-1101

PHILCO CORP.

Philco TROUBLE-SHOOTING Procedure

For rapid trouble shooting, the radio circuit is divided into four sections, with test points specified for each section; these sections and test points are indicated in the schematic diagram. The trouble-shooting procedure given for each section includes a simplified test chart and a bottom view of the chassis showing the locations of the test points and the components of that section.

In each chart, the first step is a master check for determining whether trouble exists in that section, without going through the entire test procedure.

Failure to obtain the "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before it is turned on:

1. Inspect both the top and the bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, or other obvious indications of trouble.

2. Measure the resistance between B+ (lug 1 of R101) and B—, test point B. When the ohmmeter test leads are connected in the proper polarity, the highest resistance reading will be obtained. If the reading is lower than 1875 ohms, check condensers C104A, C104B, and C104C for leakage or shorts. The resistance value given is much lower than normal, and is not intended as a quality check of these condensers; the value given is the lowest at which the rectifier will operate safely while the voltage checks of Section 1 (power supply) are performed.

3. If the 50L6GT or the 6BJ6 1st i-f amplifier is burned out, check C314 for a short before installing a new tube.

Important!

To avoid altering FM operation, special care should be used in replacing any part. Replacement parts should be placed in the same physical positions as the original parts; connections should be of the same length, and should be soldered to the same points. The placement or length of leads should not be changed.

Section 1 TROUBLE SHOOTING

POWER SUPPLY

For the tests in this section, use a d-c voltmeter. Connect the negative lead to B—, test point B; connect the positive lead to the test points indicated in the chart. The voltage readings given were taken with a 20,000-ohms-per-volt meter at a line voltage of 117 volts, a.c.

Turn on the power, and set the volume control to minimum. Set the tone control for minimum treble response (fully clockwise), and set the band switch to the broadcast position.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2 (audio circuits); if not, isolate and correct the trouble in this section.

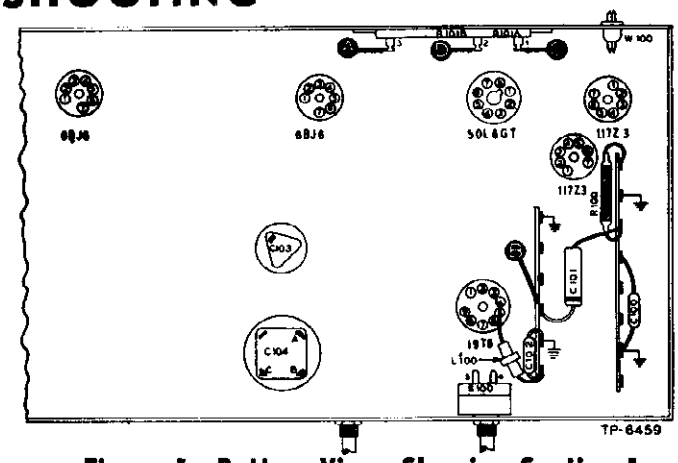


Figure 1. Bottom View, Showing Section 1 Test Points

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	120 volts		Trouble in this section. Isolate by the following tests.
2	C	210 volts	No voltage	Defective: 117Z3. Open: W100, S100, R100, C103. Shorted: C101, C104A.
			Low voltage	Defective: 117Z3. Leaky: C104A, C103. Shorted: C103, C104B. Open: C104A.
			High voltage	Open: R101A.
3	D	190 volts	No voltage	Open: R101A. Shorted: C104B.
			Low voltage	Leaky: C104B. Shorted: C104C. Open: C104B.
			High voltage	Open: R101B, T200*, R204*. Defective: 50L6GT.
4	A	120 volts	No voltage	Open: R101B. Shorted: C104C.
			Low voltage	Leaky: C104C. Shorted: C317*, C311*.

Listening Test: Abnormal hum may be caused by open C104A, C104B, or C104C.

* This part, located in another section, may cause abnormal indication in this section.

Section 2 TROUBLE SHOOTING

AUDIO CIRCUITS

For the tests in this section, use an audio-frequency signal generator. Connect the generator ground lead to B—, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, turn the tone control for maximum treble response (fully counterclockwise) and set the band switch to the broadcast position.

If the "NORMAL INDICATION" is obtained in st 1, proceed with the tests for Section 3 (i-f, detector, a a-v-c circuits); if not, isolate and correct the trouble in t section.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with moderate signal-generator input.	Trouble in this section. Isolate by the following tests.
2	C	Loud, clear output with strong input.	Defective: 50L6GT. Shorted: LS200, T200. Open: R203, R204, C205, LS200, T200. Shorted or leaky: C203, C205, C207.
3	D	Same as step 1.	Defective: 19T8. Open: R205, R202, C203, R207, R201. Shorted or leaky: C202, C204 (rotate R201 through range).
4	A	Same as step 1.	Open: R200 (rotate through range), C200, C201, R206 (rota R201 through range). Shorted or leaky: C200, C201, C206 (rotate R201 through range C305D*.
Listening Test: Distortion may be caused by leaky C200, C201, C202, or C203.			

* This part, located in another section, may cause abnormal indication in this section.

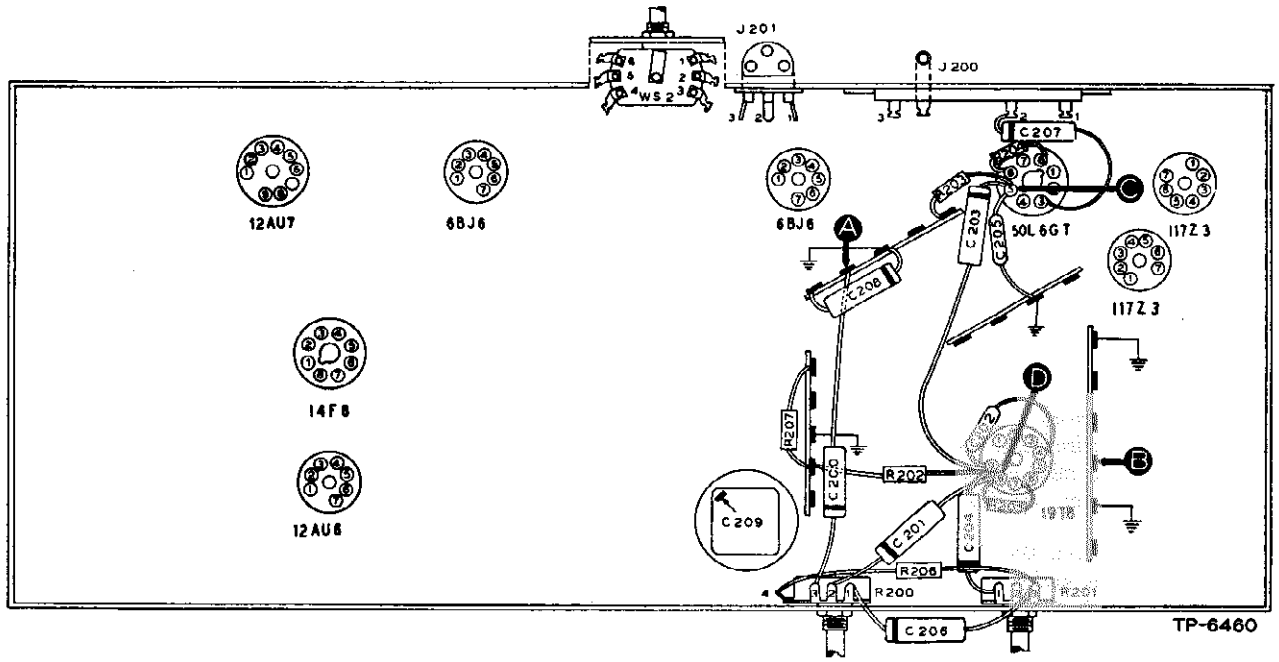


Figure 2. Bottom View, Showing Section 2 Test Points

Section 3 TROUBLE SHOOTING

I-F, DETECTOR, AND A-V-C CIRCUITS—AM CIRCUITS

For the following tests, use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to B—, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, and turn the tone control for maximum treble response (fully counterclockwise). Set the band switch to the broadcast position, and rotate the tuning control until the tuning condenser is fully meshed.

If the "NORMAL INDICATION" is obtained in st 1, proceed with the tests for the FM circuits; if not, isol and correct the trouble in the AM circuits.

To provide a complete i-f-amplifier check, test point for the AM i-f circuits is placed at the grid of the AM mi in Section 4; therefore, the effectiveness of step 1 as master check is dependent upon the condition of cert parts in the mixer circuit. These parts are listed bel under "POSSIBLE CAUSE OF ABNORMAL IND CATION."

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PHILCO CORP.

Section 3 (Cont.)

TROUBLE SHOOTING

I-F, DETECTOR, AND A-V-C CIRCUITS

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with weak signal-generator input.	Trouble in AM circuits. Isolate by the following tests.
2	D	Loud, clear output with moderate input.	Defective: 19T8, 6BJ6 (2nd i-f amplifier). Open: Z302, Z303, Z304, Z305, R307, WS2, R308, R309, R311, C305C, C305D, WS1, R310. Shorted or leaky: C303B, C315, C316, C317, C324, C305A, C305B, C305C, C305D. Shorted: Z303, Z305.
3	E	Same as step 2.	Defective: 6BJ6 (1st i-f amplifier). Open: Z300, Z301, R301, R305, R306, R302, R304, Z302, Z303. Shorted or leaky: C308, C313, C311. Shorted: Z303.
4	A	Same as step 1.	Defective: 12AU7*. Open: R409*, L404*, R303, R300, Z301, R411*, WS1. Shorted or leaky: C410*, C307. Shorted: Z301.

Listening Test: Hum and distortion may be caused by shorted or leaky C100*, C310, C314, C320, C312, C102*, C420*, C421*, C422*, C423*, C324, C325 or C323.

* This part, located in another section; may cause abnormal indication in this section.

FM CIRCUITS

For the following tests, use an AM r-f signal generator, with modulated output. Set the generator frequency to 9.1 mc. and detune to one side or the other until a satisfactory test signal is obtained. Connect the generator ground lead to B—, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, and turn the tone control for maximum treble response (fully counterclockwise). Set the band switch to the FM position, and rotate the tuning control until the tuning condenser is fully meshed.

The most satisfactory check on the operation of the discriminator is the ability of the circuit to take proper alignment, as directed under "ALIGNMENT PROCEDURE."

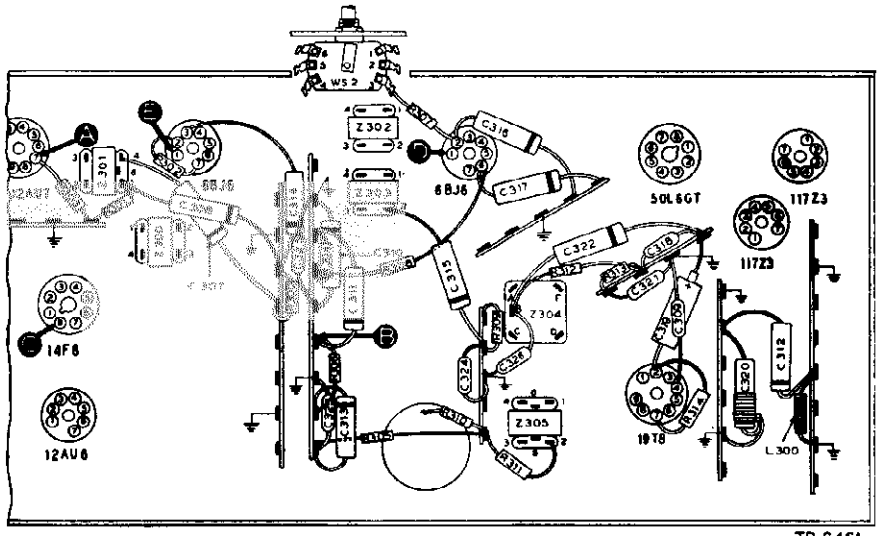


Figure 3. Bottom View, Showing Section 3 Test Points TP-6461

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 4 (r-f and converter circuits); if not, isolate and correct the trouble in the FM circuits.

The parts which were found to be satisfactory for AM operation, with the exception of those indicated in the following chart, will usually be satisfactory for FM operation.

To provide a complete i-f-amplifier check, test point A for the FM i-f circuits is placed at the grid of the FM mixer in Section 4; therefore, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in the mixer circuit. These parts are listed below under "POSSIBLE CAUSE OF ABNORMAL INDICATION."

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	C	Loud, clear speaker output with weak signal-generator input.	Trouble in FM circuits. Isolate by the following tests.
2	D	Loud, clear output with strong input.	Defective: 6BJ6 (2nd i-f amplifier), 19T8, Z304. Misaligned: Z304. Open: R312, R313, R314, C320, C319, C318, C304, C306. Shorted or leaky: C319, C320, C304, C306, C318, C326.
3	E	Loud, clear output with moderate input.	Defective: 6BJ6 (1st i-f amplifier). Misaligned: Z302. Open: Z302. Shorted: Z302.
4	C	Same as step 1.	Defective: 14F8*. Open: R300, R406*, R405*, R407*, L408*, Z300, WS1. Shorted or leaky: C418*, C419*.

* This part, located in another section, may cause abnormal indication in this section.

Section 4

TROUBLE SHOOTING

R-F AND CONVERTER CIRCUITS

AM CIRCUITS

For the following tests, with the exception of the oscillator test, use an r-f signal generator with modulated output. Connect the generator ground lead to B—, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, and turn the tone control for maximum treble response (fully counterclockwise). Set the band switch to the broadcast position, and set the tuning control and the signal-generator frequency as indicated in the chart.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for the FM circuits, if not, isolate and correct the trouble in the AM circuits.

FM CIRCUITS

For the following tests, with the exception of the oscillator test, use an AM r-f signal generator with modulated output. Connect the generator ground lead to B—, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

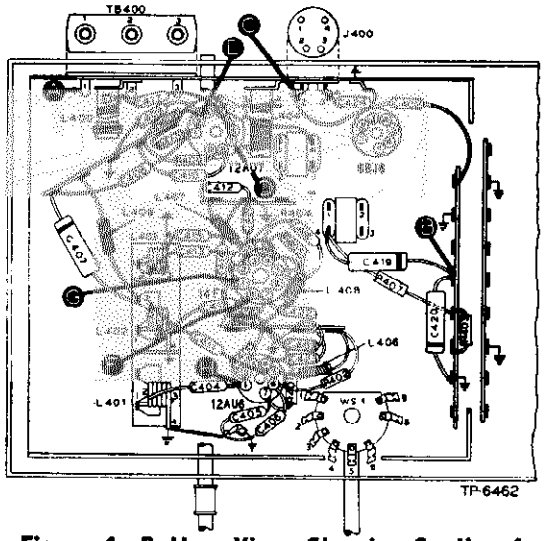


Figure 4. Bottom View, Showing Section 4 Test Points

Set the volume control to maximum, and turn the tone control for maximum treble response (fully counterclockwise). Set the band switch to the FM position, and set the tuning control and the signal-generator frequency as indicated in the chart.

If the "NORMAL INDICATION" is not obtained in step 1, isolate and correct the trouble in the FM circuits. If the trouble is not revealed by the tests for these circuits, check the alignment.

STEP	TEST POINT	SIG. GEN. FREQ.	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	1000 kc.	1000 kc.	Loud, clear speaker output with weak signal-generator input.	Trouble in AM circuits. Isolate by the following tests.
2	D	1000 kc.	1000 kc.	Loud, clear output with moderate input.	Defective: 12AU7, oscillator circuit. Shorted: C410, C417, WS1. Open: R409, R411, R303*, WS2.
3	E to B (Osc. test, see note below.)		Rotate through range.	Negative 2 to 3 volts.	Defective: 12AU7. Open: R408, R410, L404, C408, C407, L409. Shorted: C408, C409, C400, C401B.
4	A	1000 kc.	1000 kc.	Same as step 1.	Open: L400, C417, L405. Shorted: C400, C401A, C425.

OSCILLATOR TEST: Connect the positive lead of a high-resistance voltmeter to B—, test point B; connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the oscillator grid (pin 2 of 12AU7), test point E. Use a suitable meter range, such as 0—10 volts. Proper operation of the oscillator is indicated by negative voltage of approximately the value given in the chart (measured with 20,000-ohms-per-volt meter) throughout the tuning range.

STEP	TEST POINT	SIG. GEN. FREQ.	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	C	95 mc.	Tune to signal.	Loud, clear speaker output with weak signal-generator input.	Trouble in FM circuits. Isolate by the following tests.
2	F	95 mc.	Tune to signal.	Loud, clear output with moderate input.	Defective: 14F8, oscillator circuit. Open: R405, R406, R407, L408, C418, L402. Shorted: C418, C416, C400, C400B, C419, L402.
3	G to B (Osc. test, see note below.)		Tune through range.	Negative 1.2 to 2 volts.	Defective: 14F8. Open: R404, L407, R403, C413, C415, L403. Shorted: C400, C400C, C413, C415, C414, C412, L403, L407.
4	H	95 mc.	Tune to signal.	Same as step 1.	Defective: 12AU6. Open: L402, L406, R400, R401, R402, C411, C418, R412. Shorted: C405, C404, C406, C411, C400, C400B, C404, L402.
5	C	95 mc.	Tune to signal.	Same as step 1.	Open: C402, L401, C404, R412. Shorted: C404, C400, C400A, L401.

OSCILLATOR TEST: Connect the positive lead of a high-resistance voltmeter to B—, test point B; connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the oscillator grid (pin 1 of 14F8), test point G. Use a suitable meter range, such as 0—10 volts. Proper operation of the oscillator is indicated by negative voltage of approximately the value given in the chart. (measured with 20,000-ohms-per-volt meter) throughout the tuning range.

MODEL 49-909, 49-1101

PHILCO CORP.

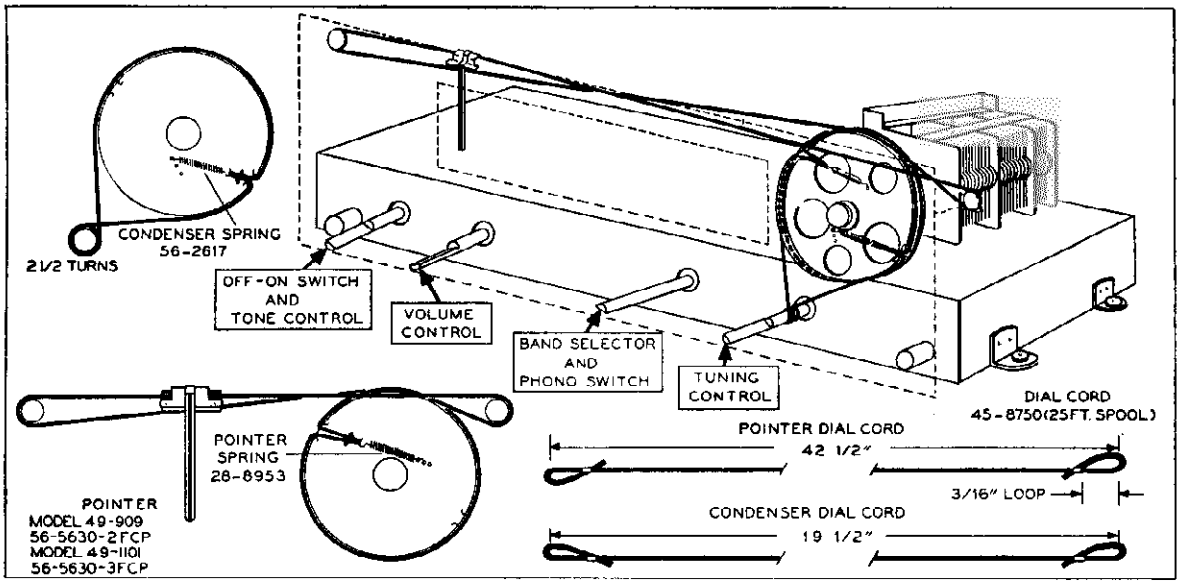


Figure 5. Drive-Cord Installation Details

REPLACEMENT PARTS LIST

NOTE: Part numbers identified by an asterisk (*) are general replacement items. These numbers may not be identical with those on factory parts; also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

SECTION 1
POWER SUPPLY CIRCUITS

Reference Symbol	Description	Service Part No.
C100	Condenser, r-f by-pass, 100 mmf.	62-110009001
C101	Condenser, line filter, .04 mf.	45-3500-2*
C102	Condenser, r-f by-pass, 100 mmf.	62-110009001
C103	Condenser, electrolytic, voltage doubler, 40 mf., 200 v.	30-2568-11
C104	Condenser, electrolytic, 4-section	30-2568-24
C104A:	Condenser, filter, 40 mf., 250 v.	Part of C104
C104B:	Condenser, filter, 40 mf., 250 v.	Part of C104
C104C:	Condenser, filter, 20 mf., 250 v.	Part of C104
I100	Lamp, pilot, 110 v., screw-base	34-2605
L100	Choke, r-f, filament by-pass	32-4143-4
R100	Resistor, current-limiting, 25 ohms	33-1334-5
R101	Resistor, filter, 2-section	33-3435-20
R101A:	Resistor, filter, 180 ohms	Part of R101
R101B:	Resistor, filter, 3800 ohms	Part of R101
S100	Switch, power on-off	Part of R201
W100	Line-cord-and-plug assembly (including FM line aerial)	41-3755-19*

SECTION 2
AUDIO CIRCUITS

Reference Symbol	Description	Service Part No.
C200	Condenser, d-c blocking, .02 mf.	61-0108*
C201	Condenser, d-c blocking, .006 mf.	45-3500-7*
C202	Condenser, plate by-pass, 100 mmf.	62-110009001
C203	Condenser, d-c blocking, .006 mf.	45-3500-7*
C204	Condenser, tone compensation, .006 mf.	45-3500-7*
C205	Condenser, r-f by-pass, 100 mmf.	62-110009001
C206	Condenser, bass compensation, .01 mf.	61-0120*
C207	Condenser, tone compensation, .006 mf.	45-3500-7*
C208	Condenser, r-f by-pass, .01 mf.	61-0120*
C209	Condenser, electrolytic, filter, 10 mf., 250 v.	Part of C104
J200	Jack, FM test	27-6180
J201	Jack, accessory input	27-6126
LS200	Speaker, permanent-magnet	
	Model 49-909	36-1629
	Model 49-1101	36-1626-1
R200	Volume control, 2 megohms	33-5535-17
R201	Tone control (with power on-off switch), 4 megohms	33-5538-34
R202	Resistor, plate load, 470,000 ohms	66-4473340*
R203	Resistor, grid return, 470,000 ohms	66-4473340*

SECTION 2 (Cont.)
AUDIO CIRCUITS

Reference Symbol	Description	Service Part No.
R204	Resistor, cathode bias, 150 ohms	66-1153340*
R205	Resistor, grid return, 10 megohms	66-6103340*
R206	Resistor, tone compensation, 33,000 ohms	66-3333340*
R207	Resistor, plate decoupling, 100,000 ohms	66-4103340
T200	Transformer, output	32-8242
WS2	Switch-wafer section	Part of 42-1745-2†

† 42-1745-2 Switch, accessory.

SECTION 3
I-F, DETECTOR, AND A-V-C CIRCUITS

Reference Symbol	Description	Service Part No.
C300A	Condenser, shunt	Part of Z300
C300B	Condenser, shunt	Part of Z300
C301A	Condenser, shunt	Part of Z301
C301B	Condenser, shunt	Part of Z301
C302A	Condenser, shunt	Part of Z302
C302B	Condenser, shunt	Part of Z302
C303A	Condenser, shunt	Part of Z303
C303B	Condenser, shunt	Part of Z303
C304	Condenser, shunt, 68 mmf.	Part of Z304
C305A	Condenser, shunt	Part of Z305
C305B	Condenser, shunt	Part of Z305
C305C	Condenser, a-v-c filter	Part of Z305
C305D	Condenser, a-v-c filter	Part of Z305
C306	Condenser, shunt, 5 mmf., Part of Z304	30-1224-5
C307	Condenser, plate decoupling, .01 mf.	61-0120*
C308	Condenser, a-v-c by-pass, .01 mf.	61-0120*
C309	Condenser, r-f by-pass, 100 mmf.	62-110009001
C310	Condenser, r-f by-pass, .05 mf.	61-0122*
C311	Condenser, decoupling, .006 mf.	45-3500-7*
C312	Condenser, r-f by-pass, .03 mf.	45-3500-1*
C313	Condenser, a-v-c by-pass, .01 mf.	61-0120*
C314	Condenser, r-f by-pass, .01 mf.	61-0120*
C315	Condenser, plate by-pass, .01 mf.	61-0120*
C316	Condenser, cathode by-pass, .01 mf.	61-0120*
C317	Condenser, screen by-pass, .01 mf	61-0120*
C318	Condenser, decoupling, 1500 mmf.	62-215001001
C319	Condenser, electrolytic, filter, FM detector, 2 mf., 50 v.	30-2417-7
C320	Condenser-and-choke assembly, .05 mf.	39-9851-6
C321	Condenser, r-f by-pass, 100 mmf.	62-110009001
C322	Condenser, compensating, .01 mf.	61-0120*
C323	Condenser, r-f by-pass, 100 mmf.	62-110009001

REPLACEMENT PARTS LIST (Cont.)

SECTION 3 (Cont.)

I-F, DETECTOR, AND A-V-C CIRCUITS

Reference Symbol	Description	Service Part No.
C324	Condenser, r-f by-pass, 100 mmf	62-110009001
C325	Condenser, r-f by-pass, 100 mmf	62-110009001
C326	Condenser, r-f by-pass, 100 mmf	62-110009001
L300	Choke, r-f by-pass	32-4061-2
R300	Resistor, decoupling, 68 ohms	66-0683340*
R301	Resistor, grid return, 1 megohm	66-5103340*
R302	Resistor, cathode bias, 68 ohms	66-0683340*
R303	Resistor, grid return, 1 megohm	66-5103340*
R304	Resistor, decoupling, 1000 ohms	66-2103340*
R305	Resistor, a-v-c filter, 3.3 megohms	66-5333340*
R306	Resistor, isolating, 68 ohms	66-0683340*
R307	Resistor, cathode bias, 120 ohms	66-1123340*
R308	Resistor, screen dropping, 1000 ohms	66-2103340*
R309	Resistor, plate decoupling, 2200 ohms	66-2223340*
R310	Resistor, diode load, 330,000 ohms	66-4333340*
R311	Resistor, diode load, 47,000 ohms	66-3473340*
R312	Resistor, decoupling, 47,000 ohms	66-3473340*
R313	Resistor, decoupling, 100,000 ohms	66-4103340*
R314	Resistor, FM-detector load, 47,000 ohms	66-3473340*
WS1	Switch-wafer section	Part of 42-1834-2‡
WS2	Switch-wafer section	Part of 42-1745-2†
TC300A	Tuning core, primary, 1st FM i-f trans.	Part of Z300
TC300B	Tuning core, secondary, 1st FM i-f trans.	Part of Z300
TC301A	Tuning core, primary, 1st AM i-f trans.	Part of Z301
TC301B	Tuning core, secondary, 1st AM i-f trans.	Part of Z301
TC302A	Tuning core, primary, 2nd FM i-f trans.	Part of Z302
TC302B	Tuning core, secondary, 2nd FM i-f trans.	Part of Z302
TC303A	Tuning core, primary, 2nd AM i-f trans.	Part of Z303
TC303B	Tuning core, secondary, 2nd AM i-f trans.	Part of Z303
TC304A	Tuning core, primary, 3rd FM i-f trans.	Part of Z304
TC304B	Tuning core, secondary, 3rd FM i-f trans.	Part of Z304
TC305A	Tuning core, primary, 3rd AM i-f trans.	Part of Z305
TC305B	Tuning core, secondary, 3rd AM i-f trans.	Part of Z305
Z300	Transformer, 1st FM i-f	32-4257
Z301	Transformer, 1st AM i-f	32-4258
Z302	Transformer, 2nd FM i-f	32-4257-1
Z303	Transformer, 2nd AM i-f	32-4160-3
Z304	Transformer, 3rd FM i-f	32-4261-1
Z305	Transformer, 3rd AM i-f	32-4240-2

SECTION 4

R-F AND CONVERTER CIRCUITS

C400	Condenser, tuning gang	31-2724-3
C400A:	Condenser, trimmer, FM aerial	Part of C400
C400B:	Condenser, trimmer, FM r-f	Part of C400
C400C:	Condenser, trimmer, FM oscillator	Part of C400
C401	Condenser, trimmer, 2-section	31-8476-18
C401A:	Condenser, trimmer, BC aerial	Part of C401
C401B:	Condenser, trimmer, BC oscillator	Part of C401
C402	Condenser, aerial coupling, 100 mmf	62-110001011
C403	Condenser, r-f by-pass, 100 mmf	62-110001001
C404	Condenser, blocking, 51 mmf	62-051009001
C405	Condenser, cathode by-pass, 100 mmf	62-110001011
C406	Condenser, screen by-pass, 100 mmf	62-110001001
C407	Condenser, isolating, .01 mf	61-0120*
C408	Condenser, blocking, 100 mmf	62-110009001
C409	Condenser, r-f by-pass, 220 mmf	62-122001001
C410	Condenser, cathode by-pass, 1500 mmf	62-215001001
C411	Condenser, d-c blocking, 51 mmf	62-051009001
C412	Condenser, r-f by-pass, 1500 mmf	62-215001001
C413	Condenser, d-c blocking, 220 mmf	62-122001001
C414	Condenser, r-f by-pass, 51 mmf	62-051009001
C415	Condenser, d-c blocking, 220 mmf	62-122001001
C416	Condenser, cathode by-pass, 100 mmf	62-110001001
C417	Condenser, isolating, 100 mmf	62-110001001
C418	Condenser, d-c blocking, 100 mmf	62-110001001
C419	Condenser, plate decoupling, .01 mf	61-0120*
C420	Condenser, r-f by-pass, .03 mf	45-3500-1*
C421	Condenser, r-f by-pass, 100 mmf	62-110001001

† 42-1745-2 Switch, accessory.
‡ 42-1834-2 Switch, band, BC-FM.

SECTION 4 (Cont.)

R-F AND CONVERTER CIRCUITS

Reference Symbol	Description	Service Part
C422	Condenser, r-f by-pass, 100 mmf	62-11000100
C423	Condenser, r-f by-pass, 100 mmf	62-11000100
C424	Condenser, aerial coupling, 100 mmf	62-11000100
C425	Condenser	
	Model 49-909—aerial coupling, 10 mmf	62-01000900
	Model 49-1101—fixed trimmer, 10 mmf	62-01000900
L400	Coil, BC aerial	
	Model 49-909	32-4217-
	Model 49-1101	32-4033-1
L401	Coil, FM aerial	32-4158-
L402	Coil, FM r-f	32-4159-
L403	Coil, FM oscillator	32-4018-
L404	Coil, BC oscillator	32-4221-
L405	Coil, r-f choke	32-4061-
L406	Coil, FM r-f plate load	32-4061-
L407	Coil, FM oscillator plate load	32-4061-
L408	Coil, r-f choke	32-4061-
L409	Coil, r-f choke	32-4061-
LA400	Loop aerial	
	Model 49-909	32-4052-2
	Model 49-1101	76-3583-
J400	FM aerial socket	27-6214-
PL400	Plug, FM aerial	Part of W10
R400	Resistor, grid return, 1 megohm	66-510334
R401	Resistor, cathode bias, 100 ohms	66-110334
R402	Resistor, screen dropping, 10,000 ohms	66-310334
R403	Resistor, plate decoupling, 4700 ohms	66-247334
R404	Resistor, grid return, 15,000 ohms	66-315334
R405	Resistor, cathode bias, 2200 ohms	66-222334
R406	Resistor, grid return, 10,000 ohms	66-310334
R407	Resistor, plate decoupling, 10,000 ohms	66-310334
R408	Resistor, grid return, 15,000 ohms	66-315334
R409	Resistor, cathode bias, 3300 ohms	66-233334
R410	Resistor, plate load, 15,000 ohms	66-315334
R411	Resistor, plate decoupling, 15,000 ohms	66-315334
R412	Resistor, isolating, 68 ohms	66-068334
TB400	Terminal panel, aerial	38-994
WS1	Switch-wafer section	Part of 42-1834-2

MISCELLANEOUS

Description	Service Part
Cabinet and Cabinet Parts	
Bezel, Model 49-1101	56-5855FC
Cabinet (less dial scale)	
Model 49-909	1072
Model 49-1101	10701
Cabinet back	
Model 49-909	54-763
Model 49-1101	54-764
Dial scale	
Model 49-909	54-502
Model 49-1101	54-502
Strap, scale mounting (2 required)	56-4756FE1
Dial-backplate assembly	76-391
Dial cord (25-foot spool)	45-875
Diffusing panel	54-759
Pointer	
Model 49-909	56-5630-2FC
Model 49-1101	56-5630-3FC
Spring, pointer	28-895
Spring, gang	56-261
Dial drive-shaft assembly	76-3479-
Knob, control (4 required)	
Model 49-909	54-4488-
Model 49-1101	54-448
Knob, accessory switch	27-480
Socket assembly, pilot lamp	27-623
Bracket-and-clip assembly, pilot lamp	76-391
Socket, 9-pin miniature	27-6203-
Socket, 8-pin Loktal	27-613
Socket, 7-pin miniature	27-622

‡ Switch, band, BC-FM.

MODEL 49-909, 49-1101

PHILCO CORP.

ALIGNMENT OF AM CIRCUITS

Make alignment with loop aerial connected to radio. The AM alignment should be completed before the FM alignment is made.

DIAL POINTER—With tuning condenser fully meshed, adjust dial pointer to coincide with index mark at low-frequency end of dial. See figure 7.

OUTPUT METER—Connect between terminal 3 (voice-coil connection) of aerial terminal panel TB400 and chassis.

AM SIGNAL GENERATOR—Connect as indicated in chart. Use modulated output.

OUTPUT LEVEL—During alignment, signal-generator output must be attenuated to hold radio output below 1.25 volts, as read on output meter.

CONTROLS—Set volume control to maximum, turn tone control for maximum treble response (fully counterclockwise), and set band switch to broadcast position.

ALIGNMENT OF FM CIRCUITS

Align the AM circuits first.

OUTPUT METER—Connect between terminal 3 (voice-coil connection) of aerial terminal panel TB400 and chassis.

ALIGNMENT INDICATOR—Connect negative lead of a 20,000-ohms-per-volt, d-c voltmeter to pin 2 of 19T8 tube; connect positive lead to B—, test point B in Section 2. Use 10-volt range.

AM SIGNAL GENERATOR—Generator must have sufficient output to give a reading of at least 8.5 volts on alignment indicator. Connect generator ground lead to B—, test point B; connect output lead as indicated in chart. Use modulated output.

CONTROLS—Same as for alignment of AM circuits, except set band switch to FM position.

Allow radio and signal generator to warm up for at least 15 minutes before starting alignment.

NOTE: Check resonance of circuits using coils L401, L402, and L403 by inserting each end of a powdered-iron tuning core, such as Philco Part No. 56-6100, in the coil. If the signal strength increases when the iron end is inserted, compress the turns slightly. If the signal strength increases when the threaded brass end is inserted, spread the turns slightly. If the signal strength decreases when either the iron or the brass end is inserted, no adjustment is necessary. Do not spread or compress the turns of the coil excessively; only a small change is required at these high frequencies.

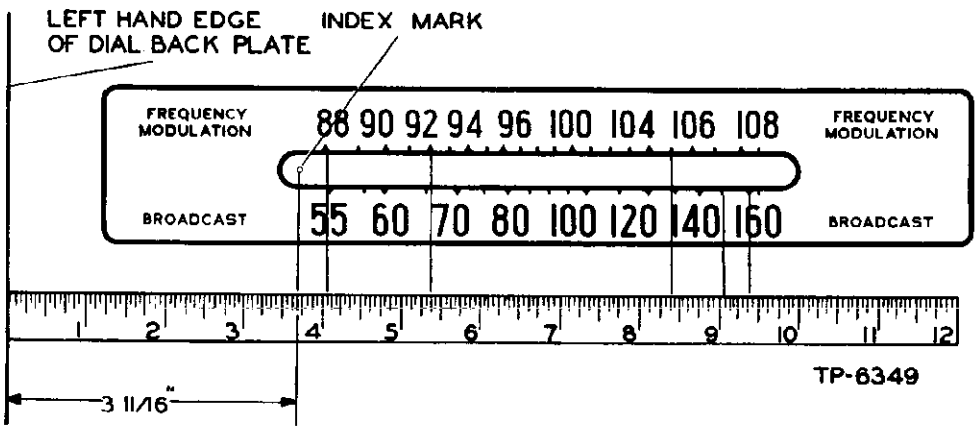


Figure 7. Dial-Backplate Calibration Measurements

MODEL 49-909,
49-1101

AM ALIGNMENT CHART

STEP	SIGNAL GENERATOR		RADIO		ADJ
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Ground lead to B--, test point B; output lead through .1-mf. condenser to terminal 1 of TB400.	455 kc.	540 kc.	Adjust each trimmer, in order given, for maximum output. Do not repeat adjustments.	TC305B- TC305A- TC303B- TC303A- TC301B- TC301A-
2	Radiating loop (see note below).	1600 kc.	1600 kc.	Adjust for maximum output.	C401
3	Same as step 2.	1500 kc.	1500 kc.	Adjust for maximum output.	C401A

RADIATING LOOP: Make up a six-to-eight-turn, 6-inch-diameter loop, using insulated wire; connect to the signal-g
leads and place near the radio loop.

FM ALIGNMENT CHART

STEP	SIGNAL GENERATOR		RADIO		ADJ
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Through .1-mf. condenser to pin 1 of 6BJ6 1st i-f amplifier.	9.1 mc.	88 mc.	Adjust for maximum reading on alignment indicator. Attenuate signal generator to maintain reading of approximately 10 volts. Repeat adjustments until no further improvement is noted. After this step, do not disturb any of these trimmers except as directed in step 3.	TC304B- TC304A- TC302B- TC302A-
2	Through .1-mf. condenser to pin 8 of 14F8.	9.1 mc.	88 mc.	Adjust for maximum reading on alignment indicator. Repeat adjustments until no further improvement is noted. Do not disturb these trimmers after this step.	TC300B- TC300A-
3	Same as step 2.	9.1 mc.	88 mc.	Adjust for minimum reading on output meter. This adjustment is critical; repeat to make sure that it is correct.	TC304B-
4	To terminal 2 of J400.	105 mc.	105 mc.	Adjust for maximum reading on alignment indicator.	C400
5	Same as step 4.	105 mc.	105 mc.	Same as step 4. Rock tuning control.	C40
6	Same as step 4.	105 mc.	105 mc.	Same as step 4.	C400A-
7	Same as step 4.	92 mc.	92 mc.	Same as step 4. See note on page 10.	L403—FM osc.
8	Same as step 4.	92 mc.	92 mc.	Same as step 7.	L402—FM r-f
9	Same as step 4.	92 mc.	92 mc.	Same as step 7.	L401—FM aeria
10	Repeat steps 4 through 9 until no further improvement is obtained.				

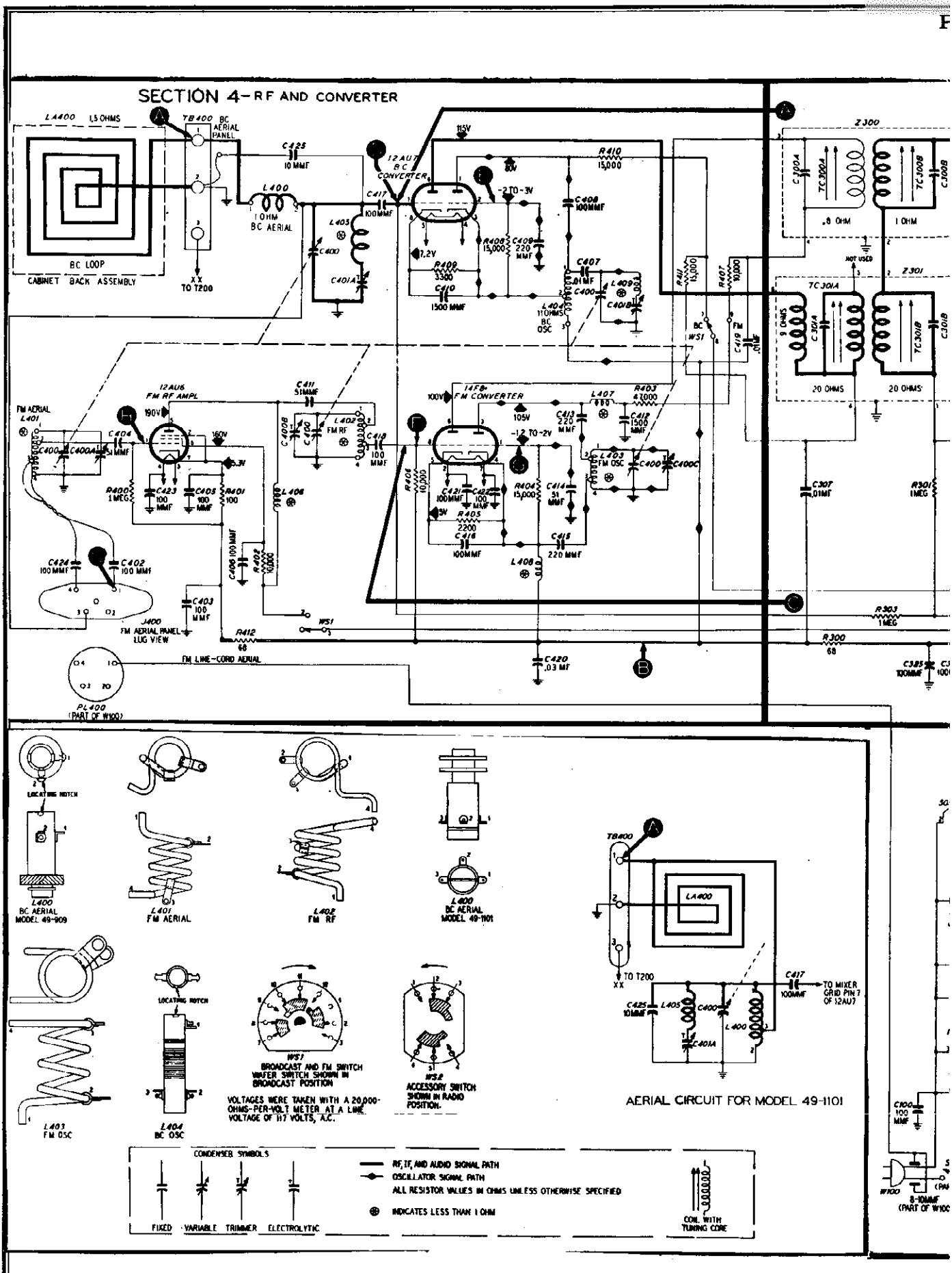
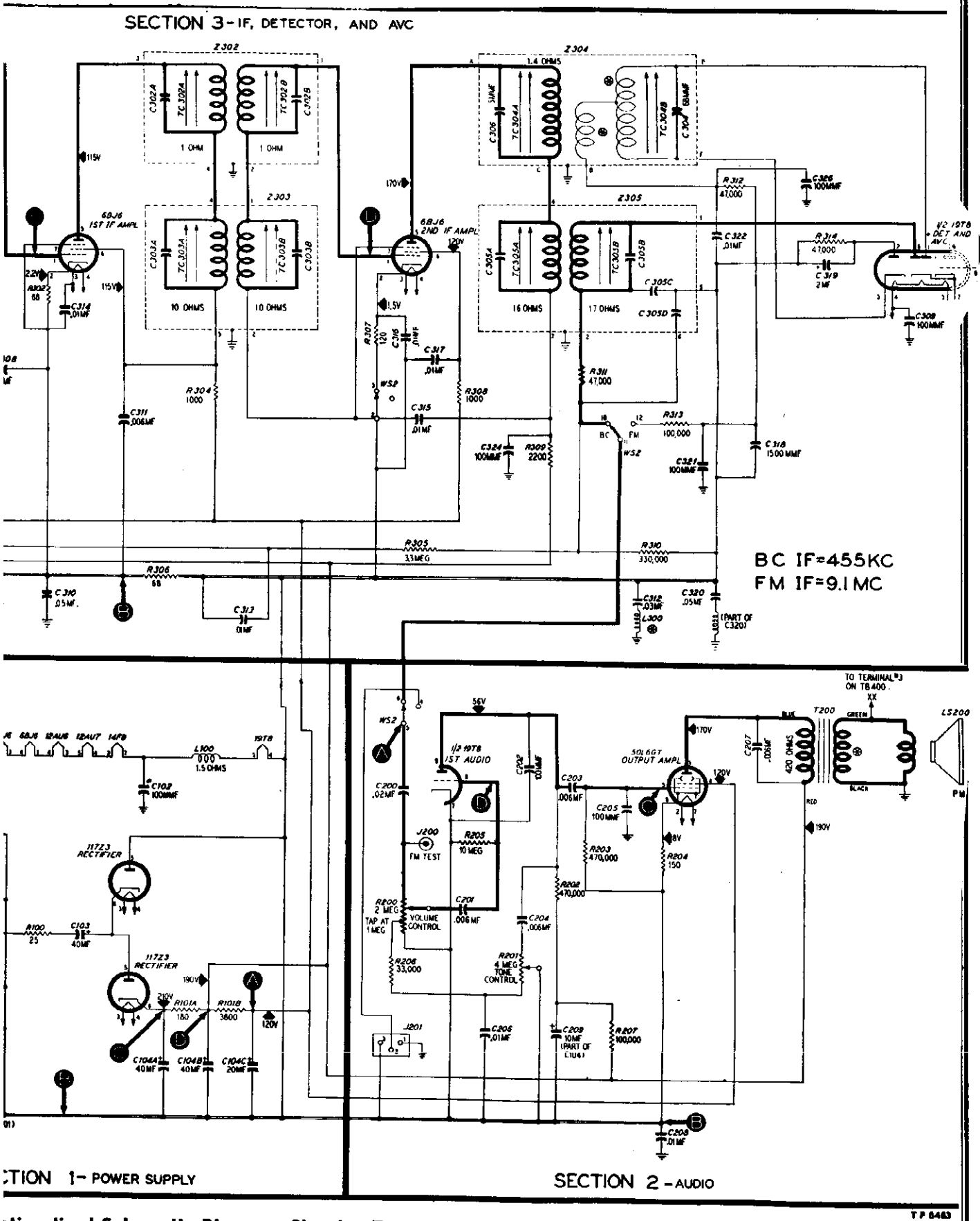


Figure 6. Philco Radio Models 49-909 and 49-1101,

ILCO CORP.

MODEL 49-909, 49-1101



tionalized Schematic Diagram, Showing Test Points

TP 6483

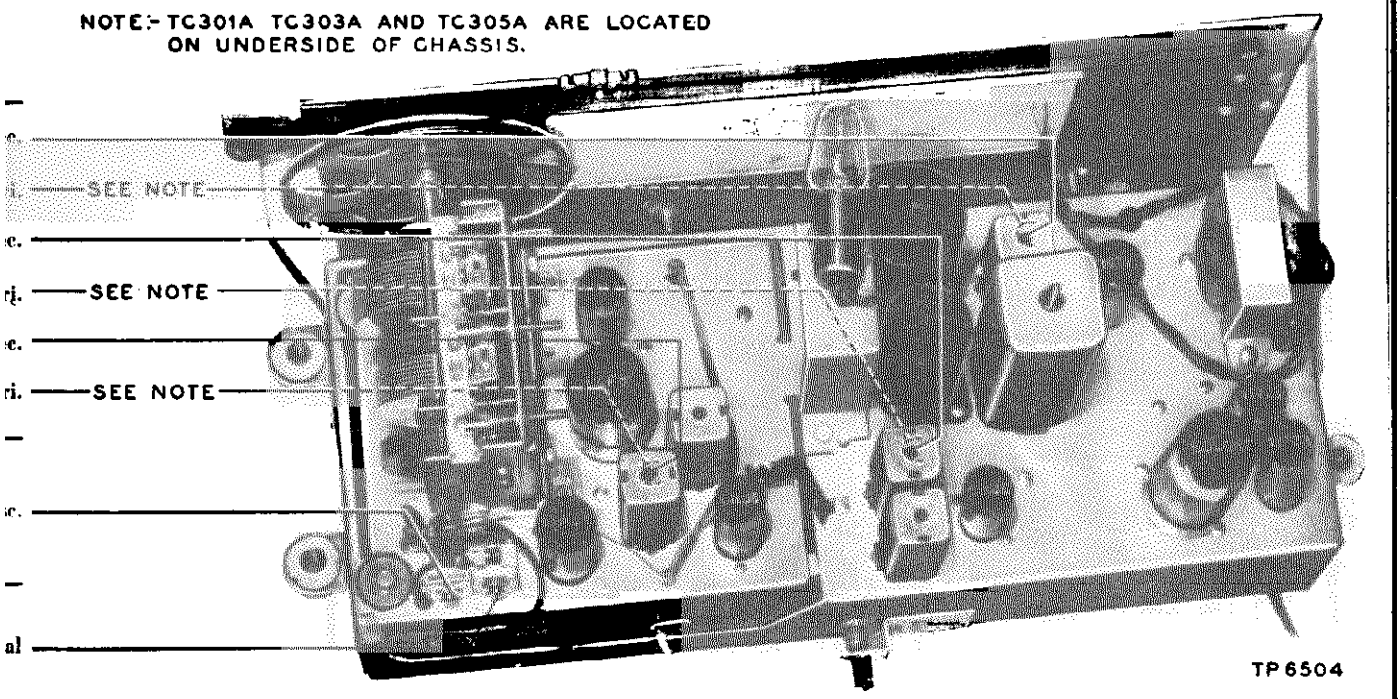


Figure 8. Top View, Showing AM Trimmer Locations

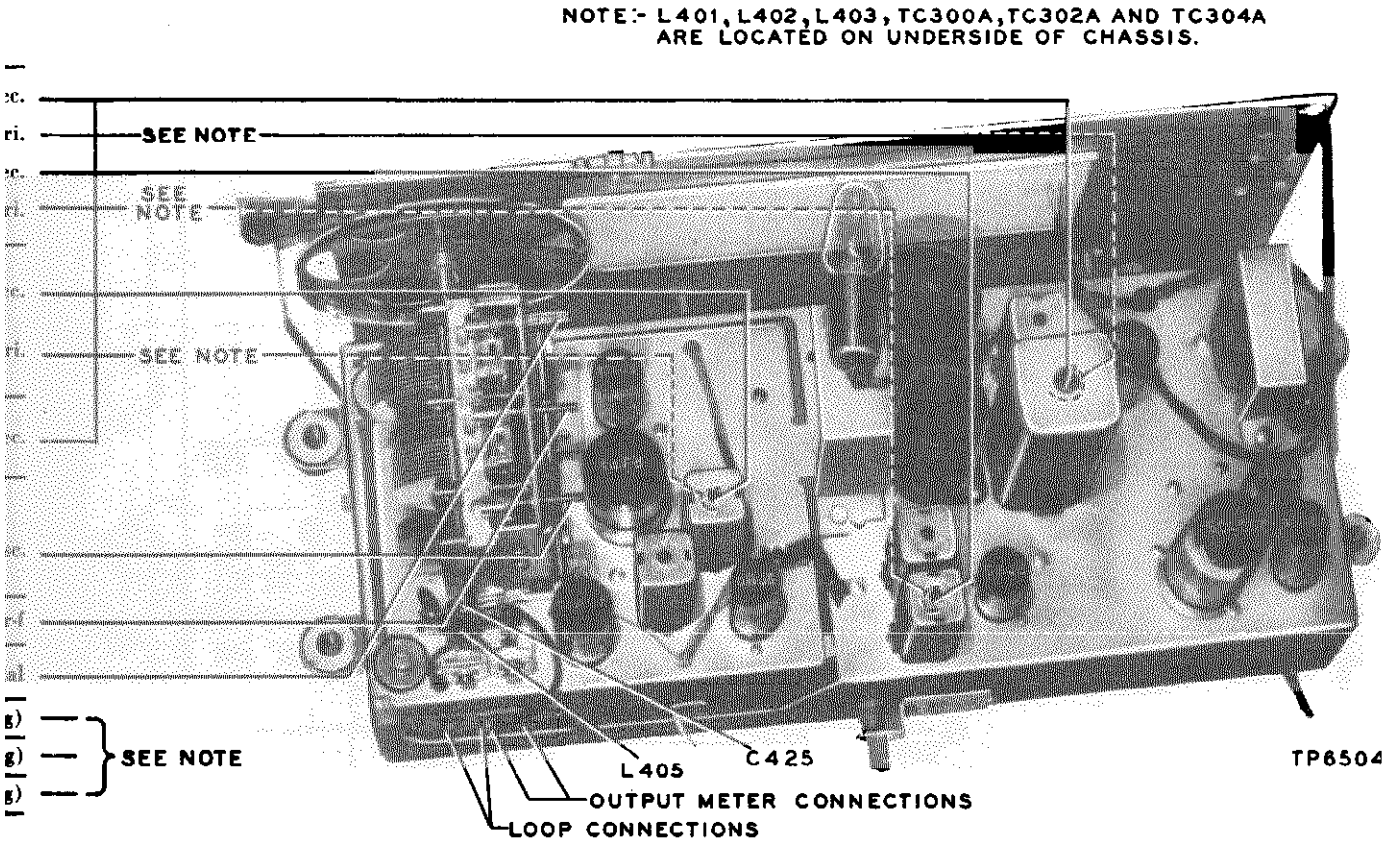
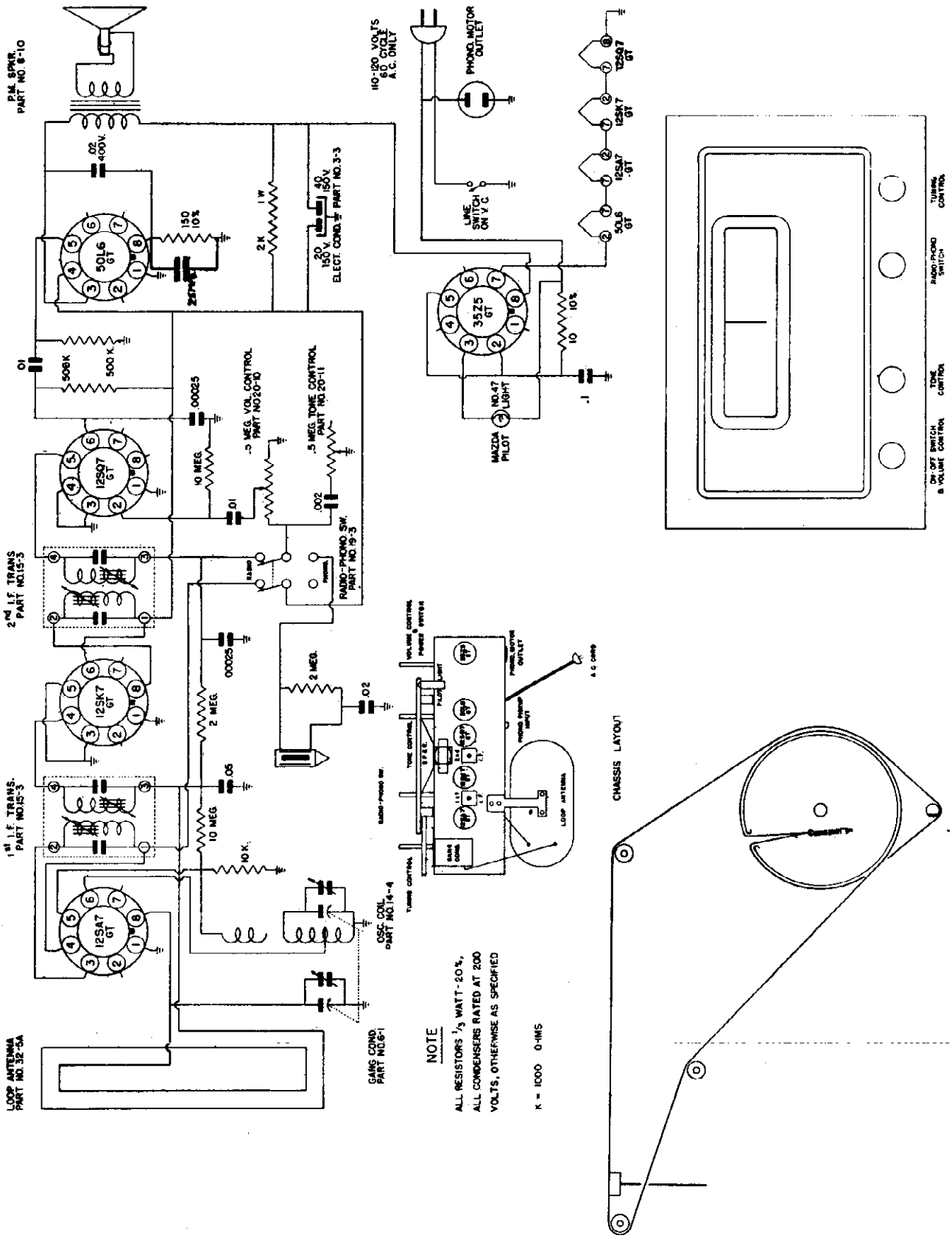


Figure 9. Top View, Showing FM Trimmer Locations

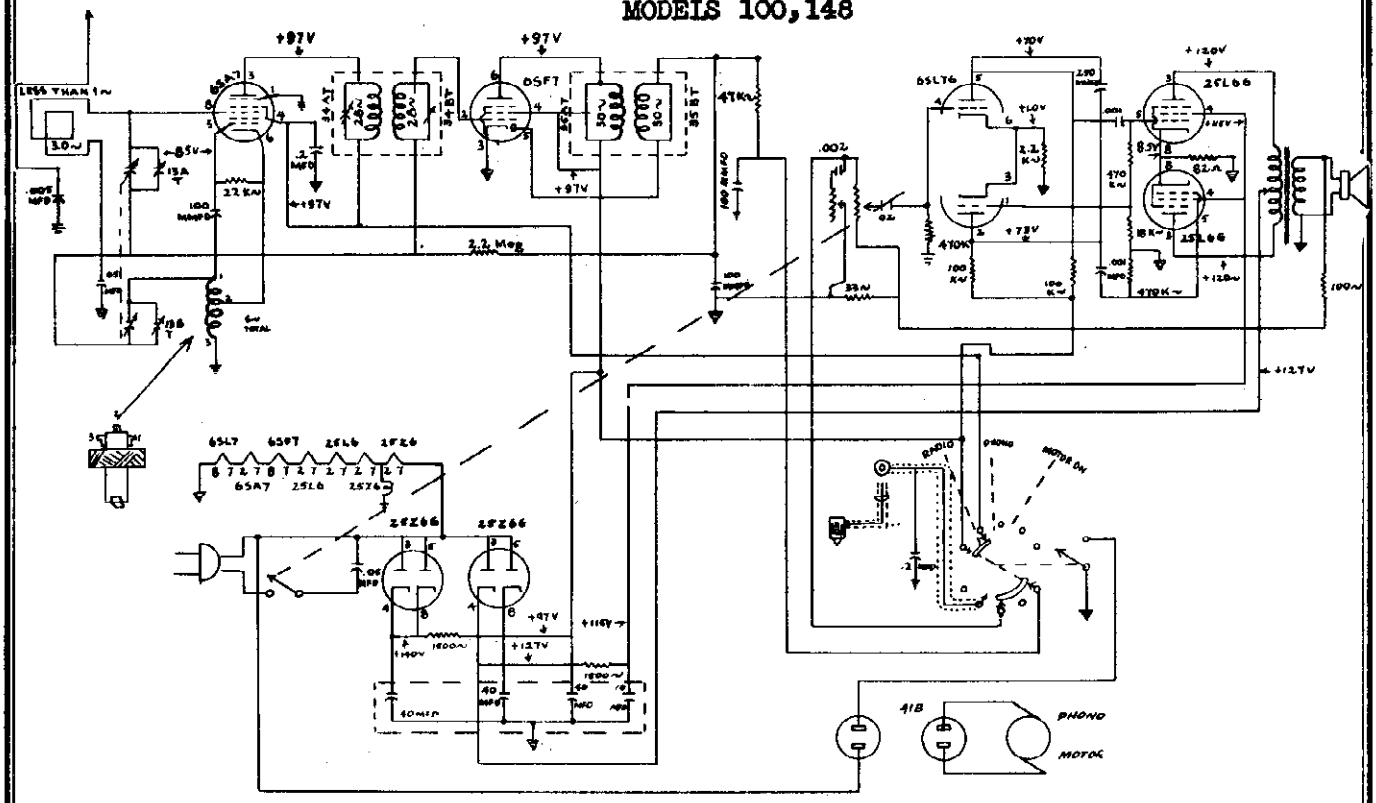
PHILHARMONIC RADIO CORP. MODEL 99T, MINI



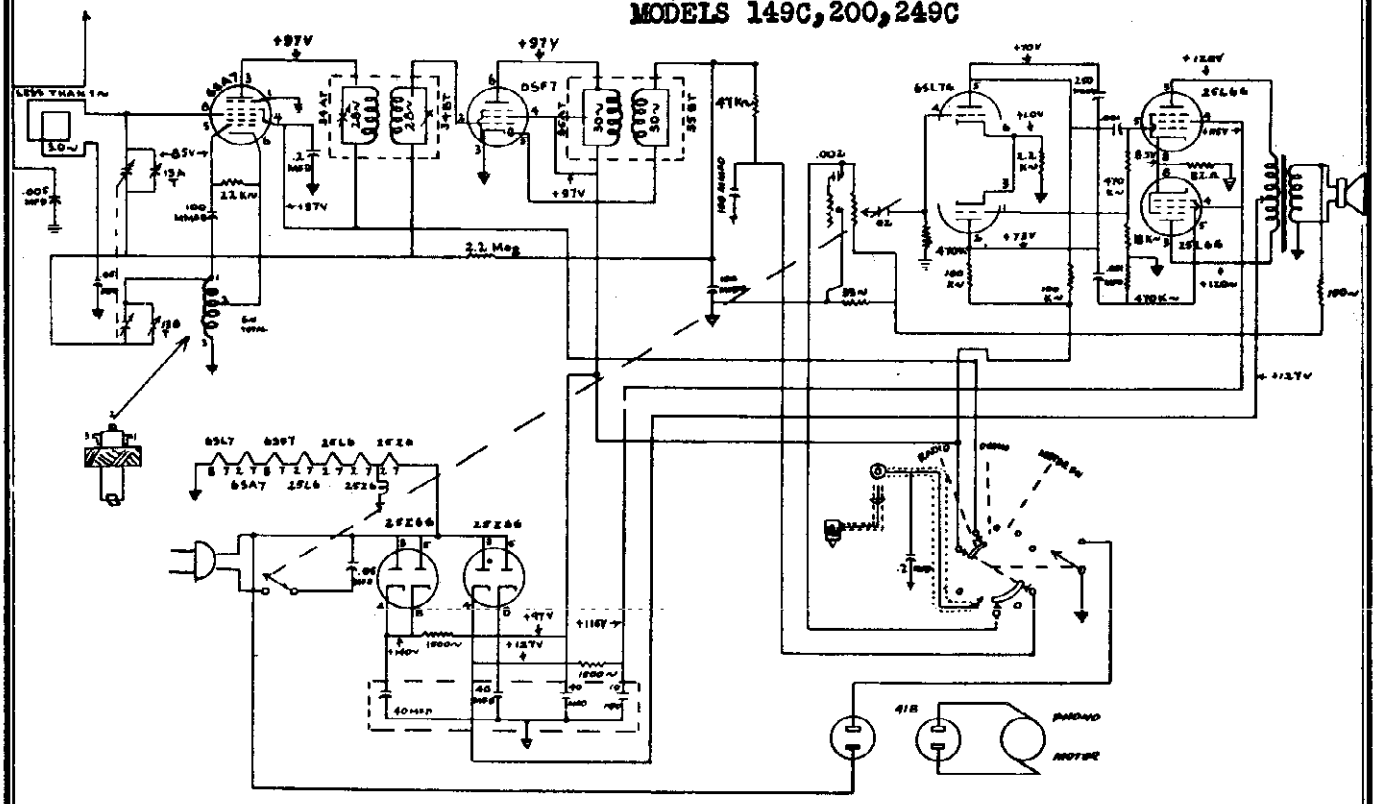
MODELS 100,148
MODELS 149C,200,249C

PHILHARMONIC RADIO CORP.

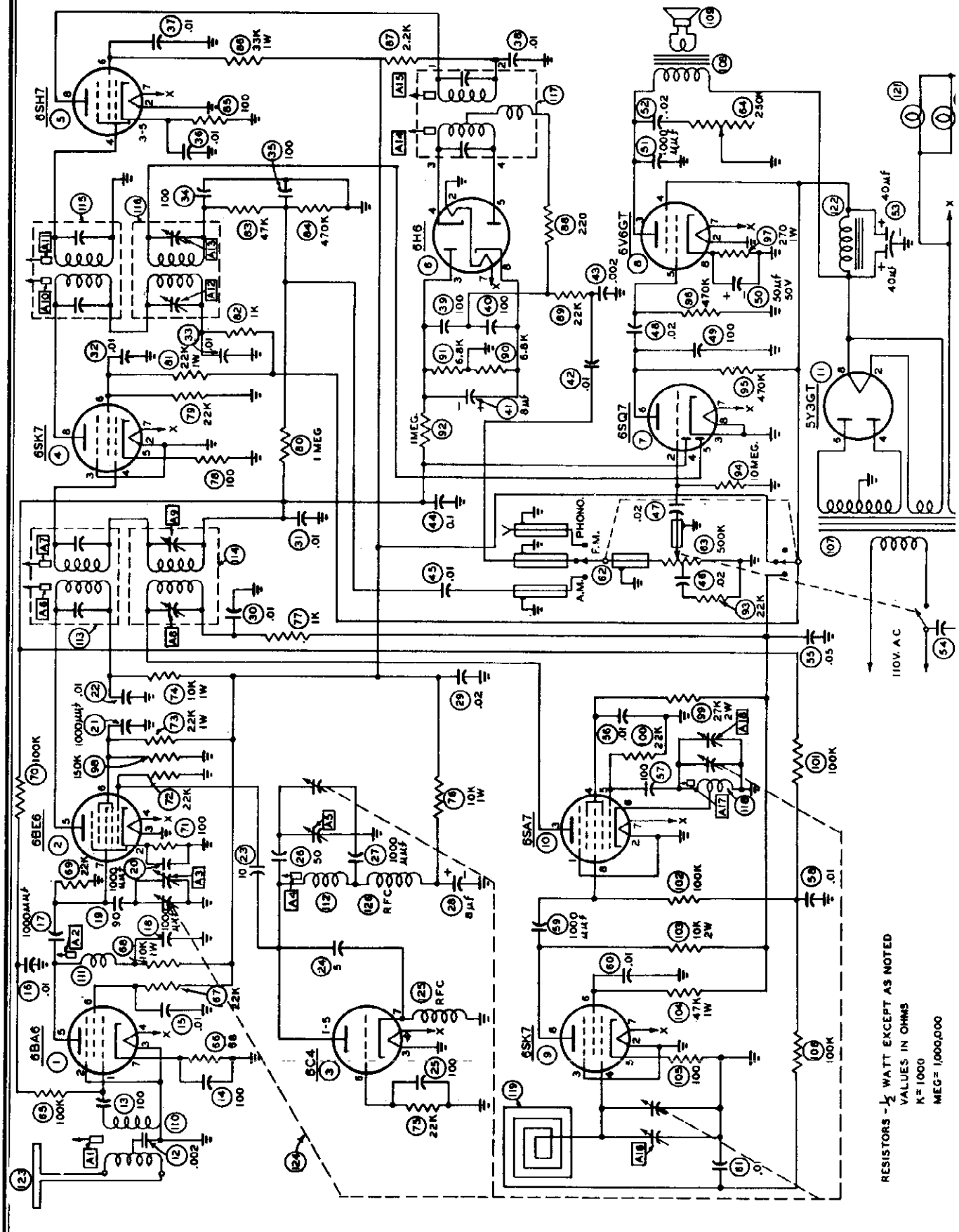
MODELS 100,148



MODELS 149C,200,249C



PHILHARMONIC RADIO CORP. MODELS 400C, 500C



RECORD CHANGER for MODEL 400C: General Instrument

MODELS 400C, 500C — PHILHARMONIC RADIO CORP.

ANTENNAS.— The built-in antennas are satisfactory in most locations, however, external antennas can be used when needed. For amplitude-modulated reception, connect an external antenna and ground wire to the terminals provided on the built-in loop.

For frequency-modulated signals, the antenna and lead-in should have an impedance of 300 ohms. Connect the lead-in to the two left-hand terminal screws on the rear of the chassis. Connect a ground wire to the third terminal screw.

POWER SOURCE.— Connect the power plug to an alternating-current supply of 115-120 volts, 60 cycles. DO NOT CONNECT TO DIRECT CURRENT.

RADIO OPERATION.— Switch on the power by turning the Volume control clockwise. Wait 35-40 seconds for the tubes to reach operating temperature. Set the three-position switch on AM or FM as desired. Select the station with the Tuning control. Adjust the Volume control and Tone control to suit.

TYPE: Eleven-tube F-M/A-M superheterodyne.

FREQUENCY RANGES: A-M, 540-1600 KC. F-M, 88-108 MC.

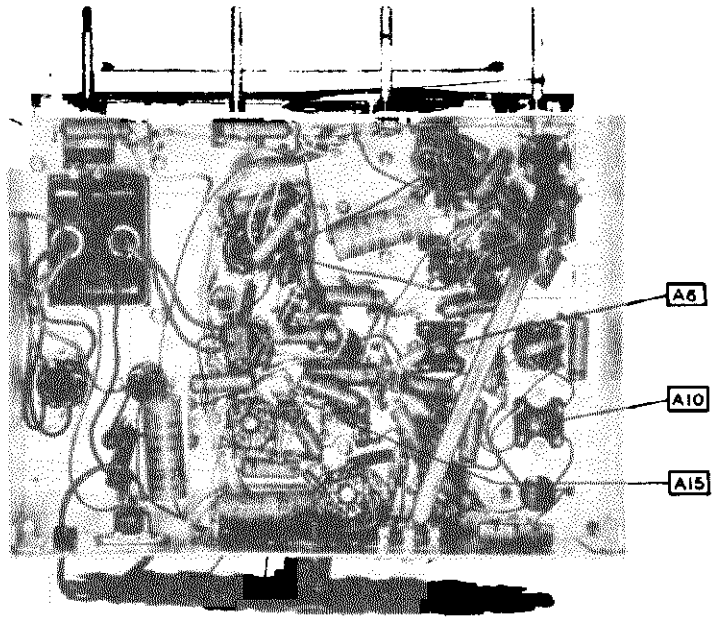
INTERMEDIATE FREQUENCIES: A-M, 456 KC; F-M, 10.7 MC.

POWER SOURCE: 105-125 volts, 60 cycles.

POWER CONSUMPTION:
RADIO, 80 watts.
RADIO AND PHONOGRAPH, 95 watts.

POWER OUTPUT: 4.5 watts

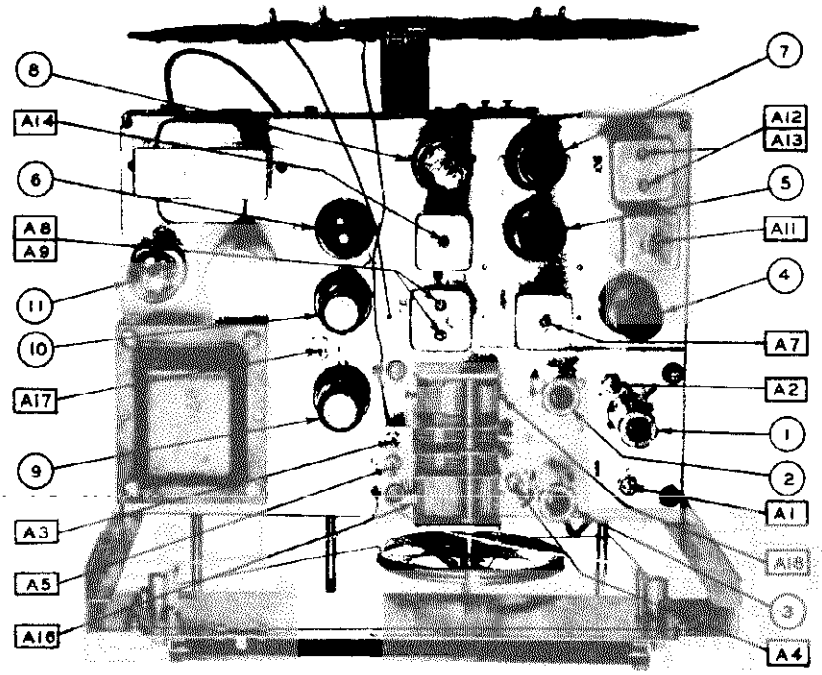
STANDARD RMA WARRANTY APPLIES.



TUBES

1 6BA6
2 6BE6
3 6C4
4 6SK7
5 6SH7
6 6H6
7 6SQ7
8 6V6GT
9 6SK7
10 6SA7
11 5Y3GT

Pilots, Mazda 47



PHILHARMONIC RADIO CORP. MODELS 400C, 500C

A-M Alignment

Turn gang condenser to fully meshed position. Set dial pointer on the small dot to the left of the end calibration. Turn volume control to maximum volume. Use a standard A-M signal generator, with the high side coupled to the input point through a .01 uf capacitor. Ground the other side to the chassis. Connect the output meter across the voice coil of output transformer 108. The output of the signal generator should be no higher than necessary to obtain the output reading. Where loop coupling is specified, connect the signal generator output to two or three turns of wire spaced about two feet from the antenna loop.

Signal Generator and Coupling Capacitor	Signal Generator Frequency	Input to	Tuning Dial Setting	Output Meter	Adjust	Remarks
A-M Signal Generator .01 uf.	455 KC	Pin 8 6SA7	Low-Freq. End.	Across Voice Coil of 108	A13, A12, A9, A8	Adjust for max. output. Repeat
	600 KC	"	600 KC	"	A17	Adjust for max. output.
	1600 KC	"	1600 KC	"	A18	" " " "
	600 KC	"	600 KC	"	A17	" " " "
	1400 KC	Loop Coupling	Tune to signal at 1400 KC	"	A16	" " " "
		F-M Alignment				
A-M .002 uf	10.7 MC	Pin 4 6SH7	Low-Freq. End.	Use D-C VTVM. Pin 3 6H6 to gnd.	A15, bottom of ratio-detector can	Adjust for max. reading
A-M .002 uf	"	"	"	Use D-C VTVM. High Side of capacitor 43 to gnd.	A14, top of ratio-detector can	Adjust for zero voltage At the correct setting, the slightest movement of A14 will throw the voltage positive or negative. A slow approach to zero indicates that A14 should be turned in the opposite direction.
A-M .002 uf	"	Pin 3 6SK7 item 4	Low-Freq. End.	Use D-C VTVM. Pin 3 6H6	A11, A10	Adjust for max. reading
A-M .002 uf	"	Pin 7 6BE6	"	"	A7, A6	" " " "
						Repeat last two steps.
F-M Signal Generator Set for 75 Kc. Deviation and 400-cycle Modulation	88 MC	Dipole antenna terminals	88 MC	Output meter across voice coil of 108	A4	Adjust for max. output.
"	"	"	"	"	A2	" " " "
"	108 MC	"	108 MC	"	A5	" " " "
"	"	"	"	"	A3	" " " "
						Repeat last four steps until properly tracked.
"	98 MC	"	Tune to signal at 98 MC	"	A1	Adjust for max. output.

MODELS 400C, 500C PHILHARMONIC RADIO CORP.

PARTS LIST

TUBES

Item No.	Type	Function
1	6BA6	R-F Amplifier (FM)
2	6BE6	Mixer (FM)
3	6C4	Oscillator (FM)
4	6SK7	I-F Amplifier (AM-FM)
5	6SH7	I-F Amplifier (FM)
6	6H6	Second Detector (FM)
7	6SQ7	Second Detector (AM)
8	6V6GT	Beam Power Amplifier
9	6SK7	R-F Amplifier (AM)
10	6SA7	Pentagrid Converter (AM)
11	5Y3GT	Full-Wave Rectifier

CAPACITORS

Capacitances in uf for electrolytic and paper capacitors, uuf for mica.

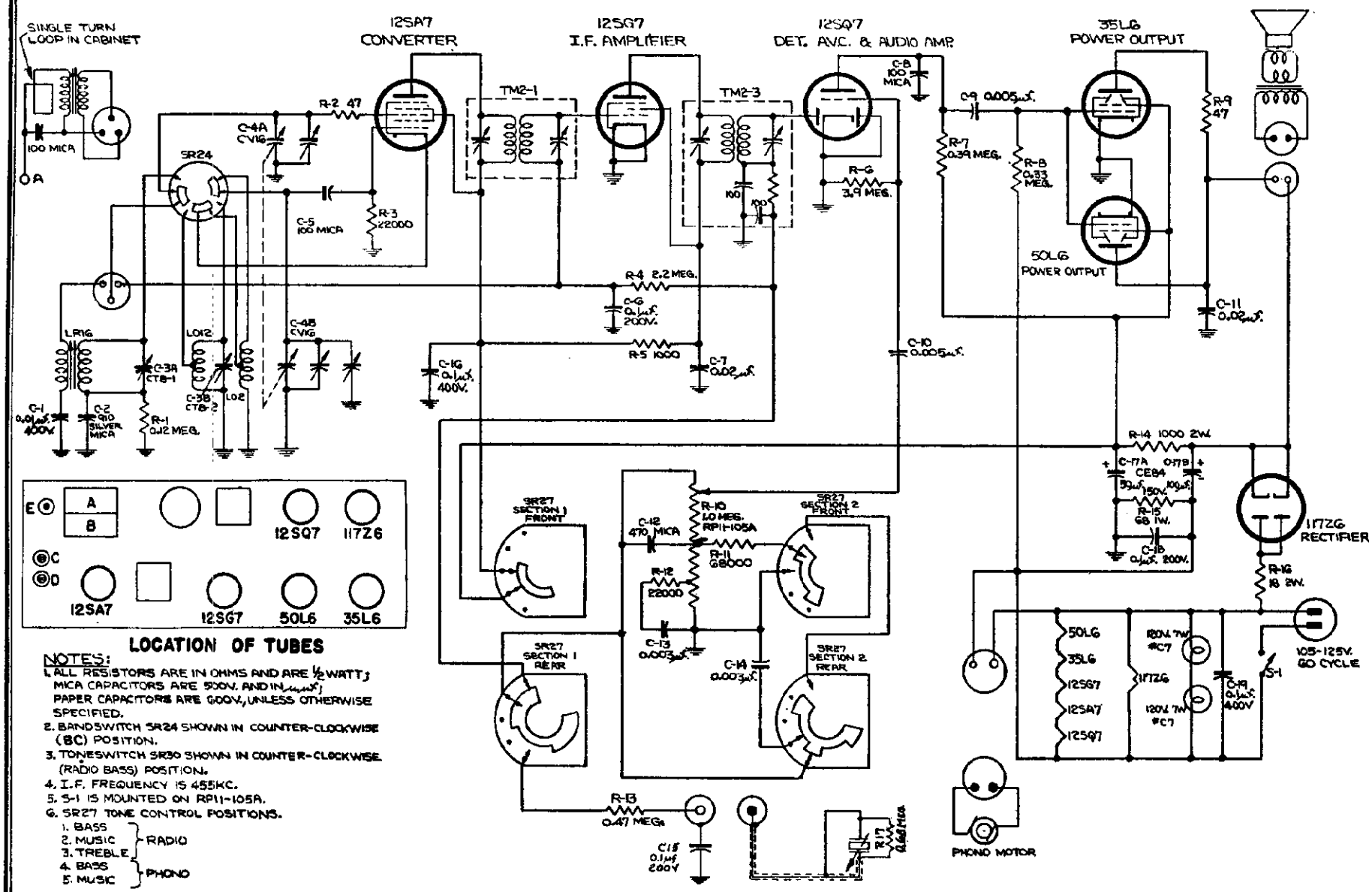
Item No.	Part No.	Cap.	Volts dcw	
12	CD-1227-3	.002	400	Paper
13	CD-1157-13	100	500	Mica
14	CD-1157-13	100	500	Mica
15	CD-1227-8	.01	400	Paper
16	CD-1227-8	.01	400	Paper
17	CD-1160-5	1000	500	Mica
18	CD-1160-5	1000	500	Mica
19	CD-1158-17	91	500	Mica
20	CD-1085-20	1000	300	Mica
21	CD-1085-20	1000	300	Mica
22	CD-1227-8	.01	400	Paper
23	CD-1245-2	10	500	Silver Mica
24	CD-1245-1	5	500	Silver Mica
25	CD-1157-13	100	500	Mica
26	CD-1245-5	50	500	Silver Mica
27	CD-1160-5	1000	500	Mica
28	CD-1247	8	450	Dry Electrolytic
29	CD-1227-10	.02	400	Paper
30	CD-1227-8	.01	400	Paper
31	CD-1227-8	.01	400	Paper
32	CD-1227-8	.01	400	Paper
33	CD-1227-8	.01	400	Paper
34	CD-1071-22	100	500	Mica
35	CD-1071-22	100	500	Mica
36	CD-1227-8	.01	400	Paper
37	CD-1227-8	.01	400	Paper
38	CD-1227-8	.01	400	Paper
39	CD-1071-22	100	500	Mica
40	CD-1071-22	100	500	Mica
41	CD-1247	8	450	Dry Electrolytic
42	CD-1227-8	.01	400	Paper
43	CD-1227-3	.002	400	Paper
44	CD-1227-15	0.1	400	Paper
45	CD-1227-8	.01	400	Paper
46	CD-1227-10	.02	400	Paper
47	CD-1227-10	.02	400	Paper
48	CD-1227-10	.02	400	Paper
49	CD-1071-22	100	500	Mica
50	CD-1246	50	50	Dry Electrolytic
51	CD-1160-5	1000	500	Mica
52	CD-1227-10	.02	400	Paper
53	CD-1248	40-40	450	Dry Electrolytic
54	CD-1227-8	.01	400	Paper
55	CD-1227-13	.05	400	Paper
56	CD-1227-8	.01	400	Paper
57	CD-1071-22	100	500	Mica
58	CD-1227-8	.01	400	Paper
59	CD-1085-20	1000	300	Mica
60	CD-1227-8	.01	400	Paper
61	CD-1227-8	.01	400	Paper

RESISTORS, FIXED

Item No.	Part No.	Res.	Watts
65	RE-1166-107	100K	1/2
66	RE-1139-683	68	1/2
67	RE-1166-226	22K	1/2
68	RE-1168-106	10K	1
69	RE-1166-226	22K	1/2
70	RE-1166-107	100K	1/2
71	RE-1139-104	100	1/2
72	RE-1166-226	22K	1/2
73	RE-1168-226	22K	1
74	RE-1168-106	10K	1
75	RE-1166-226	22K	1/2
76	RE-1168-106	10K	1
77	RE-1166-105	1K	1/2
78	RE-1139-104	100	1/2
79	RE-1166-226	22K	1/2
80	RE-1139-108	1 meg	1/2
81	RE-1168-226	22K	1
82	RE-1166-105	1K	1/2
83	RE-1166-476	47K	1/2
84	RE-1166-477	470K	1/2
85	RE-1139-104	100	1/2
86	RE-1168-336	33K	1
87	RE-1166-225	2.2K	1/2
88	RE-1139-224	220	1/2
89	RE-1166-226	22K	1/2
90	RE-1166-685	6.8K	1/2
91	RE-1166-685	6.8K	1/2
92	RE-1139-108	1 meg	1/2
93	RE-1166-226	22K	1/2
94	RE-1139-109	10 meg	1/2
95	RE-1166-476	470K	1/2
96	RE-1166-477	470K	1/2
97	RE-1063-274	270	1
98	RE-1062-157	150K	1/2
99	RE-1046-276	27K	2
100	RE-1166-226	22K	1/2
101	RE-1166-107	100K	1/2
102	RE-1166-107	100K	1/2
103	RE-1046-106	10K	2
104	RE-1153-476	47K	1
105	RE-1139-104	100	1/2
106	RE-1166-107	100K	1/2

MISCELLANEOUS

Item No.	Part No.	
62	SW-1069	Switch, Radio-Phono
63	RE-1181	Pot. Vol. Cont. and Sw., 500K
64	RE-1182	Pot., Tone Control, 250K
107	TR-1061	Transformer, Power
108	TR-1060	Transformer, Output
109	SK-1016	Speaker
110	TR-1064	Transformer, Antenna
111	CI-1057	R-F Coil (FM)
112	CI-1058	Oscillator Coil (FM)
113	TR-1065	Transformer, IF (FM)
114	TR-1052	Transformer, First IF (AM)
115	TR-1065	Transformer, IF (FM)
116	TR-1051	Transformer, Second IF (AM)
117	TR-1066	Transformer, Ratio Detector
118	CI-1059	Oscillator Coil
119	AT-1019	Antenna Loop
120	LA-1014-32	Pilot Light
121	LA-1014-32	Pilot Light
122	CK-1040	Filter Choke
123	AS-3599	Antenna (FM)
124	CDC-5001	Capacitor, Variable, Tuning
125	CK-1036	R-F Choke
126	CK-1036	R-F Choke



LOCATION OF TUBES

NOTES:

1. ALL RESISTORS ARE IN OHMS AND ARE ½ WATT; MICA CAPACITORS ARE 500V. AND IN μμf; PAPER CAPACITORS ARE 600V., UNLESS OTHERWISE SPECIFIED.
2. BANDSWITCH SR24 SHOWN IN COUNTER-CLOCKWISE (BC) POSITION.
3. TONESWITCH SR30 SHOWN IN COUNTER-CLOCKWISE (RADIO BASS) POSITION.
4. I.F. FREQUENCY IS 455KC.
5. S-1 IS MOUNTED ON RP11-105A.
6. SR27 TONE CONTROL POSITIONS.
   1. BASS
   2. MUSIC
   3. TREBLE } RADIO
   4. BASS
   5. MUSIC } PHONO

MODEL 3-63A
MODEL 3-81A

PHILLIPS PETROLEUM CO.

MODEL 3-63A

Operation: The set operates on 105-125 volts 60 cycles, AC. The power drain is approximately 35 watts on radio operation and 17 watts additional on phonograph operation.

Range: This set has both a broadcast and shortwave range. The complete broadcast band is covered from 532 to 1700 kilocycles. Since the broadcast dial scale is calibrated from 55 to 160, the actual frequency of the station may be obtained by adding zero to the dial calibration. The shortwave band covers from 5.6 to 12.5-megacycles. The shortwave dial scale is calibrated directly in megacycles.

Alignment: No attempt should be made to re-align this receiver until it has been determined that poor tubes or some local condition is not responsible for faulty reception. The signal generator may be connected through 0.01 mfd capacitor used as a dummy antenna, to the lug on the RF section "B" of the tuning capacitor. Connect ground clip of generator directly to chassis. An output meter may be clipped across the voice coil lug on the speaker. Align IF trimmers to 455 kilocycles, using the least possible input in the signal generator. With tuning plates completely out of mesh (pointer at the extreme right end of travel) the set in broadcast position, adjust the broadcast oscillator trimmer (A) to 1700 kilocycles. Then switch to shortwave and adjust the shortwave oscillator trimmer (D) to 12.5 megacycles. Replace the 01 mfd dummy by a 39 mmfd mica capacitor and connect to antenna terminal "A." Tune set and signal generator to 600 kilocycles and adjust broadcast antenna coil slug for maximum output. Then re-tune set and signal generator to 1550 kilocycles and adjust RF trimmer "B" on tuning capacitor for maximum response. Repeat these adjustments until no further adjustment is required, then switch receiver to shortwave. Tune set and signal generator to 6 megacycles and adjust shortwave antenna coil slug "E" for maximum response. Retune set and signal generator to 10.5 megacycles and tune shortwave antenna, trimmer "C" for maximum response. In these adjustments the tuning control should be rocked for best results. Repeat these adjustments until no further adjustment is needed.

For checking purposes, five marks are engraved on the dial plate. These represent, in order from left to right: the pointer position capacitor plates fully meshed and the pointer settings for 600 kc or 6 mc; 1000-kc, 10.5 mc and 1550 kc.

MODEL 3-81A

Operation: The set operates on 110 to 120 volts, 60 cycles A.C. Power drain is approximately 125 watts for radio and about 20 watts additional for the record changer

Ranges: This receiver has AM broadcast and short-wave and FM ranges

FM—87.4 to 108.7 megacycles
AM Broadcast—535 to 1720 kilocycles
AM Short-Wave—5.6 to 18.5 megacycles

Instructions For Removing Radio From Cabinet

Main Chassis:

To remove main chassis from the cabinet it is first necessary to remove the four control knobs by pulling them gently until they come off. Remove all plugs from the rear of the main chassis and power pack chassis. Pull the 5U4G rectifier tube out of the power pack chassis. The four screws holding the chassis may now be removed. The chassis itself may now be taken out by sliding it straight back toward the rear of the cabinet.

Power Pack Chassis:

The power pack chassis may be removed from the cabinet by unscrewing the four large screws holding it to its support shelf. These are accessible from the under side of the cabinet.

Record Changer:

Most adjustments may be made to the record changer without removing it from its drawer. Before attempting to remove the record changer from the cabinet the motor plug and the phono pickup plug must first be removed from the main and power pack chassis. Loosen the cable clamps on the rear of the cabinet sufficiently to lift out cables.

Pull changer drawer forward until it hits its stop. Lift the turntable completely off. Be careful not to lose the spring and loose gear on the spindle of the record changer. Remove retaining washers from the mounting screws at the front and rear of the record changer. The mounting screws may now be removed from the bottom of record changer drawer and the record changer may be lifted out.

Alignment:

No attempt should be made to realign this receiver until it has been determined that a poor tube or some local condition is not responsible for faulty reception. The following is a list of minimum equipment necessary to realign this receiver:

1—AM signal generator covering 455KC, 600KC, 1550KC, 6 MC, 10.7 MC and 18 MC

2—FM signal generator covering 10.7 MC, 92 MC and 106 MC

3—Output meter, rectifier type, approximately 0 to 2 volts RMS

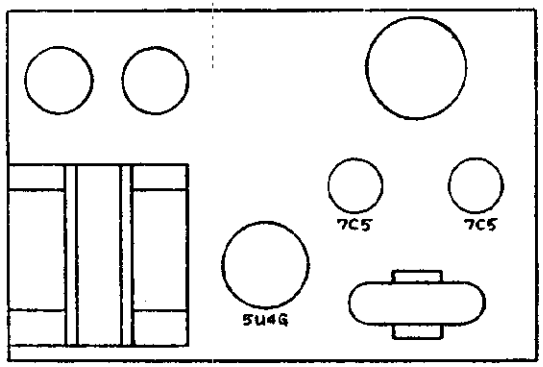
4—Dummy antennas

0.01 MFD Capacitor
200 MMF Mica Capacitor
400 Ohm Resistor
300 Ohm Resistor

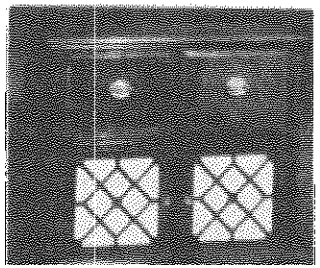
In the following alignment procedure the high side of the signal generator is connected to the terminal indicated in the "Signal Generator Coupling" column below. The ground side of the signal generator is connected directly to the chassis unless otherwise noted. The output meter should be connected across the voice coil of the speaker for all measurements.

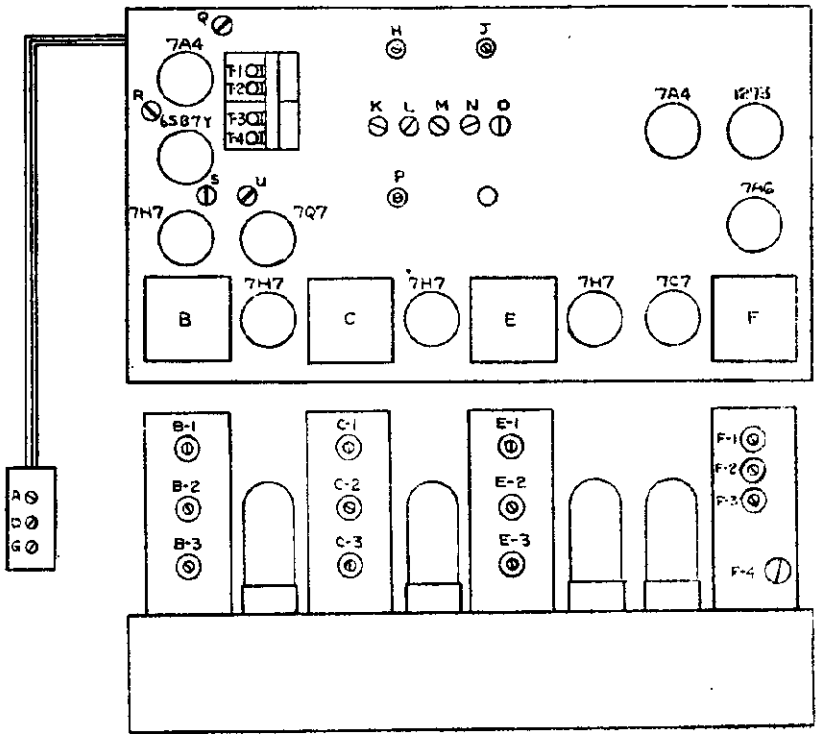
In adjusting the radio frequency trimmers and padders it is advisable to "rock" the variable capacitor gang slightly across the signal being delivered by the signal generator until that particular signal has been accurately peaked.

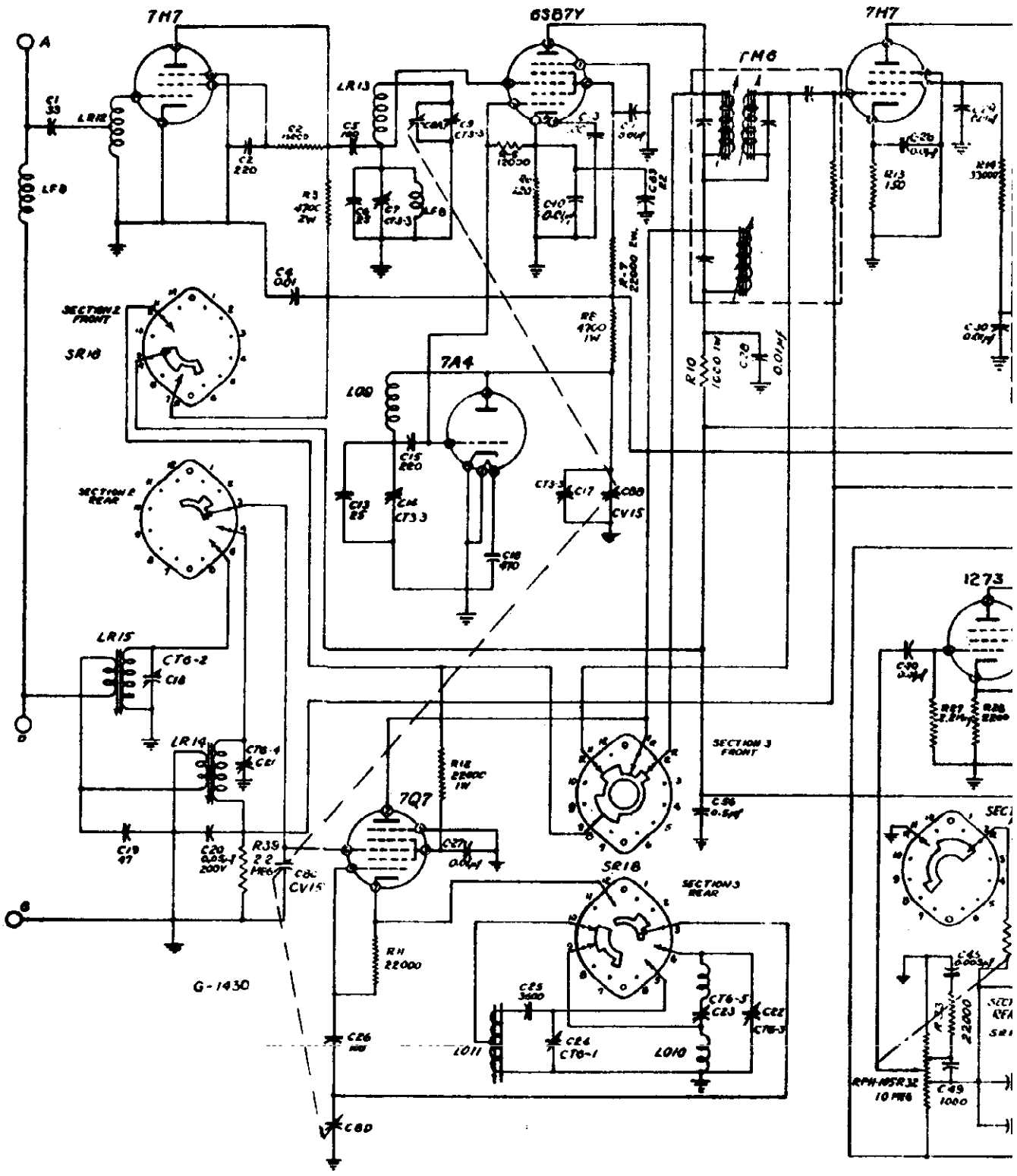
The location of the following trimmers, padders and terminals can be found by referring to the tube and trimmer location diagram.

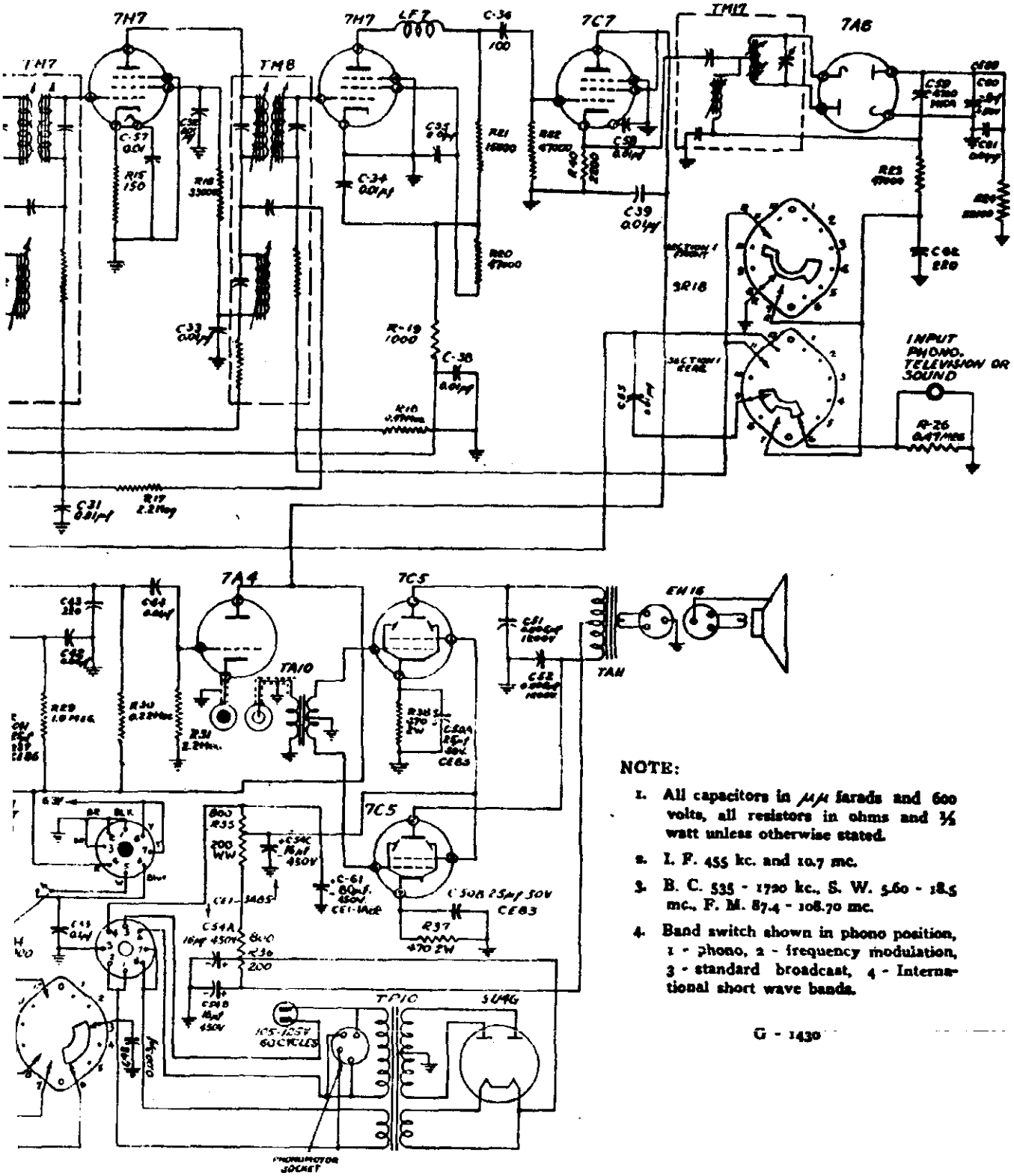


POWER PACK






7H7
6S7Y
7H7
7A4
7Q7
1273
SECTION 2 FRONT
SR18
SECTION 2 REAR
SECTION 3 FRONT
SECTION 3 REAR
LR15
LR14
LR13
LR12
LO9
LO10
LO11
G-1430



NOTE:

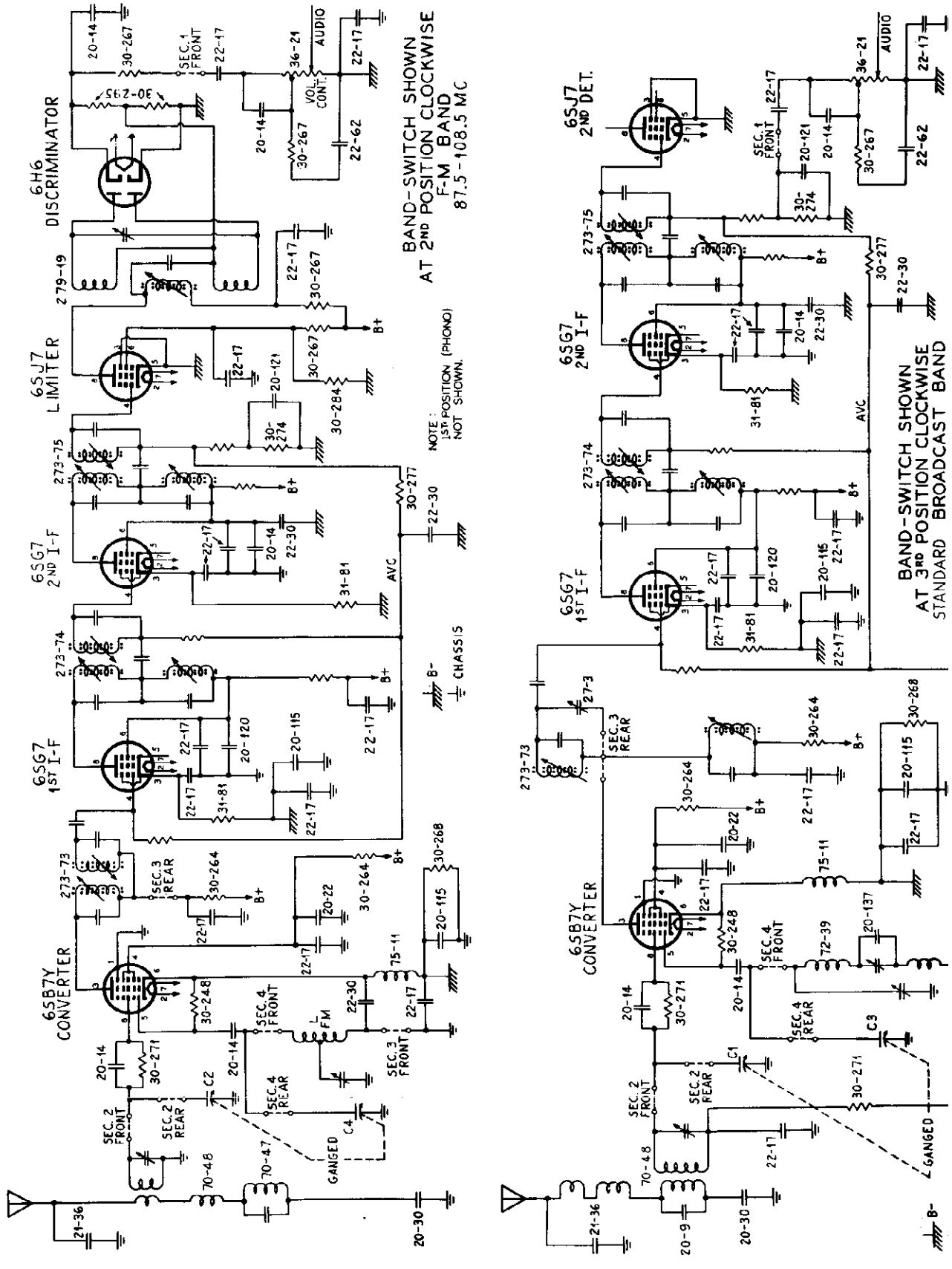
1. All capacitors in μμ farads and 600 volts, all resistors in ohms and ½ watt unless otherwise stated.
2. I. F. 455 kc. and 10.7 mc.
3. B. C. 535 - 1720 kc., S. W. 5.60 - 18.5 mc., F. M. 87.4 - 108.70 mc.
4. Band switch shown in phono position, 1 - phono, 2 - frequency modulation, 3 - standard broadcast, 4 - International short wave bands.

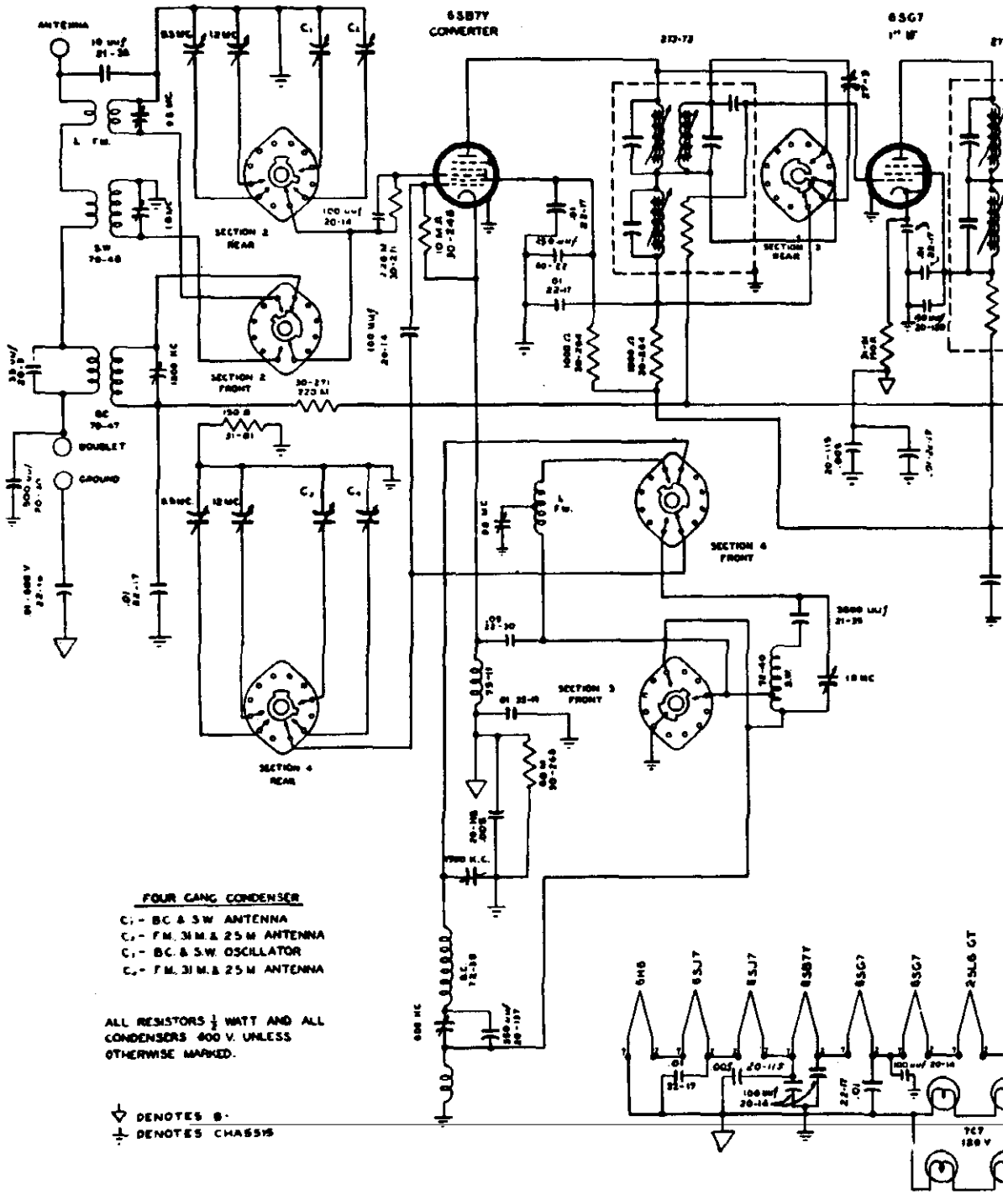
G - 1430

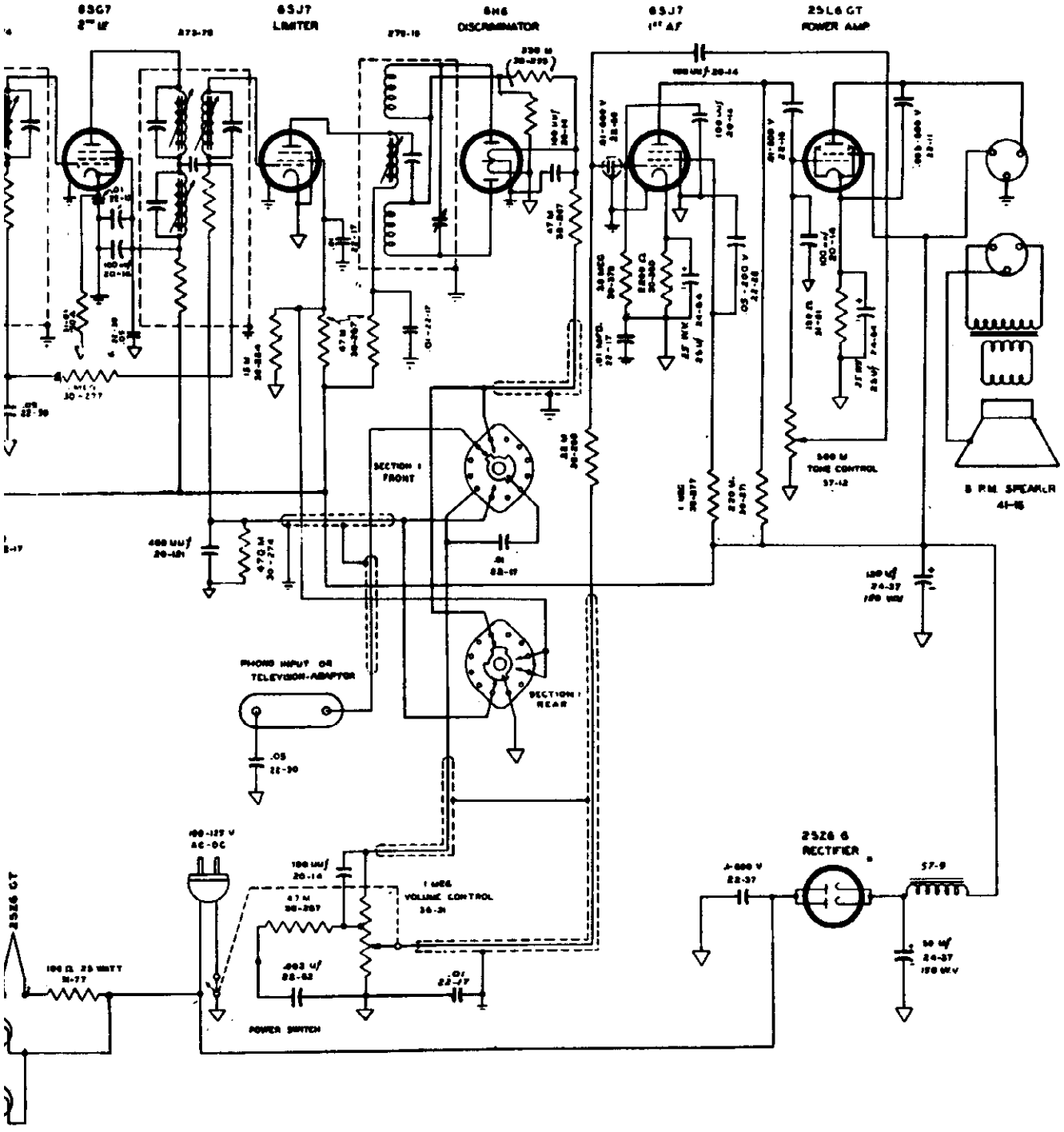
ALIGNMENT PROCEDURE:

Dummy Antenna	Signal Generator Coupling	Signal Generator Frequency	Band Switch Position	Radio Dial Setting	Adjust	Remarks
0.01 MFD	Terminal T-2	455 KC	Broadcast	1700 KC	E-1 C-1 B-1	Adjust for maximum output Repeat for fine adjustment
"	Pin 6 of 7C7 IF tube with FM Signal Generator	10.7MC	FM	108 MC	F-2	Adjust for maximum output (Broad adustment)
"	"	"	"	"	F-4	Adjust for maximum output
"	AM Signal Generator	"	"	"	F-1 or F-3	Adjust whichever is required for minimum output
						Repeat last two steps for fine adjustment until settings for maximum FM output coincides with settings for minimum AM output.
"	"	"	"	"	E-3, E-2	Adjust for maximum output
"	"	"	"	"	C-3, C-2	" " " "
"	"	"	"	"	B-3, B-2	" " " "
						Repeat last three steps for fine adjustment
			Broadcast	535 KC	Pointer	Adjust pointer to reference mark
200 MMF	Terminal D	600 KC	Broadcast	600 KC	O, J.	Adjust for maximum output
"	"	1550 KC	"	1550 KC	M, N	" " " "
400 Ohm Resistor	"	6 MC	Shortwave	6 MC	P. H	" " " "
"	"	18 MC	"	18 MC	K, L	" " " "
300 Ohm Resistor	Terminal A Ground Side of Signal Generator to Terminal D	92 MC	FM	92 MC	R, S	" " " "
"	"	106 MC	"	106 MC	Q, U	" " " "

PILOT RADIO CORP. MODELS T-530 SE

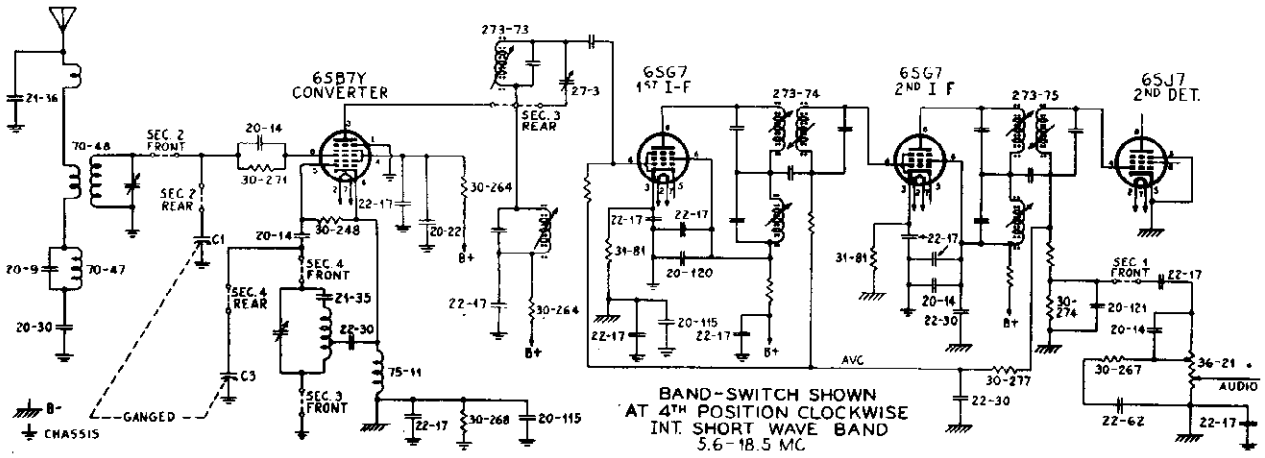


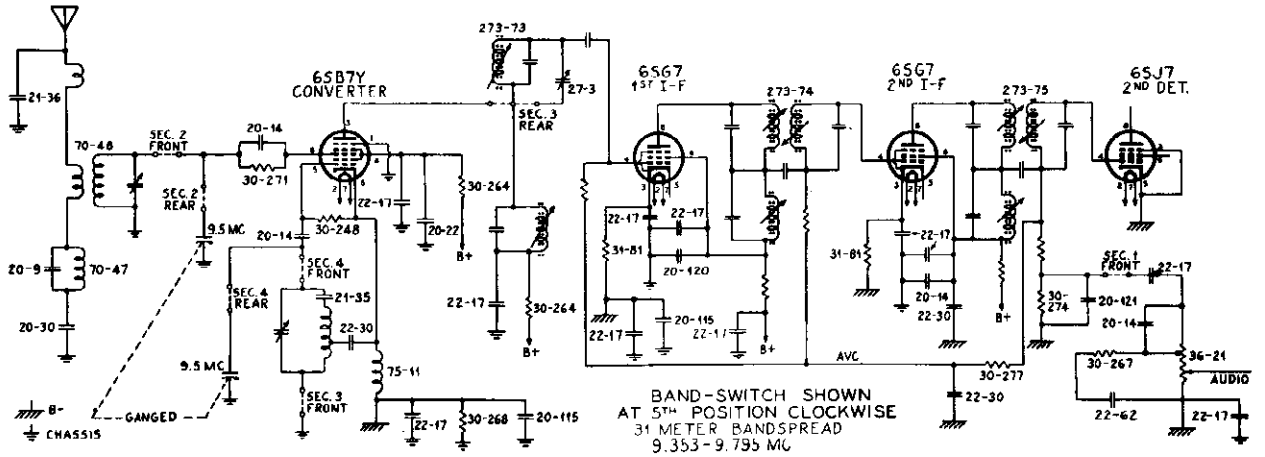

ANTENNA
6SB7Y CONVERTER
6SG7
DOUBLET
GROUND
SECTION 1 FRONT
SECTION 1 REAR
SECTION 2 FRONT
SECTION 2 REAR
SECTION 3 FRONT
SECTION 3 REAR
SECTION 4 FRONT
SECTION 4 REAR
FOUR GANG CONDENSER
C1 - BC & S.W. ANTENNA
C2 - F.M. 31 M. & 25 M ANTENNA
C3 - BC. & S.W. OSCILLATOR
C4 - F.M. 31 M. & 25 M ANTENNA
ALL RESISTORS 1/2 WATT AND ALL CONDENSERS 400 V. UNLESS OTHERWISE MARKED.
DENOTES B-
DENOTES CHASSIS
6H6
6SJ7
6SJ7
6SB7Y
6SG7
6SG7
25L6 GT
7C7
115 V

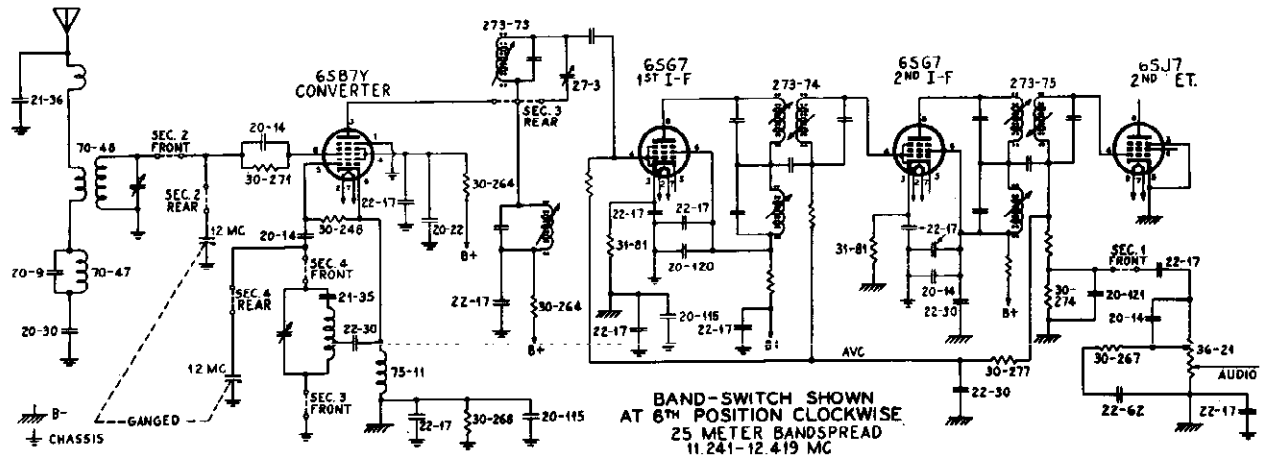

6SG7
2ND IF
6SJ7
LIMITER
6H6
DISCRIMINATOR
6SJ7
1ST AF
25L6 GT
POWER AMP
500 M
TONE CONTROL
57-12
5 P.M. SPEAKER
41-16
SECTION 1
FRONT
SECTION 1
REAR
PHONO INPUT OR
TELEVISION-ADAPTOR
1 MEG.
VOLUME CONTROL
POWER SWITCH
25Z6 G
RECTIFIER
57-9

MODELS T-530 SERIES

PILOT RADIO CORP.





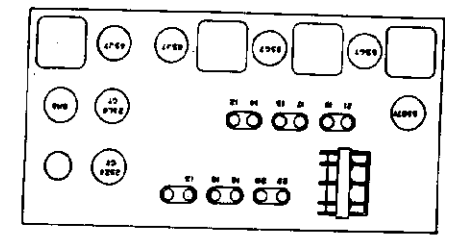


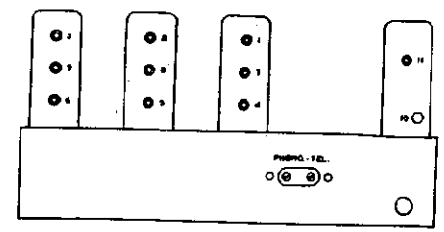
ALIGNMENT CHART

Follow trimmer sequence as indicated

Circuit Aligned	Step	Receiver: Band Switch	Receiver: Dial Pointer	Signal Generator: Frequency	Signal Generator: Connection	Output Meter: (see list) Type	Output Meter: Connection	Trimmer or slug to be adjusted	Procedure
AM IF	1	BC	At low frequency end of dial	455 KC	Through .1 mfd. condenser to grid of 6SB7	A	Across speaker voice coil	#1, 2, and 3	Adjust for maximum output
FM IF	2	FM	"	10.7 MC	"	B	To AVC circuit, connect at 1 Megohm resistor on third I.F. lug assembly.	#4, 5, 6, (secondary) 7, 8, 9 (primary)	1. Grnd. limiter screen grid 2. Adjust slugs for max. reading. Repeat. 3. Remove scr grid ground.
Discriminator	3	"	"	"	"	C	Junction of 47,000 ohm resistor and shielded lead at 6H6 socket	#10	1. #11 counterclockwise to stop. Then clockwise three turns. 2. #10 for center scale rdg. on meter.
	4	"	"	10.6 MC and 10.8 MC	"	B		#11	Repeat adjustment for maximum and identical reading at each frequency.
IF Trap	5	International SW	Tune near 10.7 MC for max. meter reading		none	"	To I.F. AVC circuit	*I.F. Trap trimmer located beneath 1st I.F. transformer	Adjust for minimum meter rdg. with insulated align. tool.
Broadcast RF	6	BC	150 on dial	1500 KC	Through 200 mmf cond. to antenna post "A"	A	Across speaker voice coil	1. #12 (osc.) 2. #13 (ant.)	Adjust for max. reading
	7	"	60 on dial	600 KC	"	"	"	#14 osc. padder	Adjust for max. meter rdg. while rocking var. cond.
	8	"	Repeat	Steps	6 & 7				
International SW	9	International SW	18 MC on dial	18 MC	Through 400 ohm resistor to antenna post "A"	A	Across speaker voice coil	1. #15 (osc.) 2. #16 (ant.)	Adjust for max. meter rdg.
31 Meter Bandspread	10	31 Mtr. Bandspread	9.5 MC on dial	9.5 MC	"	"	"	1. #17 (osc.) 2. #18 (ant.)	"
25 Meter Bandspread	11	25 Mtr. Bandspread	12 MC on dial	12 MC	"	"	"	1. #19 (osc.) 2. #20 (ant.)	"
Frequency Modulation	12	FM	98 MC on dial	98 MC	Through 300 ohm resistor to antenna post "A"	"	"	1. #21 (osc.) 2. #22 (ant.)	"

TRIMMER LAYOUT





ALIGNMENT NOTES

Alignment should be attempted only if the proper output meters and signal generators are at your disposal. Insulated alignment tools are necessary. Output meters should include (1) a low range A.C. meter, (2) a 0-200 D.C. microammeter in series with a 100,000 ohm resistor or 0-20 volt D.C. vacuum tube voltmeter, and (3) a 50-0-50 microammeter in series with a 100,000 ohm resistor. The signal generators must cover frequencies from 450 kc to 108 mc.

It is essential that the signal generator be connected to the points indicated in the alignment chart through the proper dummy antenna.

A good ground connection, between the groundpost of the signal generator and the groundpost of the antenna strip, is necessary.

The output of the signal generator must always be kept at its lowest possible value. This is to prevent the automatic volume control of the

During alignment, the line voltage feeding the receiver power supply should be kept at approximately 117 volts.

The locations of adjustment screws are indicated clearly on the schematic diagram. Alignment adjustments should be made only in the sequence given in the chart.

TUNING RANGE

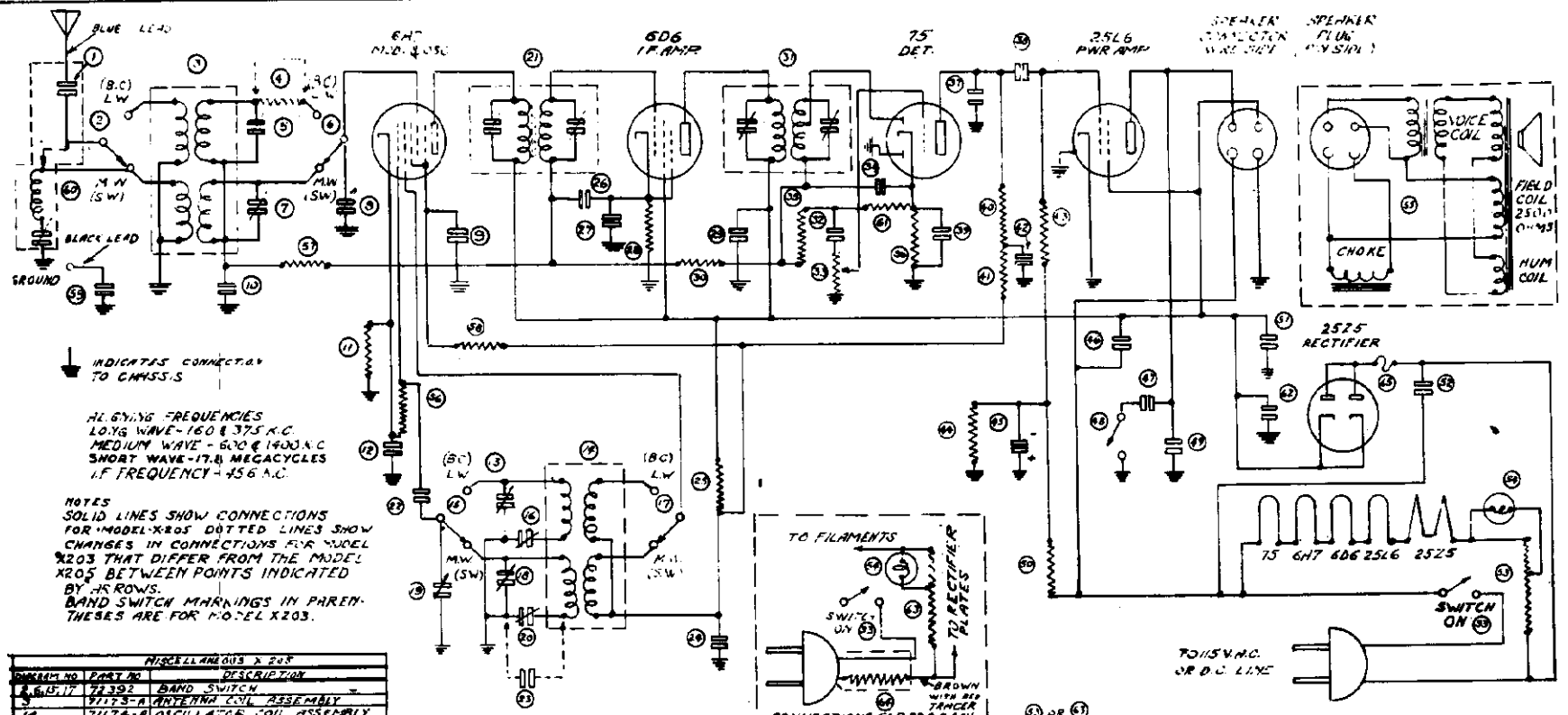
Band (1) — **Phonograph-Television** — (Must be attached to phonograph or television receiver)

Band (2) — **Frequency Modulation** — (87.5 to 108.5 mc or 2.77 to 3.43 meters)

Band (3) — **Standard Broadcast** — (535 to 1720 kc or 174 to 561 meters)

Band (4) — **International Shortwave** — (5.6 to 18.5 mc or 16.2 to 53.6 meters)

Band (5) — **31 Meter Bandspread** — (9.353 to 9.795 mc or 30.65 to 32.10 meters)



MISCELLANEOUS X 205		
DIAGRAM NO	PART NO	DESCRIPTION
4, 6, 15, 17	72392	BAND SWITCH
5	71173-A	ANTENNA COIL ASSEMBLY
14	71174-A	OSCILLATOR COIL ASSEMBLY
21	73108-A	1st I.F. TRANSFORMER ASS'Y
31	73106	2nd I.F. TRANSFORMER ASS'Y
35	79696	5" SPEAKER & FIELD ASS'Y
48	72049	TONE CONTROL SWITCH
54	78151-	DIAL LAMP 6.3 V. .15 AMP.
60	79097-H	WAVE TRAP ASS'Y
65	70033 K	FUSE 1.25 AMP

MISCELLANEOUS X 203		
SAME AS FOR MODEL X205 WITH FOLLOWING CHANGES		
3	7116 9-C	ANTENNA COIL ASS'Y
14	71170-C	OSCILLATOR COIL ASS'Y
60	79097-H	WAVE TRAP ASS'Y

CONDENSERS - X 205		
DIAGRAM NO	PART NO	DESCRIPTION
1	22055-AR	.005 MFD. 1000 V. PAPER
5, 13, 18	79[illegible]	TRIMMER & PANEL ASS'Y
8, 19	[illegible]-C	365 MMFD 2 GANG VARIABLE
9	[illegible]-P	.05 MFD. 400 V. PAPER
27	[illegible]-M	.1 MFD. 200 V. PAPER
30, 36	[illegible]-H	.08 MFD. 200 V. PAPER
16	79[illegible]-H	DUAL PADDER (20-80 MMFDS 300-600 MMFDS
20		
12	22055-X	.05 MFD. 200 V. PAPER
28	22055-AE	.25 MFD. 400 V. PAPER
32, 38, 49	22055-N	.01 MFD. 600 V. PAPER
42, 62	22055-L	.1 MFD. 400 V. PAPER
47	22055-J	.03 MFD. 600 V. PAPER
52	22055-U	.01 MFD. 1000 V. PAPER
61	85021	20 MFDS. 150 V. ELECTROLYTIC 4 MFDS.
64		
65, 39	22481	10 MFDS. 25 V. ELECTROLYTIC
46	85014-B	40 MFDS. 150 V. ELECTROLYTIC
36, 37	27101-0	250 MMFDS. MICA
58	27723-0	50 MMFDS MICA
59	22055-R	.005 MFD. 1000 V. PAPER

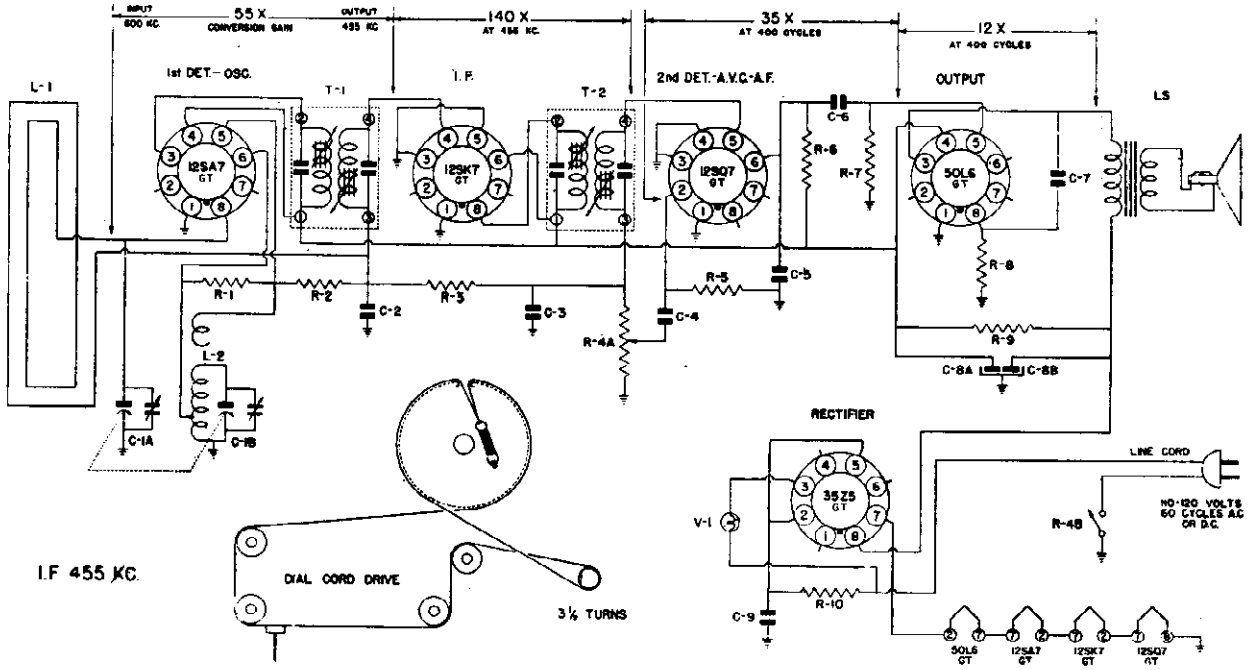
CONDENSERS - X 203		
SAME AS FOR MODEL X205 WITH FOLLOWING CHANGES		
DIAGRAM NO	PART NO	DESCRIPTION
16	7[illegible]03-C	SINGLE PADDER 300-600 MMFDS
23	27734-W	6000 MMFDS. MICA (REPLACES "50")

RESISTORS X 205		
1	13080	50 OHMS 1/4 WATT
56	13164	50,000 OHMS 1/4 WATT
30	13001	1 MEG. 1/4 WATT
10, 43, 50	13171	250,000 OHMS 1/4 WATT
44	13147	300,000 OHMS 1/4 WATT
11, 24	13115	400 OHMS 1/4 WATT
45	3133	3,000 OHMS 1/2 WATT
58	13149	6,000 OHMS 1/2 WATT
34	13146	12,000 OHMS 1/2 WATT
41, 57	13031	20,000 OHMS 1/2 WATT
35, 61	13043	150,000 OHMS 1/4 WATT
53	78553	190 WIRE WOUND TAPPED AT 90
33	79204	250,000 OHMS VOL. CONTROL & S.W.

RESISTORS X-203		
SAME AS FOR MODEL X205 EXCEPT "4" IS NOT USED		
CHANGES IN RESISTORS FOR 220-240 VOLTS		
53	78553	NOT USED
63	63021	275 OHMS TAPPED @ 40 W.W.
64	79265	180 OHMS LINE RES. CORD

PORTO-PRODUCTS, INC.

MODELS PA-510, PB-52



DUMMY ANT. IN SERIES WITH SIGNAL GENERATOR	CONNECT HIGH SIDE OF GENERATOR TO	SIGNAL GENERATOR FREQUENCY	RECEIVER DIAL SETTING	TRIMMER NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMEN
.1 MFD.	Lug on trimmer No. 6 on rear section of gang (see figure below for location of trimmer.)	455 KC	Any point where it does not affect the signal.	1 - 2	2nd I.F.	Adjust for maximum outpu Then repeat adjustment.
				3 - 4	1st I.F.	
LOOP	Radiation to set loop	1400 KC	1400 KC	5	Broadcast Oscillator	Adjust for maximum outpu
LOOP	Radiation to set loop	1400 KC	Tune to 1400 KC generator signal.	6	Broadcast Antenna	Adjust for maximum outpu

APPROXIMATE STAGE GAIN DATA

Be sure R.F. and I.F. stages are accurately aligned before measuring gain. R.F. gains can be measured with a "channel" type instrument containing a tuned and calibrated R.F. amplifier. A vacuum tube voltmeter may be used for audio gain measurements. Observe following precautions:

1. For all gain measurements connect signal generator as shown. Use 600 KC signal with 400 cycles modulation (use nearby frequency if local station interferes.)

2. For R.F. and I.F. measurements connect negative terminal of a 3-volt battery (two 1½ volt cells in series) to A.V.C. lead and positive terminal to chassis. This provides a definite operating point.

3. Be sure radio is carefully tuned to generator signal (use weak signal for sharp tuning.)

4. When using a "channel" type instrument carefully tune it for maximum output at desired frequency before making measurements.

The R.F. and I.F. stage gains shown below are less than under normal operating conditions due to the use of 3 volts fixed bias in order to establish a definite operating point. Therefore, these values are not intended to indicate the full capacity of a stage.

Differences in tube characteristics, tolerance of parts, adjustment of tuned circuits, and variations of line voltage will influence stage gain. Accuracy of measurements is dependent upon careful tuning of receiver to generator signal and experience in using your test equipment. These factors may create considerable variation in gain measurements.

ALIGNMENT PROCEDURE

1. Remove chassis and loop from cabinet.

2. With the gang condenser fully meshed, dial pointer should be in the position indicated by the last division below 55 on the dial. If it is set incorrectly, release pointer clip on dial and reposition pointer.

3. Connect an output meter across the speaker voice coil or from the plate of the 50L6GT tube to chassis through a .1 Mfd. condenser.

4. Connect the ground lead of the signal generator to the receiver chassis through a .25 Mfd. condenser.

5. Set volume control at maximum volume position and use a weak signal from the signal generator.

MODELS PA-510, PB-520 PORTO-PRODUCTS, INC.

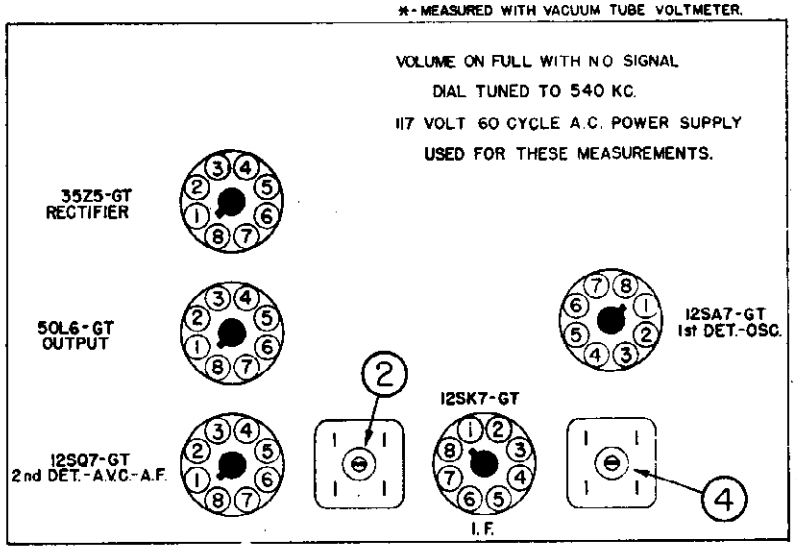
SOCKET VOLTAGES

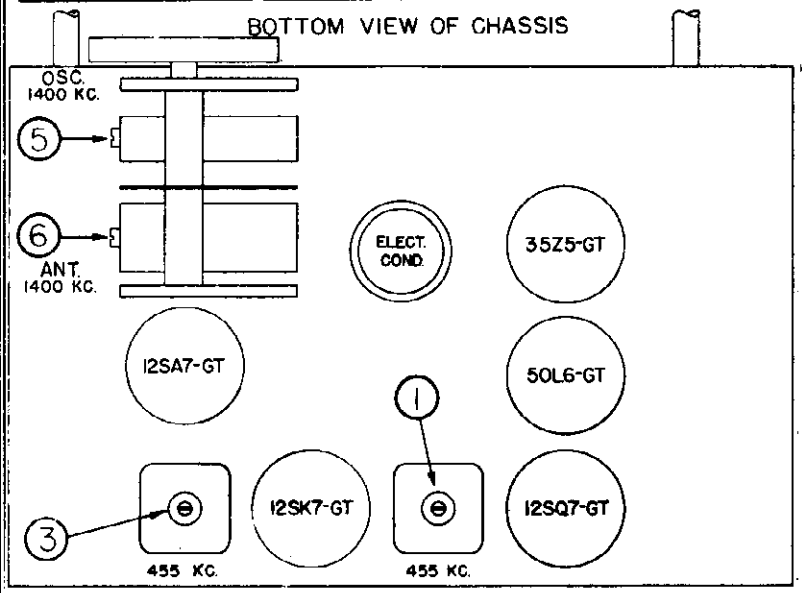
HEATER VOLTAGES MEASURED ACROSS SOCKET TERMINALS.

VOLTAGES MEASURED BETWEEN SOCKET TERMINALS & CHASSIS

TERM NO.	TO	TERM NO.	A.C. VOLTS	TUBE TYPE	SOCKET TERMINAL NO. 1	2	3	4	5	6	8
2	-	7	12	12SA7-GT	0		75	75	-8.7 *	0	-0.7 *
2	-	7	12	12SK7-GT	0		0	-0.7 *	0	75	75
7	-	8	12	12SQ7-GT	0	-1 *	0	-0.7 *	0	50 *	
2	-	7	50	50L6-GT			115	75	0		4.5
2	-	7	31	35Z5-GT					115 A.C.		125
2	-	3	5.6								

*-MEASURED WITH VACUUM TUBE VOLTMETER.

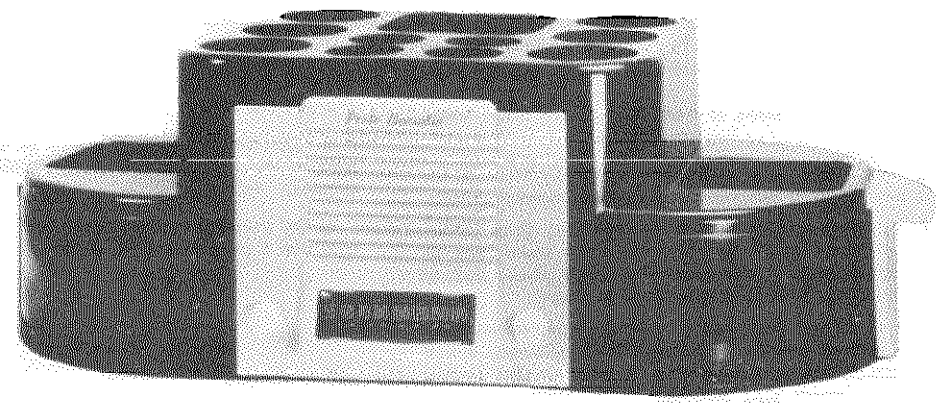


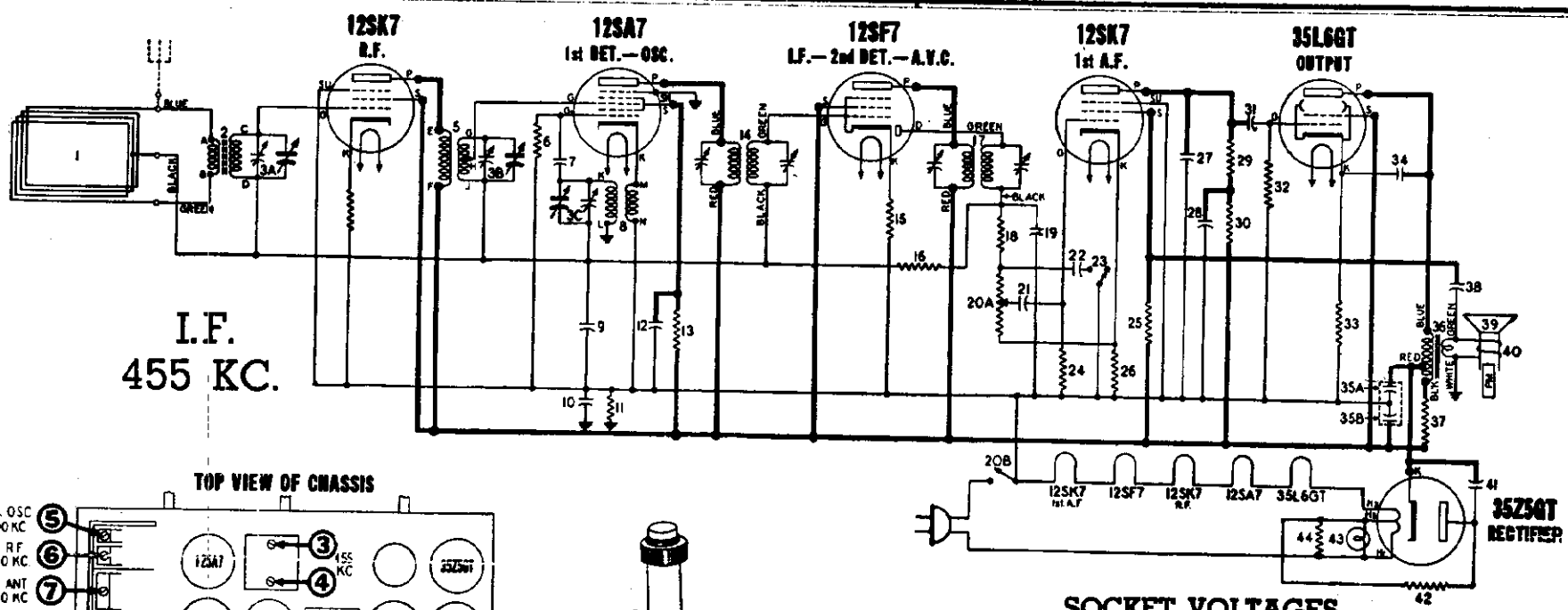


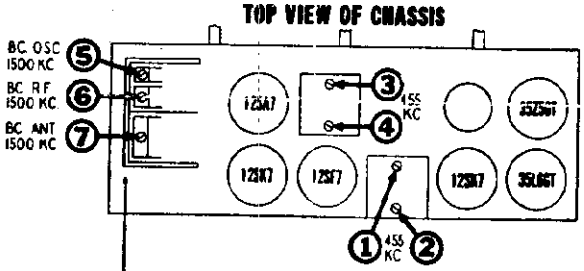
PARTS LIST

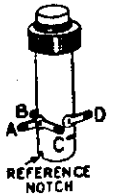
Diagram No.	Part No.	Description
		CONDENSERS
C-1A, 1B	6-6	Condenser—variable gang (with drum)
C-2		Condenser—.05 Mfd. 200 volt
C-3		Condenser mica 250 Mmfd. 500 volt
C-4		Condenser—.01 Mfd. 200 volt
C-5		Condenser—mica 250 Mmfd. 500 volt
C-6		Condenser—.01 Mfd. 200 volt
C-7		Condenser—.02 Mfd. 400 volt
C-8A, 8B	3-3	Condenser-electrolytic A—20 Mfd. 150 volt B—40 Mfd. 150 volt
C-9		Condenser—.1 Mfd. 200 volt
		RESISTORS
R-1		Resistor—carbon 10,000 ohms ⅓ watt
R-2		Resistor—carbon 10 Meg. ⅓ watt
R-3		Resistor—carbon 2 Meg. ⅓ watt
R-4A, 4B		Volume control—with switch; .5 Meg.
R-5		Resistor—carbon 10 Meg. ⅓ watt
R-6		Resistor—carbon 500,000 ohms ⅓ watt
R-7		Resistor—carbon 500,000 ohms ⅓ watt
R-8		Resistor—carbon 150 ohms ⅓ watt
R-9		Resistor—carbon 2000 ohms 1 watt
R-10		Resistor—carbon 10 ohms ⅓ watt
		COILS AND TRANSFORMERS
L-1	13-3	Loop antenna
L-2	14-4	Coil—Oscillator
T-1	15-3	Transformer—1st I.F.
T-2	15-3	Transformer—2nd I.F.
		OTHER ELECTRICAL PARTS
L-S	9-11	Speaker—P.M. dynamic (4-inch) with output transformer
V-1		Lamp—dial (Mazda 47) 6-8V. 150 Ma.
	18-2	Line cord with plugs
		Cone and voice coil for speaker
	2-18	Base for mtg. electrolytic condenser
		Cabinet—walnut (model PB 520)
		Cabinet—ivory (model PB 510)
		Clip—for mtg. handle
		Clip—for mtg. escutcheon
		Cord—dial drive (10 in. required) per ft
	7-11	Dial scale
		Dial scale backing
		Escutcheon—ivory (model PB 520)
		Escutcheon—gold (model PB 510)
		Handle—ivory (model PB 520)
		Handle—gold (model PB 510)
	36-23	Knob—ivory (model PB 520)
	36-23	Knob—gold (model PB 510)
	2-36	Pointer
		Retaining ring for tuning shaft
		Shaft—tuning control
	22-1	Socket—octal base—specify molded or laminated
	22-12	Socket—for line cord
		Socket—dial lamp
	17-1	Spring—dial cord tension.
	2-20	Washer—spring washer for tuning shaft
	7-13	Window—dial

TOP VIEW OF CHASSIS

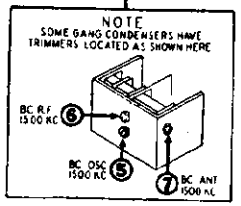


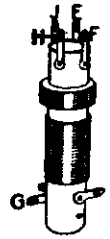




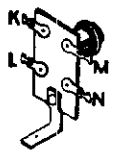


ANT. COUPLING COIL 502121

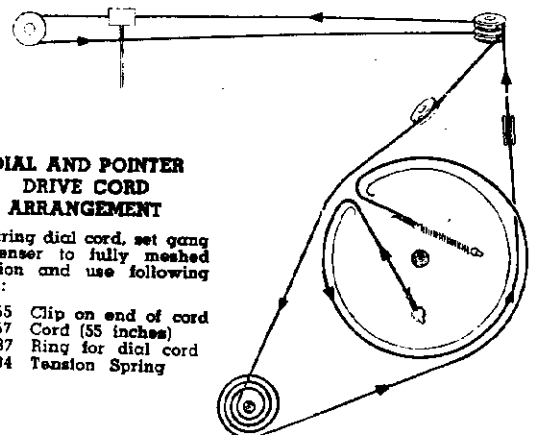




R. F. COIL 502142



OSC. COIL 502198



DIAL AND POINTER DRIVE CORD ARRANGEMENT

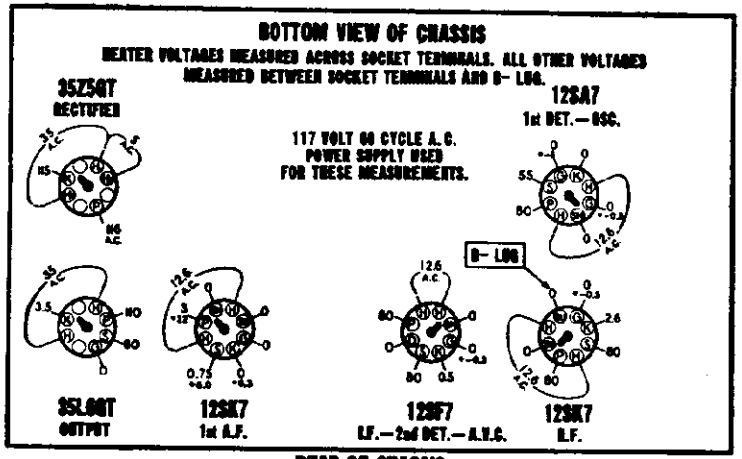
To string dial cord, set gang condenser to fully meshed position and use following parts:

114955	Clip on end of cord
117057	Cord (55 inches)
119087	Ring for dial cord
161384	Tension Spring

SOCKET VOLTAGES

Measured with voltmeter having sensitivity of 1000 ohms per volt except where indicated by (*).

VOLUME ON FULL WITH NO SIGNAL — DIAL TUNED TO 540 KC.



REAR OF CHASSIS

*—Measured with vacuum tube voltmeter

DIAGRAM NO.	PART NO.	DESCRIPTION
		CONDENSERS
3A-3B-3C	502123	Condenser—variable gang (with drum).
7	502159	Condenser—mica—.50 Mmfd. 500 Volt.
9	502157	Condenser—.05 Mfd. 400 volt.
10	502158	Condenser—.2 Mfd. 400 volt.
12	502262	Condenser—.25 Mfd. 200 Volt.
19	502160	Condenser—mica—.110 Mmfd. 500 Volt.
21	502453	Condenser—.002 Mfd. 400 Volt.
22	502470	Condenser—.0008 Mfd. 400 Volt.
27	502160	Condenser—Mica—.110 Mmfd. 500 Volt.
28	502153	Condenser—.05 Mfd. 200 Volt.
31	502156	Condenser—.004 Mfd. 400 Volt.
34	502151	Condenser—.01 Mfd. 400 Volt.
35A-35B	500256	Condenser — electrolytic A-40 Mfd. 150 Volt B-20 Mfd. 150 Volt
38	502152	Condenser—.02 Mfd. 400 Volt.
41	502157	Condenser—.05 Mfd. 400 Volt.
		RESISTORS
4	502125	Resistor—carbon 220 Ohms 1/4 watt
6	502130	Resistor—carbon 22,000 Ohms 1/4 Watt
11	502133	Resistor—carbon 220,000 Ohms 1/4 Watt
13	502291	Resistor—carbon 4700 Ohms, 1/4 Watt
15	502264	Resistor—carbon 47 Ohms 1/4 Watt
16	502269	Resistor—carbon 3.3 Meg. 1/4 Watt
18	502131	Resistor—carbon 47,000 Ohms 1/4 Watt
20A-20B	502145	Volume control 500,000 Ohms (with switch)
24	502136	Resistor—carbon 10 Meg. 1/4 Watt
25	502135	Resistor—carbon 2.2 Meg. 1/4 Watt
26	502128	Resistor—carbon 2200 Ohms 1/4 Watt
29-30	502133	Resistor—carbon 220,000 Ohms 1/4 Watt
32	502134	Resistor—carbon 470,000 Ohms 1/4 Watt
33	502138	Resistor—carbon 130 Ohms 1/4 Watt
37	502469	Resistor—carbon 1500 Ohms 1 Watt
42	502574	Resistor—carbon 33 Ohms 1/2 Watt
44	502140	Resistor—carbon 390 ohms 1/4 Watt
		COILS & TRANSFORMERS
1	502504	Loop Antenna
2	502121	Coil—antenna coupling
5	502142	Coil—R.F.
9	502198	Coil—oscillator
14	502102	Transformer 1st I.F.
17	502103	Transformer 2nd I.F.
36	502213	Trans.—output, speaker with prefix "R"
	502904	Trans.—output, speaker with prefix "A"
	504244	Trans.—output, speaker with prefix "W"
	504756	Trans.—output, speaker with prefix "Y"
	504758	Trans.—output, speaker with prefix "Z"
	504781	Trans.—output, speaker with prefix "C"
		OTHER ELECTRICAL PARTS
23	500546	Switch-tone control
39	502214	Cone & voice coil, spkr. with prefix "R"
	502903	Cone & voice coil, spkr. with prefix "A"
	504245	Cone & voice coil, spkr. with prefix "W"
	504757	Cone & voice coil, spkr. with prefix "Y"
	504759	Cone & voice coil, spkr. with prefix "Z"
	504782	Cone & voice coil, spkr. with prefix "C"
40	502998	Speaker—P.M. dynamic (5 inch)
43	118921	Lamp—dial (Mazda 47) 6-8V. 150 Ma.
		MISCELLANEOUS PARTS
	502502	Back for cabinet
	116457	Base for mtg. electrolytic condenser
	502506	Clamp—dial scale mtg.
	112745	Clip—coil mtg.
	114955	Clip—retainer on end of dial cord
	500497	Clip—retainer for cabinet back
	116563	Connector—for antenna leads
	117057	Cord—dial drive (55 in. required) per ft.
	500324	Cover—cardboard, for elect. cond.
	502599	Dial scale—glass
	502367	Pointer
	81145	Retaining ring for tuning shaft
	119087	Ring for dial cord
	17063	Screw—No. 6 x 1/4
	114628	Screw—No. 8 x 1/2 chassis mtg.
	502173	Shaft—tuning control
	116690	Socket—octal base
	160392	Socket—octal (rectifier)
	500499	Socket—dial lamp (with leads)
	161384	Spring—dial cord tension
	111458	Washer—spring washer for tuning shaft

ALIGNMENT PROCEDURE

1. Remove chassis and loop antenna from cabinet. Reconnect loop to chassis and space it approximately same distance from chassis as when installed in cabinet.
2. Note that there are four calibrating lines stamped into the metal dial frame. When gang condenser is fully meshed, dial pointer should be in the position indicated by first line at the left. If it is set incorrectly, release pointer clip on dial cord and reposition pointer.
3. Connect an output meter across the speaker voice coil or from plate of 35L6GT tube to B— through a .1 Mfd. condenser (see voltage chart for convenient B— connection).
4. Connect ground lead from signal generator to B— through a .25 Mfd. condenser.
5. Set volume control at maximum volume position and use a weak signal from the signal generator.

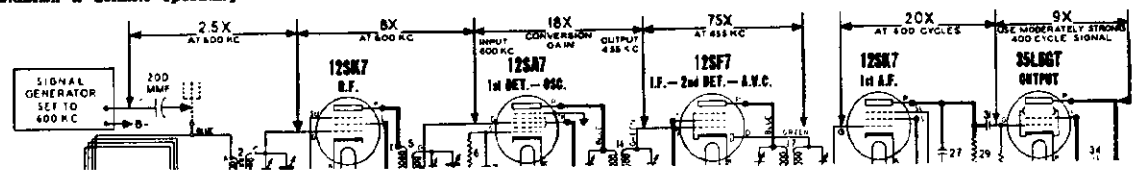
DUMMY ANT. IN SERIES WITH SIGNAL GENERATOR	CONNECTION OF SIG. GENERATOR OUTPUT TO RECEIVER	SIGNAL GENERATOR FREQUENCY	RECEIVER DIAL SETTING	TRIMMER NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT
200 MMFD. Mica Condenser	Control Grid of 12SA7	455 KC	Any point where it does not affect the signal	1-2	2nd I.F.	Adjust for maximum output. Then repeat adjustment.
				3-4	1st I.F.	
200 MMFD. Mica Condenser	External Antenna Clip on Loop Frame	1500 KC	Set pointer to 1500 KC reference line stamped into metal dial plate (first line at the right)	5	Broadcast Oscillator (Shunt)	Adjust for maximum output.
200 MMFD. Mica Condenser	External Antenna Clip on Loop Frame	1500 KC	Tune to 1500 KC generator signal	6	Broadcast R.F.	Adjust for maximum output.
200 MMFD. Mica Condenser	External Antenna Clip on Loop Frame	1500 KC	Tune to 1500 KC generator signal	7	Broadcast Antenna	Adjust for maximum output.

APPROXIMATE STAGE GAIN DATA

Be sure R.F. and I.F. stages are accurately aligned before measuring gain. R.F. gains can be measured with a "channel" type instrument containing a tuned and calibrated R.F. amplifier. A vacuum tube voltmeter may be used for audio gain measurements. Observe following precautions:

1. For all gain measurements connect signal generator as shown. Use 600 KC. signal with 400 cycle modulation (use nearby frequency if local station interferes.)
2. For R.F. and I.F. measurements connect negative terminal of a 3 volt battery (two 1½ volt cells in series) to A.V.C. lead and positive terminal to B—. This provides a definite operating point. **IMPORTANT:** Disconnect battery when measuring audio stage gains.
3. Be sure radio is carefully tuned to generator signal (use weak signal for sharp tuning.)
4. When using a "channel" type instrument carefully tune it for maximum output at desired frequency before making measurements.

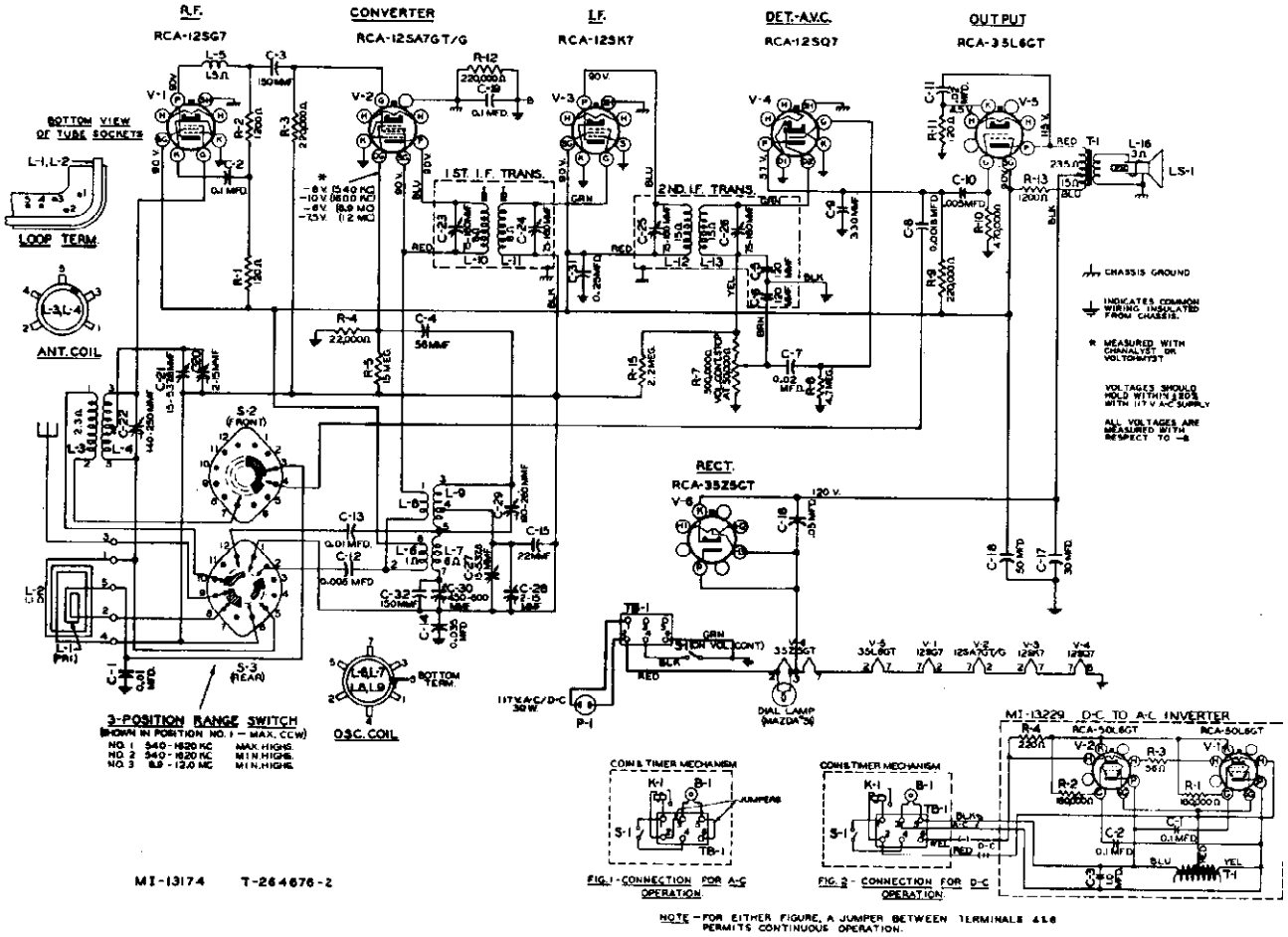
The R.F. and I.F. stage gains shown below are less than under normal operating conditions due to the use of 3 volts fixed bias in order to establish a definite operating point. Therefore, these values are not intended to indicate the full capability of a stage.



Differences in tube characteristics, tolerance of parts, adjustment of tuned circuits, and variations of line voltage will influence stage gain. Accuracy of measurements is dependent upon careful tuning of receiver to generator signal and experience in using your test equipment. These factors may create considerable variation in gain measurements.

RADIO CORP. OF AMERICA

MODELS MI-13174-1
MI-13174-3



NOTE — FOR EITHER FIGURE, A JUMPER BETWEEN TERMINALS 4 & 6 PERMITS CONTINUOUS OPERATION.

STOCK No.	DESCRIPTION
	CHASSIS ASSEMBLIES
	RC 1023B
39612	Capacitor—Mica, 22 mmf. (C15)
39622	Capacitor—Mica, 56 mmf. (C4)
39632	Capacitor—Mica, 150 mmf. (C3, C32)
70417	Capacitor—Mica trimmer, 140-250 mmf., mounted on antenna coil (C22)
39839	Capacitor—Adjustable mica, comprising 1 section of 180-260 mmf. and 1 section of 450-600 mmf. (C29, C30)
39640	Capacitor—Mica, 330 mmf. (C9)
70712	Capacitor—Tubular, .0018 mfd. 800 volts (C8)
70627	Capacitor—Tubular, .005 mfd. 600 volts, (C10, C12)
70652	Capacitor—Tubular, .01 mfd. 1000 volts (C1, C13)
70711	Capacitor—Tubular, .02 mfd. 700 volts (C7, C11)
70635	Capacitor—Tubular, .035 mfd. 600 volts (C14)
70615	Capacitor—Tubular, .05 mfd. 400 volts (C16)
70617	Capacitor—Tubular, 0.1 mfd., 400 volts (C2, C19)
70618	Capacitor—Tubular, 0.25 mfd. 400 volts (C31)
39152	Capacitor—Electrolytic, comprising 1 section of 30 mfd., 150 volts, and 1 section of 50 mfd., 150 volts (C17, C18)
70416	Coil—Antenna coil (L3, L4, C22)
39892	Coil—Oscillator coil (L6, L7, L8, L9)
70418	Coil—Peaking coil (L5)
70700	Condenser—Variable tuning condenser (C20, C21, C27, C28)
36242	Control—Volume control and power switch (R7, S1)
32634	Cord—Drive cord (approx. 49 inches overall length)
70392	Cord—Power cord
36237	Drum—Drive drum
37068	Indicator—Station selector indicator
11765	Lamp—Dial lamp (Mazda 51)
70980	Lead—Antenna lead
39841	Loop—Antenna loop (L1, L2)
36229	Plate—Dial back plate complete with drive cord pulleys less dial
36230	Pulley—Drive cord pulley
30189	Resistor—120 ohms, ¼ watt (R1, R11)
30731	Resistor—1200 ohms ¼ watt (R2)
6134	Resistor—1200 ohms, 1 watt (R13)
30492	Resistor—22,000 ohms, ¼ watt (R4)
14583	Resistor—220,000 ohms, ¼ watt (R3, R9, R12)
30648	Resistor—470,000 ohms, ¼ watt (R10)
30649	Resistor—2.2 megohms ¼ watt (R15)
30931	Resistor—4.7 megohms, ¼ watt (R8)
38785	Resistor—15 megohms, ¼ watt (R5)
36897	Shaft—Tuning knob shaft
34449	Socket—Lamp socket
37605	Socket—Tube socket, moulded
31251	Socket—Tube socket, wafer
31418	Spring—Drive cord tension spring
39837	Switch—Range switch (S2, S3)
36800	Transformer—Output transformer (T1)
70411	Transformer—First I-F transformer (L10, L11, C23, C24)
70412	Transformer—Second I-F transformer (L12, L13, C5, C6, C25, C26)
33726	Washer—"C" washer for tuning knob shaft
	SPEAKER ASSEMBLY
	92510-1
70413	Speaker—5-inch P.M. speaker complete with cone and voice coil
	NOTE: If stamping on speaker in instrument does not agree with above speaker number, order replacement parts by referring to model number of instrument, number stamped on speaker and full description of part required.
	MISCELLANEOUS ASSEMBLIES
70414	Knob—Control knob
30900	Spring—Retaining spring for knob
17397	Feet—Rubber feet for cabinet (4 required)
55083	Clamp—Dial clamp
55084	Dial—Glass dial scale

MODELS MI-13174-1, MI-13174-3

RADIO CORP. OF AMERICA

Alignment Procedure

Critical Lead Dress

1. Dress blue and green leads of both I-F transformers back in shield cans, leaving them as short as possible
2. Dress R-F plate filter capacitor (C2, 0.1 mf.) back against rear chassis apron.
3. Dress yellow and brown leads from 2nd I-F away from all other leads.
4. Dress all heater leads next to chassis.
5. Dress capacitor (C13, .01 mf.) parallel to osc. coil and approximately 3/16 inch from coil.
6. Dress tone control lead and speaker field leads next to chassis and front apron.
7. Dress pilot lamp leads away from ant. coil.
8. Dress leads from loop ant. coil around rectifier tube towards end of chassis.
9. Dress output plate lead against chassis.

Test Oscillator.—Connect high side of test oscillator as shown in chart. Connect low side through a .01 mf. capacitor to common "-B." Keep the output signal as low as possible to avoid A.V.C. action.

Output Meter.—Connect meter across speaker voice coil. Turn volume control to maximum clockwise position, station selector switch to broadcast maximum high position (pos. 1), for broadcast alignment and to position 3 for high frequency band.

Dial Pointer Adjustment.—Rotate tuning condenser fully counter-clockwise (plates fully meshed). Adjust indicator pointer to left (max. cap.) mark on dial back plate.

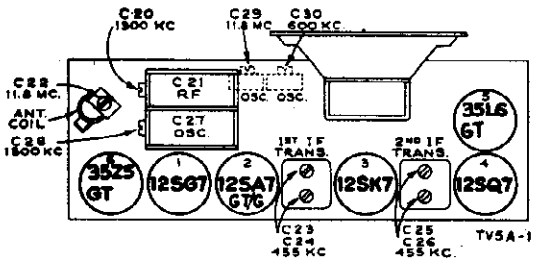
Calibration Scale.—The glass tuning dial may be easily removed from the cabinet and temporarily attached to the dial backing plate.

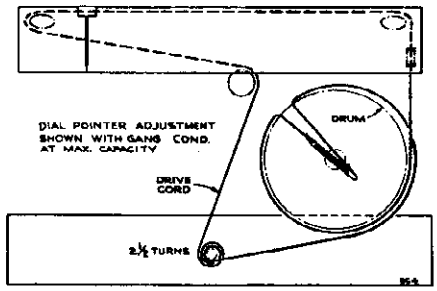
Power Supply Polarity.—For operation on d-c, the power plug must be inserted in the outlet for correct polarity. If the set does not function, reverse the plug. On a-c, reversal of the plug may reduce hum.

Steps	Connect high side of the test oscillator to—	Tune test osc. to—	Turn radio dial to—	Adjust the following for maximum peak output
1	Pin #8 of 12SA7 in series with 0.1 mfd.	455 kc	Quiet Point at 1,600 kc end of dial	C25, C26 2nd I-F trans.
2				C23, C24† 1st I-F trans.
3	Ant. terminal in series with 220 mmf.	600 kc	600 kc "A" Band	C30 (osc.) Rock gang
4		1300 kc	1300 kc "A" Band	C28 (osc.) C20 (R-F)
5		Repeat 3 Rocking gang		
6		Repeat 3, 4 and 5 for exact cal.		
7	Ant. terminal in series with 0.1 mfd.	11.8 mc	11.8 mc	C29 (osc.)* Rock gang
8	Ant. terminal in series with 47 mmf.	11.8 mc	11.8 mc	C22 (R-F) Rock gang
9	Repeat steps 7 and 8			

* Use minimum capacity peak if two can be obtained. Check for selection of correct peak by tuning receiver to approximately 10.9 mc where a weaker signal should be received.

† Do not readjust C25 or C26.





Specifications

Frequency Range

Broadcast	540-1600 kc
Short Wave	8.9-12 mc
Intermediate Frequency	455 kc
Pilot Lamp	Mazda No. 51, 6-8 volts, 0.2 amp.

Power Output

Undistorted	1.0 watts
Maximum	1.5 watts

Loudspeaker (92510-1) "PM"

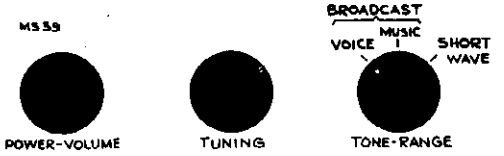
Size	5-inch
V.C. Impedance	3.4 ohms at 400 cycles

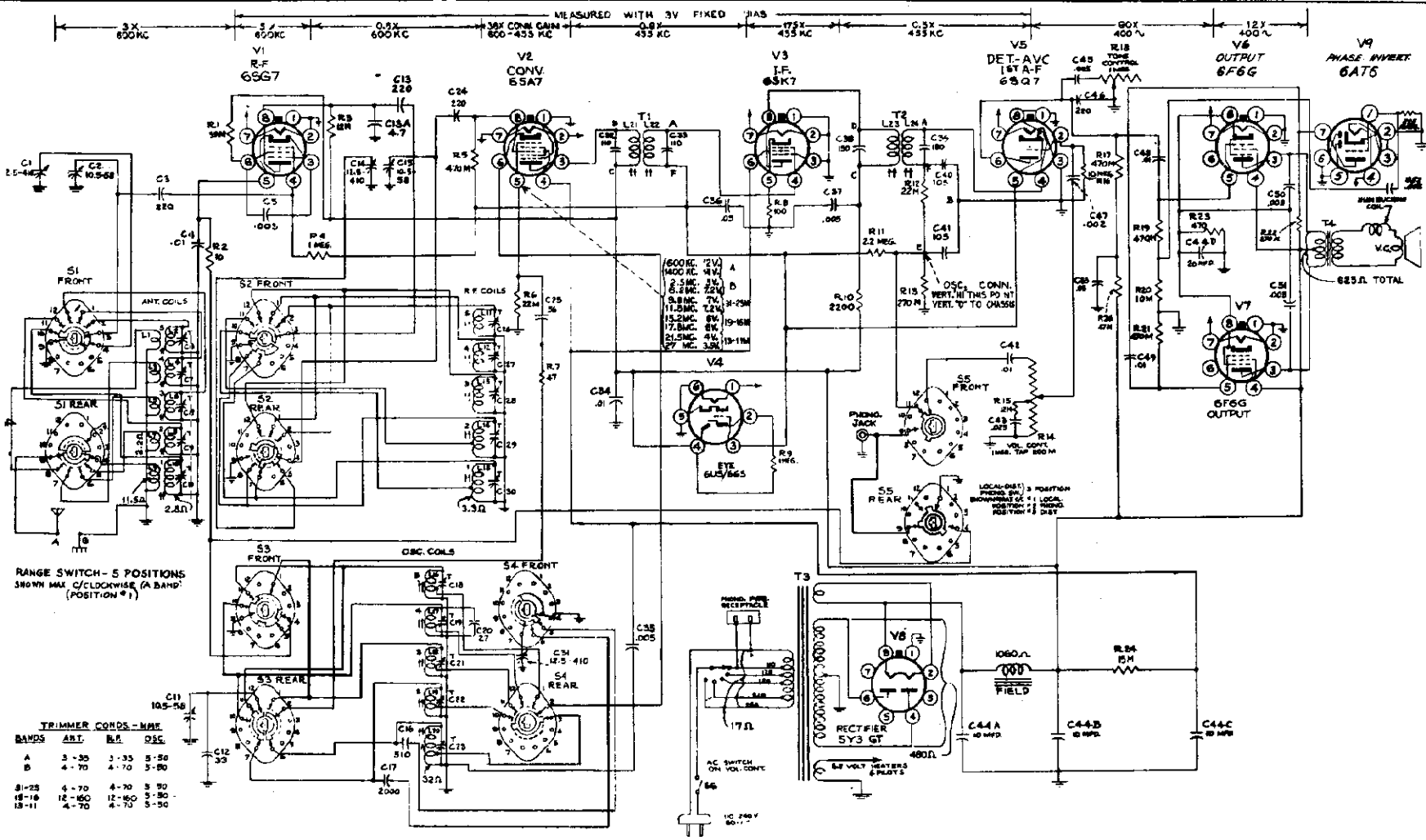
Power Supply Rating

105-125 volts, AC, 50 or 60 cycles, or DC	30 watts
Tuning Drive Ratio	20:1

Dimensions

Width	16-9/16 inches
Height	9¾ inches
Depth	10-7/16 inches





Local-Distance-Phono. Switch:

The Local-Distance-Phono. Switch (S5) used in these receivers is unusual in that the rotor segments do not contact consecutive terminals but instead contact every second terminal as explained below.

S5 Front
Local Position (#1) and Distance Position (#3)
Contacts terminals #11 and #12
Phono. Position (#2)
Contacts terminals #9 and #12

S5 Rear
Local Position (#1) and Phono. Position (#2)
No connection
Distance Position (#3)

Power Trans. Color Code:

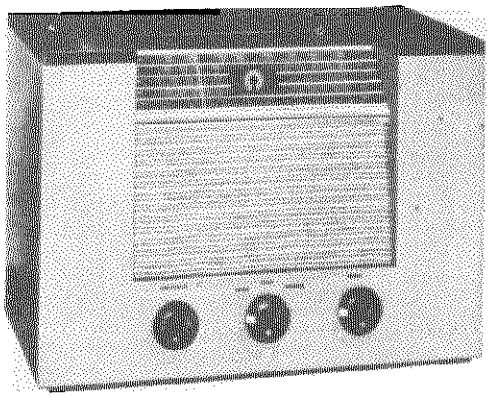
105/125 v. 50-60 cycle—stamped 901944-501
Primary—Black—Black (6.3 ohms d.c.)
H.V. Winding—Red—Red/Yellow—Red (510 ohms d.c.)
Heaters—Brown—Brown
Rect. Fil.—Yellow—Yellow

105/125 v. 25-60 cycle—stamped 901945-501
Primary—Black—Black (8 ohms d.c.)
H.V. Winding—Red—Red/Yellow—Red (460 ohms d.c.)
Heaters—Brown—Brown
Rect. Fil.—Yellow—Yellow

110/125/150/210/240 v. 50-60 cycle—stamped 901891-501
Primary (common)—Black
Primary 110 v.—Black/Yellow
Primary 110 v.—Green/Yellow (extension of 110 v. tap)
Primary 125 v.—Black/Red
Primary 150 v.—Blue/Yellow
Primary 210 v.—Green
Primary 240 v.—Yellow
D.C. resistance: Black to Black/Red 5.3 ohms
Black/Red to Yellow 10.8 ohms
H.V. Winding—Red—Red/Yellow—Red (470 ohms d.c.)
Heaters—Brown
Rect. Fil.—Yellow

MODELS Q109, Q109X

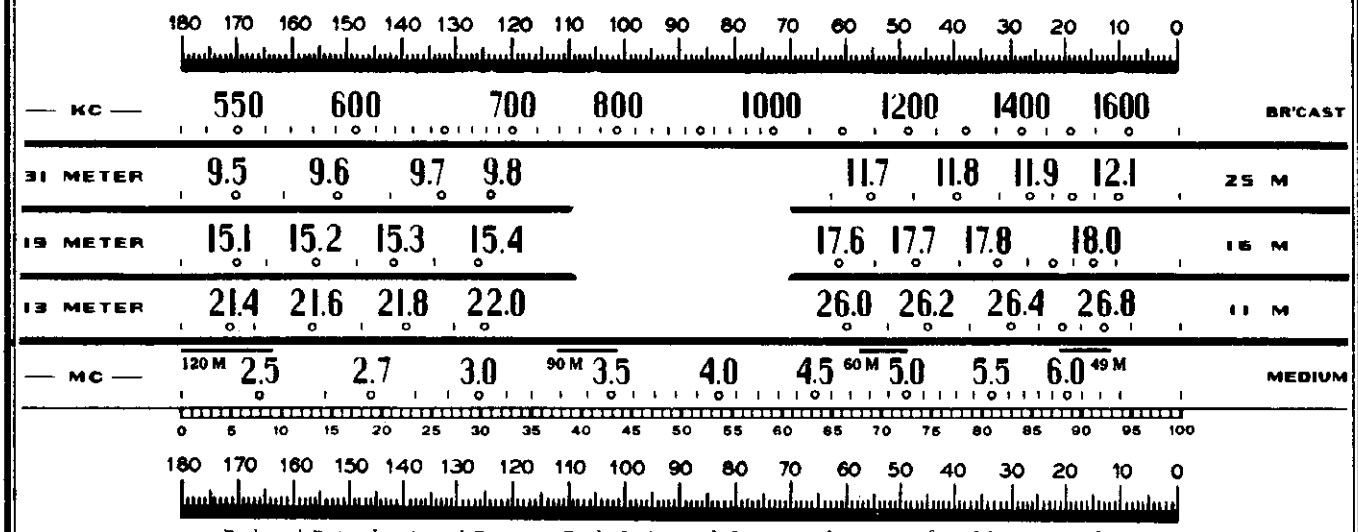
RADIO CORP. OF AMERICA



Loudspeaker

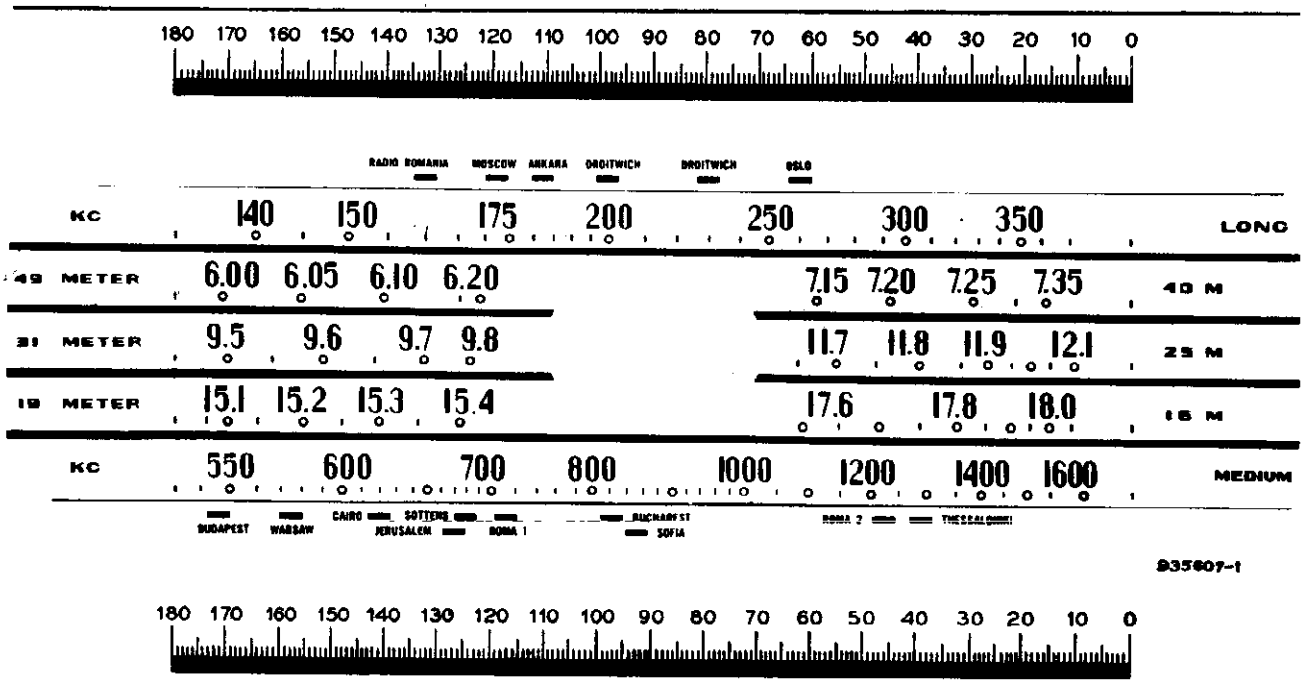
Chassis No. RC 602, RC 602A	92562-1
Type (Electrodynamic)	6"x9" Elliptical
V-C Impedance (400 c.p.s.)	2.2 ohms

Pilot Lamps ..... 2 type 51 6.3 volts, 0.15 amp.
1 type 55 6.3 volts, 0.40 amp.



Reduced Reproduction of Receiver Dial, Q109, and Corresponding 0-180° Calibration Scales

The corresponding position of the dial indicator for any setting of the calibration scale can be determined by drawing a line from this point on the bottom calibration scale to the same point on top calibration scale. For example 150° on the calibration scale corresponds to 600 kc on "A" band, etc. Read instructions under "Alignment Procedure."



Reduced Reproduction of Receiver Dial Q109X, and Corresponding 0-180° Calibration Scales

The corresponding position of the dial indicator for any setting of the calibration scale can be determined by drawing a line from this point on the bottom calibration scale to the same point on top calibration scale. For example 150° on the calibration scale corresponds to 600 kc on "A" band, etc. Read instructions under "Alignment Procedure."

Alignment Procedure

Q109

Cathode-Ray Alignment is the preferable method. Connections for the oscillograph are shown on the Schematic Circuit Diagram.

Output Meter Alignment.—If this method is used, connect the meter across the voice coil, and turn the receiver volume control to maximum.

Test Oscillator.—For all alignment operations, connect the low side of the test-oscillator to the receiver chassis, and keep the oscillator output as low as possible to avoid a-v-c action.

Calibration Scale on Indicator-Drive-Cord-Drum.—The tuning dial is fastened in the cabinet and cannot be used for reference during alignment, therefore a calibration scale is attached to the indicator-drive-cord-drum which is mounted on the shaft of the gang condenser. The setting of the gang condenser is read on this scale, which is calibrated in degrees. The correct setting of the gang in degrees, for each alignment frequency, is given in the alignment table.

As the first step in r-f alignment, check the position of the drum. The "180°" mark on the drum scale must be vertical, and directly over the center of the gang-condenser shaft when the plates are fully meshed. The drum is held to the shaft by means of two set screws, which must be tightened securely when the drum is in the correct position.

To determine the corresponding frequency for any setting of the calibration scales, refer to the calibration scale drawing which shows the dial with 0-180° calibration scales drawn at top and bottom.

Pointer for Calibration Scale.—Improvise a pointer for the calibration scale by fastening a piece of wire to the gang-condenser frame, and bend the wire so that it points to the "180°" mark on the calibration scale when the plates are fully meshed.

Dial-Indicator Adjustment.—After fastening the chassis in the cabinet, attach the dial indicator to the drive cable with indicator at the 540 kc mark (the first mark on "A" band to the left of "550"), and gang condenser fully meshed. The indicator has a spring clip for attachment to the cable.

Spread-Band Alignment.—The most satisfactory method of aligning or checking the spread-band ranges is on actual reception of short-wave stations of known frequency, by adjusting the magnetite-core oscillator coil for each spread-band so that these stations come in at the correct points on the dial.

In exceptional cases, when the set is being serviced in a location where the noise level is high enough to prevent reception of short-wave stations, a test-oscillator may be used for alignment, but an extremely high degree of accuracy is required in the frequency settings of the test-oscillator, as a slight error will produce considerable inaccuracy on the spread-band dials. The frequency settings of the test-oscillator may be checked by one or both of the following methods:

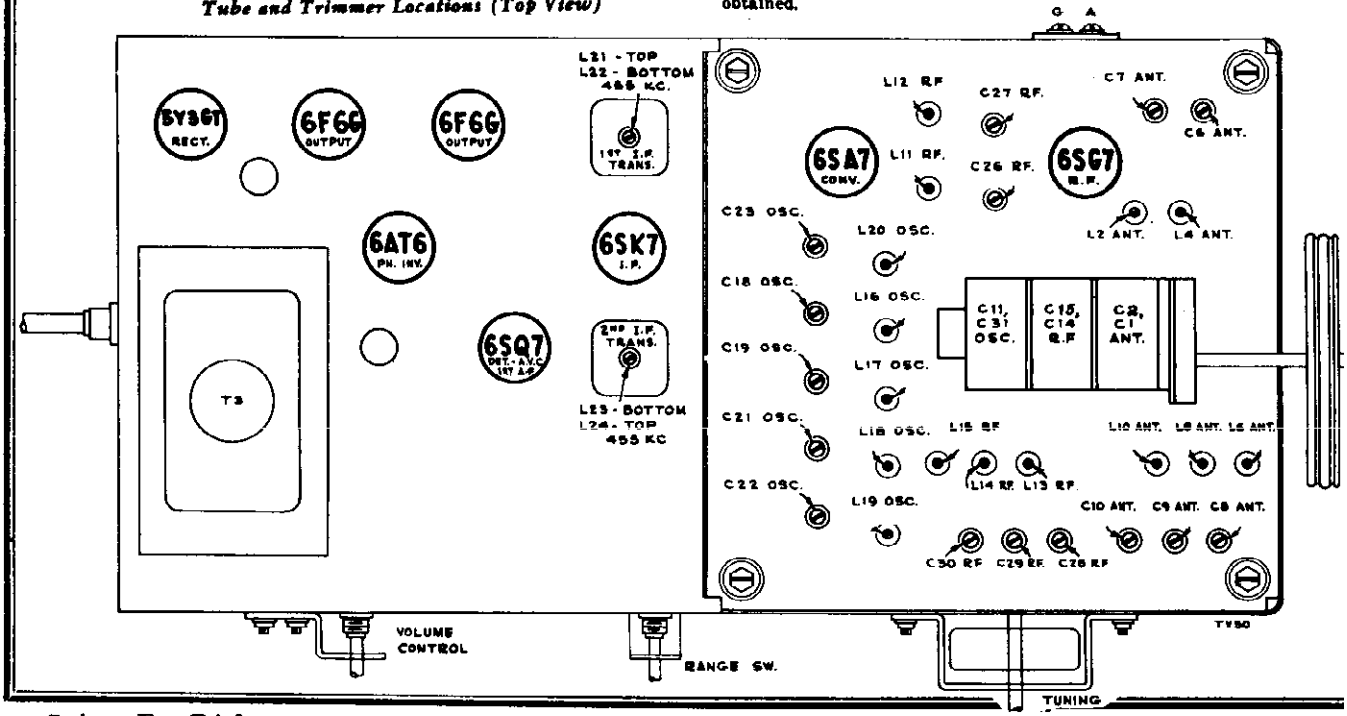
1. Determine the exact dial settings of the test-oscillator (for frequencies at or close to the specified alignment frequencies) by zero-beating the test-oscillator against short-wave stations of known frequency.
2. Use harmonics of the standard-broadcast range of a test-oscillator, first checking the frequency settings on this range by means of a crystal-controlled oscillator, or by zero-beating against standard broadcast stations.

When a test-oscillator is employed for spread-band alignment, a final check should be made on actual reception of short-wave stations of known frequency, and the magnetite-core oscillator coil for each band should be retouched so that the stations come in at the correct points on the dial.

Steps	Connect the high side of the test-osc. to—	Tune test-osc. to—	Turn Range Switch to—	Turn radio dial to—	Adjust the following for max. peak output
1	6SG7 I-F grid in series with .01 mfd.	455 kc	"A" Band	Quiet point near 600 kc (148°)	L23, L24 2nd. I-F trans.
2	6SA7 Det. grid in series with .01 mfd.				L21, L22 1st. I-F trans.
3	Antenna terminal in series with 200 mmfd.	1500 kc	"A" Band	1500 kc (19°)	C23 osc. C30 rf. C10 ant.
4		600 kc		600 kc (148°)	L20 osc. L15 rf.† L10 ant.†
5	Repeat Steps 3 and 4				
6	Antenna terminal in series with 300 ohms	6.2 mc	"B" Band	6.2 mc (14°)	C22 osc.* C29 rf. C9 ant.
7		2.6 mc		2.6 mc (152°)	L19 osc.† L14 rf.† L8 ant.†
8	Repeat Steps 6 and 7				
9	Antenna terminal in series with 300 ohms	11.8 mc	"31-25 Meter" Band	11.8 mc (40°)	C21 osc.* C28 rf.** C8 ant.**
10		9.5 mc		9.5 mc (170°)	L18 osc.† L13 rf.† L6 ant.†
11		17.75 mc	"19-16 Meter" Band	17.75 mc (40°)	C19 osc.* C27 rf.** C7 ant.**
12		15.2 mc		15.2 mc (155°)	L17 osc.† L12 rf.† L4 ant.†
13		26.25 mc	"13-11 Meter" Band	26.25 mc (42°)	C18 osc.* C26 rf.** C6 ant.**
14		21.25 mc		21.25 mc (180°)	L16 osc.† L11 rf.† L2 ant.†

Oscillator tracks above signal on all bands.
*Use minimum capacity peak if two peaks can be obtained.
†These adjustments are pre-set and should not require re-adjustment except when components of the tuning section are changed.
**Rock in—use maximum capacity peak if two peaks can be obtained.

Tube and Trimmer Locations (Top View)



MODELS Q109, Q109X

RADIO CORP. OF AMERICA

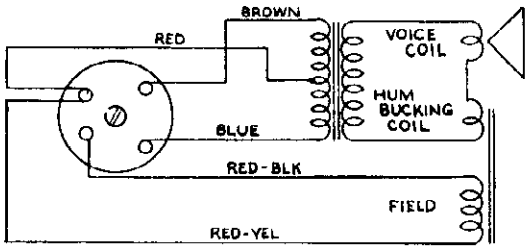
Q109X

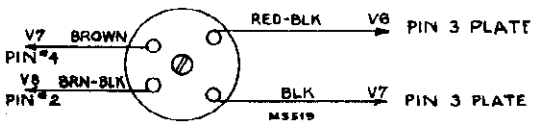
Steps	Connect the high side of the test-osc. to—	Tune test-osc. to—	Turn Range Switch to—	Turn radio dial to—	Adjust the following for max. peak output
1	6SG7 I-F grid in series with .01 mfd.	455 kc	"A" Band	Quiet point near 600 kc (148°)	L23, L24 2nd. I-F trans.
2	6SA7 Det. grid in series with .01 mfd.				L21, L22 1st. I-F trans.
3	Antenna terminal in series with 200 mmfd.	360 kc	"X" Band	360 kc (19°)	C23 osc. C30 rf. C10 ant.
4		160 kc		160 kc (133°)	L20 osc. L15 rf.† L10 ant.†
5	Repeat Steps 3 and 4				
6	Antenna terminal in series with 300 ohms	1500 kc	"A" Band	1500 kc (19°)	C22 osc.* C29 rf. C9 ant.
7		600 kc		600 kc (148°)	L19 osc.† L14 rf.† L8 ant.†
8	Repeat Steps 6 and 7				
9	Antenna terminal in series with 300 ohms	7.2 mc	"49-40 Meter" Band	7.2 mc (44°)	C21 osc.* C28 rf.** C8 ant.**
10		6.1 mc		6.1 mc (141°)	L18 osc.† L13 rf.† L6 ant.†
11		11.8 mc	"31-25 Meter" Band	11.8 mc (40°)	C19 osc.* C27 rf.** C7 ant.**
12		9.5 mc		9.5 mc (170°)	L17 osc.† L12 rf.† L4 ant.†
13		17.75 mc	"19-16 Meter" Band	17.75 mc (40°)	C18 osc.* C26 rf.** C6 ant.**
14		15.2 mc		15.2 mc (155°)	L16 osc.† L11 rf.† L2 ant.†

Oscillator tracks above signal on all bands.
*Use minimum capacity peak if two peaks can be obtained.
†These adjustments are pre-set and should not require re-adjustment except when components of the tuning section are changed.
**Rock in—use maximum capacity peak if two peaks can be obtained.

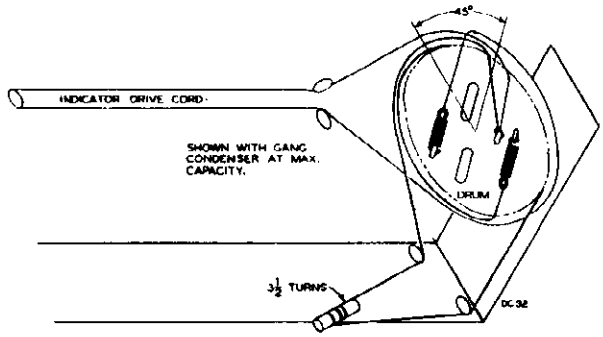
Critical Lead Dress

1. Dress C47 and R16 against chassis.
2. Dress R23 against chassis.
3. Dress C48 on power transformer side of terminal board.
4. All resistor and capacitor leads should be as short as practical.
5. Twist electrolytic capacitor leads and dress between chassis and electrolytic capacitor.
6. Twist all A.C. leads and keep close to chassis and away from other component parts and wires.
7. Dress blue treble tone control (R18) lead along intersection of chassis and rear apron and under electrolytic capacitor.
8. Keep tuning indicator and pilot lamp leads away from 6SQ7 tube.
9. Dress C35 against RF plate assembly.
10. Dress C25 and R7 and C24 midway between range switch and RF coil.
11. Keep coil leads to switch and trimmers with minimum slack but not stretched tight.
12. Flexibility of RF plate assembly must be maintained.
13. Dress black lead from phono-radio switch to range switch close to chassis.
14. Dress C13A away from RF shield.
15. Dress C34 against RF plate assembly.
16. Keep all gang leads as short as practical.
17. A loop must be maintained in ground braid connecting RF plate assembly to chassis.
18. Dress blue lead to antenna terminal against RF shield.

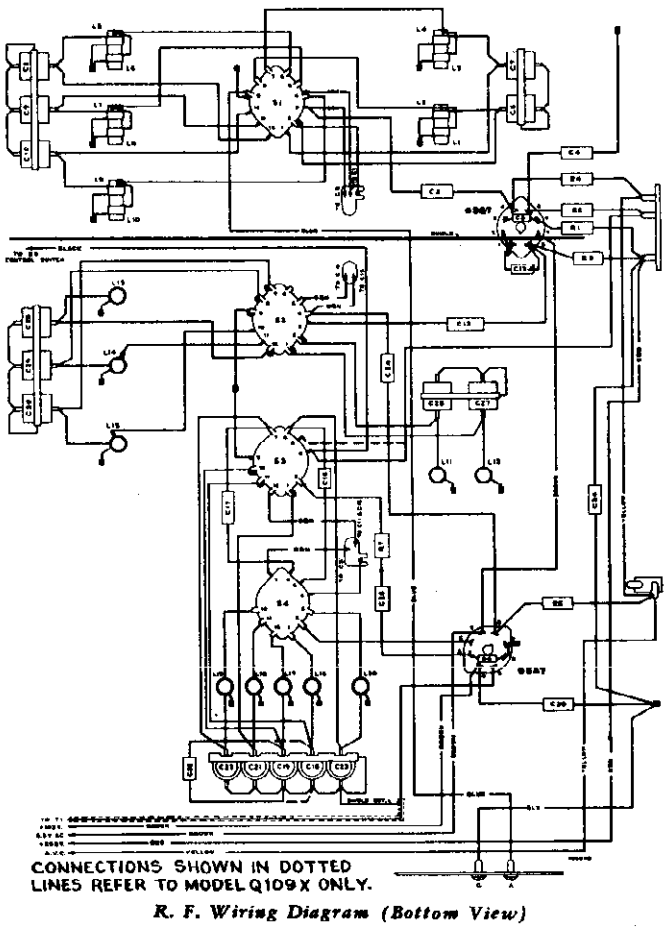




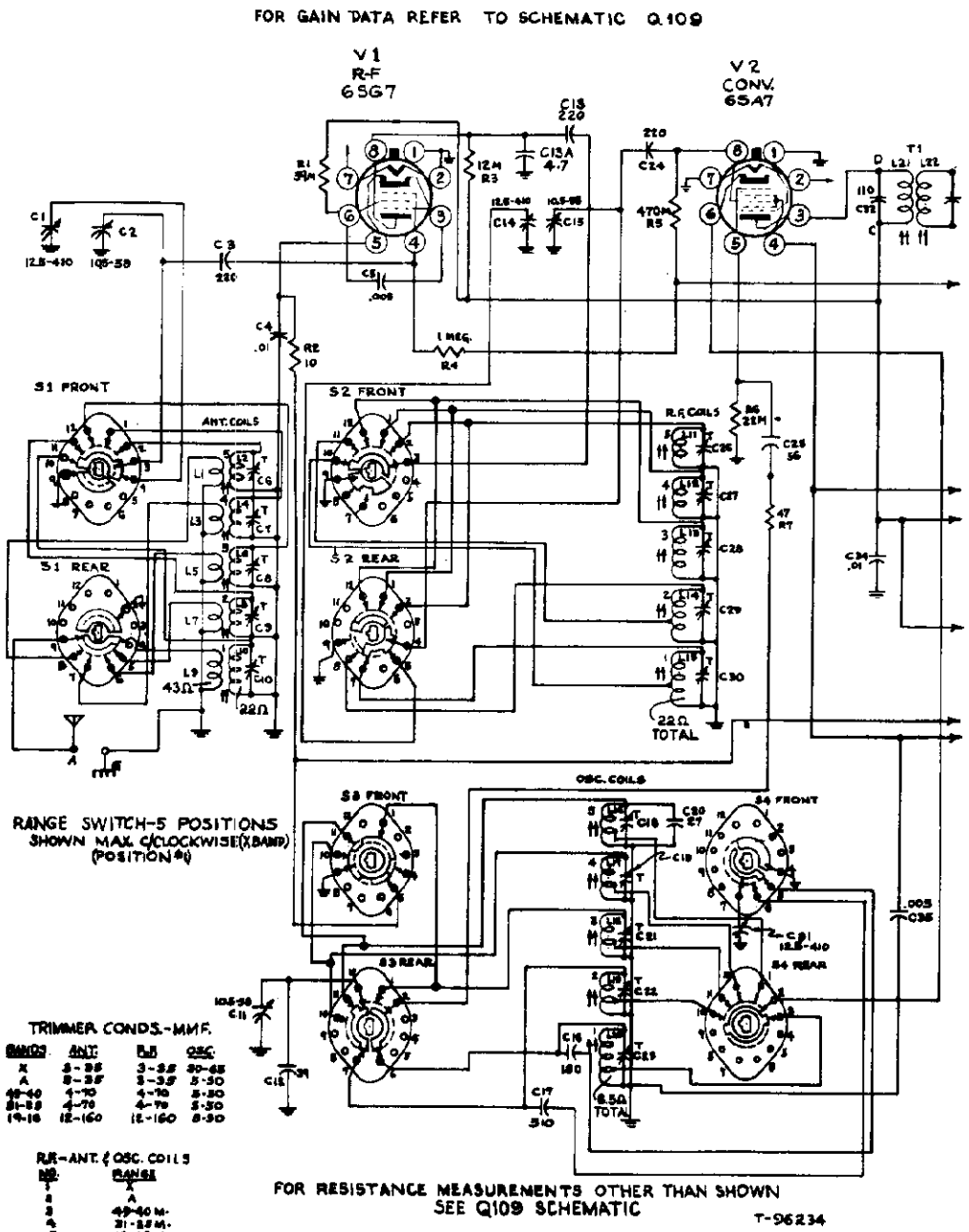
Loudspeaker Connections



Dial-Indicator and Drive Mechanism



R. F. Wiring Diagram (Bottom View)



Frequency Ranges, Q109

Standard Broadcast ("A" Band)	540—1600 kc.	(556—187 m)
Medium Wave ("B" Band)	2.45—6.3 mc.	(122—47.7 m)
"31-25 Meter" Spread Band	9.5 — 12 mc.	(31.6—25 m)
"19-16 Meter" Spread Band	15.1 — 18 mc.	(19.8—16.6 m)
"13-11 Meter" Spread Band	21.4 — 27 mc.	(14 —11.1 m)

Model Q109X will have in place of the "B" Band, and the "13-11 Meter" Band:

Long Wave ("X" Band)	140—375 kc.	(2,140—800 m)
"49-40 Meter" Spread Band	6.— 7.3 mc.	(50—41 m)

Intermediate Frequency ..... 455 kc.

Tube Complement

(1) RCA 6SG7 ..... R-F Amplifier
(2) RCA 6SA7 ..... 1st Detector
(3) RCA 6SK7 ..... I-F Amplifier
(4) RCA 6SQ7 ..... 2nd Detector, A.V.C., A-F Amplifier
(5) RCA 6AT6 ..... Phase Inverter
(6) RCA 6F6G ..... Power Output
(7) RCA 6F6G ..... Power Output
(8) RCA 5Y3 GT ..... Rectifier
(9) RCA 6U5/6G5 ..... Tuning Indicator

Power Output Rating

	Undistorted	Maximum
Q109, Q109X	5.0 watts	6.2 watts

Tuning Drive Ratio 22:1

Power Supply Ratings

Symbol	Voltages	Frequency (cycles)	Watts
Rating A	105-125	50-60	80
Rating B	105-125	25-60	80
Rating D	110 position—100 to 115 volts. 125 position—115 to 135 volts. 150 position—135 to 165 volts. 210 position—190 to 230 volts. 240 position—230 to 260 volts.	50/60	80

The desired range may be selected by the proper positioning of a link beneath a cover on the top of the power transformer:

CAUTION: Remove power cord from line receptacle before changing link position.

Phonograph Attachment.—A jack is provided on the rear of chassis for connection to a phonograph. The cable from the attachment should be terminated in a Stock No. 31048 plug.

When phonograph is in use, if necessary, tune set off frequency from any very strong station.

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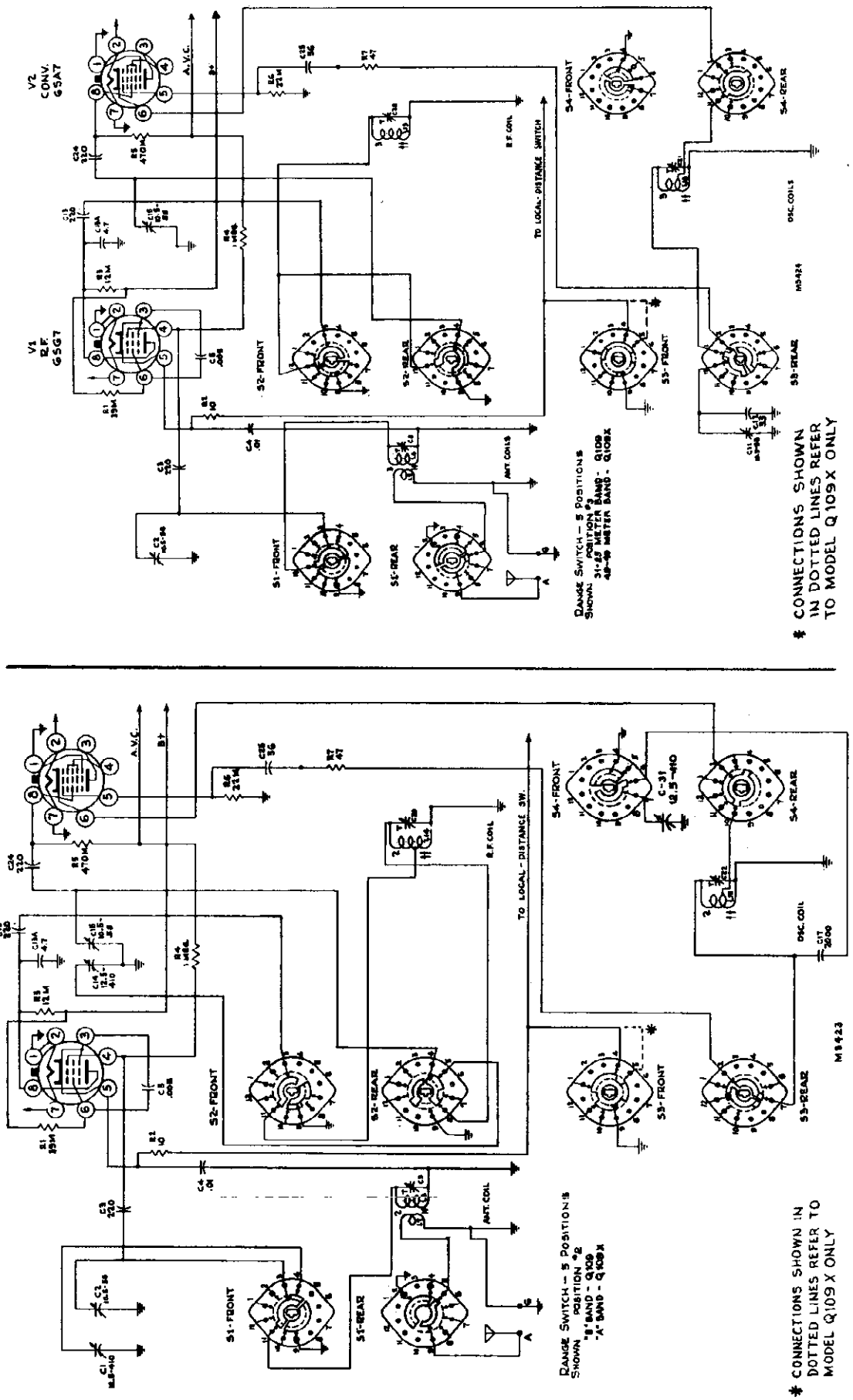
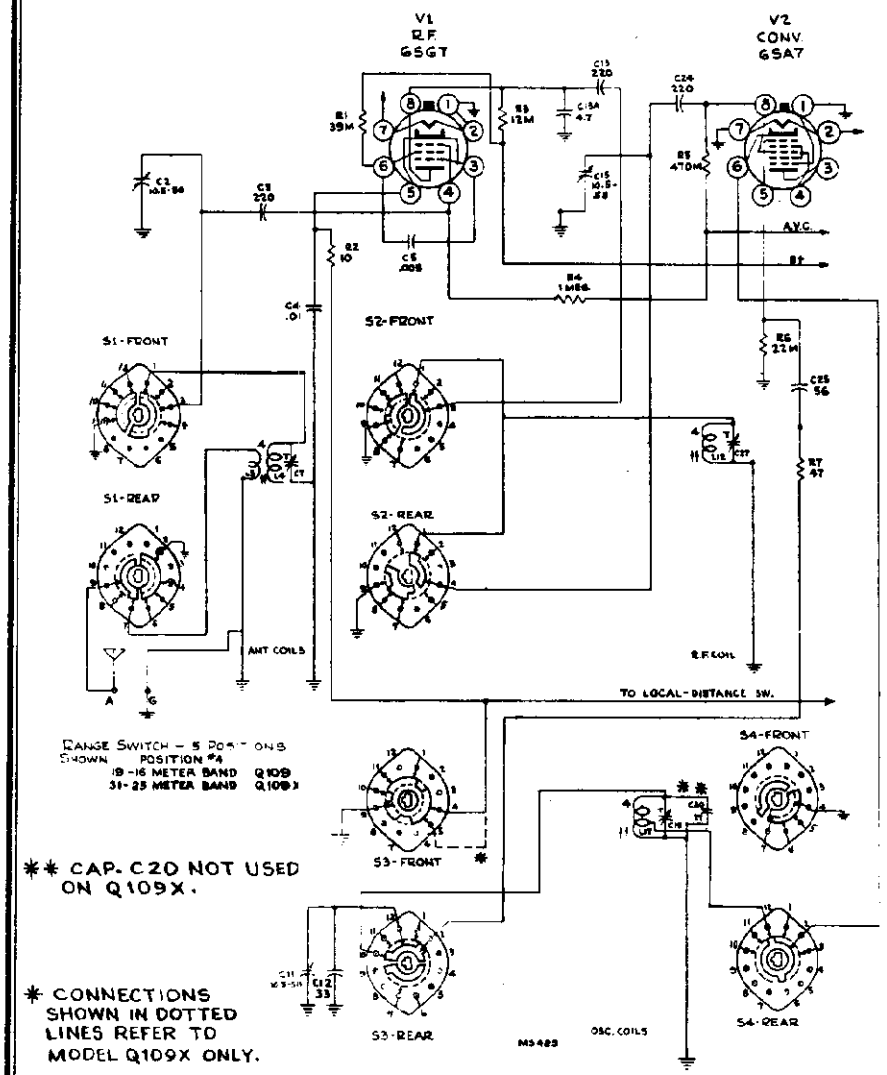
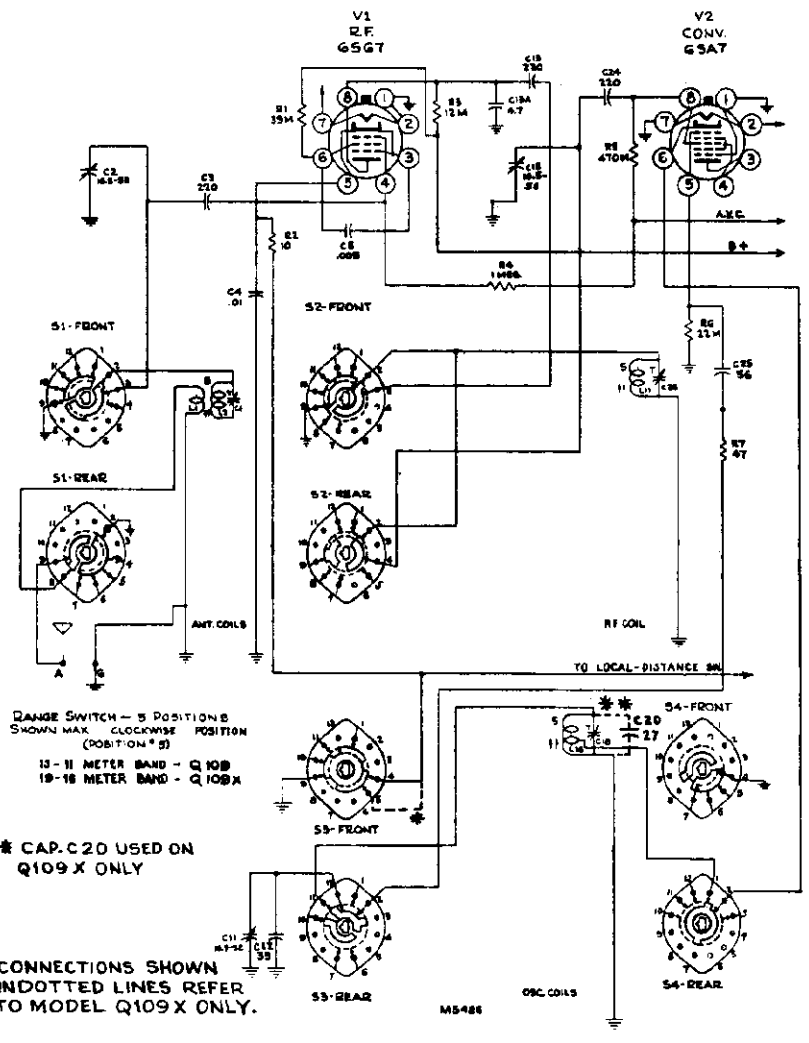
MODELS Q109, Q109X

RADIO CORP. OF AMERICA





R. F. Section
Simplified Schematic Diagram



R. F. Section
Simplified Schematic Diagram

NOTE: Circuits not in use are either disconnected or grounded thru the range switch contacts but are not illustrated.

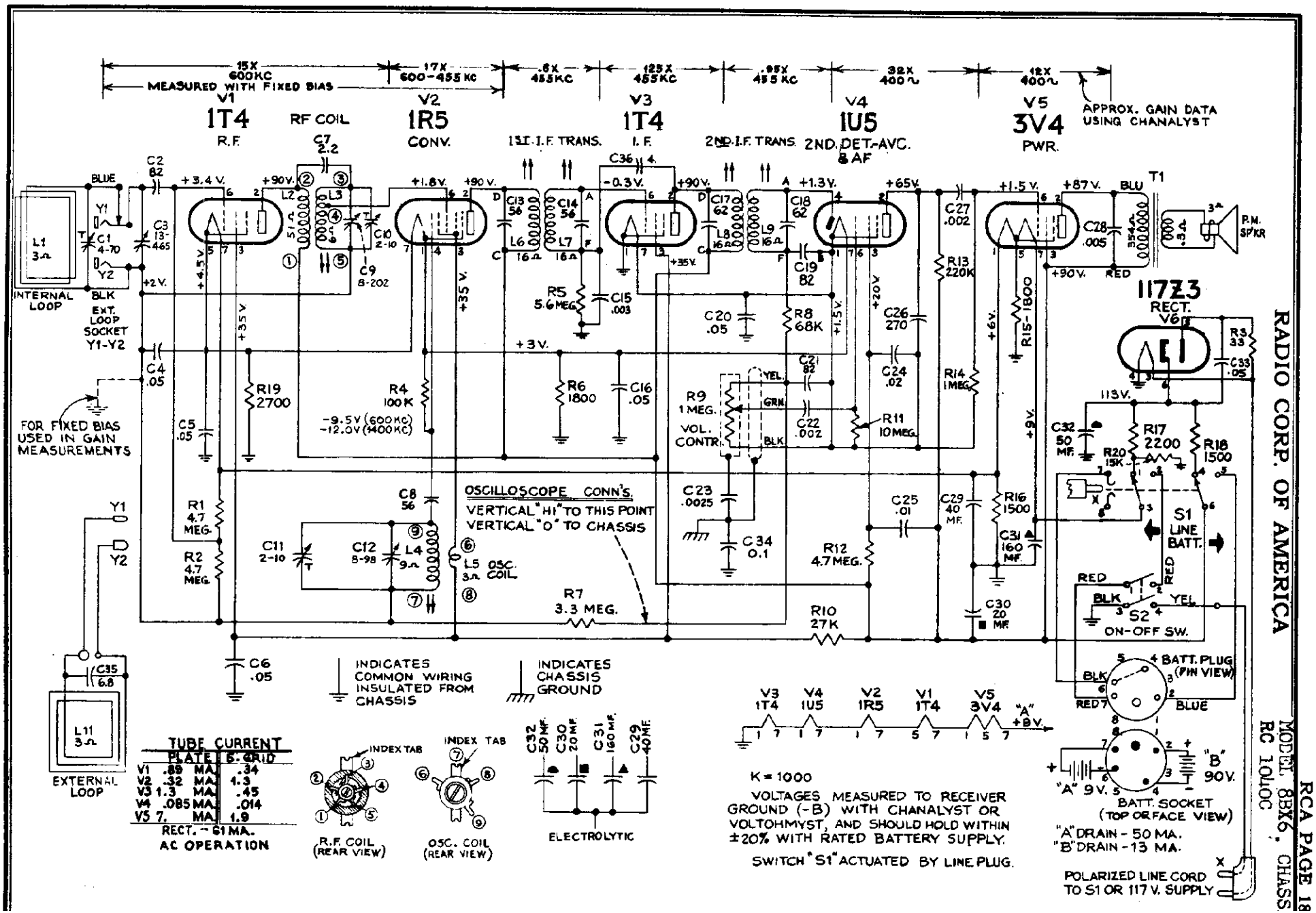
MODELS Q109, Q109X

RADIO CORP. OF AMERICA

Replacement Parts

STOCK No.	DESCRIPTION
	CHASSIS ASSEMBLIES
	RC 602-Q109
	RC 602A-Q109X
12930	Board—"Antenna-Ground" board
*70952	Bracket—L.H. bracket complete with drive cord pulley
*70951	Bracket—R. H. bracket complete with four (4) pulleys
*70840	Cable—Bronze cable (20" long) for band indicator mechanism
35795	Calibrator—Drive Drum Calibrator
*71086	Capacitor—Ceramic, 4.7 mmf. ((C13A)
70935	Capacitor—Ceramic, 27 mmf. (C20)
*73247	Capacitor—Ceramic, 33 mmf. (C12)
71924	Capacitor—Ceramic, 56 mmf. (C25)
71933	Capacitor—Mica, 180 mmf. (C16 for Q109X)
39636	Capacitor—Mica, 220 mmf. (C3, C13, C24, C46)
71932	Capacitor—Mica, 510 mmf. (C16 for Q109, C17 for Q109X)
72526	Capacitor—Mica, 2000 mmf. (C17 for Q109)
70931	Capacitor—Mica trimmer, comprising 1 section of 3-35 mmf. and 2 sections of 4-70 mmf. for Q109 (C8, C9, C10, C28, C29, C30)
*70966	Capacitor—Mica trimmer, comprising 2 sections of 3-35 mmf. and 1 section of 4-70 mmf. for Q109X (C8, C9, C10, C28, C29, C30)
70754	Capacitor—Mica trimmer, comprising 1 section of 4-70 mmf. and 1 section of 12-160 mmf. (C6, C7 for Q109X, C26, C27 for Q109)
70745	Capacitor—Mica trimmer, comprising 1 section of 12-160 mmf. and 1 section of 4-70 mmf. (C6, C7 for Q109, C26, C27 for Q109X)
*70965	Capacitor—Ceramic trimmer, comprising 5 sections of 5-50 mmf. for Q109 (C18, C19, C21, C22, C23)
*70967	Capacitor—Ceramic trimmer, comprising 4 sections of 5-50 mmf. and 1 section of 30-65 mmf. for Q109X (C18, C19, C21, C22, C23)
71592	Capacitor—Moulded paper, .002 mfd., 200 volts (C52)
*71590	Capacitor—Moulded paper, .002 mfd., 600 volts (C47)
71087	Capacitor—Moulded paper, .003 mfd., 1000 volts (C50, C51)
71587	Capacitor—Moulded paper, .005 mfd., 600 volts (C5, C35, C37)
71593	Capacitor—Moulded paper, .005 mfd., 600 volts (C45)
*71589	Capacitor—Moulded paper, .025 mfd., 200 volts (C43)
71585	Capacitor—Moulded paper, .01 mfd., 200 volts (C42)
72219	Capacitor—Moulded paper, .01 mfd., 600 volts (C4, C34, C48, C49)
72527	Capacitor—Moulded paper, .05 mfd., 100 volts (C36)
33014	Capacitor—Electrolytic, comprising three (3) sections of 10 mfd., 450 volts and one (1) section of 20 mfd., 25 volts (C44A, C44B, C44C, C44D)
*70953	Clamp—Mounting clamp for electrolytic capacitor
38201	Clamp—Clamp for drive and pointer cords
70726	Clip—Retaining clip for coils core and stud
70923	Coil—Antenna coil, 13-11 meter band for Model Q109 (L1, L2)
70924	Coil—Antenna coil, 19-16 meter band (L1, L2 for Q109X, L3, L4 for Q109)
70925	Coil—Antenna coil, 31-25 meter band (L3, L4 for Q109X, L5, L6 for Q109)
70928	Coil—Antenna coil, 49-40 meter band for Model Q109X (L5, L6)
70926	Coil—Antenna coil, "B" band for Model Q109 (L7, L8)
70927	Coil—Antenna coil, "A" band (L7, L8 for Q109X, L9, L10 for Q109)
70929	Coil—Antenna coil, "X" band for Model Q109X (L9, L10)
*70964	Coil—R. F. coil, 13-11 meter band for Model Q109 (L11)
*70963	Coil—R. F. coil, 19-16 meter, band (L11 for Q109X, L12 for Q109)
*70962	Coil—R. F. coil, 31-25 meter band (L12 for Q109X, L13 for Q109)
*70961	Coil—R. F. coil, 49-40 meter band for Model Q109X (L13)
*70960	Coil—R. F. coil, "B" band for Model Q109 (L14)
*70959	Coil—R. F. coil, "A" band (L14 for Q109X, L15 for Q109)
*70958	Coil—R. F. coil, "X" band for Model Q109X (L15)
70920	Coil—Oscillator coil, 13-11 meter band for Model Q109 (L16)
70823	Coil—Oscillator coil, 19-16 meter band (L16 for Q109X, L17 for Q109
70825	Coil—Oscillator coil, 31-25 meter band (L17 for Q109X L18 for Q109)
70921	Coil—Oscillator coil, 49-40 meter band for Model Q109X (L18)
70829	Coil—Oscillator coil, "B" band for Model Q109 (L19)
70789	Coil—Oscillator coil, "A" band (L19 for Q109X, L20 for Q109)
70922	Coil—Oscillator coil, "X" band for Model Q109X (L20)
70957	Condenser—Variable tuning condenser (C1, C2, C11, C14, C15, C31)
*70949	Control—Tone control (R18)
*70948	Control—Volume control and power switch (R14, S6)
*72953	Cord—Drive cord (approx. 45" overall length required)
72913	Cord—Indicator cord (approx. 57" overall length required)
70945	Core—Adjustable core and stud for "X" band antenna coil—for Model Q109X
70938	Core—Adjustable core and stud for "A" band antenna coils, for 31-25 meter band R. F. and oscillator coils for Model Q109's "B" band oscillator coil
70944	Core—Adjustable core and stud for 31-25 meter band antenna coils and for Model Q109's "B" band antenna coil and for Model Q109X's 49-40 meter band antenna coil
70943	Core—Adjustable core and stud for 19-16 meter band antenna coil
70941	Core—Adjustable core and stud for Model Q109's 13-11 meter band antenna coil and for Model Q109X's 49-40 meter band oscillator coil
*70968	Core—Adjustable core and stud for Model Q109X's "X" band R. F. coil
*70969	Core—Adjustable core and stud for "A" band R. F. coil
70937	Core—Adjustable core and stud for 19-16 meter band R. F. and oscillator coils and for Q109's 13-11 meter band oscillator coil
*70970	Core—Adjustable core and stud for Model Q109's 13-11 meter band R. F. coil
70942	Core—Adjustable core and stud for Model Q109X's "X" band oscillator coil
70939	Core—Adjustable core and stud for "A" band oscillator coil
72011	Drum—Band indicator actuating drum—located on range switch shaft
31273	Drum—Condenser drive drum
37396	Grommet—Rubber grommet for mounting R. F. assembly (4 required)
35787	Jack—Phono input socket
5117	Lamp—Band indicator lamp—Mazda 55
11765	Lamp—Dial lamp—Mazda 51
35630	Pulley—Drive cord pulley
5040	Plug—4 contact female plug for speaker cable
36637	Receptacle—AC power receptacle
34761	Resistor 10 ohms, ½ watt (R2)
30732	Resistor—47 ohms, ½ watt (R7)
34765	Resistor—100 ohms, ½ watt (R8)
37278	Resistor—470 ohms, 1 watt (R23)
34767	Resistor—2200 ohms, ½ watt (R10)
30436	Resistor—12,000 ohms, ½ watt (R15)
71085	Resistor—12,000 ohms, 2 watts (R3)
35523	Resistor—15,000 ohms, 2 watts (R24)
30492	Resistor—22,000 ohms, ½ watt (R6, R12)
71084	Resistor—39,000 ohms, 1 watt (R1)
30651	Resistor—270,000 ohms, ½ watt (R13, R22)
30648	Resistor—470,000 ohms, ½ watt (R5, R17, R19, R21)
30652	Resistor—1 megohm, ½ watt (R4, R9)
30649	Resistor—2.2 megohms, ½ watt (R11)
30992	Resistor—10 megohms, ½ watt (R16, R20, R25)
14350	Screw—No. 8-32 square head set screw for drive or band indicator drums
*70950	Shaft—Tuning knob shaft and flywheel
34909	Socket—Band indicator lamp socket
31364	Socket—Dial lamp socket
70827	Socket—Tube socket
9914	Socket—Tube socket for 6AT6 tube
*71554	Socket—Tuning tube socket
31418	Spring—Drive or indicator cord spring
*70955	Switch—"Local-Distance" switch (S5)
*70956	Switch—Range switch (S1, S2, S3, S4)
70917	Transformer—First I. F. Transformer (T1, L21, L22, C32, C33)
70918	Transformer—Second I. F. transformer (T2, L23, L24, C38, C39, C40, C41)
*71154	Transformer—Power transformer, 117 volts, 25 cycle (T3)
*71153	Transformer—Power transformer, 117 volts, 60 cycle (T3)
*70947	Transformer—Power transformer, 110/125/150/210/240 volts, 50/60 cycle (T3)
34373	Washer—"C" washer for tuning shaft
	SPEAKER ASSEMBLIES
	Stamped 92562-1J
70927	Cone—Cone and voice coil assembly
5039	Plug—4 prong male plug for speaker
70971	Speaker—6"x9" E. M. speaker complete with cone and voice coil less output transformer and plug
37899	Transformer—Output transformer (T4)
	NOTE: If stamping on speaker in instrument does not agree with above speaker number, order replacement parts by referring to model number of instrument, number stamped on speaker and full description of part required.
	MISCELLANEOUS
*70919	Back—Cabinet back
30716	Clip—Tuning tube mounting clip
X1655	Cloth—Grille cloth
*71906	Decal—Control panel decal
*71828	Dial—Glass dial for Q109
*71829	Dial—Glass dial for Q109X
*70977	Disc—Band indicator actuating disc—located on dial frame
11771	Foot—Rubber foot for cabinet (4 required)
*70974	Frame—Dial frame and back plate less dial, tube clip, indicator disc, spring indicator and "C" washer
*70979	Indicator—Station selector indicator
*72954	Knob—"Local-Distance-Phono" switch knob
*72950	Knob—Tone control or range switch knob
*72949	Knob—Volume control or tuning knob
35630	Pulley—Drive cord pulley
*70976	Screen—Band indicator screen—green
6647	Shade—Lamp shade
*70978	Spring—Band indicator disc spring
14270	Spring—Retaining spring for knob
*71143	Washer—"C" washer to hold disc

*This is the first time that this stock number has appeared in service data.


RADIO CORP. OF AMERICA
MODEL 8BX6, CHASS. RC 1040C
RCA PAGE 18
15X 600KC MEASURED WITH FIXED BIAS
17X 600-455 KC
.6X 455KC
125X 455KC
.95X 455 KC
32X 400~
12X 400~
APPROX. GAIN DATA USING CHANALYST
V1 1T4 R.F.
RF COIL
V2 1R5 CONV.
1ST I.F. TRANS.
V3 1T4 I.F.
2ND I.F. TRANS.
V4 1U5 2ND. DET.-AVC. & AF
V5 3V4 PWR.
V6 117Z3 RECT.
T1
P.M. SP'KR
INTERNAL LOOP
EXT. LOOP SOCKET Y1-Y2
FOR FIXED BIAS USED IN GAIN MEASUREMENTS
OSCILLOSCOPE CONN'S.
VERTICAL "HI" TO THIS POINT
VERTICAL "O" TO CHASSIS
R9 1 MEG. VOL. CONTR.
S1 LINE BATT.
S2 ON-OFF SW.
INDICATES COMMON WIRING INSULATED FROM CHASSIS
INDICATES CHASSIS GROUND
EXTERNAL LOOP
TUBE CURRENT
PLATE G2 GRID
V1 .89 MA. .34
V2 .32 MA. 1.3
V3 1.3 MA. .45
V4 .085 MA. .014
V5 7. MA. 1.9
RECT. -61 MA.
AC OPERATION
R.F. COIL (REAR VIEW)
OSC. COIL (REAR VIEW)
ELECTROLYTIC
K = 1000
VOLTAGES MEASURED TO RECEIVER GROUND (-B) WITH CHANALYST OR VOLTOHMYST, AND SHOULD HOLD WITHIN ±20% WITH RATED BATTERY SUPPLY.
SWITCH "S1" ACTUATED BY LINE PLUG.
"A" 9V.
"B" 90V.
BATT. SOCKET (TOP OR FACE VIEW)
"A" DRAIN - 50 MA.
"B" DRAIN - 13 MA.
POLARIZED LINE CORD TO S1 OR 117 V. SUPPLY

RADIO CORP. OF AMERICA

Alignment Procedure

Cathode Ray Alignment is the preferable method. Connections for the oscilloscope are shown on the schematic diagram.

Output Meter Alignment.—If this method is used, connect the meter across the voice coil and turn the receiver volume control to maximum.

Test Oscillator.—For all alignment operations, connect the low side of the test oscillator to the receiver chassis and keep the oscillator output as low as possible to avoid AVC action.

Battery operation of the receiver is preferable during alignment; on AC operation an isolation transformer (117v./117v.) may be necessary for the receiver if the test oscillator is also AC operated.

Calibration Scale.—The calibrated dial scale is attached to the chassis. It can be used directly as a reference for alignment.

With the gang at full mesh set the dial pointer so that the pointer is in line with the left hand vertical of the first figure 5 of the figures 55 on the dial scale as illustrated below.

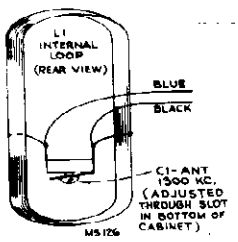
Alignment Tabulation

Steps	Connect high side of sig. gen. to—	Sig. gen. output	Turn radio dial to—	Adjust for peak output
1	Pin No. 6 of 1T4 I.F. Amplifier thru .01 mfd.	455 kc	Quiet point near 1600 kc	2nd I.F. Trans. L8, L9 top† & bottom
2	Pin No. 6 of 1R5 Converter thru .01 mfd.			1st I.F. Trans. L6, L7 top† & bottom
3				2nd I.F. Trans. L8 bottom core
4	High side of loop (Blue lead) in series with .01 mfd. Bottom shield cover in place	1600 kc	1600 kc	C11 (osc.)
5		1400 kc	1400 kc	C10 (r.f.)
6		600 kc	600 kc	L4 (osc.) L3 (r.f.)
7	Repeat steps 4, 5 and 6			
8	Short wire placed near loop. (Chassis in cabinet and internal loop connected)	1400 kc	1400 kc	C1†† (loop) (Cabinet closed)

† Two peaks may be found, the correct peak is that with the core in the outer position (counter-clockwise).

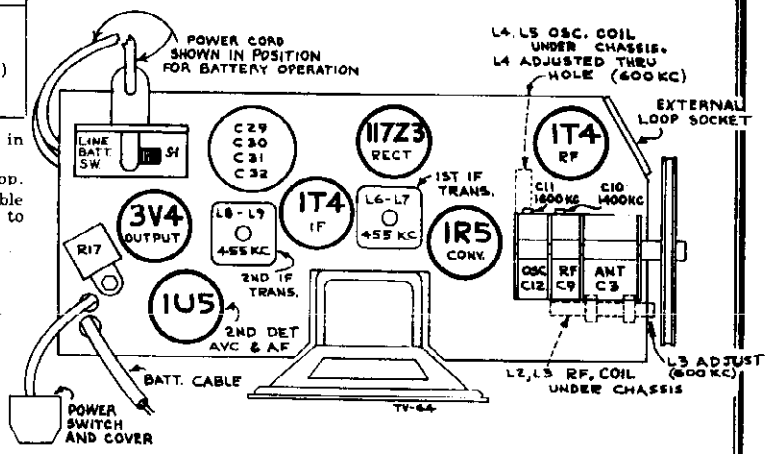
†† Accessible thru slot in case provided for cable of external loop.

NOTE: Adjustments L8, L9, L6, L7, L4 and L3 do not have visible adjusting screws. The magnetite cores have a screw driver slot to permit adjustment (use non-metallic screw driver).



Critical Lead Dress

1. Dress all filament leads next to chassis.
2. Keep the leads short on the end of the three components which connect to the grid terminal (#6) of the r.f. socket. (R-1, R-2, C-2).
3. Keep lead to center section of gang as short as possible.
4. Dress loop leads away from tuning drum and battery.
5. Dress lead to pin #4 of 1U5 tube away from other wiring.
6. Dress r.f. plate lead away from r.f. grid circuit.
7. Dress components and wiring near external loop socket to clear external loop pins.
8. Dress avc lead away from 2nd IF transformer and associated components.
9. Dress converter plate lead away from chassis and away from output leads.
10. Dress output leads up and away from other wiring.
11. Dress neutralizing capacitor C36, flat against chassis.
12. Dress 1st audio plate lead up and away from other wiring.
13. Dress 33 ohm resistor (R3) over bottom of rectifier socket and clear of other wiring.
14. Dress R.F. tube plate lead slightly away from chassis base.



Tube and Trimmer Locations

Specifications

Frequency Range .....540-1,600 kc

Intermediate Frequency .....455 kc

Power Supply Rating

110 to 125 volts, AC 50 or 60 cycles, or DC.....18 watts

Batteries required

One RCA Battery Pack VS019 or equivalent

Tube Complement

(1) RCA—1T4 .....R.F.
(2) RCA—1R5 .....Converter
(3) RCA—1T4 .....I.F.-Amplifier
(4) RCA—1U5 .....2nd Det. AVC. & A.F.-Amplifier
(5) RCA—3V4 .....Power Output
(6) RCA—117Z3 .....Rectifier

Current Consumption

Battery Operation.....“A” 50 ma., “B” 13 m
(Average life of RCA VS019 Battery
125 hrs. intermittent service.)
Total Rect. Current (117 volt, 60 cycle).....61 m

Power Output

Undistorted .....150 wa
Maximum .....275 wa

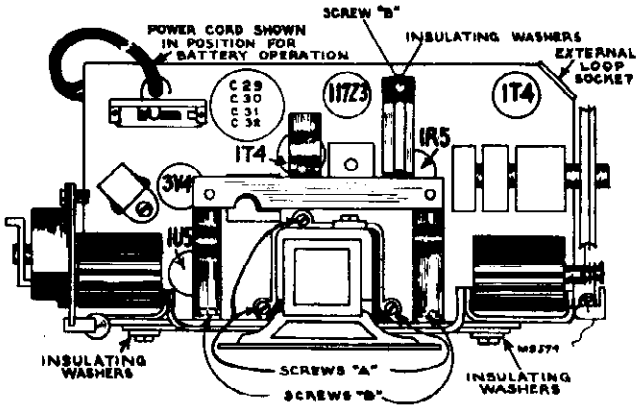
Loudspeaker.....4 in. P.M. 3.4 ohms at 400 cycl

Cabinet Dimensions

Height...13¼ in. Width...9½ in. Depth...5½ i

CAUTION.—

1. **Do not remove any tubes from the chassis with the set oper ing and the plug connected to the power line. Damage to tub may result.**
2. **When cleaning the aluminum portion of the case use soap a water or cleaning fluid. Do not use abrasive cleansers.**



Insulating Washers:

The mounting bracket and dial frame are insulated from t chassis with insulating washers. This serves to insulate the ca from the chassis. In servicing make certain that these washers a in place and properly positioned.

To Remove Chassis from Cabinet:

1. Disconnect battery plug and remove battery.
2. Disconnect antenna in cabinet.
3. Remove the two screws in the top of the cabinet (beneath handle
4. Remove the two battery clips.
5. Remove the chassis from the cabinet

To Remove Speaker:

1. Remove tubes 3V4 and 1U5.
2. Remove the three screws “B” holding power cord bracket assemb and remove bracket.
3. Remove the three screws “A” holding speaker bracket assembl
4. Disconnect voice coil leads.
5. The speaker and speaker bracket may now be removed.

Using External Loop.—

A loop antenna is mounted inside the cabinet. Under normal conditions this will give satisfactory reception. If however, the receiver is used in a shielded compartment such as an automobile, airplane or railroad train, an RCA VICTOR EXTERNAL LOOP ANTENNA can be used.

This external loop antenna has a strap connector cord with identical two prong plugs on either end, this makes it convenient in connecting it to the circuit through the receptacle located in the left hand side of the chassis.

Open the case, plug the external loop antenna cord into the socket (it will only go in one way), bring the strap out through the slot in the case and attach the external loop antenna by means of the suction cup to any convenient vertical surface.

This external loop antenna can be stored in the cabinet, in the compartment below the battery pack, and the cord in the small compartment in the lower right hand corner of the cabinet.

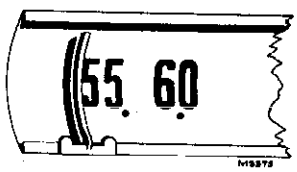
AC-DC Operation.—

This receiver will operate on 105 to 125 volts, AC 50 or 60 cycles, DC.

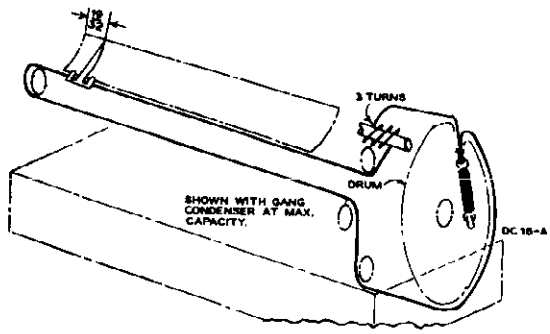
A power cord is stored in the fiber tube which is clamped above chassis inside the cabinet. To open the cabinet, push the w latch on the bottom of the case to the right, and raise the ba cover upward on its hinges. Then pull the power cord plug out the socket on the top of the chassis as shown, and take out and un the power cord. A slot in the bottom of the cabinet allows the closi of the cabinet with the power cord passing through. Close the cabi with the cord extending through the slot and insert the plug int convenient electrical outlet.

When returning to battery operation, be sure to replace the pov plug in its socket inside the case with the cord stored in the fiber tu

NOTE. If reception is not obtained on DC, reverse plug in ou receptacle. This may also reduce hum on AC operation.



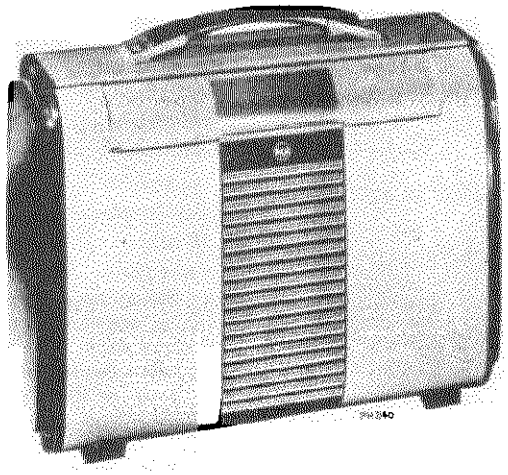
Dial Pointer Setting



Dial-Indicator and Drive Mechanism

MODEL 8BX6, CHASSIS RC 1040C

RADIO CORP. OF AMERICA



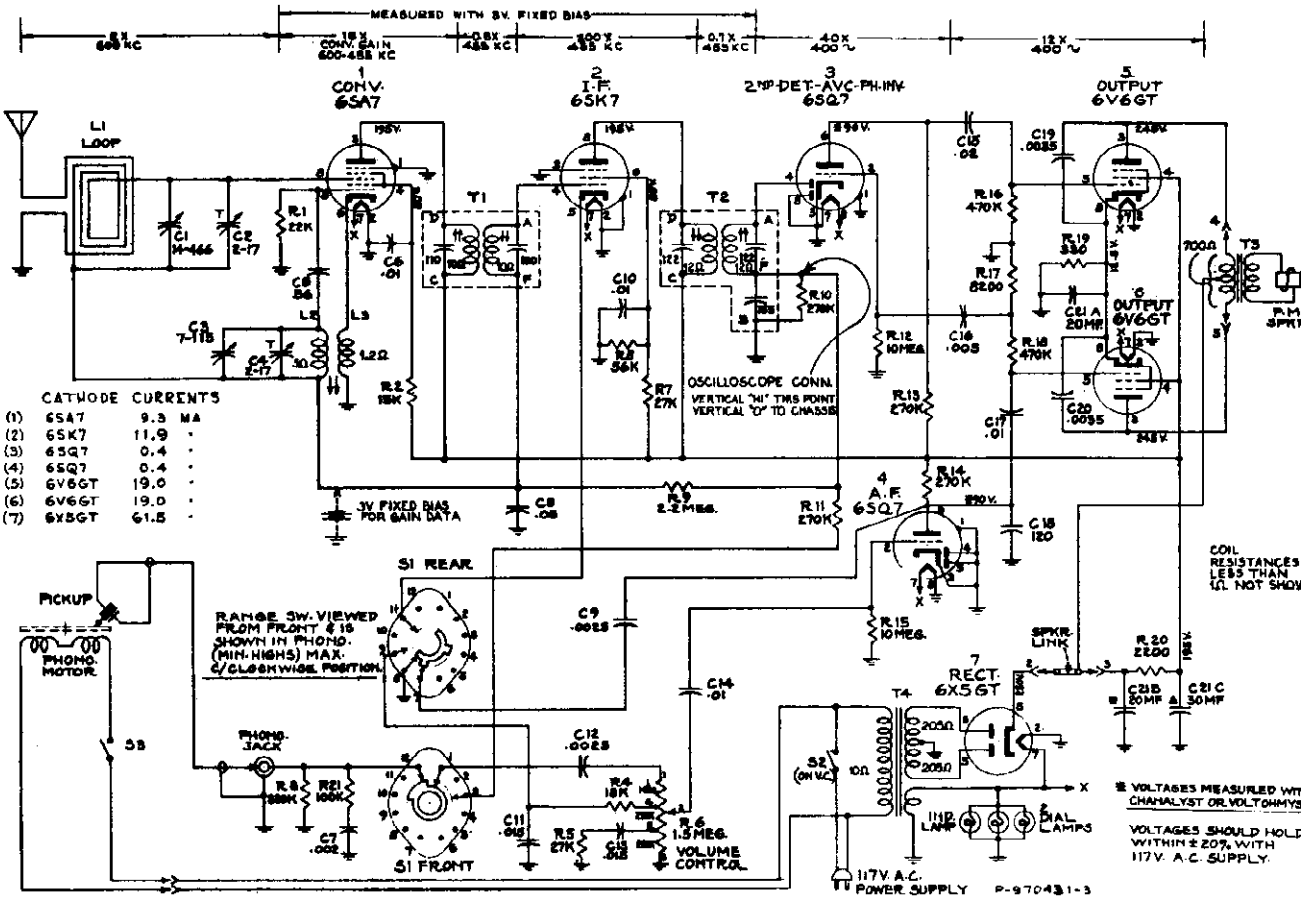
Replacement Parts

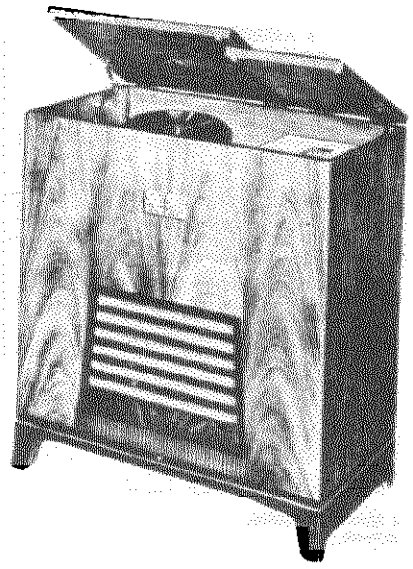
STOCK No.	DESCRIPTION
	CHASSIS ASSEMBLIES RC 1040C
71056	Bracket—Drive cord pulley bracket complete with pulley (volume control side)
71054	Bracket—Drive cord pulley bracket complete with two (2) pulleys
71044	Bracket—Power switch bracket complete with actuating lever less switch
71042	Button—Plug button
71502	Capacitor—Ceramic, 2.2 mmf. (C7)
*73153	Capacitor—Ceramic, 4 mmf. (C36)
71924	Capacitor—Ceramic, 56 mmf. (C8)
71514	Capacitor—Ceramic, 82 mmf. (C2, C21)
71540	Capacitor—Ceramic, 270 mmf. (C26)
70602	Capacitor—Tubular, .0025 mfd., 400 volts (C23)
71552	Capacitor—Tubular, .002 mfd., 400 volts (C22, C27)
71921	Capacitor—Tubular, .003 mfd., 200 volts (C15)
71553	Capacitor—Tubular, .005 mfd., 400 volts (C28)
70610	Capacitor—Tubular, .01 mfd., 400 volts (C25)
70611	Capacitor—Tubular, .02 mfd., 400 volts (C24)
71551	Capacitor—Tubular, .05 mfd., 200 volts (C5, C16, C20)
70615	Capacitor—Tubular, .05 mfd., 400 volts (C4, C6, C33)
70617	Capacitor—Tubular, 0.1 mfd., 400 volts (C34)
*73113	Capacitor—Electrolytic, comprising 1 section of 50 mfd., 150 volts; 1 section of 20 mfd., 150 volts; 1 section of 160 mfd., 25 volts and 1 section of 40 mfd., 25 volts (C29, C30, C31, C32)
*73176	Coil—R-F coil complete with core and stud (L2, L3)
*73114	Coil—Oscillator coil complete with core and stud (L4, L5)
*73112	Condenser—Variable tuning condenser (C3, C9, C10, C11, C12)
71057	Control—Volume control (R9)
†72953	Cord—Drive cord (approx. 38" overall required)
70022	Cord—Power cord
*73118	Dial—Dial scale and window assembly
72283	Grommet—Rubber grommet for mounting tuning condenser (3 required)
71031	Holder—Power cord holder (fibertube)
*73111	Indicator—Station selector indicator
*73121	Knob—Tuning knob (roller-type) or volume control knob (roller-type)
18469	Plate—Mounting plate for electrolytic capacitor
71041	Plug—5 prong male plug for battery cable
36230	Pulley—Drive cord pulley
*73237	Resistor—Wire wound, 33 ohms, 150 MA (R3)
	Resistor—Fixed composition, 1500 ohms, ±10%, ½ watt (R16)
	Resistor—Fixed composition, 1500 ohms, ±10%, 1 watt (R18)
	Resistor—Fixed composition, 1800 ohms, ±10%, ½ watt (R6, R15)
*73238	Resistor—Ballast resistor, 2200 ohms, 6 watts (R17)
	Resistor—Fixed composition, 2700 ohms, ±10%, ½ watt (R19)
	Resistor—Fixed composition, 15,000 ohms, ±20%, ½ watt (R20)
	Resistor—Fixed composition, 27,000 ohms, ±10%, ½ watt (R10)
	Resistor—Fixed composition, 68,000 ohms, ±20%, ½ watt (R8)
	Resistor—Fixed composition—100,000 ohms, ±20%, ½ watt (R4)
	Resistor—Fixed composition, 220,000 ohms, ±20%, ½ watt (R13)
	Resistor—Fixed composition, 1 megohm, ±20%, ½ watt (R14)
	Resistor—Fixed composition, 3.3 meg., ±10%, ½ watt (R7)
	Resistor—Fixed composition, 4.7 meg., ±10%, ½ watt (R1, R2, R12)
	Resistor—Fixed composition, 5.6 meg., ±10%, ½ watt (R5)
	Resistor—Fixed composition, 10 meg., ±20%, ½ watt (R11)
*73122	Shaft—Tuning knob shaft
*73119	Shield—L.H. end shield for dial
*73120	Shield—R.H. end shield for dial
*73115	Socket—Tube socket—miniature—⅞" mounting center—moulded (no center shield)
*73116	Socket—Tube socket—miniature—⅞" mounting center—moulded (center shield)
*73117	Socket—Tube socket—minature—1" mounting center—wafer
70390	Spring—Drive cord tension spring
30900	Spring—Retaining spring for knob
71039	Switch—"Line-Battery" change switch (S1)
71045	Switch—Power switch (S2)
*73174	Transformer—First I-F transformer (L6, L7, C13, C14)
*73175	Transformer—Second I-F transformer (L8, L9, C17, C18, C19)
71047	Transformer—Output transformer (T1)
71081	Washer—"C" washer for tuning knob shaft
*73332	Washer—Insulating washer (flat) for mounting base holder bracket (1 required) and dial support to chassis base (4 required)
*73333	Washer—Insulating washer (extruded) for mounting base holder bracket (1 required) and dial support to chassis base (4 required)
71049	Window—Dial window only
	SPEAKER ASSEMBLY 92577-3
71059	Gasket—Speaker gasket (black tubing)
*73123	Speaker—4" PM speaker complete with cone and voice coil
	SPEAKER ASSEMBLY 922258-2
71059	Gasket—Speaker gasket (black tubing)
71058	Speaker—4"x6" PM speaker complete with cone and voice coil
	NOTE: If stamping on speaker in instrument does not agree with above speaker number, order replacement parts by referring to model number of instrument, number stamped on speaker and full description of part required.
	MISCELLANEOUS
71074	Arm—Shutter arm lever.
*73243	Back—Case back complete with center strip, feet and case spring latch
71073	Bracket—Bearing bracket for shutter arm lever
71070	Bracket—Mounting bracket for capacitor
71069	Capacitor—Adjustable trimmer, 3-35 mmf. (C1)
71080	Clip—Case side spring clip & screw (2 required)
71061	Foot—Case foot for rear section of case (2 required)
71068	Foot—Case foot for front section of case—(2 required)
*73124	Front—Case front complete less shutter
71063	Handle—Carrying handle
*73244	Latch—Latch to mount rear feet (2 required)
71065	Link—Carrying handle link consisting of two (2) links, two (2) shafts and four (4) drive screws (2 required)
71079	Loop—Antenna loop (L1)
71064	Retainer—Battery retainers spring bracket (2 required)
71066	Screw—No. 8—32x5/16" long screw to hold case together (located under carrying handle) (2 required)
71077	Screw—Screw complete with washer and nut to secure case side to case front or to mount rear feet
71071	Shutter—Case shutter
72980	Side—Case side—L.H.
72979	Side—Case side—R.H. (loop side)—less capacitor and bracket
71072	Spring—Case shutter compression spring
31608	Washer—"C" washer for shutter shafts
71078	Washer—Dampening washer for shutter shafts (2 required)

*This is the first time this Stock No. has appeared in Service Data.

RADIO CORP. OF AMERICA

MODEL 8V7, CHASSIS RC-615





Tuning Drive Ratio ..... 16:1 (8 turns of knob)

Lamps (3)

Dial, indicator or compartment lamp .. Mazda 51, 6-8 volts, 0.2 amp.

Loudspeaker (92569-1)

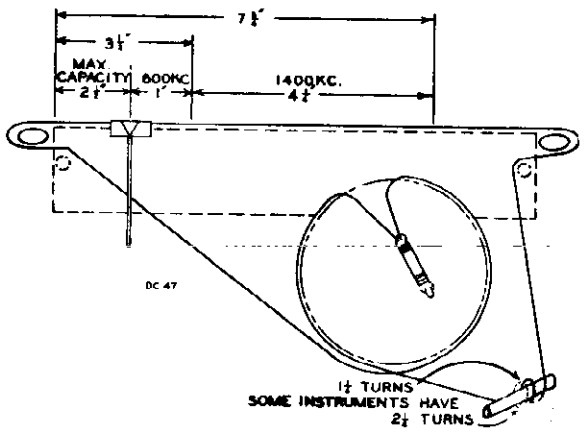
Type ..... 12-inch P.M.
V. C. impedance at 400 cycles ..... 2.2 ohms

Power Output Rating

Undistorted ..... 5 watts
Maximum ..... 5.5 watts

Record Changer (RP-178)

Record Capacity ..... Twelve 10-in., or Ten 12-in.
Turntable Speed ..... 78 r.p.m.
Type Pickup ..... Crystal



Dial Indicator and Drive Mechanism

Frequency Range

Standard Broadcast "A" ..... 540-1,600 kc

Intermediate Frequency ..... 455 kc

Tube Complement

(1) RCA-6SA7 ..... Converter
(2) RCA-6SK7 ..... I-F Amplifier
(3) RCA-6SQ7 ..... 2nd Det., A. V. C. and Phase Inverter
(4) RCA-6SQ7 ..... A-F Amplifier
(5) RCA-6V6GT ..... Output
(6) RCA-6V6GT ..... Output
(7) RCA-6X5GT ..... Rectifier

Power Supply Rating (including record changer)

105-125 volts, 60 cycles ..... 70 watts

MODEL 8V7 RADIO CORP. OF AMERICA

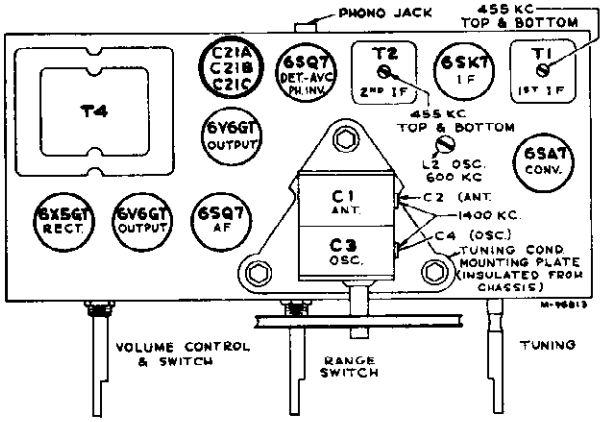
Alignment Procedure

Cathode-Ray Alignment is the preferable method. Connections for the oscilloscope are shown on the Schematic Diagram.

Output Meter Alignment.—If this method is used, connect the meter across the voice coil, and turn the receiver volume control to maximum.

Test Oscillator.—For all alignment operations, connect the low side of the test-oscillator to the receiver chassis, and keep the oscillator output as low as possible to avoid a-v-c action.

Steps	Connect high side of test oscillator to—	Tune test oscillator to—	Turn radio dial to—	Adjust the following for maximum peak output
1	6SK7 grid in series with .01 mfd.	455 kc.	Quiet Point at 550 kc. end of dial	Top and bottom (2nd I-F Trans.) T-2
2	6SA7 grid in series with .01 mfd.			Top and bottom (1st I-F Trans.) T-1
3	Primary lead on loop in series with 200 mmfd.	1,400 kc.	1,400 kc.	C4 (osc.) C2 (ant.)
4		600 kc.	600 kc.	L2 (osc.) Rock gang
5		Repeat steps 3 and 4		



Tube and Trimmer Locations (Top View)

Critical Lead Dress:

1. Dress speaker cable leads down next to chassis.
2. Dress output plate capacitors next to chassis.
3. Dress plate lead of output tube away from grid of audio amplifier.
4. Dress all a-c leads away from volume control down next to chassis.
5. Dress lead from top tap of volume control to range-tone switch along front apron of chassis.
6. Dress R12 and R15 down near chassis base.

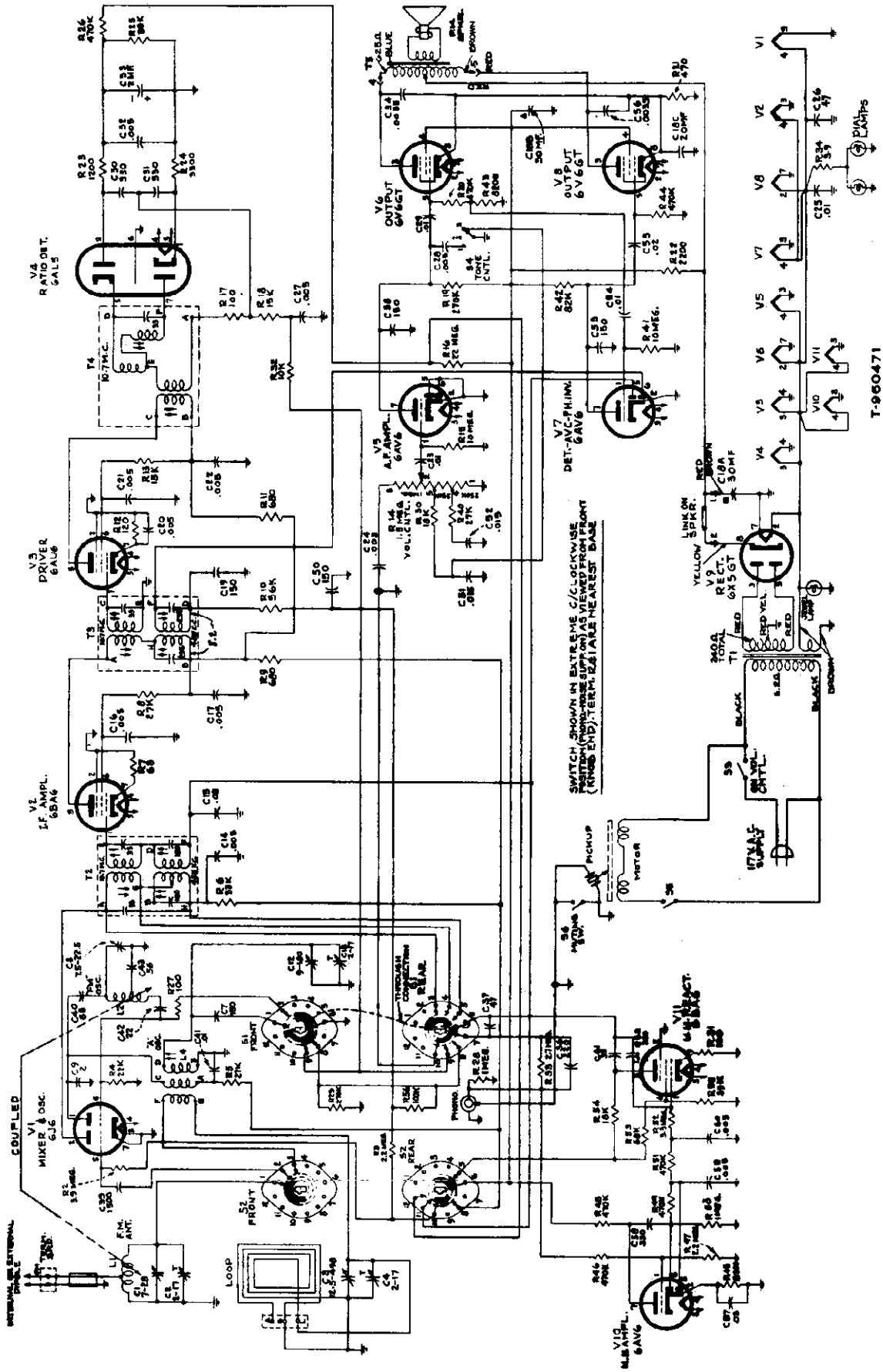
Replacement Parts

STOCK No.	DESCRIPTION
	CHASSIS ASSEMBLIES RC 615
*70137	Bracket—Dial bracket—L.H.—complete with drive cord pulley
*70136	Bracket—Dial bracket—R.H.—complete with drive cord pulley
71924	Capacitor—Ceramic, 56 mmf. (C5)
71614	Capacitor—Ceramic, 120 mmf. (C18)
70602	Capacitor—Tubular, .0025 mfd., 400 volts (C9, C12)
70646	Capacitor—Tubular, .0035 mfd., 1000 volts (C19, C20)
70601	Capacitor—Tubular, .002 mfd., 400 volts (C7)
70606	Capacitor—Tubular, .005 mfd., 400 volts (C14, C16)
70572	Capacitor—Tubular, .015 mfd., 400 volts (C13)
70610	Capacitor—Tubular, .01 mfd., 400 volts (C6, C10, C17)
70611	Capacitor—Tubular, .02 mfd., 400 volts (C11, C15)
70615	Capacitor—Tubular, .05 mfd., 400 volts (C8)
71976	Capacitor—Electrolytic, comprising 1 section of 20 mfd., 450 volts; 1 section of 30 mfd., 350 volts; and 1 section of 20 mfd., 25 volts (C21A, C21B, C21C)
*70133	Coil—Oscillator coil (L2, L3)
*70139	Condenser—Variable tuning condenser (C1, C2, C3, C4)
70342	Control—Volume control and power switch (R6, S2)
†72953	Cord—Drive cord (approx. 49" overall length required)
70930	Grommet—Rubber grommet to mount variable condenser (3 required)
71608	Indicator—Station selector indicator
*70138	Plate—Dial back plate
30868	Plug—2 contact female plug for Motor cable
12493	Plug—5 contact female plug for speaker cable
72602	Pulley—Drive cord pulley
	Resistor—Fixed composition, 330 ohms, ±10%, 1 watt (R19)
	Resistor—Fixed composition, 2200 ohms, ±10%, 2 watts (R20)
	Resistor—Fixed composition, 8200 ohms, ±10%, ½ watt (R17)
	Resistor—Fixed composition, 15,000 ohms, ±10%, 2 watts (R2)
	Resistor—Fixed composition, 18,000 ohms, ±10%, ½ watt (R4)
	Resistor—Fixed composition, 22,000 ohms, ±10%, ½ watt (R1)
	Resistor—Fixed composition, 27,000 ohms, ±10%, ½ watt (R5, R7)
	Resistor—Fixed composition, 56,000 ohms, ±10%, ½ watt (R8)
	Resistor—Fixed composition, 100,000 ohms, ±10%, ½ watt (R21)
	Resistor—Fixed composition, 270,000 ohms, ±10%, ½ watt (R10, R11, R13, R14)
	Resistor—Fixed composition, 330,000 ohms, ±10%, ½ watt (R3)
	Resistor—Fixed composition, 470,000 ohms, ±10%, ½ watt (R16, R18)
	Resistor—Fixed composition, 2.2 megohms, ±20%, ½ watt (R9)
	Resistor—Fixed composition, 10 megohms, ±20%, ½ watt (R12, R15)
*70135	Shaft—Tuning knob shaft
31364	Socket—Lamp socket
35787	Socket—Phono input socket
31251	Socket—Tube socket
31418	Spring—Drive cord tension spring

STOCK No.	DESCRIPTION
*70134	Switch—Range switch (S1)
70128	Transformer—First I. F. transformer (T1)
70129	Transformer—Second I. F. transformer (T2)
70127	Transformer—Power transformer, 117 volt, 60 cycles (T4)
35969	Washer—"C" Washer for tuning shaft
	SPEAKER ASSEMBLIES 92569-1W RL 103-1
13867	Cap—Dust cap
36145	Cone—Cone and voice coil assembly
71560	Plug—5 prong male plug for speaker
71961	Speaker—12" P.M. speaker complete with cone and voice coil less output transformer and plug
71145	Suspension—Metal cone suspension
37899	Transformer—Output transformer (T3)
	NOTE: If stamping on speaker in instrument does not agree with above speaker number, order replacement parts by referring to model number of instrument, number stamped on speaker and full description of part required.
	MISCELLANEOUS
71599	Bracket—Indicator lamp bracket
72437	Cable—Shielded pickup cable complete with pin plug
13103	Cap—Indicator lamp jewel
70142	Clamp—Dial clamp
X1796	Cloth—Grille cloth
*73413	Decal—Control panel decal for blonde instruments
73084	Decal—Control panel decal for walnut or mahogany instruments
71966	Decal—Trade mark decal (Victrola)
71910	Decal—Trade mark decal (RCA Victor)
70141	Dial—Glass dial scale
72856	Grommet—Rubber grommet for mounting record changer (3 required)
30698	Hinge—Cabinet lid hinge (4 required)
72824	Knob—Radio-phono-tone switch knob — brown — for blonde instruments
71822	Knob—Radio-phono-tone switch knob—maroon—for walnut or mahogany instruments
72800	Knob—Tuning or volume control knob—brown—for blonde instruments
71821	Knob—Tuning or volume control knob—maroon—for walnut or mahogany instruments
11765	Lamp—Dial indicator or compartment lamp—Mazda 51
70140	Loop—Antenna loop complete
73109	Nut—Tee nut for mounting record changer (3 required)
31048	Plug—Pin plug for shielded pickup cable
73110	Screw—¼-20 fillister head screw for mounting record changer (3 required)
30900	Spring—Retaining spring for knobs
*73411	Support—Cabinet lid support—L.H.
*73412	Support—Cabinet lid support—R.H.

*This is the first time this Stock No. has appeared in Service Data.
† Stock No. 72953 is a reel containing 250 ft. of cord.

RADIO CORP. OF AMERICA MODEL 8V112, CHASSI
RC-616



Circuit Description

The chassis used in this receiver has a 6J6 tube (V1) (twin triode), one section of which is used as mixer and the other section as oscillator. The FM antenna coil and the FM oscillator coil are placed in such position as to provide coupling between them. A section of the AM oscillator coil is connected in series with the mixer grid input when the selector switch is in AM position.

Dual I-F transformers are used, each transformer containing both AM and FM windings. The I-F amplifier is V2 (6BA6).

The selector switch has five functions:

(1) Selection of tuning range.
(2) Selection of AVC supply voltages to be applied to the controlled tubes. Simple AVC is applied to the grids of V1 and V2 on AM. Delayed AVC is used on FM and is applied only to the grid of V2.
(3) Controls application of B+ voltage to V1, V2, V3 and V11.
(4) Controls audio input to volume control.
(5) Controls circuit loading of M.M. reactor tube V11 (6BA6).

The driver V3 (6AU6) and ratio detector V4 (6AL5) circuits are similar to those used in other RCA Victor AM-FM receivers.

The audio system is conventional. It consists of V5 (6AV6 a.f. amp.), V7 (6AV6 ph. inv.), V6 and V8 (6V6GT p. p. output).

The rectifier is V9 (6X5GT).

The Magic Monitor system uses V10 (6AV6 M. M. amp.) and V11 (6BA6 M. M. reactor).

Tuning Ranges

Standard Broadcast (AM)..... 540-1,600 kc.
Frequency Modulation (FM)..... 88-108 mc.

Intermediate Frequencies...AM—455 kc., FM—10.7 mc.

Tube Complement

(1) 6J6..... Mixer and Oscillator
(2) 6BA6..... I. F. Amplifier
(3) 6AU6..... Driver
(4) 6AL5..... Ratio Detector
(5) 6AV6..... A. F. Amp.
(6) 6V6GT..... Output
(7) 6AV6.....AM Det.—AVC—Ph. Inv.
(8) 6V6GT..... Output
(9) 6X5GT..... Rectifier
(10) 6AV6..... M. M. Amp.
(11) 6BA6..... M. M. Reactor

Power Supply Rating..... 115 volts, 60 cycles, 90 watts

Loudspeaker

Type 92569-5..... 12 in. P.M.
Voice coil impedance at 400 cycles..... 3.2 ohms

Tuning Drive Ratio..... 18:1 (9 turns of knob)

Dial Lamps (2)..... Type No. 51, 6-8 volts, 0.2 amp.

Jewel Lamp..... Type No. 51, 6-8 volts, 0.2 amp.

Power Output

Maximum..... 7 watts
Undistorted..... 6 watts

Record Changer (RP-178)

Record Capacity..... Twelve 10-in. or ten 12-in.
Turntable Speed..... 78 r.p.m.

Antennas:

These receivers have built-in antennas for standard broadcast (AM) and frequency modulation (FM) reception.

Under average conditions these antennas will provide satisfactory reception. However, provision is made for the use of external antennas if desired — connect as indicated below:

Ground: Connect external ground to "G" terminal.

AM Antenna: Connect a single wire antenna to terminal "A."

FM Antenna: Remove the built-in FM antenna lead from the "FM" terminals of the terminal board. Connect the transmission line of an external FM dipole antenna to these two "FM" terminals.

Alignment Procedure

CORRECT ALIGNMENT OF THE FM BAND REQUIRES THAT THE AM BAND BE ALIGNED FIRST

Alignment Indicators:

An RCA VoltOhmyst or equivalent meter is necessary for measuring developed d-c voltage during FM alignment. Connections are specified in the alignment tabulation. An output meter is also necessary to indicate minimum audio output during FM Ratio Detector alignment. Connect the output meter across the speaker voice coil.

The RCA VoltOhmyst can also be used as an AM alignment indicator, either to measure audio output or to measure a-v-c voltage.

When audio output is being measured the volume control should be turned to maximum.

Signal Generator:

For all alignment operations connect the low side of the signal generator to the receiver chassis. The output should be adjusted to provide accurate resonance indication at all times. If output measurement is used for AM alignment the output of the signal generator should be kept as low as possible to avoid a-v-c action.

The FM i-f alignment may be checked by means of an FM sweep generator and cathode ray oscilloscope. Connect the output from the sweep generator, which is set to 10.7 mc., to the mixer grid (6J6 Pin No. 5), low side to chassis. Disconnect the 2 mfd. capacitor C33 from the Ratio Detector circuit.

Connect the high side of the oscilloscope to the junction of R25 and R26, low side to chassis. Adjust the sweep generator and oscilloscope to obtain the response curve.

The Ratio Detector characteristic may be viewed by connecting the oscilloscope across the volume control R14. Capacitor C33 should be re-connected before checking the Ratio Detector characteristic.

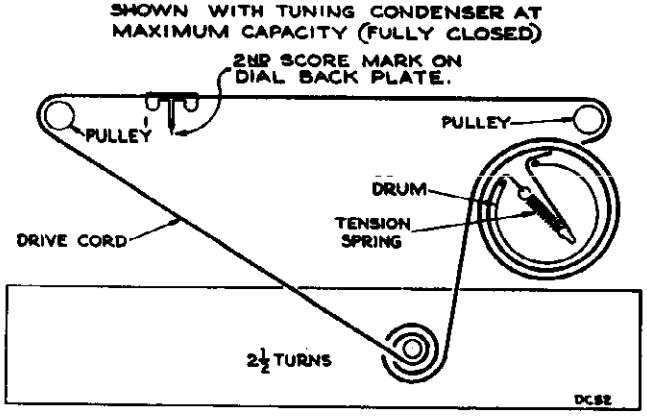
CRITICAL LEAD DRESS

1. Keep leads of C7 short.
2. Dress R27 away from range switch and pin No. 5 of V1.
3. The ground lead of pin No. 2 of V2 and V3 should be down against chassis. Its length is critical.
4. The AVC lead from R26 to range switch should be dressed against chassis and away from 6AU6 driver tube socket.
5. C43 should have short leads and the color code of the capacitor should go to the coil L4. The capacitor should be cemented down with polystyrene cement at the same time L2 is cemented.
6. The lead from the high side of the loop should be dressed away from tubes.
7. Lead from pin No. 2 of V1 to terminal "A" of 1st I. F. transformer should be dressed against the chassis.
8. Connect C40 directly between the gang condenser and pin No. 1 of V1.
9. Make all FM leads as short as possible.
10. Dress lead from pin No. 5 of V2 to terminal "A" of 2nd I. F. transformer down against chassis.
11. Dress resistor R15 near chassis base.
12. Dress all A. C. leads away from volume control.
13. The lead from "FM" terminal of antenna terminal board to L1 tap should be dressed away from V2.
14. The taps on L1 and L2 are critical. L1 tap should be ⅛ turn from the ground end. L2 tap should be 2½ turns from the gang condenser C8.
15. Dress C25 and C26 against the chassis with the shortest lead length possible.
16. The position of L1 and L2 is critical. L1 should be midway between V1 and the 1st I. F. transformer. The end of L2 should be approximately 3/16" from V1.

Dial Indicator

With the tuning condenser fully meshed (closed) the indicator should be set to the SECOND REFERENCE MARK from the left hand edge of the dial back plate.

Refer to the dial scale reproduction on page 7.



Dial Indicator and Drive Mechanism

AM Alignment

RANGE SWITCH IN BC POSITION

Steps	Connect high side of sig. gen. to—	Sig. gen. output	Turn radio dial to—	Adjust for peak output
1	C3 in series with .01 mfd.	455 kc.	Quiet point at low freq. end.	AM windings.† T3 bottom core (sec.). T3 top core (pri.).
2				AM windings.† T2 top core (sec.). T2 bottom core (pri.).
3	"A" terminal of terminal board at rear of chassis in series with 220 mmf.	1400 kc.	1400 kc.	C13 osc. C4 ant.
4		600 kc.	600 kc.	L4 osc. (Rock gang.)
5	Repeat Steps 3 and 4.			

† Use alternate loading.

Alternate loading involves the use of a 47,000 ohm resistor to loa the AM plate winding while the AM grid winding of the SAM TRANSFORMER is being peaked. Then the grid winding is loade with the resistor while the plate winding is peaked. Only one windin is loaded at any one time. Remove the 47,000 ohm resistor after T and T2 have been aligned.

Oscillator frequency is above signal frequency on both AM and FM

FM Alignment

RANGE SWITCH IN FM POSITION — VOLUME CONTROL MAXIMUM

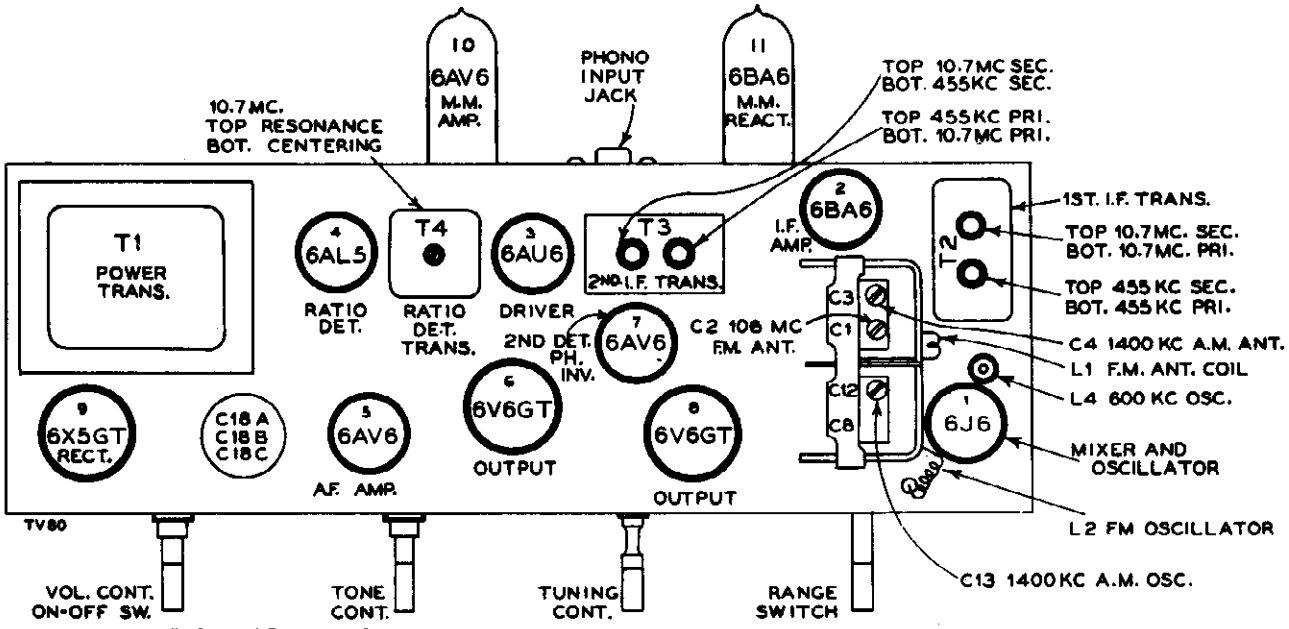
Steps	Connect high side of sig. gen. to—	Sig. gen. output	Turn radio dial to—	Adjust for peak output
1	Connect the d-c probe of a VoltOhmyst to the negative lead of the 2 mfd. capacitor C33 and the common lead to chassis. Turn gang condenser to max. capacity (fully meshed).			
2	Pin 1 of 6AU6 in series with .01 mfd.	10.7 mc. modulated 30% 400 cycles AM (Approx. .05 volt).	Max. capacity (fully meshed).	T4 top core for max. d-c voltage across C33. T4 bottom core for min. audio output.*
3	FM ant. term. in series with a 300 ohm resistor. (Remove ant. lead from "FM" term.)	10.7 mc. Adjust to provide 2 to 3 volts indication on VoltOhmyst during alignment.		FM windings.†† T3 top core (sec.). T3 bottom core (pri.).
4				FM windings.†† T2 top core (sec.). T2 bottom core (pri.).
5		106 mc.	106 mc.	L2 osc.** C2 ant. Set C2 at max. capacity while adjusting L2.
6		90 mc.	90 mc.	L1 ant.** (Rock gang.)
7	Repeat Steps 5 and 6 until further adjustment does not improve calibration.			

* Two or more points may be found which lower the audio output At the correct point the minimum audio output is approached rapidly and is much lower than at any incorrect point.

†† Align T3 and T2 by means of alternate loading as explained under AM alignment. Use a 680 ohm resistor instead of a 47,000 ohm resistor and load the FM windings.

** L1 and L2 are adjustable by increasing or decreasing the spacing between turns.

MODEL 8V112 RADIO CORP. OF AMERICA



Tube and Trimmer Locations

Note: FM mixer and oscillator coils are adjustable by increasing or decreasing the spacing between turns. The position of the coils and location of the taps are critical (refer to "Critical Lead Dress").

SOCKET VOLTAGES

Voltages measured with Chanalyst or VoltOhmyst and should hold within ±20% with rated line voltage. Tuning condenser closed—no signal input.

Tube	Terminal	Voltage			
		M.M.	Phono	A.M.	F.M.
(1) 6J6	Plate 1	—	—	102	98
	Grid 6	-0.4	-0.4	-6.8	-6.0
	Plate 2	—	—	96	110
	Grid 5	-0.7	-0.8	-2.7	-2.5
(2) 6BA6	Plate 5	—	—	196	192
	Screen 6	—	—	100	83
	Cathode 7	—	—	0.7	0.84
	Grid 1	-1.0	-0.9	-1.3	-0.2
(3) 6AU6	Plate 5	—	—	190	185
	Screen 6	—	—	145	141
	Cathode 7	—	—	1.25	1.21
(4) 6AL5	——— —	—	—	—	—
(5) 6AV6	Plate 7	95	125	85	84
	Grid 1	-0.6	-0.6	-0.6	-0.6
(6) 6V6GT	Plate 3	295	299	282	280
	Screen 4	275	295	220	217
	Cathode 8	19.6	21.4	15.5	15.4
(7) 6AV6	Plate 7	158	168	125	125
	Grid 1	-0.5	-0.5	-0.5	-0.5
(8) 6V6GT	Plate 3	295	299	282	280
	Screen 4	275	295	220	217
	Cathode 8	19.6	21.4	15.5	15.4
(9) 6X5GT	Cathode 8	310	313	300	299
(10) 6AV6	Plate 7	171	184	131	130
	Cathode 2	1.85	1.98	1.55	1.53
(11) 6BA6	Plate 5	195	—	—	—
	Screen 6	56.5	—	—	—
	Cathode 7	0.65	—	—	—
	Grid 1	-0.2	-0.8	-0.8	-0.8

MAGIC MONITOR

Circuit Description

The Magic Monitor circuit acts as a capacity shunt across the audio input to the volume control when the selector switch is turned to M. M. position. This shunt is variable, diminishing with increasing input level and increasing with increase of frequency. The phono signal input is applied to the grid of V10 (6AV6 M. M. amp.), is amplified and fed through a resistance-capacity network to the diode plates of V10 which rectifies it and produces a grid voltage on V11 in proportion to the level of the high frequencies contained in the audio signal.

Tests

(1) Feed a .04 volt 400 cycle signal from a low impedance source into the phono jack. Adjust the volume control for maximum output with selector switch in PHONO position. Set switch to M. M. The output level should decrease to approximately one-half.

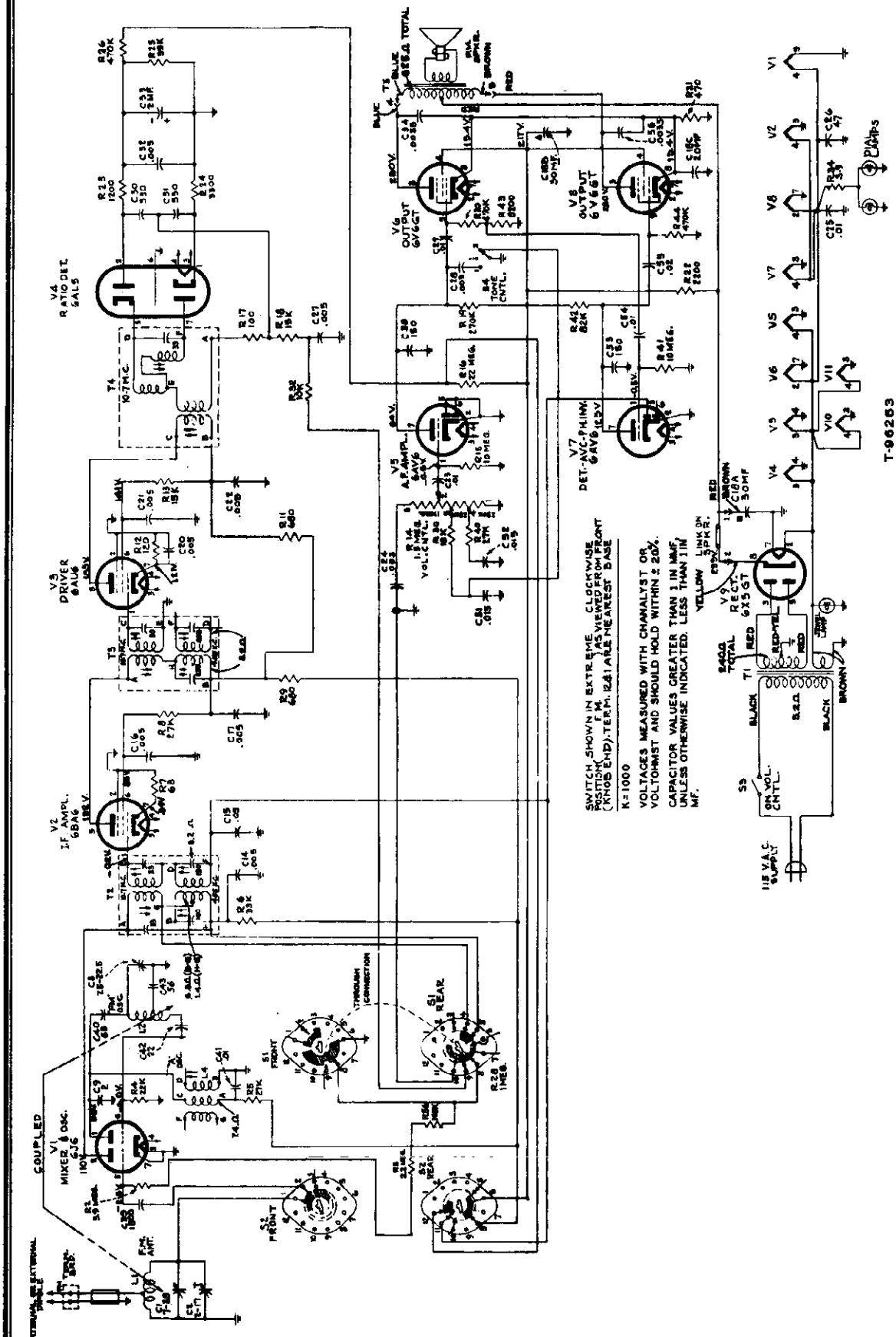
(2) Repeat Step 1 except using 2 volt signal. The output level should decrease only slightly when the selector switch is turned to M. M. position.

(3) Repeat Step 2 except using 3,000 cycle signal. The output level should not decrease when the selector switch is turned to M. M. position.

(4) Repeat Step 3 except using .04 volt signal. The output level should decrease to approximately one-fourth when the selector switch is turned to M. M. position.

CATHODE CURRENTS (MA)

Tube	Terminal	M.M.	Phono	A.M.	F.M.
(1) 6J6	7	—	—	8.2	8.7
(2) 6BA6	7	—	—	11.6	13.4
(3) 6AU6	7	—	—	10	9.7
(4) 6AL5	1 & 5	—	—	—	—
(5) 6AV6	2	0.7	0.75	0.5	0.5
(6) 6V6GT	8	23.2	25.1	19.1	18.5
(7) 6AV6	2	1.6	1.7	1.1	1.1
(8) 6V6GT	8	23.2	25.1	19	18.5
(9) 6X5GT	8	57	53	70	70.5
(10) 6AV6	2	0.2	0.25	0.2	0.2
(11) 6BA6	7	8.0	—	—	—



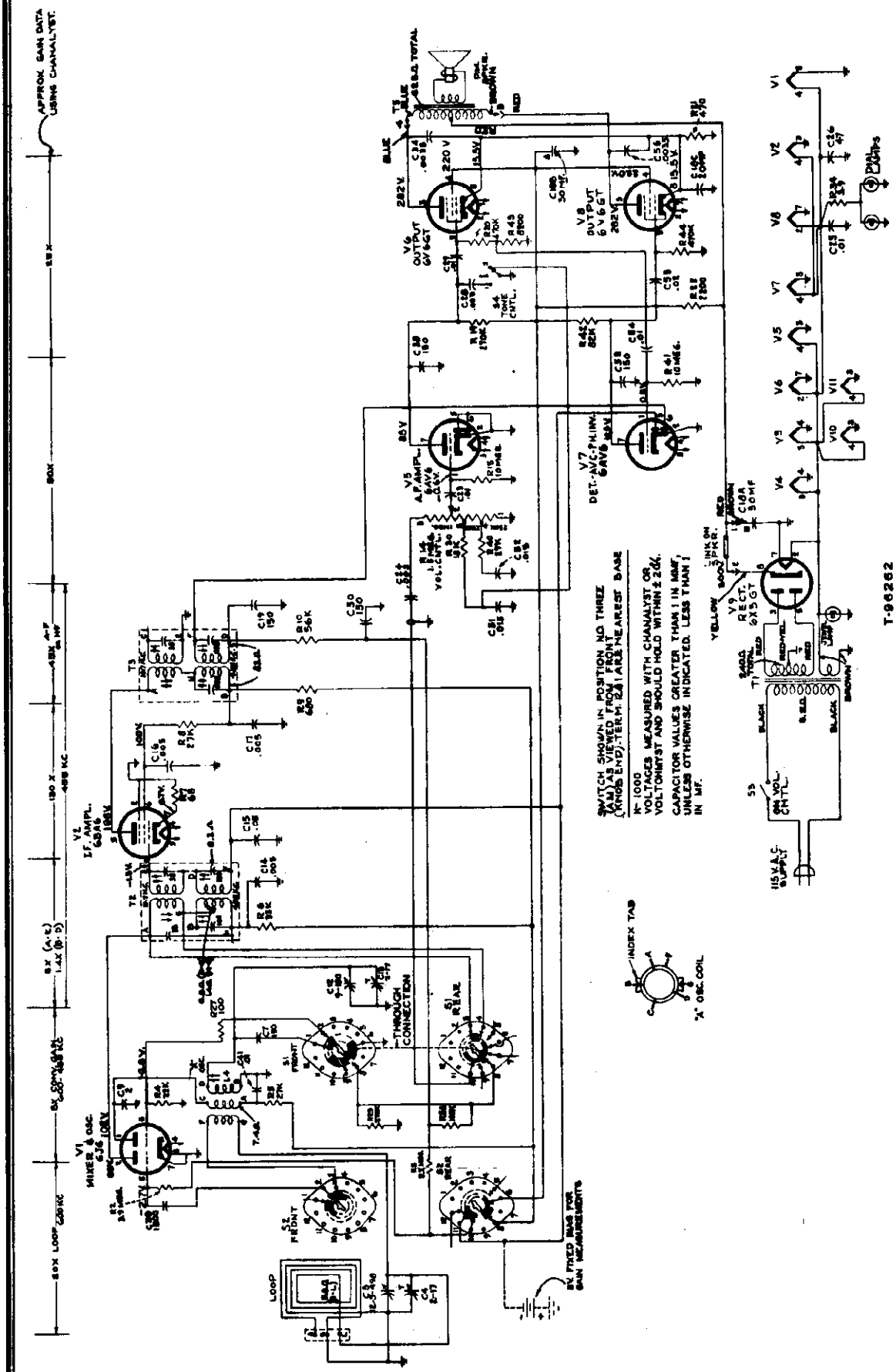
NOTE—2nd I.F. Transformer:

Some chassis may use 2nd I.F. trans. stamped 970435-5 (Stock No. 74019), the 455 k.c. windings have a d.c. resistance of 12 ohms each, the resonating capacitors are 150 mmf. instead of 235 mmf. They are interchangeable with transformers stamped 970435-2 (Stock No. 73363).

Simplified Schematic Diagram
"FM" Band

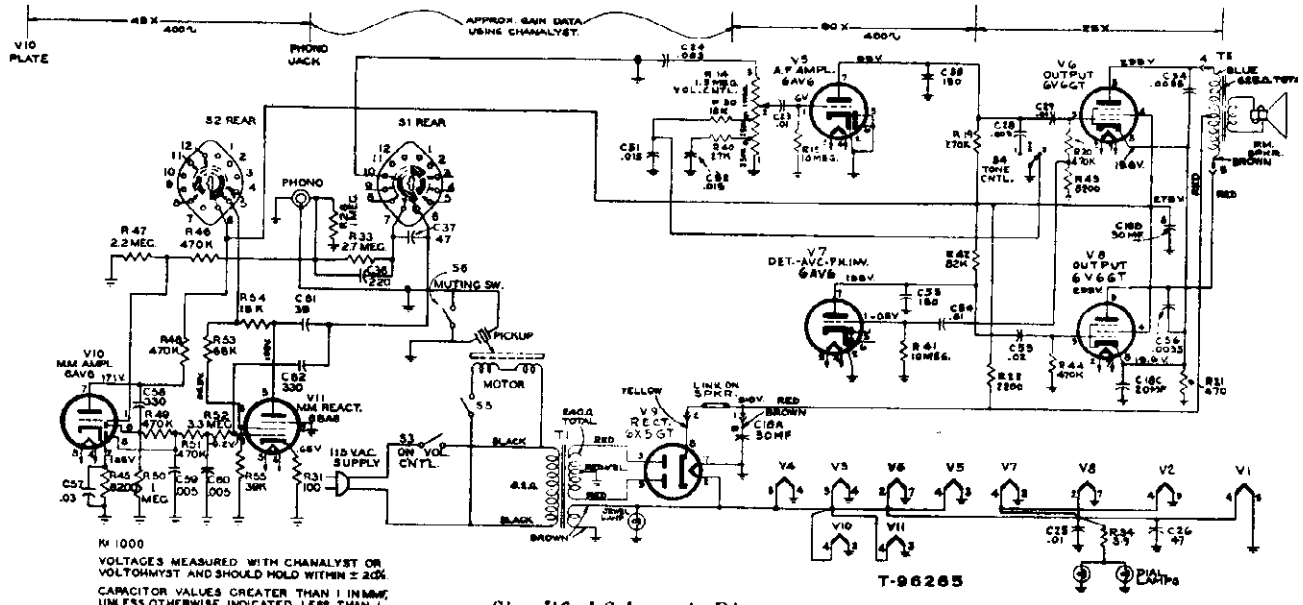
MODEL 8V112

RADIO CORP. OF AMERICA

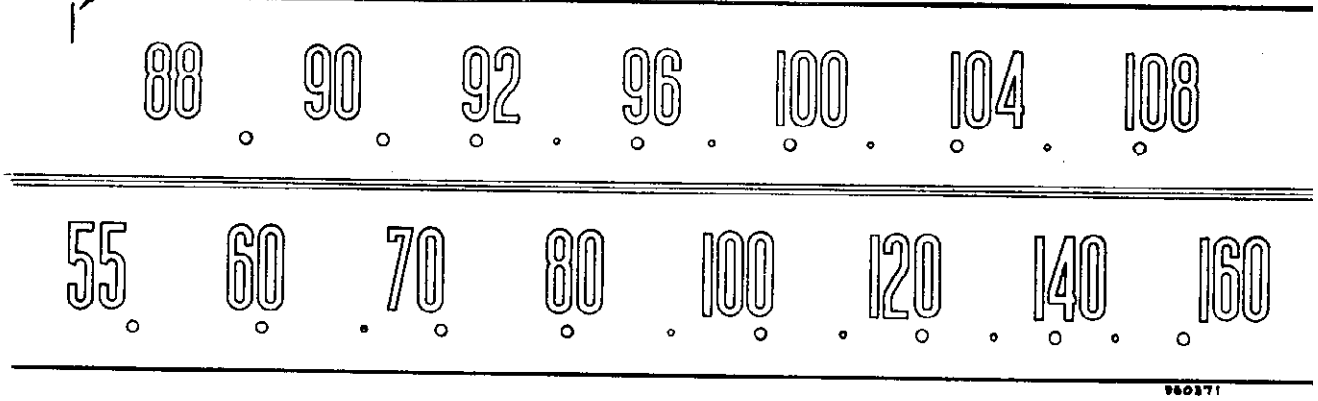


Simplified Schematic Diagram
"A" Band

NOTE—2nd I.F. Transformer:
Some chassis may use 2nd I.F. trans. stamped 970435-5 (Stock No. 74019), the 455 k.c. windings have a d.c. resistance of 12 ohms each, the resonating capacitors are 150 mmf. instead of 235 mmf. They are interchangeable with transformers stamped 970435-2 (Stock No. 73363).



Simplified Schematic Diagram
Magic Monitor Position

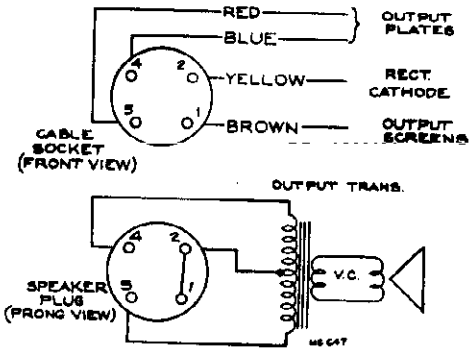


The dial scale drawing shown is a full size reproduction. It can be used as a reference in alignment procedure.

PHONO Position

Similar to that shown above.

Plate and screen supply (term. No. 5 of S2 rear) to V11 (6BA6 M. M. reactor) is disconnected. Signal circuit (term. No. 6 of S1 rear) to V11 is also disconnected. This removes the variable capacity shunt of V11 from the audio circuit.



Speaker Connections

Replacement Parts

Stock No.	DESCRIPTION
	CHASSIS ASSEMBLIES RC 616
*73610	Board—Terminal board (FM - G) with link
73866	Capacitor—Ceramic, 2 mmf. (C9)
33101	Capacitor—Ceramic, 22 mmf. (C42)
*73664	Capacitor—Ceramic, 39 mmf. (C61)
39042	Capacitor—Ceramic, 47 mmf. (C26, C37)
73867	Capacitor—Ceramic, 56 mmf. (C43)
33103	Capacitor—Ceramic, 68 mmf. (C40)
48125	Capacitor—Ceramic, 150 mmf. (C7, C19, C38, C50, C53)
71920	Capacitor—Ceramic, 220 mmf. (C36)
39640	Capacitor—Mica, 330 mmf. (C30, C31, C58, C62)
73748	Capacitor—Ceramic, 1,500 mmf. (C39)
70646	Capacitor—Tubular, .0035 mfd., 1,000 volts (C34, C56)
*73659	Capacitor—Tubular, .003 mfd., 100 volts (C24)
72573	Capacitor—Tubular, .003 mfd., 400 volts (C28)
71926	Capacitor—Tubular, .005 mfd., 200 volts (C20, C27, C32, C59, C60)
72791	Capacitor—Tubular, .005 mfd., 400 volts (C14, C16, C17, C21, C22)
72120	Capacitor—Tubular, .015 mfd., 200 volts (C51, C52)
71923	Capacitor—Tubular, .01 mfd., 200 volts (C23, C25)

MODEL 8V112 RADIO CORP. OF AMERICA

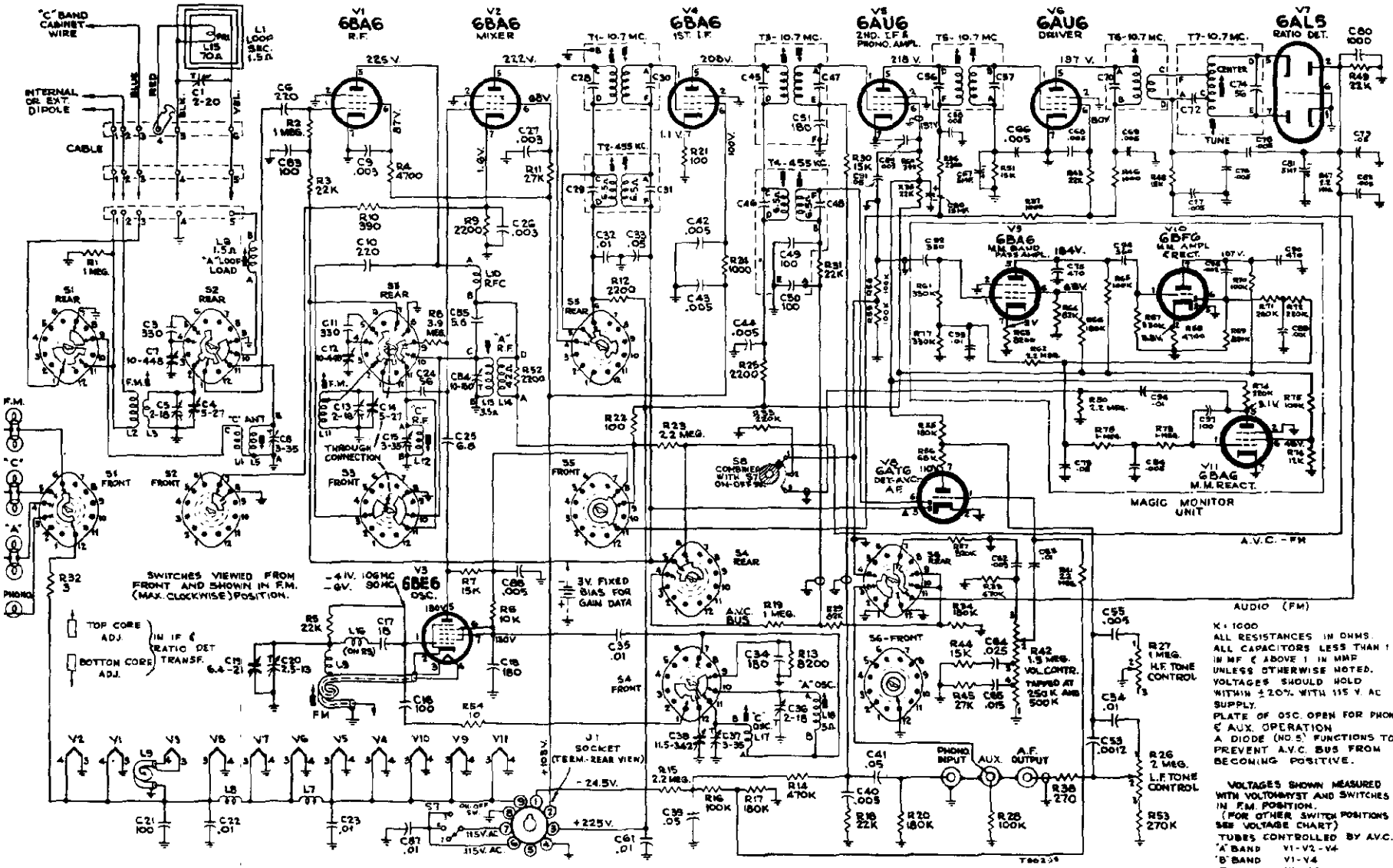
Replacement Parts (continued)

Stock No.	DESCRIPTION
72827	Capacitor—Tubular, .01 mfd., 400 volts (C29, C41, C54)
*73638	Capacitor—Tubular, .02 mfd., 400 volts (C55)
*73639	Capacitor—Tubular, .03 mfd., 400 volts (C57)
72596	Capacitor—Tubular, .05 mfd., 200 volts (C15)
73747	Capacitor—Electrolytic, 2 mfd., 50 volts (C33)
73372	Capacitor—Electrolytic, comprising 1 section of 30 mfd., 350 volts, 1 section of 30 mfd., 300 volts and 1 section of 20 mfd., 25 volts (C18A, C18B, C18C)
73918	Coil—FM antenna coil (No. 16 tinned bus wire, 8 turns per inch, 1¾ turns L. H., .469 I. D.) (L1)
73916	Coil—FM oscillator coil (No. 16 tinned bus wire, 7 turns per inch, 4¼ turns R. H., .469 I. D.) (L2)
73744	Coil—Oscillator coil, "A" band (L4)
*73607	Condenser—Variable tuning condenser (C1, C2, C3, C4, C8, C12, C13)
*73602	Control—Tone control (S4)
70342	Control—Volume control and power switch (R14, S3)
†72953	Cord—Drive cord (approx. 38" overall length required)
*73690	Cord—Power cord and plug
28451	Cover—Insulating cover for electrolytic capacitor
16058	Grommet—Rubber grommet to mount R. F. shelf (4 required)
72069	Grommet—Rubber grommet for rear mounting feet (2 required)
*73710	Indicator—Station selector indicator
71607	Plate—Dial back plate
30868	Plug—2 contact female plug for motor cable
5040	Plug—4 contact female plug for speaker cable
70250	Resistor—Wire wound, 3.9 ohms, 1 watt (R34)
	Resistor—Fixed, composition, 68 ohms, ±10%, ½ watt (R7)
	Resistor—Fixed, composition, 100 ohms, ±10%, ½ watt (R17, R27, R31)
	Resistor—Fixed, composition, 120 ohms, ±10%, ½ watt (R12)
	Resistor—Fixed, composition, 470 ohms, ±10%, 2 watt (R21)
	Resistor—Fixed, composition, 680 ohms, ±20%, ½ watt (R9, R11)
	Resistor—Fixed, composition, 1,200 ohms, ±5%, ½ watt (R23)
*73637	Resistor—Wire wound, 2,200 ohms, 5 watts (R22)
	Resistor—Fixed, composition, 3,300 ohms, ±5%, ½ watt (R24)
	Resistor—Fixed, composition, 8,200 ohms, ±10%, ½ watt (R43, R45)
	Resistor—Fixed, composition, 10,000 ohms, ±10%, ½ watt (R32)
	Resistor—Fixed, composition, 15,000 ohms, ±10%, ½ watt (R13, R18)
	Resistor—Fixed, composition, 18,000 ohms, ±10%, ½ watt (R30)
	Resistor—Fixed, composition, 18,000 ohms, ±10%, 1 watt (R54)
	Resistor—Fixed, composition, 22,000 ohms, ±20%, ½ watt (R4)
	Resistor—Fixed, composition, 27,000 ohms, ±10%, ½ watt (R8, R40)
	Resistor—Fixed, composition, 27,000 ohms, ±10%, 1 watt (R5)
	Resistor—Fixed, composition, 33,000 ohms, ±10%, ½ watt (R6)
	Resistor—Fixed, composition, 39,000 ohms, ±10%, ½ watt (R25, R55)
	Resistor—Fixed, composition, 56,000 ohms, ±10%, ½ watt (R10)
	Resistor—Fixed, composition, 68,000 ohms, ±10%, 1 watt (R53)
	Resistor—Fixed, composition, 82,000 ohms, ±10%, ½ watt (R42)
	Resistor—Fixed, composition, 100,000 ohms, ±10%, ½ watt (R56)
	Resistor—Fixed, composition, 270,000 ohms, ±10%, ½ watt (R19, R29)
	Resistor—Fixed, composition, 470,000 ohms, ±10%, ½ watt (R20, R26, R44, R46, R48, R49, R51)
	Resistor—Fixed, composition, 1 megohm, ±10%, ½ watt (R28, R50)
	Resistor—Fixed, composition, 2.2 megohm, ±20%, ½ watt (R3, R47)
	Resistor—Fixed, composition, 2.7 megohm, ±10%, ½ watt (R33)
	Resistor—Fixed, composition, 3.3 megohm, ±20%, ½ watt (R52)
	Resistor—Fixed, composition, 3.9 megohm, ±10%, ½ watt (R2)
	Resistor—Fixed, composition, 10 megohm, ±20%, ½ watt (R15, R41)
	Resistor—Fixed, composition, 22 megohm, ±20%, ½ watt (R16)
*73605	Shaft—Tuning knob shaft
31364	Socket—Dial or jewel lamp socket
73606	Socket—Tube socket, 7 prong, miniature, for tubes V1, V2 and V3
35787	Socket—Phono input socket
72516	Socket—Tube socket, 7 prong, miniature, for tubes V4, V5 and V7
73117	Socket—Tube socket, 7 pin, miniature, for tubes V10 and V11
31251	Socket—Tube socket, octal, for tubes V6, V8 and V9
72540	Spring—Drive cord spring
*73603	Support—Dial plate mounting support complete with pulley — R. H.
*73604	Support—Dial plate mounting support complete with pulley — L. H.
*73608	Switch—Range switch (S1, S2)
*73601	Transformer—Power transformer, 115 volts, 60 cycle (T1)
73745	Transformer—First I. F. transformer—dual (T2)
74019	Transformer—Second I. F. transformer—dual (T3)
73743	Transformer—Ratio detector transformer (T4)
33726	Washer—"C" washer for tuning knob shaft
	SPEAKER ASSEMBLIES 92569-5W RL 103B5
13867	Cap—Dust cap
73934	Cone—Cone and voice coil assembly
31826	Plug—4 prong male plug for speaker
73635	Speaker—12" PM speaker complete with cone and voice coil less output transformer and plug (92569-5W)
71145	Suspension—Metal cone suspension
73636	Transformer—Output transformer (T5)
	NOTE: If stamping on speaker in instrument does not agree with above speaker number, order replacement parts by referring to model number of instrument, number stamped on speaker and full description of part required.
	MISCELLANEOUS
71864	Antenna—FM antenna
*73880	Back—Cabinet back—burgundy—for mahogany or walnut instruments
*73881	Back—Cabinet back—tan—for blonde instruments
71599	Bracket—Jewel lamp bracket
73626	Bumper—Rubber bumper for carriage actuating link
72437	Cable—Shielded pickup cable complete with pin plug
13103	Cap—Jewel lamp cap
*73613	Carriage—Record changer mounting carriage complete with runners
71892	Catch—Bullet catch and strike for speaker compartment or record storage compartment door
*73623	Check—Radio compartment door check
X1898	Cloth—Grille cloth for blonde instruments
X1897	Cloth—Grille cloth for mahogany or walnut instruments
*73764	Decal—Control panel decal for mahogany or walnut instruments
*73765	Decal—Control panel decal for blonde instruments
71984	Decal—Trade mark decal (RCA-Victor)
71986	Decal—Trade mark decal (Victrola)
*73628	Dial—Glass dial scale
*73627	Escutcheon—Dial scale escutcheon
11889	Grommet—Rubber grommet for front apron of chassis
*73614	Grommet—Rubber grommet to mount record changer (3 required)
37396	Grommet—Rubber grommet to mount speaker (3 required)
73735	Hinge—Hinge for phono compartment or radio compartment door (2 required for each door)
36817	Hinge—Record storage compartment door hinge (1 set)
36610	Hinge—Speaker compartment door hinge (1 set)
71822	Knob—Tone control or range switch knob—maroon—for mahogany or walnut instruments
72824	Knob—Tone control or range switch knob—brown—for blonde instruments
71821	Knob—Tuning or volume control knob—maroon—for mahogany or walnut instruments
72800	Knob—Tuning or volume control knob—brown—for blonde instruments
11765	Lamp—Dial or jewel lamp—Mazda 51
73616	Link—Actuating link assembly for record changer carriage—R. H.
73617	Link—Actuating link assembly for record changer carriage—L. H.
*73611	Loop—Antenna loop complete
*73869	Nut—Speed nut for "MM" plate
73109	Nut—Tee nut to mount record changer (3 required)
*73868	Plate—"Magic Monitor" nameplate
71819	Plate—Radio compartment door check mounting
30868	Plug—2 contact female plug for record changer power cable
31048	Plug—Pin plug for shielded pickup cable
72937	Pull—Phono compartment or radio compartment door pull (2 required for each door)
*73909	Pull—Speaker compartment or record storage compartment door pull
*73615	Screw—¼-20 x 1½" fillister head machine screw to mount record changer (3 required)
73618	Spring—Connecting spring between actuating link and record changer carriage
71818	Spring—Radio compartment door check spring
30900	Spring—Retaining spring for knobs
73185	Stop—Carriage mechanism stop (2 required)
70164	Stop—Stop for phono compartment, speaker compartment or record storage compartment door
73612	Track—Carriage mechanism track complete with mounting plate (2 required)

*This is the first time that this Stock No. has appeared in Service Data.
†Stock No. 72953 is a reel containing 250 feet of cord.

RADIO CORP. OF AMERICA

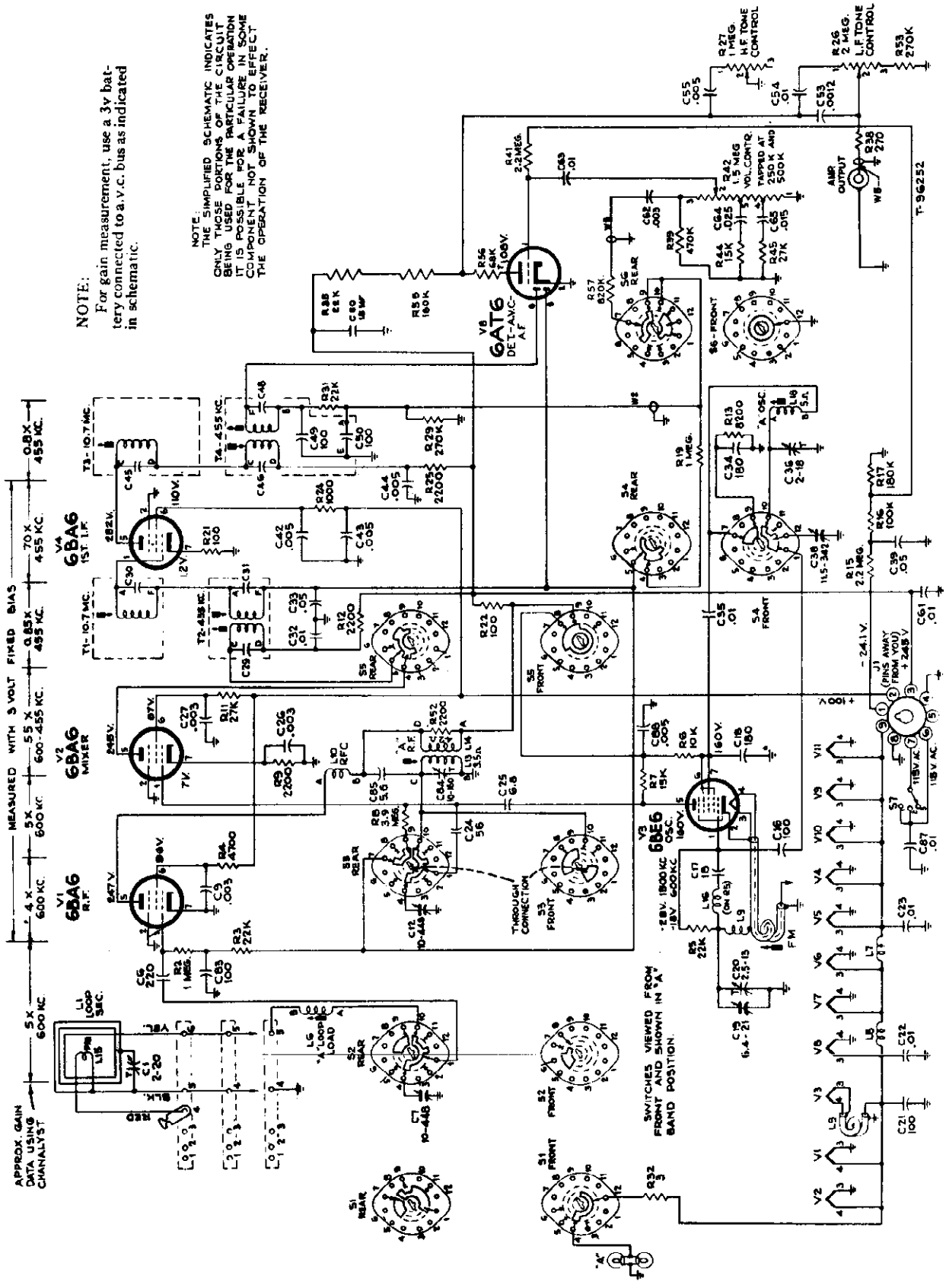
MODEL 8V151, CHA
RK 121C, RS-123D

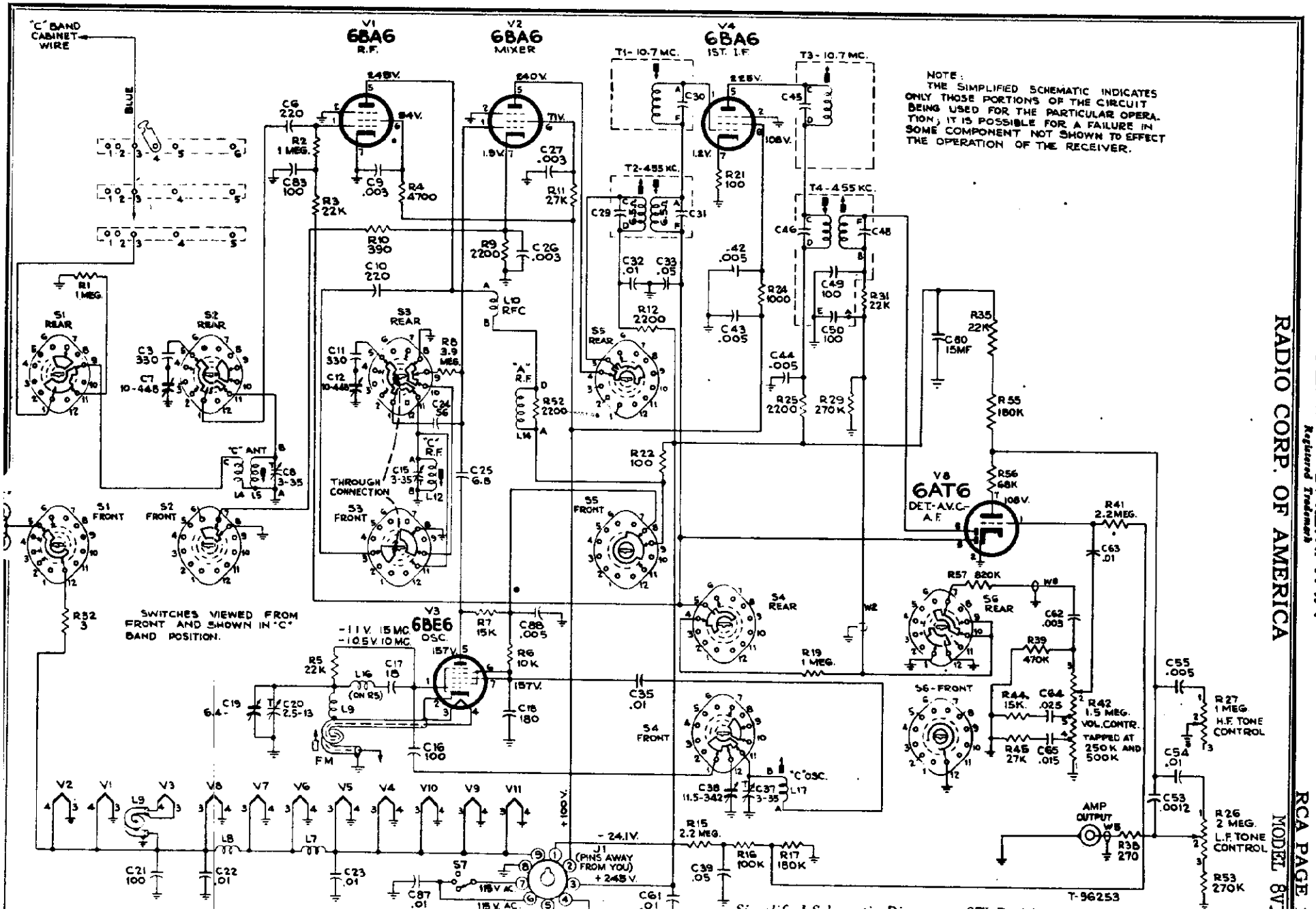


Complete Schematic Diagram RK-121C — Range Switch shown in FM position.

MODEL 8V151

RADIO CORP. OF AMERICA




CLARI-SKEMATIX
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RADIO CORP. OF AMERICA
RCA PAGE
MODEL 8V
V1 6BA6 R.F.
V2 6BA6 MIXER
V4 6BA6 1ST. I.F.
V3 6BE6 OSC.
V8 6AT6 DET-A.V.C.-A.F.
T1- 10.7 MC.
T2-455 KC.
T3- 10.7 MC.
T4-455 KC.
NOTE:
THE SIMPLIFIED SCHEMATIC INDICATES ONLY THOSE PORTIONS OF THE CIRCUIT BEING USED FOR THE PARTICULAR OPERATION; IT IS POSSIBLE FOR A FAILURE IN SOME COMPONENT NOT SHOWN TO EFFECT THE OPERATION OF THE RECEIVER.
"C" BAND CABINET WIRE
BLUE
SWITCHES VIEWED FROM FRONT AND SHOWN IN "C" BAND POSITION.
THROUGH CONNECTION
FM
"C" OSC.
"C" ANT
"A" R.F.
"C" R.F.
AMP OUTPUT
J1 (PINS AWAY FROM YOU)
- 24.1 V.
+ 245 V.
+ 100 V.
118 V. AC
T-96253

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MODEL 8V151

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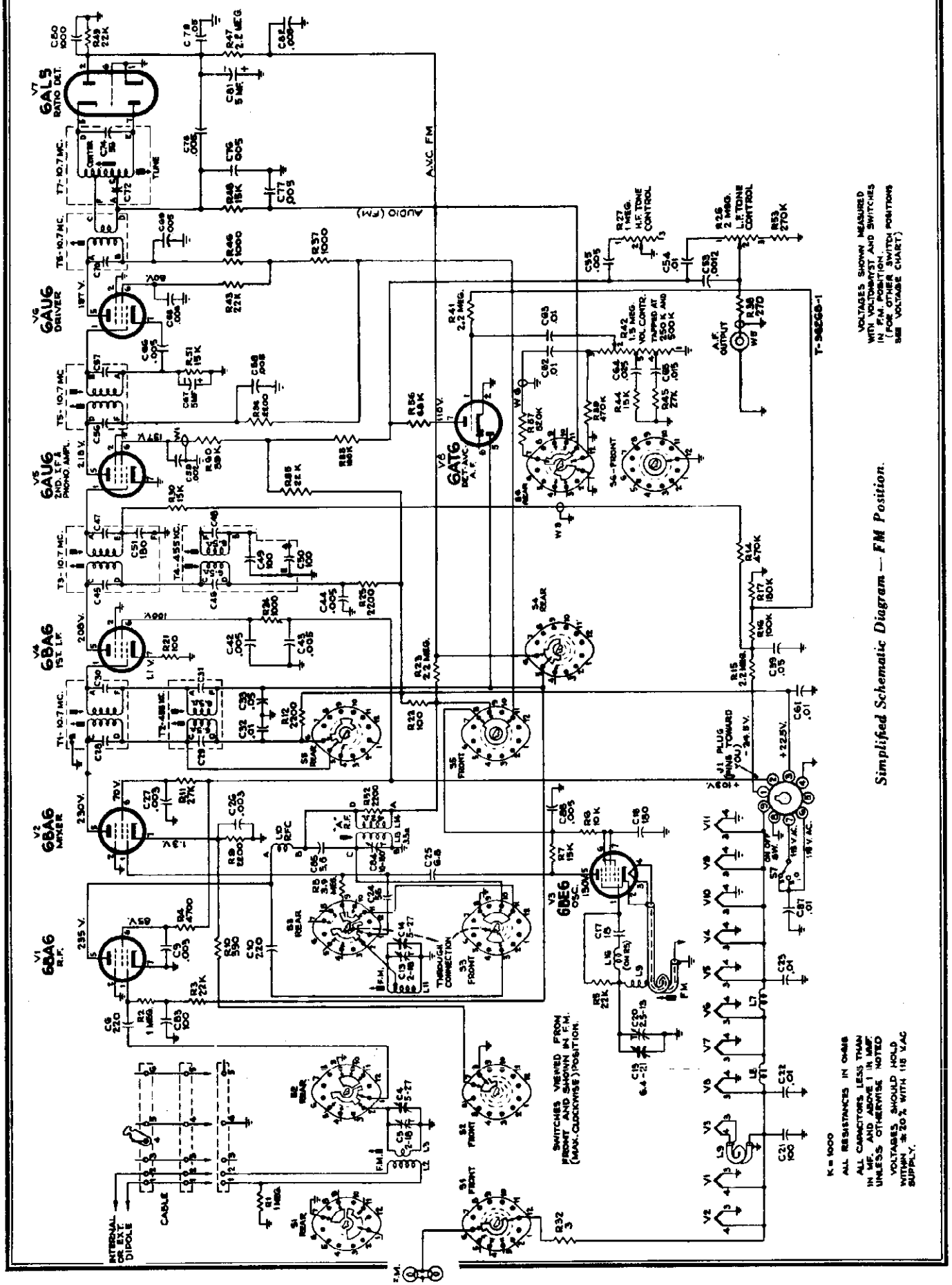
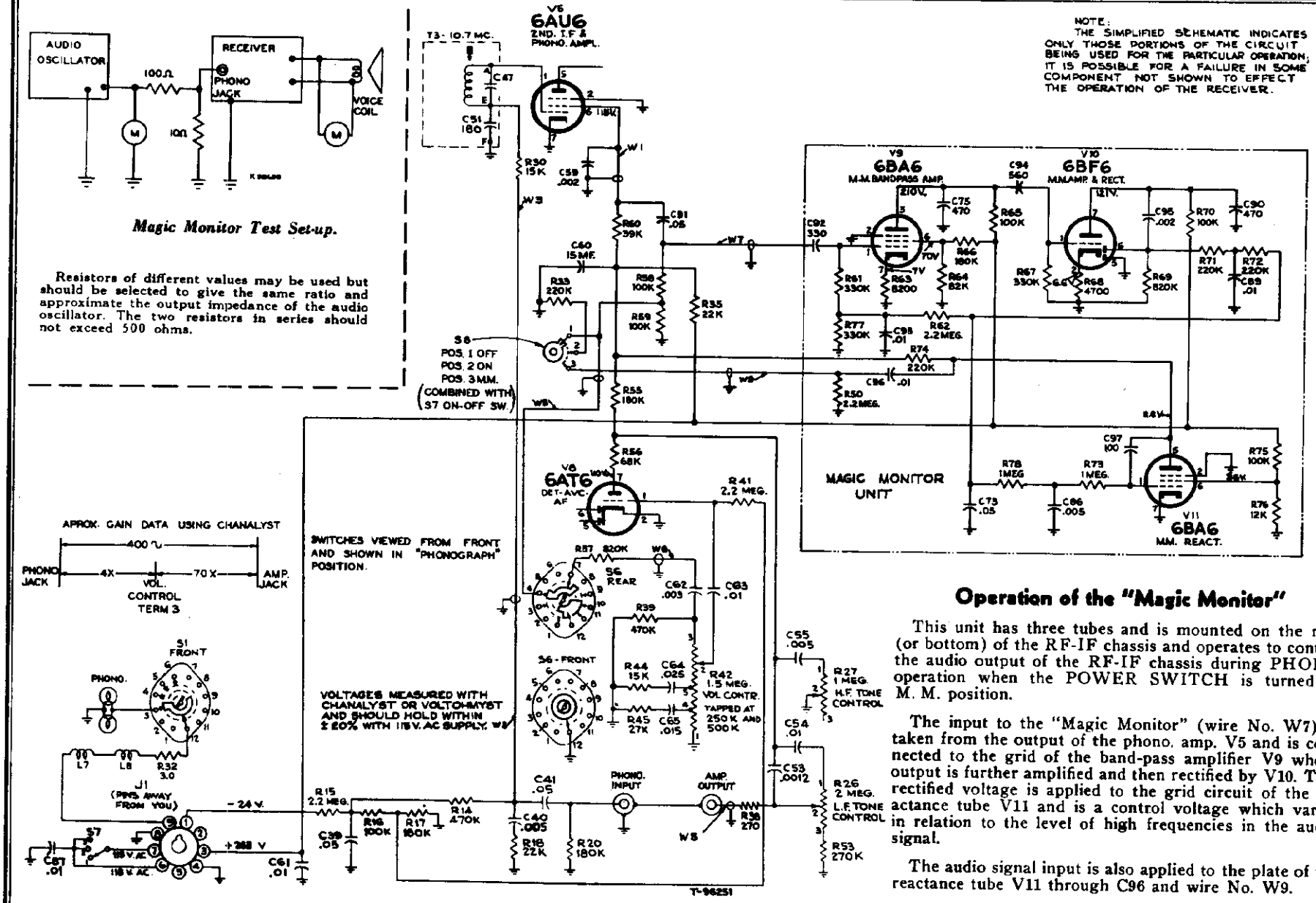


Simplified Schematic Diagram — FM Position.

Magic Monitor Test Set-up.

Resistors of different values may be used but should be selected to give the same ratio and approximate the output impedance of the audio oscillator. The two resistors in series should not exceed 500 ohms.



Simplified Schematic Diagram — PH Position.

Operation of the "Magic Monitor"

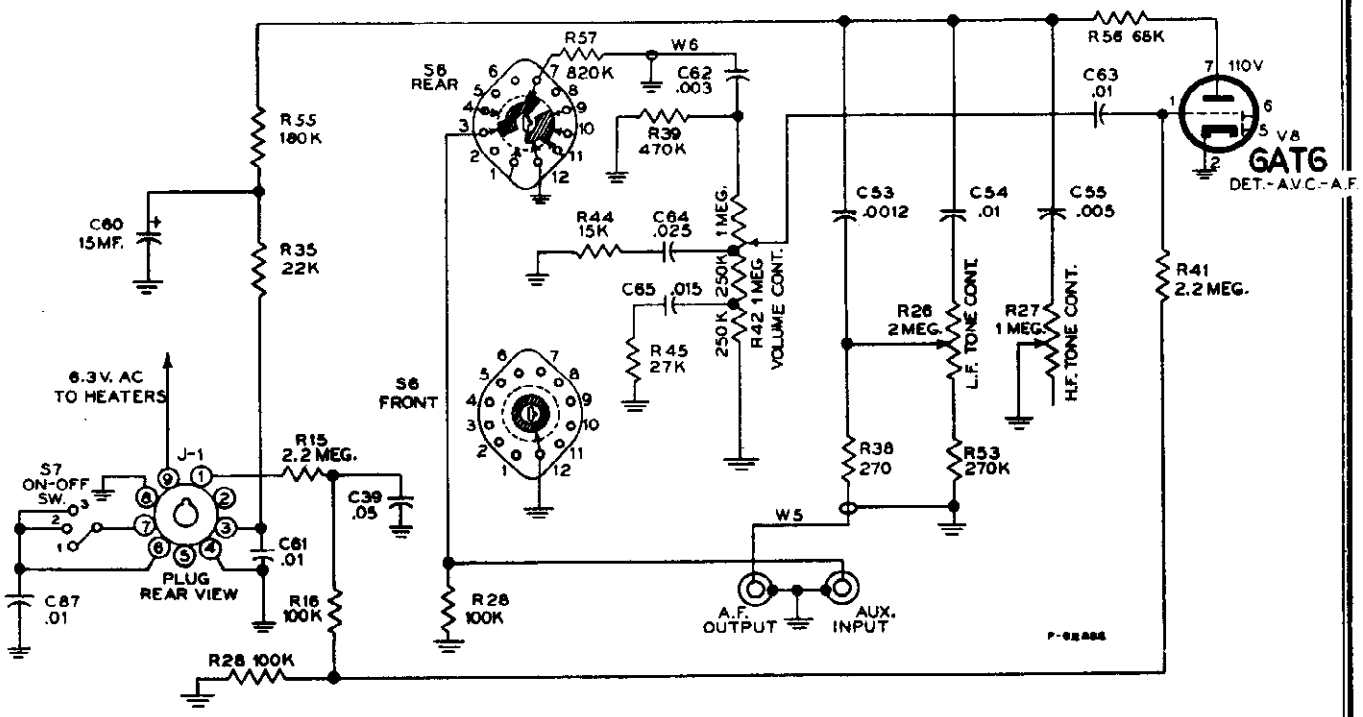
This unit has three tubes and is mounted on the rear (or bottom) of the RF-IF chassis and operates to control the audio output of the RF-IF chassis during PHONO operation when the POWER SWITCH is turned to M. M. position.

The input to the "Magic Monitor" (wire No. W7) is taken from the output of the phono. amp. V5 and is connected to the grid of the band-pass amplifier V9 whose output is further amplified and then rectified by V10. This rectified voltage is applied to the grid circuit of the reactance tube V11 and is a control voltage which varies in relation to the level of high frequencies in the audio signal.

The audio signal input is also applied to the plate of the reactance tube V11 through C96 and wire No. W9.

When the control voltage on V11 is below a predetermined level the tube will act as a shunt capacity between the audio signal and chassis thereby attenuating the high frequency portion of the audio signal.

MODEL 8V151 RADIO CORP. OF AMERICA



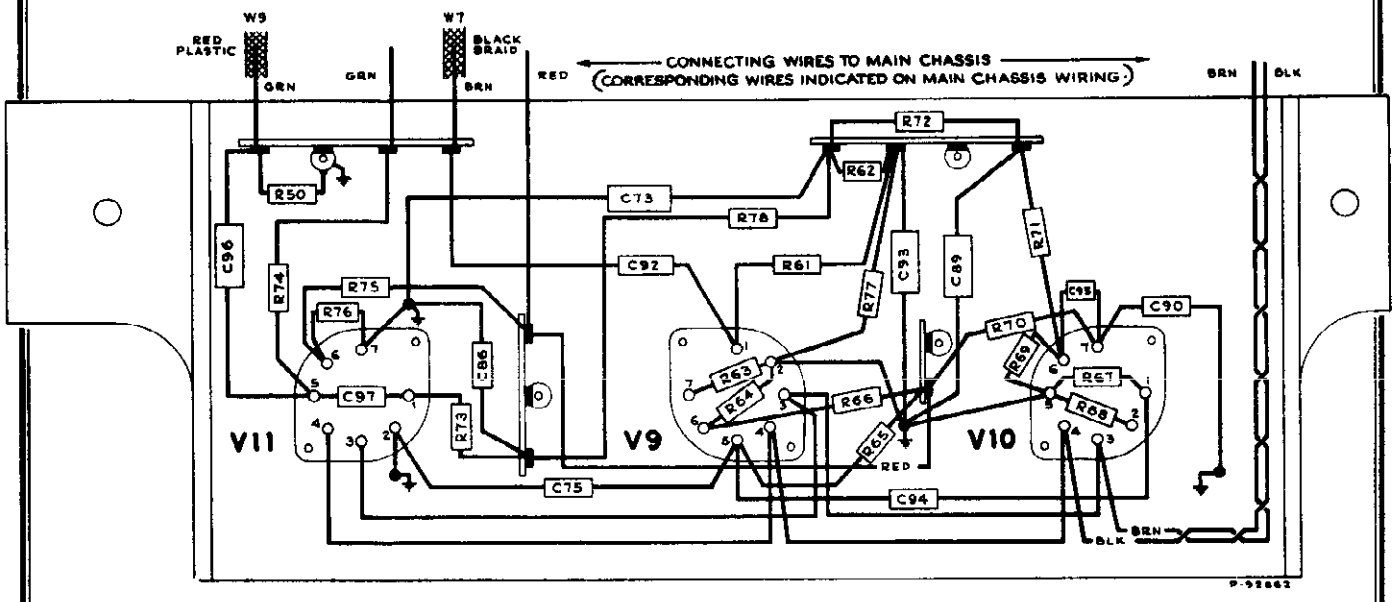
Simplified Schematic Diagram — ● Position. (AUX.).

Testing the Magic Monitor:

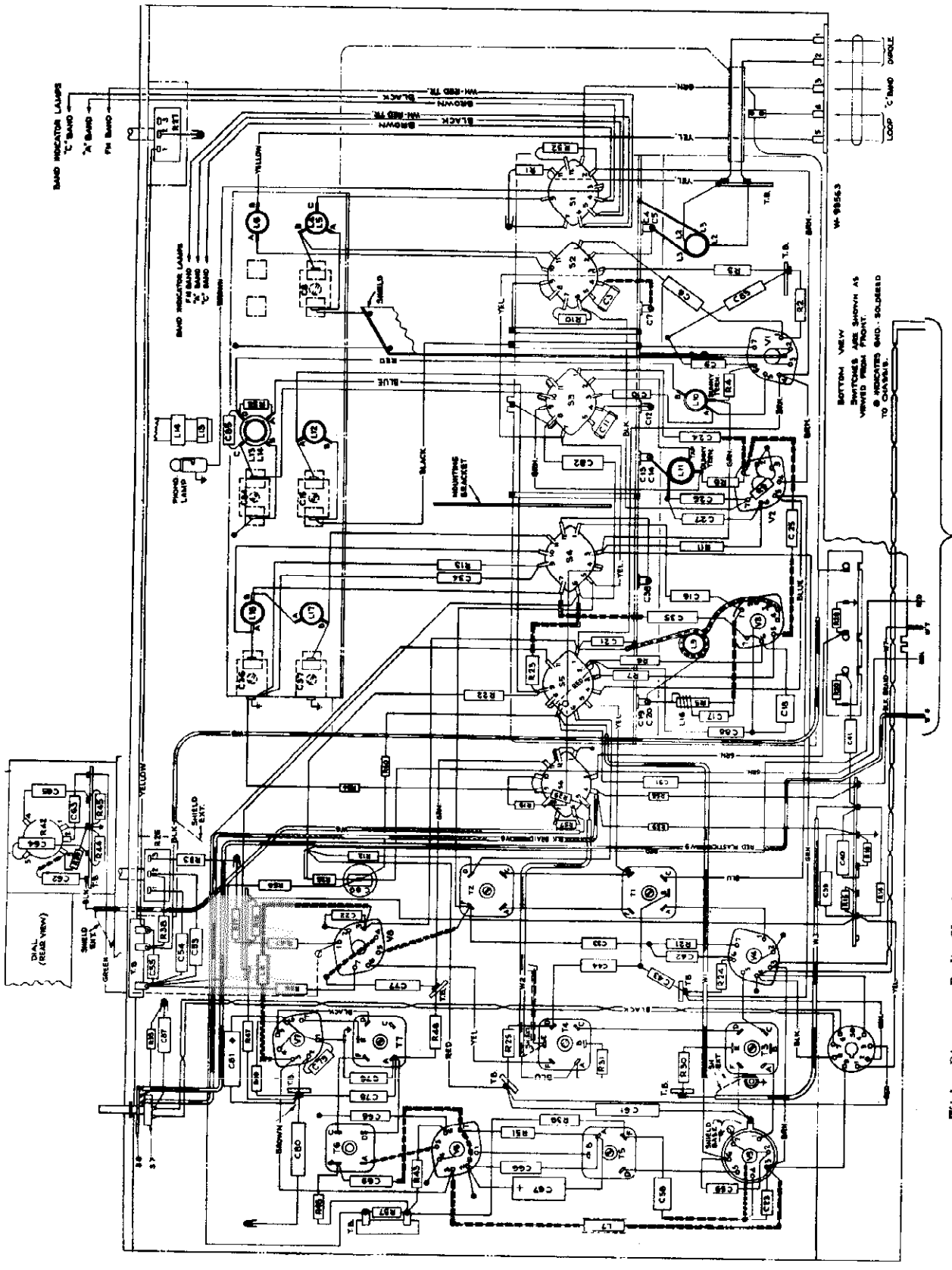
Any serious defects in Magic Monitor operation will be made evident by the following tests. An audio oscillator and an a-c voltmeter flat to 3,000 cycles are needed for the tests.

Procedure:

1. Set up the equipment as shown in Fig. 10. Although two voltmeters are shown, one can be used in both positions.
2. Turn the receiver function switch to PHONO and turn S8 to ON position. Set the audio oscillator to 400 cycles and adjust its output to 0.2 volt (measured across the oscillator output terminals). Adjust the receiver volume control for a reading of 1 volt (measured at the voice coil). There should be little or no change in receiver output when S8 is turned to "M.M." position.
3. Repeat Step 2 except using oscillator output of 1 volt, 400 cycles. There should be little or no change in receiver output when S8 is turned to "M.M." position.
4. Repeat Step 2 except using oscillator output of 1 volt, 3,000 cycles. There should be little or no change in receiver output when S8 is turned to "M.M." position.
5. Repeat Step 2 except using oscillator output of 0.2 volt, 3,000 cycles. When S8 is turned to "M.M." position the output should decrease to approximately 1/5 of that obtained with S8 in ON position.



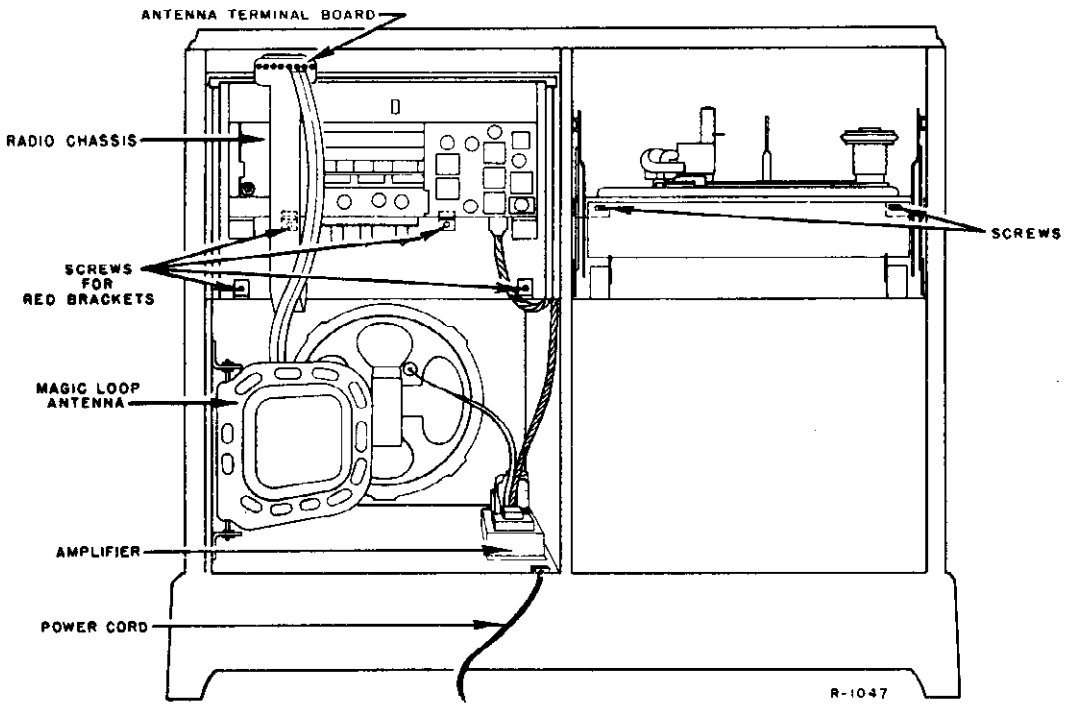
Wiring Diagram — Magic Monitor Unit.



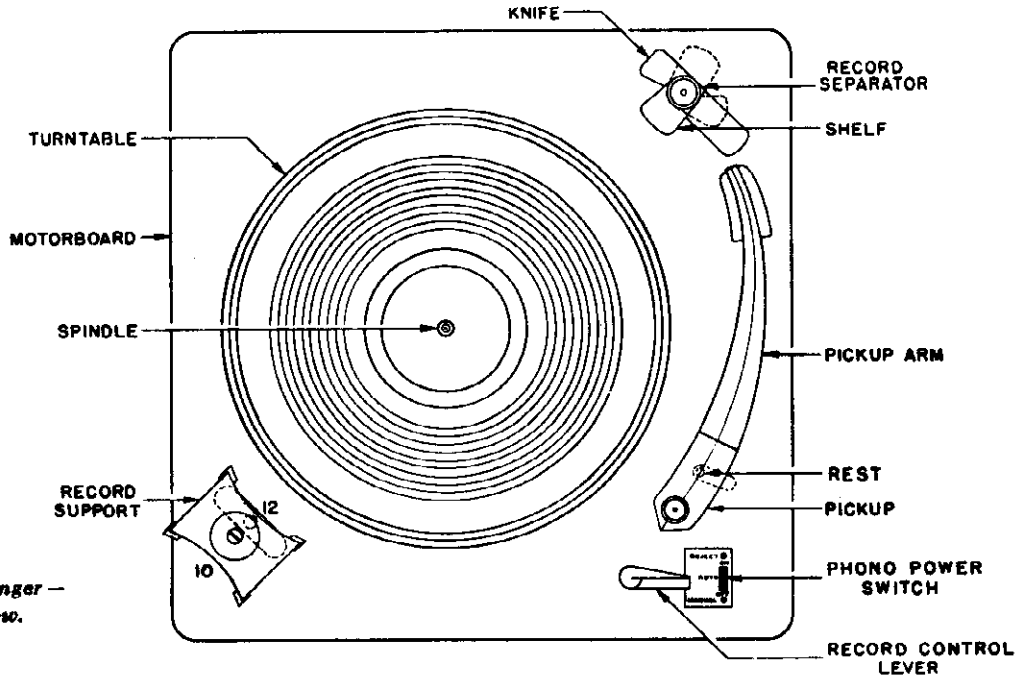
Wiring Diagram — Radio Chassis.

MODEL 8V151

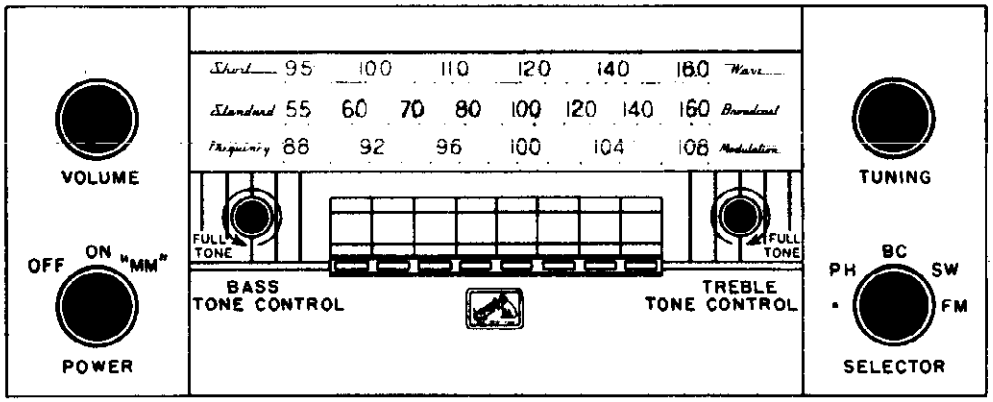
RADIO CORP. OF AMERICA



Back View.



Record Changer — Top View.



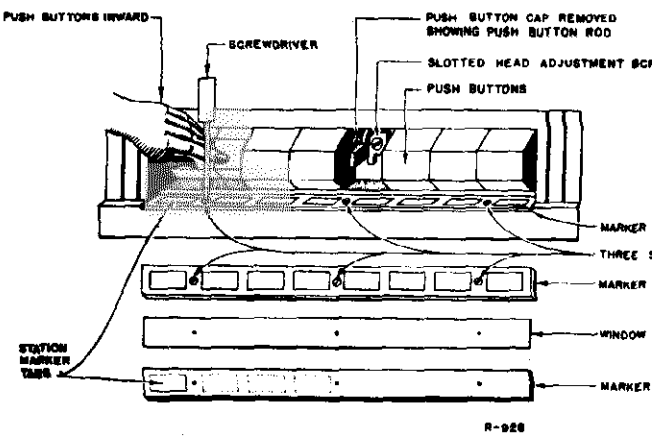
Control Panel.

Push-Button Adjustment

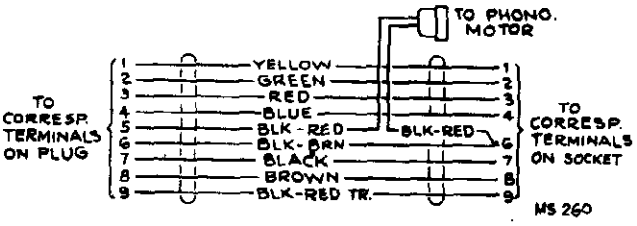
The push-buttons should be adjusted for eight favorite stations after the receiver is operating, and has had a 5 or 10 minute warm-up period.

Any standard broadcast or frequency modulation stations may be chosen. The preferable arrangement is to adjust for stations in the order of frequency, from low to high. Proceed as follows:

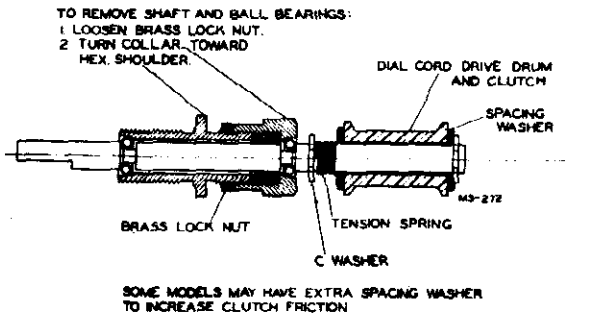
1. Remove the first PUSH-BUTTON (Just pull) and note the adjustment screw beneath.
2. Loosen the adjustment screw.
3. Manually tune very accurately for the desired station.
4. Push the PUSH-BUTTON rod in till it is against stop.
5. Tighten adjustment screw.
6. Make adjustment for the other buttons, setting up and checking each for the chosen station in a similar manner.
7. Recheck all PUSH-BUTTONS and reset if found necessary.



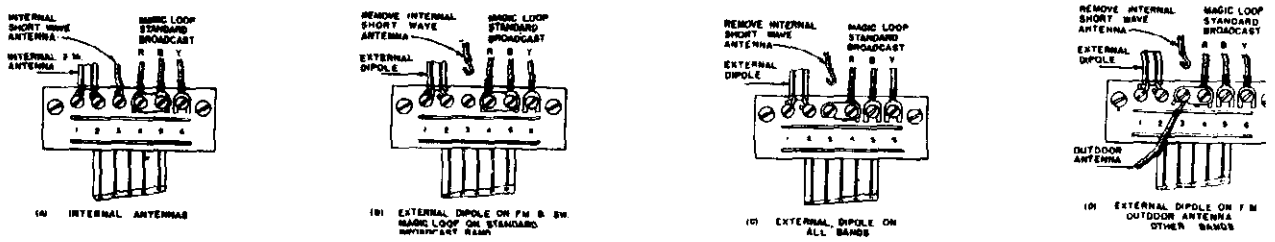
Push-Button set-up



Power Cable.
Some may not have the color code indicated.



Tuning Shaft and Clutch Assembly.



Antenna Terminal Board Connections

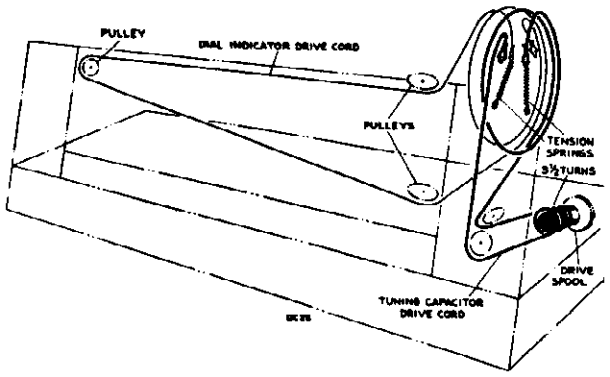
EXTERNAL ANTENNAS—If reception is not satisfactory on one or more of the three bands, using the built-in cabinet antennas, an external antenna may be used. The Magic Loop Antenna will usually provide sufficient pickup on the Standard Broadcast band, but if an external dipole is installed to improve reception on Frequency Modulation it may be used for Standard Broadcast and Short Wave as well. Connections are made to the antenna terminal board in the back of the cabinet. External antennas may be erected indoors or outdoors and should be oriented in direction for requirements of best reception. RCA Television Antenna, Stock No. 225 or 226, or the equivalent with 300-ohm transmission line is recommended for an external antenna.

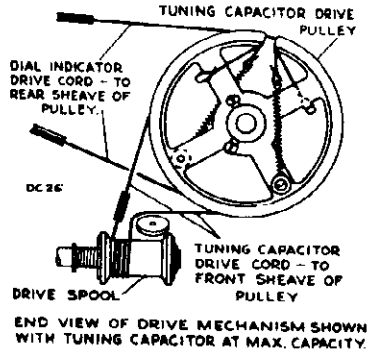
Figure 21 (A) shows the *Antenna Terminal Board* with connections for *internal* cabinet *antennas.*

Figure 21 (B) shows connections for the RCA Television Antenna replacing those for the *internal FM antenna* on terminals 1 and 2, and the *internal SW antenna* disconnected at terminal 3. The external dipole antenna is now the antenn for FM and SW bands.

Figure 21 (C) shows the additional change for connecti the Standard Broadcast band to make use of the extern RCA Television Antenna. The link across terminals 4 and 5 changed to terminals 4 and 3. The external antenna is no effective on all bands. Tighten terminals and be sure that t red, black and yellow leads (R.B.Y.) to terminals 4, 5 and are still in place and securely connected.

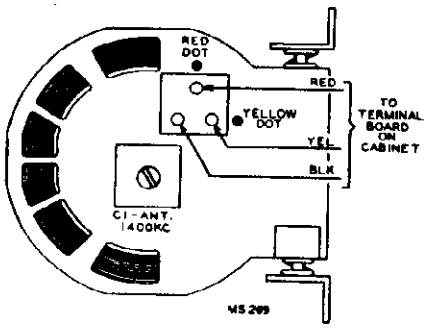
Figure 21 (D) shows connections for a separate outdo antenna on SW and SB reception, and the external dipole FM. This outdoor antenna should consist of a wire 30 to feet or so in length mounted in a convenient location as hig as possible. Connect lead-in from the antenna to terminal on the antenna terminal board. This outdoor antenna effective on SB and SW bands. If this connection mak the SB signal too strong, causing overload and distortio replace the link across terminals 4 and 5 as in Figure 21 (and (B). This outdoor antenna is now effective on SW onl



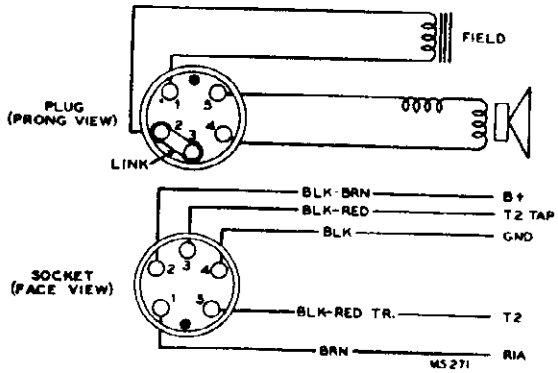


END VIEW OF DRIVE MECHANISM SHOWN WITH TUNING CAPACITOR AT MAX. CAPACITY.

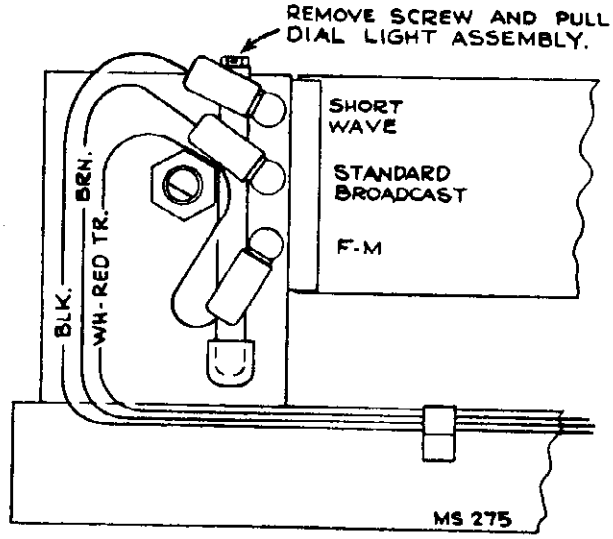
Dial Cord Assembly.



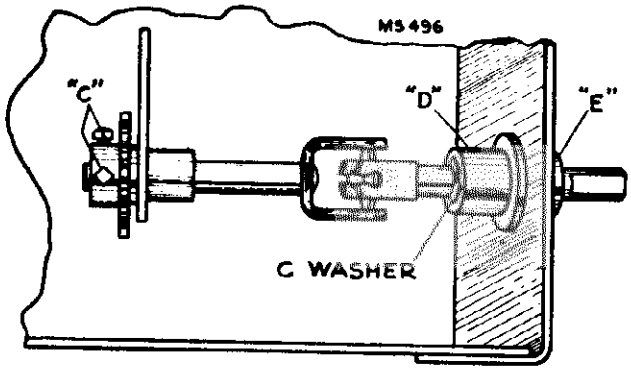
Loop Antenna.



Speaker Connections.



Dial Lamp Assembly.



Range Switch Coupling Shaft.

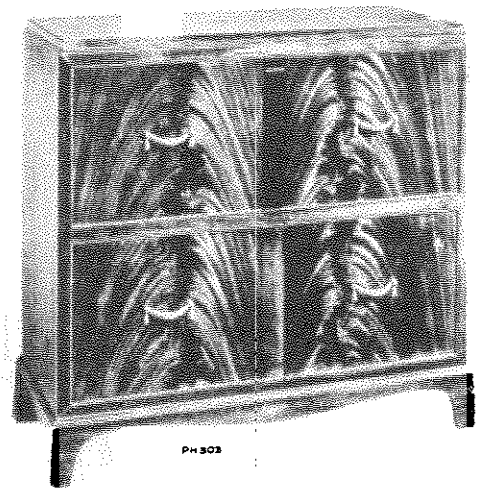
Removal of Dial Lamps

1. Remove the six control knobs.
2. Remove the four "T" bushings which hold the escutcheon to the control shafts—remove escutcheon.
3. Remove the screw which holds the dial light assembly to the chassis (accessible from back with radio compartment closed)—pull the assembly out of its retaining slot. (See Fig. 25.)

To Remove Shaft: Loosen square head set screws "C" in collar of gear. Remove nut "E" (on front apron of chassis) from bushing "D." Push shaft and bushing to the rear so that shaft and bushing are clear of the chassis apron. Flex the shaft and pull forward.

To Remove Bushing from Shaft: Remove "C" washer from shaft at inside end of bushing, push shaft through bushing to permit removal of "C" washer normally recessed inside bushing. Pull shaft through bushing to inside of chassis.

Specifications



Tuning Ranges

Broadcast ..... 540-1600 kc
Shortwave "C" Band ..... 9.2-16.0 mc
Frequency Modulation ..... 88-108 mc

Intermediate Frequency AM ..... 455 kc

Intermediate Frequency FM ..... 10.7 mc

Tube Complement of RK-121C

1. RCA-6BA6 ..... RF Amplifier
2. RCA-6BA6 ..... Mixer
3. RCA-6BE6 ..... Oscillator
4. RCA-6BA6 ..... 1st IF
5. RCA-6AU6 ..... 2nd IF and Phono. Amp.
6. RCA-6AU6 ..... Driver
7. RCA-6AL5 ..... Ratio Detector
8. RCA-6AT6 ..... AM-DET-AVC-AF
9. RCA-6BA6 ..... M. M. Band-Pass Amp.
10. RCA-6BF6 ..... M. M. Amp. and Rect.
11. RCA-6BA6 ..... M. M. Reactor

Tube Complement of RS-123D

1. RCA-5U4G ..... Rectifier
2. RCA-6SN7GT ..... Amp. and Phase Inverter
3. RCA-6F6G ..... Output
4. RCA-6F6G ..... Output

Record Changer (RP-177B)
Turntable Speed ..... 78 r.p.m.
Record Capacity ..... Ten 12" or twelve 10" records

Undistorted Power Output ..... 10 watts

Maximum Power Output ..... 14 watts

Loudspeaker (92567-2)
Type ..... 12 inch Electrodynamic
Voice Coil Impedance ..... 2.2 ohms at 400 cycles

Dial Lamps (6) ..... Type No. 51, 6-8 volts, 0.2 amp.

Victrola Indicator Lamp. Type No. 44, 6-8 volts, 0.25 amp.

Jewel Lamp ..... Type No. 51, 6-8 volts, 0.2 amp.

Cabinet Dimensions
Height ..... 36 7/16" Width ..... 40 1/8" Depth ..... 17 15/16"

Tuning Drive Ratio ..... 18.4:1 (4.6 turns of knob)

Power Supply Rating ..... 115 volts, 60 cycles, 180 watts

Circuit Description

Built-in antennas are provided for Standard Broadcast ("A" Band), Short Wave ("C" Band) and Frequency Modulation ("FM"); connected through the range switch to the R.F. amplifier tube (V1). The output of the R.F. amplifier and the oscillator (V3) is fed into the grid of the mixer tube (V2). The intermediate frequency output of the mixer is coupled through transformers T1 (10.7 mc.) and T2 (455 kc.) (series connected) to the 1st I.F. amplifier tube. The output of the I.F. amplifier is coupled through trans. T3 (10.7 mc.) and T4 (455 kc.) whose secondaries are connected to the grid of V5 (2nd I.F.) and the detector diode of V8 (AM Det.) respectively. The 10.7 mc. output of V5 is coupled through trans. T5 to the grid of the driver tube (V6) whose output is coupled through the driver trans. (T6) and the ratio detector trans. to the ratio detector tube (V7).

Simple A.V.C. is used on "A" and "C" bands, delayed A.V.C. is used on FM.

The audio voltages developed in the detector circuits of V7 (FM) and V8 (AM) are coupled through the range switch and volume control to V8 (AF amp.)

When the range switch is turned to PHONO position grid of V5 (this tube serves as 2nd I.F. on FM); the output of V5 (as phono. amp) is the screen grid (pin No. 6) and is coupled through the range switch and volume control to V8 (A.F. amp.) and also to the "Magic Monitor" which varies the audio output during phono operation. The audio output of V8 is coupled to the AMP output jack.

When the selector switch is turned to max. counter-clockwise position this instrument may be used as an audio amplifier. The audio input for this purpose is connected to the AUX jack (middle) at the rear (or bottom) of the chassis. The input from this jack is coupled through the range switch and volume control to the grid of V8.

Note: Plate voltage supplied to V5 (2nd I.F.) on FM only. Plate and screen voltages supplied to V6 (driver) on FM only. Plate and screen voltages supplied to V3 (osc.) on FM, A and C bands only.

The circuit of the A.F. amplifier chassis is conventional consisting of a 6SN7GT which serves as audio amplifier and phase inverter feeding into two 6F6G tubes connected in push-pull. A 5U4G rectifier supplies B+ voltage for both chassis (RK-121C and RS-123D).

MODEL 8V151

RADIO CORP. OF AMERICA

RADIO CHASSIS (RK-121C) VOLTAGE CHART

Tube	Type	Terminal	Aux or PH	BC	SW	FM
V1	6BA6 R.F.	Plate No. 5	260	247	245	225
		Screen No. 6	100	96	94	87
V2	6BA6 Mixer	Plate No. 5	260	245	240	222
		Screen No. 6	96	87	71	68
		Cathode No. 7	6.1	7	1.9	1.6
V3	6BE6 Osc.	Plate No. 5	..	160	157	130
		Screen Nos. 6 & 7	..	160	157	130
		*Grid No. 1	..	-28	-11	-4.1
		†Grid No. 1	..	-18	-10.5	-6
V4	6BA6 1st I.F.	Plate No. 5	240	232	225	208
		Screen No. 6	118	110	106	100
		Cathode No. 7	1.2	1.2	1.2	1.1
V5	6AU6 2nd I.F.	Plate No. 5	115	112	112	218
		Screen No. 6				137
V6	6AU6 Driver	Plate No. 5	..	..	..	197
		Screen No. 6	..	..	..	80
V7	6AL5 R. Det.	.....	..	..	..	..
V8	6AT6 Det.-AF.	Plate No. 7	110	108	108	110
V9	6BA6 M.M. Amp.	Plate No. 5	210	200	200	184
		Screen No. 6	70	68	68	63
		Cathode No. 7	7	6.6	6.6	6
V10	6BF6 M.M. Amp.&Rect.	Plate No. 7	121	117	117	107
		Cathode No. 2	6.6	6.4	6.4	5.8
V11	6BA6 Reactor	Plate No. 5	2.6	2.6	2.6	3.1
		Screen No. 6	36	35	35	45

*Tuning condenser at high frequency end.
†Tuning condenser at low frequency end.

RADIO CHASSIS CATHODE CURRENTS (MA)

V1	6BA6	No. 7	16.9	16.5	16.5	14
V2	6BA6	No. 7	3.1	3.2	3.8	4.9
V3	6BE6	No. 2	0	14.1	14.1	15.8
V4	6BA6	No. 7	14	13.8	13.8	†13.2
V5	6AU6	No. 7	1.8	1.8	1.8	3.9
V6	6AU6	No. 7	0	0	0	18.3
V7	6AL5	.....	0	0	0	0
V8	6AT6	No. 2	.25	.25	.25	.25
V9	6BA6	No. 7	.9	.9	.9	.88
V10	6BF6	No. 2	1.3	1.3	1.3	1.2
V11	6BA6	No. 7	1.36	1.35	1.35	1.3

Voltages measured with Chanalyst or VoltOhmyst and should hold within ± 20% with rated power supply. No signal. Tuning condenser closed except as stated.

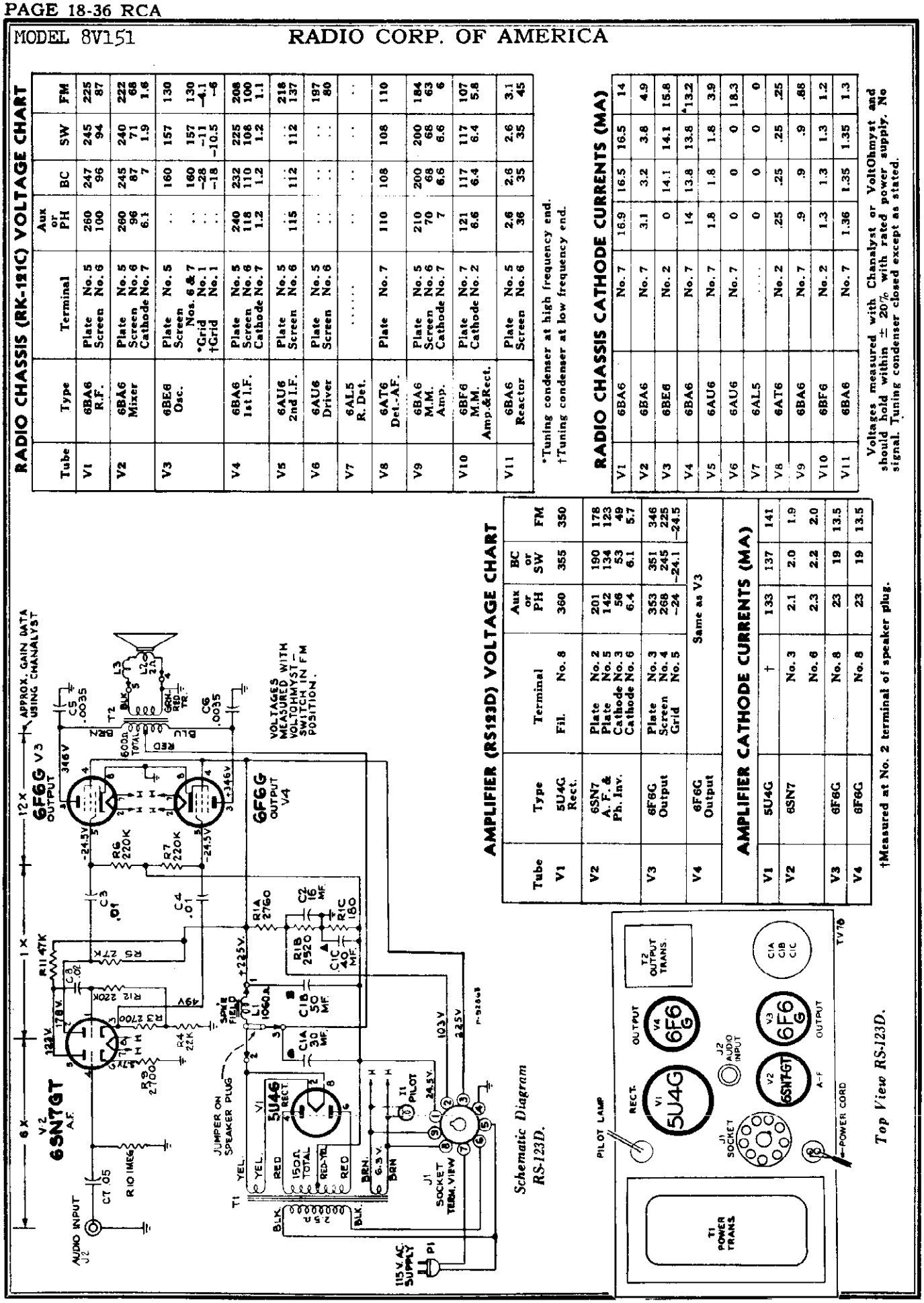
AMPLIFIER (RS123D) VOLTAGE CHART

Tube	Type	Terminal	Aux or PH	BC or SW	FM
V1	5U4G Rect.	Fil. No. 8	360	355	350
V2	6SN7 A. F. & Ph. Inv.	Plate No. 2	201	190	178
		Plate No. 5	142	134	123
		Cathode No. 3	56	53	49
		Cathode No. 6	6.4	6.1	5.7
V3	6F6G Output	Plate No. 3	353	351	346
		Screen No. 4	268	245	225
		Grid No. 5	-24	-24.1	-24.5
V4	6F6G Output	Same as V3			

AMPLIFIER CATHODE CURRENTS (MA)

V1	5U4G	†	133	137	141
V2	6SN7	No. 3	2.1	2.0	1.9
		No. 6	2.3	2.2	2.0
V3	6F6G	No. 8	23	19	13.5
V4	6F6G	No. 8	23	19	13.5

†Measured at No. 2 terminal of speaker plug.



ALIGNMENT PROCEDURE

Before aligning set, completely mesh the gang and set the dial pointer on the mechanical maximum calibration point at the extreme left hand end of the dial.

When making a complete alignment follow in proper sequence the tabulated form below.

If only a portion of the circuit is to be aligned select the portion required, followed by the remaining steps in the chart. Any adjustments made on the FM 10.7 mc. IF's make it necessary to realign the AM 455 kc. IF's.

For "A" and "C" band alignment use output meter across voice coil keeping Test Oscillator output as low as possible to prevent AVC action.

CRITICAL LEAD DRESS

(Make lead dress before alignment)

1. Lead from pin 5, tube V2, to terminal "C" on transformer T1 should be dressed close to chassis.
2. Leads to terminals "C" and "D" on transformer T2 should be dressed close together.
3. The following capacitors must be dressed close to the chassis with leads kept as short as possible: C32, C33, C66, C69, C79, and C80.
4. All FM coil connections must be soldered in exact place as the original. (One-sixteenth inch difference in length may be excessive).
5. Lead from pin 7, tube V8, must be dressed away from lead to terminal "D" of transformer T7.
6. ALL wiring in the receiver is critical as to length and placement. It is therefore important when servicing, that extreme care should be taken so as not to disturb more of the wiring than absolutely necessary.

Note: Keep tuning capacitor rotor grounding brushes clean and making good contact.

FM RATIO DETECTOR ALIGNMENT

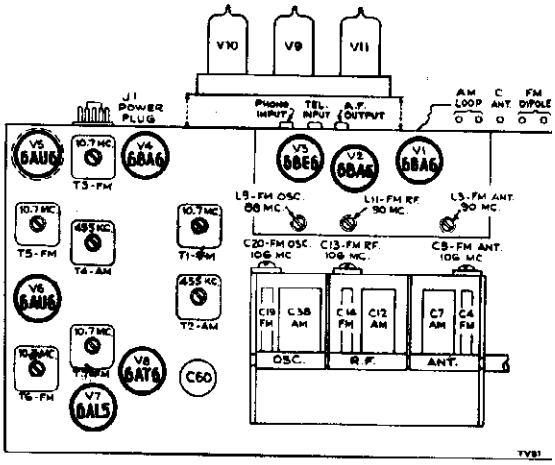
SET RANGE SWITCH TO FM POSITION

Steps	Connect High Side of Test Osc. To—	Tune the Osc. To—	Turn Vol. Cont. To—	Adjust
1.	Connect a 680 ohm Resistor between lugs D and E of the ratio detector transformer T7. Connect DC probe of a volt-ohmyst to the negative lead of the 5 mfd. Electrolytic capacitor C81. The common lead of the meter to chassis.			
2.	Driver grid pin 1, of 6AU6 (V6) in series with a .01 MFD capacitor.	10.7 MC 30% Mod. 400 Cycles AM	Maximum Volume	Driver transformer T6 for maximum DC voltage across C-81
3.	Remove Meter Leads and disconnect the 680 ohm resistor from D and E on T7. Connect two 68,000 ohm resistors (within 1% of each other) in series, across C81. Connect the common lead of the Voltohmyst to the center point of the 68,000 ohm resistors and the DC probe to contact No. 7 on rear of Switch wafer S6. Use the 30 volt scale.			
4.	Same as Step 2	Same as Step 2	Volume Control Maximum	†T7 Bottom core for Zero DC Balance on Voltohmyst ††T7 top core for minimum audio output. (Output meter across voice coil)
5.	Reconnect voltohmyst as in step 1, omitting the 680 ohm resistor.			
6.	Repeat step 2 omitting 680 ohms.			
7.	Remove all connections.			

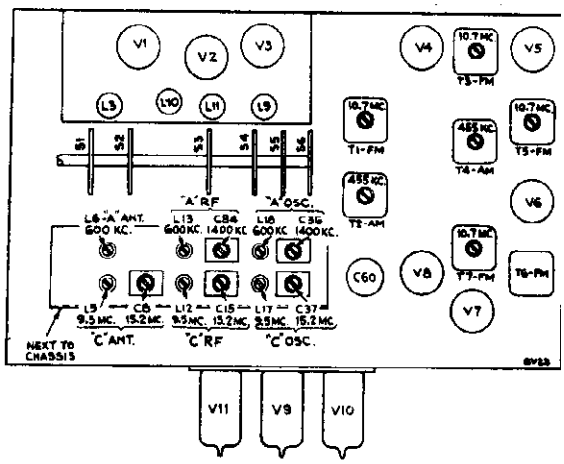
†Near the correct core position the zero point is approached rapidly and continued adjustment causes the indicated polarity to reverse. A slow approach to the zero point is an indication of severe detuning, and the bottom core should be turned in the opposite direction.

††The zero DC balance and the minimum AF output should occur at the same point: if such is not the case, the two cores should be adjusted until both occur with no further adjustment of either core. It may be advantageous to adjust both cores simultaneously, watching the volt-ohmyst, and an output meter connected across the voice coil for the point at which both zero DC and minimum output occurs.

Note:—Two or more points may be found which will satisfy the condition required in step 4. T7 top core should be correctly adjusted when approximately ⅛ inch of threads extend above the can, therefore, it is desirable to start adjustment with the top core in its furthest "in" position and turn out, while adjusting the bottom core, until the first point of minimum AF and minimum DC is reached.



Tube and Trimmer Locations — Top View.



Tube and Trimmer Locations — Bottom View.

ANT.—RF.—IF. ALIGNMENT

Steps	Connect the High Side of the Test Osc. to—	Connect Ground Side of the Test Osc.	Tune the Osc. To—	Radio Dial Tuned to—	Adjust

"FM" IF Alignment

1.	Connect the DC probe of a voltohmyst to the negative lead of the 5 MFD electrolytic capacitor C 81, and the common lead of the meter to chassis ground				
2.	Mixer grid pin #1 of 6BA6, (V2) in series with a .01 MFD capacitor (Adjust test osc. output for 6-10 volts developed across C81) (Range switch in FM position) (Use very short lead)	To RF Tube shelf ground near mixer tube(use very short leads)	10.7 MC 30% modulated at 400 cycles AM.	Max. cap. (Fully meshed)	*T5, T3, T1 top and bottom cores alternately loading primary & secondary of each transformer with 680 ohms while the opposite side of the same transformer is being adjusted. Adjust all transformers for maximum voltage across C81.

*This method is known as alternate loading which involves the use of 680 ohm resistor to load the plate winding while the grid winding of the same transformer is being peaked. Then the grid winding is loaded with 680 ohm resistor while the plate winding is being peaked.

When the windings are loaded, it is necessary to increase the 10.7 MC input since the gain will decrease and the voltage across C81 will be less

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ANT—RF—IF—ALIGNMENT (Continued)

Steps	Connect the High Side of the Test Osc. to—	Connect Ground Side of the Test Osc.	Tune the Osc. To—	Radio Dial Tuned to—	Adjust
"AM" IF Alignment					
3.	Mixer grid pin #1 of (V2) in series with a .01 MFD Capacitor. (Turn band switch to "A" or "C" band)	To chassis ground	455KC	High Freq. end of Dial	**Top and bottom Cores of T2 and T4. (For maximum voltage across voice coil)
"C" Band OSC.—RF.—ANT. Alignment					
4.	"C" Band Ant. Terminal #3 Through a dummy Ant. comprising a 150 ohm resistor in series with a 25 to 30 mmf capacitor	To Chassis ground	15.5 MC	15.5 MC	Osc.—C37*** RF.—C15 Ant.—C8 (For maximum voltage across voice coil)
5.			9.5 MC	9.5 MC	Osc.—L17*** RF—L12 Ant.—L5 (For maximum voltage across voice coil)
6.	Repeat steps 4 and 5 for accurate alignment				
"A" Band OSC.—RF.—ANT.					
7.	High Side (Red Lead) of Loop Primary with link open through a Dummy Ant. comprising a 200 mmf. Capacitor	To Chassis ground	1400 KC	1400 KC	Osc.—C36 RF.—C84 Ant.—C1 (For maximum voltage across voice coil)
8.			600 KC	600 KC	Osc.—L18 RF—L13 Ant.—L6 (For maximum voltage across voice coil)
9.	Repeat steps 7 and 8 for Max. output.				

**It is necessary to alternately load the primary and secondary of each 455 KC I. F. transformer with 10,000 ohms while the opposite side of the same transformer is being adjusted.

***To guard against the possibility of alignment of L17 and C37 to image frequencies, tune the test oscillator to 15.5 MC and turn the radio dial to 15.5 MC. Then adjust the test oscillator to 16.41 MC (image frequency). By increasing the test oscillator output, a signal should be heard.

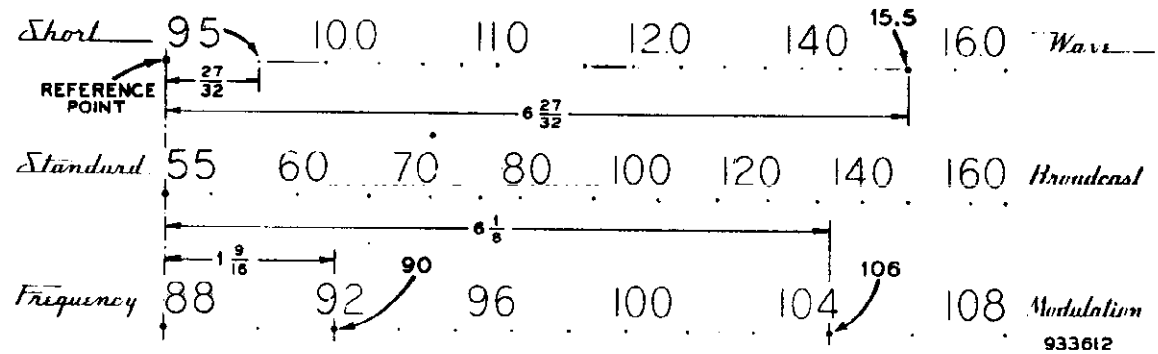
Tune the test oscillator to 9.5 MC and turn the radio dial to 9.5 MC, then adjust the test oscilliator to 10.41 MC (image frequency). By increasing the test oscillator output, a signal should be heard.

(If these image frequencies cannot be heard, the set is incorrectly aligned, therefore repeat steps 4 and 5)).

Steps	Connect the High Side of the Test Osc. to—	Connect Ground Side of the Test Osc.	* Tune the Osc. To—	Radio Dial Tuned to	Adjust
"FM" Band OSC.—RF.—ANT. Alignment					
10.	FM antenna terminal #1 in series with a 120 ohm resistor	To FM antenna terminal #2 in series with a 120 ohm resistor	106 MC	106 MC	Osc.—C20 for maximum voltage across C81.
11.			88 MC	88 MC	**** Osc.—L9 for maximum voltage across C81.
12.	Repeat steps 10 and 11 for exact calibration.				
13.	Remove or turn test oscillator off.			106 MC No Carrier	***** RF, C13 for maximum voltage across C81 (Noise Voltage)
14.				90 MC No Carrier	**** RF, L11 for maximum voltage across C81. (Noise Voltage)
15.	Repeat steps 13 and 14 for maximum output.				
16.	Same as step 10	Same as step 10	106 MC	106 MC	Ant. C5 for maximum voltage across C81.
17.	Same as step 10	Same as step 10	90 MC	90 MC	Ant. L3 for maximum voltage across C81.
18.	Repeat steps 16 and 17 for maximum output.				
19.	Disconnect dummy antenna and adjust Ant. trimmer C1 on loop when set is installed in cabinet.				

****Two points may be found to fulfill the requirements. Use the one with the longest threaded end extending out of the transformer.

*****Two points can be found having the greatest noise voltage developed Use the one with the greater capacity (tighter adjustment).



Dial Scale Drawing.

Replacement Parts

Stock No.	DESCRIPTION
	HEAD END UNIT RK 121C
71964	Arm—Push arm and cam for tuning capacitor
71651	Ball—Steel ball (3/32" dia.) for manual tuning shaft
3658	Ball—Steel ball (3/32" dia.) for tuning capacitor
10705	Ball—Steel ball (5/32" dia.) for tuning capacitor
71638	Board—5 contact terminal board for antenna lead-in
71811	Bracket—Idler bracket less pulley
71642	Bracket—Dial plate support bracket R.H.
71643	Bracket—Dial plate support bracket L.H.
72986	Bushing—Threaded bushing for knob end of switch coupling shaft
71809	Capacitor—Adjustable, 1.6-18 mmf. (C36)
71804	Capacitor—Adjustable, 1.6-18 mmf. (C5, C13)
71803	Capacitor—Adjustable, 2.5-13 mmf. (C20)
71808	Capacitor—Adjustable, 3-35 mmf. (C37, C84)
71930	Capacitor—Ceramic, 5.6 mmf. (C85)
39043	Capacitor—Ceramic, 6.8 mmf. (C25)
71807	Capacitor—Adjustable, 10-160 mmf. (C8, C15)
71924	Capacitor—Ceramic, 56 mmf. (C24)
39396	Capacitor—Ceramic, 100 mmf. (C16, C21, C83, C97)
71922	Capacitor—Ceramic, 180 mmf. (C34)
71933	Capacitor—Mica, 180 mmf. (C18)
71920	Capacitor—Ceramic, 220 mmf. (C6, C10)
71919	Capacitor—Ceramic, 330 mmf. (C3, C11)
39640	Capacitor—Mica, 330 mmf. (C92)
39644	Capacitor—Mica, 470 mmf. (C75, C90)
39646	Capacitor—Mica, 560 mmf. (C94)
71929	Capacitor—Ceramic, 1000 mmf. (C80)
72117	Capacitor—Tubular, .0012 mfd., 400 v. (C53)
71927	Capacitor—Tubular, .002 mfd., 400 v. (C59, C95)
71921	Capacitor—Tubular, .003 mfd., 200 v. (C9, C26, C27, C62, C82)
71926	Capacitor—Tubular, .005 mfd., 200 v. (C40, C42, C43, C66, C76, C77, C78, C86)
72791	Capacitor—Tubular, .005 mfd., 400 v. (C44, C55, C58, C68, C69, C88, C91)
72120	Capacitor—Tubular, .015 mfd., 200 v. (C65)
70612	Capacitor—Tubular, .025 mfd., 200 v. (C64)
71923	Capacitor—Tubular, .01 mfd., 200 v. (C22, C23, C63, C93)
72827	Capacitor—Tubular, .01 mfd., 400 v. (C32, C35, C54, C89, C96)
70631	Capacitor—Tubular, .01 mfd., 600 v. (C61)
71588	Capacitor—Moulded paper, .01 mfd., 600 v. (C87)
72596	Capacitor—Tubular, .05 mfd., 200 v. (C33, C39, C41, C73, C79)
72121	Capacitor—Electrolytic, 5 mfd., 50 v. (C67, C81)
32223	Capacitor—Electrolytic, 15 mfd., 300 v. (C60)
71646	Clamp—Dial clamp (2 required)
71940	Coil—Antenna coil—F.M.—Complete with adjustable core and stud (L2, L3)
71856	Coil—Antenna coil—"C" band—complete with adjustable core and stud (L4, L5)
71942	Coil—Filament choke coil (L7, L8)
71855	Coil—Loop loading coil—"A" band—complete with adjustable core and stud (L6)
71937	Coil—Oscillator coil—F.M.—complete with adjustable core and stud (L9)
71853	Coil—Oscillator coil—"C" band—complete with adjustable core and stud (L17)
71852	Coil—Oscillator coil—"A" band—complete with adjustable core and stud (L18)
71854	Coil—R. F. coil—"C" band—complete with adjustable core and stud (L12)
71939	Coil—R. F. choke coil (L10)
71857	Coil—R. F. coil—"A" band—Complete with adjustable core and stud (L13, L14)
71938	Coil—R. F. coil—F.M.—complete with adjustable core and stud (L11)
38405	Control—Tone control—H.F. (R27)
38401	Control—Tone control—L.F. (R26)
71596	Control—Volume control (R42)
72987	Cord—Manual drive cord (approx. 42" overall required) or indicator drive cord (approx. 30" overall required)
71941	Coupling—F.M. coupling unit (L16, C17, R5)
71654	Dial—Glass dial scale—F.M.
71653	Dial—Glass dial scale—Standard Broadcast
71652	Dial—Glass dial scale—Short Wave
71805	Drum—Tuning condenser drive drum
71800	Gear—12 tooth gear fastened to selector switch coupling shaft
71801	Gear—18 tooth gear fastened to selector switch shaft
35844	Gear—Scissor gear for tuning capacitor
71799	Grommet—Rubber grommet to mount R.F. unit cradle (6 required)
70429	Grommet—Rubber grommet to mount tube socket (4 required)
72674	Grommet—Rubber grommet for chassis front mounting (2 required)
72069	Grommet—Rubber grommet for chassis rear mounting (2 required)
71647	Guide—Indicator slide guide
71832	Indicator—Station selector indicator
11765	Lamp—Dial lamp—Mazda 51
11891	Lamp—Pilot lamp—Mazda 44
71962	Pinion—Pinion and shaft for tuning capacitor
71963	Plate—Bearing plate for tuning capacitor pinion
72984	Plate—Connecting plate for selector switch extension shafts
71644	Plate—Dial back plate only, less dial window, dials, supports, indicator slide, indicator and pulleys
71648	Pulley—Idler pulley (2 required) or indicator cord pulleys
71650	Pulley—Manual tuning shaft cord pulley
71636	Receptacle—9 prong male plug for power cable (J1)
71637	Receptacle—AMP-AUX-PHONO jacks
72323	Resistor—Wire wound, 3 ohms, ½ watt (R32)
	Resistor—Fixed, composition, 10 ohms, ±20%, ½ watt (R54)
	Resistor—Fixed, composition, 100 ohms, ±10%, ½ watt (R21, R22)
	Resistor—Fixed, composition, 270 ohms, ±10%, ½ watt (R38)
	Resistor—Fixed, composition, 390 ohms, ±10%, ½ watt (R10)
	Resistor—Fixed, composition, 1,000 ohms, ±20%, ½ watt (R24, R37, R46)
	Resistor—Fixed, composition, 2,200 ohms, ±20%, ½ watt (R12, R25, R36)
	Resistor—Fixed, composition, 2,200 ohms, ±10%, ½ watt (R9, R52)
	Resistor—Fixed, composition, 4,700 ohms, ±20%, ½ watt (R4, R68)
	Resistor—Fixed, composition, 8,200 ohms, ±10%, ½ watt (R13, R63)
	Resistor—Fixed, composition, 10,000 ohms, ±10%, 1 watt (R6)
	Resistor—Fixed, composition, 12,000 ohms, ±10%, ½ watt (R76)
	Resistor—Fixed, composition, 15,000 ohms, ±20%, ½ watt (R30, R51)
	Resistor—Fixed, composition, 15,000 ohms, ±10%, ½ watt (R44, R48)
	Resistor—Fixed, composition, 15,000 ohms, ±10%, 1 watt (R7)
	Resistor—Fixed, composition, 22,000 ohms, ±20%, ½ watt (R3, R31, R35, R49)
	Resistor—Fixed, composition, 22,000 ohms, ±10%, ½ watt (R18)
	Resistor—Fixed, composition, 22,000 ohms, ±20%, 1 watt (R43)
	Resistor—Fixed, composition, 27,000 ohms, ±10%, ½ watt (R11, R45)
	Resistor—Fixed, composition, 39,000 ohms, ±10%, ½ watt (R60)
	Resistor—Fixed, composition, 68,000 ohms, ±20%, ½ watt (R56)
	Resistor—Fixed, composition, 82,000 ohms, ±10%, ½ watt (R29, R64)
	Resistor—Fixed, composition, 100,000 ohms, ±20%, ½ watt (R28, R58, R59, R65, R70)
	Resistor—Fixed, composition, 100,000 ohms, ±10%, ½ watt (R16)
	Resistor—Fixed, composition, 100,000 ohms, ±10%, 1 watt (R75)
	Resistor—Fixed, composition, 180,000 ohms, ±10%, ½ watt (R17, R20, R34, R55, R66)
	Resistor—Fixed, composition, 220,000 ohms, ±20%, ½ watt (R33, R71, R72, R74)
	Resistor—Fixed, composition, 270,000 ohms, ±10%, ½ watt (R53)
	Resistor—Fixed, composition, 330,000 ohms, ±20%, ½ watt (R61, R67)
	Resistor—Fixed, composition, 330,000 ohms, ±10%, ½ watt (R77)
	Resistor—Fixed, composition, 470,000 ohms, ±20%, ½ watt (R14, R39)
	Resistor—Fixed, composition, 820,000 ohms, ±10%, ½ watt (R57, R69)
	Resistor—Fixed, composition, 1 megohm, ±20%, ½ watt (R1, R2, R19, R73, R78)
	Resistor—Fixed, composition, 2.2 megohm, ±10%, ½ watt (R15, R41, R47, R50, R62)
	Resistor—Fixed, composition, 3.9 megohm, ±10%, ½ watt (R8)
	Resistor—Fixed, composition, 22 megohm, ±20%, ½ watt (R23)
71798	Screw—No. 8—32 x 5/32" set screw
71965	Screw—Push arm locking screw
71812	Shaft—Manual tuning shaft less spring and pulley
*73726	Shaft—Selector switch coupling shaft—switch end
*73727	Shaft—Selector switch coupling shaft—knob end—less threaded bushing
72951	Shield—Lead tube shield
71833	Socket—Dial lamp socket—R.H.
71834	Socket—Dial lamp socket—L.H.
71931	Socket—Pilot lamp socket
71850	Socket—Tube socket complete with base and shield
73117	Socket—Tube socket
72516	Socket—Tube socket, miniature
71649	Spring—Coil spring for manual tuning shaft

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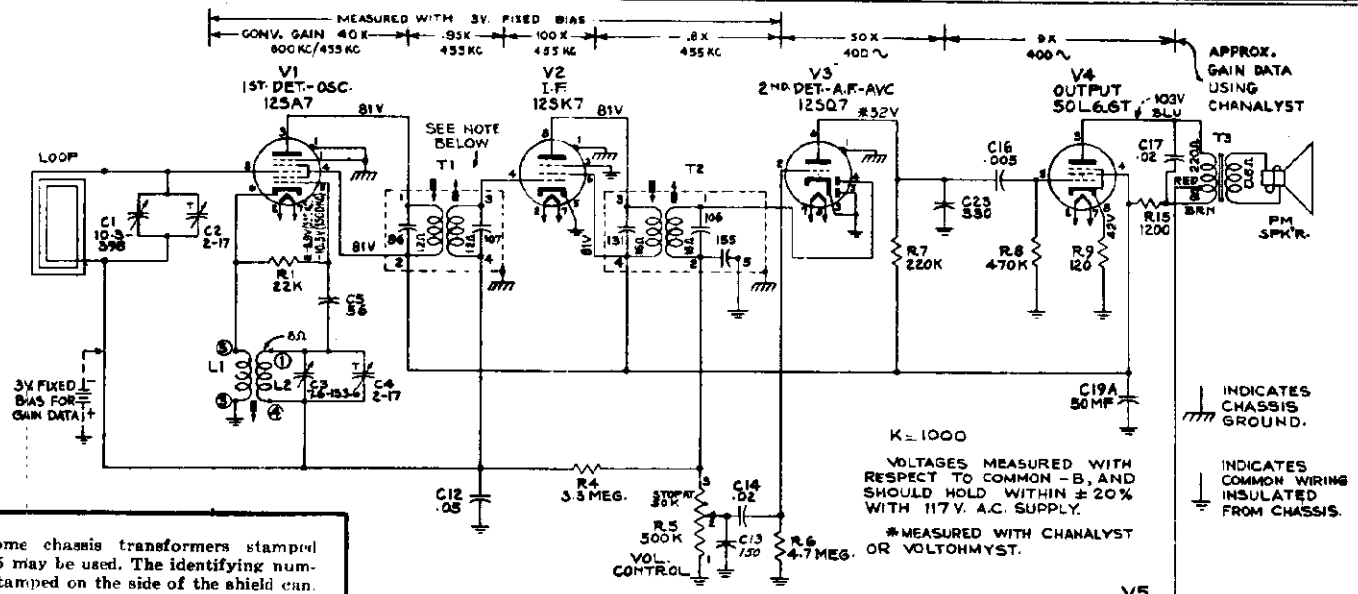
Replacement Parts (Continued)

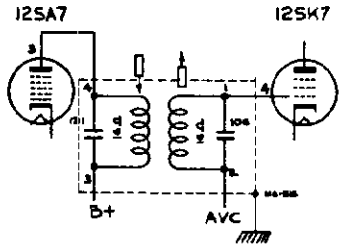
Stock No.	DESCRIPTION
71936	Spring—Drive cord spring
33622	Spring—Push button arm return spring
*73658	Switch—"Magic Monitor" and power switch (S7, S8)
71802	Switch—Selector switch (S1, S2, S3, S4, S5, S6)
71645	Support—Glass support (rubber) (2 required)
71845	Transformer—First I.F. transformer — F.M. (T1) (C28, C30)
71846	Transformer—First I.F. transformer — A.M. (T2) (C29, C31)
71847	Transformer—Second I.F. transformer — F.M. (T3) (C45, C47, C51)
71848	Transformer—Second I.F. transformer — A.M. (T4) (C46, C48, C49, C50)
71849	Transformer—Third I.F. transformer — F.M. (T5) (C56, C57)
71935	Transformer—Driver transformer (T6) (C70)
71934	Transformer—Ratio detector transformer (T7) (C72, C74)
37435	Washer—"C" washer for holding threaded bushing to selector switch shaft
31608	Washer—Spring washer for drive cord pulleys or idler pulley
71875	Washer—Spring washer for chassis front mounting
2917	Washer—Spring washer for selector switch coupling shaft and bushing (knob-end) or manual tuning shaft
71810	Window—Dial window (clear glass)
	AMPLIFIER ASSEMBLIES RS 123D
70646	Capacitor—Tubular, .0035 mfd., 1,000 volts (C5, C6)
70631	Capacitor—Tubular, .01 mfd., 600 volts (C3, C4)
70632	Capacitor—Tubular, .02 mfd., 600 volts (C8)
72596	Capacitor—Tubular, .05 mfd., 200 volts (C7)
31323	Capacitor—Electrolytic, 16 mfd., 150 volts (C2)
72955	Capacitor—Electrolytic, comprising 1 section of 30 mfd., 450 volts; 1 section of 50 mfd., 400 volts; and 1 section of 40 mfd., 25 volts (C1A, C1B, C1C)
11765	Lamp—Jewel lamp—Mazda 51
18469	Plate—Mounting plate (bakelite) for electrolytic capacitor
12493	Plug—5 contact female plug for speaker cable
	Resistor—Fixed, composition, 2,700 ohms, ±10%, ½ watt (R3, R9)
	Resistor—Fixed, composition, 22,000 ohms, ±10%, ½ watt (R4)
	Resistor—Fixed, composition, 27,000 ohms, ±10%, ½ watt (R5)
	Resistor—Fixed, composition, 47,000 ohms, ±20%, ½ watt (R11)
	Resistor—Fixed, composition, 220,000 ohms, ±20%, ½ watt (R6, R7, R12)
71660	Resistor—Voltage divider, comprising 1 section of 180 ohms, 3.5 watts, 1 section of 2,520 ohms, 3.97 watts, and 1 section of 2,760 ohms, 9.3 watts (R1a, R1b, R1c)
	Resistor—Fixed, composition, 1 megohm, ±20%, ½ watt (R10)
35787	Socket—Audio input socket
71659	Socket—9 prong power socket (J1)
31364	Socket—Jewel lamp socket
31319	Socket—Tube socket
37048	Transformer—Power transformer, 115 volts, 60 cycle (T1)
71661	Transformer—Output transformer (T2)
	SPEAKER ASSEMBLIES 92567-2W RL 70R1
13867	Cap—Dust cap
71147	Clamp—Clamp to hold metal cone suspension (2 required)
71146	Coil—Field coil—1,060 ohms
11469	Coil—Neutralizing coil
36145	Cone—Cone complete with voice coil
31539	Plug—5 prong male plug for speaker
71144	Speaker—12" EM speaker complete with cone and voice coil less plug
71145	Suspension—Metal cone suspension
	NOTE: If stamping on speaker in instrument does not agree with above speaker number, order replacement parts by referring to model number of instrument, number stamped on speaker and full description of part required.
	MISCELLANEOUS
72555	Antenna—Dipole antenna
*73714	Back—Cabinet back—burgundy—for mahogany or walnut instruments
*73715	Back—Cabinet back—tan—for blonde instruments
71599	Bracket—Jewel lamp bracket
71874	Bushing—Bushing and washer for large knobs
*73626	Bumper—Rubber bumper for record changer carriage actuating link
71884	Button—Push button
71863	Cable—5 wire moulded lead-in cable
72583	Cable—Shielded pickup cable complete with pin plug
13103	Cap—Pilot lamp jewel
38684	Capacitor—Mica trimmer, 2-20 mmf. (C1)
*73695	Carriage—Record changer mounting carriage complete with runners
71892	Catch—Bullet catch and strike for lower doors
72434	Check—Radio compartment door check
X1813	Cloth—Grille cloth for mahogany or walnut instruments
X1666	Cloth—Grille cloth for blonde instruments
71966	Decal—Trade mark decal (Victrola)
71910	Decal—Trade mark decal (RCA-Victor)
*73716	Escutcheon—Escutcheon only less window, screen and marker strips for mahogany instruments
*73717	Escutcheon—Escutcheon only less window, screen and marker strips for walnut instruments
*73718	Escutcheon—Escutcheon only less window, screen and marker strips for blonde instruments
*73712	Gasket—Rubber gasket—tan—for under escutcheon for blonde instruments
*73713	Gasket—Rubber gasket—black—for under escutcheon for mahogany or walnut instruments
*73870	Grille—Metal grille for mahogany or walnut instruments
*73873	Grille—Metal grille for blonde instruments
*73699	Grommet—Rubber grommet for mounting record changer (4 required)
*73702	Grommet—Rubber grommet for loop mounting (2 required)
16058	Grommet—Rubber grommet for speaker mounting (3 required)
*73871	Hinge—Speaker compartment door or record storage compartment door hinge (2 required for each door)
73735	Hinge—L.H. hinge for phono compartment door or R.H. hinge for radio compartment door
*73751	Hinge—R.H. hinge for phono compartment door or L.H. hinge for radio compartment door
*73711	Knob—Selector switch or power switch knob—brown—for blonde instruments
71822	Knob—Selector switch or power switch knob—maroon—for mahogany or walnut instruments
72761	Knob—Tone control knob—brown—for blonde instruments
71883	Knob—Tone control knob—maroon—for mahogany or walnut instruments
72118	Knob—Volume control or tuning knob—brown—for blonde instruments
71821	Knob—Volume control or tuning knob—maroon—for mahogany or walnut instruments
*73616	Link—Actuating link assembly for record changer carriage—R.H.
*73617	Link—Actuating link assembly for record changer carriage—L.H.
71862	Loop—Antenna loop complete (L1, L15, C1)
71969	Marker—Station markers
72765	Nut—Speed nut to fasten transparent screen to escutcheon (2 required)
71879	Plate—Backing plate for transparent screen
71881	Plate—Call letter marker plate
71819	Plate—Radio compartment door check mounting plate
30868	Plug—2 contact female plug for power cable
30870	Plug—2 prong male plug for power cable
32641	Plug—3 prong male plug for loop cable
31048	Plug—Pin plug for shielded pickup cable
*73872	Pull—Door pull
71878	Screen—Transparent screen (Victrola indicator)
36422	Socket—3 contact socket for loop cable
*73618	Spring—Connecting spring between link and record changer carriage
*73697	Spring—Conical spring for mounting record changer
71818	Spring—Radio compartment door check spring
30900	Spring—Retaining spring for knobs
71867	Spring—Retaining spring for push button
73185	Stop—Metal stop for record changer carriage
72936	Stop—Stop for lower doors
70164	Stop—Stop for phono compartment door
71880	Strip—Backing strip for call letter marker plate
*73612	Track—Record changer carriage mechanism track complete with mounting plate (2 required)
71814	Washer—Rubber washer for radio compartment door check
71882	Window—Window for call letter markers

†Stock No. 72987 is a spool containing 150 feet of cord.

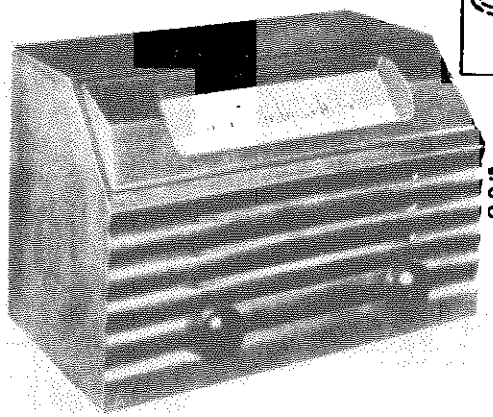
*This is the first time that this Stock No. has appeared in Service Data.

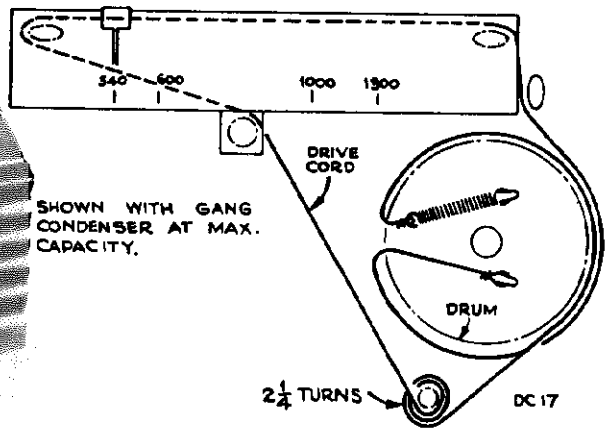


In some chassis transformers stamped 970441-5 may be used. The identifying number is stamped on the side of the shield can. The schematic diagram below shows the connections, d-c resistance and shunt capacitors of transformers stamped 970441-5.



Frequency Range ..... 540-1600 kc
Intermediate Frequency ..... 455 kc
Power Output
Undistorted ..... 1.0 watt
Maximum ..... 1.5 watts
Tube Complement
(1) RCA-12SA7 ..... Converter
(2) RCA-12SK7 ..... I.F. Amplifier
(3) RCA-12SQ7 ..... 2nd Det., A.V.C., and A.F. Amplifier
(4) RCA-50L6GT ..... Power Output
(5) RCA-35Z5GT ..... Rectifier
Pilot Lamp ..... Mazda No. 51, 6-8 volts, 0.2 amp.
Loudspeaker
Type ..... 4" x 6" PM
V. C. Impedance ..... 3.4 ohms at 400 cycles
Power Supply Rating
105-125 volts, AC, 50 or 60 cycles, or DC ..... 80 watts





SHOWN WITH GANG CONDENSER AT MAX. CAPACITY.

Dial-Indicator and Drive Mechanism

MODEL 8X53

RADIO CORP. OF AMERICA

Alignment Procedure

Output Meter Alignment.—If this method is used, connect the meter across the voice coil, and turn receiver the volume control to maximum.

Test-Oscillator.—For all alignment operations, connect the low side of the test-oscillator to the receiver chassis, and keep the oscillator output as low as possible to avoid a-v-c action.

Calibration Scale.—The glass tuning dial may be removed from the cabinet and mounted above the pointer for reference during alignment. The extreme left hand mark of the Standard Broadcast scale must be in line with the left hand mark on the dial backing plate.

Dial Backing Plate.—In the event that only the chassis is returned for service, the marks on the dial backing plate may be used during alignment; refer to the Dial Indicator and Drive Mechanism drawing for corresponding frequencies.

Dial Pointer.—With the gang condenser in full mesh the dial pointer should be set to the left hand reference mark on the dial backing plate.

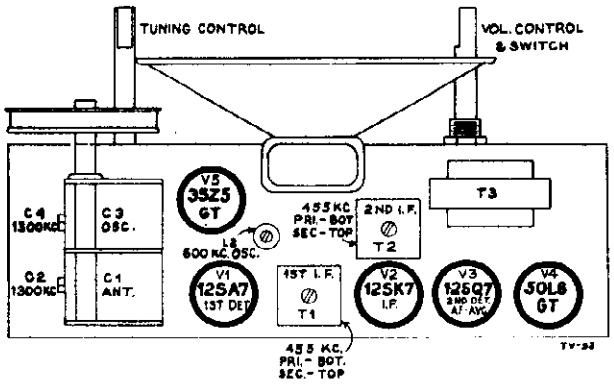
For additional information refer to booklet, "RCA Victor Receiver Alignment."

Steps	Connect the high side of test-oscillator to—	Tune test-osc. to—	Turn radio dial to—	Adjust the following for max. peak output
1	12SK7 I-F grid through 0.1 mfd. capacitor	455 kc	Quiet-point 1,600 kc end of dial	T2 Top & bottom 2nd. I-F trans.
2	Stator of C1 through 0.1 mfd.			*T1 Top & bottom 1st. I-F trans.
3	Short wire placed near loop antenna	1,300 kc	1,300 kc	C4 (osc.) C2 (ant.)
4		600 kc	600 kc "A" Band	L2 (osc.) Rock gang
5	Repeat steps 3 and 4			

*Do not readjust T2 when test oscillator is connected to C1.

Critical Lead Dress

1. Dress all heater leads next to chassis.
2. Dress power cord away from volume control and audio circuits.
3. Dress capacitor (C14) toward switch and parallel to chassis length.
4. Dress capacitor (C16) back against rear chassis apron.
5. Dress capacitor (C17) over and towards 50L6 socket perpendicular to capacitor (C14) and (C16).
6. Dress pilot lamp leads over second I-F transformer and away from tubes.
7. Dress blue lead from output transformer against front apron and away from I-F leads.



Tube and Trimmer Locations

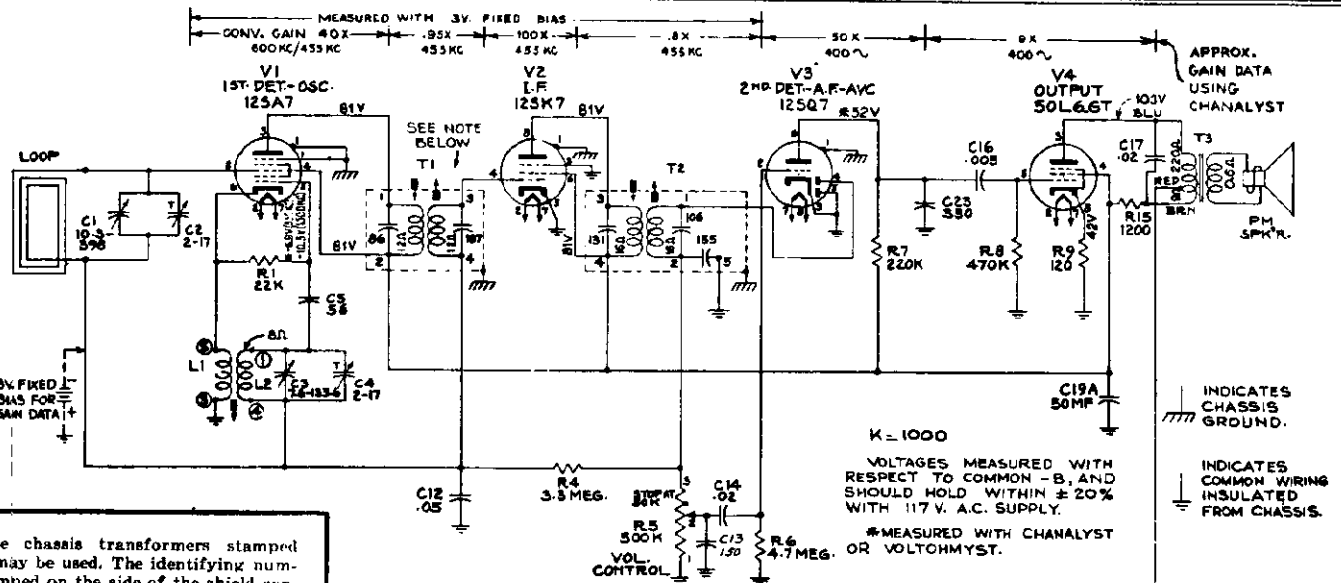
Replacement Parts

STOCK No.	DESCRIPTION	STOCK No.	DESCRIPTION
	CHASSIS ASSEMBLY RC-1064		Resistor—Fixed composition, 3.3 megohms, ±20%, ½ watt (R4)
			Resistor—Fixed composition, 4.7 megohms, ±20%, ½ watt (R6)
39622	Capacitor—Mica, 56 mmf. (C5)	70467	Shaft—Tuning knob shaft
39632	Capacitor—Mica, 150 mmf. (C13)	34449	Socket—Lamp socket
72571	Capacitor—Mica, 330 mmf. (C23)	37605	Socket—Tube socket, molded
70606	Capacitor—Tubular, .005 mfd., 400 volts (C16)	70390	Spring—Drive cord tension spring
70611	Capacitor—Tubular, .02 mfd., 400 volts (C14, C17)	73036	Transformer—First I.F. transformer (T1)
70615	Capacitor—Tubular, .05 mfd., 400 volts (C12, C18)	73037	Transformer—Second I.F. transformer (T2)
70617	Capacitor—Tubular, 0.1 mfd., 400 volts (C24)	72296	Transformer—Output transformer (T3)
70408	Capacitor—Electrolytic, comprising 1 section of 30 mfd., 150 volts and 1 section of 50 mfd., 150 volts (C19A, C19B)	33726	Washer—"C" washer for tuning knob shaft
73048	Coil—Oscillator coil (L1, L2)		**SPEAKER ASSEMBLY 922258-1**
73047	Condenser—Variable tuning condenser complete with drive drum (C1, C2, C3, C4)		
70322	Control—Volume control and power switch (R5, S1)	70470	Speaker—4" x 6" elliptical speaker complete with cone and voice coil
72913	Cord—Drive cord (approx. 40" overall length required)		
72283	Grommet—Rubber grommet to mount tuning condenser (3 required)		NOTE: If stamping on speaker in instrument does not agree with above speaker number, order by referring to model number of instrument, and number stamped on speaker.
70469	Indicator—Station selector indicator		
11765	Lamp—Dial lamp—Mazda No. 51		**MISCELLANEOUS**
73049	Loop—Antenna loop complete		
70462	Plate—Dial back plate complete with drive cord pulleys less dial	*73209	Back—Cabinet back
36230	Pulley—Drive cord pulley	70398	Clamp—Dial clamp (1 set)
	Resistor—Fixed composition, 120 ohms, ±10%, ½ watt (R9)	*X1660	Cloth—Grille cloth
	Resistor—Fixed composition, 1200 ohms, ±10%, 1 watt (R15)	70476	Dial—Glass dial scale
	Resistor—Fixed composition, 22,000 ohms, ±20%, ½ watt (R1)	11771	Foot—Rubber foot (4 required)
	Resistor—Fixed composition, 220,000 ohms, ±20%, ½ watt (R7, R16)	71821	Knob—Control knob—maroon
	Resistor—Fixed composition, 470,000 ohms, ±20%, ½ watt (R8)	30900	Spring—Retaining spring for knobs

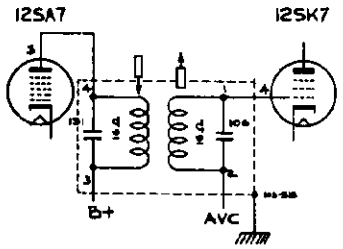
*THIS IS THE FIRST TIME THIS STOCK NUMBER HAS APPEARED IN SERVICE DATA

RADIO CORP. OF AMERICA

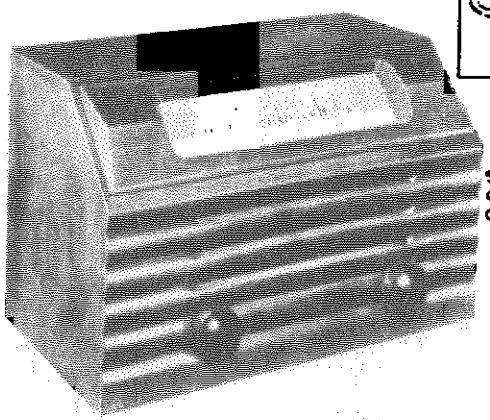
MODEL 8X53, CHASSIS RC 1064



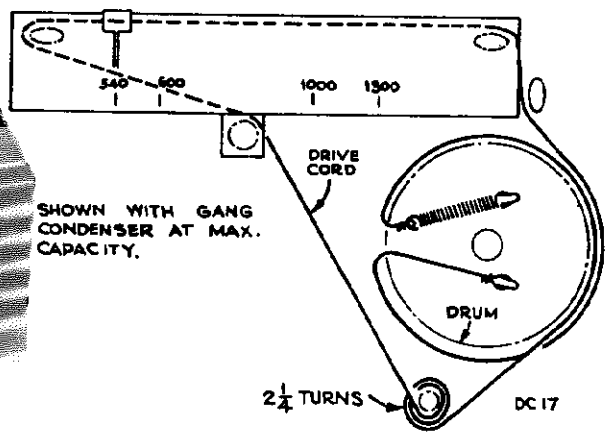
In some chassis transformers stamped 970441-5 may be used. The identifying number is stamped on the side of the shield can. The schematic diagram below shows the connections, d-c resistance and shunt capacitors of transformers stamped 970441-5.



Frequency Range	540-1600 kc
Intermediate Frequency	455 kc
Power Output	
Undistorted	1.0 watt
Maximum	1.5 watts
Tube Complement	
(1) RCA-12SA7	Converter
(2) RCA-12SK7	I.F. Amplifier
(3) RCA-12SQ7	2nd Det., A.V.C., and A.F. Amplifier
(4) RCA-50L6GT	Power Output
(5) RCA-35Z5GT	Rectifier
Pilot Lamp	Mazda No. 51, 6-8 volts, 0.2 amp.
Loudspeaker	
Type	4" x 6" PM
V. C. Impedance	3.4 ohms at 400 cycles
Power Supply Rating	
105-125 volts, AC, 50 or 60 cycles, or DC	30 watts



SHOWN WITH GANG CONDENSER AT MAX. CAPACITY.



Dial-Indicator and Drive Mechanism

MODEL 8X53 RADIO CORP. OF AMERICA

Alignment Procedure

Output Meter Alignment.—If this method is used, connect the meter across the voice coil, and turn receiver the volume control to maximum.

Test-Oscillator.—For all alignment operations, connect the low side of the test-oscillator to the receiver chassis, and keep the oscillator output as low as possible to avoid a-v-c action.

Calibration Scale.—The glass tuning dial may be removed from the cabinet and mounted above the pointer for reference during alignment. The extreme left hand mark of the Standard Broadcast scale must be in line with the left hand mark on the dial backing plate.

Dial Backing Plate.—In the event that only the chassis is returned for service, the marks on the dial backing plate may be used during alignment; refer to the Dial Indicator and Drive Mechanism drawing for corresponding frequencies.

Dial Pointer.—With the gang condenser in full mesh the dial pointer should be set to the left hand reference mark on the dial backing plate.

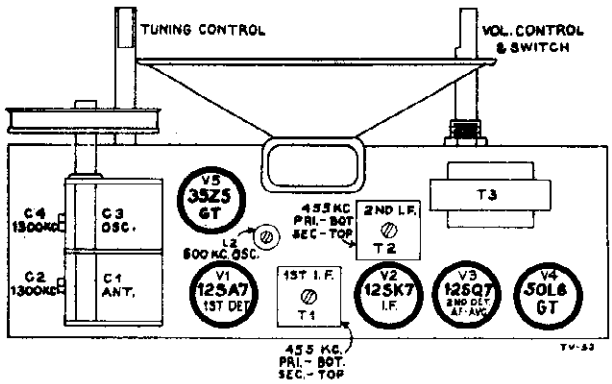
For additional information refer to booklet, "RCA Victor Receiver Alignment."

Steps	Connect the high side of test-oscillator to—	Tune test-osc. to—	Turn radio dial to—	Adjust the following for max. peak output
1	12SK7 I-F grid through 0.1 mfd. capacitor	455 kc	Quiet-point 1,600 kc end of dial	T2 Top & bottom 2nd. I-F trans.
2	Stator of C1 through 0.1 mfd.			*T1 Top & bottom 1st. I-F trans.
3	Short wire placed near loop antenna	1,300 kc	1,300 kc	C4 (osc.) C2 (ant.)
4		600 kc	600 kc "A" Band	L2 (osc.) Rock gang
5	Repeat steps 3 and 4			

*Do not readjust T2 when test oscillator is connected to C1.

Critical Lead Dress

1. Dress all heater leads next to chassis.
2. Dress power cord away from volume control and audio circuits.
3. Dress capacitor (C14) toward switch and parallel to chassis length.
4. Dress capacitor (C16) back against rear chassis apron.
5. Dress capacitor (C17) over and towards 50L6 socket perpendicular to capacitor (C14) and (C16).
6. Dress pilot lamp leads over second I-F transformer and away from tubes.
7. Dress blue lead from output transformer against front apron and away from I-F leads.

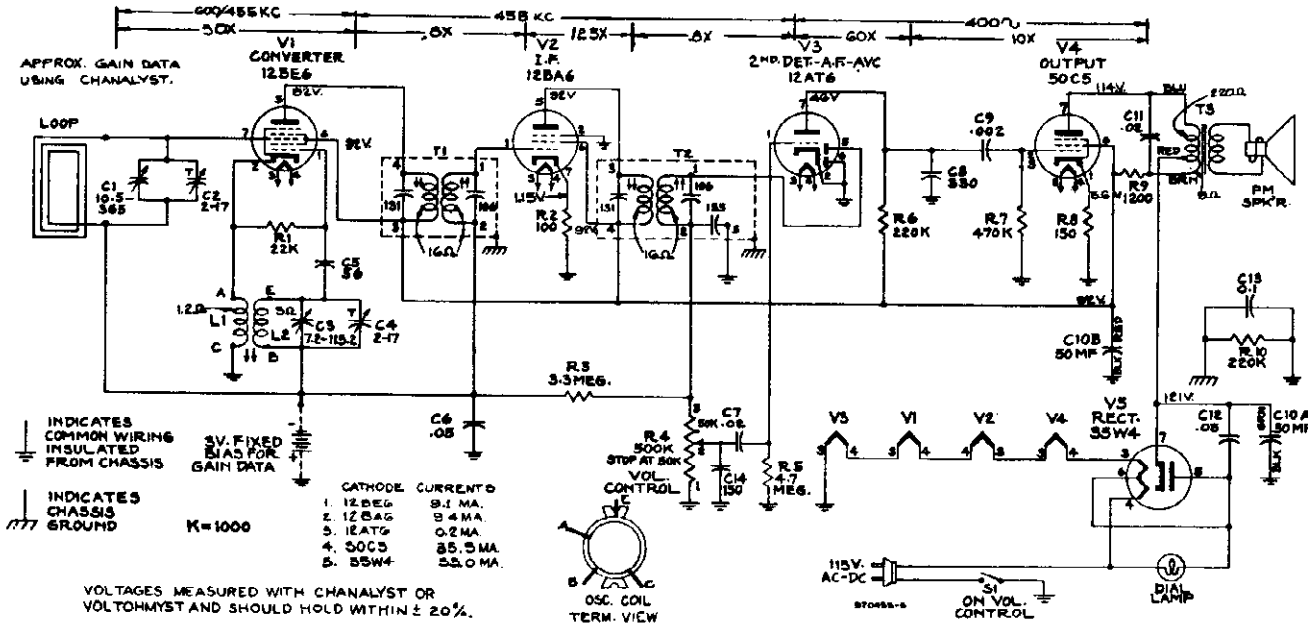


Tube and Trimmer Locations

Replacement Parts

STOCK No.	DESCRIPTION
	CHASSIS ASSEMBLY RC-1064
39622	Capacitor—Mica, 56 mmf. (C5)
39632	Capacitor—Mica, 150 mmf. (C13)
72571	Capacitor—Mica, 330 mmf. (C23)
70606	Capacitor—Tubular, .005 mfd., 400 volts (C16)
70611	Capacitor—Tubular, .02 mfd., 400 volts (C14, C17)
70615	Capacitor—Tubular, .05 mfd., 400 volts (C12, C18)
70617	Capacitor—Tubular, 0.1 mfd., 400 volts (C24)
70408	Capacitor—Electrolytic, comprising 1 section of 30 mfd., 150 volts and 1 section of 50 mfd., 150 volts (C19A, C19B)
73048	Coil—Oscillator coil (L1, L2)
73047	Condenser—Variable tuning condenser complete with drive drum (C1, C2, C3, C4)
70322	Control—Volume control and power switch (R5, S1)
72913	Cord—Drive cord (approx. 40" overall length required)
72283	Grommet—Rubber grommet to mount tuning condenser (3 required)
70469	Indicator—Station selector indicator
11765	Lamp—Dial lamp—Mazda No. 51
73049	Loop—Antenna loop complete
70462	Plate—Dial back plate complete with drive cord pulleys less dial
36230	Pulley—Drive cord pulley
	Resistor—Fixed composition, 120 ohms, ±10%, ½ watt (R9)
	Resistor—Fixed composition, 1200 ohms, ±10%, 1 watt (R15)
	Resistor—Fixed composition, 22,000 ohms, ±20%, ½ watt (R1)
	Resistor—Fixed composition, 220,000 ohms, ±20%, ½ watt (R7, R16)
	Resistor—Fixed composition, 470,000 ohms, ±20%, ½ watt (R8)
	Resistor—Fixed composition, 3.3 megohms, ±20%, ½ watt (R4)
	Resistor—Fixed composition, 4.7 megohms, ±20%, ½ watt (R6)
70467	Shaft—Tuning knob shaft
34449	Socket—Lamp socket
37605	Socket—Tube socket, molded
70390	Spring—Drive cord tension spring
73036	Transformer—First I.F. transformer (T1)
73037	Transformer—Second I.F. transformer (T2)
72296	Transformer—Output transformer (T3)
33726	Washer—"C" washer for tuning knob shaft
	SPEAKER ASSEMBLY 922258-1
70470	Speaker—4" x 6" elliptical speaker complete with cone and voice coil
	NOTE: If stamping on speaker in instrument does not agree with above speaker number, order by referring to model number of instrument, and number stamped on speaker.
	MISCELLANEOUS
*73209	Back—Cabinet back
70398	Clamp—Dial clamp (1 set)
*X1660	Cloth—Grille cloth
70476	Dial—Glass dial scale
11771	Foot—Rubber foot (4 required)
71821	Knob—Control knob—maroon
30900	Spring—Retaining spring for knobs

*THIS IS THE FIRST TIME THIS STOCK NUMBER HAS APPEARED IN SERVICE DATA



Alignment Procedure

Cathode Ray Alignment is the preferable method. Connections for the oscilloscope are shown on the schematic diagram.

Output Meter Alignment.—If this method is used, connect the meter across the voice coil, and turn the receiver volume control to maximum.

Test-Oscillator.—For all alignment operations, connect the low side of the test-oscillator to the receiver chassis, and keep the oscillator output as low as possible to avoid a-v-c action.

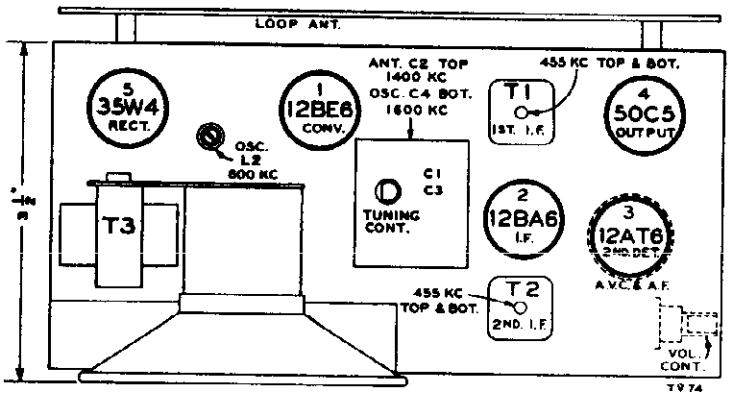
On AC operation an isolation transformer (115 v./115 v.) may be necessary for the receiver if the test oscillator is also AC operated.

For additional information refer to booklet "RCA Victor Receiver Alignment."

NOTE.—If the speaker should be removed in servicing, its position should be checked when re-assembling. The distance between the front of the speaker and the rear chassis apron should be maintained at 3½ inches.

Steps	Connect the high side of test-oscillator to—	Tune test-osc. to—	Turn radio dial to—	Adjust the following for max. output
1	12BA6 I-F grid through 0.1 mfd. capacitor	455 kc	Quiet-point 1,600 kc end of dial	T-2 (top and bottom) 2nd I-F trans.
2	Stator of C1 through 0.1 mfd.			T-1 (top and bottom) 1st I-F trans.
3	Short wire placed near loop to radiate signal.	1,600 kc	1,600 kc	C4 (osc.)
4		1,400 kc	1,400 kc	C2 (ant.)
5		600 kc	600 kc	L2 (osc.) Rock gang
6		Repeat steps 3, 4 and 5.		

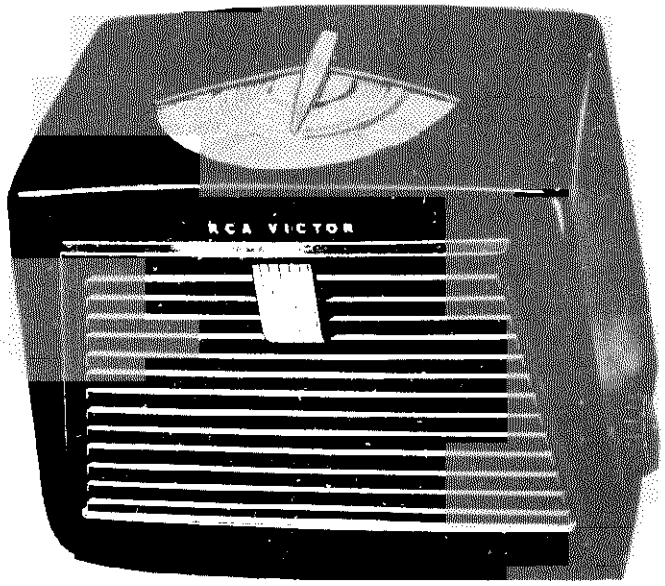
*Do not readjust T-2 when test oscillator is connected to C1.



Tube and Trimmer Locations

MODELS 8X521, 8X522,
CHASSIS RC-1066, 1066A

RADIO CORP. OF AMERICA



Specifications

Tuning Range ..... 540-1600 kc
Intermediate Frequency ..... 455 kc
Power Output
Undistorted ..... 1.0 watt
Maximum ..... 1.4 watts
Tube Complement
(1) RCA-12BE6 ..... Converter
(2) RCA-12BA6 ..... I.F. Amplifier
(3) RCA-12AT6...2nd Det., A.V.C., and A.F. Amplifier
(4) RCA-50C5 ..... Output
(5) RCA-35W4 ..... Rectifier
Pilot Lamp ..... Mazda No. 51, 6-8 volts, 0.2 amp.
Loudspeaker (92577-1)
Type ..... 4-inch PM
V. C. Impedance ..... 3.2 ohms at 400 cycles

Cabinet Dimensions
Height ..... 5⅝" Width ..... 7⅞" Depth ..... 5"

Power Supply Rating
115 volts, AC, 50 or 60 cycles, or DC ..... 30 watts

POWER SUPPLY POLARITY.—For operation on d-c, the power plug must be inserted in the outlet for correct polarity. If the set does not function, reverse the plug. On a-c, reversal of the plug may reduce hum.

Critical Lead Dress

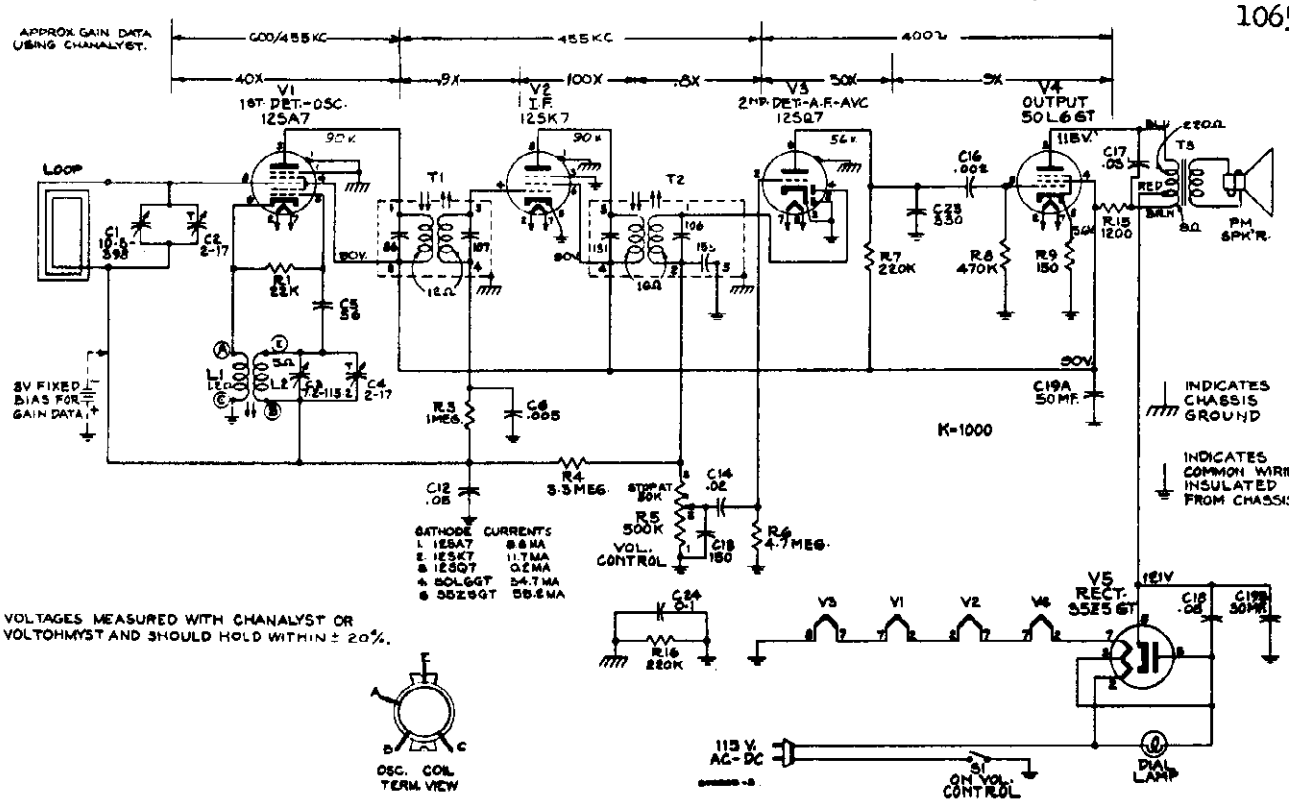
1. Dress all heater leads close to chassis.
2. Dress output plate bypass capacitor C11 inside of terminal board.
3. Dress all exposed leads away from each other and away from chassis.

Replacement Parts

Stock No.	DESCRIPTION
	CHASSIS ASSEMBLIES **RC 1066—8X521** **RC 1066A—8X522**
73499	Capacitor—Ceramic, 56 mmf. (C5)
*73501	Capacitor—Ceramic, 150 mmf. (C14)
72571	Capacitor—Mica, 330 mmf. (C8)
70601	Capacitor—Tubular, .002 mfd., 400 volts (C9)
70611	Capacitor—Tubular, .02 mfd., 400 volts (C7, C11)
70615	Capacitor—Tubular, .05 mfd., 400 volts (C6, C12)
70617	Capacitor—Tubular, 0.1 mfd., 400 Volts (C13)
*73500	Capacitor—Electrolytic, comprising 1 section of 30 mfd., 150 volts and 1 section of 50 mfd., 150 volts (C10A, C10B)
*73935	Clip—Spring clip for mounting I.F. transformers (2 required)
70133	Coil—Oscillator coil (L1, L2)
*73495	Condenser—Variable tuning condenser (C1, C2, C3, C4)
*73498	Control—Volume control and power switch (R4, S1)
*73496	Loop—Antenna loop and back cover—for Model 8X521
*73497	Loop—Antenna loop and back cover—for Model 8X522
	Resistor—Fixed, composition, 100 ohms, ±10%, ½ watt (R2)
	Resistor—Fixed, composition, 150 ohms, ±10%, ½ watt (R8)
	Resistor—Fixed, composition, 1,200 ohms, ±10%, 1 watt (R9)
	Resistor—Fixed, composition, 22,000 ohms, ±20%, ½ watt (R1)
	Resistor—Fixed, composition, 220,000 ohms, ±20%, ½ watt (R6, R10)
	Resistor—Fixed, composition, 470,000 ohms, ±20%, ½ watt (R7)
	Resistor—Fixed, composition, 3.3 megohm, ±20%, ½ watt (R3)
	Resistor—Fixed, composition, 4.7 megohm, ±20%, ½ watt (R5)
34449	Socket—Lamp socket
73117	Socket—Tube socket
*73488	Transformer—First I.F. transformer (T1)
73037	Transformer—Second I.F. transformer (T2)
72296	Transformer—Output transformer (T3)
	SPEAKER ASSEMBLY **92577-1W**
73123	Speaker—4" P.M. speaker complete with cone and voice coil
	MISCELLANEOUS
*73502	Bezel—Decorative bezel
Y2001	Cabinet—Ivory plastic cabinet complete with dial back plate, indicator, escutcheon and wire trim for Model 8X522
Y1499	Cabinet—Maroon plastic cabinet complete with dial back plate, indicator, escutcheon and wire trim for Model 8X521
*73508	Clip—Spring clip to fasten dial knob
*73507	Dial—Calibrated dial knob
*73511	Fastener—Push fastener to hold dial back plate (3 required)
*73510	Fastener—Push fastener to hold loop (2 required)
*73504	Indicator—Station selector indicator
*73506	Knob—Volume control and power switch knob—Ivory—for Model 8X522
*73505	Knob—Volume control and power switch knob—maroon—for Model 8X521
11765	Lamp—Dial lamp—Mazda 51
71095	Nut—Speed nut to fasten wire trim (2 required)
*73509	Plate—Dial back plate
*73503	Rod—Wire trim rod
30900	Spring—Retaining spring for knobs

RADIO CORP. OF AMERICA

MODELS 8X541, 8X542, 8X547; CHASSIS RC-106 106!



Alignment Procedure

Cathode-Ray Alignment is the preferable method. Connections for the oscilloscope are shown in the schematic diagram.

Output Meter Alignment.—If this method is used, connect the meter across the voice coil, and turn the receiver volume control to maximum.

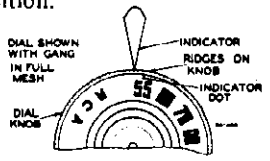
Test-Oscillator.—For all alignment operations, connect the low side of the test-oscillator to the receiver chassis, and keep the oscillator output as low as possible to avoid a-v-c action.

On AC operation an isolation transformer (115 v./115 v.) may be necessary for the receiver if the test oscillator is also AC operated.

Dial Centering:

If the mounting of the tuning condenser has been disturbed, it may be necessary to adjust its position after replacing the chassis in the cabinet. This may be done in the following manner:

1. Install chassis and tighten the three mounting screws.
2. Replace tuning knob.
3. Loosen the two screws which hold the tuning condenser mounting bracket to the chassis.
4. Adjust the position of the tuning condenser mounting bracket so that the tuning knob may be rotated without binding on the cabinet. With tuning condenser plates fully meshed the dial should be in the position indicated below.
5. The two screws should then be tightened to maintain this position.

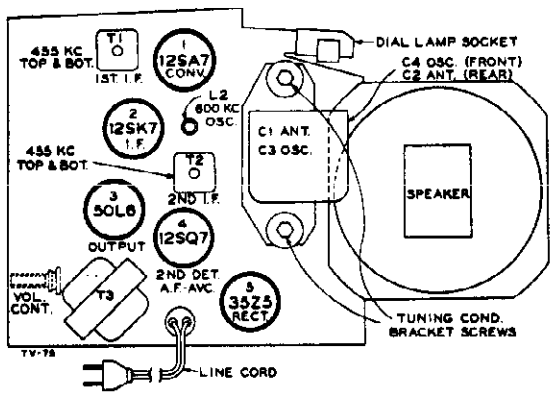


Dial and Indicator

Steps	Connect the high side of test-oscillator to—	Tune test-osc. to—	Turn radio dial to—	Adjust the following for max. output
1	12SK7 I-F grid through 0.1 mfd. capacitor	455 kc	Quiet-point 1600 kc end of dial	T2 (Top and bottom) 2nd I-F trans.
2	Stator of C1 through 0.1 mfd.			*T1 (top and bottom) 1st I-F trans.
3	Short wire placed near loop to radiate signal	1600 kc	1600 kc	C4 (osc.)
4		1400 kc	1400 kc	†C2 (ant.)
5		600 kc	600 kc	L2 (osc.) Rock gang
6		Repeat steps 3, 4 and 5.		

*Do not readjust T2 when test oscillator is connected to C1.

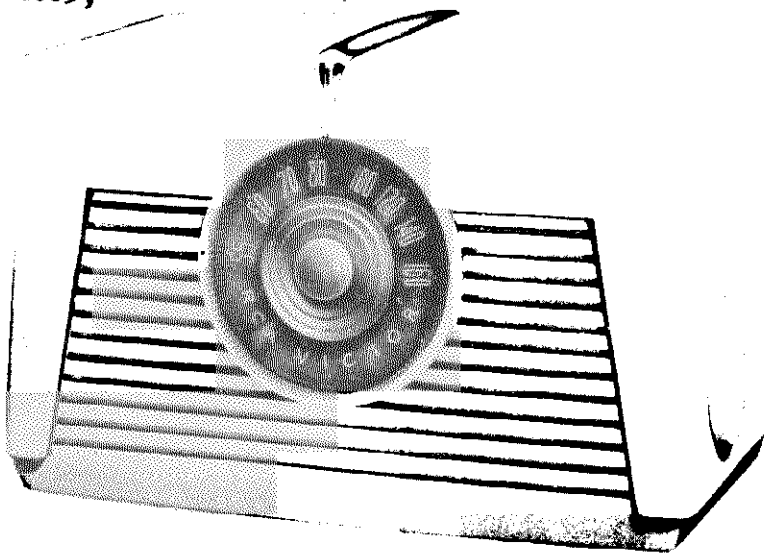
†When adjusting C2 (ant. trimmer) it is necessary to have the loop in the same position and spacing as it will have when assembled in the cabinet. This spacing is 3¼" from chassis loop.



Tube and Trimmer Locations

MODELS 8X541, 8X542, 8X547; CHASSIS RC-1065, 1065A

RADIO CORP. OF AMERICA



Specifications

Tuning Range ..... 540-1600 kc

Intermediate Frequency ..... 455 kc

Power Output
Undistorted ..... 1.0 watt
Maximum ..... 1.5 watts

Tube Complement
(1) RCA-12SA7 ..... Converter
(2) RCA-12SK7 ..... I.F. Amplifier
(3) RCA-12SQ7 ..... 2nd Det., A.V.C., and A.F. Amplifier
(4) RCA-50L6GT ..... Output
(5) RCA-35Z5GT ..... Rectifier

Pilot Lamp ..... Mazda No. 47, 6-8 volts, 0.15 amp.

Loudspeaker (92577-5)
Type ..... 4-inch PM
V. C. Impedance ..... 3.2 ohms at 400 cycles

Cabinet Dimensions
Height ..... 7" Width ..... 10¾" Depth ..... 5⅞"

Power Supply Rating
115 volts, AC, 50 or 60 cycles, or DC ..... 30 watts

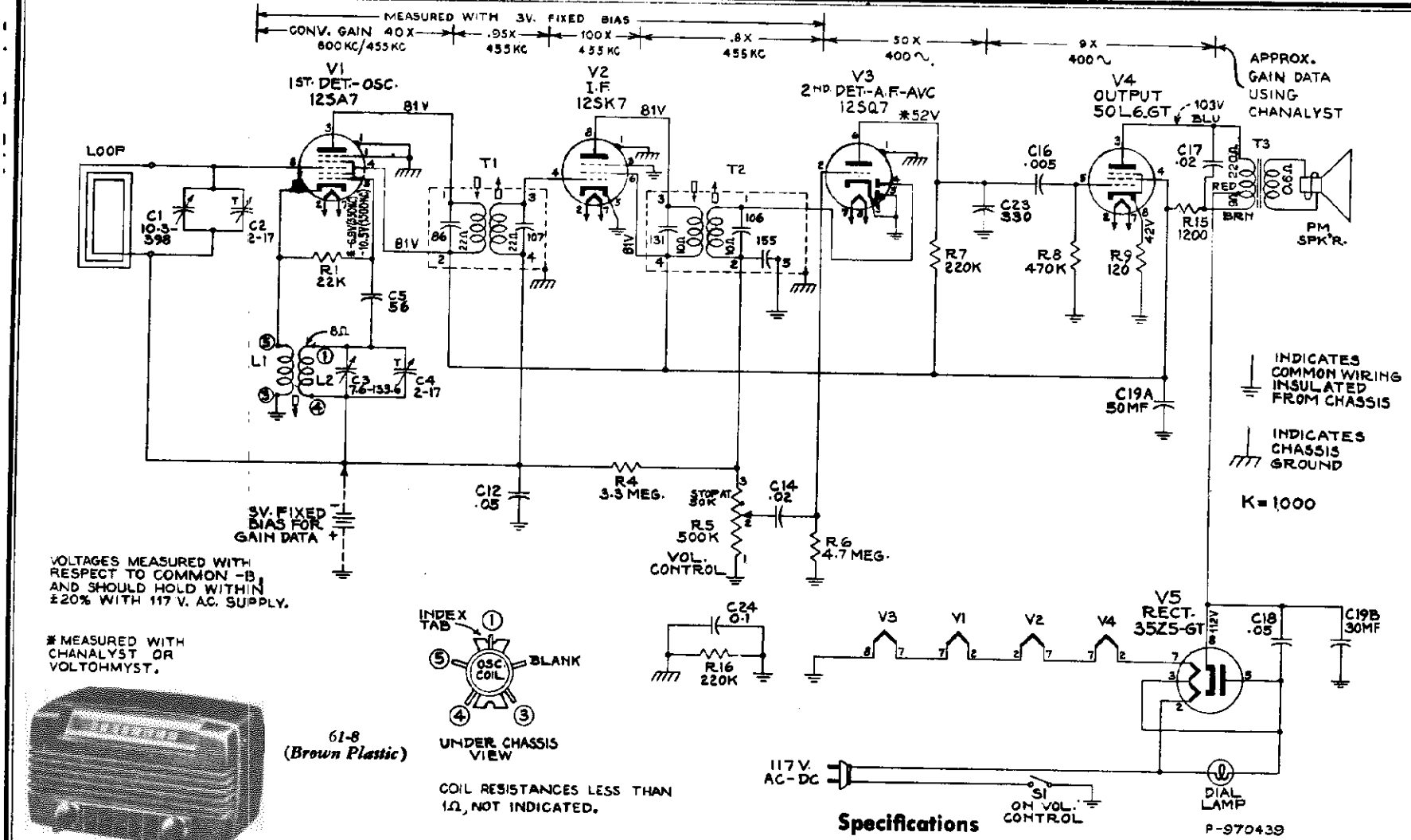
POWER SUPPLY POLARITY.—For operation on d-c, the power plug must be inserted in the outlet for correct polarity. If the set does not function, reverse the plug. On a-c, reversal of the plug may reduce hum.

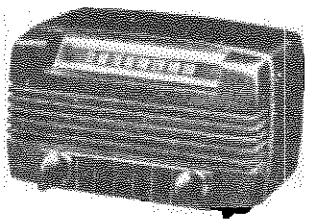
Critical Lead Dress

1. Dress all heater leads close to chassis.
2. Dress pilot light leads away from speaker cone.
3. Dress lead to low side of loop between the two gang condenser leads.
4. Dress C5 (AVC by-pass) close to the bend in the base and clear of the 2nd I.F. transformer.

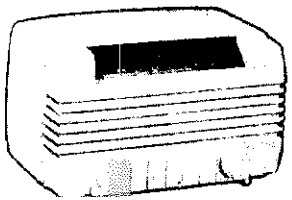
Replacement Parts

Stock No.	DESCRIPTION
	CHASSIS ASSEMBLIES **RC 1065—8X541** **RC 1065A—8X542, 8X547**
73499	Capacitor—Ceramic, 56 mmf. (C5)
73501	Capacitor—Ceramic, 150 mmf. (C13)
72571	Capacitor—Mica, 330 mmf. (C23)
70601	Capacitor—Tubular, .002 mfd., 400 volts (C16)
70606	Capacitor—Tubular, .005 mfd., 400 volts (C6)
70611	Capacitor—Tubular, .02 mfd., 400 volts (C14)
70613	Capacitor—Tubular, .03 mfd., 400 volts (C17)
70615	Capacitor—Tubular, .05 mfd., 400 volts (C12, C18)
70617	Capacitor—Tubular, 0.1 mfd., 400 volts (C24)
73500	Capacitor—Electrolytic, comprising 1 section of 50 mfd., 150 volts and 1 section of 30 mfd., 150 volts (C19a, C19b)
73935	Clip—Spring clip for mounting I.F. transformers (2 required)
70133	Coil—Oscillator coil (L1, L2)
*73485	Condenser—Variable tuning condenser (C1, C2, C3, C4)
38410	Control—Volume control and power switch (R5, S1)
72283	Grommet—Rubber grommet to mount tuning condenser (3 required)
*73486	Loop—Loop and back cover assembly for Model 8X541
*73487	Loop—Loop and back cover assembly for Models 8X542 or 8X547
	Resistor—Fixed, composition, 150 ohms, ±10%, ½ watt (R9)
	Resistor—Fixed, composition, 1,200 ohms, ±10%, 1 watt (R15)
	Resistor—Fixed, composition, 22,000 ohms, ±20%, ½ watt (R1)
	Resistor—Fixed, composition, 220,000 ohms, ±20%, ½ watt (R7, R16)
	Resistor—Fixed, composition, 470,000 ohms, ±20%, ½ watt (R8)
	Resistor—Fixed, composition, 1 megohm, ±20%, ½ watt (R3)
	Resistor—Fixed, composition, 3.3 megohm, ±20%, ½ watt (R4)
	Resistor—Fixed, composition, 4.7 megohm, ±20%, ½ watt (R6)
34449	Socket—Lamp socket
54414	Socket—Tube socket
73036	Transformer—First I-F transformer (T1)
73037	Transformer—Second I-F transformer (T2)
71111	Transformer—Output transformer (T3)
	SPEAKER ASSEMBLY **92577-5W**
73919	Speaker—4" P.M. speaker complete with cone and voice coil
	MISCELLANEOUS
*Y1495	Cabinet—Plastic cabinet — maroon — complete with station indicator and dial backing disc for Model 8X541
*Y1496	Cabinet—Plastic cabinet — ivory — complete with station indicator and dial backing disc for Model 8X542
*Y2053	Cabinet—Plastic cabinet—white—complete with station indicator and dial backing disc—for Model 8X547
73494	Clip—Spring clip to hold cabinet back and loop assembly to cabinet (4 required)
73489	Dial—Dialing knob
*73493	Disc—Dial backing disc
*73492	Indicator—Station selector indicator
*73490	Knob—Volume control and power switch knob—maroon—for Model 8X541
*73491	Knob—Volume control and power switch knob—ivory—for Model 8X542
74007	Knob—Volume control and power switch knob—white — for Model 8X547
31480	Lamp—Dial lamp—Mazda 47
38458	Nut—Speed nut to fasten indicator to cabinet (2 required)
*73914	Spring—Retaining spring for dial knob
14270	Spring—Retaining spring for volume control knob





61-8
(Brown Plastic)



61-9
(Ivory Plastic)

Specifications

Frequency Range ..... 540-1600 kc

Intermediate Frequency ..... 455 kc

Power Output

Undistorted ..... 1.0 watt
Maximum ..... 1.5 watts

Tube Complement

(1) RCA Radiotron 12SA7 ..... Converter
(2) RCA Radiotron 12SK7 ..... I-F Amplifier
(3) RCA Radiotron 12SQ7 ..... 2nd Det., A.V.C., and A-F Amplifier
(4) RCA Radiotron 50L6GT ..... Power Output
(5) RCA Radiotron 35Z5GT ..... Rectifier

POWER SUPPLY POLARITY.—For operation on DC, the power plug must be inserted in the outlet for correct polarity. If the set does not function, reverse the plug. On AC, reversal of the plug may reduce hum.

Loudspeaker (922258-1)

Type ..... 4" x 6" PM
V. C. Impedance ..... 3.4 ohms at 400 cycles

Cabinet Dimensions	**Height**	**Width**	**Depth**
Cabinet (Outside)	7"	11¾"	7½"
Shipping Weight			9 lbs.
Tuning Drive Ratio			20:1

Power Supply Rating

MODELS 61-8, 61-9,
CHASSIS RC-1064

RADIO CORP. OF AMERICA

Alignment Procedure

Output Meter Alignment.—If this method is used, connect the meter across the voice coil, and turn receiver the volume control to maximum.

Test-Oscillator.—For all alignment operations, connect the low side of the test-oscillator to the receiver chassis, and keep the oscillator output as low as possible to avoid a-v-c action.

Calibration Scale.—The glass tuning dial may be removed from the cabinet and mounted above the pointer for reference during alignment. The extreme left hand mark of the Standard Broadcast scale must be in line with the left hand mark on the dial backing plate.

Dial Backing Plate.—In the event that only the chassis is returned for service, the marks on the dial backing plate may be used during alignment; refer to the Dial Indicator and Drive Mechanism drawing for corresponding frequencies.

Dial Pointer.—With the gang condenser in full mesh the dial pointer should be set to the left hand reference mark on the dial backing plate.

For additional information refer to booklet, "RCA Victor Receiver Alignment."

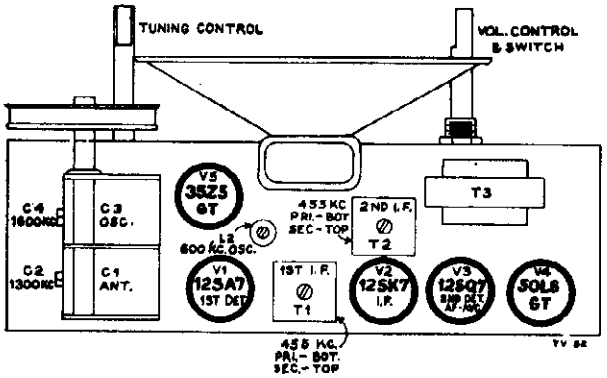
ALIGNMENT TABULATION RC-1064

Steps	Connect the high side of test-oscillator to—	Tune test-osc. to—	Turn radio dial to—	Adjust the following for max. peak output
1	12SK7 I-F grid through 0.1 mfd. capacitor	455 kc	Quiet-point 1,600 kc end of dial	T2 Top & bottom 2nd. I-F trans.
2	Stator of C1 through 0.1 mfd.			*T1 Top & bottom 1st. I-F trans.
3	Short wire placed near loop antenna	1,300 kc	1,300 kc	C4 (osc.) C2 (ant.)
4		600 kc	600 kc "A" Band	L2 (osc.) Rock gang
5	Repeat steps 3 and 4			

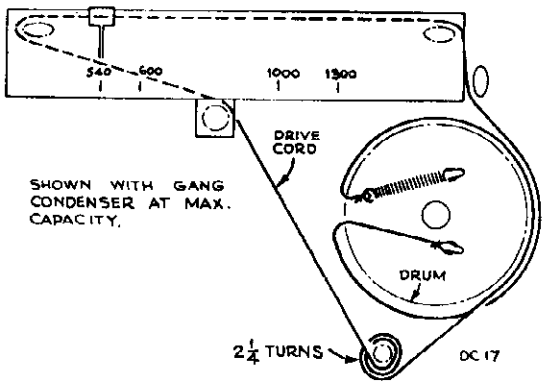
* Do not readjust T2 when test oscillator is connected to C2.

Critical Lead Dress

1. Dress blue and green leads of both I-F transformers back in shield cans, leaving them as short as possible.
2. Dress all heater leads next to chassis.
3. Dress power cord toward output transformer away from volume control and audio circuits.
4. Dress capacitor (C14) toward switch and parallel to chassis length.
5. Dress capacitor (C16) back against rear chassis apron.
6. Dress capacitor (C17) over and towards 50L6 socket perpendicular to capacitor (C14) and (C16).
7. Dress pilot lamp leads over second I-F transformer and away from tubes.
8. Dress blue leads from output transformer against front apron and away from I-F leads.
9. Dress contact on oscillator section of gang condenser back away from oscillator coil adjustment.



TUBE AND TRIMMER LOCATIONS RC-1064



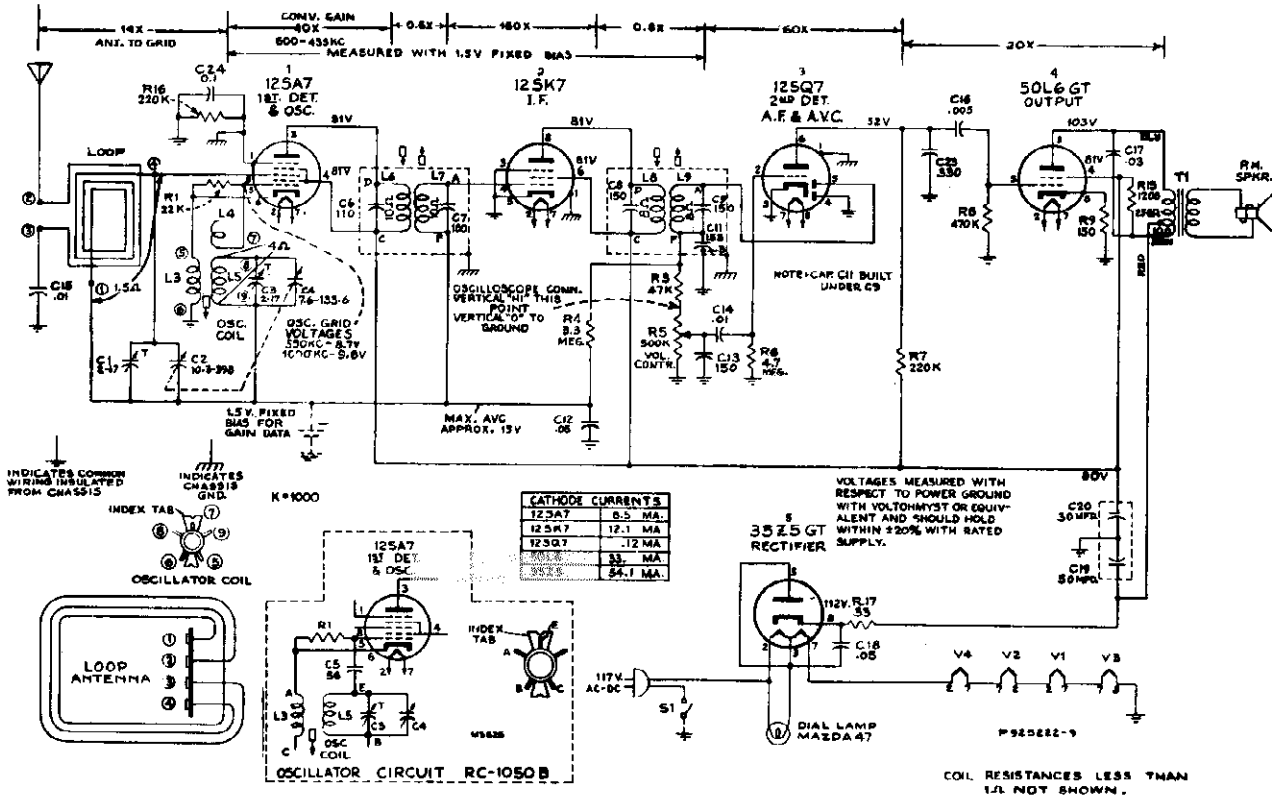
Dial-Indicator and Drive Mechanism

Replacement Parts

STOCK No.	DESCRIPTION
	CHASSIS ASSEMBLIES RC 1034 RC 1064
39622	Capacitor—Mica, 56 mmf. (for RC-1064 & some RC-1034) (C5)
72571	Capacitor—Mica, 330 mmf. (C23)
70606	Capacitor—Tubular, .005 mfd., 400 volts (C16)
70611	Capacitor—Tubular, .02 mfd., 400 volts (C14, C17)
70615	Capacitor—Tubular, .05 mfd., 400 volts (C12, C18)
70617	Capacitor—Tubular, 0.1 mfd., 400 volts (C24)
70408	Capacitor—Electrolytic, comprising 1 section of 30 mfd., 150 volts and 1 section of 50 mfd., 150 volts (C19A, C19B or C19, C20)
70477	Coil—Oscillator coil (for some RC-1034) (L3, L4, L5)
71406	Coil—Oscillator coil (for some RC-1034) (L3, L4)
73048	Coil—Oscillator coil (for RC-1064) (L1, L2)
70643	Condenser—Variable tuning condenser complete with drive drum (for RC-1034) (C1, C2, C3, C4)
73047	Condenser—Variable tuning condenser complete with drive drum (for RC-1064) (C1, C2, C3, C4)
70322	Control—Volume control and power switch (R-5, S-1)
72913	Cord—Drive cord (approx. 40" overall length)
72283	Grommet—Rubber grommet to mount tuning condenser (3 required)
70469	Indicator—Station selector indicator
11765	Lamp—Dial lamp—Mazda #51
70468	Loop—Antenna loop (for RC-1034) (L1, L2)
73049	Loop—Antenna loop complete (for RC-1064)
70462	Plate—Dial back plate complete with drive cord pulleys less dial
36230	Pulley—Drive cord pulley
	Resistor—Fixed composition, 120 ohms ±10%, ½ watt (R9)
	Resistor—Fixed composition, 1200 ohms ±10%, 1 watt (R15)
	Resistor—Fixed composition, 22,000 ohms ±20%, ½ watt (R1)
	Resistor—Fixed composition, 220,000 ohms ±20%, ½ watt (R7, R16)
	Resistor—Fixed composition, 470,000 ohms ±20%, ½ watt (R8)
	Resistor—Fixed composition, 3.3 megohms ±20%, ½ watt (R4)
	Resistor—Fixed composition, 4.7 megohms ±20%, ½ watt (R6)
70467	Shaft—Tuning knob shaft
34449	Socket—Lamp socket
37605	Socket—Tube socket, molded
70390	Spring—Drive cord tension spring
70465	Transformer—First I.F. transformer (for RC-1034) (L6, L7, C6, C7)
73036	Transformer—First I.F. transformer (for RC-1064) (T1)
70466	Transformer—Second I.F. transformer (for RC-1034) (L8, L9, C8, C9)
73037	Transformer—Second I.F. transformer (for RC-1064) (T2)
70385	Transformer—Output transformer (for RC-1034) (T1)
72296	Transformer—Output transformer (for RC-1064) (T3)
33726	Washer—"C" washer for tuning knob shaft
	SPEAKER ASSEMBLY 922258-1
70470	Speaker—4" x 6" elliptical speaker complete with cone and voice coil
	MISCELLANEOUS
71794	Back—Cabinet back for Radiola 61-8
71795	Back—Cabinet back for Radiola 61-9
X1365	Cabinet—Brown plastic cabinet for Radiola 61-8
Y1366	Cabinet—Ivory plastic cabinet for Radiola 61-9
70475	Clamp—Dial clamp (1 set)
71796	Dial—Glass dial scale
37831	Fastener—Push fasteners (1 set) for cabinet back
70473	Knob—Control knob—red-brown—for Radiola 61-8
70474	Knob—Control knob—ivory—for Radiola 61-9
30900	Spring—Retaining spring for knob

CHASSIS RC-1050, RC-1050A, RADIO CORP. OF AMERICA
RC-1050B

MODELS 75X11, 75X1
75X14, 75X15, 75X1



Alignment Procedure

Output Meter Alignment.—Connect the meter across the voice coil, and turn the receiver volume control to maximum.

Test-Oscillator.—For all alignment operations, connect the low side of the test-oscillator to the receiver chassis, and keep the oscillator output as low as possible to avoid a-v-c action.

On AC operation an isolation transformer (117v./117v.) may be necessary for the receiver if the test oscillator is also AC operated.

Dial Pointer.—With the tuning condenser in full mesh the dial pointer should be adjusted to approx. 17.0° counterclockwise from the vertical position. It should be adjusted before re-assembling the bezel to the cabnet. Check on actual reception of stations.

Dis-assembly.—To remove bezel assembly:

Remove the two knobs and the four hex head screws in the feet, pull the bottom of the bezel outward and upward.

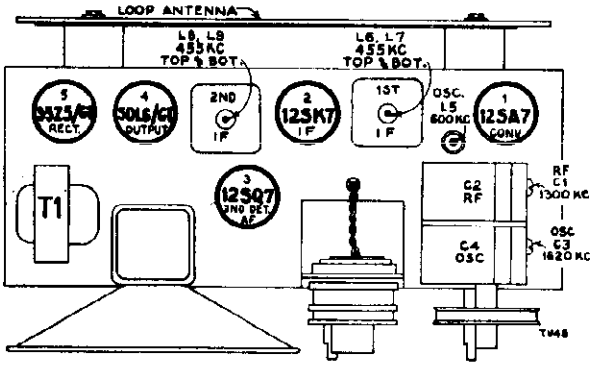
To remove chassis from cabinet:

Remove bezel assembly as described above, remove the dial by prying assembly outward on the bottom edge, remove the pointer by pulling straight to the front, remove the dial lamp, remove the round head screws which hold the chassis to the cabinet.

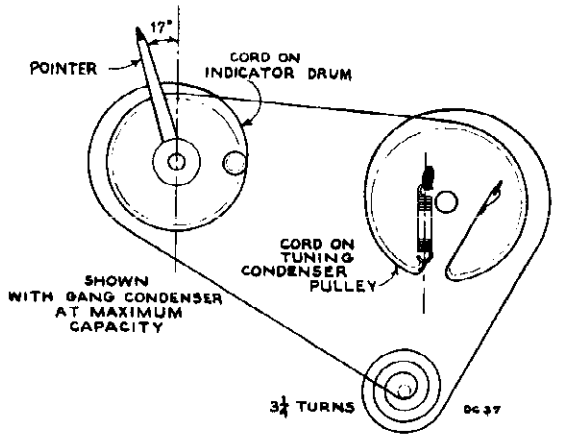
For additional information refer to booklet "RCA Victor Receiver Alignment."

Steps	Connect the high side of test-oscillator to—	Tune test-osc. to—	Turn radio dial to—	Adjust the following for max. peak output
1	12SK7 I-F grid through 0.1 mfd. capacitor	455 kc	Quiet-point 1,600 kc end of dial	L8 and L9 2nd I-F transformer
2	Stator of C2 through 0.1 mfd.			L6 and L7 1st I-F transformer
3	Ant. lead in series with 200 mmfd.	1,620 kc	full clock-wise	C3 (osc.)
4		1,400 kc	1,400 kc signal	C1 (ant.)
5		600 kc	600 kc signal	L5 (osc.) Rock gang
6	Repeat steps 3, 4 and 5.			

* Do not readjust L8 or L9 when test oscillator is connected to C2.



Tube and Trimmer Locations



Dial-Indicator and Drive Mechanism

MODELS 75X11, 75X12, 75X14, 75X15, 75X16 RADIO CORP. OF AMERICA

Specifications

Frequency Range ..... 540-1600 kc
Intermediate Frequency ..... 455 kc

Power Output
Undistorted ..... 1.0 watt
Maximum ..... 1.5 watts

Tube Complement
(1) RCA-12SA7 ..... Converter
(2) RCA-12SK7 ..... I.F. Amplifier
(3) RCA-12SQ7 ..... 2nd Det., A.V.C., and A.F. Amplifier
(4) RCA-50L6GT ..... Power Output
(5) RCA-35Z5GT ..... Rectifier

Pilot Lamp ..... Mazda No. 47, 6-8 volts, 0.15 amp.

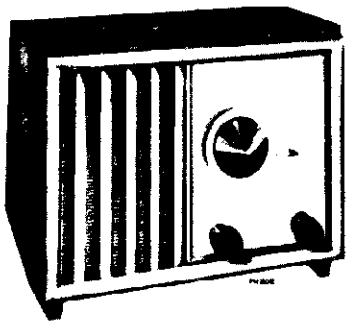
Loudspeaker (92572-2)
Type ..... 5-inch PM
V. C. Impedance ..... 3.2 ohms at 400 cycles

Cabinet Dimensions
Height, 7-1/4"; Width, 10"; Depth, 7-3/16"

Tuning Drive Ratio ..... 10:1 (5 turns of knob)

Power Supply Rating
105-125 volts, AC, 50 or 60 cycles, or DC ..... 30 watts

POWER SUPPLY POLARITY.—For operation on d-c, the power plug must be inserted in the outlet for correct polarity. If the set does not function, reverse the plug. On a-c, reversal of the plug may reduce hum.



75X11 Maroon
75X12 Ivory
75X14 Mahogany
75X15 Walnut
75X16 Blonde

Critical Lead Dress

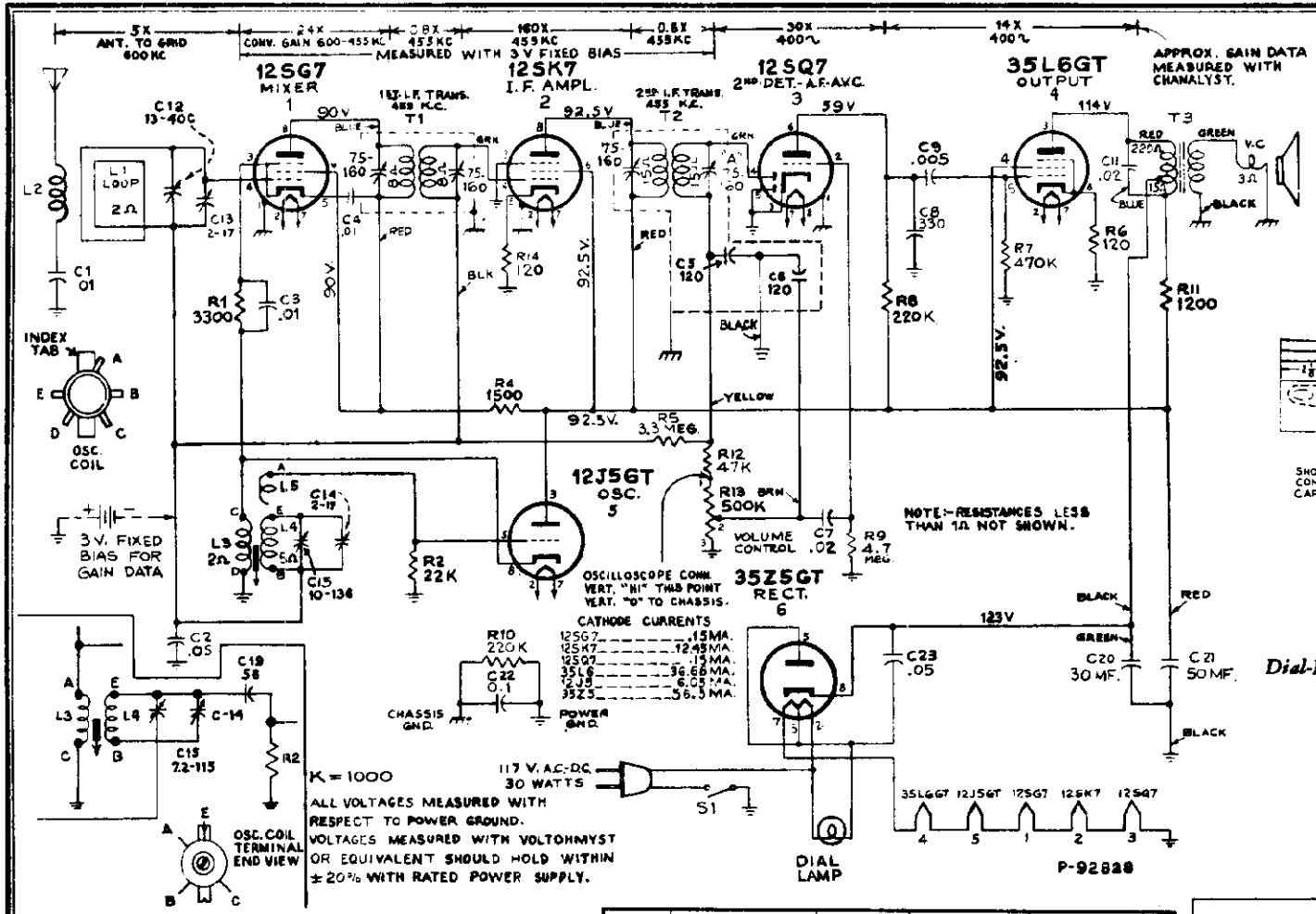
1. Dress all heater leads close to chassis.
2. Dress AVC resistor R4 away from 12SK7 tube socket.
3. Dress diode-load resistor R3 away from 12SQ7 tube socket.
4. Dress 12SQ7 plate resistor R7 over 2nd IF transformer terminal.
5. Dress output plate bypass capacitor C17 close to rear of chassis.
6. Dress power cord lead along rear and bottom of chassis between 35Z5GT and 50L6GT tubes.
7. Dress audio coupling capacitor C14 close to bottom of chassis.

Replacement Parts

STOCK No.	DESCRIPTION
	CHASSIS ASSEMBLIES RC-1050, RC-1050A, RC-1050B
72880	Bracket—Dial lamp bracket
72878	Bracket—Mounting bracket for indicator pulley assembly
*73499	Capacitor—Ceramic, 56 mmf., for RC-1050B (C5)
39632	Capacitor—Mica, 150 mmfd. (C13)
39640	Capacitor—Mica, 330 mmf. (C23)
70606	Capacitor—Tubular, .005 mfd., 400 volts (C16)
70610	Capacitor—Tubular, .01 mfd., 400 volts (C14, C15)
70613	Capacitor—Tubular, .03 mfd., 400 volts (C17)
70615	Capacitor—Tubular, .05 mfd., 400 volts (C12, C18)
70617	Capacitor—Tubular, 0.1 mfd., 400 volts (C24)
70408	Capacitor—Electrolytic, comprising 1 section of 50 mfd., 150 volts and 1 section of 30 mfd., 150 volts (C19, C20)
70477	Coil—Oscillator coil (L3, L4, L5) for RC-1050 & RC-1050A
73048	Coil—Oscillator coil (L3, L5) for RC-1050B
72992	Condenser—Variable tuning condenser complete with drive pulley (C1, C2, C3, C4)
38410	Control—Volume control and power switch (R5, S1)
†72953	Cord—Drive cord (approx. 29" required)
72283	Grommet—Rubber grommet to mount tuning condenser (3 required)
72867	Loop—Antenna loop complete (L1, L2) for RC-1050 & RC-1050A
*73706	Loop—Antenna loop complete (L1, L2) for RC-1050B
72882	Pulley—Dial indicator pulley
72313	Resistor—Wire wound, fuse type, 33 ohms (R17)
	Resistor—Fixed composition, 150 ohms, ±10%, ½ watt (R9)
	Resistor—Fixed composition, 1200 ohms, ±10%, 1 watt (R15)
	Resistor—Fixed composition, 22,000 ohms, ±20%, ½ watt (R1)
	Resistor—Fixed composition, 47,000 ohms, ±20%, ½ watt (R3)
	Resistor—Fixed composition, 220,000 ohms, ±20%, ½ watt (R7, R16)
	Resistor—Fixed composition, 470,000 ohms, ±20%, ½ watt (R8)
	Resistor—Fixed composition, 3.3 megohms, ±20%, ½ watt (R4)
	Resistor—Fixed composition, 4.7 megohms, ±20%, ½ watt (R6)

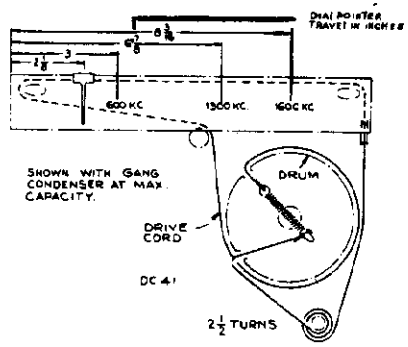
STOCK No.	DESCRIPTION
72881	Ring—Retaining ring for indicator pulley assembly
72877	Shaft—Tuning knob shaft
72879	Socket—Dial lamp socket
32299	Socket—Tube socket—wafer—for RC-1050 & RC-1050A
54414	Socket—Tube socket—molded—for RC-1050B
72540	Spring—Drive cord spring
71558	Transformer—First I. F. transformer (L6, L7, C6, C7) for RC-1050
71631	Transformer—Second I. F. transformer (L8, L9, C8, C9, C11) for RC-1050
70128	Transformer—First I. F. transformer (L6, L7, C6, C7) for RC-1050A & RC-1050B
70129	Transformer—Second I. F. transformer (L8, L9, C8, C9, C11) for RC1050A & RC-1050B
72296	Transformer—Output transformer (T1)
33726	Washer—"C" washer for tuning shaft
	SPEAKER ASSEMBLY 92572-2W RL 101-3
72201	Speaker—5" P.M. speaker complete with cone and voice coil
	MISCELLANEOUS
72884	Baffle—Speaker baffle board and grille cloth
72883	Bezel—Dial scale bezel only—less dial
Y1428	Cabinet—Maroon plastic cabinet for 75X11
Y1431	Cabinet—Ivory plastic cabinet for 75X12
*Y2013	Cabinet—Mahogany plastic cabinet for 75X14
*Y2014	Cabinet—Walnut plastic cabinet for 75X15
*Y2015	Cabinet—Blonde plastic cabinet for 75X16
72871	Cover—Bottom cover
72868	Dial—Dial scale complete with dial lamp shield
72885	Foot—Mounting foot (bakelite) (2 required)
72869	Indicator—Station selector indicator
72870	Knob—Control knob (maroon) for 75X11, 75X14 & 75X15
72890	Knob—Control knob (ivory) for 75X12
*73707	Knob—Control knob (tan) for 75X16
31480	Lamp—Indicator lamp—Mazda #47
*73728	Screen—Ventilating screen for back of cabinet for 75X11, 75X14 & 75X15
*73729	Screen—Ventilating screen for back of cabinet for 75X12 & 75X16
14270	Spring—Retaining spring for knobs

* THIS IS THE FIRST TIME THAT THIS STOCK NO. HAS APPEARED IN SERVICE DATA.
† STOCK NO. 72953 IS A REEL CONTAINING 250 FEET OF CORD.



Oscillator Circuit—
Chassis No. RC-1058A

Otherwise identical to Chassis No. RC-1058, except C12 (10-398)



Dial-Indicator and Drive Mechanism

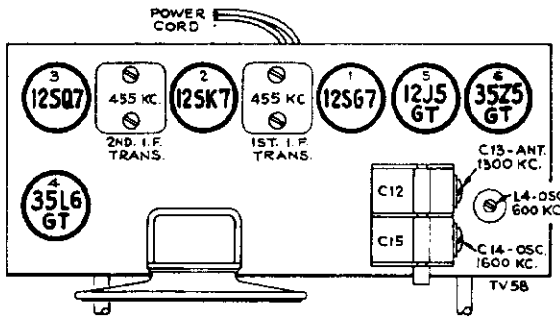
Alignment Procedure

Test Oscillator.—Connect high side of test oscillator as shown in chart. Connect low side through a .01 mf capacitor to common "—B." Keep the output signal as low as possible to avoid AVC action.

Output Meter.—Connect leads between speaker voice coil and chassis. Turn volume control to maximum.

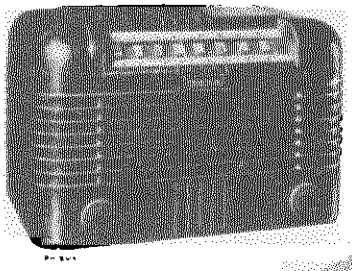
Dial Pointer Adjustment.—Rotate tuning condenser fully counter-clockwise (plates closed). Adjust indicator to 2⅛" from left hand edge of dial back plate.

Steps	Connect the high side of test-oscillator to—	Tune test-osc. to—	Turn radio dial to—	Adjust the following for max. peak output
1	Stator of C-12 in series with .01 mfd.	455 kc	Quiet-point 1,600 kc end of dial	Sec. and pri. 2nd I-F trans.
2				Sec. and pri. 1st I-F trans.
3	Ant. lead in series with 200 mmfd.	1,600 kc	1,600 kc	C14 (osc.)
4		1,300 kc	1,300 kc	C13 ant.
5		600 kc	600 kc	L4 (osc.) Rock in
6	Repeat steps 3, 4 and 5.			

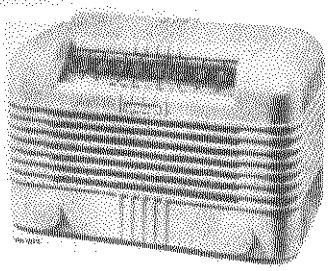


Tube and Trimmer Locations

MODELS 76ZX11, 76ZX12 RADIO CORP. OF AMERICA



76ZX11
(Walnut)



76ZX12
(Ivory)

Critical Lead Dress

1. Dress output plate bypass capacitor (C-11 .02 mf) against chassis.
2. Dress 35L6GT plate lead (red) against chassis and away from volume control, leads and terminals.
3. Dress audio coupling capacitor (C-7 .02 mf) away from 35L6GT heater leads.
4. Dress 2nd i-f yellow and brown leads away from output plate bypass capacitor (C-11, .02 mf) and away from all heater leads.
5. Dress blue and green leads of both i-f transformers back in shields leaving exposed lengths as short as possible.

Specifications

Frequency Range ..... 540-1600 kc
Intermediate Frequency ..... 455 kc

Power Output
Undistorted ..... 1.0 watt
Maximum ..... 1.5 watts

Tube Complement
(1) RCA Radiotron 12SG7 ..... Mixer
(2) RCA Radiotron 12SK7 ..... I.F. Amplifier
(3) RCA Radiotron 12SQ7 ..... 2nd Det., A.V.C., and A.F. Amplifier
(4) RCA Radiotron 35L6GT ..... Power Output
(5) RCA Radiotron 12J5GT ..... Oscillator
(6) RCA Radiotron 35Z5GT ..... Rectifier

Loudspeaker (92572-2)
Type ..... 5-inch PM
V. C. Impedance ..... 3.2 ohms at 400 cycles
Cabinet Dimensions ..... Height, 7¾; Width, 12⅛; Depth, 6¾

Power Supply Rating
105-125 volts, AC, 50 or 60 cycles, or DC ..... 30 watts
Pilot Lamp ..... type 51, 6-8 volts, 0.20 amp.
Tuning Drive Ratio 14.5:1

POWER SUPPLY POLARITY.—For operation on d-c, the power plug must be inserted in the outlet for correct polarity. If the set does not function, reverse the plug. On a-c, reversal of the plug may reduce hum.

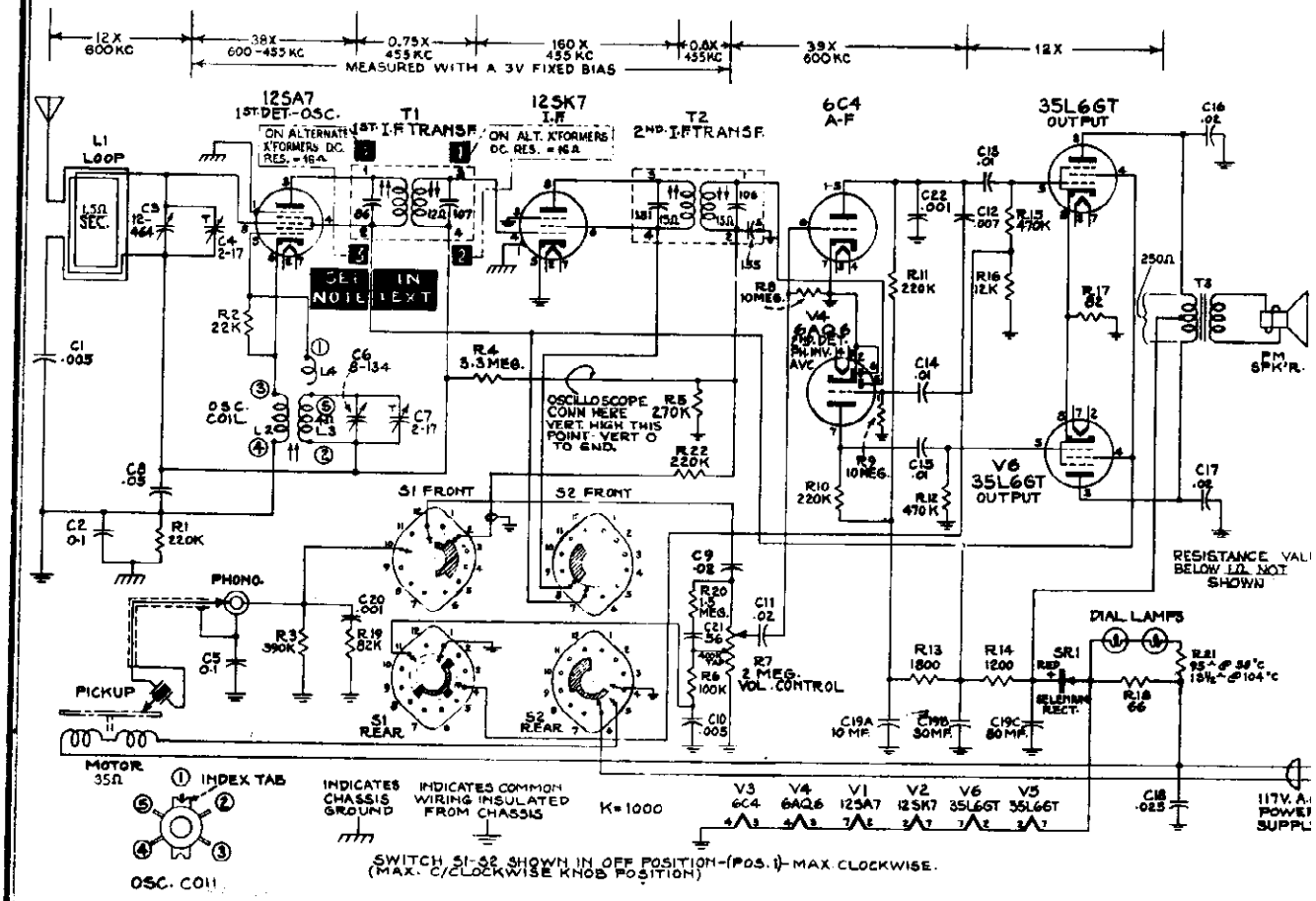
Replacement Parts

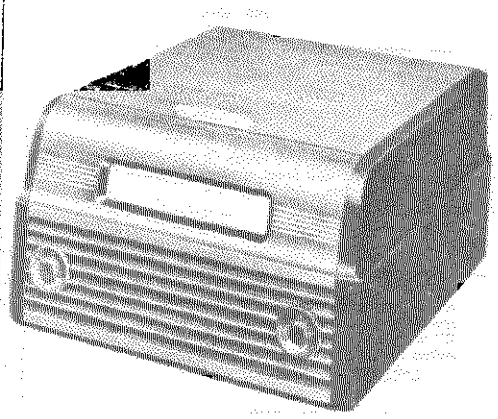
STOCK No.	DESCRIPTION
	CHASSIS ASSEMBLIES RC-1058—RC-1058A
*73172	Capacitor—Ceramic, 56 mmfd., (C19)—for RC-1058A
72571	Capacitor—Mica, 330 mmfd. (C8)
70606	Capacitor—Tubular, .005 mfd., 400 volts (C9)
70610	Capacitor—Tubular, .01 mfd., 400 volts (C1, C3, C4)
70611	Capacitor—Tubular, .01 mfd., 400 volts (C7, C11)
70615	Capacitor—Tubular, .05 mfd., 400 volts (C2, C23)
70617	Capacitor—Tubular, 0.1 mfd., 400 volts (C22)
39152	Capacitor—Electrolytic, comprising 1 section of 30 mfd., 150 volts and 1 section of 50 mfd., 150 volts (C20, C21)
*73704	Coil—Oscillator coil (L3, L4, L5)—for RC-1058
*73163	Coil—Oscillator coil (L3, L4)—for RC-1058A
*72991	Condenser—Variable tuning condenser complete with drive pulley (C12, C13, C14, C15)—for RC-1058
*73171	Condenser—Variable tuning condenser, complete with drive pulley (C12, C13, C14, C15)—for RC-1058A
38410	Control—Volume control and power switch (R13, S1)
72953	Cord—Drive cord (approx. 50" overall length)
72283	Grommet—Rubber grommet to mount tuning condenser (3 required)
37068	Indicator—Station selector indicator
*73030	Loop—Antenna loop complete (L1, L2)
*72872	Plate—Dial back plate complete with drive cord pulleys
72602	Pulley—Drive cord pulley
	Resistor—Fixed composition, 120 ohms, ±10%, ½ watt (R6, R14)
	Resistor—Fixed composition, 1200 ohms, ±10%, 1 watt (R11)
	Resistor—Fixed composition, 1500 ohms, ±20%, ½ watt (R4)
	Resistor—Fixed composition, 3300 ohms, ±20%, ½ watt (R1)
	Resistor—Fixed composition, 22,000 ohms, ±10%, ½ watt (R2)
	Resistor—Fixed composition, 47,000 ohms, ±20%, ½ watt (R12)
	Resistor—Fixed composition, 220,000 ohms, ±20%, ½ watt (R8, R10)
	Resistor—Fixed composition, 470,000 ohms, ±20%, ½ watt (R7)
	Resistor—Fixed composition, 3.3 megohms, ±20%, ½ watt (R5)
	Resistor—Fixed composition, 4.7 megohms, ±20%, ½ watt (R9)
*72886	Shaft—Tuning knob shaft
34449	Socket—Lamp socket
37605	Socket—Tube socket, moulded
32299	Socket—Tube socket—wafer
31418	Spring—Drive cord tension spring
70411	Transformer—First I. F. transformer (T1)
70412	Transformer—Second I. F. transformer (T2, C5, C6)
36800	Transformer—Output transformer (T3)
35969	Washer—"C" washer for tuning shaft
	SPEAKER ASSEMBLY 92572-2W RL 101-3
72201	Speaker—5" P.M. speaker complete with cone and voice coil
	MISCELLANEOUS
39953	Back—Cabinet back for 76ZX11
70409	Back—Cabinet back for 76ZX12
Y1429	Cabinet—Brown plastic cabinet for 76ZX11
Y1430	Cabinet—Ivory plastic cabinet for 76ZX12
36890	Clamp—Dial clamp—L.H.
36891	Clamp—Dial clamp—R.H.
*72903	Dial—Glass dial scale
37831	Fastener—Push fastener to hold cabinet back (1 set)
36886	Knob—Control knob—ivory—for 76ZX12
*72981	Knob—Control knob—maroon—for 76ZX11
11765	Lamp—Dial lamp—Mazda #51
30900	Spring—Retaining spring for knobs

*** THIS IS THE FIRST TIME THAT THIS STOCK NO. HAS APPEARED IN SERVICE DATA.**

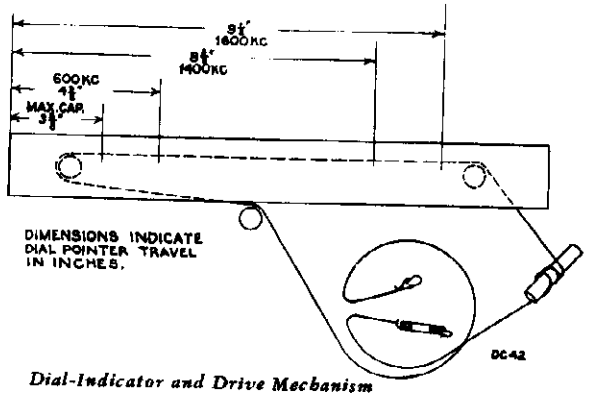
RADIO CORP. OF AMERICA

MODEL 77U, CHASS
RC-1057A





The first I-F transformer shown in the schematic is stamped 970441-1. Some chassis will have a first I-F transformer stamped 970441-5. Connections to this alternate transformer are as shown in the black letters. Performance will be identical for both sets.



Dial-Indicator and Drive Mechanism

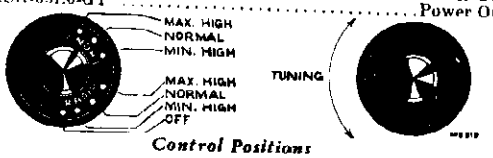
Electrical and Mechanical Specifications

Six-Tube, Single-Band, Superheterodyne Receiver

Frequency Range ..... 540-1,600 kc
Intermediate Frequency ..... 455 kc
Power Output
Undistorted ..... 2.2 watts
Maximum ..... 3 watts
Loudspeaker "PM"
Size ..... 5x7 inch elliptical
V.C. Impedance ..... 3.4 ohms at 400 cycles
Power Supply Rating
105-125 volts, AC, 60 cycles with RP-178 record changer .... 60 watts
IMPORTANT—Do not plug chassis into a d-c power supply.

Cabinet dimensions (inches) ..... Height 10¾" Width 15⅝" Depth 18¾"

Tube Complement
(1) RCA-12SA7 ..... 1st Det.—Osc.
(2) RCA-12SK7 ..... I-F Amplifier
(3) RCA-6C4 ..... A-F Amplifier
(4) RCA-6AQ6 ..... 2nd Det., AVC, Ph. Inv.
(5) RCA-35L6-GT ..... Power Output
(6) RCA-35L6-GT ..... Power Output



Control Positions

MODEL 77U, CHASSIS RC-1057A

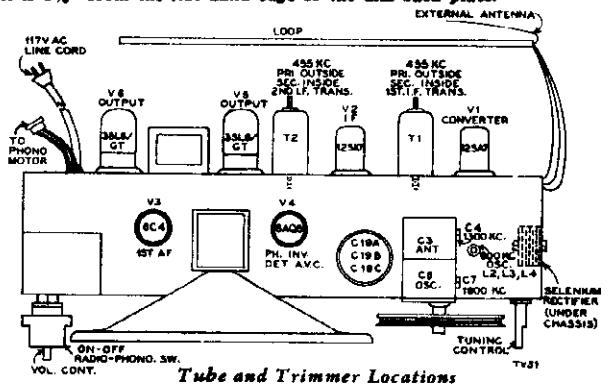
RADIO CORP. OF AMERICA

Alignment Procedure

CAUTION.—CLOSE TUNING CONDENSER PLATES COMPLETELY (C-C-W) BEFORE REMOVING CHASSIS FROM CABINET.
Take off both wooden strips on bottom of cabinet by removing wood-screws before loosening chassis bolts.

CRITICAL LEAD DRESS.—
1. Dress output plate bypasses as near chassis as possible.
2. Dress all filament leads down to chassis.
3. Dress all exposed leads away from each other and away from chassis to prevent short circuits.
4. Dress R-6 away from shield.
5. Dress AVC resistor away from R-18 and R-14.
6. Dress output plate leads down to chassis.
7. Dress R-18 away from R-15.
8. Dress R-16 away from V4 socket.
9. Dress R-10 away from V4 socket.
10. Dress high side of line cord down to front apron.
11. Dress lead of C-5 which connects to phono input away from side of chassis.

Dial Pointer Adjustment.—Rotate tuning condenser fully counter-clockwise (plates fully meshed). Adjust indicator pointer so that it is 3⅝" from the left hand edge of the dial back plate.



Tube and Trimmer Locations

Tubes 6C4 and 6AQ6 may be replaced by removing the sloping panel (remove four wood screws) in the front of the record changer compartment. Before removing the chassis from the cabinet it is advisable to loosen the two hex screws holding the speaker horizontally. This will allow the chassis to be removed and replaced easily. When the chassis is replaced the dial lights should be adjusted so as not to be visible from the front of the cabinet, and yet to give correct dial lighting. Move the speaker so it is flush against the baffle before retightening the hex nuts. The chassis mounting board should be flush against the front of the cabinet, and the chassis mounting holes should be centered over the holes in the board.

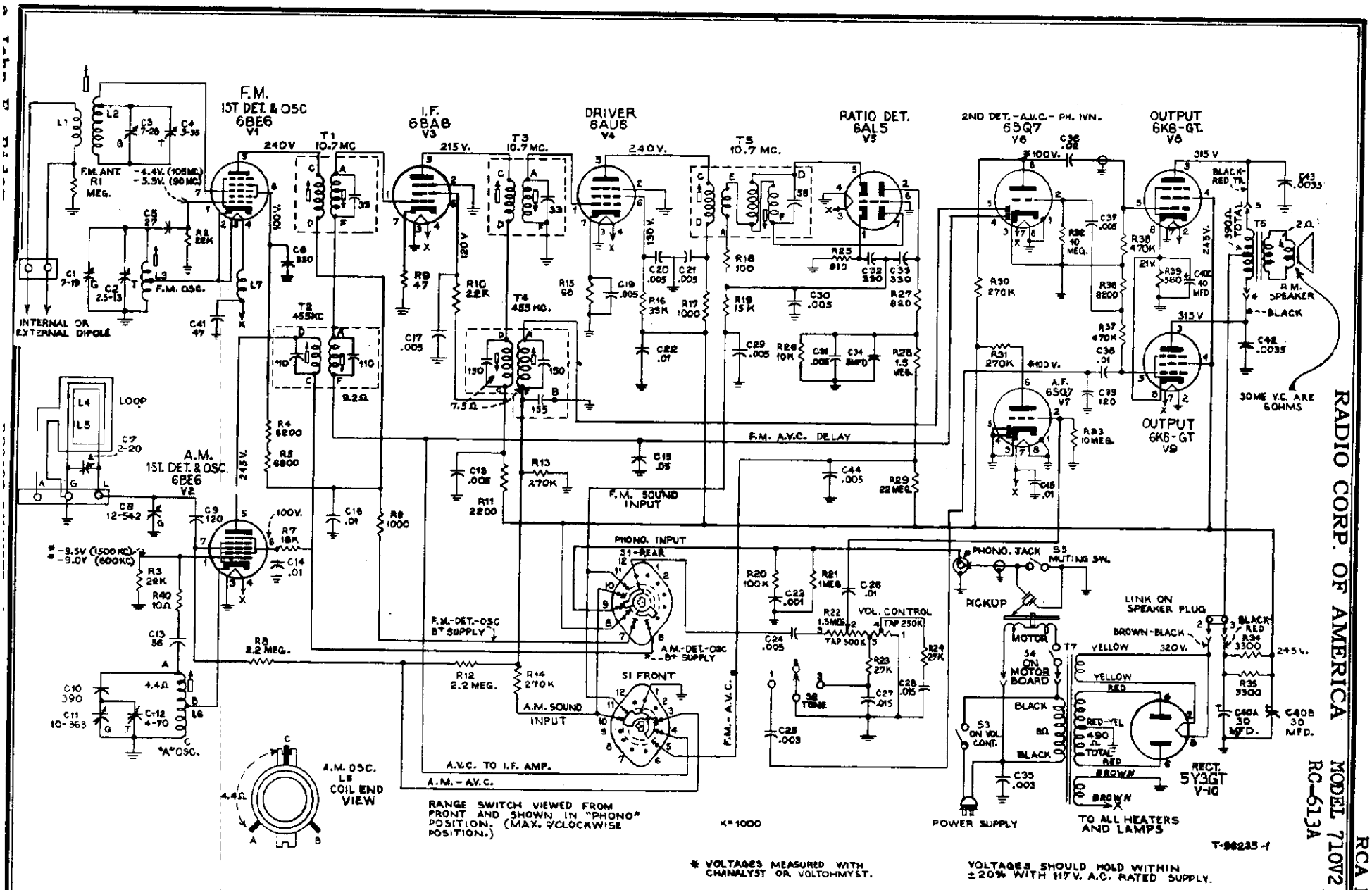
Output Meter.—Connect meter across speaker voice coil. Turn volume control clockwise to radio maximum high position (3) for alignment.

Steps	Connect the high side of test-oscillator to—	Tune test-osc. to—	Turn radio dial to—	Adjust the following for max. peak output
1	I.F. grid, in series with .01 mfd.	455 kc	Quiet point 1,600 kc end of dial	Pri. & Sec. 2nd I.F. transformer
2	1st Det. grid in series with .01 mfd.			Pri. & Sec. 1st I.F. transformer
NOTE.—ANTENNA LOOP AND RECORD CHANGER MUST BE IN CABINET				
3	Antenna terminal in series with 220 mmfd.	1,600 kc	1,600 kc	C7 (osc.)
4		1,400 kc	1,400 kc	C4 (ant.)
5		600 kc	600 kc	Osc. Coil L2, L3 Rock gang
6	Repeat steps 3, 4, & 5 if necessary			

Test Oscillator.—Connect high side of test oscillator as shown in chart. Connect low side through a .01 mf capacitor to common "—B". Keep the output signal as low as possible to avoid a-v-c action.

STOCK No.	DESCRIPTION
	CHASSIS ASSEMBLIES RC 1057A
70407	Button—Plug button to cover holes for I. F. transformers' adjustment
39622	Capacitor—Mica, 56 mmf. (C21)
70600	Capacitor—Tubular, .001 mfd., 400 volts (C20, C22)
70606	Capacitor—Tubular, .005 mfd., 400 volts (C1)
72791	Capacitor—Tubular, .005 mfd., 400 volts (C10)
70608	Capacitor—Tubular, .007 mfd., 400 volts (C12)
70612	Capacitor—Tubular, .025 mfd., 400 volts (C18)
70610	Capacitor—Tubular, .01 mfd., 400 volts (C13, C14, C15)
71928	Capacitor—Tubular, .02 mfd., 400 volts (C9)
70611	Capacitor—Tubular, .02 mfd., 400 volts (C11, C16, C17)
70615	Capacitor—Tubular, .05 mfd., 400 volts (C8)
70617	Capacitor—Tubular, 0.1 mfd., 400 volts (C2, C5)
*73013	Capacitor—Electrolytic, comprising 1 section of 80 mfd., 150 volts; 1 section of 30 mfd., 150 volts; and 1 section of 10 mfd., 150 volts (C19A, C19B, C19C)
38201	Clamp—Drive cord clamp
70477	Coil—Oscillator coil (L2, L3)
*73007	Condenser—Variable tuning condenser (C3, C4, C6, C7)
38403	Control—Volume control (R7)
72953	Cord—Drive cord (approx. 52" overall length)
70392	Cord—Power cord and plug
70397	Gear—Power, radio and phono switch gear
73014	Gear—Volume control gear—less spring
72283	Grommet—Rubber grommet to mount tuning condenser (3 required)
*73015	Indicator—Station selector indicator
73010	Loop—Antenna loop complete (L1)
*73006	Plate—Dial back plate complete with (3) pulleys
30868	Plug—2 contact female plug for motor cable
*73009	Rectifier—Selenium rectifier (SR1)
*73038	Resistor—Normal value 66 ohms with positive temperature coefficient (R18)
	Resistor—Fixed composition, 82 ohms ±10%, 1 watt (R17)
*73072	Resistor—Normal value 95 ohms @38°C with negative temperature coefficient (R21)
	Resistor—Fixed composition, 1200 ohms, ±10%, 1 watt (R14)
	Resistor—Fixed composition, 1800 ohms, ±10%, ½ watt (R13)
	Resistor—Fixed composition, 12,000 ohms, ±10%, ½ watt (R16)
	Resistor—Fixed composition, 22,000 ohms, ±20%, ½ watt (R2)
	Resistor—Fixed composition, 82,000 ohms, ±10%, ½ watt (R19)
	Resistor—Fixed composition, 100,000 ohms, ±10%, ½ watt (R6)
	Resistor—Fixed composition, 220,000 ohms, ±20%, ½ watt (R1, R10, R11, R22)
	Resistor—Fixed composition, 270,000 ohms, ±10%, ½ watt (R5)
	Resistor—Fixed composition, 390,000 ohms, ±10%, ½ watt (R3)
	Resistor—Fixed composition, 470,000 ohms, ±20%, ½ watt (R12)
	Resistor—Fixed composition, 470,000 ohms, ±10%, ½ watt (R15)
	Resistor—Fixed composition, 1.5 megohms, ±10%, ½ watt (R20)
	Resistor—Fixed composition, 3.3 megohms, ±20%, ½ watt (R4)
	Resistor—Fixed composition, 10 megohms, ±20%, ½ watt (R8, R9)
*73012	Shaft—Tuning knob shaft
*73103	Shield—Tube shield for miniature tubes (2 required)
*72998	Socket—Dial lamp socket and lead assembly
35787	Socket—Phono input socket
72516	Socket—Tube Socket, miniature
37605	Socket—Tube socket, molded
70390	Spring—Drive cord tension spring
70396	Spring—Volume control gear tension spring
*73011	Switch—Power, radio and phono switch (S1, S2)
73036	Transformer—First I. F. transformer (T1)
73037	Transformer—Second I. F. transformer (T2)
*73008	Transformer—Output transformer (T3)
33726	Washer—"C" washer for tuning knob shaft
34457	Washer—Spring washer for tuning knob shaft
	SPEAKER ASSEMBLIES 92573-1K
72728	Cone—Cone and voice coil assembly
72727	Speaker—5"x7" PM speaker complete with cone and voice coil
	NOTE: If stamping on speaker in instrument does not agree with above speaker number, order replacement parts by referring to model number of instrument, number stamped on speaker and full description of part required.
	MISCELLANEOUS
71105	Cable—Shielded pickup cable
73017	Clamp—Dial clamp (2 required)
X1660	Cloth—Grille cloth
*73051	Decal—Styling line decal (2 required)
71966	Decal—Trade mark decal (Victrola)
71984	Decal—Trade mark decal (RCA Victor)
*73039	Dial—Glass dial scale
72894	Foot—Rubber mounting foot (4 required)
72856	Grommet—Rubber grommet to mount record changer (3 required)
*73052	Handle—Cabinet lid handle
72692	Hinge—Cabinet lid hinge (2 required)
*73016	Knob—Power, radio and phono switch knob
73065	Knob—Tuning knob
73078	Knob—Volume control knob
11765	Lamp—Dial lamp
14270	Spring—Retaining spring for knobs
71824	Stud—Stud and screw to mount lid hinge (1 set)
*73050	Support—Cabinet lid support

*THIS IS THE FIRST TIME THIS STOCK NUMBER HAS APPEARED IN SERVICE DATA



RADIO CORP. OF AMERICA MODEL 710V2, CHAS RC-613A

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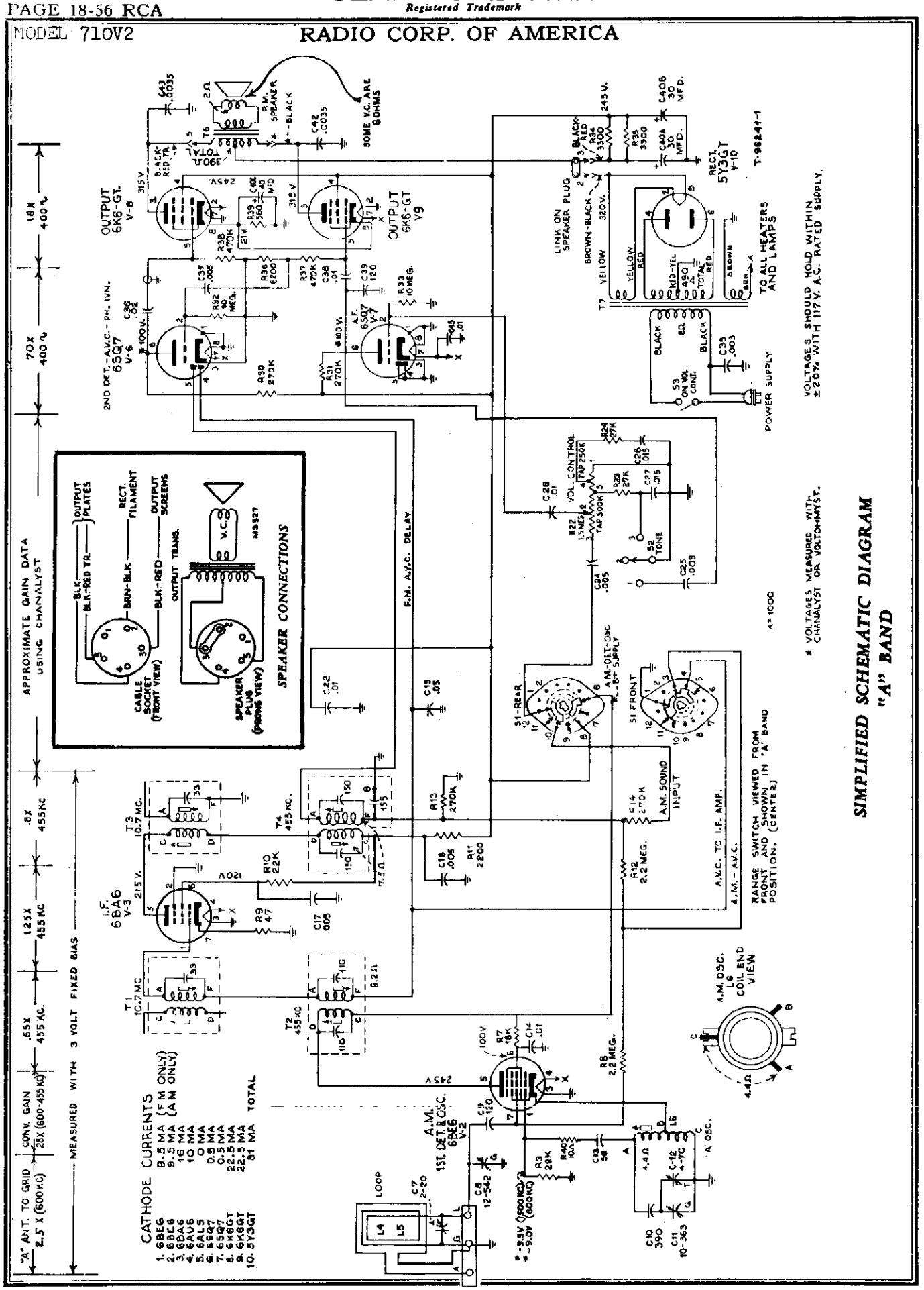
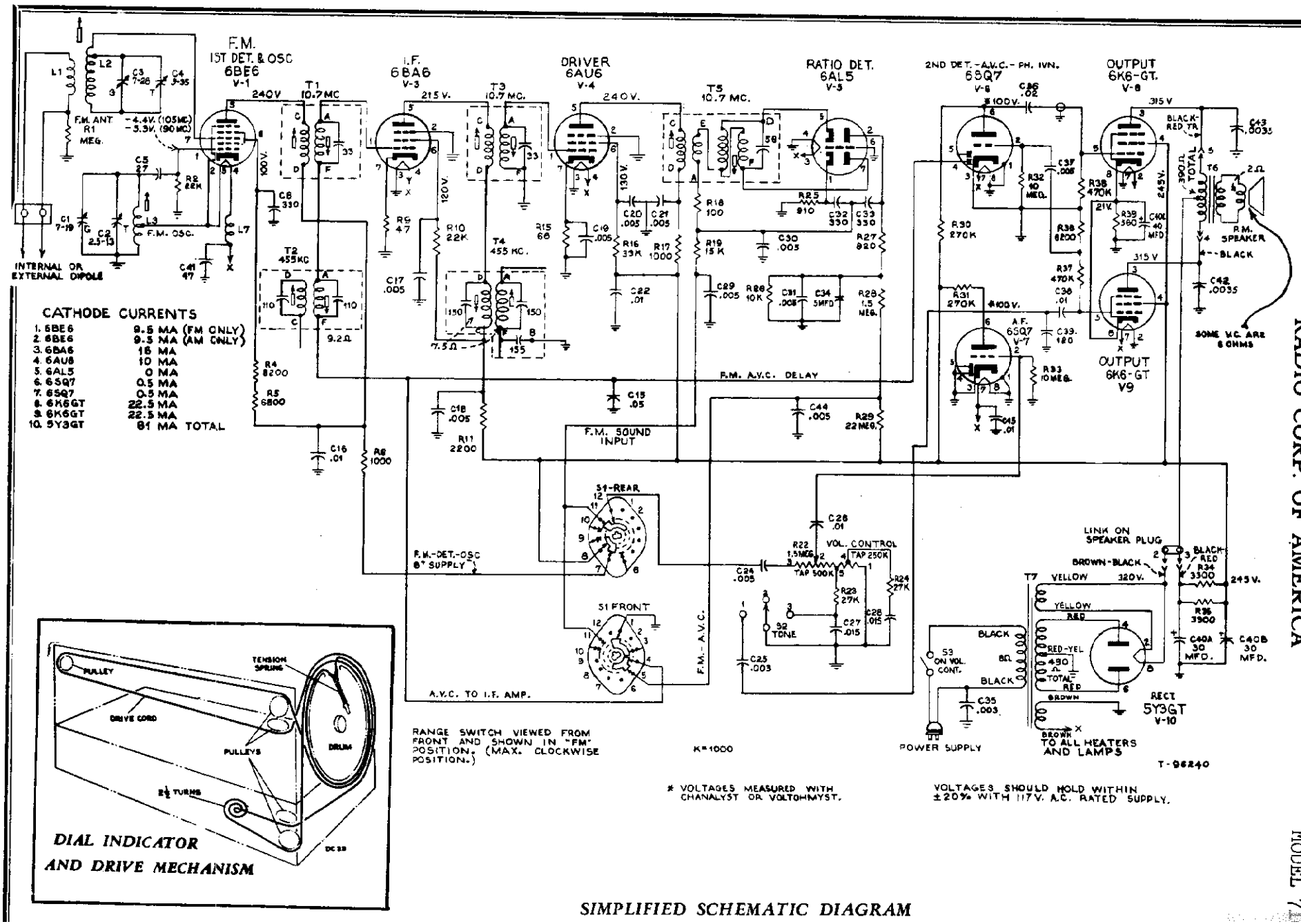
MODEL 710V2

RADIO CORP. OF AMERICA





DIAL INDICATOR AND DRIVE MECHANISM

SIMPLIFIED SCHEMATIC DIAGRAM

MODEL 710V2

RADIO CORP. OF AMERICA

Alignment Procedure

Alignment Indicators:

An RCA VoltOhmyst or equivalent meter is necessary for measuring developed d-c voltage during FM alignment. Connections are specified in the alignment tabulation below. An output meter is also necessary to indicate minimum audio output during alignment. Connect the output meter across the speaker voice coil.

The RCA VoltOhmyst can also be used as an AM alignment indicator, either to measure audio output or to measure a-v-c voltage.

When audio output is being measured the volume control should be turned to maximum.

Signal Generator:

For all alignment operations, except as stated in FM alignment, connect the low side of the signal generator to the receiver chassis. The output should be adjusted to provide accurate resonance indication at all times. If output measurement is used for AM alignment the output of the signal generator should be kept as low as possible to avoid a-v-c action.

Calibration Scale.—The dial scale printed in this service note may be temporarily attached to the chassis for quick reference during alignment.

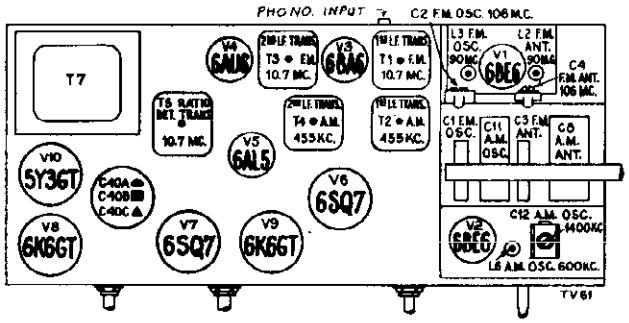
Using Printed Dial Scale.—

1. Cut out the printed dial scale, or, make a tracing of the scale.
2. With gang at full mesh the pointer should be set to the first reference mark from the left hand end of the dial backing plate.
3. Place the printed dial scale or the tracing under the pointer so that the extreme left scale graduations coincide with the pointer. Use scotch tape to hold the dial scale in place.

Note.—It is not recommended that the glass dial scale in the cabinet be removed as an alignment reference. This glass dial scale is fastened to the bezel with sheet metal lugs bent over the scale to hold it in place. Removing the glass dial scale will necessitate bending the lugs, resulting in their weakening and subsequent breakage.

Critical Lead Dress

1. Dress capacitor C5 near chassis base.
2. Dress lead from pin 5, V-1, to terminal C, of transformer T1, as near bottom of FM shelf as possible.
3. The lead from capacitor C24 to the high side of the volume control must be dressed next to chassis along front apron.
4. Dress resistors R32 & R33 near chassis base.
5. Dress all A.C. leads away from volume control.
6. Solder FM antenna coil primary leads to terminal board with as short a lead length as is practical.
7. Make all FM leads as short as possible.
8. The lead from pin 2, V-3, to chassis ground must be dressed as close to base and as near to the back apron as possible. This lead provides degeneration for the IF stage and neither its length nor the point at which it is grounded to the chassis should be changed.
9. Dress all leads away from the 8300 ohm resistors R34 and R35.



TOP VIEW OF CHASSIS

The FM i-f alignment may be checked by means of an FM sweep generator and cathode ray oscilloscope. Connect the output from the sweep generator, which is set to 10.7 mc., to the FM 1st Det.-Osc. grid (6BE6 Pin No. 7) low side to chassis. Disconnect the 5 mfd. capacitor C34 from the Ratio Detector circuit.

Connect the high side of the oscilloscope to the junction of R27 and R28, low side to chassis. Adjust the sweep generator and oscilloscope to obtain the response curve.

The Ratio Detector characteristic may be viewed by connecting the oscilloscope across the volume control R22. Capacitor C34 should be re-connected before checking the Ratio Detector characteristic.

FM Alignment

RANGE SWITCH IN FM POSITION—VOLUME CONT. MAXIMUM

Steps	Connect sig. gen.	Sig. gen. output	Turn radio dial to—	Adjustment for peak output
1	Connect the d-c probe of a VoltOhmyst to the negative lead of the 5 mfd. capacitor C34 and the common lead to chassis. Turn gang condenser to max. capacity (fully meshed).			
2	High side to Pin 1 of driver tube 6AU6 in series with .01 mfd. low side to chassis	10.7 mc. modulated 30% 400 cycles AM (Approx. .1 volt)	Max. capacity (fully meshed)	T5 top core for max. d-c voltage across C34. T5 bottom core for min. audio output
3	High side to one FM ant. term. in series with .01 mfd. Low side to the other FM ant. term.	10.7 mc. 30% modulation, 400 cycles AM. Adjust to provide 2 to 3 volts indication on VoltOhmyst during alignment.		†Using alternate loading: T3 bottom core (sec.) T3 top core (pri.) T1 bottom core (sec.) T1 top core (pri.)
4	High side to one FM ant. term. in series with a 120 ohm resistor. Low side to the other FM ant. term in series with a 120 ohm resistor.	106 mc	106 mc	C2 osc. C4 ant.
5		90 mc	90 mc	L3 osc. L2 ant.
6	Repeat Steps 4 and 5 until further adjustment does not improve calibration.			

†Alternate loading involves the use of a 680 ohm resistor to load the plate winding while the grid winding of the SAME TRANSFORMER is being peaked. Then the grid winding is loaded with the resistor while the plate winding is peaked. Only one winding is loaded at any one time. Remove the 680 ohm resistor after T3 and T1 have been aligned.

AM Alignment

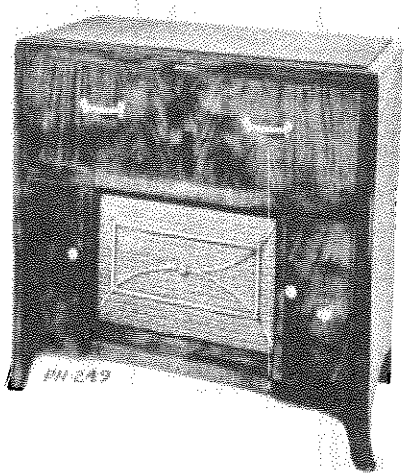
(Correct alignment of the 455 kc. IF requires that the 10.7 mc. IF be aligned previously)

RANGE SWITCH IN BC POSITION

Steps	Connect high side of sig. gen. to—	Sig. gen. output	Turn radio dial to—	Adjust for peak output
1	AM converter grid 6BE6 V-2 in series with .01 mfd.	455 kc	Quiet point at low freq. end.	†T4 top core (sec.) †T4 bottom core (pri.)
2				†T2 bottom core (sec.) †T2 top core (pri.)
3	"A" terminal of terminal board at rear of chassis in series with 200 mmf. (link open)	1400 kc	1400 kc	C12 osc. C 7 ant. (loop)
4		600 kc	600 kc	L6 osc. (Rock gang)
5	Repeat Step 3.			
6	After chassis and loop have been installed in cabinet, adjust C7 for max. output on a weak station near 1400 kc.			

†Align T4 and T2 by means of alternate loading as explained under FM alignment. Use a 47,000 ohm resistor instead of a 680 ohm resistor.

Oscilator frequency is above signal frequency on both AM and FM.



Electrical and Mechanical Specifications

FREQUENCY RANGES

Standard Broadcast (BC)	540-1600 kc.
Frequency Modulation (FM)	88-108 mc.
Intermediate Frequency (AM)	455 kc.
Intermediate Frequency (FM)	10.7 mc.

TUBE COMPLEMENT

(1) RCA 6BE6	FM 1st Det.-Osc.
(2) RCA 6BE6	AM 1st Det.-Osc.
(3) RCA 6BA6	IF Amplifier
(4) RAC 6AU6	Driver
(5) RCA 6AL5	FM Ratio Detector
(6) RCA 6SQ7	AM 2nd Det.-AVC-Phase Inverter
(7) RCA 6SQ7	AF Amplifier
(8) RCA 6K6GT	Output
(9) RCA 6K6GT	Output
(10) RCA 5Y3GT	Rectifier
Pilot Lamps (3)	Mazda No. 51 6-8 volts 0.2 amp.
Tuning Drive Ratio	16.25:1

CABINET DIMENSIONS

Height, ...35" Width ....37½" Depth ....16⅝"

POWER OUTPUT

Undistorted	5 watts
Maximum	6.5 watts

LOUDSPEAKER

Type (92569-1)	12 inch PM
Voice Coil Impedance	2.2 ohms at 400 cycles

(Speakers stamped 92569-1W2 are 6 ohms)

POWER SUPPLY RATING (including phono motor)

105-125 volts, 60 cycles ....max. 110 watts

AUTOMATIC RECORD CHANGER—RP-177

Type Pickup	Crystal
Record Capacity	Twelve 10-in., Ten 12-in.

Circuit Description

Model 710V2 has individual built-in antennas for FM and AM coupled to individual 1st Det.-Osc. tubes (6BE6 V1 and V2). The outputs of these two tubes are connected to separate IF transformers (T1 and T2) whose secondaries are in series and connected to the IF amplifier tube (6BA6 V3). The output of V3 is connected to separate IF transformers (T3 and T4) whose primaries are in series. The secondary of T3 (FM IF) is connected to the driver tube (6AU6 V4). The secondary of T4 (AM IF) is connected to the AM second detector (6SQ7 V6). The output of the driver tube (V4) is coupled thru the ratio detector transformer (T5) to the FM ratio detector tube (6AL5 V5).

The audio outputs of the AM second detector and the FM ratio detector are connected thru a section of the range switch to the volume control input.

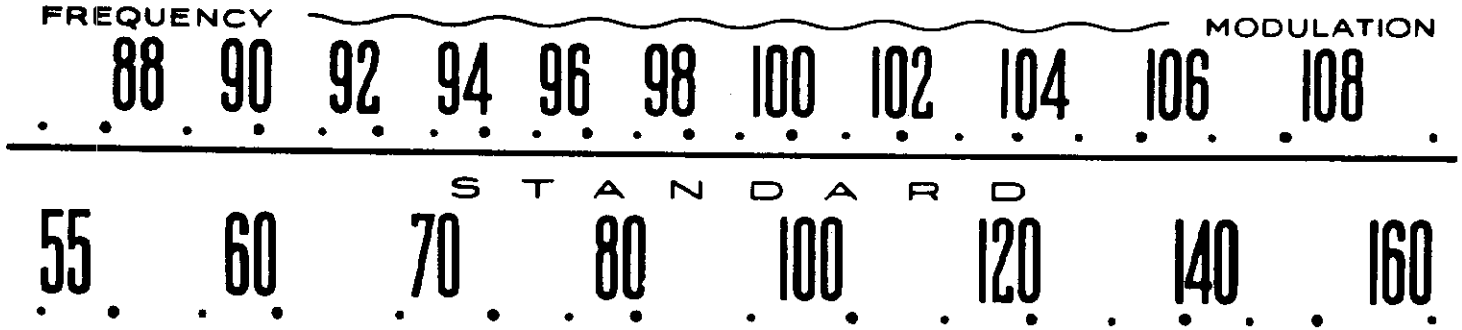
The B+ supply (+245 V) to the plates and screen grids of V1 and V2 is controlled thru a section of the range switch.

Simple AVC is used on AM and is applied to both the IF amplifier (V3) and the AM 1st detector (V2). Delayed AVC is used on FM and is applied only to the IF amplifier (V3). The AVC distribution is controlled thru a section of the range switch.

Antennas

Under conditions of normal field strength and interference, the RCA Victor antennas installed inside the cabinet will be effective for Frequency Modulation and Standard Broadcasts.

If reception is not satisfactory on one or both of the bands using the built-in cabinet antennas, one or two external antennas may be used. Connections are made to the antenna terminal boards in the back of the cabinet. External antennas may be erected indoors or outdoors and should be oriented in direction for requirements of best reception. RCA Television Antenna Stock No. 225 or 226 or the equivalent with 300 ohm transmission line is recommended for an FM external antenna. In this case, disconnect the two leads at the two terminals marked "FM" and attach the ends of the two lead wires from the RCA Television Antenna transmission line in their places. To replace the Standard Broadcast antenna, connect the lead-in from the antenna to terminal A. This antenna should consist of a wire 30 to 60 feet or so in length, mounted in a convenient location as high as possible. A ground connection to G should not be necessary but a flexible wire to a waterpipe or other good ground may be used.



DIAL SCALE

The dial scale drawing shown is a full size reproduction. It can be used as a reference in alignment procedure.

MODEL 710V2

RADIO CORP. OF AMERICA

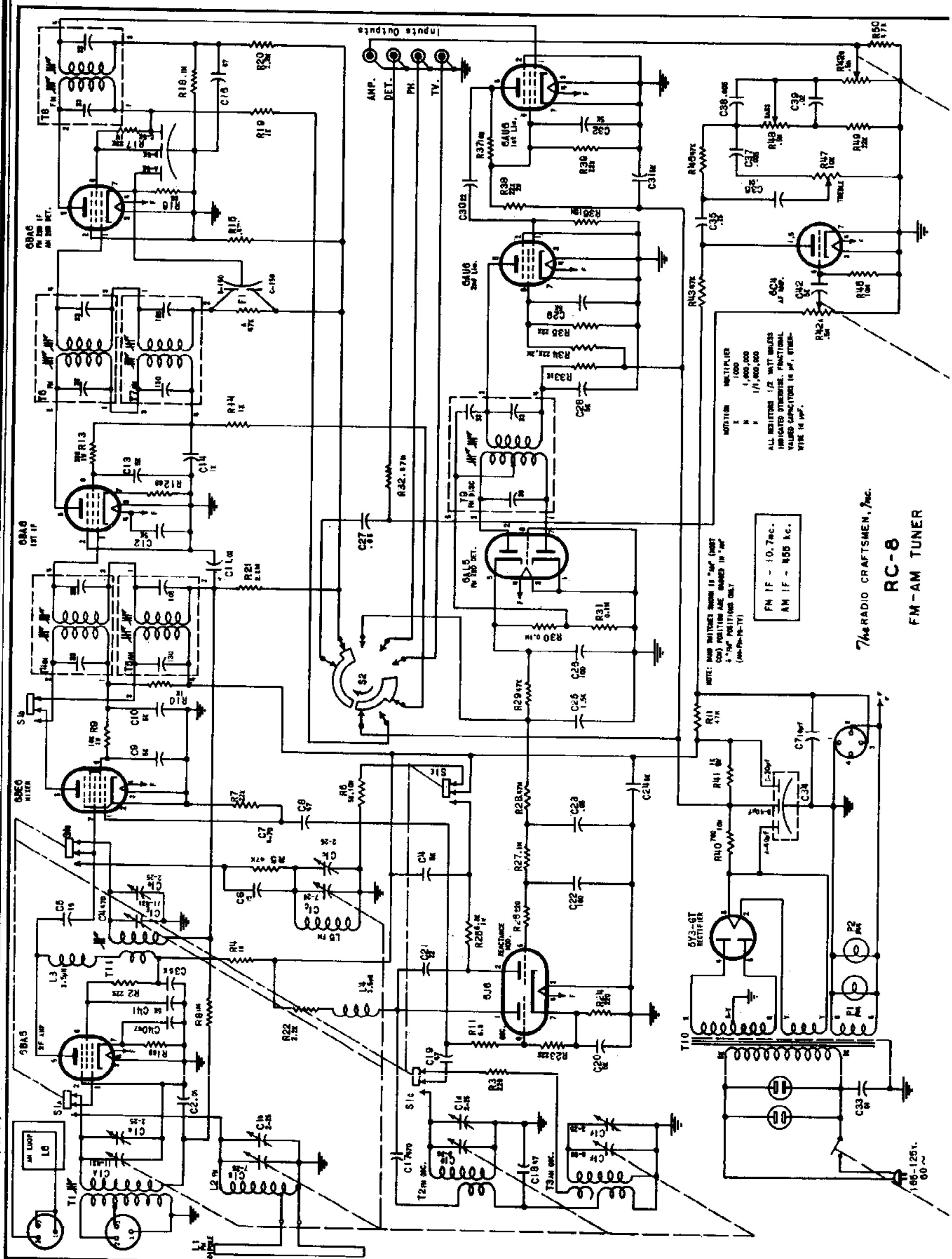
Replacement Parts

STOCK No.	DESCRIPTION
	CHASSIS ASSEMBLIES RC 613A
*73107	Board—"F.M." board—antenna end
*73106	Board—Two (2) contact terminal board for transmission line—chassis end
72046	Capacitor—Mica trimmer, 2.5-13mmf. (C2)
71808	Capacitor—Adjustable, 3-35 mmf. (C4)
72334	Capacitor—Adjustable, 4-70 mmf. (C12)
72570	Capacitor—Ceramic, 27 mmf. (C5)
39042	Capacitor—Ceramic, 47 mmf. (C41)
71924	Capacitor—Ceramic, 56 mmf. (C13)
71614	Capacitor—Ceramic, 120 mmf. (C9, C39)
39640	Capacitor—Mica, 330 mmf. (C6, C32, C33)
39642	Capacitor—Mica, 390 mmf. (C10)
70646	Capacitor—Tubular, .0035 mfd., 1000 volts (C42, C43)
73186	Capacitor—Tubular, .001 mfd., 400 volts (C23)
72573	Capacitor—Tubular, .003 mfd., 400 volts (C25)
72874	Capacitor—Moulded paper, .003 mfd., 600 volts (C35)
72490	Capacitor—Tubular, .005 mfd., 200 volts (C19, C29, C30, C31, C44)
71553	Capacitor—Tubular, .005 mfd., 400 volts (C17, C18, C20, C21)
70606	Capacitor—Tubular, .005 mfd., 400 volts (C24, C37)
72120	Capacitor—Tubular, .015 mfd., 200 volts (C27, C28)
71923	Capacitor—Tubular, .01 mfd., 200 volts (C26, C45)
71925	Capacitor—Tubular, .01 mfd., 400 volts (C14, C16, C22)
70610	Capacitor—Tubular, .01 mfd., 400 volts (C38)
70611	Capacitor—Tubular, .02 mfd., 400 volts (C36)
71551	Capacitor—Tubular, .05 mfd., 200 volts (C15)
72121	Capacitor—Electrolytic, 5 mfd., 50 volts (C34)
72052	Capacitor—Electrolytic, comprising 1 section of 30 mfd., 450 volts, 1 section of 30 mfd., 350 volts and 1 section of 40 mfd., 25 volts (C40A, C40B, C40C)
72335	Coil—Antenna coil—F.M.—complete with adjustable core and stud (L1, L2)
72336	Coil—Oscillator coil—F.M.—complete with adjustable core and stud (L3)
72333	Coil—Oscillator coil—"A" band—complete with adjustable core and stud (L6)
72574	Coil—Filament choke coil (L7)
72059	Condenser—Variable tuning condenser (C1, C3, C8, C11)
70342	Control—Volume control and power switch (R22, S3)
†72953	Cord—Drive cord (approx. 82" overall required)
70392	Cord—Power cord and plug
72069	Grommet—Rubber grommet for rear mounting feet (2 required)
71799	Grommet—Rubber grommet to mount R.F. shelf (3 required)
71608	Indicator—Station selector indicator
71607	Plate—Dial back plate
30868	Plug—2 contact female plug for motor cable
12493	Plug—5 contact female plug for speaker cable
72602	Pulley—Drive cord pulley
	Resistor—Fixed composition, 10 ohms, ½ watt (R40)
	Resistor—Fixed composition, 47 ohms, ±10%, ½ watt (R9)
	Resistor—Fixed composition, 68 ohms, ±10%, ½ watt (R15)
	Resistor—Fixed composition, 100 ohms, ±5%, ½ watt (R18)
72865	Resistor—Wire wound, 560 ohms, 2 watt (R39)
	Resistor—Fixed composition, 820 ohms, ±5%, ½ watt (R27)
	Resistor—Fixed composition, 910 ohms, ±5%, ½ watt (R25)
	Resistor—Fixed composition, 1000 ohms, ±20%, ½ watt (R6, R17)
	Resistor—Fixed composition, 2200 ohms, ±20%, 1 watt (R11)
	Resistor—Fixed composition, 3300 ohms, ±10%, 2 watt (R34, R35)
	Resistor—Fixed composition, 6800 ohms, ±10%, 1 watt (R5)
	Resistor—Fixed composition, 8200 ohms, ±10%, ½ watt (R36)
	Resistor—Fixed composition, 8200 ohms, ±10%, 1 watt (R4)
	Resistor—Fixed composition, 10,000 ohms, ±10%, ½ watt (R26)
	Resistor—Fixed composition, 15,000 ohms, ±10%, ½ watt (R19)
	Resistor—Fixed Composition, 18,000 ohms, ±10%, 2 watt (R7)
	Resistor—Fixed composition, 22,000 ohms, ±10%, ½ watt (R2, R3)
	Resistor—Fixed composition, 22,000 ohms, ±10%, 1 watt (R10)
	Resistor—Fixed composition, 27,000 ohms, ±10%, ½ watt (R23, R24)
	Resistor—Fixed composition, 33,000 ohms, ±10%, ½ watt (R16)
	Resistor—Fixed composition, 100,000 ohms, ±10%, ½ watt (R20)
	Resistor—Fixed composition, 270,000 ohms, ±10%, ½ watt (R13, R14, R30, R31)
	Resistor—Fixed composition, 470,000 ohms, ±10%, ½ watt (R37, R38)
	Resistor—Fixed composition, 1 megohm, ±20%, ½ watt (R1)
	Resistor—Fixed composition, 1 megohm, ±10%, ½ watt (R21)
	Resistor—Fixed composition, 1.5 megohm, ±20%, ½ watt (R28)
	Resistor—Fixed composition, 2.2 megohm, ±20%, ½ watt (R8, R12)
	Resistor—Fixed composition, 10 megohm, ±20%, ½ watt (R32, R33)
	Resistor—Fixed composition, 22 megohm, ±20%, ½ watt (R29)
72055	Shaft—Tuning knob shaft
31364	Socket—Lamp socket
35787	Socket—Phono input socket
72516	Socket—Tube socket—miniature
31251	Socket—Tube socket—octal
31418	Spring—Drive cord tension spring
*73104	Support—Dial back plate support—R.H.—complete with four (4) drive cord pulleys
*73105	Support—Dial back plate support—L.H.—complete with one (1) drive cord pulley
72060	Switch—Rang switch (S1)
71603	Switch—Tone control switch (S2)
72887	Transformer—First I.F. transformer—F.M. (T1)
71625	Transformer—First I.F. transformer—A.M. (T2)
72888	Transformer—Second I.F. transformer—F.M (T3)
71631	Transformer—Second I.F. transformer—A.M. (T4)
72889	Transformer—Ratio detector transformer (T5)
71975	Transformer—Power transformer—117 volt, 60 cycle (T7)
35969	Washer—"C" washer for tuning knob shaft
	SPEAKER ASSEMBLIES 92569-1W or 92569-1W1
13867	Cap—Dust cap
36145	Cone—Cone and voice coil assembly—(2.2 ohm voice coil)
71560	Plug—5 prong male plug for speaker
71961	Speaker—12" PM speaker complete with cone and voice coil less output transformer and plug (92569-1W)
71145	Suspension—Metal cone suspension
37899	Transformer—Output transformer (T6)
	SPEAKER ASSEMBLIES 92569-1W2
13867	Cap—Dust cap
72828	Cone—Cone and voice coil assembly—(6 ohm voice coil)
71560	Plug—5 prong male plug for speaker
71145	Suspension—Metal cone suspension
*73242	Transformer—Output transformer (T6)
	NOTE: If stamping on speaker in instrument does not agree with above speaker number, order replacement parts by referring to model number of instrument, number stamped on speaker and full description of part required.
	MISCELLANEOUS
72555	Antenna—Di-pole antenna
71599	Bracket—Pilot lamp bracket
72583	Cable—Shielded pickup cable complete with pin plug
13103	Cap—Pilot lamp jewel
71892	Catch—Record storage compartment door catch and strike
71820	Check—Radio compartment door check
X1752	Cloth—Grille cloth
73088	Decal—Control panel decal
71910	Decal—Trade mark decal (RCA Victor)
71966	Decal—Trade mark decal (Victrola)
72682	Dial—Glass dial scale
72861	Escutcheon—Dial escutcheon less dial
*73181	Grille—Metal grille
11889	Grommet—Rubber grommet for radio chassis mounting strap (2 required)
73024	Hinge—Radio compartment door hinge (2 required)
36817	Hinge—Record storage compartment door hinge—L.H. (1 set)
36610	Hinge—Record storage compartment door hinge—R.H. (1 set)
71821	Knob—Control knob
11765	Lamp—Dial or jewel lamp—Mazda 51
*73108	Loop—Antenna loop complete (L4, L5, C7)
70546	Mounting—One set of hardware to mount record changer consisting of four (4) upper springs and four (4) lower springs
71819	Plate—Mounting plate for door check
30870	Plug—2 prong male plug
73034	Pull—Record storage compartment door pull (2 required)
72556	Pull—Record changer compartment or radio compartment door pull (2 required)
*73184	Runner—Record changer motor board runner—R.H.
*73183	Runner—Record changer motor board runner—L.H.
*73185	Stop—Metal stop for motor board runners (2 required)
72936	Stop—Record storage compartment door stop
71818	Spring—Radio compartment door check spring
30900	Spring—Retaining spring for knob
*73182	Track—Record changer compartment track (2 required)
*73248	Washer—Flat washer (1" square) to mount record changer (4 required)

*This is the first time this Stock No. has appeared in Service Data.

†This is a reel containing 250 ft. of cord, order from your distributor by specifying Stock No. and length required.

THE RADIO CRAFTSMEN INC.



ALIGNMENT PROCEDURE

To set pointer, completely mesh tuning capacitor and align pointer with last reference mark at low frequency end of dial. Volume control should be in maximum clockwise position. Bass and treble controls should be in maximum counter-clockwise position. Output of signal generator should be no higher than necessary to obtain an output reading. Low side of signal generator and indicating meter should be connected directly to chassis at all times. Use an insulated screw driver with 1/16" thick blade for adjusting IF transformers.

Operation	Signal Generator			Band Switch Position	Dial Setting	Indicating Meter	Adjust	Indication
	Coupling	Freq.	Modulation					
1.	.01μf to pin 7 (grid) 6BE6	455kc	400cps AM	AM (most CCW)	point of no interference	AC voltmeter across audio output	T7,T5 top & bottom	maximum deflection
2.	220μμf to loop ant. socket pin 2.	1500kc	400cps AM	AM (most CCW)	1500kc	AC voltmeter across audio output	C1a,C1e,C1f	maximum deflection
3.	220μμf to loop ant. socket pin 2.	600kc	400cps AM	AM (most CCW)	tune for maximum response	AC voltmeter across audio output	T1, T11	maximum deflection
4.	Repeat steps 2 and 3							
5.	.01μf to pin 7 (grid) 6BE6	10.7mc	none	FM (1 pos. CW from most CCW)	point of no interference	neg. DC VTVM to output of diode filter (F1)	T8,T6,T4 top & bottom	maximum deflection
6.	.01uf to pin 7 (grid) 6BE6	10.7mc	none	FM (1 pos. CW from most CCW)	point of no interference	neg. DC VTVM across C25	T9 top	zero volts
7.	300 Ω (carbon) to top FM ant. post	104mc	400cps FM	FM (1 pos. CW from most CCW)	104mc	AC voltmeter across audio output	C1d,C1c,C1b, T9 bottom	maximum deflection

ELECTRICAL SPECIFICATIONS

Power supply . . . . . 105-125 V., 60 cycle AC

Power Consumption . . . . . 100 watts

Tuning Range . . . . . (AM) 535 - 1620 kc.

(FM) 88 - 108 mc

Intermediate Frequency . . . . . (AM) 455 kc.

(FM) 10.7 mc

Antennas . . . . . (AM) low-impedance loop

(FM) 300-ohm folded dipole

Output Impedance . . . . . 47,000 ohms

Sensitivity . . . . . (AM) 5 microvolts

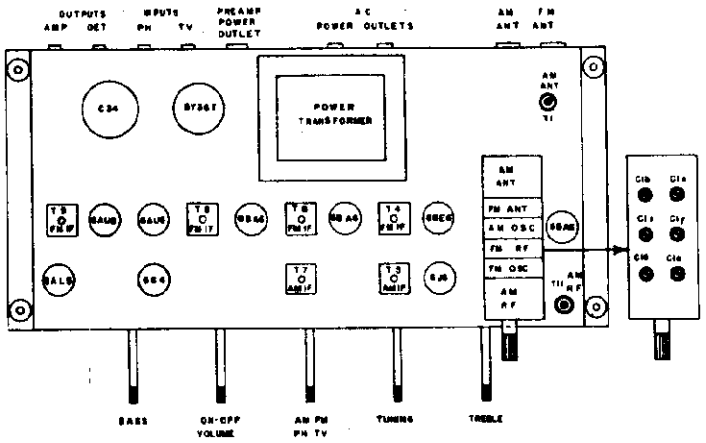
(30% mod., 0.5 V. output) . . . . . (FM) 8 microvolts

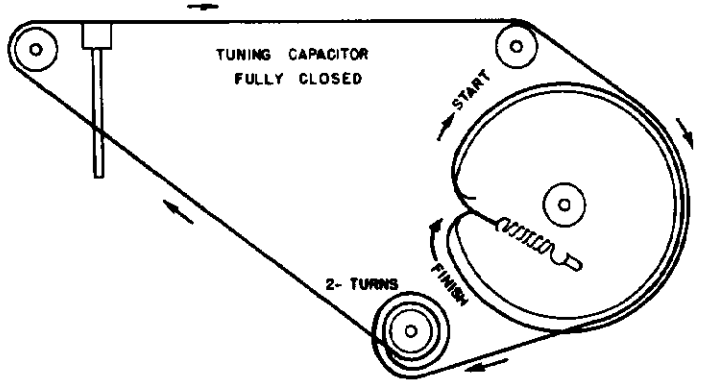
STAGE GAIN MEASUREMENTS

Location	AM		FM	
Ant. to RF grid	600 kc.	2X	100 mc.	1.2X
RF grid to Conv. grid	600 kc.	10X	100 mc.	
Conv. grid to 1st IF grid	600 - 455 kc.	50X	100 - 10.7 mc.	20X
1st IF grid to 2nd IF grid	455 kc.	110X	10.7 mc.	30X
2nd IF grid to 3rd IF grid			10.7 mc.	25X
Audio grid to output plug	400 cps.	1.5X	400 cps.	1.5X

VOLTAGE READINGS

TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
6BA6 R.F.	-0.6DC *0*	0 *0*	0 *0*	6.3AC *6.3AC*	140DC *160DC*	85DC *85DC*	0.7DC *0.9DC*	—
6BE6 Mixer	-6 DC *-5 DC*	0 *0*	0 *0*	6.3AC *6.3AC*	155DC *165DC*	85DC *95DC*	-0.6DC *-0.5DC*	—
6BA6 1st I.F.	-0.6DC *-0.1DC*	0 *0*	0 *0*	6.3AC *6.3AC*	210DC *205DC*	100DC *95DC*	0.9DC *0.9DC*	—
6BA6 2nd I.F.	-0.9DC *-0.1DC*	0 *0*	0 *0*	6.3AC *6.3AC*	0 *210DC*	0 *95DC*	0 *0.9DC*	—
6AU6 1st. Lim.	-0.6DC *-0.6DC*	0 *0*	0 *0*	6.3AC *6.3AC*	25DC *25DC*	50DC *50DC*	0 *0*	—
6AU6 2nd. Lim.	-0.7DC *-0.7DC*	0 *0*	0 *0*	6.3AC *6.3AC*	210DC *210DC*	85DC *85DC*	0 *0*	—
6AL5 Disc.	0 *0*	-0.6DC *-4DC*	0 *0*	6.3AC *6.3AC*	0 *-0.3DC*	0 *0*	-0.8DC *-4DC*	—
6J6 Osc.	130DC *160DC*	0 *150DC*	0 *0*	6.3AC *6.3AC*	0 *-0.6DC*	-5 DC *-1.5DC*	2DC *3DC*	—
6C4 Audio	30DC *35DC*	0 *0*	0 *0*	6.3AC *6.3AC*	30DC *35DC*	-0.6DC *-0.6DC*	0 *0*	—
5Y3-GT Rect.	0 *0*	280DC *290DC*	0 *0*	285AC *285AC*	0 *0*	285AC *285AC*	0 *0*	280DC *290DC*
	(A)	(B)	(C)					



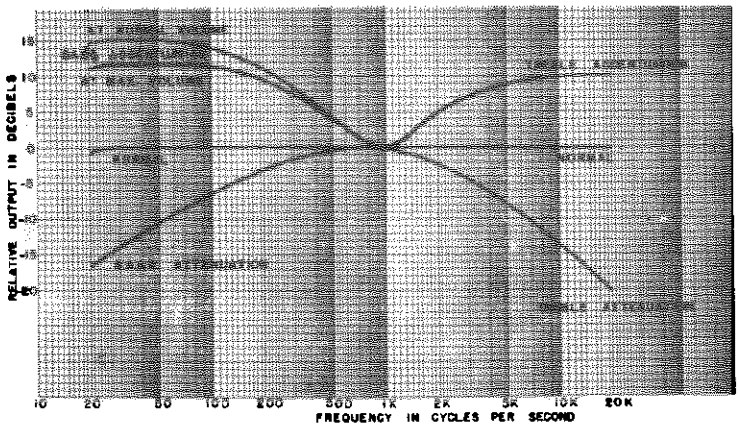


Dial Cord Drive

Top reading in AM position, bottom italic reading in FM
DC Voltages measured with vacuum-tube voltmeter
AC Voltages measured at 1,000 ohms per volt.
Socket connections are shown as bottom views.
Measured values are from socket pin to common negative.
Line voltage maintained at 117 volts for voltage readings.
Nominal tolerance on component values makes possible a variation of ± 10% in voltage.
Voltage measurements are with no signal applied.

AUDIO

CHARACTERISTIC

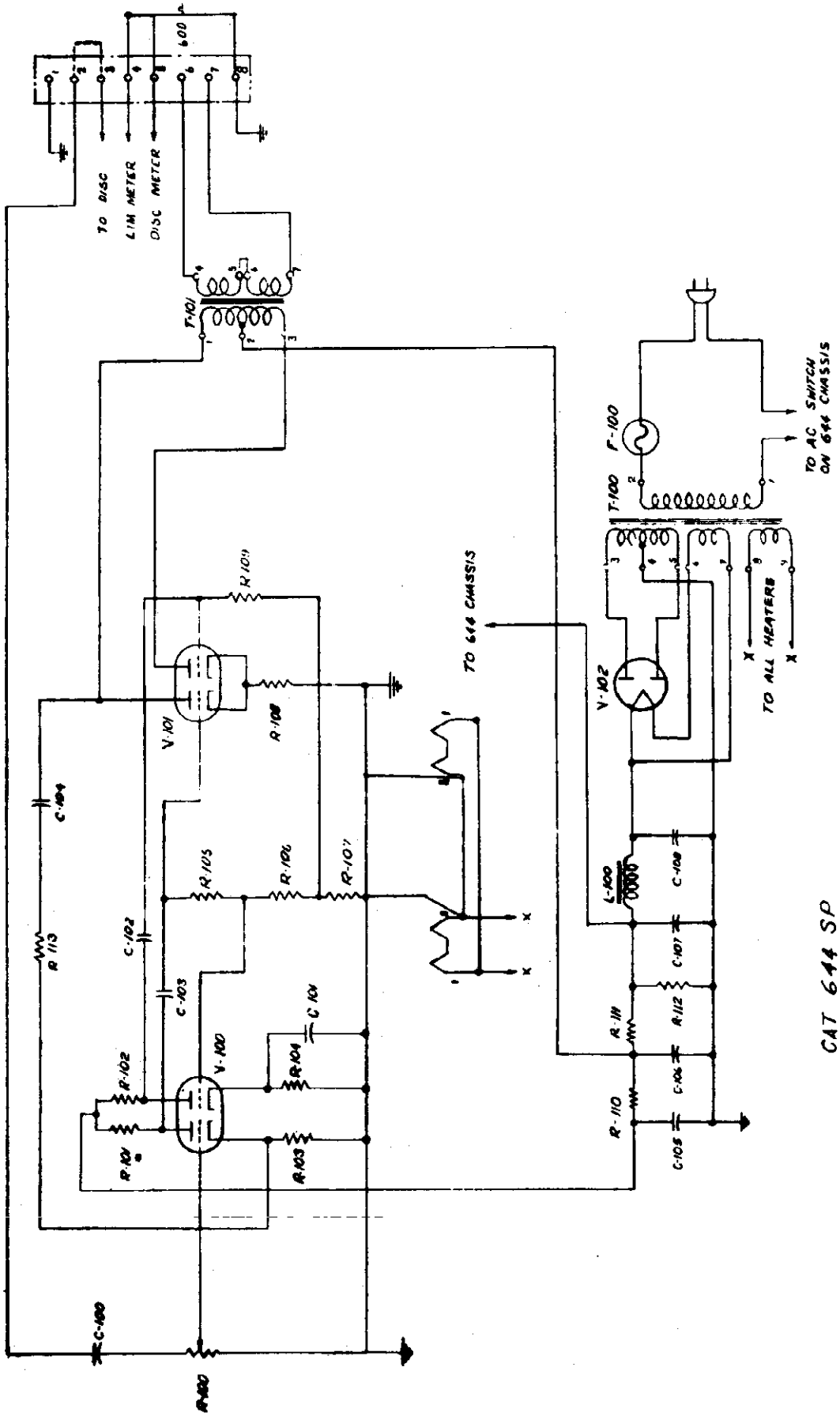


THE RADIO CRAFTSMEN INC. MODEL R

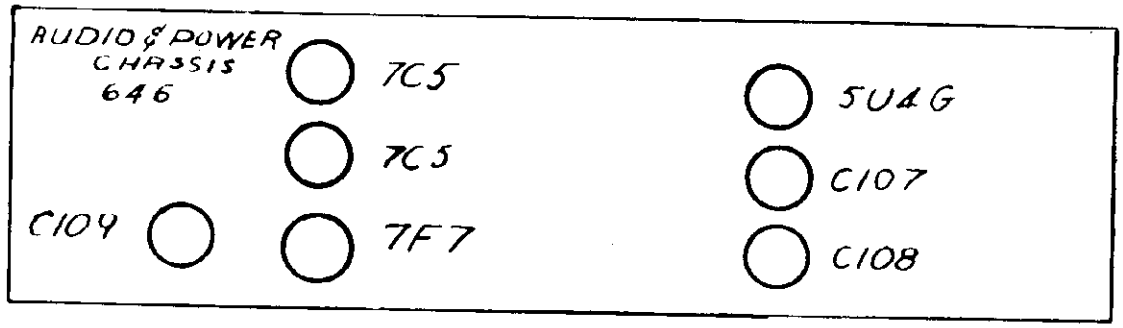
REPLACEMENT PARTS LIST

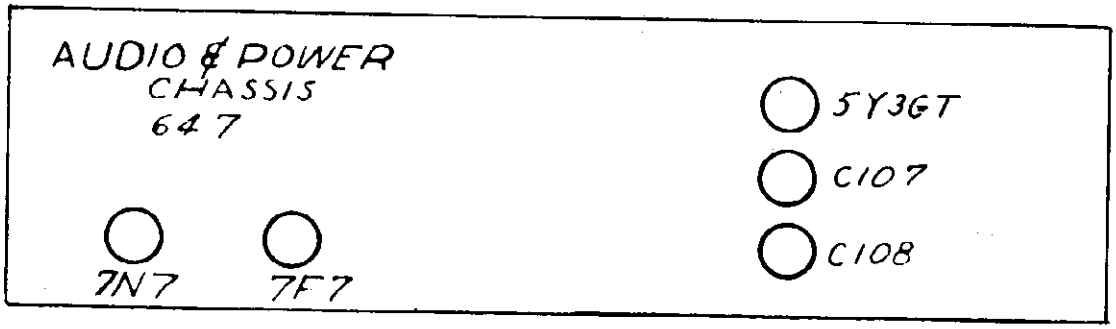
Ref. No.	Part No.	Description	Function
		TUBES	
	6BA6	glass 7 pin miniature	RF amplifier
	6BE6	glass 7 pin miniature	mixer
	6BA6	glass 7 pin miniature	1st IF amplifier
	6BA6	glass 7 pin miniature	FM 2nd IF amp. AM 2nd det.
	6AU6	glass 7 pin miniature	FM 1st lim.
	6AU6	glass 7 pin miniature	FM 2nd lim.
	6AL5	glass 7 pin miniature	FM 2nd det.
	6J6	glass 7 pin miniature	osc.-reactance mod.
	6C4	glass 7 pin miniature	AF amplifier
	5Y3-GT	glass octal	rectifier
		CAPACITORS	
C1A	17B005	11-431 µµf 300v ganged air	AM ant. tuning
B		7-26 µµf 300v ganged air	FM ant. tuning
C		7-26 µµf 300v ganged air	FM RF tuning
D		8-36 µµf 300v ganged air	FM osc. tuning
E		11-431 µµf 300v ganged air	AM RF tuning
F		8-98 µµf, 300v ganged air	AM osc. tuning
a		2-25 µµf 300v var. mica.	AM ant. trimmer
b		2-25 µµf 300v var. mica.	FM ant. trimmer
c		2-25 µµf 300v var. mica.	FM RF trimmer
d		2-25 µµf 300v var. mica.	FM osc. trimmer
e		2-25 µµf 300v var. mica	AM RF trimmer
f		2-25 µµf, 300v var. mica	AM osc. trimmer
C2	18X206	0.05 µf, 400v paper	AVC filter
C3	18X608	5K µµf 400v ceramic	RF plate dec.
C4	18X608	5K µµf 400v ceramic	reac. mod. bypass
C5	18X602	15 µµf 500v ceramic	FM RF coupling
C6	18X602	15 µµf 500v ceramic	FM RF coupling
C7	18X005	10 µf, 300v dry electrolytic	filter
C8	18X603	22 µµf 500v ceramic	osc. coupling
C9	18X608	5K µµf 400v ceramic	mix. screen bypass
C10	18X608	5K µµf 400v ceramic	FM mix. plate dec.
C11	18X202	0.02 µf 400v paper	AVC filter
C12	18X608	5K µµf 400v ceramic	filter bypass
C13	18X608	5K µµf 400v ceramic	1st IF screen bypass
C14	18X608	5K µµf 400v ceramic	1st IF plate dec.
C15A	18X610	5K µµf 400v ceramic	2nd IF cathode bypass
B		5K µµf 400v	2nd IF screen bypass
C		5K µµf 400V	2nd IF plate dec.
C16	18X604	47 µµf 500v ceramic	lim. grid filter
C17	18X606	470 µµf 500v ceramic	osc. plate coupling
C18	18X604	47 µµf 500v ceramic	FM osc. grid filter
C19	18X604	47 µµf 500v ceramic	osc. grid coupling
C20	18X608	5K µµf 400v ceramic	osc. cathode bypass
C21	18X603	22 µµf 500v ceramic	reac. mod. coupling
C22	18X605	100 µµf 500v ceramic	RF bypass
C23	18X206	0.05 µf 400v paper	AF bypass
C24	18X608	5K µµf 400v ceramic	B+IF bypass
C25	18X607	1.5K µµf 350v ceramic	FM de-emphasis
C26	18X605	100 µµf 500v ceramic	IF filter
C27	18X206	0.05 µf 400v paper	AF coupling
C28	18X608	5K µµf 400v ceramic	2nd lim. plate decoupling
C29	18X608	5K µµf 400v ceramic	2nd lim. screen bypass
C30	18X603	22 µµf 500v ceramic	lim. coupling
C31	18X608	5K µµf 400v ceramic	B+IF bypass
C32	18X608	5K µµf 400v ceramic	1st lim. screen bypass
C33	18X210	0.01 µf 600v paper	line bypass
C34A	18S003	40 µf 400v dry electrolytic	filter
B		40 µf 400v	filter
C		20 µf 300v	filter
C35	18X209	0.25 µf 200v paper	AF coupling
C36	18X208	0.01 400v paper	tone compensation
C37	18X211	0.005 400v paper	tone compensation
C38	18X211	0.005 400v paper	tone compensation
C39	18X202	0.02 400v paper	tone compensation
C40	18X604	47 µµf 500v ceramic	RF cathode bypass
C41	18X608	5K µµf 400v ceramic	RF screen bypass
		FILTER	
F1A	18X609	47K 1/2 watt carbon resistor	AM det. filter
B		150 µµf 400v ceramic cap.	
C		150 µµf 400v ceramic cap.	
		RF COILS	
L1	7X401	300Ω polyethylene twin lead	FM dipole Ant.
L2	5A210	RF auto transformer	FM ant. coil
L3	5S402	3.5 µh RF choke	FM RF plate load
		RF COILS - Continued	
L4	5S402	3.5 µh RF choke	FM osc. choke
L5	5A209	RF coil	FM RF inductor
L6	5B603	Low impedance loop	AM antenna
		PILOT LITES	
P1	15X003	#44 6-8v, 0.15a, bayonet	blue bead
P2	15X003	#44 6-8v, 0.15a, bayonet	blue bead
		RESISTORS	
		ohms watts	
R1	23X016	68 1/2 carbon	Cathode bias
R2	23X021	22K 1/2 carbon	screen dropping
R3	23X017	220 1/2 carbon	parasitic suppressor
R4	23X019	1K 1/2 carbon	RF plate decoupling
R5	23X022	47K 1/2 carbon	FM mixer grid
R6	23X606	5K 10 wire-wound	voltage regulation
R7	23X021	22K 1/2 carbon	mixer osc. grid
R8	23X026	1M 1/2 carbon	AVC decoupling
R9	23X203	10K 1 carbon	screen dropping
R10	23X019	1K 1/2 carbon	FM mixer plate decouplin
R11	23X022	47K 1/2 carbon	filter
R12	23X016	68 1/2 carbon	cathode bias
R13	23X206	33K 1 carbon	screen dropping
R14	23X019	1K 1/2 carbon	1st IF plate decoupling
R15	23X025	0.47M 1/2 carbon	AM det. load
R16	23X016	68 1/2 carbon	cathode bias
R17	23X206	33K 1 carbon	screen dropping
R18	23X023	0.1M 1/2 carbon	1st lim. grid
R19	23X019	1K 1/2 carbon	2nd IF plate decoupling
R20	23X027	2.2M 1/2 carbon	AVC decoupling
R21	23X027	2.2M 1/2 carbon	AVC decoupling
R22	23X011	2.2K 1/2 carbon	osc. plate load
R23	23X021	22K 1/2 carbon	osc. grid
R24	23X017	220 1/2 carbon	cathode bias
R25	23X201	6.8K 1 carbon	reac. mod. plate load
R26	23X017	220 1/2 carbon	phase-shifter
R27	23X023	0.1M 1/2 carbon	AFC isolation
R28	23X025	0.47M 1/2 carbon	AFC audio filter
R29	23X022	47K 1/2 carbon	FM de-emphasis
R30	23X028	0.1M 1/2 carbon	FM det. load
R31	23X028	0.1M 1/2 carbon	FM det. load
R32	23X025	0.47M 1/2 carbon	AF isolation
R33	23X019	1K 1/2 carbon	2nd lim. plate decoupling
R34	23X401	22K 2 carbon	screen dropping
R35	23X021	22K 1/2 carbon	screen supply bleeder
R36	23X024	0.15M 1/2 carbon	2nd lim. grid
R37	23X020	10K 1/2 carbon	1st lim. plate load
R38	23X401	22K 2 carbon	screen dropping
R39	23X021	22K 1/2 carbon	screen supply bleeder
R40	23X603	500 10 wire-wound	filter
R41	23X602	1K 5 wire-wound	filter
R42A	23S704	0.5M 1/4 carbon	vol. control
B		0.5M 1/4 carbon	vol. control
R43	23X022	47K 1/2 carbon	AF plate load
R44	23X404	33K 2 carbon	cathode bias
R45	23X018	330 1/2 carbon	cathode bias
R46	23X022	47K 1/2 carbon	tone compensation
R47	23S702	10K 1/4 carbon	treble control
R48	23S703	0.5M 1/4 carbon	bass control
R49	23X021	22K 1/2 carbon	tone compensation
R50	23X032	6.8 1/2 carbon	parasitic suppressor
		SWITCHES	
S1	4B002	5P2T slide	AM-FM
S2	4S003	2P4T rotary	AM-FM-PH-TV
		TRANSFORMERS	
T1	5A212	slug-tuned	AM antenna
T2	5A208		FM osc.
T3	5A211	oscillator coil	AM osc.
T4	5X004	10.7 mc slug-tuned	FM IF
T5	5X003	455kc slug-tuned	AM IF
T6	5X004	10.7 mc slug-tuned	FM IF
T7	5X003	455 kc slug-tuned	AM IF
T8	5X004	10.7 mc slug-tuned	FM IF
T9	5X005	10.7 mc slug-tuned	FM discriminator
T10	19S201	600v CT @125a, 6.3v @3.5a, 5v @2a	power
T11	5B214	slug-tuned	AM RF

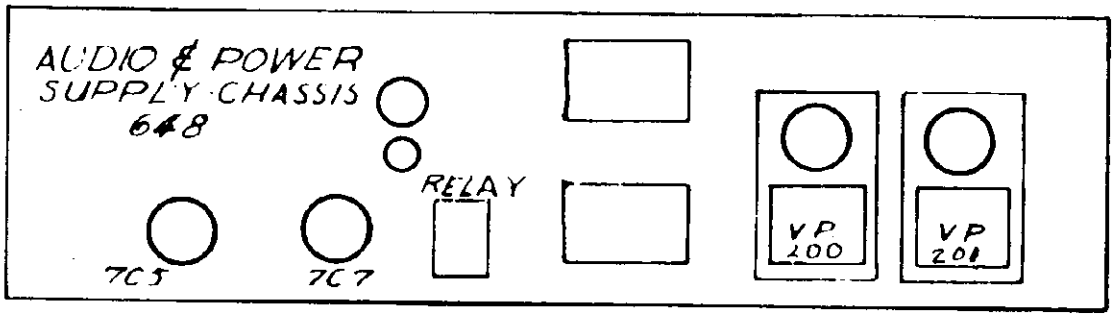
RADIO ENGINEERING LABS., INC.

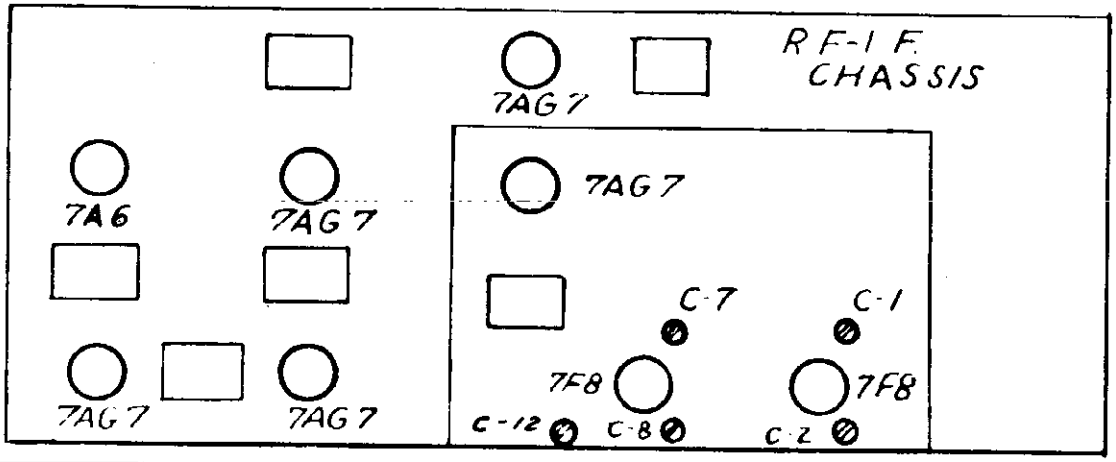


CHASSIS TUBE AND TRIMMER LAYOUT









These receivers are single superheterodyne units of orthodox circuit and design. As with all VHF receiving equipment, performance is dependent on correct installation, particularly the associated antenna and lead-in system.

The nominal impedance at the antenna terminals (marked A - A) is 150 ohms, Both 70 and 300 ohm lines may be used here without serious mismatch consequences. Whether or not the ground terminal (marked G) is used depends on local conditions. Because of uncertainties in this connection and because the input circuit coupling is fairly tight, the latter is not precisely tracked at the factory. For very weak signals or for technical use at any one frequency, these circuits may be trimmed up by adjusting C2, for the 88 to 108 band, and C1 for the 44 to 50 band. These are accessible at the top of the chassis and are located as shown in the tube layout sketch.

For convenience in tuning and rough measuring the circuits are adjusted so tha one small division of the TUNE meter corresponds to a frequency shift of about 20 kilocycles, and so that the steps of the RF GAIN control are roughly ten to 1 each. Indications on the SIGNAL meter are approximately linear. Both these meters may be supplemented externally by use of the connections on the rear te: minal board. The TUNE meter is 25-0-25 microamperes, and the SIGNAL is 0-1 milliampere.

To use external meters, remove the strap between terminals 4 and 5 and the ground bus from terminal 5, then connect the TUNE meter between terminals 5 an 1 (ground) and the SIGNAL meter between terminal 4 and 1. If only one of thes meters are connected externally, the terminal for the second meter must be connected to terminal 1.

The output of the detector is directly available at the rear at terminals 3 (high) and 1 (ground). This is at a fairly high impedance and not more than 50 micro-microfarads should be placed across this pair unless C33 (part of the standard de-emphasis network) is reduced correspondingly. The audio amplifier may be used by connecting to 2 (high) and 1 (ground). The terminals present to AC about one megohm and 30 micro-microfarads. For the 646, about 2.0 volts R.M.S. at these terminals gives full output of the audio amplifier.

The 646 and 647 receivers are designed for operation at 115 volts. They shoul not be operated permanently on lines higher than 125 volts. The 648 receiver requires at least 5.8 volts DC at the indicated terminals. They are connected for negative ground. If the vehicle has a positive ground system the vibrator <u>must</u> be reoriented according to the legend on the top of the Vibrapacks.

The maximum audio output of the 646 receiver is ten watts into either 500 or 8 ohms (mismatch up to 2 to 1 here is not generally aurally serious). The maximum output of the 647 receiver is + 18 DBM into 600 or 150 ohms. This receiv is connected for 600 ohm load; to use with 150 ohm load the output transformer should be restrapped by replaceing strap from 5 to 6 by a strap from 4 to 6 and another from 5 to 7. The maximum audio output of the 648 receiver is 4 watts into 6 ohms.

SYMBOL REF.	DESCRIPTION
R7	Resistor, 220,000 ohms ± 10%, 1/2 watt
R8	Resistor, 150 ohms, ± 10%, 1/2 watt
R9	Resistor, 47 ohms, ± 10%, 1/2 watt
R10	Resistor, 1000 ohms, ± 20%, 1/2 watt
R11	Resistor, 330 ohms, ± 10%, 1/2 watt
R12	Resistor, 560 ohms, ± 10%, 1/2 watt
R13	Resistor, 820 ohms, ± 10%, 1/2 watt
R14	Same as R8
R15	Same as R10
R16	Resistor, 220 ohms, ± 10%, 1/2 watt
R17	Same as R10
R18	Same as R10
R19	Resistor, 100000 ohms, ± 10%, 1 watt
R20	Resistor, 47000 ohms, ± 10%, 1 watt
R21	Same as R20
R22	Resistor, 47000 ohms, ± 10%, 1/2 watt
R23	Resistor, 68000 ohms, ± 10%, 1 watt
R24	Resistor, 10000 ohms, ± 10%, 1/2 watt
R25	Same as R24
R26	Resistor, 33000 ohms, ± 10%, 1/2 watt
R27	Same as R26
R28	Resistor, 470,000 ohms, ± 10%, 1/2 watt
R29	Resistor, 150,000 ohms, ± 10%, 1/2 watt
R30	Same as R9
S1	Switch, ceramic, 3 wafer, 2 position, 3 pole
S2	Switch, tap, 3 pole, 4 position
S3	Switch, single pole, single throw, rotary
V1	Type 7F8 tube
V2	Same as V1

SYMBOL REF.	DESCRIPTION
V3	Type 7AG7 tube
V4) V5) V6) V7)	Same as V3
V8	Type 7A6 tube
X1	Socket, octal, mica filled bakelite
X2	Same as X1
X3	Same as X1
X4	Same as X1
X5	Same as X1
X6	Same as X1
X7	Same as X1
X8	Same as X1
X9	Miniature, bayonet type socket
X10	Same as X9
X11	Same as X9
X12	Same as X9
Z1	Interstage coupling unit, 10.7 mc.
Z2	Interstage coupling unit, 10.7 mc.
Z3	Same as Z1
Z4	Interstage coupling units, 10.7 mc.
Z5	Interstage coupling unit, 10.7 mc.
Z6	Discriminator assembly unit 10.7 mc.

CAT. 646, 647, and 648 FM RECEIVER PARTS LIST FOR RF AND IF CHASSIS.
SCHEMATIC WIRING DIAGRAM DWG. S-615.

SYMBOL REF.	DESCRIPTION	SYMBOL REF.	DESCRIPTION
C1	Capacitor, glass, variable 1-12 mmfd. 500 V.D.C.W.	C32	Same as C6
C1A	Capacitor, ceramic 27 mmfd.	C33	Capacitor, 470 mmfd. ±10%, 500 V.D.C.W.
C2	Same as C1	C34	Same as C18
C2A	Capacitor, ceramic 4.7 mmfd.	C35	Capacitor, 1.0 mmfd. ±20%
C3	Capacitor, 500 mmfd, ±20%, 500 V.D.C.W.	I1	Pilot light, miniature bayonet base, 6-8 volts, .15 amps.
C4	Capacitor, 1200 mmfd., ±20%, 300 V.D.C.W.		
C5	Same as C4	I2)	
C6	Capacitor, 47 mmfd. ±10%, 500 V.D.C.W.	I3)	Same as I1
C7	Same as C1	I4)	
C7A	Capacitor, ceramic 27 mmfd.	L1)	Antenna and first grid
C8	Same as C1	L2)	coil assembly
C9	Same as C4	L3)	
C10	Same as C4		
C11	Capacitor, 22 mmfd. ±10%, 500 V.D.C.W.	L4)	Mixer grid coil
C12	Same as C1	L5)	
C13	Capacitor, 20 mmfd. ±10%, 500 V.D.C.W. N750	L6)	Oscillator coil
C14	Same as C3	L7)	
C15	Same as C11	L8)	Choke, 3 microhenries ±25%
C16	Capacitor, 4.7 mmfd. ±5%, mmfd. 500 V.D.C.W.		
C17	Same as C12.	L9)	
C18	Capacitor, .005 mfd. 600 V.D.C.W.	L10)	Same as L8
		L11)	
C19)		M1	Signal strength meter, 0-1 m.a.
C20)	Same as C18		
C21)		M2	Tuning meter, 25-0-25 microamps.
C21A	Capacitor, 500 mmfd.		
C22)		R1	Resistor, 4700 ohms ± 10%, 1 watt
C23)	Same as C4		
C24)		R2	Resistor, 270 ohms ± 10%, 1/2 watt
C25)		R3	Resistor, 100 ohms, ± 10%, 1/2 watt
C26)			
C27)		R4	Resistor, 1500 ohms, ±10%, 1/2 watt
C28)	Same as C18		
C29)		R5	Resistor, 15000 ohms, ±10%, 1/2 watt
C30)			
C31)		R6	Resistor, 39000 ohms, ±10%, 1 watt

CAT. 646 COMBINED AUDIO & POWER SUPPLY CHASSIS, SCHEMATIC WIRING DIAGRAM DWG. B-685

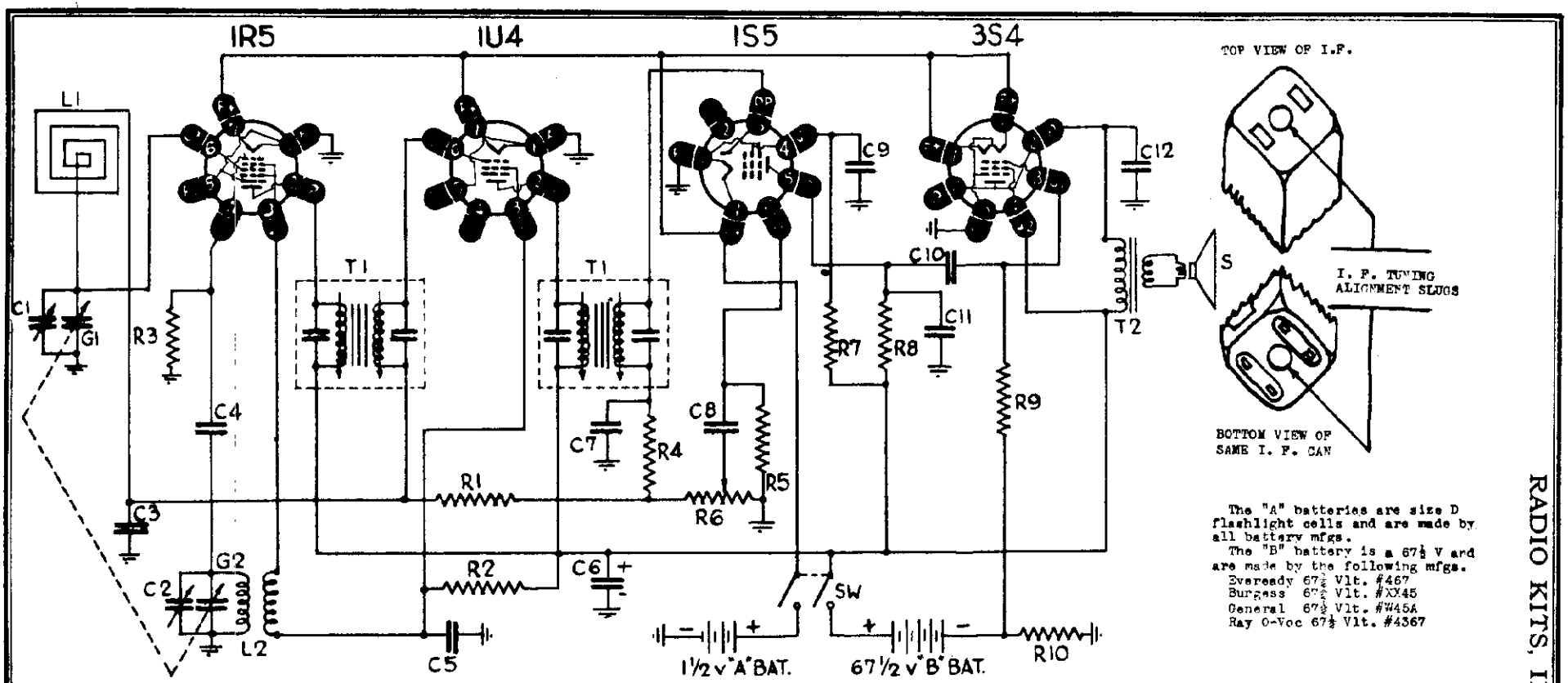
SYMBOL REF.	DESCRIPTION
C101	Capacitor, fixed, paper, tubular, .05 mfd. 600 volts D.C. WkG. plug/ minus 20%.
C102	Capacitor, fixed, dry electrolytic, 25 mfd., 25 volts D.C. wkg.
C103	Same as C102
C104	Same as C101
C105	Same as C101
C106	Capacitor, fixed, dry electrolytic, 25 mfd., 50 volts D.C. Wkg.
C107	Capacitor, fixed, electrolytic, 20 mfd., 475 volts D.C. Wkg.
C108	Capacitor, fixed, electrolytic, 40 mfd., 475 volts D.C. Wkg.
C109	Capacitor, fixed, electrolytic, 10 mfd., 475 volts D.C. Wkg.
C110	Capacitor, fixed, mica 300 mmfd., plus/minus 20%, 500 volts D.C. Wkg.
F101	Fuse, 2 ampere, 250 volts
L101	Choke, 10 henries, 0.160 amps
R101	Resistor, variable, composition, 1 megohm, Z taper, standard shaft
R102	Resistor, 220 ohms, 1/2 watt, plus/minus 10%.
R103	Resistor, 2700 ohms, 1/2 watt, plus/minus 10%
R104	Same as R103
R105	Resistor, 180,000 ohms, 1/2 watt, plus/minus 10%
R106	Same as R105
R107-	Resistor,330,000 ohms, 1/2 watt, plus/minus 10%
R108	Same as R107
R109	Resistor, 100,000 ohms, 1/2 watt, plus/minus 10%
R110	Resistor, 4700 ohms, 1 watt, plus/minus 10%
R111	Resistor, 200 ohms, 10 watt, plus/minus 5%
R112	Same as R110
R113	Resistor, 10,000 ohms, plus/minus 10%, 1 watt
R114	Resistor, 150,000 ohms, 2 watt, plus/minus 10%
T101	Transformer, output, Pri. 10,000 ohms CT, 12 MA DC unbalance, push-pull windings, balanced at high audio frequencies, Sec. 8/500 ohms, Max. operation level 10 watts
T102	Transformer, power, Pri. 115 volts, 50-60 cycles, single phase, Sec. #1, 320-0-320 volts RMS at 0.160 amp. Sec. #2, 5 volts at 3 amp. Sec. #3, 6.3 #4, 6.3 volts C.T. at 1.5 amp.
V101	Tube, Type 7F7
V102	Tube, Type 7C5
V103	Tube, Same as V102
V104	Tube, Type 5U4G
X101	Socket, loctal, mica-filled bakelite
X102	Same as X101
X103	Same as X101
X104	Socket, octal, mica-filled bakelite
X105	Fuse holder, molded black bakelite, finger operated.

CAT. 647 COMBINED AUDIO & POWER SUPPLY
CHASSIS: SCHEMATIC WIRING DIAGRAM DWG. B-709

SYMBOL REF.	DESCRIPTION	SYMBOL REF.	DESCRIPTION
C100	Capacitor, .05 mfd., 600 v.D.C.W.	R109	Same as R105
C101	Capacitor, Electrolytic 50 mfd., 25v. D.C.w.	R110	Resistor, 27,000 ohms ±10%, 1/2 watt
C102	Same as C100	R111	Resistor, 1500 ohms ±10%, 1 watt
C103	Same as C100	R112	Resistor, 100,000 ohms, ±10%, 2 watts
C104	Capacitor, .25 mfd. 600 v. D.C.w.	R113	Resistor, 68,000 ohms, ±10%, 1/2 watt
C105	Capacitor, electrolytic, dual 20 mfd. 450 v. D.C.w.	T100	Transformer, power, Pri 115 volts, 50-60 cycles, single phase, Sec. #1, 310-0-310 volts RMS at 0.1 amp., Sec. #2, 5 volts at 2.0 amp Sec. #3, 6.3 volts @ 2.5 amps
C106	Part of C105		
C107	Capacitor, electrolytic, 40 mfd. 475 v. D.C.w.		
C108	Capacitor, electrolytic, 20 mfd. 475 v. D.C.w.	T101	Transformer, output, Pri. 16,000 ohms CT; 6 ma. D.C. unbalance, push-pull windings balanced for high audio frequencies, Sec. 600/150 ohms Max. operation level +26 d b m
F100	Fuse, glass, 1 amp. 250V.		
L100	Choke, 10 henries, at 0.100 amp.		
R100	Resistor, variable, 1 megohm, ±10%, 1/2 watt, "Z" taper, clarostat 37		
R101	Resistor, 100,000 ohms ±10%, 1/2 watt	V100	Type 7F7
R102	Same as R101	V101	Type 7N7
R103	Resistor, 2200 ohms, ±10%, 1/2 watt	V102	Type 5Y3GT
R104	Same as R103	X100	Socket, loctal, mica filled, bakelite
R105	Resistor, 330,000 ohms, ±10%, 1/2 watt	X101	Same as X100
R106	Resistor, 4,700 ohms ±10%, 1/2 watt	X102	Socket, loctal, mica filled bakelite
R107	Same as R101	X105	Fuse holder, molded black bakelite, finger operated.
R108	Resistor, 680 ohms, ±10%, 1/2 watt		

DC AUDIO AND POWER SUPPLY FOR 6 V. DC. USED WITH CAT.648. SCHEMATIC WIRING DIAGRAM DWG.B-684

SYMBOL REF.	DESCRIPTION
C200	Capacitor, .05 mfd. 600 volts DC Wkg. ± 20%
C201	Capacitor, 0.1 mfd. 600 volts DC Wkg. ± 20%
C202	Capacitor - Same as C200
C203	Capacitor - 50 mfd. 50 volts, D.C. Wkg.
C204	Capacitor - 3 section 10-10-10-mfd. 450 volts DC Wkg.
C205	Capacitor - dual, 40-40 mfd. 450 volts DC Wkg.
C206	Capacitor - Part of C-204 (10 mfd. section)
C207	Capacitor - Part of C-205 (40 mfd. section)
C208	Capacitor - Part of C-204 (10 mfd. section)
F200	Fuse, 20 amp. *Littlefuse type 4AG
K200	Relay, filament - single pole, normally open, DC operation
L200	Choke, filter, smooth - 10 henries
L201	Choke - Same as L-1
R200	Resistor, variable, .5 megohm, 20% accuracy, 1/2 watt
R201	Resistor, 560 ohms, 1/2 watt, ±10%
R202	Resistor, 100,000 ohms, 1 watt, ± 10%
R203	Resistor, 680,000 ohms, 1/2 watt, ± 10%
R204	Resistor, 1,000 ohms, 1/2 watt, ± 10%
R205	Resistor, 390,000 ohms, 1/2 watt, ± 10%
R206	Resistor, 330 ohms, 1 watt, ± 10%
R207	Resistor, 15,000 ohms, 1 watt, ±10%
T200	Transformer, output, single 7Q5 to loudspeaker
V201	Tube, type 7Q5
VP-200	Vibrapack, audio supply.
VP-201	Vibrapack -(receiver supply) Same as VP-200
X200	Socket - loctal, mica-filled bakelite
X201	Socket - Same as X-200
X202	Fuse holder,



The "A" batteries are size D flashlight cells and are made by all battery mfgs.

The "B" battery is a 67½ V and are made by the following mfgs.

Eveready 67½ Vlt. #467
Burgess 67½ Vlt. #XX45
General 67½ Vlt. #W45A
Ray O-Voc 67½ Vlt. #4367

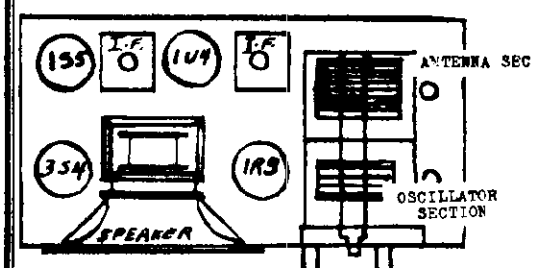
PARTS LIST FOR MODEL B-4

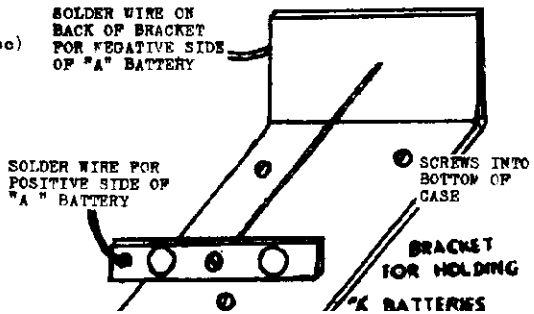
C12 - .002 MF
G1 - Ant. Trimmer) on Var.
G2 - Osc. Trimmer) Cond.
L1 - Loop Ant.

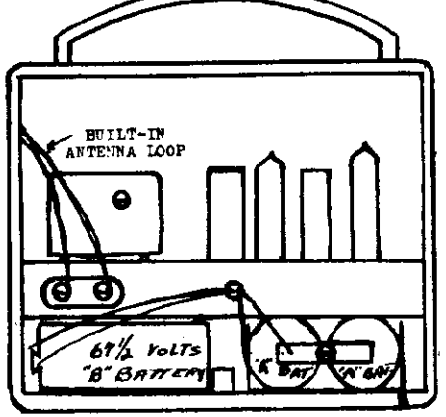
R1 - 3 megs ½ watt
R2 - 10K
R3 - 240
R4 - 100K
R5 - 10 megs
R6 - 500K (Vol. Cont.)
R7 - 3.3 megs
R8 - 1 meg
R9 - 2 megs
R10 - 270 ohms

C1 - Variable Cap. (Ant)
C2 - Variable Cap. (Osc)
C3 - .02 MFD
C4 - 100 MMF (.0001 MFD)
C5 - .02 MFD
C6 - .20 MF @ 150V
C7 - .100 MMF (.0001 MFD)
C8 - .002 MF
C9 - .02 MF
C10 - .002 MF
C11 - .100 MF

L2 - Osc. coil
T1 - IF Trans.
T2 - Output Trans.
C1 - Var. Cond. (Ant. Sec)
C2 - Var. Cond. (Osc. Sec)
S - P.M. Speaker
Sw - DPST Switch
Tubes-1R5-1U4-1S5-3S4



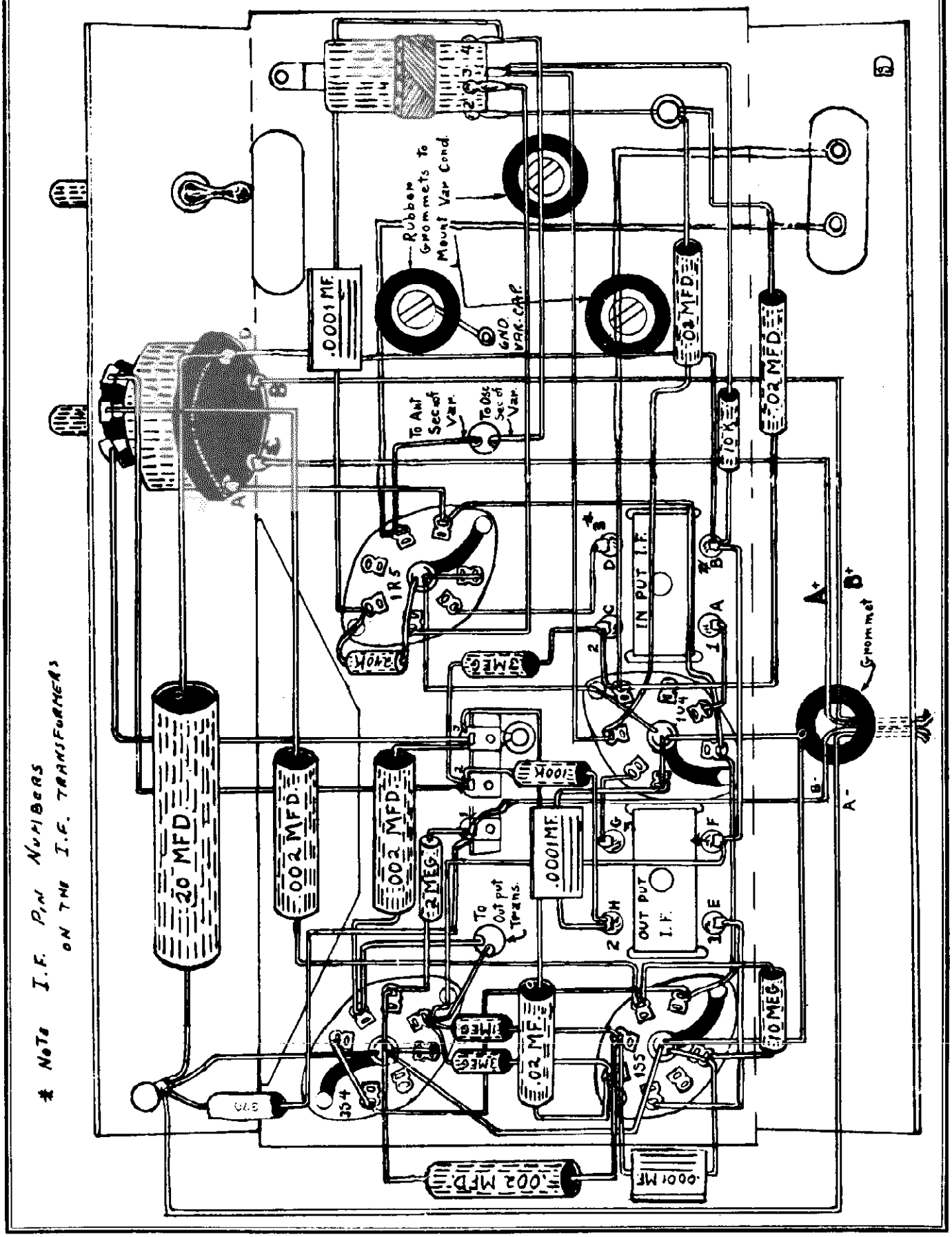




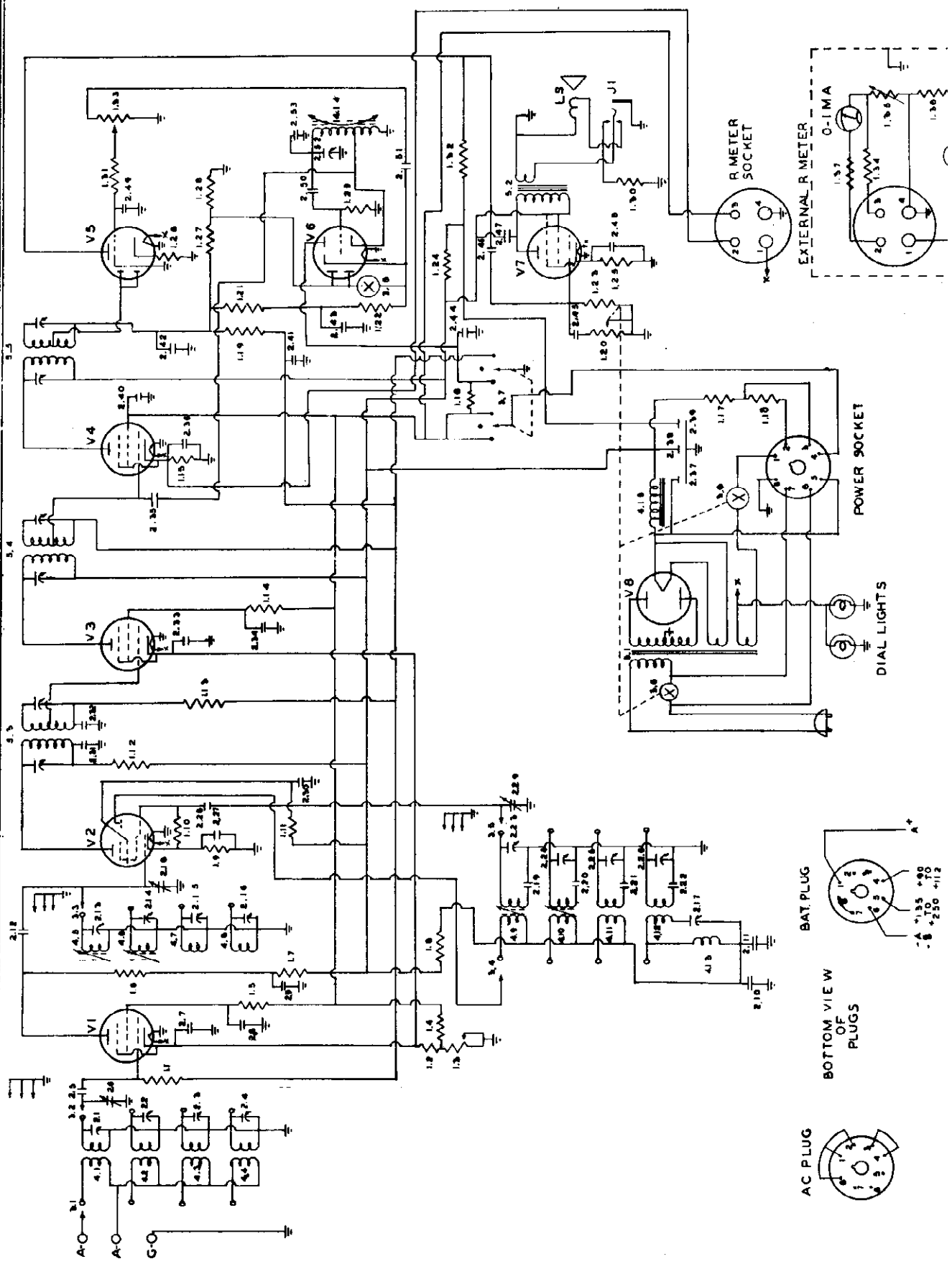
BACK OF CABINET

MODEL B4

RADIO KITS, INC.

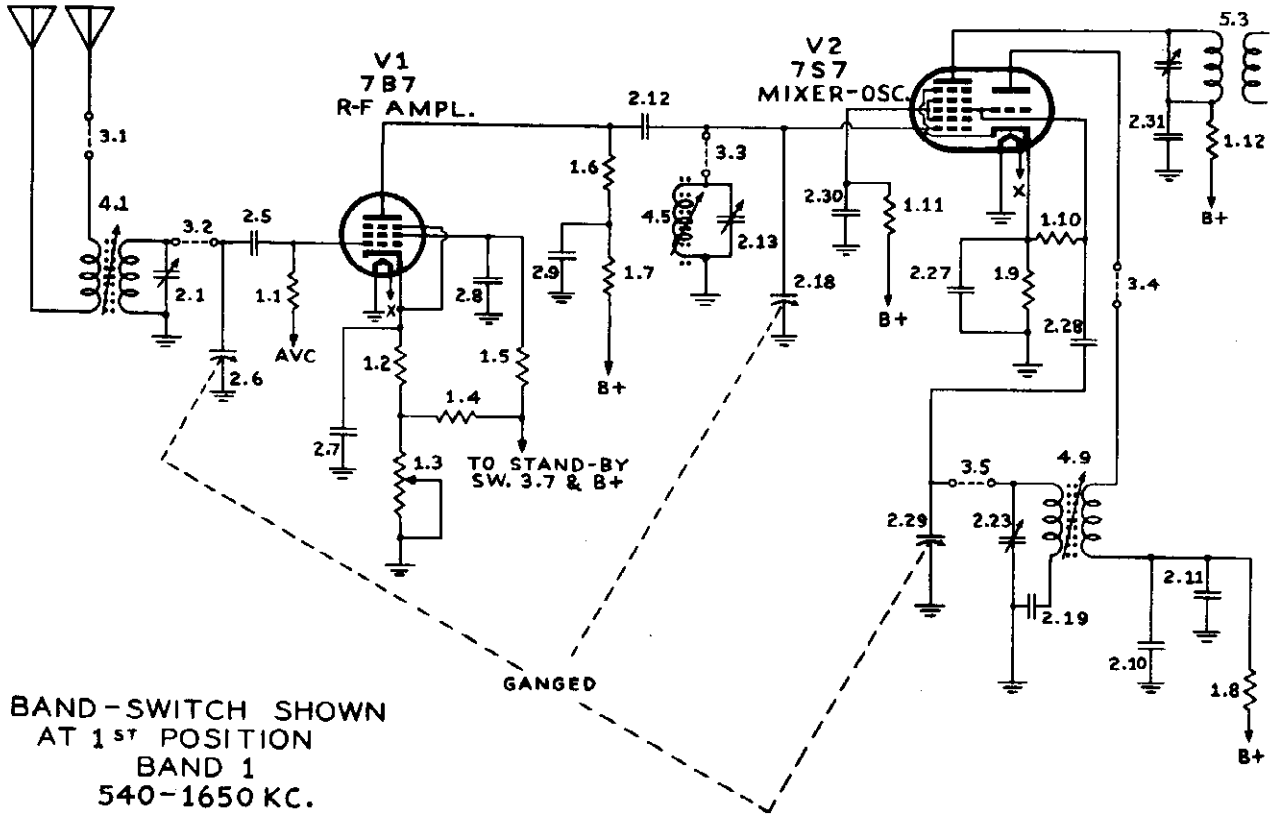


RADIO MFG. ENGINEERS INC.

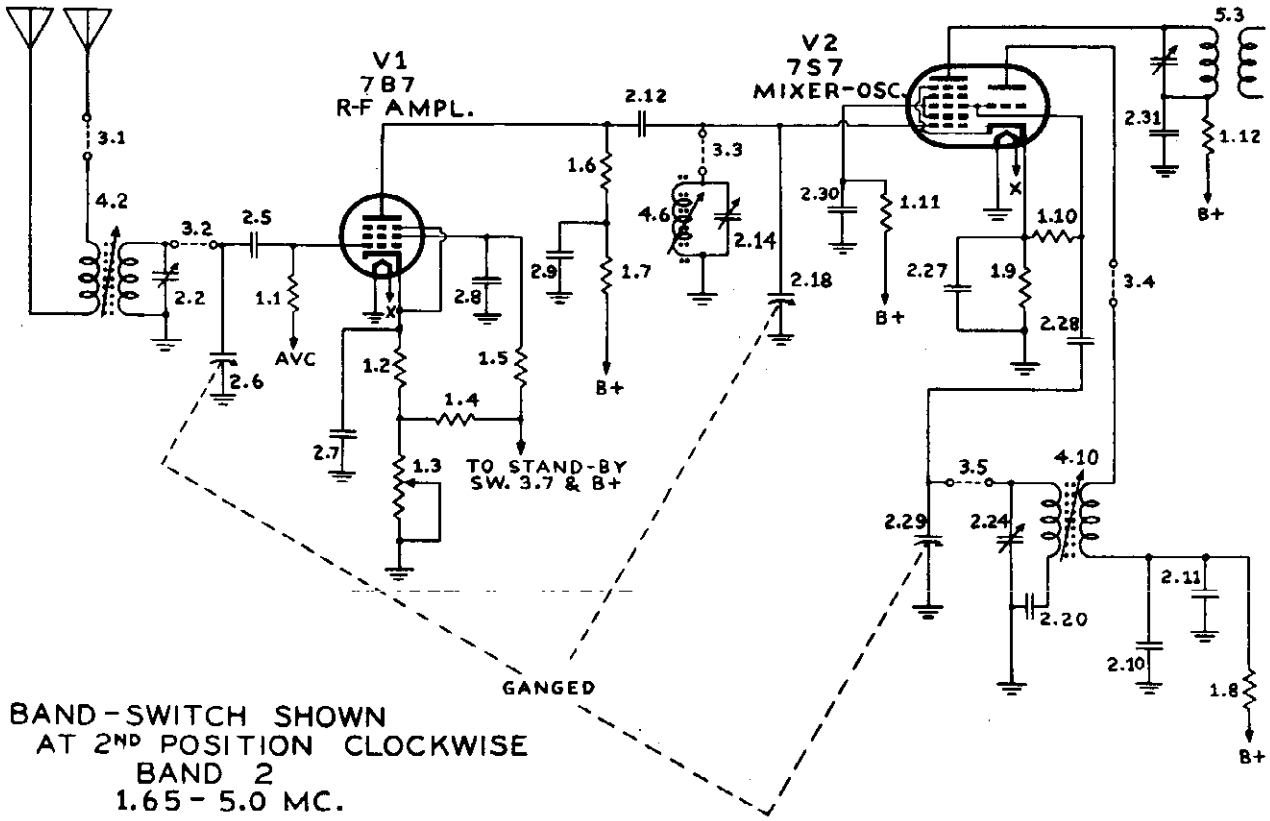


CLARI-SKEMATIX
Registered Trademark

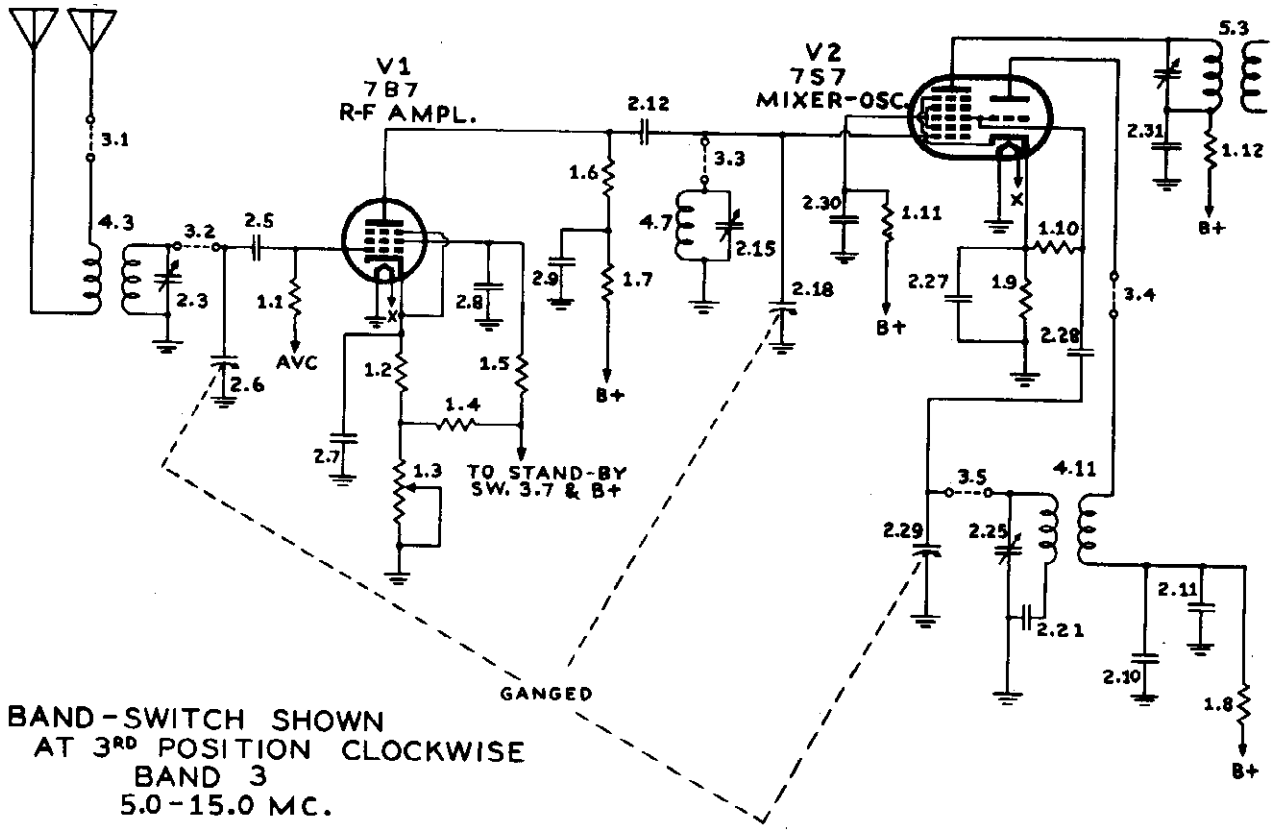
RADIO MFG. ENGINEERS INC.



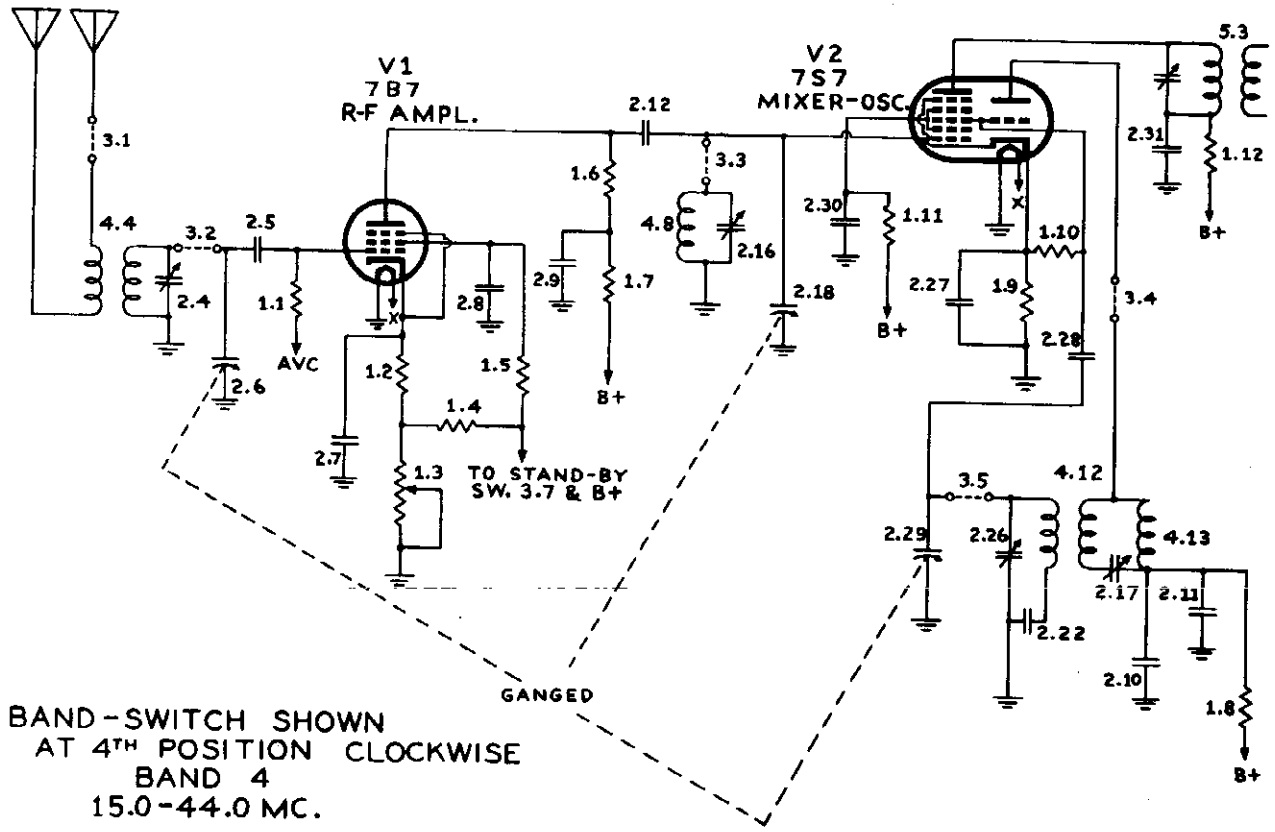
BAND-SWITCH SHOWN
AT 1ST POSITION
BAND 1
540-1650 KC.



BAND-SWITCH SHOWN
AT 2ND POSITION CLOCKWISE
BAND 2
1.65-5.0 MC.

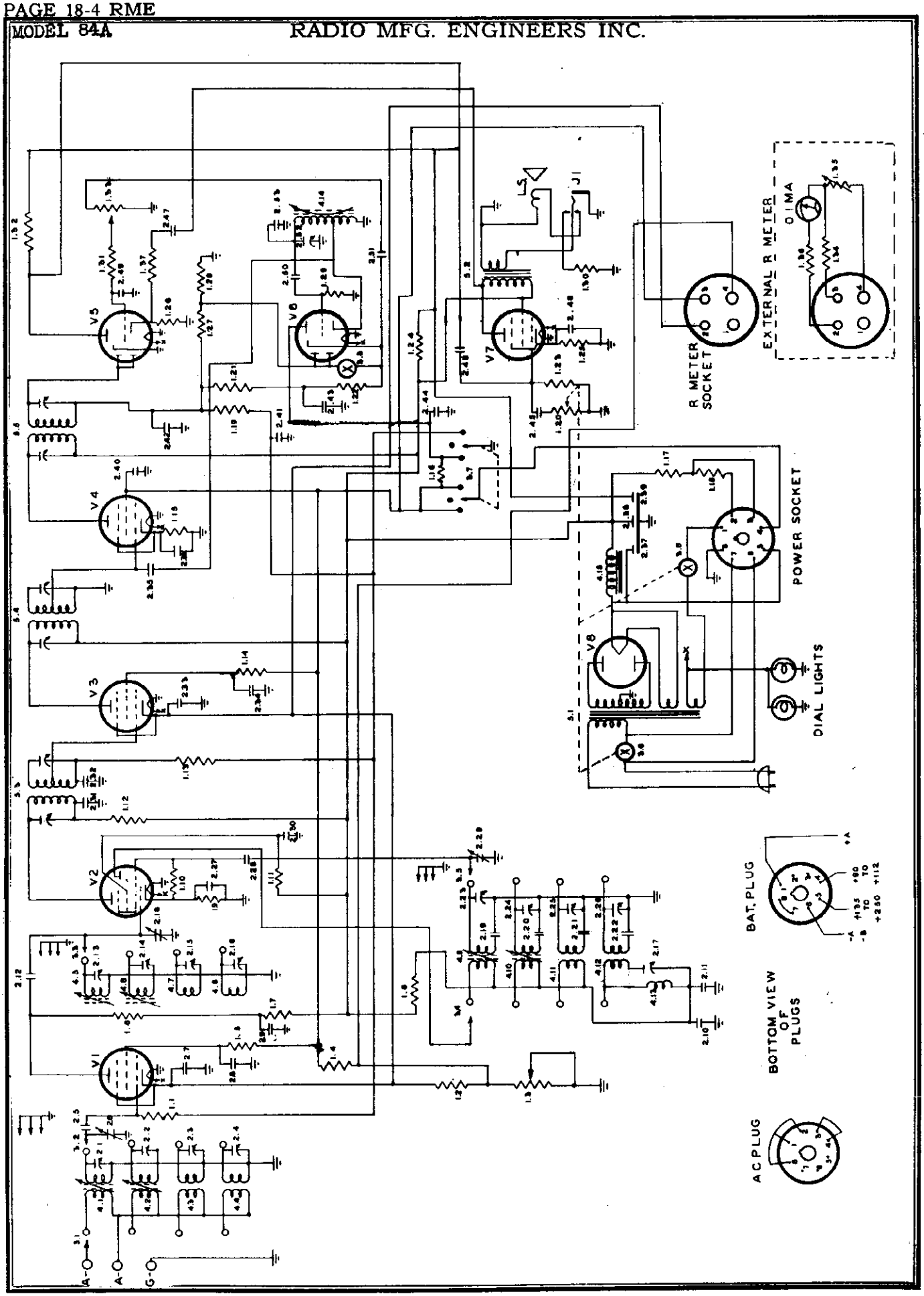


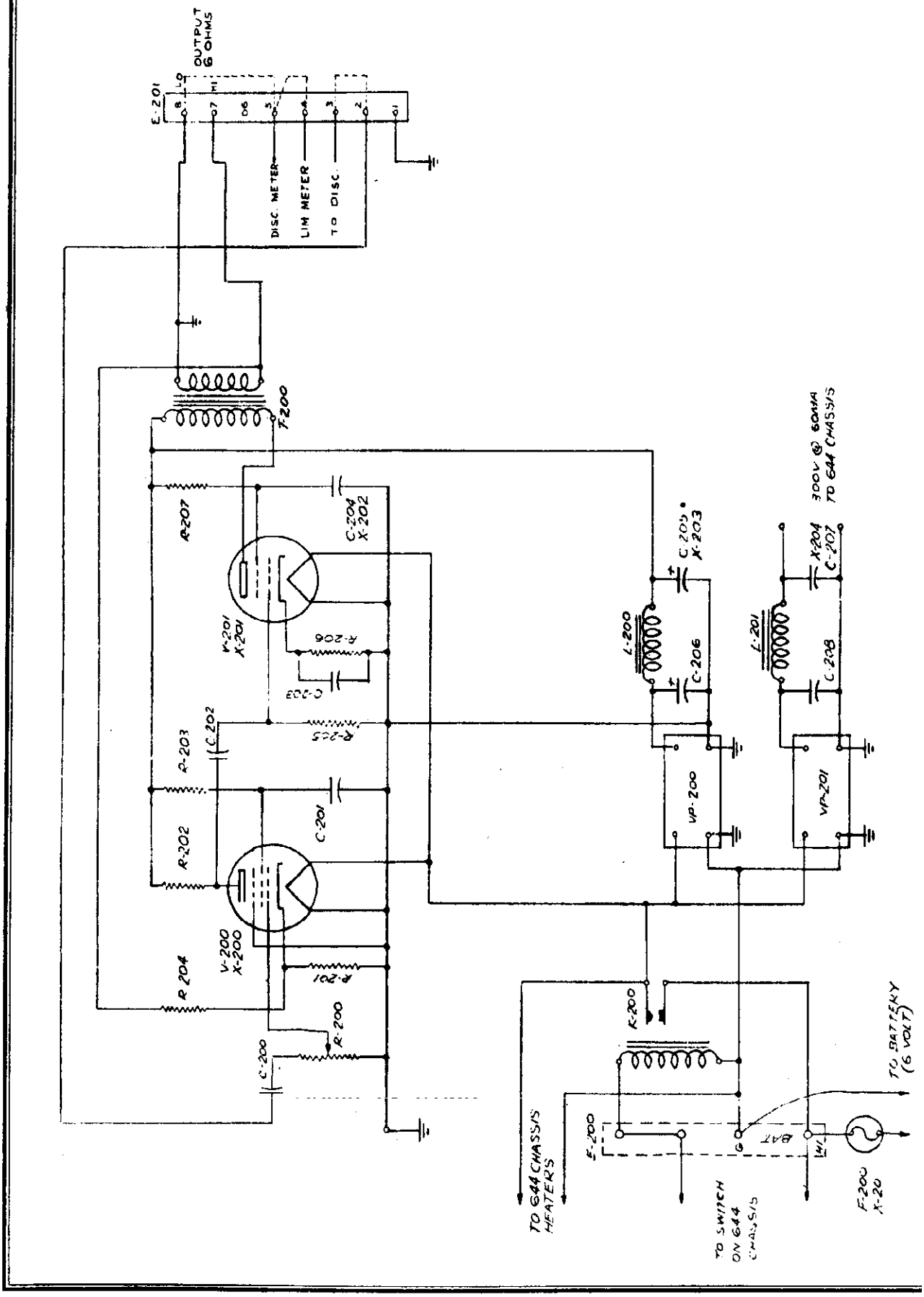
BAND-SWITCH SHOWN
AT 3RD POSITION CLOCKWISE
BAND 3
5.0-15.0 MC.

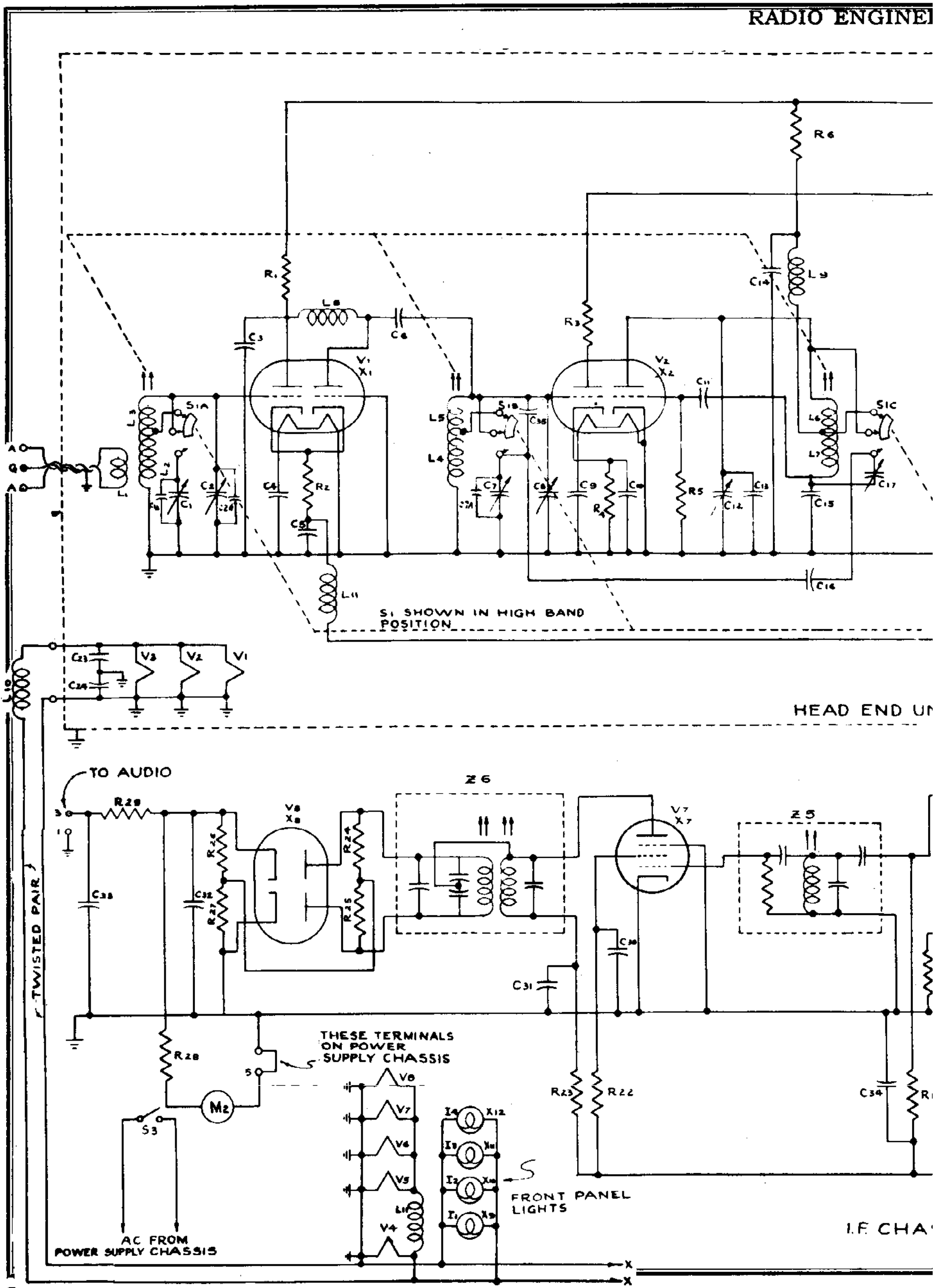


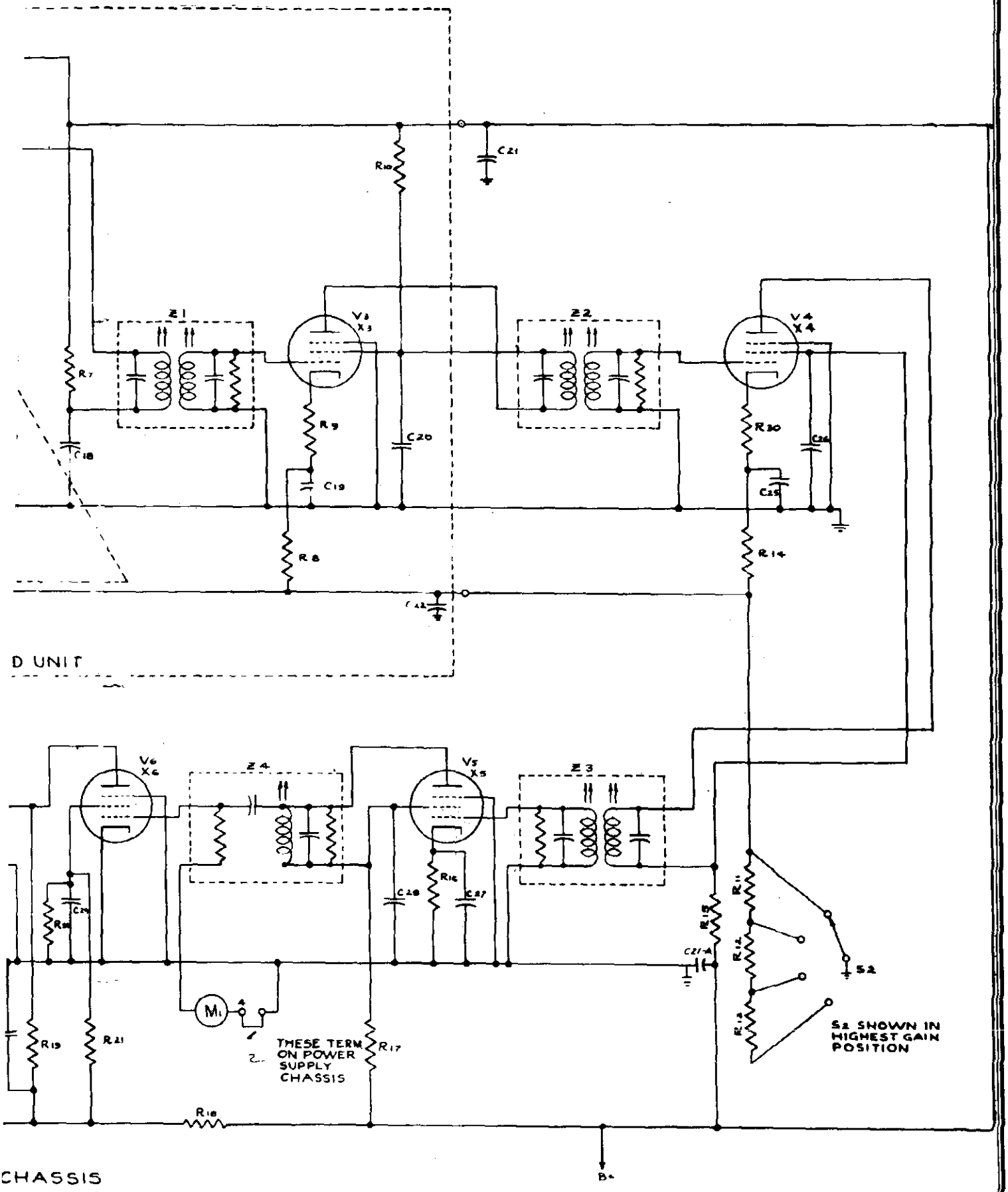
BAND-SWITCH SHOWN
AT 4TH POSITION CLOCKWISE
BAND 4
15.0-44.0 MC.

MODEL 84A RADIO MFG. ENGINEERS INC.

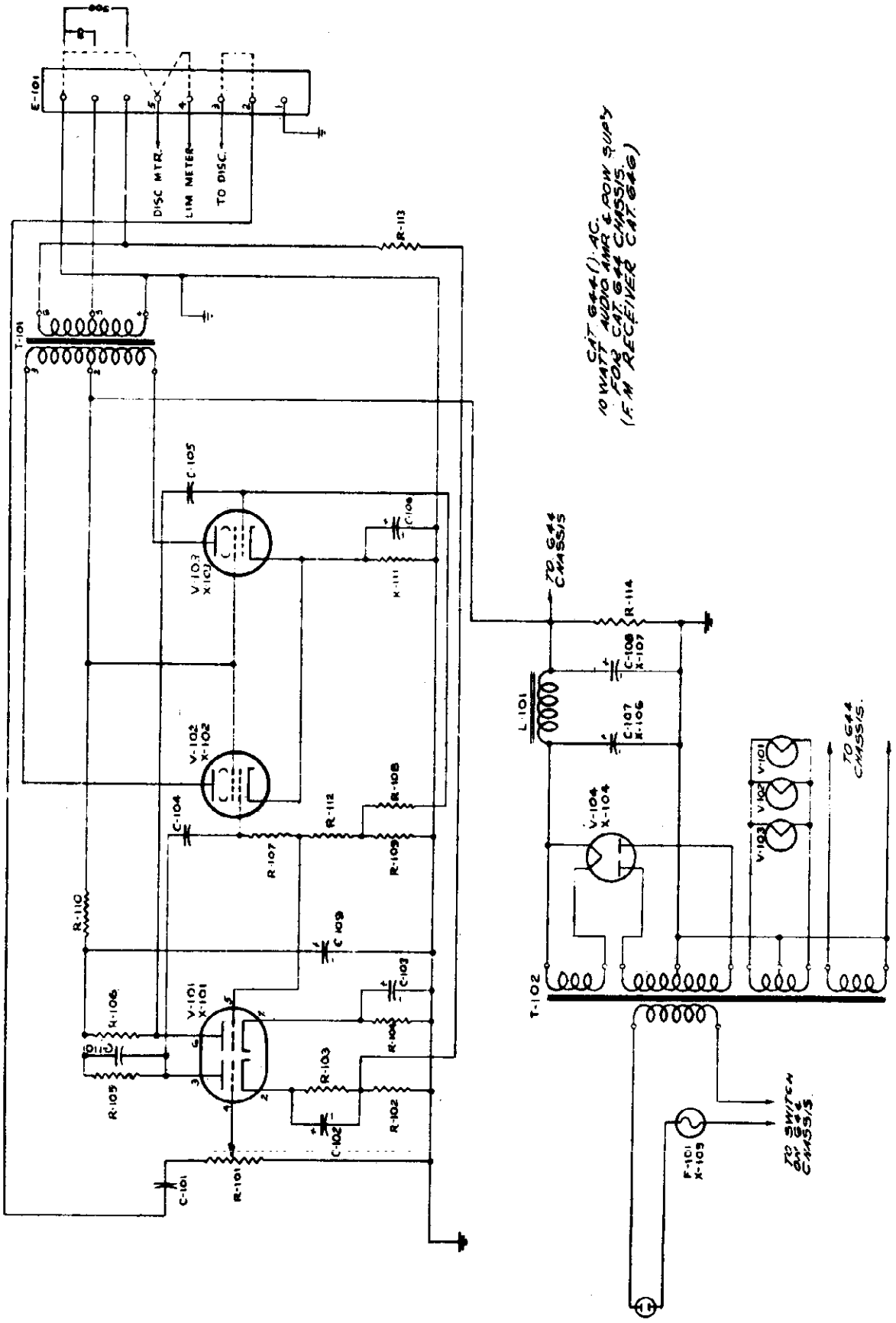



OUTPUT OHMS
LO
HI
E-201
8
7
6
5
4
3
2
1
DISC. METER
LIM METER
TO DISC.
T-200
R-207
C-204
X-202
V-201
X-201
R-206
C-203
R-205
C-202
R-203
C-201
R-202
V-200
X-200
R-204
R-201
R-200
C-200
C-205
X-203
L-200
C-206
VR-200
X-204
C-207
300V @ 60MA
TO 644 CHASSIS
L-201
C-208
VR-201
K-200
E-200
BAT
TO BATTERY
(6 VOLT)
TO 644 CHASSIS
HEATERS
TO SWITCH
ON 644
CHASSIS
F-200
X-20


RADIO ENGINEE
R6
R1
L8
C6
C3
V1
X1
R3
V2
X2
C14
L9
C11
S1A
S1B
S1C
L3
L2
L1
L5
L4
L6
L7
C1
C2
C4
R2
C5
C7
C8
C9
C10
R5
C12
C13
C15
C16
C17
L11
S1 SHOWN IN HIGH BAND POSITION
C23
C24
V3
L10
HEAD END UN
TO AUDIO
R29
C33
C32
R26
R27
V8
X8
R24
R25
Z6
V7
X7
Z5
C30
C31
TWISTED PAIR
R28
THESE TERMINALS ON POWER SUPPLY CHASSIS
M2
S3
AC FROM POWER SUPPLY CHASSIS
V6
V5
V4
I4
I3
I2
I1
X12
FRONT PANEL LIGHTS
R23
R22
C34
I.F. CHA


C21
R10
Z1
V3
X3
Z2
V4
X4
R7
R9
C20
R30
C26
C18
C19
C25
R8
R14
D UNIT
V6
X6
Z4
V5
X5
Z3
R16
C28
C27
R15
C27-A
R11
R12
R13
S2
S2 SHOWN IN HIGHEST GAIN POSITION
M1
THESE TERM ON POWER SUPPLY CHASSIS
R17
R19
R21
R18
CHASSIS
B+

MODELS 646,647,648 RADIO ENGINEERING LABS., INC.



The RME-84 is an eight tube superheterodyne communication type receiver. It has a continuous tuning range from .54 megacycles to 44 megacycles in four overlapping bands. The bandspread dial provides 1000 arbitrary divisions on each range.

Specifications

Power Supply: 115 volts, 60 cycle, single phase
Power Consumption: 62 watts at 117 volts
Audio Output: 1.1 watts
Audio Frequency Responses 100 to 3,500 cycles ± 3db
Overall Cabinet Dimensions:

Height	Depth	Length
9-3/8"	9-3/4"	18"

Weight: 28 pounds

Tube Complement

	Type	Use	Schematic Circuit Symbol
1.	7B7	R.F. Amplifier	V1
2.	7S7	Mixer and Oscillator	V2
3.	7B7	1st I.F. Amplifier	V3
4.	7B7	2nd I.F. Amplifier	V4
5.	7K7	Detector, AVC, and 1st Audio	V5
6.	7K7	Noise Limiter and Beat Freq. Osc.	V6
7.	6G6G	Output Amplifier	V7
8.	5Y3G	Rectifier	V8

Antenna

The terminals on the rear apron marked "A-A-G" are for the antenna and ground connections. When the receiver leaves the factory there is a jumper between the ground post (Marked G) and the adjacent antenna post. Good results may be obtained by connecting a wire 50 to 75 feet long to the other "A" post. If a 2 wire feeder system is used the jumper is removed and the two feeders are connected to "A" and "A". The input impedance between these points is approximately 300 ohms. A ground may be connected to the "G" post if it improves reception.

OPERATION AND CIRCUIT DETAILS

Introduction

The purpose of this book is to familiarize the operator with the RME-84, that he may realize the maximum results and enjoyment from his receiver. Each control on the RME-84 has a definite function. The following paragraphs briefly describe them.

Tuning Dial

The RME-84 tuning mechanism features a spring loaded gear, engaged by a planetary driven pinion. The pre-loading eliminates backlash. Bandspread logging is obtained by using the figures on the illuminated translucent dial visible through the window in the center of the megacycle scale. The 200 divisions on this dial are calibrated from zero to 100. The dial makes 5 complete revolutions as the

megacycle pointer travels from one end of the scale to the other. This dial is used in conjunction with the innermost half circle, calibrated from 0 to 4, on the megacycle scale. While the red pointer is covering one of the megacycle scale sections the bandspread dial makes one complete revolution. After a station has been heard it can be logged accurately by using the two sets of figures.

For example, if a station is heard on band II with the pointer in section 3 of the megacycle scale and with the bandspread dial at 28, that station is definitely logged as 328 because it will always be found at 328 on band II. Or, if a station is logged at 173 on band III, it is always tuned in on band III by turning the tuning knob until the red pointer is section I of the megacycle scale and until 73 comes upon the bandspread dial.

Elimination of the bandspread condenser necessary in an electrical bandspread system lowers the losses in the R.F. circuit and gives greater gain and stability.

Standby Switch

The second control from the left is the standby switch, used to make the receiver inoperative without turning off the line switch. It also turns on the beat frequency oscillator for CW reception.. There are three positions and reading clockwise they are marked CW, TR, and PH. The first position makes both receiver and beat frequency oscillator operative for CW reception. The second position makes the set inoperative while leaving it warmed up, as during a transmitting period, by disabling the RF and IF stages of the receiver. The third position provides for phone reception without the beat frequency oscillator.

Beat Oscillator PITCH Control.

The pitch of the beat frequency may be varied by means of the control labeled B.O. Pitch. The beat frequency oscillator is indispensible in the reception of CW signals and is an aid in locating weak phone carriers.

AUDIO GAIN

The AUDIO GAIN Control in the center of the control panel adjusts the audio volume to the desired level.

Best CW reception is usually obtained with this control well advanced (clockwise) and the gain of the receiver controlled by the RF gain control.

LINE Switch and TONE Control

The LINE TONE Control turns the receiver on and off. As the control is turned clockwise the line switch will close. Continued turning of the knob controls the tone by increasing the high frequency response.

Band Selector Switch

The BAND SELECTOR Switch selects the frequency range desired. The range of the receiver is divided into 4 bands. The range covered by each band is as follows:

Band I	.540	to	1.65	MC (American Broadcast)
Band II	1.65	to	5.	MC
Band III	5.	to	15.	MC
Band IV	15.	to	44.	MC

Actually these figures do not represent the full range of each band since there is considerable overlap between the end of one band and the start of the next.

Radio Frequency GAIN Control

Counter clockwise rotation of this control reduces the gain of the receiver manually. Automatic control of the receiver gain is fully effective only when the R.F. GAIN control knob is rotated to and set at its maximum clockwise position.

Noise Limiter

An AUTOMATIC NOISE LIMITER is incorporated in the receiver circuit. No adjustment is required. The circuit is of a type that automatically adjusts itself to maximum effectiveness.

IMPORTANT

The action of the noise limiter is such that a slight amount of distortion is introduced on the signal. Therefore when it is desirable to do so the noise limiter may be switched out of the circuit. This is controlled by the slide switch just below the control panel. When the switch is to the left the limiter is out of the circuit.

Automatic Volume Control

AVC is obtained by feeding a portion of the signal rectified by the 7K7 tube back to the grids of the RF and IF tubes. As the RF gain is rotated counterclockwise the AVC action becomes subordinate to the bias developed in the cathodes by this control. The AVC is fully effective only when the RF gain control is in the extreme clockwise position. AVC is removed when the standby switch (3.4) is turned to CW.

Power Supply

The RME-84 is provided with very flexible power requirements. The standard receiver operates from 115 volts AC, 50-60 cycles. On special order it may be had for 115 or 230 volts, 25 to 60 cycle operation. All models may be operated from A and B batteries, or vibropack. The octal plug on the rear apron must be in place for AC operation. It is removed and replaced by a battery cable for battery operation. The 5Y3G rectifier supplies current through pi-section filter. This filter is also in the circuit when the battery cable is used, simplifying converter or vibropack requirements.

Battery Operation

The RME-84 is designed for econimical battery operation. The standard RME-84 has an octal socket on the rear apron into which is inserted a shorting plug when operating on AC. For battery operation the shorting plug is removed and battery cable is plugged into the socket. The battery cable is not supplied with the 84 but may be purchased separately or made up from the schematic diagram.

Battery requirements are as follows: "A" battery 6V at 1.5 amperes. "B" battery, 135 volts with a tap at 90 volts. The "B" battery drain is 32 milliamperes. The "A" battery drain may be reduced to 1.2 amperes by removing the dial lamps.

When operating on batteries all of the controls function normally. The re-

ceiver is turned on and off by means of the power switch on the LINE TONE CONTROL.

IMPORTANT

THE LINE CORD MUST BE DISCONNECTED FROM THE AC SUPPLY BEFORE ATTEMPTING TO CONNECT FOR BATTERY OPERATION.

MAINTENANCE AND SERVICE

No maintenance work of importance is required on this unit. It is suggested that periodic cleaning of the equipment be done, including blowing out any accumulated dust with a suitable air stream.

UNLESS IT IS DEFINITELY ESTABLISHED THAT ALIGNMENT IS INCORRECT, NO ADJUSTMENTS OF THE TUNED CIRCUITS SHOULD BE MADE.

Equipement required is a signal generator, an INSULATED screwdriver, and an output meter unless the receiver has an "R" meter.

In this paragraph, and following paragraphs on alignment the "meter" referred to is either the output meter or the "R" meter, whichever is used. A difference in procedure required is as follows:

When the R meter is used, the R.F. gain is turned full clockwise, all other operating conditions are normal.

When using an audio output meter it is necessary to ground the AVC line, and it may be necessary to reduce the R.F. gain control setting to avoid overloading the first stages of the receiver with strong signal inputs. The meter may be clipped across the voice coil windings of the speaker, both terminals of which are accessible through the lid of the cabinet. The AVC may be removed from the receiver by turning the STANDBY switch to CW. This will also turn on the beat frequency oscillator. Since it is undesirable to have the BFO on while aligning the receiver, the BFO tube (V6) should be removed from the socket. It must, of course, be replaced while aligning the BFO.

I.F. Alignment

The I.F. frequency of the RME-84 is 455 KC. The bandswitch should be turned to band I. The tuning dial should be turned to the low frequency end (.55 MC) and the hot lead from the signal generator clipped to the lug on the detector (center) section of the tuning condenser. With the signal generator set at 455 KC each padder on the 1st, 2nd and 3rd I.F. transformers is carefully adjusted for maximum response as indicated on the meter.

B.F.O. Alignment

With the signal generator connected as for aligning I.F. circuits, turn the stand-by switch to CW and set "B.O. PITCH" control pointer vertical. With an insulated screwdriver adjust BFO padder until zero beat is obtained.

R.F. Alignment

Alignment of the radio frequency section of the receiver will affect, principally, the calibration of the receiver. Within certain limits this, of course, will also affect the sensitivity. Small variations in frequency (up to 2%) will not

materially reduce the sensitivity of the receiver although they will, of course, show up as variations in the calibration as indicated by the setting of the MAIN TUNING DIAL. Correction of any variation of calibration can be made by following the suggestions outlined in the following paragraphs.

All adjustments are made from the top of the chassis. The proper points for each band are marked on figure 3. There are 18 of them, plus one used only on band IV and accessible from the rear apron.

High frequency beat is used on all bands, that is, the oscillator is 455 KC higher in frequency than the signal received.

If sufficient input is used, a given signal can be received at two points on the tuning dial. There is 910 KC difference in frequency between these points. The true signal is the one received at the higher frequency dial reading while the image or "Low-beat" signal is received with the dial reading 910 KC lower in frequency. The circuits must be aligned to the true signal.

When using a signal generator or test oscillator to align the receiver, a resistor of about 300 ohms should be inserted between the signal generator and the antenna terminal. This will prevent misaligning of the RF stage caused by connecting the receiver input, the low impedance output of the signal generator.

Band I includes frequencies between 540 and 1650 KC. For Band I there are two frequency adjustments for adjusting the dial to the proper calibration.

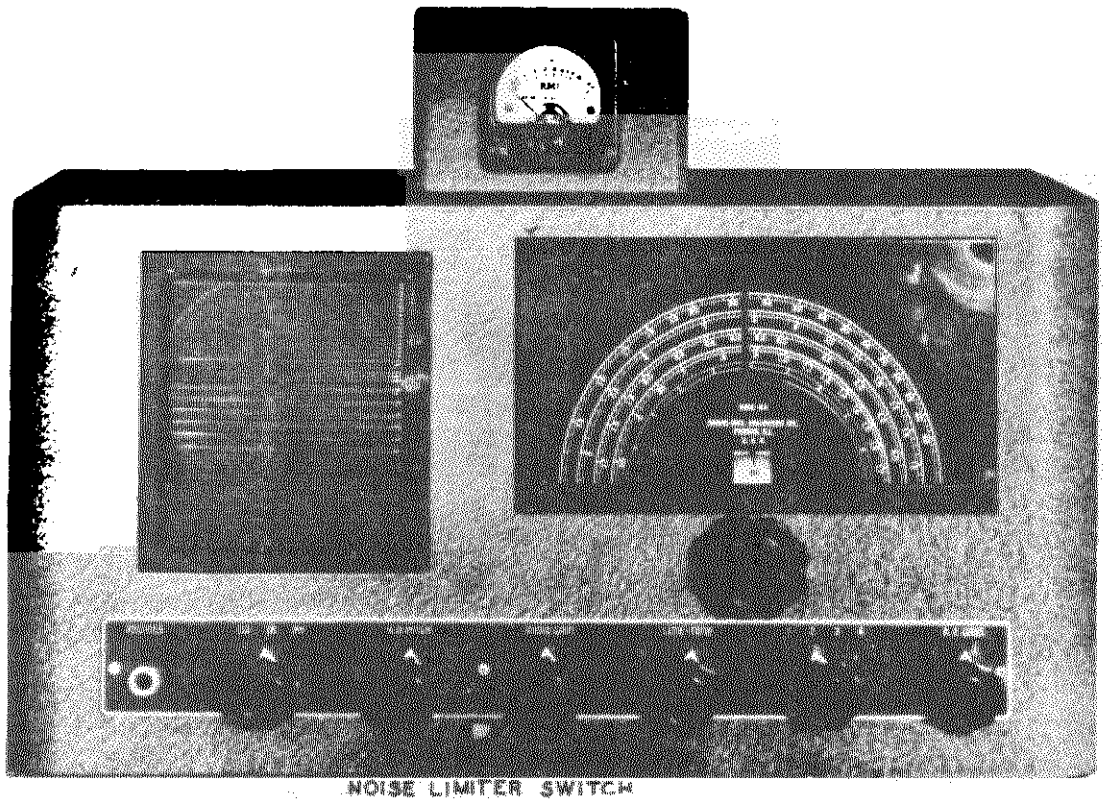
The first step is to choose a station or a signal of accurately known frequency on the low frequency end of the range (for example 600 KC) and set the main tuning scale to read this frequency. If the signal is not tuned in when the scale indicates its frequency it may be brought in by adjusting the oscillator coil core. This may be done with a small screwdriver at the point marked "BAND I OSC. Lo". Another station or signal is now selected near the high frequency end of the range (for example 1400 KC). If this signal is not heard when the dial is accurately set to its frequency it may be brought in by adjusting the padder under the large hole marked "BAND I OSC. Hi" by means of an insulated trimmer tool. When this signal is accurately brought in as indicated by a maximum reading on the meter, the low frequency test point should be readjusted if it has changed. It may be necessary to go back and forth several times until both frequencies are accurately calibrated.

When the calibration is correct the R.F. circuits can be aligned. The two marked "Band I Mixer Lo" and "Band I RF Lo" are adjusted for maximum meter reading on the low frequency end of the band (such as 600 KC); and the trimmers marked "Band I Mixer Hi" and "Band I RF Hi" are used to obtain maximum output at the high frequency end, such as 1400 KC. It may be necessary to repeat these adjustments for perfect alignment. The oscillator calibration of any band must be done first, and should not be changed while making the other adjustments.

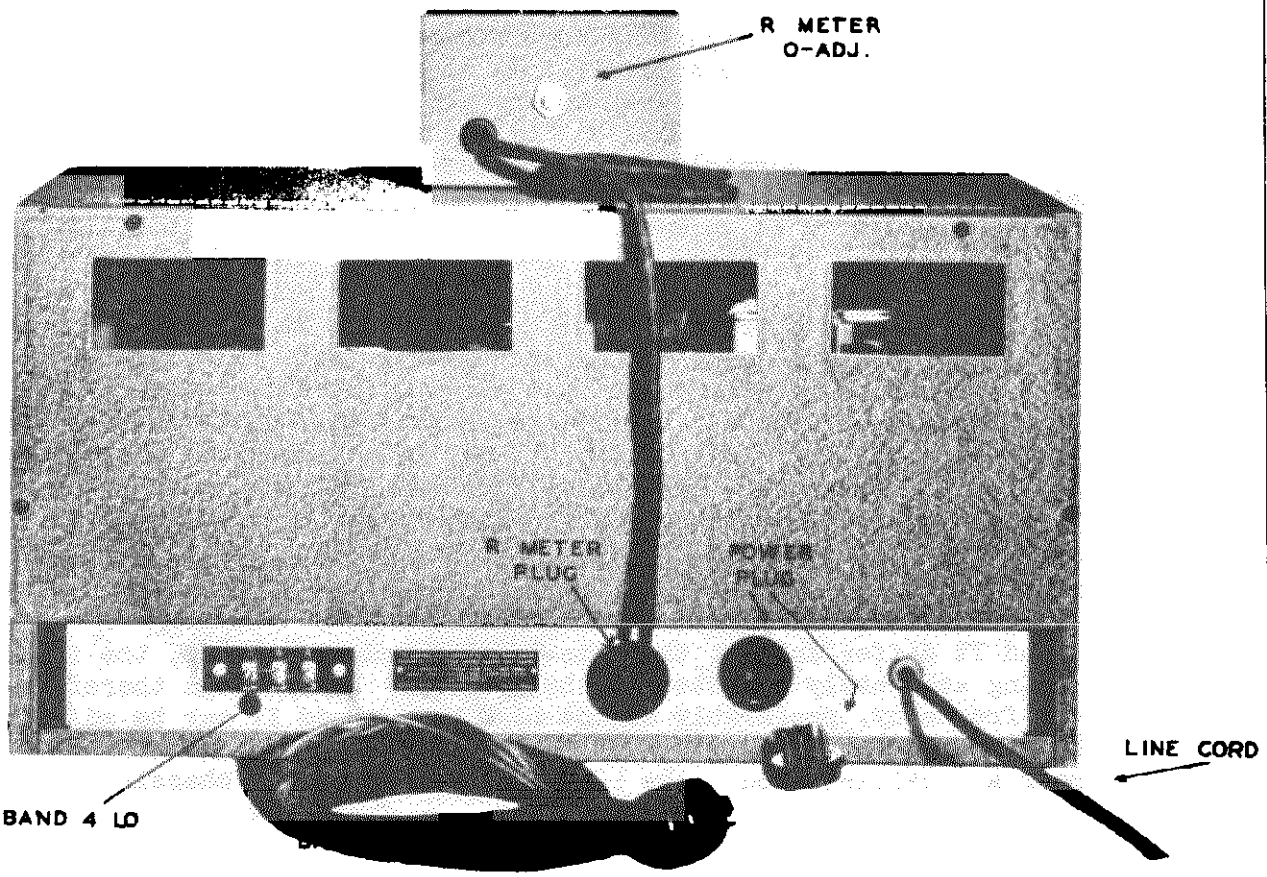
The procedure on Band II is the same as for Band I. Adjust "Band II Osc.Lo" at approximately 1.9 MC and "Band II Osc. Hi" around 4.5 to 5 MC; then tune the mixer and RF stages.

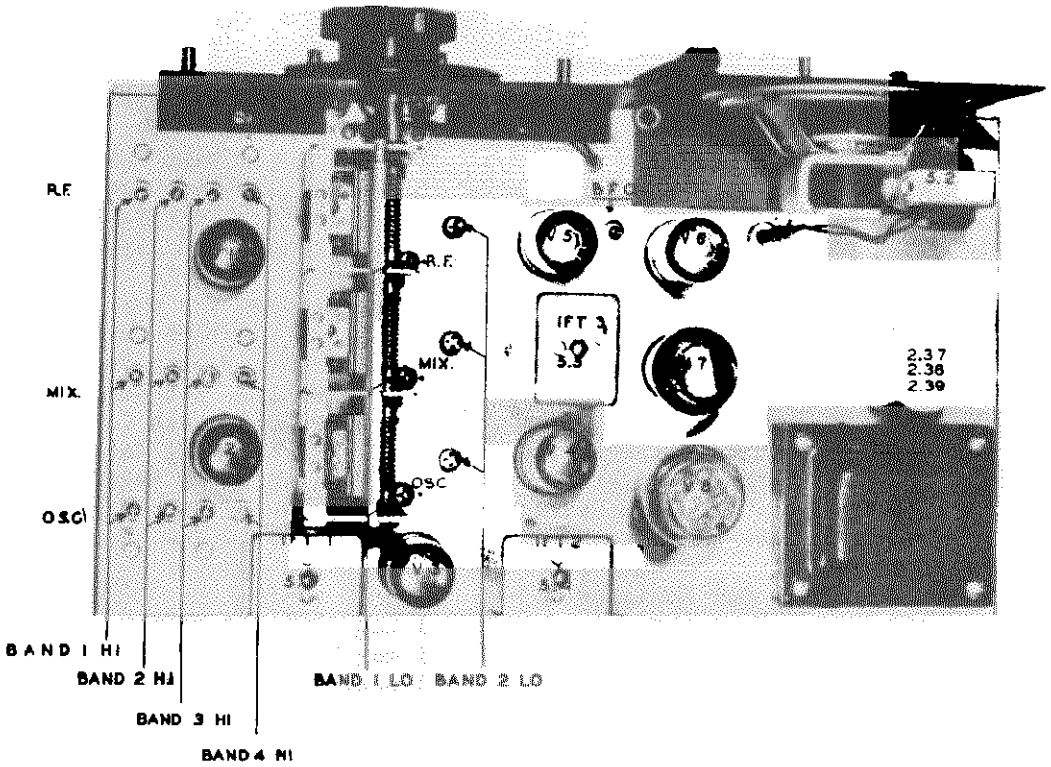
Band III and IV differ in that there is no "Lo" end adjustment, the inductance of the coils being accurately adjusted at the factory. Band III is therefore set at only one frequency, preferably at the high end. Band IV may be adjusted at about 30 MC.

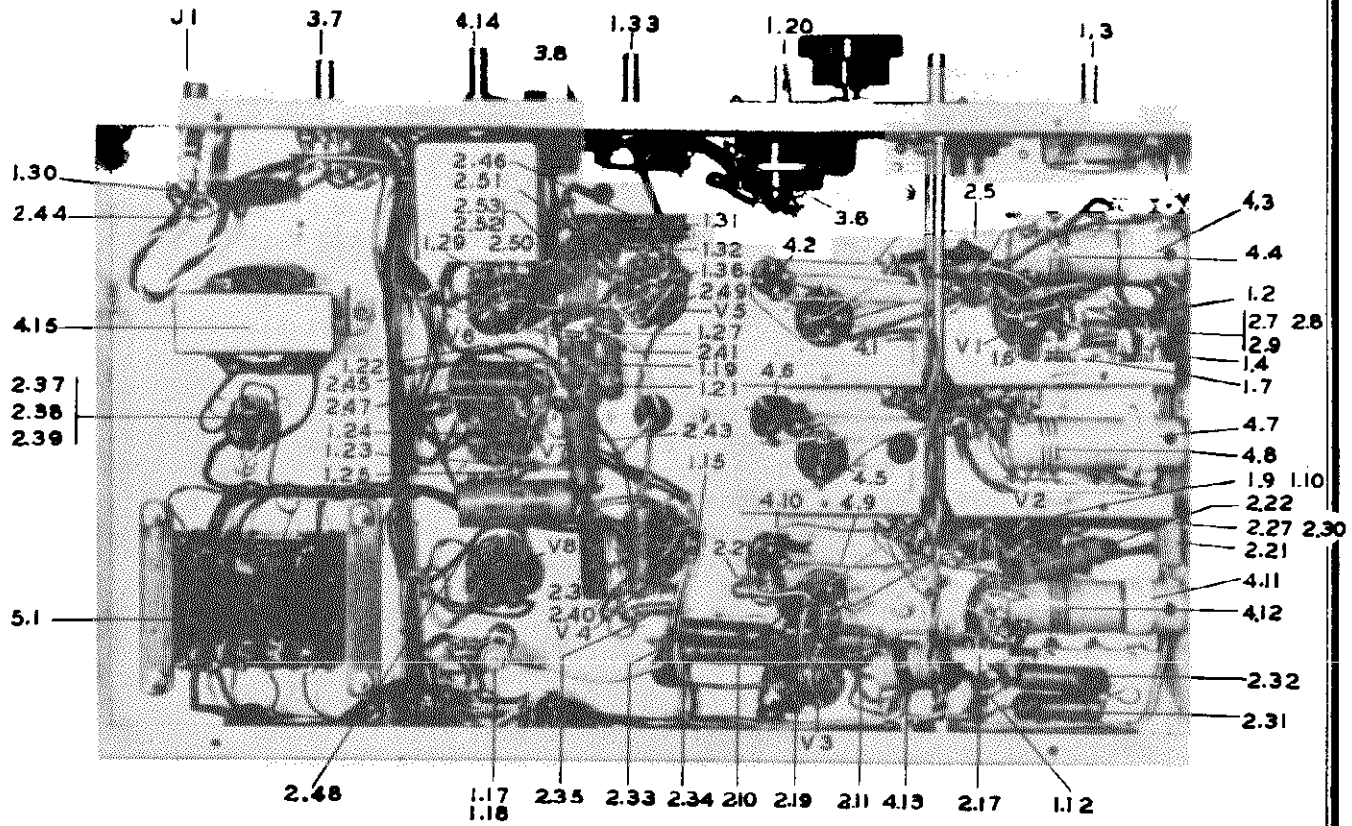
The trimmer accessible through the hole in the rear of the chassis affects only the extreme low end of Band IV and should not be disturbed unless absolutely necessary. It will determine calibration only between 14 and 17 MC, and will also affect sensitivity of the set through that region of Band IV.



NOISE LIMITER SWITCH
ON ←→ OFF




R.F.
MIX.
OSC.
R.F.
MIX.
OSC.
IFT
2.37
2.38
2.39
BAND 1 HI
BAND 2 HI
BAND 3 HI
BAND 4 HI
BAND 1 LO
BAND 2 LO


J1
3.7
4.14
3.8
1.33
1.20
1.3
1.30
2.44
4.15
2.37
2.38
2.39
5.1
2.48
1.17
1.18
2.35
2.33
2.34
2.10
2.19
2.11
4.13
2.17
1.12
2.32
2.31
4.3
4.4
1.2
2.7 2.8
2.9
1.4
1.7
4.7
4.8
1.9 1.10
2.22
2.27 2.30
2.21
4.11
4.12
2.5
3.6
4.2
4.1
4.5
4.6
V1
V2
V3
V4
V5
V6
V7
V8

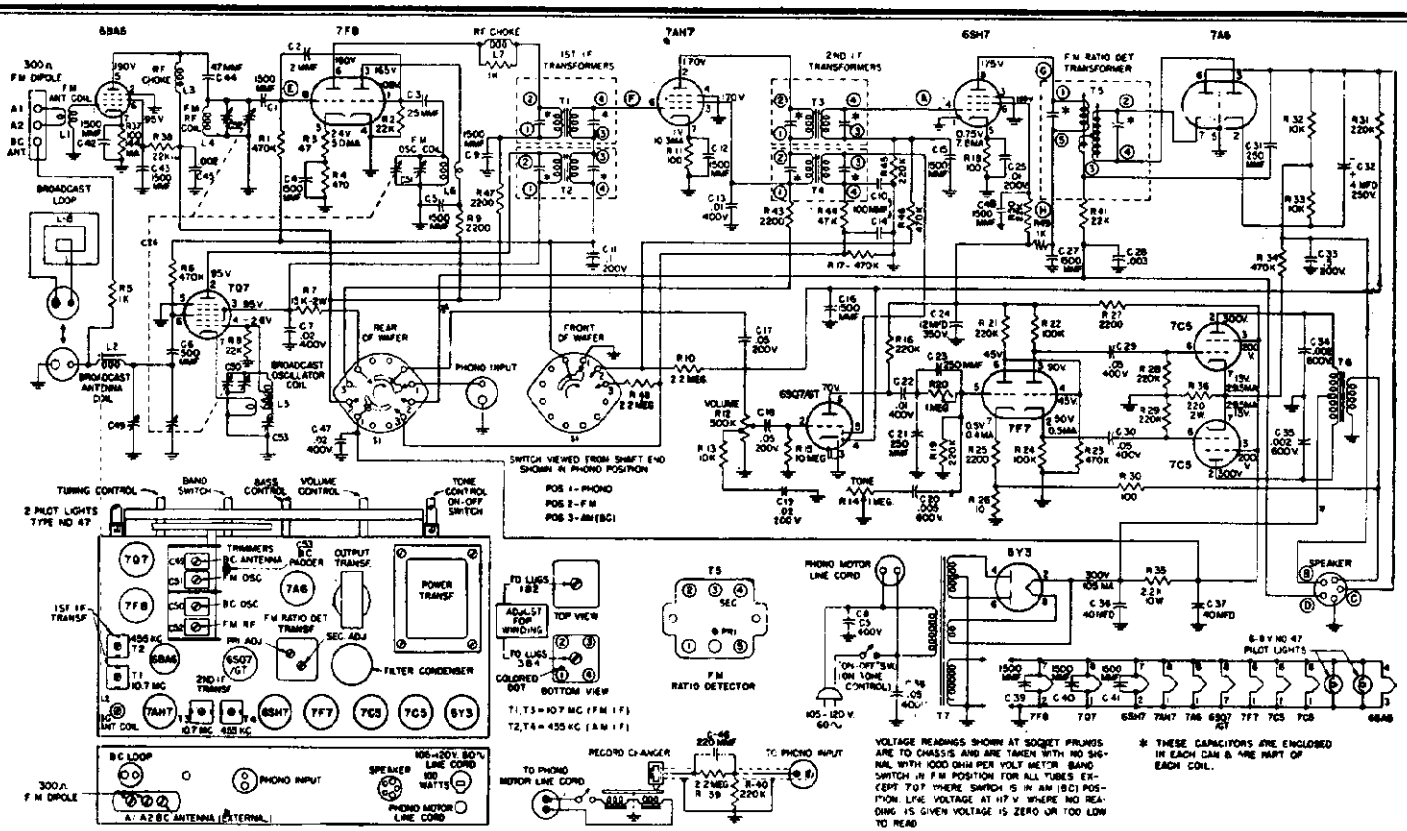
MODEL 84 RADIO MFG. ENGINEERS INC.

Schematic Symbol	Function	Specification
1.1	R.F. Grid Resistor	220 K ±20% 1/2 Watt Carbon
1.2	R.F. & 1st I.F. Cathode Resistor	150 ohms ±20% 1/2 Watt Carbon
1.3	R.F. Gain Control	30 K Variable
1.4	R.F. Gain Bleeder	47 K ±20% 1/2 Watt Carbon
1.5	R.F. Screen Filter Resistor	4700 ohms ±20% 1/2 Watt Carbon
1.6	R.F. Plate Resistor	22 K ±20% 1/2 Watt Carbon
1.7	R.F. Plate Decoupling Resistor	4700 1/2 Watt 20% Carbon
1.8	Oscillator Plate Filter Resistor	22 K ±20%
1.9	Mixer Cathode Resistor	220 ohms ±20% 1/2 Watt Carbon
1.10	Oscillator Grid Leak	47 K ±20% 1/2 Watt Carbon
1.11	Mixer Screen Filter Resistor	220 K ±20% 1/2 Watt Carbon
1.12	Mixer Plate Filter Resistor	22 K ±20% 1/2 Watt Carbon
1.13	1st I.F. AVC Resistor	220 K ±20% 1/2 Watt Carbon
1.14	1st I.F. Screen Filter Resistor	4700 ohms ±20% 1/2 Watt Carbon
1.15	2nd I.F. Cathode Resistor	470 ohms ±20% 1/2 Watt Carbon
1.16	B.F.O. Plate Dropping Resistor	100 K ±20% 1/2 Watt Carbon
1.17	Part of Bleeder Resistor	10,000 ohms 10 Watt Tapped at 5500 wire wound
1.18	Part of Bleeder Resistor	
1.19	AVC Filter Resistor	1 meg ±20% 1/2 Watt Carbon
1.20	Tone Control	1 meg Variable with switch
1.21	ANL Decoupling Resistor	1 meg. ±20% 1/2 Watt
1.22	Noise Limiter Bias Resistor	680 K ±10% 1/2 Watt Carbon
1.23	Output Amp. Grid Resistor	220 K ±20% 1/2 Watt Carbon
1.24	First AF Plate Filter Resistor	22 K ±20% 1/2 Watt Carbon
1.25	Output Amp. Cathode Resistor	470 ohms ±20% 1/2 Watt Carbon
1.26	1st Audio Cathode Resistor	820 ohms ±10% 1/2 Watt Carbon
1.27	Part of Diode Load	220 K ±20% 1/2 Watt Carbon
1.28	Part of Diode Load	220 K ±20% 1/2 Watt Carbon
1.29	B.F.O. Grid Leak	47 K ±20% 1/2 Watt Carbon
1.30	Phone Shunt Resistor	33 ohms ±20% 1/2 Watt Carbon
1.31	1st AF Grid Filter Resistor	22 K ±20% 1/2 Watt Carbon
1.32	1st AF Plate Resistor	100 K ±20% 1/2 Watt Carbon
1.33	Audio Gain Control	250 K Variable
1.34	Meter Bleeder	68 K ±20% 1/2 Watt Carbon
1.35	Meter Zero Adjustment	5 K Variable WW Screw Driver Slot
1.36	Pilot Lamp Dropping Resistor	18 ohms ±20% 1/2 Watt Carbon
2.1	Band I RF Trimmer	40 mmfd Mica Variable
2.2	Band II RF Trimmer	40 mmfd Mica Variable
2.3	Band III RF Trimmer	40 mmfd Mica Variable
2.4	Band IV RF Trimmer	40 mmfd Mica Variable
2.5	RF Grid Blocking Condenser	250 mmfd ±20% 600 V Mica
2.6	RF Tuning Condenser	Part of Gang Condenser
2.7	RF Cathode Bypass Condenser	.01 mfd ±20% 600 V Paper
2.8	RF Screen Bypass Condenser	.01 mfd. ±20% 600 V Paper
2.9	RF Plate Decoupling Condenser	.01 mfd ±20% 600 V Paper
2.10	Oscillator Plate Bypass Cond.	.01 mfd ±20% 600 V Paper
2.11	Oscillator Plate Filter Cond.	.001 mfd ±20% 600 V Mica
2.12	RF Plate Coupling Condenser	250 mfd ±20% 600 V Mica
2.13	Band I Mixer Trimmer	40 mmfd Mica Variable
2.14	Band II Mixer Trimmer	40 mmfd Mica Variable
2.15	Band III Mixer Trimmer	40 mmfd Mica Variable
2.16	Band IV Mixer Trimmer	40 mmfd Mica Variable
2.17	Band IV Osc. Series Trimmer	70 mmfd Mica Variable
2.18	Mixer Tuning Condenser	Part of Gang Condenser
2.19	Band 1 Series Pad	.0005 mfd ±5% 600 Volt Mica
2.20	Band II Series Pad	.0015 mfd ±5% 600 Volt Mica
2.21	Band III Series Pad	.004 mfd 5% 600 Volt Mica
2.22	Band IV Series Pad	.015 600 Volt Paper

Schematic Symbol	Function	Specification
2.23	Band I Osc. Trimmer	40 mmfd Mica Variable
2.24	Band II Osc. Trimmer	40 mmfd Mica Variable
2.25	Band III Osc. Trimmer	40 mmfd Mica Variable
2.26	Band IV Osc. Trimmer	40 mmfd Mica Variable
2.27	Mixer Cathode Bypass Condenser	.01 mfd ±20% 600 V Paper
2.28	Osc. Grid Condenser	50 mmfd ±20% 600 V Mica
2.29	Osc. Tuning Condenser	Part of Gang Condenser
2.30	Mixer Screen Bypass Condenser	.01 mfd ±20% 600 V Paper
2.31	Mixer Plate Filter Condenser	.01 mfd ±20% 600 V Paper
2.32	First I.F. Grid Filter Condenser	.01 mfd ±20% 600 V Paper
2.33	1st I.F. Cathode Bypass Condenser	.01 mfd ±20% 600 V Paper
2.34	1st I.F. Screen Bypass Condenser	.01 mfd ±20% 600 V Paper
2.35	B.F.O. Coupling Condenser	5 mmfd ±20% Mica
2.36	2nd I.F. Cathode Bypass Cond.	.01 mfd ±20% 600 V Paper
2.37		
2.38	Power Supply Filter Condenser	10-10-15 mfd Electrolytic
2.39		
2.40	2nd I.F. Screen Bypass Cond.	.01 mfd ±20% 600 V Paper
2.41	AVC Bypass Condenser	.01 mfd ±20% 600 V Paper
2.42	Diode Lead Filter Condenser	50 mmfd ±20% 600 V Mica
2.43	AVL Bias Filter Condenser	.01 mfd ±20% 600 V Paper
2.44	B.F.O. Plate Bypass Condenser	.01 mfd ±20% 600 V Paper
2.45	Tone Control Condenser	.01 mfd ±20% 600 V Paper
2.46	First Audio Plate Coupling Cond.	.01 mfd ±20% 600 V Paper
2.47	Output Plate Leading Condenser	.01 mfd ±20% 600 V Paper
2.48	Output Cathode Bypass Condenser	20 mfd 25 V Tubular Electrolytic
2.49	1st Audio Grid Decoupling Cond.	250 mmfd ±20% 600 V Mica
2.50	B.F.O. Grid Condenser	100 mmfd ±20% 600 V Mica
2.51	1st Audio Grid Coupling Cond.	.01 mfd ±20% 600 V Paper
2.52	B.F.O. Trimmer Condenser	70 mmfd Mica Variable
2.53	B.F.O. Grid Condenser	100 mmfd ±20% 600 V Mica
3.1	RF Coil Switch	Primary Section, part of Bandswitch
3.2	RF Coil Switch	Grid Section, part of Bandswitch
3.3	Mixer Coil Switch	Part of Bandswitch
3.4	Osc. Coil Switch	Plate Section, part of Bandswitch
3.5	Osc. Coil Switch	Grid Section, part of Bandswitch
3.6	Off-On Switch	2 pole, single throw on tone control
3.7	Stand-by Switch	2 pole, 3 throw rotary
3.8	Noise Limiter Switch	SPST Slide Switch
4.1	Band I R.F. Coil Assembly	
4.2	Band II R.F. Coil Assembly	
4.3	Band III R.F. Coil Assembly)	Wound on same form
4.4	Band IV R.F. Coil Assembly)	
4.5	Band I Mixer Coil Assembly	
4.6	Band II Mixer Coil Assembly	
4.7	Band III Mixer Coil Assembly)	Wound on same form
4.8	Band IV Mixer Coil Assembly)	
4.9	Band I Osc. Coil Assembly	
4.10	Band II Osc. Coil Assembly	
4.11	Band III Osc. Coil Assembly)	Wound on same form
4.12	Band IV Osc. Coil Assembly)	
4.13	Band IV Oscillator Series Coil	
4.14	B.F.O. Coil	
4.15	Filter Choke	
5.1	Power Transformer	
5.2	Output Transformer	
5.3	1st I.F. Transformer	
5.4	2nd I.F. Transformer	
5.5	3rd I.F. Transformer	

Schematic Symbol	Function	Specification
1.1	R.F. Grid Resistor	220 K ±20% 1/2 Watt Carbon
1.2	R.F. & 1st I.F. Cathode Resistor	150 ohms ±20% 1/2 Watt Carbon
1.3	R.F. Gain Control	30 K Variable
1.4	R.F. Gain Bleeder	47 K ±20% 1/2 Watt Carbon
1.5	R.F. Screen Filter Resistor	4700 ohms ±20% 1/2 Watt Carbon
1.6	R.F. Plate Resistor	22 K ±20% 1/2 Watt Carbon
1.7	R.F. Plate Decoupling Resistor	4700 1/2 Watt 20% Carbon
1.8	Oscillator Plate Filter Resistor	22 K ±20%
1.9	Mixer Cathode Resistor	220 ohms ±20% 1/2 Watt Carbon
1.10	Oscillator Grid Leak	47 K ±20% 1/2 Watt Carbon
1.11	Mixer Screen Filter Resistor	220 K ±20% 1/2 Watt Carbon
1.12	Mixer Plate Filter Resistor	22 K ±20% 1/2 Watt Carbon
1.13	1st I. F. AVC Resistor	220 K ±20% 1/2 Watt Carbon
1.14	1st I. F. Screen Filter Resistor	4700 ohms ±20% 1/2 Watt Carbon
1.15	2nd I.F. Cathode Resistor	470 ohms ±20% 1/2 Watt Carbon
1.16	B.F.O. Plate Dropping Resistor	100 K ±20% 1/2 Watt Carbon
1.17	Part of Bleeder Resistor	10,000 ohms 10 Watt Tapped at 5500 wire wound
1.18	Part of Bleeder Resistor	
1.19	AVC Filter Resistor	1 meg ±20% 1/2 Watt Carbon
1.20	Tone Control	1 meg Variable with switch
1.21	ANL Decoupling Resistor	1 meg ±20% 1/2 Watt
1.22	Noise Limiter Bias Resistor	680 K ±10% 1/2 Watt Carbon
1.23	Output Amp. Grid Resistor	220 K ±20% 1/2 Watt Carbon
1.24	First AF Plate Filter Resistor	22 K ±20% 1/2 Watt Carbon
1.25	Output Amp. Cathode Resistor	470 ohms ±20% 1/2 Watt Carbon
1.26	1st Audio Cathode Resistor	820 ohms ±10% 1/2 Watt Carbon
1.27	Part of Diode Load	220 K ±20% 1/2 Watt Carbon
1.28	Part of Diode Load	220 K ±20% 1/2 Watt Carbon
1.29	B.F.O. Grid Leak	47 K ±20% 1/2 Watt Carbon
1.30	Phone Shunt Resistor	33 ohms ±20% 1/2 Watt Carbon
1.31	1st AF Grid Filter Resistor	22 K ±20% 1/2 Watt Carbon
1.32	1st AF Plate Resistor	100 K ±20% 1/2 Watt Carbon
1.33	Audio Gain Control	250 K Variable
1.34	Meter Bleeder	68 K ±20% 1/2 Watt Carbon
1.35	Meter Zero Adjustment	2 K Variable WW Screw Driver Slot
1.36	Feedback Resistor	250 K ±20% 1/2 Watt Carbon
2.1	Band I RF Trimmer	40 mmfd Mica Variable
2.2	Band II RF Trimmer	40 mmfd Mica Variable
2.3	Band III RF Trimmer	40 mmfd Mica Variable
2.4	Band IV RF Trimmer	40 mmfd Mica Variable
2.5	RF Grid Blocking Condenser	250 mmfd ±20% 600 V Mica
2.6	RF Tuning Condenser	Part of Gang Condenser
2.7	RF Cathode Bypass Condenser	.01 mfd ±20% 600 V Paper
2.8	RF Screen Bypass Condenser	.01 mfd. ±20% 600 V Paper
2.9	RF Plate Decoupling Condenser	.01 mfd ±20% 600 V Paper
2.10	Oscillator Plate Bypass Cond.	.01 mfd ±20% 600 V Paper
2.11	Oscillator Plate Filter Cond.	.001 mfd ±20% 600 V Mica
2.12	RF Plate Coupling Condenser	250 mfd ±20% 600 V Mica
2.13	Band I Mixer Trimmer	40 mmfd Mica Variable
2.14	Band II Mixer Trimmer	40 mmfd Mica Variable
2.15	Band III Mixer Trimmer	40 mmfd Mica Variable
2.16	Band IV Mixer Trimmer	40 mmfd Mica Variable
2.17	Band IV Osc. Series Trimmer	70 mmfd Mica Variable
2.18	Mixer Tuning Condenser	Part of Gang Condenser
2.19	Band I Series Pad	.0005 mfd ±5% 600 Volt Mica
2.20	Band II Series Pad	.0015 mfd ±5% 600 Volt Mica
2.21	Band III Series Pad	.004 mfd 5% 600 Volt Mica
2.22	Band IV Series Pad	.015 600 Volt Paper

Schematic Symbol	Function	Specification
2.23	Band I Osc. Trimmer	40 mmfd Mica Variable
2.24	Band II Osc. Trimmer	40 mmfd Mica Variable
2.25	Band III Osc. Trimmer	40 mmfd Mica Variable
2.26	Band IV Osc. Trimmer	40 mmfd Mica Variable
2.27	Mixer Cathode Bypass Condenser	.01 mfd ±20% 600 V Paper
2.28	Osc. Grid Condenser	50 mmfd ±20% 600 V Mica
2.29	Osc. Tuning Condenser	Part of Gang Condenser
2.30	Mixer Screen Bypass Condenser	.01 mfd ±20% 600 V. Paper
2.31	Mixer Plate Filter Condenser	.01 mfd ±20% 600 V Paper
2.32	First I.F. Grid Filter Condenser	.01 mfd ±20% 600 V Paper
2.33	1st I.F. Cathode Bypass Condenser	.01 mfd ±20% 600 V Paper
2.34	1st I.F. Screen Bypass Condenser	.01 mfd ±20% 600 V Paper
2.35	B.F.O. Coupling Condenser	5 mmfd ±20% Mica
2.36	2nd I.F. Cathode Bypass Cond.	.01 mfd ±20% 600 V Paper
2.37		
2.38	Power Supply Filter Condenser	10-10-15 mfd Electrolytic
2.39		
2.40	2nd I.F. Screen Bypass Cond.	.01 mfd ±20% 600 V Paper
2.41	AVC Bypass Condenser	.01 mfd ±20% 600 V Paper
2.42	Diode Lead Filter Condenser	50 mmfd ±20% 600 V Mica
2.43	ANL Bias Filter Condenser	.01 mfd ±20% 600 V Paper
2.44	B.F.O. Plate Bypass Condenser	.01 mfd ±20% 600 V Paper
2.45	Tone Control Condenser	.01 mfd ±20% 600 V Paper
2.46	First Audio Plate Coupling Cond.	.01 mfd ±20% 600 V Paper
2.47	Feed Back Blocking Condenser	.01 mfd ±20% 600 V Paper
2.48	Output Cathode Bypass Condenser	20 mfd 25 V Tubular Electrolytic
2.49	1st Audio Grid Decoupling Cond.	250 mmfd ±20% 600 V Mica
2.50	B.F.O. Grid Condenser	100 mmfd ±20% 600 V Mica
2.51	1st Audio Grid Coupling Cond.	.01 mfd ±20% 600 V Paper
2.52	B.F.O. Trimmer Condenser	70 mmfd Mica Variable
2.53	B.F.O. Grid Condenser	100 mmfd ±20% 600 V Mica
3.1	RF Coil Switch	Primary Section, part of Bandswitch
3.2	RF Coil Switch	Grid Section, part of Bandswitch
3.3	Mixer Coil Switch	Part of Bandswitch
3.4	Osc. Coil Switch	Plate Section, part of Bandswitch
3.5	Osc. Coil Switch	Grid Section, part of Bandswitch
3.6	Off-On Switch	2 pole, single throw on tone control
3.7	Stand-by Switch	2 pole, 3 throw rotary
3.8	Noise Limiter Switch	SPST Slide Switch
4.1	Band I R.F. Coil Assembly	
4.2	Band II R.F. Coil Assembly	
4.3	Band III R.F. Coil Assembly)	Wound on same form
4.4	Band IV R.F. Coil Assembly)	
4.5	Band I Mixer Coil Assembly	
4.6	Band II Mixer Coil Assembly	
4.7	Band III Mixer Coil Assembly)	Wound on same form
4.8	Band IV Mixer Coil Assembly)	
4.9	Band I Osc. Coil Assembly	
4.10	Band II Osc. Coil Assembly	
4.11	Band III Osc. Coil Assembly)	Wound on same form
4.12	Band IV Osc. Coil Assembly)	
4.13	Band IV Oscillator Series Coil	
4.14	B.F.O. Coil	
4.15	Filter Choke	
5.1	Power Transformer	
5.2	Output Transformer	
5.3	1st I.F. Transformer	
5.4	2nd I.F. Transformer	
5.5	3rd I.F. Transformer	



This receiver features the latest in post-war engineering design. It employs 10 tubes plus a rectifier in an AM-FM superheterodyne circuit. Four of the tubes are the dual-purpose type giving the set 15-tube performance. The tuning ranges are:

A.M. — 540 Kc. to 1700 Kc.
F.M. — 88 Mc. to 108 Mc.

The receiver has two built-in antennas; a loop antenna for the AM broadcast band and a folded dipole for the FM broadcast band. Provisions are made for external antenna connections. The easy-to read "slide-rule" type dial is illuminated when the set is on; a dial pointer of red plastic reflects illumination from the two pilot lights. A high ratio drive on the tuning condenser provdies smooth tuning. High Fidelty reproduction on FM and AM is the result of well-engineered circuits and the use of high quality parts.

Tube Complement:

1 Type 6BA6—FM RF Amplifier.
1 Type 7F8—FM Mixer, Oscillator.
1 Type 7AH7—1st IF Amplifier.
1 Type 6SH7—FM Detector Driver.
1 Type 7A6—FM Detector.
1 Type 6SQ7/GT—AM Det., A.V.C. and 1st Audio Amplifier.
1 Type 7F7—2nd Audio, Phase Inverter.
2 Type 7C5—Push-pull Power Amplifiers.
1 Type 5Y3—Rectifier.
1 Type 7Q7—AM Mixer Oscillator.

Power:

This receiver operates on 105-125 volts, 60 cycle, AC. Do not plug this radio receiver into a direct current socket. Power consumption is 80 watts.

ALIGNMENT PROCEDURE FOR A.M.:

Equipment Required:

a) Broadcast Band Signal Generator.
b) Output Meter.

1. Set band switch to AM. Advance volume control to full volume setting.
2. Connect output meter across voice coil.
3. Connect the Signal Generator across the broadcast band antenna section of the variable condenser. The "high" side of the Generator should connect to the stator section and the "ground" side to the frame or chassis. Adjust the Signal Generator to 455 kc and with the receiver switched on, adjust the first and second I.F. transformers for peak output as shown on the output meter. The signal injected into the receiver should be as small in magnitude as possible, consistent with a useful deflection on the output meter.
4. Connect the "high" side of the Generator to the antenna terminal with a 200 mmf condenser inserted in series. Connect the "ground" side of the Generator to the chassis. Tune receiver to 60 on the dial, adjust Signal Generator to 600 kc. Adjust the BC padder and the BC antenna coil for maximum deflection on the output meter. Use a weak signal.
5. Tune receiver to 160 on the dial. Adjust Signal Generator to 1600 kc. Adjust BC oscillator and BC antenna trimmers for maximum output.
6. Repeat operations 4 and 5.

V ALIGNMENT PROCEDURE FOR F.M.:

Note: Points A, B, C, D, E, F, G, and H are noted on circuit diagram.

Points B, C, and D have been brought out to the unused contacts of the speaker socket at the rear of the chassis.

Equipment Required:

a) High frequency Signal Generator with 88-108 Mc tuning range.
b) Signal Generator capable of delivering .1V at 10.7 mc.
c) Audio output meter.
d) D.C. vacuum tube voltmeter with zero center scale.

a. Ratio Detector Alignment:

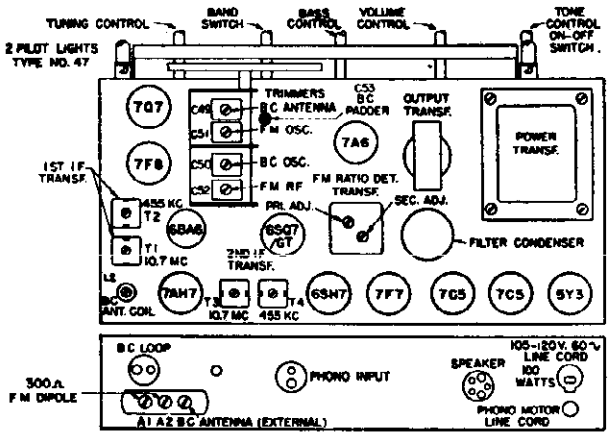
1. Connect V.T.V.M. across points "B" and "C" (A.V.C. Voltage).
2. Feed 10.7 mc unmodulated R.F. signal into 6SH7 grid (point A) through .01 μfd. condenser. This signal should be .1 volt.
3. Adjust primary of Ratio Detector (T-5) for maximum voltage indication on V.T.V.M.
4. Connect zero centered V.T.V.M. across points "B" and "D".
5. Adjust secondary of Ratio Detector (T-5) for zero indication.
6. Tune 10.7 mc Signal Generator higher in grequency (about 200 kc) until maximum voltage reading is obtained on V.T.V.M.; note this voltage, then tune signal generator lower in frequency until maximum voltage of the opposite polarity is obtained. Note this voltage, then if necessary re-adjust primary of the Det. (T-5) until the detector voltages are about equal on either the high or low side of 10.7 mc.

b. 10.7 I.F. Alignment:

1. Shunt a 1,000-ohm carbon resistor across the primary of the detector (T-5) (Points G and H).
2. Connect output meter across speaker voice coil.
3. Volume and tone controls at maximum clockwise position.
4. Connect 10.7 mc (modulated 30% signal generator through .01 μfd. condenser across point "F" and ground.
5. Adjust secondary, then primary of (T-3) for maximum audio output. (Reduce input signal to maintain output at .5-watt level.)
6. Connect 10.7 mc 30% modulated signal generator across point "E" and ground.
7. Adjust secondary, then primary of (T-1) for maximum audio output. (Reduce input signal to maintain output at .5-watt level.)
8. Remove 1000-ohm shunting resistor from across primary of (T-5).

c. Oscillator and R.F. Alignment:

1. Connect V.T.V.M. across "B" and "C" (A.V.C. voltage).
2. Connect 108 mc signal generator to FM antenna terminals. If generator impedance is low, put one 150-ohm carbon resistor in series with each of the generator leads. Tune receiver dial to 108 mc.
3. Adjust FM oscillator trimmer (C-51) for maximum V.T.V.M. reading.
4. Adjust FM R.F. trimmer (C-52) for maximum V.T.V.M. reading. During alignment reduce input signal to maintain A.V.C. voltage at 2 V.
5. Repeat steps 3 and 4.
6. Feed a 90 mc signal into antenna terminals (as in C-2), tune receiver dial to signal.
7. Adjust spacing of FM R.F. coil (L-4) for maximum V.T.V.M. reading at 90 mc. During alignment reduce input signal to maintain A.V.C. voltage at 2 V.
8. Repeat steps 2 and 4 if necessary.



Tube and Trimmer Locations.

RADIO & TELEVISION INC.

MODELS T4400, T4400½
MODEL T5000

C 1—1,500 mmfd., ±300 mmfd.
C 2—2 mmfd., 20%
C 3—25 mmfd., 10%
C 4—1,500 mmfd., ±300 mmfd.
C 5—1,500 mmfd., ±300 mmfd.
C 6—500 mmfd., 20%
C 7—.02 mfd., 400 V.
C 8—.05 mfd., 400 V.
C 9—1,500 mmfd., ±300 mmfd.
C10—100 mmfd., 20%
C11—.1 mfd., 400 V.
C12—1,500 mmfd., ±300 mmfd.
C13—.01 mfd., 400 V.
C14—100 mmfd., 20%
C15—1,500 mmfd., ±300 mmfd.
C16—1,500 mmfd., ±300 mmfd.
C17—.05 mfd., 200 V.
C18—.05 mfd., 200 V.
C19—.02 mfd., 200 V.
C20—.005 mfd., 600 V.
C21—250 mmfd., 20%
C22—.01 mfd., 400 V.
C23—250 mmfd., 20%
C24—12 mfd., 350 V.
C25—.01 mfd., 200 V.
C26—Var. cond. (AM-FM) *C-6.042
C27—1,500 mmfd., ±300 mmfd.
C28—.003 mfd., 20%
C29—.05 mfd., 400 V.
C30—.05 mfd., 400 V.
C31—250 mmfd., 20%
C32—4 mfd., 250 V.
C33—.5 mfd., 200 V.
C34—.002 mfd., 600 V.
C35—.002 mfd., 600 V.
C36 & C37—40 mfd. x 40 mfd., electrolytic, 400 V.
C38—.05 mfd., 400 V.
C39—1,500 mmfd., ±300 mmfd.
C40—1,500 mmfd., ±300 mmfd.
C41—1,500 mmfd., ±300 mmfd.
C42—1,500 mmfd., ±300 mmfd.
C43—1,500 mmfd., ±300 mmfd.
C44—47 mmfd., 10%
C45—.002 mfd., 400 V.
C46—100 mmfd., 20%
C47—.02 mfd., 400 V.
C48—1,500 mmfd., ±300 mmfd.
C49—Trimmer, compression, 3-35 mmfd.
C50—Trimmer, compression, 3-35 mmfd.
C51—Trimmer, ceramic, 1.5-7 mmfd.
C52—Trimmer, compression, 1.6-18 mmfd.
C53—Padder condenser, 275-1,000 mmfd.
R 1—470KΩ, ¼W., 20%
R 2—22KΩ, ¼W., 20%
R 3—47Ω, ¼W., 20%
R 4—470Ω, ¼W., 20%
R 5—1KΩ, ¼W., 20%
R 6—470KΩ, ¼W., 20%
R 7—15KΩ, ¼W., 20%
R 8—22KΩ, ¼W., 20%
R 9—2,200Ω, ¼W., 20%
R10—2.2 Meg.Ω, ¼W., 20%
R11—100Ω, ¼W., 20%
R12—.5 Meg.Ω Volume Control (Audio Taper) tapped at 50KΩ *RA-9.069
R13—10KΩ, ¼W., 20%
R14—1 Meg.Ω Tone Control, with power switch *RA-9.070
R15—10 Meg.Ω, ¼W., 20%
R16—220KΩ, ¼W., 20%
R17—470KΩ, ¼W., 20%
R18—100Ω, ¼W., 20%
R19—220KΩ, ¼W., 20%
R20—1 Meg.Ω Bass Control *RA-9.112
R21—220KΩ, ¼W., 20%
R22—100KΩ, ¼W., 20%
R23—470KΩ, ¼W., 20%
R24—100KΩ, ¼W., 20%
R25—2,200Ω, ¼W., 20%
R26—10Ω, ¼W., 20%
R27—2,200Ω, ¼W., 20%
R28—220KΩ, ¼W., 20%
R29—220KΩ, ¼W., 20%
R30—100Ω, ¼W., 20%
R31—220KΩ, ¼W., 20%
R32—10KΩ, ¼W., 20%
R33—10KΩ, ¼W., 20%
R34—470KΩ, ¼W., 20%
R35—2,200Ω, 10W., wirewound, 10%
R36—220Ω, 2W., 20%
R37—100Ω, ¼W., 20%
R38—22KΩ, 1W., 20%
R39—2.2 Meg.Ω, ¼W., 20%
R40—47KΩ, ¼W., 20%
R41—22KΩ, ¼W., 20%
R42—100KΩ, ¼W., 20%
R43—2,200KΩ, ¼W., 20%
R44—47KΩ, ¼W., 20%
R45—220KΩ, ¼W., 20%
R46—470KΩ, ¼W., 20%
R49—1KΩ, ¼W., 20%
R50—22KΩ, ½W., 20%
T 1—FM I.F. Trans., 10.7 Mc. *ZB-2.276
T 2—AM I.F. Trans., 455 Kc *ZB-2.275
T 3—FM I.F. Trans., 10.7 Mc. *ZB-2.276
T 4—AM I.F. Trans., 455 Kc. *ZB-2.275
T 5—FM Ratio Detector Transformer, 10.7 Mc. *ZC-2.278
T 6—Output Trans. *ZB-15.019
T 7—Power Trans. *TA-18.053
S 1—Band Switch *SA-12.060
L 1—FM Antenna Coil *LA-2.241
L 2—Antenna Coil, Broadcast *LA-2.273
L 3—R.F. Plate Choke *LA-2.279
L 4—R.F. Coil, FM *LA-2.243
L 5—Oscillator Coil, Broadcast *LA-2.221
L 6—Oscillator Coil, FM *LA-2.222
L 7—R.F. Choke, Conv. Plate *LA-2.242
L 8—Loop, Broadcast *LC-5.018
Antenna, FM, Folded Dipole (300Ω) *LA-5.010
Pilot Lamp, No. 47, 6-8 V.

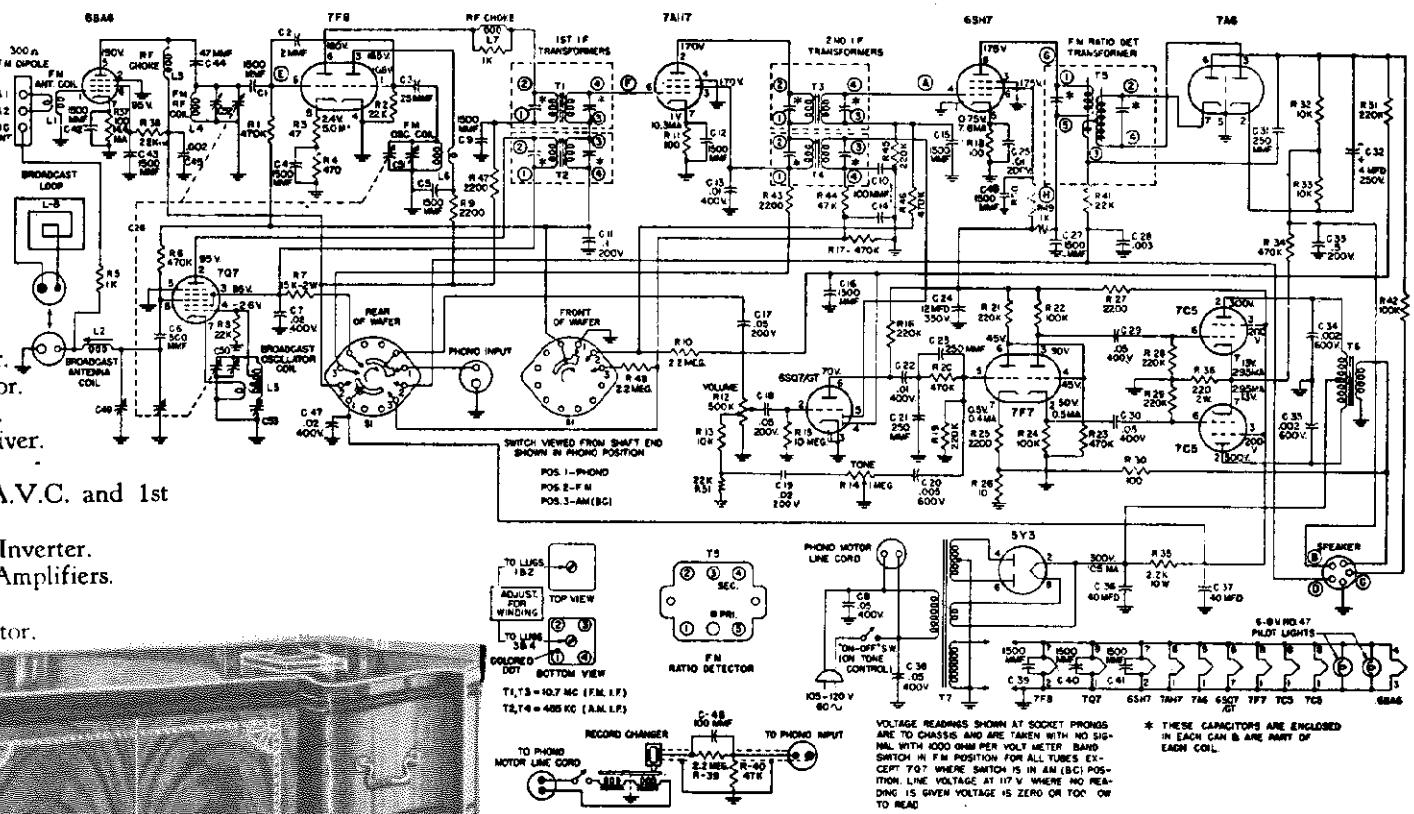
Part No. GN-559 *Mfg. Part No.

MODELS T4400, T4400½

C 1—1,500 mmfd., ± 300 mmfd.
C 2—2 mmfd., 20%
C 3—25 mmfd., 10%
C 4—1,500 mmfd., ±300 mmfd.
C 5—1,500 mmfd., ±300 mmfd.
C 6—500 mmfd., 20%
C 7—.02 mfd., 400 V.
C 8—.05 mfd., 400 V.
C 9—1,500 mmfd., ±300 mmfd.
C10—100 mmfd., 20%
C11—.1 mfd., 200 V.
C12—1,500 mmfd., ±300 mmfd.
C13—.01 mfd., 400 V.
C14—100 mmfd., 20%
C15—1,500 mmfd., ±300 mmfd.
C16—1,500 mmfd., ±300 mmfd.
C17—.05 mfd., 200 V.
C18—.05 mfd., 200 V.
C19—.02 mfd., 200 V.
C20—.005 mfd., 600 V.
C21—250 mmfd., 20%
C22—.01 mfd., 400 V.
C23—250 mmfd., 20%
C24—12 mfd., 350 V.
C25—.01 mfd., 200 V.
C26—Var. cond. (AM-FM) *C-6.012
C27—1,500 mmfd., ±300 mmfd.
C28—.003 mfd., 20%
C29—.05 mfd., 400 V.
C30—.05 mfd., 400 V.
C31—250 mmfd., 20%
C32—4 mfd., 250 V.
C33—.5 mfd., 200 V.
C34—.002 mfd., 600 V.
C35—.002 mfd., 600 V.
C36 & C37—40 mfd. x 40 mfd., electrolytic, 400 V.
C38—.05 mfd., 400 V.
C39—1,500 mmfd., ±300 mmfd.
C40—1,500 mmfd., ±300 mmfd.
C41—1,500 mmfd., ±300 mmfd.
C42—1,500 mmfd., ±300 mmfd.
C43—1,500 mmfd., ±300 mmfd.
C44—47 mmfd., 10%
C45—.002 mfd., 400 V.
C46—100 mmfd., 20%
C47—.02 mfd., 400 V.
C48—1,500 mmfd., ±300 mmfd.
C49—Trimmer, compression, 3-35 mmfd.
C50—Trimmer, compression, 3-35 mmfd.
C51—Trimmer, ceramic, 1.5-7 mmfd.
C52—Trimmer, compression, 1.6-18 mmfd.
C53—Padder condenser, 275-1,000 mmfd.
R 1—470KΩ, ¼W., 20%
R 2—22KΩ, ¼W., 20%
R 3—47Ω, ¼W., 20%
R 4—470Ω, ¼W., 20%
R 5—1KΩ, ¼W., 20%
R 6—470KΩ, ¼W., 20%
R 7—15KΩ, 2W., 20%
R 8—22KΩ, ¼W., 20%
R 9—2,200Ω, ¼W., 20%
R10—2.2 Meg.Ω, ¼W., 20%
R11—100Ω, ¼W., 20%
R12—.5 Meg.Ω Volume Control (Audio Taper) tapped at 50KΩ *RA-9.069
R13—10KΩ, ¼W., 20%
R14—1 Meg.Ω Tone Control, with power switch *RA-9.070
R15—10 Meg.Ω, ¼W., 20%
R16—220KΩ, ¼W., 20%
R17—470KΩ, ¼W., 20%
R18—100Ω, ¼W., 20%
R19—220KΩ, ¼W., 20%
R20—470KΩ, ¼W., 20%
R21—220KΩ, ¼W., 20%
R22—100KΩ, ¼W., 20%
R23—470KΩ, ¼W., 20%
R24—100KΩ, ¼W., 20%
R25—2,200Ω, ¼W., 20%
R26—10Ω, ¼W., 20%
R27—2,200Ω, ¼W., 20%
R28—220KΩ, ¼W., 20%
R29—220KΩ, ¼W., 20%
R30—100Ω, ¼W., 20%
R31—220KΩ, ¼W., 20%
R32—10KΩ, ¼W., 20%
R33—10KΩ, ¼W., 20%
R34—470KΩ, ¼W., 20%
R35—2,200Ω, 10W., wirewound, 10%
R36—220Ω, 2W., 20%
R37—100Ω, ¼W., 20%
R38—22KΩ, 1W., 20%
R39—2.2 Meg.Ω, ¼W., 20%
R40—47KΩ, ¼W., 20%
R41—22KΩ, ¼W., 20%
R42—100KΩ, ¼W., 20%
R43—2,200Ω, ¼W., 20%
R44—47KΩ, ¼W., 20%
R45—220KΩ, ¼W., 20%
R46—470KΩ, ¼W., 20%
R47—2,200Ω, ¼W., 20%
R48—2.2 Meg.Ω, ¼W., 20%
R49—1KΩ, ¼W., 20%
R 50—22KΩ, ½W., 20%
T 1—FM I.F. Trans., 10.7 Mc. *ZB-2.276
T 2—AM I.F. Trans., 455 Kc. *ZB-2.275
T 3—FM I.F. Trans., 10.7 Mc. *ZB-2.276
T 4—AM I.F. Trans., 455 Kc. *ZB-2.275
T 5—FM Ratio Detector Transformer, 10.7 Mc. *ZC-2.278
T 6—Output Trans. *ZB-15.019
T 7—Power Trans. *TA-18.053
S 1—Band Switch *SA-12.060
L 1—FM Antenna Coil *LA-2.241
L 2—Antenna Coil, Broadcast *LA-2.273
L 3—R.F. Plate Choke *LA-2.279
L 4—R.F. Coil, FM *LA-2.243
L 5—Oscillator Coil, Broadcast *LA-2.221
L 6—Oscillator Coil, FM *LA-2.222
L 7—R.F. Choke, Conv. Plate *LA-2.242
L 8—Loop, Broadcast *LC-5.018
Antenna, FM, Folded Dipole (300Ω) *LA-5.010
Pilot Lamp, No. 47, 6-8 V.

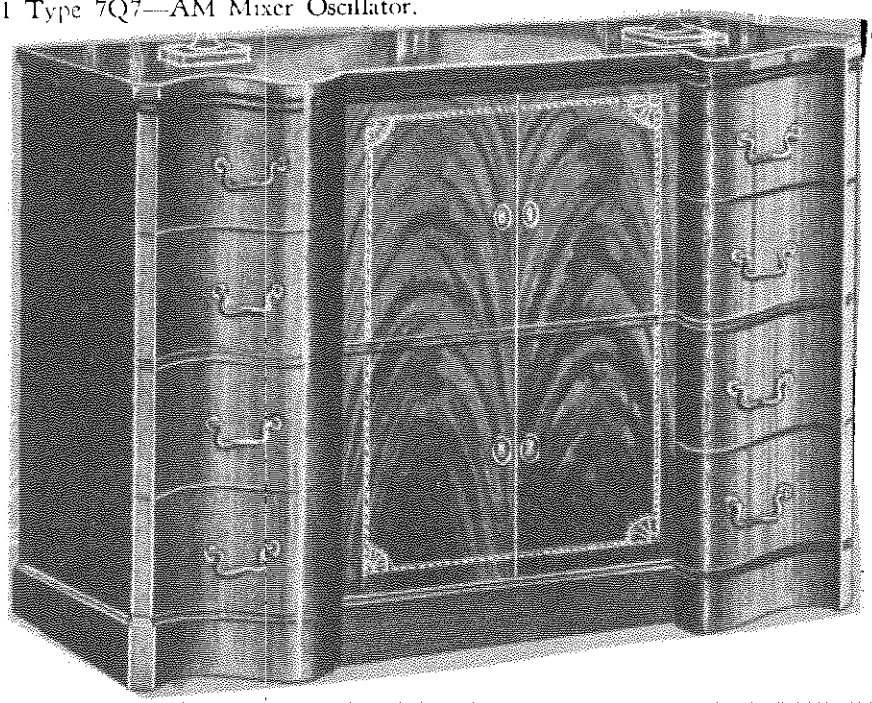
Part No. GN-569—Rev. 2-5-48 * Mfg. Part No.

MODEL T5000



Tube Complement:

1 Type 6BA6—FM RF Amplifier.
1 Type 7F8—FM Mixer, oscillator.
1 Type 7AH7—1st IF Amplifier.
1 Type 6SH7—FM Detector Driver.
1 Type 7A6—FM Detector.
1 Type 6SQ7/GT—AM Det., A.V.C. and 1st Audio Amplifier.
1 Type 7F7—2nd Audio, Phase Inverter.
2 Type 7C5—Push-pull Power Amplifiers.
1 Type 5Y3—Rectifier.
1 Type 7Q7—AM Mixer Oscillator.



This receiver features the latest in post-war engineering design. It employs 10 tubes plus a rectifier in an AM-FM superheterodyne circuit. Four of the tubes are the dual-purpose type giving the set 15-tube performance. The tuning ranges are:

A.M. — 540 Kc. to 1700 Kc.
F. M. — 88 Mc. to 108 Mc.

The receiver has two built in antennas; a loop antenna for the AM broadcast band and a folded dipole for the FM broadcast band. Provisions are made for external antenna connections. The easy-to-read "slide-rule" type dial is illuminated when the set is on; a dial pointer of red plastic reflects illumination from the two pilot lights. A high ratio drive on the tuning condenser provides smooth tuning. High Fidelity reproduction on FM and AM is the result of well-engineered circuits and the use of high quality parts.

ALIGNMENT PROCEDURE FOR A.M.:

Equipment Required:

a) Broadcast Band Signal Generator.
b) Output Meter.

1. Set band switch to AM. Advance volume control to full volume setting.

2. Connect output meter across voice coil.

3. Connect the Signal Generator across the broadcast band antenna section of the variable condenser. The "high" side of the Generator should connect to the stator section and the "ground" side to the frame or chassis. Adjust the Signal Generator to 455 kc and with the receiver switched on, adjust the first and second I.F. transformers for peak output as shown on the output meter. The signal injected into the receiver should be as small in magnitude as possible, consistent with a useful deflection on the output meter.

4. Connect the "high" side of the Generator to the antenna terminal with a 200 mmf condenser inserted in series. Connect the "ground" side of the Generator to the chassis. Tune receiver to 60 on the dial, adjust Signal Generator to 600 kc. Adjust the BC padder and the BC antenna coil for maximum deflection on the output meter. Use a weak signal.

5. Tune receiver to 160 on the dial. Adjust Signal Generator to 1600 kc. Adjust BC oscillator and BC antenna trimmers for maximum output.

6. Repeat operations 4 and 5.

ALIGNMENT PROCEDURE FOR F.M.:

Note: Points A. B. C. D. E. F. G. and H are noted on circuit diagram.

Points B, C, and D have been brought out to the unused contacts of the speaker socket at the rear of the chassis.

Equipment Required:

a) High frequency Signal Generator with 88-108 Mc tuning range.
b) Signal Generator capable of delivering .1 V at 10.7 mc.
c) Audio output meter.
d) D.C. vacuum tube voltmeter with zero center scale.

a. Ratio Detector Alignment:

1. Connect V.T.V.M. across points "B" and "C" (A.V.C. Voltage).

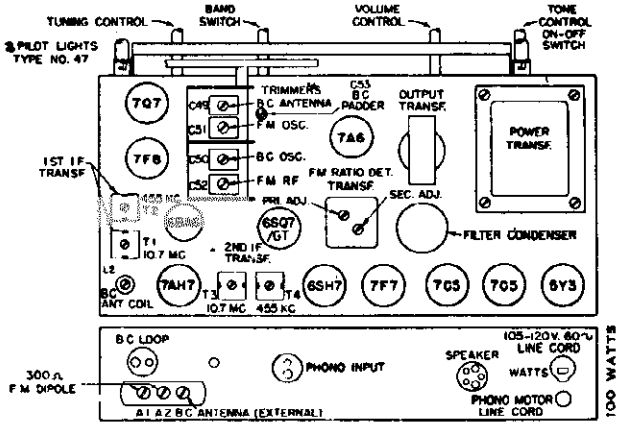
2. Feed 10.7 mc unmodulated R.F. signal into 6SH7 grid (point A) through .01 μfd. condenser. This signal should be .1 volt.

3. Adjust primary of Ratio Detector (T-5) for maximum voltage indication on V.T.V.M.

4. Connect zero centered V.T.V.M. across points "B" and "D".

5. Adjust secondary of Ratio Detector (T-5) for zero indication.

6. Tune 10.7 mc Signal Generator higher in frequency (about 200 kc) until maximum voltage reading is obtained on V.T.V.M.; note this voltage, then tune signal generator lower in frequency until maximum voltage of the opposite polarity is obtained. Note this voltage, then if necessary re-adjust primary of the Det. (T-5) until the detector voltages are about equal on either the high or low side of 10.7 mc.



Tube and Trimmer Locations.

b. 10.7 I.F. Alignment:

1. Shunt a 1,000-ohm carbon resistor across the primary of the detector (T-5) (Points G and H).

2. Connect output meter across speaker voice coil.

3. Volume and tone controls at maximum clockwise position.

4. Connect 10.7 mc (modulated 30% signal generator through .01 μfd. condenser across point "F" and ground.

5. Adjust secondary, then primary of (T-3) for maximum audio output. (Reduce input signal to maintain output at .5-watt level.)

6. Connect 10.7 mc 30% modulated signal generator across point "E" and ground.

7. Adjust secondary, then primary of (T-1) for maximum audio output. (Reduce input signal to maintain output at .5-watt level.)

8. Remove 1000-ohm shunting resistor from across primary of (T-5).

c. Oscillator and R.F. Alignment:

1. Connect V.T.V.M. across "B" and "C" (A.V.C. voltage).

2. Connect 108 mc signal generator to FM antenna terminals. If generator impedance is low, put one 150-ohm carbon resistor in series with each of the generator leads. Tune receiver dial to 108 mc.

3. Adjust FM oscillator trimmer (C-51) for maximum V.T.V.M. reading.

4. Adjust FM R.F. trimmer (C-52) for maximum V.T.V.M. reading. During alignment reduce input signal to maintain A.V.C. voltage at 2 V.

5. Repeat steps 3 and 4.

6. Feed a 90 mc signal into antenna terminals (as in C-2), tune receiver dial to signal.

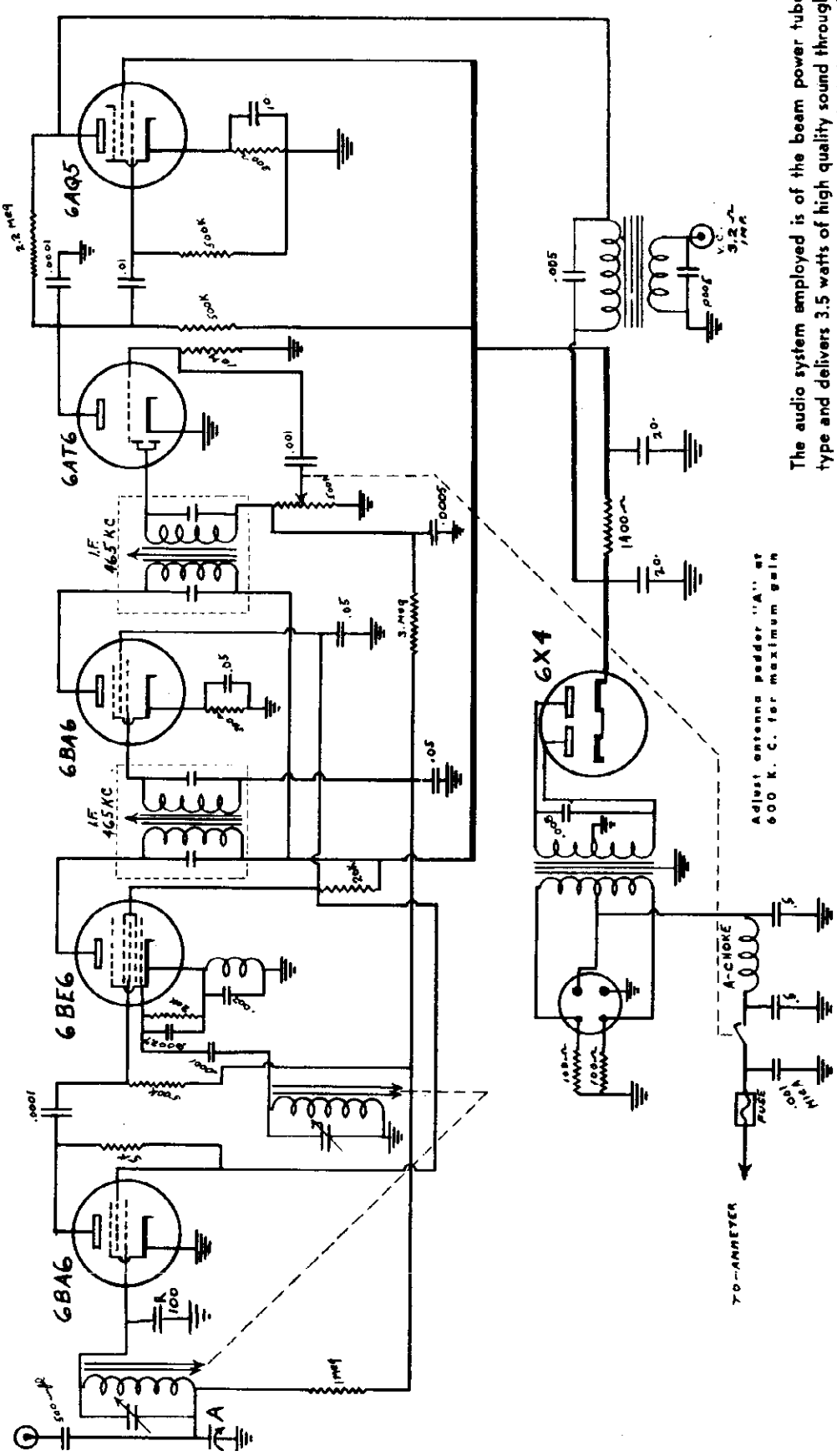
7. Adjust spacing of FM R.F. coil (L-4) for maximum V.T.V.M. reading at 90 mc. During alignment reduce input signal to maintain A.V.C. voltage at 2 V.

8. Repeat steps 2 and 4 if necessary.

Power:

This receiver operates on 105-125 volts, 60 cycle, AC. Do not plug this radio receiver into a direct current socket. Power consumption is 80 watts.

RADIO & TELEV. PRODUCTS CO. MODEL 47602



The audio system employed is of the beam power tube type and delivers 3.5 watts of high quality sound through a 6 inch Alnico V-PM speaker which is supplied along with the necessary mounting hardware and baffle for most automobiles.

This auto radio can be mounted in practically all widely sold automobiles.

The circuit employed in the 47602 is of the Superheterodyne type, foremost in the radio world of today. It consists of a 6 miniature tube radio chassis featuring: High sensitivity, permeability tuning and high fidelity in an efficient compact size.

ANTENNA

A shielded antenna cable (30 mmf. capacity) with bayonet connector plug is required.

The plug on the antenna cable is inserted in the socket at the side of the radio case. The wire at the other end of the cable is connected to the antenna.

Low Capacity Antenna

This radio is designed for a low capacity car antenna. The total capacity of antenna and shielded cable should be 40 to 70 mmf.

The following procedure has been found to be effective in reducing motor noise to a satisfactory level in most cars. Follow the steps in the order given. Additional procedure, which may be required in exceptional cases of motor noise, is not covered here and will be found by referring to current literature on this subject.

GENERATOR CONDENSER—A generator condenser is required in all cases. Connect the condenser lead to the battery terminal of the generator. The case and mounting strap connect the other side of the condenser to ground. This unit must, therefore, be well grounded at its mounting.

CAUTION—In cars with automatic regulators, it is important not to connect the condenser across the field terminal. Most manufacturers at the present time have a recommendation for the proper post at which to connect the condenser.

DISTRIBUTOR SUPPRESSOR—A distributor suppressor will be required in most cases. Remove the high tension lead to the distributor. Insert a distributor suppressor and connect the wire to the other end of the suppressor. If this is not practical, cut the high tension lead close to the distributor and use a wood screw end type distributor suppressor in this line.

Withdraw Antenna Cable Plug

Turn on the radio and start the motor.

If motor noise is heard, proceed as follows:

BONDING CABLES, STEERING COLUMN, ETC.—Try grounding to the fire wall all cables and tubing which pass through it such as oil lines, gas lines, etc. It is also possible for the steering column, foot pedals, and brake lever to carry interference to the back of the fire wall at which point it may affect the radio. By means of a file, contact can be established between any of these parts and the fire wall or frame in order to determine whether such a ground will reduce the noise. To bond the parts to the fire wall or frame, clean the point of contact, wrap a length of one inch braided shielding around the part, and solder the connection. Then solder the end of the shielding to the fire wall or frame or ground it under a screw head if one is convenient.

Sufficient play should be left in the bonding shielding so that movement of the parts will not loosen this shielding.

Then Reinsert Antenna Cable Plug

If motor noise is heard when the antenna cable is reconnected, proceed as follows until the noise is satisfactorily reduced:

BYPASS CONDENSERS—Try a .5 mfd. bypass condenser from the ammeter to ground and see if interference is reduced. Install this condenser permanently if there is an improvement.

In like manner, try a .5 mfd. condenser from car fuse to ground, switch to ground, tail light and stop light connections to ground, windshield wiper and various other 6 volt connections to ground, noting what effect these condensers have on the noise pickup.

Try a .5 mfd. condenser between the point at which the dome light lead leaves the pillar post and ground.

Try a .5 mfd. condenser from the "Hot" side of the coil primary to ground.

The electric gauges used for oil, water, and gas are often a source of interference and bypass condensers should be tried. The condenser should usually be connected to the end of the line nearest the measuring device rather than at the instrument panel.

HIGH AND LOW TENSION LEADS—In some cases, the high and low tension leads between the coil and distributor are run close together. In some cars, they are in the same conduit. If this is the case, remove the low tension lead from this conduit. In any event, keep the high and low tension leads as far apart from each other as possible.

If separating the two leads is not sufficient, shield and ground the shield of the low tension lead.

GROUNDING MOTOR AND OTHER PARTS—The motor must, in every case, be well grounded to the frame of the car. If it is not, use a very heavy braided lead for this purpose, similar to a storage battery ground lead. In like manner, it may be necessary to check the grounding of the metal fire wall, instrument panel, transmission, radiator, hood, and muffler to the frame of the automobile. To obtain a good electrical connection, scrape off the paint, if necessary, at the point where ground contact is made.

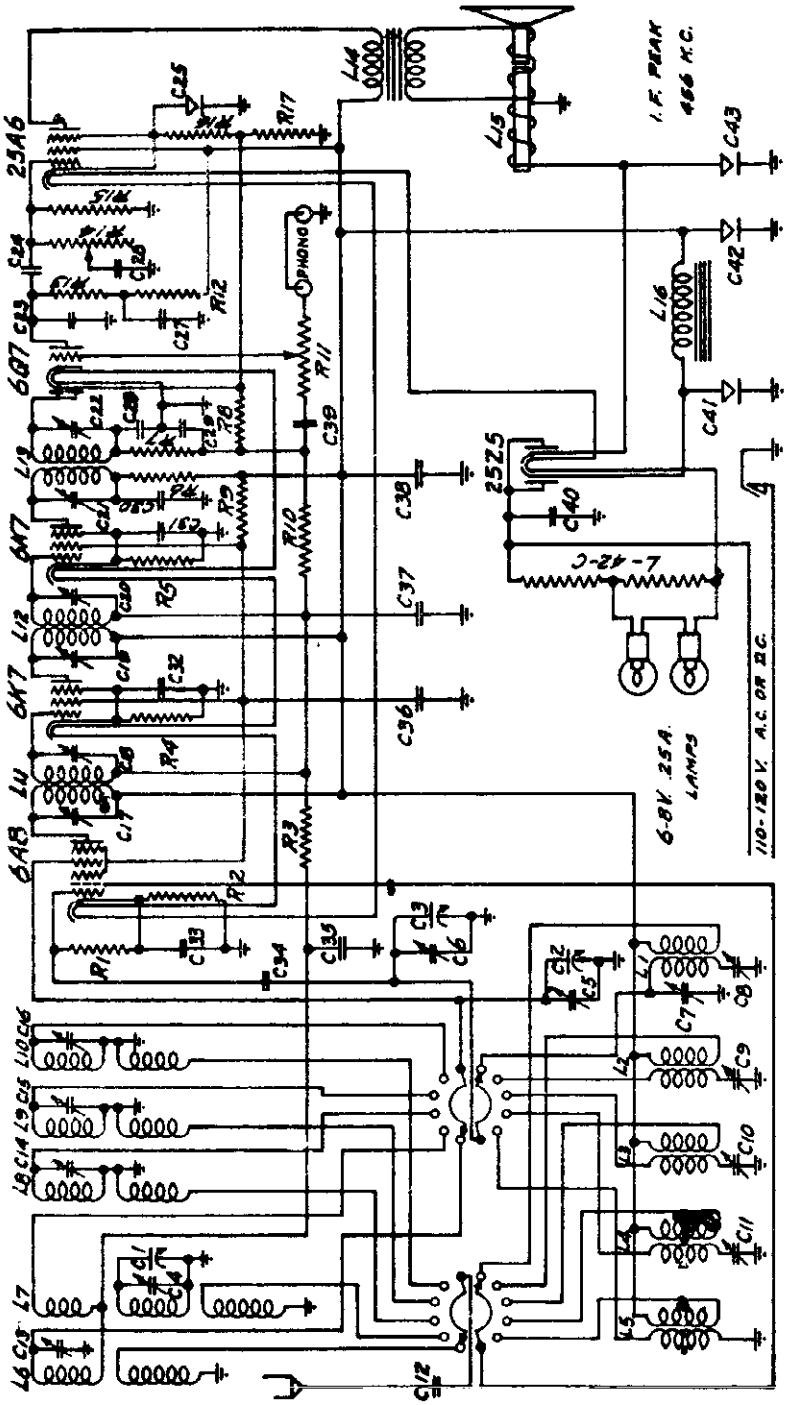
PEENING ROTOR ARM—In extreme cases of motor noise, it is advisable to peen the distributor rotor arm, that is, increase the length of the arm by using a small machinist's hammer. This will lessen the gap between the rotor arm and the stationary contacts thus reducing the spark. Be sure, after peening the arm, that it does not strike the stationary contacts.

SPARK PLUG SUPPRESSORS—If motor noise persists, spark plug suppressors must be installed. One suppressor is put on each plug. These are not regularly supplied with the radio and must be purchased extra. Ninety-five per cent of all cars will not require spark plug suppressors. Care should be taken that a good mechanical and electrical connection is made between the spark plugs, suppressors, and plug wires.

WHEEL OR BRAKE STATIC—To determine if noise is being caused from this source, set the car in motion; then with the motor shut off and the clutch disengaged, apply the brakes. If the noise stops, the source of the static is in the wheels. The use of a front or rear wheel static eliminator will generally end the trouble.

RADIO WIRE TELEVISION

MODEL A-23



RESISTORS

CODE	PART NO.		
R1	53-838	50,000 Ohm	Oscillator Grid Resistor
R2	53-1062	250 Ohm	Oscillator Cathode Resistor
R3	53-923	100,000 Ohm	A.V.C. Network Resistor
R4	53-1063	500 Ohm	First I.F. Cathode Resistor
R5	53-1063	500 Ohm	Second I.F. Cathode Resistor
R6	53-919	5,000 Ohm	Second I.F. Plate Isolation Resistor
R7	53-838	50,000 Ohm	Diode Filter Resistor
R8	53-838	50,000 Ohm	Diode Load Resistor
R9	53-925	500,000 Ohm	Screen Feed Resistor
R10	53-921	40,000 Ohm	Output Grid Resistor
R11	53-926	1 Meg Ohm	A.V.C. Network Resistor
R12	19-1291	500,000 Ohm	Volume Control & Switch
R13	53-838	50,000 Ohm	Second Detector Plate Hum Resistor
R14	53-924	250,000 Ohm	Second Detector Plate Resistor
R15	19-1317	One	Tone Control
R16	53-925	500,000 Ohm	Output Grid Resistor
R15	53-1425	750 Ohm	Output Cathode Resistor
R17	53-1124	40 Ohm	Second Detector Cathode Resistor

INDUCTANCES

CODE	PART NO.		
L1	17-1648	No. 5 Band	Oscillator Coil Assembly
L2	17-1646	No. 4 Band	Oscillator Coil Assembly
L3	17-2083	No. 3 Band	Oscillator Coil Assembly
L4	17-1668	No. 2 Band	Oscillator Coil Assembly
L5	17-2084	No. 1 Band	Oscillator Coil Assembly
L6	17-2085	No. 5 Band	Preselector Coil Assembly
L7	17-2080	No. 4 Band	Preselector Coil Assembly
L8	17-2082	No. 3 Band	Preselector Coil Assembly
L9	17-1666	No. 2 Band	Preselector Coil Assembly
L10	17-1664	No. 1 Band	Preselector Coil Assembly
L11	68-2014	First I.F.	Transformer Assembly
L12	68-2014	Second I.F.	Transformer Assembly
L13	68-2021	Third I.F.	Transformer Assembly
L14	64-2026	8" Speaker	25A6 Output Trans. on L15
L15	64-2026	8" Speaker	3000 Ohm Field
L16	16-940	20 Henry	Filter Choke

CONDENSERS

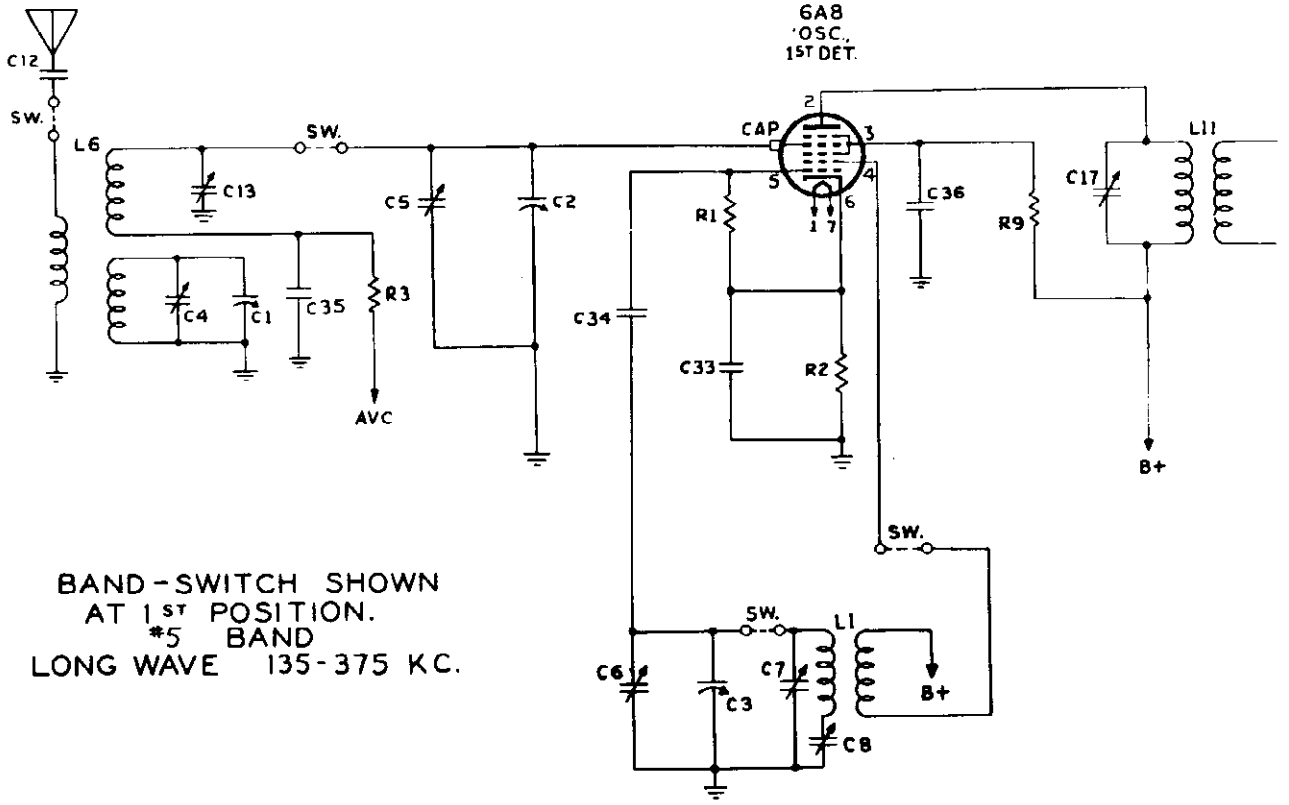
CODE	PART NO.		
C1	77-1581	1st. Preselector Section of 3 Gang Condenser	
C2	77-1581	2nd. Preselector Section of 3 Gang Condenser	
C3	77-1581	Oscillator Section of 3 Gang Condenser	
C4		C1 Reciprocal Trimmer	
C5		C2 Reciprocal Trimmer	
C6		C3 Reciprocal Trimmer	
C7	78-2010	3-30 MMFD. No. 5 Band	Oscillator Trimmer
C8	78-1569	140 MMFD. No. 5 Band	Oscillator Series Trimmer
C9	78-1569	450 MMFD. No. 4 Band	Oscillator Series Trimmer
C10	78-1572	600 MMFD. No. 3 Band	Oscillator Series Trimmer
C11	78-1572	1600 Mfd. No. 2 Band	Oscillator Series Trimmer
C12	75-2003	.01 Mfd. Antenna	Series Condenser
C13	78-2010	3-30 MMFD. No. 5 Band	Preselector Coil Parallel Trimmer
C14	78-2010	3-30 MMFD. No. 5 Band	Preselector Coil Parallel Trimmer
C15	78-2010	3-30 MMFD. No. 2 Band	Preselector Coil Parallel Trimmer
C16	78-2010	3-30 MMFD. No. 1 Band	Preselector Coil Parallel Trimmer
C17	78-1561	70-120 MMFD. 1st.	I.F. Primary Trimmer
C18	78-1561	70-120 MMFD. 1st.	I.F. Secondary Trimmer
C19	78-1561	70-120 MMFD. 2nd.	I.F. Primary Trimmer
C20	78-1561	70-120 MMFD. 2nd.	I.F. Secondary Trimmer
C21	78-1561	70-120 MMFD. 3rd.	I.F. Primary Trimmer

CONDENSERS (Cont.)

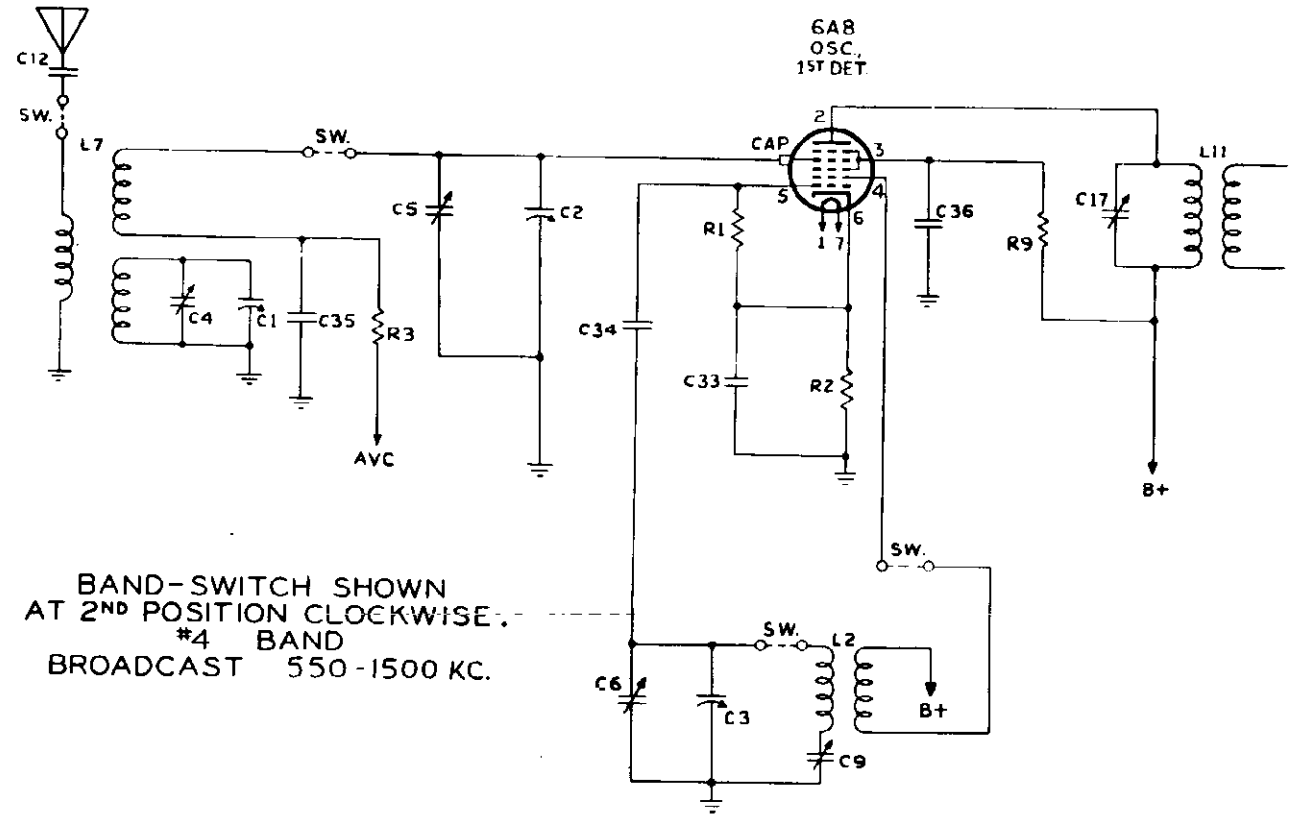
CODE	PART NO.		
C22	78-1561	70-120 MMFD. 3rd.	I.F. Secondary Trimmer
C23	76-265	.001 Mfd. Second	Detector Plate Filter
C24	75-2003	.01 Mfd. Audio	Feed Condenser
C25	18-928	25 Mfd. Electrolytic	Condenser 25A6 Cathode By-Pass
C26	75-2003	.01 Mfd. Tone	Control Condenser
C27	76-2005	.1 Mfd. 200 Volt Paper	Second Detector Plate Hum Filter
C28	76-2001	.0004 Mfd. Mica	Diode Filter Condenser
C29	76-2001	.0001 Mfd. Mica	Diode Filter Condenser
C30	75-2003	.01 Mfd. 400 V. Paper	2nd. I.F. Plate Isolation Cond.
C31	76-2005	.1 Mfd. 200 Volt Paper	2nd. I.F. Cathode Resistor
C32	76-2005	.1 Mfd. 200 Volt Paper	1st. I.F. Cathode Resistor
C33	76-2005	.1 Mfd. 200 Volt Paper	Osc. & 1st. Det. Cathode Resistor
C34	76-286	.00025 Mfd. Mica	Oscillator Grid Condenser
C35	76-2005	.1 Mfd. 200 Volt Paper	A.V.C. By-Pass Condenser
C36	75-2011	.5 Mfd. 200 Volt Paper	Screen Grid By-Pass Condenser
C37	75-2005	.1 Mfd. 200 Volt Paper	A.V.C. By-Pass Condenser
C38	75-2013	1. Mfd. 400 Volt Paper	B Supply By-Pass Condenser
C39	76-2003	.01 Mfd. 400 Volt Paper	Audio Feed Condenser
C40	75-2005	.1 Mfd. 200 Volt Paper	Line By-Pass Condenser
C41	18-2003	11 Mfd. Dry Electrolytic	Condenser 150 W.V.
C42	18-2003	4 Mfd. Dry Electrolytic	Condenser 150 W.V.
C43	18-2003	4 Mfd. Dry Electrolytic	Condenser 150 W.V.

MODEL A-23

RADIO WIRE TELEVISION

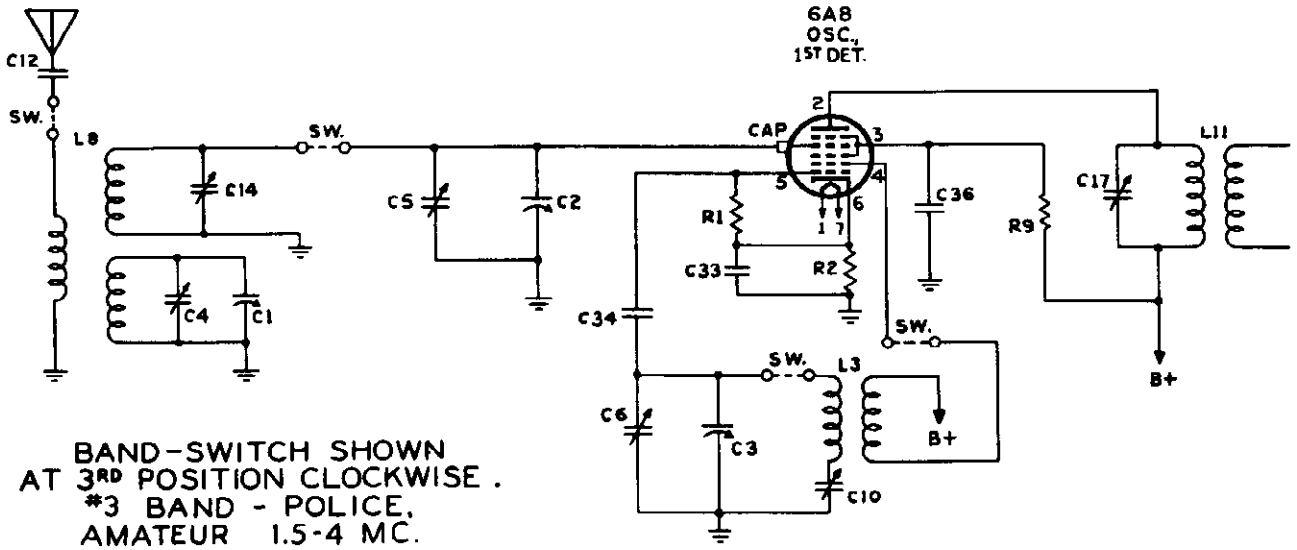


BAND-SWITCH SHOWN
AT 1ST POSITION.
#5 BAND
LONG WAVE 135-375 KC.

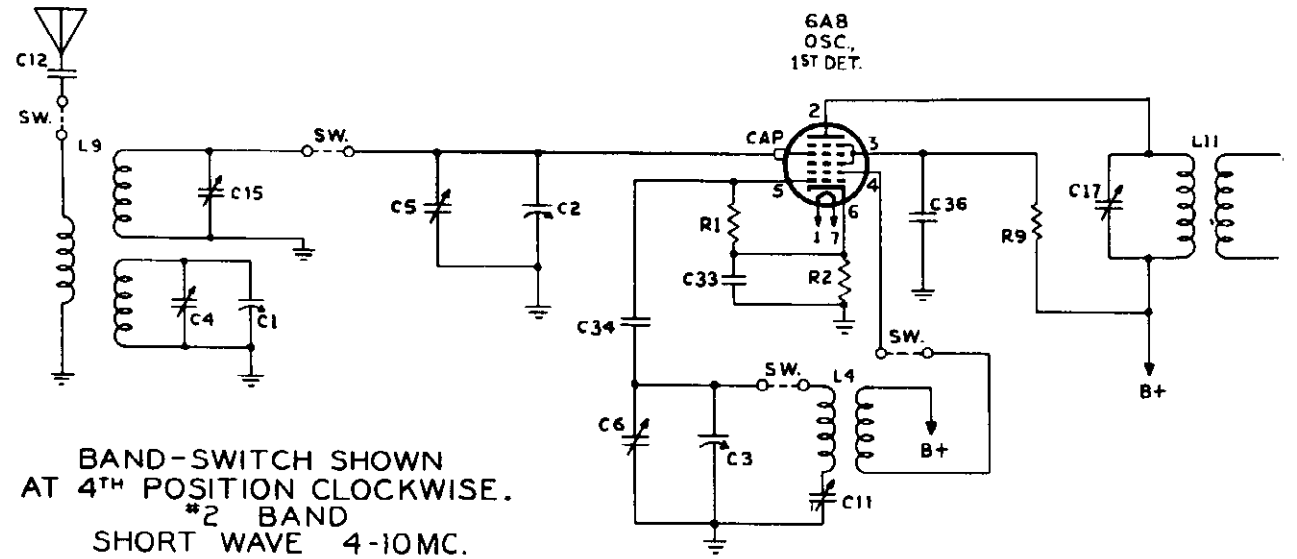


BAND-SWITCH SHOWN
AT 2ND POSITION CLOCKWISE.
#4 BAND
BROADCAST 550-1500 KC.

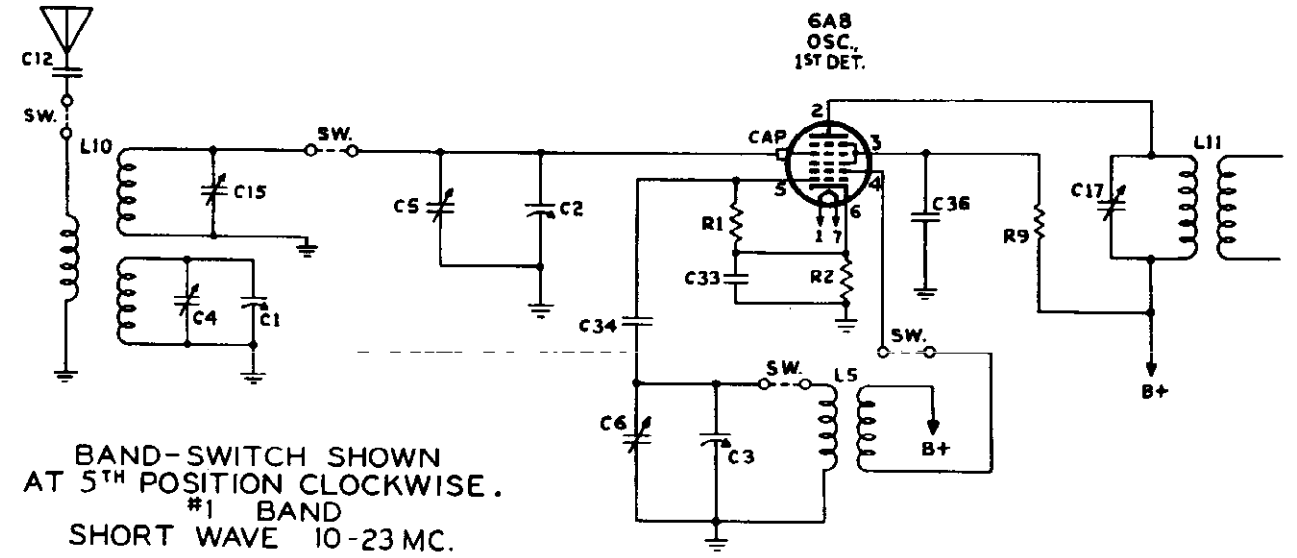
RADIO WIRE TELEVISION MODEL A-23



BAND-SWITCH SHOWN
AT 3RD POSITION CLOCKWISE.
#3 BAND - POLICE,
AMATEUR 1.5-4 MC.



BAND-SWITCH SHOWN
AT 4TH POSITION CLOCKWISE.
#2 BAND
SHORT WAVE 4-10MC.



BAND-SWITCH SHOWN
AT 5TH POSITION CLOCKWISE.
#1 BAND
SHORT WAVE 10-23 MC.

MODEL A-23 RADIO WIRE TELEVISION

GANGING OF AC-DC SEVEN TUBE SUPERHETERODYNE

APPARATUS:

Signal Generator having output frequencies from 20 megacycles to 150 kilocycles.
Output Meter.
Small tools such as screwdriver, 1/4" wrench, etc.

GANGING OF THE I.F. AMPLIFIER:

The signal generator should be adjusted to 456 kilocycles, its output should be adjusted to some medium value and connected directly (no dummy antenna being used) to the grid of the first detector which is the first tube on the left hand side of the receiver when facing the front of the receiver. With this connection made and the volume control turned on a signal should be indicated on the output meter. This should be adjusted to approximate half scale reading and the adjustments of the trimming condensers in the I.F. transformers made. The last intermediate frequency transformer, which is the transformer furthest to the rear of the receiver on the right hand side. These two circuits should be ganged for maximum amplitude as indicated by the output meter and output of the signal generator should be decreased from time to time as the ganging operation progresses so that it is not over loaded. After carefully ganging the last transformer the second transformer should be ganged. The ganging operation should be carried on as before and then the first transformer, which is the transformer on the right hand front corner of chassis, should be ganged. It is often desirable to go over this procedure a second time because slight variations of one circuit tend to detune other circuits and the operation will be found to have been more accurately made if the whole ganging sequence pertaining to the I.F. amplifier is gone over a second time.

The sensitivity of the I.F. amplifier after it is correctly ganged should be in the neighborhood of 8 to 10 microvolts.

GANGING OF OSCILLATOR AND PRESELECTOR CIRCUITS:

(Broadcast Band)

The output of the signal generator should now go through a standard dummy antenna and be connected to antenna and ground posts of the radio chassis. The signal generator should be set at 1400 kilocycles, the wave change switch should be set on its fourth position and the dial set so that No. 4 band reads 1400 kilocycles. At this point the trimming condenser on the first section of the variable condenser should be trimmed until a signal is indicated on the output meter. After correctly peaking this signal, the two preselector trimming condensers occurring on the second and rear sections of the variable condenser should be trimmed, for maximum output. The dial reading of the receiver and the signal generator should now be changed to 600 kilocycles and the reciprocal trimmer for the broadcast band, which is the trimming adjustment occurring at the left upper position of the four trimmers on the front of the chassis, should be varied until the 600 kilocycle signal is indicated on the output meter. The signal generator and the receiver should again be tuned to 1400 kilocycles and the trimming adjustment on the first section of the variable condenser retuned for maximum amplitude at 1400 kilocycles. The signal generator and receiver should now be tuned to 1000 kilocycles and the sensitivity at this point checked. This completes the ganging for the broadcast band.

(Police Band No. 3)

The signal generator should be set at 4 megacycles, the wave change switch changed to the No. 3 position and the receiver tuned in the vicinity of the dial reading on the No. 3 band of 4 megacycles where the signal will be found. After peaking this signal on the output meter by means of dial tuning, the No. 3 band preselector adjustment should be peaked - this will be found on the under side of the receiver and it will be that adjustment mounted on the small coil which is nearest the rear of the receiver. In making these preselector adjustments on the higher frequencies, it is often desirable to continuously sweep the tuning of the receiver back and forth across the receiver and note the amplitude of the output meter, continuously trimming the preselector circuit because at these higher frequencies a change in preselector tuning will affect the oscillator tuning to some extent. After this adjustment is made the signal generator and receiver should be adjusted to 1.5 megacycles and the left lower adjustment to the left of the wave change switch should be adjusted until the signal peaks on the output meter. The signal generator and receiver should again be set to the 4 megacycle reading then checked for amplitude.

(No. 2 Band)

The signal generator should now be adjusted to 10 megacycles and the wave change switch be in the No. 2 position and the tuning adjustment of the radio receiver swept back and forth in the vicinity of ten megacycles until the signal peaks on the output meter. The center adjustment of the three adjusting trimmers underneath the chassis should now be adjusted for maximum amplitude on the output meter after which the signal and receiver should be tuned to 4 megacycles and the left lower adjustment on the left hand side of the wave change switch should be adjusted until the signal peaks on the output meter.

(No. 1 Band)

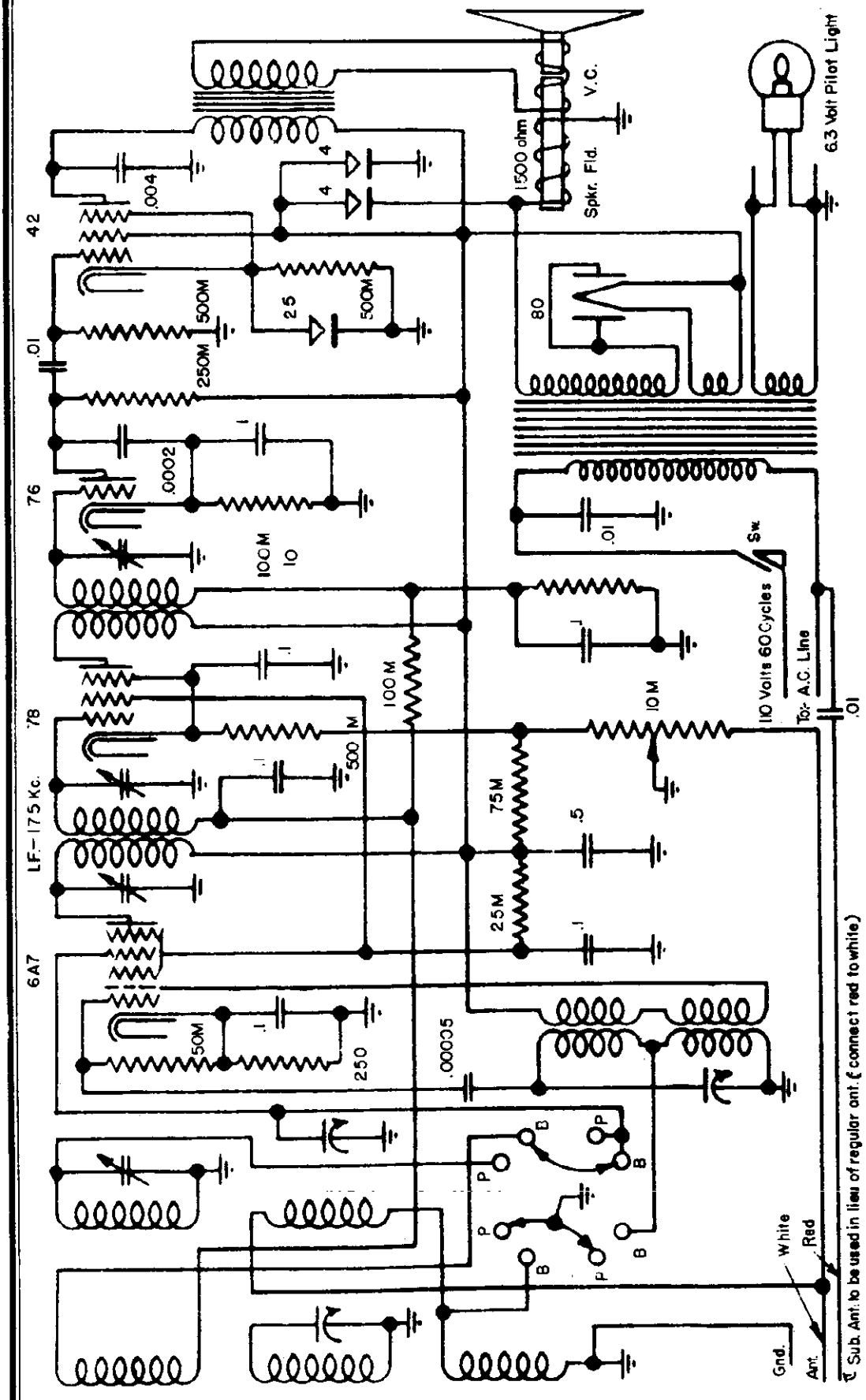
The signal generator should be adjusted to a frequency of 20 megacycles and the wave change switch placed in its No. 1 position. The tuning adjustment of the radio receiver should be swept back and forth in the vicinity of 20 megacycles until the signal peaks on the output meter after which the adjusting trimmer nearest the front chassis skirt should be adjusted for maximum amplitude.

(No. 5 Long Wave Band)

The signal generator and tuning adjustment on the radio should be adjusted to 350 kilocycles and the wave change switch be in its No. 5 position and the adjustment located underneath the chassis near the left hand front corner should be adjusted until the signal is indicated on the output meter, after which the adjustment on the coil on top of the receiver chassis immediately to the left of the variable condenser should be adjusted for maximum amplitude. The signal generator and the tuning adjustment on the radio chassis should be adjusted to 150 kilocycles and the adjustment furthest to the left above and to the left of the wave change switch should now be adjusted until the signal peaks on the output meter. The signal generator and radio chassis should again be adjusted to 350 kilocycles and the first adjustment compensated for any change that the last adjustments may have had on it.

MODEL A-41

RADIO WIRE TELEVISION



WAVE BAND SWITCH

This receiver affords operation on the broadcast band and also on the policy band, extending from 4 megacycles to 1.5 megacycles. With the switch turned to the left, operation will be afforded on the broadcast band. When it is turned to the right, or clockwise, the police band is connected and all police stations, commercial phone stations and amateur stations operating on the 80 meter and 150 meter band will be received.

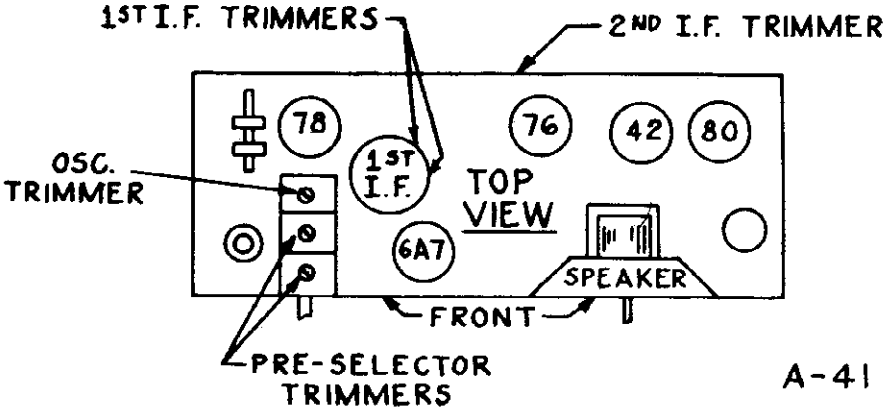
ALIGNMENT PROCEDURE

Do not attempt the following adjustments unless thoroughly familiar with the alignment procedure of modern superheterodyne circuits and in possession of all necessary equipment.

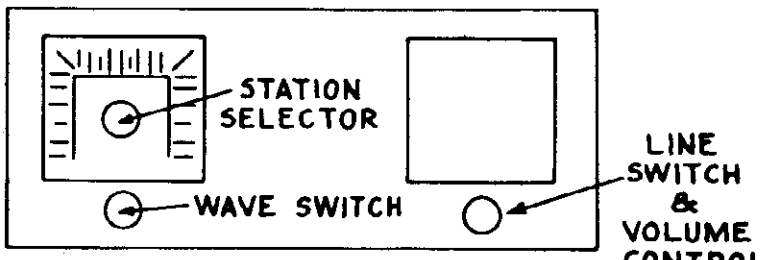
To align the Model A-41

Short antenna to ground. Short oscillator section of 3 gang tuning condenser. Connect a signal generator tuned to 175 K.C. thru a .00025 mfd. condenser to grid of first detector tube. Signal generator and receiver grounds should be connected together. Connect output meter to output of amplifier tube. With volume control at maximum, adjust signal generator attenuator for minimum visible deflection on output meter. Adjust I.F. trimmer condensers for maximum deflection on output meter. When I.F. is aligned, remove shorts from oscillator condenser and antenna. Using same procedure as in aligning I.F.'s, now connect signal generator tuned to 1400 K.C. to antenna lead. Adjust trimmer condensers on three gang condenser for correct calibration and maximum output.

To align receiver on policy band, tune three gang condenser to a 4000 K.C. signal from generator, and adjust police band trimmer till maximum sensitivity is noted on output meter. Band Switch is on "Police Band" position during this alignment.



A-41



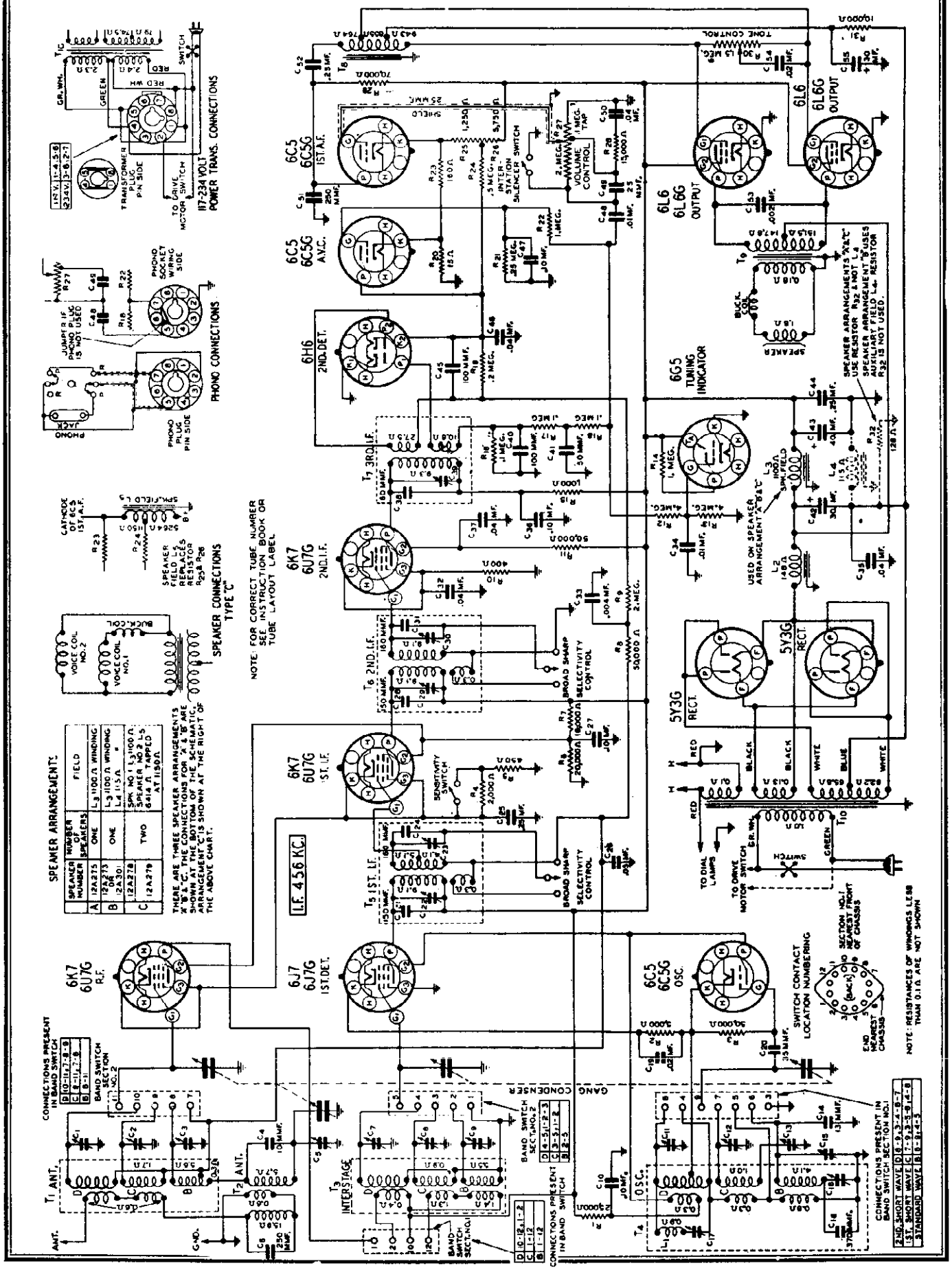
FRONT VIEW

D.C. VOLTAGES TO CHASSIS

TUBE	FILAMENT	CATHODE	SCREEN GRID	PLATE	OSC. GRID	OSC. PLATE
78	5.3	2.65	69	170	----	----
76	5.3	----	--	93	----	----
42	5.3	9.6	178	168	----	----
80	4.2	(Fil. to chassis)- 178 volts				
6A7	5.3	2.6	97	178	5.3	178

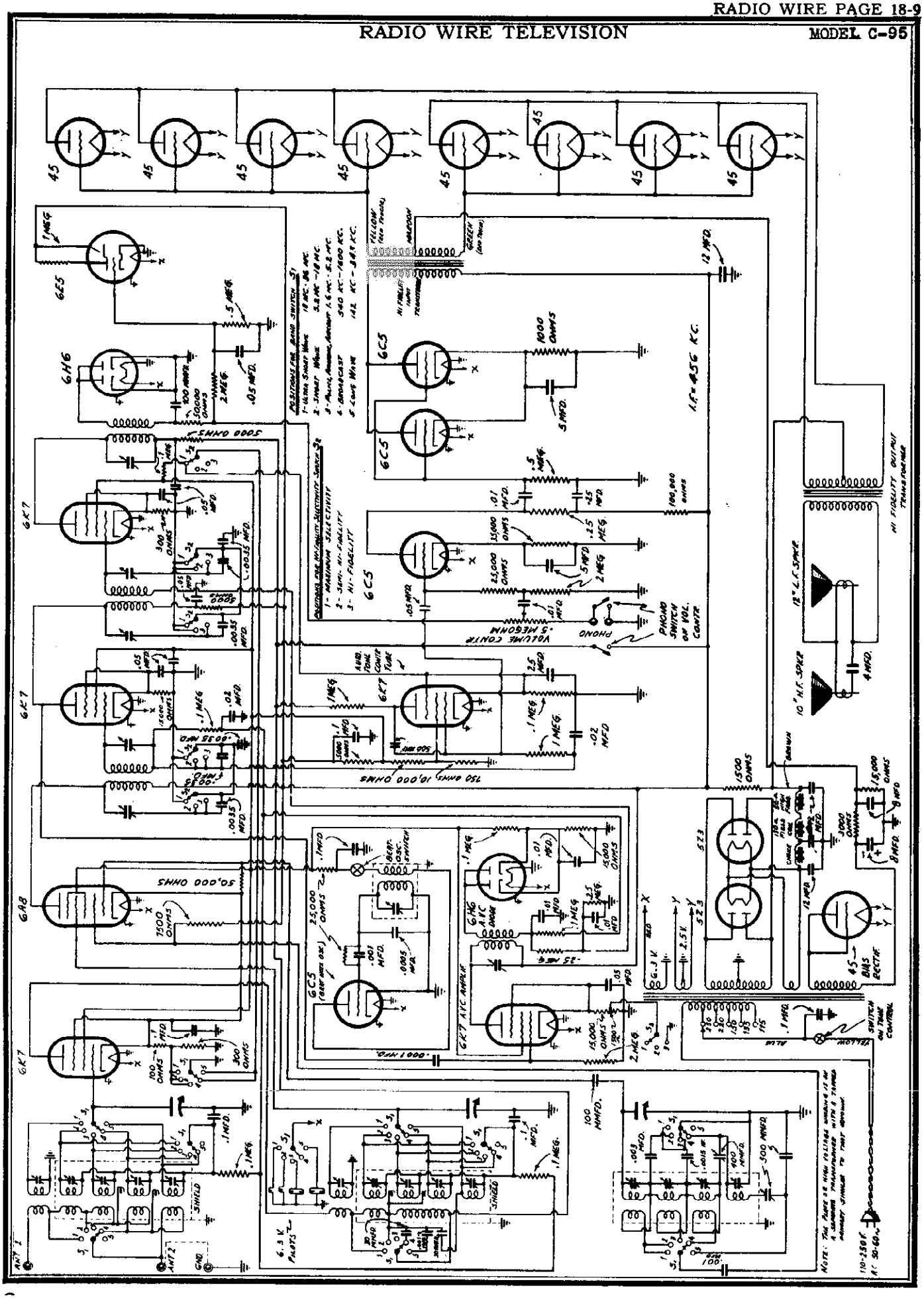
MODELS B43, BB60, BB61

RADIO WIRE TELEVISION



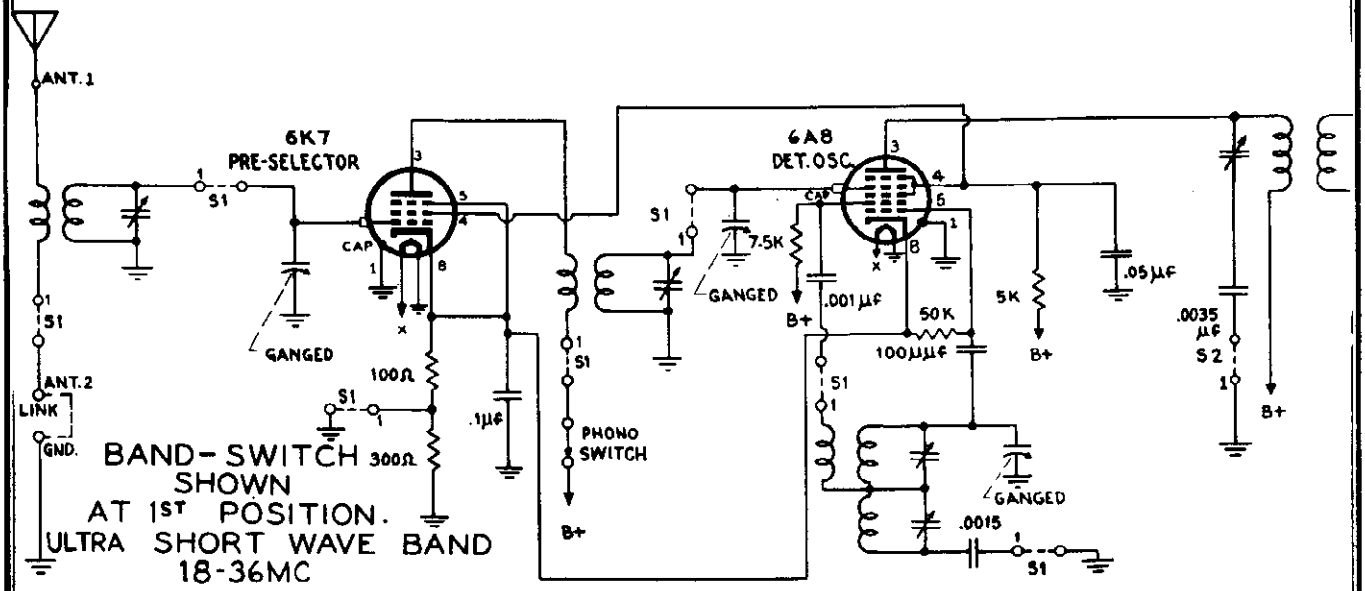
RADIO WIRE TELEVISION

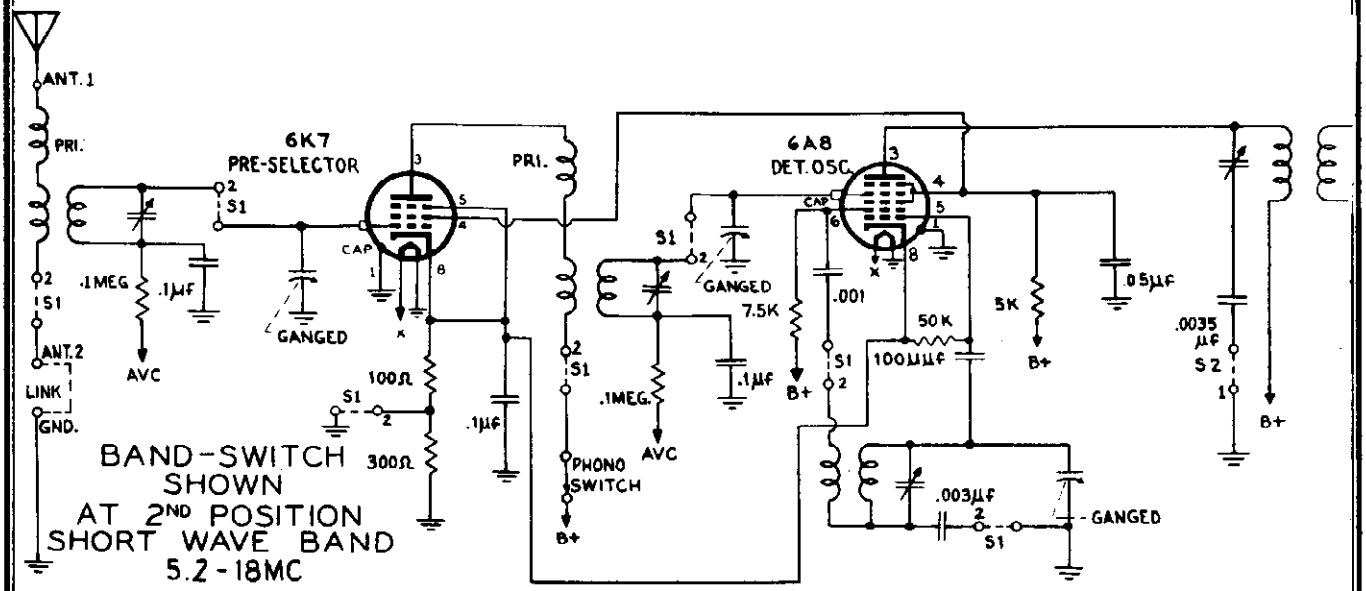
MODEL C-95

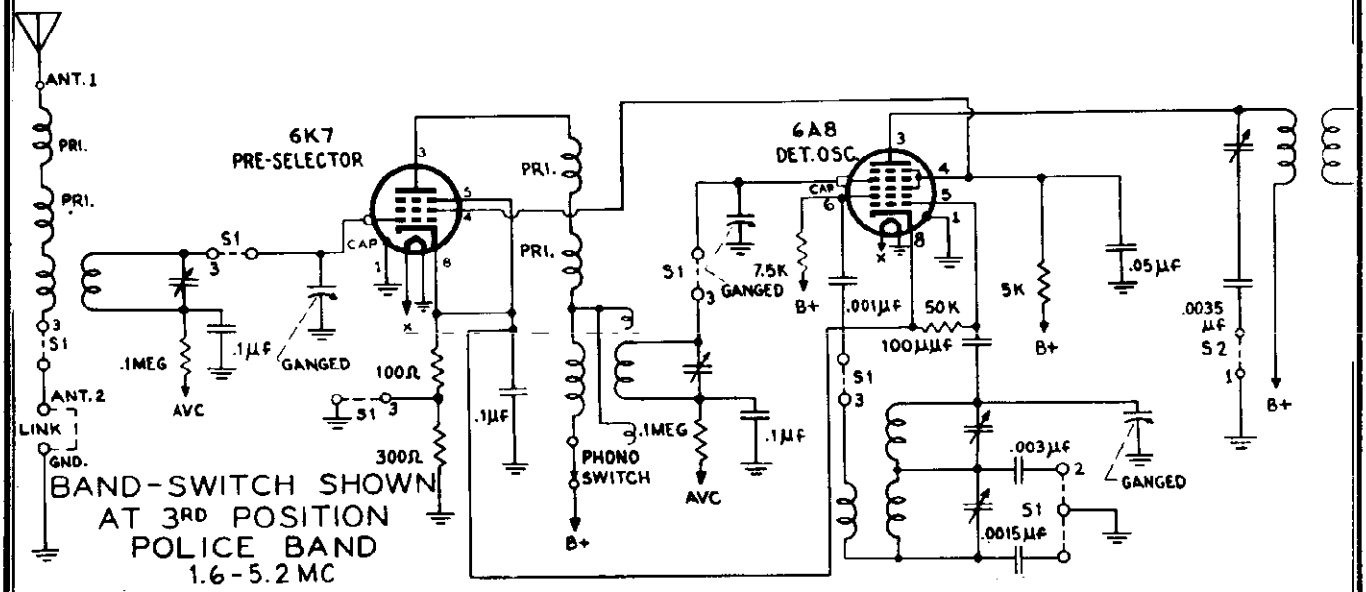


MODEL C-95

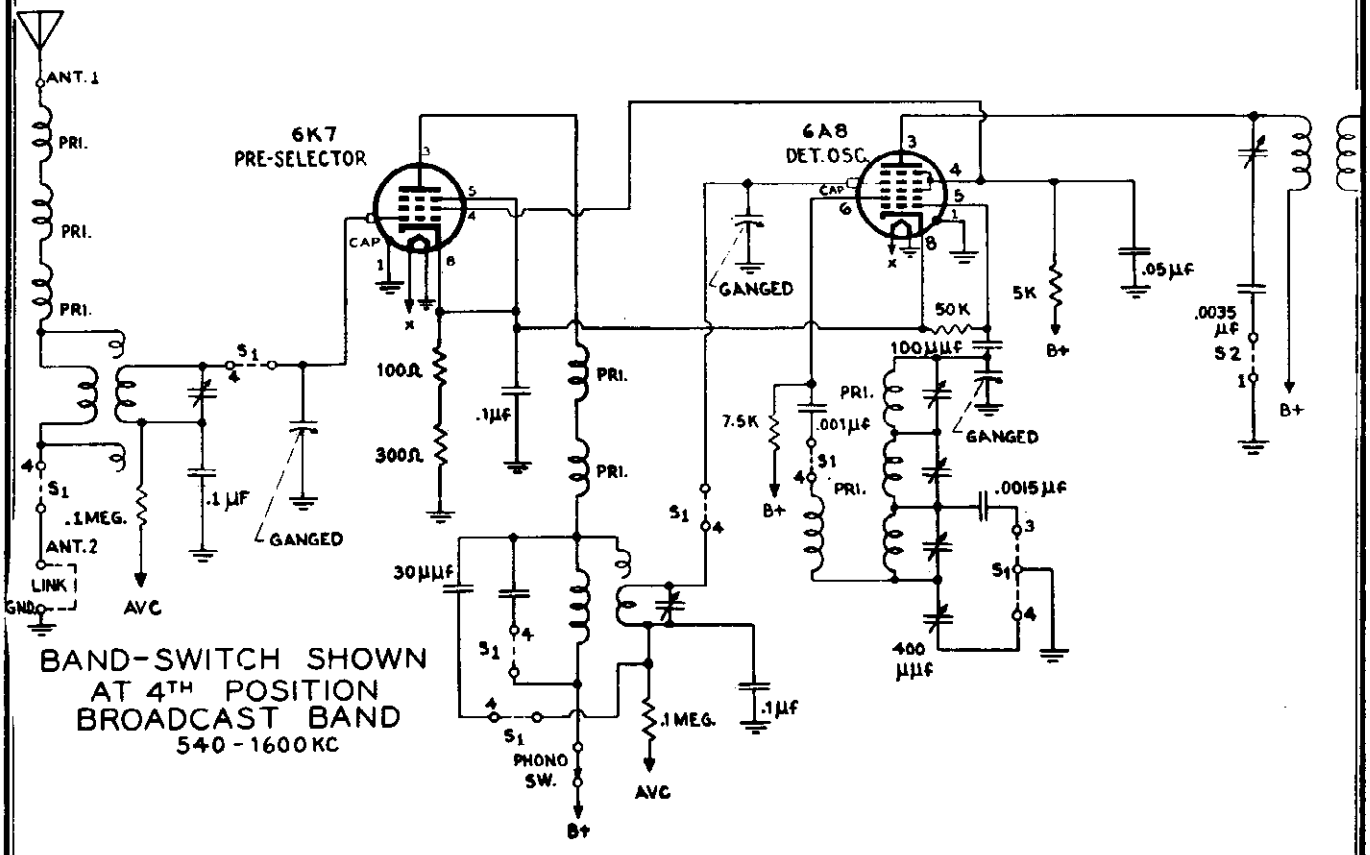
RADIO WIRE TELEVISION



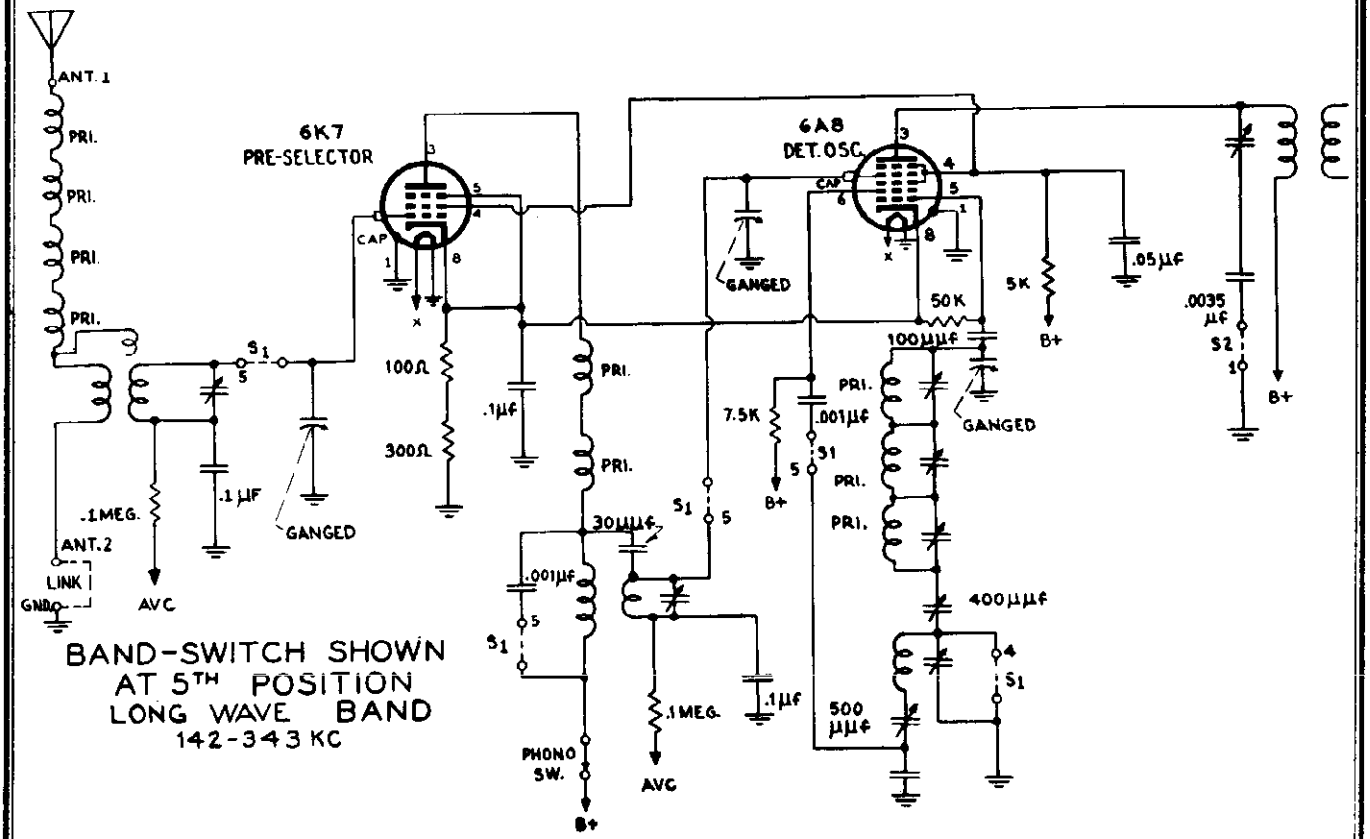




RADIO WIRE TELEVISION MODEL C-95



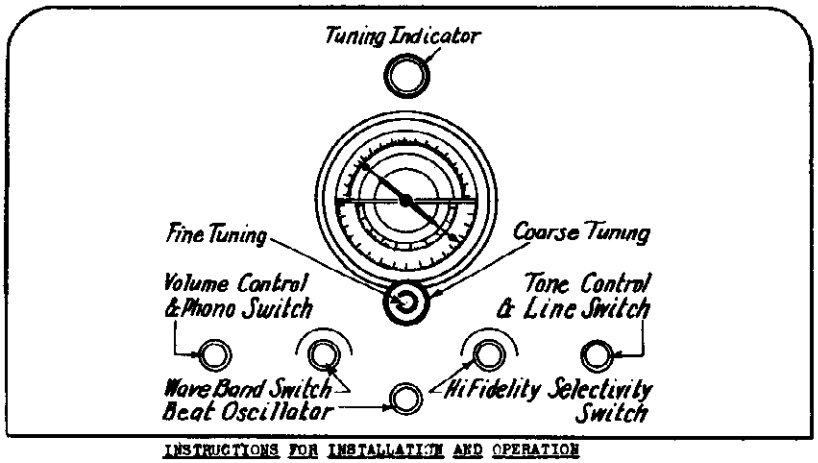
BAND-SWITCH SHOWN AT 4TH POSITION
BROADCAST BAND
540 - 1600 KC



BAND-SWITCH SHOWN AT 5TH POSITION
LONG WAVE BAND
142 - 343 KC

MODEL C-95

RADIO WIRE TELEVISION



INSTRUCTIONS FOR INSTALLATION AND OPERATION

CURRENT: This receiver operates on AC (Alternating Current) only on frequencies from 40 to 60 cycles.

VOLTAGE: Any line voltage from 105 to 260 volts may be used. This model is equipped with 2 Universal Transformers for filament and plate supply, with five taps marked as follows:- 115, 135, 150, 220, 250. Access to this tap changer is obtained by lifting off the box-like black cover on top of the transformer. The lug attached to the flexible lead is then moved to the point which corresponds most nearly to the line voltage available. The cover is then snapped back into place. Unless otherwise specified, the receiver is always connected to the 115 volt tap (suitable for 105 to 125 volts). Before inserting the line plug, be sure to ascertain what the line voltage is and connect to the correct tap. Be sure to set both transformers for the corrected voltage..

ANTENNA:- While this receiver will operate extremely well with almost any kind of antenna, it is desirable to have a good antenna installation in order to obtain best results on all bands. The exact length is not of any great importance. A short well insulated antenna with properly soldered connections may give results much better than a longer antenna which is poorly installed. Best results will be obtained with an All-Wave Doublet Antenna which has been especially designed for this receiver, and which can be obtained from your dealer. Detailed instructions for the antenna installation are enclosed with this kit. Proper installation will result in reduction of noise and more consistent and dependable short-wave reception.

ANTENNA CONNECTION:- Three antenna terminals are provided marked A-1-A-2 and G. If a doublet antenna is used, the two lead-in wires or the two leads from the transformer are connected to A-1 and A-2, and a ground to G. (This ground may be unnecessary in certain cases.) If however, the usual type of antenna with only one lead-in is used, this is connected to A-1. A2 and G are connected together by a wire and both to a ground connection.

WAVE BANDS:- The wave bands covered by this receiver are as follows:

		Kilocycles	or Megacycles	Meters
(1)	Ultra Short Wave	36.25	18	8.125-16.6
(2)	Foreign & American Short Wave, Airplanes	18	5.2	16.6 57.5
(3)	Police, Amateur, Airplanes	5.2	1.6	57.5- 18.7.5
(4)	Broadcast	1600-540		187.5- 554
(5)	Long Wave	343-142		872 - 2100

ALIGNMENT PROCEDURE

Realignment of this receiver should not be attempted except by an experienced serviceman and only after all other possible causes of faulty operation have first been thoroughly investigated. An accurately calibrated signal generator which will cover the necessary wave bands is required. Either a suitable output meter or the cathode-ray tuning indicator may be used for indicating the effects of adjustments. It is necessary, in all of the ensuing procedure, that the signal generator be attenuated as much as possible.

I.F. ADJUSTMENT - The i.f. transformers are housed in the polished metal shield on the chassis. The location of these transformers is indicated in the accompanying diagram. The trimmers are on the tops of the transformer cans. The first and second i.f. transformers have two trimmers each and the detector coupling transformer has only one trimmer. These trimmers are adjusted at 456 kc. for maximum gain. In making this adjustment, the oscillator (rear) section of the tuning condenser should be short-circuited. and the signal generator connected between the grid cap of the 6A8 and the ground post of the receiver. The selectivity switch should of course be in the high selectivity position.

SHORT WAVE BAND - With the output from the signal generator connected across the aerial and ground terminals of the receiver, and the volume control in position for maximum volume, the oscillator trimmer for this band is adjusted for maximum response as indicated by the 6E5. This adjustment must be made with the dial set at exactly 17 mc., otherwise the calibration will be off. The series padder for this band should then be adjusted by setting the signal generator at a frequency of 5.5 megacycles and tuning the signal in on the receiver. The tuning condenser is rotated slightly back and forth as the padder screw is adjusted for maximum output. The 17 mc. adjustment should then be rechecked. If the dial calibration is off, the procedure should be repeated again.

ULTRA SHORT WAVE BAND - The trimmers for this band are adjusted at 36 megacycles in the manner described above. They are located on the under side of the chassis and are not shown on the chassis layout diagram. There are only two trimmers for this band, the oscillator operating on a harmonic of another band.
POLICE BAND ADJUSTMENT - The trimmers for this band are adjusted at 4.8 megacycles in the manner described and the series padder at 1.7 mc. exactly as indicated in the SHORT WAVE BAND ADJUSTMENT procedure.
BROADCAST BAND - The adjustments for this band are as described above. The trimmers are adjusted at 1400 kc. and the padder at 600 kc.
LONG WAVE BAND - The adjustments for this band are made in the prescribed manner, the trimmers being adjusted at 340 kc. and the padder at approximately 150 kc.
A.V.C. AMPLIFIER ADJUSTMENT - The a.v.c. has a separate amplifier which is tuned as follows: The signal generator is set at 1400 kc. and the signal tuned in on the receiver, as indicated by the minimum opening in the 6E5 beam. The a.v.c. trimmer is then adjusted to give the WIDEST opening in the beam. The receiver is then carefully retuned and the adjustment repeated.
BEAT NOTE OSCILLATOR ADJUSTMENT - A weak signal from the signal generator is tuned in on the receiver as indicated by the minimum opening in the 6E5 beam. The beat oscillator switch is then turned on. An audible note should be heard whose pitch may be varied by adjusting the screw on the small square can on the left side of the chassis. This should be so adjusted that when the station is tuned in exactly, no beat is heard (zero beat). If no beat note is audible when first turned on, rotation of this same screw should bring in the note.

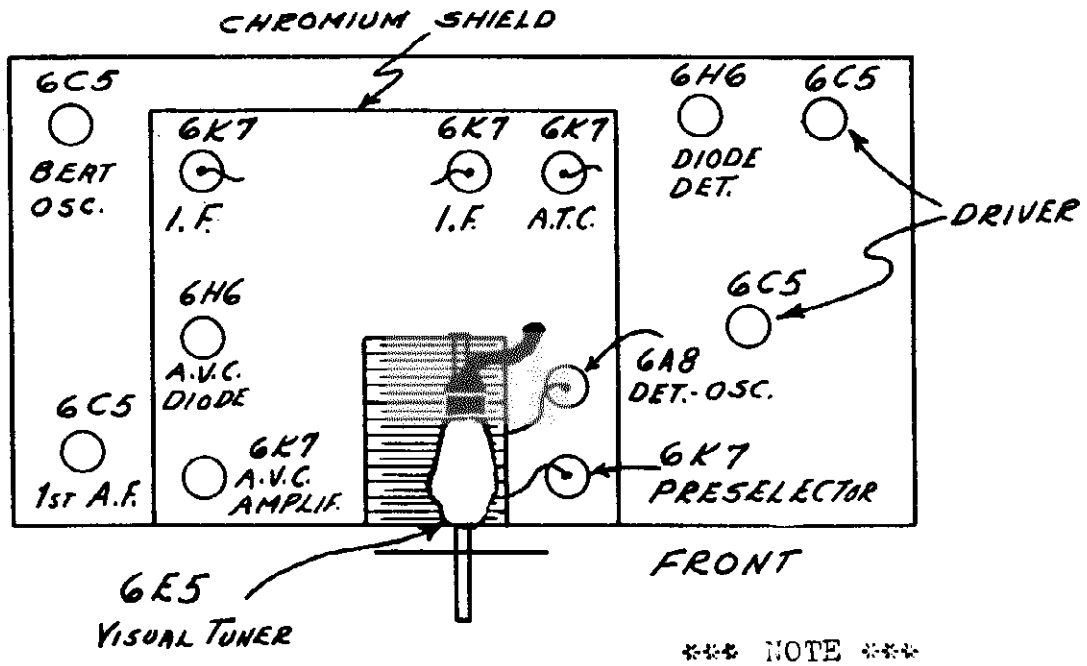
VOLTAGE TABLE

All voltages are measured between socket terminals and chassis: set in operation: volume control full on; antenna disconnected. voltmeter sensitivity - 1000-ohms-per volt. Line voltage measured:- 115.0 Power Consumption: 250 watts

TUBE	FUNCTION	H'T'R	PLATE	SCR.GR.	SUPPR.GR.	CATH.	OSC.PL.
6K7	preselector	6.0	200.0	85.0	1.0	1.0	---
6A8	det.-osc.	6.0	200.0	100.0	---	5.2	175.0
6K7	i.f. amplif.	6.0	175.0	85.0	----	2.2	----
6K7	i.f. amplif.	6.0	175.0	85.0	12.0	12.0	----
6H6	diode det.	6.0	-----	----	----	----	----
6C5	1st audio	6.0	120.0	----	----	7.0	----
6C5) 6C5)	2nd audio	6.0	200.0	----	----	7.0	----
45's	audio output	2.2	240.0	----	----	----	----
6K7	A.T.C.	6.0	200.0	85.0	9.0	9.0	----
6C5	beat osc.	6.0	58.0	----	----	7.0	----
6H6	a.v.c.-diode	6.0	9.0	----	----	10.0	----
6K7	a.v.c. amplif.	6.0	140.0	8.0	40.0	40.0	----
6E5	tuning indicator	6.0	-----	200.0(target)	----	145.0	----
523) 523)	rectifier	4.5	340.0	-----	---	-----	----
45	grid bias rectifier	2.2	75.0	-----	----	-----	---

MODEL C-95 RADIO WIRE TELEVISION

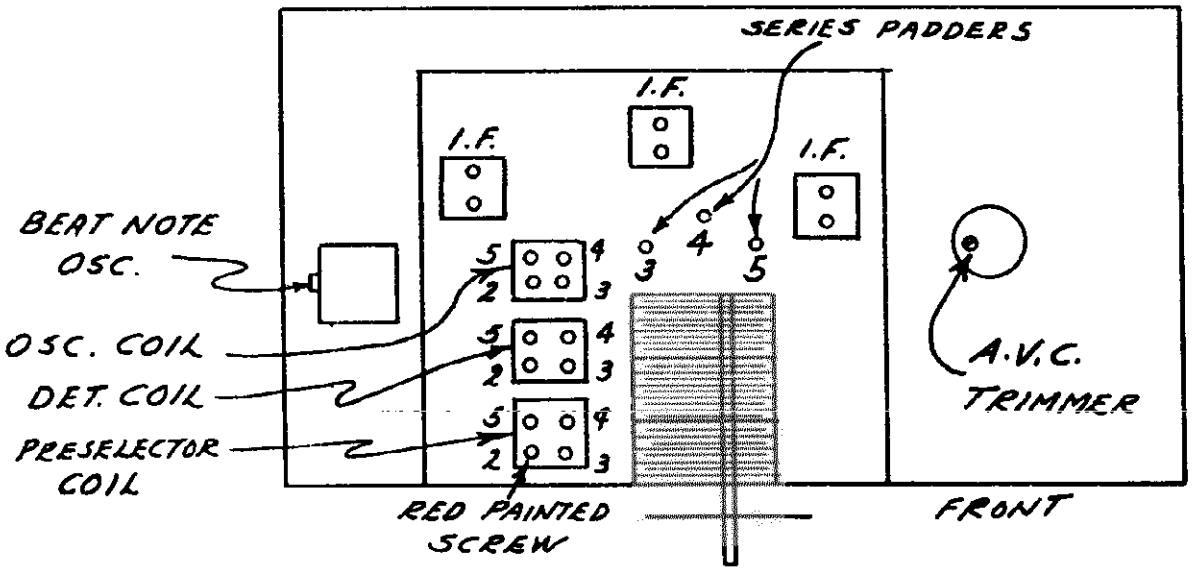
TOP VIEW OF CHASSIS SHOWING LOCATION OF TUBES



*** NOTE ***

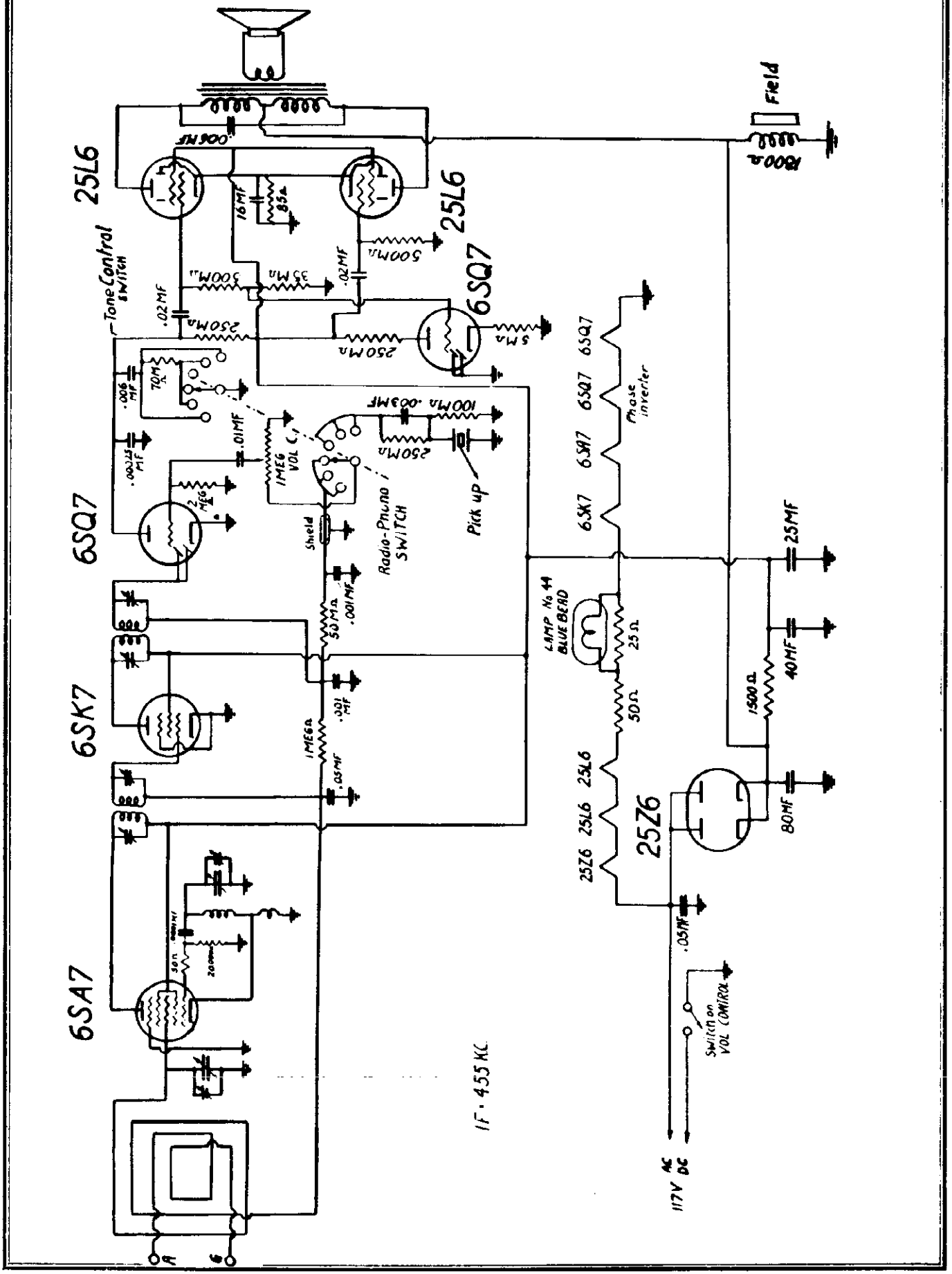
AUDIO OUTPUT AND RECTIFIER TUBES ARE IN POWER SUPPLY CHASSIS.

TOP VIEW OF CHASSIS SHOWING LOCATION OF ALIGNING TRIMMERS

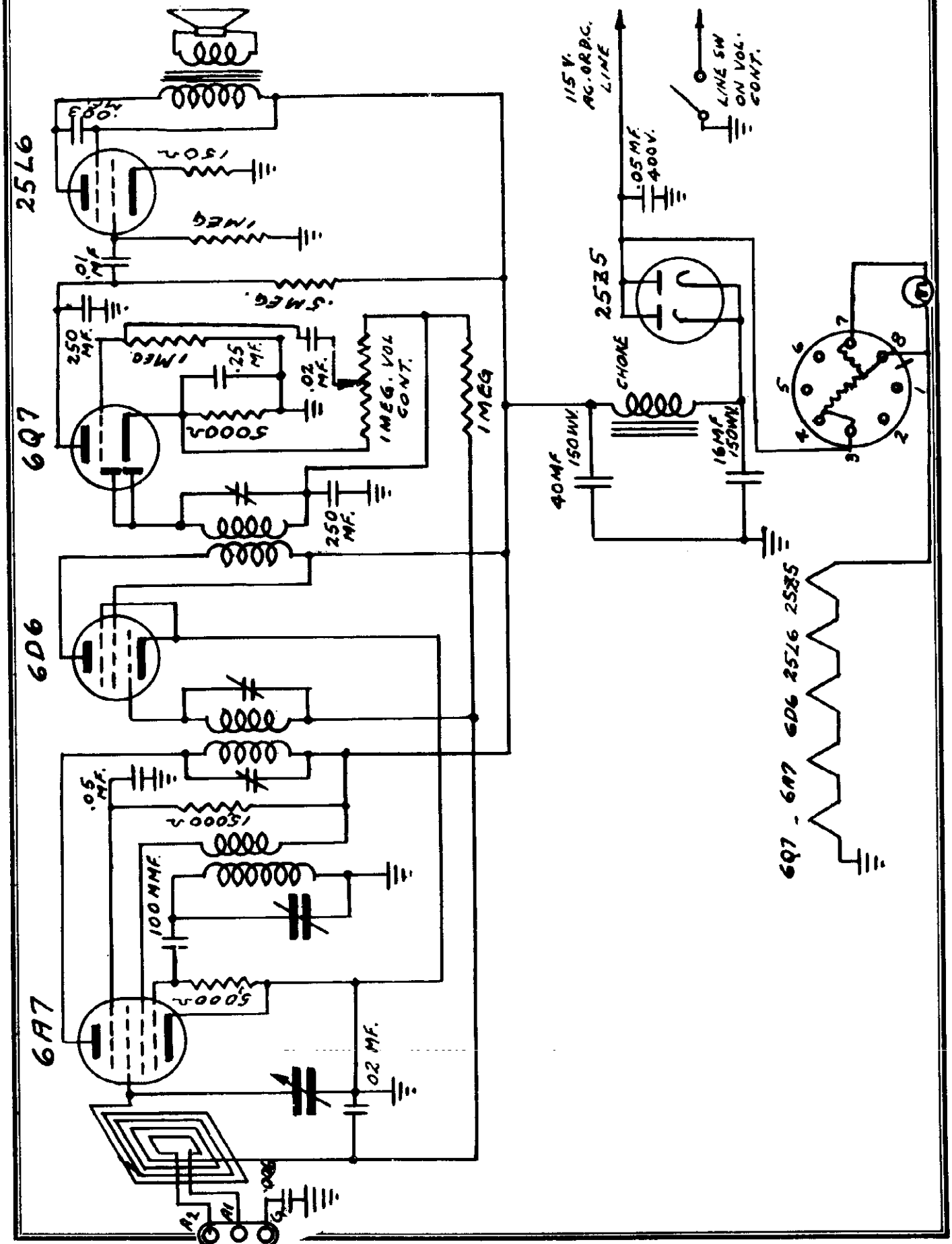


1 BAND TRIMMERS UNDER CHASSIS

RADIO WIRE TELEVISION MODEL C104



MODELS CC24, CC25 RADIO WIRE TELEVISION



SERVICE INSTRUCTIONS

Realignment of this receiver should not be attempted unless all other possible causes have been thoroughly investigated. An accurately calibrated signal generator which will cover the necessary wave bands, and an output meter for indicating the effect of adjustments are required.

During the alignment procedure all adjustments should be made under the following conditions:

1) Line voltage as indicated on instruction sheet.

2) Volume and Tone control at maximum volume positions.

3) Minimum Input from signal generator.

If this procedure is not adhered to, all adjustments will appear very broad. This is due to the action of the automatic volume control.

I.F. ADJUSTMENT

The signal generator is set at 456KC and is connected to the grid of the converter tube (6A7) through a .5 MFD condenser. Be sure to connect a resistor of approximately 25,000 OHMS between the converter grid and ground so that the grid circuit is at ground potential for D.C.

The Input I.F. transformer trimmers are adjusted for maximum output as indicated by the output meter connected across either the voice coil or the primary coil of the loud speaker.

The Output I.F. transformer trimmer is located underneath the chassis. Adjust the trimmer for maximum output as indicated on the output meter. The Input I.F. should now be re-checked for maximum output.

BROADCAST BAND ALIGNMENT

Connect the output of the signal generator to a loop antenna consisting of about five turns of "bell" wire making a circle a foot in diameter. This loop should be VERY LOOSELY coupled to the receiver loop and should not be less than one foot from the receiver.

Set the signal generator at 1500KC and tune the receiver until a response is indicated on the output meter with signal generator set at 1500KC. Rock the gang condenser while adjusting the oscillator trimmer condenser for maximum output.

The dial pointer should co-incide with the 1500KC mark on the dial. If it does not, check other calibration points at both ends of the scale before re-setting the pointer.

OPERATING INSTRUCTIONS

This receiver is designed for operation on 117-125V, AC or DC, unless otherwise noted on the back of the cabinet. Serious damage to the receiver may result from attempts to operate it from any other source.

RANGE

540-1850 Kilocycles (or 555-162 Meters)

Consult radio publications and newspapers for listings of stations.

DIAL

The scale on the dial is calibrated in kilocycles.

CONTROLS

There are two control knobs on the front of the cabinet:

1. Power-Volume Control- This is the knob at the left-hand side of the cabinet. A twist to the right (clockwise) turns on the current. Turning the knob further increases the volume.

2. The tuning Control - The right-hand knob operates the tuning pointer and selects stations.

TUNING

Turn the Power-Volume Control on and advance half way. Allow the tubes to warm up for about a minute. Then select your station on the dial by means of the tuning control knob. Carefully regulate both knobs until best reception is obtained. Turn the receiver to its best position for intercepting the signals.

ANTENNA

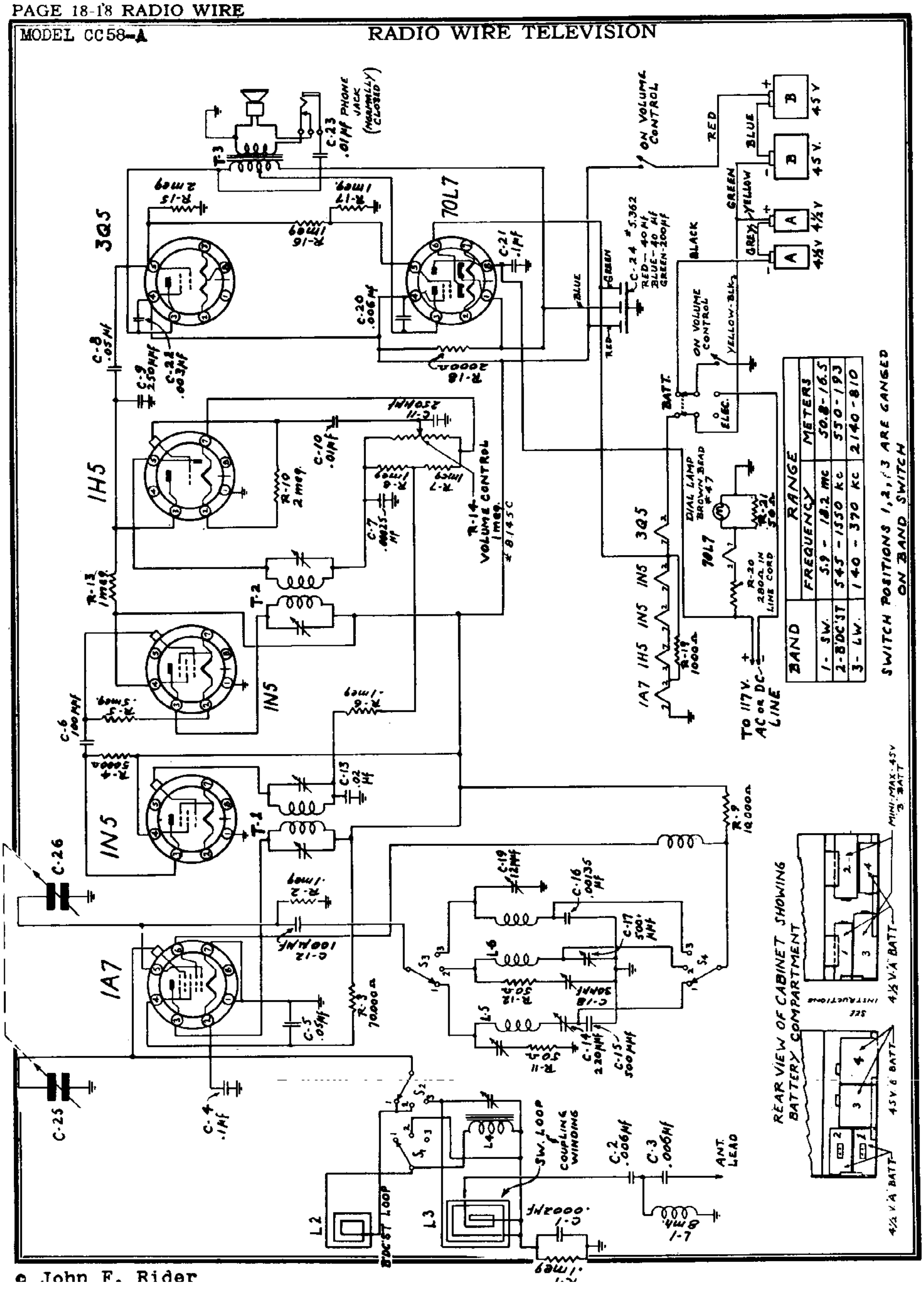
The enclosed loop antenna gives best pick-up of the waves from a direction at right angles to the plane of the loop. It may be advantageous to turn the set end-on to interfering stations and the front and back in line of desired stations. By slowly twisting the receiver round, a best position for reception may always be found.

On the back of the cabinet there is an oval-shaped terminal board for attachment of an external antenna. If you use the set in a "stationary" position, and where station signal intensities are low, it is advisable to connect the A-1 and G binding posts to ground and a small antenna wire to the A-2 post. If too large an antenna is used, excessive signal intensities will be fed into the receiver. The resulting overload will manifest itself as a "gargling" sound when a station is tuned in.

If a "doublet" type of antenna is used, connect the leads to the A-1 and A-2 posts and the G post to ground.

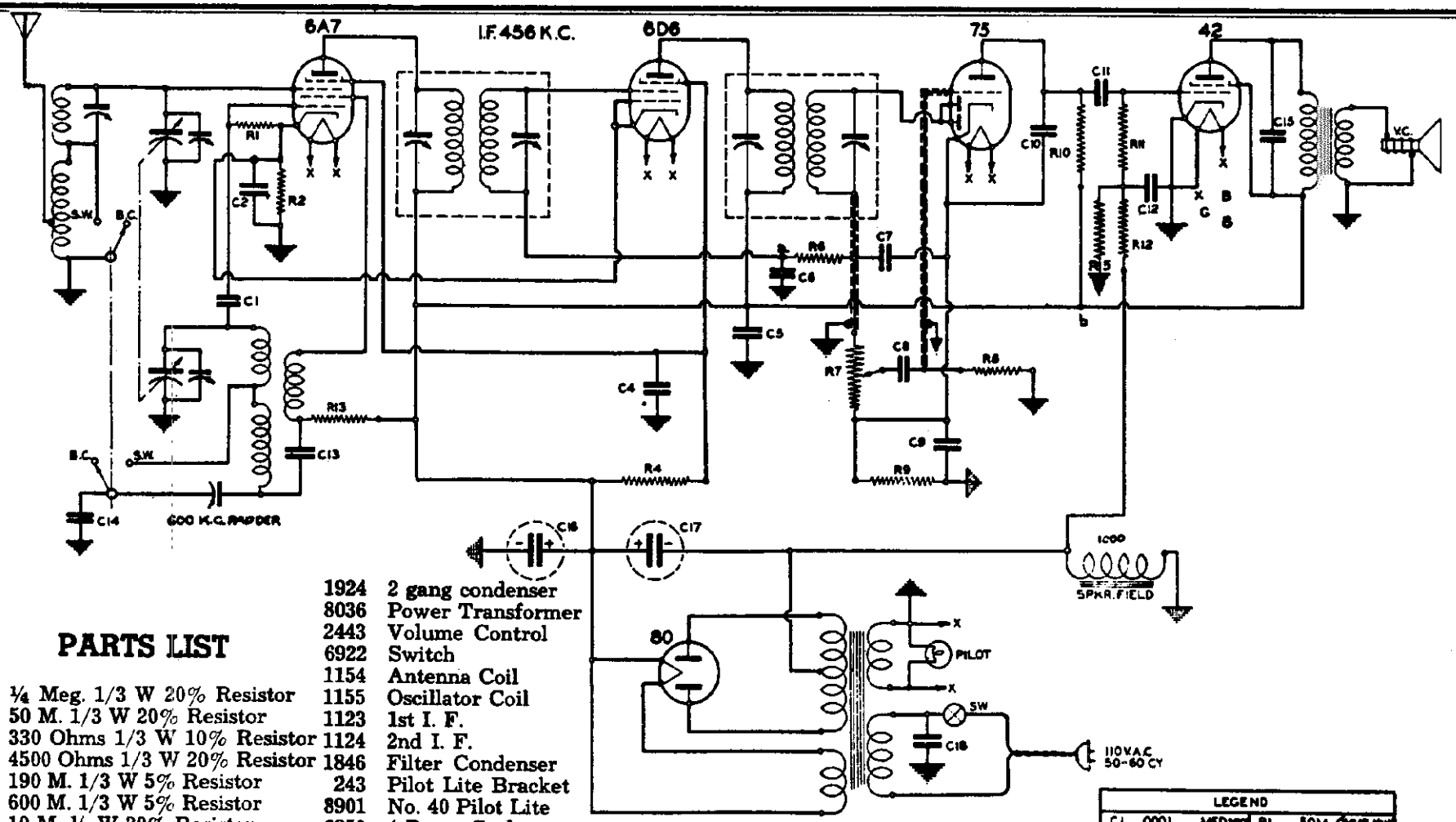
MODEL CC58-A

RADIO WIRE TELEVISION



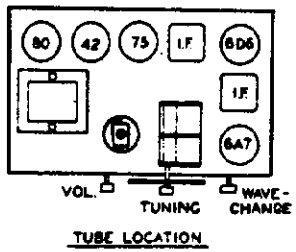
BAND	RANGE FREQUENCY	METERS
1 - SW.	5.9 - 18.2 mc	50.8 - 16.5
2 - BDC'ST	545 - 1550 kc	550 - 193
3 - LW.	140 - 370 kc	2140 - 810

SWITCH POSITIONS 1, 2, & 3 ARE GANGED ON BAND SWITCH



PARTS LIST

6024	¼ Meg. 1/3 W 20% Resistor
6025	50 M. 1/3 W 20% Resistor
6058	330 Ohms 1/3 W 10% Resistor
6057	4500 Ohms 1/3 W 20% Resistor
6059	190 M. 1/3 W 5% Resistor
6060	600 M. 1/3 W 5% Resistor
6105	10 M. ½ W 20% Resistor
6117	25 M. ½ W 20% Resistor
1600	.1—200 V Bypass Condenser
1601	.1—400 V. Bypass Condenser
1628	.01—200 V. Bypass Condenser
1604	.01—600 V. Bypass Condenser
1614	.25—200 V. Bypass Condenser
1622	.05—200 V. Bypass Condenser
1602	.1—600 V. Bypass Condenser
1651	.004—600 V. Bypass Condenser
Dial (order by name and description)	
7946A	Speaker
5218	Knobs
1924	2 gang condenser
8036	Power Transformer
2443	Volume Control
6922	Switch
1154	Antenna Coil
1155	Oscillator Coil
1123	1st I. F.
1124	2nd I. F.
1846	Filter Condenser
243	Pilot Lite Bracket
8901	No. 40 Pilot Lite
6850	4 Prong Socket
6852	6 Prong Socket
6853	7 Prong Socket
2006	Padder
2052	Trimmer
7104	Tube Shield Base
7105	Tube Shield
1500	.001—20%
1501	.0001—20%
1509D	.002—5%
1504	.00025—20%
6016	5 M. 1/3 20% Resistor
6017	1 Meg. 1/3 W 20% Resistor
6018	½ Meg. 1/3 W 20% Resistor



TUBE LOCATION

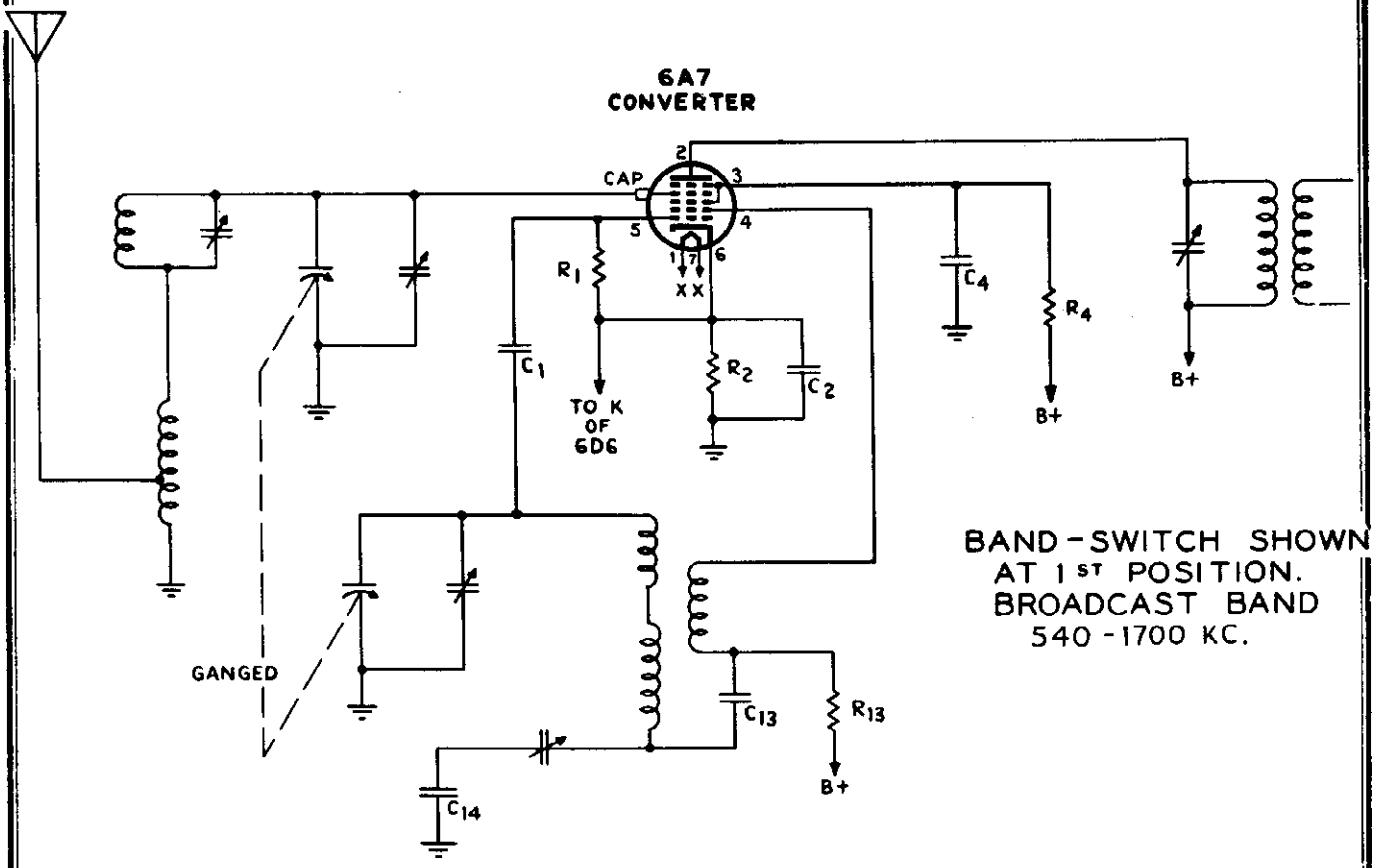
LEGEND

C1	.0001	MFD	R1	50M	OHMS
C2	.25	200V	R2	330	
			R3	5M	
C4	.1	400V	R4	25M	1W
C5	.1	600V	R5	250M	
C6	.05	200V	R6	1MEG.	
C7	.00025	MICA	R7	500M	
C8	.01	600V	R8	1MEG.	
C9	.1	200V	R9	4500	
C10	.00025	MICA	R10	250M	
C11	.01	600V	R11	500M	
C12	.01	200V	R12	1MEG.	
C13	.001	MICA	R13	10M	
C14	.002	MICA			
C15	.004	600V			
C16	8	450V			
C17	8	450V			
C18	.1	400V			

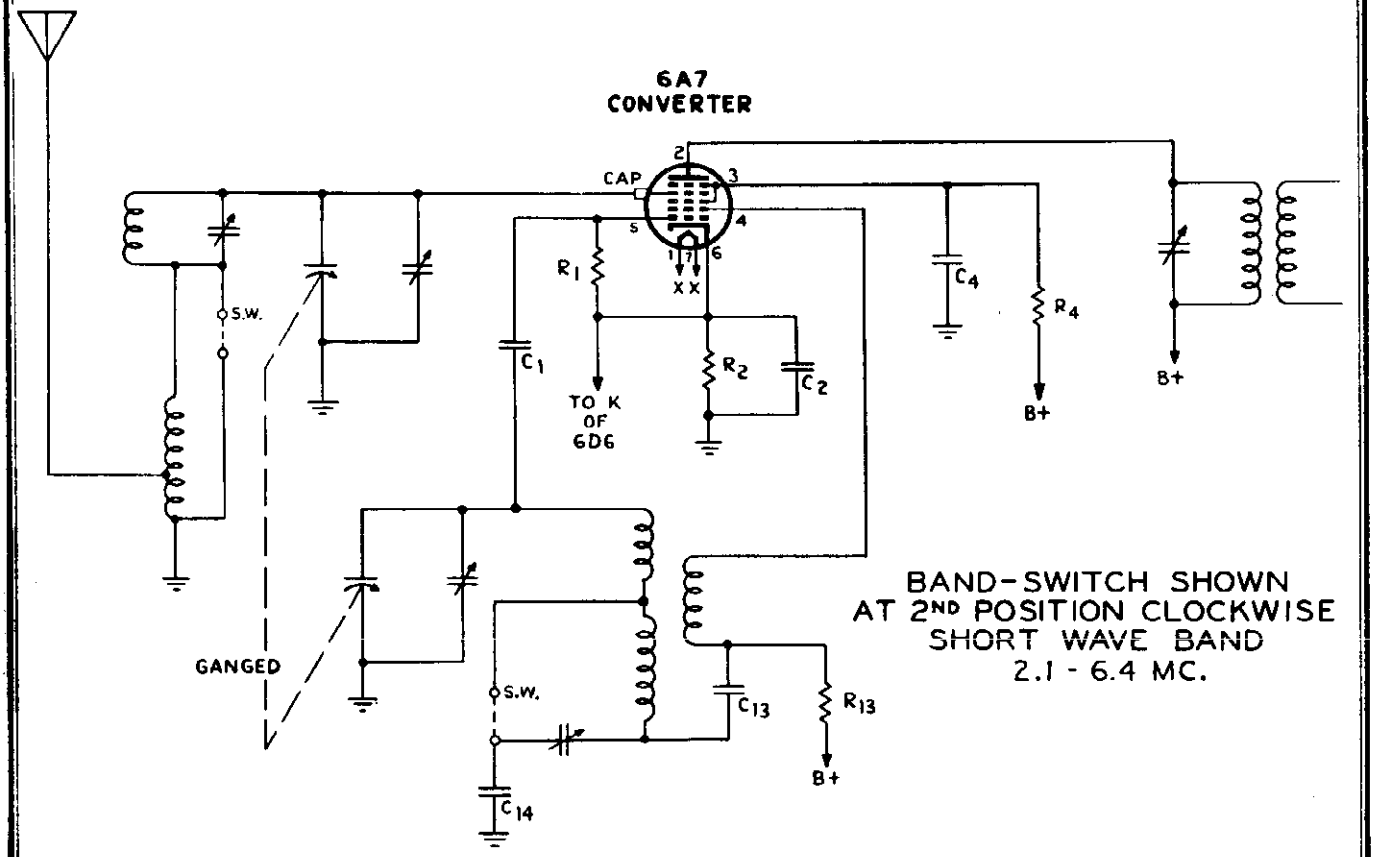
CLARI-SKEMATIX
Registered Trademark

MODEL D-13

RADIO WIRE TELEVISION



BAND-SWITCH SHOWN
AT 1ST POSITION.
BROADCAST BAND
540 - 1700 KC.



BAND-SWITCH SHOWN
AT 2ND POSITION CLOCKWISE
SHORT WAVE BAND
2.1 - 6.4 MC.

SERVICE INSTRUCTIONS

In case of faulty operation of the receiver, first make sure that the antenna and ground are in good condition and properly attached to the receiver. Then determine if any of the tubes are faulty. In case of trouble within the receiver itself, the circuit diagram shown on the opposite page will be useful to the service man in locating and correcting the trouble.

I. F. Alignment:

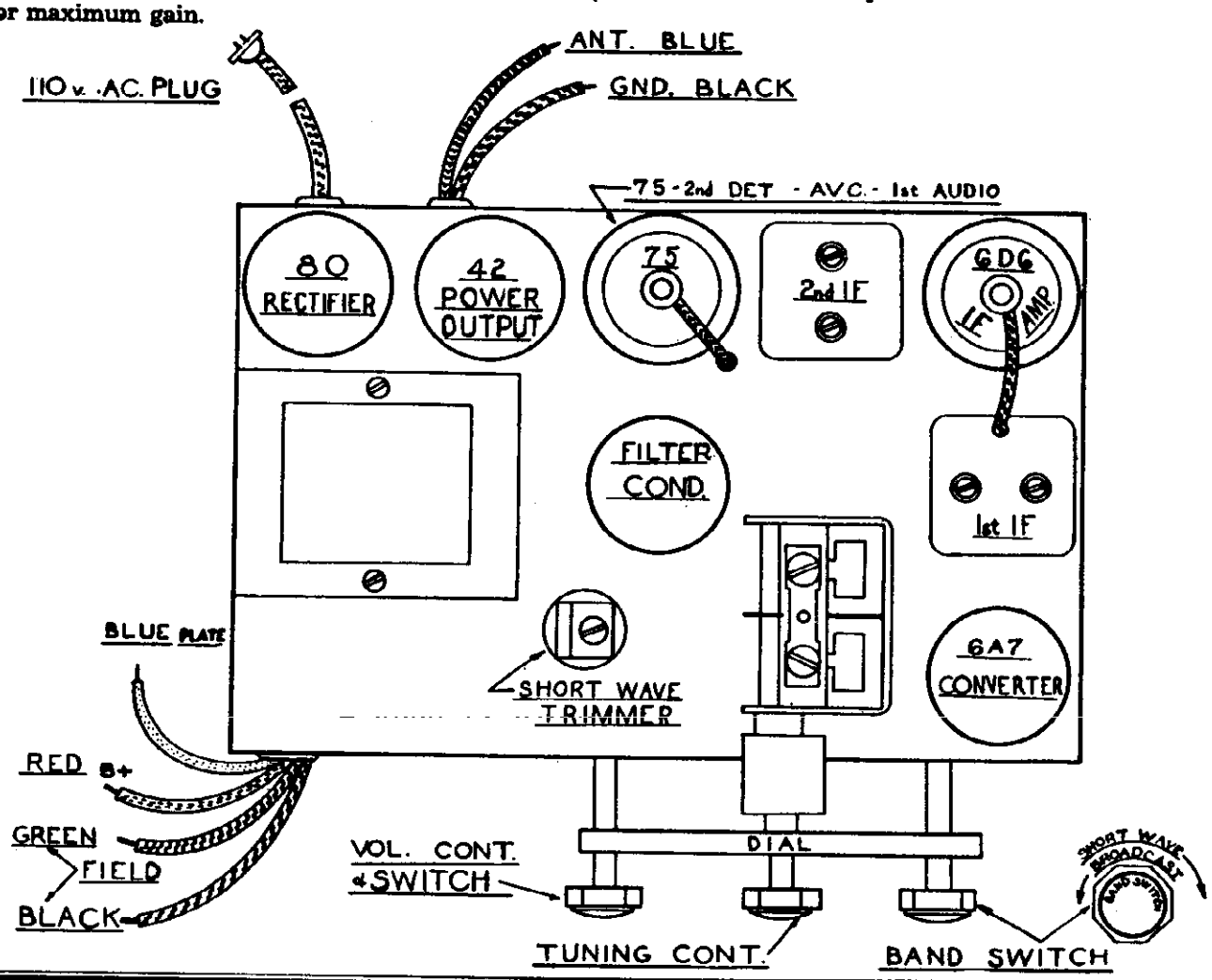
Connect a test oscillator or signal generator through a .1 mfd. condenser to the grid of the 6A7 tube and set the oscillator to 456 KC. Use an output meter connected to the speaker if possible, to obtain the most accurate adjustments. Peak each I.F. stage to maximum response, reducing the output of the oscillator as far as possible for final adjustments.

R. F. Alignment:

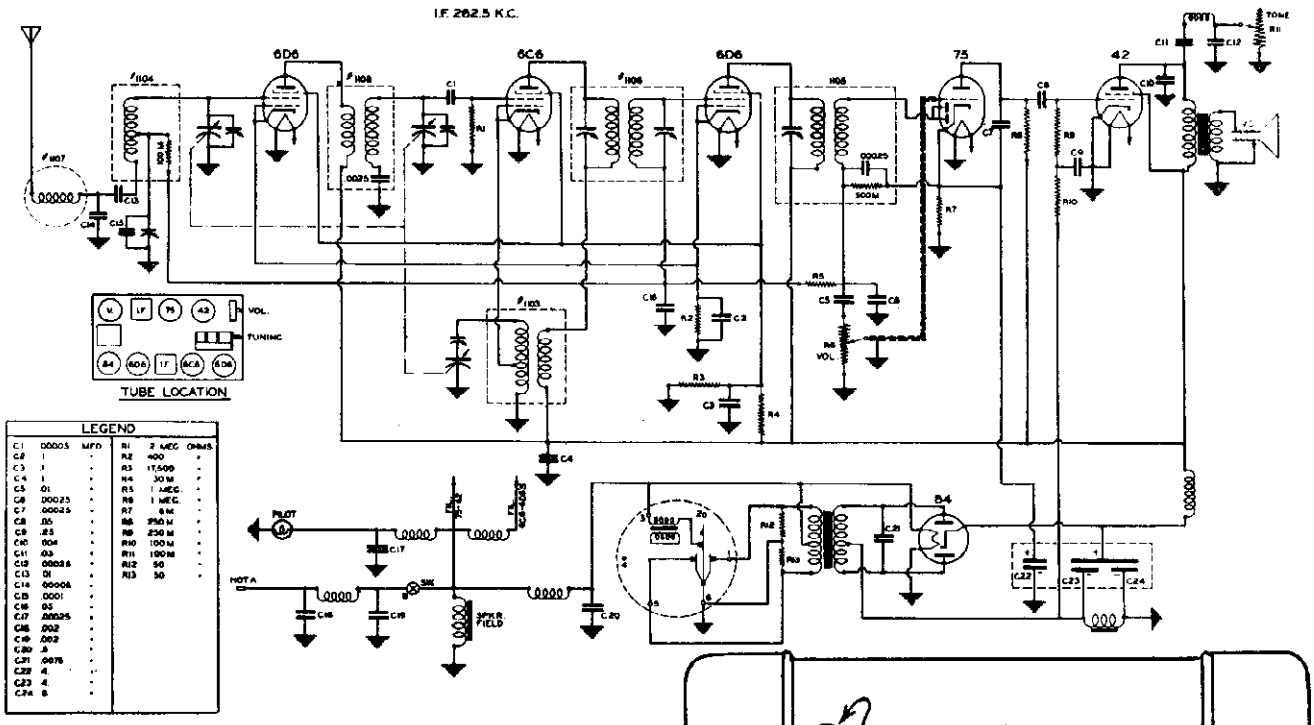
With the test oscillator set to 1720 KC and connected to the antenna wire of the receiver through a .00025 mfd condenser, switch the receiver to the broadcast band and set the pointer at the end of travel on the right (at the 1700 KC end). Adjust the rear trimmer on the top of the variable condenser, for maximum gain. Then set the test oscillator at 1400 KC and tune in this signal on the receiver as though tuning a station. If an adjustment at this point is necessary on your set, you will have a trimmer condenser to adjust on top of the variable condenser at the front; this is adjusted for maximum gain.

Now adjust the test oscillator to 600 KC and tune in this signal. Adjust the padder condenser (which is adjusted through the right hand end of the chassis) in the following manner: turn the dial slowly and repeatedly back and forth across the signal while adjusting the padder. Adjust for maximum gain.

Now switch the receiver to short wave. With the test oscillator set at 6 megacycles, tune in this signal on the receiver. Then adjust the short wave trimmer (which is located on top of the coil above the chassis) for maximum gain.



MODELS D45, D46 RADIO WIRE TELEVISION



I. F. ALIGNMENT:

With volume control on full and variable gang condenser at maximum capacity, attach test oscillator lead in series with a .1 mfd. condenser to stator of R. F. section of gang condenser (center section). Set test oscillator at 262.5 KC and adjust I.F. trimmers for maximum output as indicated on an output meter connected across voice coil of speakers or from plate and screen of 42 tube.

Set test oscillator to 600 KC and adjust oscillator padding (located on bakelite strip, 2nd from front). Also adjust 600 KC antenna padding condenser (located on bakelite strip, 1st condenser). Reset test oscillator to 1400 KC and readjust antenna and R. F. trimmers.

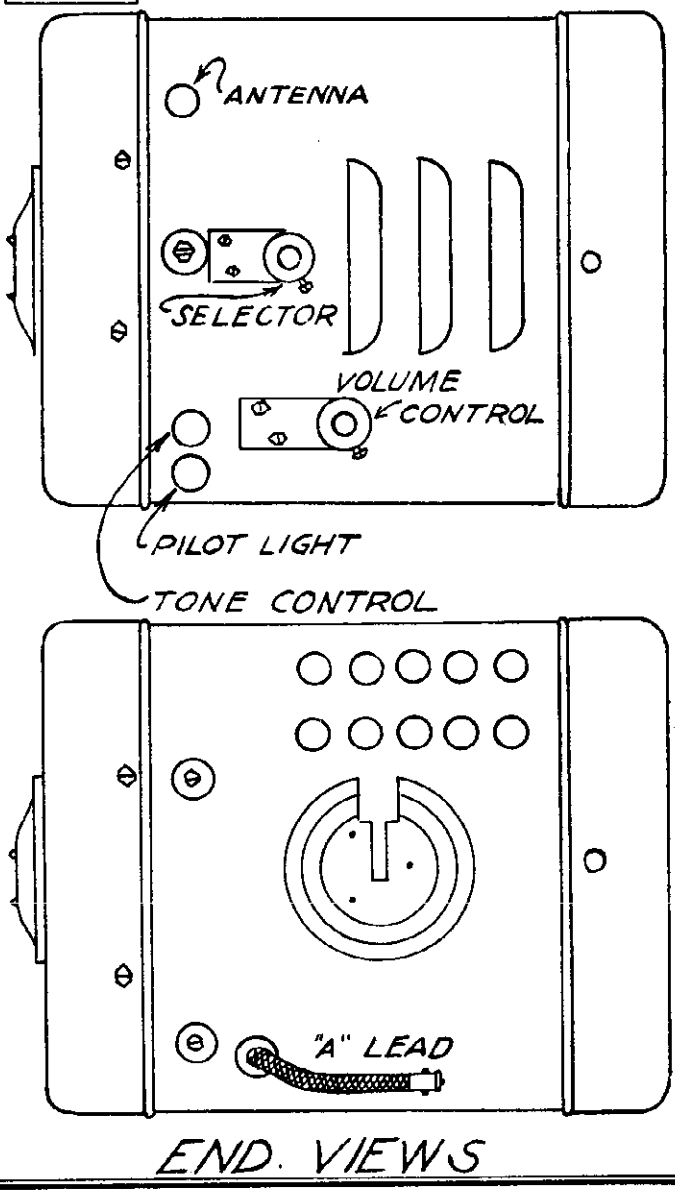
R. F. ALIGNMENT:

Set test oscillator at 1550 KC and connect through a 150 mmf. condenser to antenna of reciever. Rotate variable gang condenser to minimum capacity and back off slightly. Adjust trimmer on oscillator section of gang condenser (third section from shaft end) to resonance indicated by maximum output. Re-set test oscillator of 1400 KC and rotate variable condenser until oscillator signal is picked up. Adjust antenna trimmer (front section) and R. F. trimmer (center section) to resonance.

ANTENNA ADJUSTMENT:

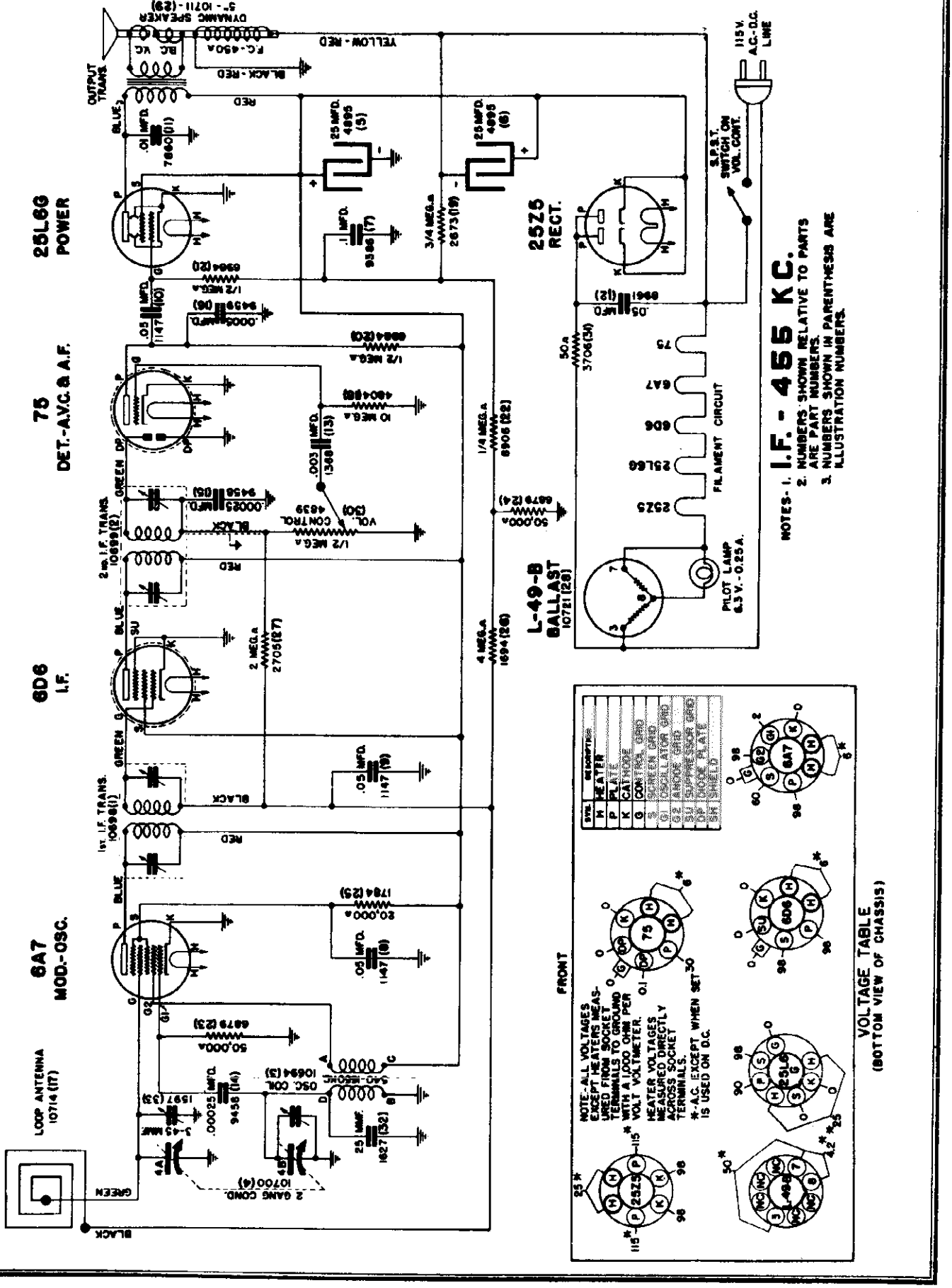
When set is in operation, tune to a station on or about 1400 KC and adjust antenna trimmer to maximum volume. This trimmer is accessable by removing the plug button on the front cover of the receiver.

Proper adjustment of this trimmer matches the particular antenna used in the auto to the receiver which increases the sensitivity of the receiver.



RADIO WIRE TELEVISION

MODELS E76, E77



ALIGNMENT PROCEDURE IN TABULATED FORM

Be sure to follow procedure carefully and in the order given—otherwise the receiver will be insensitive and the dial calibration incorrect. For alignment procedure read tabulations from left to right. If more than one adjustment is required on any one band, make the adjustment marked (1) first, (2) next, (3) third.

Before starting alignment:

(a) Check tuning dial adjustment by turning gang condenser until plates touch maximum capacity stop (completely in mesh) at which point the dial needle must be exactly even with the last line at the low frequency end of the dial calibration. If dial needle does not point exactly to last line move to correct position.

(b) Use, an accurately calibrated test oscillator with some type of output measuring device.

IMPORTANT: BEFORE ALIGNING, PLACE LOOP ANTENNA IN THE SAME APPROXIMATE POSITION IN THE BACK OF CHASSIS IT WILL BE IN WHEN THE SET IS IN THE CABINET AND THE BACK ATTACHED.

When adjusting 1650 K.C. oscillator trimmer and 1400 K.C. antenna trimmer, couple test oscillator to set loop by placing lead from high side of test oscillator on top of or near set loop. Be sure that neither the loop or test oscillator lead moves during alignment.

DO NOT ATTACH LOW SIDE OF TEST OSCILLATOR TO RECEIVER—LEAVE UNCONNECTED.

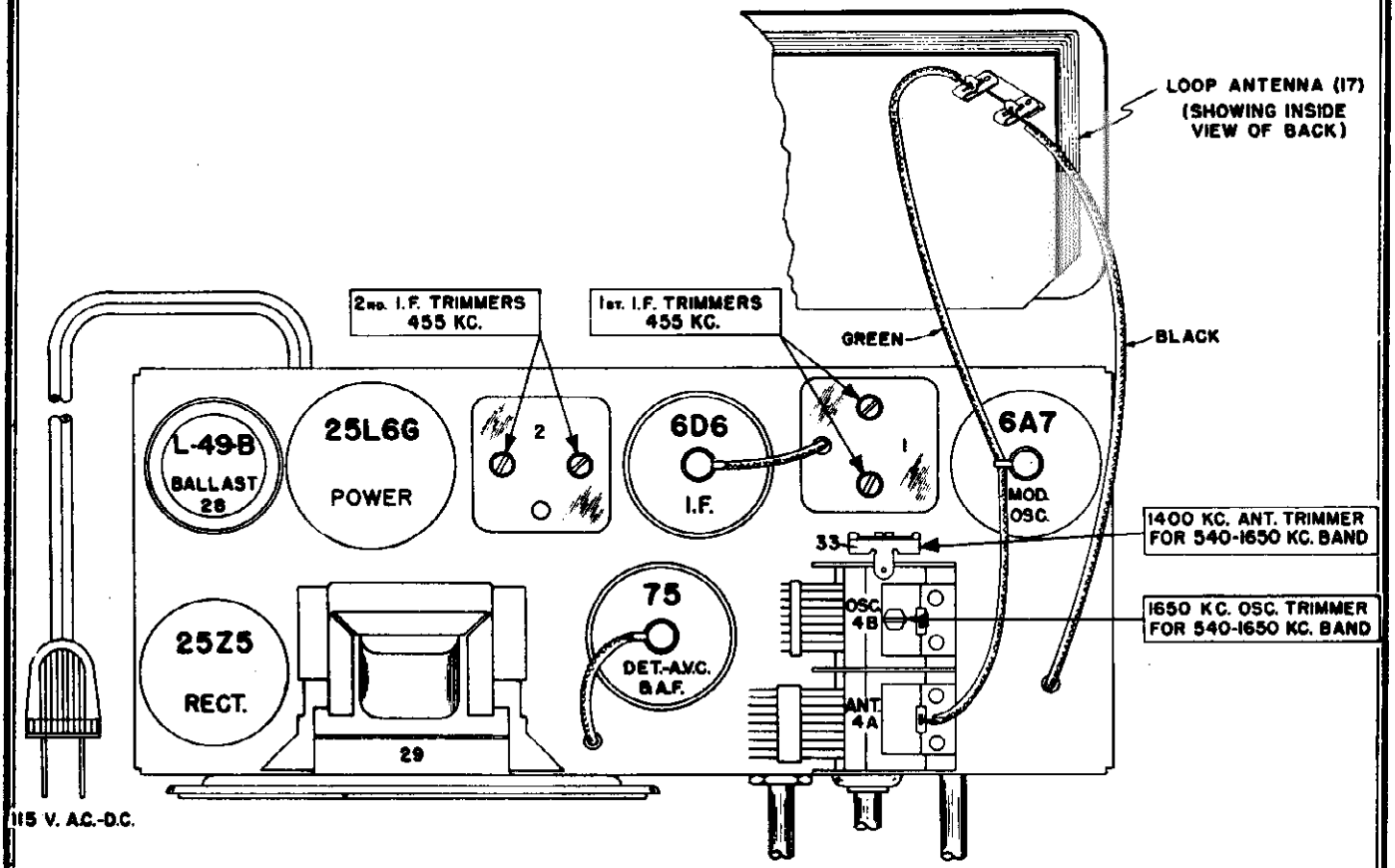
Set receiver dial to:	TEST OSCILLATOR: Adjust test oscillator frequency to:	TEST OSCILLATOR: Use dummy antenna in series with output of test oscillator consisting of:	TEST OSCILLATOR: Attach output of test oscillator to:	Refer to parts layout diagram for location of trimmers mentioned below—and:
I. F. Any point where no interfering signal is received	455 K. C.	.02 MFD condenser	High side to grid terminal of 6A7 tube DO NOT REMOVE CAP.	Adjust each of the second I. F. transformer trimmers for maximum output—then adjust each of the first I. F. trimmers for maximum output.
(1) Exactly 1650 K. C.	Exactly 1650 K. C.	None	Lay lead on top of or close to loop	Adjust 1650 K. C. oscillator trimmer for maximum output.
(2) Approx. 1400 K. C.	Exactly 1400 K. C.	None	Lay lead on top of or close to loop	Adjust 1400 K. C. antenna trimmer for maximum output.

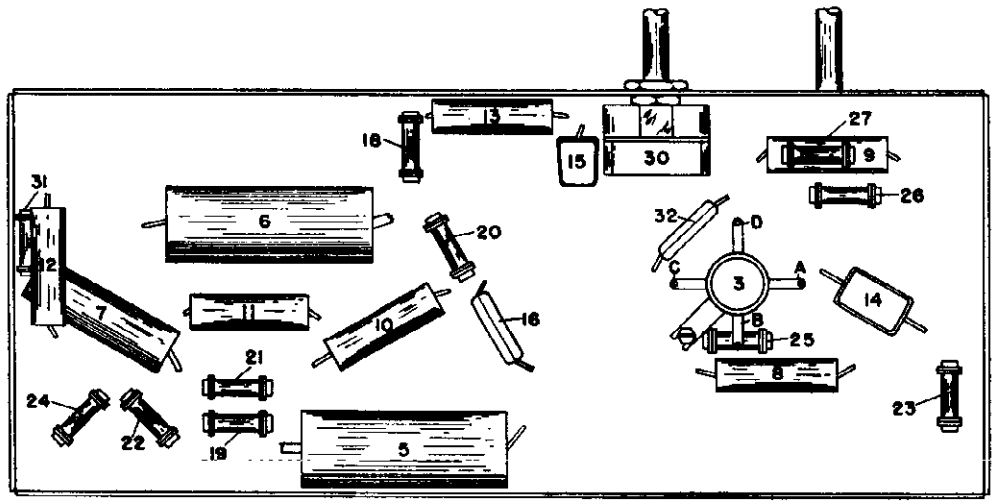
PARTS LIST

Illus. No.	Part No.	Part Name	Description
1	10698	Coil	1st I.F. Transformer
2	10699	Coil	2nd I.F. Transformer
3	10694	Coil	Oscillator
4	10700	Condenser	Tuning Two Gang
5	4895	Condenser	Tubular Dry Electrolytic 25 Mfd. 200 Volt
6	4895	Condenser	Tubular Dry Electrolytic 25 Mfd. 200 Volt
7	9386	Condenser	Tubular .1 Mfd. 200 Volts
8	1147	Condenser	Tubular .05 Mfd. 200 Volts
9	1147	Condenser	Tubular .05 Mfd. 200 Volts
10	1147	Condenser	Tubular .05 Mfd. 200 Volts
11	7860	Condenser	Tubular .01 Mfd. 400 Volts
12	8961	Condenser	Tubular .05 Mfd. 400 Volts
13	1368	Condenser	Tubular .003 Mfd. 400 Volts
14	9458	Condenser	Mica .00025 Mfd.
15	9458	Condenser	Mica .00025 Mfd.
16	9459	Condenser	Mica .0005 Mfd.
17	10714	Loop Antenna	Cabinet Back with Loop Aerial
18	4804	Resistor	Carbon 10 Meg Ohm ½ Watt
19	2673	Resistor	Carbon 750,000 Ohm ½ Watt
20	6984	Resistor	Carbon 500,000 Ohm ½ Watt
21	6984	Resistor	Carbon 500,000 Ohm ½ Watt
22	8906	Resistor	Carbon 250,000 Ohm ½ Watt
23	6879	Resistor	Carbon 50,000 Ohm ½ Watt
24	6879	Resistor	Carbon 50,000 Ohm ½ Watt
25	1784	Resistor	Carbon 20,000 Ohm ½ Watt
26	1694	Resistor	Carbon 4 Meg Ohm ½ Watt
27	2705	Resistor	Carbon 2 Meg Ohm ½ Watt
28	10721	Resistor	Line Ballast Type L-55-B
29	10711	Speaker	Electro Dynamic 5"
30	4839	Volume Control	With Switch
31	3706	Resister	Carbon 50 Ohm ½ Watt
32	1627	Condenser	Mica .000025 Mfd.
33	1597	Condenser	Trimmer 3-45 Mmf.
		MISCELLANEOUS PARTS	
	10292	Bulb	6-8 Volt .250 Ampere Dial Light
	10707	Dial Scale	Calibrated Glass Scale
	3814	Dial Cord	Dial Drive Cord
	4975	Dial Shaft	Dial Drive Shaft
	4762	Dial Pulley	With Bushing
	10654	Dial Pointer	For Dial
	10650	Escutcheon	For Dial Used With Wood Cabinet Only
	10208	Knob	For Use With Wood Cabinet Only
	4784	Knob	Walnut Finish
	10207	Knob	Ivory Finish
	8117	Shaft Clamp	"C" Retainer Washer for Drive Shaft
		Cabinet	Walnut Plastic
		Cabinet	Ivory Plastic
	10712	Cabinet Handle	Mention Required Finish.

RADIO WIRE TELEVISION

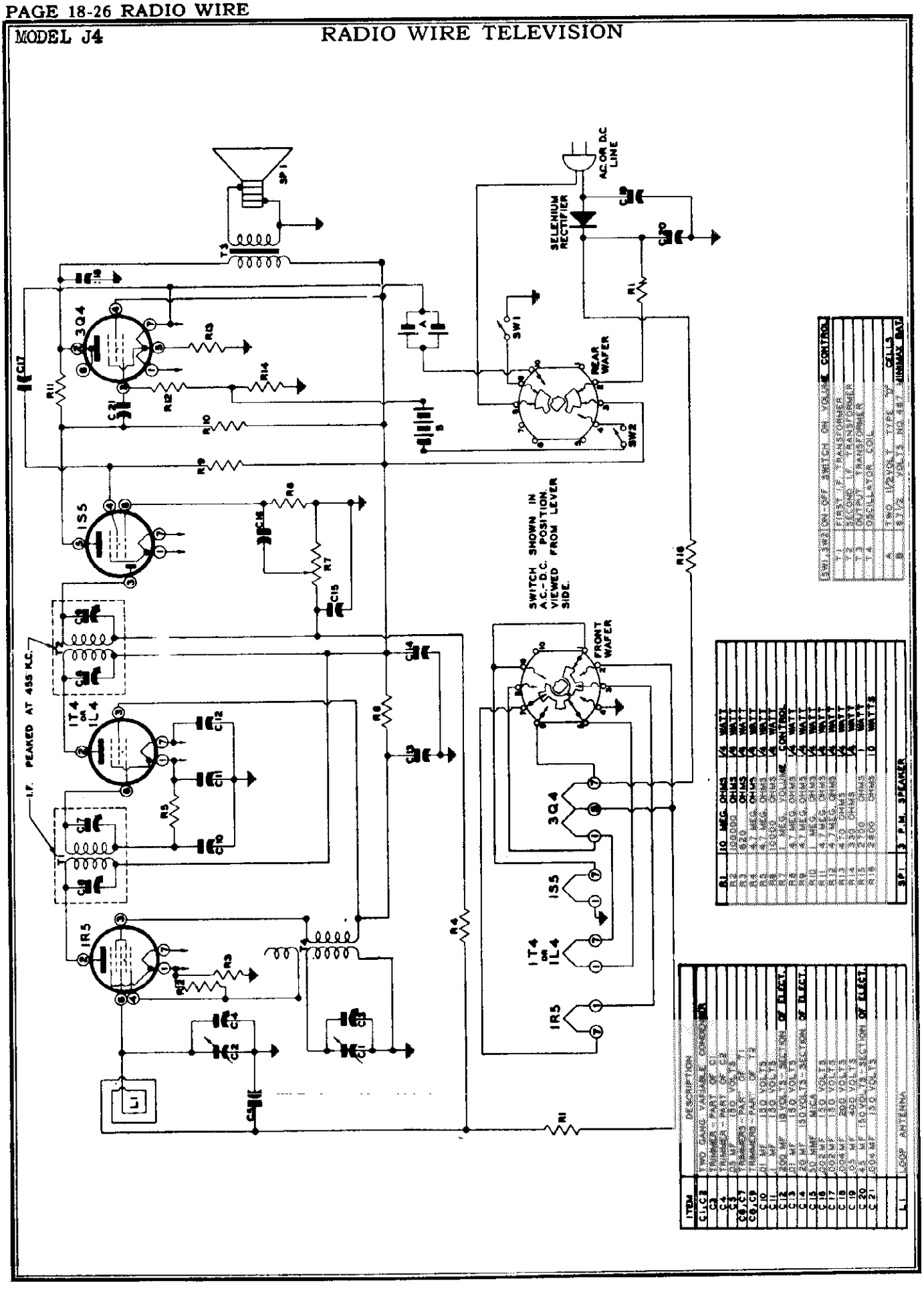
MODELS E76, E77



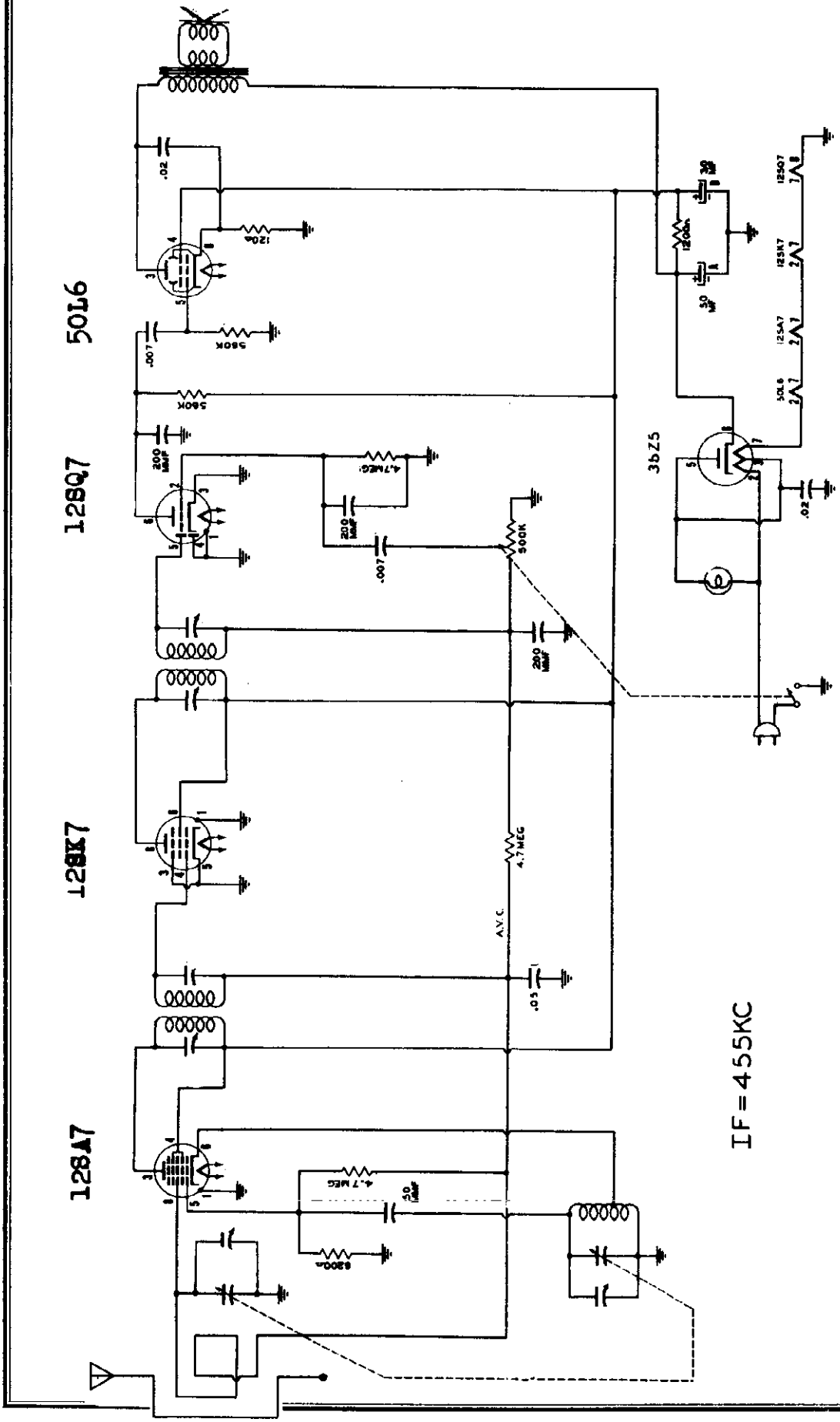


MODEL J4

RADIO WIRE TELEVISION



RADIO WIRE TELEVISION MODEL J5



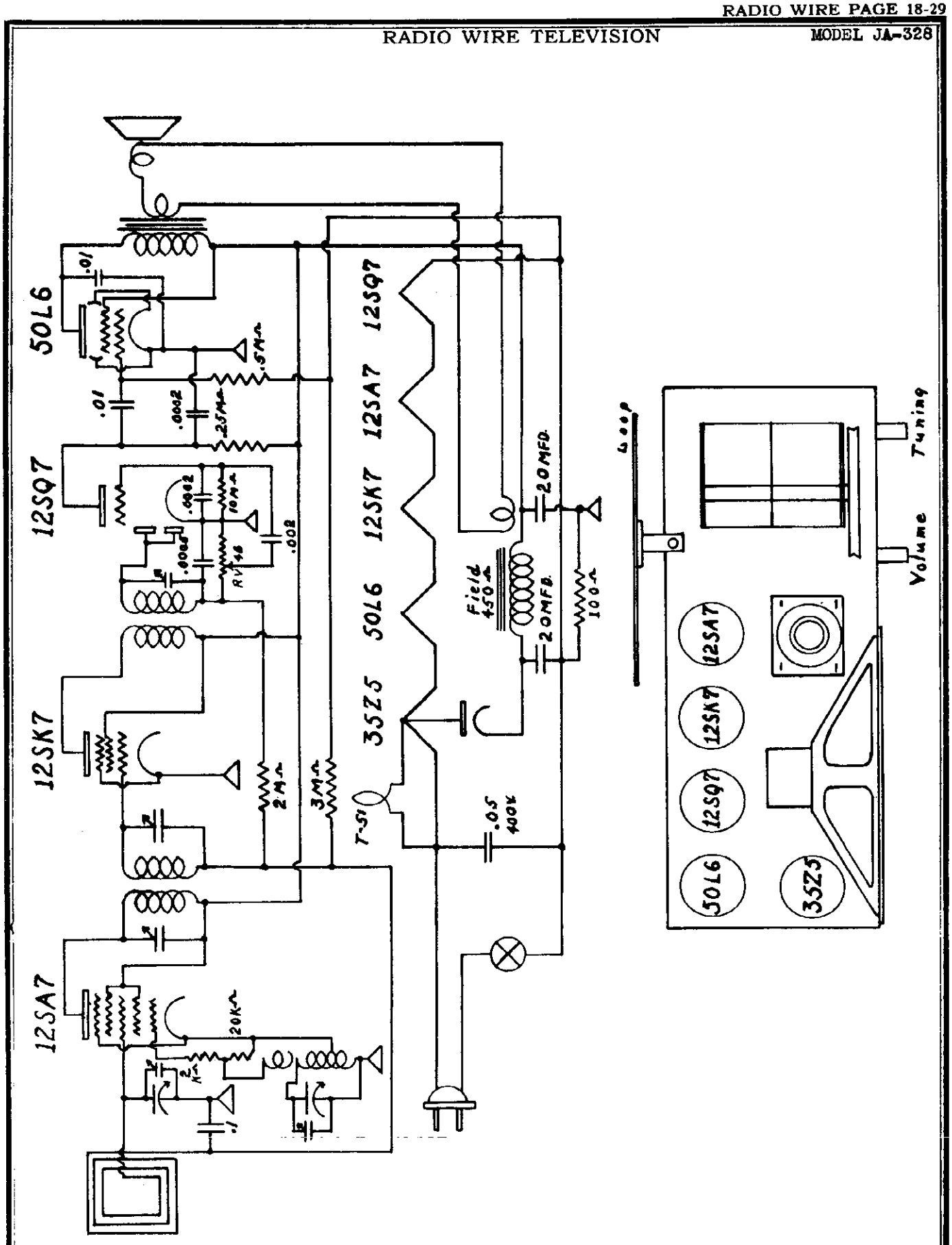
VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
1	12BA7GT	0V.	35VAC	84VAC	84VAC	-7.3VDC	0V.	25VAC	-.7VDC
2	12BK7GT	0V.	25VAC	0V.	-.7VDC	0V.	94VDC	13VAC	84VDC
3	12B07GT	0V.	-.6VDC	0V.	0V.	-.6VDC	55VDC	13VAC	0V.
4	5016GT	0V.	85VAC	117VDC	84VDC	0V.	0V.	35VAC	5.4VDC
5	35Z5GT	0V.	117VAC	112VAC	0V.	112VAC	0V.	85VAC	122VDC

RESISTANCE READINGS

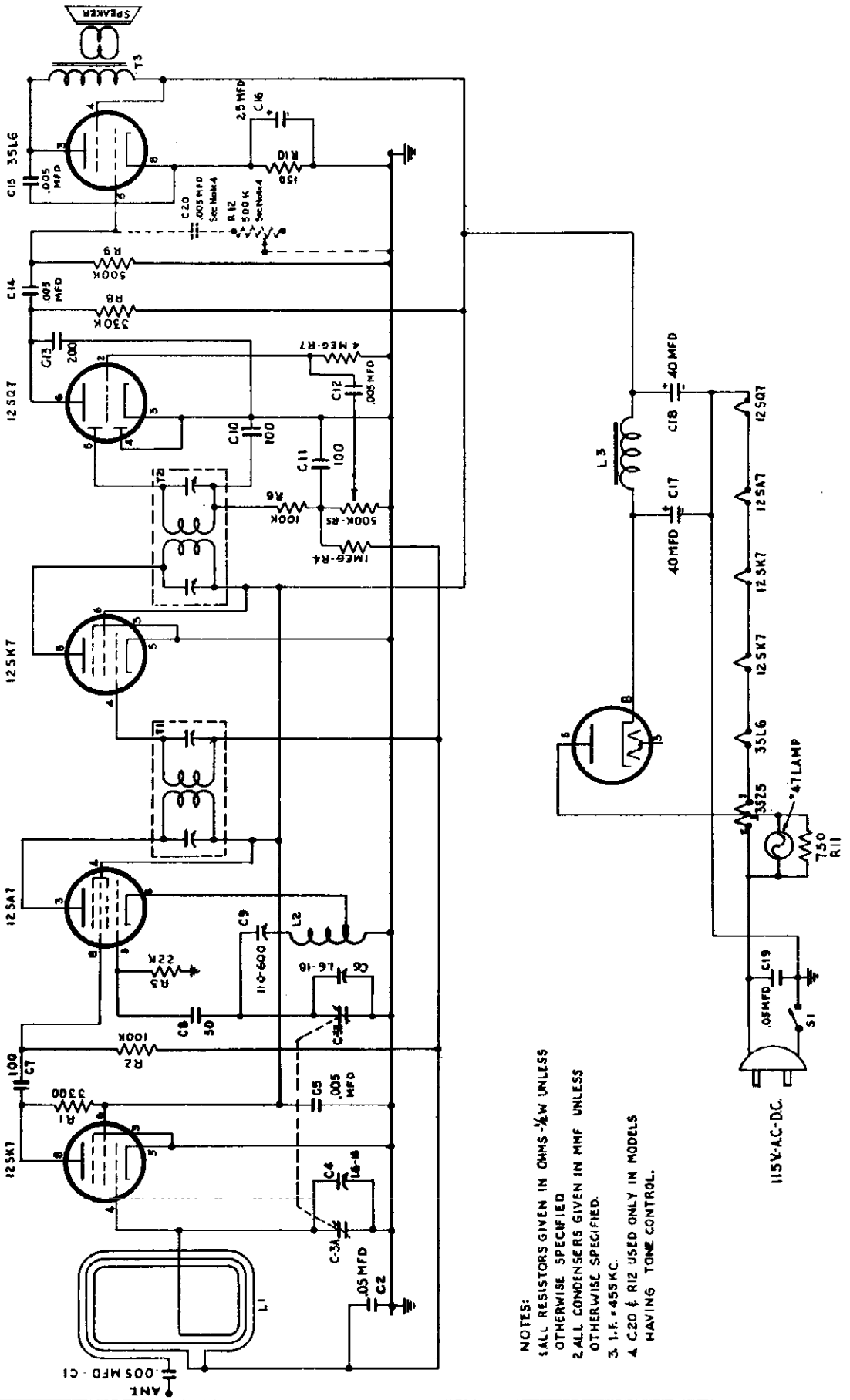
Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
1	12BA7GT	0Ω	38Ω	70KΩ	70KΩ	8KΩ	1Ω	25Ω	2.5 Meg
2	12BK7GT	0Ω	25Ω	0Ω	2.5 Meg.	0Ω	70KΩ	12Ω	70KΩ
3	12B07GT	0Ω	5 Meg.	0Ω	0Ω	500KΩ	630KΩ	12Ω	0Ω
4	5016GT	INF.	90Ω	70KΩ	70KΩ	560KΩ	INF.	38Ω	120Ω
5	35Z5GT	INF.	120Ω	115Ω	INF.	115Ω	INF.	90Ω	70KΩ

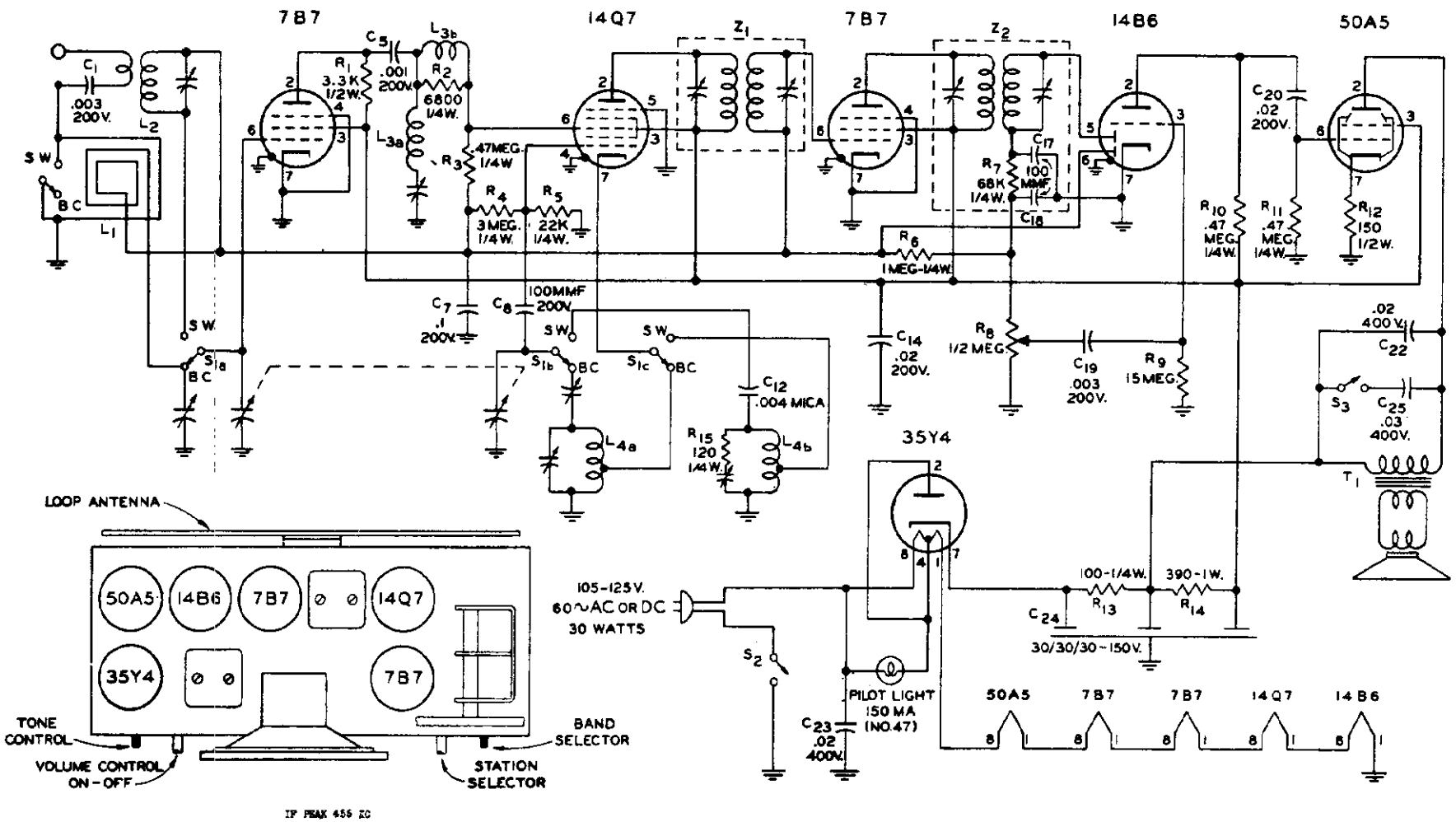
RADIO WIRE TELEVISION MODEL JA-328



MODEL JL5

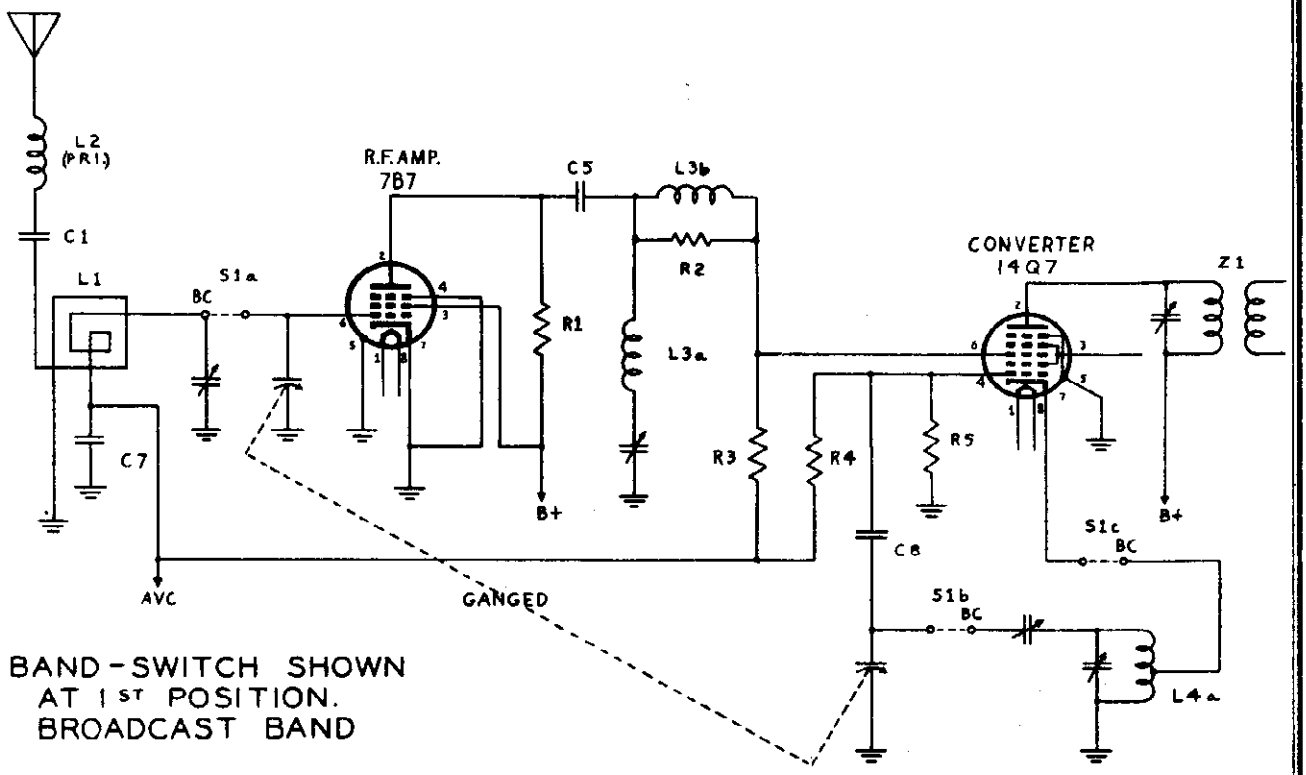
RADIO WIRE TELEVISION



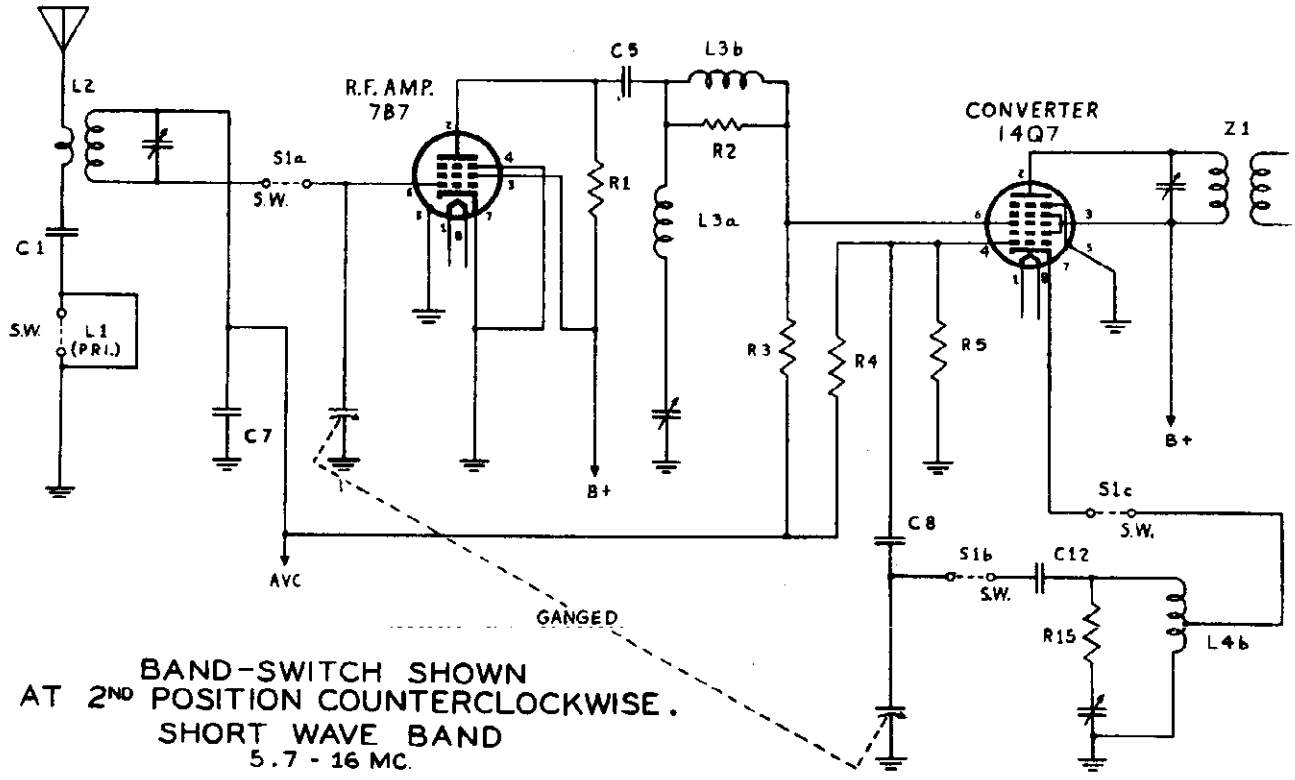


CAUTION:

TO REPLACE TUBES, REMOVE SCREW & WASHER AT CENTER OF LOOP ANTENNA, AFTER FIRST REMOVING PLUG FROM CURRENT OUTLET



BAND-SWITCH SHOWN AT 1ST POSITION. BROADCAST BAND

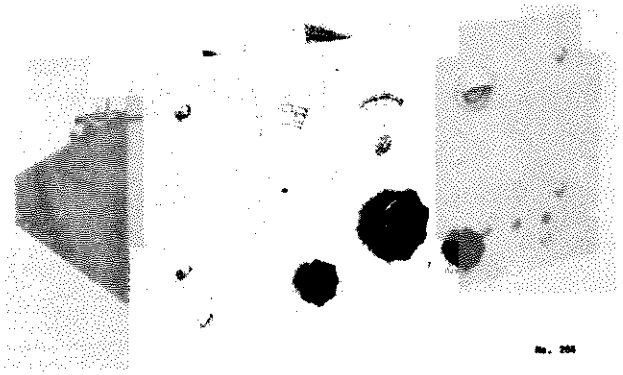


BAND-SWITCH SHOWN AT 2ND POSITION COUNTERCLOCKWISE. SHORT WAVE BAND 5.7 - 16 MC.

The MI-13154 radio features a circuit design utilizing over coupled i.f.transformers. Certain alignment procedures must be followed to insure proper adjustment of the r.f. and i.f. stages.

A. I.F. ALIGNMENT

1. Full mesh on gang condenser.
2. V.T.V.M. connected at juncture of R-27 and R-28.
3. Connect signal generator in series with .02 mfd. condenser to pin 4 of V-6. Set generator at 455 k.c.
4. Tune T-9 top and bottom for maximum signal on V.T.V.M.
5. Move signal generator connection to pin 4 of V-5.
6. Now shunt terminals B and D (top of T8) with a 3900 ohm ½ watt resistor and tune the primary (bottom slug) of T8. Remove 3900 ohm resistor.
7. Now shunt terminals F and G (bottom of T8 and tune the secondary (top slug) of T8. Remove 3900 ohm resistor.
8. Follow the same procedure for T-7.
9. Move signal generator to pin 4 of V-4 and follow same procedure for T-6 and T-5.
10. Move signal generator to pin 8 of V-3 and tune for maximum signal on V.T.V.M.

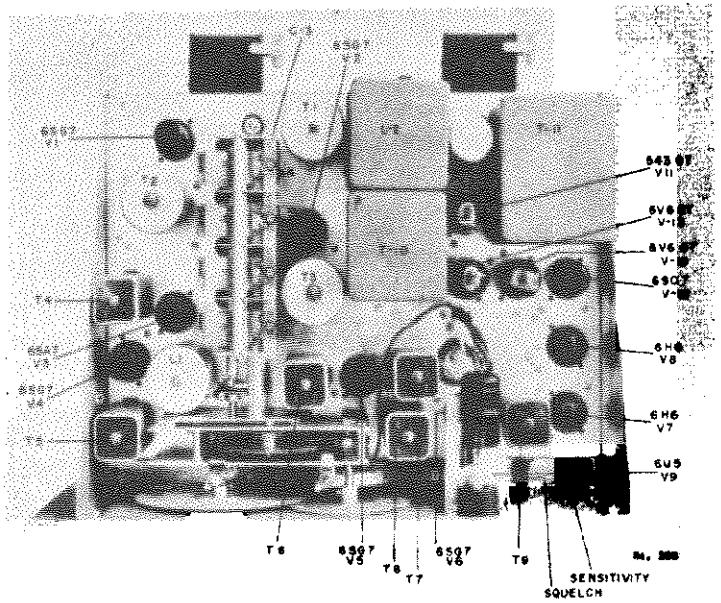


B. R.F. ALIGNMENT

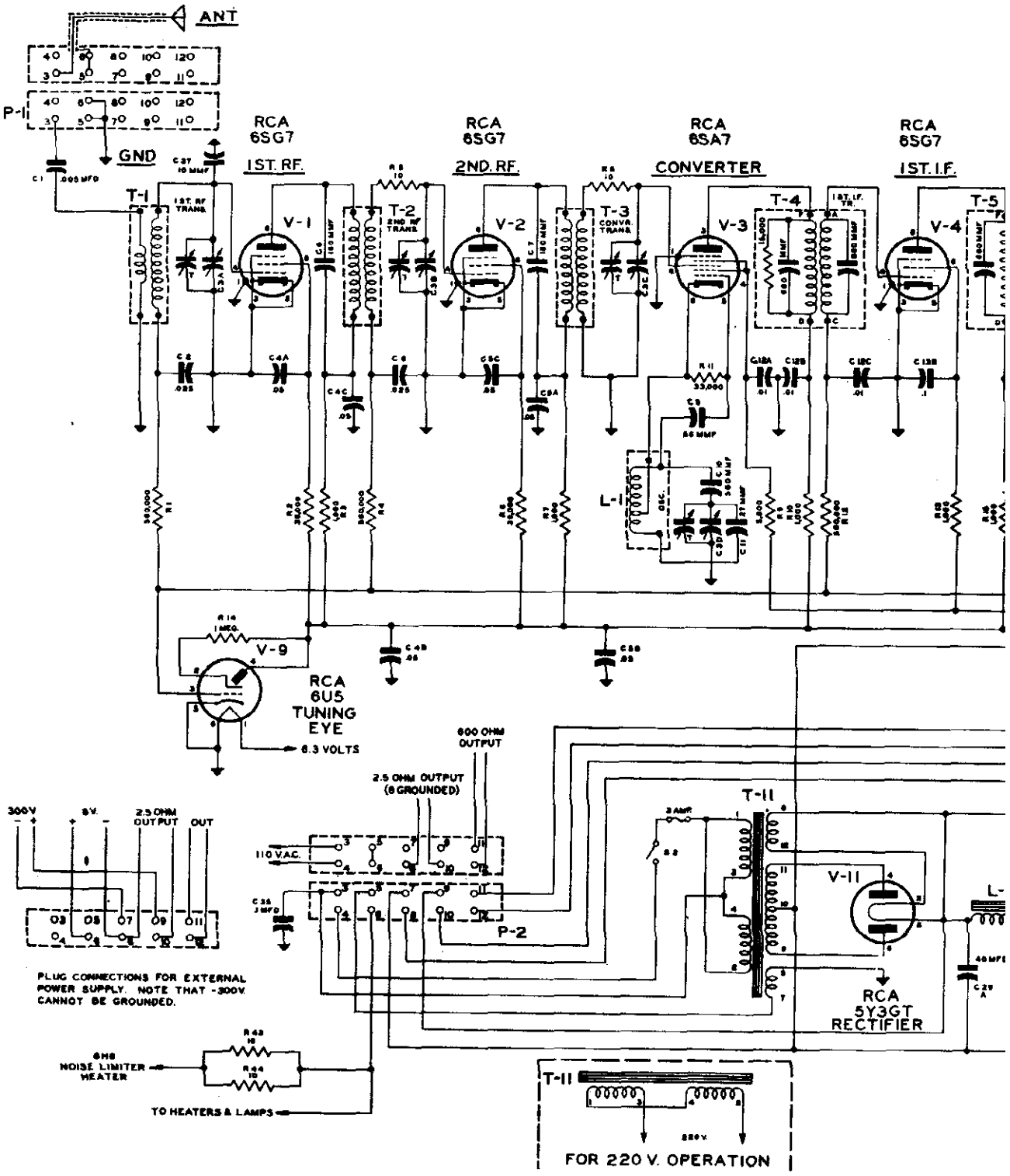
"Connect signal generator in series with 500 mmfd. condenser to pin 3 of plug P-1 and then follow procedures 1 through 5.

1. Turn oscillator L-1 to 535 k.c. (Condenser full mesh.)
2. Move condenser full out and tune C-3D to 1600 k.c.
3. Return condenser to 550 k.c. and tune C-1, T-1, T-2, and T-3 for maximum.
4. Move condenser to 1400 k.c. and tune C-3A, C-3B, and C-3C for maximum.
5. Return condenser to 535 k.c. and retune L-1.

This completes alignment. Check receiver on local signal with 70' antenna. Normal receiver should develop 18-20 volts on V.T.V.M.



MI-13154 - Tube and Parts Location

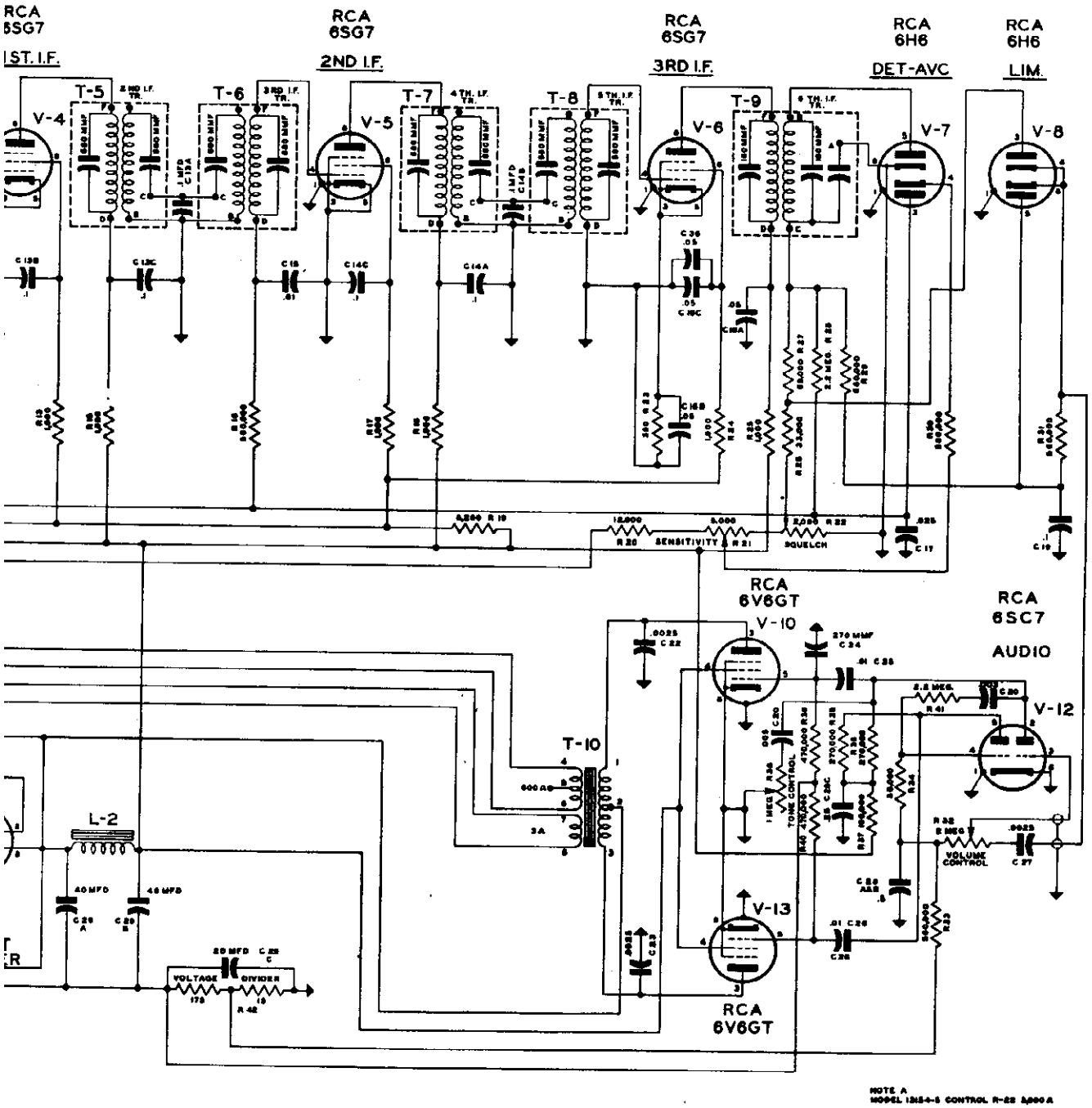


CHANGES

1. SENSITIVITY CONTROL CHANGE

a. For improved squelch action and greater sensitivity control on early models change R-21 to 10,000 ohms and R-20 to 6800 ohms 1/2 watt. (MI-13154-10 receivers incorporate the above.)

b. In actual operation set the squelch control full on (counter-clockwise) and then reduce sensitivity



control (counter-clockwise) until noise level drops to an acceptable point. This adjustment should be accomplished with the receiver not tuned to any station.

c. For improved TUNING EYE operation move yellow lead from juncture of R-1 and pin A of T-6 to pin 5 of tube V8.

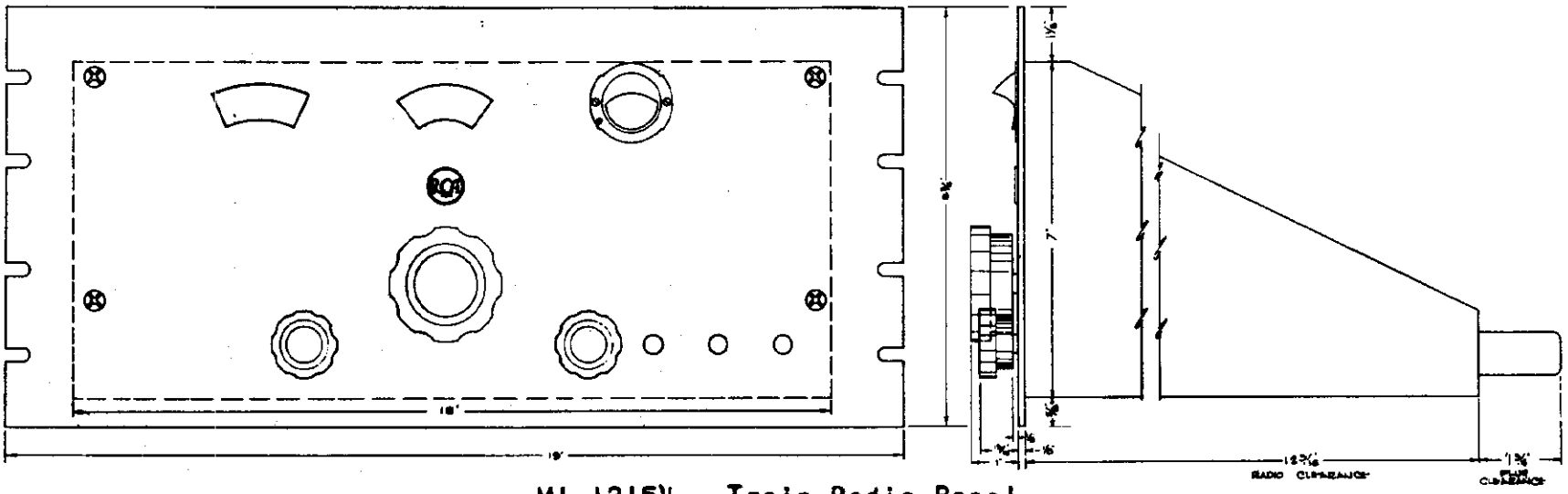
APPLICATION — RAILROAD AND SPECIAL SERVICE

Voltage Rating	110/220 volts, 50/60 cycle
Power Consumption	115 watts
Fuse Rating	3 amps.
Power Output 2% RMS Harmonic Distortion	12 watts
Power Output (maximum)	15 watts
Sensitivity	1.5-2.0 microvolts
Antenna input	70 ohms, 250-800 mmfd.

TUBE COMPLEMENT:

1	RCA-6SG7 1st RF	1	RCA-6H6 Detector AVC
1	RCA-6SG7 2nd RF	1	RCA-6H6 Limiter
1	RCA-6SA7 converter	1	RCA-6SC7 audio driver
1	RCA-6SG7 1st IF	2	RCA-6V6 power output
1	RCA-6SG7 2nd IF	1	RCA-6U5 turning indicator
1	RCA-6SG7 3rd IF	1	RCA-5Y3GT rectifier

The MI-13154 Radio Receiver is primarily designed for operation under adverse operating conditions and varying signal levels such as encountered in train radio operation. Excellent sensitivity and improved automatic volume control are featured plus peak noise squelch control.



MI-13154 - Train Radio Panel

REPLACEMENT PARTS

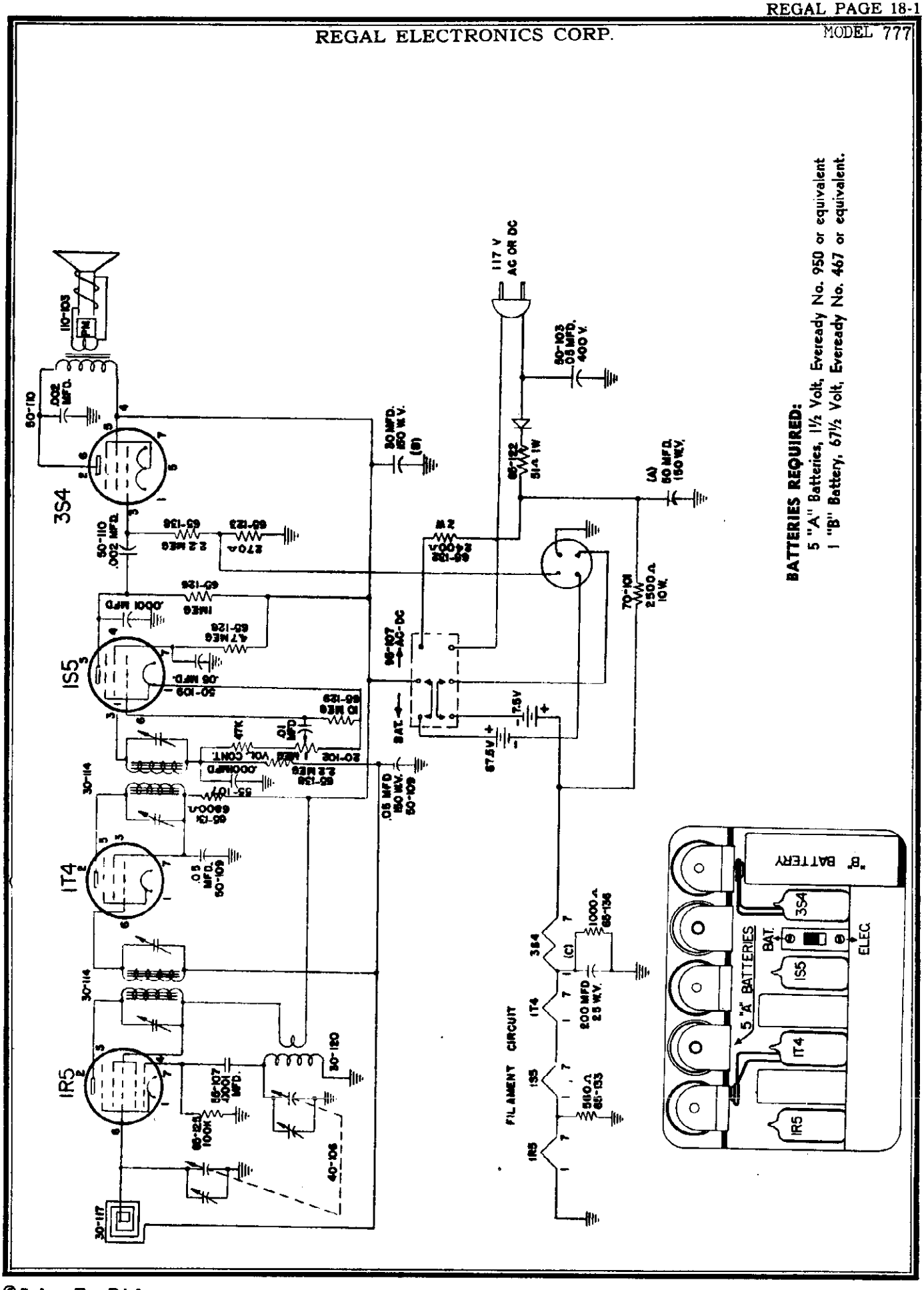
MI-13154

Train Radio Receiver

Stock No.		
TR 101	R1, R4, R12, R16, R30, R31, R33	560,000 ohm 1/2 w
TR 102	R2, R6	39,000 ohm 1/2 w
TR 103	R3, R7, R10, R13, R15, R17, R18, R24, R25	1,000 ohm 1/2 w
TR 104	R5, R8, R43, R44	10 ohm 1/2 w
TR 105	R9	5,600 ohm 1/2 w
TR 106	R11, R26	33,000 ohm 1/2 w
TR 107	R19	8,200 ohm 2 w
TR 108	R20	12,000 ohm 1/2 w
TR 109	R23	390 ohm 1/2 w
TR 110	R27	68,000 ohm 1/2 w
TR 111	R28, R41	2.2 meg 1/2 w
TR 112	R29	680,000 ohm 1/2 w
TR 113	R34	56,000 ohm 1/2 w
TR 114	R35, R36	270,000 ohm 1/2 w
TR 115	R37	100,000 ohm 1/2 w
TR 116	R39, R40	470,000 ohm 1/2 w
TR 117	R21	5,000 ohm potentiometer
TR 118	R22	2,000 ohm potentiometer
TR 119	R38	1 meg potentiometer
TR 120	R32	2 meg potentiometer
TR 121	R42	190 ohm tapped at 15 ohm - 20w
TR 122	C1, C21	.005 mfd. 600 V paper
TR 123	C2, C8, C17	.025 mfd. 600 V paper
TR 124	C4, C5, C16	.05 mfd. 600 V paper
		3 section metal can
TR 125	C6, C7,	180 mmf mica
TR 126	C9	56 mmf mica
TR 127	C10	560 mmf mica
RR 128	C11	27 mmf ceramic
TR 129	C12	.01 mfd 3 section metal can 600 V
TR 130	C13, C14	.1 mfd 3 section metal can 600 V
TR 131	C15, C25, C26	.01 mfd 600 V
TR 132	C19, C36	.1 mfd 600 V
TR 133	C20	.003mfd 600 V
TR 134	C22, C23, C27	.0025mfd 600 V
TR 135	C24	270 mmf mica
TR 136	C28	.25 mfd 3 section metal can 600 V
TR 137	C35	.05 mfd 600 V
TR 138	C37	10 mmf mica
TR 139	C3A, B, C, D	4 section tuning capacitor
TR 140	T-1	antenna coil (#95520-509)
TR 141	T-2, T-3	2nd RF and converter coils (#95520-501)
TR 142	L-1	oscillator coil (#95520-510)
TR 143	T-4	1st IF (#92430-501)
TR 144	T-5k T-6, T-7, T-8,	IF 2nd, 3rd, 4th, 5th coils (#92430-503)
TR 145	T-9	IF 6th coil (#92430-502)
TR 146	V-1, V-2, V-4, V-5, V-6,	RCA 6SG7 tube
TR 147	V-3	RCA 6SA7 tube
TR 148	V-7, V-8	RCA 6H6 tube
TR 149	V-12	RCA 6SC7 tube
TR 150	V-10, V-13	RCA 6V6 tube
TR 151	V-11	RCA 5Y3 tube
TR 152	V-9	RCA 6U5 tube
TR 153	T-10	output transformer (#14329 F)
TR 154	T-11	power transformer (#14300 F)
TR 155	L-2	filter choke (#14299 F)
TR 156	F-1	fuse holder HKM fuse type 3AG 3 amp.
TR-157	* 10,000 ohm potentiometer	
TR-158	* 6,800 ohm 1/2 w	

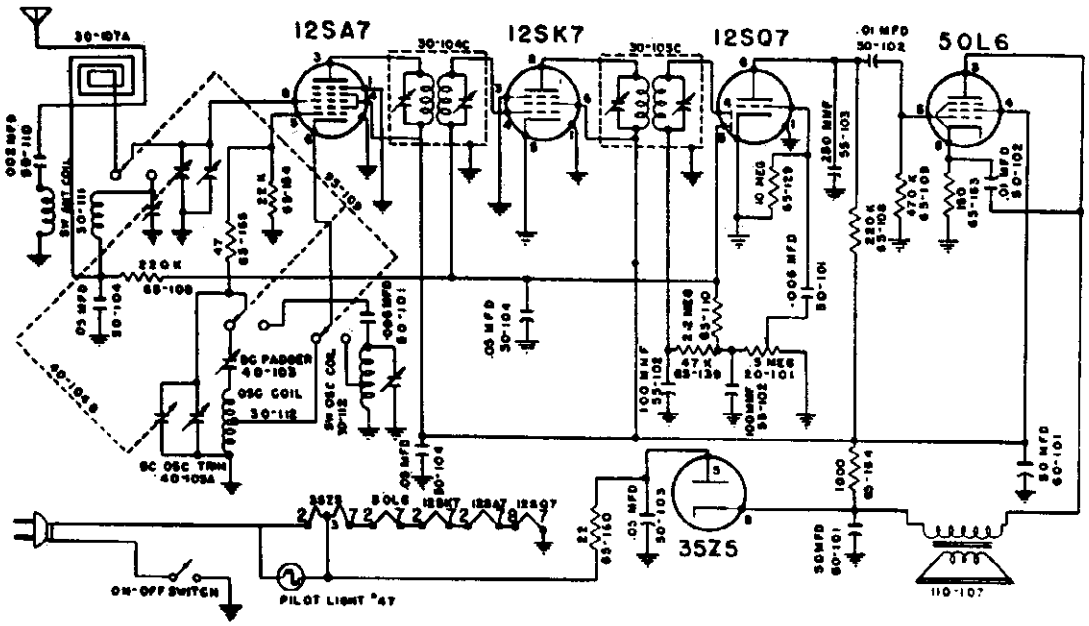
* Model 13154-10 only

REGAL ELECTRONICS CORP. MODEL 777

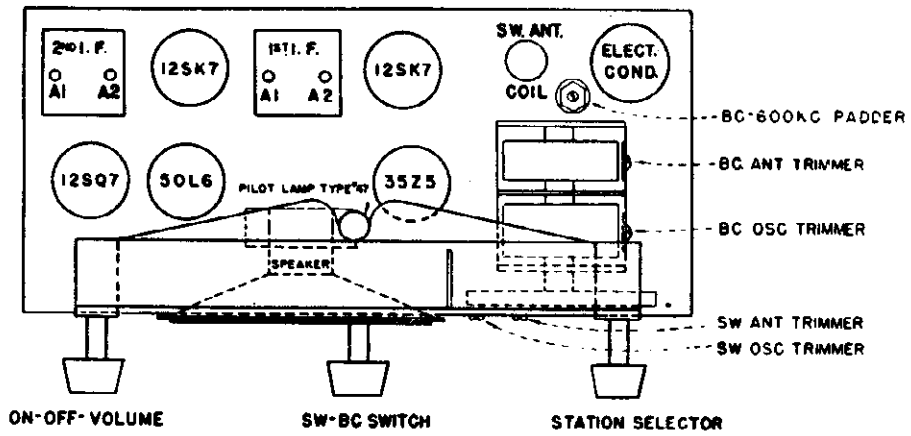


MODEL 7152

REGAL ELECTRONICS CORP.



BAND SWITCH SHOWN IN BC (CENTER CLOCKWISE) POSITON



This Model is a 5 tube 2 band superheterodyne which will give reception over a wide range, including standard broadcast and foreign shortwave. The tuning range of the broadcast frequency is 540 to 1650 kilocycles, or 560 to 182 meters. The short wave frequency is 5.8 to 18.3 megacycles, or 16 to 49 meters, which includes the following: 16, 19, 25, 31, 39 and 49 meter bands.
This radio is designed for convenient use in any location within range of a standard outlet receptacle. It will operate on 105 to 125 volts, 50 to 60 cycles alternating current, or on 105 to 125 volts direct current.

ELECTRICAL SPECIFICATIONS

The circuit is a superheterodyne employing 9 tuned circuits for maximum sensitivity and selectivity, with automatic volume control (AVC), beam power output system. The tube complement consists of (1) 12SA7 as a converter, (1) 12SK7 if amplifier, (1) 12SQ7 detector AVC and first audio amplifier, (1) 50L6 beam power amplifier and (1) 35Z5 rectifier.

(See diagram on back for location of tubes)

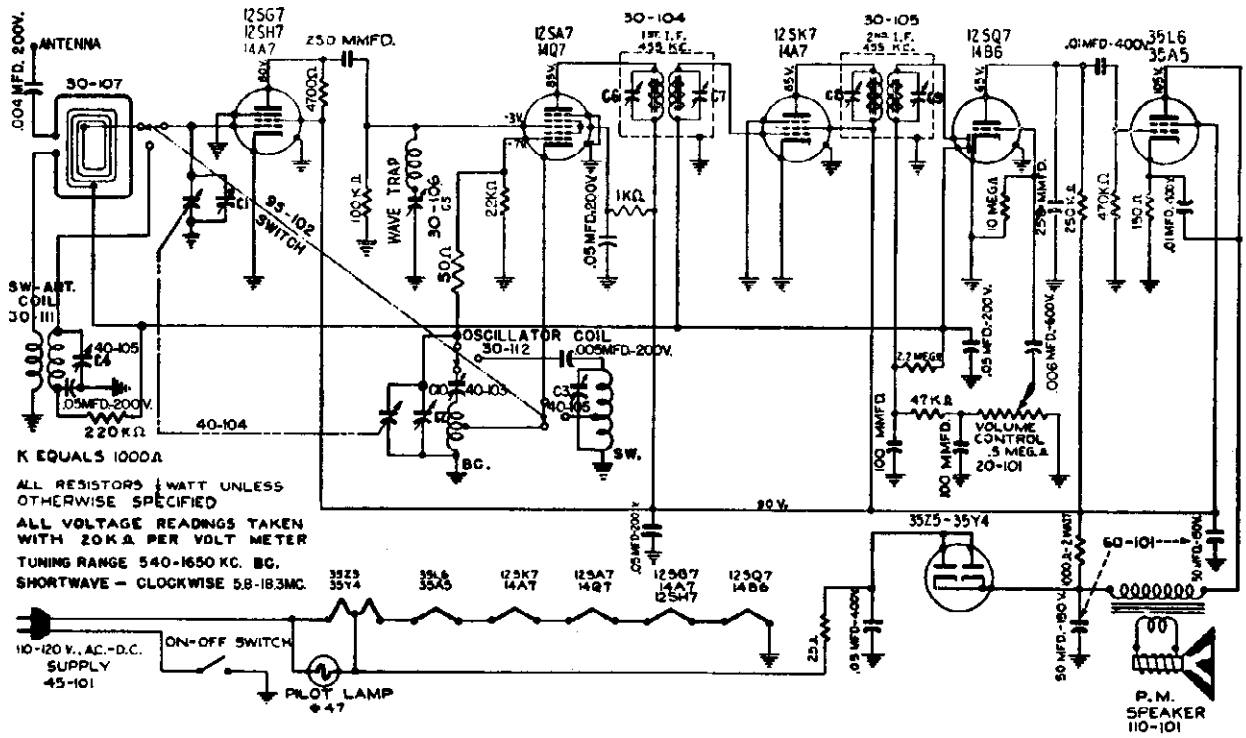
If your set does not work check your tubes. Make sure each tube is in its socket and also make sure the pilot light works.

INSTALLATION

Antenna

The loop Antenna in this receiver will give good reception under normal conditions. It is directional and the best position may be obtained by slowly rotating the receiver in different directions until the signal volume is at its strongest. For better results on weak signals and for foreign reception connect a good outside Antenna. A connection is provided at the rear of the receiver for connecting an outdoor Antenna.

REGAL ELECTRONICS CORP. MODEL 7162



The Model 7162 is a 6 tube 2 band superheterodyne which will give reception over a wide range, including standard broadcast and foreign shortwave. The tuning range of the broadcast frequency is 540 to 1650 kilocycles, or 560 to 182 meters. The short wave frequency is 5.8 to 18.3 megacycles, or 16 to 49 meters, which includes the following: 16, 19, 25, 31, 39 and 49 meter bands.

This radio is designed for convenient use in any location within range of a standard outlet receptacle. It will operate on 105 to 125 volts, 50 to 60 cycles, alternating current, or on 105 to 125 volts direct current.

ELECTRICAL SPECIFICATIONS

The circuit used is a superheterodyne employing 9 tuned circuits for maximum sensitivity and selectivity, with automatic volume control (AVC), beam power output system, IF wave trap, and a URF stage (untuned radio frequency stage). The tube complement consists of (1) 12SG7, 12SH7, or 12SK7 in the RF stage, (1) 12SA7 as a converter, (1) 12SK7 if amplifier, (1) 12SQ7 detector AVC and first audio amplifier, (1) 35L6 or 50L6 beam power amplifier and (1) 35Z5 rectifier.

Antenna

The loop Antenna in this receiver will give good reception under normal conditions. It is directional and the best position may be obtained by slowly rotating the receiver in different directions until the signal volume is at its strongest. For better results on weak signals and for foreign reception connect a good outside Antenna. A connection is provided at the rear of the receiver for connecting an outdoor Antenna.

MODEL 7162

REGAL ELECTRONICS CORP.

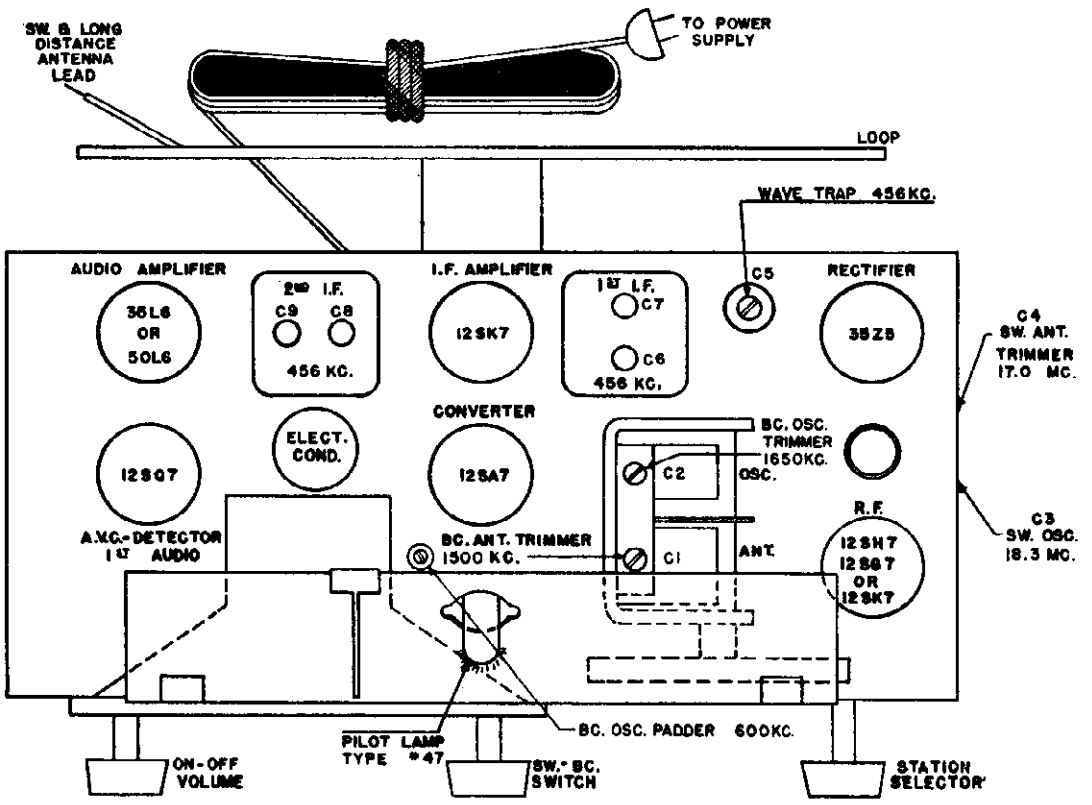
ALIGNMENT INSTRUCTIONS

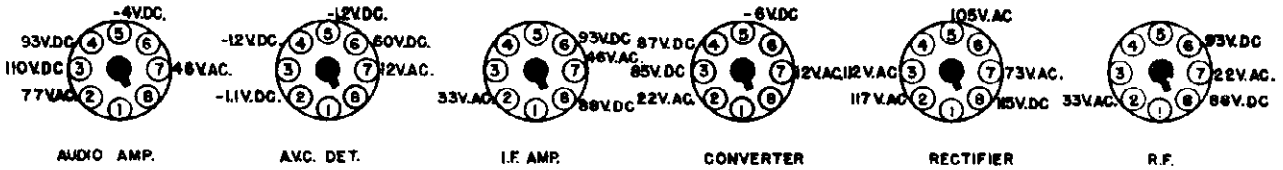
SET VOLUME CONTROL AT MAXIMUM VOLUME AND OUTPUT FROM SIGNAL GENERATOR NO HIGHER THAN IS NECESSARY TO OBTAIN OUTPUT READING.

TUNING RANGE: BROADCAST 540-1650KC. SHORTWAVE 5.8-18.3MC.

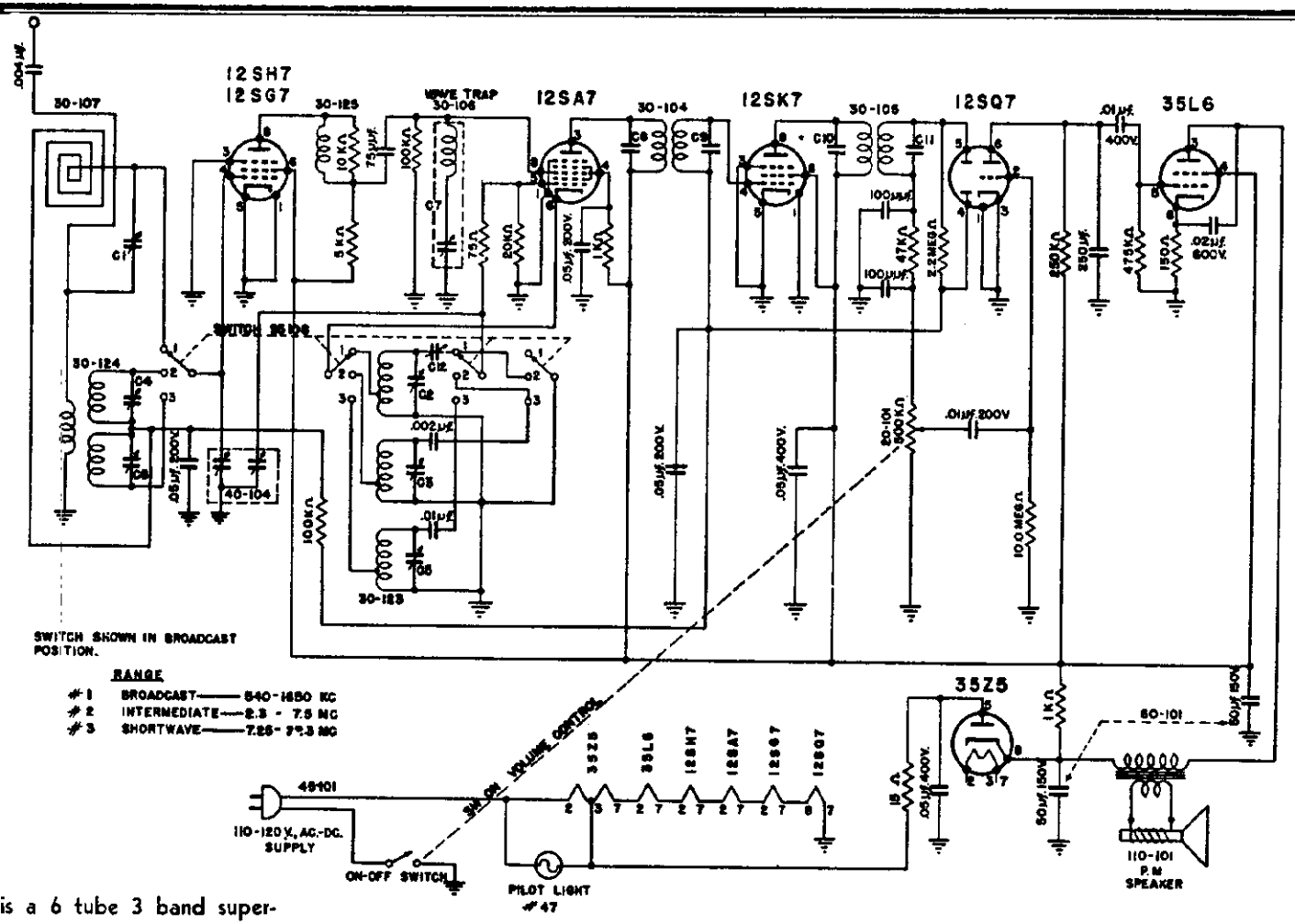
DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	BAND SWITCH POSITION	SIGNAL GEN. FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
.1 MFD.	R.F. SECTION OF VARIABLE CONDENSER	BC.	455 KC.	1650 KC.	ACROSS VOICE COIL	C9, C8, C7, C6	ADJUST FOR MAXIMUM
.1 MFD.	" "	BC.	455 KC.	1650 KC.	" "	C5	" " MINIMUM
.1 MFD.	" "	BC.	1650 KC.	1650 KC.	" "	C2	" " MAXIMUM
.1 MFD.	" "	BC.	600 KC.	600 KC.	" "	C10	" " "
200 MFD.	ANTENNA LEAD	BC.	1500 KC.	1500 KC.	" "	C1	ROCK GANG & ADJUST FOR MAXIMUM OUTPUT
.1 MFD.	R.F. SECTION OF VARIABLE CONDENSER	SW.	18.3 MC.	18.3 MC.	" "	C3	ADJUST FOR MAXIMUM
400Ω	ANTENNA LEAD	SW.	17 MC.	17 MC.	" "	C4	ROCK GANG & ADJUST FOR MAXIMUM OUTPUT

IF TWO PEAKS CAN BE OBTAINED, USE ONE WITH TRIMMER SCREW FURTHER OUT.





VOLTAGES TAKEN WITH 20KΩ PER VOLT METER WITH CHASSIS GROUND, AT 1000KC.



The Model 7163 is a 6 tube 3 band superheterodyne which will give reception over a wide range, including standard broadcast, intermediate short wave, and foreign short wave. The tuning range of the broadcast frequency is 540 to 1650 kilocycles, or 560 to 182 meters. The intermediate short wave frequency is 2.3 to 7.5 megacycles, or 130.0 to 40.0 meters, and the foreign short wave frequency is 7.25 to 22.3 megacycles or 41.5 to 13.5 meters. This receiver covers the following meter bands, 13, 16, 19, 25, 31, 49, 60, 90, and 125.

This radio is designed for convenient use in any location with range of a standard outlet receptacle. It will operate on 105-125 volts, 50-60 cycles, alternating current, or 105-125 volts direct current.

ELECTRICAL SPECIFICATIONS

The circuit of the 7163 is a superheterodyne employing 11 tuned circuits for maximum sensitivity and selectivity, with automatic volume control (AVC) beam power output system, IF wave trap, and a URF stage (untuned radio frequency stage). The tube complement consists of (1) 12SG7 or 12SH7 in the RF stage, (1) 12SA7 as a converter, (1) 12SK7 amplifier, (1) 12SQ7 detector AVC and first audio amplifier, (1) 35L6 beam power amplifier and (1) 35Z5 rectifier.

MODEL 7163

REGAL ELECTRONICS CORP.

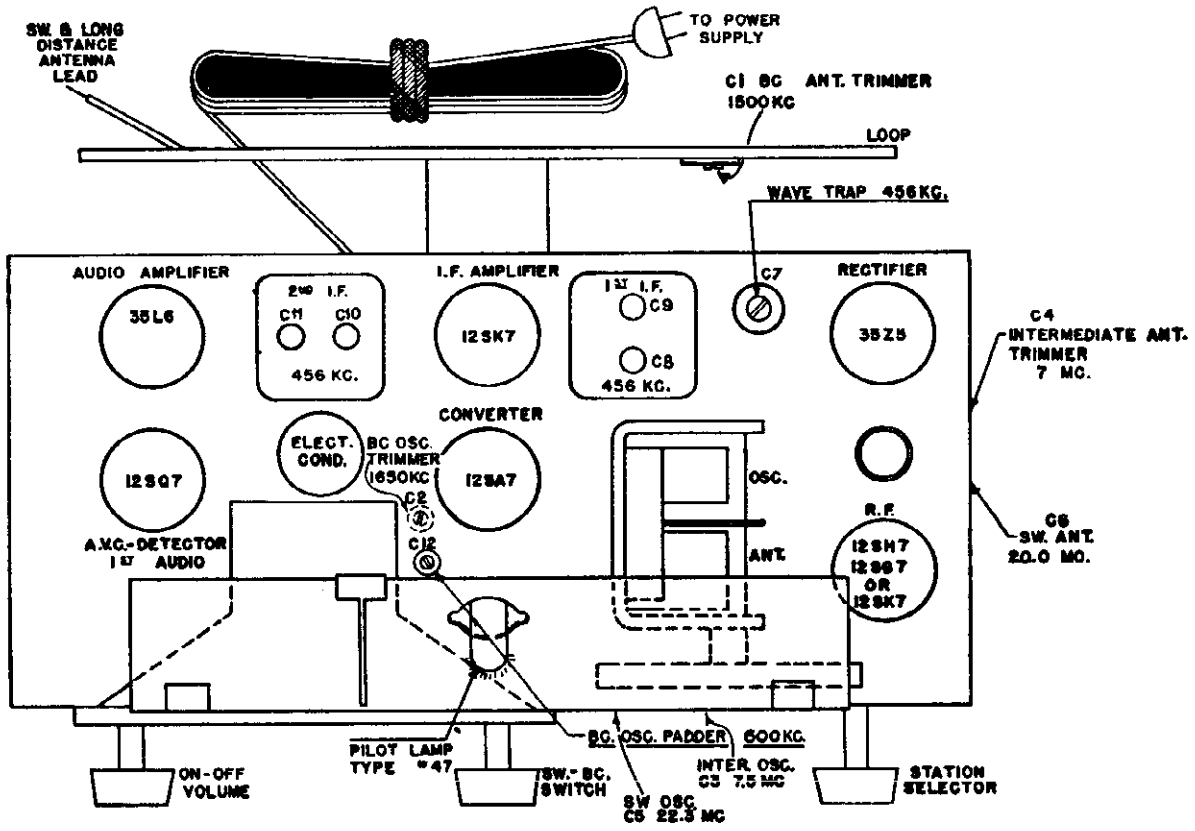
ALIGNMENT INSTRUCTIONS

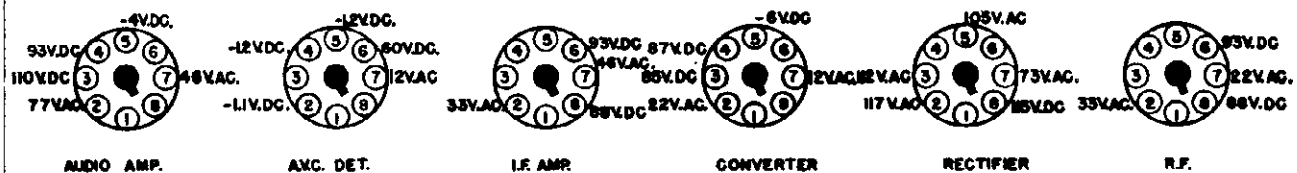
SET VOLUME CONTROL AT MAXIMUM VOLUME AND OUTPUT FROM SIGNAL GENERATOR NO HIGHER THAN IS NECESSARY TO OBTAIN OUTPUT READING

TUNING RANGE BROADCAST 540 - 1650 INTERMEDIATE 2.25 - 7.5 SHORTWAVE 7.25 - 22.5

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	BAND SWITCH POSITION	SIGNAL GEN FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
.1 MFD	RF SECTION OF VARIABLE CONDENSER	BC	455 KC	1650 KC	ACROSS VOICE COIL	C8 , C9 C10 , C11	ADJUST FOR MAXIMUM
.1 MFD	" "	BC	455 KC	600 KC	" "	C7	" " MINIMUM
200 MMFD	ANTENNA LEAD	BC	1650 KC	1650 KC	" "	C2	" " MAXIMUM TRIMMER UNDER CHASSIS
200 MMFD	" "	BC	1500 KC	1500 KC	" "	C1	" " "
200 MMFD	" "	BC	600 KC	600 KC	" "	C12	ROCK GANG & ADJUST FOR MAXIMUM OUTPUT RECHECK C1 & C2 ADJUSTMENTS AS GIVEN
400 Ω	" "	INTERMEDIATE	7.5 MC	7.5 MC	" "	C3	ADJUST FOR MAXIMUM
400 Ω	" "	INTERMEDIATE	7.0 MC	7 MC	" "	C4	ROCK GANG & ADJUST FOR MAXIMUM OUTPUT
400 Ω	" "	SW	22.3 MC	22.3 MC	" "	C5	ADJUST FOR MAXIMUM
400 Ω	" "	SW	20 MC	20 MC	" "	C6	ROCK GANG & ADJUST FOR MAXIMUM OUTPUT

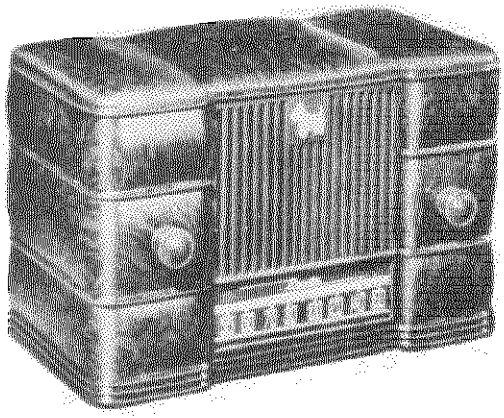
IF TWO PEAKS CAN BE OBTAINED USE ONE WITH TRIMMER SCREW FURTHER OUT





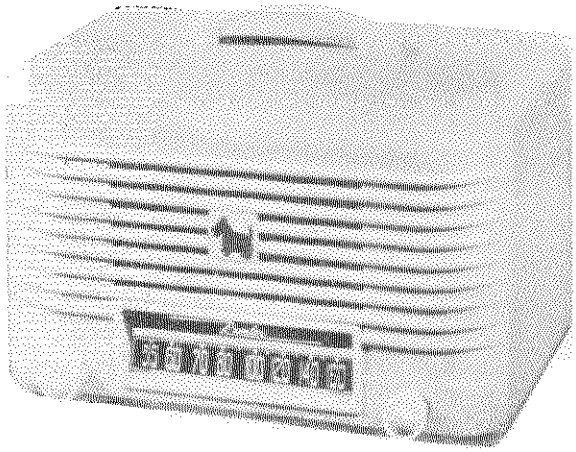
VOLTAGES TAKEN WITH 20KΩ PER VOLT METER WITH CHASSIS GROUND, AT 1000KC.

REMLER COMPANY LTD. All Models, Cabinets



REMLER Scottie Junior

#5520 — De Luxe — Walnut
#5530 — De Luxe — White



REMLER Scottie Pup

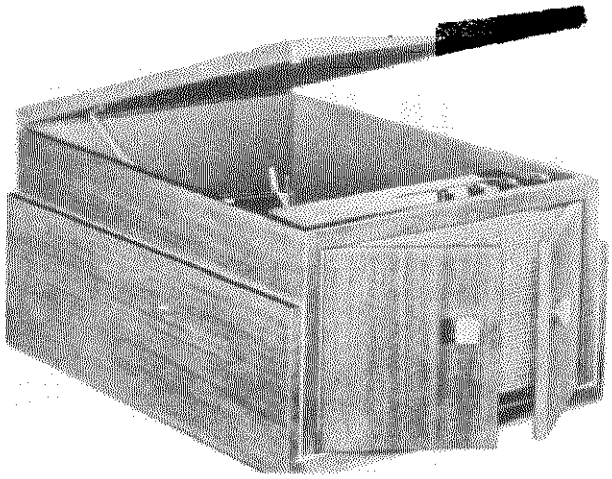
#5500 — Walnut Plastic
#5505 — Ebony with White Grille and Knobs
#5510 — White Plastic
#5515 — Red with White Grille and Knobs
#5535 — Red with White Grille and Knobs

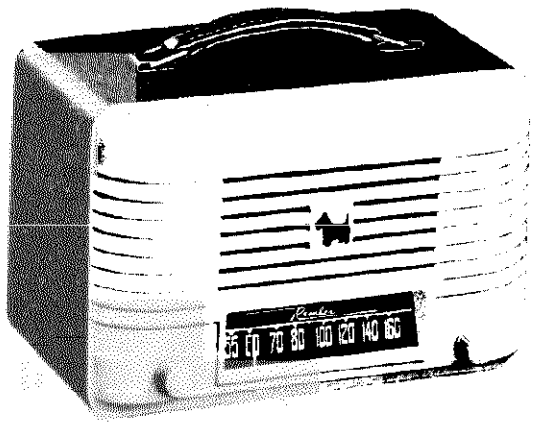
REMLER AUTOMATIC Table Combination

#5310 M — Mahogany
#5310 BL — Blonde

Base and Record Cabinet

#110 — Mahogany
#111 — Blonde



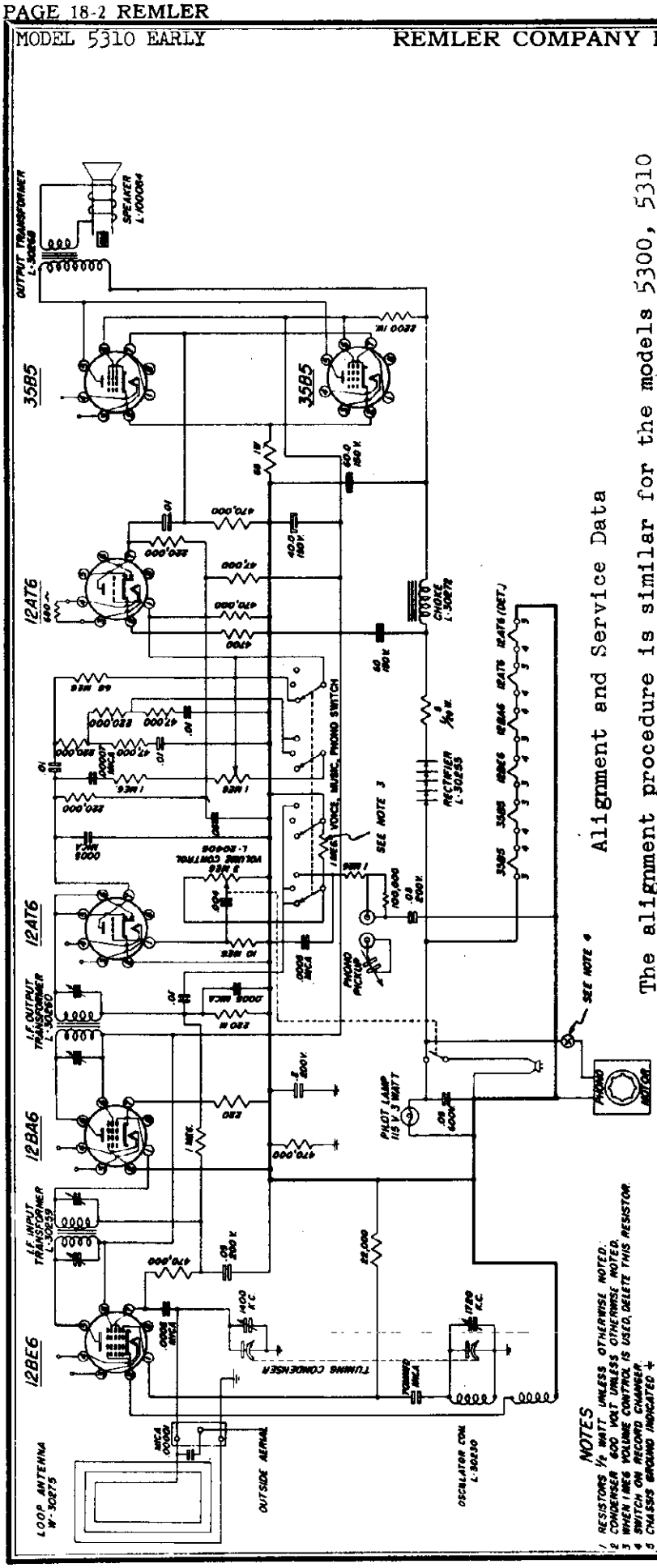


REMLER AC-DC Battery Portable

#5400 — Walnut with matching leatherette
#5410 — White with brown leatherette

MODEL 5310 EARLY

REMLER COMPANY LTD.



Alignment and Service Data

The alignment procedure is similar for the models 5300, 5310 5400 and 5500 series. Intermediate frequency is 450 KC.

The oscillator should track at 545 KC (closed gang) and 1635 KC (open gang). The voltage across the grid resistor should run within limits of 4 to 8 volts negative throughout the dial.

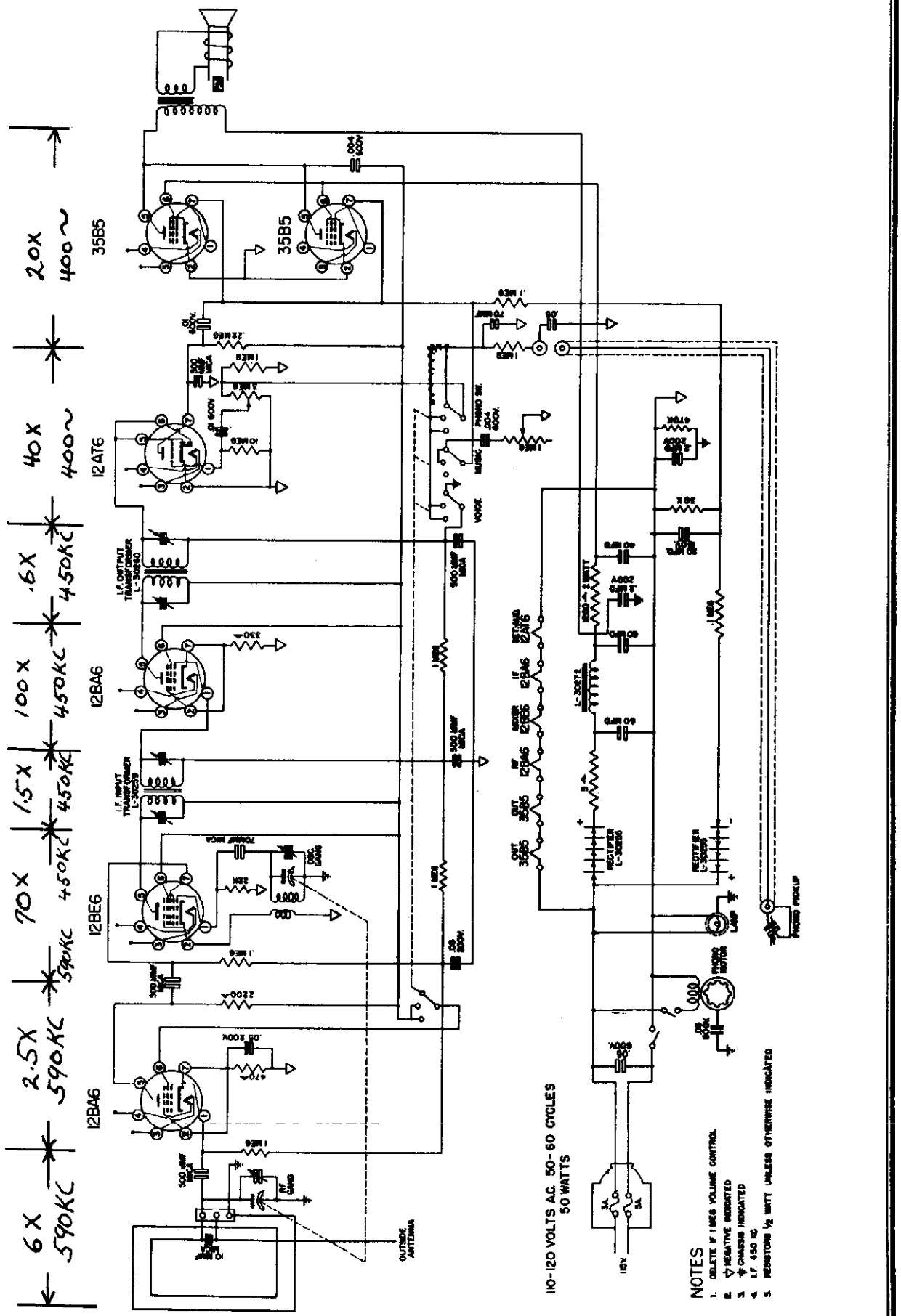
Tune R.F. at 590 KC, 1090 KC and 1500 KC. The position of the loop with respect to the chassis must be maintained as within the cabinet for all alignment. If sensitivity is low on low end of dial, increase the oscillator 70 mmf to 100 or 150 mmf.

For I.F. Oscillation, check for 100 ohms I.F. Cathode resistance. This may be increased if found necessary.

On the 5500 series, if the residual hum level is too high, dress volume control loads away from A.C.

On the 5310, to decrease residual hum, increase the 30 K bias filter resistor.

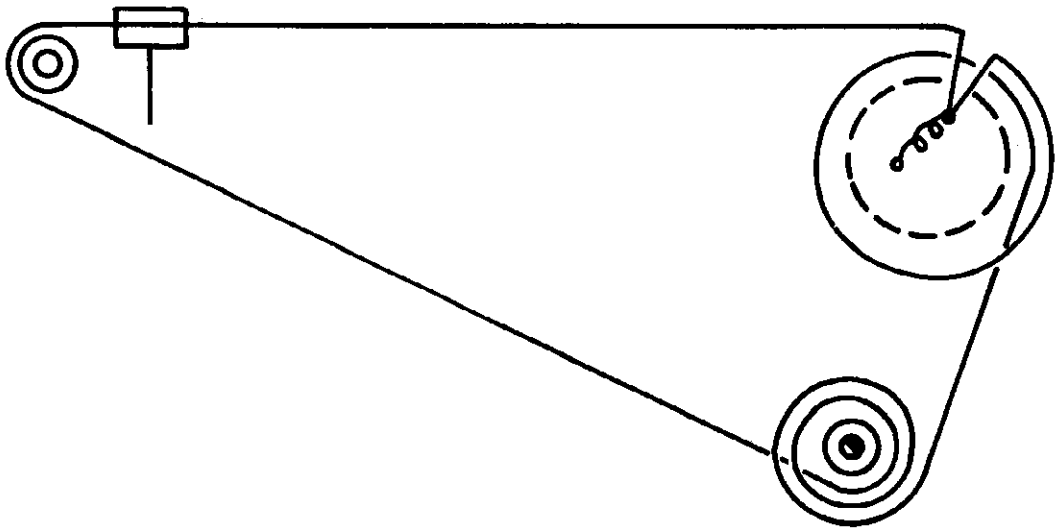
REMLER COMPANY LTD. MODEL 5310 LATE



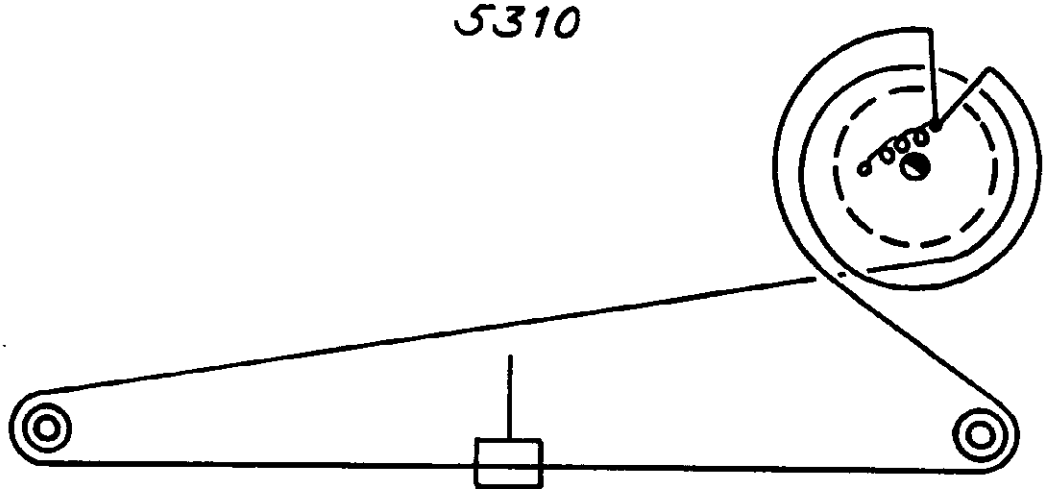
MODELS 5310, 5400, 5500, 5520, 5530, 5560, 5565

REMLER COMPANY LTD.

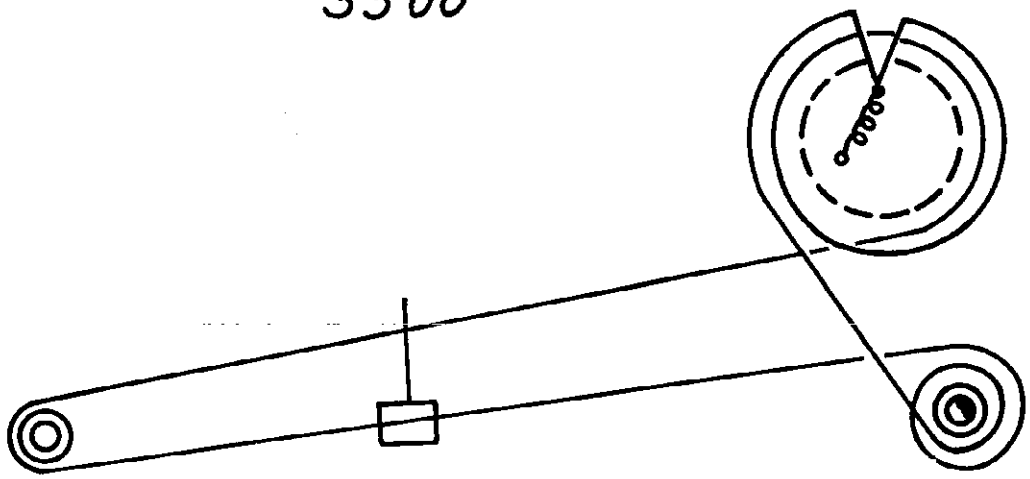
DIAL CORD DRIVES



5310



5500

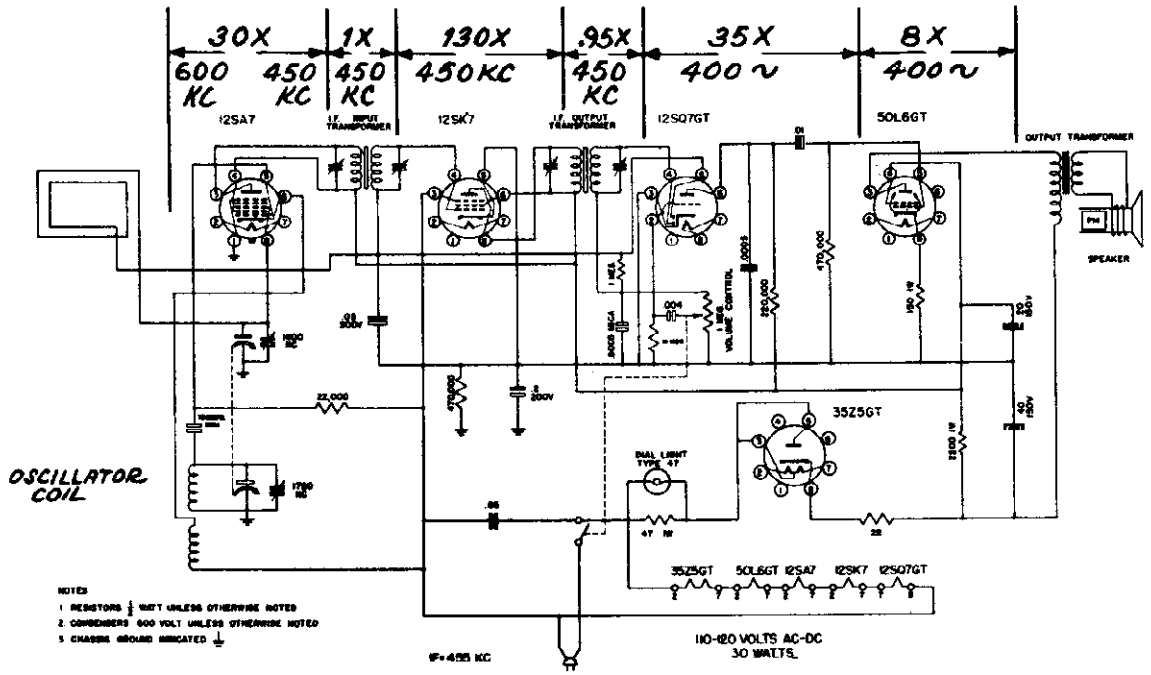


5400-5520-30-60-65

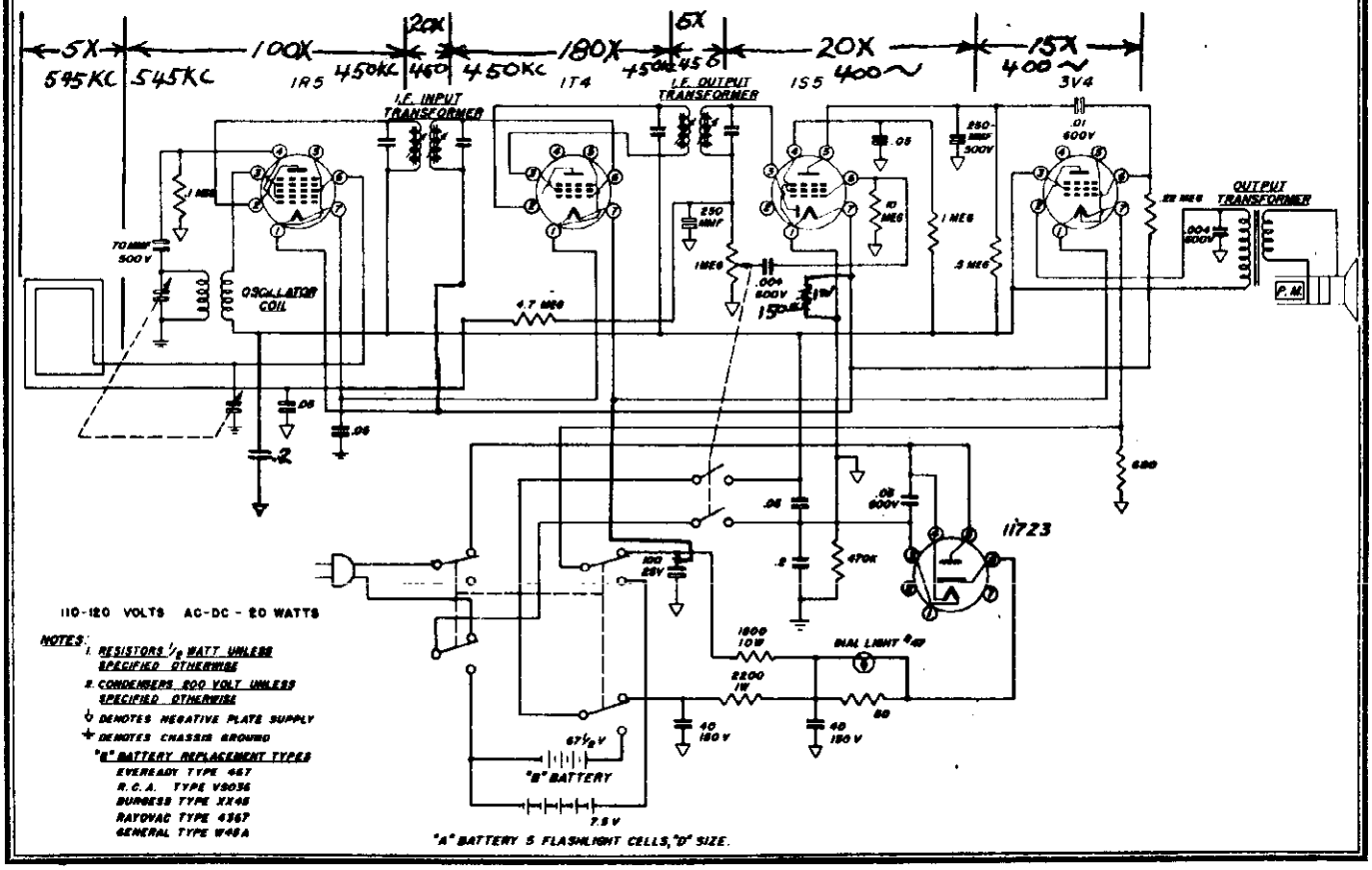
REMLER COMPANY LTD.

MODELS 5500, 5505, 5510, 5515, 5520, 5530, 5535, 5560, 5565
MODELS 5400, 5410

MODELS 5500, 5505, 5510, 5515, 5520, 5530, 5535. 5560, 5565



MODELS 5400, 5410



GENERAL DESCRIPTION

1. GENERAL

These instructions cover the installation, operation and servicing of the Scott Export Radio Receiver.

THEY SHOULD BE READ AND STUDIED WITH GREAT CARE BEFORE THE INSTALLATION OR OPERATION OF THE RECEIVER IS ATTEMPTED IN ORDER THAT OPTIMUM PERFORMANCE MAY BE OBTAINED.

The receiver employs twelve tubes and covers the frequency range of 0.54 to 1.6 megacycles and 3.2 to 23.5 megacycles in four frequency bands.

The Scott Export Radio Receiver is designed for operation from a 115 volt DC source of 115 volt 60 cycle single phase AC source. Power consumption is 78 watts.

All operating controls are mounted on the front panel of the receiver. Power, antenna, ground, audio output, record player input and fuses are located at the rear of the receiver.

2. DESCRIPTION

2.1 General

The Scott Export Radio Receiver is a superheterodyne type receiver. The electrical circuits employed for signal reception on all frequency ranges comprise one stage of R.F. amplification, first detector or mixer, a separate high frequency oscillator, two stages of intermediate frequency amplification operating at 455 kilocycles, a diode type second detector, two stages of resistance coupled audio amplification, and a push pull audio frequency power output stage. The second detector utilizes one set of elements of a dual diode, the other set of elements is utilized to supply AVC voltage to the RF and IF amplifiers. One half of a twin triode tube is utilized as the 1st audio amplifier, the other half of the twin triode is utilized in an efficient peak noise limiter circuit. A self contained power supply provides the necessary DC voltages for operation of the receiver from either an AC or DC power source. Inverse feedback is incorporated in the output audio amplifier to reduce hum and provide better audio response.

2.2 Frequency Range

The receiver covers the frequency range of 0.54 to 23.5 megacycles in four bands as follows:

Band	Frequency Range
1	0.54 - 1.6 megacycles
2	3.2 - 8.4 megacycles
3	8.2 - 14.4 megacycles
4	14.2 - 23.5 megacycles

2.3 Audio Output Connections

The audio output transformer is mounted on the receiver chassis. The secondary of this transformer is connected to a two terminal strip marked "SPEAKER" mounted on the rear of the chassis. The loudspeaker is connected to this terminal strip by means of the two conductor cable fastened on the speaker. The voice coil impedance of the loudspeaker is 8 ohms. The maximum undistorted audio output is 2.16 watts measured across an 8 ohm load.

2.4 Antenna Connections

The antenna terminal strip is mounted at the rear of the receiver for antenna and ground connections.

The input circuit of the receiver is primarily designed for operation with a separate antenna not used for other equipment. A conventional single wire antenna will suffice. It should be well insulated and erected as high as possible. The recommended minimum overall length of antenna and lead-in is fifty feet. The antenna proper should be erected out in the open as much as possible.

In an installation having a simple antenna-ground combination, connect the antenna lead-in to the outer antenna terminal and the ground lead to the terminal marked "GND". Then connect a jumper wire between the center antenna terminal and the ground terminal.

When a doublet type antenna, such as the Scott Super Double Doublet, is used the two lead-in conductors should be connected to the two terminals marked "ANT" and the ground wire to the terminal marked "GND".

CAUTION: When connecting the ground wire between the receiver and the water pipe or other ground point remove the power plug from the wall receptacle as a slight shock may be felt if the plug is left in with the polarity reversed.

2.5 Power Requirements

The radio receiving equipment is designed to operate from either 115 volts DC or 115 volts 60 cycle single phase AC. Line current at 115 volts is .62 amperes. The nominal power consumption at 115 volts AC or DC is 78 watts.

Connection to the power source should be made through the plug and cord attached to the receiver. When the receiver is used on a DC power source the correct polarity must be observed or the receiver will not operate. After the receiver has been connected and turned on if it fails to operate after warming up, reverse the power plug to obtain the correct polarity.

When the receiver is used on an AC power source the polarity is not important. It may be desirable, however, to reverse the power plug in some installations to reduce hum.

The fuse in the power supply line is mounted adjacent to the power input at the rear of the receiver. The fuse mounting is of such design that the fuse, which is of the cartridge type, is replaceable without the use of tools, and without the necessity for the removal of the receiver chassis from its cabinet.

2.6 Record Player Connections

Provision is made at the rear of the chassis for connection of a record player pickup of the high-impedance type. A low impedance pickup may be used with the proper matching transformer.

2.7 Tube Complement

The vacuum tubes employed in the Scott Export Radio Receiver are as follows:

Symbol	Tube Type	Function
V-101	6K7	R. F. Amplifier
V-102	12J5GT	H. F. Oscillator
V-103	12SA7	First detector mixer
V-104	12SK7	First IF Amplifier
V-105	12SK7	Second IF Amplifier
V-106	12H6	Second Detector, AVC
V-107	12SN7GT	First Audio, Noise Limiter
V-108	12SN7GT	Second Audio, Phase Inverter
V-109	25L6GT	Output Audio Amplifier
V-110	25L6GT	Output Audio Amplifier
V-111	1629	Tuning Indicator
V-112	25Z6GT	Rectifier

3. CONSTRUCTION

The Scott Export Radio Receiver is furnished with a complete set of escutcheons and hardware for mounting the receiver in the cabinet. If it is desired to house the receiver in a custom installation or any cabinet built to the customers specifications Figure 3 shows the cut-out dimensions for the front panel and loudspeaker baffle board. The following table gives the dimensional outlines of the receiver chassis and loudspeaker and lists the weight of each unit.

Width	Depth	Height	Weight
Receiver Chassis			
16 5/8"	16 7/8"	10 1/2"	35 lbs.
Loudspeaker			
12 1/4" dia.	5 1/4"	-	6 lbs.

EXPORT RECEIVER SCOTT RADIO LABS., INC.

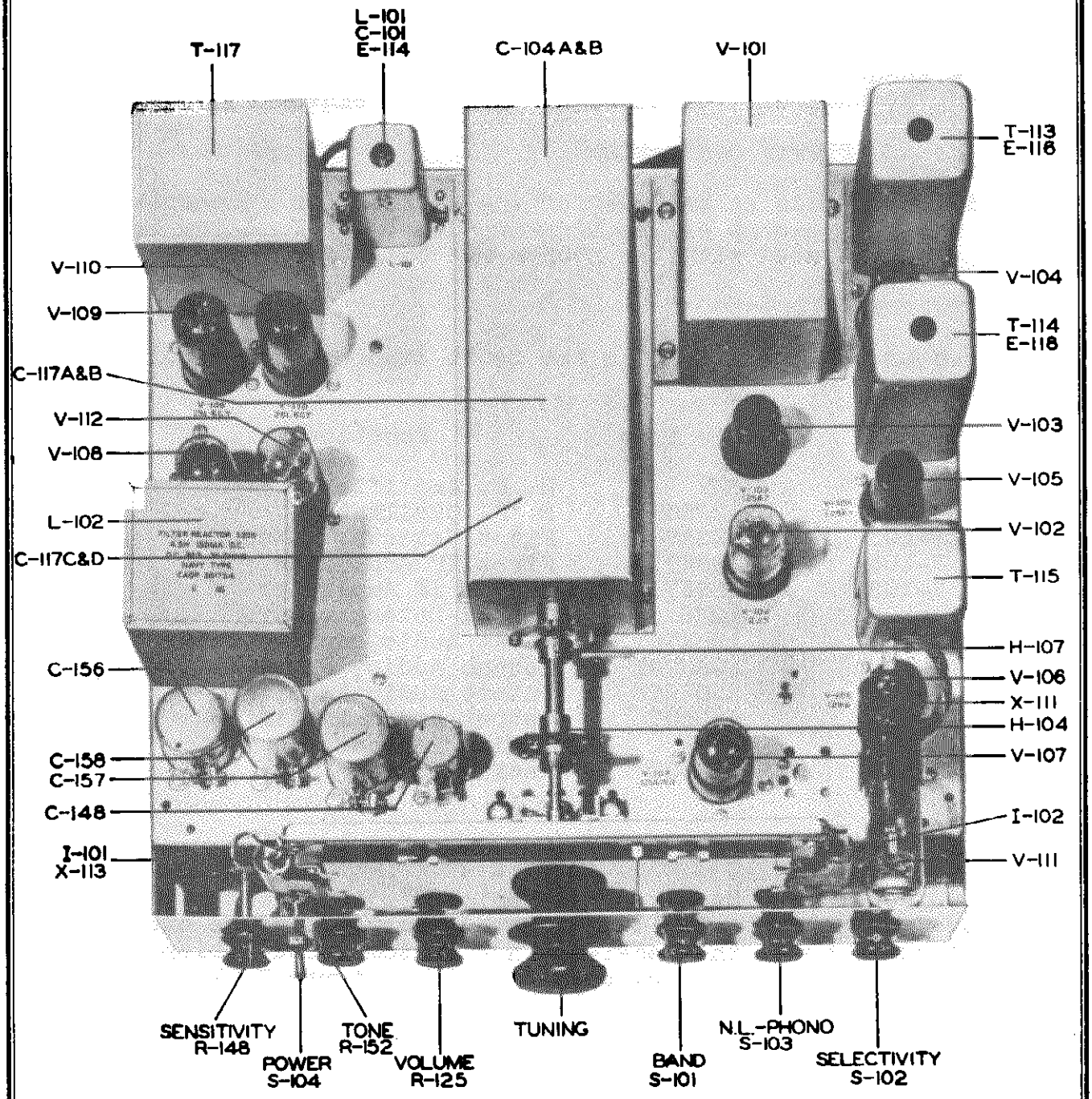


Figure 1 Top View Export Radio Receiver Chassis

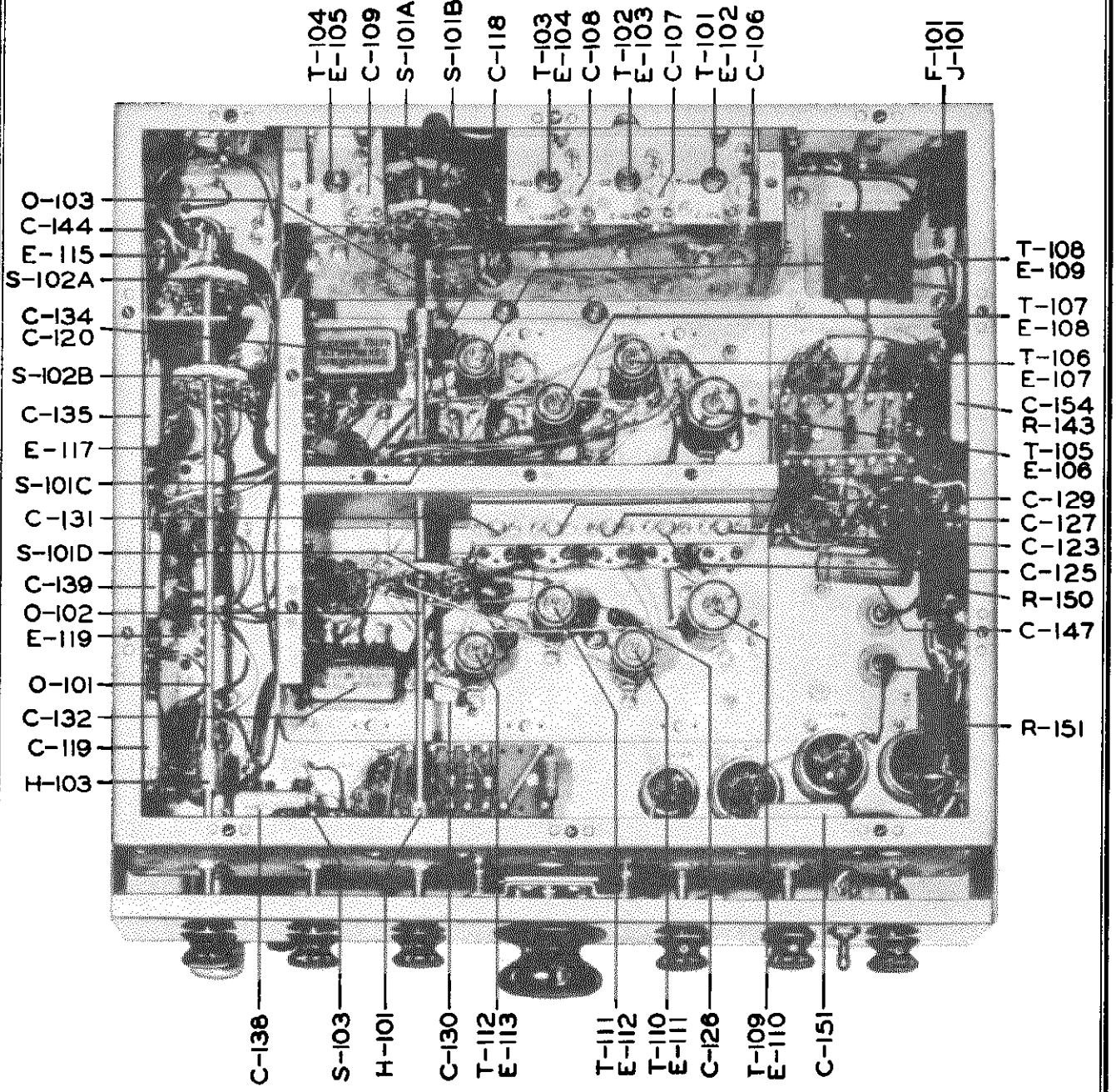
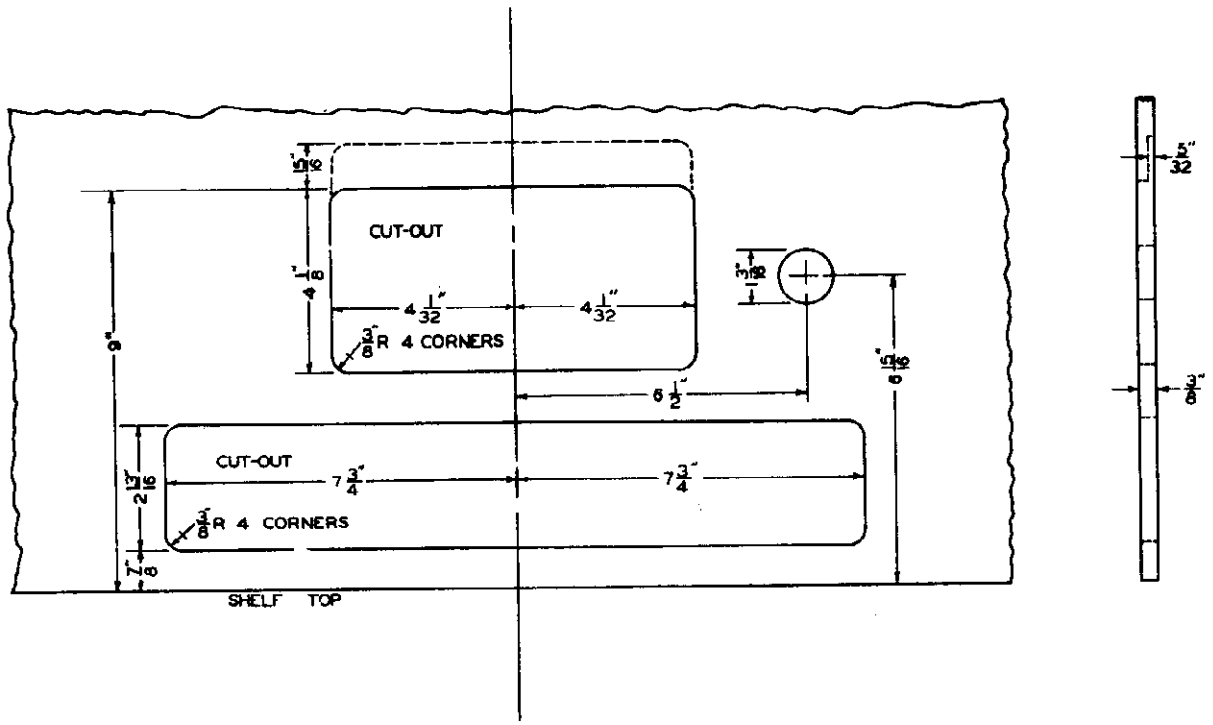


Figure 2 Bottom View Export Radio Receiver Chassis



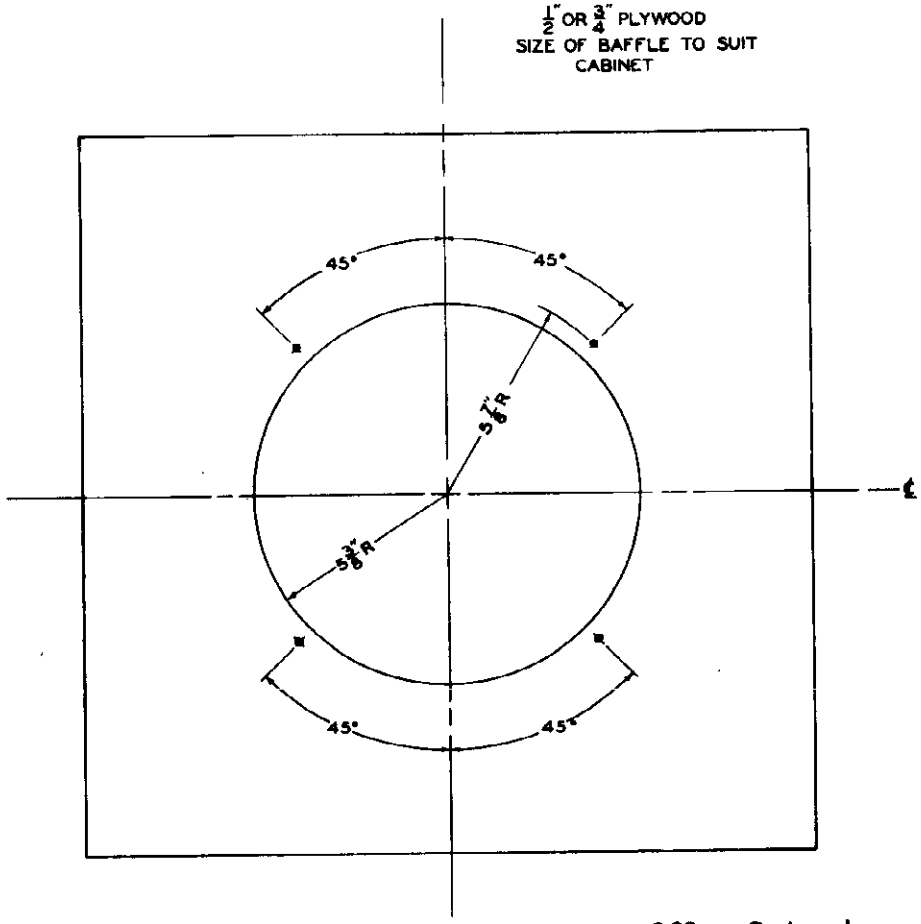


Figure 3 Panel and Speaker Baffle Cutouts

CIRCUIT DESCRIPTION

4. GENERAL

The actual schematic diagram of the Scott Export Radio Receiver is shown in Figure 7. For purposes of illustration, it will be assumed that the circuits are set up as for signal reception on Band 1 (.54 - 1.6 MC) as shown in the diagram. The following description will refer therefore, to the symbol numbers of the circuit elements of this band. It shall be assumed that unless otherwise noted, the description will be equally applicable to Bands 2 - 3 - 4.

5. SIGNAL FREQUENCY CIRCUITS

Signal input to the receiver through antenna terminal E-120 is connected to the primary winding of antenna input transformer T-101 by switch S-101A. Wave trap inductor L-101 is provided to attenuate signals at IF frequency (455 KC). This circuit is tuned by series connected capacity C-101 and tuned to 455 KC by adjustable iron core E-114. An electrostatic shield, at ground potential, separates the secondary winding from the primary winding. The secondary winding together with variable air dielectric capacitor C-104 (A and B) constitutes the first tuned circuit. Transfer of r-f signal, at the resonant frequency of this tuned circuit, from the antenna to the control grid of R.F. amplifier tube V-101, is accomplished by inductive coupling through antenna input transformer T-101. Variable capacitor C-104 is a two section capacitor, both sections being connected in parallel on Bands 1 and 2 by means of switch S-101B. On Bands 3 and 4 capacitor section C-104A is switched out of the circuit and C-104B alone used. Variable capacitor C-104 is ganged with variable capacitor C-117 to provide uni-controlled tuning of the receiver. The secondary winding of transformer T-101 is provided with an adjustable iron core for inductance trimming and a shunt connected variable trimmer capacitor C-106. These trimmer elements permit the accurate alignment of the tuned circuit at both ends of the frequency band and are accessible for adjustment as shown in Figure 2. The high potential end of the tuned circuit is connected to the control grid of R.F. amplifier tube V-101 by switch S-101B and through coupling capacitor C-103. The low potential end of the tuned circuit is returned to ground bus. The d-c bias return from the control grid of R.F. amplifier tube V-101 to the A.V.C. line is closed through resistor R-101.

Plate potential from the high voltage d-c line is applied to the plate of R.F. amplifier tube V-101 through decoupling resistor R-109, bypassed to ground by capacitor C-134C and through R.F. transformer T-105 primary. Screen potential is applied through resistor R-103 bypassed by capacitor C-111B. The suppressor is connected to the cathode. Initial grid bias is obtained by means of cathode resistor R-102 bypassed by capacitor C-111A. One side of the heater of V-101 connects to the heater of V-108, the other side connects to the heater of V-107.

The amplified signal from the plate of R.F. amplifier tube V-101 is transferred to the signal grid of mixer tube V-103, through R. F. transformer T-105. The primary of T-105 is untuned, the secondary winding together with variable capacitor C-117 (A and B) constitute the second and final tuned circuit operating at signal frequency. The high potential end of the tuned circuit is connected to the signal grid of mixer tube V-103 by switch S-101C through coupling capacitor C-116. The low potential end of the tuned circuit connects to ground bus. Adjustable iron core E-106 and parallel connected trimmer capacitor C-112 are provided for purposes of circuit alignment. The DC bias return from the control grid of mixer tube V-103 to the AVC line is closed through resistor R-104 bypassed to ground bus by capacitor C-159.

Screen potential from the high voltage DC line is applied to the screen of mixer tube V-103 through resistor R-108 bypassed to ground by capacitor C-134A. The suppressor is internally connected to the shell of the tube. Initial bias is obtained by means of cathode resistor R-106 bypassed to ground by capacitor C-120B.

6. HIGH FREQUENCY OSCILLATOR CIRCUITS

The high frequency oscillator circuit is of the "electron-coupled" type. The tuned circuit consists of tapped inductor T-109, shunted with variable trimmer capacitor C-125 and is tuned by variable capacitor C-117 (C and D). Inductor T-109 is provided with an adjustable iron core for inductance adjustment. Fixed capacitor C-124 shunted by variable trimmer capacitor C-123 is provided to modify the tuning of the H.F. oscillator so that it will maintain a fixed frequency difference of 455 kilocycles with respect to the signal frequency when tuning capacitors C-104, C-117AB and C-117CD are varied from minimum to maximum capacity. The oscillator circuits are aligned on the high side of the signal circuits on Bands 1 and 2 and on the low side of the signal circuits on Bands 3 and 4 as outlined in Paragraph 21.

The high potential end of the tuned circuit is connected to the control grid of H.F. oscillator tube V-102, through switch S-101D and fixed capacitor C-122. This grid is returned to the ground bus through resistor R-110. The low potential end of the tuned circuit is also returned to the ground bus. The cathode of the H.F. oscillator tube V-102 is connected to the tap of inductor T-109 through switch S-101D and through coupling capacitor C-121 to the oscillator injector grid of mixer tube V-103. This grid is returned to ground bus through resistor R-107. The plate of the H.F. oscillator tube V-102 is connected to the high voltage DC line through resistor R-111 and bypassed to ground by capacitor C-132A. One side of the heater circuit of the H.F. oscillator tube V-102 connects to the heater of V-105 bypassed to ground bus by capacitor C-132C. The other side of the heater connects to the heater of V-104.

7. I.F. AMPLIFIER CIRCUITS

The signal frequency arriving at the control grid of mixer tube V-103 and the H. F. oscillator frequency arriving at the injector grid of this tube are mixed (or heterodyned) and the resultant difference frequency (455 kilocycles) is fed to the input of the I.F. amplifier.

Transfer of IF signal from the plate of the mixer tube V-103 to second detector tube V-106 is accomplished by inductive coupling through IF transformers T-113, T-114, T-115 and amplified by tubes V-104 and V-105. First IF transformer T-113 consists of two tuned circuits, primary and secondary with the secondary tuned circuit operating in conjunction with switch S-102A and a tapped tertiary winding, to provide five degrees of selectivity by changing the coefficient of coupling with the primary circuit. The primary and secondary windings are each tuned to 455 kilocycles by fixed capacitors C-136 and C-137 and adjustable iron cores E-115 and E-116. These cores are accessible for adjustment through the top of the shield can for E-116 and at the bottom of the receiver for E-115. The high potential end of the primary tuned circuit connects to the plate of mixer tube V-103 through a shielded conductor while the low potential end connects to the high voltage DC line through resistor R-112, bypassed to ground by capacitor C-135C. The high potential end of the secondary tuned circuit is connected to the grid of first IF amplifier tube V-104 while the low potential end is connected to the AVC line through resistor R-113, bypassed to ground bus by capacitor C-144A. DC potential from the high voltage DC line is applied to the screen of first IF amplifier tube V-104 through resistor R-115, bypassed to ground by capacitor C-144B. Plate potential is applied through resistor R-116 bypassed by capacitor C-139C. Initial cathode bias is obtained through resistor R-114, bypassed to ground by capacitor C-135A. The suppressor is connected to the cathode. One side of the heater of the first IF amplifier tube V-104 is connected to the heater of V-102. The other side of the heater connects to the heater of mixer tube V-103.

Second IF transformer T-114 is identical to first IF transformer with respect to design, construction, and operating characteristics, accordingly, except for differences in symbol designations. The circuit description of first IF transformer T-113 is applicable to this transformer.

The circuit arrangement of second IF amplifier tube V-105 is the same, except for symbol designations as for first IF amplifier tube V-104 except that the grid is returned to ground bus instead of AVC. One side of the heater of second IF amplifier tube V-106 connects to the heater of V-102. The other side of the heater connects to the heater of V-111.

Third IF transformer T-115 consists of a tuned primary circuit and an untuned secondary. The primary circuit consists of the primary winding shunted by a fixed capacitor C-142 and permeability tuned by iron core E-119 which is accessible for adjustment at the bottom of the chassis. Plate potential is applied to the plate and screen of second IF amplifier tube V-105 through resistor R-118, bypassed to ground by capacitor C-139B. The high potential end of the secondary winding feeds the second detector diode while its low potential end connects to ground bus through diode load resistor R-119 and filter resistors R-120 and R-121.

8. SECOND DETECTOR CIRCUITS

Tube V-106 is a dual diode tube, one section V-106A, is used as a second detector, the plate of which is connected to the high potential end of the secondary winding of the third IF transformer T-115. The cathode is connected to ground bus, thus the tube acts as a half wave rectifier.

The second section, V-106B of twin diode V-106, is utilized as an AVC diode. Signal is fed from the primary of IF transformer T-115 to the plate of V-106B through capacitor C-150. This plate is returned to ground bus through load resistor R-129. Bias is applied to the cathode of V-106B to delay AVC action so that on weak signals the AVC is inoperative and the full sensitivity of the receiver may be utilized. The voltage developed across load resistor R-129 as a result of the demodulating action of AVC diode V-106B, is filtered by resistor R-127 and capacitor C-119A and the resultant DC voltage is used to control the gain of amplifier tubes V-101, V-103, V-104. The degree of control being dependent on the strength of the incoming signal.

DC potential from the AVC diode is further filtered by resistor and capacitor C-119B and applied to the control grid of electron-ray indicator V-111. This DC voltage regulates the shadow angle of the electron-ray tube to indicate when the receiver is tuned to resonance with the received signal.

9. NOISE LIMITER CIRCUIT

One section of twin triode V-107 is utilized as a peak noise limiter. When the noise limiter switch SW3 is set at "ON" position voltage from the second detector diode is applied to the grid of V-107A through a filter consisting of R-122 and C-119C, the time constant of this filter is long enough so that normal variations in modulation will not affect the input voltage yet short enough so that variations on voltage due to signal fading will be followed, thus providing automatic adjustment of the noise limiter circuit for different carrier levels.

Under normal conditions the cathode of V-107A is negative with respect to the ground bus by the voltage drop across R-119, R-120 and the grid is held more negative by the voltage drop across R-120 while the plate is positive by the voltage drop across R-123 in the cathode of the AVC diode V-106B.

Under these conditions the plate to cathode resistance is very high and very little conduction takes place until the modulation reaches approximately 85%. When the current through the diode load is suddenly greatly increased by a pulse of "Noise voltage" the cathode of V-107A will go more negative and the plate more positive but the grid will remain at the original potential due to the time constant of the filter R-122, C-119C. The cathode now becomes more negative than the grid, and the plate to cathode resistance becomes very low and bleeds off the peak voltage developed by the noise pulse.

10. A. F. AMPLIFIER CIRCUITS

The A.F. voltage developed across the diode load resistor R-119 as a result of the demodulating action of second detector diode V-106A, is applied to the control grid of first A.F. amplifier tube V-107B, through capacitor C-145 and A.F. gain potentiometer R-125.

Switch S-103 operates to transfer the audio input to volume control R-125 and hence the input circuit of the first A.F. amplifier tube V-107B, from the second detector circuit to "PHONO" terminals E-121 to permit the operation of the audio amplifier system of the receiver with a high impedance record player pick-up. Low impedance pick-ups may also be employed provided that their connection to terminals E-121 are made through suitable matching transformers.

Amplification of the A.F. signals from the second detector is accomplished by resistance-capacity coupling between first A.F. amplifier tube V-107B and output power amplifier tubes V-109 and V-110. Transfer of audio frequency energy from the plate of output amplifier tubes V-109 and V-110, to loud speaker terminal E-122 is accomplished through output transformer T-117 which matches the plate impedance of the tube with the 8 ohm output load with which the receiver is designed to work.

DC potential is applied to the plate of first A.F. amplifier tube V-107B through plate load resistor R-130 and filter resistor R-131, bypassed to ground bus by electrolytic capacitor C-148. Bias is applied to the cathode through resistor R-126 which returns to ground bus. One side of the heater of V-107 connects to the heater of V-101, the other side connects to one side of the power line.

A.F. signal from the plate of first audio tube V-107B, is transferred to the grid of second audio tube V-108 through capacitor C-147 and series resistor R-132. The grid of V-108B is returned to ground bus through resistor R-133.

The grid of V-108A is returned to ground bus through resistor R-135. DC potential is applied to the plate of V-108A through resistor R-137 and to the plate of V-108B through resistor R-136. Bias is provided for V-108B through resistor R-134 and for V-108A through resistor R-135 bypassed by C-149.

A.F. signal is transferred from the plate of V-108B to the grid of V-109 through capacitor C-152 and from the plate of V-108A to the grid of V-110 through capacitor C-153. The grid of V-109 is returned to ground bus through load resistors R-139, R-140 and filter resistor R-142. The grid of V-110 is returned to ground bus through load resistor R-140 and filter R-142. Resistors R-139 and R-140 in series are utilized as a voltage divider to supply the proper amount of audio signal to the grid of V-108A so that the signal output from the plates of V-108A and V-108B will be equal and 180 degrees out of phase thus providing push-pull signal input to the grids of the output tubes V-109, V-110.

DC potential is applied to the plates of output amplifier tubes V-109 and V-110 through output transformer T-117 primary which is center-tapped. The cathodes of V-109 and V-110 are returned to ground bus, through resistor R-143 bypassed by capacitor C-154. One side of the heater of V-109 connects to the heater of V-108, the other side connects to the heater of V-110, the other side of the heater of V-110 connects to the heater of V-112.

AF signal from the plate of V-109 is fed back to the cathode of V-108B through resistor R-138 and capacitor C-155 in series. This feedback arrangement is provided to supply more constant voltage output at the loudspeaker terminals thus providing more uniform frequency response from the loudspeaker.

Variable potentiometer R-152 and series connected capacitor C-151 constitute the control for regulating the fidelity of the audio amplifier system of the receiver. The series combination is connected from the plate of 1st audio tube V-108B to ground bus.

Output transformer T-117 is provided to transfer the A.F. signal from the audio amplifier of the receiver to the loudspeaker connections.

11. RECTIFIER POWER CIRCUITS

The Scott Export Radio Receiver is designed for AC-DC operation, therefore, no power transformer is used. The heaters of all tubes are connected in series in two circuits. In one circuit V-101, V-107, V-108, V-110, V-109 and V-112 are connected in series with resistor R-105. The other heater circuit consists of V-102, V-106, V-105, V-103, V-104 and V-111 in series with resistor R-151.

Rectifier tube V-112 is utilized to supply DC potential for operation of the receiver when used with an AC power source. The pulsating DC potential from the cathodes of V-112 is filtered by iron core inductor L-102 and electrolytic capacitors C-156, C-157 and C-158.

The two lamps used for lighting the dial scale are connected in series across resistor R-150. If one of these lamps burns out, both lamps will go out until the defective lamp is replaced.

NOTE: WHEN REPLACING THESE LAMPS MAKE CERTAIN THE REPLACEMENT LAMP IS RATED AT 6-8 VOLTS .25 AMP OR BLUE BEAD TYPE.

INSTALLATION AND INITIAL ADJUSTMENTS

12. UNPACKING THE EQUIPMENT

After unpacking the equipment, it should be inspected for any possible damage that might have resulted from careless handling in transit. Make certain that all vacuum tubes are firmly seated in their sockets.

13. INSTALLATION

The necessary hardware for installing the receiver and loudspeaker in the cabinet is included in the chassis carton.

The loudspeaker should be installed first, and is accomplished by placing the speaker on the four bolts which are already fastened into the speaker baffle. The speaker is then fastened down using the four nuts and washers furnished. NOTE: DO NOT draw the speaker down too tight against the baffle as the frame may be distorted and misalign the voice coil.

The escutcheons for the dial and tuning indicator should be mounted next, centering the escutcheons in the panel cutout provided and fastening them down with the small wood screws provided.

The receiver can now be mounted in the cabinet, pushing it forward until the knob escutcheon plate hits the back of the panel. Then center the dial calibration scale in the escutcheon opening and fasten the receiver in place using the right and left hand brackets and wood screws furnished. These brackets are mounted at the rear corners of the chassis. Connect the two speaker leads to the terminals marked speaker, the power connection and antenna connections are made as outlined below.

14. CONNECTIONS TO RECEIVER

14.1 Power Connections

The receiver may be operated from a 115 volt DC supply or 115 volts 60 cycle single phase power source. Connection to the power source should be made by means of the plug and cord furnished with the receiver. CAUTION: When a DC power source is used, if the power plug is inserted in the wall receptacle with the wrong polarity the set will not operate. Therefore when operating the receiver on DC power if the receiver fails to work after being turned on, reverse the power plug. On an AC power source the receiver will operate with the plug inserted either way, although in some instances the hum level may be lower if the plug is inserted one way.

14.2

Antenna and ground connections are made to the receiver through the terminal strip furnished on the receiver. Connections should be made as outlined in Paragraph 2.4.

14.3 Loudspeaker Connections

Terminals are provided at the rear of the receiver for connection of the loudspeaker which has an input impedance of 8 ohms. It is not necessary to observe polarity when connecting the loudspeaker.

14.4 Record Player Connections

A record player pickup may be connected to the terminals marked "PHONO" located at the rear of the chassis. If the pickup is high impedance such as a crystal, direct connection may be made. If the pickup is low impedance, a matching transformer must be used.

14.5 Installation Inspection

Before turning the receiver on, inspect all connections to ascertain that they have been properly made. Then set the panel controls as follows:

1. Sensitivity control set at zero.
2. Tone control set at maximum.
3. Volume control set at zero.
4. Band selector control set to frequency band in which signals are desired.
5. N.L. control to center "OFF" position.
6. Selectivity control to No. 1 position.

The equipment is now ready for operation and is turned on by means of switch S-104 when set at "Power" position.

Section IV OPERATION

15. OPERATION OF CONTROLS

All switches and controls (with the exception of the main tuning control) of the radio receiver are identified by panel engraving.

For reception of broadcast signals the following procedure should be followed:

1. Set Power switch to "Power" position.
2. Set Band Selector control to frequency band in which the desired signal is located.
3. Set Selectivity control at No. 1 position.
4. Set N.L. control to "OFF" position.
5. Set Sensitivity control to maximum position.
6. Advance Volume control to suitable noise level.

7. Tune the receiver to the approximate station frequency by means of the main tuning control. Slowly rotate the tuning knob back and forth until the signal is properly tuned in as indicated by tuning indicator tube.

8. Adjust the Volume control to the proper output level.

9. Adjust the Tone control to the desired position to eliminate background noise.

When the Sensitivity control is turned counterclockwise the sensitivity of the receiver is decreased. By turning this control back the inter-station noise level can be cut down or eliminated when it is desired to receive the more powerful local stations.

If conditions of reception are such that peak noise levels interfere with received signals, the N.L. control should be set to the N.L. "ON" position. Under these conditions the peak noises will be chopped off and signals may be received through heavy interference.

In order to widen the IF selectivity and pass a wider band of frequencies for better fidelity, the Selectivity control should be set at No. 2, 3, 4 or 5 position to suit conditions.

CORRECTIVE MAINTENANCE

16. When servicing the Export Radio Receiver the first step should be a complete check of all tubes. This can be accomplished easily by replacing one at a time with tubes of known good quality. All tubes which are not defective should be reinserted in the socket from which they were taken. Failure of a vacuum tube in the receiver may reduce the sensitivity, cause intermittent operation or cause the receiver to be completely inoperative. Since the heaters of the vacuum tubes in the receiver are connected in series, in two strings, if one tube in a string burns out all the tubes in that string will be inoperative until the defective tube is replaced.

17. FAILURE OF THE RADIO RECEIVER

In case of failure or breakdown of the receiver the fault must first be localized in one portion of the circuit. This can be accomplished by observation of some peculiar action of one of the controls or by checking the receiver against test data tabulated in Tables 1 and 2. It must be remembered that resistance or voltage checks will not positively locate certain faults. For instance, an open circuited by-pass capacitor will not appear in point to point resistance tests and may introduce regeneration or oscillation in certain circuits which effect the stage gain of other circuits. Similarily, a short circuit occuring in a low resistance inductor will not appear in a point to point resistance test and if the short appears in an R.F. coil, a false indication of the necessity for realignment may result.

EXPORT RECEIVER

SCOTT RADIO LABS., INC.

Table 1 Tube Socket Voltages

Symbol	Type	1	2	3	4	5	6	7	8
V-101	6K7	0.0	17 AC	98	98	2.5	0.0	11AC	2.5
V-102	12J5	0.0	34 AC	100	0.0	-10.5	0.0	45 AC	0.0
V-103	12SA7	0.0	22 AC	100	86	-2.4	2.4	10.5 AC	.05
V-104	12SK7	0.0	34 AC	2	-2	2	88	22 AC	96
V-105	12SK7	0.0	56 AC	4.2	0.0	4.2	98	45 AC	98
V-106	12H6	0.0	0.0	-.3	0.0	0.0	0.0	10.5 AC	1.05
V-107	12SN7GT	-.6	1.05	0.6	0.0	42	1.65	11 AC	0.0
V-108	12SN7GT	0.0	48	1.7	0.0	40	1.4	17 AC	29.5 AC
V-109	25L6GT	0.0	29.5 AC	100	100	0.0	0.0	56 AC	8
V-110	25L6GT	0.0	80.5 AC	100	100	0.0	0.0	56 AC	8
V-111	1629	0.0	68 AC	100	100	0.6	100	56 AC	0.0
V-112	25Z6GT	0.0	80.5 AC	0.0	106	0.0	0.0	109 AC	106 AC

All readings are measured from socket contacts to common ground bus with voltohmyst meter.

Adjust controls as follows:

Sensitivity	Max.
Volume	Min.
Tone	Max.
Band	Band 1
N.L.Control	Off
Selectivity	Sharp

Table 2 Tube Socket Terminal Resistance Table

Symbol	Type	1	2	3	4	5	6	7	8
V-101	6K7	0.0	-	10260	12100	330	0.0	-	330
V-102	12J5	0.0	-.	9920	-	47000	-	-	50
V-103	12SA7	0.0	-	10380	12100	20000	270	-	3.67 Meg
V-104	12SK7	0.0	-	220	3.67 Meg	220	15300	-	10380
V-105	12SK7	0.0	-	680	4.7	680	10380	-	10380
V-106	12H6	0.0	-	.118 Meg	0.0	2.2 Meg	0.0	-	10000
V-107	12SN7GT	1.12 Meg	10000	-	0.0	76700	1800	-	-
V-108	12SN7GT	.125 Meg	56700	1000	75000	56700	1500	-	-
V-109	25L6GT	0.0	-	9800	9700	.145 Meg	-	-	125
V-110	25L6GT	0.0	-	9800	9700	.24 Meg	-	-	125
V-111	1629	-	-	2.2 Meg	9700	4.2 Meg	9700	-	0.0
V-112	25Z6GT	-	-	55	9770	55	-	-	9770

All readings are measured from socket terminal to the common ground bus.

Table 3 TROUBLE LOCATION CHART

Symptom	Cause	Remedy
Weak or dead on all bands	Blown fuse	Replace from spares
	Defective tube	Replace from spares or stock
	Dial lamp burned out	Replace from spares
	Socket voltages wrong	Check associated bypass capacitors
		Check continuity of wiring and components
		Check resistors and switch contacts
	No signal	Check receiver stage by stage
		Check for disconnected or broken antenna connections
Weak or dead one band only	No signal	Check all coils on specific band
		Check switch contacts
Noisy Reception	Defective tube	Tap all tubes lightly and replace any that are noisy
	Defective antenna	Check antenna installation and connection
	Defective component	Tap all components lightly with insulated rod, check carefully suspected parts
Oscillation	Defective tube	Replace tubes one at a time
	Open bypass capacitor	Connect good capacitor across suspected unit, temporarily. Replace defective unit
Hum	Defective tube	Replace tubes one at a time
	Defective filter capacitor	Replace defective unit
	Defective bypass capacitor	
	Improper power source connection	Reverse power input connection

Bypass or filter capacitors, which develop poor internal connections or which become open-circuited, will cause decreased sensitivity and/or poor stability. An open unit can be located by temporarily connecting a good capacitor in parallel with the unit under suspicion. Failures of any bypass or filter capacitor may seriously overload resistors of associated circuits. Overloads of sufficient magnitude to permanently damage a resistor will cause the painted surface of the resistor to be scorched, making the defective unit easy to locate by visual inspection.

Loose connections, causing intermittent or noisy operation, and which cannot be found by point to point resistance tests, can usually be located by individually testing each circuit element, or by tapping or shaking the component under suspicion, when the receiver is adjusted for normal operation.

18. VOLTAGE AND RESISTANCE TESTS

Table 1 lists the tube socket voltages for various settings of the controls. All voltages are measured between the GROUND BUS and socket terminals. Voltage measurements listed are made with an electronic voltmeter such as the voltohmyst using the scale that can be most easily read. The receiver should be connected for normal operation and the controls adjusted as listed in Table 1. Line voltage should be 115 volts AC or DC. Resistance measurements are listed in Table 2. All resistance measurements are made between ground bus and terminal. The most suitable scale for the measurement being taken, should be used. The receiver should be disconnected from the power source with controls adjusted as listed in Table 1.

19. ALIGNMENT DATA

Should realignment of the Scott Export Radio Receiver become necessary, the following alignment data should be carefully studied before making any circuit adjustments. It is important that the operator understand the functions of each circuit element so that correct alignment may be made quickly and accurately.

All alignment and measurements may be made with a signal generator capable of producing both a 30% 400 cycle modulated signal or an unmodulated signal between 400 kilocycles and 25 megacycles and a General Radio Type 583A or equivalent output meter. For RF alignment and measurements at the antenna input a Standard RMA dummy antenna as shown in Figure 4 should be used.

Before proceeding with the alignment of any circuit of the receiver, the chassis must be removed from the cabinet, and the bottom cover plate of the chassis removed. For IF alignment the bottom cover shield of the oscillator-converter compartment must be removed.

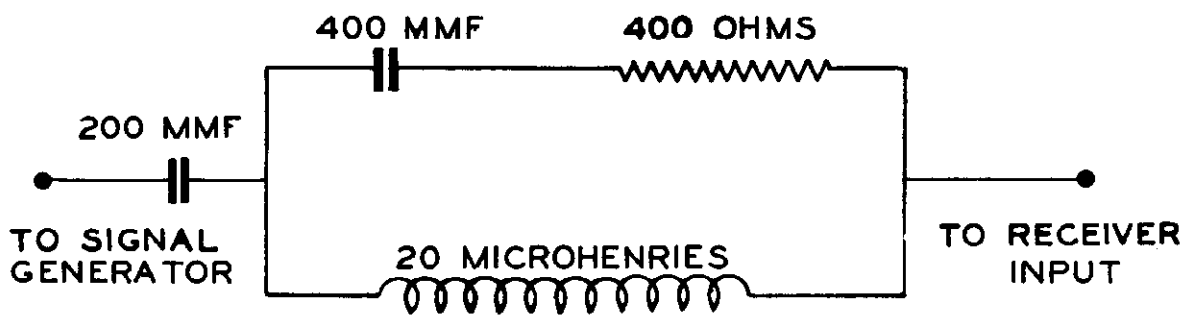


Figure 4 Schematic Diagram RMA Standard Dummy Antenna

The receiver must be connected to a 115 volt AC or DC power source and the controls set as follows unless otherwise noted.

Control	Position	Control	Position
Power Switch	Power	Tone	Maximum
Sensitivity	Maximum	Band Selector	As Noted
Volume	As Noted	N.L. Control	Off
		Selectivity	Sharp (1)

The complete alignment of the radio receiver may be divided into three steps.

1. I.F. Amplifier Alignment
2. High Frequency Oscillator Alignment
3. Radio Frequency Amplifier Alignment

NOTE: THE CIRCUITS MUST BE CHECKED IN THE ABOVE ORDER WHEN COMPLETE ALIGNMENT IS NECESSARY.

20. I.F. AMPLIFIER ALIGNMENT

The intermediate frequency of the radio receiver is 455 kilocycles.

Tuning adjustments are provided in each I.F. transformer. These adjustments consist of adjustable iron cores and are designated by symbol numbers E-115 to E-119 inclusive as indicated on Schematic Diagram, Figure 7.

The high potential lead of the signal generator should be connected to the control grid (terminal No. 8) of the mixer tube V-103 through a .01 mfd. capacitor and the ground lead to any metal part of the chassis.

The frequency of the signal generator should be carefully adjusted to 455 kilocycles modulated 30% at 400 cycles and the signal input to mixer tube V-103, adjusted to provide a reading on the output meter. Starting with the Third I.F. transformer the trimmers should be adjusted in the following order: E-119, E-118, E-117, E-116 and E-115.

NOTE: IT IS ESSENTIAL THAT THE INPUT SIGNAL FROM THE SIGNAL GENERATOR, BE KEPT BELOW THE THRESHOLD OF OPERATION OF THE AUTOMATIC VOLUME CONTROL. EXCESSIVE SIGNAL INPUTS WHICH WILL CAUSE OVERLOAD OF EITHER THE SECOND DETECTOR OR AUDIO CIRCUITS SHOULD ALSO BE AVOIDED.

The performance of the I.F. amplifier can be checked against the following data. For an audio output of .5 watt across an 8 ohm load (2 volts) the following input values should not be exceeded, if the I.F. amplifier is in proper operating condition.

V-103 grid	50	Microvolts
V-104 grid	1000	Microvolts
V-105 grid	50000	Microvolts

21. R. F. AND H. F. OSCILLATOR ALIGNMENT

CAUTION: READJUSTMENT OF THE H.F. OSCILLATOR CIRCUIT TRIMMERS SHOULD NOT BE ATTEMPTED UNTIL AFTER THE NEED FOR SUCH READJUSTMENT HAS BEEN POSITIVELY ESTABLISHED.

Table 3 gives the alignment frequency, trimmer adjustment and nominal sensitivity for each of the four frequency bands.

The signal generator should be connected through a Standard RMA dummy antenna to the antenna-ground input terminals. A 400 cycle, 30% modulated signal should be used. The receiver controls should be adjusted as listed in Paragraph 19 with the band selector control set to the desired frequency band.

It is important that the H.F. oscillator circuits operate at a higher frequency than that of the RF amplifier circuit on Bands 1 and 2 and at a lower frequency than the RF amplifier circuits on Bands 3 and 4. The correct operating point can be checked by leaving the signal generator set at the alignment frequency and on Bands 1 and 2 the image signal should appear 910 KC lower in frequency on the dial if the oscillator is correctly aligned. On Bands 3 and 4 the image should appear 910 KC higher in frequency on the dial. It may be necessary to increase the signal output of the generator in order to pickup the image signal.

The following general procedure should be employed in the alignment of the H.F. oscillator and R.F. amplifier circuits. Set signal generator to high frequency alignment point of desired band. Set radio dial to high frequency alignment point and adjust corresponding trimmer adjustments for maximum output. Repeat this procedure for the low frequency alignment point.

The alignment of the R.F. and oscillator circuits may be considered satisfactory if the signal input necessary to produce a 500 milliwatt output, measured across an 8 ohm load at the speaker terminals, does not exceed the values given in Table 3.

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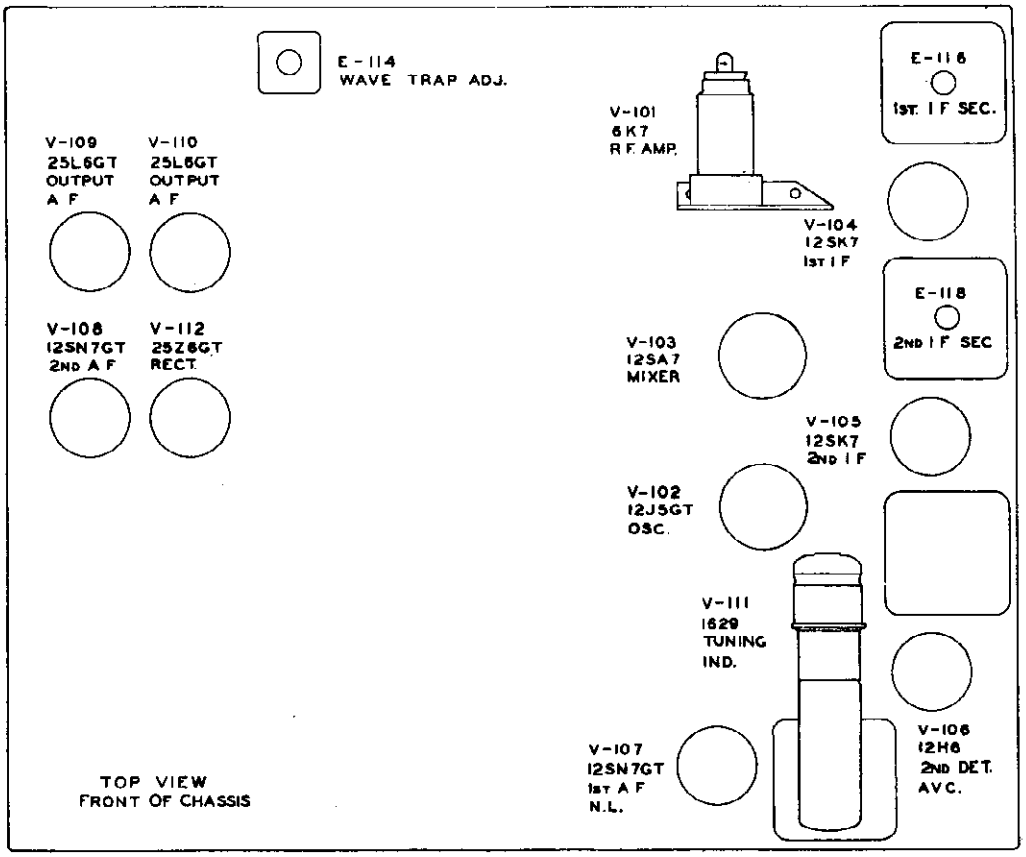

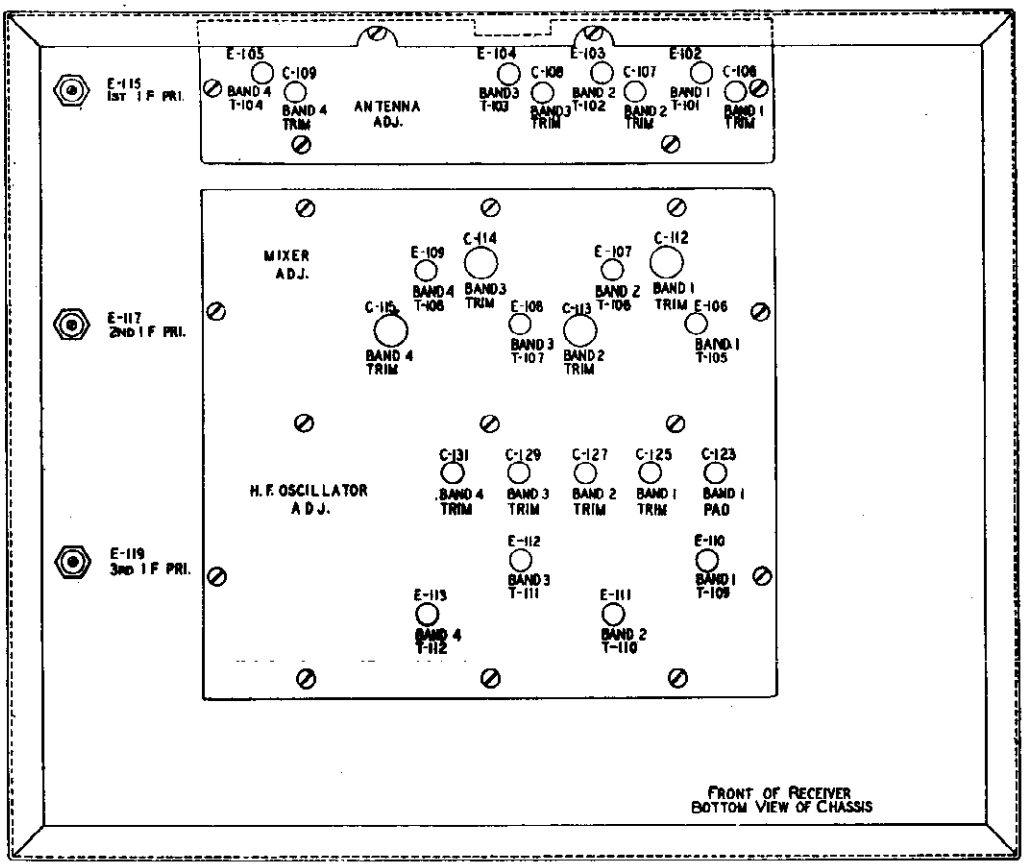

Figure 5 Trimmer Positions and Tube Location

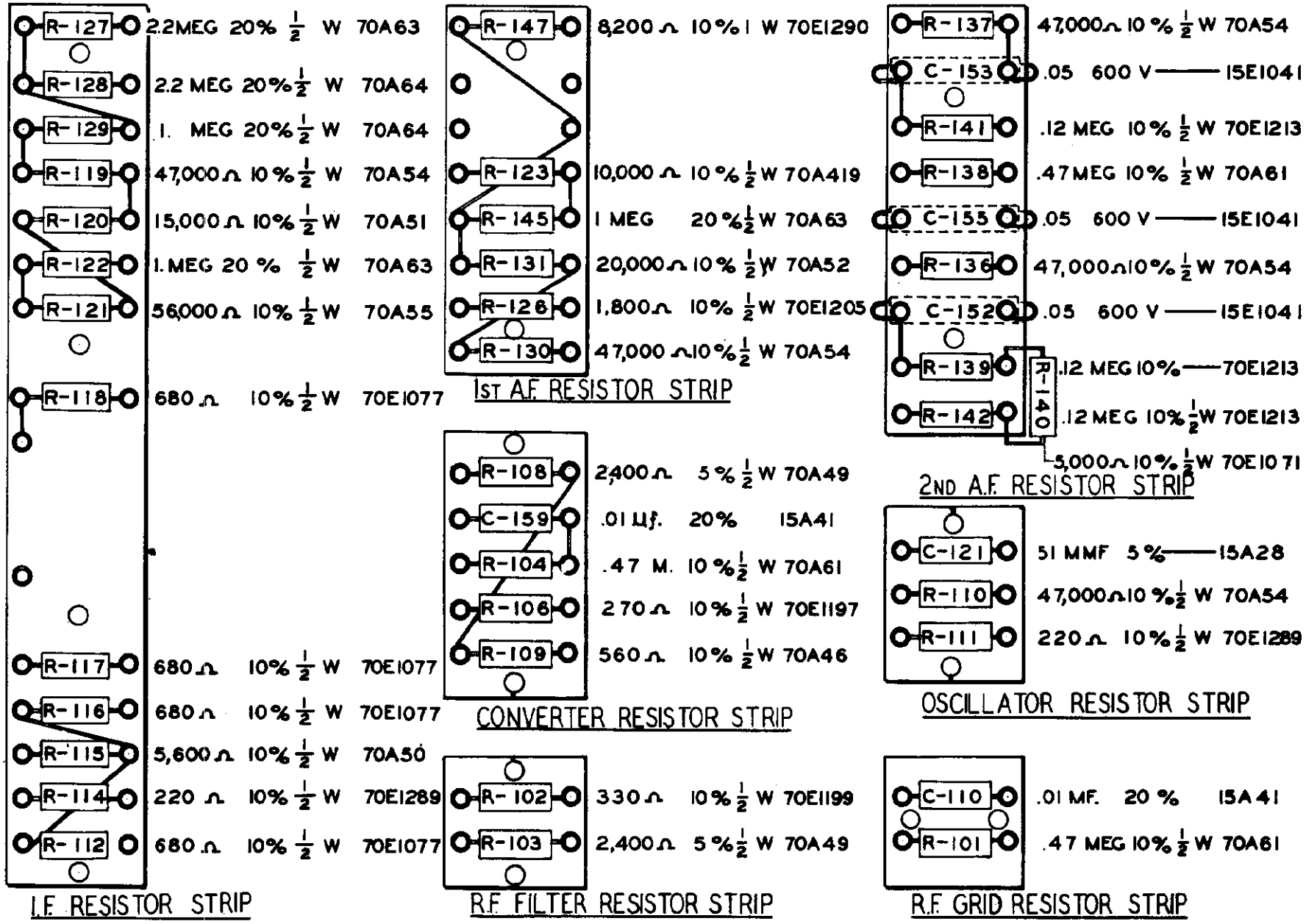

Figure 6 Resistor Strip Layout

Sensitivity measurements are made at a 10 to 1 signal to noise ratio as follows:

With the signal generator and receiver set to the same frequency, turn off the signal generator modulation; adjust the signal generator output to 10 microvolts; adjust the A.F. gain control on the receiver to give an output reading of 50 milliwatts, .63 volts across an 8 ohm load. Turn the signal generator modulation on and adjust the signal generator output control to give an output reading from the receiver of .5 watt (2 volts). Repeat this procedure as a check. Then the output reading of the signal generator will be the sensitivity of the receiver at a 10 to 1 signal to noise ratio.

NOTE: The sensitivity control should be set at maximum position when making the above measurements.

TABLE 4

Alignment Data

Band	Freq.	Adjustment			Nominal Sensitivity
		Osc.	Mixer	Ant.	
1	1400 KC 1000 KC 600 KC	C-125 E-110 C-123	C-112 E-106	C-106 E-102	10 uv
2	7.5 MC 3.5 MC	C-127 E-111	C-113 E-107	C-107 E-103	10 uv
3	13.5 MC 9.0 MC	C-129 E-112	C-114 E-108	C-108 E-104	10 uv
4	22.6 MC 15 MC	C-131 E-113	C-115 E-109	C-109 E-105	10 uv

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Parts List By Symbol Designation

Symbol Desig.	Function	Description	Part Number
		CAPACITORS	
C-101	L-101 tuning	Capacitor, silver mica, 200 MMF 5%, 500 V DC wkg., bakelite case	15E1257
C-102	Antenna series	Capacitor, mica, .01 MF 20% 300 V DC wkg.,bakelite case	15A427
C-103	V-101 grid coupling	Capacitor, mica, 240 MMF 10%, 500 V DC wkg.,bakelite case	15A31
C-104 C-104A C-104B	Antenna tuning	Capacitor, variable air, single unit, split stator Section"A" 17 plates, min. cap 12 MMF, max. cap 262 MMF. Section "B" 9 plates, min.cap. 9 MMF max.cap.134 MMF. Air gap .015", shaft: 3/8" dia. x 1 3/32 long	15E1280
C-105	C-104B shunt on Bands 2, 3,4	Capacitor, silver ceramic, 10 MMF 10%, 500 V DC wkg., insulated, pigtail leads	15A22
C-106	T-101 secondary trimmer	Capacitor, ceramic trimmer, min.cap. 1.5 MMF, max.cap. 10 MMF, 500 V DC test	15E1284
C-107	T-102 secondary trimmer	Capacitor, ceramic trimmer, min.cap. 4.5 MMF, max.cap. 25 MMF, 500 V DC test	15A21
C-108	T-103 secondary trimmer	Same as C-107	
C-109	T-104 secondary trimmer	Same as C-107	
C-110	V-101 grid return bypass	Capacitor, mica, .01 MF 20% 300 V DC wkg., CM35 case	15A41
C-111 C-111A C-111B	Section "A", V-101 cathode bypass Section "B", V-101 screen bypass	Capacitor, paper, 0.1/0.1 MFD 10%, 600 V DC wkg., bathtub container 1 13/16" long x 1" wide x 7/8" high, mtg centers 2 1/8",hermetically sealed	15B796
C-112	T-105 secondary trimmer	Same as C-106	
C-113	T-106 secondary trimmer	Same as C-107	
C-114	T-107 secondary trimmer	Same as C-107	
C-115	T-108 secondary trimmer	Same as C-107	
C-116	V-103 grid coupling	Same as C-103	
C-117 C-117A C-117B C-117C C-117D	Sections "A" and "B" mixer tuning Sections "C" and"D" H.F. oscillator tuning	Capacitor, variable air, 2 unit, split stator, Section "A" both units 17 plates, min.cap. 12 MMF, max.cap. 262 MMF. Section "B" both units, 9 plates, min.cap. 9 MMF, max.cap. 134 MMF,air gap.015",shaft at both ends 3/8"dia., 1 3/32" long at rear, 2 3/4"long at front	15E1281

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SCOTT RADIO LABS., INC.

Parts List By Symbol Designation

Symbol Desig.	Function	Description	Part Number
	CAPACITORS (Continued)		
C-118	Ground bus to chassis ground at V-103 socket	Same as C-110	
C-119	Section "A" V-107 #1 grid	Capacitor, paper, 2 x .05 MFD 10%, 600 V DC wkg., bathtub container, 1 13/16" long x 1" wide x 7/8" high, hermetically sealed	15A11
C-119A	Section "B" V-111 grid filter		
C-119B	Section "C" N.L. grid filter		
C-119C	Section "A" V-103 heater bypass		
C-120	Section "B" V-103 cathode bypass	Same as C-111	
C-120A	V-102 cathode to V-103 osc. grid coupling		
C-120B	V-102 grid coupling	Capacitor, silver mica, 51 MMF 5%, 500 V DC wkg., bakelite case, pigtail leads	15A28
C-121	T-109 variable pad	Same as C-121	
C-122	T-109 fixed pad	Capacitor, variable air trimmer, min.cap. 6.5 MMF, max.cap. 100 MMF, 28 plates ¼" hex adj. shaft with screwdriver slot	15B862
C-123	T-109 trimmer	Capacitor, silver mica, 560 MMF 5%, 500 V DC wkg., bakelite case, pigtail leads	15E1283
C-124	T-110 fixed pad	Capacitor, variable air trimmer, min.cap. 3 MMF, Max.cap. 25 MMF, 7 plates, ¼" hex adj. shaft with screwdriver slot	15A18
C-125	T-110 trimmer	Capacitor, silver mica, 3000 MMF 5%, 500 V DC wkg., bakelite case, pigtail leads	15A38
C-126	Bypass from case of C-139 to ground bus.	Same as C-125	
C-127	T-111 trimmer	.005 MF mica 300 V DC wkg.	15E1263
C-128	Ground bus to chassis bypass at V-102	Same as C-125	
C-129	T-112 trimmer	Same as C-110	
C-130	Section "A", V-102 plate bypass	Same as C-125	
C-131	Section "B", V-102 plate filter	Same as C-119	
C-132	Section "C", heater bypass at V-102 socket		
C-132A	T-104 secondary shunt		
C-132B			
C-132C			
C-133		Capacitor, silver ceramic, 20 MMF 10%, 500 V DC wkg., N.P.O.	15B864

Parts List By Symbol Designation

Symbol Desig.	Function	Description	Part Number
	CAPACITORS (Continued)		
C-134 C-134A C-134B C-134C	Section "A",V-103 screen bypass Section "B", +B bus bypass Section "C", V-101 plate return bypass	Same as C-119	
C-135 C-135A C-135B C-135C	Section "A", V-104 cathode bypass Section "B", sensitivity control bypass Section "C", V-103 plate bypass	Same as C-119	
C-136	T-113 primary tuning	Same as C-101	
C-137	T-113 secondary tuning	Capacitor, silver mica, 240 MMF 5%,500 V DC wkg., bakelite case, pigtail leads	15B602
C-138 C-138A C-138B	Section "A", ground bus to chassis bypass at V-106 Section "B", ground bus to chassis bypass at Pin 8 of V-107	Capacitor, paper, 0.1/0.1 MFD 600 V DC wkg., bathtub container, 1 13/16" long x 1" wide x 7/8" high,mounting centers 2 1/8"	15E2573
C-139 C-139A C-139B C-139C	Section "A", V-105 cathode bypass Section "B", V-105 screen and plate filter Section "C", V-104 plate filter	Same as C-119	
C-140	T-114 primary tuning	Same as C-137	
C-141	T-114 secondary tuning	Same as C-137	
C-142	T-115 primary tuning	Capacitor, silver mica, 100 MMF 5%, 500 V DC wkg.,bakelite case, pigtail leads	15A428
C-143	V-106A diode filter	Capacitor, mica 100 MMF 10% 500 V DC wkg., bakelite case, pigtail leads	15A29
C-144 C-144A C-144B	Section "A", V-104 grid return bypass Section "B", V-104 screen filter	Capacitor,paper, .05/.05 MF 10%, 600 V DC wkg, bathtub container, hermetically sealed	15A11
C-145	S-103 to volume control R-125 coupling	Same as C-102	
C-146	AVC diode cathode bypass	Same as C-143	
C-147	V-107B plate to V-108B grid coupling	Capacitor, paper,.05 MF 10% 600 V DC wkg.,tubular paper case, pigtail leads	15E1041

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Parts List By Symbol Designation.

Symbol Desig.	Function	Description	Part Number
		HARDWARE (Continued)	
H-102	Band change switch shaft coupling	Same as H-101	
H-103	Selectivity switch shaft coupling	Same as H-101	
H-104	Dial to main tuning capacitor coupling	Coupling,insulated,for 3/8" dia. and 1/4" dia. shaft, 1 1/8"long, 1 25/32" dia., phenolic insulator ring	25E2580
H-105	Single and double unit main tuning capacitor coupling	Coupling, insulated, for 3/8"dia.shaft, 1" long x 1 25/32" dia., phenolic insulating ring	25A301
H-106	#8 set screw wrench	Wrench, 5/64"x 1 7/8"long for #8 hollow head set screws	94B810
H-107	Main tuning capacitor coupling	Coupling, flexible for 3/8" dia., shaft, 1" long x 1 25/32" dia.	25E2430
		INDICATING DEVICES	
I-101	Dial lamp	Lamp, 6-8 volt, 0.15 amp miniature bayonet base	49E899
I-102	Dial lamp	Same as I-101	
		JACKS AND RECEPTACLES	
J-101	Fuse holder for power input fuse	Receptacle, extractor type, fuse holder, mounts in 1/2" hole	67A192
		INDUCTORS RF AND AF	
L-101	455 KC wavetrap	RF inductor,195 T 7/41 litz wire,universal wound, 0.51 MH at 1000 CPS DC resistance 5.87 ohms 10%includes C-101	20E2379
L-102	Power supply filter choke	Filter reactor, 4.5 H at 3 V 60 CPS with 150 MA DC., DC resistance 70 ohms, 2060 turns #28 E wire, hermetically sealed	17E1339
		LOUDSPEAKERS	
LS-101	Loudspeaker	Loudspeaker, 12 inch PM, 8 ohm voice coil, 3 ft wire leads with terminal lugs	85E2418A

Parts List By Symbol Designation

Symbol Desig.	Function	Description	Part Number
		MECHANICAL PARTS, SHAFTS	
O-101	Selectivity switch extension shaft	Shaft, 1/4" dia. x 10 1/4" long, flat on 2 sides, .187 thick, steel	79E1356
O-102	Band change switch shaft	Shaft, 1/4" dia. x 9 1/2" long, flat on 2 sides, .187 thick, steel	79E1357
O-103	Band change switch shaft for antenna section	Shaft, 1/4" dia. x 3 1/8" long, flat on 2 sides, .187 thick, PBG bakelite, wax impregnated	79E2425
		PLUGS	
P-101	Power input plug	Plug, 2 contact, male	65B679
		RESISTORS	
R-101	V-101 grid return	Resistor, composition, 0.47 meg 10%, ½ watt, pigtail terminals	70A61
R-102	V-101 cathode bias	Resistor, composition, 330 ohms 10%, ½ watt, pigtail terminals	70E1199
R-103	V-101 screen filter	Resistor, composition, 2400 ohms 5%, ½ watt, pigtail terminals	70A49
R-104	V-103 grid return	Same as R-101	
R-105	Not used		
R-106	V-103 cathode bias	Resistor, composition, 270 ohms 10%, ½ watt, pigtail terminals	70E1197
R-107	V-103 oscillator grid return	Resistor, composition, 20000 ohms 5%, ½ watt, pigtail terminals	70A52
R-108	V-103 screen filter	Same as R-103	
R-109	V-101 plate filter	Resistor, composition, 560 ohms 10%, ½ watt, pigtail terminals	70A46
R-110	V-102 grid return	Resistor, composition, 47000 ohms 10% ½ watt, pigtail terminals	70A54
R-111	V-103 plate load	Resistor, composition, 220 ohms 10%, ½ watt, pigtail terminals	70E1289
R-112	V-103 plate filter	Resistor, composition, 680 ohms 10%, ½ watt, pigtail terminals	70E1077

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SCOTT RADIO LABS., INC.

Parts List By Symbol Designation

Symbol Desig.	Function	Description	Part Number
	RESISTORS (Continued)		
R-113	V-104 grid return	Same as R-101	
R-114	V-104 cathode bias	Same as R-111	
R-115	V-104 screen filter	Resistor, composition, 5600 ohms 10%, ½ watt, pigtail terminals	70A50
R-116	V-104 plate filter	Same as R-112	
R-117	V-105 cathode bias	Same as R-112	
R-118	V-105 plate filter	Same as R-112	
R-119	V-106 diode load	Same as R-110	
R-120	V-106 diode filter	Resistor, composition, 15,000 ohms 10%, ½ watt, pigtail terminals	70A51
R-121	V-106 diode filter	Resistor, composition, 56,000 ohms 10% ½ watt, pigtail terminals	70A55
R-122	Noise limiter filter	Resistor, composition, 1 meg 20%, ½ watt, pigtail terminals	70A63
R-123	Diode bias V-106 AVC	Resistor, composition, 10,000 meg 10%, ½ watt, pigtail terminals	70A419
R-124	Phono input shunt	Resistor, composition, 0.1 meg 10%, ½ watt, pigtail terminals	70A58
R-125	Volume control	Potentiometer, composition, 0.25 meg 20%, 0.4 watt, clockwise logarithmic taper, cover insulated from mtg bushing and connected to left hand terminal, shaft 2" long	70E1285
R-126	V-107B cathode bias	Resistor, composition, 1800 ohms 10%, ½ watt, pigtail terminals	70E1205
R-127	AVC filter	Same as R-128	
R-128	V-111 grid filter	Resistor, composition, 2.2 meg 20%, ½ watt, pigtail terminals	70A64
R-129	AVC diode filter	Same as R-122	
R-130	V-107B plate load	Same as R-110	
R-131	V-107B plate filter	Same as R-107	
R-132	V-108B grid series	Resistor, composition, .12 meg 10%, ½ watt, pigtail terminals	70E1213
R-133	V-108B grid return	Resistor, composition, 75,000 ohms 10%, ½ watt, pigtail terminals	70A56

Parts List By Symbol Designation

Symbol Desig.	Function	Description	Part Number
	RESISTORS (Continued)		
R-134	V-108B cathode bias	Resistor, composition, 1500 ohms 10%, ½ watt, pigtail terminals	70A48
R-135	V-108A cathode bias	Resistor, composition, 1000 ohms 10%, ½ watt, pigtail terminals	70A47
R-136	V-108B plate load	Same as R-110	
R-137	V-108A plate load	Same as R-110	
R-138	V-109 plate feedback	Same as R-101	
R-139	V-109 grid return	Same as R-132	
R-140	V-109 grid return	Resistor, composition, 5000 ohms 10%, ½ watt, pigtail terminals	70E1071
R-141	V-110 grid return	Same as R-132	
R-142	V-109 and V-110 grid return	Same as R-132	
R-143	V-109 and V-110 cathode bias	Resistor,wirewound,125 ohms 5%,5 watt,pigtail terminals	70E2447
R-144	Dial lamp series	Resistor,composition, 10 ohms 10%, ½ watt, pigtail terminals	70A42
R-145	AVC diode bleeder	Same as R-122	
R-146	V-111 triode plate series	Same as R-129	
R-147	Sensitivity control bleeder	Resistor, composition, 8200 ohms 10%, 1 watt, pigtail terminals	70E1290
R-148	Sensitivity control	Potentiometer,wirewound, 1500 ohms 10%, 4 watts, linear taper, shaft 1/4" dia. x 2" long	70E1287
R-149	Not used		
R-150	Vacuum tube heater series	Resistor,wirewound,50 ohms 5%, 15 watts, pigtail terminals	70E2449
R-151	Vacuum tube heater series	Resistor, wirewound, 310 ohms 5%, 20 watts, pigtail terminals	70E2448
R-152	Tone control	Potentiometer,composition, 0.25 meg 20%, 0.4 watt, clockwise logarithmic taper, shaft 1/4" dia. x 2" long	70E1286

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Parts List By Symbol Designation

Symbol Desig.	Function	Description	Part Number
		SWITCHES	
S-101A	Antenna primary circuit switch	Switch section, 2 pole, 4 position, rotary type, ceramic wafer, silver contacts	89E1299-1
S-101B	Antenna secondary circuit switch	Switch section, 2 pole, 4 position, rotary type, ceramic wafer, silver contacts	89E1299-1A
S-101C	Mixer circuit switch	Switch section, 2 pole, 4 position, rotary type, ceramic wafer, silver contacts	89E1299-2A
S-101D	Oscillator circuit switch	Same as S-101B	
S-102A	First IF amp.selectivity switch	Switch section, 2 pole, 5 position, rotary type, ceramic wafer, silver contacts	89E1292-1
S-102B	Second IF amp. selectivity switch	Same as S-102A	
S-103	Noise limiter and phono-radio switch	Switch section, 3 pole, 3 position, rotary type, bakelite wafer, silver contacts	89E1600-1
S-104	Power switch	Toggle switch, D.P.S.T., 3 A, 125 V DC, silver plated contacts	89E1329
		TRANSFORMERS RF, AF AND POWER	
T-101	Band 1 antenna transformer	RF Transformer Pri.-175 T #34 SCE wire on 1" dia.form, DC resistance 14 ohms, universal wound Sec. 97½ T #34 SCE wire progressive universal wound on 1" dia. form DC resistance 7.0 ohms, wax impregnated	Pri. 20E2360 Sec. 20E2361
T-102	Band 2 antenna transformer	RF Transformer Pri. 32 T #34 SCE wire universal wound on 3/4" form,DC resistance 1.9 ohms Sec.16½ T #24 E wire close-wound on 3/4" form, DC resistance 0.1 ohms, wax impregnated	Pri. 20E2362 Sec. 20E2363

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Parts List By Symbol Designation

Symbol Desig.	Function	Description	Part Number
	TRANSFORMERS RF, AF AND POWER (Continued)		
T-103	Band 3 antenna transformer	RF Transformer Pri.23½ T #32 wire universal wound on 3/4" form, DC resistance .8 ohms Sec. 9 3/4 T #24 E wire closewound on 3/4"form, DC resistance .07 ohms, wax impregnated	Pri. 20E2364 Sec. 20E2365
T-104	Band 4 antenna transformer	RF transformer Pri.23½ T #32 E wire closewound on 3/4" form, DC resistance 0.8 ohms Sec. 4 3/4 T #24 E wire spacewound on 3/4"form, DC resistance .04 ohms, wax impregnated	Pri. 20E2366 Sec. 20E2367
T-105	Band 1 mixer transformer	RF Transformer Pri. 60 T #34 SCE wire, universal wound, DC resistance 5.0 ohms Sec. 96¼ T #34 SCE wire, progressive universal wound, DC resistance 7.0 ohms, 1" dia. form, wax impregnated	20E2368
T-106	Band 2 mixer transformer	RF Transformer Pri. 9½ T #28 DSC wire, universal wound, DC resistance .16 ohms Sec. 15½ T #24 E wire, closewound, DC resistance .11 ohms, 3/4" dia. form, wax impregnated	20E2369
T-107	Band 3 mixer transformer	RF Transformer Pri.9 3/4 T #28 DCC wire closewound, DC resistance 0.143 ohms Sec.8½ T #24 E wire,closewound, DC resistance .07 ohms, 3/4" dia. form, wax impregnated	20E2370
T-108	Band 4 mixer transformer	RF Transformer Pri.4¼ T #28 DCC wire interwound, DC resistance .11 ohms Sec. 4 3/8 T #24 E wire, spacewound, DC resistance .04 ohms, 3/4" form, wax impregnated	20E2371

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Parts List By Symbol Designation

Symbol Desig.	Function	Description	Part Number
	TRANSFORMERS RF, AF AND POWER (Continued)		
T-109	Band 1 oscillator transformer	RF Transformer Pri. 12 T #32 E wire, closewound, DC resistance 0.55 ohms Sec. 49 1/4 T #32 E wire, closewound, DC resistance 2.2 ohms, 1" dia. form, wax impregnated	20E2372
T-110	Band 2 oscillator transformer	RF Transformer Pri. 5 1/2 T #24 E wire, closewound, DC resistance .03 ohms Sec. 13 T #24 E wire, closewound, DC resistance 0.1 ohms, 3/4" dia. form, wax impregnated	20E2373
T-111	Band 3 oscillator transformer	RF Transformer Pri. 2 1/2 T #24 E wire, spacewound, DC resistance .01 ohms Sec. 8 T #24 E wire, spacewound, DC resistance .04 ohms, 3/4" dia. form, wax impregnated	20E2374
T-112	Band 4 oscillator transformer	RF Transformer Pri. 1 1/8 T #24 E wire, spacewound, DC resistance .005 ohms Sec. 3 1/2 T #24 E wire, spacewound, DC resistance .03 ohms, 3/4" dia. form, wax impregnated	20E2375
T-113	#1 IF transformer V-103 to V-104 coupling	IF Transformer, 455 KC Pri. 162 T, 7/41 litz wire, universal wound, DC resistance 4.72 ohms Sec. 162 T, 7/41 litz wire, universal wound, DC resistance 4.93 ohms Tertiary: 6 T, 7/41 litz wire, tapped at 3 T and wound under primary. 7/16" dia. form, iron core tuned, wax impregnated	20E2376

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Parts List By Symbol Designation

Symbol Desig.	Function	Description	Part Number
	TRANSFORMERS RF, AF AND POWER (Continued)		
T-114	#2 IF transformer V-104 to V-105 coupling	IF transformer, 455 KC Pri. 162 T, 7/41 litz wire, universal wound, DC resistance 4.93 ohms Sec. 162 T, 7/41 litx wire, universal wound, DC resistance 4.73 ohms Tertiary: 6 T, 7/41 litz wire tapped at 3 T and wound under primary. 7/16" dia. form, iron core tuned, wax impregnated	20E2377
T-115	#3 IF transformer V-105 to V-106 coupling	IF Transformer, 455 KC Pri. 210 T, #34 SCE wire universal wound, DC resistance 12.3 ohms Sec. 2 pi winding 160 each pi, #34 SCE wire, DC resistance total 16.7 ohms, wax impregnated	20E2378
T-116	Not used		
T-117	V-109 and V-110 to speaker terminals coupling	Output transformer Pri. 4000 ohms at 1000 CPS 80 MA DC Sec. 8 ohms	91E2355
	VACUUM TUBES		
V-101	RF amplifier, 6K7	Vacuum tube (receiving-metal) triple grid super control amplifier. Base: small wafer octal 7 pin, miniature cap. Heater: current 0.3 amp at 6.3 volts AC or DC Type 6K7	92E1057
V-102	HF oscillator, 12J5	Vacuum tube (receiving-glass) detector amplifier triode, Base:intermediate shell octal 6 pin.Heater: current 0.15 amp at 12.6 volts AC or DC Type 12J5	92E1298
V-103	First detector and mixer, 12SA7	Vacuum tube (receiving-metal) pentagrid converter Base: small wafer octal 8 pin. Heater: current 0.15 amp at 12.6 volts AC or DC Type 12SA7	92E1417

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Parts List By Symbol Designation

Symbol Desig.	Function	Description	Part Number
	VACUUM TUBES (Continued)		
V-104	First IF amplifier, 12SK7	Vacuum tube (receiving-metal) triple grid super control amplifier. Base: small wafer octal 8 pin. Heater: current 0.15 amp at 12.6 volts AC or DC Type 12SK7	92E1294
V-105	Second IF amplifier, 12SK7	Same as V-104	
V-106	Second detector AVC, 12H6	Vacuum tube (receiving-metal) twin diode. Base: small wafer octal 7 pin. Heater: current 0.15 amp at 12.6 volts AC or DC Type 12H6	92E1295
V-107	First AF amplifier, noise limiter, 12SN7GT	Vacuum tube (receiving-glass) twin triode. Base: intermediate shell octal 8 pin. Hater:current 0.3 amp at 12.6 volts AC or DC Type 12SN7GT	92E1297
V-108	Second AF amplifier, Phase inverter, 12SN7GT	Same as V-107	
V-109	Output audio amplifier 25L6GT	Vacuum tube (receiving-glass) beam power amplifier. Base: intermediate shell octal 7 pin. Heater: current 0.3 amp at 25 volts AC or DC Type 25L6GT	92E1418
V-110	Output audio amplifier, 25L6GT	Same as V-109	
V-111	Tuning indicator, 1629	Vacuum tube (receiving-glass) electron ray indicator. Base: small shell octal 7 pin. Heater:current 0.15 amp at 12.6 volts AC or DC Type 1629	92E1296
V-112	Rectifier, 25Z6GT	Vacuum tube (receiving-glass) high vacuum rectifier. Base: intermediate shell octal 7 pin.Heater: current 0.3 amp at 25 volts AC or DC Type 25Z6GT	92E1419

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Parts List By Symbol Designation

Symbol Desig.	Function	Description	Part Number
		SOCKET	
X-101	Socket for V-101	Vacuum tube socket,8 prong octal,mica filled bakelite with mounting plate and retainer ring	82E132
X-102	Socket for V-102	Same as X-101	
X-103	Socket for V-103	Same as X-101	
X-104	Socket for V-104	Same as X-101	
X-105	Socket for V-105	Same as X-101	
X-106	Socket for V-106	Same as X-101	
X-107	Socket for V-107	Same as X-101	
X-108	Socket for V-108	Same as X-101	
X-109	Socket for V-109	Same as X-101	
X-110	Socket for V-110	Same as X-101	
X-111	Socket for V-111 tuning indicator	Vacuum tube socket,8 prong octal, bakelite with metal shield cap, 5 wire leads, contains R-146	82E137
X-112	Socket for V-112	Same as X-101	
X-113	Dial lamp socket for I-101, I-102	Socket Assembly,miniature bayonet lamp, 2 sockets with wire leads	82E241

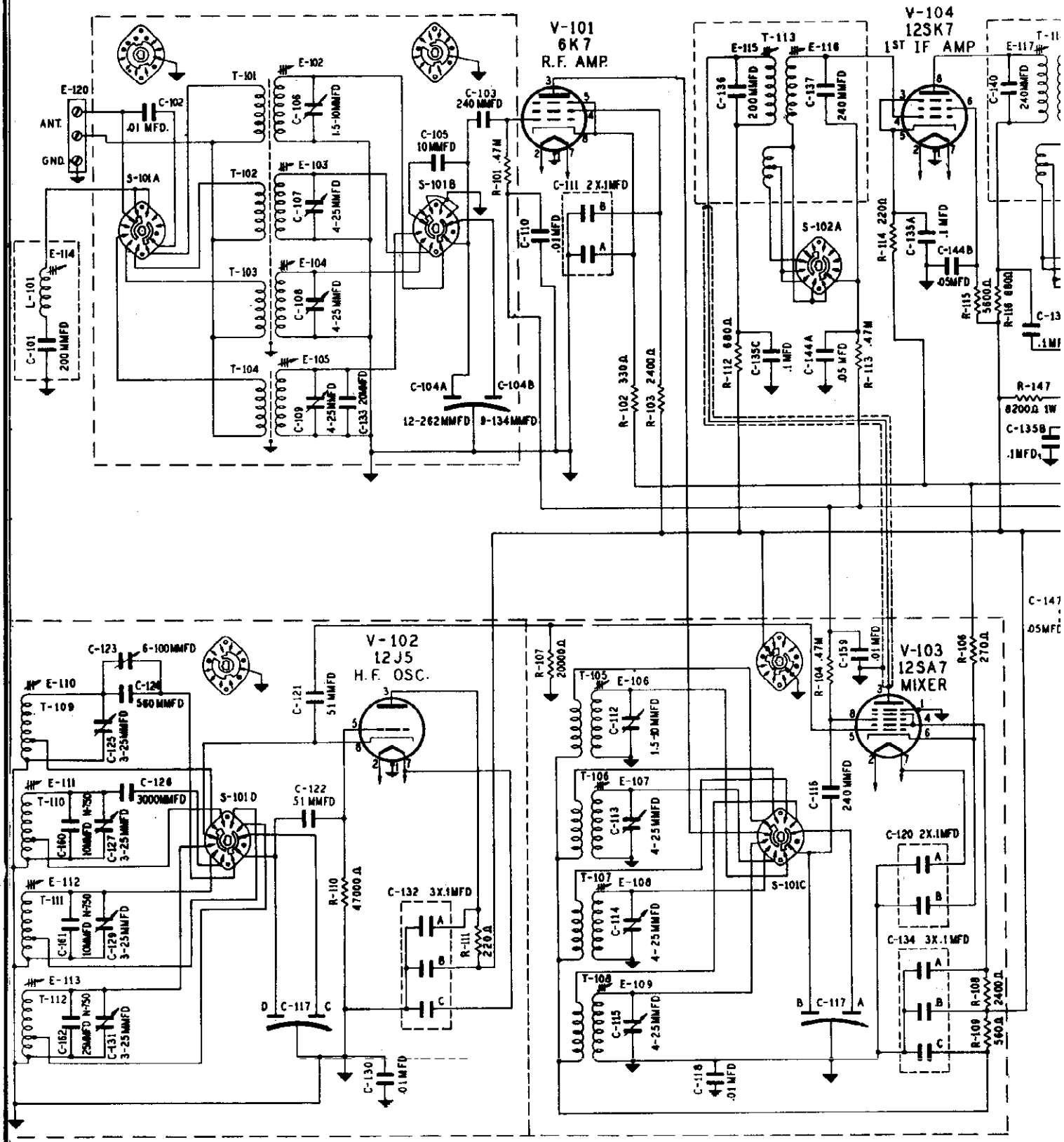

Figure 7 Schematic Circuit Diagram

T RADIO LABS., INC. EXPORT RECEIVER

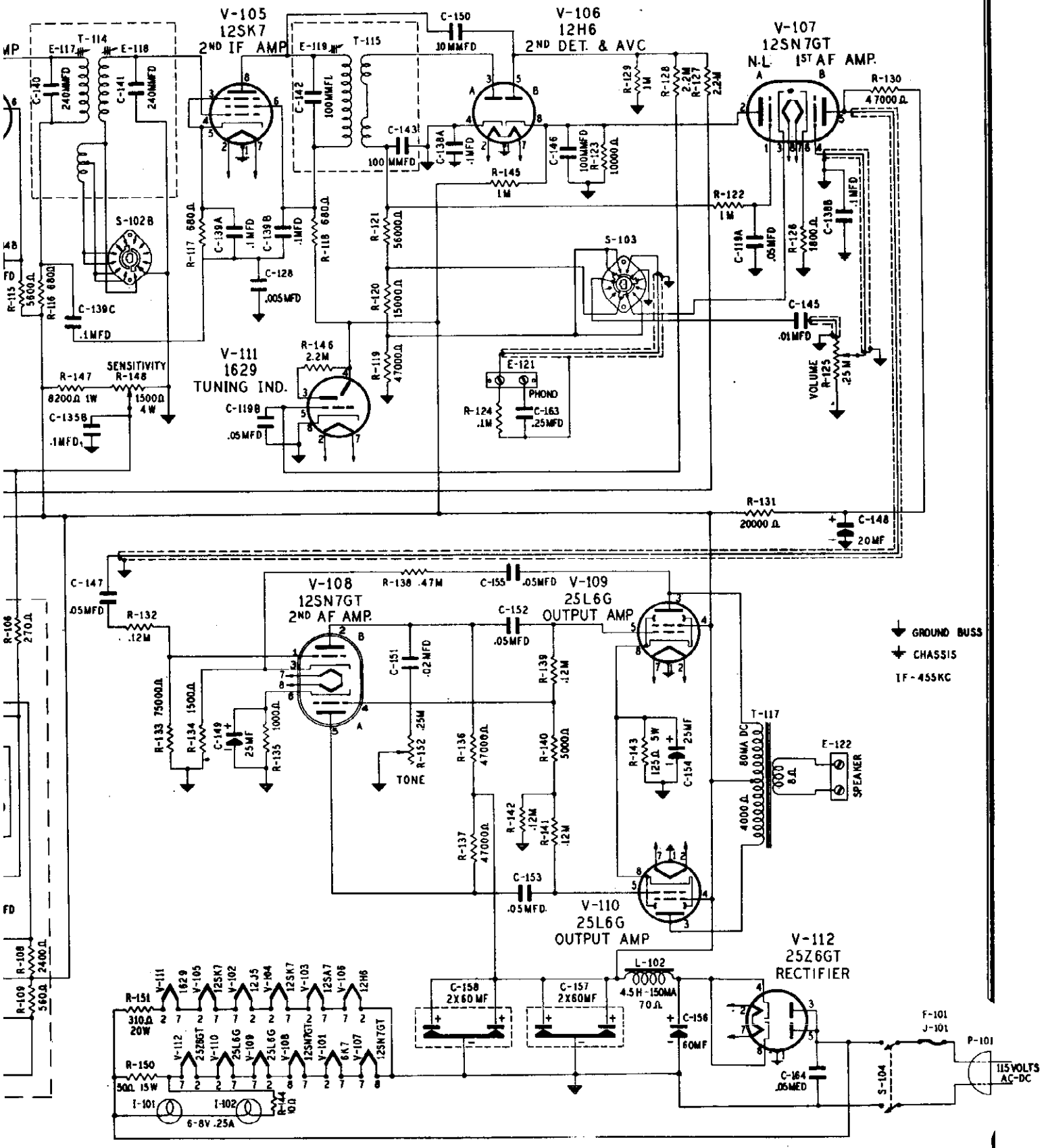

Diagram of Scott Export Receiver

SCOTT RADIO LABORATORIES INC.
3-15-47

1. INTRODUCTION

1.1 These instructions cover the installation, operation, and servicing of the Model SLR-12-A Radio Receiving Equipment. THEY SHOULD BE READ AND STUDIED WITH GREAT CARE BEFORE THE INSTALLATION OR OPERATION OF THE EQUIPMENT IS ATTEMPTED IN ORDER THAT OPTIMUM PERFORMANCE MAY BE OBTAINED.

2. GENERAL DESCRIPTION

2.1 The Model SLR-12-A Radio Receiving Equipment is suitable and is primarily intended for use aboard marine vessels of all types. It is equally suitable for use at Radio shore stations.

2.2 The receiving equipment covers the frequency ranges of 0.53 to 1.60 and 5.55 to 15.60 megacycles in three frequency bands. It is specifically designed to provide optimum performance and high quality reception of voice or tone modulated radio frequency signals, on all frequency bands, by head telephone or loud speaker methods. For this reason, no beat frequency oscillator for the reception of radio telegraph signals is provided.

2.3 Special circuits and features are incorporated in the Model SLR-12-A Radio Receiving Equipment to preclude its oscillator feeding voltages into the antenna circuit and radiating interferences which could be detected by sensitive radio receiving or radio direction finding equipments in the same, or close vicinity.

2.4 The receiving equipment is designed for a-c operation, being equipped with a self-contained rectifier type power supply for supplying all operating voltages required from an a-c source of 110/125 volts, 58/62 cycles, single phase, such as the Model 262 Inverter.

2.5 The audio frequency output circuits of the receiving equipment are designed to permit the use of one pair of standard head telephones separately or in conjunction with a suitable local loud speaker, of the permanent magnet type, coupled to the equipment by means of either a 600 ohm or 5000 ohm matching transformer.

2.6 The Model SLR-12-A Radio Receiving equipment consists of three major units, the Radio receiver mounted in a metal cabinet, a 115 volt D.C. to 115 volt A.C., 250 Watt inverter, and a loudspeaker of the permanent magnet type.

2.7 The equipment is supplied with one set of vacuum tubes contained within the Radio Receiver. Two instruction books and one set of spare tubes are also supplied with each equipment.

2.8 The net weights and overall dimensions of the major unit of the complete equipment are listed in Par. 8.16.

3. DESCRIPTION OF MAJOR UNIT

3.1 The Model SLR-12-A Radio Receiver is a 12 tube superheterodyne covering the frequency ranges of 0.53 to 1.60 and 5.55 to 15.60 megacycles in three frequency bands, as follows:

BROADCAST BAND
0.53 to 1.60 MEGACYCLES
SHORT WAVE BAND-1
5.55 to 9.55 MEGACYCLES
SHORT WAVE BAND-2
9.20 to 15.60 MEGACYCLES

3.2 This major unit employs the cabinet type of construction, with the cabinet suitably shock mounted and designed for top of table or bench mounting. The chassis design and construction are such that the chassis may be mounted in a standard, cabinet type, relay rack. However, this type of mounting is not recommended for installations where the equipment will be subjected to severe shock or vibration, owing to the fact, that it can be accomplished only with the sacrifice of the shock mounting feature.

3.3 The major unit contains, on a single chassis, all apparatus, (including power supply) necessary for taking energy from an antenna, amplifying and converting such energy into intermediate frequency energy, amplifying the intermediate frequency energy and then demodulating such energy into audio frequency energy for delivery, through an audio frequency amplifier to a phone jack on the front operating panel and/or one of three sets of loud speaker terminals at the rear of the chassis.

3.4 The electrical circuits of the Model SLR-12-A Radio Receiver employed for signal reception on all frequency ranges, com-

prises one stage of radio frequency amplification, first detector (or mixer), high frequency oscillator, two stages of intermediate frequency amplification operating at 455 kilocycles, a diode type second detector two stages of resistance coupled audio frequency amplification and an audio frequency power output stage. The second detector utilizes one set of elements of a dual diode; the other set of elements is utilized for an efficient noise limiter circuit. Inverse feedback is incorporated, within the audio output circuits, to maintain a relatively constant voltage across the primary of the output transformer, when the output load is varied upon connection of one or more amplifier type loud speakers across the secondary winding of the output transformer which also feeds the front panel mounted phone jack.

3.5 The power supply section of the Model SLR-12-A Radio Receiver, which is employed for supplying the necessary operating voltages for the receiver circuits, is designed for operation from a 110/125 volt, 58/62 cycle, single phase source of a-c power. The power supply includes a power transformer with r-f input filter and primary fuse, two vacuum tube rectifiers, and a two-section a-f filter.

3.6 Four audio output circuits are provided:

(1) A phone jack is mounted on the front panel and is supplied from one of three output windings on the audio output transformer. This winding is directly connected to one pair of speaker terminals at the rear of the chassis and to the phone jack through an attenuation network which limits the maximum available power at the phone jack to approximately 30 milliwatts. The phone jack is provided for monitoring purposes, by head telephone methods, since the equipment is primarily intended for loud speaker signal reproduction.

(2) The pair of speaker terminals, referred to in (1), above, is provided for the connection of the audio output of the Radio Receiver to a system of remotely installed, parallel connected Speaker Amplifiers. The output winding on the audio output transformer supplying these terminals, as well as the phone jack, is capable of supplying, by virtue of the inverse feedback associated with the audio output stage of the receiver, substantially constant voltage at the speaker terminals for any variation in load impedance from 60 to 600 ohms.

(3) A second pair of speaker terminals at the rear of the receiver chassis is supplied from a separate output winding on the audio output transformer. These terminals are provided for the connection of a high quality, permanent magnet type, locally installed loud speaker having a self-contained input transformer designed to match the 600 ohm impedance of the audio output transformer winding supplying the speaker terminals. The maximum undistorted audio power available at these terminals is nominally 2 watts.

(4) A third pair of speaker terminals, also supplied from a separate output winding on the audio output transformer, provides for the connection, at the rear of the receiver chassis, of a high quality, permanent magnet type, locally installed loud speaker having a self-contained input transformer designed to match the 5000 ohm impedance of the winding supplying the terminals. The maximum undistorted audio power available at these terminals is nominally 2 watts.

(5) FOR ANY INSTALLATION, ONLY ONE OF THE THREE SETS OF SPEAKER TERMINALS MAY BE EMPLOYED AT ANY ONE TIME FOR SUPPLYING AUDIO POWER TO LOUD SPEAKER CIRCUITS. This does not preclude the use of a head telephone set for monitoring while the required loud speaker system is in operation.

3.7 A concentric jack, Type 49120, is mounted at the rear of the chassis of the Radio Receiver for antenna and ground connection. A hole in the rear of the cabinet provides access to the jack. A concentric plug, Type 49121A, which mates with the concentric jack is furnished as part of the complete Model SLR-12-A Equipment, but with no antenna or ground leads attached.

3.8 A power receptacle and mating plug are also provided at the rear of the chassis for a-c power input connection. No power input cable is furnished.

3.9 The fuse, in the primary circuit of the power supply, is mounted adjacent to the power input receptacle at the rear of the receiver chassis. The fuse mounting is of such design that the fuse, which is of the miniature cartridge type, is replaceable without the use of tools, and without the neces-

sity for the removal of the receiver chassis from its cabinet.

3.10 Facilities are also provided, in the form of separate auxiliary terminals at the rear of the receiver chassis and a suitable switching arrangement, for connecting a phonograph pickup to the input circuits of the audio frequency amplifier. With the necessary switching completed, the radio frequency circuits are rendered ineffective during operation of the audio frequency circuits in conjunction with a phonograph pickup.

4. TUBE COMPLEMENT

4.1 The vacuum tubes employed in the Model SLR-12-A Radio Receiver are as follows:

Symbol	*Commercial Type*	*Function*
V-101	6K7	R.F. Amplifier
V-102	6J5	H.F. Oscillator
V-103	6SA7	First Detector and MIXER
V-104	6SK7	First I.F. Amplifier
V-105	6SK7	Second I.F. Amplifier
V-106	6H6	Second Detector, A.V.C.
V-107	6J5	First A.F. Amplifier
V-108	6SJ7	Second A.F. Amplifier
V-109	6K6GT	A.F. Power Output
V-110	6E5	Tuning Indicator
V-111	6X5GT	Rectifier (Full Wave)
V-112	6X5GT	Rectifier (Full Wave)

5. POWER REQUIREMENTS

5.1 The Model SLR-12-A Radio Receiving Equipment is designed for operation from a 110/125 volt, 58/62 cycle, single phase power source. The line current at 115 volts is .74 amperes. The nominal power consumption at 115 volts is 85 watts.

6. ANTENNA REQUIREMENTS

6.1 The input circuit of the Model SLR-12-A Radio Receiver is primarily designed for operation with a separate antenna not used for other equipment. A conventional single wire antenna will suffice since the antenna requirements are not critical. Such a single wire antenna should be spaced at least six feet away from any parallel stay, mast, or stack. It should be well insulated and should be erected as high as possible. The recommended minimum overall length of antenna and lead-in is fifty feet. The antenna proper (not including lead-in) should be at least fifty feet in the clear. A one-half megohm static-drain resistor should be permanently installed between the antenna and ground.

6.2 In an installation having a simple antenna-ground combination, solder the antenna lead-in to the retaining nut for the jack socket of the Type 49121A concentric plug. Connect the ground lead to the terminal provided for this purpose and mounted adjacent to the Type 49120 concentric jack af the rear of the receiver chassis.

7. INSTALLATION

7.1 The Model SLR-12-A Equipment, with its Radio Receiver equipped with one full complement of vacuum tubes, one Type 49121A concentric antenna-ground connecting plug, and one female power input plug, is shipped in a single wooden packing box. Two instruction books, one Model 262 Inverter, one loudspeaker, and one set of spare vacuum tubes, are also contained in the same packing box.

7.2 After unpacking the equipment it should be inspected for any possible damage that might have resulted from careless handling in transit. Make certain that all vacuum tubes in the Radio Receiver are firmly seated in their respective sockets. Inspection of the chassis and vacuum tubes may be readily effected upon the removal of the chassis from its cabinet. This is accomplished by removing two screws in the rear of cabinet, then loosening the four thumb screws and removing their respective retaining plates at either side of the front operating panel. The chassis may then be drawn out of the cabinet by pulling on the two handles on the front panel.

7.3 The mounting base, to which the shock mounts for the Radio Receiver are attached, should be drilled with four mounting

holes. The location and size of the mounting holes should be such as permit the use of sufficiently large screws or bolts to provide a secure mounting for the Radio Receiver when the mounting base is fastened on the top of an operating table or bench. Such security should predicate freedom from loosening or "tearing away" of the mounting screws or bolts when the equipment is subjected to strains resulting from vessel rolling in heavy seas.

7.4 In planning an installation, care should be exercised to provide adequate clearance from the back of the Radio Receiver to the bulkhead or nearest obstruction in order to provide access to the power input plug, the antenna-ground concentric plug, speaker output or phonograph input terminals, fuse, or the movement of feeder cables when withdrawing the chassis from the cabinet for servicing, vacuum tube replacement, or inspection.

7.5 Make connection to the proper 110/125 volt, 58/62 cycle, single phase, a-c power source by means of a suitable, two conductor, cable for connecting the power source with plug P-102 which is then inserted in receptacle E-106 at the rear of the receiver chassis.

7.6 Make antenna connections in accordance with Section 6, Antenna Requirements. The antenna lead, or shielded patch cable, should be soldered to plug P-101 in accordance with previously described methods.

7.7 A loudspeaker of the permanent magnet type is supplied with the equipment, this speaker should be connected to the 600 ohm terminals E-104 by means of the two conductor cable supplied with the speaker. Where two or more loud speakers are to be connected to the receiver, terminals E-105 should be used, the load applied to these terminals may be varied from 60 ohms to 600 ohms with only a 2 D.B. change in output. Where speakers are installed more than twenty five feet from the receiver the connecting cable should be shielded.

7.8 The loudspeaker should be mounted to the bulkhead or some flat surface by means of the attached brackets, the speaker can then be rotated to the desired position and fastened by tightening the screws holding the brackets to the side of the speaker case.

7.9 The model 262 inverter supplied with the equipment is used to supply 115 volts A.C. from a 115 volt D.C. source. It will supply 250 watts which is sufficient for both the SLR-12-A Radio Receiver and a record player when used. The Power cable from the SLR-12-A receiver should be plugged into receptacle E-201 on the Inverter, Plug P-201 attached to the Inverter should then be plugged into a 115 volt D.C. source, the Inverter is then ready to operate and may be turned on and off with the power switch on the front panel of the Inverter. The Inverter is protected against Overload by fuse F-201 rated at 10 amperes, 25 volts, the Vibrator Unit of the Inverter is of the Plug-in type and is easily replaced after removing the case from the unit.

7.10 A phonograph pick-up may be connected, through a suitable matching transformer, to terminals E-102 at the rear of the chassis. These terminals are marked PHONO and GND for convenience in making the desired connections.

7.11 The equipment is now ready for operation and is turned on by means of toggle switch S-201 on the front panel of the Inverter, switch S-103 on the front panel of the Receiver should be left on.

7.12 The Radio Receiver may be mounted with other units of the same type in a common cabinet type relay rack in such installations as, for example, at Radio shore stations where the problem of vibration is relatively unimportant. This is accomplished by removing the receiver chassis from its cabinet and securing the chassis on the relay rack by its front panel, using the same holes in the edges of the panel for the securing screws as for the original securing thumb screws. It is essential that a cabinet type relay rack be employed in order to preclude the accumulation of dust on the chassis mounted components, and in the tuning drive mechanism. This method of installing the Model SLR-12-A Equipment does not abrogate the contents of Paragraphs 7.5 to 7.12, inclusive, except as they might be qualified with respect to certain minor details.

8. CONSTRUCTION

8.1 The Model SLR-12-A Radio Receiver is primarily designed for top of table or bench mounting. It is furnished with its chassis housed in a metal cabinet supported from its mounting base with rubber shockmounts at the four bottom corners of the cabinet. The front panel, to which the chassis is secured, forms the enclosure for one side of the cabinet. The general appearance and type of construction employed are shown in Figures 1 and 2.

8.2 The cabinet is of fabricated construction with ventilating louvers in its two sides and clearance apertures in the rear for access to the antenna and power input receptacles, fuse, and speaker and phonograph feeder connection terminals.

8.3 The chassis assembly is rigidly secured to the front panel. All component items, exclusive of those mounted on the front panel, entering into the construction of the Radio Receiver, are mounted either on top or underneath the chassis structure. The chassis and front panel form a basic assembly capable of being inserted or withdrawn from the cabinet, as a unit.

8.4 When the chassis assembly is housed in the cabinet, it is secured to the cabinet by the front panel through the use of eight knurled, captivated type, thumb screws which pass through four slots in opposite edges of the panel and engage with suitable inserts in the flanged sides of the front opening of the cabinet. The captivated type thumb screws are retained, when loosened, in groups of four in removable angles which also serve as "trim," for the front side corners of the cabinet, by concealing the mounting screw slots in the front panel. Two handles are conveniently arranged on the front panel to permit the insertion or removal of the chassis assembly without subjecting any of the operating controls to strain.

8.5 The construction of the chassis assembly and the arrangement and mounting of the component parts are clearly depicted in Figures 3 to 6, inclusive. All vacuum tubes are accessible from the top side of the chassis upon removal of the chassis from the cabinet. The design and construction of the chassis assembly, and the arrangement of the component items mounted thereon, provides a high degree of accessibility to all items for inspection, servicing, or replacement. A bottom cover plate, not shown in Figures 5 & 6, completely encloses the bottom of the chassis proper. It is provided as an added shielding feature, and for the protection of the under side chassis mounted components against damage due to careless handling. It is secured to the chassis with machine screws so that it is readily removable, as and when necessary to make repairs or to effect replacement of chassis mounted components.

8.6 The receiver panel layout is shown in Figure 1, and the location and functions of the various controls are described in Section 10, Operating Instructions.

8.7 The Model SLR-12-A Radio Receiver is especially designed to minimize radiation from the high frequency oscillator. This is accomplished by isolating the antenna input circuits from the first detector (or mixer) and the high frequency oscillator circuits, through the use of extensive shielding and filtering, and by the employment of a type of construction which reduces, to practical limits, undesirable circuit coupling by virtue of circulating currents in common shields.

8.8 A separate shielded compartment, designed as a complete sub-assembly and easily detachable, as such, from the chassis for inspection and servicing of the component parts which it houses, contains all the circuit elements between the antenna input and the signal grid of the R.F. amplifier tube. This sub-assembly, as pictured in Figures 3 to 6, inclusive, is mounted at the rear center of the chassis, and is centrally disposed, above and below the chassis, through an aperture in the chassis. The compartment is grounded at only one point on the chassis and since the mounting flanges are insulated from the chassis this ground constitutes the only grounding for the compartment. Details of the construction of the shielded compartment and the arrangement and mounting of the component parts, which it contains, are shown in Figure 8. The figure depicts an oblique rear view of the shielded compartment with the sides removed or opened to display the internal components. The compartment, as pictured, is inverted with respect to its normal position in the receiver.

8.9 A second shielded compartment, constructed and mounted in the same manner as for that containing the antenna circuit elements, but larger in overall dimensions, contains all of the circuit elements from the R. F. amplifier tube to the 1st I. F. amplifier input transformer, and includes also, all circuit elements associated with the high frequency oscillator. This compartment, as pictured in Figures 3 to 6, inclusive, is mounted on the chassis between the front panel and the compartment containing the antenna input circuit elements. The arrangement and mounting of the circuit components are depicted in Figure 7 which portrays an oblique view of the sub-assembly with the bottom cover plate removed to show the disposition of the internal circuit components. This view depicts the sub-assembly in an inverted position with respect to its normal position in the receiver. Circuit components, associated with the compartment sub-assembly, and not visible in Figure 7, are shown in Figure 4 which shows the two compartment sub-assemblies, described above, mounted in their normal positions, but with their top shield cover plates removed.

8.10 Insulated mechanical couplings are employed for joining together the shafts of the tuning capacitors and band selector

switches in the two shielded compartments. These couplings are shown in Figures 3 to 6 inclusive. The R.F. amplifier tube is mounted in a horizontal position in a socket which is provided with a clamp for securing the tube in place. The socket is mounted on one side wall of the large compartment and all wiring thereto is contained within the shielded compartment. The vacuum tube then projects into the side of the compartment containing the antenna circuit components, and connection to the signal grid cap is made within the confines, of this compartment. The internal shields in the vacuum tube isolates the signal grid circuit from the plate circuit, and, in effect, completes the shielding of the antenna circuit compartment so that these circuits are electrically isolated from the plate circuit of the R.F. amplifier tube, insofar as stray coupling from the high frequency oscillator is concerned.

8.11 Removable cover plates, secured with thumb screws, are provided on the two shielded compartments for access to the vacuum tubes contained within. Similar cover plates on the bottoms of the shielded compartments are secured with conventional machine screws. Either the top or bottom cover plate, as described above, must be removed for access to the circuit trimmers of the R.F. amplifier, 1st detector and high frequency oscillator, since it was not possible to provide access holes in the plates, themselves, without compromising the shielding integrity of the receiver.

8.12 The secondary windings of the antenna coupling transformers feeding the grid of the R.F. amplifier tube are provided with individual adjustable iron cores for inductance trimming, and adjustable mica dielectric trimmer capacitors for capacity trimming during circuit alignment. Adjustment of the trimmer capacitors is afforded through access holes in the rear of the shielded compartment housing these transformers. Corresponding holes in the rear of the chassis and cabinet permits the adjustment of the trimmer capacitors, as a final adjustment, in the installation of the equipment for optimum performance with the specific antenna employed, without the necessity for the removal of the receiver chassis from its cabinet. Access to the adjustable iron cores is provided upon the removal of the top cover plate of the shielded compartment containing the antenna coupling transformers.

8.13 The r-f transformers, coupling the plate of the R.F. amplifier tube with the signal grid of the first detector, are each provided with both inductance trimmers, in the form of adjustable iron cores, and capacity trimmers in the form of adjustable mica dielectric trimmer capacitors, for purposes of alignment, of these circuits with the high frequency oscillator circuits. Access to all trimmers, either capacitive or inductive, is afforded upon the removal of the bottom cover plate from the shielded compartment containing these transformers.

8.14 The inductors employed in the high frequency oscillator circuits are similarly provided with adjustable powdered iron cores, and adjustable, air-dielectric trimmer capacitors for inductance and capacity trimming. These adjustable trimmers, together with "padder" capacitors, permit the "tracking" of the high frequency oscillator circuits with the R.F. amplifier circuits. The "padder" capacitors are, except for the BROADCAST BAND, of the fixed, molded phenolic, mica dielectric type. In the excepted case, an adjustable, air-dielectric capacitor is employed in parallel with the fixed capacitor. All adjustable trimmer and "padder" capacitors are accessible for adjustment upon the removal of the bottom cover plate of the compartment containing these circuit elements.

8.15 The cabinet, front panel and mounting base of the Radio Receiver have a standard black wrinkle finish. All metallic parts which enter into the construction of the chassis are finished with a suitable plating or paint to provide; first, a high degree of protection to these parts against the deleterious effects of corrosion; and second, a chassis assembly presenting a pleasing appearance.

8.16 The dimensions and weights of the Radio Receiver are as follows:

(1) *Dimensions:*

	Chassis in Cabinet	*Chassis Only*
Length	20.50 inches	19.00 inches
Depth	18.50 inches	18.50 inches
Height	13.75 inches	10.50 inches

(2) *Weights:*

Chassis in Cabinet — 103 pounds
Chassis Only — 79 pounds

9. CIRCUIT DESCRIPTION

9.1 GENERAL

9.11 The actual schematic diagram of the Model SLR-12-A Radio Receiver is shown in Figure 9. For purposes of illustration, it will be assumed that the circuits are set up as for signal reception on SHORT-WAVE BAND-2, as depicted in the diagram. The following description will refer, there-

fore, to the symbol numbers of the circuit elements of the band as, or when, pertinent to the description. It shall be assumed that, unless otherwise specifically noted, the description will be equally applicable to SHORT-WAVE BAND-1 and the BROADCAST BAND.

9.2 Signal Frequency Circuits

9.21 Signal input to the receiver through concentric jack J-103 is connected to the primary winding of antenna input transformer T-103 by switch S-102E. An electrostatic shield, at ground potential, separates the secondary winding from the primary winding. The secondary winding together with variable, air dielectric capacitor C-156 and series capacitor C-134, constitutes the first tuned circuit. Transfer of r-f signal, at the resonant frequency of this tuned circuit, from the antenna to the control grid of R.F. amplifier tube V-101, is accomplished by inductive coupling through antenna input transformer T-103. Variable capacitor C-156 is ganged with variable capacitors C-144A and C-144B to provide uni-controlled tuning of the receiver. Capacitor C-134 is shorted out for the BROADCAST BAND and its selection and proper connection is controlled by switch S-102D. The secondary winding of transformer T-103 is provided with adjustable iron core E-123, for inductance trimming, and a shunt connected, variable, mica dielectric capacitor C-151 for capacity trimming. These trimmer elements permit the accurate alignment of the tuned circuit with the succeeding tuned circuit, at both ends of the frequency band, and are accessible for adjustment, as described under Section 8. The high potential end of the tuned circuit is connected to the control grid of R.F. amplifier tube V-101 by switch S-102D and through coupling capacitor C-123. The low potential end of the tuned circuit is returned to ground. The d-c bias return from the control grid of R.F. amplifier tube V-101 to the A.V.C. bus is closed through grid resistor R-135.

9.22 Plate potential from the high voltage d-c bus is applied to the plate of R.F. amplifier tube V-101 through decoupling filter resistor R-112, by-passed to ground by capacitor C-109B, and r-f inductor L-101. Screen potential, also obtained from the high voltage d-c bus, is applied to the screen through a decoupling filter consisting of filter resistor R-126 and by-pass capacitor C-109C. The suppressor is connected to the side of the heater circuit which is operated at ground potential. Initial grid bias is obtained by means of cathode resistor R-109, by-passed by capacitor C-109A.

9.23 The amplified signal voltage from the plate of R.F. amplifier tube V-101 is applied to the primary winding of R.F. transformer T-106, through coupling capacitor C-124, by switch S-102C. The low potential end of the primary winding is returned to ground. The secondary winding of transformer T-106, together with variable, air dielectric tuning capacitor C-144A and series connected capacitor C-135 (the latter employed for the same purpose and in the same manner as capacitor C-134), constitute the second and final tuned circuit operating at the signal frequency. Transfer of signal energy from the plate circuit of R.F. amplifier tube V-101 to the control grid of first detector tube V-103 is accomplished by inductive coupling through R.F. transformer T-106 and by the connection of the high potential end of the tuned circuit to the control grid of first detector tube V-103 by switch S-102C, through coupling capacitor C-125. The low potential end of the tuned circuit connects to ground. Adjustable iron core E-126 and parallel connected (variable) mica dielectric trimmer capacitor are associated with the tuned circuit for purposes of circuit alignment and are accessible for adjustment as described in Section 8. The d-c bias return from the control grid of first detector tube V-103 to the A.V.C. bus is closed through grid resistor R-136.

9.24 Screen potential from the high voltage d-c bus is applied to the screen of first detector tube V-103 through r-f inductor L-102, by-passed to ground by capacitor C-129, and thence through decoupling filter resistor R-144, by-passed to ground by capacitor C-107B. The suppressor is internally connected to the shell of the tube. Initial bias is obtained by means of cathode resistor R-105, by-passed to ground by capacitor C-107A.

9.3 High Frequency Oscillator Circuits

9.31 The H. F. oscillator circuit is of the so called "electron coupled" type. The tuned circuit consists of tapped inductor element T-109, shunted with variable, air dielectric trimmer capacitor C-147 and tuned with variable, air dielectric tuning capacitor C-144B, series connected capacitor C-136 and padder capacitor C-143. Capacitor C-136 is shorted out by the switch S-102B for the BROADCAST BAND. The inductor element is also provided with adjustable iron core E-129 for inductance trimming. Padder capacitor C-143 is used to modify the tuning of the H. F. oscillator so that it will maintain a fixed frequency difference of 455 kilocycles with respect to the signal frequency when tuning capacitors C-156, C-144A and C-144B are simultaneously varied from minimum to maximum capacity. The high potential end

of the oscillator tuned circuit is connected, by switch S-102B, through coupling capacitor C-132 to the control grid of the H. F. oscillator tube V-102. This grid is returned to ground through grid resistor R-122 for d-c bias return. The low potential end of the tuned circuit is also returned to ground. The cathode of H. F. oscillator tube V-102 is connected, by switch S-102B, to the tap on inductor element T-109, and through coupling capacitor C-131 to the oscillator injector grid of first detector tube V-103. This grid has a d-c return to ground through grid resistor R-118.

9.32 The plate of H. F. oscillator tube V-102 is connected to the high voltage d-c bus through decoupling filter resistor R-143, by-passed to ground by capacitor C-106B, and r-f filter inductor L-103, by-passed to ground by capacitor C-130. One side of the heater circuit operates at ground potential while the other side is filtered by capacitors C-106A and C-128 and r-f filter inductor L-104.

9.4 I. F. Amplifier Circuits

9.41 The signal frequency arriving at the control grid of first detector tube V-103 and the H. F. oscillator frequency arriving at the injector grid of this tube are mixed (or hetrodyned) and the resultant difference frequency (455 kilocycles) is fed to the input of the intermediate frequency amplifier.

9.42 Transfer of intermediate frequency energy, from the first detector tube V-103 to second detector tube V-106 is accomplished by inductive coupling through I. F. transformer T-110, T-111, and T-112 and amplified through I. F. amplifier tubes V-104 and V-105. First I. F. transformer T-110 consists of two tuned circuits, primary and secondary, with the secondary tuned circuit operating in conjunction with switch S-101B, resistors R-103 and R-104 and a tertiary winding to provide three degrees of selectivity by changing the electrical constants of the secondary tuned circuit and its coefficient of coupling with the primary tuned circuit. The primary and secondary windings are each tuned to the intermediate frequency by fixed, mica dielectric capacitors C-137 and C-138, augmented by adjustable iron cores E-130 and E-131, provided for inductance trimming, and accessible through the top and bottom of the transformer shield can. The high potential end of the primary tuned circuit connects to the plate of first detector V-103 through a shielded conductor, while the low potential end connects to the high voltage d-c bus through decoupling filter resistor R-113, by-passed to ground by capacitor C-112A. The high potential end of the secondary tuned circuit is connected to the grid of first I. F. amplifier tube V-104 while the low potential end is connected to the A.V.C. bus through A.V.C. filter R-134 and C-112B.

9.43 Screen potential from the high voltage d-c bus is applied to the screen of first I. F. amplifier tube V-104 through decoupling filter resistor R-127, by-passed to ground by capacitor C-113B. Initial cathode bias is applied through bias resistor R-110, by-passed by capacitor C-113A.

9.44 Second I. F. transformer T-111 is identical to first I. F. transformer T-110, with respect to its design, construction, and operating characteristics. Accordingly, except for differences in circuit symbol designations, which becomes obvious upon examination of Fig. 9, the circuit description of paragraph 9.42 is applicable to this transformer, in all details, except that the low potential end of the secondary tuned circuit is returned to ground instead of to the A.V.C. bus.

9.45 The circuit arrangement of second amplifier tube V-105 is the same, except for symbol designations, as described for the first I. F. amplifier tube V-104, in paragraph 9.43 above. No automatic control of control grid bias is provided for this tube, however.

9.46 Third I. F. transformer T-112 contains a tuned primary circuit and an untuned secondary circuit. The primary tuned circuit consists of the primary winding shunted by fixed, mica dielectric capacitor C-133, and permeability tuned by adjustable iron core E-134 which is accessible, for adjustment, through the top of the transformer shield can. Plate potential to the plate of third I. F. amplifier tube V-105 is applied from the high voltage d-c bus through the primary winding and decoupling filter resistor R-115, by-passed to ground by capacitor C-116B. The high potential end of the secondary winding feeds the second detector diode while its low potential end connects to the A.V.C. bus.

9.5 Second Detector Circuits

9.51 Tube V-106 is a dual diode tube, one section is used as a second detector the plate of which is connected to the high potential end of the secondary winding of third I. F. transformer T-112. The cathode is grounded thus the tube acts as a half-wave rectifier. The voltage appearing across diode load resistor R-130, R-131 is filtered by resistor R-139 and condenser C-114A and the resulting direct current A.V.C. voltage is used to control the gain of amplifier tubes V-101, V-103, V-104, the degree of control being de-

pendent on the strength of the incoming signal. The other half of dual diode V-106 is used in a very efficient noise limiter circuit which reduces peak noise levels so that weak signals may be received in locations where the noise level is high.

9.6 A. F. Amplifier Circuits

9.61 The a-f voltage developed across the diode load resistor R-130, R-131 as the result of the demodulating action of the second detector tube V-106, is applied to the control grid of first A. F. amplifier tube V-107, through coupling capacitor C-117, by switch S-101A and VOLUME control potentiometer R-146.

9.62 Switch S-101A is ganged with switch S-101B and S-101C. It operates to transfer the input to VOLUME control potentiometer R-146, and hence, the input circuits of first A. F. amplifier tube V-107 from the second detector circuit to PHONO terminals E-102 to permit the operation of the audio amplifier system of the Receiver with a high impedance phonograph pick-up. Low impedance pick-ups may also be employed provided that their connection to E-102 are made through suitable matching transformers.

9.63 Amplification of the a-f signals from the second detector is accomplished by resistance-capacity coupling between first and second A.F. amplifier tubes V-107 and V-108, respectively, and the output amplifier tube V-109. Transfer of audio frequency energy, from the plate of output amplifier tube V-109 to head telephone PHONE(S) jack J-101 and loud speaker terminals E-103, E-104, and E-105, is accomplished through output transformer T-113, E-104 and E-105, which matches the plate impedance of the tube with the separate loads with which the Receiver is designed to operate. A resistance net work, consisting of resistors R-106, R-107, and R-108 is connected between head telephone jack J-101 and the secondary winding of output transformer T-113 to reduce the maximum audio power below that available at speaker terminal E-105.

9.64 Inverse feed back is provided for the second A. F. and output amplifier stages to maintain approximately constant voltage across the primary winding of output transformer T-113 for relatively wide changes in output load, as specified elsewhere in these instructions.

9.65 A separate high voltage d-c bus supplies d-c voltage to the plates and screens of A. F. amplifier tubes V-107, V-108 and V-109. Direct current potential is applied to the plate of first A. F. amplifier tube V-107 through load resistor R-123 and decoupling filter R-124 and C-155; to the screen of second amplifier tube V-108 through decoupling filter R-138 and C-108B, to the plate of this tube through load resistor R-132, and decoupling filter R-125 and C-108A; and finally, to the screen and plate of output amplifier tube V-109, directly, with respect to the screen, and through the primary of output transformer T-113.

9.66 Variable potentiometer R-147 and series connected capacitor C-118 constitutes the control for regulating the fidelity of the audio amplifier system of the Receiver. The series combination is connected between the plate of first A. F. amplifier tube V-107 and ground.

9.7 Rectifier Power Circuits

9.71 The proper a-c heater potential for all vacuum tubes except the rectifiers is obtained from a common secondary winding of power transformer T-114. One side of the secondary is operated at ground potential. High voltage a-c plate potential from a second secondary winding of the transformer is applied to the parallel connected plates of rectifier tubes V-111 and V-112. The rectified pulsating potentials are derived from each cathode and fed through separate filters to two separate high voltage d-c feeder circuits to the Receiver vacuum tubes. The cathode of rectifier tube V-111 supplies d-c power to one feeder line through filter L-105, C-103, C-104 and C-110, while the cathode of rectifier tube V-112 supplies d-c power to the second feeder line through filter L-106, C-101, C-102 and C-120.

9.72 The a-c power input line to the primary winding of power transformer T-114 is filtered by capacitors C-111A and C-111B to prevent stray r-f potentials from being applied across the primary winding. Power is applied through switch S-103 in one side of the line circuit, which also is fused by F-101.

10. OPERATING INSTRUCTIONS

10.1 All switches and controls (with the exception of the main tuning control) of the Model SLR-12-A Radio Receiver are identified by panel engraving.

10.2 The main tuning control knob E-118 is centrally located near the bottom of the front panel and is secured to a shaft which drives the ganged, main tuning capaci-

tors through a friction operated mechanical drive. The mechanical drive, also controls the movement of dial pointer N-106, through a system of pulleys and a flexible bronze cable, across the face of main tuning dial, N-107. Dial disc N-104, which carries a linear dial scale and operates in conjunction with fixed index plate N-105, is rotated by the tuning drive mechanism in such a manner that one rotation is completed with a complete traverse of dial pointer N-106 across the face of main tuning dial N-107. Main tuning dial N-107 is of Lucite with white scale markings and characters on a black background. This dial carries a frequency scale for each band. The Lucite dial is framed with escutcheon plate H-110, fitted with a transparent shatter-proof lens. Indirect dial illumination is afforded by edge lighting of the Lucite dial plate, from suitably placed dial lamps mounted behind the panel and at the two sides of the dial plate.

10.3 The VOLUME control is located at the left of the main tuning control and is operated by control knob E-117. The control is a potentiometer which operates to adjust the signal input level that is applied to the grid of the first A.F. amplifier tube, and hence, the signal level at the output terminals of the receiver, since the A.F. amplifier is operated at constant gain. Clockwise rotation of control knob E-117 increases the audio output signal level.

10.4 The FIDELITY control, located at the left of the VOLUME control, is operated by control knob E-116. It is a rheostat which operates, in conjunction with a series connected fixed capacitor, in the plate circuit of the first A.F. amplifier tube to limit the high frequency response of the receiver. Full clockwise to full counter-clockwise rotation of this control affords a continuous reduction of the high frequency audio response. The control should be adjusted to an extreme clockwise setting for high fidelity reception. For such reception, the SELECTIVITY control, described in Paragraph 10.8 should be set at BROAD.

10.5 Immediately above the FIDELITY control is mounted PHONE(S) jack J-101 which is provided to permit monitoring of the received signals by head telephone methods, as described in previous portions of these instructions.

10.6 The power on-off toggle switch, located at the upper left-hand corner of the operating panel of the receiver, is connected in the power line input circuit and is provided to apply or remove line power to or from the complete equipment.

10.7 A BAND SELECTOR switch, operating by control knob E-119, is located at the right of the main tuning control knob E-118. This control operates to select the R.F. and high frequency oscillator circuits for the three frequency ranges covered by the Model SLR-12-A Radio Receiver. The settings of this switch for the three frequency bands covered by the Receiver are marked SW2, SW1 and BC, in left to right sequence.

10.8 The SELECTIVITY control is located adjacent to the BAND SELECTOR control. It operates the ganged, rotary type, four-position switches, operating in conjunction with the second I. F. transformers, to vary the selective characteristics of the I. F. amplifier. Selectivity control is afforded by three positions of the ganged selector switches to provide for three degrees of selectivity, namely SHARP, MEDIUM and BROAD; while the fourth position of the ganged switches connects the "PHONO" input terminals, at the rear of the Receiver chassis, to the input of the audio amplifier through the VOLUME control. The panel markings for the four-positions of the SELECTIVITY control are marked in left to right sequence, SHARP, MED, BRD and PHONO.

10.9 There is located at the upper right hand corner of the Receiver panel an electron ray indicator which indicates when the Receiver is tuned to resonance with the frequency of the received signals. Resonance is indicated by the shadow angle of the electron ray indicator, which should be adjusted, by manipulation of the main tuning control, until the two halves of the shadow approximately meet. The shadow of the electron ray indicator can be adjusted on a strong signal, so that the two halves of the shadow just meet, by turning the eye-adjusting control R-148 with a screwdriver. CAUTION: WHEN TUNING THE RECEIVER ALWAYS TURN THE SELECTIVITY CONTROL TO THE *SHARP* POSITION AND TUNE FOR MAXIMUM SIGNAL AS INDICATED BY THE ELECTRON RAY INDICATOR. Should the receiver be tuned while the SELECTIVITY control is at MEDIUM or BROAD, the electron ray indicator may indicate maximum signal on either side of resonance owing to the fact that the selectivity characteristic of the I. F. amplifier has somewhat of a flat-top characteristic in each of these two positions of the selectivity control. After the Receiver has been properly tuned to resonance, as described above, the SELECTIVITY control may then be adjusted to the BROAD and MEDIUM positions as desired. Hand grips H-111 and H-112, are mounted on either side of the panel for convenience in the removal of the chassis from its cabinet without subjecting any of the operating controls to undue strain.

11. PERFORMANCE DATA

11.1 The SENSITIVITY vs. FREQUENCY curves are plotted in Plate 1 and are representative of the overall sensitivity of the Model SLR-12-A Radio Receiving Equipment over the three frequency bands covered by the Radio Receiver. These curves, together with the OVERALL SELECTIVITY curves shown in Plate 2, provide data for definitely checking the Radio Receiver to determine if repairs or re-alignment are necessary since the majority of circuit element failures or any misalignment will reduce the sensitivity of the equipment. The data referred to above will, therefore, also serve to show the efficacy of repairs or realignment.

11.2 The selectivity of a radio receiving equipment is that characteristic which determines the extent to which it is capable of differentiating between the desired signal and disturbances of other frequencies. The OVERALL SELECTIVITY curves of Plate 2, are representative of the overall selectivity characteristics of the equipment for the three degrees of selectivity, that is made possible by suitable adjustment of the SELECTIVITY control of the Radio Receiver. Over the frequency ranges covered by the Model SLR-12-A Radio Receiving Equipment, the OVERALL SELECTIVITY, for any adjustment of the SELECTIVITY control, will be essentially the SELECTIVITY characteristics of the intermediate frequency amplifier. For signal frequencies below 1000 kilocycles, the OVERALL SELECTIVITY characteristics for the BROAD and MEDIUM adjustments of the SELECTIVITY control will be somewhat sharper than shown by the corresponding curves in Plate 2, due to "side band cutting" by the tuned circuits of the r-f amplifier preceding the first detector.

11.3 The image attenuation is the degree to which a superheterodyne type of radio receiving equipment is capable of rejecting signals off resonance which, in combination with the fundamental or any harmonic of the conversion oscillator, produce intermediate frequencies which are amplified by the intermediate frequency amplifier and result in spurious responses. The IMAGE ATTENUATION vs. DESIRED SIGNAL FREQUENCY curves of Plate 3, show the extent to which the Model SLR-12-A Radio Receiving Equipment is capable of rejecting image responses. The curves of Plate 3, are representative of the extent to which primary image frequencies are attenuated by the preselector tuned circuits of the Radio Receiver. The primary image frequency is equal to the desired signal frequency plus two times the intermediate frequency. The attenuation of the primary image, corresponding to any desired signal frequency, as derived from the curves of Plate 3, is predicated on the ratio between the r-f inputs, at the desired signal and primary image frequencies, to produce a constant output as measured with the receiver tuned for resonance with the desired signal frequency.

11.4 The intermediate frequency rejection offered by the Model SLR-12-A Radio Receiver is better than 75.0 decibels. This expression is the ability of the Model SLR-12-A Radio Receiving Equipment to reject signals at the frequency to which the intermediate frequency amplifier is resonated.

11.5 The A.V.C., OVERALL FIDELITY, and A.F. AMPLIFIER FIDELITY characteristics shown on Plates 4, 5, and 6 are necessary when particular performance checks are desired, but are of secondary importance in most cases in the determination of the necessity for repairs or realignment.

11.6 The maximum undistorted power output, as measured at 400 cycles across a load impedance of 60 ohms connected to terminals E-105, is approximately 2 watts. Due to the inverse feed-back feature associated with the audio amplifier system of the Radio Receiver, the voltage appearing across terminals E-105 remains constant, within a total tolerance of 2 decibels, as the load impedance is varied from 60 to 600 ohms. A maximum undistorted power output of approximately 2 watts may also be obtained across terminals E-104 and E-103 when connected to load impedances of 600 and 5000 ohms, respectively, providing that at no time more than one set of output terminals E-103, E-104, or E-105 are used.

11.7 The high frequency oscillator radiation, as measured at the r-f input terminals of the Radio Receiver, is less than 400 micro-microwatts at any frequency covered by the Model SLR-12-A Radio Receiving Equipment. This characteristic will permit "safe" operation of the equipment on Marine vessels.

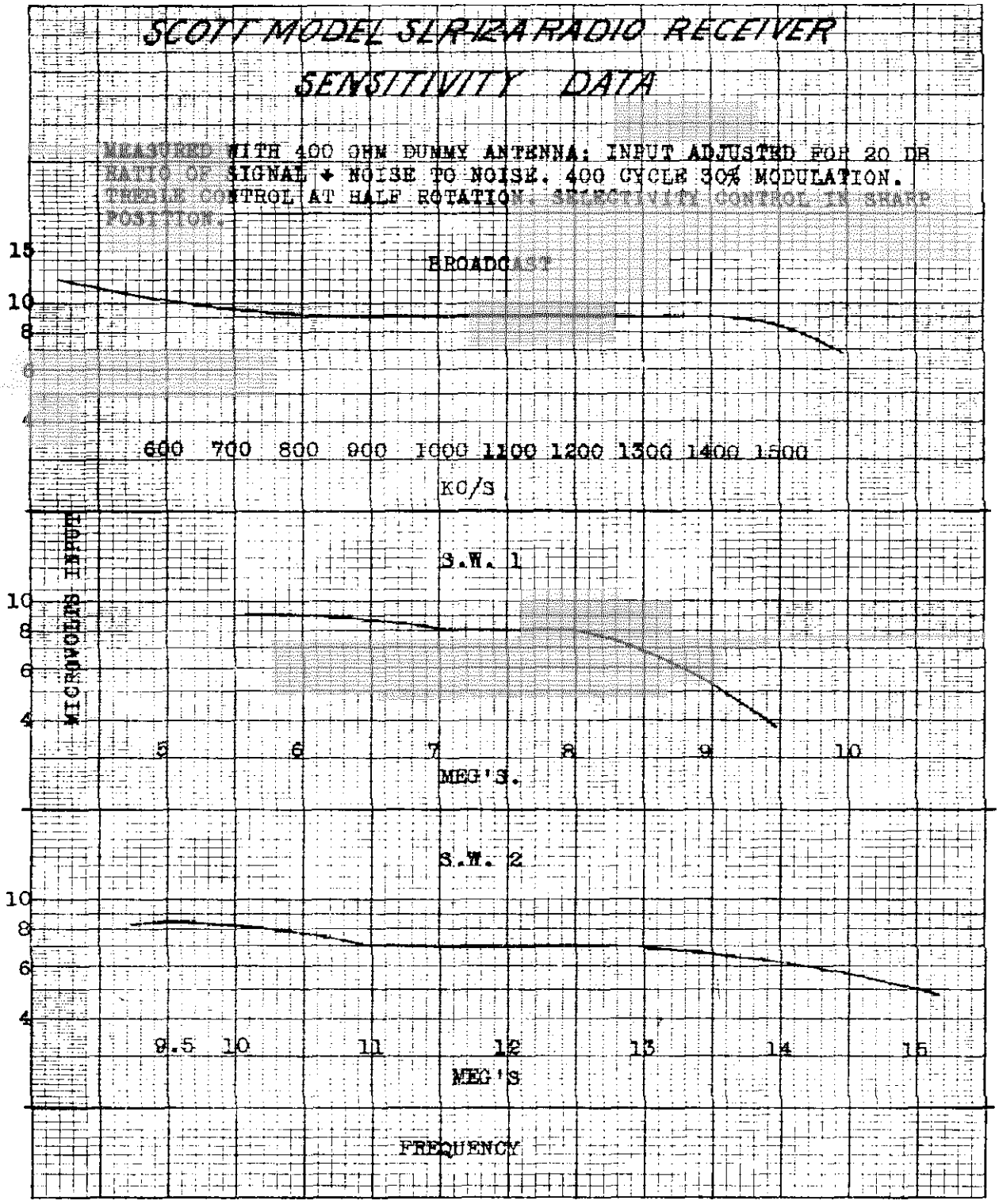
SCOTT MODEL SLR12A RADIO RECEIVER
SENSITIVITY DATA
MEASURED WITH 400 OHM DUMMY ANTENNA; INPUT ADJUSTED FOR 20 DB RATIO OF SIGNAL + NOISE TO NOISE. 400 CYCLE 30% MODULATION. TREBLE CONTROL AT HALF ROTATION. SELECTIVITY CONTROL IN SHARP POSITION.
BROADCAST
15
10
8
600 700 800 900 1000 1100 1200 1300 1400 1500
KC/S
S.W. 1
MICROVOLTS INPUT
10
8
6
4
5 6 7 8 9 10
MEG'S.
S.W. 2
10
8
6
4
9.5 10 11 12 13 14 15
MEG'S
FREQUENCY

PLATE 1

MODEL SLR-12-A

SCOTT RADIO LABS., INC.

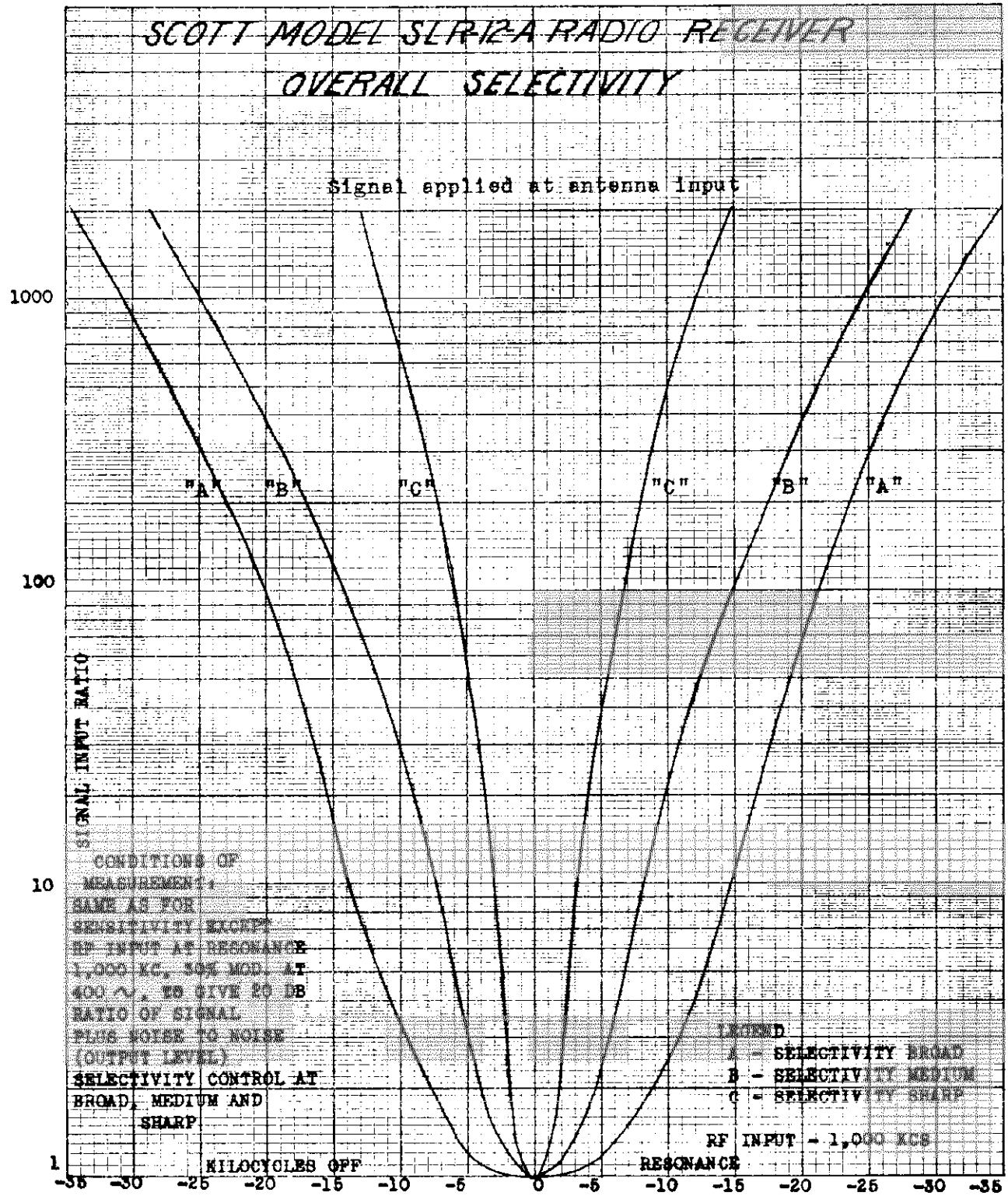

PLATE 2

SCOTT RADIO LABS., INC. MODEL SLR-12-A

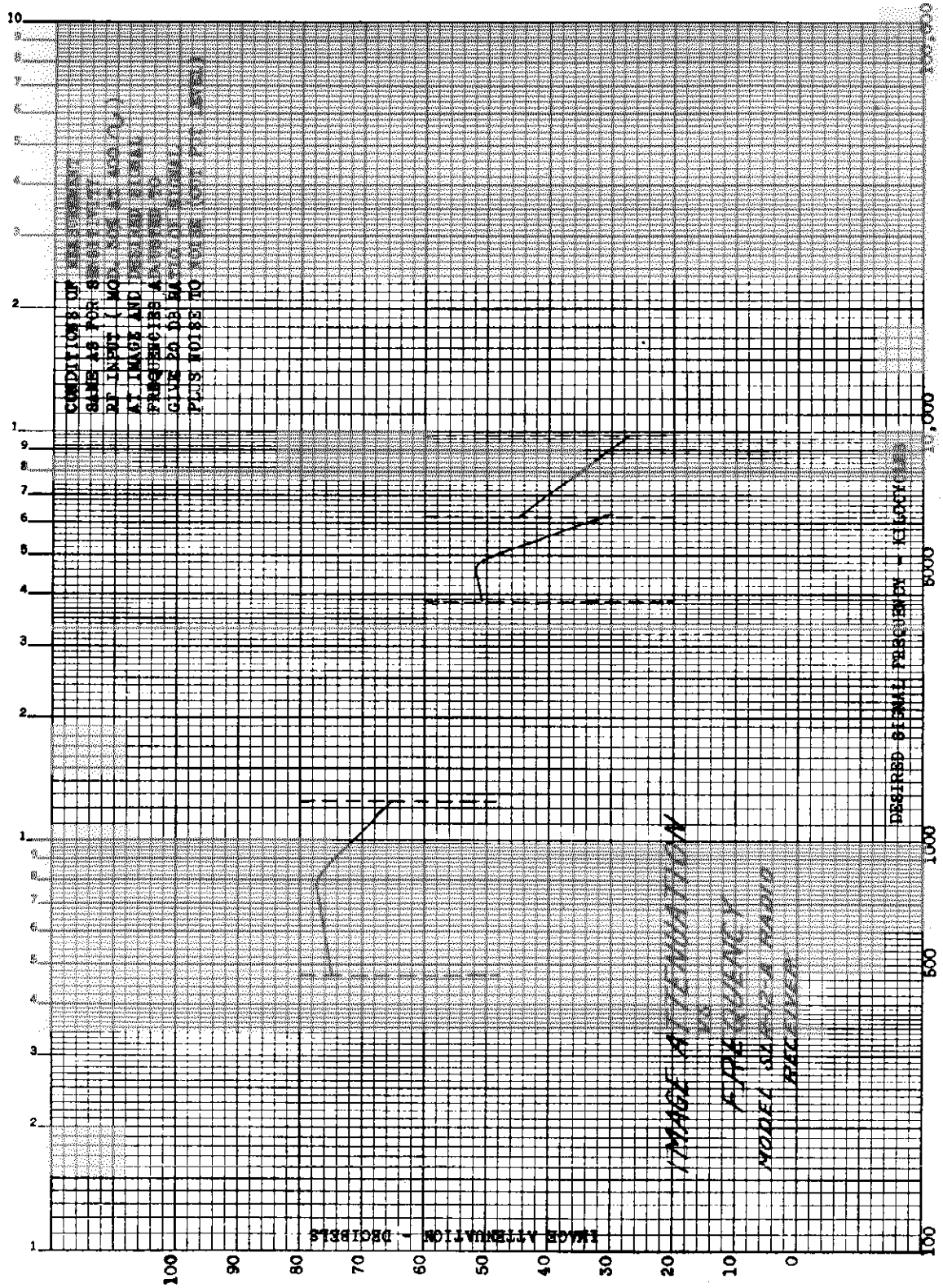

PLATE 3

MODEL SLR-12-A

SCOTT RADIO LABS., INC.

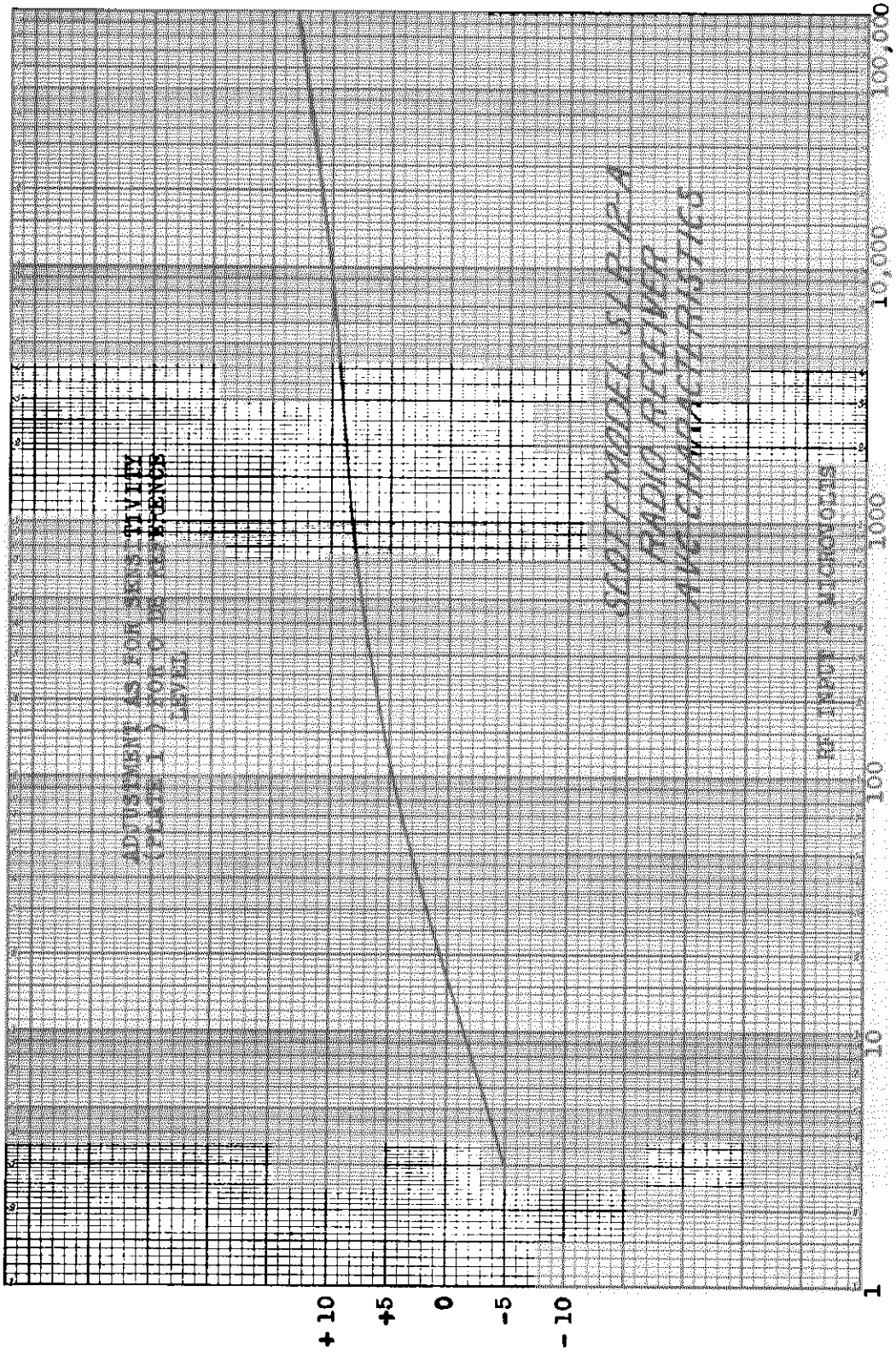

PLATE 4

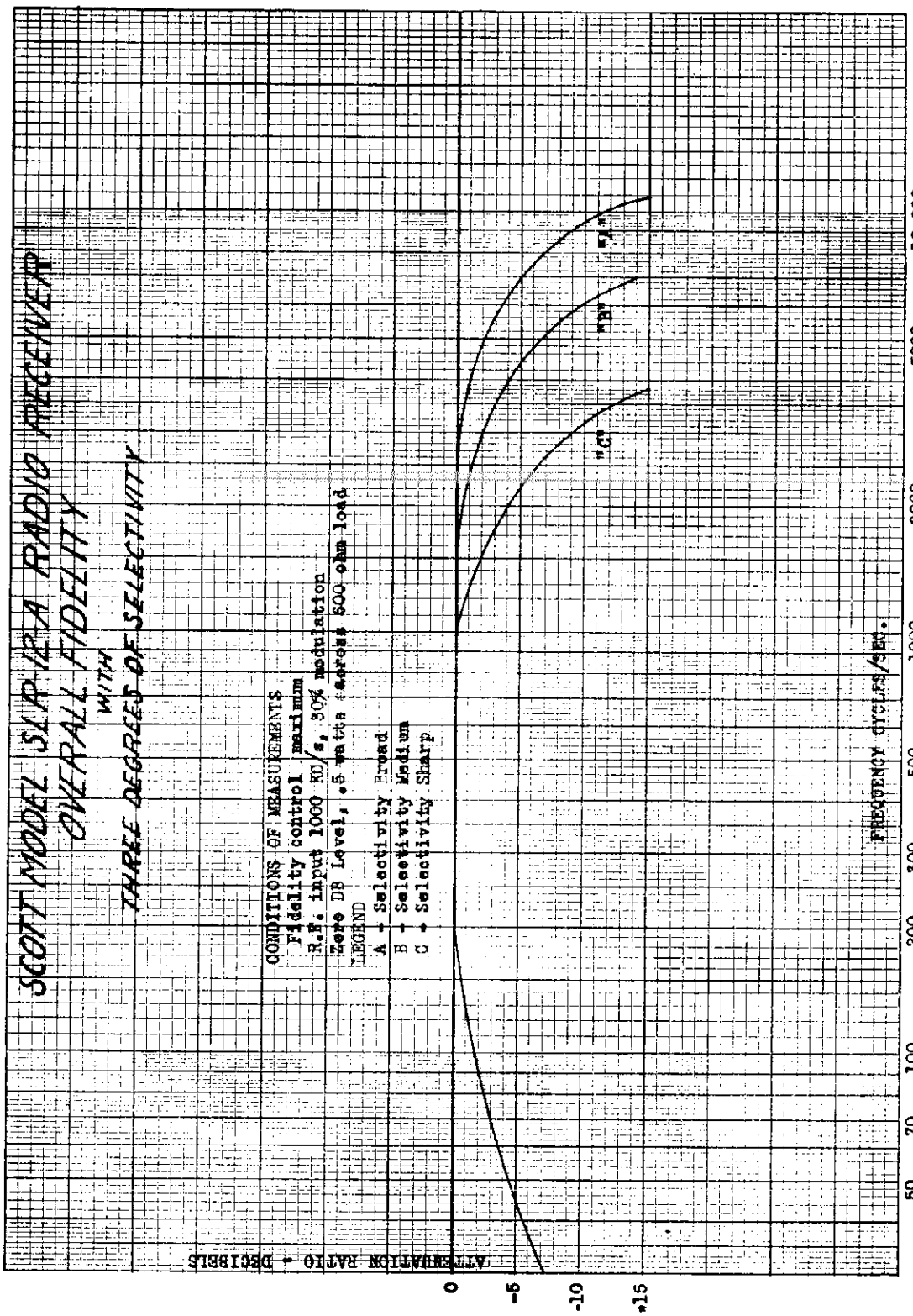

PLATE 5

SCOTT RADIO LABS., INC.

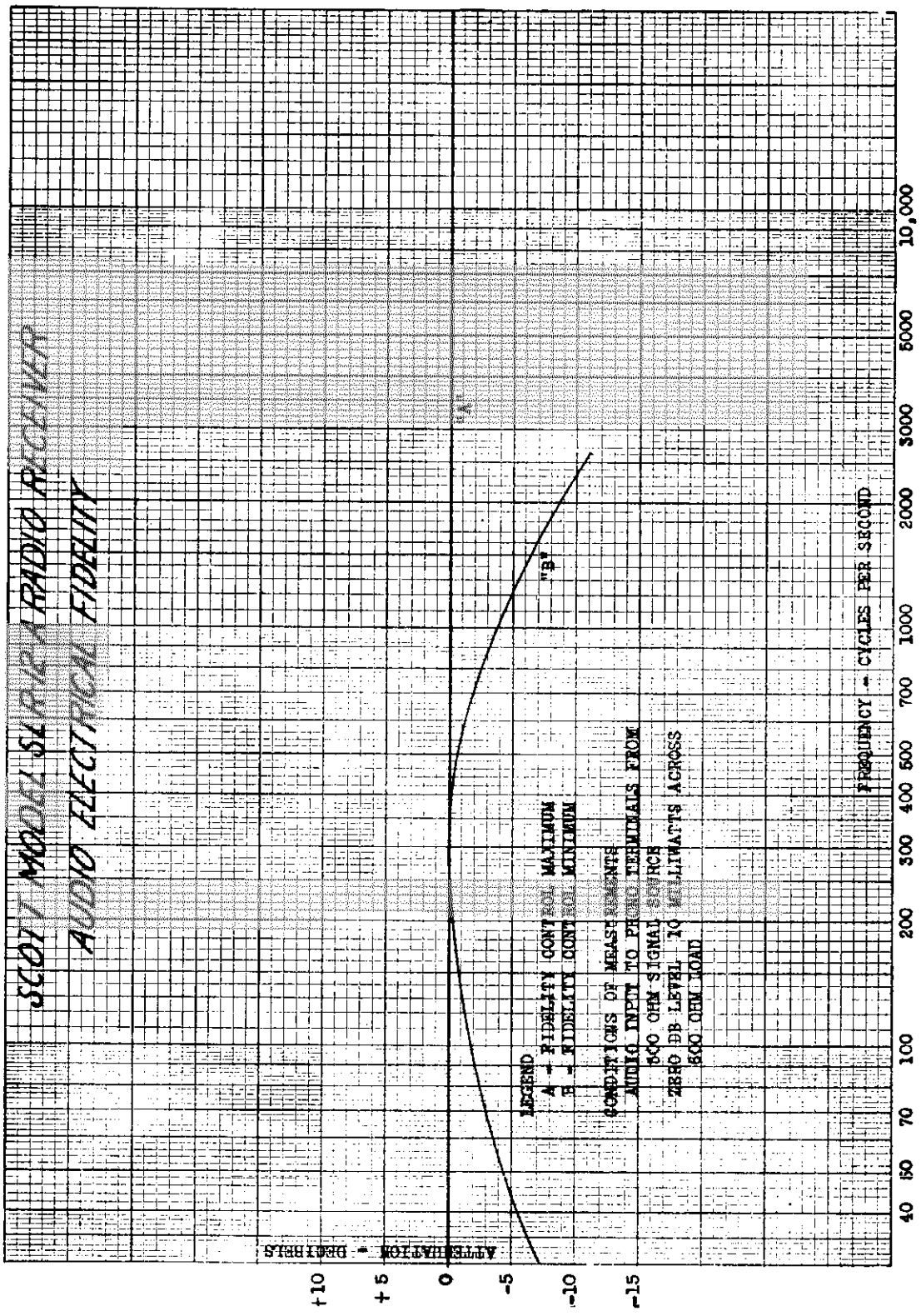

PLATE 6

12. MAINTENANCE-FAILURES AND REMEDIES

12.1 General

12.11 Adequate test equipment for maintenance of Model SLR-12-A Radio Receiving Equipment should include the following items:

(1) A Radio Frequency Standard Signal Generator.

(2) An audio output meter, General Radio Company Type 583A, or equivalent.

(3) A Model OE Analyzer, or equivalent, for resistance measurements, testing vacuum tubes and measuring a-c and d-c potentials and currents in the circuits with which the tube under test is associated. The Performance and Test Data of Sections 11 and 13 may be determined with equipment as listed above.

12.12 In making any tests or adjustments, it is essential that the operator consider the influence that any one circuit element may have upon other associated circuits. The Test Data of Section 13 will be particularly helpful in determining extent of such influences and the necessity for making further replacement after a fault in one particular circuit element has been located and repaired.

12.13 Any repairs in the Model SLR-12-A Radio Receiving Equipment which necessitate resoldering of joints should be made with care. The new joint should be such that the pieces to be soldered are firmly connected mechanically before solder is applied.

12.2 Tube Replacement

12.21 ALL TUBES SUPPLIED WITH THE EQUIPMENT OR AS SPARES ON THE EQUIPMENT CONTRACT SHALL BE USED IN THE EQUIPMENT PRIOR TO EMPLOYMENT OF TUBES FROM GENERAL STOCK.

12.22 Failure of a vacuum tube in the Receiver may reduce the sensitivity of the equipment to radio signals, produce intermittent operation or cause the equipment to be completely inoperative. In such cases all tubes should be checked either in an analyzer, or similar tube testing equipment, or by replacement with tubes of proven quality. When any tube is tested it should be tapped or jarred to make sure it has no internal loose connections or intermittent short-circuits.

12.23 When tube replacements become necessary, substitution of new tubes may alter alignment of r-f or i-f amplifier circuits inasmuch as the replacement tubes may not be identical with those originally employed. The necessity for realignment as well as alignment procedure are discussed in Section 14.

12.3 Failure of the Radio Receiver

12.31 In case of breakdown or failure of the Model SLR-12-A Radio Receiver, the fault must first be localized in one portion of the circuit. This can be accomplished by observation of some peculiar action of one of the controls or by checking the Receiver against Test Data tabulated in Section 13. Reference to Figures 1 to 9, inclusive, will show the location of any component part of the Receiver. Functions and ratings of component parts are given in Parts List, Section 15.

12.32 It must be remembered that the Test Data of Section 13 will not positively locate certain faults. For instance, an open-circuited by-pass capacitor will not appear in point to point resistance tests and may introduce regeneration or oscillation in certain circuits which effect the stage gain of other circuits. Similarly, a short circuit occurring in a low resistance inductor will not appear in point to point resistance tests and if the short appears in an R.F. coil, a false indication of the necessity for realignment may result.

12.33 By-pass or filter capacitors, which develop poor internal connections or which become open-circuited, will cause decreased sensitivity and/or poor stability. The defective unit can generally be located by temporarily connecting a good capacitor in parallel with each capacitor that is under suspicion.

12.34 Failures of any by-pass or filter capacitor may seriously overload resistors of associated circuits. Overloads of sufficient magnitude to permanently damage a resistor will cause the painted surface of the resistor to be scorched, making the defective unit easy to locate by visual inspection.

12.35 Open, — or short-circuited resistors can be definitely located by testing the resistance of each individual resistor. The Schematic diagram, Figure 9, should be consulted to make sure that any particular resistor under test is not connected in parallel with some other circuit element which might produce misleading measurements.

12.36 Loose connections, causing intermittent or noisy operation, and which cannot be found by point to point resistance

tests, can usually be located by individually testing each circuit element, or by tapping or shaking the component, under suspicion, when the Receiver is adjusted for normal operation.

12.37 The primary fuse F-101 will "blow" when the primary circuit, of transformer T-114, is subjected to a sustained primary current in excess of approximately two amperes.

13. TEST DATA

13.1 The TUBE SOCKET VOLTAGES AND CATHODE CURRENTS, Table 1 must not be considered as a list of the actual operational voltages and currents in the circuits of the Model SLR-12-A Radio Receiver. The resistance of the measuring instruments, together with capacitive and resistive loading effects, will disturb many of the circuits to such an extent that they become inoperative, thus altering normal voltage and current distribution.

13.2 The only currents listed in Table 1 are those in the various cathode circuits. This listing is a desirable simplification, inasmuch as measurements of cathode current constitutes a definite check on all circuits directly associated with the vacuum tube in question.

13.3 The POINT TO POINT RESISTANCE Table 2 shows average resistance values in the Model SLR-12-A Radio Receiver with speakers disconnected from terminal panels E-103, E-104, E-105 and headphones removed from PHONES(S) jack J-101. The vacuum tubes need not be removed from their sockets. In using Table 2, the statements of Par. 12.32 must be given consideration.

13.4 All measurements in Table 1 are made with the Receiver connected for normal operation a 115 volt, 60 cycle, single phase a-c power source. The *VOLUME* control should be adjusted for full clockwise rotation and the FIDELITY control for approximately mid rotation.

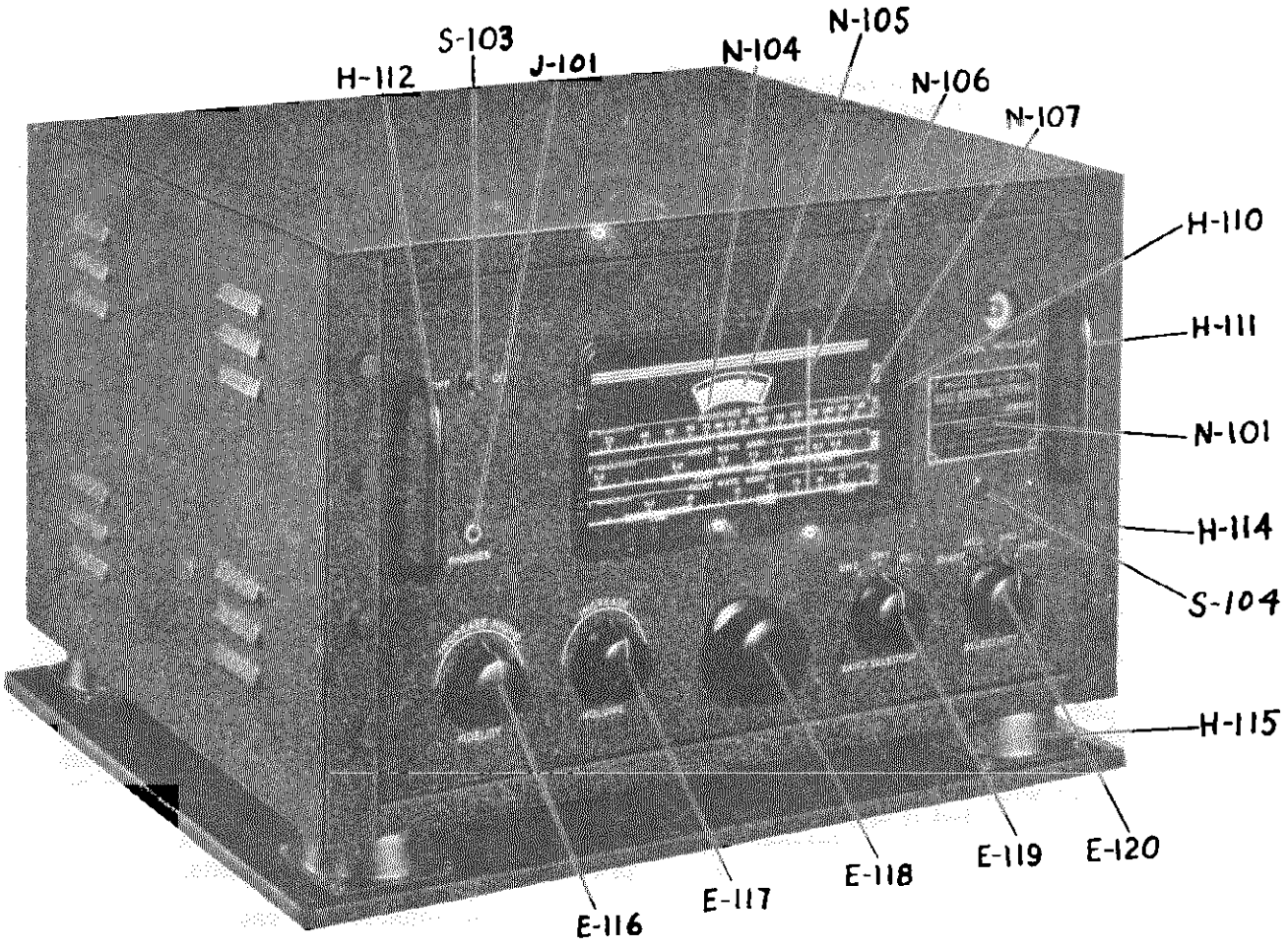

FIG. 1. LEFT FRONT OBLIQUE VIEW, RADIO RECEIVER.

Table 1: TUBE SOCKET VOLTAGES AND CATHODE CURRENTS

Terminal		*Voltages D.C. Volts*	*Currents D.C. M.A.*
V-101	Grid	0	
	Cathode	5	6.5
	Screen	110	
	Suppressor	0	
	Plate	270	
V-102	Grid	0	
	Cathode	0	8.0
	Plate	150	
V-103	Grid #1	0	
	Cathode	3.2	11.5
	Grid #3	0	
	Grid #5	0	
	Grids #2 & 4	110	
	Plate	270	
V-104	Grid	0	
	Cathode	4.8	6.7
	Screen	100	
	Suppressor	0	
	Plate	270	
V-105	Grid	0	
	Cathode	5.0	7.0
	Screen	100	
	Suppressor	0	
	Plate	270	
V-106	Cathode	0	
	Plate #1	0	
	Plate #2	0	
V-107	Grid	0	
	Cathode	3.0	1.6
	Plate	100	
V-108	Grid	0	
	Cathode	2.6	1.8
	Screen	65	
	Suppressor	0	
	Plate	70	
V-109	Grid	0	
	Cathode	20	29
	Screen	270	
	Plate	260	
V-110	Grid	0	
	Cathode	0	1.4
	Target	270	
	Plate	100	
V-111	Cathode	290	31
	Plate #1	255 A.C.	
	Plate #2	255 A.C.	
V-112	Cathode	290	42
	Plate #1	255 A.C.	
	Plate #2	255 A.C.	

Measured on 500 Volt Scale

Voltage measurements made with a D.C. Voltmeter, 20,000 ohms per volt. All voltage measurements made between socket terminals and Receiver chassis.

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Table 2: POINT TO POINT RESISTANCES
(Terminal to Chassis)

Terminal		Variable		Resistance (Ohms) Plus or Minus 10%
		Symbol	Setting	
V-101	Grid	NONE		1.91 Meg.
	Cathode	NONE		680
	Screen	NONE		Infinite
	Suppressor	NONE		0
	Plate	NONE		Infinite
V-102	Grid	NONE		.047 Meg.
	Cathode	S-102	BC	.72
	Cathode	S-102	SW-1	.17
	Cathode	S-102	SW-2	.167
	Plate	NONE		Infinite
V-103	Grid #1	NONE		20,000
	Cathode	NONE		270
	Grid #3	NONE		1.91 Meg.
	Grid #5	NONE		0
	Grids #2 & 4	NONE		Infinite
	Plate	NONE		Infinite
V-104	Grid	S-101	SHARP	1.1 Meg.
	Grid	S-101	MED	1.1 Meg.
	Grid	S-101	BRD	1.1 Meg.
	Grid	S-101	PHONO	1.1 Meg.
	Cathode	NONE		680
	Screen	NONE		Infinite
	Suppressor	NONE		0
	Plate	NONE		Infinite
V-105	Grid	S-101	SHARP	5
	Grid	S-101	MED	15
	Grid	S-101	BRD	52
	Grid	S-101	PHONO	52
	Cathode	NONE		680
	Screen	NONE		Infinite
	Suppressor	NONE		0
	Plate	NONE		Infinite
V-106	Cathode #1	NONE		0
	Cathode #2	NONE		1.3 Meg.
	Plate #1	NONE		.3 Meg.
	Plate #2	NONE		.3 Meg.
V-107	Grid	R-146	MIN	0
	Grid	R-146	MAX	.5 Meg.
		S-101	SHARP	
	Grid	R-146	MAX	.5 Meg.
		S-101	MED	
	Grid	R-146	MAX	.5 Meg.
		S-101	BRD	
	Grid	R-146	MAX	.5 Meg.
	Grid	S-101	PHONO	.5 Meg.
V-107	Cathode	NONE		2,400
	Plate	NONE		Infinite
V-108	Grid	NONE		.47 Meg.
	Cathode	NONE		1,500
	Screen	NONE		Infinite
	Suppressor	NONE		0
	Plate	NONE		Infinite

Table 2: POINT TO POINT RESISTANCES (*Continued*)
(*Terminal to Chassis*)

Terminal	*Variable*		*Resistance (Ohms) Plus or Minus 10%*
	Symbol	*Setting*	
V-109 Grid	NONE		1 Meg.
Cathode	NONE		680
Screen	NONE		Infinite
Plate	NONE		Infinite
V-110 Grid	R-148	MAX	.84 Meg.
Grid	R-148	MIN	.2 Meg.
Cathode	NONE		0
Target	NONE		Infinite
Plate	NONE		Infinite
V-111 Cathode	NONE		Infinite
Plate #1	NONE		85
Plate #2	NONE		85
V-112 Cathode	NONE		Infinite
Plate #1	NONE		85
Plate #2	NONE		85

13.5 Stage Gain Measurements

13.51 The sensitivity measurements, listed below, are made under the following conditions:

(1) The Model SLR-12-A Radio Receiving Equipment is set up in accordance with Par. 14.13. The Standard Signal Generator is connected in accordance with Par. 14.23, except that the high potential output lead is connected to the control grid of the tubes specified in Table 3.

(2) Adjust the standard Signal Generator for a test signal frequency of 455 kilocycles, modulated 30% at 400 cycles.

(3) The VOLUME control of the Receiver is fully advanced, the FIDELITY control set approximately mid position and the SELECTIVITY control on SHARP position.

(4) Table 3 as a tabulation of the minimum allowable I.F. sensitivity (maximum signal input) for 10 milliwatts as measured at the PHONE(S) jack with the General Radio Type 583A output meter.

Table 3

Terminal	*I.F. Sensitivity Microvolts*
V-103 Grid	120 uv ± 20 uv
V-104 Grid	1500 uv ± 300 uv
V-105 Grid	60000 uv ± 5000 uv

14. ALIGNMENT DATA

14.1 General

14.11 Should realignment of the Model SLR-12-A Radio Receiver become necessary, the following alignment data should be carefully studied before making any circuit adjustments. It is important that the operator understand the functions of each circuit element so that correct alignment may be obtained quickly and accurately. The alignment data of this section is, therefore, supplemented by Section 8, Construction, and Section 9, Circuit Description.

14.12 Performance Data and Test Data, presented in Sections 11 and 13, will be particularly helpful in determining the necessity for making any specific adjustments. The operator is cautioned against making any adjustments indiscriminately and he should not realign any circuit unless tests definitely indicate realignment is necessary.

14.13 All alignment and calibration tests, measurements, etc., may be made with the Standard Signal Generator, or similar equipment, and an output meter, General

Radio Type 583A, or equivalent. All tests are made with the Standard Signal Generator adjusted to provide a test signal having 400 cycle 30% modulation, unless otherwise specified.

14.14 Before proceeding with the alignment of any circuit of the Model SLR-12-A Radio Receiver, other than adjustment of trimmer capacitors associated with the secondary windings of the antenna coupling transformers, then the Receiver chassis must be taken out of its cabinet; the bottom cover plate of the chassis; top cover plate of the shielded compartment (Fig. 8), containing the antenna coupling transformers; and the bottom cover plate of the shielded compartment containing the H.F. oscillator and R.F. transformers, (Fig. 7) must be removed. Removal of the latter cover plates provide access to the capacitive and inductive trimming components.

14.15 The Model SLR-12-A Radio Receiver must be connected to 115 volt, 60 cycle, single phase, A.C. power source; the power switch S-103 to ON; SELECTIVITY control knob, E-120, to SHARP; FIDELITY control knob E-116 to approximate mid position, and, VOLUME control knob E-117 to full clockwise rotation. An output meter, General Radio Type 583A, or equivalent, should be connected either to the PHONE(S) output jack J-101, or to speaker terminals E-105, and adjusted for 600 ohm impedance.

14.16 The complete alignment of the Radio Receiver may be divided into four steps:

(1) Intermediate frequency amplifier alignment.
(2) High frequency oscillator alignment.
(3) Radio frequency amplifier alignment.
(4) Trimming of antenna input circuit.

NOTE: THE CIRCUITS MUST BE CHECKED IN THE ABOVE ORDER WHEN COMPLETE ALIGNMENT IS NECESSARY.

14.2 I. F. Amplifier Alignment

14.21 The intermediate frequency of the Radio Receiver is 455 kilocycles, plus or minus one kilocycle.

14.22 Tuning adjustments are provided in each I.F. transformer. These adjustments consist of adjustable iron cores and are designated by symbol numbers E-130 to E-134, inclusive, as indicated on schematic diagram, Figure 9.

14.23 The high potential lead of the Standard Signal Generator should be connected to the control grid (terminal No. 5) of the first detector tube V-103 and the ground potential lead to any metal part making direct connection to the chassis.

14.24 The frequency of the Standard Signal Generator should be carefully adjusted to 455 kilocycles and the signal input to first detector tube V-103 adjusted to provide a reading on the output meter. The I.F. tuning adjustments, listed in Paragraph 14.22, should be carefully adjusted to give a maximum reading on the output meter. The order in which the adjustments are made is unimportant.

NOTE: IT IS ESSENTIAL THAT THE INPUT SIGNAL, FROM THE STANDARD SIGNAL GENERATOR, BE KEPT BELOW THE THRESHOLD OF OPERATION OF THE AUTOMATIC VOLUME CONTROL. EXCESSIVE SIGNAL INPUTS WHICH WILL CAUSE OVERLOAD OF EITHER THE SECOND DETECTOR OR AUDIO CIRCUITS SHOULD ALSO BE AVOIDED.

14.25 The performance of the Model SLR-12-A Radio Receiver, from the control grid of the first detector to the output load, can be checked against the stage gain data in Table 3, Section 13, after alignment has been completed. Similarly, the selectivity may be checked against the curves of Plate 2, Section 11.

14.3 High Frequency Oscillator Alignment

14.31 Realignment of the H.F. oscillator circuits for any frequency band is usually necessary if the resonant frequency of the Receiver, as indicated by the tuning dial reading, is in error with respect to the actual resonant frequency by more than ± 1.0 percent.

WARNING: READJUSTMENT OF THE H.F. OSCILLATOR CIRCUIT TRIMMERS SHOULD NOT BE ATTEMPTED UNTIL AFTER THE NEED FOR SUCH READJUSTMENTS HAS BEEN POSITIVELY ESTABLISHED BY TESTS COVERED IN SECTION 13.

14.32 To check the operation of the R.F. amplifier and H.F. oscillator circuits, the Standard Signal Generator, or equivalent, should be connected to the antenna input jack J-103, using a 400 ohm non-inductive resistor as a dummy antenna. The VOLUME control may be retarded somewhat if desired, as background noise may be excessive when the control is fully advanced.

14.33 If error in calibration is found, check the dial pointer to make certain that it has not been pushed out of position. This may be checked by turning the main tuning control knob E-118 until pointer N-106 is at the extreme left position of its travel. At this point the pointer should line up with the vertical lines on the end of the dial scales.

14.34 The following general procedure should be employed in the alignment of H.F. oscillator circuits of any frequency band.

(1) General.
If, when the Receiver is resonated, at the high frequency end of the band, with a test signal frequency, the dial pointer appears above the dial scale marking for this test frequency, then adjustment is made by tuning the oscillator trimmer capacitor, associated with that band, in a clockwise direction to increase its capacity; conversely, if the Receiver resonants at a lower frequency, as indicated by the markings on the dial, correction is made by turning trimmer counterclockwise.

(2) Broadcast-B.C. position of BAND SELECTOR switch.
- (A) Set Signal Generator to 1500 kilocycles.
- (B) Set Receiver dial pointer to 1500.
- (C) Adjust trimmer C-145 until maximum output is obtained.
- (D) Set Signal Generator to 600 kilocycles.
- (E) Set Receiver dial pointer to 600.
- (F) Adjust padder C-148 for maximum output.
- (G) Set Signal Generator to 900 kilocycles.
- (H) Set Receiver dial pointer to 900.
- (I) Adjust iron core E-127 for maximum output.
- (J) Repeat operations A to I, inclusive, until the pointer lines up with the dial markings at all three points on this band.

(3) Shortwave Band I-SW 1 position of BAND SELECTOR switch.
- (A) Set Signal Generator to 9.0 megacycles.
- (B) Set Receiver dial pointer to 9.0.
- (C) Adjust trimmer capacitor C-146 for maximum output.
- (D) Set Signal Generator to 5.8 megacycles.
- (E) Set Receiver Dial pointer to 5.8.
- (F) Adjust iron core E-128 for maximum output.
- (G) Repeat A to F, inclusive, until the dial markings correspond to these two frequencies without further adjustment.

(4) Shortwave Band II-SW 2 position on BAND SELECTOR switch.
- (A) Set Signal Generator to 15 megacycles.
- (B) Set Receiver Dial pointer to 15.
- (C) Adjust C-147 until maximum output is obtained.
- (D) Set Signal Generator to 9.3 megacycles.
- (E) Set Receiver dial pointer to 9.3.
- (F) Adjust E-129 for maximum output.
- (G) Repeat A to F, inclusive, until these two frequencies are resonated at the dial markings for these frequencies.

14.4 R. F. Amplifier Alignment

14.41 The following general procedure should be employed in the Alignment of R.F. and antenna stages.

(1) General.
Standard Signal Generator is adjusted to provide a 30%, 400 cycle modulated carrier, specified in (2), (3) and (4); connection made to the Receiver through J-103 using a 400 ohm, non-inductive resistance as a dummy antenna.

(2) Broadcast Band (BC).
- (A) Set Signal Generator to 1500 kilocycles.
- (B) Set Receiver dial pointer to 1500.
- (C) Adjust C-149 and C-152 for maximum output.
- (D) Set Signal Generator to 600 kilocycles.
- (E) Set Receiver dial pointer to 600.
- (F) Adjust E-121 and E-124 for maximum output.

(G) Repeat A to C, inclusive, for final adjustment.

(3) Shortwave Band 1 (SW1).

(A) Set Signal Generator to 9.0 megacycles.

(B) Set Receiver dial pointer to 9.0.

(C) Adjust C-150 and C-153 for maximum output.

(D) Set Signal Generator to 5.8 megacycles.

(E) Set Receiver dial pointer to 5.8.

(F) Adjust E-122 and E-125 for maximum output.

(G) Repeat A to C, inclusive, for final adjustment.

(4) Shortwave Band II (SW2).

(A) Set Signal Generator to 15 megacycles.

(B) Set Receiver dial pointer to 15.

(C) Adjust C-151 and C-154 for maximum output.

(D) Set Signal Generator to 9.3 megacycles.

(E) Set Receiver dial pointer to 9.3.

(F) Adjust E-123 and E-126 for maximum output.

(G) Repeat A to C, inclusive, for final adjustment.

14.5 Antenna Alignment

Final antenna alignment should be made after installation, by adjusting trimmers C-149, C-150 and C-151, for the B.C., SW-1 and SW-2 bands respectively, for optimum performance with the specific antenna employed.

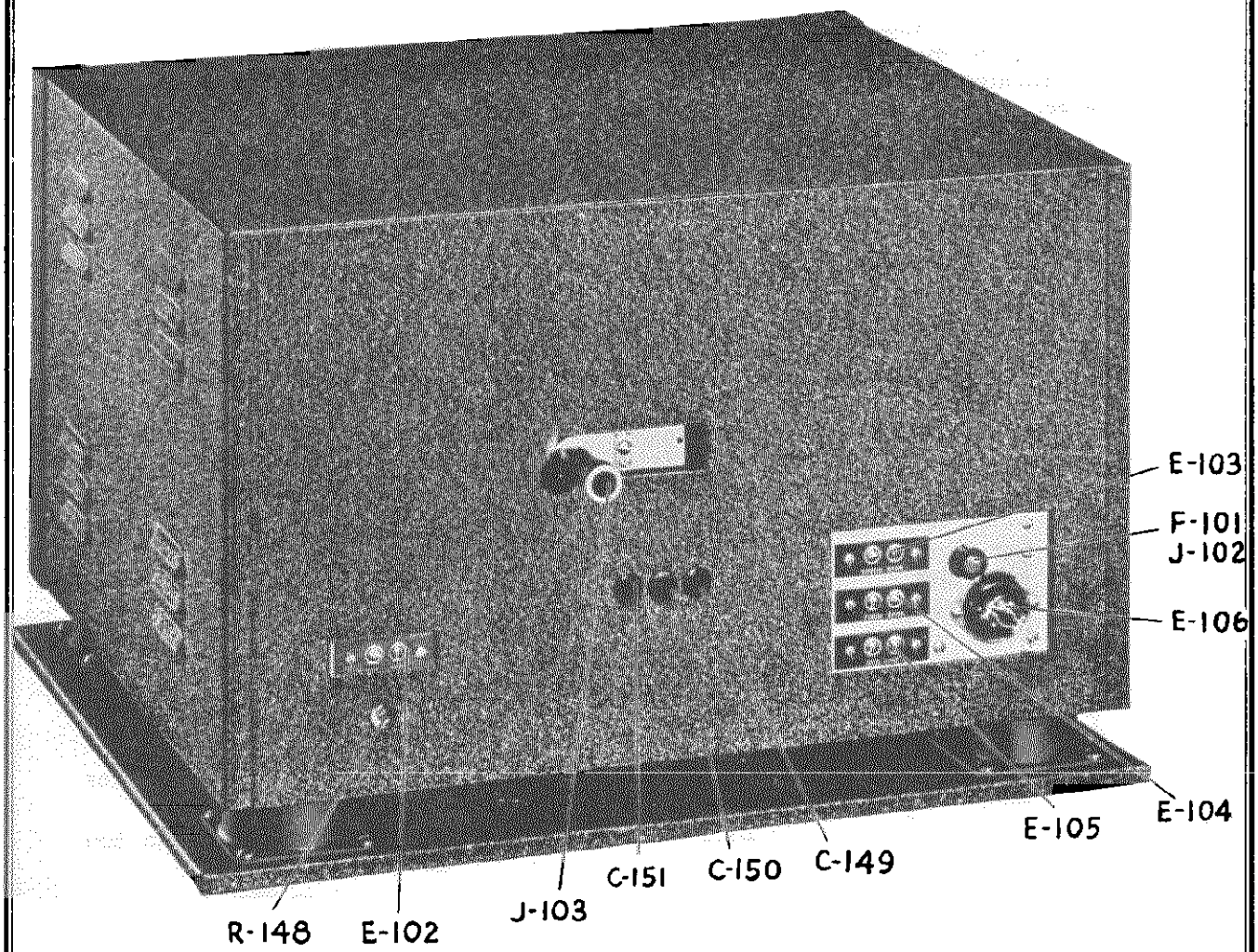

FIG. 2. Left Rear Oblique View, Radio Receiver.

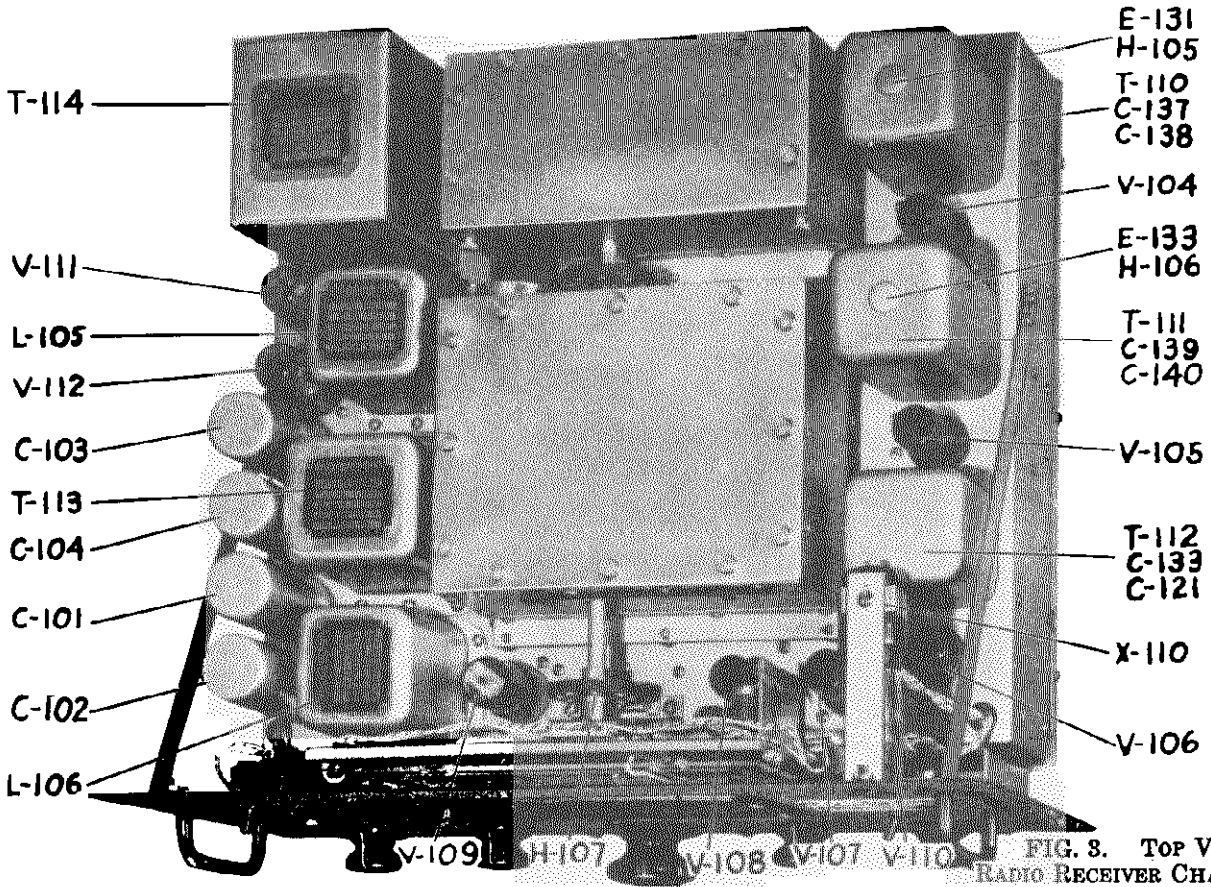

FIG. 3. TOP VIEW, RADIO RECEIVER CHASSIS.

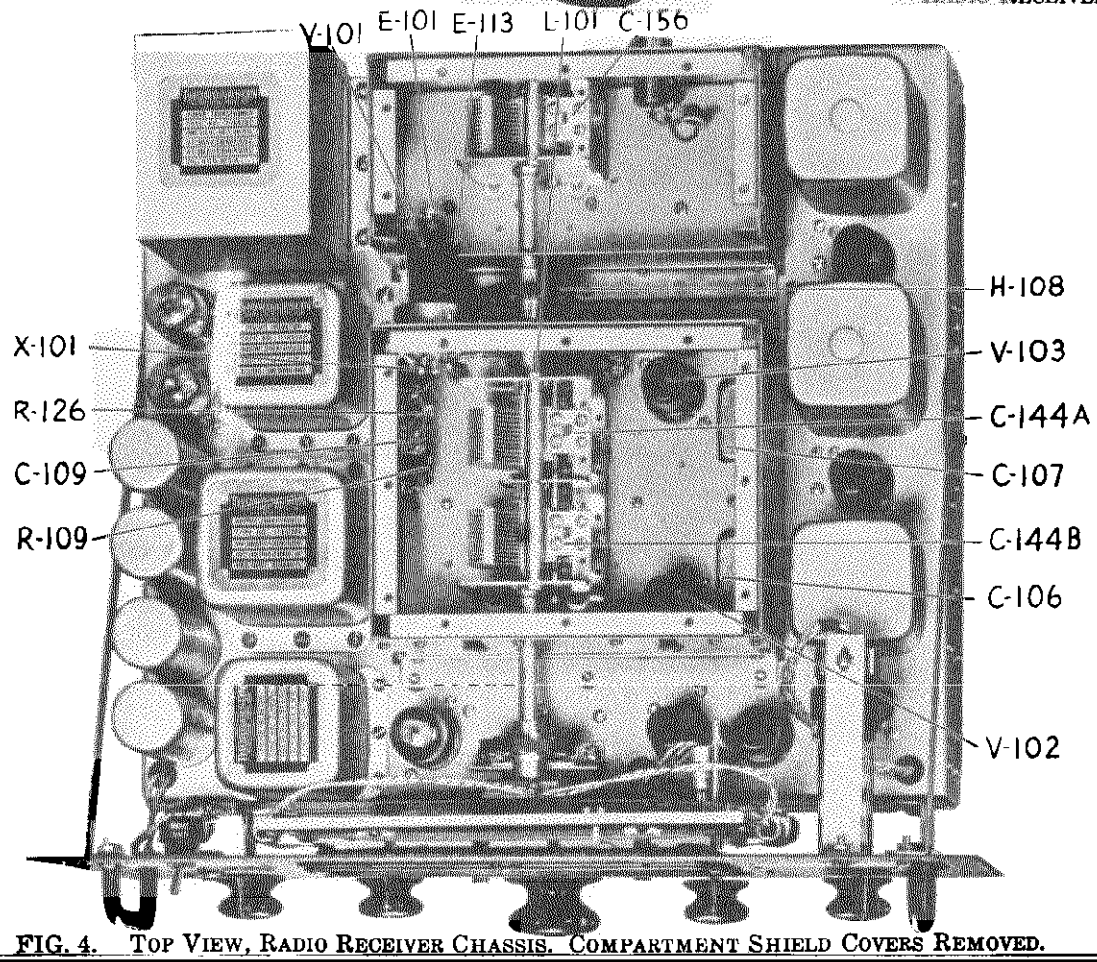

FIG. 4. TOP VIEW, RADIO RECEIVER CHASSIS. COMPARTMENT SHIELD COVERS REMOVED.

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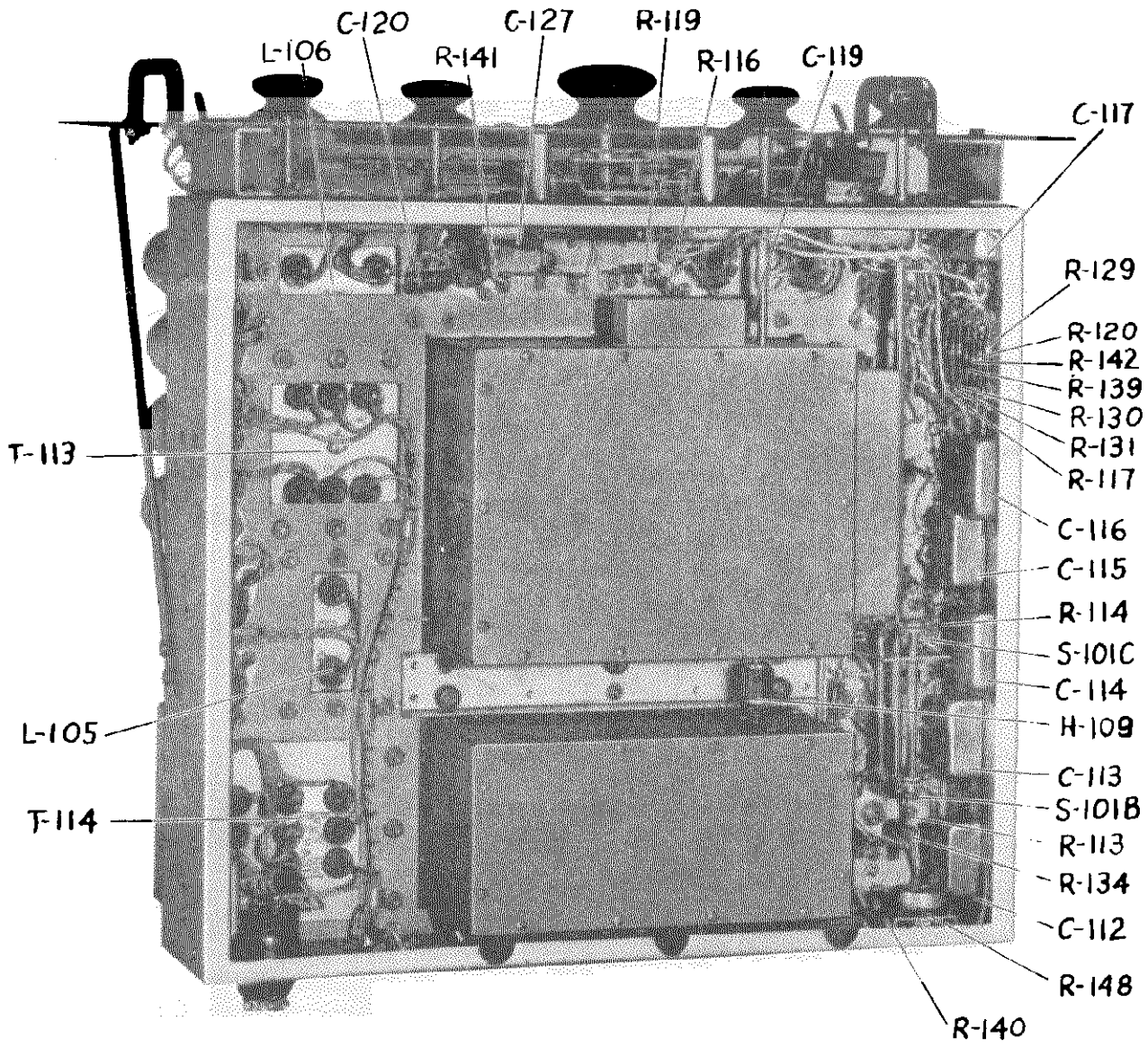


FIG. 5. LEFT BOTTOM OBLIQUE VIEW, RADIO RECEIVER CHASSIS. BOTTOM COVER PLATE REMOVED.

15.2 TABLE II
PARTS LIST BY SYMBOL DESIGNATIONS
FOR MODEL SLR-12-A RADIO RECEIVING EQUIPMENT
SECTION 1 — MODEL SLR-12-A RECEIVER

Symbol Desig.	Function	Description	Drawing and Part Number
		CAPACITORS	
C-101	Input Filter	Capacitor, paper, 4 mfd, 600 volts DC working.	5070
C-102	Output Filter	Same as C-101	
C-103	Input Filter	Same as C-101	
C-104	Output Filter	Same as C-101	
C-105	V-107 Cathode Bypass	Capacitor, electrolytic, 25 Mfd. +50%, —10%,	5088
C-106		25 Volts DC working.	
C-106A	V-102 Heater Bypass	Capacitor, paper, 0.1/0.1 Mfd. each section 600	5069
C-106B	V-102 Plate Bypass	Volts DC working. Hermetically sealed.	
C-107		Same as C-106	
C-107A	V-103 Cathode Bypass		
C-107B	V-103 Screen Bypass		
C-108		Capacitor, paper, 0.1/0.1 Mfd. each section 600	5089
C-108A	V-108 Plate Bypass	Volts DC working. Hermetically sealed.	
C-108B	V-108 Screen Bypass		
C-109		Capacitor, paper, 0.1/0.1/0.1 Mfd. each section	5065
C-109A	V-101 Cathode Bypass	600 Volts DC working. Hermetically sealed.	
C-109B	V-101 Plate Bypass		
C-109C	V-101 Screen Bypass		
C-110	Filter Tuning	Capacitor, paper, 0.05 Mfd. 600 Volts DC work-	7002
		ing. Hermetically sealed.	
C-111		Capacitor, paper, 0.05/0.05 Mfd. each section	5067
C-111A	Line Bypass	600 Volts DC working. Hermetically sealed.	
C-111B	Line Bypass		
C-112		Same as C-111	
C-112A	V-103 Plate Filter		
C-112B	V-104 Grid Filter		
C-113		Same as C-111	
C-113A	V-104 Cathode Bypass		
C-113B	V-104 Screen Bypass		
C-114		Same as C-111	
C-114A	A.V.C. Line Bypass		
C-114B	V-104 Plate Filter		
C-115		Same as C-109	
C-115A	V-105 Plate Bypass		
C-115B	V-105 Cathode Bypass		
C-115C	V-105 Screen Bypass		
C-116		Same as C-111	
C-116A	V-110 Grid bypass		
C-116B	Limiter bypass		
C-117	V-106 to V-107 Coupling	Capacitor, paper, 0.02 Mfd. 600 Volts DC work-	5066
		ing. Hermetically sealed.	
C-118	Fidelity Control Condenser	Same as C-117	
C-119	V-107 to V-108 Coupling	Capacitor, mica, 5000 MMF, ±10% 300 Volts	5079
		DC working.	
C-120	+ B bypass	Same as C-119	
C-121	Diode filter bypass	Capacitor, mica, 50 MMF, ±10%, 500 Volts DC	5076
C-122	Not used	working. Low loss case.	
C-123	Ant to V-101 Coupling	Capacitor, mica, 250 MMF, ±10% 500 Volts DC	5077
		working. Low loss case.	
C-124	V-101 Plate coupling	Same as C-123	
C-125	V-103 Grid coupling	Same as C-123	
C-126	Not used		
C-127	V-108 to V-109 Coupling	Same as C-119	
C-128	V-102 Heater bypass	Same as C-119	

15.2 TABLE II (*Continued*)
PARTS LIST BY SYMBOL DESIGNATIONS
FOR MODEL SLR-12-A RADIO RECEIVING EQUIPMENT
SECTION 1 — MODEL SLR-12-A RECEIVER

Symbol Desig.	Function	Description	Drawing and Part Number
		CAPACITORS (*Continued*)	
C-129	V-103 B + bypass	Same as C-119	
C-130	V-102 B + bypass	Same as C-119	
C-131	Oscillator coupling	Capacitor, Silver mica, 50 MMF ±2.5%, 500 Volts DC working.	5080
C-132	Oscillator grid Coupling	Same as C-131	
C-133	T-112 Primary tuning	Capacitor, Silver mica, 100 MMF ±2.5%, 500 Volts DC working.	5081
C-134	Antenna tuning padder	Capacitor, Silver mica, 175 MMF ±2.5%, 500 Volts DC working.	5082
C-135	R.F. tuning padder	Same as C-134	
C-136	Oscillator tuning padder	Same as C-134	
C-137	T-110 Primary tuning	Capacitor, Silver mica, 225 MMF ±2.5%, 500 Volts DC working.	5083
C-138	T-110 Secondary tuning	Capacitor, Silver mica, 250 MMF ±2.5%, 500 Volts DC working.	5084
C-139	T-111 Primary tuning	Same as C-138	
C-140	T-111 Secondary tuning	Same as C-138	
C-141	T-107 Padder fixed	Capacitor, Silver mica, 350 MMF ±2.5%, 500 Volts DC working.	5085
C-142	T-108 Padder	Capacitor, Silver mica, 3000 MMF ±2.5%, 500 Volts DC working.	5086
C-143	T-109 Padder	Capacitor, Silver mica, 4000 MMF ±2.5%, 300 Volts DC working.	5087
C-144 C-144A C-144B	R.F. tuning Oscillator tuning	Capacitor, variable air, 2 gang. Minimum capacity 14 MMF, Max. capacity 390 MMF. 25 plates each section curve "C", 0.015 inches min. spacing.	5101
C-145	T-107 trimmer	Capacitor, variable air. Minimum capacity 3 MMF, Max. capacity 25 MMF.	5072
C-146	T-108 trimmer	Capacitor, variable air. Minimum capacity 4 MMF, Max. capacity 50 MMF.	5073
C-147	T-109 trimmer	Same as C-146	
C-148	T-107 variable padder	Capacitor, variable air. Minimum capacity 6 MMF, Max. capacity 75 MMF.	5074
C-149	T-101 trimmer	Capacitor, Var. mica, Min. capacity 1 MMF, Max. capacity 12 MMF. Compression type.	6093
C-150	T-102 trimmer	Capacitor, variable mica, Minimum capacity 4 MMF, Max. capacity 60 MMF. Compression type.	5071
C-151	T-103 trimmer	Same as C-150	
C-152	T-104 trimmer	Same as C-149	
C-153	T-105 trimmer	Same as C-150	
C-154	T-106 trimmer	Same as C-150	
C-155	V-107 Plate filter	Same as C-109	
C-156	Antenna tuning	Capacitor, variable air. Min. capacity 14 MMF, Max. capacity 390 MMF 25 plates, curve "C", 0.015 min. spacing.	5100
		MISCELLANEOUS ELECTRICAL PARTS	
E-101	V-101 Grid cap	¼" Grid cap for octal tubes	5045
E-102	Phono input terminals	Phono input two terminal strip marked PHONO and GND, Terminals have captive screws.	6001
E-103	Speaker output term. 5000 ohm	Speaker output two terminal strip marked 5000 ohm SPKR. Terminals have captive screws.	6003

15.2 TABLE II (*Continued*)
PARTS LIST BY SYMBOL DESIGNATIONS
FOR MODEL SLR-12-A RADIO RECEIVING EQUIPMENT
SECTION 1 — MODEL SLR-12-A RECEIVER

Symbol Desig.	Function	Description	Drawing and Part Number
		MISCELLANEOUS ELECTRICAL PARTS (*Continued*)	
E-104	Speaker output term. 600 ohm	Speaker output two terminal strip marked 600 ohm SPKR. Terminals have captive screws.	6004
E-105	Line term. 60 ohm	Output two terminal strip marked 60 ohm LINE. Terminals have captive screws.	6005
E-106	AC power receptacle	Two pole plug set in drawn steel shell for below surface mounting.	7006
E-107	SW II lamp socket	Bayonet type socket	5174
E-108	SW I lamp socket	Bayonet type socket	5173
E-109	BC lamp socket	Bayonet type socket	5172
E-110	Phono lamp socket	Bayonet type socket	5171
E-111	Dial lamp socket	Bayonet type socket	5041
E-112	Dial lamp socket	Same as E-111	
E-113	V-101 grid lead insul.	Porcelain lead through bushing	5036
E-114	L-101 support insul.	Same as E-113	
E-115	L-101 support insul.	Same as E-113	
E-116	Treble control knob	1½" Black bakelite knob.	5119
E-117	Volume control knob	Same as E-116	
E-118	Main tuning knob	2⅛" Black bakelite knob.	5120
E-119	Wave Change knob	Same as E-116	
E-120	Selectivity knob	Same as E-116	
E-121	T-101 Sec. Inductance Trimmer	Compressed powdered-iron core coil inductance trimmer.	5103
E-122	T-102 Sec. Inductance Trimmer	Compressed powdered-iron core coil inductance trimmer.	5102
E-123	T-103 Sec. Inductance Trimmer	Same as E-122	
E-124	T-104 Sec. Inductance Trimmer	Same as E-121	
E-125	T-105 Sec. Inductance Trimmer	Same as E-122	
E-126	T-106 Sec. Inductance Trimmer	Same as E-122	
E-127	T-107 Sec. Inductance Trimmer	Same as E-121	
E-128	T-108 Sec. Inductance Trimmer	Same as E-122	
E-129	T-109 Sec. Inductance Trimmer	Same as E-122	
E-130	T-110 Pri. Inductance Trimmer	Same as E-121	
E-131	T-110 Sec. Inductance Trimmer	Same as E-121	
E-132	T-111 Pri. Inductance Trimmer	Same as E-121	
E-133	T-111 Sec. Inductance Trimmer	Same as E-121	
E-134	T-112 Pri. Inductance Trimmer	Same as E-121	
		FUSES	
F-101	AC line fuse	Fuse, 2 Amps, up to 250 V., cartridge type, 1¼" long, ferrules ¼" diameter.	5111
		HARDWARE	
H-101	Plug button for T-101 Trimmer	½" Plug button	5038
H-102	Plug button for T-102 Trimmer	Same as H-101	
H-103	Plug button for T-103 Trimmer	Same as H-101	
H-104	Not used		
H-105	Plug button for T-110 Shield	½" Plug button	5037
H-106	Plug button for T-111 Shield	Same as H-105	
H-107	N-106 to C-144 coupling	Insulated coupling for ⅜" shaft	7157
H-108	C-144 to C-156 coupling	Insulated coupling for ⅜" shaft	6081A
H-109	O-101 to O-102 coupling	Insulated coupling for ¼" shaft	5106
H-110	Dial escutcheon	Transparent Escutcheon	5109
H-111	Pull Handle	Right Pull Handle	5115
H-112	Pull Handle	Left Pull Handle	5115

15.2 TABLE II (*Continued*)
PARTS LIST BY SYMBOL DESIGNATIONS
FOR MODEL SLR-12-A RADIO RECEIVING EQUIPMENT
SECTION 1 — MODEL SLR-12-A RECEIVER

Symbol Desig.	Function	Description	Drawing and Part Number
		HARDWARE (*Continued*)	
H-113	Captive thumb screws	8/32 Captive thumb screws	5166
H-114	Panel thumb screws	10/32 thumb screws	5167
H-115	Shock Mounting	Rubber Shock Mounting	5170
		INDICATING DEVICES	
I-101	SW II Indicator lamp	Type 44—6.3V, .25A lamp	5110
I-102	SW I Indicator lamp	Same as I-101	
I-103	B.C. Indicator lamp	Same as I-101	
I-104	Phono Indicator lamp	Same as I-101	
I-105	Dial lighting lamp	Same as I-101	
I-106	Dial lighting lamp	Same as I-101	
		JACK AND RECEPTACLES	
J-101	Phone Jack	Jack, single, open circuit, short, for 2 conductor plugs, with tip and sleeve only.	5118
J-102	Fuse Holder	Extractor type fuse holder	5112
J-103	Concentric Antenna	Concentric line jack for RF connections	7010
		INDUCTORS R.F. & A.F.	
L-101	V-101 Plate choke	Radio Frequency choke, 2.5 M H., 125 MA.DC, distributed capacity 1MMF 50 ohms DC resistance. Pigtail terminals.	5047
L-102	V-103 + B choke	Same as L-101	
L-103	V-102 + B choke	Same as L-101	
L-104	V-102 heater filter	RF choke, 32 turns of #20 wire	5046
L-105	Audio + B filter choke	32 H, 40MA choke ±10% Test voltage 1500 RMS 3900 T #34E, 450 OHMS.	5048
L-106	RF + B filter choke	Same as L-105	
		NAMEPLATES, DIALS, CHARTS	
N-101	Model nameplate	Etched model plate	8001
N-104	Linear dial	Etched linear scale	5107A
N-105	Dial Index plate	Etched indicator index plate	5107B
N-106	Dial main tuning	Friction Drive dial pointer	7100
N-107	Frequency dial	Dial plate with lucite calibration	5108
		PLUGS	
P-101	Antenna and ground plug	Concentric plug single circuit for RF connection	7009
P-102	Power input receptacle & plug	Receptacle, 2 pole	7006
		MECHANICAL PARTS, SHAFTS	
O-101	Band switch shaft	Switch shaft & detent plate	5195-A
O-102	Band switch shaft extension	Shaft extension	7018
O-103	Selectivity switch shaft	Switch shaft & detent plate	5196-A
		RESISTORS	
R-101	T-111 secondary series	Resistor, wire wound, 10 ohms, ±10%, ½ watt, phenolic insulated. Pigtail type terminals.	5131
R-102	T-111 secondary series	Resistor, wire wound, 47 ohms, ±10%, ½ watt, phenolic insulated. Pigtail type terminals.	5132

15.2 TABLE II (*Continued*)
PARTS LIST BY SYMBOL DESIGNATIONS
FOR MODEL SLR-12-A RADIO RECEIVING EQUIPMENT
SECTION 1 — MODEL SLR-12-A RECEIVER

Symbol Desig.	Function	Description	Drawing and Part Number
		RESISTORS (*Continued*)	
R-103	T-110 secondary series	Same as R-102	
R-104	T-110 secondary series	Same as R-102	
R-105	V-103 Cathode bias	Resistor, composition, 270 ohms, ±10%, ½ watt, pigtail terminals	7145
R-106	Phone pad resistor	Same as R-105	
R-107	Phone pad resistor	Same as R-105	
R-108	Phone pad resistor	Resistor, composition, 560 ohms, ±10%, ½ watt, pigtail terminals	7220
R-109	V-101 Cathode bias	Resistor, composition, 680 ohms, ±10%, ½ watt, pigtail terminals	7146
R-110	V-104 Cathode bias	Same as R-109	
R-111	V-105 Cathode bias	Same as R-109	
R-112	V-101 Plate filter	Resistor, composition, 1000 ohms, ±10%, ½ watt, pigtail terminals	5136
R-113	V-103 Plate filter	Same as R-112	
R-114	V-104 Plate Filter	Same as R-112	
R-115	V-105 Plate Filter	Same as R-112	
R-116	V-108 Cathode bias	Resistor, composition, 1500 ohms, ±10%, ½ watt, pigtail terminals	5137
R-117	V-107 Cathode bias	Resistor, composition, 2400 ohms, ±10%, ½ watt, pigtail terminals	7148
R-118	V-103 Grid #1 resistor	Resistor, composition, 20,000 ohms, ±10%, ½ watt, pigtail terminals	7150
R-119	T-113 to V-108 Feedback	Resistor, composition, 10,000 ohms, ±10%, ½ watt, pigtail terminals	7008
R-120	V-106 noise limiter	Resistor, composition, 1.0 meg. ohms, ±10%, ½ watt, pigtail terminals	5146
R-121	Not used		
R-122	V-102 Grid leak	Resistor, composition, 47,000 ohms, ±10%, ½ watt, pigtail terminals	5141
R-123	V-107 plate load	Same as R-122	
R-124	V-107 plate filter	Same as R-122	
R-125	V-108 plate filter	Same as R-122	
R-126	V-101 screen filter	Resistor, composition, 100,000 ohms, ±10%, ½ watt, pigtail terminals	5142
R-127	V-104 screen filter	Same as R-126	
R-128	V-105 screen filter	Same as R-126	
R-129	V-106 Limiter Cathode resistor	Resistor, composition, .82 meg., ±10%, ½ watt, pigtail terminals.	7090
R-130	Diode filter	Resistor, composition, .22 Meg. ±10%, ½ watt, pigtail terminals.	5144
R-131	Diode load	Same as R-130	
R-132	V-108 plate load	Resistor, composition, .47 Meg. ± 10%, ½ watt, pigtail terminals.	5145
R-133	V-109 to V-108 feedback	Same as R-130	
R-134	V-104 grid filter	Same as R-130	
R-135	V-101 grid filter	Same as R-132	
R-136	V-103 grid filter	Same as R-132	
R-137	V-108 grid leak	Resistor, composition, .47 Meg. ±10%, ½ watt, pigtail terminals.	5145
R-138	V-108 screen filter	Same as R-132	
R-139	A.V.C. filter	Resistor, composition, 1.0 Meg. ±10%, ½ watt, pigtail terminals.	5146
R-140	Eye control limiting	Same as R-130	

15.2 TABLE II (*Continued*)
PARTS LIST BY SYMBOL DESIGNATIONS
FOR MODEL SLR-12-A RADIO RECEIVING EQUIPMENT
SECTION 1 — MODEL SLR-12-A RECEIVER

Symbol Desig.	Function	Description	Drawing and Part Number
		RESISTORS (*Continued*)	
R-141	V-109 grid leak	Same as R-139	
R-142	V-110 indicator filter	Resistor, composition, 2.2 Meg. ±10%, ½ watt, pigtail terminals.	5147
R-143	V-102 plate filter	Resistor, composition, 15,000 ohms, ±10%, 2 watt, pigtail terminals.	7230
R-144	V-103 screen filter	Resistor, composition, 18,000 ohms, ±10%, 2 watt, pigtail terminals.	7231
R-145	V-109 cathode bias	Resistor, wire wound, 680 ohms, ±10%, 2 watts, phenolic insulated, pigtail type terminals.	7239
R-146	Volume control	Potentiometer, .5 meg ±20% Composition, semi-logarithmic Clockwise taper, shaft .250x2.187	5129
R-147	Treble control	Potentiometer, .25 meg ±20% Composition, semi-logarithmic Clockwise taper, shaft .250x2.187	5130
R-148	Tuning indicator control	Potentiometer 1 meg ±20% Composition, linear taper Shaft .250x.500, screwdriver slot	5128
		SWITCHES	
S-101A	Phono Radio section	Selectivity gang switch, rotary type, 3 wafer sections	5196-B
B	#1 IF selectivity section		
C	#2 IF selectivity section		
S-102		Band switch, rotary type, 5 wafer sections	5195-B
A	Indicator lamp section		
B	Oscillator section		
C	R.F. section		
D	Antenna secondary section		
E	Antenna primary section		
S-103	A.C. - off - on switch	Toggle switch S.P.S.T., silver plated contacts rated 3A, 250 volts DC	5197
S-104	Noise limiter - off - on switch	Toggle switch S.P.D.T., silver plated contacts rated 3A, 250 volts D.C.	7091
		TRANSFORMERS R.F., A.F. AND POWER	
T-101	J-103 to V-101 coupling B.C. band	R.F.Transformer assembly antenna section Pri.D.C. resistance 0.58 ohms ±10% Sec.D.C. resistance 4.73 ohms ±10%	Pri-5050 Sec-5051
T-102	J-103 to V-101 coupling S.W.I. band	R.F.Transformer assembly antenna section Pri.D.C. resistance 0.2 ohms ±10% Sec.D.C. resistance 0.11 ohms ±10%	Pri-5054 Sec-5055
T-103	J-103 to V-101 coupling S.W. II band	R.F.Transformer assembly antenna section Pri.D.C. resistance 0.16 ohms ±10% Sec.D.C. resistance 0.06 ohms ±10%	Pri-5058 Sec-5059
T-104	V-101 to V-103 coupling B.C. band	R.F.Transformer assembly R.F. section Pri.D.C. resistance 0.3 ohms ±10% Sec.DC. resistance 4.82 ohms ±10%	5052
T-105	V-101 to V-103 coupling S.W.I. band	R.F.Transformer assembly R.F. section Pri.D.C. resistance 0.14 ohms ±10% Sec.D.C. resistance 0.11 ohms ±10%	5056
T-106	V-101 to V-103 coupling S.W. II band	R.F.Transformer assembly R.F. section Pri. D.C. resistance 0.094 ohms ±10% Sec.D.C. resistance 0.062 ohms ±10%	5060

15.2 TABLE II (*Continued*)
PARTS LIST BY SYMBOL DESIGNATIONS
FOR MODEL SLR-12-A RADIO RECEIVING EQUIPMENT
SECTION 1 — MODEL SLR-12-A RECEIVER

Symbol Desig.	FUNCTION	DESCRIPTION	Drawing and Part Number
		TRANSFORMERS R.F., A.F. AND POWER (*Continued*)	
T-107	B.C. Band oscillator	R.F.Transformer assembly oscillator section Tap D.C. resistance 0.564 ohms ±10% Total coil D.C. resistance 3.1 ohms ±10%	5053
T-108	S.W.I. Band oscillator	R.F.Transformer assembly oscillator section Tap, D.C. resistance 0.03 ohms ±10% Total coil, D.C. resistance 0.1 ohms ±10%	5057
T-109	S.W.II Band oscillator	R.F.Transformer assembly oscillator section Tap, D.C. resistance 0.023 ohms ±10% Total coil, D.C. resistance 0.06 ohms ±10%	5061
T-110	V-103 to V-104 coupling	1st I.F. Transformer 455 K.C. Pri.D.C. resistance 4.65 ohms ±10% Sec.D.C. resistance 4.78 ohms ±10%	5062
T-111	V-104 to V-105 coupling	2nd I.F. Transformer 455 K.C. Pri.D.C. resistance 4.89 ohms ±10% Sec.D.C. resistance 4.78 ohms ±10%	5063
T-112	V-105 to V-106 coupling	3rd I.F. Transformer 455 K.C. Pri.D.C. resistance 13 ohms ±10% Sec.D.C. resistance 17.4 ohms ±10%	5064
T-113	V-109 to Speaker terminals	Output Transformer Pri. 2500 turns #37E, D.C. resistance 649 ohms ± 10%, impedance 8000 ohms Sec. #1, 236 turns #26E, D.C. resistance, 5.088 ohms ± 10%, impedance 60 ohms Sec. #2, 753 turns #31E, D.C. resistance, 55.8 ohms ±10%, impedance 600 ohms Sec. #3, 2250 turns #36E, D.C. resistance 489 ohms ±10%, impedance 5000 ohms	6008
T-114	Power Transformer	Pri. 308 turns #22E, D.C. resistance 3.1 ohms ±10%, 70 Va. 115 V., 0.61A, ± 10%. Sec. #1, 1416 turns centertapped #32E, D.C. resistance 166.2 ohms ±10%, 255 V. A.C., 40 Ma. 255 V. A.C., 40 Ma., ±10% Sec. #2, 18 turns #17E, D.C. resistance 0.072 ohms ±10%, 6.3 V. A.C., 3.8A ±10% Sec. #3, 18 turns #20E, D.C. resistance 0.15 ohms, 6.3 V. A.C., 1.2A ±10%	6007
		VACUUM TUBES	
V-101	R.F. amplifier 6K7	Vacuum tube (Receiving—Metal). Triple grid super-control amplifier. Base: Small wafer octal 7 pin. Miniature cap. Heater: Current 0.30 amp at 6.3 volts AC or DC	6017
V-102	H.F. oscillator 6J5	Vacuum tube (Receiving—Metal). Detector amplifier triode. Base: Small wafer octal 6 pin, phenolic. Heater: Current 0.30 amp at 6.3 volts AC or DC	6015
V-103	1st detector and mixer 6SA7 or 6SA7-GT	Vacuum tube (Receiving—Metal). Pentagrid converter. Base: Small wafer octal 8 pin, phenolic. Heater: current 0.3 amp at 6.3 volts AC or DC	6014

15.2 TABLE II (*Continued*)
PARTS LIST BY SYMBOL DESIGNATIONS
FOR MODEL SLR-12-A RADIO RECEIVING EQUIPMENT
SECTION 3—MODEL SPM-8 SPEAKER

Symbol Desig.	Function	Description	Drawing and Part Number
		TRANSFORMERS	
T-301	Output transformer	Output coupling transformer Pri. impedance—600 ohms Sec. impedance—4.4 ohms	8010
		LOUD SPEAKERS	
LS-301	Loud speaker	8 inch permanent magnet loud speaker. Voice coil impedance 4.4 ohms	8002
		INTERCONNECTING CABLES	
W-301	Speaker cable	2 wire rubber covered connector cable	8004A

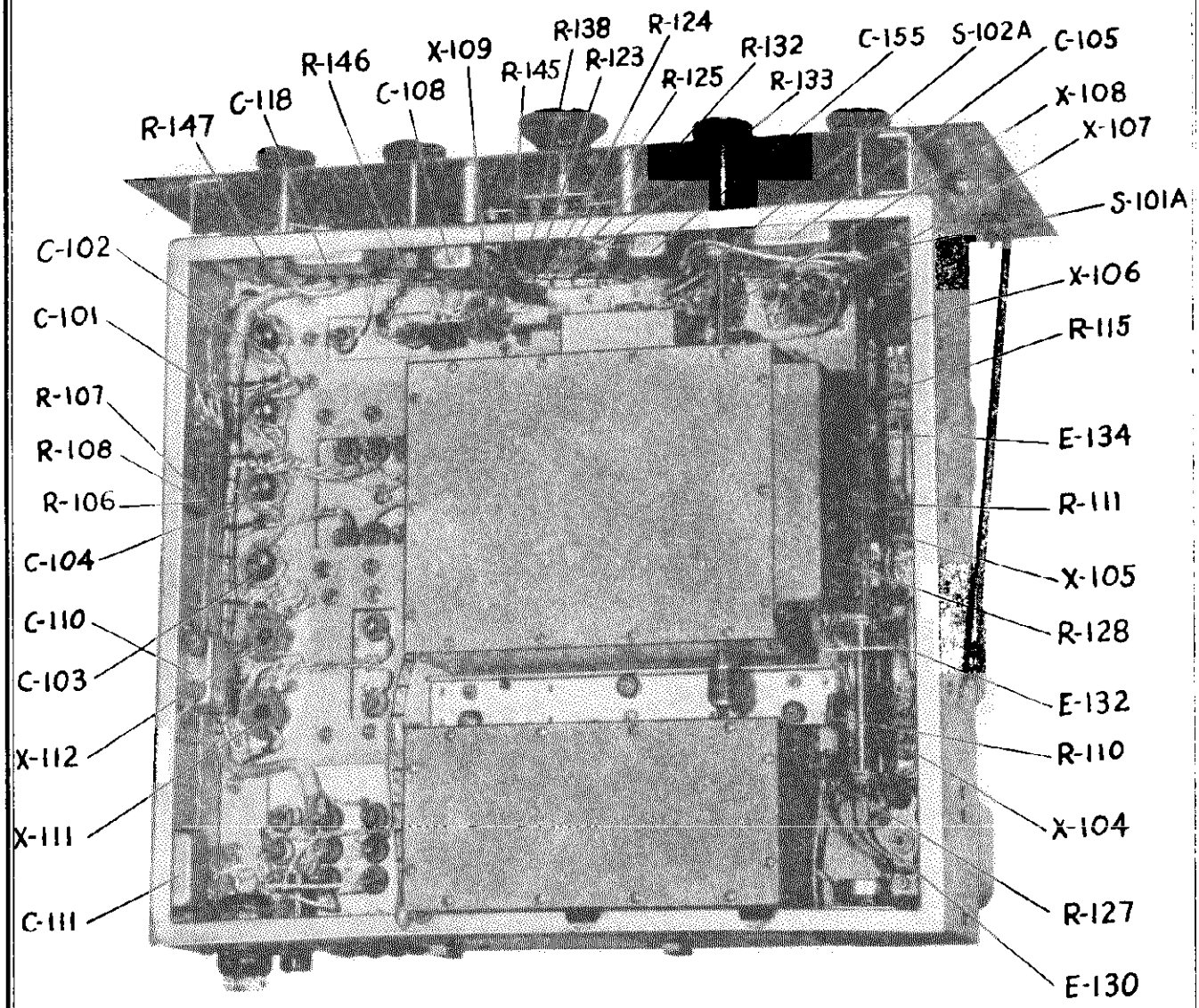


FIG. 6. RIGHT BOTTOM OBLIQUE VIEW, RADIO RECEIVER CHASSIS. BOTTOM COVER PLATE REMOVED.

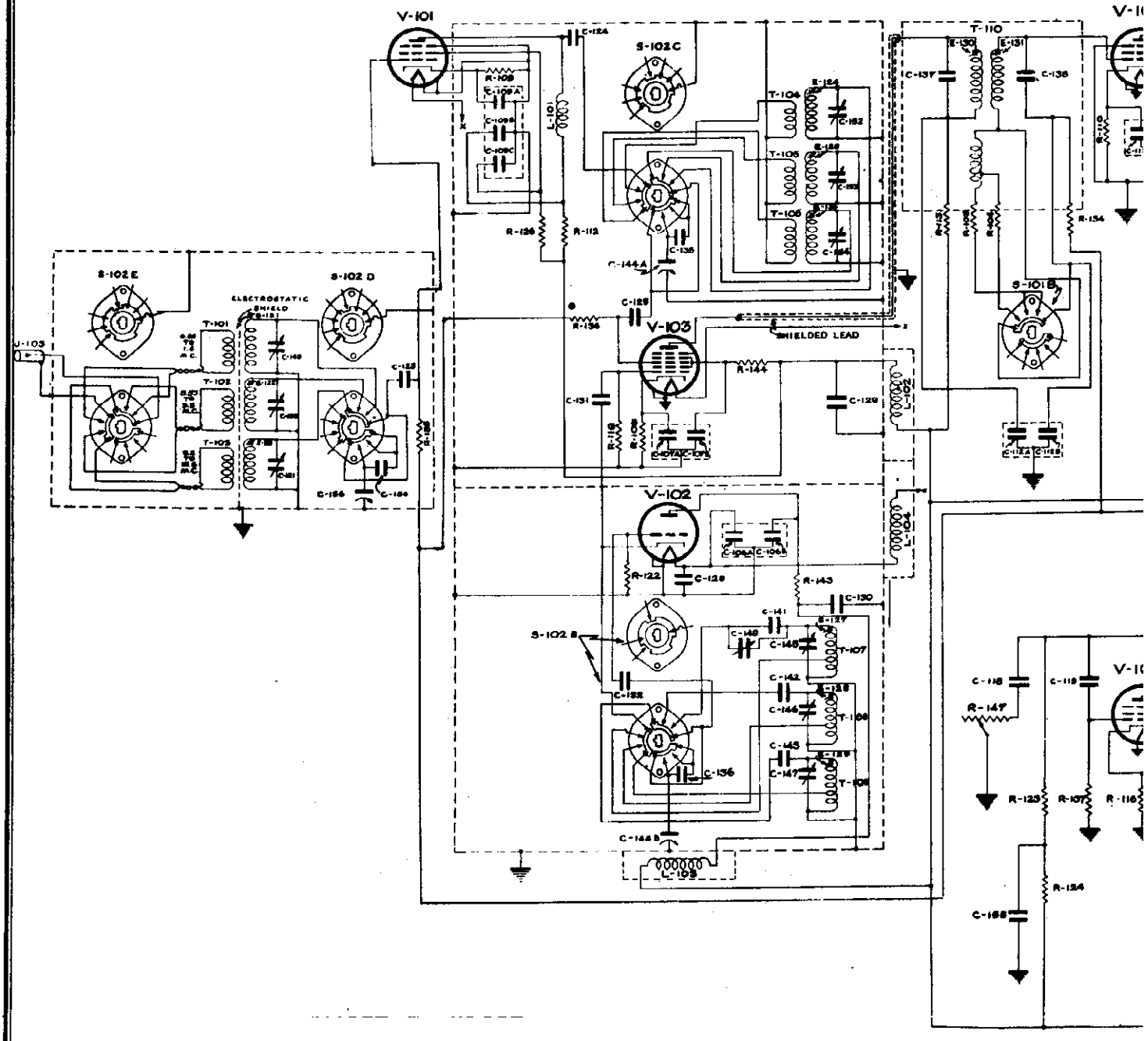
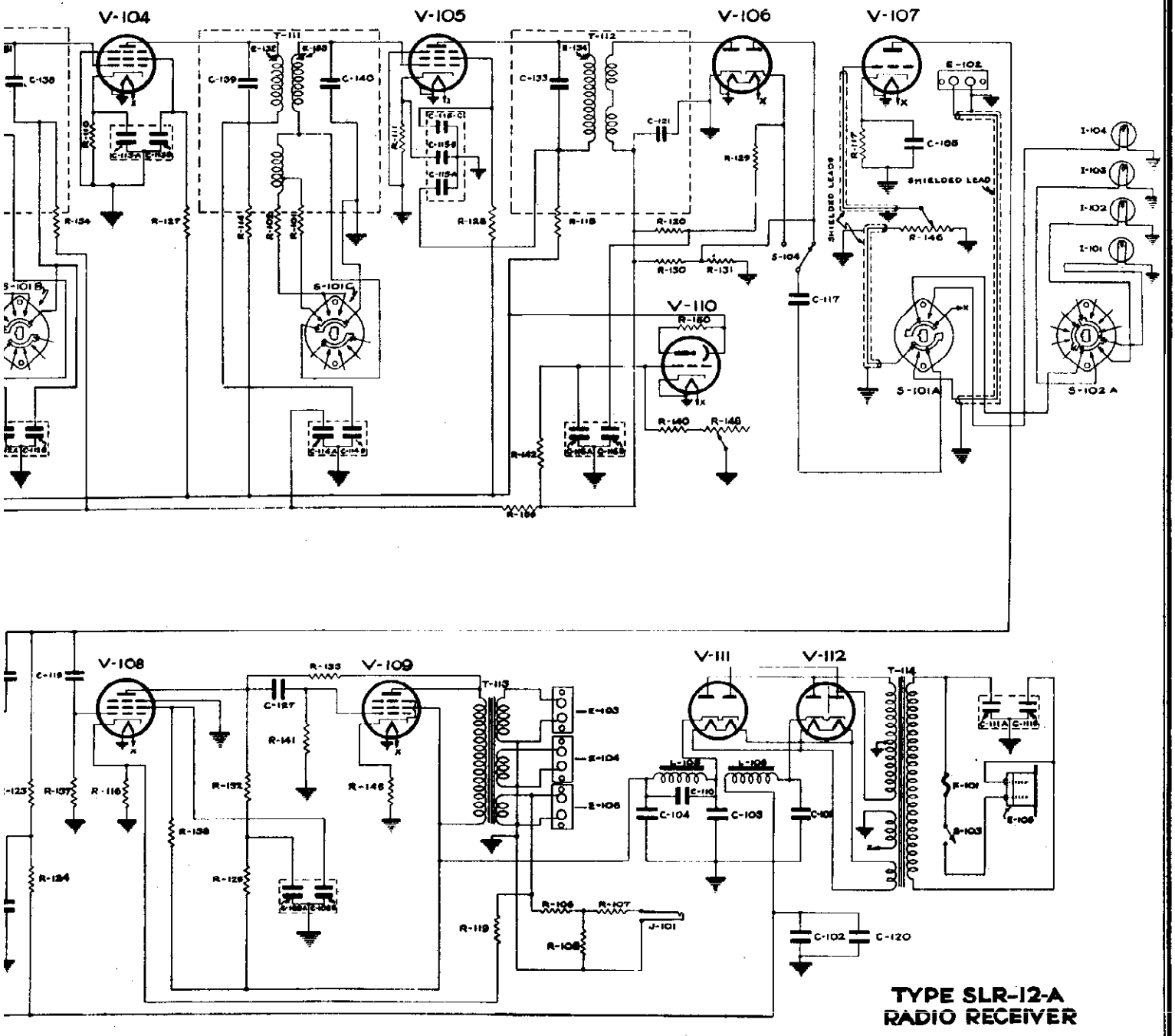


FIG. 9. ACTUAL SCHEMATIC DIAGRAM. MO



IAGRAM. MODEL SLR-12-A RADIO RECEIVER.

MODEL SLR-12-A SCOTT RADIO LABS., INC.

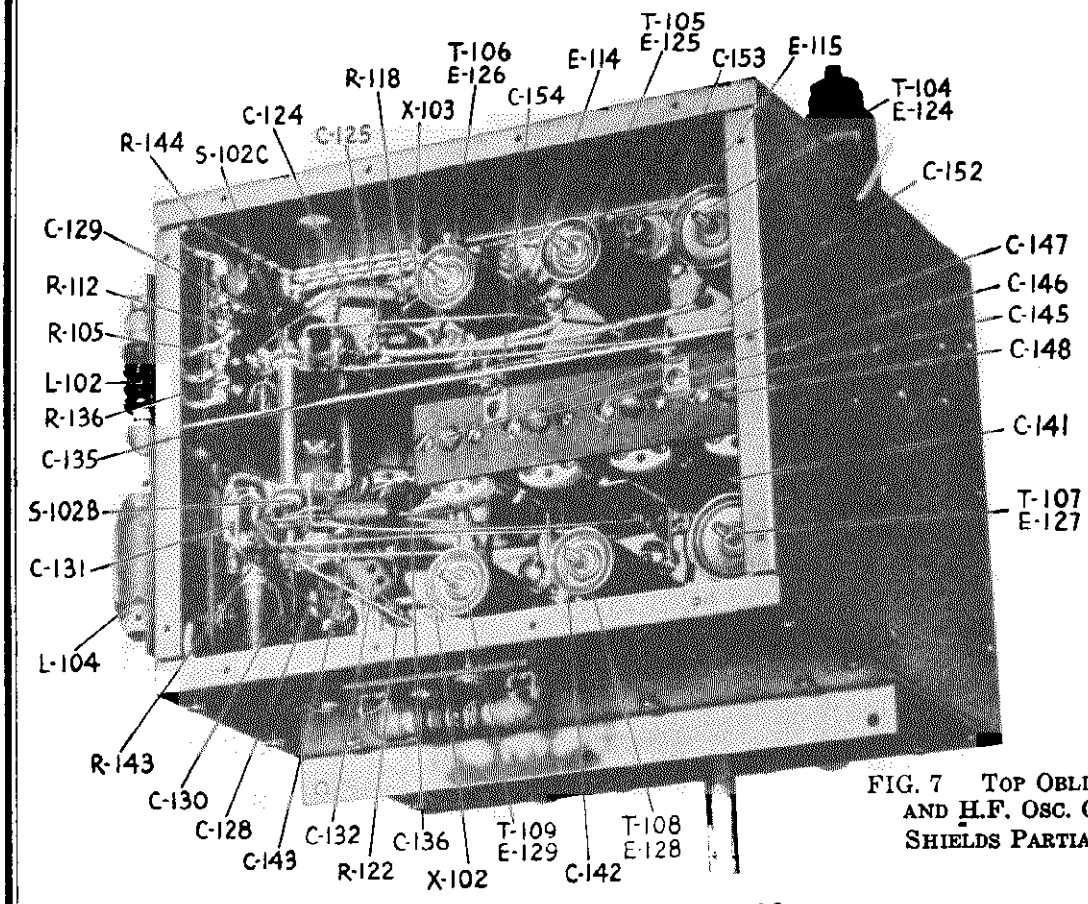


FIG. 7 TOP OBLIQUE VIEW, R.F. AND H.F. OSC. COMPARTMENT. SHIELDS PARTIALLY REMOVED.

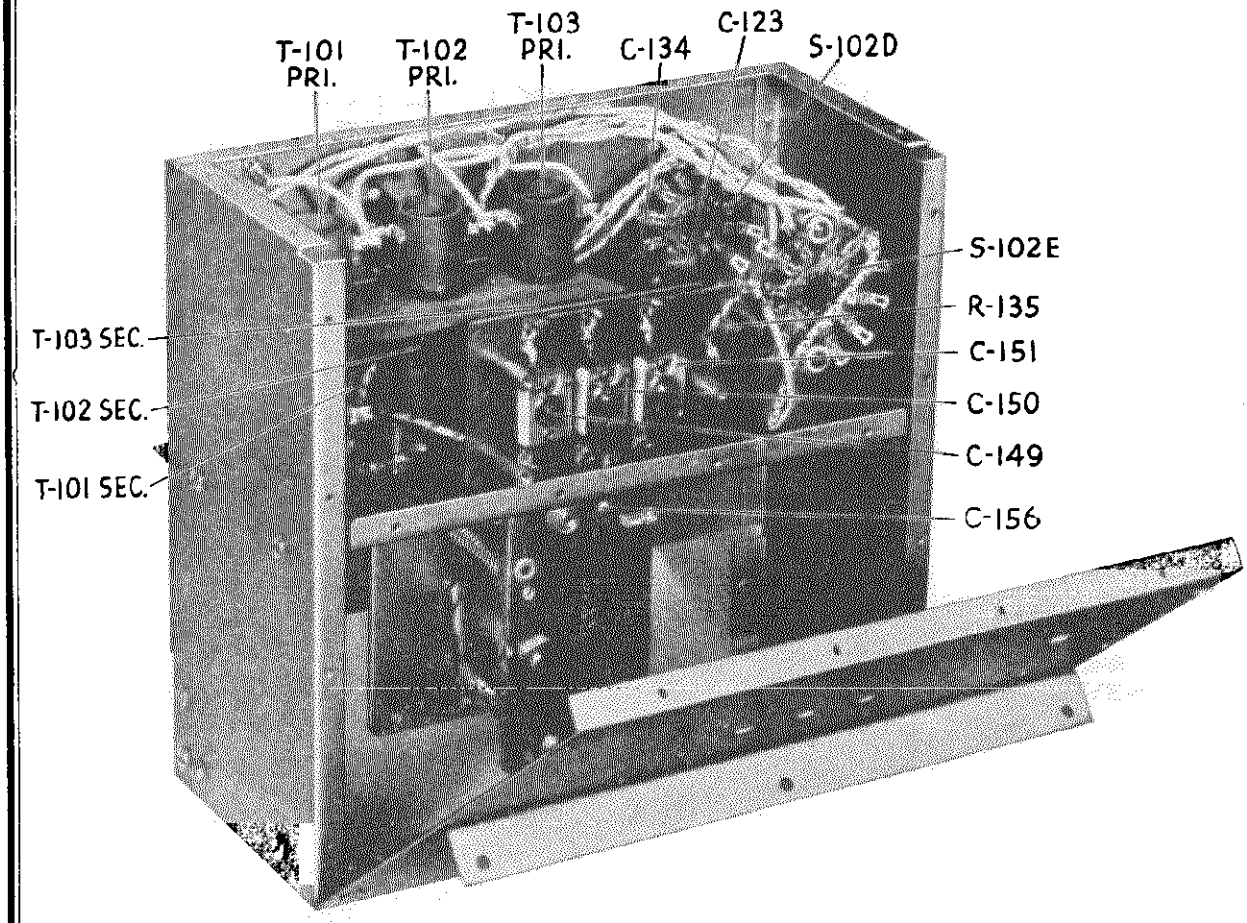
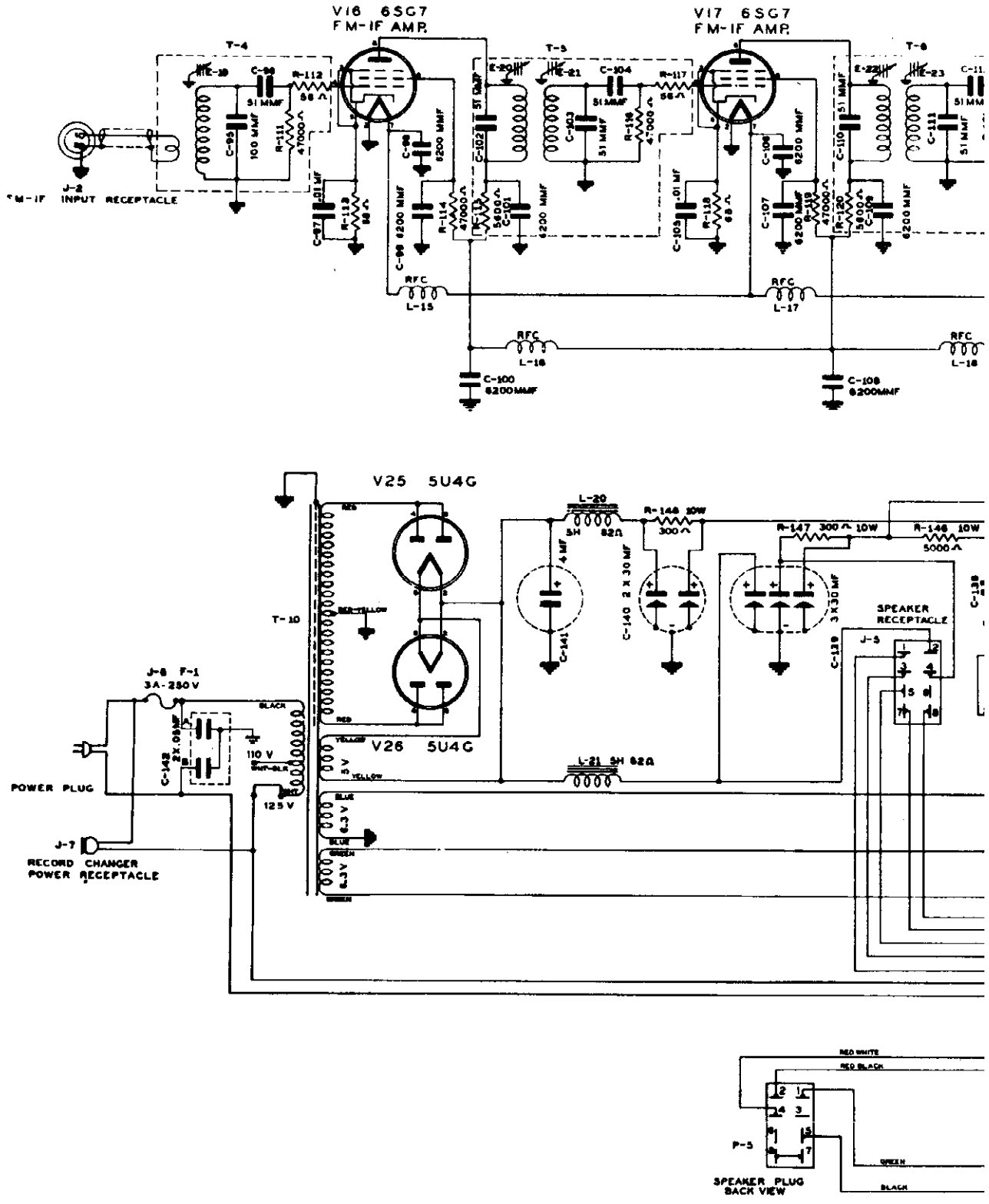
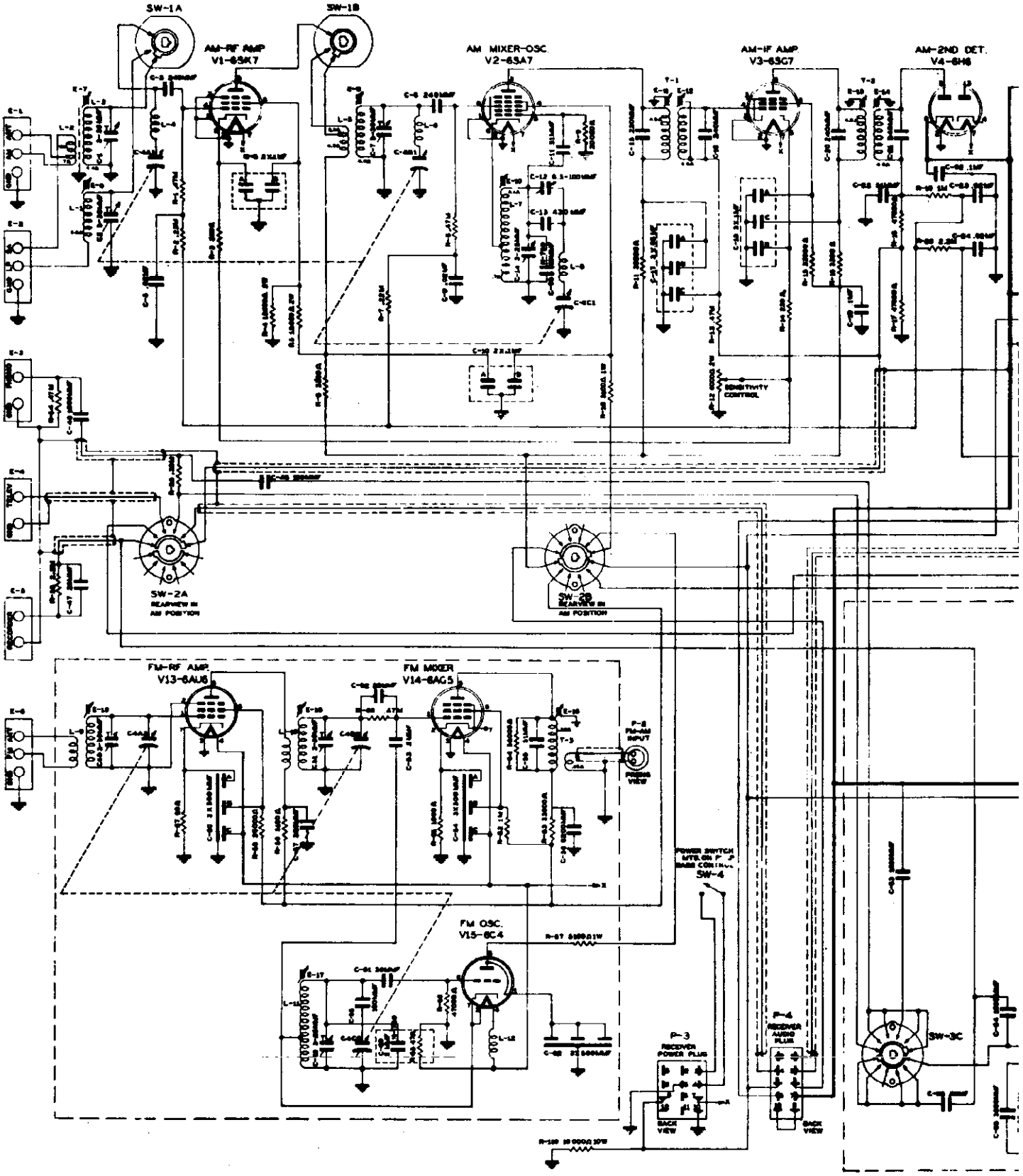


FIG. 8. LEFT OBLIQUE, INVERTED VIEW, ANTENNA COMPARTMENT. SHIELDS PARTIALLY REMOVED.

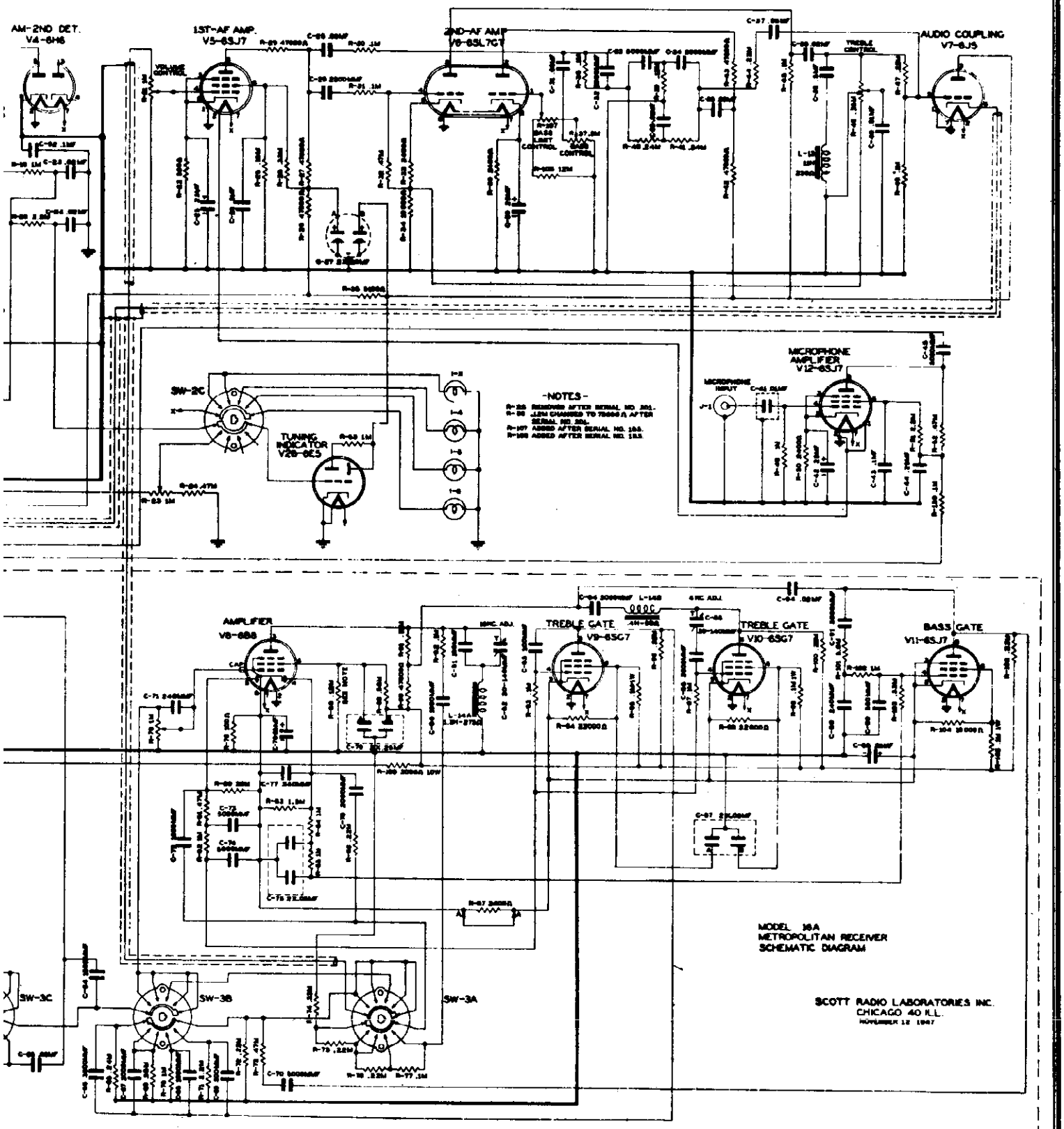
MODEL 16A
(Metropolitan)

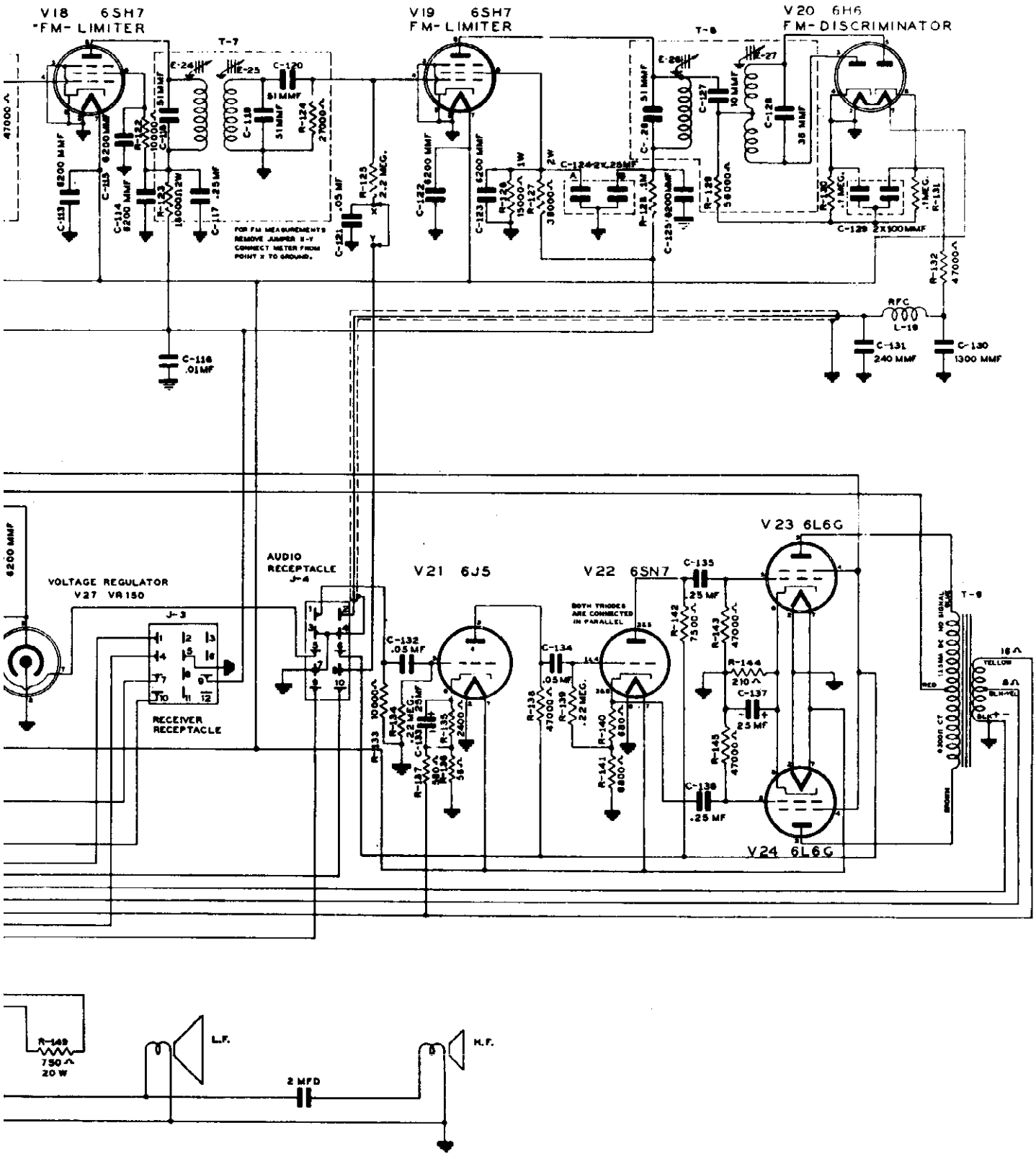


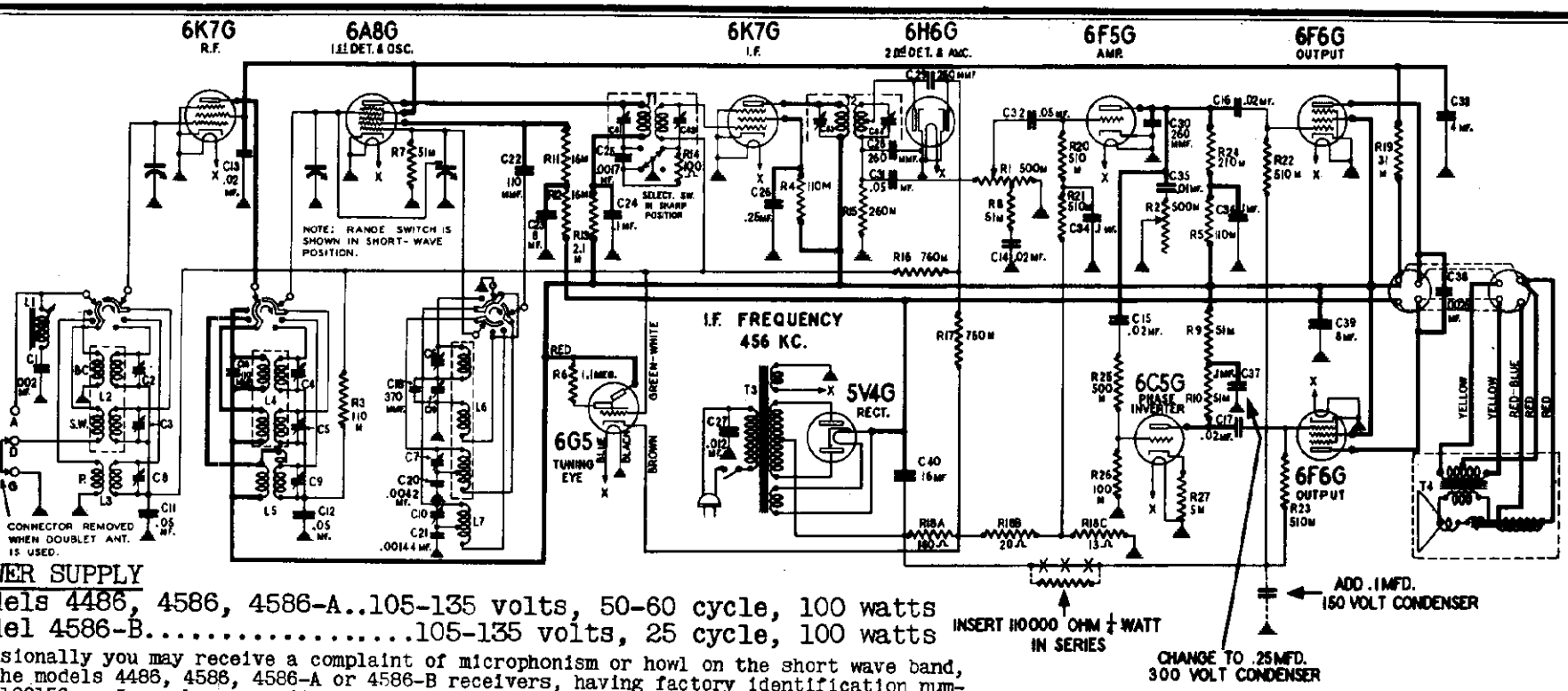

SW-1A
SW-1B
AM-RF AMP
V1-6SK7
AM MIXER-OSC.
V2-6SA7
AM-IF AMP.
V3-6SG7
AM-2ND DET.
V4-6H6
SW-2A
REAR VIEW IN
AM POSITION
SW-2B
REAR VIEW IN
AM POSITION
FM-RF AMP.
V13-6AU6
FM MIXER
V14-6AG5
FM OSC.
V15-6C4
SW-4
SW-3C
P-3
RECEIVER
POWER PLUG
BACK
VIEW
T-4
RECEIVER
AUDIO
PLUG
BACK
VIEW

SCOTT RADIO LABS., INC.

MODEL 16A
(Metropolitan)




V18 6SH7
FM-LIMITER
V19 6SH7
FM-LIMITER
V20 6H6
FM-DISCRIMINATOR
T-7
T-8
FOR FM MEASUREMENTS REMOVE JUMPER X-Y CONNECT METER FROM POINT X TO GROUND.
C-116 .01MF
RFC L-19
C-131 240 MMF
C-130 1300 MMF
VOLTAGE REGULATOR V27 VR150
J-3
RECEIVER RECEPTACLE
AUDIO RECEPTACLE J-4
V21 6J5
V22 6SN7
BOTH TRIODES ARE CONNECTED IN PARALLEL
V23 6L6G
V24 6L6G
T-9
R-149 750Ω 20W
L.F.
H.F.
2 MFD



POWER SUPPLY

Models 4486, 4586, 4586-A..105-135 volts, 50-60 cycle, 100 watts
Model 4586-B.....105-135 volts, 25 cycle, 100 watts

Occasionally you may receive a complaint of microphonism or howl on the short wave band, in the models 4486, 4586, 4586-A or 4586-B receivers, having factory identification number 100156. In such cases, first make a careful test of all tubes, eliminating those which are microphonic, and other parts which might cause howl if defective. A good ground must be used. It is also advisable to see that the control knobs are not jammed too tightly against the cabinet front. If microphonics or howl is not caused by defective parts or any of the above items, it can usually be eliminated or greatly reduced by making the following circuit changes:

1. Disconnect and remove the 110,000 ohm, 1/4 watt carbon resistor which is connected from the junction of the two 510,000 ohm grid resistors in the grid circuits of the output stage, to the center tap of the power transformer. This resistor will be found only in receivers carrying changes shown in supplement No. 1 of bulletin 57 RL 26. In receivers where this resistor is not present the lead between the junction of the two grid resistors and the center tap should be removed. The junction point referred to should then be connected to ground.

2. Short out the R-18A section of the candohm bias resistor strip.

3. (a) Open the cathode connections to ground on both of the 6F6 output tubes.

   (b) Connect the two cathode terminals, of the 6F6 output tubes, together.

   (c) From the cathode terminal, of either of the 6F6 output tubes, connect a 270 ohm 2 watt resistor to ground. The value given for this resistor is quite critical.

INTERMEDIATE FREQUENCY.....456 KC.

FREQUENCY RANGES	ALIGNMENT FREQUENCIES
Band A.....526 to 1750 KC.	1500 KC.; 600 KC.
Band P....1730 to 5600 KC.	5000 KC.
Band F..5500 to 18,000 KC.	16,000 KC.

POWER OUTPUT

Type.....Class A
Undistorted.....3.0 Watts
Maximum.....3.5 Watts

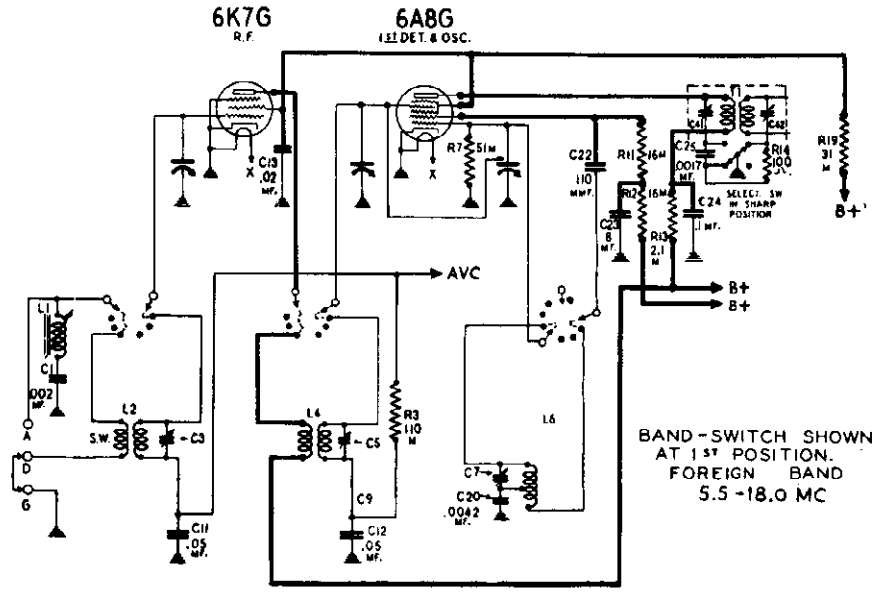
CHASSIS FEATURES

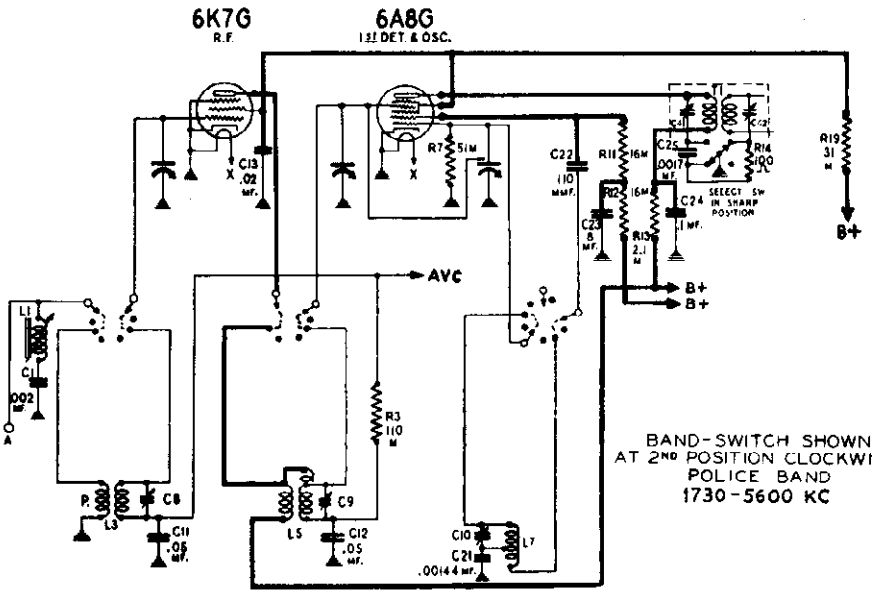
Number of R.F. Stages.....One
Number of I.F. Stages.....One
Number of Cond. in Gang.....Three
Antenna....Conventional or Doublet
456 KC. Wave Trap

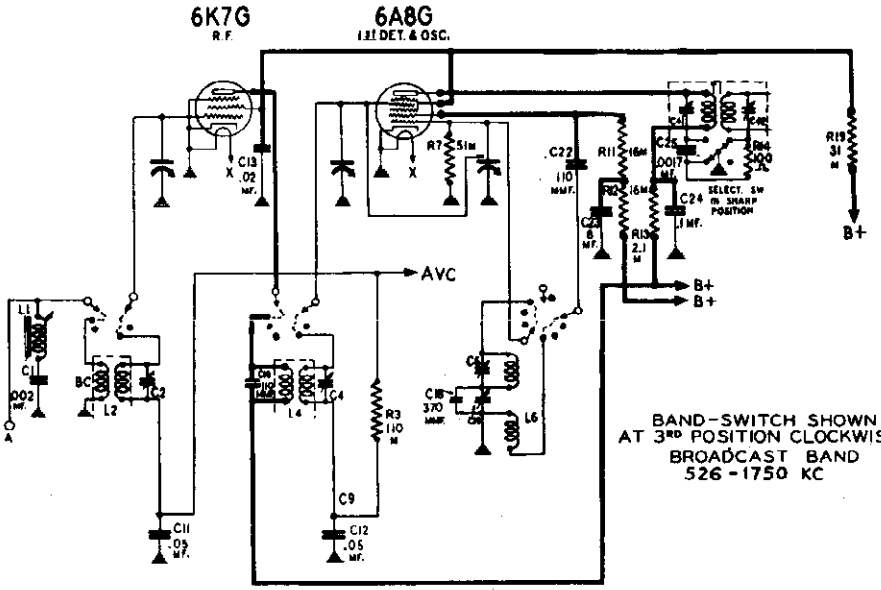
CLARI-SKEMATIX
Registered Trademark

MODELS 4486,4586,4586-A, 4586-B CHASSIS 100,156

SEARS, ROEBUCK & CO.







SEARS, ROEBUCK & CO. MODELS 4486,4586,4586-A, 4586-B CHASSIS 100,156

ALIGNMENT PROCEDURE

PRELIMINARY

Output meter connections.....Across voice coil leads
Output meter reading to indicate 1 watt output.....10" spkr. 1.4 volts
12" spkr. 2.0 volts
Average sensitivity in microvolts for 1 watt output.....See chart below

Generator ground connection.....Receiver Chassis
Dummy antenna to be in series with generator output.....See chart below
Connection of generator output lead.....See chart below
Generator modulation.....30%, 400 cycles

Position of selectivity control.....Sharp position (clockwise)
Position of volume control.....Maximum clockwise
Position of tone control.....Maximum clockwise

BAND SWITCH	POSITION OF * DIAL POINTER	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION	TRIMMERS ADJUSTED (In order shown)	MICRO-VOLTS (Sharp Pos.)
Band A I.F.	1000 KC.	456 KC.	.1 Mfd.	6A8-G Grid	C41, C42, C43, C44	150
I.F. Trap	600 KC.	456 KC.	.00025 Mfd.	Ant. Lead	L1 for Min.Output	
	1500 KC.	1500 KC.	.00025 Mfd.	Ant. Lead	C6,C4,C2	15
	600 KC. ** (Rock Dial)	600 KC.	.00025 Mfd.	Ant. Lead	C19	15
Band P	5000 KC.	5000 KC.	400 Ohm.	Ant. Lead	*** ** C10,C9,C8	30
Band F	16000 KC.	16000 KC.	400 Ohm.	Ant. Lead	*** ** C7,C5,C3	30

IMPORTANT ALIGNMENT NOTES

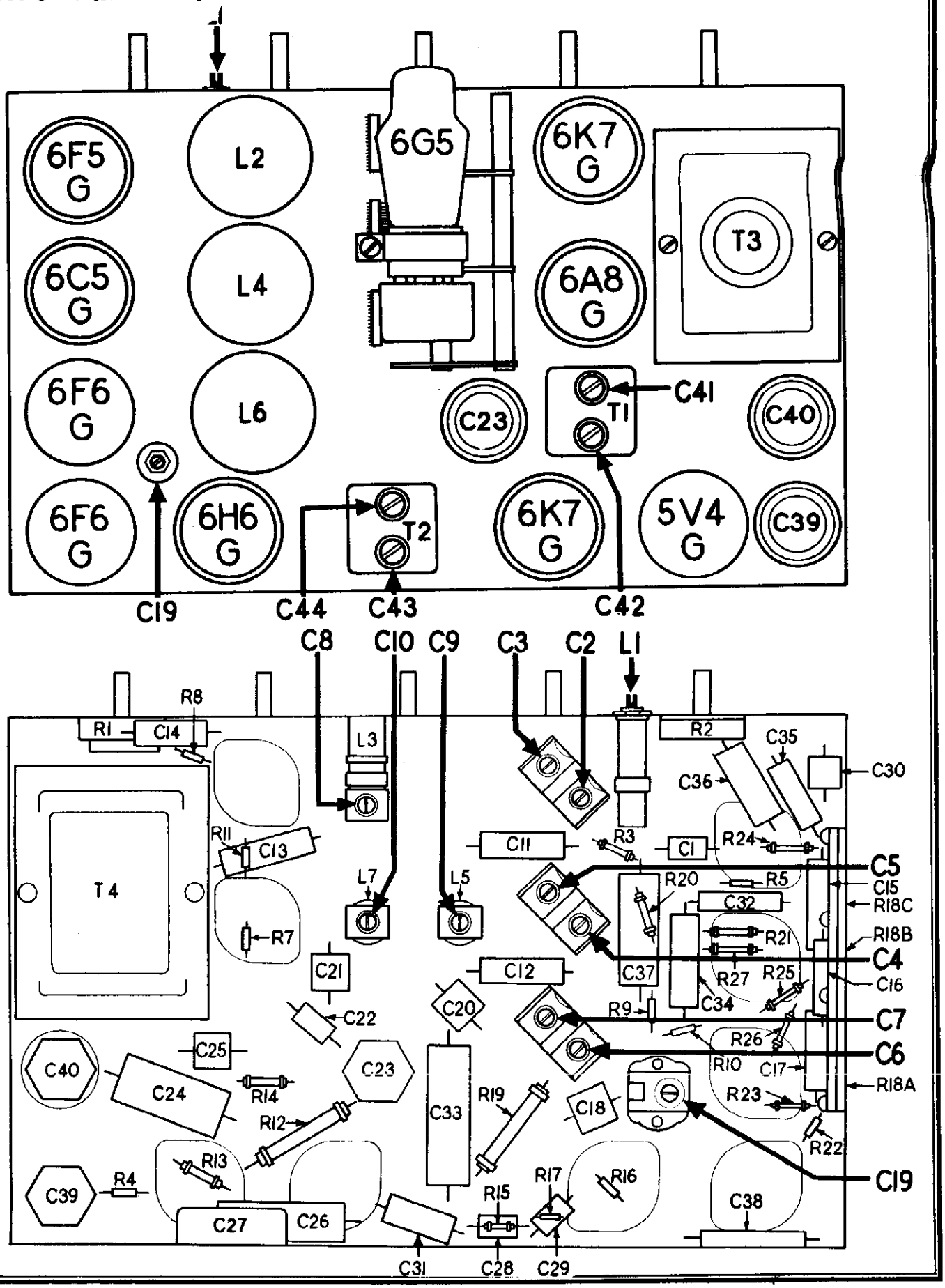
* Before attempting to align the receiver check to see that the dial pointer coincides with the last scale division at the low frequency end of the dial scale when the gang condenser is in full mesh.

After adjusting the I.F. trimmers C41, C42, C43 and C44, go back and repeat the adjustment, since the setting of each trimmer will have some effect on others. When adjusting L1, antenna trap trimmer, increase generator output to obtain clearly defined trimmer setting for a minimum.

** When aligning the broadcast band padder C19 at 600 KC. and the short wave detector trimmers, it is necessary to adjust the trimmers while slowly rocking the gang condenser through a small distance. Rocking the gang is essential if maximum sensitivity is to be obtained.

*** When aligning the short wave bands, care should be taken in adjusting trimmers C7 and C10, since two possible adjustments of these trimmers will result in signal peaks. The proper peak is that which occurs with the trimmer screw farthest out.

MODELS 4486,4586,4586-A, 4586-B CHASSIS 100,156 SEARS, ROEBUCK & CO.



GENERAL INFORMATION

The R-100156 three band radio receiver has a frequency range extending from 526 KC. to 18,000 KC. The intermediate frequency is 456 KC. A three deck band selector switch is used for selecting the proper combination of coils to be used for each wave band. Special contacts on one deck of the switch are used for shorting out unused oscillator coils to prevent dead spots due to absorption.

The coils for the antenna, R.F., and oscillator circuits covering the broadcast and short wave bands, are shielded and located on top of the chassis. They are designated by L2, L4 and L6 respectively in the circuit diagram. The antenna, R.F. and oscillator coils covering the police band are located on the underside of the chassis and are designated by L3, L5 and L7 respectively in the circuit diagram.

The receiver is designed for use with a conventional or doublet antenna. A 456 KC. wave trap is connected across the antenna input to prevent code interference from stations operating on frequencies in the vicinity of 456 KC.

The control grid circuit of the 6K7-G, radio frequency amplifier, is tuned by the secondary of the antenna coil and one section of the variable condenser. Similarly, the control grid circuit of the 6A8-G first detector and oscillator, is tuned by the secondary of the R.F. coil and one section of the variable condenser. After amplification in the 6K7-G R.F. amplifier, the signal is impressed on the control grid of the 6A8-G, 1st detector and oscillator, where frequency conversion to 456 KC. takes place. The 456 KC. output voltage of the 6A8-G tube is amplified by the 6K7-G intermediate frequency amplifier and impressed on the diode plates of the 6H6-G second detector and A.V.C. tube.

By means of the selectivity control, two degrees of selectivity are obtainable in the intermediate frequency amplifier. This is accomplished by altering the resonance characteristics of the 1st I.F. transformer. When the selectivity control is in the sharp position (clockwise) the 1st I.F. transformer functions as a typical transformer with tuned primary and secondary circuits. When it is in the broad position (counter-clockwise) the resonant frequency of the primary circuit is decreased and that of the secondary circuit increased. At the same time the selectivity curve of the secondary is broadened.

One section of the 6H6-G twin diode tube is used as a linear detector. The 260,000 ohm resistor R15 serves as a load resistor for the detector section of the twin diode. The potentiometer type of volume control R1, is capacity coupled to the diode load resistor R15, and acts as a continuous voltage divider of the audio frequency voltage developed. Hence any portion of the audio frequency voltage developed may be applied to the control grid of the 6F5-G resistance coupled audio frequency amplifier. The second section of the twin diode, fed through the condenser C29 is used for delayed A.V.C. With sufficient signal intensity, A.V.C. voltage is developed across resistance R17 and applied to the control grids of the 6K7-G and 6A8-G tubes through a resistance capacity filter.

The output of the 6F5-G audio amplifier is fed into a resistance coupled push-pull output stage. In this circuit, the 6C5-G tube operating as a phase inverter, takes the place of a push-pull input transformer.

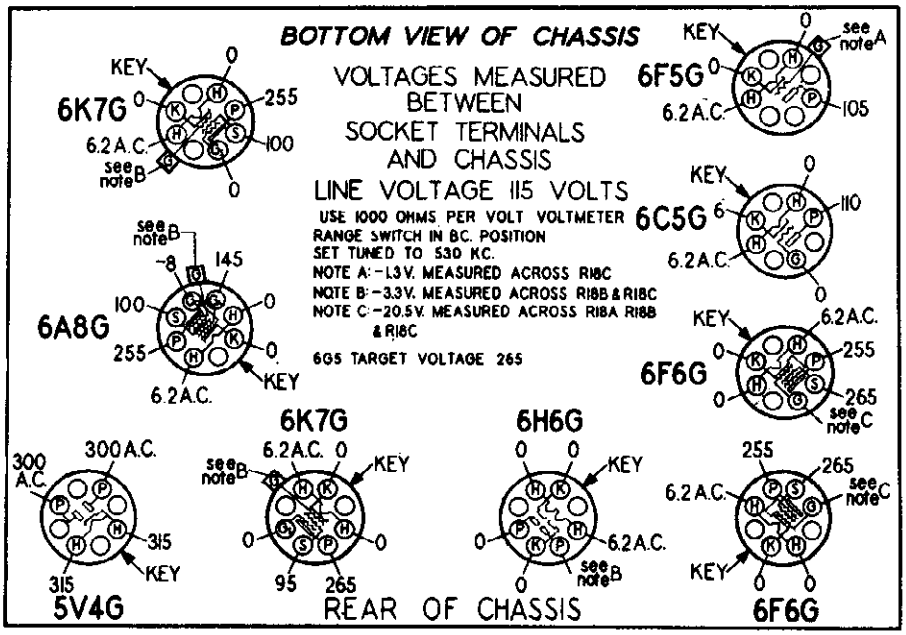
The control grid bias of the 6F5-G is obtained from the negative end of resistance R18-C. Similarly, the control grid bias of the 6K7-G tubes, the 6A8-G tube, and the delay voltage for the A.V.C. section of the 6H6-G is obtained from the negative end of resistances R18-B and R18-C. Also the bias for the 6F6-G output tubes is obtained from the negative end of resistors R18-A, R18-B and R18-C. Resistances R18-A, R18-B and R18-C are located in the negative lead of the high voltage D.C. supply.

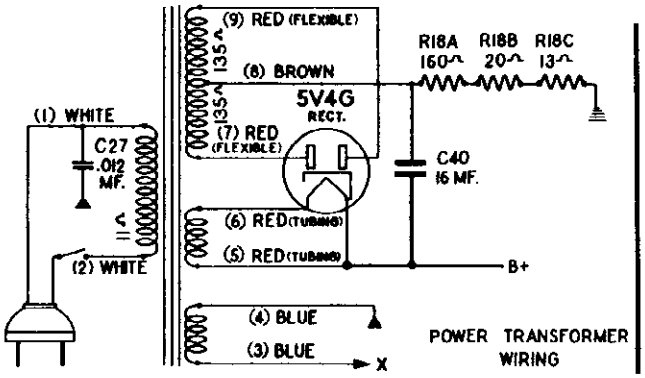
WEAK OR INOPERATIVE SETS DUE TO SHORT-CIRCUITED POLICE BAND R.F. COILS

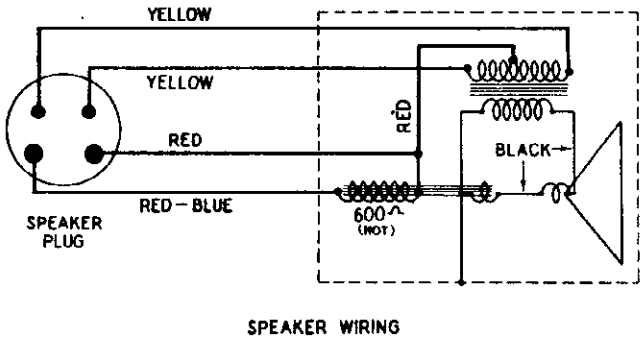
Occasionally you may find a set which is weak or completely inoperative on all three bands due to a short between the coupling turn and the secondary of the police band R.F. coil (L5). The short circuit may first cause crackling and sputtering and then later the set will stop playing. To test for this short, disconnect the red and yellow wires from the coil (L5) and test for continuity from either end of the trimmer condenser on the coil to the lug to which the coil coupling turn is connected. This should show an open circuit. Even the slightest leakage between these two points with the red and yellow wires disconnected, calls for the replacement of the coil which is part number 1002888604. Such shorted coils do not occur very often, therefore, we recommend that tubes and voltages be checked first to make sure that no other trouble exists.

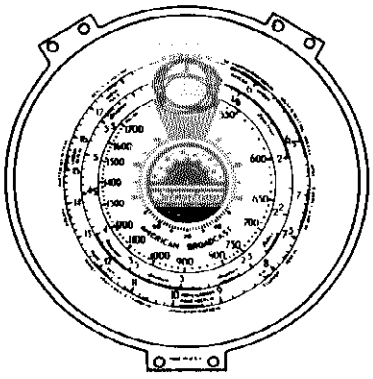
MODELS 4486,4586,4586-A, 4586-B CHASSIS 100,156

SEARS, ROEBUCK & CO.





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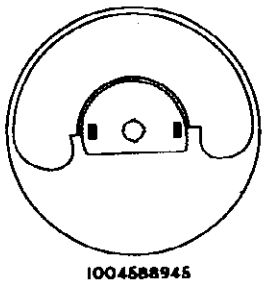
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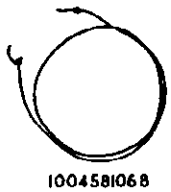
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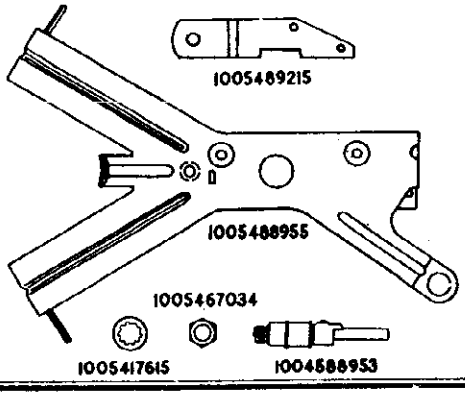


SEARS, ROEBUCK & CO. MODELS 4486,4586,4586-A, 4586-B CHASSIS 100,156

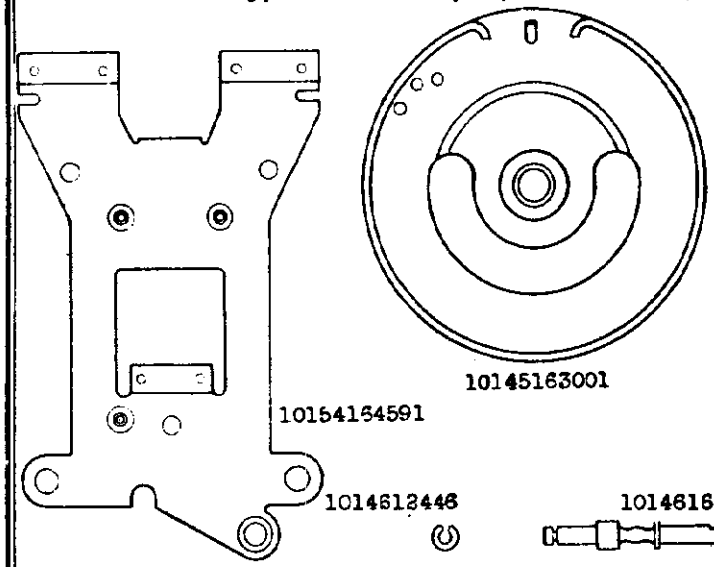
DEFECT	GENERALLY CAUSED BY	REMEDY
Dead Receiver On All Bands	No power at A.C. outlet.....	Check or repair A.C. power source.
	Shorted by-pass condenser. Burned out power transformer. Defective tubes. Open coupling condenser. Shorted filter condenser. Open plate resistor.	Determine defective parts by means of continuity and voltage tests, and replace.
	High resistance short between coupling turn (primary circuit) and secondary of Police band R.F. Coil (L5) ...	Replace coil.
Low Volume, Insensitive. Tuning Eye Does Not Close Sufficiently	Inadequate antenna.....	Replace antenna system.
	Defective tubes. Leaky filter condenser. Leaky by-pass condenser.	Replace defective parts.
	High resistance short between coupling turn (primary circuit) and secondary of Police band R.F. Coil (L5) ...	Replace coil.
Poor Tone	Defective tubes. Leaky by-pass condenser. Open filter condenser.	Replace defective parts.
	Speaker cone off center.....	Recenter speaker cone.
	Receiver out of alignment.....	Realign receiver.
Oscillating Receiver	Defective tubes. Open by-pass condenser. Poor contact of tube shield.	Repair or replace defective parts.
	Receiver out of alignment.....	Realign receiver.
	Poor chassis grounds.....	Check ground connections in chassis.
Fading Receiver	Defective tubes.....	Replace defective tubes.
	Defective audio coupling condenser..	Replace defective condenser.
	Loose connections.....	Resolder loose connections.
	Defective antenna system	Check and repair antenna.
Hum	Open filter condenser. Defective by-pass condenser. Shorted heater type tube.	Replace defective parts.
Off Calibration	Dial pointer shifted.....	Set dial pointer.
	Receiver out of alignment.....	Realign receiver.
Audio Howl	Shipping blocks not removed.....	Remove wood shipping blocks.
	Knob shafts in contact with cabinet.	Readjust chassis in cabinet.
	Microphonic tubes.....	Replace microphonic tubes.

Part No.	Schematic Location	Description
1002089186	C33	Condenser - 4 mfd. 150 V. electrolytic
	C34	Condenser - .1 mfd. 150 V.
	C35	Condenser - .01 mfd. 400 V.
	C36 C37	Condenser - .1 mfd. 300 V.
1001989543	C38	Condenser - .0025 mfd. 750 V.
1002089542	C39	Condenser - 8 mfd. 400 V. electrolytic
1002088679	C40	Condenser - 16 mfd. 450 V. electrolytic
1001688850		Condenser - variable gang
1005585321		Connector - ground
1002489524	R1	Control - volume (250 M. with switch)
1002588677	R2	Control - tone (500 M.)
1004581068		Dial drive cord per ft.
1004089450		Dial scale
1004589509		Dial gear
1005789193		Diaphragm and voice coil assembly 10" sp.
1005789880		Diaphragm and voice coil assembly 12" sp.
1004589514		Drum and bushing assembly
1004488916		Escutcheon - dial
1004489819		Escutcheon - dial see note
1005789196		Gasket 3/16" for 10" speaker
1005467034		Hex. nut 3/8" - planetary
1003988804		Knob - range switch
1003988802		Knob - selectivity control
1003988807		Knob - tone control } specify if knobs are lettered in gold
1003988801		Knob - tuning control
1003988806		Knob - volume control
1004983278		Lamp - pilot 6 volt
1005417615		Lockwasher - 3/8" planetary per 100
1005436437		Pin - escutcheon
1004588953		Planetary - dial drive
1001888631		Plug - speaker
1001888632		Plug Cap - speaker
1004189521		Pointer and stud assembly
1004189523		Pointer - band spread
	R3 R4 R5	Resistor - 110,000 ohm 1/4 watt
	R6	Resistor - 1.1 megohm 1/4 watt
	R7 R8 R9 R10	Resistor - 51,000 ohm 1/4 watt
	R11	Resistor - 16,000 ohm 1/2 watt
	R12	Resistor - 16,000 ohm 1 watt
	R13	Resistor - 2,100 ohm 1/4 watt
	R14	Resistor - 100 ohm 1/4 watt
	R15	Resistor - 260,000 ohm 1/4 watt
	R16 R17	Resistor - 760,000 ohm 1/4 watt
	R18A	Resistor - 160 ohm sect. 3 watt
3189603	R18B	Resistor - 20 ohm sect. 2 watt
	R18C	Resistor - 13 ohm sect. 2 watt
	R19	Resistor - 31,000 ohm 1 watt
	R20 R21	
	R22 R23	Resistor - 510,000 ohm 1/4 watt
	R24	Resistor - 210,000 ohm 1/4 watt
	R25	Resistor - 500,000 ohm 1/4 watt
	R26	Resistor - 100,000 ohm 1/4 watt
	R27	Resistor - 5,000 ohm 1/4 watt

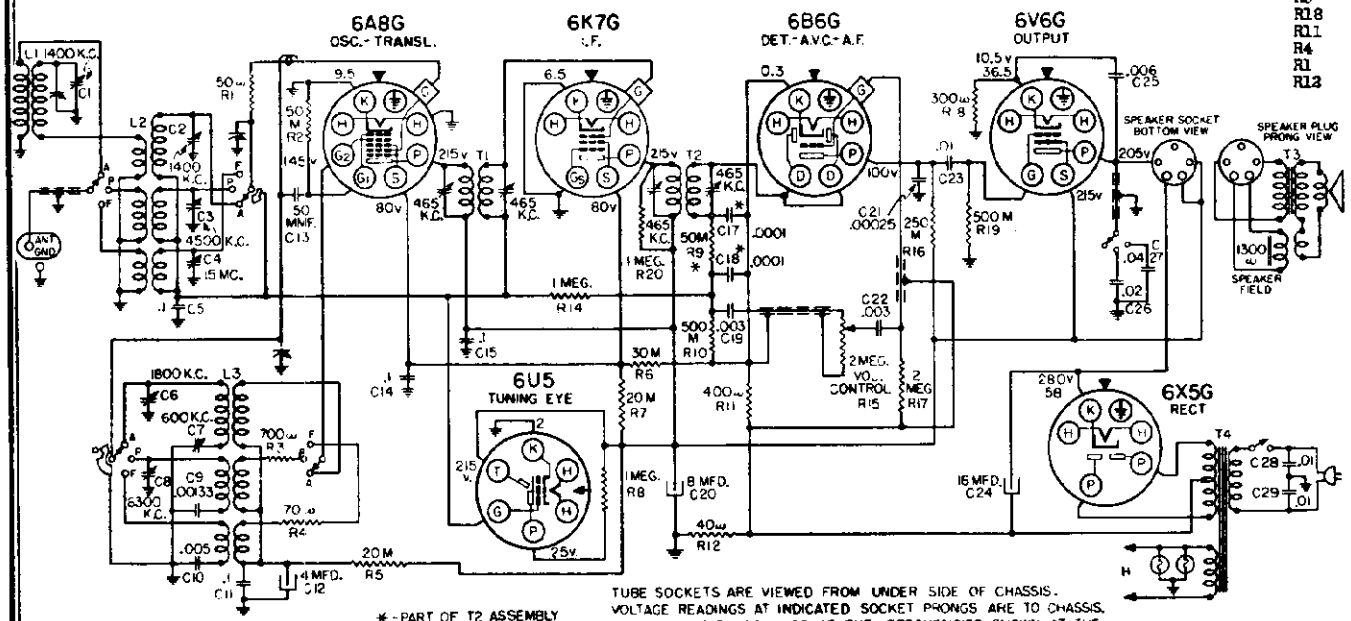
Part No.	Schematic Location	Description
1004689511		Shaft and gear - pointer
1005384982		Shield - tube, section (slotted end)
1005384981		Shield - tube, section
1005388708		Shield - tube, section
1001884758		Socket - pilot light
1001888675		Socket - speaker
10058264		Speaker - 10"
10058268		Speaker - 12"
1005489837		Speed nut used on 1004489819 (each)
1005384983		Spring ring - tube shield
1004581069		Spring - dial cord
1004388918		Spring - dial glass retainer
1004388919		Spring - escutcheon mounting used on 1004488916
1003788877		Switch - range
1002688874		Switch - selectivity
1005585066		Terminal strip G.D.A.
1003388882	T1	Transformer - 1st I.F.
1003588885	T2	Transformer - 2nd I.F.
1001089582	T3	Transformer - Power, 115 V. 60 cycles
1001089822	T3	Transformer - Power, 115 V. 25 cycles
1001389508	T4	Transformer - Output 10" sp.
1001389881	T4	Transformer - Output 12" sp.
1005488955		Bracket - dial mounting
1005488875		Bracket - selectivity switch
1005489215		Bracket - planetary support
1005588969		Cable and Plug - tuning indicator
1005481145		Clip - pointer shaft retaining spring
1003189560	L1	Coil - antenna trap
1002888592	L2	Coil - antenna (B.C. & S.W. with shd. & trimmer)
1002888881	L3	Coil - antenna (Police)
1002888597	L4	Coil - R.F. (B.C. & S.W. with shd. & trimmer)
1002888604	L5	Coil - R.F. (Police)
1002888599	L6	Coil - osc. (B.C. & S.W. with shd. & trimmer)
1002888605	L7	Coil - osc. (Police)
1001988686	C1	Condenser - .002 mfd. (mica)
	C2 C3 C4	
1001788596	C5 C6 C7	Condenser - dual trimmer
1001788477	C8 C9 C10	Condenser - single trimmer
	C11 C12	Condenser - .05 mfd. 150 V.
	C13 C14	
	C15 C16 C17	Condenser - .02 mfd. 400 V.
1001989525	C18	Condenser - .00037 mfd. (mica)
1001785285	C19	Condenser - padding trimmer
1001988587	C20	Condenser - .0042 mfd. (mica)
1001985562	C21	Condenser - .00144 mfd. (mica)
	C22	Condenser - .00011 mfd. (mica)
1002089614	C23	Condenser - 8 mfd. 300 V. electrolytic
	C24	Condenser - .1 mfd. 400 V.
1001988887	C25	Condenser - .0017 mfd. (mica)
	C26	Condenser - .25 mfd. 200 V.
1001983976	C27	Condenser - .012 mfd. 1,000 V.
	C28 C29 C30	Condenser - .00026 mfd. (mica)
	C31 C32	Condenser - .05 mfd. 200 V.

Note: This escutcheon is mounted on cabinet with three escutcheon pins No. 1005436437 and three speed nuts No. 1005489837.

Before ordering parts for Dial Drive System, check these drawings:



SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
	10155147031	Board - Antenna terminal
	10154154591	Bracket - Dial mounting
	1015413407	Bushing - Rubber, chassis mtg.
	1015516484	Cable - Tuning Eye, with socket
	1015413808	Clip - Grid
L1	1013814821	Coil - Antenna, broadcast
L3	1013815467	Coil - Oscillator
L2	1013815466	Coil - Translator
	1011613455	Condenser - Variable
C24	1013014573	Condenser - 16 mfd. 350 volts, electrolytic
C12,C20	1013016570	Condenser - Electrolytic, dry, dual
C2,C3,C4	1011716448	Condenser - Trimmer, triple, antenna
C5,C8	1011713909	Condenser - Trimmer, dual, oscillator
C7	1011714433	Condenser - Padder
C9,C14		Condenser - .1 mfd. 200 volts
C11,C15		Condenser - .1 mfd. 400 volts
C27		Condenser - .04 mfd. 600 volts
C26		Condenser - .02 mfd. 600 volts
C23		Condenser - .01 mfd. 400 volts
C28,C29		Condenser - .01 mfd. 600 volts
C25		Condenser - .006 mfd. 600 volts
C10	1011916656	Condenser - .005 mfd. mica
C19,C22		Condenser - .003 mfd. 200 volts
C9	1011916531	Condenser - .00133 mfd. mica
C21		Condenser - .00025 mfd. mica
C13		Condenser - .00005 mfd. mica
C16		Condenser - .000035 mfd. mica
R15	1012416453	Control - Volume with switch
	1015516706	Cord - Power
	10145139740	Cord - Condenser drive
	1014016475	Dial - Station selector
	10145163001	Drum - Condenser drive
	1014416461	Escutcheon -
	1015410980	Grommet - Rubber, condenser mtg.
	1013916504	Knob - Tone
	1013916550	Knob - Tuning
	1013916513	Knob - Volume
	1013916548	Knob - Wave switch
	1014914914	Lamp - Dial light
	1015916561	Leaflet - Instruction
	1015915947	Log - Station
	1014313437	Nut - Escutcheon mounting
	1014116304	Pointer - Dial
R17		Resistor - 2 megohms, 1/3 watt
R8,R13, R14,R20		Resistor - 1 megohm, 1/3 watt
R10,R19		Resistor - 500M ohms, 1/3 watt
R16		Resistor - 250M ohms, 1/3 watt
R2		Resistor - 50M ohms, 1/3 watt
R6		Resistor - 30M ohms, 1/2 watt
R7		Resistor - 20M ohms, 2 watts
R5		Resistor - 20M ohms, 1/3 watt
R3		Resistor - 700 ohms, 1/3 watt
R18		Resistor - 300 ohms, 1/2 watt
R11		Resistor - 400 ohms, 1/3 watt
R4		Resistor - 70 ohms, 1/3 watt
R1		Resistor - 50 ohms, 1/3 watt
R12		Resistor - 40 ohms, 1/3 watt
	1014616464	Shaft - Pointer drive
	1015315548	Shield - Tube
	1015315550	Shield - Tube, base
	1011888253	Socket - 5 prong, Speaker
	1011812809	Socket - 6 prong, Octal
	1011815173	Socket - 8 prong, Octal
	1011817096	Socket - Dial light, Left Hand
	1011817117	Socket - Dial light, Right Hand
	1015816562	Speaker - Dynamic, 6"
	1015716563	Cone and voice coil
	1011516564	Field coil
	1011316565	Transformer
	1014613948	Spring - Condenser drive cord tension
	1013716480	Switch - Wave
	1013816454	Switch - Tone control
	10133164461	Transformer - IF Input
	1013513447	Transformer - IF Output
	1011016482	Transformer - Power, 60 cycle
	1011116483	Transformer - Power, 25 cycle
	1014613446	Washer - Retaining, pointer drive shaft



TUBE SOCKETS ARE VIEWED FROM UNDER SIDE OF CHASSIS. VOLTAGE READINGS AT INDICATED SOCKET PRONGS ARE TO CHASSIS. ALIGNMENT IS TO BE MADE AT THE FREQUENCIES SHOWN AT THE TRIMMER CONDENSERS. VOLTAGES MUST BE MEASURED WITH NO SIGNAL. WHERE NO VOLTAGE READING IS SHOWN AT SOCKET PRONG, IT INDICATES ZERO VOLTAGE OR A VERY LOW READING. FIGURES AT CATHODES ARE CATHODE CURRENT IN MILLIAMPERES.

WIRING DIAGRAM FOR SILVERTONE CHASSIS 101.471

SEARS, ROEBUCK & CO.

MODELS 4663,4763
CHASSIS 101.471

ALIGNMENT PROCEDURE

PRELIMINARY:

Output meter connections . . . . . Across voice coil leads

Output meter reading to indicate .5 watts output . . . . . 1.04 volts

Average sensitivity in microvolts for .5 watts output . . . . . See chart below

Dummy antenna value to be in series with generator output . . . . . See chart below

Connection of generator output lead . . . . . See chart below

Connection of generator ground lead . . . . . To chassis

Generator modulation . . . . . 30%, 400 cycles

Position of Volume Control . . . . . Fully clockwise

Position of Tone Control . . . . . Fully clockwise

Position of Dial Pointer . . . . . To be horizontal when variable is fully meshed.

WAVE BAND SWITCH POSITION	POSITION OF DIAL POINTER	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION	TRIMMERS ADJUSTED (IN ORDER SHOWN)	TRIMMER FUNCTION	APPROXIMATE MICROVOLTS
"A"	550 kc	455 kc	.1 mfd.	6A8G Grid	T2,T1	IF Output IF Input	60
"A"	1800 kc	1800 kc	.0002 mfd.	Ant. Term.	C6	Oscillator	200
"A"	1400 kc	1400 kc	.0002 mfd.	Ant. Term.	C1,C2	Antenna Oscillator	35
"A"	600 kc (rock)	600 kc	.0002 mfd.	Ant. Term.	C7	Padder	35
"P"	Fully open	6.3 mc	400 ohms	Ant. Term.	C8	Oscillator	35
"P"	4.5 mc (rock)	4.5 mc	400 ohms	Ant. Term.	C3	Translator	25
"F"	15 mc (rock)	15 mc	400 ohms	Ant. Term.	C4	Translator	30
"F"	6 mc	6 mc	400 ohms	Ant. Term.	-	-	110

IMPORTANT ALIGNMENT NOTES

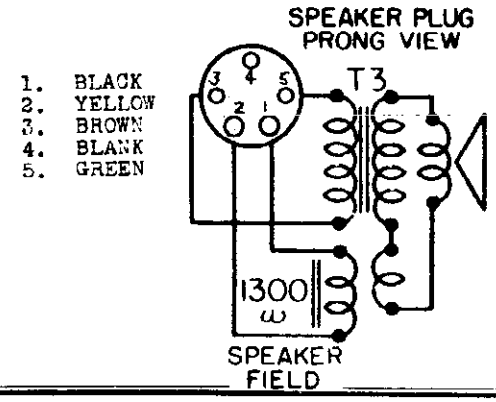
Where indicated by the word, "Rock", the variable should be rocked back and forth a degree or two while making the adjustment.

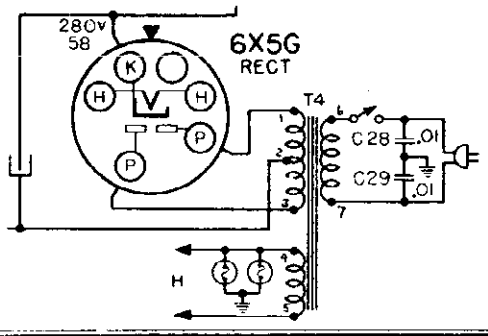
It it advisable to repeat the entire alignment procedure band by band and in the original order to insure greater accuracy.

Always keep the output from the test oscillator at its lowest possible value. As the sensitivity is increased by alignment, the generator output should be reduced correspondingly.

After the alignment procedure has been completed, tune in a broadcast signal at about 1000 kc. If necessary, shift the dial pointer so that it indicates this frequency.

Values shown under, "Microvolts", are only approximate.





T4 COLOR CODE

1. RED
2. GREEN
3. RED
4. BLACK
5. BLACK
6. BLUE
7. BLUE

MODELS 4663,4763 SEARS, ROEBUCK & CO.

CHASSIS 101.471

ELECTRICAL SPECIFICATIONS

POWER SUPPLY:

All models available . . . . . 105-125 volts, 50-60 cycle, 45 watts
All models available . . . . . 105-125 volts, 25 cycle, 55 watts

FREQUENCY RANGES:

Band "A" . . . . . 540-1800 kc
Band "P" . . . . . 1760-6300 kc
Band "F" . . . . . 5950-18500 kc

ALIGNMENT FREQUENCIES:

	Oscil. Trimmer	Ant.-Transl. Trimmer	Padder
Band "A"	1800 kc	1400 kc	600 kc
Band "P"	6300 kc	4500 kc	Fixed
Band "F"	-	15 mc	Fixed

INTERMEDIATE FREQUENCY . . . . . 465 kc

POWER OUTPUT:

Type . . . . . Beam tube
Undistorted . . . . . 2 watts
Maximum . . . . . 3.3 watts

OPERATING FEATURE

Fidelity Range . . . 50 - 5000 cycles

LOUD SPEAKER:

Type . . . . . Dynamic
Size . . . . . 6 inch
App. field coil resistance. .1300 ohms
App. field coil voltage drop . . . 75 volts

GENERAL INFORMATION

THE AVC CIRCUIT:

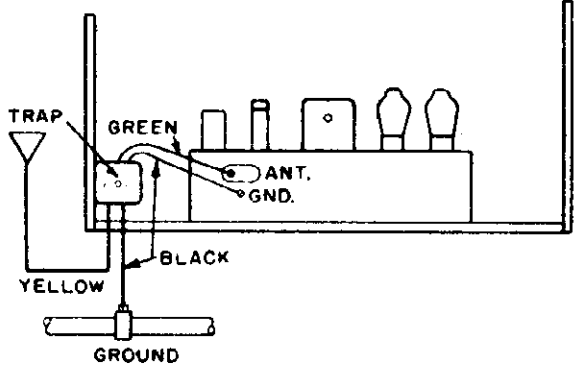
The diode current of the 6B6G tube, flowing through the 500M ohm resistor, R10, creates a voltage drop across it. This voltage is applied to the control grids of the 6A8G and 6K7G tube to provide AVC.

WAVE-TRAP TO ELIMINATE INTERFERENCE FROM SHIP OR AIRPORT TRANSMITTERS:

In locations near ship transmitters or airports or air beacon stations, code interference may be experienced. Part #1013114256 wave-trap is designed to eliminate such interference. It may be ordered directly from the Colonial Radio Corporation, 254 Rano Street, Buffalo, N. Y., using Purchase Order blank, form F5284.

Mount the trap, by means of two wood screws, at any convenient place on the chassis shelf or cabinet where it will be near the antenna terminal of the receiver. Connect the yellow lead of the wave-trap to the antenna downlead. Connect the green lead of the wave-trap to the antenna terminal of the receiver. Cut off any excess length of green wire from the trap so that the green lead from the wave-trap to the chassis is as short as possible. The yellow lead from the wave-trap should be run so that it is as far as possible from the green lead. Connect one of the black leads from the wave-trap to the ground terminal of the receiver. Connect the other wave-trap black lead to the ground used for the installation.

The trap is pre-tuned to the IF frequency so that normally no further adjustment is necessary. However, should interference still be experienced, tune the receiver between approximately 550 and 600 kc. Then adjust the wave-trap, by means of the trimmer screw at the bottom of the container, until the interference is eliminated. Addition of the trap will reduce the sensitivity of the receiver around 600 kc by approximately 50%. The customer should be forewarned of this to avoid complaints of reduced sensitivity.



INSTALLATION OF A PHONOGRAPH PICK-UP JACK OR AN EARPHONE JACK:

A kit, part #1016117189, can be ordered from Colonial Radio Corporation, 254 Rano Street, Buffalo, N. Y. This kit contains the necessary parts for installing either a phonograph pick-up jack or an earphone jack. If the customer desires both a phonograph pick-up jack and an earphone jack, it will be necessary to use two kits and to drill an additional hole in the back of the chassis for the additional jack.

PHONOGRAPH PICK-UP JACK: A hole, covered with a brass insert, is provided in the back of the chassis. Remove the brass insert and mount the jack in this hole. Insulate the jack from the chassis by means of the two insulating washers supplied in the kit. The Schematic Section shows the connections to the jack. In addition, changes must be made in the wiring to the speaker socket and the electrolytic condenser. As the Schematic Section shows, these wiring changes and the connections to the jack are as follows:

SEARS, ROEBUCK & CO.

MODELS 4663, 4763
CHASSIS 101-471

Disconnect the jumper between prongs 1 and 5 of the speaker socket.

Disconnect the jumper between prong #2 of the speaker socket and the anode (center terminal) of the wet electrolytic.

There is a lead running from the 40 ohm resistor, mounted on the terminal board near the power transformer, to the cathode (can terminal) of the wet electrolytic. Disconnect this lead from the electrolytic and connect it to terminal #2 of the speaker socket.

Run a lead from terminal #1 of the speaker socket to the cathode (can terminal) of the electrolytic.

Run a lead from terminal #1 of the jack to the cathode prong of 6B6G tube.

Connect the .05 condenser from terminal #2 of the jack to the junction of R10 and C19. This junction is at the end lug of the terminal board mounted under the IF output transformer.

Connect the 500M ohm resistor from terminal #3 of the jack to the end of R14 that is connected to the blank prong of the 6B6G socket.

Connect prong #4 of the jack to prong #1 of the speaker socket.

The radio Volume Control and Tone Control will operate for the phonograph pick-up.

EARPHONE JACK: Mount the jack in the hole in the back of the chassis. The jack frame must be grounded to the chassis. Therefore, do not use the insulating washers.

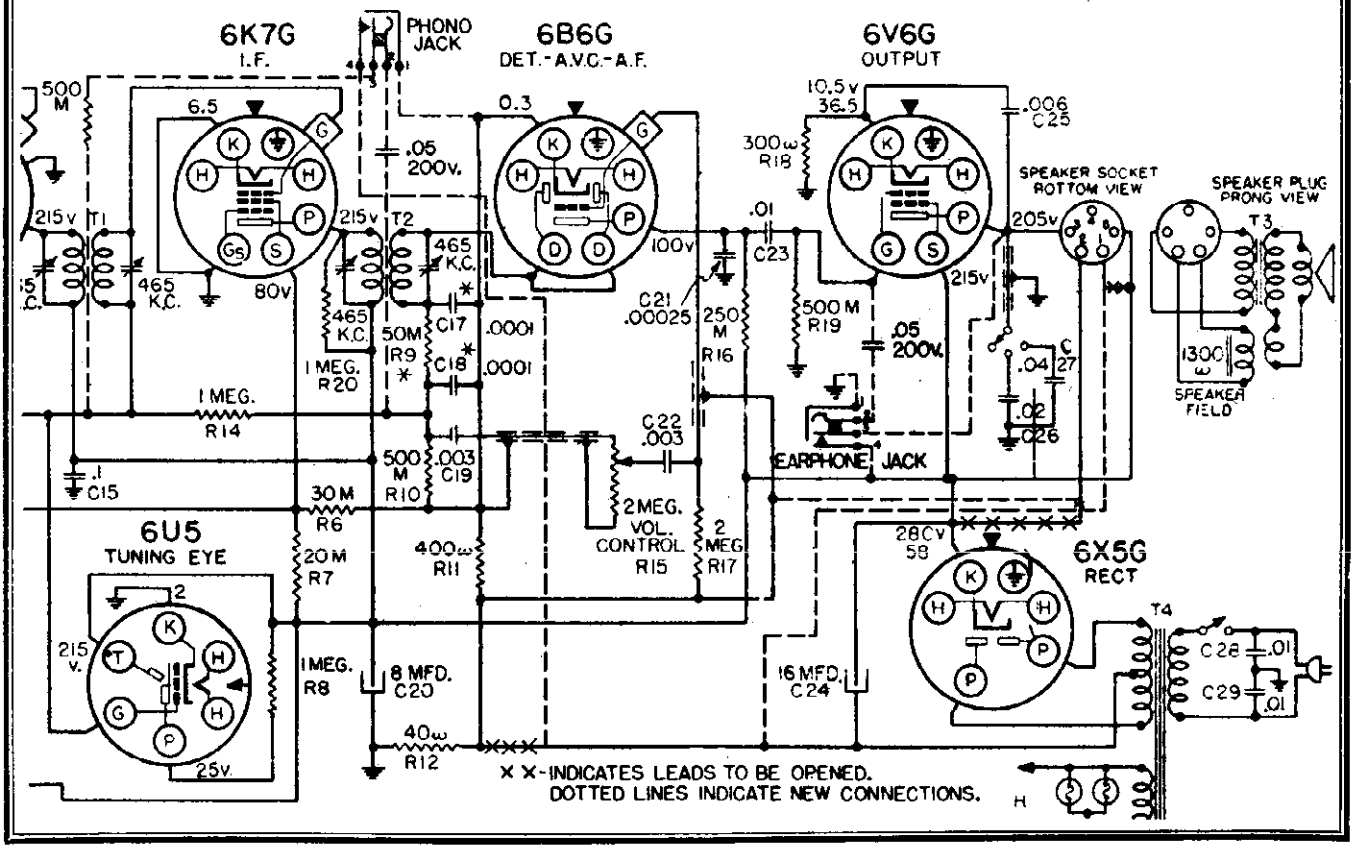
Connect the .05 condenser from terminal #2 of the jack to the grid prong of the 6V6G output tube.

Connect terminal #3 of the jack to terminal #3 of the speaker socket.

Connect terminal #4 of the jack to terminal #5 of the speaker socket.

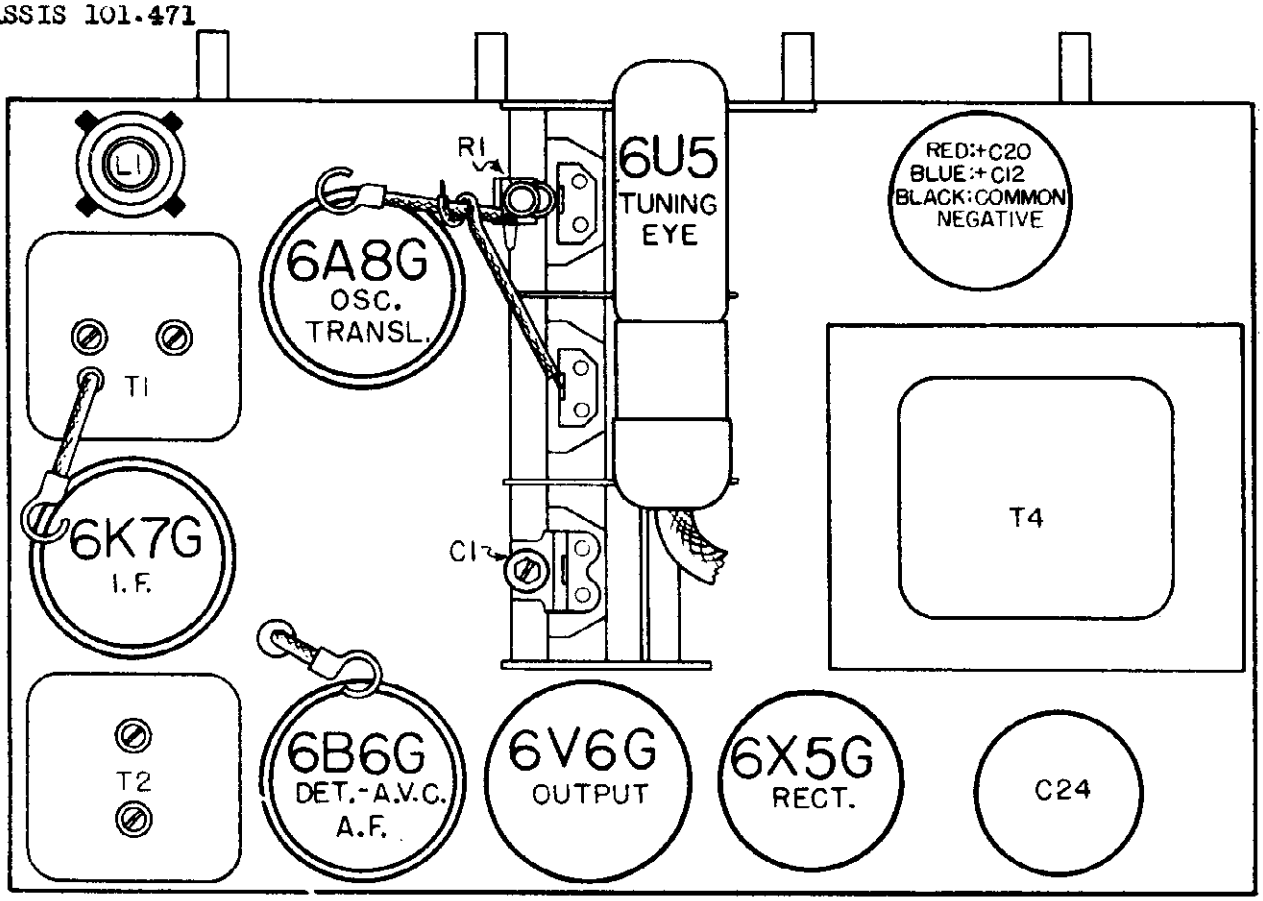
This is the only wiring necessary. The wiring changes mentioned above for connection of the phonograph pick-up jack are not to be done if only an earphone jack is used.

With the connections as described, the loud speaker will not operate when the earphones are plugged in. If it is desired to have the loud speaker operate at the same time the earphones are plugged in, the connections to terminals 3 and 4 of the jack should be omitted.

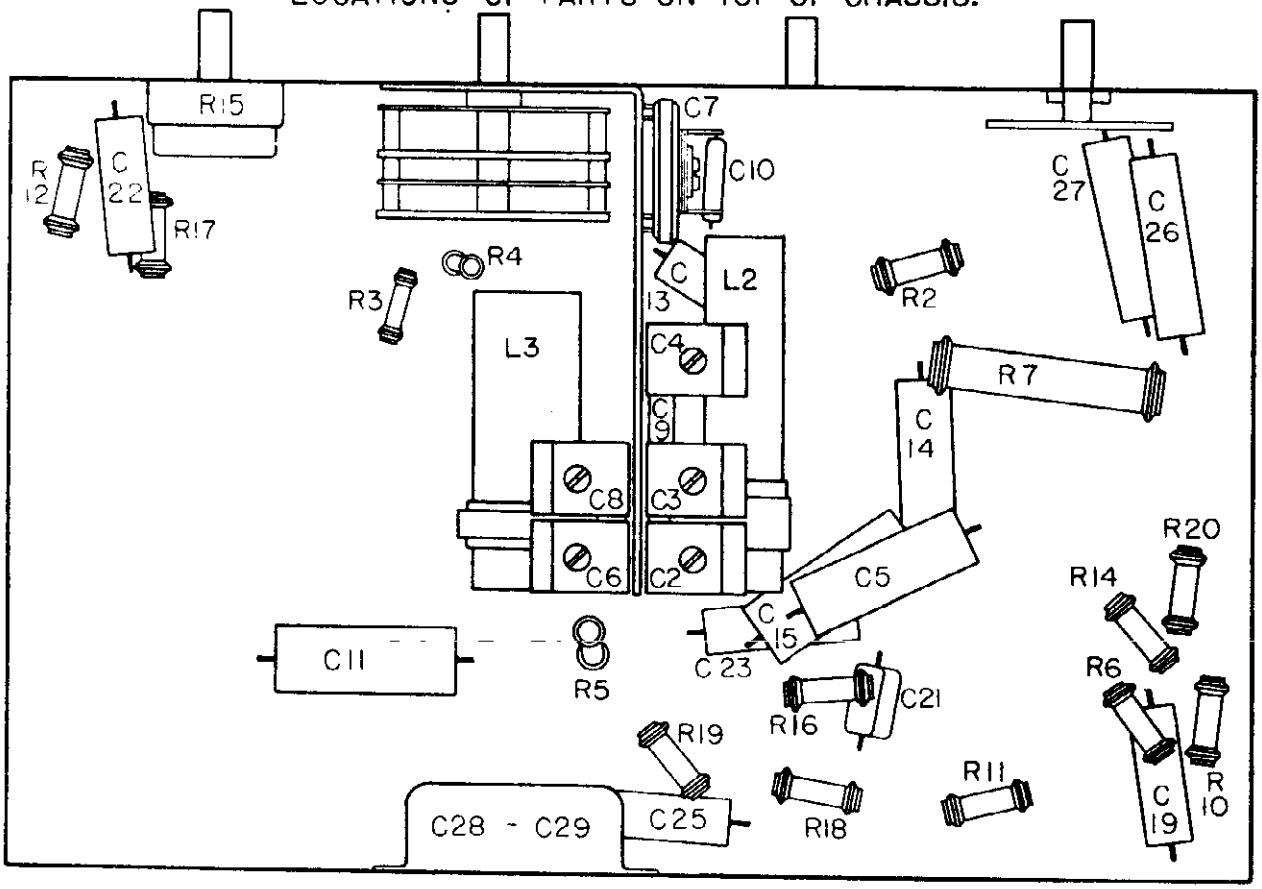


MODELS 4663,4763
CHASSIS 101.471

SEARS, ROEBUCK & CO.



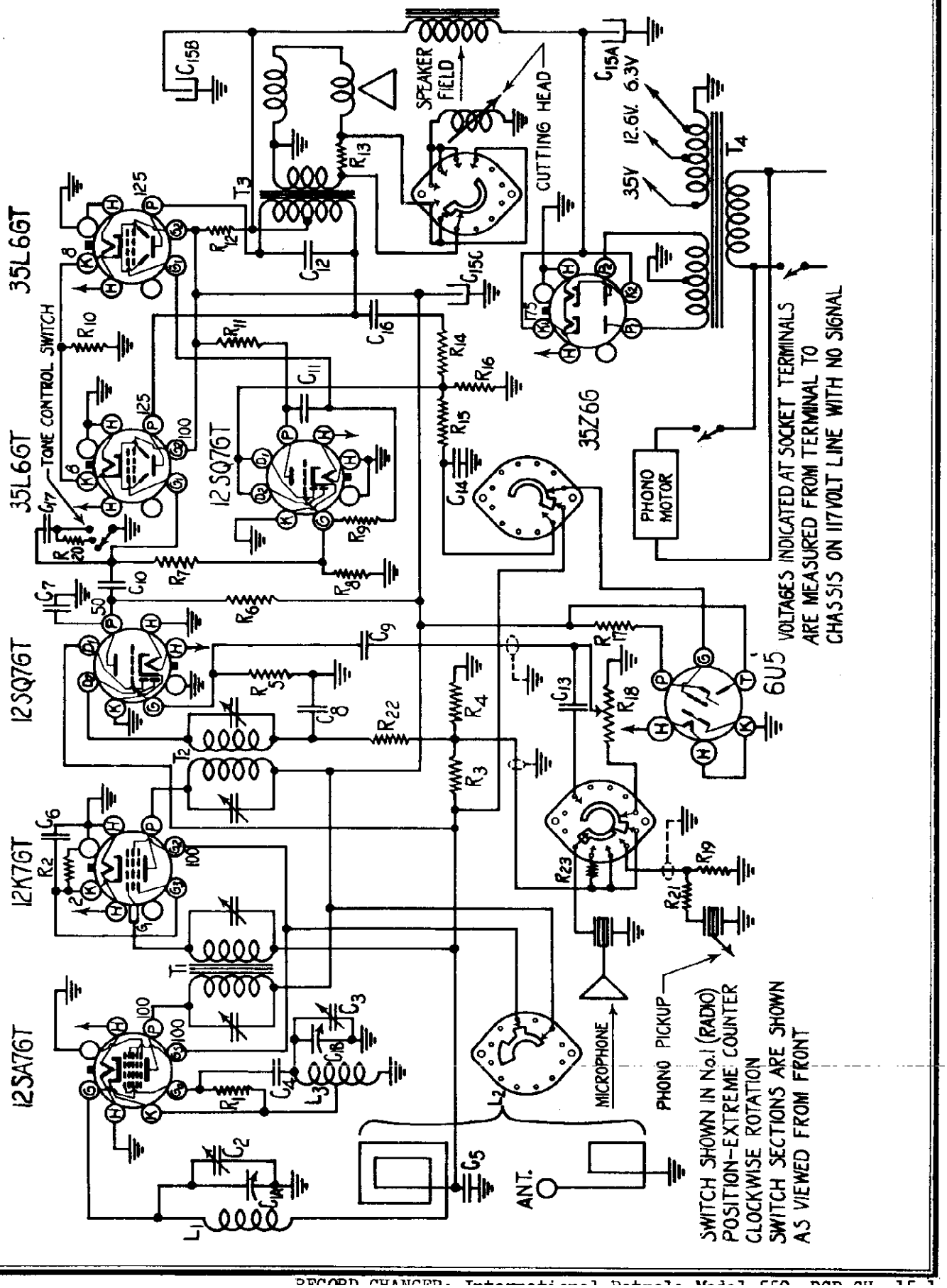
LOCATIONS OF PARTS ON TOP OF CHASSIS.



LOCATIONS OF PARTS UNDER CHASSIS

SEARS, ROEBUCK & CO.

MODELS 5372, 5372-B
CHASSIS 109.371, 109.371-1



MODELS 5372,5372-B SEARS, ROEBUCK & CO.
CHASSIS 109.371,109.371-1

CIRCUIT CHANGE IN 109.371 RADIO RECEIVER

The 109.371-1 receiver is identical with 109.371 with the following changes:

The value of C-13 is changed to .02 Mfd. 400V.
The value of C-9 is changed to .001 Mfd. 600V.

The connection from condenser C-13 is changed from the volume control side of condenser C-9 to the 12SQ7GT grid side of C-9.

ELECTRICAL SPECIFICATIONS

CHASSIS 109.371

TUBES AND FUNCTIONS

12SA7GT ..... Oscillator Translator	2 - 35L6GT ..... Power Output
12K7GT ..... IF Amplifier	35Z6G ..... Rectifier
12SQ7GT ..... Detector-AVC-Audio	6U5 ..... Tuning/Volume Indicator
12SQ7GT ..... Phase Inverter	

POWER SUPPLY ..... 105-125 Volts AC
50 and 60 cycle models available.

POWER OUTPUT

Type ..... Push Pull Beam Tubes
Undistorted ..... 2 Watts
Maximum ..... 3.5 Watts

SPEAKER

Type ..... Dynamic
Size ..... 6½ Inch
Field Resistance ..... 500 Ohms

THE MASTER CONTROL SWITCH

This switch has six positions. The recording positions are described in detail on the next page.

Position No. 1 ..... Radio
Position No. 2 ..... Phono
Position No. 3 ..... Record Radio Programs
Position No. 4 ..... Record Radio Program & with Microphone at the same time
Position No. 5 ..... Record with Microphone Only
Position No. 6 ..... Public Address

THE TUNING EYE

When the Master Control Switch is in the "Radio" position the eye acts in the normal manner as a tuning indicator.

When the Master Control Switch is in any position except No. 1 the eye is connected to the output of the receiver so that it indicates volume. For recording, the volume control should be adjusted so that the eye just closes. In recording a radio program it is very hard to predict just how loud the loudest part of the program will be, therefore, it is best to set the volume control so that the eye is slightly open.

THE LOOP ANTENNA

The loop antenna is somewhat directional in its reception characteristics, therefore turning the receiver to a particular position will often improve reception or reduce interference.

ANTENNA AND GROUND CONNECTIONS

If the receiver is used in a building which has metal lath or a large amount of steel in its construction, or in a location where reception conditions are poor, an outdoor antenna and a ground connection may be necessary.

Two terminals are provided on the back of the cabinet for connection of antenna and ground.

DIAL LAMPS

The two dial lamps are connected in series, therefore if one burns out the other will not light. Mazda #47 dial lamps are used.

PHONO OPERATION

Turning the Master Control Switch to the No. 2 or Phono position connects the phono pickup to the audio amplifier of the receiver and disconnects the radio. The Volume control acts for phono the same as for radio.

RECORDING

The recording mechanism will cut records up to 10 inches in diameter. Recordings of excellent quality can be made if the instructions in the following paragraphs are very carefully followed.

INSERTING THE RECORDING NEEDLE IN THE HEAD OF THE RECORDER ARM

Notice that the shank of the recording needle is ground flat on one side. Loosen the screw in the end of the Recorder Arm. Insert the needle into the hole in the under side so that the flat side is towards the front of the cabinet. Tighten the retaining screw so that the needle is held firmly. Check to make sure that the recording needle is tight each time a recording is made.

TO RECORD A RADIO PROGRAM

Place a blank record on the turntable making sure that the small pin on the turntable projects through the hole provided for it in the record. This is necessary to prevent the record from slipping and ruining the recording.

Turn the Master Control Switch to the No. 1 (Radio) position. Tune in the program you desire to record. Observe the tuning eye carefully and be sure that the station is tuned in perfectly.

Turn the Master Control Switch to the "Record Radio" (No. 3) position. Notice that the shadow on the tuning eye screen now varies in width with the volume of sound.

Adjust the Volume Control so that the eye just closes.

Turn the phono motor ON.

Raise the Recorder Arm and move it so that the needle is just inside the edge of the record. Lower the arm carefully on the record.

When the recording arm is lowered on the record an arm on the under side of the recorder unit engages the lead screw which moves the arm across the record. The arm must be raised about three inches to disengage the lead screw so that the arm can be moved.

As the recording is being made, a small shaving is cut out of the record by the recording needle. This piles up in the center of the record.

After the record has been cut, raise the recorder arm, swing it outwardly and place it on the rest. Stop the turntable and remove the shaving which has been cut out of the record.

The record may now be played in the normal manner.

TO RECORD WITH THE MICROPHONE

Plug the Microphone into the socket provided on the rear of the cabinet.

Turn the Master Control Switch to the No. 5 position.

Speak into the microphone and adjust the volume control until the eye just closes. Whatever sound is picked up by the microphone will be recorded on the record. Keep the microphone some distance away from the receiver, preferably to one side so that it does not pick up the sound from the speaker. Keep the microphone at least six inches from your mouth and try to keep the same voice level as used initially in setting the volume.

Place the recording arm on the record as described above.

TO RECORD WITH MICROPHONE AND RADIO AT THE SAME TIME

Tune in the program you desire to record exactly as described under "Recording Radio Programs".

Turn the Master Control Switch to the No. 4 position.

Speak into the microphone and adjust the volume control so that the combined volume of the radio and the microphone just closes the eye as described previously. To make the voice predominate, retard the volume setting slightly to reduce the radio volume, and speak a little closer to the microphone.

Place the recorder arm on the record and proceed with the recording.

PUBLIC ADDRESS

The No. 6 position of the Master Control Switch connects the circuits so that the microphone, and the audio amplifier and speaker of the receiver may be used as a small public address system. Keep the microphone as far as possible from the speaker so that the sound from the speaker will not reach the microphone, causing a "Howl" or whistle.

GENERAL INFORMATION

In the recording positions (Positions 3, 4 and 5 of the Master Control Switch) the volume from the speaker is reduced. This is done automatically by the switch for three reasons, some of the power from the output tune is needed for operating the recording head, the volume level necessary for recording is too high for the average size room, and to prevent the sound from the speaker from reaching the microphone.

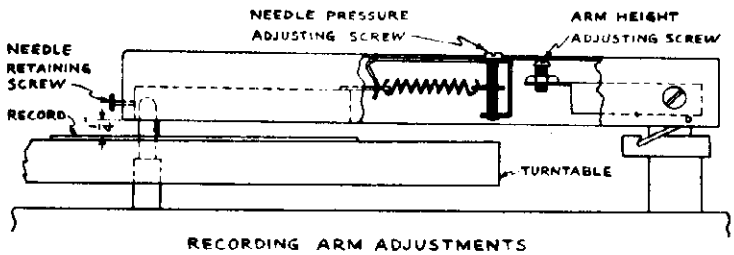
If the recording needle is not very sharp, the quality of the recording will be poor. A needle which has become dull through use or which has been otherwise damaged should be replaced.

The Master Control Switch should always be turned to the No. 1 (Radio) position when listening to radio programs.

RECORDING ARM ADJUSTMENTS

The bottom of the recording arm should be exactly 1/4 inch from the surface of the record. This should be measured beside the needle retaining screw on the end of the arm. The screw for making this adjustment can be found when the arm is raised, on a small platform near the hinge. Turning the adjusting screw to the left raises the arm, turning to the right lowers it. In making an adjustment turn the screw only a small fraction of a turn at a time.

Make a cut of at least ten or fifteen turns to see whether or not the needle is exerting the correct pressure on the record. This is correct when the groove cut by the needle is of approximately the same width as the space between grooves. On top of the cutting arms is a flat head screw. Turning this screw to the right increases the depth of cut, to the left decreases it. This adjustment is quite critical and the screw should be turned not more than 1/4 turn at a time.



RECORDING ARM ADJUSTMENTS

MODELS 5372, 5372-B
CHASSIS 109,371, 109.371-1

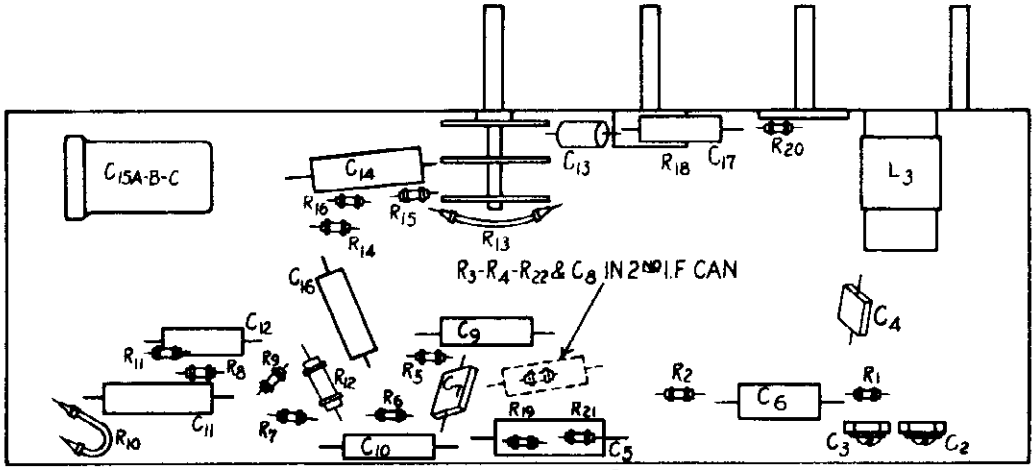
SEARS, ROEBUCK & CO.

ALIGNMENT PROCEDURE

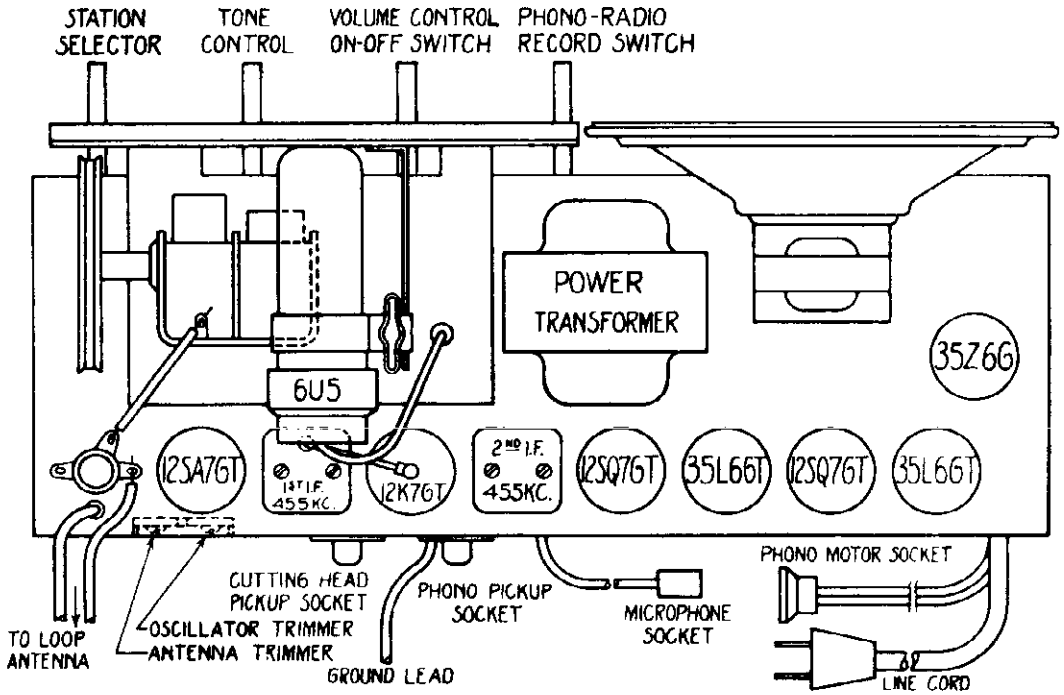
Output Meter connection ..... Across speaker voice coil
Connection of generator lead ..... See chart below
Connection of generator ground lead ..... Tomchassis
Dummy antenna value ..... See chart below
Position of volume control ..... Fully clockwise
Position of Master Control Switch ..... "Radio" (Position No.1)

POSITION OF VARIABLE	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION	TRIMMERS ADJUSTED (In order shown)
Open (Minimum capacity	455 Kc.	.1 mfd.	Antenna section of variable	T2, T1.
Minimum capacity	1720 Kc.	50 mmf.	Antenna terminal	Oscillator trimmer
Tune in Sig. from generator	1400 Kc.	50 mmf.	Antenna terminal	Antenna trimmer.

The alignment procedure should be repeated stage by stage in the original order for greatest accuracy. Always keep the output from the generator at the lowest possible level so that the AVC action of the receiver is ineffective.



LOCATION OF PARTS UNDER CHASSIS 109.371



PARTS LIST

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
		CHASSIS PARTS
	109544417	Button, snap (Dial Mounting)
	109548931	Cable, Tuning Tube
	109542163	Cable, Drive
	109543227	Cap, Grid
R18	109248910	Control, Volume & Switch (1 meg.)
	109551732	Cord, Line
	109546424	Clamp, Linecord
	109544314	Clamp, Tapped) For Tuning
	109544315	Clamp, Plain) Tube
L3	109288422	Coil, Oscillator
L1	109288423	Coil, Tracking
C1A & B	109168911	Condenser, Variable (with pulley)
C2 & 3	109178504	Condenser, Dual Trimmer
C15A, B & C	109208425	Condenser, Electrolytic(20 - 250)-(20 - 150)(20 150)
C4		Condenser, 100 Mmf, Mica
C5, 14		Condenser, .1 Mfd. 200 v.
C6		Condenser, .05 Mfd. 200 v.
C7		Condenser, 250 Mmf, Mica
C8		Condenser, 100 Mmf. Mica
C9		Condenser, .002 Mfd. 600 v.
C10, 16		Condenser, .01 Mfd. 400 v.
C11		Condenser, .05 Mfd. 400 v.
C12, 13		Condenser, .001 - 600 v.
C17		Condenser, .005 Mfd. 600 v.
	109547209	Grommet, Tuner Assembly MTG
	109408913	Dial Chart
	109548941	Microphone Socket Assembly
	109456244	Pulley, Idler
	109415026	Pointer
	6158	Pilot Lite
	109541207	Retainer, "C" Washer (Holds Tuning Shaft)
R1		Resistor, 20M, 1/3 Watt
R2		Resistor, 200 Ohm, 1/3 Watt
R3, 4, 14, 16		Resistor, 1 Meg, 1/3 Watt
R5		Resistor, 10 Meg, 1/3 Watt
R6, 7, 8, 9, 11		Resistor, 200M, 1/3 Watt
R10		Resistor, 120 Ohm 1/2 Watt
R12		Resistor, 1000 Ohm, 1 Watt
R13		Resistor, 35 Ohm, 1/2 Watt
R15		Resistor, 2 Meg, 1/3 Watt
R17		Resistor, 1 Meg (in tuning tube socket)
R19, 20, 21, 22		Resistor, 50M, 1/3 Watt
R23		Resistor, 4 Meg, 1/3 Watt
	109188440	Socket, Dual Dial Lamp
	109548648	Spring, Drive Cable
	109548427	Shaft, Drive
	109388428	Switch, Tone Control
	109388932	Switch, Master Control
	109588919	Speaker, 6-1/2" Dynamic
T4	109108918	Transformer, Power, 60 cycle
T4	109108933	Transformer, Power, 50 cycle
T3	1091389191	Transformer, Output
T1	109338434	Transformer, 1st IF
T2	109358435	Transformer, 2nd IF

109608920	Back for Cabinet
109598921	Book, Instruction
109548462	Bushing, rubber (recorder unit MTG)
109628922	Carton, shipping
109608923	Cabinet (Price on application)
109448924	Escutcheon
109392750	Knob, Motor Switch
109398487	Knob, Tuning
109398488	Knob, Tone
109398489	Knob, Volume
109398925	Knob, Master Control Switch
109288491	Loop Antenna Assembly
109448928	Plate, Instruction
109448477	Plate, Motor-on-off
109548287	Plug, 1 Prong (for cutter leads)
109548288	Plug, 1 Prong (for phono pickup leads)
109548493	Plug, 2 Prong (for Motor leads)
109388454	Switch, Motor
109542997	Washer, Rubber (for recorder MTG)

CABINET ASSEMBLY PARTS

RECORDER UNIT PARTS

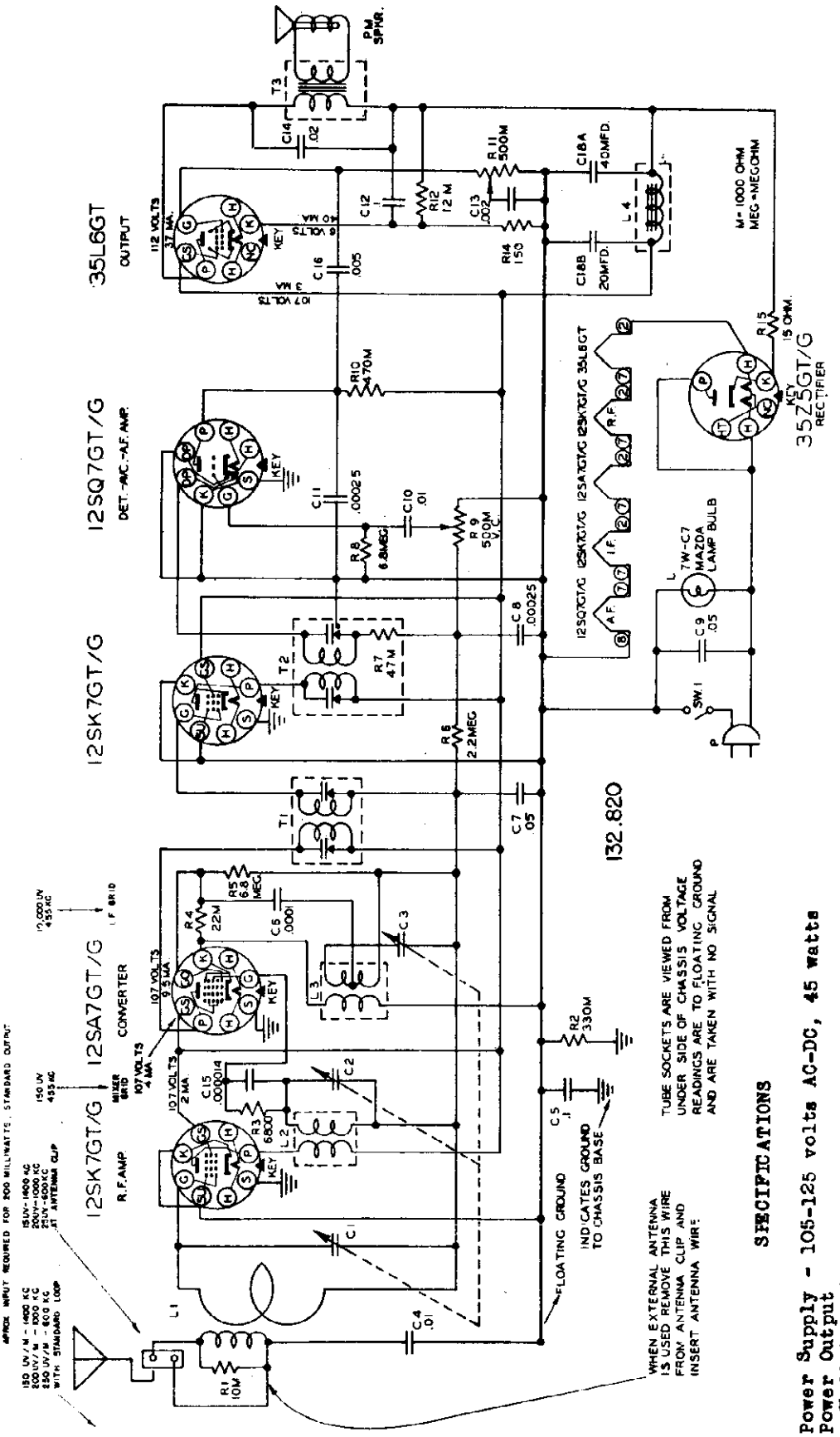
1095486943	Hex nut for pivot post
1095486947	Motor mounting screw
1095486948	Adjusting screw (Follower Arm)
10954869413	Turntable shaft locking screw
10954869417	Recorder Arm Rest
10954869418	Follower arm complete
10963869424	Pickup Cartridge
10963869426	Pickup Arm complete
10954869428	Cutter head tension spring
10964869484	Magnetic Cutter Head with leads
10963869434	Recorder arm complete
10954869438	Pivot post return spring
10964869450	10" one piece turn table
10964869456	Turntable drive disc stud clip
10964869458	Lead screw and pinion assembly
10964869463	Turntable drive disc tension spring
10964869464	Turntable shaft
10964869466	Turntable drive disc
10964869467	Turntable drive disc mounting bracket assembly
109547799	Connector - Microphone
109541297	Plug - Microphone
109548658	Bracket - Mic. Connector
109546909	Spring - Mic. Connector
109546908	Washer - Mic. Connector

The following parts are for models with ONE PIECE TURNTABLE ONLY

10964869469	Retractable pin spring
10964869470	Retractable pin
10964869472	Rotor shaft pulley
10964869474	Rotor shaft pulley set screw
10964869481	Motor 60 cycle
10964869482	Motor 50 cycle

MODELS 6015, 6016
CHASSIS 132.820

SEARS, ROEBUCK & CO.



SPECIFICATIONS

Power Supply - 105-125 volts AC-DC, 45 watts
Power Output
Undistorted .8 watts, maximum - 2.5 watts

Tuning Range Broadcast Band 540-1600 Kc
Speaker
Voice Coil Impedance 3.2 Ohms

Difference between 6015 and 6016:

Model 6015 has a walnut cabinet. Model 6016 has an ivory cabinet.

SEARS. ROEBUCK & CO.

MODELS 6015, 6016
CHASSIS 132.820

ALIGNMENT PROCEDURE

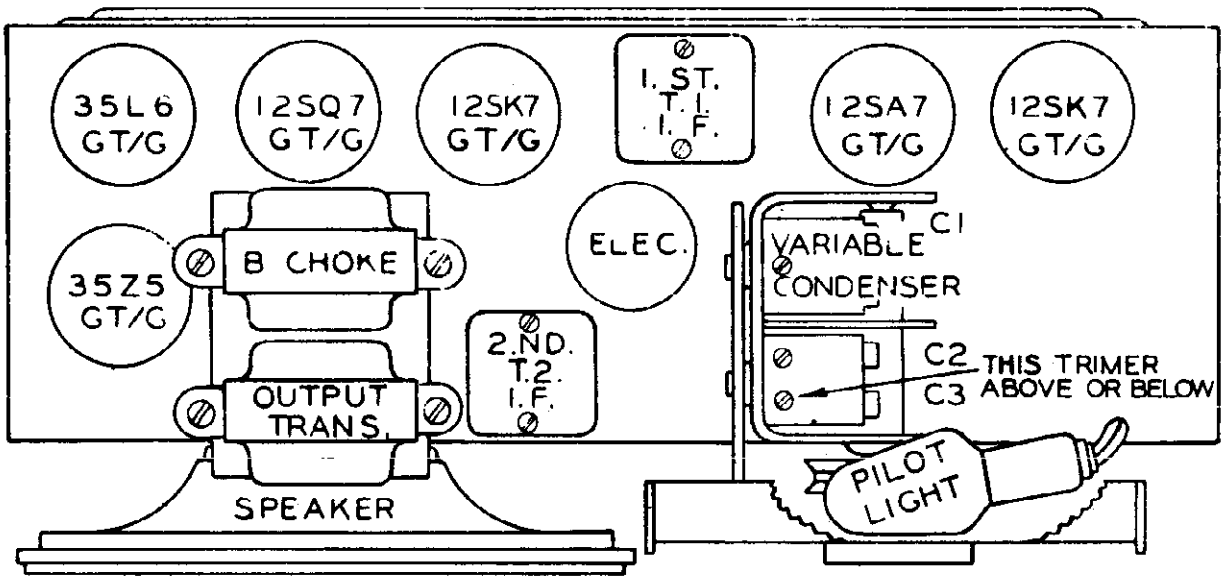
PRELIMINARY:

Output meter connection ..... Across Speaker Voice Coil
Output meter reading to indicate 200 mw (Standard Output)..... .8 Volts
Dummy antenna value used in series with generator output ..... See Chart Below
Connection of generator output lead ..... See Chart Below
Connection of generator ground lead ..... Floating Ground
Generator modulation ..... 30% 400 Cycles
Position of volume control ..... Fully Clockwise
Position of tone control ..... Treble
Position of dial pointer with variable fully closed ..... Horizontal

POSITION OF VARIABLE	FREQUENCY OF GENERATOR	DUMMY ANTENNA	GENERATOR OUTPUT CONNECTION	TRIMMERS ADJUSTED IN ORDER SHOWN FOR MAX. OUTPUT	FUNCTION OF TRIMMER
Open	455	.05 mfd.	12SA7 Grid (or Stator of C-2)	Top of 2nd & 1st IF Trans.	IF
1400	1400	.0002 mfd.	Antenna Clip (with black wire removed)	C-3; C-2; C-1 Trimmers located on Variable Condenser	Oscillator Mixer RF

IMPORTANT ALIGNMENT NOTES:

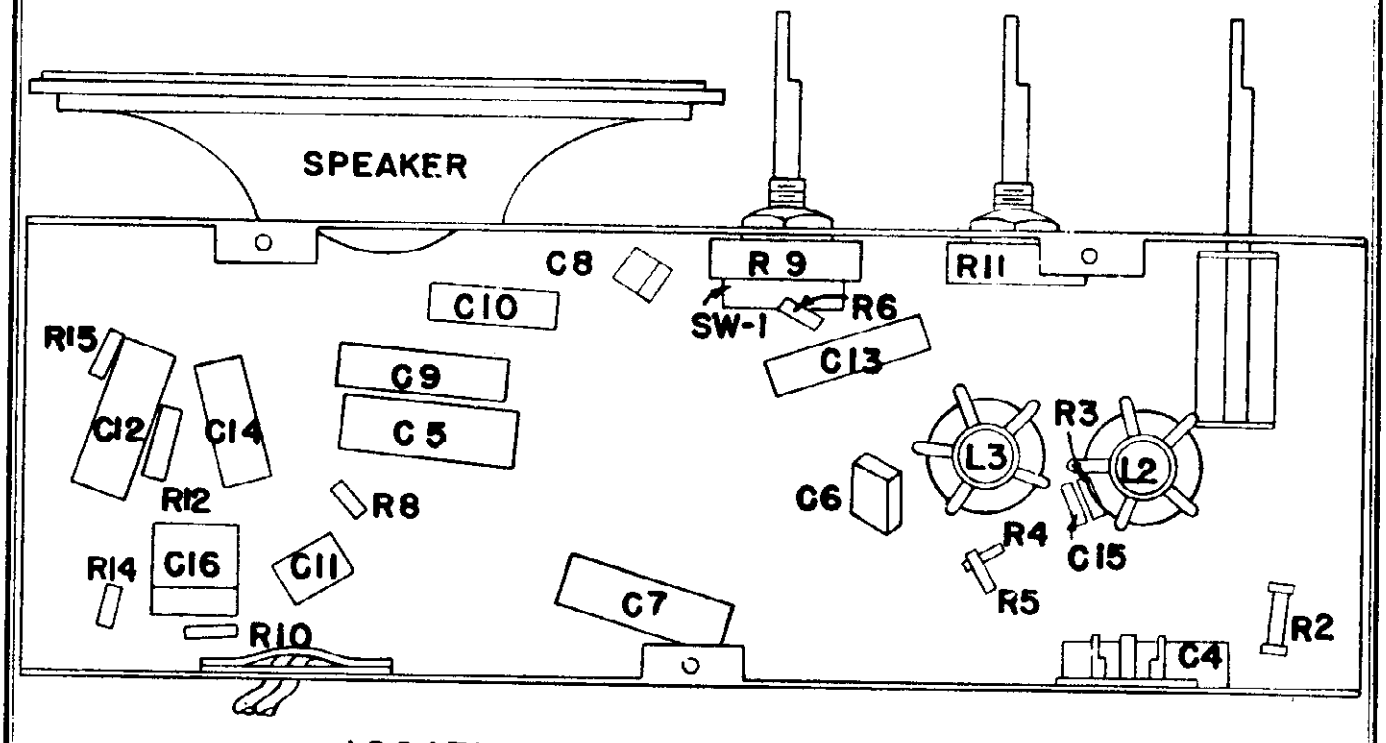
1. Place set loop in the same position and at the same distance with respect to the back of the chassis as it would be when the set is mounted in the cabinet, during alignment of the RF stage.
2. If a standard test loop is used with the Signal Generator for alignment of the receiver, the black wire will be left in the antenna clip.
3. The alignment procedure should be repeated in the original order for greatest accuracy. Always keep the output from the signal generator at its lowest possible value to make the A. V. C. action of the receiver ineffective.



LOCATION OF PARTS ON TOP OF CHASSIS

MODELS 6015, 6016
CHASSIS 132.820

SEARS, ROEBUCK & CO.



LOCATION OF PARTS UNDER CHASSIS

SERVICE NOTE:

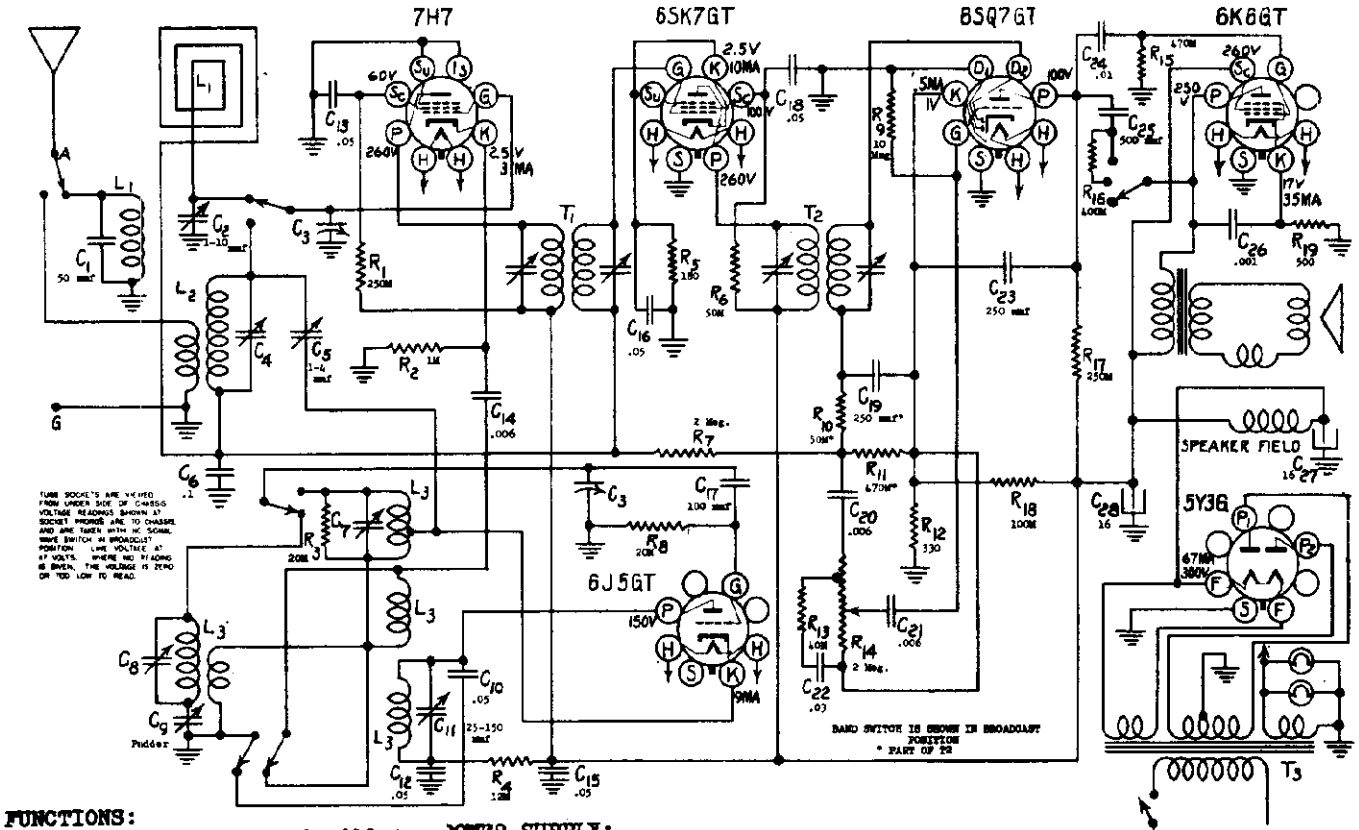
The AC hum can often be greatly reduced on this chassis by replacing C12 with an .03 mfd. 400V condenser. Sometimes the hum can be further reduced by replacing R12 with a 15,000 ohm 1 watt resistor.

PARTS LIST

Schematic Location	Part No.	Description
R1		Resistor, 10,000 ohm, 1/4 watt
R2		Resistor, 330,000 ohm, 1/4 watt
R3		Resistor, 6800 ohm, 1/4 watt
R4		Resistor, 22,000 ohm, 1/4 watt
R5-R8		Resistor, 6.8 megohm, 1/4 watt
R6		Resistor, 2.2 megohm, 1/4 watt
R7		Resistor, 47,000 ohm, 1/4 watt
R9	N19448	Resistor, 500,000 ohm Volume Control & Sw
R10		Resistor, 470,000 ohm, 1/4 watt
R11	N19966	Resistor, 500,000 ohm Tone Control
R12		Resistor, 12,000 ohm, 1 watt
R14		Resistor, 150 ohm, 1/4 watt
R15		Resistor, 15 ohm, 1/4 watt
C1, 2, 3	N18564	Condenser, Variable
C4, C10		Condenser, .01 mfd. 400 volt
C5, C12		Condenser, .1 mfd. 400 volt
C6		Condenser, .0001 mfd. 500 volt Mica
C7, C9		Condenser, .05 mfd. 400 volt
C8, C11		Condenser, .00025 mfd. 500 volt Mica
C13		Condenser, .002 mfd. 600 volt
C14		Condenser, .02 mfd. 400 volt
C15		Condenser, .000014 mfd. 500 volt Mica
C16		Condenser, .005 mfd. 600 volt
C18A-18B	N19239	Condenser, Electrolytic, 20-40 mfd. 150 v
L1	N19666	Antenna Loop Assembly
L2	N19860	Coil, R. F.
L3	N18580	Coil, Oscillator
L4	N18583	Choke, Iron Core "B"

Schematic Location	Part No,	Description
T1	N21009	Transformer, First I. F.
T2	N18578	Transformer, 2nd I. F.
T3	N18582	Transformer, Output
Spkr.	N18550	Speaker, 5-1/4" P.M.
P	N20064	Line Cord with Plug
L		Dial Light, Mazda 7W, C7-117 volt
	N21137	Cabinet Assembly, Walnut (Cat. #6015,
	N21138	Cabinet Assembly, Ivory (Cat. #6016)
	N19518	Handle Assembly, Walnut (Cat. #6015)
	N19519	Handle Assembly, Ivory (Cat. #6016)
	N19463	Knob, Volume, Walnut (Cat. #6015)
	N19466	Knob, Tone, Walnut (Cat. #6015)
	N19469	Knob, Tuning, Walnut (Cat. #6015)
	N19462	Knob, Volume, Ivory (Cat. #6016)
	N19465	Knob, Tone, Ivory (Cat. #6016)
	N19468	Knob, Tuning, Ivory (Cat. #6016)
	N19225	Scale, Dial
	N19226	Pointer, Dial
	N18272	Crystal, Dial
	N19436	Shaft, Tuning
	N19132	Cord, Dial Drive
	N19234	Socket, Antenna
	N19134	Socket Assembly, Dial Light with Leads
	N19295	Spring, Dial Cord
	N19410	Retainer, Antenna Loop
	N17311	Baffle Board, Speaker
	N19768	Baffle, Rear Cabinet
	N19454	Instruction Sheet

WIRING DIAGRAM



TUBES AND FUNCTIONS:

6J5GT	Oscillator
7H7	Translator
6SK7GT	IF
6SQ7GT	Detector-AVC-Audio
6K6GT	Output
5Y3G	Rectifier

ALIGNMENT FREQUENCIES:

Oscillator	Antenna-Transl.	
Trimmer	Trimmer	Padder
1610 kc	1400 kc	600 kc
18.2 mc	15 mc	6 mc

POWER SUPPLY:

All models available	105-125 volts, 50-60 cycles; 70 watts
All models available	105-125 volts, 25-60 cycles; 75 watts

INTERMEDIATE FREQUENCY . . . . . 455 kc

POWER OUTPUT:

Type	Single Pentode
Undistorted	2.5 watts
Maximum	4.0 watts

FREQUENCY RANGES:

Band "A"	540-1600 kc
Band "B"	6.0-18.0 mc

LOUD SPEAKER:

Type	Dynamic
Size	7.5 inch
Approx.field coil res.	750 ohms
Approx.field coil voltage drop	40 V.

MODEL 7046
CHASSIS 141.416

SEARS, ROEBUCK & CO.

GENERAL INFORMATION & SERVICE HINTS

The RADIONET Antenna System equipped with the receiver is in use for Broadcast band operation only. An external antenna must be used for short-wave operation.

ALIGNMENT PROCEDURE

PRELIMINARY:

Output meter connection . . . . . Across loudspeaker voice coil
Output meter reading to indicate 500 milliwatts . . . . . 1.1 volts
Generator ground lead connection . . . . . To chassis
Dummy antenna value to be in series with generator output . . . . . See chart below
Connection of generator output lead . . . . . See chart below
Generator modulation . . . . . 30%, 400 cycles
Position of Volume Control . . . . . Fully clockwise
Position of Tone Control . . . . . "I"
Position of Dial Pointer with variable fully closed . . . . . At mark to left of 550 kc calibration mark.

WAVE BAND SWITCH POSITION	POSITION OF VARIABLE	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION	TRIMMERS ADJUSTED (IN ORDER SHOWN)	TRIMMER FUNCTION	ANT. COUPLED APPROXIMATE MICROVOLTS
"BC"	Closed	455 kc	.1 mfd.	7H7 Grid	T2, T1	IF	100
"BC"	Open	1610 kc	.00005 mfd.	Ant. Term.	C8	Oscillator	--
"BC"	1400 kc	1400 kc	.00005 mfd.	Ant. Term.	C2	Translator	80**
"BC"	600 kc(rock)	600 kc	.00005 mfd.	Ant. Term.	C9	Padder	70***
"SW"	Open	18.2 mc	400 ohms	Ant. Term.	C7*	Oscillator	--
"SW"	15 mc(rock)	15 mc	400 ohms	Ant. Term.	C4	Translator	70
"SW"	6 mc(rock)	6 mc	400 ohms	Ant. Term.	C11	Padder	100

IMPORTANT ALIGNMENT NOTES

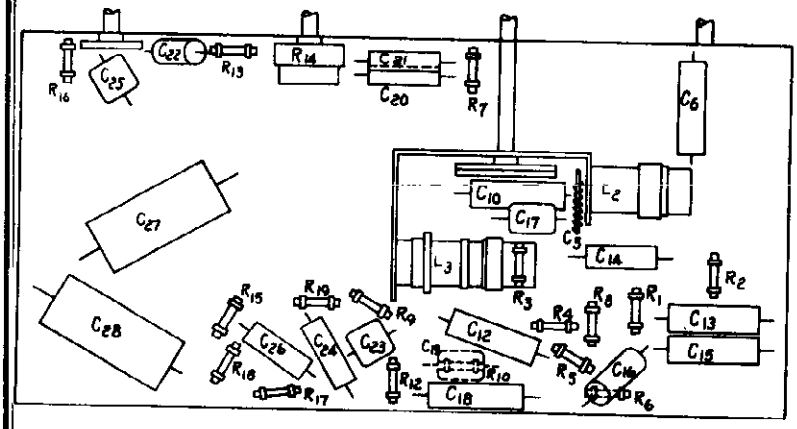
* If two peaks can be had, the correct one is with the trimmer screw further out. The other peak is the image.

** 160 microvolts per meter using standard Hazeltine alignment loop 24 inches from receiver loop.

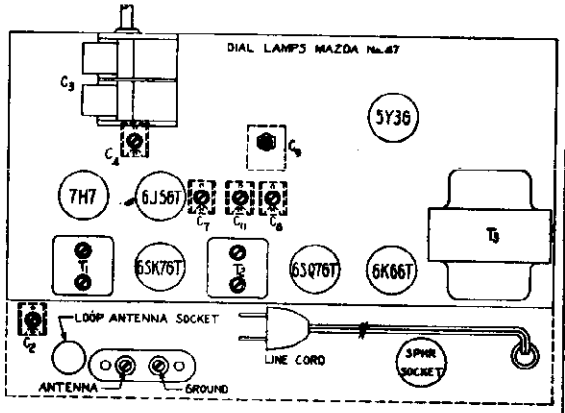
*** 140 microvolts per meter using standard Hazeltine alignment loop 24 inches from receiver loop.

Where indicated by the work, "Rock", the variable should be rocked back and forth a degree or two while making the adjustment.

The alignment procedure should be repeated stage by stage, in the original order, for greatest accuracy. Always keep the output from the test oscillator at its lowest possible value to make the AVC action of the receiver ineffective.



LOCATIONS OF PARTS UNDER CHASSIS

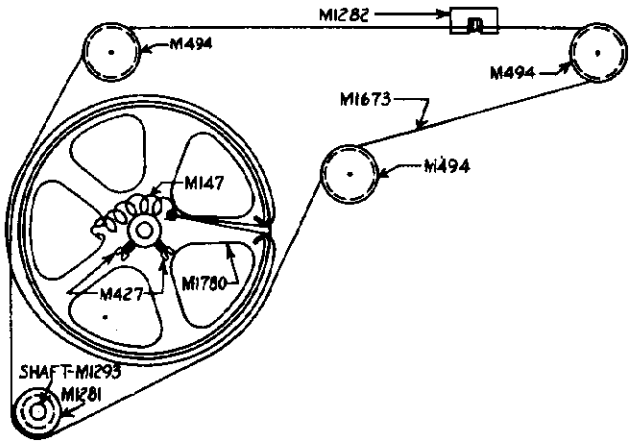


LOCATIONS OF PARTS ON TOP OF CHASSIS

PARTS LIST

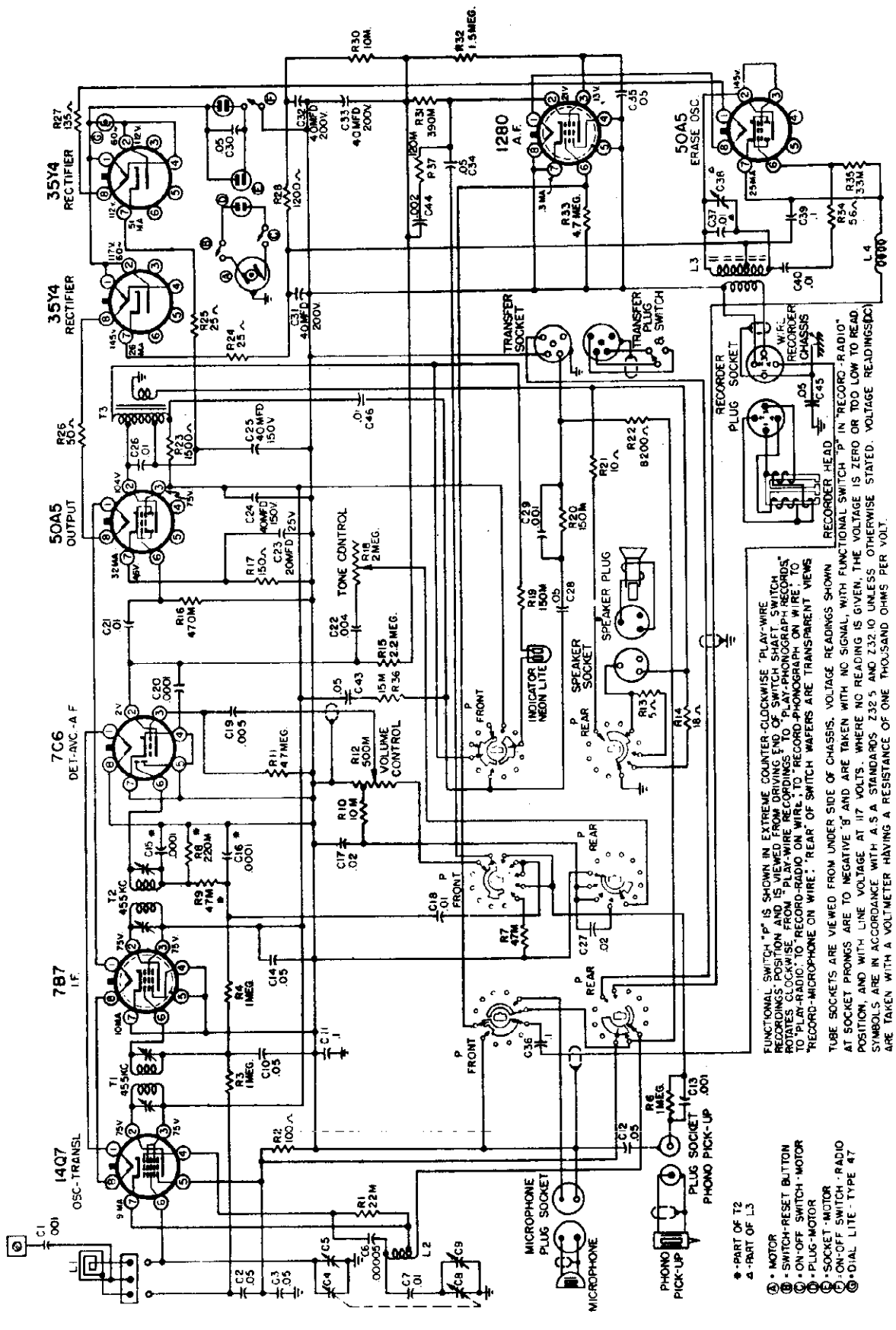
SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
	M1297	Book - Instruction
	M1188	Bracket - Drive Support
	M306	Button - Snap
	M712	Cabinet
	M1673	Cable - Drive
	M1298	Carton - Shipping
	M119	Clamp - Line Cord
L2	M1305	Coil - Short Wave Antenna
L3	M1306	Coil - Oscillator
C6		Condenser - .1 mfd. 200 V.
C10,12,13, 15,18		Condenser - .05 mfd. 400 V.
C14,20,21		Condenser - .006 mfd. 400 V.
C16		Condenser - .05 mfd. 200 V.
C22		Condenser - .03 mfd. 200 V.
C24		Condenser - .01 mfd. 400 V.
C26		Condenser - .001 mfd. 400 V.
C27	M482	Condenser - Elec. 16 mfd. 400 V.
C28	M550	Condenser - Elec. 16 mfd. 400 V.
C1	M517	Condenser - Mica 50 mmf.
C2	M1161	Condenser - Trimmer 1-10 mmf.
C5	M1307	Condenser - 1-4 mmf.
C11	M1274	Condenser - Trimmer 25-150 mmf.
C17		Condenser - Mica 100 mmf.
C23		Condenser - Mica 250 mmf.
C25		Condenser - Mica 500 mmf.
C7,8	M766	Condenser - Trimmer
C4	M766	Condenser - Trimmer
C9	M228	Condenser - Padder
C3	M1086	Condenser - Variable
R14	M1193	Control - Volume & Switch 2 Meg.
	M412	Cord - Line
	M1060	Envelope - Instruction Book
	M1196	Escutcheon with Crystal
	M652	Grommet - Rubber
	M653	Grommet - Rubber
	M1279	Indicator
	M1139	Knob - Volume & Switch
	M1138	Knob - Tuning
	M1141	Knob - Tone Control
	M1299	Knob - Band Switch
	M136	Lamp - Dial Mazda #47
L1	M1300	Loop - Assembly
	M1311	Plug - 4 Prong Loop Connecting
	M1282	Pointer
	M1780	Pulley - Drive with Hub
	M494	Pulley - Idler
	M645	Pulley - Rubber
R5		Resistor - 180 ohms 1/3 W.
R12		Resistor - 330 ohms 1/3 W.
R19		Resistor - 500 ohms 1 W.
R2		Resistor - 1M 1/3 W.
R4		Resistor - 12M 2 W.
R3,8		Resistor - 20M 1/3 W.
R13		Resistor - 40M 1/3 W.
R6		Resistor - 50M 1/3 W.
R18		Resistor - 100M 1W.
R1,17		Resistor - 250M 1/3 W.
R16		Resistor - 400M 1/3 W.
R15		Resistor - 470M 1/3 W.
R7		Resistor - 2 Megohms 1/3 W.
R9		Resistor - 10 Megohms 1/3 W.
	M1293	Shaft - Drive
	M661	Socket - 4 Prong
	M1254	Socket - 5 Prong
	M1290	Socket - Dual Dial Lamp
	M1169	Socket - Loctal
	M363	Socket - Octal
	M1172	Speaker - Complete
	M147	Spring - Drive Cable
	M1273	Switch - Band
	M1291	Switch - Tone Control
	M1690	Transformer - Output
T1	M1295	Transformer - 1st I.F.
T2 with R10, R11,C19	M1296	Transformer - 2nd I.F.
T3	M1194	Transformer - Power 50-60 cycle
T3	M1691	Transformer - Power 25 cycle
	M436	Washer - Cup
	M168	Washer - Drive Shaft Retaining

Before ordering parts for Dial Drive System, check these drawings:



MODELS 7085,7102,8085
CHASSIS 101.814,
101.814-1A,101.814-4C

SEARS, ROEBUCK & CO.



SEARS, ROEBUCK & CO.

MODELS 7085, 7102, 8085
CHASSIS 101.814,
101.814-1A, 101.814-4C

CHASSIS 101.814-4C

is Similar to chassis 101.814 except 14A7 I. F. Tube is used in place of 7B7. Elliptical Speaker is used in place of 5 1/4" Speaker. The styling of this model with respect to Escutcheon, Knobs, Dial Background and Pointer are similar to the 101.814-2B.

SPECIFICATIONS

CHASSIS 101.814 AND 101.814-1A

Model Differences:
Both models are similar, however, 101.814-1A is a console with a larger speaker. The 101.814 is a table model.

Power Supply:
All models available.....117 Volts AC 60 Cycles 90 Watts

PRELIMINARY:

ALIGNMENT PROCEDURE

Output Meter Connection.....Across loud speaker voice coil
Output Meter Reading to Indicate 50 Milliwatts (Standard Output)..... 0.4 Volt
Generator Ground Lead Connection.....Receiver chassis
Dummy Antenna Value to be in Series with Generator Output.....See chart below
Connection of Generator Output Lead.....See chart below
Generator Modulation.....30%, 400 cycles
Position of Volume Control.....Fully on
Position of Tone Control.....Treble (clockwise)
Position of Pointer with Tuner Fully Closed.....Last line below 540 calibration mark

POSITION OF TUNER	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION	TRIMMER ADJUSTMENTS (IN ORDER) SHOWN	TRIMMER FUNCTION
Closed	455 KC	.1 mfd.	Trans. Grid	T2,T1	IF
1500 KC	1500 KC	.0002 mfd.	Antenna	C9	Oscillator
1500 KC	1500 KC	.0002 mfd.	Antenna	C5	Transl.

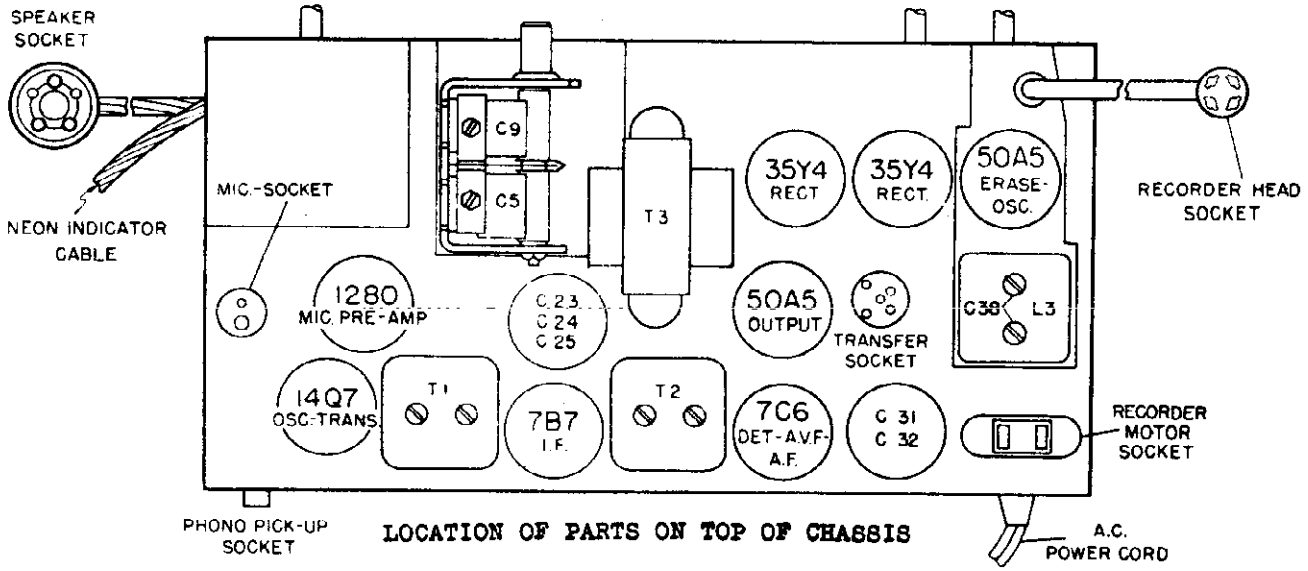
IMPORTANT ALIGNMENT NOTES

The Alignment must be done in the order given.
The entire Alignment Procedure should be repeated step by step in the original order for greatest accuracy.

Always keep the output power from the generator at its lowest possible value to prevent the AVC of the receiver from interfering with accurate alignment.

The Erase Oscillator Coil has been set at 39.5 Kc. at the factory. If necessary, it can be adjusted with the use of a Beat Frequency Oscillator.

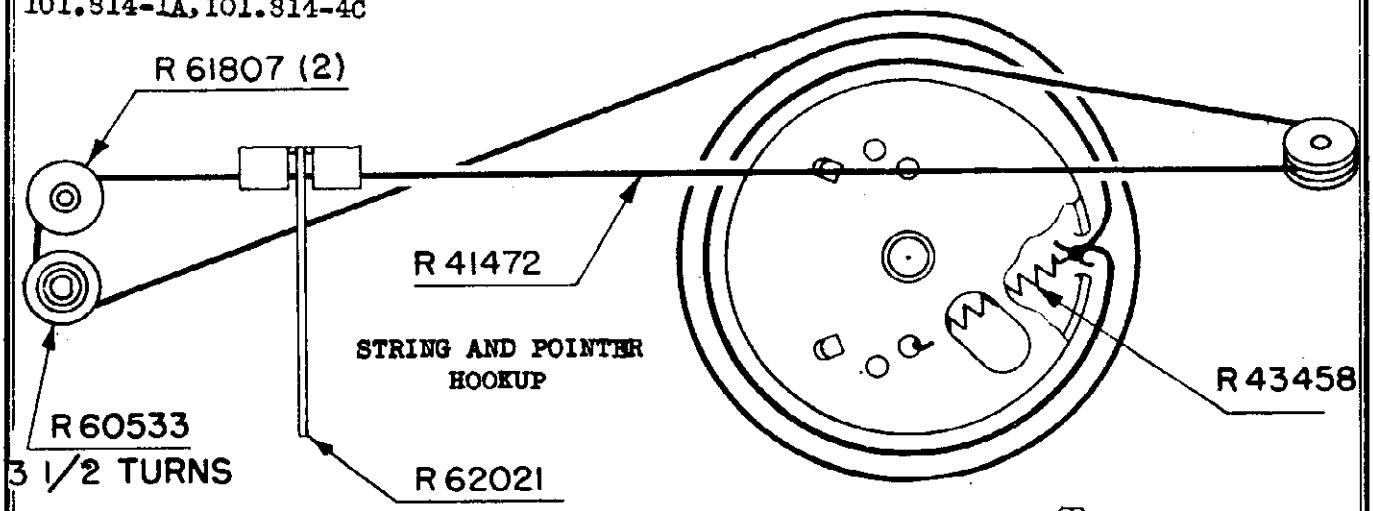
The Erase voltage on the Recording Head should be approximately 3.3 volts as measured with a Vacuum Tube Voltmeter.

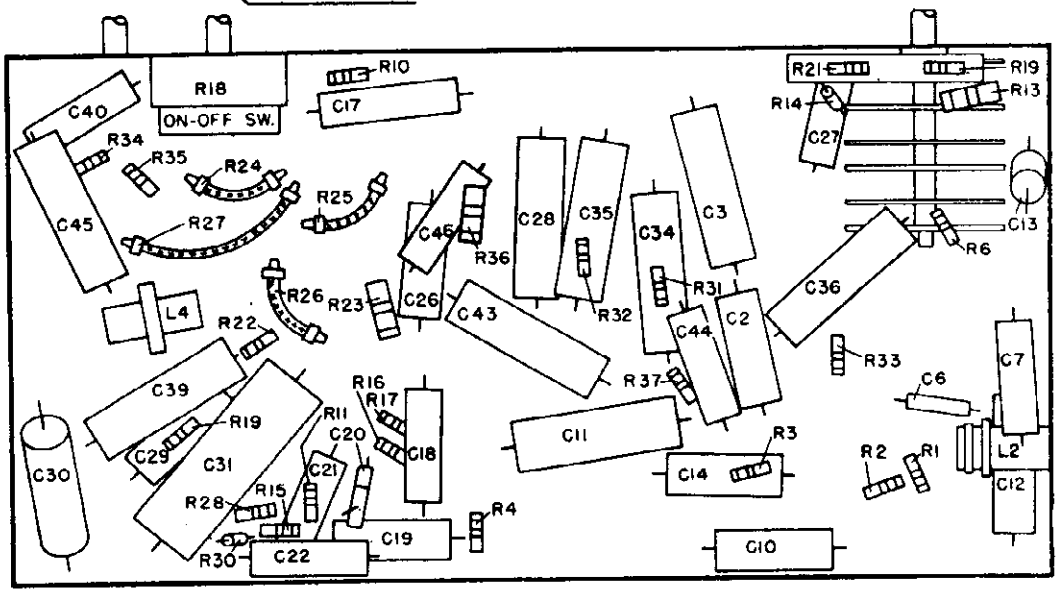


LOCATION OF PARTS ON TOP OF CHASSIS

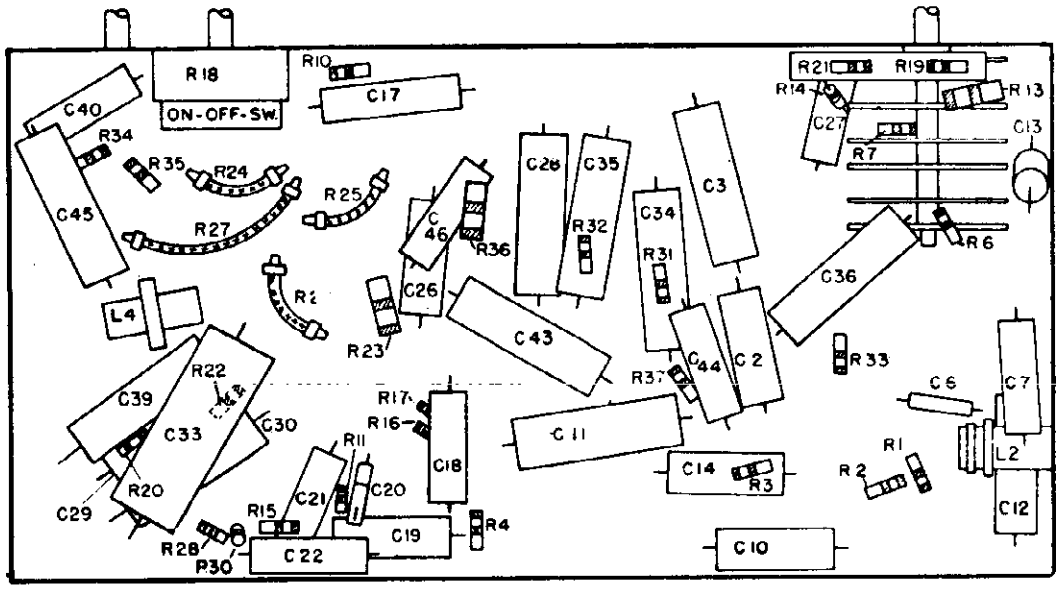
MODELS 7085,7102,8085
CHASSIS 101.814,
101.814-1A,101.814-4C

SEARS, ROEBUCK & CO.





LOCATION OF PARTS UNDER CHASSIS - 101.814



LOCATION OF PARTS UNDER CHASSIS - 101.814-1A

SEARS, ROEBUCK & CO MODEL 7085 CHASSIS 101.814

MODEL 7102 CHASSIS 101.814-1A
MODEL 8085 CHASSIS 101.814-4C
MODELS 8102,8102B CHASSIS 101.814-2B
MODEL 8102A CHASSIS 101.814-3B
MODEL 8086 CHASSIS 101.814-5C
MODELS 8086A,8086B CHASSIS 101.814-6C

PARTS LIST

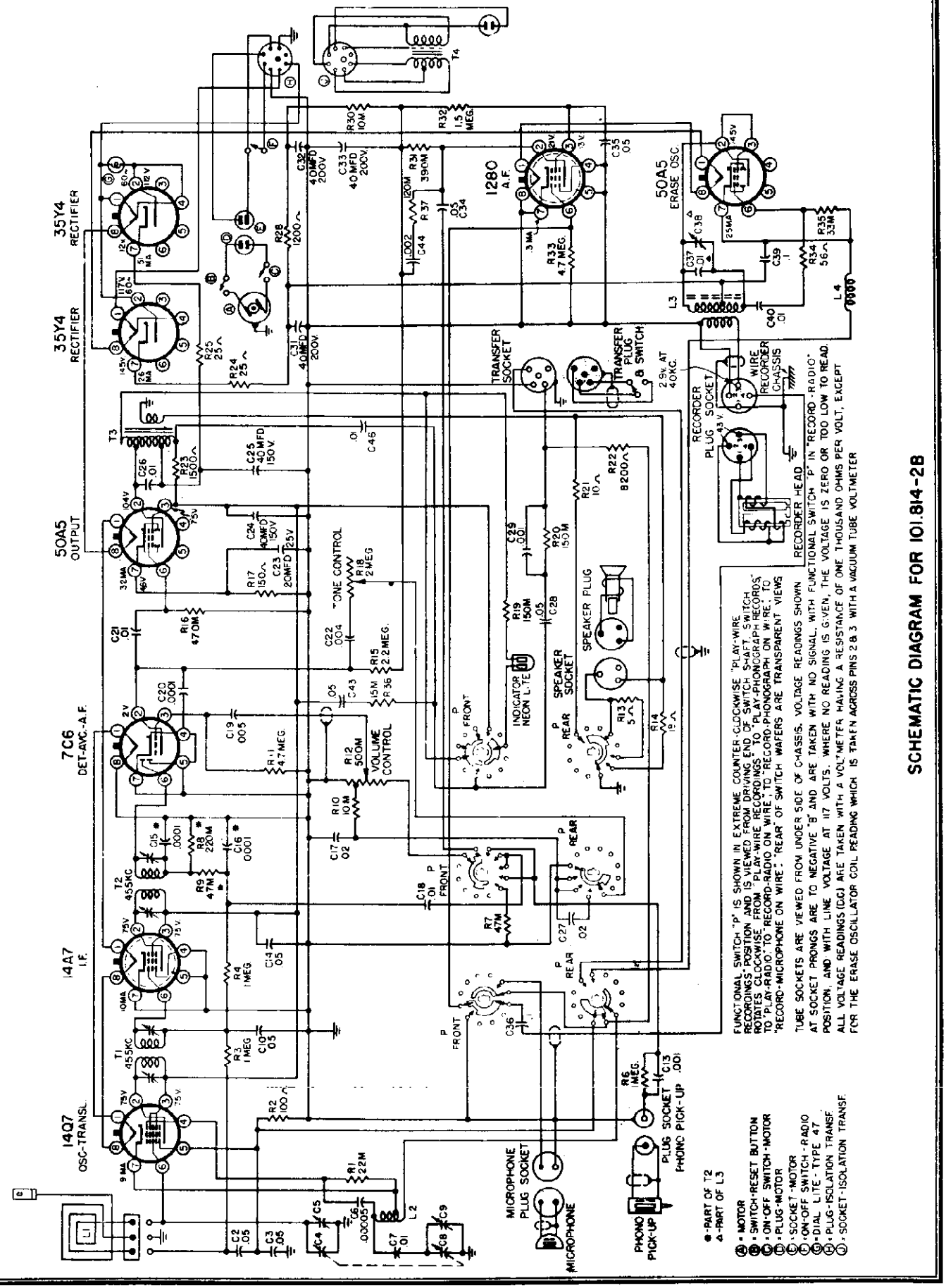
SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
	R62076	Background - Dial
	R61846	Button - Snap - Dial Background Mounting
	R_3890	Cable & Socket Assembly (101.814,-1A,-2B)
	R54690	Cable & Socket Assembly (101.814-3B,-5C,-6C)
C11,C36,C39		Capacitor - .1 Mfd. 600 Volt (101.814,-1A)
C36,C39		Capacitor - .1 Mfd. 600 Volt (101.814-2B)
C11,C34		Capacitor - .1 Mfd. 600 Volt (101.814-3B,-5C,-6C)
C7,C18,C21, C26,C40,C46		Capacitor - .01 Mfd. 600 Volt (101.814,-1A,-2B)
C6,C14,C21, C27,C29,C32		Capacitor - .01 Mfd. 600 Volt (101.814-3B,-5C,-6C)
C17,C27		Capacitor - .02 Mfd. 600 Volt (101.814,-1A,-2B)
C13,C17		Capacitor - .02 Mfd. 600 Volt (101.814-3B,-5C,-6C)
C2,C3,C10,C12, C14,C28,C30,C34, C35,C43,C45		Capacitor - .05 Mfd. 600 Volt (101.814,-1A)
C2,C3,C10, C14,C28,C34 C35,C43		Capacitor - .05 Mfd. 600 Volt (101.814-2B)
C1,C2,C10,C12, C20,C23,C35, C40		Capacitor - .05 Mfd. 600 Volt (101.814-3B,-5C,-6C)
C9		Capacitor - .001 Mfd. 600 Volt (101.814-6C)
C1,C13,C29		Capacitor - .001 Mfd. 600 Volt (101.814,-1A)
C13,C29		Capacitor - .001 Mfd. 600 Volt (101.814-2B)
C26		Capacitor - .001 Mfd. 600 Volt (101.814-3B,-5C,-6C)
C44		Capacitor - .002 Mfd. 600 Volt (101.814,-1A,-2B)
C35		Capacitor - .002 Mfd. 600 Volt (101.814-3B,-5C,-6C)
C42		Capacitor - .003 Mfd. 600 Volt
C22		Capacitor - .004 Mfd. 600 Volt (101.814,-1A,-2B)
C22,C31		Capacitor - .004 Mfd. 600 Volt (101.814-3B,-5C,-6C)
C19		Capacitor - .005 Mfd. 600 Volt (101.814,-1A,-2B)
C18		Capacitor - .005 Mfd. 600 Volt (101.814-3B,-5C,-6C)
C6		Capacitor - Mica - 50 Mmfd. (101.814,-1A,-2B)
C5		Capacitor - Mica - 50 Mmfd. (101.814-3B,-5C,-6C)
C20		Capacitor - Mica - 100 Mmfd. (101.814,-1A,-2B)
C19		Capacitor - Mica - 100 Mmfd. (101.814-3B,-5C,-6C)
C4,C8	R61100	Capacitor - Variable Tuning (101.814,-1A,-2B)
C3,C7	R61100	Capacitor - Variable Tuning (101.814-3B,-5C,-6C)
C33	R61517	Capacitor - 40 Mfd. 200 Volt (101.814,-1A,-2B)
C40	R61517	Capacitor - 40 Mfd. 200 Volt (101.814-3B,-5C,-6C)
C31,C32	R61507	Capacitor - 40 Mfd. 200 Volt, 40 Mfd. 200 Volt (101.814,-1A,-2B)
C30,C39	R61507	Capacitor - 40 Mfd. 200 Volt, 40 Mfd. 200 Volt (101.814-3B,-5C,-6C)
C23,C24,C25	R60416	Capacitor - Electrolytic - 40 Mfd. 150 Volt, 40 Mfd. 150 Volt, 20 Mfd. 25 Volt (101.814,-1A,-2B)
C24,C25,C28	R60416	Capacitor - Electrolytic - 40 Mfd. 150 Volt, 40 Mfd. 150 Volt, 20 Mfd. 25 Volt (101.814-3B,-5C,-6C)
L3	R64696	Coil - Brass Oscillator (101.814-3B,-5C,-6C)
L4	R43050	Coil - Choke
L3	R51519	Coil - Brass Oscillator (101.814,-1A,-2B)
L2	R51107	Coil - Oscillator - B.C.
	R62045	Clip - Lens Retaining
	R61191	Clip - Neon Lamp Retaining
	R60639	Connector - Loop Terminal
R12	R61128	Control - Volume (101.814,-1A,-2B)
R18	R61864	Control - On-Off & Tone
R11	R61128	Control - Volume (101.814-3B,-5C,-6C)
	R41748	Cord - Line
	R41472	Cord - Dial Drive (44")
	R60506	Dial - Station (101.814,-1A)
	R60520	Escutcheon - Dial (101.814,-1A)
	R62080	Escutcheon & Dial Assembly (101.814-2B,-3B,-5C,-6C)
	R62531	Knob - Volume (101.814-2B,-3B,-5C,-6C)
	R60484	Knob - Volume (101.814,-1A)
	R61408	Knob - On-Off & Tone (101.814,-1A)
	R62538	Knob - Master Control (101.814-2B,-3B,-5C,-6C)
	R61566	Knob - Master Control (101.814,-1A)
	R60480	Knob - Tuning (101.814,-1A)
	R62712	Knob - Tuning (101.814-2B,-3B,-5C,-6C)
		Lamp - Mazda Type #47
	R45981	Lamp - Neon
	R54425	Leaflet - Instruction (101.814)
	R54451	Leaflet - Instruction (101.814-1A)
	R64075	Leaflet - Instruction (101.814-2B)
	R64295	Leaflet - Instruction (101.814-3B)
	R61473	Leaflet - Instruction (101.814-5C)
	R66520	Leaflet - Instruction (101.814-6C)
	R61137	Lens - Recorder Indicating Lamp
	R61196	Loop & Board Assembly (101.814)
	R61557	Loop & Board Assembly (101.814-1A)
	R64589	Loop & Board Assembly (101.814-2B,-3B)
	R65216	Loop & Board Assembly (101.814-5C,-6C)
	R61168	Microphone (101.814,-1A)
	R49264	Cartridge - Crystal Microphone
	R56115	Ring - Mounting
	R56449	Cover Assembly - Terminal Shield
	R64674	Microphone (101.814-2B,-3B,-5C,-6C)
	R56076	Cartridge - Crystal Microphone
	R56115	Ring - Mounting
	R56449	Cover Assembly - Terminal Shield
	R61527	Plate - Instruction (101.814)
	R61594	Plate - Instruction (101.814-1A)
	R64567	Plug - 9 Prong
	R62077	Pointer Assembly (101.814-2B,-3B,-5C,-6C)
	R62021	Pointer - Dial (101.814,-1A)
	R62013	Pointer - Plastic - Master Control Knob (101.814,-1A)
	R61807	Pulley - Metal
R21		Resistor - 10 Ohm - 1/2 Watt
R14		Resistor - 18 Ohm - 1/2 Watt
R34		Resistor - 56 Ohm - 1/2 Watt (101.814,-1A,-2B)
R29		Resistor - 56 Ohm - 1/2 Watt (101.814-3B,-5C,-6C)
R2		Resistor - 100 Ohm - 1/2 Watt
R17		Resistor - 150 Ohm - 1/2 Watt
R28		Resistor - 1200 Ohm - 1/2 Watt (101.814,-1A,-2B)
R26		Resistor - 1200 Ohm - 1/2 Watt (101.814-3B,-5C,-6C)
R22		Resistor - 8200 Ohm - 1/2 Watt
R10,R30		Resistor - 10,000 Ohm - 1/2 Watt (101.814,-1A,-2B)
R9,R33		Resistor - 10,000 Ohm - 1/2 Watt (101.814-3B,-5C,-6C)
R1		Resistor - 22,000 Ohm - 1/2 Watt
R35		Resistor - 33,000 Ohm - 1/2 Watt (101.814,-1A,-2B)
R30		Resistor - 33,000 Ohm - 1/2 Watt (101.814-3B,-5C,-6C)
R7		Resistor - 47,000 Ohm - 1/2 Watt (101.814,-1A,-2B)
R6		Resistor - 47,000 Ohm - 1/2 Watt (101.814-3B,-5C,-6C)
R37		Resistor - 120,000 Ohm - 1/2 Watt (101.814,-1A,-2B)
R27		Resistor - 120,000 Ohm - 1/2 Watt (101.814-3B,-5C,-6C)
R19,R20		Resistor - 150,000 Ohm - 1/2 Watt
R31		Resistor - 390,000 Ohm - 1/2 Watt
R16		Resistor - 470,000 Ohm - 1/2 Watt
R4		Resistor - 1 Megohm - 1/2 Watt (101.814-6C)
R3,R4,R5, R3,R5		Resistor - 1 Megohm - 1/2 Watt (101.814,-1A,-2B)
R38		Resistor - 1 Megohm - 1/2 Watt (101.814-3B,-5C,-6C)
R15		Resistor - 1.5 Megohm - 1/2 Watt
R11,R33		Resistor - 2.2 Megohm - 1/2 Watt
R10,R28		Resistor - 4.7 Megohm - 1/2 Watt (101.814,-1A,-2B)
R23		Resistor - 4.7 Megohm - 1/2 Watt (101.814-3B,-5C,-6C)
R36		Resistor - 1500 Ohm - 1 Watt
R12		Resistor - 15,000 Ohm - 1 Watt (101.814,-1A,-2B)
R24,R25		Resistor - 15,000 Ohm - 1 Watt (101.814-3B,-5C,-6C)
R26	R40232	Resistor - Glasohm - 25 Ohm - 1 Watt
R27	R62030	Resistor - Glasohm - 50 Ohm - 3 Watts (101.814,-1A)
R13	R61605	Resistor - Glasohm - 135 Ohm - 5 Watts (101.814,-1A)
		Resistor - 5 Ohm - 1 Watt
	R60633	Shaft Assembly - Tuning
	R62641	Screw - Escutcheon & Dial Mounting
	R63141	Screw - Wire Recorder Mounting
	R64566	Shell - (for R64567 Plug)
	R62014	Shield - Switch
	R44145	Socket - 2 Prong - AC to Wire Recorder
	R62049	Socket Assembly - 1280 Tube only
	R44897	Socket - 1 Prong - Phono Connector
	R57049	Socket - Tube - 8 Prong Lock-In
	R60515	Socket - Pilot Lamp
	R60597	Socket - 5 Prong - Transfer Cable
	R60693	Socket - Speaker Cable
	R61291	Socket - 2 Prong - Microphone Connector
	R64569	Socket - 9 Contact (101.814-2B,-3B)
		WHEN ORDERING SPEAKER PARTS ALWAYS GIVE THE PART NUMBER ON THE SPEAKER
	R61117	Speaker - 5 1/4" P.M. (101.814)
	R60780	Cone & Voice Coil
	R49743	Plug
	R64668	Speaker - 6" x 9" P.M. (101.814-5C,-6C)
	R62659	Cone & Voice Coil
	R49743	Plug
	R61558	Speaker - 8" P.M. (101.814-1A)
	R59799	Cone & Voice Coil
	R49743	Plug
	R63021	Speaker - 10" P.M. (101.814-2B,-3B)
	R63056	Cone & Voice Coil
	R49743	Plug
	R43458	Spring - Tension - Dial Drive
	R67035	Switch - Master Control (101.814,-1A)
	R62695	Switch - Master Control (101.814-2B,-3B,-5C,-6C)
T1	R61111	Transformer - I. F. #1
T2	R61142	Transformer - I. F. #2
T3	R61506	Transformer - Output
T4	R64563	Transformer - Isolation - 60 Cycle (101.814-2B,-3B,-5C,-6C)
	R61570	Tray - Spool Storage (101.814-1A,-2B,-3B)
	R61523	Tray - Spool Storage (101.814,-5C,-6C)
	R60450	Wafer - Electrolytic Capacitor Mounting
	R18897	Washer - Flat - Dial Plate Mounting
	R46042	Washer - Phono Socket Insulating
	R61815	Washer - Metal Pulley Retaining

For CHASSIS 101.814-4C

PART NUMBER	DESCRIPTION
R64931	Loop & Board Assembly
R64310	Leaflet - Instruction
R64668	Speaker - 6" x 9" P. M.
R62659	Cone & Voice Coil
R49743	Plug

MODELS 8102,8102B
CHASSIS 101.814-2B

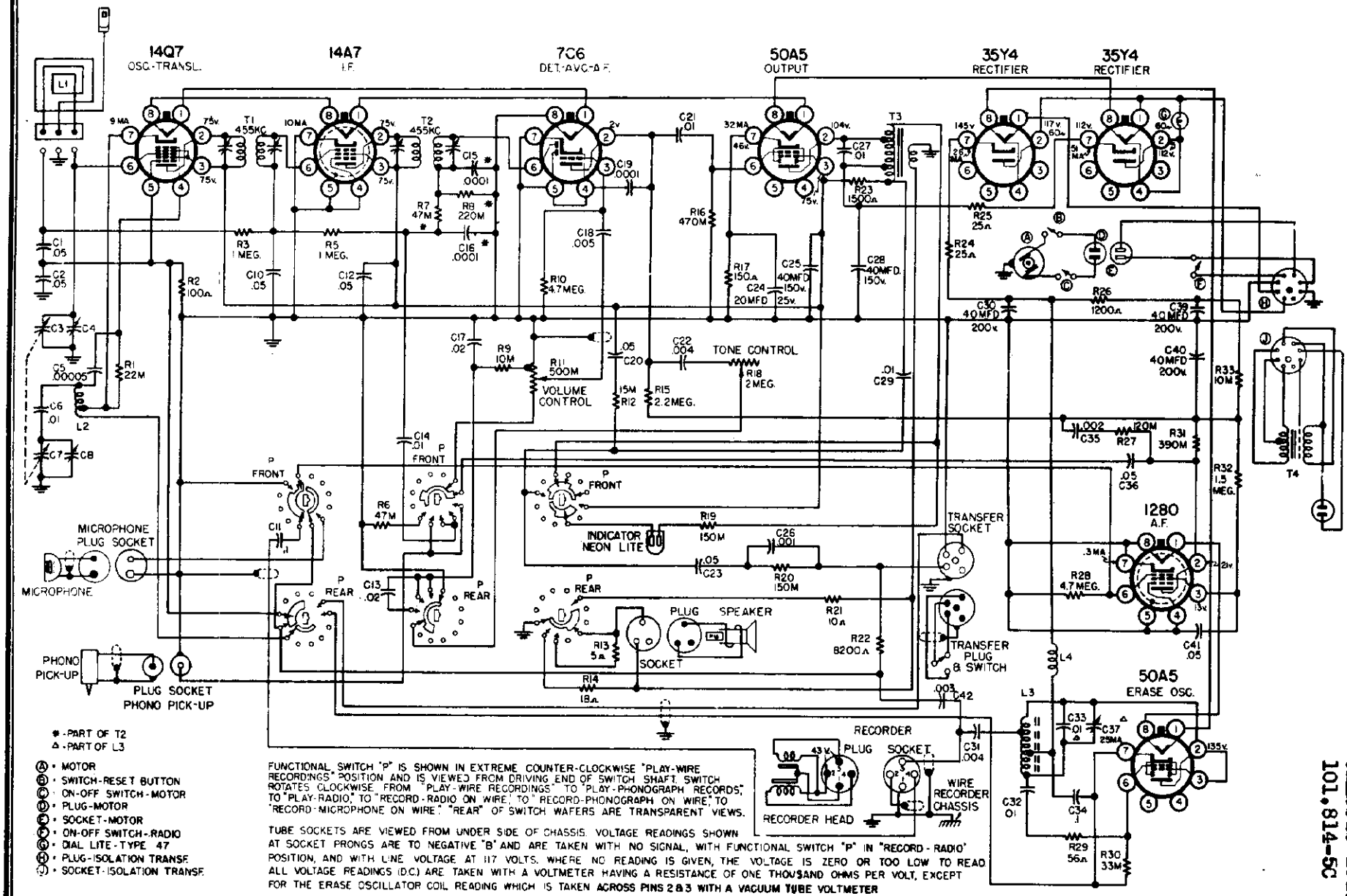
SEARS, ROEBUCK & CO.



SCHEMATIC DIAGRAM FOR 101.814-2B

SEARS, ROEBUCK & CO.

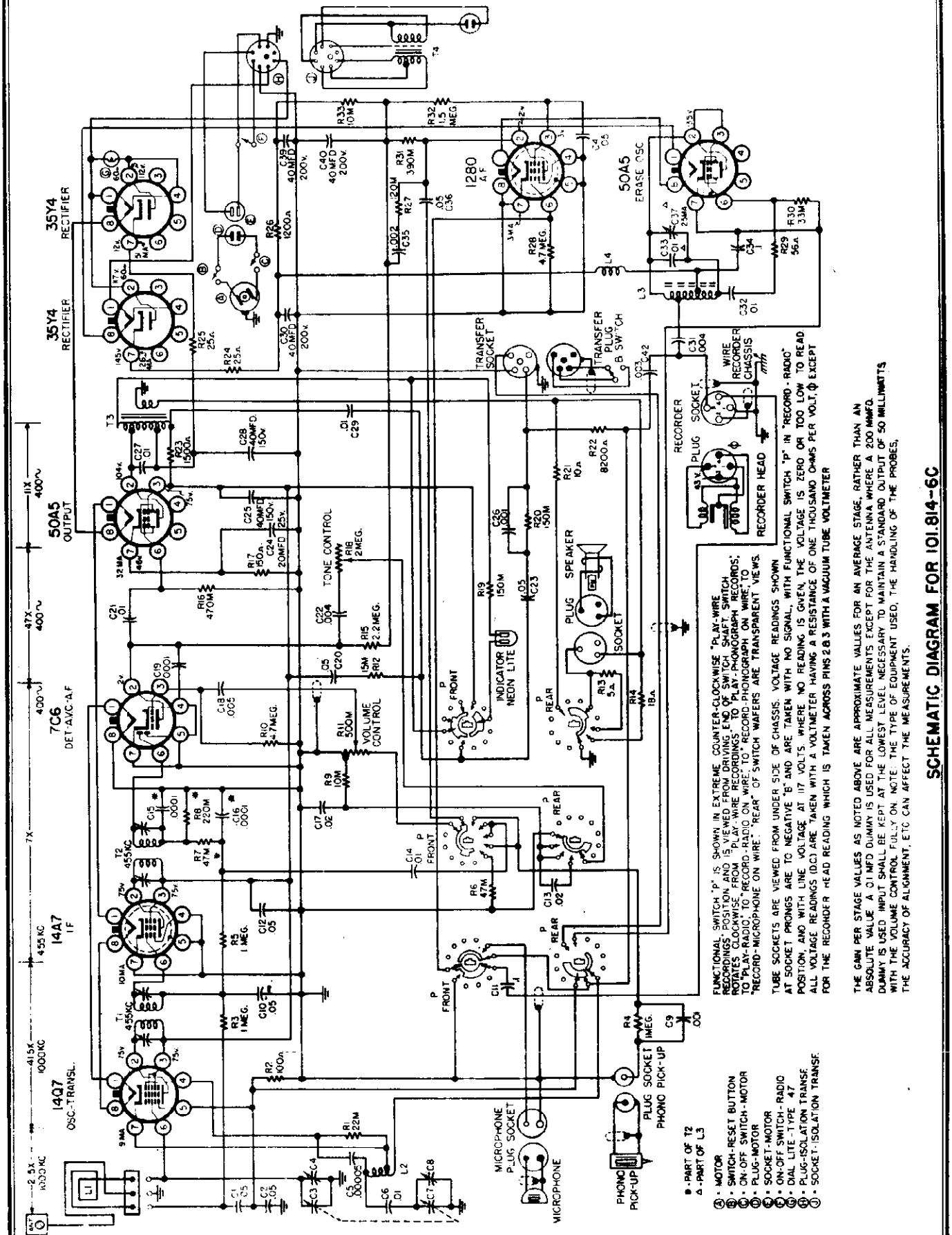
MODELS 8102A, 8086
CHASSIS 101.814-3B, 101.814-5C



SCHEMATIC DIAGRAM FOR 101.814-3B,-5C

MODELS 8086A, 8086B
CHASSIS 101.814-6C

SEARS, ROEBUCK & CO.



FUNCTIONAL SWITCH "P" IS SHOWN IN EXTREME COUNTER-CLOCKWISE "PLAY-WIRE RECORDINGS" POSITION AND IS VIEWED FROM DRIVING END OF SWITCH SHAFT. SWITCH ROTATES CLOCKWISE FROM "PLAY-WIRE RECORDINGS" TO "PLAY-PHONOGRAPH RECORDS," TO "PLAY-RADIO," TO "RECORD-RADIO ON WIRE," TO "RECORD-PHONOGRAPH ON WIRE," TO "RECORD-MICROPHONE ON WIRE." "REAR" OF SWITCH WAFERS ARE TRANSPARENT VIEWS.

TUBE SOCKETS ARE VIEWED FROM UNDER SIDE OF CHASSIS. VOLTAGE READINGS SHOWN AT SOCKET PRONGS ARE TO NEGATIVE "B" AND ARE TAKEN WITH NO SIGNAL, WITH FUNCTIONAL SWITCH "P" IN "RECORD-RADIO" POSITION AND WITH LINE VOLTAGE AT 117 VOLTS WHERE NO READING IS GIVEN, THE VOLTAGE IS ZERO OR TOO LOW TO READ. ALL VOLTAGE READINGS (D.C.) ARE TAKEN WITH A VOLTMETER HAVING A RESISTANCE OF ONE THOUSAND OHMS PER VOLT, EXCEPT FOR THE RECORDER HEAD READING WHICH IS TAKEN ACROSS PINS 2 & 3 WITH A VACUUM TUBE VOLTMETER.

THE GAIN PER STAGE VALUES AS NOTED ABOVE ARE APPROXIMATE VALUES FOR AN AVERAGE STAGE, RATHER THAN AN ABSOLUTE VALUE. A .01 MFD. DUMMY IS USED FOR ALL MEASUREMENTS EXCEPT FOR THE ANTENNA WHERE A 200 MMFD. DUMMY IS USED. INPUT SHALL BE KEPT AT THE LOWEST LEVEL NECESSARY TO MAINTAIN A STANDARD OUTPUT OF 50 MILLIWATTS WITH THE VOLUME CONTROL FULLY ON. NOTE THE TYPE OF EQUIPMENT USED, THE HANDLING OF THE PROBES, THE ACCURACY OF ALIGNMENT, ETC. CAN AFFECT THE MEASUREMENTS.

SCHEMATIC DIAGRAM FOR 101.814-6C

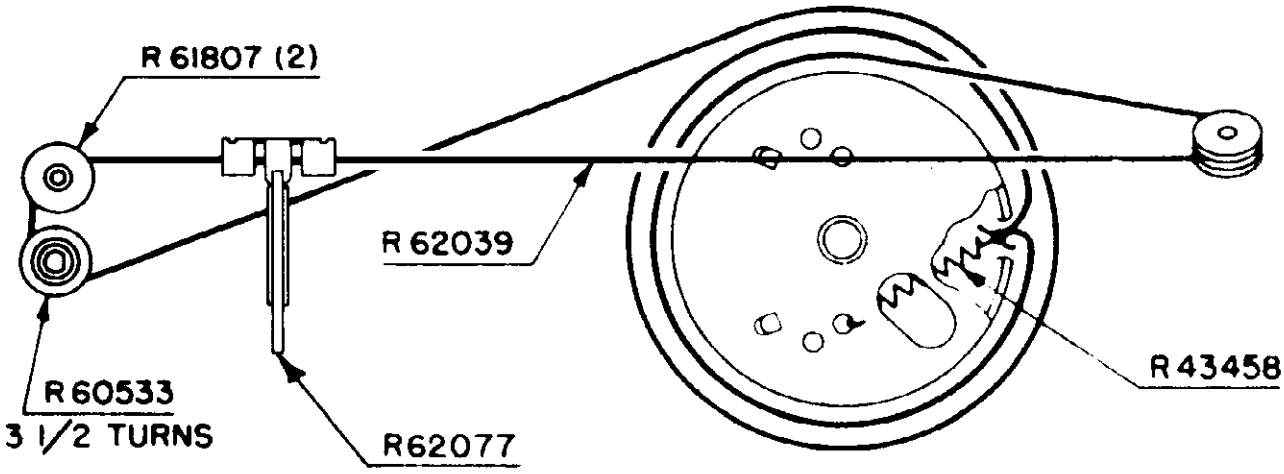
* - PART OF T2
Δ - PART OF L3

① - MOTOR
② - SWITCH-RESET BUTTON
③ - ON-OFF SWITCH-MOTOR
④ - PLUG-MOTOR
⑤ - SOCKET-MOTOR
⑥ - ON-OFF SWITCH-RADIO
⑦ - DIAL LITE-TYPE 47
⑧ - PLUG-ISOLATION TRANSF.
⑨ - SOCKET-ISOLATION TRANSF.

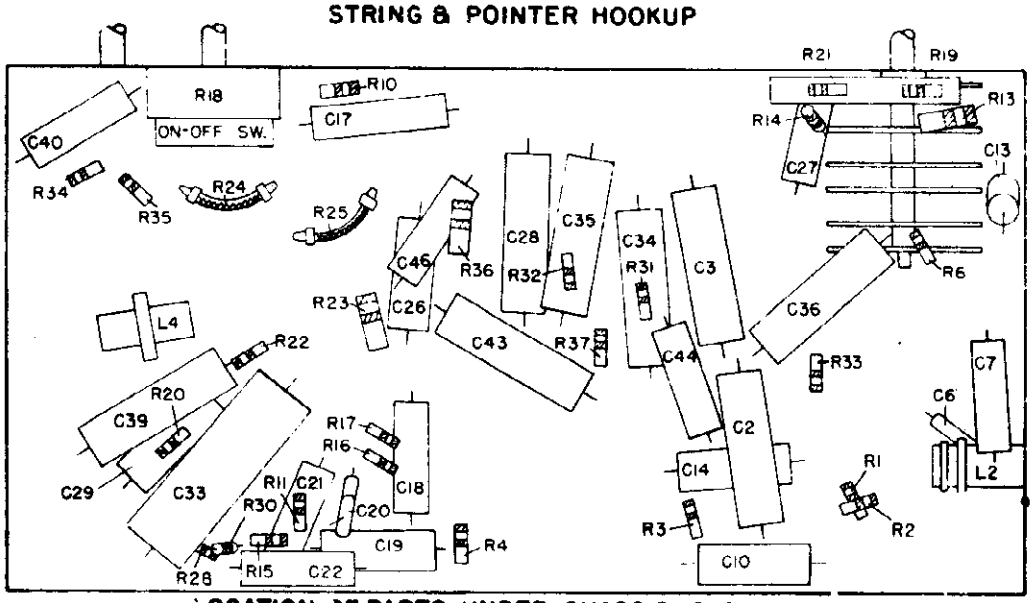
CHASSIS 101.814-2B
CHASSIS 101.814-3B
CHASSIS 101.814-5C
CHASSIS 101.814-6C

SEARS, ROEBUCK & CO.

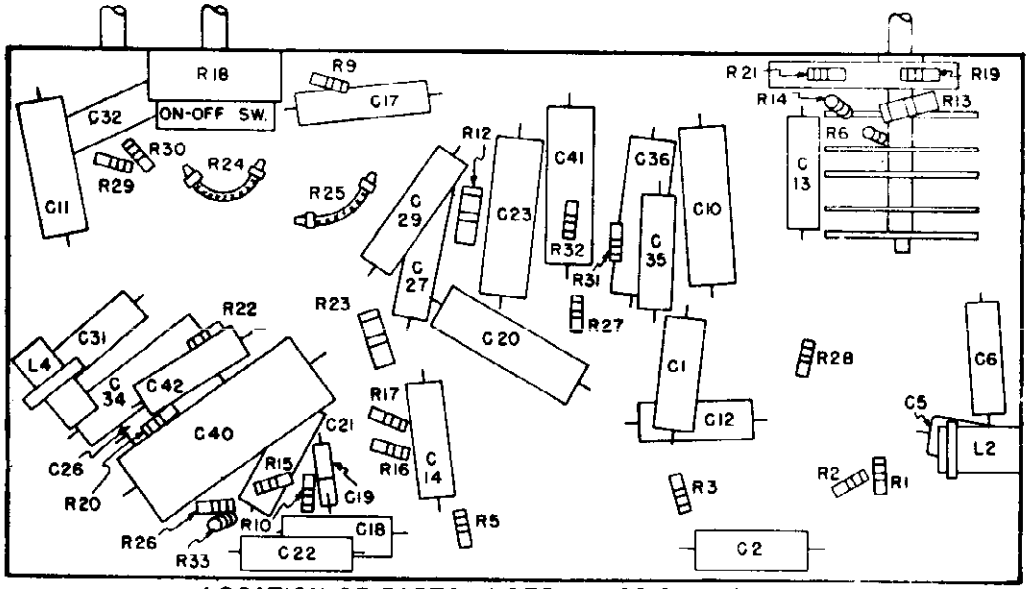
MODELS 8102, 8102B
MODEL 8102A
MODEL 8086
MODELS 8086A, 8086B



STRING & POINTER HOOKUP



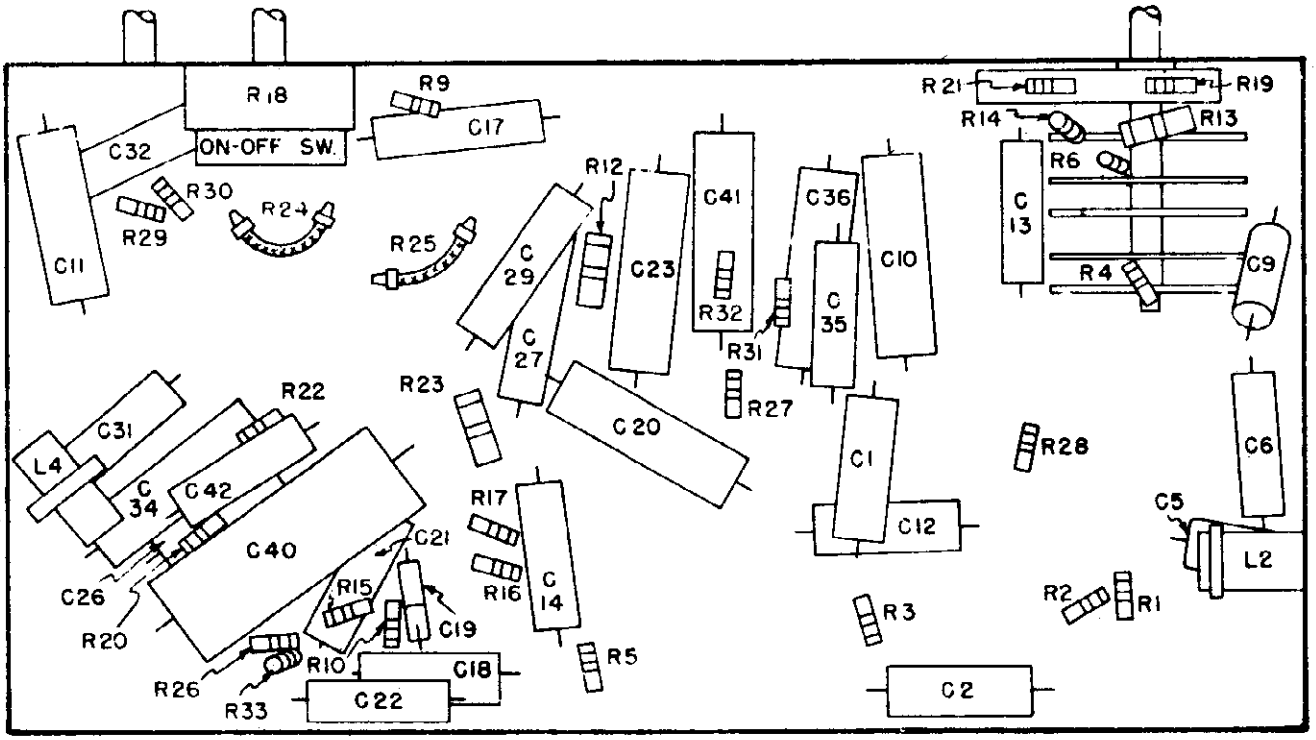
LOCATION OF PARTS UNDER CHASSIS 101.814-2B



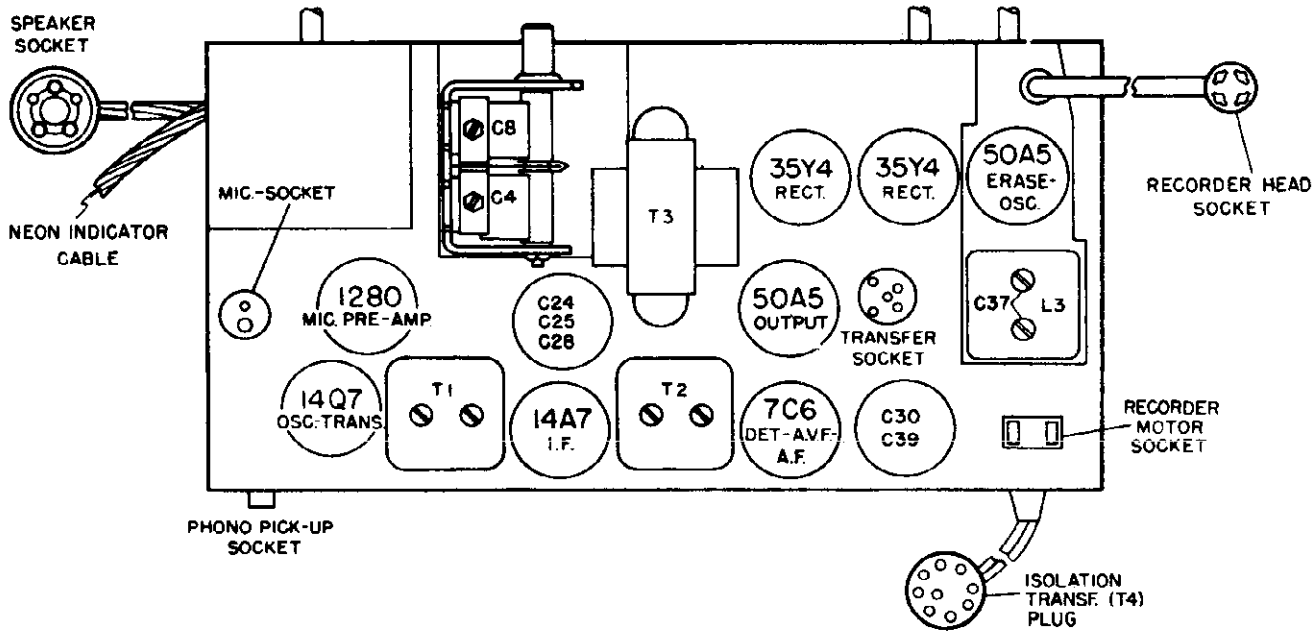
LOCATION OF PARTS UNDER CHASSIS 101.814-3B,5C

MODELS 8102,8102B
CHASSIS 101.814-2B
MODELS 8086A,8086B
CHASSIS 101.814-6C

SEARS, ROEBUCK & CO.



LOCATION OF PARTS UNDER CHASSIS 101.814-6C



LOCATION OF PARTS ON TOP OF CHASSIS 101.814-2B

SEARS, ROEBUCK & CO. MODEL 8102A CHASSIS 101.814-3B
MODEL 8086 CHASSIS 101.814-5C
MODELS 8086A, 8086B
CHASSIS 101.814-6C

ALIGNMENT PROCEDURE FOR 101.814-3B,5C,6C ONLY

PRELIMINARY:

Output meter reading to indicate 0.05 watt across voice coil.....0.4 volt
Generator ground lead connection.....Receiver chassis
Generator modulation.....30%, 400 cycles
Position of volume control.....Fully on
Position of tone control.....H1
Position of pointer with tuner fully closed.....Last line below 540 Kc. calibration mark on the Dial or at the "Start" of calibration point on the dial background plate.

POSITION OF TUNER	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION	TRIMMER ADJUSTMENTS (IN ORDER SHOWN)	TRIMMER FUNCTION
Closed	455 Kc.	0.1 mfd.	Transl.-Grid	T2 & T1	I.F.
See note below	1400 Kc.	200 mmfd.	Ant.	C8	Osc.
See note below	1400 Kc.	200 mmfd.	Ant.	C4	Transl.

IMPORTANT ALIGNMENT NOTES:

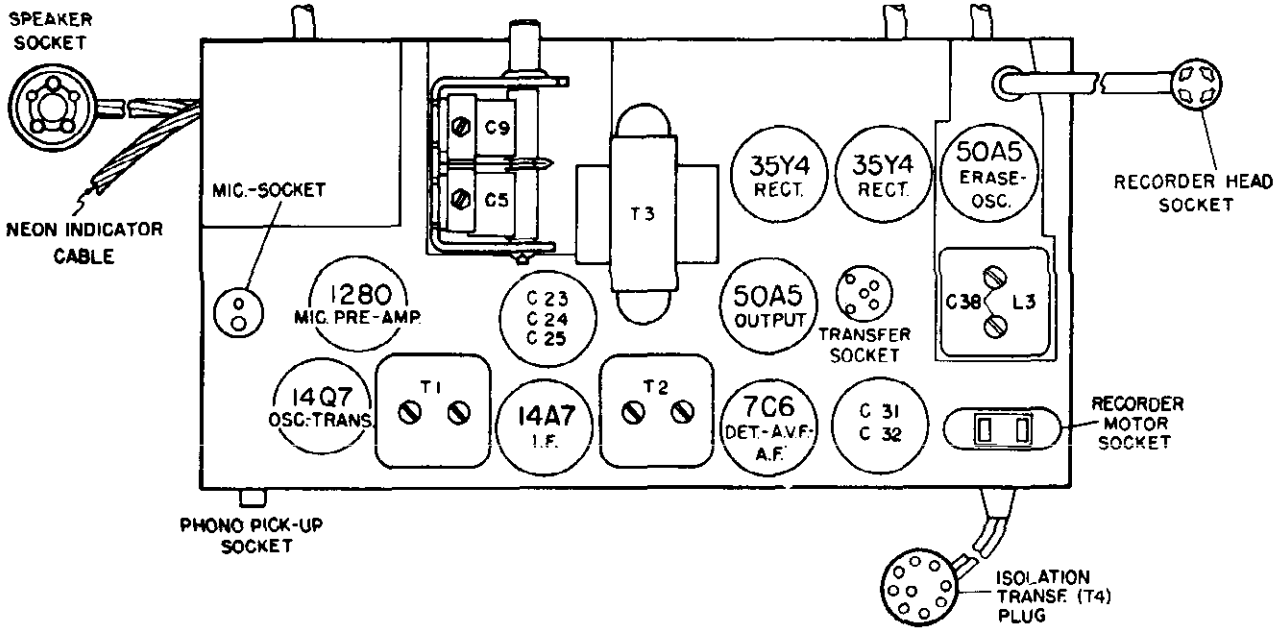
NOTE: With the dial background removed, the tuner should be positioned at the 1400 Kc. mark on the dial background plate.

The alignment must be done in the order given.

The alignment procedure should be repeated step by step in the original order for greatest accuracy.

Always keep the output voltage from the generator at its lowest possible value to prevent the AVC of the receiver from interfering with accurage alignment.

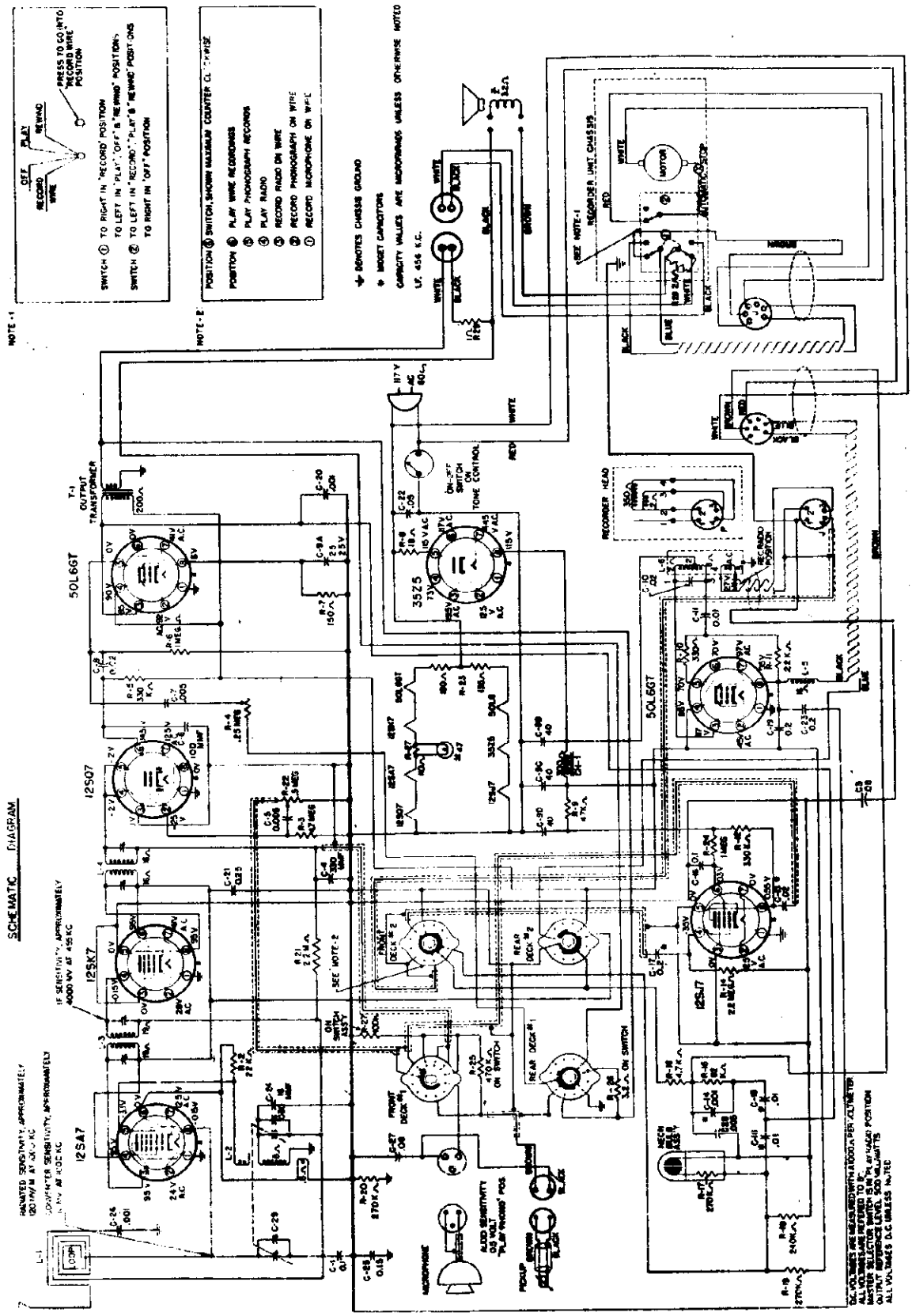
The erase oscillator coil has been set at 33.7 Kc. at the factory. If necessary it can be adjusted with the use of a beat frequency oscillator.



LOCATION OF PARTS ON TOP OF CHASSIS 101.814-3B,-5C,-6C

MODELS 7086,7103
CHASSIS 110.466,
110.466-1

SEARS, ROEBUCK & CO.



SCHEMATIC DIAGRAM 110.465 and 110.466-1

SEARS, ROEBUCK & CO.

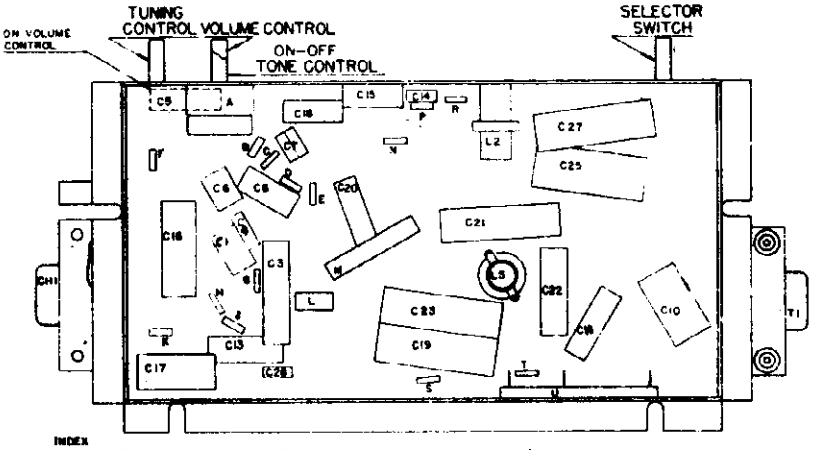
MODELS 7086,7103
CHASSIS 110.466,
110.466-1

SPECIFICATIONS

Power Supply:

All models available. . . . . .117V 60 cycle AC 90 watts

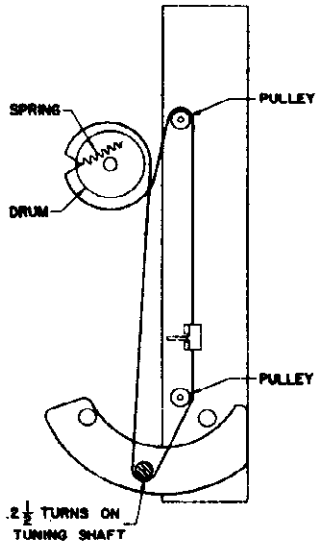
Frequency Ranges:. 540-1580KC



INDEX

A	R4	K	R13
B	R15	L	R9
C	R5	M	R27
D	R7	N	R2
E	R6	P	R15
F	R3	R	R16
G	R21	S	R9
H	R24	T	R10
J	R12	U	R23

LOCATIONS OF PARTS UNDER CHASSIS



DIAL STRINGING DIAGRAM

ALIGNMENT PROCEDURE

PRELIMINARY:

OUTPUT METER CONNECTION. . . . . ACROSS LOUD SPEAKER VOICE COIL
OUTPUT METER READING TO INDICATE 500 MILLIWATTS. . . . . .1.25 VOLTS
DUMMY ANTENNA VALUE TO BE IN SERIES WITH GENERATOR OUTPUT . . . . . SEE CHART BELOW
CONNECTION OF GENERATOR OUTPUT LEAD. . . . . SEE CHART BELOW
CONNECTION OF GENERATOR GROUND LEAD. . . . . .B— BUS
GENERATOR MODULATION. . . . . 30% AT 400 CYCLES
POSITION OF VOLUME CONTROL. . . . . FULLY CLOCKWISE
POSITION OF TONE CONTROL . . . . . COUNTER CLOCKWISE (HI)
POSITION OF DIAL POINTER WITH VARIABLE FULLY CLOSED . . . . . ON MARK BELOW 540 KC. CALIBRATION MARK
POSITION OF MASTER CONTROL SWITCH . . . . . "PLAY RADIO"

POSITION OF VARIABLE	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION	ADJUSTMENTS (In order shown)	FUNCTION
Any	455	.2 mfd.	Grid. 12BA7GT	L3, L4	I.F.
1500 Kc	1500 Kc	***	*** See Below	C30, C29	Osc. R. F.
600 Kc	600 Kc	***	*** See Note Below	(Check-Point)	(Check Point)

***Run a wire from the output terminal of generator near the receiver. No connection is made between the signal generator and the receiver.

IMPORTANT ALIGNMENT NOTES

The alignment procedure should be repeated stage by stage, in the original order for greatest accuracy. Always keep the output from the test oscillator at its lowest possible value to make the AVC action of the Receiver ineffective.

POWER OUTPUT . . UNDISTORTED . . . . .95 WATTS MAXIMUM. . . . . 2.0 WATTS

SPECIAL SERVICE NOTES

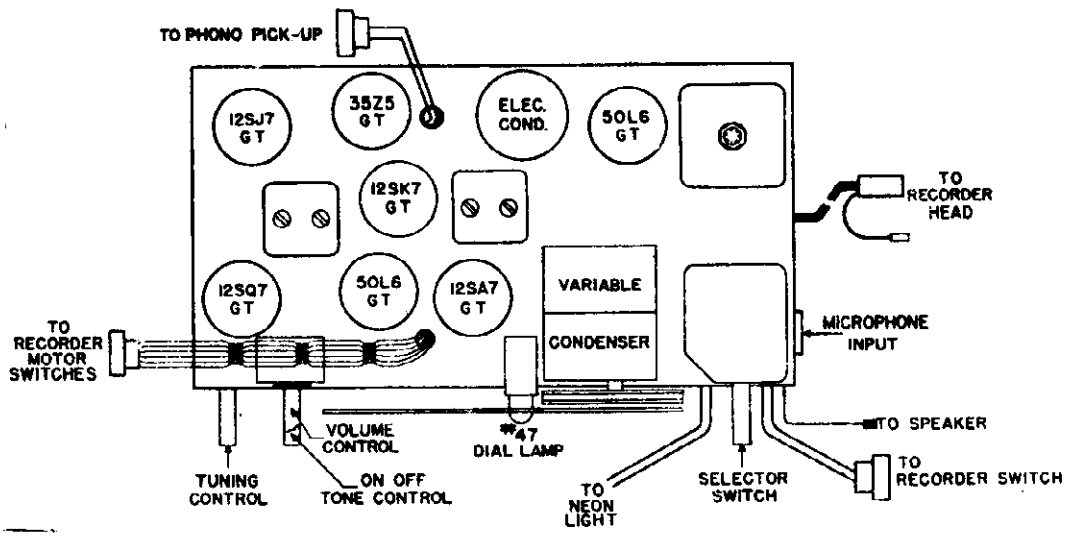
To check the erasing voltage of the Recorder Head, turn set on. Set Master Selector Switch to Position #3 *(Record Radio)*. Set the Recorder Control Lever to "Record Wire" and measure the voltage between Pin #2 and 3 of the Recorder Head. This should be done with Recorder Head attached to the plug of the Recorder Cable. The voltage at this point should be 2.7 Volts, minimum, as measured with the Vacuum Tube Voltmeter.

The erasing voltage may also be checked using a #57 Pilot Light. This is done by setting the Master Selector Switch to Position #3 *(Record Radio)* and the Recorder Control Lever to "Record Wire". The voltage appearing across Pin #2 and 3 of the "J" Connector *(see schematic)* will light the lamp to a pale orange color which outlines the filament. *(without recorder head attached).*

MODELS 7086,7103
CHASSIS 110.466,
110.466-1

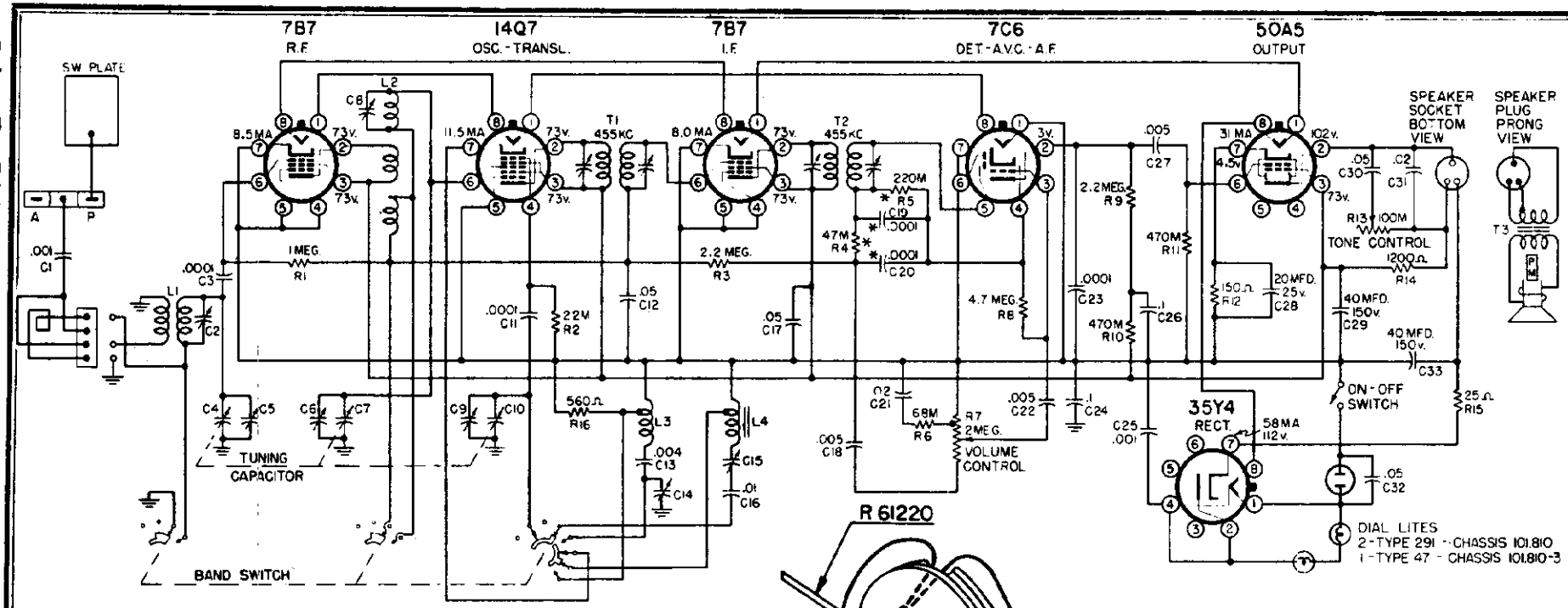
SEARS, ROEBUCK & CO.

TUBE LOCATION



PARTS LIST

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
C21		Condenser- .25 mfd. paper, 400 volts
C22		Condenser- .05 mfd. paper, 400 volts
C24		Condenser- 18 mmfd. mica or ceramic
C25		Condenser- .5 mfd. paper, 400 volts
C26		Condenser- .001 mfd. paper, 200 volts
C28		Condenser- .002 mfd. paper, 150 volts
	A-1691	Condenser- variable
R4	A-2474	Control, Tone, with Switch
R22	A-2475	Control, Volume
	A-54367	Cord, Dial Drive (Per Yard)
	A-5589	Cord, Line 8 ft.
	A-4447	Escutcheon (Dial Crystal)
	A-4445	Escutcheon (Meter Control)
	A-39166	Knob Selector
	A-39167	Knob-Tone Control, On - Off
	A-39165	Knob-Tuning
	A-39168	Knob-Volume Control
		Lamp, Pilot Light No.47
	A-59309	Leaflet - Instruction
	A-28174	Loop Antenna Ass'y.
	A-18127	Plug Phono - 2 Wire
L5	A-3010	Choke 1 mh R.F. 15 ohms
SH1	A-1400	Choke Filter
L2	A-28173	Coil-Oscillator B. C.
C1	A-1979	Condenser- .1 mfd. paper, 150 volts
C3,C27		Condenser- .08 mfd. paper, 400 volts
C4		Condenser- 330mmfd mica
C5		Condenser- .005 mfd. paper
C6		Condenser- 470 mmfd mica, 400 volts
C7	A-1978	Condenser- .005 mfd. paper, 150 volts
C8		Condenser- .02 mfd. paper, 400 volts
C9	A-2074	Condenser- Electrolytic 40 40-40 x 150 volts - 25 x 25 volts
C10		Condenser- .02 mfd. oil, 600 volts
C11		Condenser- .01 mfd. 400 volts
C12	A-2077	Condenser- Electrolytic 25 mfd. 10 volts
C13	A-1982	Condenser- .02 mfd. 400 volts
C14	A-1980	Condenser- .001 mfd. 150 volts
C15,C16	A-1981	Condenser- .01 mfd. 400 volts
C16		Condenser- .1 mfd. paper, 400 volts
C17	A-1983	Condenser- .2 mfd. paper, 200 volts
C19,C23		Condenser- .2 mfd. paper, 400 volts
C20		Condenser- .001 mfd. paper, 400 volts
	A-5586	Plug (Recorder Motor AC)
	A-4142	Pointer-Dial
R2		Resistor- 22,000 ohms, 1/4 watt
R3		Resistor- 4.7 meg ohms, 1/4 watt
R5		Resistor- 330,000 ohms, 1/4 watt
R6,R14,R25		Resistor- 470,000 ohms, 1/4 watt
R7		Resistor- 150 ohms, 1/4 watt
R8		Resistor- 18 ohms, 2 watt
R9		Resistor- 47,000 ohms, 1/4 watt
R10		Resistor- 330 ohms, 1/4 watt
R11		Resistor- 22,000 ohms, 1/4 watt
R12		Resistor- 240,000 ohms, 1/4 watt
R13		Resistor- 2200 ohms, 1/4 watt
R15		Resistor- 62,000 ohms, 1/4 watt
R16		Resistor- 4700 ohms, 1/4 watt
R18		Resistor- 220,000 ohms, 1/4 watt
R19,R20		Resistor- 270,000 ohms, 1/4 watt
R21		Resistor- 2.2 meg ohms, 1/4 watt
R23	A-2176	Resistor- Fil. Dropping 135-180 ohms
R24		Resistor- 1 meg ohms, 1/4 watt
R26		Resistor- 3.2 ohms, 1/2 watt
R27		Resistor- 110 ohms, 2 watt
	A-40116	Scale Dial
	A-4677	Shaft, Dial Drive
	A-18133	Socket Ass'y. Neon Bulb
	A-18123	Socket, Dial Light
	A-18134	Socket, Female for Recorder Head
	A-18101	Socket, Microphone
	A-18126	Socket, Phono
	A-5586	Socket, Recorder Motor AC
	A-5874	Speaker - 6" (PM) used on 466 only
	A-5875	Speaker - 8" (PM) used on 466-1 only
	A-53335	Spring Dial Cord
	A-3786	Switch, wafer 6 position
	A-3360	Transformer - 1st I.F.
	A-3530	Transformer - 2nd I.F.
	A-28178	Transformer - Bias Oscillator
	A-1336	Transformer - Output
	A-6610	Microphone



SCHEMATIC DIAGRAM 101.810 & 101.810-3

* - PART OF T2

TUBE SOCKETS ARE VIEWED FROM UNDER SIDE OF CHASSIS. BAND SWITCH SECTIONS ARE VIEWED FROM DRIVING END AND WITH ROTORS IN EXTREME COUNTER-CLOCKWISE (BC.) POSITION. VOLTAGE READINGS SHOWN AT SOCKET PRONGS ARE TO NEG "B" AND ARE TAKEN WITH NO SIGNAL, WITH BAND SWITCH IN BC POSITION, AND WITH LINE VOLTAGE AT 117 VOLTS. WHERE NO READING IS GIVEN THE VOLTAGE IS ZERO OR TOO LOW TO READ. SYMBOLS ARE IN ACCORDANCE WITH A.S.A. STANDARDS Z32.5 AND Z32.10 UNLESS OTHERWISE STATED.

SPECIFICATIONS

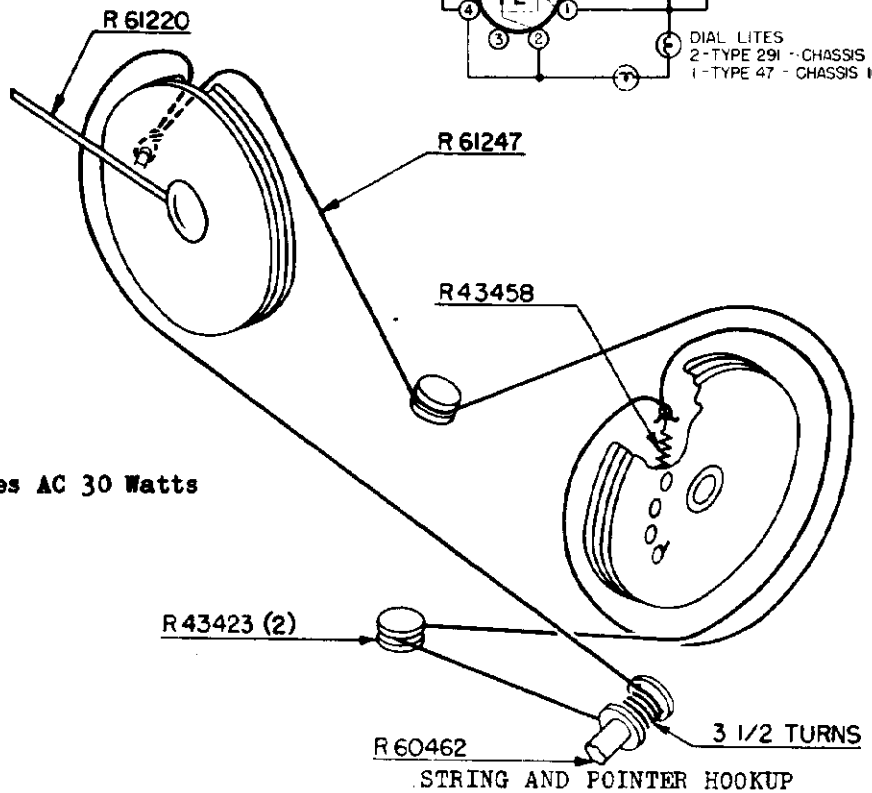
Power Supply:

All models available.....117 Volts DC 25-60 Cycles AC 30 Watts

Frequency Range:

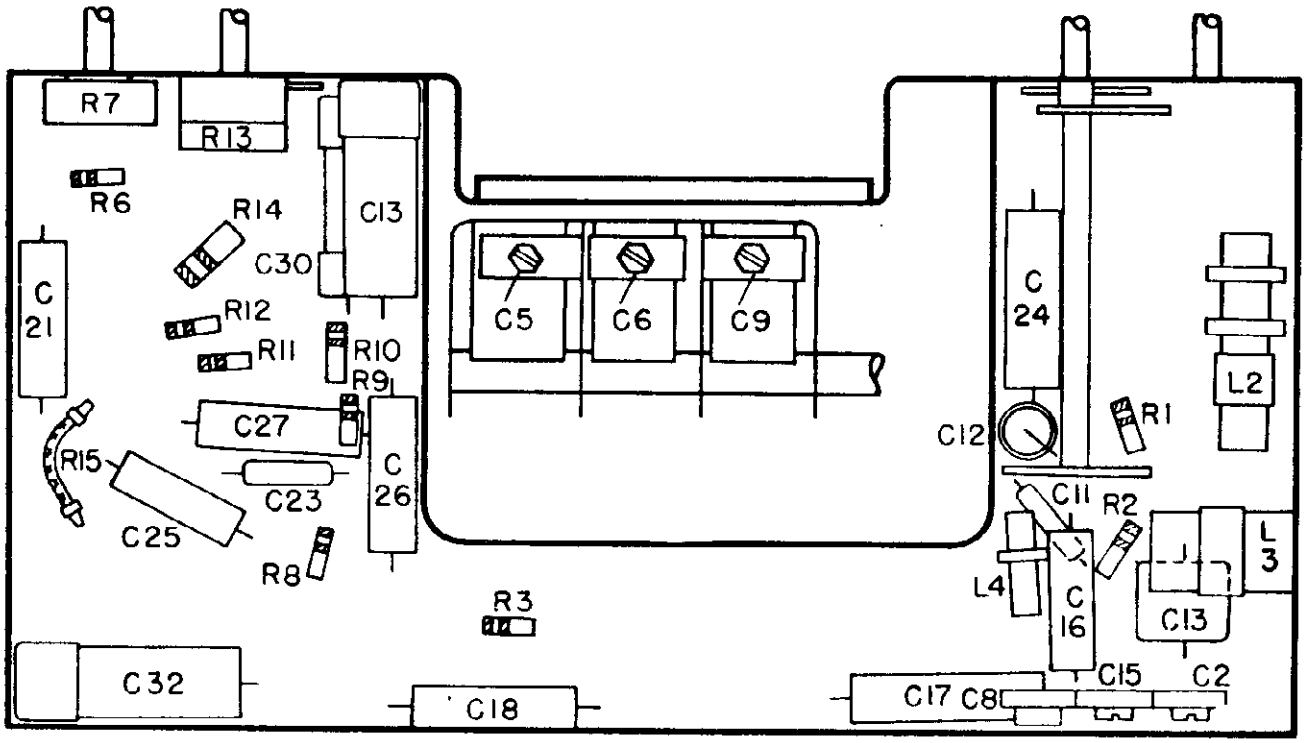
Broadcast.....540-1600 KC

Shortwave.....6-16 MC



MODEL 7090
CHASSIS 101.810,
101.810-3

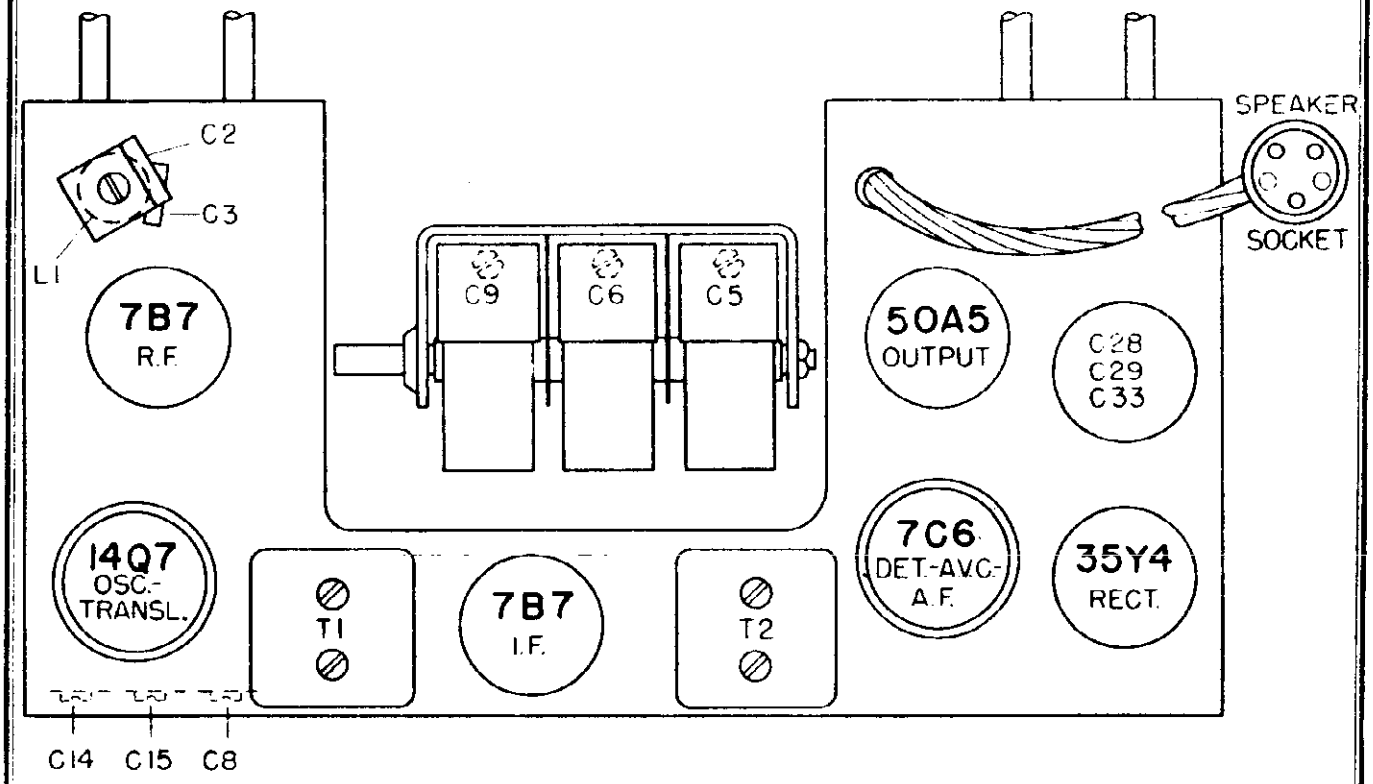
SEARS, ROEBUCK & CO.



LOCATION OF PARTS UNDER CHASSIS

Model Differences:

Two Type 291 Dial Lamps Used On 101.810
One Type 47 Dial Lamp Used On 101.810-3



LOCATION OF PARTS ON TOP OF CHASSIS

SEARS, ROEBUCK & CO. MODEL 7090 CHASSIS 101.810, 101.810-2, 101.810-3
MODEL 8092 CHASSIS 101.810-1A

ALIGNMENT PROCEDURE

Preliminary:

Output Meter Connection.....Across Loud Speaker Voice Coil
Generator Ground Lead Connection.....Receiver Chassis
Dummy Antenna Value to be in Series with Generator Output.....See Chart Below
Connection of Generator Output Lead.....See Chart Below
Generator Modulation.....30%, 400 Cycles
Position of Volume Control.....Fully on
Position of Tone Control.....Treble
Position of Pointer with Tuner Fully Closed.....Last Line Below 540 Calibration Mark

BAND SWITCH POSITION	POSITION OF TUNER	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION	TRIMMER ADJUSTMENTS	TRIMMER FUNCTION
BC	Closed	455 KC	0.1	Trans. Grid	T2-T1	I. F.
BC	1500 KC	1500 KC	200 Mmfd.	Ant.	C9	Oscillator
BC	1500 KC	1500 KC	200 Mmfd.	Ant.	C6	Translator
BC	1500 KC	1500 KC	200 Mmfd.	Ant.	C4	Antenna
BC	600 KC (Rock)	600 KC	200 Mmfd.	Ant.	C15	Padder
SW	Open	16.5 MC	400 Ohms	Ant.	C14	Oscillator
SW	15 MC (Rock)	15 MC	400 Ohms	Ant.	C8	Translator
SW	15 MC (Rock)	15 MC	400 Ohms	Ant.	C2	Antenna

IMPORTANT ALIGNMENT NOTES

The Alignment must be done in the order given.
The Alignment Procedure should be repeated step by step in the original order for greatest accuracy.
Always keep the output power from the generator at its lowest possible value to prevent the AVC of the receiver from interfering with accurate alignment.
During alignment of the BC Band Padder and the SW Band Translator and Antenna Trimmers, the Tuner should be rocked through resonance to assure alignment.

Power Output — Undistorted 1.1 Watts — Maximum 2 Watts

THE FOLLOWING PARTS LIST COVERS CHASSIS 101.810, 101.810-1A, 101.810-3 AND 101.810-2

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
	R62842	Antenna Assembly - S. W. (101.810-1A)
	R61412	Antenna Assembly - S. W. (101.810,-3)
	R62643	Background - Dial (101.810-1A,-2)
	R62652	Button - Push (101.810-1A)
	R60486	Button - Push (101.810,-3)
	R13761	Button - Snap
C4,C7,C10	R61200	Capacitor - Variable
C24,C26		Capacitor - .1 Mfd. 600 Volt
C31,C21		Capacitor - .02 Mfd. 600 Volt
C12,C17,C30,C32		Capacitor - .05 Mfd. 600 Volt
C16		Capacitor - .01 Mfd. 600 Volt
C1,C25		Capacitor - .001 Mfd. 600 Volt (101.810,-1A,-3)
C1,C25,C30		Capacitor - .001 Mfd. 600 Volt (101.810-2)
C18,C22,C27		Capacitor - .005 Mfd. 600 Volt
C3,C11,C23		Capacitor - .0001 Mfd. Mica
C13		Capacitor - .004 Mfd. Mica
C6,C14,C15	R61231	Capacitor - Trimmer Assembly
C28,C29,C33	R60416	Capacitor - Electrolytic - 40x40 Mfd. 150 Volt 20 Mfd. 25 Volt
L3	R63166	Coil - Oscillator - SW (101.810-1A,-2)
L2	R61236	Coil - BC & SW R. F.
L4	R61237	Coil - BC Oscillator
L1	R61238	Coil - SW Antenna
L3	R61239	Coil - SW Oscillator (101.810,-3)
R7	R60430	Control - Volume (101.810,-3)
R13	R61232	Control - On-Off & Tone (101.810,-3)
R9	R62052	Control - Volume (101.810-1A)
R11	R62539	Control - On-Off & Tone (101.810-1A)
R13	R62340	Control - On-Off & Tone (101.810-2)
	R41472	Cord - Dial Drive (42")
	R16706	Cord - Line
	R60540	Cover - Tab (101.810,-2,-3)
	R62653	Cover - Tab (101.810-1A)
	R61215	Dial - Station (101.810,-2,-3)
	R60461	Drum & Pinion Assembly (Used on R61200)
	R62373	Escutcheon & Dial Assembly (101.810-1A)
	R61214	Escutcheon - Dial (101.810,-2,-3)
	R61218	Escutcheon - Push Button
	R60724	Gear & Hub Assembly (Tuner Assembly) (101.810-1A,-2)
	R60459	Gear & Hub Assembly (Tuner Assembly) (101.810,-3)
	R62315	Key - Plunger - Tuner Assembly (101.810-1A,-2)
	R62531	Knob - Volume (101.810-1A)
	R62534	Knob - On-Off & Tone (101.810-1A)
	R62537	Knob - BC, SW & Phono (101.810-1A)
	R63712	Knob - Tuning (101.810-1A)
	R61331	Knob - Tuning (101.810,-2,-3)
	R61222	Knob - Volume (101.810,-2,-3)
	R61223	Knob - Tone & On-Off (101.810,-2,-3)
	R61224	Knob - Wave Switch (101.810,-2,-3)
		Lamp - Mazda Type #291 (101.810)
		Lamp - Mazda Type #47 (101.810-1A,-2,-3)
	R64064	Leaflet - Instruction (101.810-2)
R12		Resistor - 150 Ohm - 1/2 Watt
R2		Resistor - 22,000 Ohm - 1/2 Watt
R10,R11		Resistor - 470,000 Ohm - 1/2 Watt
R1		Resistor - 1 Megohm - 1/2 Watt
R3,R9		Resistor - 2.2 Megohm - 1/2 Watt
R8		Resistor - 4.7 Megohm - 1/2 Watt
R14		Resistor - 1200 Ohm - 1 Watt
R6		Resistor - 68,000 Ohm - 1/2 Watt
R14		Resistor - 560 Ohm - 1/2 Watt
R15	R40232	Resistor - Glasohm - 25 Ohm - 1 Watt
	R62640	Screw - Escutcheon Mounting (101.810-2)
	R62641	Screw - Escutcheon & Dial Mounting (101.810-1A)
	R44897	Socket - 1 Prong - Phono Connector (101.810-1A)
	R60515	Socket - Pilot Lamp (101.810-1A)
	R60693	Socket - Speaker Cable
	R62173	Socket - Pilot Lamp (101.810-2,-3)
	R57049	Socket - 8 Prong - Lock-In
	R61234	Socket - Dial Lamp (101.810)
	R59193	Shield - Tube
		WHEN ORDERING SPEAKER PARTS ALWAYS GIVE THE PART NUMBER ON THE SPEAKER
	R61032	Speaker - 8" P. M.
	R61037	Cone & Voice Coil
	R61030	Transformer - Output
	R43458	Spring - Tension - Dial Drive (101.810,-2,-3
	R60677	Spring - Tension - Dial Drive (101.810-1A)
	R60427	Spring - Extension (Tuner Assembly)
	R60437	Spring - Compression (Tuner Assembly)
	R62250	Switch - Wave (101.810-1A)
	R61228	Switch - Wave (101.810,-2,-3)
	R62838	Tabs - Station (101.810-1A)
	R60474	Tabs - Station (101.810,-2,-3)
	R62597	Tuning Shaft Assembly (101.810-1A)
T1	R60417	Transformer - 1st I. F.
T2	R60418	Transformer - 2nd I. F.
	R60462	Tuning Shaft Assembly (101.810,-2,-3)
	R60480	Wafer - Electrolytic Capacitor Mtg.
	R60472	Washer - Felt
	R46042	Washer - Phono Socket Insulating (101.810-1A)
	R60439	Washer - Spring - Tuner Assembly
	R61815	Washer - Metal Pulley Retaining (101.810-1A)

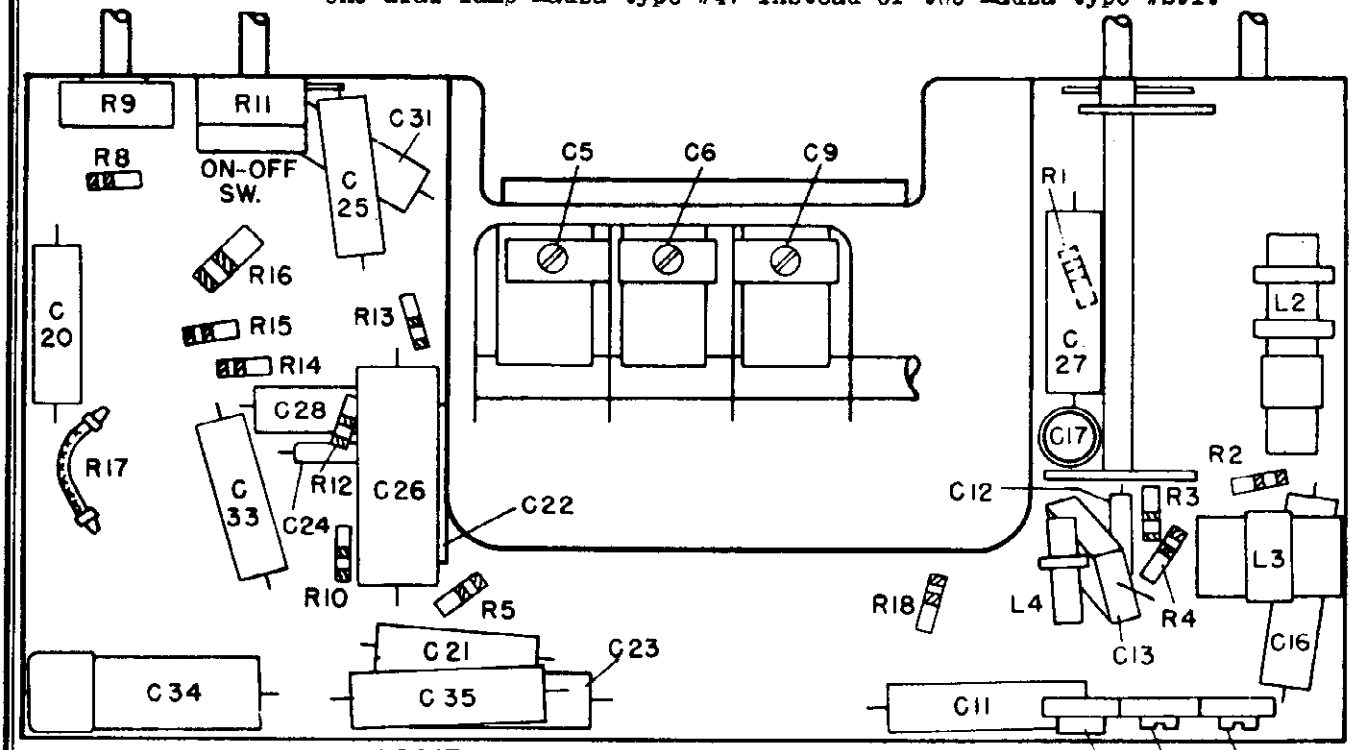
MODELS 7090,8092
CHASSIS 101.810-2,
101.810-1A

SEARS, ROEBUCK & CO.

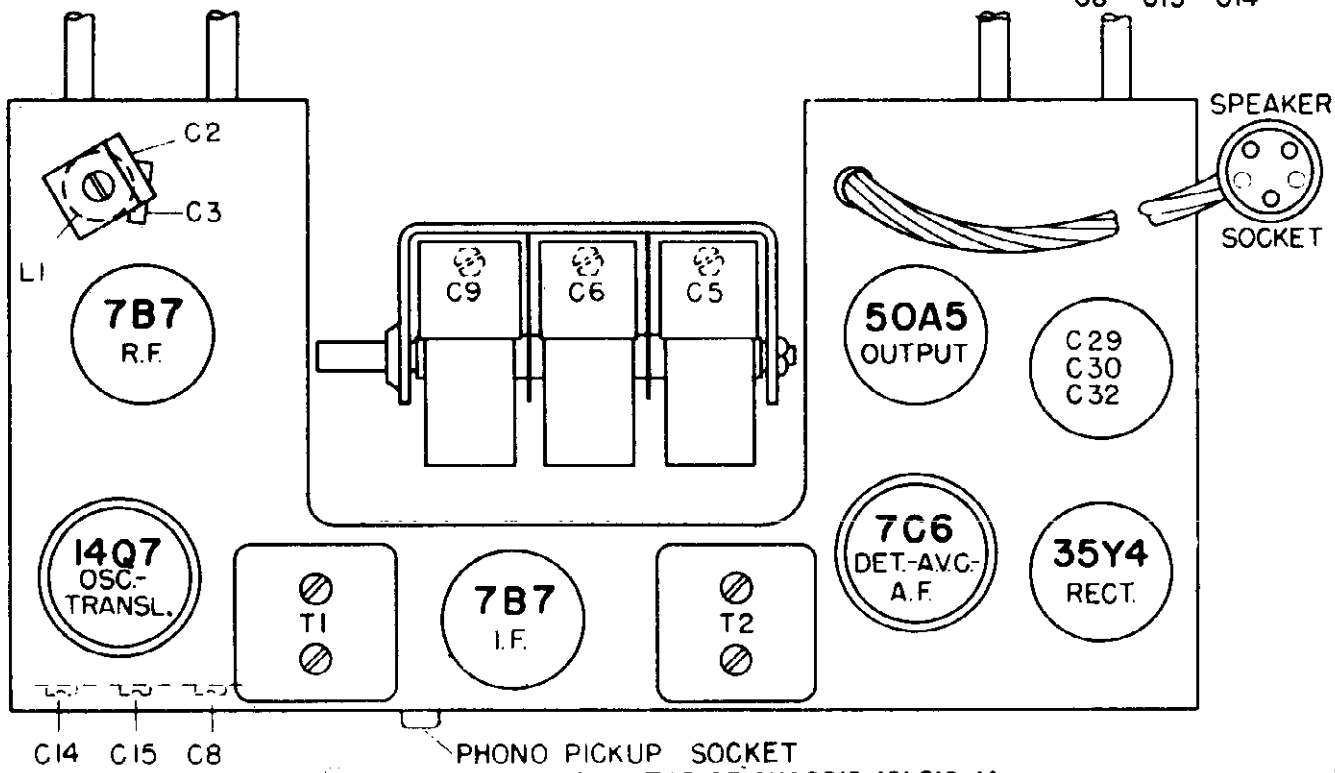
Chassis Differences:

101.810-1A - Chassis similar to 101.810-3 except linear dial.

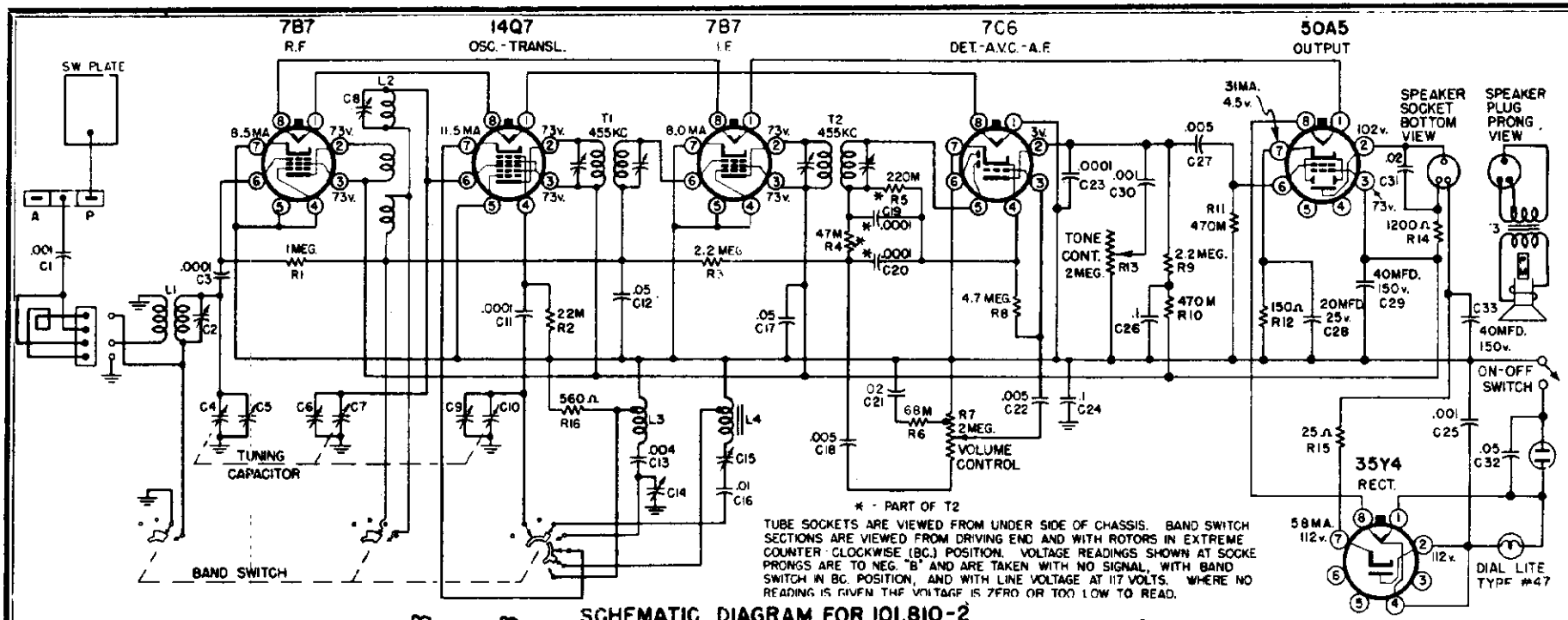
101.810-2 - Chassis same as 101.810 except new type tone control and uses one dial lamp Madza type #47 instead of two Madza type #291.



LOCATION OF PARTS UNDER CHASSIS 101.810-1A

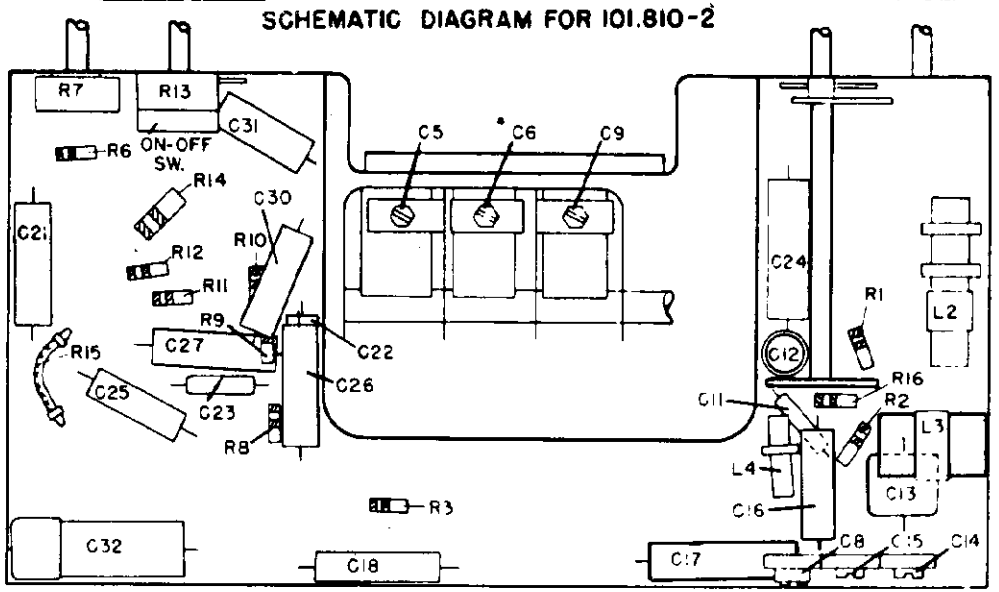


LOCATION OF PARTS ON TOP OF CHASSIS 101.810-1A



TUBE SOCKETS ARE VIEWED FROM UNDER SIDE OF CHASSIS. BAND SWITCH SECTIONS ARE VIEWED FROM DRIVING END AND WITH ROTORS IN EXTREME COUNTER CLOCKWISE (BC.) POSITION. VOLTAGE READINGS SHOWN AT SOCKE PRONGS ARE TO NEG. "B" AND ARE TAKEN WITH NO SIGNAL, WITH BAND SWITCH IN BC. POSITION, AND WITH LINE VOLTAGE AT 117 VOLTS. WHERE NO READING IS GIVEN THE VOLTAGE IS ZERO OR TOO LOW TO READ.

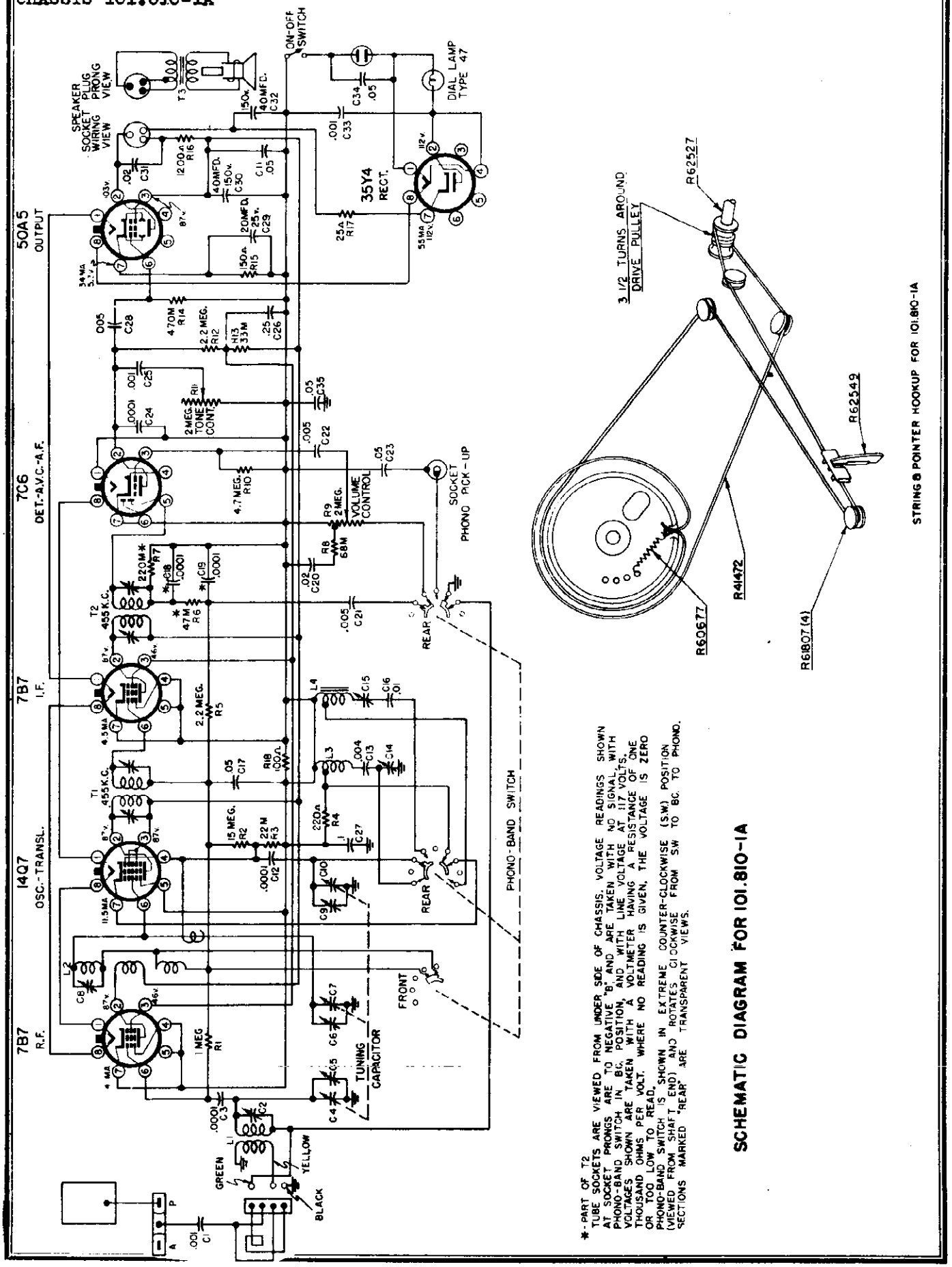
SCHEMATIC DIAGRAM FOR 101.810-2



LOCATION OF PARTS UNDER CHASSIS 101.810-2

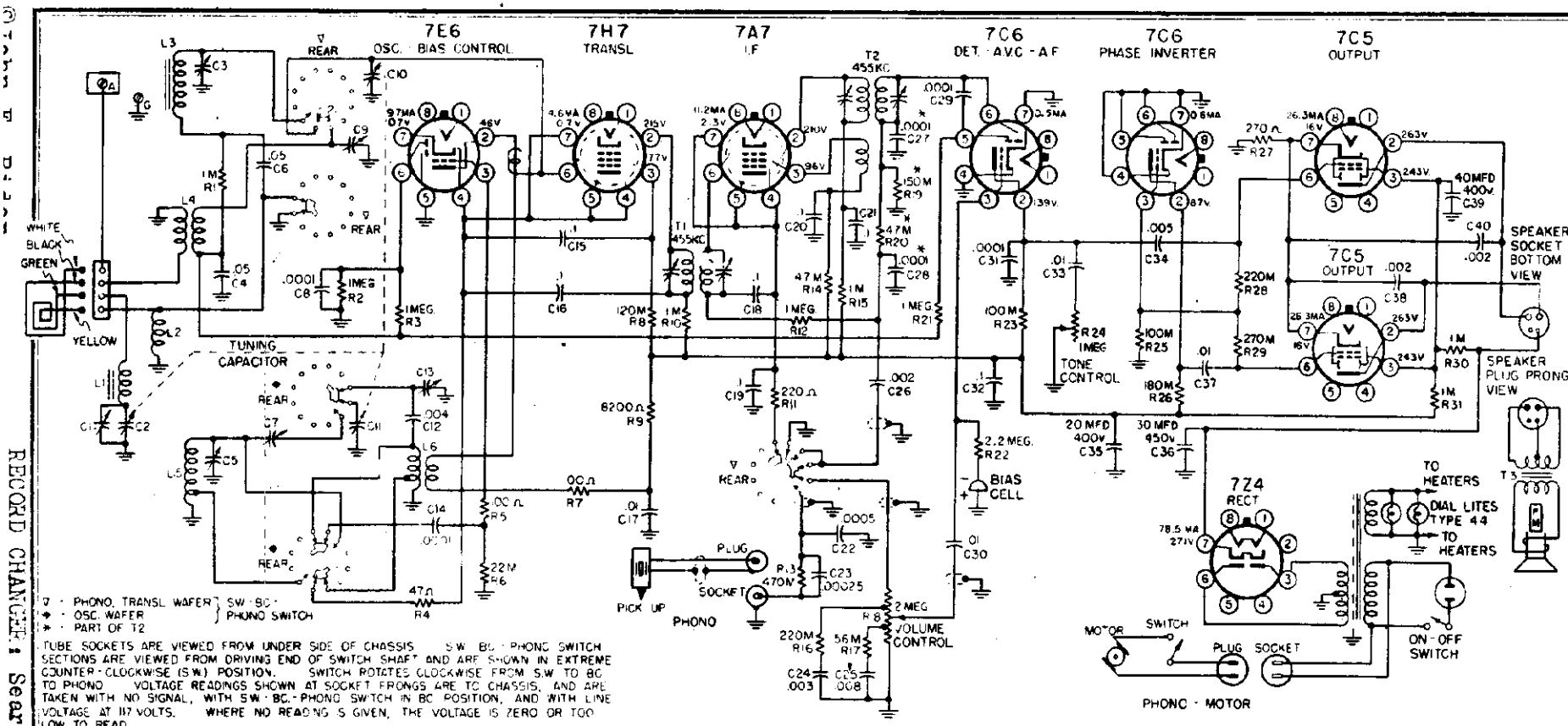
MODEL 8092
CHASSIS 101.810-1A

SEARS, ROEBUCK & CO.



SCHEMATIC DIAGRAM FOR 101.810-1A

*-PART OF T2
TUBE SOCKETS ARE VIEWED FROM UNDER SIDE OF CHASSIS. VOLTAGE READINGS SHOWN AT SOCKET PRONGS ARE TO NEGATIVE "B" AND ARE TAKEN WITH NO SIGNAL, WITH PHONO-BAND SWITCH IN BC. POSITION, AND WITH LINE VOLTAGE AT 117 VOLTS. VOLTAGES SHOWN ARE TAKEN WITH A VOLTMETER HAVING A RESISTANCE OF ONE THOUSAND OHMS PER VOLT. WHERE NO READING IS GIVEN, THE VOLTAGE IS ZERO OR TOO LOW TO READ.
PHONO-BAND SWITCH IS SHOWN IN EXTREME COUNTER-CLOCKWISE (S.W.) POSITION (VIEWED FROM SHAFT END) AND ROTATES CLOCKWISE FROM SW TO BC. TO PHONO. SECTIONS MARKED "REAR" ARE TRANSPARENT VIEWS.



TUBE SOCKETS ARE VIEWED FROM UNDER SIDE OF CHASSIS. S.W. BC - PHONO SWITCH SECTIONS ARE VIEWED FROM DRIVING END OF SWITCH SHAFT AND ARE SHOWN IN EXTREME COUNTER-CLOCKWISE (S.W.) POSITION. SWITCH ROTATES CLOCKWISE FROM S.W. TO BC TO PHONO. VOLTAGE READINGS SHOWN AT SOCKET PRONGS ARE TO CHASSIS, AND ARE TAKEN WITH NO SIGNAL, WITH S.W. - BC. - PHONO SWITCH IN BC POSITION, AND WITH LINE VOLTAGE AT 117 VOLTS. WHERE NO READING IS GIVEN, THE VOLTAGE IS ZERO OR TOO LOW TO READ.

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION	SCHEMATIC LOCATION
	R61034	Background - Dial	L3
	R60493	Ball - .125 Dia. Tuner Unit Assembly	L2
	R60982	Ball - .093 Dia. Tuner Unit Assembly	R18
	R60713	Bar - Plunger	R24
	R17998	Board - Antenna	
	R61094	Bracket & Trimmer Assembly (101.828-1A)	
	R13961	Button - Snap	
	R60730	Button - Push	
C16,C19		Capacitor - .1 Mfd. 200 V.	
C15,C18,C20,		Capacitor - .1 Mfd. 400 V.	
C21,C26			
C17,C33		Capacitor - .01 Mfd. 400 V.	
C30,C37		Capacitor - .01 Mfd. 600 V.	
C4,C6		Capacitor - .05 Mfd. 200 V.	
C28,C36,C40		Capacitor - .002 Mfd. 400 V.	
C34		Capacitor - .003 Mfd. 400 V.	
C24		Capacitor - .003 Mfd. 400 V.	
C25		Capacitor - .004 Mfd. 400 V.	
C18		Capacitor - .004 Mfd. Mica	
C8,C14,C29,		Capacitor - 100 Mmfd. Mica	
C31			
C22		Capacitor - 250 Mmfd. Mica	
C23		Capacitor - 500 Mmfd. Mica	
C38,C36,C39	R61468	Capacitor - Electrolytic, 20 Mfd. 400 V. 30 Mfd. 450 V., 40 Mfd. 400 V.	
C2,C10,C11	R61436	Capacitor - Variable	
C3,C9	R61468	Capacitor - Trimmer - 2 Gang	
C1,C5,C7,C12	R61461	Capacitor - Trimmer - 4 Gang	
	R17915	Coil - Bias	R4
	R57293	Clip - Open Link	R5,R7
L5,L6	R61410	Coil - Oscillator - BC. & S.W.	R11
L1	R61466	Coil - Antenna Loop Loading	R1,R10,R15
L3	R61460	Coil - S. W. Antenna	R6
			R14

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION	SCHEMATIC LOCATION
	R61466	Coil - BC. Translator	R17
	R62300	Coil - Preselector Coupling	R23,R24
	R67240	Control - Volume	R5
	R60736	Control - On-Off & Tone	R26
	R60983	Cord - Dial Drive	R16,R28
	R60993	Cord - Line	R29
	R61033	Covers - Tab - Celluloid	R13
	R61192	Diffuser - Pilot Lamp	R3,R3,R18,
	R61472	Escutcheon Assembly (With Dial Glass)	R21
	R60741	Escutcheon (Without Dial Glass)	R22
	R61470	Dial - Station - Glass	R27
	R61080	Friction Arm Assembly (101.828-1A)	
	R60747	Knob - On-Off & Tone	
	R60749	Knob - Tuning	
	R60750	Knob - Volume	
	R61460	Knob - Wave Switch & Phono	
		Lamp - Mazda Type #44	
	R54685	Leaflet - Instruction (101.828)	
	R54696	Leaflet - Instruction (101.828-1A)	
	R61476	Loop Assembly (101.828)	
	R61496	Loop Assembly (101.828-1A)	
	R57272	Plug - 1 Prong - Phono Input	
	R60898	Plunger & Yoke Assembly	T3
	R61009	Pointer - Dial	
	R42943	Pulley - Wood	
	R43416	Pulley - Wood	
	R61571	Pulley - Wood	
	R60442	Pulley - Tuning Shaft Assembly	
		Resistor - 47 Ohm - 1/3 Watt	
		Resistor - 100 Ohm - 1/3 Watt	
		Resistor - 220 Ohm - 1/3 Watt	T1
		Resistor - 1000 Ohm - 1/3 Watt	T2
		Resistor - 22,000 Ohm - 1/3 Watt	T4
		Resistor - 47,000 Ohm - 1/3 Watt	

	Resistor - 56,000 Ohm - 1/3 Watt
	Resistor - 100,000 Ohm - 1/3 Watt
	Resistor - 150,000 Ohm - 1/3 Watt
	Resistor - 180,000 Ohm - 1/3 Watt
	Resistor - 220,000 Ohm - 1/3 Watt
	Resistor - 270,000 Ohm - 1/3 Watt
	Resistor - 470,000 Ohm - 1/3 Watt
	Resistor - 1 Megohm - 1/3 Watt
	Resistor - 2.2 Megohm - 1/3 Watt
	Resistor - 1000 Ohm - 1 Watt
	Resistor - 8200 Ohm - 1 Watt
	Resistor - 270 Ohm - 2 Watt
R60734	Shaft - Tuning Assembly
R17981	Socket - 4 Prong Rec. - Speaker
R44897	Socket - 1 Prong - Phono Input
R44145	Socket - 2 Prong A.C. - (Rec. Chgr.)
R57049	Socket - Tube - 8 Prong Lock-in Wafer
R61014	Socket - Pilot Lamp
R61015	Socket - Tube - 8 Prong Lock-in Molded
	WHEN ORDERING SPEAKER PARTS ALWAYS GIVE THE PART NUMBER ON THE SPEAKER
R61437	Speaker - 10" P. M.
R61036	Cone & Voice Coil
R61439	Output Transformer
R60677	Spring - Extension - Dial Drive
R60487	Spring - Extension - Tuner Unit
R60437	Spring - Compression - Tuner Unit
R61098	Spring - Counterbalance (101.828-1A)
R61458	Switch - 3 Pos. - Tuner Unit
R61454	Switch - Wave - 3 Pos. - Under Chassis
R60782	Tube - Call Letter
R61431	Transformer - 1. F. #1
R61432	Transformer - 1. F. #2
R61433	Transformer - Power
R61434	Tuner & R. F. Assembly

Power Supply:
All models available

117 Volts 60 Cycle AC 100 Watts

Frequency Range:

Standard Broadcast.....540-1600 KC
Shortwave.....6-16 MC

Model Differences:

101.828 Cabinet is a Vertical Console
101.828-1A Cabinet is a Walnut Loboy

SEARS, ROEBUCK & CO. MODELS 7105,7106
CHASSIS 101.828,101.828-1A

IMPORTANT ALIGNMENT NOTES

The Alignment must be done in the order given.

The Alignment Procedure should be repeated step by step in the original order for greatest accuracy.

Always keep the output power from the generator at its lowest possible value to prevent the AVC of the receiver from interfering with accurate alignment.

During alignment of the BC Band Padder and the SW Band Translator Trimmers, the Tuner should be rocked through resonance to assure alignment.

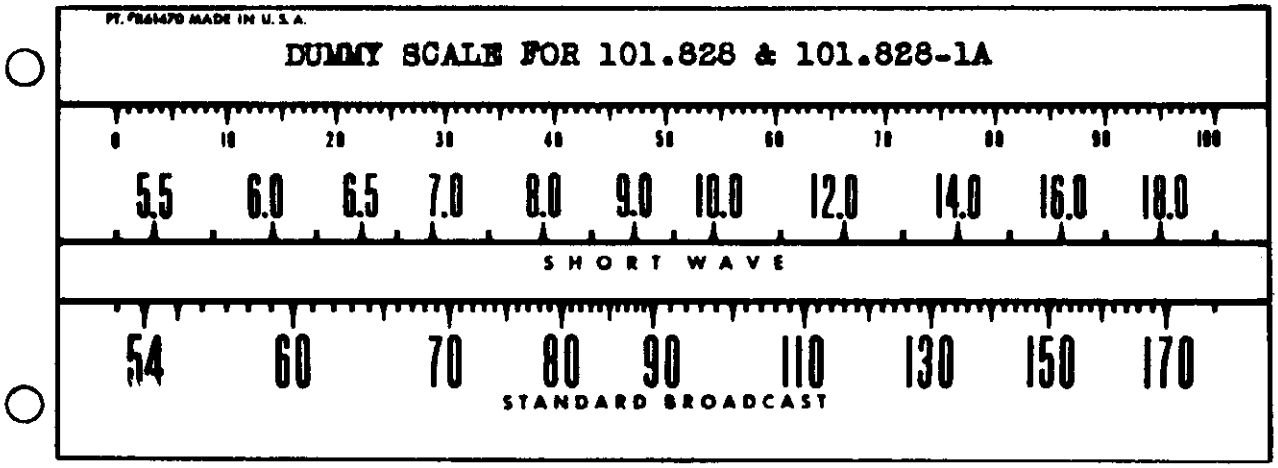
Power Output — Undistorted 3.6 Watts — Maximum 6.5 Watts

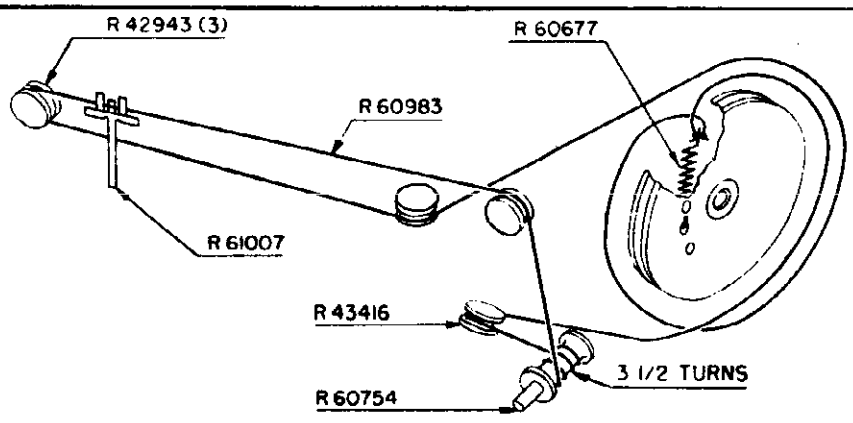
ALIGNMENT PROCEDURE

Preliminary:

Output Meter Reading to Indicate.5 Watts Across Voice Coil.....1.2 Volts
Generator Ground Lead Connection.....Receiver Chassis
Generator Modulation.....30%, 400 Cycles
Position of Volume Control.....Fully on
Position of Tone Control.....Treble
Position of Pointer with Tuner Fully Closed.....Last Line Below 540 Calibration Mark

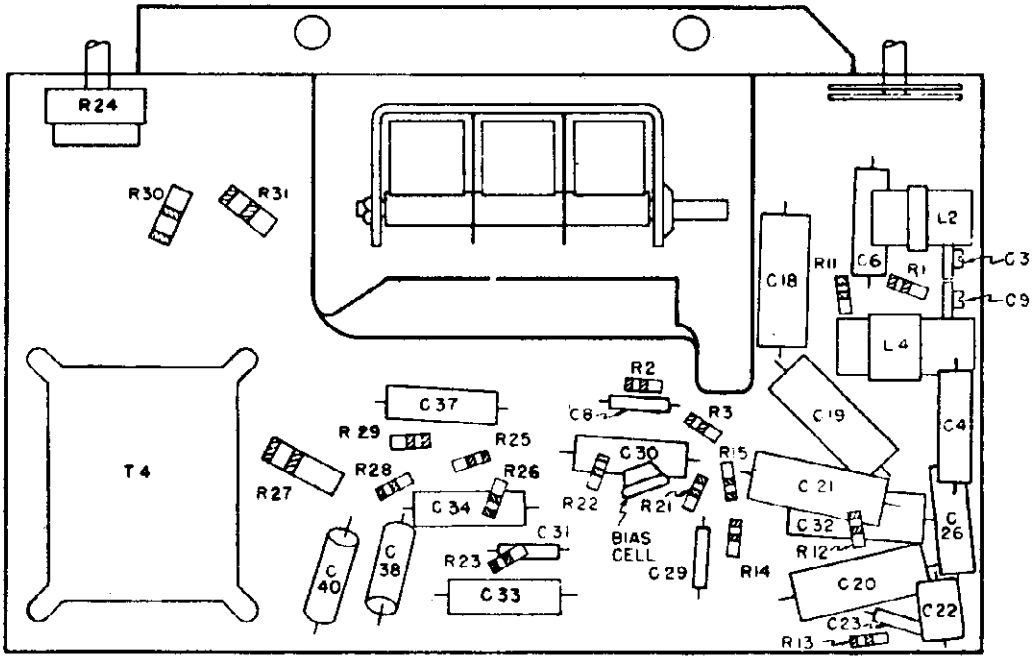
WAVE BAND SWITCH POSITION	POSITION OF TUNER	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION	ADJUSTMENTS (IN ORDER SHOWN)	TRIMMER FUNCTION
BC	Closed	455 KC	0.1 Mfd.	7H7 Transl. Grid	T2, T1	I. F.
BC	1410 KC	1410 KC	.0002 Mfd.	Ant. Terminal	C1	Oscillator
BC	1410 KC	1410 KC	.0002 Mfd.	Ant. Terminal	C2	Transl.
BC	1410 KC	1410 KC	.0002 Mfd.	Ant. Terminal	C3	Antenna
BC	600 KC (rock)	600 KC	.0002 Mfd.	Ant. Terminal	C4	Padder
SW	15 MC	15 MC	400 Ohm	Ant. Terminal	C5	Oscillator
SW	15 MC (rock)	15 MC	400 Ohm	Ant. Terminal	C6	Transl.



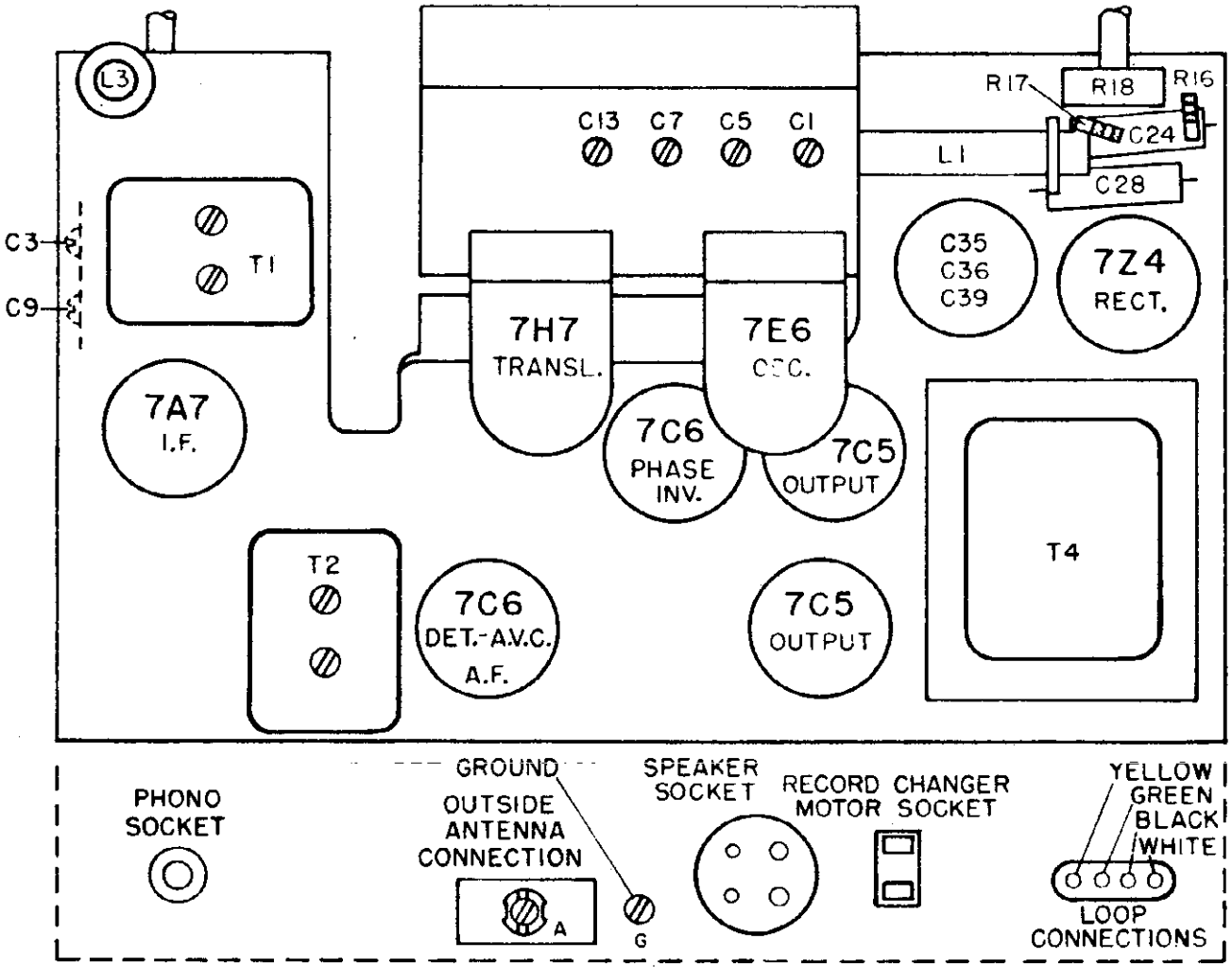


STRING AND POINTER HOOKUP

MODELS 7105,7106 SEARS, ROEBUCK & CO.
CHASSIS 101.828,101.828-1A



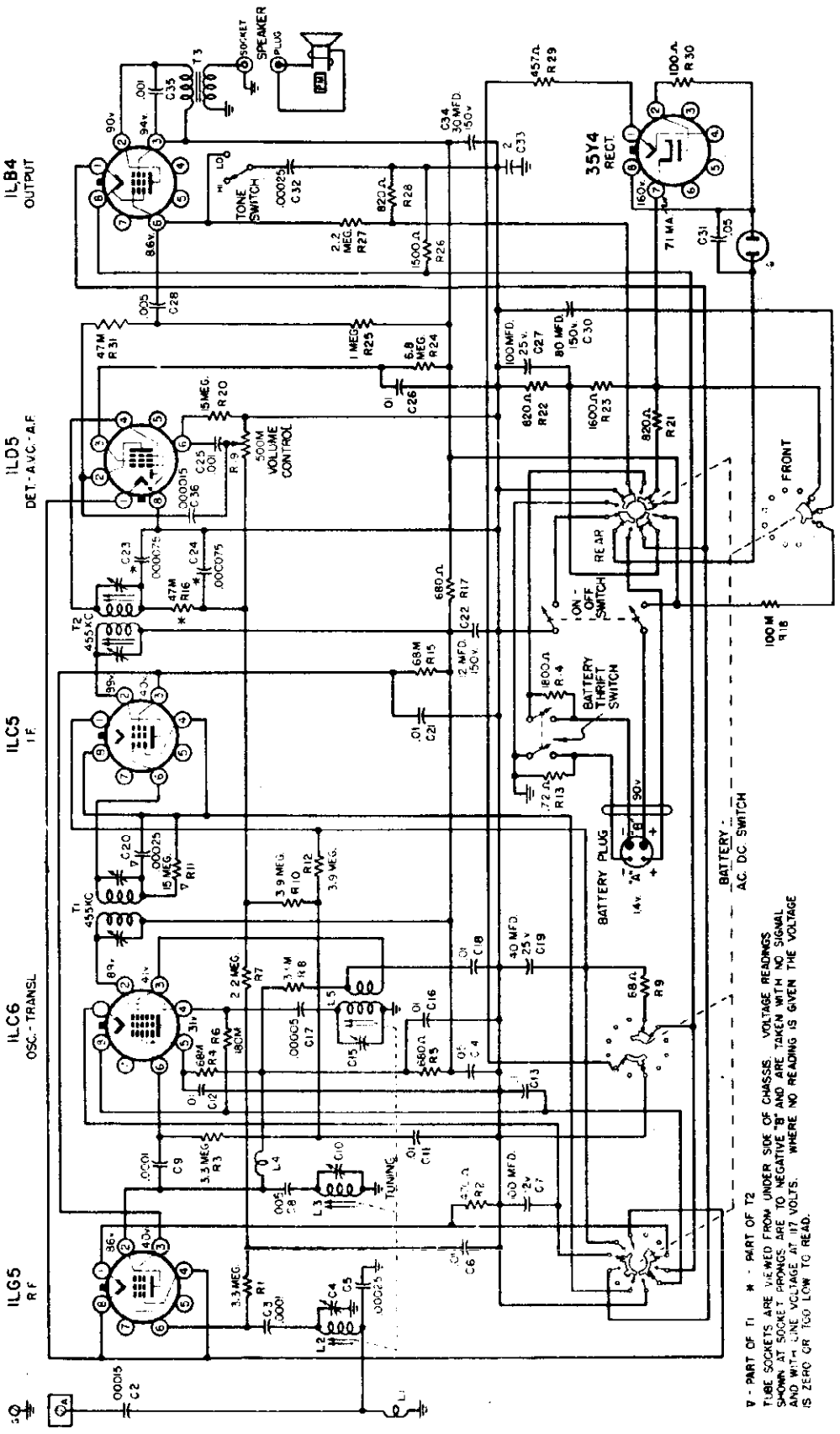
LOCATION OF PARTS ON BOTTOM OF CHASSIS



LOCATION OF PARTS ON TOP OF CHASSIS

SEARS, ROEBUCK & CO.

MODEL 7226
CHASSIS 101.819A



SCHEMATIC DIAGRAM FOR 101.819A

V - PART OF T1 M - PART OF T2
TUBE SOCKETS ARE VIEWED FROM UNDER SIDE OF CHASSIS. VOLTAGE READINGS SHOWN AT SOCKET PRONGS ARE TO NEGATIVE "B" AND ARE TAKEN WITH NO SIGNAL AND WITH LINE VOLTAGE AT 117 VOLTS. WHERE NO READING IS GIVEN THE VOLTAGE IS ZERO OR TOO LOW TO READ.

MODEL 7226
CHASSIS 101.819A

SEARS, ROEBUCK & CO.

PRELIMINARY:

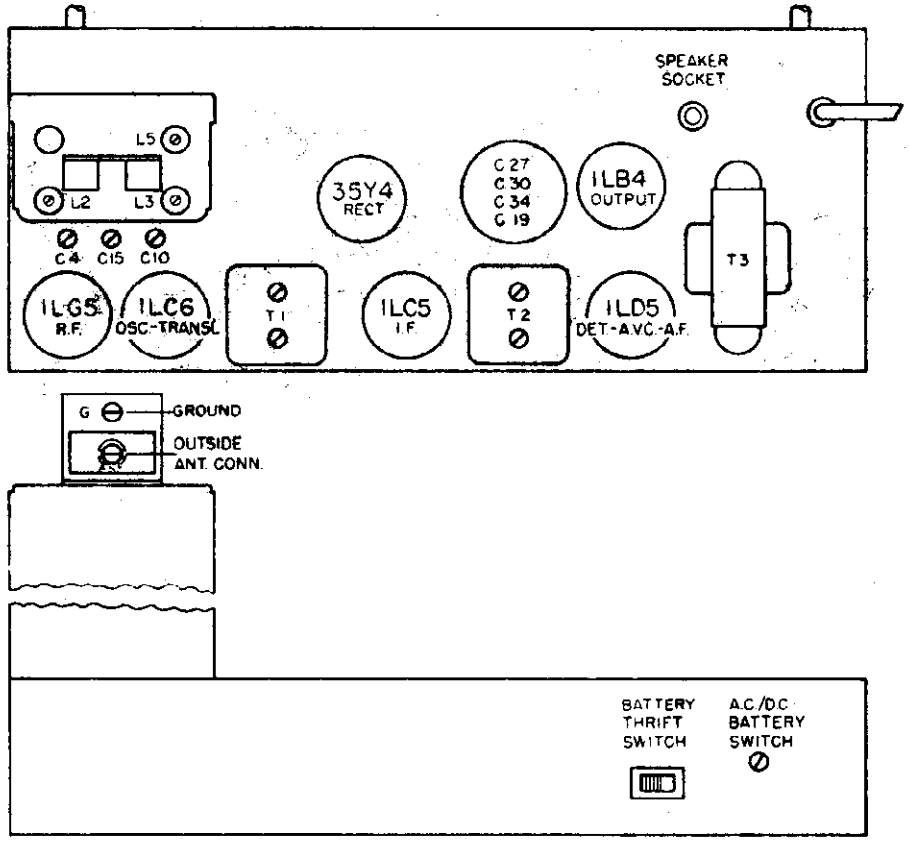
Output meter connections.....Across loud speaker voice coil
Output meter reading to indicate 50 milliwatts (Standard output).....0.4 Volt
Generator ground lead connection.....Receiver chassis
Dummy antenna value to be in series with generator output.....See chart below
Connection of generator output lead.....See chart below
Generator modulation.....30%, 400 cycles
Position of Volume Control.....Fully on
Position of Tone Control..... HI
Position of pointer with tuner fully closed....To the left of 540 Kc calibration mark

POSITION OF TUNER	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION	ADJUSTMENTS (IN ORDER SHOWN)	FUNCTION
Closed	455 Kc.	.1 mfd.	1LC6 Transl. Grid	T2,T1	I.F.
1725	1725 Kc.	.000075 mfd.	Ant. Terminal	C15	Oscillator
1725	1725 Kc	.000075 mfd.	Ant. Terminal	C4,C10	Ant., Transl.
1500	1500 Kc	.000075 mfd.	Ant. Terminal	L5	Oscillator Core
1500	1500 Kc	.000075 mfd.	Ant. Terminal	L2,L3	Ant., Transl. Cores
1725	1725 Kc	.000075 mfd.	Ant. Terminal	C4,C10,C15	Oscillator, Ant., & Transl. Recheck

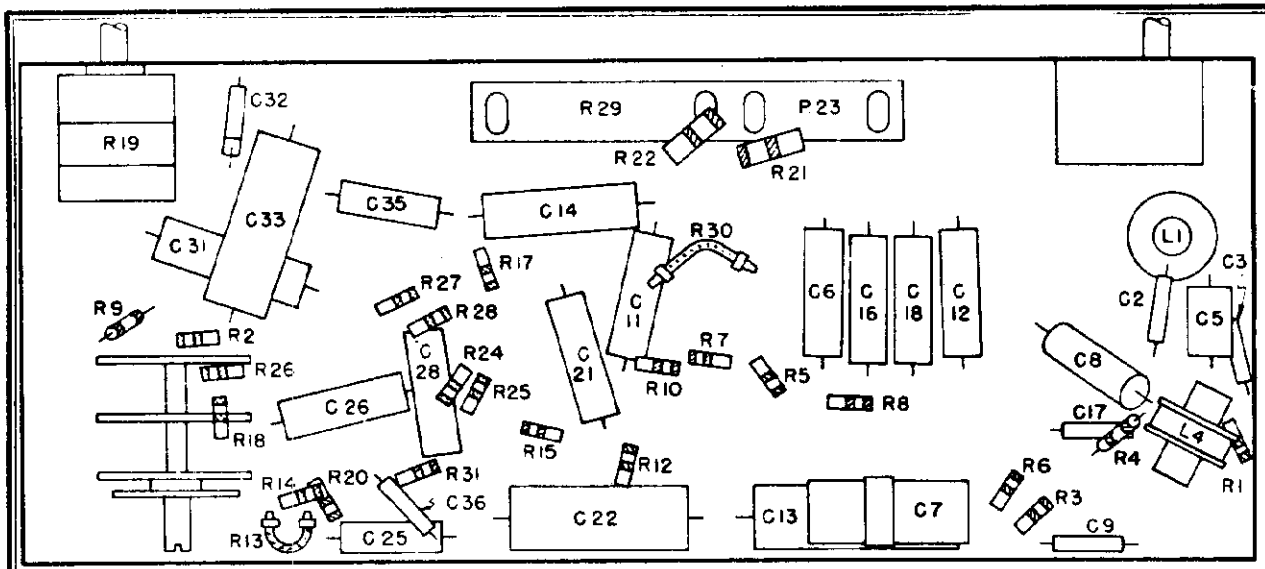
The alignment must be done in the order given.

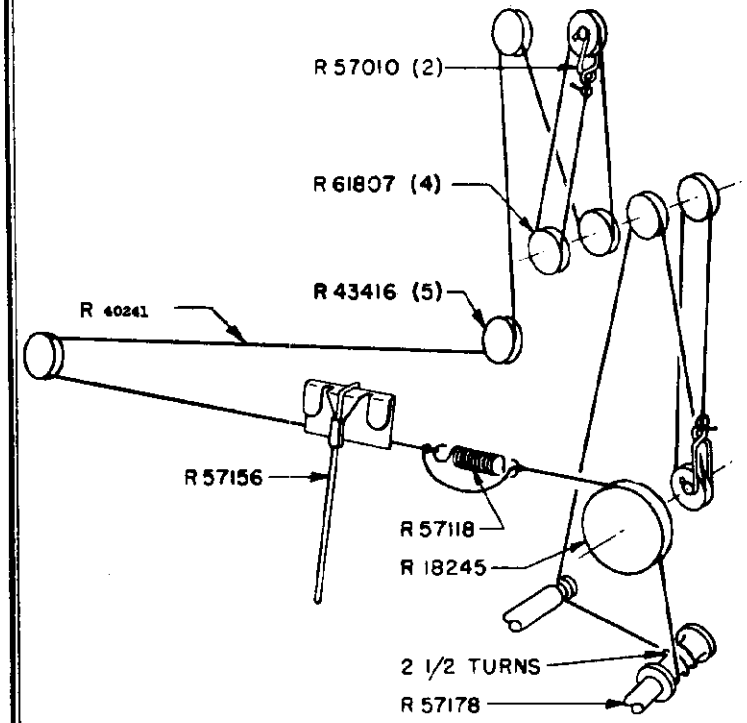
The Alignment Procedure should be repeated step by step in the original order for greatest accuracy.

Always keep the output power from the generator at its lowest possible value to prevent the AVC of the receiver from interfering with accurate alignment.



LOCATION OF PARTS ON TOP AND BACK OF CHASSIS





STRING AND POINTER HOOKUP

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
	R57165	Antenna Package
	R57174	Bushing - Drive Shaft
	R15961	Button Snap - Dial Mtg.
C15		Capacitor - .1 Mfd. 200 V.
C33		Capacitor - .2 Mfd. 200 V.
C4,C11,C12, C16,C18,C21, C26		Capacitor - .01 Mfd. 200 V.
C14		Capacitor - .05 Mfd. 200 V.
C31		Capacitor - .05 Mfd. 400 V.
C35,C35		Capacitor - .001 Mfd. 600 V.
C8,C28		Capacitor - .005 Mfd. 400 V.
C36		Capacitor - Mica - 15 Mmfd.
C17		Capacitor - Mica - 50 Mmfd.
C3,C9		Capacitor - Mica - 100 Mmfd.
C7		Capacitor - Mica - 150 Mmfd.
C32		Capacitor - Mica - 250 Mmfd.
C5	P46799	Capacitor - Silver Mica - 280 Mmfd. 500 V.
C19,C27,C30	R60803	Capacitor - Elect. 30 Mfd. 150 V., 40 Mfd. 25 V., 100 Mfd. 25 V., 80 Mfd. 150 V.
C22	R61860	Capacitor - Dry Elect. - 12 Mfd. 150 V.
C7	R62274	Capacitor - Dry Elect. - 100 Mfd. 12 V.
C4,C10,C15	R57061	Capacitor - Trimmer - 3 Gang
L1,L4	R45255	Coil - Cache - Antenna
R19	R57071	Control - On-Off - Volume & Tone
	R40241	Cord - Dial Drive
	R17166	Cord - Line
	R61816	Cover - Dial
	R45067	Cover - Perm. Coil Unit
	R61801	Dial - Station
	R57150	Knob - On-Off & Volume
	R57151	Knob - Tuning
	R57153	Knob - Tone Control
	R64166	Leaflet - Instruction
	R60457	Plug - Battery - 4 Prong
	R63019	Pointer - Dial
	R18245	Pulley - Wood
	R43416	Pulley - Cord
	R57117	Pulley - Drive Shaft
	R61407	Pulley - Metal

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
R9		Resistor - 68 Ohm - 1/3 Watt
R2		Resistor - 470 Ohm - 1/3 Watt
R5,R17		Resistor - 680 Ohm - 1/3 Watt
R28		Resistor - 820 Ohm - 1/3 Watt
R26		Resistor - 1500 Ohm - 1/3 Watt
R14		Resistor - 1800 Ohm - 1/3 Watt
R6		Resistor - 33,000 Ohm - 1/3 Watt
R31		Resistor - 47,000 Ohm - 1/3 Watt
R4,R15		Resistor - 68,000 Ohm - 1/3 Watt
R18		Resistor - 100,000 Ohm - 1/3 Watt
R8		Resistor - 180,000 Ohm - 1/3 Watt
R25		Resistor - 1 Megohm - 1/3 Watt
R7,R27		Resistor - 2.2 Megohm - 1/3 Watt
.1,R3		Resistor - 3.3 Megohm - 1/3 Watt
R10,R12		Resistor - 3.9 Megohm - 1/3 Watt
R24		Resistor - 6.8 Megohm - 1/3 Watt
R20		Resistor - 15 Megohm - 1/3 Watt
R21,R22		Resistor - 820 Ohm - 1 Watt
R13	R45254	Resistor - Flexohm - 22 Ohm - 1/2 Watt
R30	R61719	Resistor - Glaxohm 100 Ohm - 2 Watt
R.5,R29	R61838	Resistor - Jira Ohmit 2 Section - Centohm 475 Ohm - 1800 Ohm
	R57178	Shaft - Drive Assembly - Dial
	R44487	Socket - 3 Prong - Speaker Connector
	R57049	Socket - Tube - 8 Prong Lock-in
		SHAFT (CORRECTS SPEAKER PARTS ALIAS) GIVE THE PART NUMBER OF THE SPEAKER
	R57081	Speaker - 5" P.M.
	R57118	Spring - Extension - Dial
	R57038	Switch - Thrift
	R61028	Switch - A.C. - Battery Changeover
T1	R57120	Transformer - 1. P. #1
T2	R62271	Transformer - 1. P. #2
T3	R62213	Transformer - Output
	R61814	Tuner - Permeability Unit
	R61824	Coil - Antenna
	R61825	Coil - Oscillator
	R61826	Coil - R. F.
	R61815	Core Slide Bracket Assembly
	R61830	Rafer - Plastic Selector Mtg.
	R45109	Washer - [illegible]

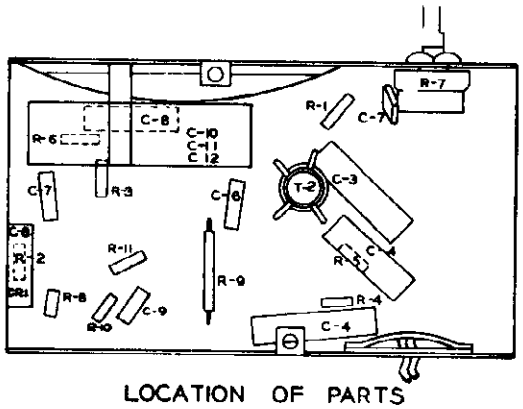
MODEL 8003
CHASSIS 132.818-1

SEARS, ROEBUCK & CO.

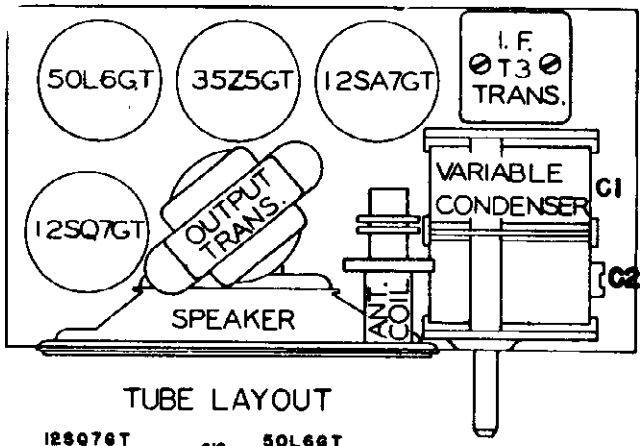
SPECIFICATIONS

Power Supply -- 105-125 Volts AC-DC, 30 Watts
Power Output
Undistorted .8 Watts, Maximum - 2.5 Watts

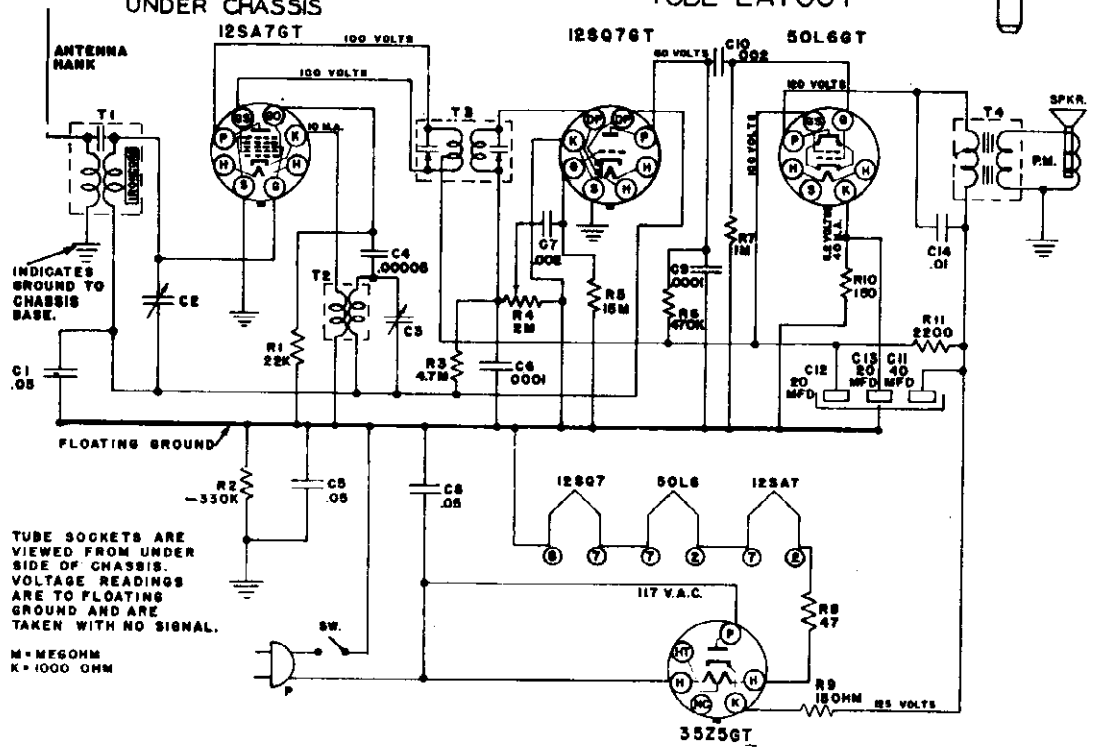
Tuning Range Broadcast Band 540-1600 Kc
Speaker
Voice Coil Impedance 3.2 Ohms



LOCATION OF PARTS UNDER CHASSIS



TUBE LAYOUT



SCH. LOC.	PART NO.	DESCRIPTION	M.U. CODE
	N19936-2	Cabinet, grey-green	
T1	N18255	Coil, antenna	
T2	N18256	Coil, oscillator	
C1		Condenser, .05 mfd., 200 v	
C2,C3	N17115	Condenser, variable, 2-gang	AAO
C4		Condenser, .00005 mfd., 500 v, mica	
C5,C8		Condenser, .05 mfd., 400 v	
C6,C9		Condenser, .0001 mfd., 500 v	
C7,C10		Condenser, .002 mfd., 600 v	
C11)	N19176	Condenser, 40 mfd., 150 v	
C12)		Condenser, 20 mfd., 150 v	
C13)		Condenser, 20 mfd., 25 v	
C14		Condenser, .01 mfd., 400 v	
	N20237	Cord, Power	
	N21823	Emblem, Dial Scale	
	N19120-1	Knob, tuning	
	N18678	Knob, volume	
	N21925	Leaflet, instruction	

SCH. LOC.	PART NO.	DESCRIPTION
R1		Resistor, 22,000 Ohms, 1/4 w
R2		Resistor, 330,000 ohms 1/4 w
R3		Resistor, 4.7 megohms, 1/4 w
R4	N18587	Resistor, 2 meg., vol control & sw
R5		Resistor, 15 meg., 1/4 w
R6		Resistor, 470,000 ohms, 1/4 w
R7		Resistor, 1 meg., 1/4 w
R8	N19177	Resistor, 470 ohms, 1 w
R9		Resistor, 15 ohms, 1/4 w
R10		Resistor, 150 ohms, 1/4 w
R11		Resistor, 2200 ohms, 1 watt
Spk.	N19937-1	Speaker & Output transformer assy.
	N21626-1	Speaker, 4" P. M.
T4	N18258	Transformer, output
T3	N19649	Transformer, I.F.
	N20040	Washer, white felt
	N18136	Wire, antenna

SEARS, ROEBUCK & CO.

MODEL 8003
CHASSIS 132.818-1
MODEL 8090
CHASSIS 101.821

MODEL 8003 CHASSIS 132.818-1
ALIGNMENT PROCEDURE

PRELIMINARY:

Output meter connection ..... Across speaker voice coil
Output meter reading to indicate 200 milliwatts ..... .8 volt
Connection of generator ground lead ..... Floating ground
Generator modulation ..... 30%, 400 cycles
Position of volume control ..... Fully clockwise
Position of dial pointer with variable fully closed ..... 54 on dial

POSITION OF VARIABLE	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION (high)	TRIMMERS ADJUSTED (in order shown)	TRIMMER FUNCTION
Open	455 kc	.05 mfd.	12SA7GT grid	Top of T3	I. F.
1400 kc	1400 kc	.00005 mfd.	**Antenna	*C2	Oscillator
600 kc	600 kc	.00005 mfd.	**Antenna	Check point	- - - - -

IMPORTANT ALIGNMENT NOTES

*Since the antenna stator section of the variable has no trimmer, the rotor is rocked back and forth while adjusting oscillator trimmer, to obtain maximum output.

Check the sensitivity at 600 kc; if weak, adjust antenna section plates for maximum output at 600 kc; tracking is accomplished by adjusting plates of rotor.

**Unsolder 20' antenna lead from lug on antenna coil, and connect signal generator lead to lug through .00005 mfd. Dummy Antenna.

Approximate stage by stage sensitivities are: Mixer - 455 kc - 2600 uv; Mixer 1000 kc - 2600 uv; Antenna - 1000 kc - 180 uv.

ALIGNMENT PROCEDURE
MODEL 8090 CHASSIS 101.821

PRELIMINARY:

Output meter reading to indicate 0.05 Watt across voice coil.....0.4 Volt

Generator ground lead connection.....I.F. alignment-negative "B" lead
.....Ant. alignment-Receiver chassis

Generator modulation.....30%, 400 cycles

Position of volume control.....Fully on

Position of pointer with tuner fully closed..Last line to left of 540 calibration mark on escutcheon or the second light brown mark from the left-hand end on the upper edge of the dial background.

POSITION OF TUNER	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION	ADJUSTMENTS (IN ORDER SHOWN)	TRIMMER FUNCTION
Closed	455 Kc.	0.1 mfd.	Transl.-Grid	T2 & T1	I. F.
Fully open	1650 Kc.	.0002 mfd.	Antenna	C7	Oscillator
See note below	1410 Kc.	.0002 mfd.	Antenna	C3	Antenna

IMPORTANT ALIGNMENT NOTES:

NOTE: The 1410 Kc. calibration point is the first light brown mark from the right-hand edge of the dial background.

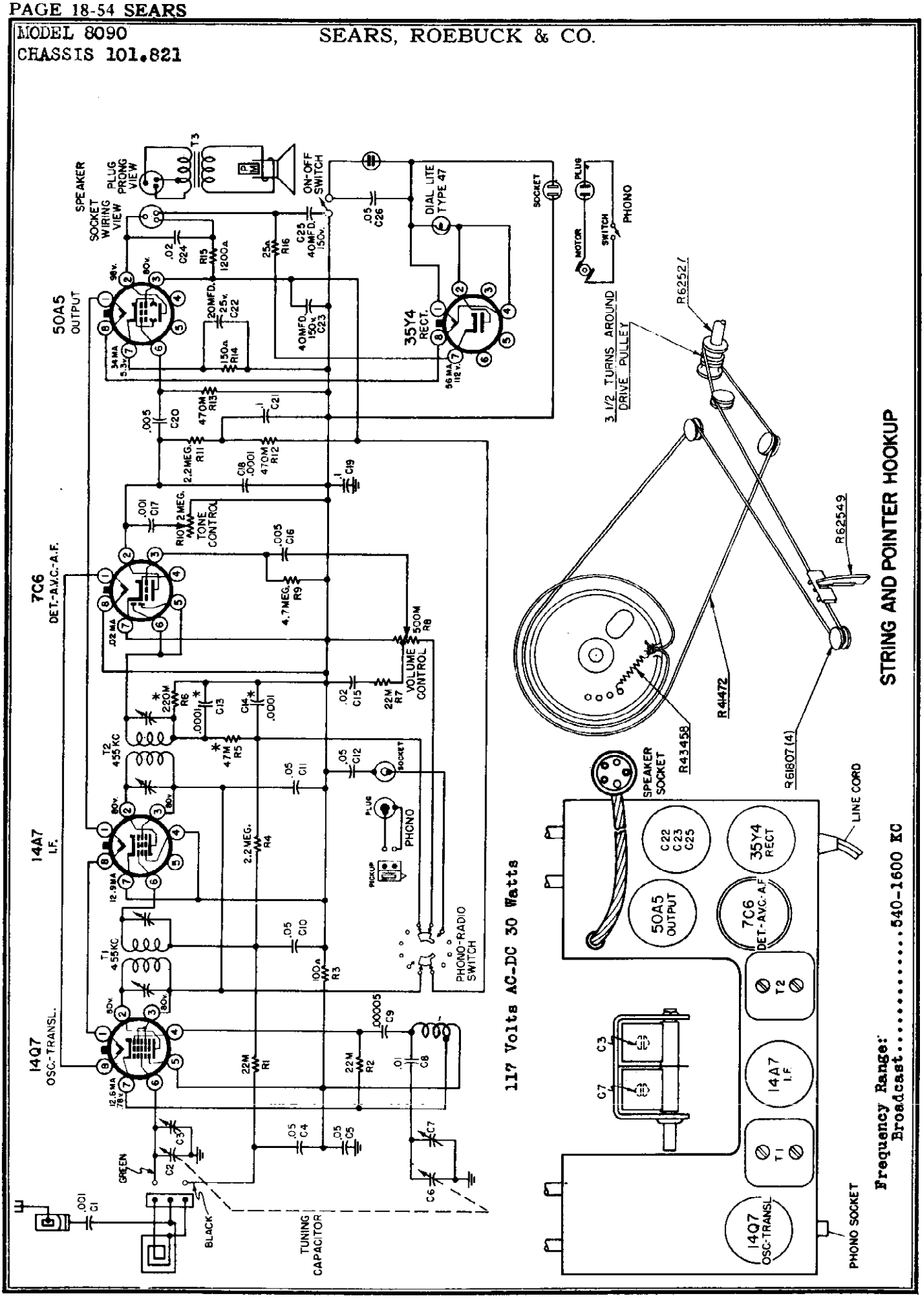
The alignment must be done in the order given.

The entire Alignment Procedure should be repeated step by step in the original order for greatest accuracy.

Always keep the output from the generator at its lowest possible value to prevent the AVC of the receiver from interfering with accurate alignment.

MODEL 8090
CHASSIS 101.821

SEARS, ROEBUCK & CO.

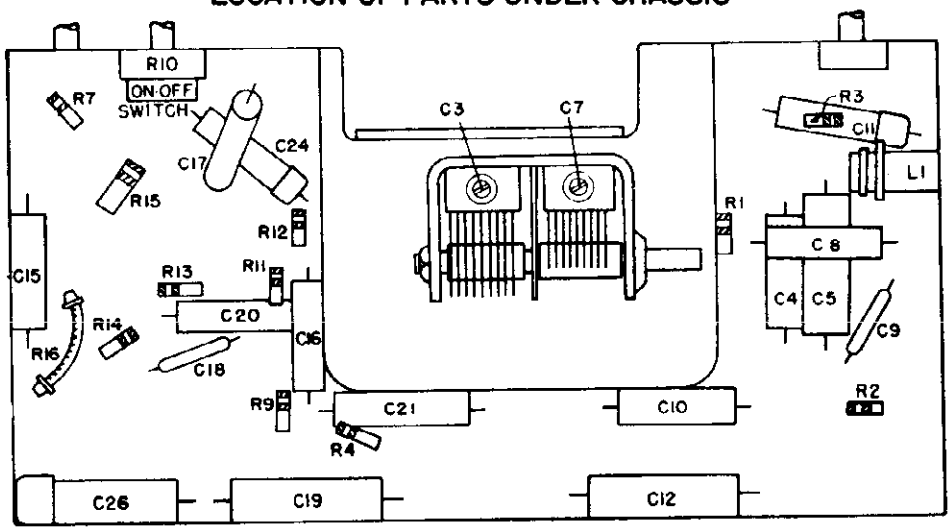


SEARS, ROEBUCK & CO.

MODEL 8090
CHASSIS 101.821

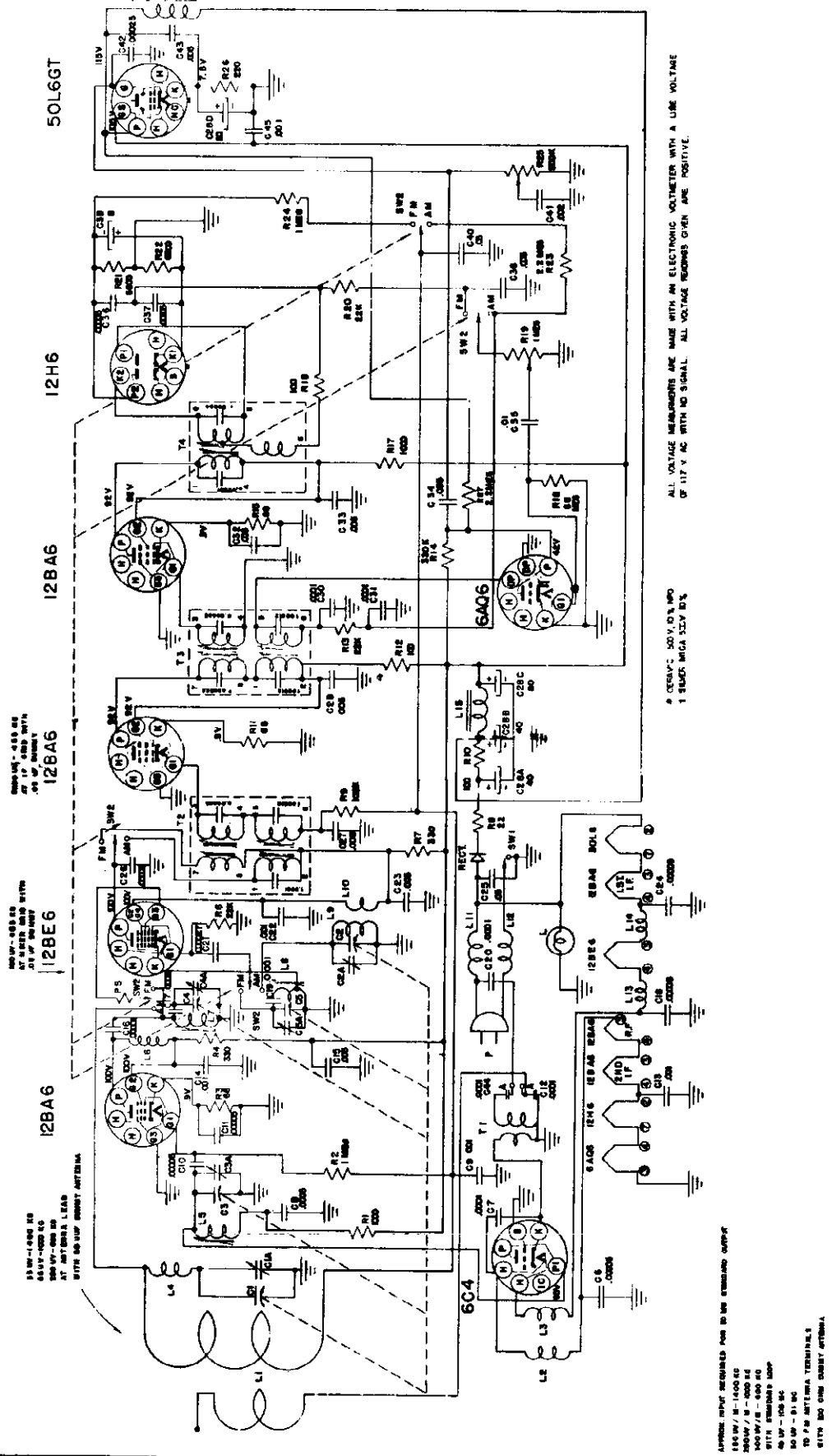
SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
	R62643	Background - Dial
	R61846	Button - Snap
C16,C20		Capacitor - .005 Mfd. 600 Volt
C1,C17		Capacitor - .001 Mfd. 600 Volt
C4,C5,C10, C11,C12,C26		Capacitor - .05 Mfd. 600 Volt
C15,C24		Capacitor - .02 Mfd. 600 Volt
C8		Capacitor - .01 Mfd. 600 Volt
C19,C21		Capacitor - 0.1 Mfd. 400 Volt
C9		Capacitor - Mica - 50 Mmfd.
C18		Capacitor - Mica - 100 Mmfd.
C22,C23,C25	R60416	Capacitor - Electrolytic - 20 Mfd. 25 Volt 40 Mfd. 150 Volt, 40 Mfd. 150 Volt
C2,C6	R61100	Capacitor - Variable - With Drum
L1	R61107	Coil - Oscillator
R8	R62371	Control - On-Off & Volume
R10	R62393	Control - Tone
	R41472	Cord - Dial Drive - 42"
	R16706	Cord - Line
	R62397	Escutcheon & Dial Assembly
	R62713	Knob - On-Off & Volume
	R62535	Knob - Phono - Radio
	R62532	Knob - Tone
	R62712	Knob - Tuning
		Lamp - Dial #47
	R64007	Leaflet - Instruction
	R63189	Loop Antenna Assembly
	R62549	Pointer & Slide Assembly
	R61807	Pulley - Metal
R12,R13		Resistor - 470,000 Ohm - 1/3 Watt
R1,R2,R7		Resistor - 22,000 Ohm - 1/3 Watt
R14		Resistor - 150 Ohm - 1/3 Watt
R3		Resistor - 100 Ohm - 1/3 Watt
R9		Resistor - 4.7 Megohm - 1/3 Watt
R4,R11		Resistor - 2.2 Megohm - 1/3 Watt
R15		Resistor - 1200 Ohm - 1 Watt
R16	R40232	Resistor - Glasohm - 25 Ohm - 1 Watt
	R62527	Tuning Shaft Assembly
	R62322	Shield - On-Off Switch Cover
	R44897	Socket - Phono Input
	R60515	Socket - Pilot Lamp
	R57049	Socket - Tube - 8 Prong Lock-In
		WHEN ORDERING SPEAKER PARTS ALWAYS GIVE THE PART NUMBER ON THE SPEAKER
	R62600	Speaker - 6" P. M.
	R62601	Cone & Voice Coil
T3	R62602	Output Transformer
	R49743	Plug (Speaker)
	R60693	Socket (Speaker Cable)
	R43458	Spring - Tension
	R62394	Switch - Phono - Radio
T1	R62513	Transformer - I. F. #1
T2	R60418	Transformer - I. F. #2
	R60450	Wafer - Electrolytic Mounting

LOCATION OF PARTS UNDER CHASSIS



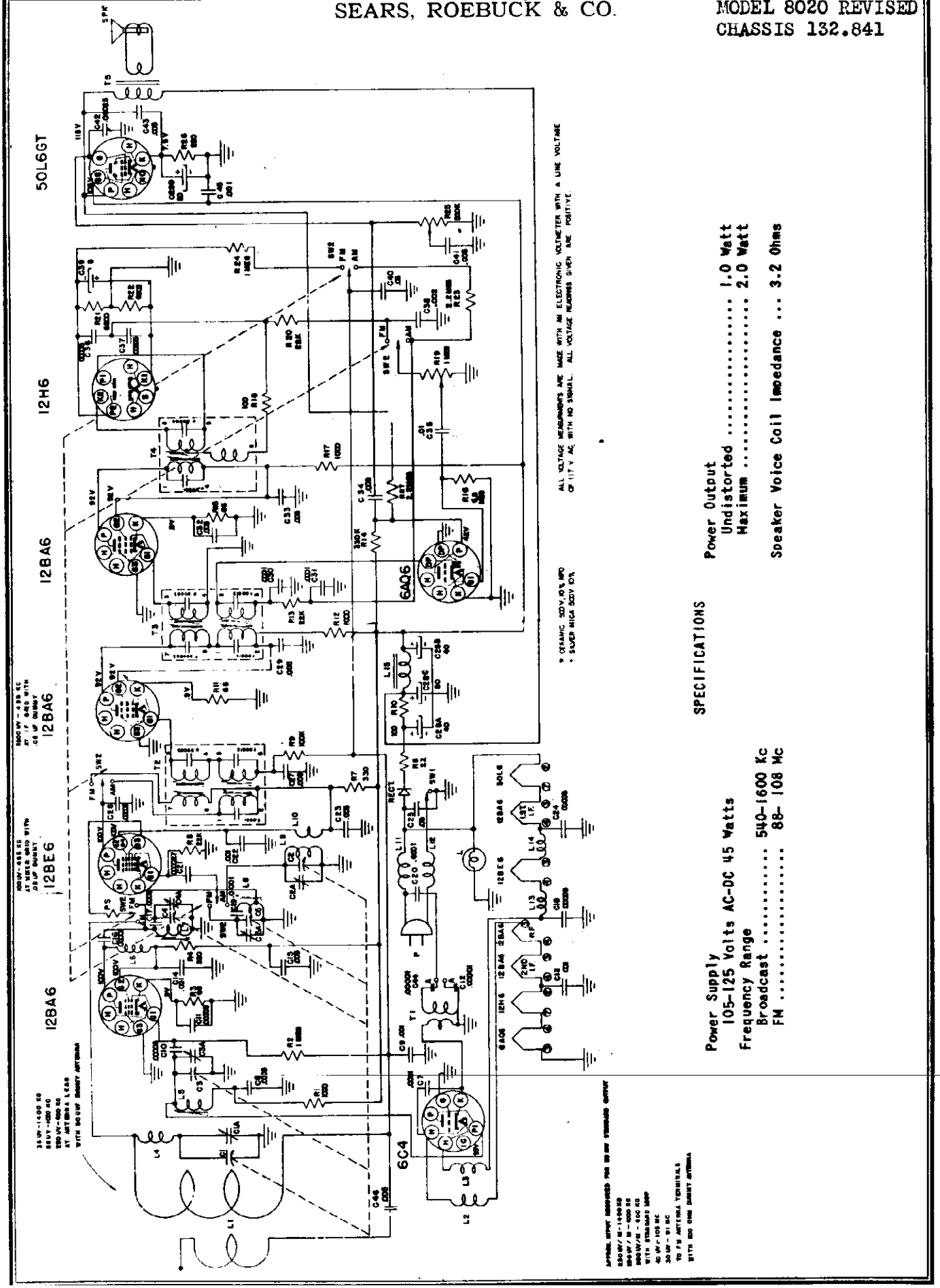
MODEL 8020
CHASSIS 132.841

SEARS, ROEBUCK & CO.



SEARS, ROEBUCK & CO.

MODEL 8020 REVISED
CHASSIS 132.841



SPECIFICATIONS

Power Output
Undistorted ..... 1.0 Watt
Maximum ..... 2.0 Watt

Speaker Voice Coil Impedance ... 3.2 Ohms

Power Supply
105-125 Volts AC-DC 45 Watts

Frequency Range
Broadcast ..... 540-1600 Kc
FM ..... 88- 108 Mc

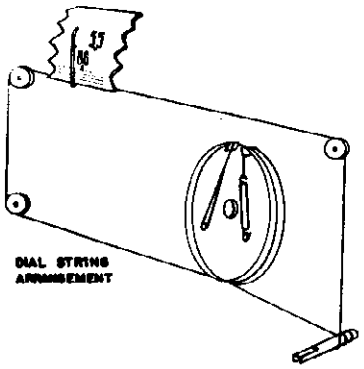
MODEL 8020
CHASSIS 132.841

SEARS, ROEBUCK & CO.

CIRCUIT CHANGES

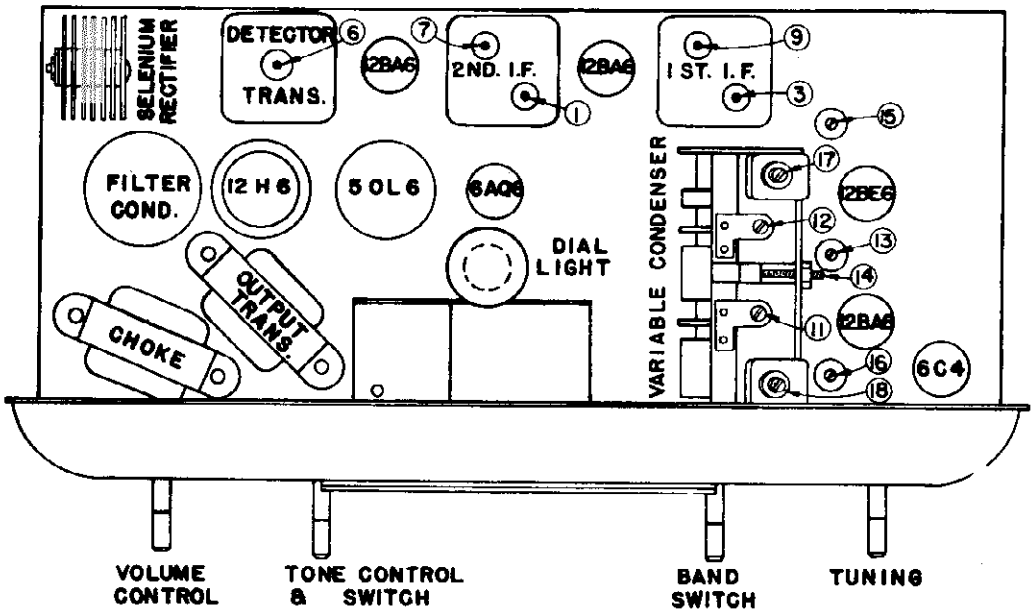
Before start of Production on this model, certain circuit improvements were made, which do not appear on the printed stickers and instruction sheets which accompany each receiver. These differences are as follows:

1. A pickup coil was added to the AM loop antenna.
2. C44 added to FM antenna circuit and C12 relocated in FM antenna circuit.
3. R27 added from plate of 50L6 to plate of 6AQ6.
4. C34 -- .005 Mfd. was .05 Mfd.
5. C38 -- .005 Mfd. was .002 Mfd.
6. C47 -- .002 Mfd. was .005 Mfd.
7. L4 -- is relocated on the Schematic Diagram.
8. R5 -- deleted from FM antenna circuit.

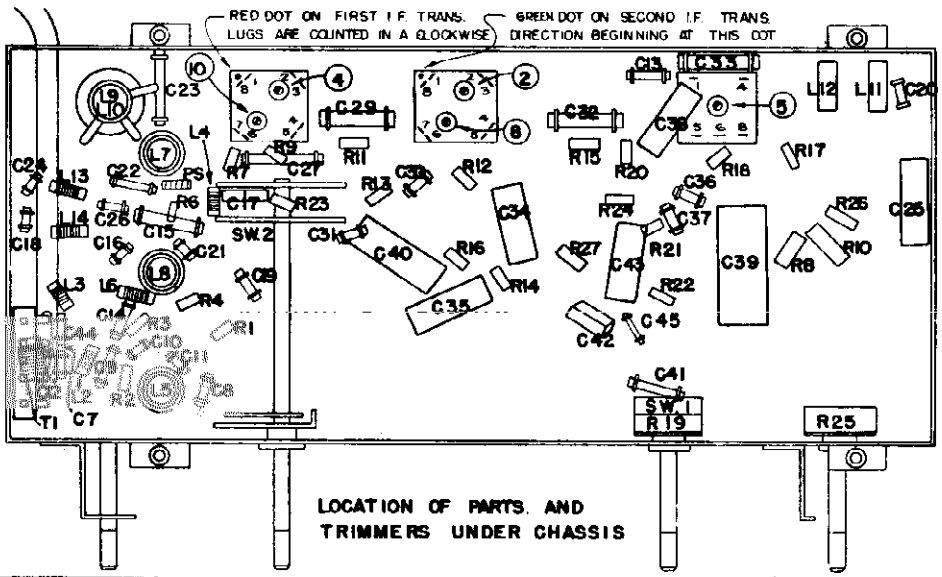


The following changes were made after some sets had been produced, to improve the sensitivity and tone.

1. C45 Condenser added from 50L6 screen grid to chassis .001 uf.
2. C12 Condenser changed from .001 uf. to .00001 uf.
3. C44 Condenser changed from .001 uf. to .00001 uf.
4. C34 Condenser changed from 400 Volt to 600 Volt.



LOCATION OF TUBES AND TRIMMERS ON TOP OF CHASSIS



LOCATION OF PARTS AND TRIMMERS UNDER CHASSIS

SEARS, ROEBUCK & CO. MODEL 8020
CHASSIS 132.841

ALIGNMENT PROCEDURE

PRELIMINARY:

Output meter connection ..... Across speaker voice coil
Output meter reading to indicate 50 MW (Standard Output) ..... .4 volt
Generator modulation ..... 30 % 400 cycles
Position of volume control ..... Fully clockwise
Set dial pointer ..... To last mark on left end of dial with variable condenser closed
Set band switch ..... To left for AM alignment and to right for FM alignment

AM ALIGNMENT

POSITION OF VARIABLE	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION HIGH SIDE	GENERATOR CONNECTION GROUND LEAD	ADJUST TRIMMERS IN ORDER SHOWN FOR MAX. OUTPUT	TRIMMER FUNCTION
Open	455 Kc	.05 Mfd.	Mixer grid	Chassis	1-2-3-4	IF
1400 Kc	1400 Kc		*Test loop	Test loop	11	Oscillator
1400 Kc	1400 Kc		*Test loop	Test loop	12	Antenna
**600 Kc	600 Kc		*Test loop	Test loop	Check point	Antenna

*Connect generator lead to a Standard Hazeltine Test Loop, Model 1150, placed two feet from the set loop, or three turns of wire about six inches in diameter, placed about one foot from the set loop. Or the generator can be connected with the high side lead to the green lead on the set loop and the ground lead to the chassis.

**With a generator signal of 600 Kc, tune the set to the point where maximum output is obtained, which should be approximately 600 Kc on the dial. Adjust antenna section plates of variable for maximum output.

The alignment procedure should be repeated in the original order for greatest accuracy.

Always keep the output from the signal generator at its lowest possible value to make the A.V.C. action of the receiver ineffective.

FM ALIGNMENT

Discriminator

POSITION OF VARIABLE	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION HIGH SIDE	GENERATOR CONNECTION GROUND LEAD	ADJUST TRIMMERS IN ORDER SHOWN	TRIMMER FUNCTION
Open	10.7 Mc	.05 Mfd.	2d IF grid	Chassis	*5, 6	Discriminator

*5 is adjusted for maximum A.V.C. voltage.
*6 is adjusted for zero reading of a vacuum tube voltmeter connected across the volume control. Rock this adjustment through the zero point to see that the voltage is positive on one side of the zero point and negative on the other.

IF

Open	10.7 Mc	.05 Mfd.	Mixer grid	Chassis	7, 8, 9, 10	IF

Adjust trimmers for maximum A. V. C. voltage.

Repeat "Discriminator" and "IF Alignment" with generator connected to mixer grid, being careful not to shift the generator frequency during this operation.

NOTE: If a 10.7 Mc FM generator is not available for alignment of discriminator and IF, an unmodulated signal of 10.7 Mc from an accurately calibrated conventional AM type generator can be used.

RF

108 Mc	108 Mc	200 Ohm Resistor	Ant. Terminal on Rear Cover	Ant. Terminal on Rear Cover	14	Oscillator
88 Mc	88 Mc	200 Ohm Resistor	Ant. Terminal on Rear Cover	Ant. Terminal on Rear Cover	13	Oscillator

Repeat the above oscillator adjustments until proper coverage is obtained.

105 Mc	105 Mc	200 Ohm Resistor	Ant. Terminal on Rear Cover	Ant. Terminal on Rear Cover	17, 18	Mixer & Antenna
91 Mc	91 Mc	200 Ohm Resistor	Ant. Terminal on Rear Cover	Ant. Terminal on Rear Cover	15, 16	Mixer & Antenna

All RF trimmers are adjusted for maximum output.

Repeat "Mixer & Antenna" adjustments until proper tracking is obtained.

MODEL 8020
CHASSIS 132.841

SEARS, ROEBUCK & CO.

PARTS LIST

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
	M21535	Cabinet (Less metal grille & dial cover)
L15	M21394-2	Choke, 84 Filter
L2,L3,L6	M21405-1	Choke, R. F.
L6,L13,L14		
L11, L12	M21406-1	Choke, R. F.
L5	M21398-1	Coil, F. M., First R. F.
L7	M21400-1	Coil, F. M., Second R. F.
L9,L10	M21396-1	Coil, A. M. Oscillator
L8	M21397-1	Coil, F. M. Oscillator
C1,C2,C3	M21401-2	Condenser, Variable
C4,C5		
C6		Condenser, .00005 Mfd., 500 Volts
C7		Condenser, .0001 Mfd., 500 Volts
C8		Condenser, .0005 Mfd., 350 Volts
C9		Condenser, .01 Mfd., 350 Volts
C10		Condenser, .00005 Mfd., 350 Volts
C11		Condenser, .00005 Mfd., 500 Volts
C12, C44		Condenser, .00001 Mfd., 350 Volts
C13		Condenser, .001 Mfd., 350 Volts
C14		Condenser, .001 Mfd., 350 Volts
C15		Condenser, .005 Mfd., 350 Volts
C16		Condenser, .00001 Mfd., 500 Volts
C17		Condenser, .0002 Mfd., 500 Volts
C18		Condenser, .00005 Mfd., 500 Volts
C19		Condenser, .0001 Mfd., 500 Volts
C20		Condenser, .0001 Mfd., 500 Volts
C21		Condenser, .000027 Mfd., 500 Volts
C22		Condenser, .001 Mfd., 350 Volts
C23		Condenser, .005 Mfd., 350 Volts
C24		Condenser, .00005 Mfd., 500 Volts
C25		Condenser, .05 Mfd., 400 Volts
C26		Condenser, .00002 Mfd., 500 Volts
C27		Condenser, .005 Mfd., 350 Volts
C28A,C28B, C28C, C28D	M21402	Condenser, Electrolytic 40-40-80 Mfd., 150 Volt, 20 Mfd., 25 Volts
C29		Condenser, .005 Mfd., 350 Volts
C30		Condenser, .0001 Mfd., 500 Volts
C31		Condenser, .0001 Mfd., 500 Volts
C32		Condenser, .005 Mfd., 350 Volts
C33		Condenser, .005 Mfd., 150 Volts
C34		Condenser, .005 Mfd., 600 Volts
C35		Condenser, .01 Mfd., 400 Volts
C36		Condenser, .00005 Mfd., 500 Volts
C37		Condenser, .00005 Mfd., 500 Volts
C38		Condenser, .005 Mfd., 350 Volts
C39	M21403	Condenser, Electrolytic, 8 Mfd., 50 Volts
C40		Condenser, .05 Mfd., 200 Volts
C41		Condenser, .002 Mfd., 200 Volts
C42		Condenser, .00025 Mfd., 500 Volts
C43		Condenser, .005 Mfd., 600 Volts
C45		Condenser, .001 Mfd., 350 Volts
R19	M21661	Control, Volume, 1 Megohm

MU-CODE	SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
BS	Sw-1, R25	M21662	Control, AC Switch & Tone, 1 Megohm
		M19132	Cord, Dial Drive
		M21585	Cover, Dial
		M21584	Grille, Metal
			Lamp, Dial, Mazda, No. 47
	N	M21592	Leaflet, Instruction
	L1	M21605-1	Loop Antenna Assembly, A. M.
		M20054-5	Power Cord and Plug
		M21604	Pointer, Dial
BS	R1		Resistor, 1000 Ohms, 1/4 Watt
	R2		Resistor, 1 Megohm, 1/4 Watt
	R3		Resistor, 68 Ohm, 1/4 Watt
	R4		Resistor, 330 Ohm, 1/4 Watt
	R5		Resistor, 220 Ohm, 1/4 Watt
	R6		Resistor, 22,000 Ohm, 1/4 Watt
	R7		Resistor, 330 Ohm, 1/4 Watt
	R8		Resistor, 22 Ohm, 1/4 Watt
	R9		Resistor, 100,000 Ohm, 1/4 Watt
	R10		Resistor, 100 Ohm, 1/4 Watt
	R11		Resistor, 68 Ohms, 1/4 Watt
	R12		Resistor, 1000 Ohm, 1/4 Watt
	R13		Resistor, 22,000 Ohm, 1/4 Watt
	R14		Resistor, 330,000 Ohm, 1/4 Watt
	R15		Resistor, 68 Ohm, 1/4 Watt
	R16		Resistor, 6.8 Megohm, 1/4 Watt
	R17		Resistor, 1,000 Ohm, 1/4 Watt
	R18		Resistor, 100 Ohm, 1/4 Watt
	R20		Resistor, 22,000 Ohm, 1/4 Watt
	R21		Resistor, 6800 Ohms, 1/4 Watt
	R22		Resistor, 5800 Ohms, 1/4 Watt
	R23		Resistor, 2.2 Megohm, 1/4 Watt
	R24		Resistor, 1 Megohm, 1/4 Watt
	R26		Resistor, 220 Ohm, 1/4 Watt
	R27		Resistor, 2.2 Megohm, 1/4 Watt
		M21601	Scale, Dial
		M21603	Shaft, Tuning
		M19134-4	Socket,Dial Light with Leads
		M21709-1	Suppressor, Parasitic
	Sw-2	M21662	Switch, Wave
		M21658	Speaker, 5-1/4" P.M.
		M19295	Spring, Dial Cord
	T2	M21390-2	Transformer, First I. F.
	T3	M21391-2	Transformer, Second I. F.
	T1	M21388-1	Transformer, Antenna Coupling
	T4	M21392-2	Transformer, F. M. Detector
	T5	M21393-2	Transformer, Output
		M20207-3	Rectifier, Selenium
		M21587	Knob, Tuning
		M21588	Knob, Volume
		M21589	Knob, Tone (Off-On)
		M21590	Knob, AM-FM

Subject: General Service Suggestions and Circuit Changes.

This supplement is issued for the purpose of distributing information which should be helpful in servicing this radio. The following points are covered.

1. REDUCTION OF HUM LEVEL:

On some earlier production sets, excessive hum may be reduced to an acceptable level by reversing the intermediate and output sections of the electrolytic condenser, part no. M21402. The intermediate section, indicated as C28C on the Schematic Diagram printed herewith, should be 80 Mfd., and the output section 40 Mfd. Should these be connected oppositely, reversing them as indicated in the diagram below, will result in a lower hum level.

2. MICROPHONISM:

Examination of the metal chassis will disclose that the R. F. unit (variable condenser, three miniature tubes and related parts underneath) is rubber mounted on a separate panel. Any direct contact between this panel and the main chassis base may result in a tendency toward microphonics, particularly at high volume level. Slightly loosening the three mounting screws which protrude through the rubber grommets,so as to free the "floating" action of the panel, will, in some cases, eliminate the microphonic tendency. It may be necessary also to pry up the front edge of the panel in order to clear contact with the head of the rivet in the front of the panel. On later production sets, the location of this rivet was changed, so as to avoid any contact with the main chassis base.

3. DISTORTION AT LOW VOLUME LEVEL:

A complaint of low volume distortion or "hum modulation" may be satisfied by the addition of a .001 mfd. condenser from the 50L6GT screen grid to chassis ground. This addition was incorporated in early production; however, some sets were shipped without it

4. NEW CIRCUITS:

(4) additional circuit changes have been made in current production. These are indicated on the revised schematic diagram printed here, and are as follows:

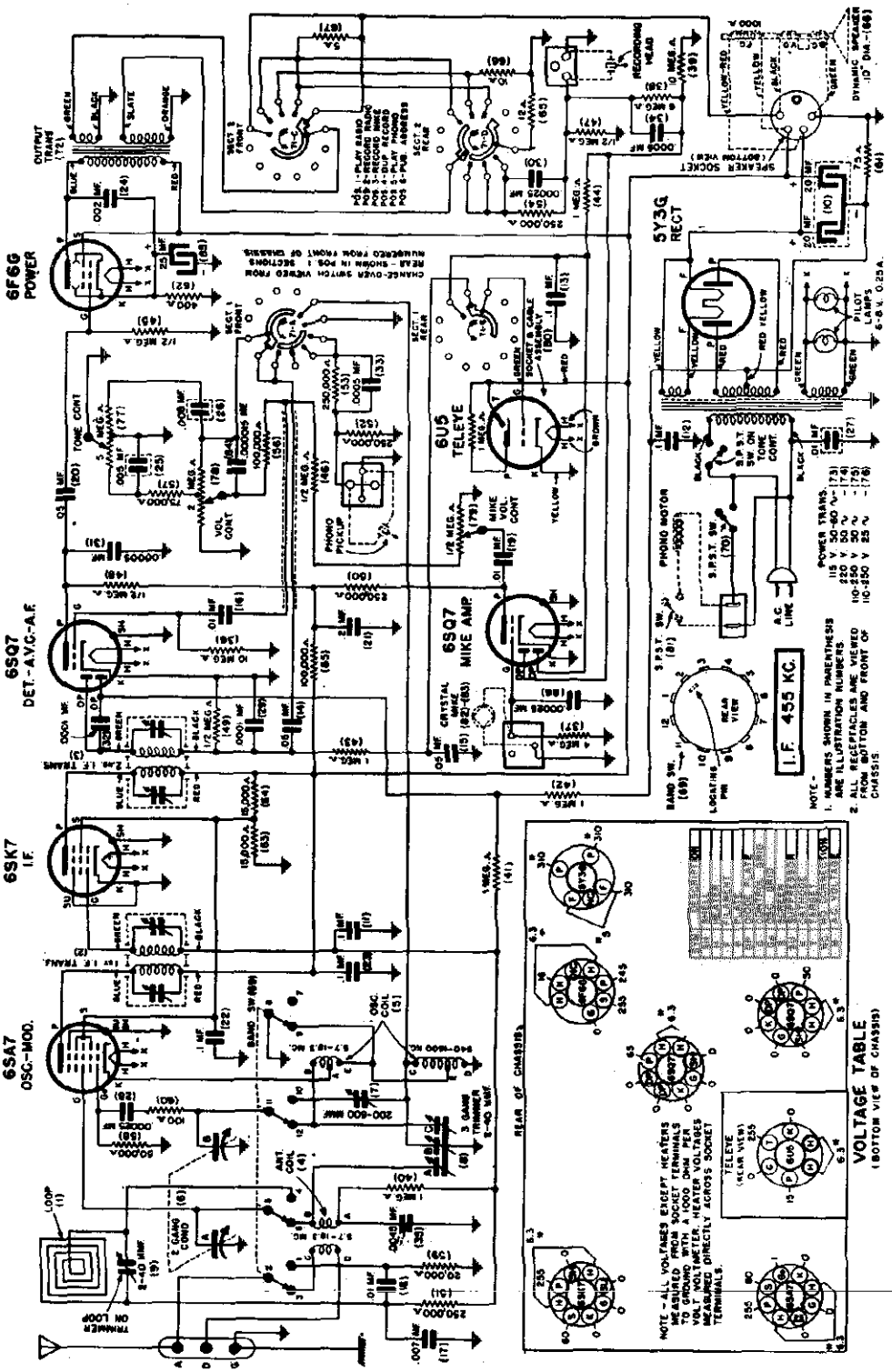
1. Condenser C6 - .00005 mfd., deleted.
2. Condenser C46 - .005 mfd., added across antenna loop sections and connection to antenna screw terminals removed.
3. Condenser C41 - changed from .002 mfd. to .005 mfd.
4. Condenser C38 - changed from .005 mfd. to .002 mfd.

Any set not wired in accordance with the above #2 change should be changed over, only if it is to be used in conjunction with an external antenna. Otherwise, these changes are not necessary.

Changes #3 and #4 make the tone control more effective.

SENTINEL RADIO CORP.

MODEL 216J

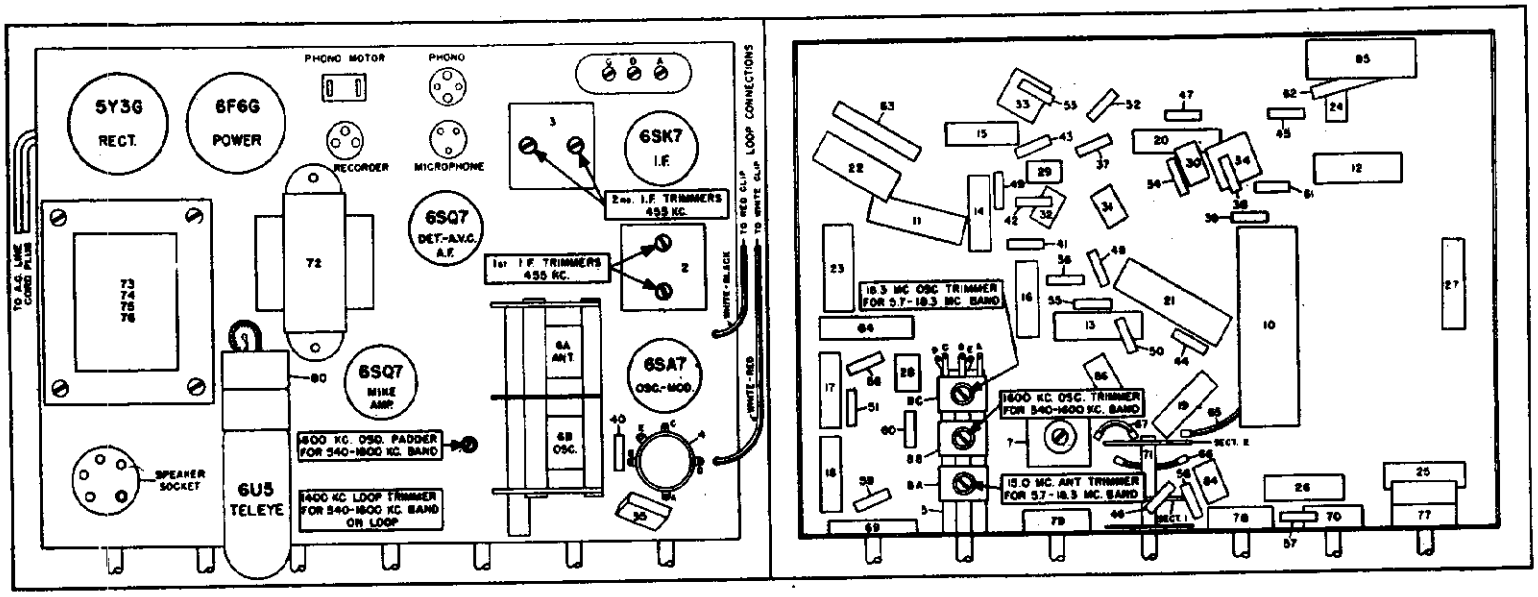


ALIGNMENT PROCEDURE

For alignment procedure read tabulations from left to right. If more than one adjustment is required on any one band, make the adjustment marked (1) first, (2) next, (3) third. IMPORTANT: BEFORE ALIGNING, PLACE LOOP ANTENNA IN THE SAME POSITION IT WILL BE IN WHEN THE SET IS IN THE CABINET, AND HAVE CHANGE OVER SWITCH KNOB IN "PLAY RADIO" POSITION.

When adjusting 1600 kilocycle oscillator trimmer and 1400 kilocycle antenna trimmer, do not connect oscillator to loop. Couple test oscillator to receiver loop by: (a) Make a loop consisting of five to ten turns of No. 20 to 30 size wire wound on a three inch form and attach across output of test oscillator. (b) Place test oscillator loop near set loop—BE SURE THAT NEITHER MOVES WHILE ALIGNING.

Place band switch for operation on:	Set Receiver dial to:		TEST OSCILLATOR: Adjust test oscillator frequency to:	TEST OSCILLATOR: Use dummy antenna in series with output of test oscillator consisting of:	TEST OSCILLATOR: Attach output of test oscillator to:	Refer to parts layout diagram for location of trimmers mentioned below:
I. F. alignment use any band position.	Any point where no interfering signal is received		Exactly 455 K. C.	0.2 Mfd. condenser	High side to grid of 6SA7 tube.	Adjust each of the second I.F. transformer trimmers for maximum output, then adjust each of the first I.F. transformer trimmers for maximum output.
1600 to 540 K.C. Band	1	Exactly 1600 K.C.	Exactly 1600 K.C.	None	Use Small Loop to couple test oscillator to receiver loop.	Adjust 1600 K. C. oscillator trimmer for maximum output.
	2	Approx. 1400 K.C.	Approx. 1400 K.C.	None	Use Small Loop to couple test oscillator to receiver loop.	While rocking gang condenser adjust 1400 K. C. loop trimmer for maximum output.
	3	Approx. 600 K.C.	Approx. 600 K.C.	None	Use Small Loop to couple test oscillator to receiver loop.	While rocking gang condenser adjust 600 K. C. oscillator padder for maximum output.
5.7 to 18.3 M.C. Band	1	Exactly 18.3 M.C.	Exactly 18.3 M.C.	400 Ohm carbon resistor	High side to "A" Post. Low side to chassis.	Adjust 18.3 M.C. oscillator trimmer for maximum output—be sure to use proper peak. If more than one peak is noticed, back off trimmer to minimum capacity, then screw down trimmer (add capacity) until the second peak—which is the proper one to use is tuned in.
	2	Approx. 15 M.C.	Approx. 15 M.C.	400 Ohm	High side to "A" Post, Low side to chassis.	While rocking gang condenser adjust 15 M. C. antenna trimmer for maximum output.



VOLTAGE RATING

WHILE THE RADIO MAY BE OPERATED ON EITHER 50 OR 60 CYCLE 100-120 VOLT ALTERNATING CURRENT (A.C.), THE PHONOGRAPH MOTOR MUST BE USED ON THE FREQUENCY DESIGNATED ON THE PAPER LICENSE TAG, which will be found attached to the cabinet.

Check receiver and recorder motor voltage and frequency rating before attempting to operate this unit. Be sure that the voltage and frequency rating given on the license tag is the same as the house current supply.

IF THE LICENSE NOTICE IS MARKED 115 VOLTS 60 CYCLE, THE PHONOGRAPH MOTOR IS DESIGNED FOR OPERATION ON 110-120 VOLTS 60 CYCLE CURRENT ONLY.

IF LICENSE NOTICE IS MARKED 115 VOLTS 50 CYCLE, THE PHONOGRAPH MOTOR IS DESIGNED FOR OPERATION ON 110-120 VOLT 50 CYCLE CURRENT ONLY

AERIAL

THE LOOP AERIAL SUPPLIED with the radio should provide ample 540-1600 kilocycle band reception in average locations.

OUTSIDE AERIAL

LOOP AERIALS ARE NOT SATISFACTORY FOR SHORT WAVE RECEPTION, AND BECAUSE OF THIS AN EXTERNAL AERIAL MUST BE ATTACHED TO THE RADIO WHEN TUNING FOR SHORT WAVE STATIONS. Also, if the radio is used in shielded areas or when located a great distance from broadcast stations, the volume of the stations operating in the 560-1600 kilocycle band may not be ample, in which case it would be necessary to attach a 35 to 50 foot outdoor aerial to the receiver to obtain satisfactory results.

A DOUBLET TYPE ANTENNA can be used and will be of aid in eliminating man made static noises in locations where this interference is excessive, if the flat top of the aerial can be located outside of the field of disturbance. Satisfactory doublet type aerials containing necessary material and complete installation instructions are available in kit form from most radio dealers.

THERE ARE THREE POSTS marked "A," "D," and "G" on the rear of the chassis. When the receiver is shipped from the factory a flexible wire is connected to post "D" and "G." When a straight aerial is used this wire should be left in this position and the aerial lead-in connected to the post marked "A."

When a doublet type antenna is used, remove the small piece of wire connecting "G" and "D" posts together and attach one of the doublet antenna lead-ins to "A" post and the other to "D" post.

GROUND

A GOOD GROUND such as a cold water pipe, steam radiator, or an iron rod driven into the ground three or four feet in a place where it is moist should be attached to the post marked "G" regardless of the type of antenna used.

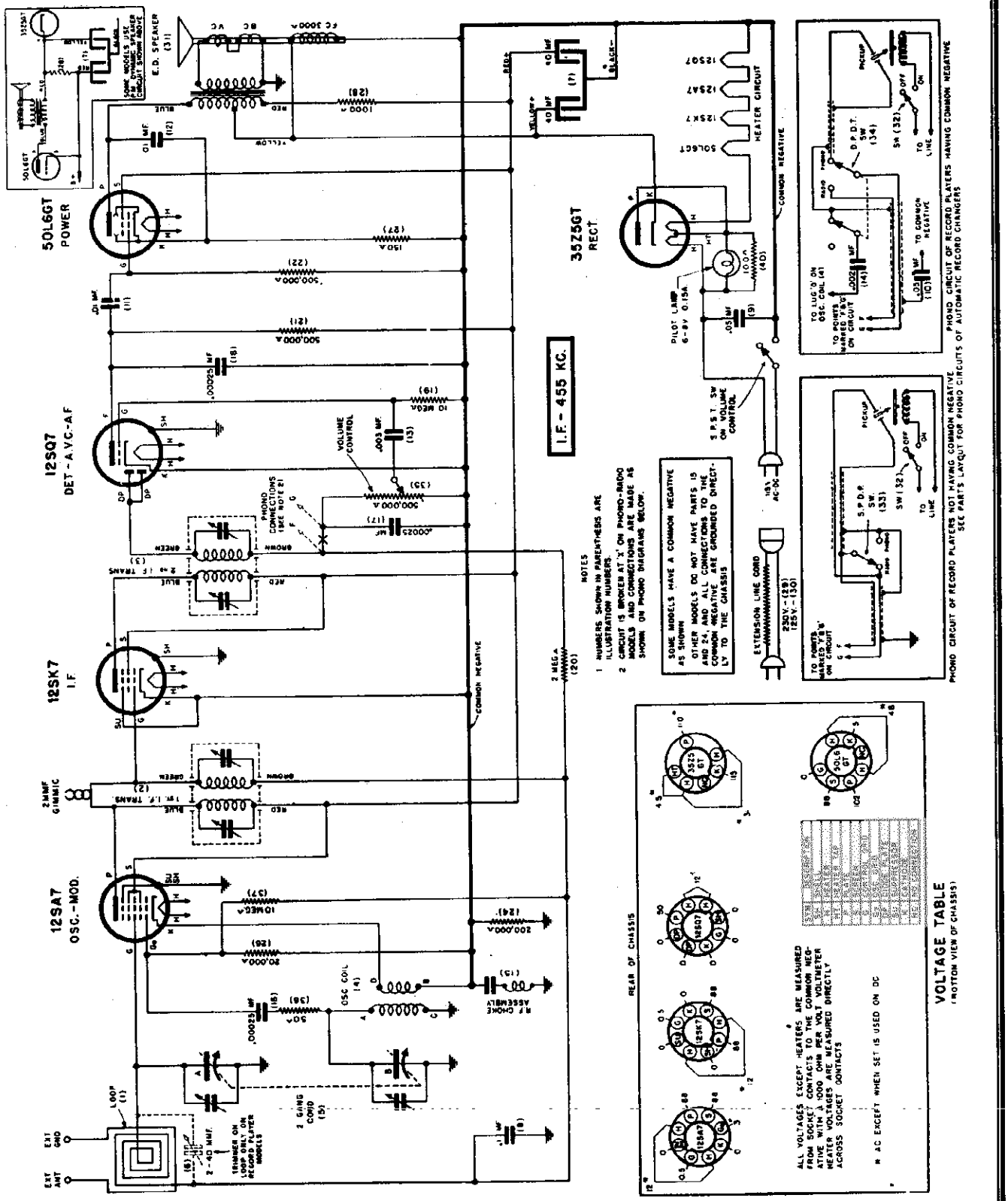
PARTS LIST

Illus. No.	Part No.	Part Name	Description
1	12150	Coil	Loop Antenna
2	4404	Coil	1st I.F. Transformer
3	4404	Coil	2nd I.F. Transformer
4	12118	Coil	Antenna
5	12119	Coil	Oscillator
6	12121	Condenser	Tuning Two Gang—With Pulley
7	3596	Condenser	Padder 340-460 Mmf.
8	3762	Condenser	Trimmer Three Gang Strip
9	1597	Condenser	Trimmer 3-35 Mmf.
10	12139	Condenser	Tubular Dry Elec. 20-20 Mfd. 450 V. D.C. Wkg.
11	1151	Condenser	Tubular .1 Mfd. 200 Volt
12	1151	Condenser	Tubular .1 Mfd. 200 Volt
13	1151	Condenser	Tubular .1 Mfd. 200 Volt
14	1147	Condenser	Tubular .05 Mfd. 200 Volt
15	1147	Condenser	Tubular .05 Mfd. 200 Volt
16	1149	Condenser	Tubular .01 Mfd. 200 Volt
17	10078	Condenser	Tubular .002 Mfd. 200 Volt 10%
18	9468	Condenser	Tubular .01 Mfd. 400 Volt
19	9468	Condenser	Tubular .01 Mfd. 400 Volt
20	9457	Condenser	Tubular .05 Mfd. 400 Volt
21	1219	Condenser	.2 Mfd. 400 Volt
22	9203	Condenser	.1 Mfd. 400 Volt
23	9203	Condenser	.1 Mfd. 400 Volt
24	1551	Condenser	.002 Mfd. 600 Volt
25	11856	Condenser	.005 Mfd. 200 Volt Shielded
26	11856	Condenser	.005 Mfd. 200 Volt Shielded
27	4305	Condenser	.01 Mfd. 200 Volt Shielded
28	9458	Condenser	Mica .00025 Mfd.
29	7934	Condenser	Mica .0001 Mfd.
30	9458	Condenser	Mica .00025 Mfd.
31	1544	Condenser	Mica .00005 Mfd.
32	7934	Condenser	Mica .0001 Mfd.
33	9459	Condenser	Mica .0005 Mfd.
34	9459	Condenser	Mica .0005 Mfd.
35	1628	Condenser	Mica .0045 Mfd.
36	4804	Resistor	Carbon 10 Megohm 1/3 Watt
37	1694	Resistor	Carbon 4 Megohm 1/3 Watt
38	2333	Resistor	Carbon 6 Megohm 1/3 Watt
39	4804	Resistor	Carbon 10 Megohm 1/3 Watt
40	7998	Resistor	Carbon 1 Megohm 1/3 Watt
41	7998	Resistor	Carbon 1 Megohm 1/3 Watt
42	7998	Resistor	Carbon 1 Megohm 1/3 Watt
43	7998	Resistor	Carbon 1 Megohm 1/3 Watt
44	7998	Resistor	Carbon 1 Megohm 1/3 Watt
45	6984	Resistor	Carbon 500,000 Ohm 1/3 Watt
46	6984	Resistor	Carbon 500,000 Ohm 1/3 Watt
47	6984	Resistor	Carbon 500,000 Ohm 1/3 Watt
48	6984	Resistor	Carbon 500,000 Ohm 1/3 Watt
49	6984	Resistor	Carbon 500,000 Ohm 1/3 Watt
50	8906	Resistor	Carbon 250,000 Ohm 1/3 Watt
51	8906	Resistor	Carbon 250,000 Ohm 1/3 Watt
52	8906	Resistor	Carbon 250,000 Ohm 1/3 Watt
53	8906	Resistor	Carbon 250,000 Ohm 1/3 Watt
54	8906	Resistor	Carbon 250,000 Ohm 1/3 Watt
55	8000	Resistor	Carbon 100,000 Ohm 1/3 Watt
56	8000	Resistor	Carbon 100,000 Ohm 1/3 Watt
57	3534	Resistor	Carbon 75,000 Ohm 1/3 Watt
58	6879	Resistor	Carbon 50,000 Ohm 1/3 Watt
59	1784	Resistor	Carbon 20,000 Ohm 1/3 Watt
60	2431	Resistor	Carbon 100 Ohm 1/3 Watt
61	12728	Resistor	Carbon 75 Ohm 1/3 Watt
62	3549	Resistor	Carbon 400 Ohm 1 Watt
63	1385	Resistor	Carbon 15,000 Ohm 1 Watt
64	12727	Resistor	Carbon 15,000 Ohm 3 Watt
65	12141	Resistor	Flexible Wire Wound 12 Ohm 2 Watt
66	12142	Resistor	Flexible Wire Wound 10 Ohm 2 Watt
67	12143	Resistor	Flexible Wire Wound 5 Ohm 1 Watt
68	12148	Speaker	Electro-Dynamic 10"
69	12134	Switch	Band
70	10014	Switch	Phono Motor
71	12133	Switch	Selector
72	12120	Transformer	Output
73	12135	Transformer	Power 115 Volt 50-60 Cycle
74	12136	Transformer	Power 220 Volt 50 Cycle
75	12137	Transformer	Power 110-250 Volt 50 Cycle
76	12138	Transformer	Power 110-250 Volt 25 Cycle
77	12131	Tone Control	With S.P.S.T. Switch
78	10227	Volume Control	
79	12132	Volume Control	(Microphone)
80	10108	Cable	6U5 Tuning Eye Socket and Cable Assembly
	12177	Recording Unit	With Motor for 115 Volt 50 Cycle Operation
	12162	Recording Unit	With Motor for 115 Volt 60 Cycle Operation
	12163	Recording Unit	With Motor for 220 Volt 50 Cycle Operation
	12164	Recording Unit	With Motor for 110-250 Volt 50 Cycle Operation
	12165	Recording Unit	With Motor for 110-250 Volt 25 Cycle
81	12169	Switch	S.P.D.T (On-Off)
82	12167	Microphone	With 10 Ft. Cable
84	10258	Condenser	Mica .000015 Mfd.
85	9196	Condenser	Tubular Dry Elec. 25 Mfd. 25 Volt
86	9458	Condenser	Mica .00025 Mfd.

MISCELLANEOUS PARTS

Part No.	Part Name	Description
10292	Bulb	6-8 Volt .250 Ampere Dial Light
8184	Dial Cord	30" of 16 Lb. Drive Cord
11693	Dial Spring	Cord Tension Spring
12122	Dial Shaft	Drive Shaft
12126	Dial Scale	Calibrated Glass Scale
12128	Dial Pointer	Large for Tuning Scale
12129	Dial Pointer	Small Indicator
11449	Escutcheon	For Dial with Crystal
12154	Knob	Marked "Tuning"
12155	Knob	Marked "Volume"
12156	Knob	Marked "Mike Volume"
12157	Knob	Marked "Off-On-Tone"
12158	Knob	Marked "Band Switch"
12159	Knob	Marked "Motor Switch"
12160	Knob	Marked "Change Over Switch"
	Needle	Cutting
	Needle	Play Back
12172	Plug	For Recorder
12173	Plug	For Microphone
12174	Plug	For Phonograph
12114	Socket	For Recorder
12115	Socket	For Microphone
12116	Socket	For Phonograph
12226	Socket	For Phonograph Motor
11698	Strip	Three Post—Antenna and Ground Terminal

MODELS 248, 10-248 SENTINEL RADIO CORP.



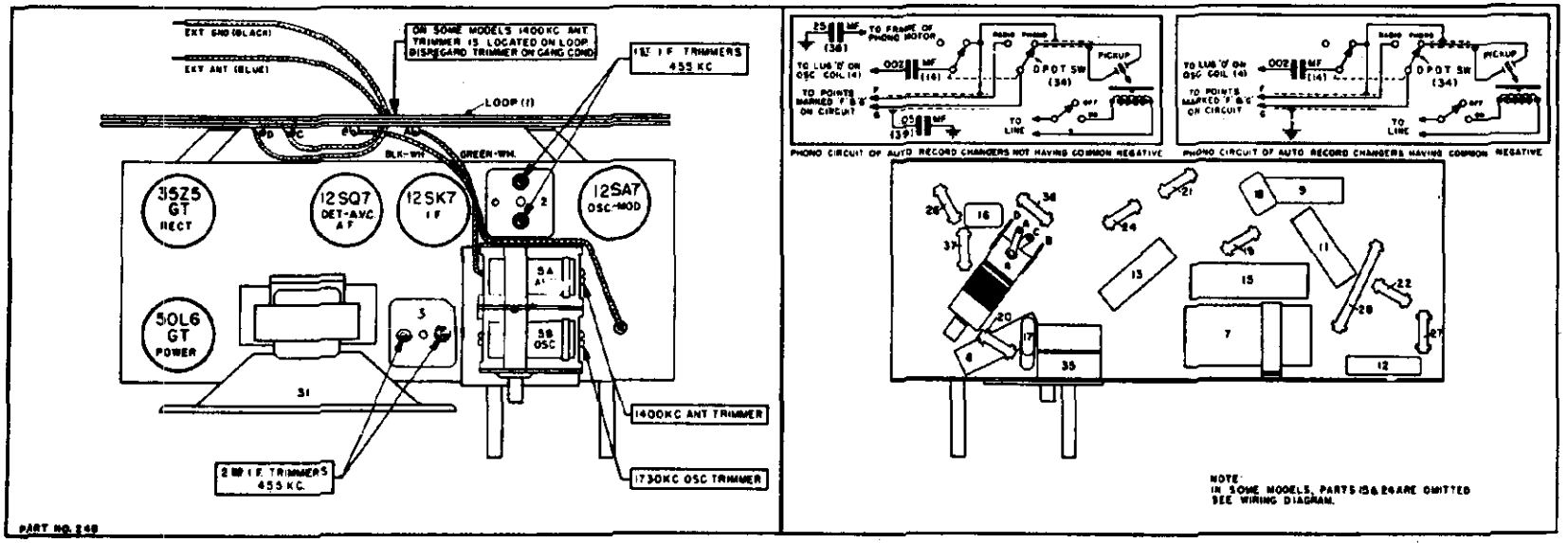
New Products Model 300, ARCR-312; R.C.A. Model 9865, ARCR-963;

ALIGNMENT PROCEDURE

For alignment procedure read tabulations from left to right. If more than one adjustment is required on any one band, make the adjustment marked (1) first, (2) next, (3) third. IMPORTANT: BEFORE ALIGNING, PLACE LOOP ANTENNA IN THE SAME POSITION IT WILL BE IN WHEN THE SET IS IN THE CABINET.

When adjusting 1730 kilocycle oscillator trimmer and 1400 kilocycle antenna trimmer, do not connect test oscillator to loop. Couple test oscillator to receiver loop by: (a) Make a loop consisting of five to ten turns of No. 20 to 30 size wire wound on a three inch form and attach across output of test oscillator. (b) Place test oscillator loop near set loop—BE SURE THAT NEITHER MOVES WHILE ALIGNING.

	Set receiver dial to:	Adjust test oscillator frequency to:	Use dummy antenna in series with output of test oscillator consisting of:	Attach output of test oscillator to:	Refer to parts layout diagram for location of trimmers mentioned below:
Any point where no interfering signal is received		Exactly 455 K.C.	0.1 Mfd. condenser	High side to grid of 12SA7 tube. Low side to frame of gang condenser through .01 Mfd. condenser.	Adjust each of the second I.F. transformer trimmers for maximum output, then adjust each of the first I.F. transformer trimmers for maximum output.
1	Exactly 1730 K.C.	Exactly 1730 K.C.	None	Use Small Loop to couple test oscillator to receiver loop. Low side to frame of gang condenser through .01 Mfd. condenser.	Adjust 1730 K. C. oscillator trimmer for maximum output.
2	Approx. 1400 K.C.	Approx. 1400 K.C.	None	Use Small Loop to couple test oscillator to receiver loop. Low side to frame of gang condenser through .01 Mfd. condenser.	While rocking gang condenser adjust 1400 K. C. loop trimmer for maximum output.



VOLTAGE RATING

BE SURE THAT THE VOLTAGE RATING MARKED ON THE WHITE PAPER LICENSE NOTICE ATTACHED EITHER TO THE BOTTOM OR THE INSIDE OF THE CABINET IS EXACTLY THE SAME AS YOUR HOUSE LIGHT CURRENT SUPPLY—IF IN DOUBT CONSULT YOUR LOCAL ELECTRIC LIGHT COMPANY OR RADIO DEALER.

VOLTAGE RATING OF ALL MODELS NOT EQUIPPED WITH PHONO PLAYER OR AUTOMATIC RECORD-CHANGER

IF THE RECEIVER IS NOT EQUIPPED WITH PHONO PLAYER OR AUTOMATIC RECORD-CHANGER it may be used on either 110-120 volt 50/60 cycle alternating current (AC) or 110-120 volt direct current (DC).

If the radio does not operate on DC current after approximately one minute remove the plug on the end of radio line cord from the house current receptacle turn it half way around (180°) and re-insert it into power receptacle.

VOLTAGE RATING OF PHONO PLAYER AND AUTOMATIC RECORD-CHANGER MODELS

MODELS EQUIPPED WITH PHONO PLAYER OR AN AUTOMATIC RECORD-CHANGER ARE DESIGNED FOR USE ON ALTERNATING CURRENT ONLY. While the radio may be operated on either 50 or 60 cycle 110-120 volt alternating current (AC) the phonograph motor must only be used on the correct frequency.

If license notice is marked 115 volt 60 cycle the phonograph motor is designed for operation on 110-120 volt 60 cycle current only.

If license notice is marked 115 volt 50 cycle the phonograph motor is designed for operation on 110-120 volt 50 cycle current only.

DO NOT ATTEMPT TO OPERATE PHONO PLAYER OR RECORD CHANGER MODELS ON DIRECT CURRENT. TO DO SO WILL DAMAGE THE MOTOR.

THE LOOP AERIAL SUPPLIED with the radio should provide ample reception in average locations.

Loop aerials are directional — for maximum volume and range when using the loop carefully tune in the desired station, next lift the complete radio and slowly turn it until the station is heard with greatest volume, then set the radio down in this position.

OUTSIDE AERIAL

When the radio is used in shielded areas or when located a great distance from broadcast stations, the volume of some or all stations may not be ample in which case it would be necessary to ATTACH A 25-50 ft. OUTDOOR AERIAL TO THE BLUE LEAD COMING OUT THE REAR OF THIS CHASSIS to obtain satisfactory results.

GROUND

When a regular aerial is used, best result will be obtained with a ground attached to the black lead.

WARNING—Do not attach a ground direct to the radio chassis—ANY EXTERNAL GROUND CONNECTION TO ANY METAL PART OF THE CHASSIS WILL CAUSE A SHORT AND POSSIBLE DAMAGE.

PARTS LIST

Illus. No.	Part No.	Part Name	Description
1	13222	Coil	Loop Antenna (A & B)
1	13259	Coil	Loop Antenna (C & D)
1	13254	Coil	Loop Antenna (E & F)
2	13213	Coil	First I.F. Transformer
3	11966	Coil	Second I.F. Transformer
4	13221	Coil	Oscillator
5	13215	Condenser	Tuning (2 Gang) with Pulley
6	1567	Condenser	Trimmer 3-35 Mmf (A & C)
7	13701	Condenser	Tubular Dry Elec. 40-40 Mfd 150 V (B, D & F)
7	13545	Condenser	Tubular Dry Elec. 40-40 Mfd 150V (A, C, & E)
8	1151	Condenser	Tubular .1 Mfd. 200 Volt
9	9457	Condenser	Tubular .05 Mfd. 400 Volt
10	9457	Condenser	Tubular .05 Mfd. 400 Volt (C)
11	9468	Condenser	Tubular .01 Mfd. 400 Volt
12	9468	Condenser	Tubular .01 Mfd. 400 Volt
13	1568	Condenser	Tubular .003 Mfd. 400 Volt
14	10702	Condenser	Tubular .002 Mfd. 400 Volt (C, E & F)
15	13474	Condenser	R.F. Choke Wound as a Tubular .2 Mfd. 400 Volt (A, C & E)
16	9456	Condenser	Mica .00025 Mfd. + or — 20%
17	9456	Condenser	Mica .00025 Mfd. + or — 20%
18	9456	Condenser	Mica .00025 Mfd. + or — 20%
19	4804	Resistor	Carbon 10 Meg Ohm 1/3 Watt
20	2705	Resistor	Carbon 2 Meg Ohm 1/3 Watt
21	6984	Resistor	Carbon 500,000 Ohm 1/3 Watt
22	6684	Resistor	Carbon 500,000 Ohm 1/3 Watt
24	2155	Resistor	Carbon 200,000 Ohm 1/3 Watt (A, C, & E)
25	1784	Resistor	Carbon 20,000 Ohm 1/3 Watt
27	6618	Resistor	Carbon 150 Ohm 1/3 Watt
28	4993	Resistor	Carbon 1,000 Ohm 1 Watt
29	11660	Resistor	230 Volt Line Cord (B)
30	11661	Resistor	125 Volt Line Cord (B)
31	13288	Speaker	Permanent 5" (B & D)
	13284	Speaker	P.M. 5" (A & C)
	13280	Speaker	P.M. 5" (F)
	13283	Speaker	P.M. 5" (E)
	13285	Speaker	E.D. 5" (B & D)
	13286	Speaker	E.D. 5" (A & E)
	13287	Speaker	E.D. 5" (F)
	13288	Speaker	E.D. 5" (E)
32	12281	Switch	S.P.D.T. Motor On-Off Switch (C & D)
33	12281	Switch	S.P.D.T. Radio-Phone Switch (D)
34	12309	Switch	D.P.D.T. Radio-Phone Switch (D,E&F)
35	11703	Vol. Control	With S.P.S.T. Switch
36	11705	Resistor	Carbon 50 Ohm 1/3 Watt
37	4804	Resistor	Carbon 10 Meg Ohm 1/3 Watt
38	9652	Condenser	Tubular .25 Mfd. 200 Volt (F)
39	1147	Condenser	Tubular .05 Mfd. 200 Volt (F)
40	13540	Resistor	Carbon 100 Ohm ½ Watt

(A)—Used only in models having common ground and not equipped with phone player or automatic record changer.

(B)—Used only in models not having common ground and not equipped with phone player or automatic record-changer.

(C)—Used only in phone player model and having common ground.

(D)—Used only in phone player model not having common ground.

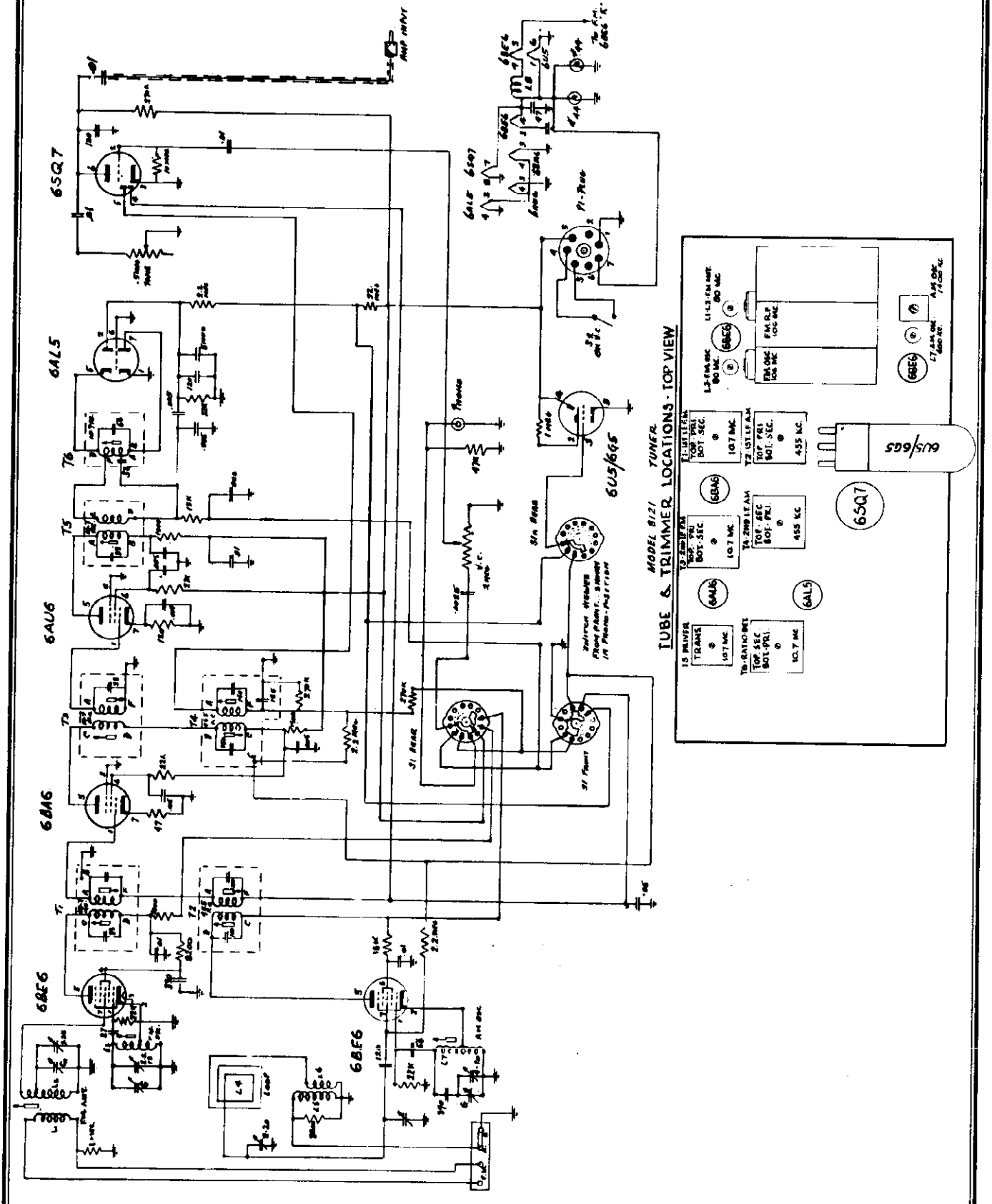
(E)—Used only in models having record-changer and having common ground.

(F)—Used only in models having record-changer and not having common ground.

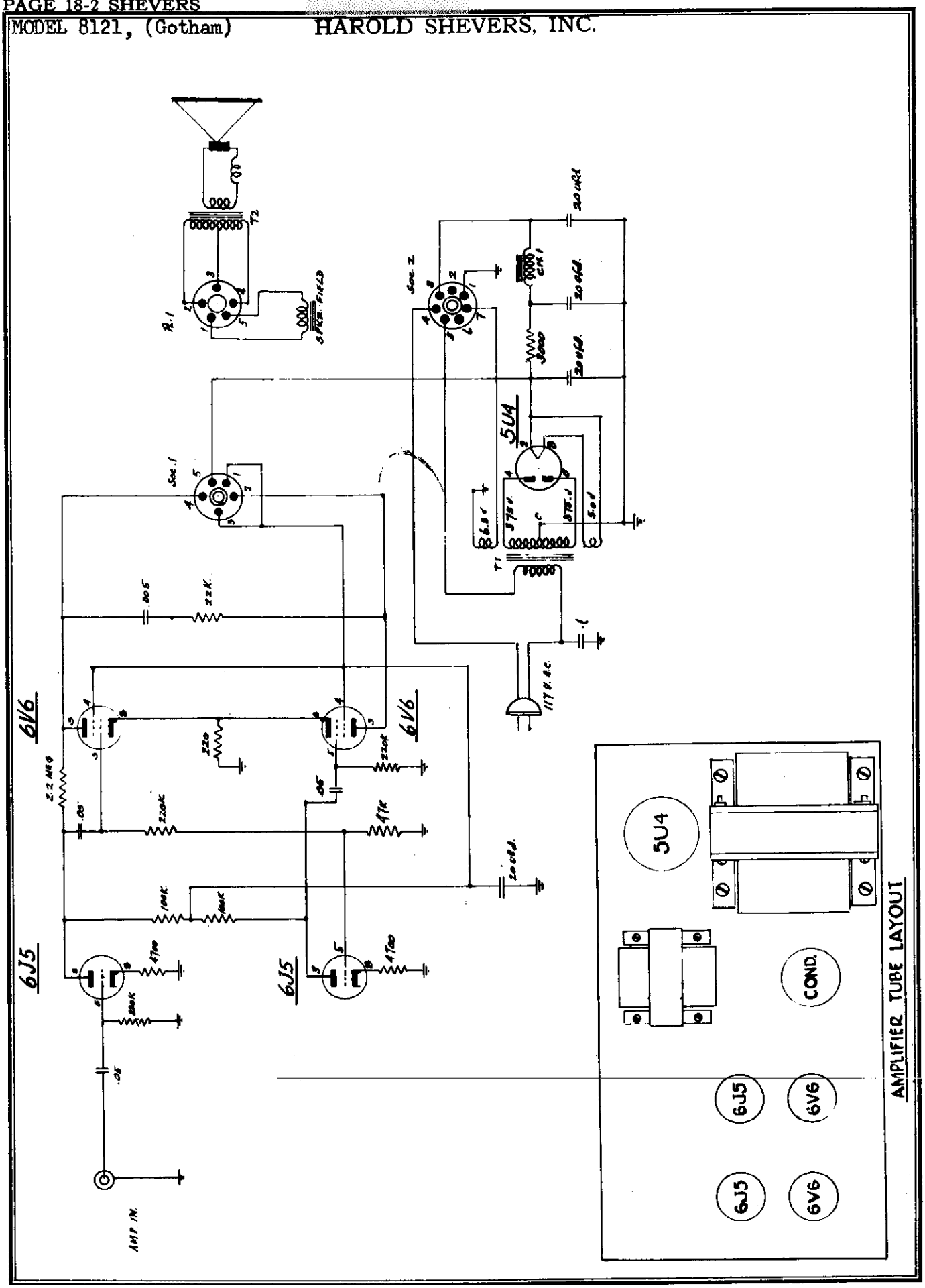
MISCELLANEOUS PARTS

Part No.	Part Name	Description
12022	Back	For Plastic Cabinets
12280	Back	For Phone Player Cabinet
11364	Bulb	6-8 Volt .150 Amp. No. 47 Bayonet Base Dial Light
276	Cabinet	Ivory Plastic
278	Cabinet	Walnut Plastic
13217	Dial Scale	Calibrated Scale
11992	Dial Shaft	Drive Shaft
6184	Dial Cord	17" of 18 Lb. Drive Cord
11357	Dial Crystal	Acetate Crystal for Dial
13245	Dial Pointer	Dial Indicator
12105	Knob	Used with Walnut Plastic Cabinet
12106	Knob	Used with Ivory Plastic Cabinet
12096	Knob	Used with Phone Player and Automatic Record-Changer Model only
12816	Pickup	Crystal Pickup and Arm Used Only with Phone-Player

HAROLD SHEVERS, INC. MODEL 8121, (Gotham)



MODEL 8121, (Gotham) HAROLD SHEVERS, INC.



ALIGNMENT PROCEDURE

Alignment Indicators:

A high resistance volt meter is necessary for measuring D.C. voltage during F.M. alignment. An output meter is also necessary to indicate minimum audio output during F.M. ratio detector alignment. The output meter may be connected across the speaker voice coil.

For A.M. alignment, the high resistance volt meter can be used as an indicator by measuring developed A.V.C. voltage.

F.M. RATIO DETECTOR ALIGNMENT

1. Connect a 680 ohm resistor between pins 5 and 7 of the ratio detector tube 6AL5. Connect the D.C. probe of the indicating meter to the negative lead of the 5 mfd. electrolytic condenser. The common lead is connected to ground.

2. Set the generator at 10.7 m.c., modulated 30% at 400 cycles (AM). Turn the volume control to maximum volume and connect the generator to the driver grid, pin 1, of the 6AU6 in series with a .01 mfd. condenser.

3. Adjust driver transformer, T5, for maximum D.C. across the 5 mfd. electrolytic condenser.

4. Remove the meter leads and disconnect the 680 ohm resistor. Connect two 100,000 ohms (±1%) resistors in series, across the 22,000 ohms ratio detector load resistor. Connect the common lead of the indicating meter to the center point of the 100,000 ohm resistors and the D.C. probe to terminal "A" of the ratio detector transformer, T6,

5. Repeat connections as in step 2 above and adjust T6, bottom core for zero D.C. balance. This point is approached rapidly and continued adjustment causes the indicated polarity to reverse. A slow approach to zero is an indication of severe detuning.

Adjust T6 top core for minimum audio output. Alternate the adjustments of the top and bottom core of T6 until minimum audio output and zero D.C. balance occur at the same point.

6. Disconnect the two 100,000 ohm resistors and repeat steps two and three, eliminating the 680 ohm resistor.

7. Repeat steps 5 and 6 until further adjustment does not improve the calibration.

A.M. ALIGNMENT

1. Connect the signal generator to pin 1, converter grid, 6BE6 in series with .01 condenser. Tune the generator to 455 kc.
2. Turn the radio dial to a quiet point at the low frequency end of the variable condenser.
3. Adjust the A.M. I.F. transformers for peak output.
4. Connect the signal generator to the antenna lead in series with 200 mmf. Tune the generator to 1400 kc.
5. Turn the radio dial to 1400 kc, and adjust the oscillator trimmer and the loop trimmer for peak output.
6. Set the generator and set at 600 kc. and "rock in" L7, oscillator coil.

NOTE:
Correct alignment of 455 kc. I.F. requires that the 10.7 mc. F.M. I.F. be aligned previously.

F.M. I.F.-R.F. ALIGNMENT

1. Connect the D.C. probe of the high resistance meter to the negative lead of the 5 mfd. electrolytic condenser and the common lead of the meter to ground.
2. Set the generator at 10.7 m.c., modulated 30% at 400 cycles (AM). Set the radio dial at the low frequency end of the variable condenser and connect the signal generator in series with a .01 condenser to pin 7 of the 6BE6.
3. Adjust the I.F. transformers for peak output on the meter.
4. Set the generator at 106 m.c. and connect the high side in series with 120 ohm resistor and the low side in series with 120 ohm resistor to the F.M. antenna terminals. Set the radio dial at 106 mc.
5. Adjust the F.M. osc. ceramic trimmer and the F.M. antenna trimmer maximum output.
6. Set the generator and radio dial for 90 mc. and adjust L3 and L2 oscillator and antenna coil for peak output.

MODEL 8121 TUNER MEASUREMENTS, VOLTAGE AND RESISTANCE

Tube	Pin	Voltage	Resistance
FM osc.	1	-.3	18 K
6BE6	2	0	0
	3	Gnd.	0
	4	AC	0
	5	175	over 500 K
	6	80	over 500 K
	7	0	0
IF amp.	1	-.5	2.5 meg
6AB6	2	Gnd.	Gnd.
	3	Gnd.	Gnd.
	4	AC	0
	5	170	over 500 K
	6	120	over 500 K
	7	.5	47 ohm
Ratio Detector	1	Gnd.	Gnd.
6AL5	2	-.5	18 K
	3	AC	0
	4	Gnd.	Gnd.
	5	-.25	
	6	Gnd.	Gnd.
	7	-.25	
Magic Eye	1	AC	0
6U5/6G5	2	50	over 500 K
	3	0	2 meg.
	4	200	over 500 K
	5	Gnd.	Gnd.
	6	Gnd.	Gnd.
AM osc.	1	-6.8	20 K
6BE6	2	0	0
	3	Gnd.	Gnd.
	4	AC	0
	5	190	over 500 K
	6	80	over 500 K
	7	0	4.5 meg.
FM driver	1	0	0
6AU6	2	Gnd.	Gnd.
	3	Gnd.	Gnd.
	4	AC	0
	5	185	over 500 K
	6	155	over 500 K
	7	1 V.	100 ohm
Detector	1	Gnd.	Gnd.
6SQ7	2	0	10 meg.
	3	Gnd.	Gnd.
	4	-.5	2 meg.
	5	-.3	220 K
	6	100	over 500 K
	7	AC	0
	8	Gnd.	Gnd.

MODEL 8121 AMPLIFIER MEASUREMENTS, VOLTAGE AND RESISTANCE

Tube	Pin	Voltage	Resistance
Input 6J5	1	Gnd.	Gnd.
	2	AC	0
	3	105	over 500 K
	4	N.C.	N.C.
	5	0	240 K
	6	N.C.	N.C.
	7	AC	0
	8	4.6	470 ohm
1st 6V6	11	Gnd.	Gnd.
	2	AC	0
	3	185	over 500 K
	4	200	over 500 K
	5	0	∞
	6	N.C.	N.C.
	7	AC	0
	8	15V	220 Ohm
Rectifier 5U4	1	N.C.	N.C.
	2	360	over 1 meg.
	3	N.C.	N.C.
	4	380 AC	70 ohm
	5	0	∞
	6	380 AC	70 ohm
	7	0	0
	8	0	∞
Inverter 6J5	1	Gnd.	Gnd.
	2	AC	0
	3	105	over 500 K
	4	N.C.	N.C.
	5	0	50 K
	6	N.C.	N.C.
	7	AC	0
	8	4.6	470 ohm
2nd 6V6	1	Gnd.	Gnd.
	2	AC	0
	3	185	over 500 K
	4	200	over 500 K
	5	0	300 K
	6	N.C.	N.C.
	7	AC	AC
	8	15V	200 ohm

All voltage taken with a 20,000 ohm per volt meter and taken with respect to chassis ground.

NOTE: 5 volts AC measured from pins 2 and 8 of 5U4 tube.

ELECTRICAL AND MECHANICAL SPECIFICATIONS

FREQUENCY RANGE

Broadcast (AM Band).....540-1600 kc.
Frequency Modulation (FM Band).....88-108. mc.

INTERMEDIATE FREQUENCY

Broadcast.....455 kc.
Frequency Modulation.....10.7 mc.

TUBE COMPLEMENT (Tuner)

1. 6BE6.....1st Det. & Osc. FM.
2. 6BE6.....1st Det. & Osc. AM.
3. 6BA6.....I.F. Amp.
4. 6AU6.....FM. Driver
5. 6AL5.....Ratio Detector
6. 6SQ7.....2nd Det., A.V.C. & A.F. Amplifier
7. 6U5/6G5.....AM-FM. Tuning Eye Indicator

TUBE COMPLEMENT (Amplifier-Power Supply)

8. 6J5.....2nd A. F.Amplifier
9. 6J5.....Phase Inverter
10. 6V6.....A.F. Power Amplifier
11. 6V6.....A.F. Power Amplifier
12. 5U4G.....Rectifier

FRONT PANEL CONTROLS

1. Tuning
2. Range Switch.....3 position; Phono, AM, FM
3. Tone.....Treble - Bass
4. Volume

POWER SUPPLY RATING

105-125 volts-60 cycles.....105 watts

PILOT LAMPS.....(2) No. 44, 6-8 volts, 0.25 amp.

LOUDSPEAKER

Type.....Rola G12, Auditorium Model
Size.....12" Electrodynamic
Voice coil impedance.....6.8 ohms at 400 cycles

POWER OUTPUT

Undistorted.....10 watts
Maximum.....14 watts

CIRCUIT DESCRIPTION

This receiver is a twelve tube combination FM-AM superheterodyne radio with provision for phono operation. Three separate sections are employed for the entire receiver; a tuner, amplifier-power supply and a metal encased auditorium speaker.

The tuner incorporates two separate convertors, one for FM and the other for the broadcast band. A range switch is provided with a third position allowing phonograph operation through the sound channel. A 6U5/6G5 tuning eye tube facilitates visual indication of proper tuning for both AM and FM operation.

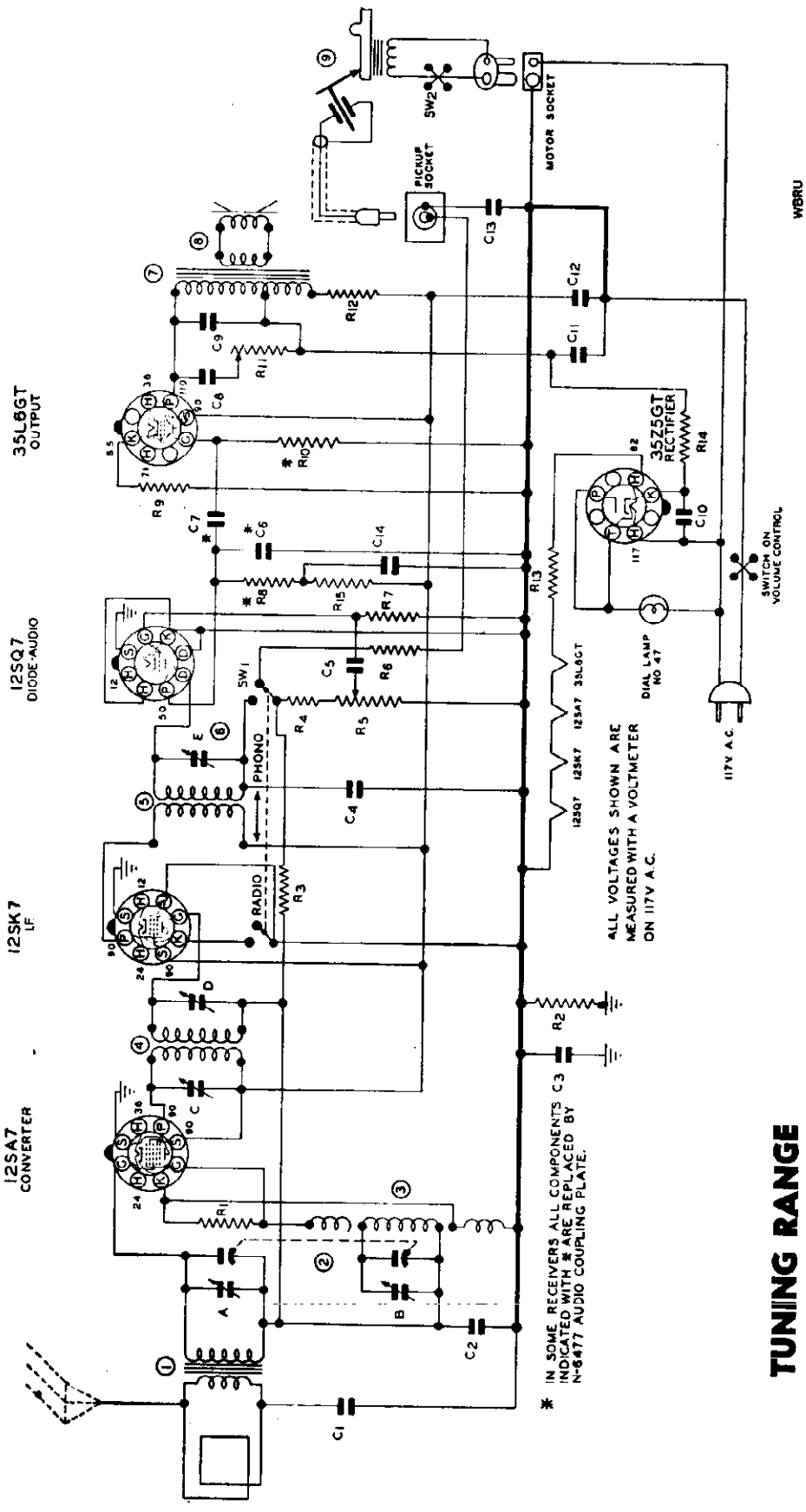
The set utilizes a ratio detector eliminating the necessity of a limiting stage preceeding the detector and having an inherent insensitivity to amplitude modulated signals.

A loop antenna is included for the broadcast band.

The amplifier section employs two 6J5 tubes as phase inverter and amplifier driving a pair of 6V6 in push-pull operation which deliver ten watts of undistorted output from a Rola G12 auditorium speaker.

A 5U4 rectifier is used in the power supply with separately filtered sections for both the tuner and amplifier.

SONORA RADIO & TELEV. CORP. MODEL WBRU-239



LF 455 KC.
5 TUBE A.C.-D.C.
SUPERHETERODYNE
SINGLE BAND
PHONO-CHANGER COMBINATION
DRAWN BY APP'D.
MARCH 1947

TUNING RANGE

The receiver is designed to operate over the standard broadcast band which extends from 535 to 1620 Kilocycles (KC) (185 to 560 Meters).

DIAL CALIBRATION. The scale is calibrated from 55 to 160 (Standard Broadcast). This band covers all Standard Broadcast frequencies of the United States, Canada, Mexico, Cuba and many Central and South American Countries. Add a zero to figures on the scale to obtain kilocycles.

SERVICE DATA

Lack of sensitivity and poor tone quality may be due to any one or a combination of causes such as weak or defective tubes or speaker, open or grounded bias resistor, bypass condenser, etc. Never attempt to realign set until all other possible sources of trouble have been first thoroughly investigated and definitely proved not to be the cause.

NOTE: IT IS ABSOLUTELY NECESSARY THAT AN ACCURATELY CALIBRATED TEST OSCILLATOR WITH SOME TYPE OF OUTPUT MEASURING DEVICE BE USED WHEN ALIGNING THE RECEIVER AND THAT THE PROCEDURE BE CAREFULLY FOLLOWED. OTHERWISE THE RECEIVER WILL BE INSENSITIVE AND THE DIAL CALIBRATION WILL BE INCORRECT. THE TRIMMERS WILL BE REFERRED TO BY THEIR FUNCTION AS INDICATED ON THE PARTS DIAGRAM.

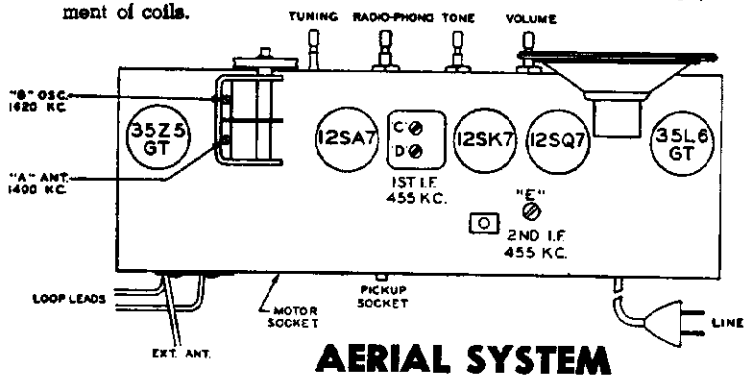
ALIGNMENT PROCEDURE

GENERAL DATA. The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 455, 600, 1400 and 1620 KC and an output meter to be connected across the primary or secondary of the output transformer. If possible, all alignments should be made with the volume control on maximum and the test oscillator output as low as possible to prevent the AVC from operating and giving false readings.

CORRECT ALIGNMENT PROCEDURE. The intermediate frequency (I.F.) stages should be aligned properly as the first step. After the I.F. transformers have been properly adjusted and peaked, the broadcast band should be adjusted.

I. F. ALIGNMENT. Remove chassis from the cabinet. Care should be taken to have no iron or other metal near the loop. Do not make this set-up on a metal bench. With the gang condenser set at minimum, adjust the test oscillator to 455 KC and connect the output to the grid of the first detector tube (12SA7) through a .05 or .1 mfd. condenser. The ground on the test oscillator should be connected to the ground buss, indicated on the circuit diagram. Align all three I.F. trimmers to peak or maximum reading on the output meter.

BROADCAST BAND ALIGNMENT. Connect the test oscillator to the antenna of the set through a 100 mmfd. (.0001) condenser. With the gang condenser set at minimum capacity, set the test oscillator at 1620 KC, and adjust the oscillator (or 1620 KC trimmer) on gang condenser. Next—set the test oscillator at 1400 KC, and tune in the signal on the gang condenser. Adjust the antenna trimmer (or 1400 KC trimmer) for maximum signal. Next set the test oscillator at 600 KC, and tune in signal on condenser to check alignment of coils.



AERIAL SYSTEM

The receiver has a built-in "loop" aerial. Its excellent design is such as to increase pick-up from stations having wide variations in signal strength. The efficiency and selectivity of the loop provide outstanding reception without the use of an external aerial. The "loop" aerial used on this receiver is somewhat directional so reception from weak stations can be improved by turning the set in the proper direction. In or near metal buildings, iron ore deposits or steel structures or in localities remote from broadcasting stations, reception can be improved by using an outside aerial 50 feet to 100 feet in length including lead-in. Connect the outside aerial to the aerial lead. When using the outside aerial it may be necessary to reverse the power cord plug in wall socket to eliminate hum or distortion.

DIA. NO.	PART NO.	DESCRIPTION
R1	N-4025	22,000 OHM .5W 20%
R2	N-4026	220,000 OHM .5W 20%
R3	N-1262	1 MEGOHM .5W 20%
R4	N-4083	47,000 OHM .5W 20%
R5	N-4843 / N-5757	.5 MEGOHM VOL. CONT.
R6	N-1262	1 MEGOHM .5W 20%
R7	N-4028	6.8 MEGOHM .5W 20%
R8	N-4026	220,000 OHM .5W 20%
R9	N-4087	180 OHM .5W 10%
R10	N-4027	470,000 OHM .5W 20%
R11	N-6157	25,000 OHM TONE CONT.
R12	N-3358	1000 OHM 1.W 10%
R13	N-4023	82 OHM 2.W 10%
R14	N-4022	33 OHM .5W 20%
R15	N-4084	33,000 OHM .5W 20%
C1	N-6015	100 MMFD 500V 20%
C2	N-1345	.05 MFD 200V 20%
C3	N-1345	.05 MFD 200V 20%
C4	N-6015	100 MMFD 500V 20%
C5	N-4884	.005 MFD 600V -15+40%
C6	N-6135	250 MMFD 500V 20%
C7	N-1344	.01 MFD 400V 20%
C8	N-1823	.1 MFD. 400V -10+20%
C9	N-1376	.02 MFD 400V 20%
C10	N-1346	.05 MFD 400V 20%
C11	N-5051	40MFD 150V ELECTROLYTIC
C12		40MFD 150V
C13	N-4057	.09 MFD 200V 20%
C14	N-1345	.05 MFD 200V 20%
1	N-6149	ANT. COIL
2	N-6154	2 GANG CONDENSER
3	N-4810	OSCILLATOR COIL
4	N-4813	1ST I.F. TRANSFORMER
5	N-4846	2ND I.F. TRANSFORMER
6	N-4885	TRIMMER
7	N-4675	OUTPUT TRANSFORMER
8	N-6148	5" P.M. SPEAKER
9	N-6151	RECORD CHANGER
S1	N-6145 / N-6156	RADIO-PHONO SWITCH
S2		MOTOR SWITCH ON CHANGER

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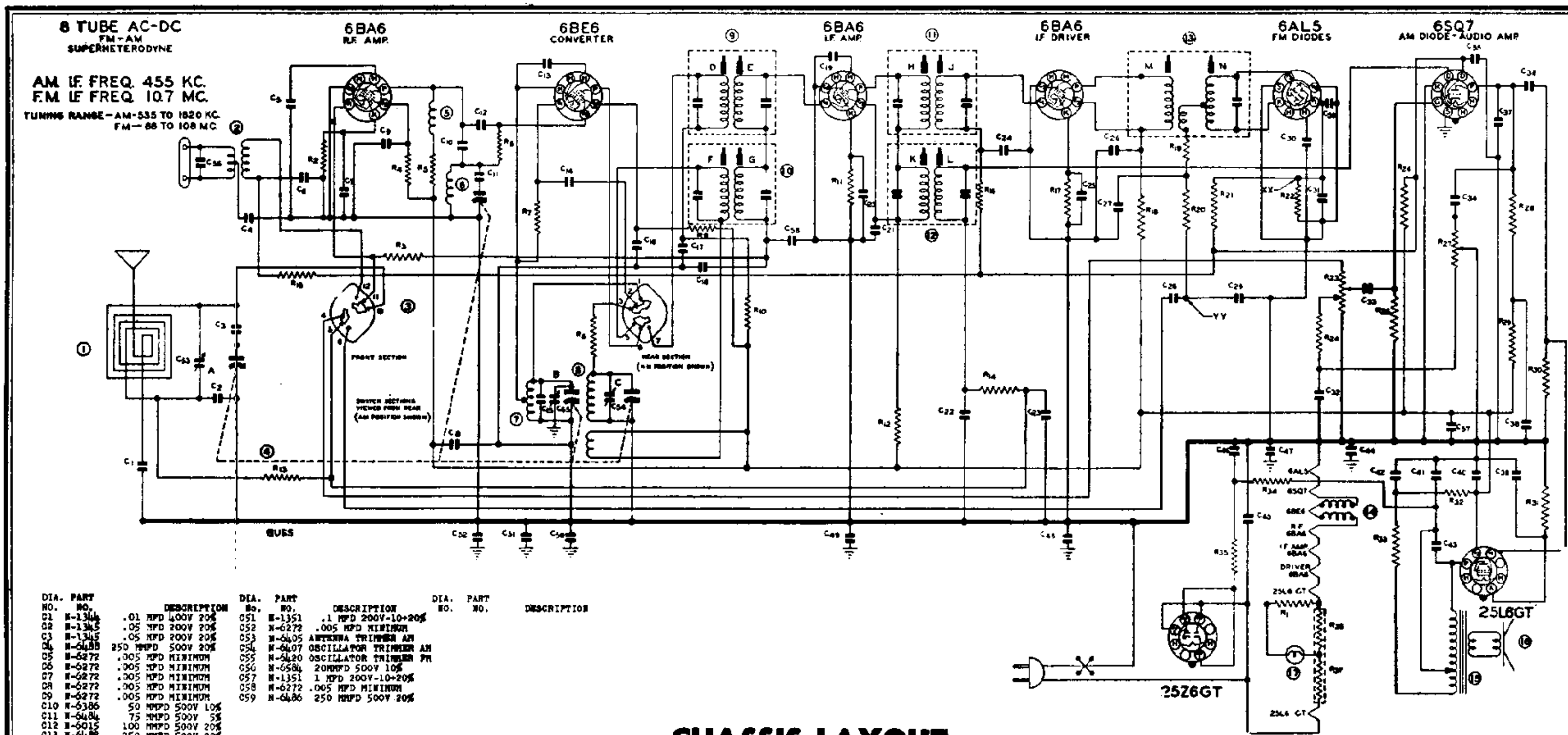
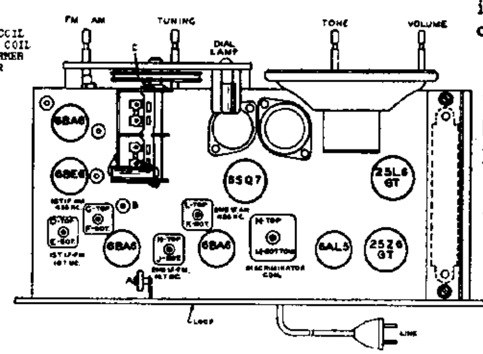
MODELS WEU-240, WEU-262



CHASSIS LAYOUT AND TUBE POSITIONS



This receiver is designed to operate over two tuning ranges; the broadcast band which extends from 535 to 1620 Kilocycles (KC) (185 to 560 Meters), and the Frequency Modulation (FM) Band which extends from 87 to 109 Megacycles (MC).

DIAL CALIBRATION. **(Standard Broadcast Band.)** The upper scale is calibrated from 55 to 160 (Standard Broadcast). This band covers all Standard Broadcast frequencies of the United States, Canada, Mexico, Cuba, and many Central and South American Countries. Add a zero to figures on the scale to obtain kilocycles.

DIAL CALIBRATION. **(Frequency Modulation Band.)** The entire lower scale is calibrated from 88 to 108 Megacycles (201 to 300 FM channels) which covers the entire popular Frequency Modulation (FM) Band.

DIA. NO.	PART NO.	DESCRIPTION
C1	N-1344	.01 MFD 400V 20%
C2	N-1345	.05 MFD 200V 20%
C3	N-1345	.05 MFD 200V 20%
C4	N-6488	250 MMFD 500V 20%
C5	N-6272	.005 MFD MINIMUM
C6	N-6272	.005 MFD MINIMUM
C7	N-6272	.005 MFD MINIMUM
C8	N-6272	.005 MFD MINIMUM
C9	N-6272	.005 MFD MINIMUM
C10	N-6386	50 MMFD 500V 10%
C11	N-6484	75 MMFD 500V 5%
C12	N-6015	100 MMFD 500V 20%
C13	N-6488	250 MMFD 500V 20%
C14	N-6365	50 MMFD 500V 10%
C15	N-8483	4.5 MMFD 500V 20%
C16	N-6272	.005 MFD MINIMUM
C17	N-6272	.005 MFD MINIMUM
C18	N-1345	.05 MFD 200V 20%
C19	N-6272	.005 MFD MINIMUM
C20	N-6272	.005 MFD MINIMUM
C21	N-6272	.005 MFD MINIMUM
C22	N-6375	50 MFD 500V 20%
C23	N-6375	50 MFD 500V 20%
C24	N-6272	.005 MFD MINIMUM
C25	N-6272	.005 MFD MINIMUM
C26	N-6272	.005 MFD MINIMUM
C27	N-6487	130 MMFD 500V 5%
C28	N-1376	.02 MFD 400V 20%
C29	N-6377	.002 MFD 600V-15+40%
C30	N-6272	.005 MFD MINIMUM
C31	N-6374	4 MFD 50V ELECTROLYTIC
C32	N-1344	.01 MFD 400V 20%
C33	N-4894	.005 MFD 600V-15+40%
C34	N-4894	.005 MFD 600V-15+40%
C35	N-6488	250 MMFD 600V 20%
C36	N-1344	.01 MFD 400V 20%
C37	N-6488	.250 MFD 500V 20%
C38	N-1361	.1 MFD 200V-10+20%
C39		20 MFD 25V
C40		50 MFD 150V ELECTROLYTIC
C41	N-6913	50 MFD 150V ELECTROLYTIC
C42		50 MFD 150V ELECTROLYTIC
C43	N-1344	.01 MFD 400V 20%
C44	N-6486	250 MMFD 500V 20%
C45	N-1340	.05 MFD 400V 20%
C46	N-6312	80 MFD 150V ELEC.
C47	N-6462	.01 MFD MINIMUM
C48	N-6272	.005 MFD MINIMUM
C49	N-6482	.01 MFD MINIMUM
C50	N-6272	.005 MFD MINIMUM

DIA. NO.	PART NO.	DESCRIPTION
C51	N-1351	.1 MFD 200V-10+20%
C52	N-6272	.005 MFD MINIMUM
C53	N-6405	ANTENNA TRIMMER AM
C54	N-6407	OSCILLATOR TRIMMER AM
C55	N-6420	OSCILLATOR TRIMMER FM
C56	N-6584	20MMFD 500V 10%
C57	N-1351	1 MFD 200V-10+20%
C58	N-6272	.005 MFD MINIMUM
C59	N-6486	250 MMFD 500V 20%
R1	N-6311	REGULATING RES.
R2	N-6485	68 OHM .5W 10%
R3	N-4277	2.2 MEGOHM .5W 20%
R4	N-4098	2,200 OHM .5W 10%
R5	N-4279	820 OHM .5W 10%
R6	N-4895	10,000 OHM .5W 20%
R7	N-4025	22,000 OHM .5W 20%
R8	N-5053	12 OHM .5W 10%
R9	NN-1694	1,000 OHM .5W 10%
R10	N-1694	1,000 OHM .5W 20%
R11	N-6485	68 OHM .5W 10%
R12	N-6011	470 OHM .5W 20%
R13	N-1262	1.0 MEGOHM .5W 20%
R14	N-4063	47000 OHM .5W 20%
R15	N-4026	220,000 OHM .5W 20%
R16	N-4026	220,000 OHM .5W 20%
R17	N-6485	68 OHM .5W 10%
R18	N-6011	470 OHM .5W 20%
R19	N-6485	68 OHM .5W 10%
R20	N-4064	33,000 OHM .5W 20%
R21	N-2973	100,000 OHM .5W 10%
R22	N-6378	33,000 OHM .5W 5%
R23	N-6274	.5 MEGOHM VOLUME CONT.
R24	N-4451	27,000 OHM .5W 10%
R25	N-4028	68 MEGOHM .5W 20%
R26	N-6486	1.8 MEGOHM .5W 10%
R27	N-6273	.5 MEGOHM TONE CONTROL
R28	N-4026	220,000 OHM .5W 20%
R29	N-5683	68,000 OHM .5W 10%
R30	N-4027	470,000 OHM .5W 20%
R31	N-3663	150 OHM .5W 10%
R32	N-1613	100 OHM .5W 10%
R33	N-3663	150 OHM .5W 10%
R34	N-6379	68 OHM 1.0W 10%
R35	N-5053	12 OHM .5W 10%
R36	N-6362	100 OHM 7.7W
R37	N-6362	60 OHM 6.0W 10%

DIA. NO.	PART NO.	DESCRIPTION
1	N-6343	ANTENNA LOOP COIL
2	N-6371	ANTENNA COIL FM
3	N-6351	AM-FM SWITCH
4	N-6276	2 GANG CAPACITOR
5	N-6373	R.F. CHOKE COIL
6	N-6372	R.F. COIL FM
7	N-6349	OSC. COIL FM
8	N-6348	OSC. COIL FM
9	N-6346	1st IF COIL FM
10	N-6344	1st IF COIL AM
11	N-6346	2nd IF COIL FM
12	N-6345	2nd IF COIL AM
13	N-6341	DISCRIMINATOR COIL
14	N-6309	FILAMENT CHOKE COIL
15	N-6369	OUTPUT TRANSFORMER
16	N-6286	5" P.M. SPEAKER
17	N-1147	DIAL LAMP

MODELS WEU-240, WEU-262

SONORA RADIO & TELEV. CORP.

SERVICE DATA

Lack of sensitivity and poor tone quality may be due to any one or a combination of causes, such as weak or defective tubes or speaker, open or grounded resistors, or bypass condensers. Never attempt to realign the set until all other possible sources of trouble have been first thoroughly investigated and definitely proved not to be the cause. It will be necessary to follow the procedure outlined below and to use recommended equipment for satisfactory results.

BROADCAST ALIGNMENT PROCEDURE

EQUIPMENT REQUIRED: Modulated Test Oscillator that will cover the frequencies of 455, 600, 1400 and 1620 KC, also an Output Meter to connect across the primary or secondary of the output transformer.

I. F. ALIGNMENT: Put switch in the broadcast position and connect the test oscillator to the converter grid through a .05 condenser. The ground lead of the test oscillator should be connected to the buss of the receiver. Adjust the four I. F. trimmers (F,G,L and K) for maximum reading on the output meter. Always use the peak on the slug which is obtained when screw is out of the can the greatest distance.

R. F. ALIGNMENT: Connect the test oscillator to the antenna lead on the loop through a 100 mmf. condenser. Set the gang condenser to the maximum high frequency position and the test oscillator to 1620 KC. Adjust Trimmer "C" to the maximum output. Set test oscillator to 1400 KC and tune in signal with the gang condenser and adjust Trimmer "A" to maximum response. Set test oscillator to 600 KC and tune in signal with gang condenser. Check for damage to gang condenser or coils.

F. M. ALIGNMENT PROCEDURE

EQUIPMENT REQUIRED: F. M. Generator with frequencies of 90, 98, 106, and 109 megacycles, and generator without any modulation which covers 10.7 megacycles, also a zero center microammeter, and a DC Vacuum Tube Voltmeter (An oscilloscope and variable frequency audio oscillator can be used for better results. This method of alignment is described in the last paragraph).

DISCRIMINATOR ALIGNMENT: Connect DC Vacuum Tube Voltmeter between the buss and point "XX" on circuit diagram. Point "XX" is negative potential on the vacuum tube voltmeter. Isolate point "XX" and buss connections to vacuum tube voltmeter with chokes made by wrapping approximately 20 turns of hookup wire around a pencil. This is illustrated in Figure 1. Connect two 100,000 ohm resistors in series. (These resistors must match to 5%.) Connect them from point "XX" to buss. Between junction of 100,000 ohm resistors and the point "YY" connect Zero Center Meter, which is also isolated by the choke described above. These connections are illustrated in Figure 1. Connect test oscillator which is adjusted to 10.7 megacycles to grid of IF Driver through a 250 mmf condenser. Adjust slug "M" to maximum on the vacuum tube voltmeter. Reduce test oscillator to keep vacuum tube voltmeter to around 5 volts. Adjust slug "N" to bring zero center meter to zero point. Slug "N" should never be touched after this alignment.

PRELIMINARY IF ALIGNMENT: Connect test oscillator to the converter grid through a 250 mmf. mica condenser. Adjust slugs D, E, H and J to maximum output on the vacuum tube voltmeter. In making these adjustments reduce the generator input to keep the vacuum tube voltmeter at approximately 5 volts when making this adjustment. Always use the peak on the slug which is obtained when the screw is out of the can the greatest distance.

FINAL I. F. ALIGNMENT: Set the test oscillator to 109 MC without frequency moldulation and connect it to converter grid. Adjust trimmer "B" for approximate maximum output on the vacuum tube voltmeter and zero center for exact centering. Adjust test oscillator to approximately 25 KC deviation, carefully adjust trimmers D, E, H, J and M for maximum on vacuum tube voltmeter. It may be necessary to shift the frequency of the oscillator slightly to hold the zero center meter on center. In making this adjustment turn up volume control slightly to obtain an audio signal out of the speaker. If this signal is free of distortion, increase the deviation to approximately 75 KC and repeat the above alignment. If this is done carefully there will be no distortion in the speaker with this deviation. If distortion is obtained in the speaker with this deviation, it will be necessary to carefully repeat the I.F. alignment.

R. F. ALIGNMENT: Move the signal generator to the FM antenna terminals, using 150 ohm resistors between the generator terminals and each of the FM antenna terminals. Set the test oscillator to 106 megacycles and tune in signal with gang condenser to obtain approximate maximum on the vacuum tube voltmeter and zero center on the meter. Slightly bend the RF section in the gang condenser for maximum output with vacuum tube voltmeter. Set the signal generator to 98 megacycles, tune in signal with the gang condenser. Repeat the above procedure at this frequency and also at 90 megacycles. Recheck alignment at 106 megacycles.

FINAL ALIGNMENT OF FM IF WITH OSCILLOSCOPE AND VARIABLE AUDIO OSCILLATOR: The oscilloscope and variable audio oscillator should be connected as shown in Figure 2. Adjust the deviation to approximately 25 KC and align trimmers D, E, H, J and M to maximum on the vacuum tube voltmeter while watching the oscilloscope for a straight line. It may be necessary to vary the frequency of the variable audio oscillator in order to make the line straight on the scope. Next increase deviation to approximately 75 KC and repeat procedure, adjusting for maximum or as close to maximum as it is possible to obtain without losing the straight line on the oscilloscope. After all the trimmers have been properly adjusted to a maximum and a straight line on the scope, increase the deviation from approximately 125 to 150 KC. The curves illustrated in Figure 3 should be obtained. In making the above adjustments it may be necessary to make slight variations in the RF frequency in order to hold the zero center meter at the zero point.

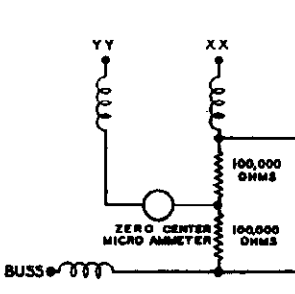


FIG. 1

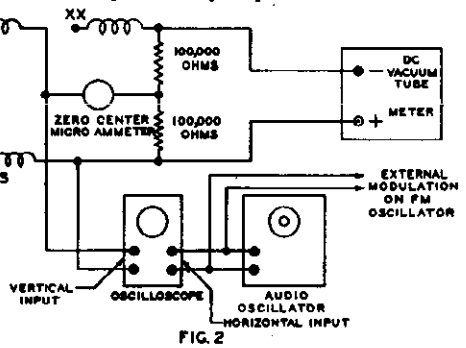
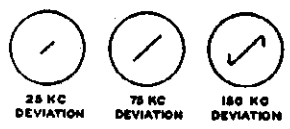
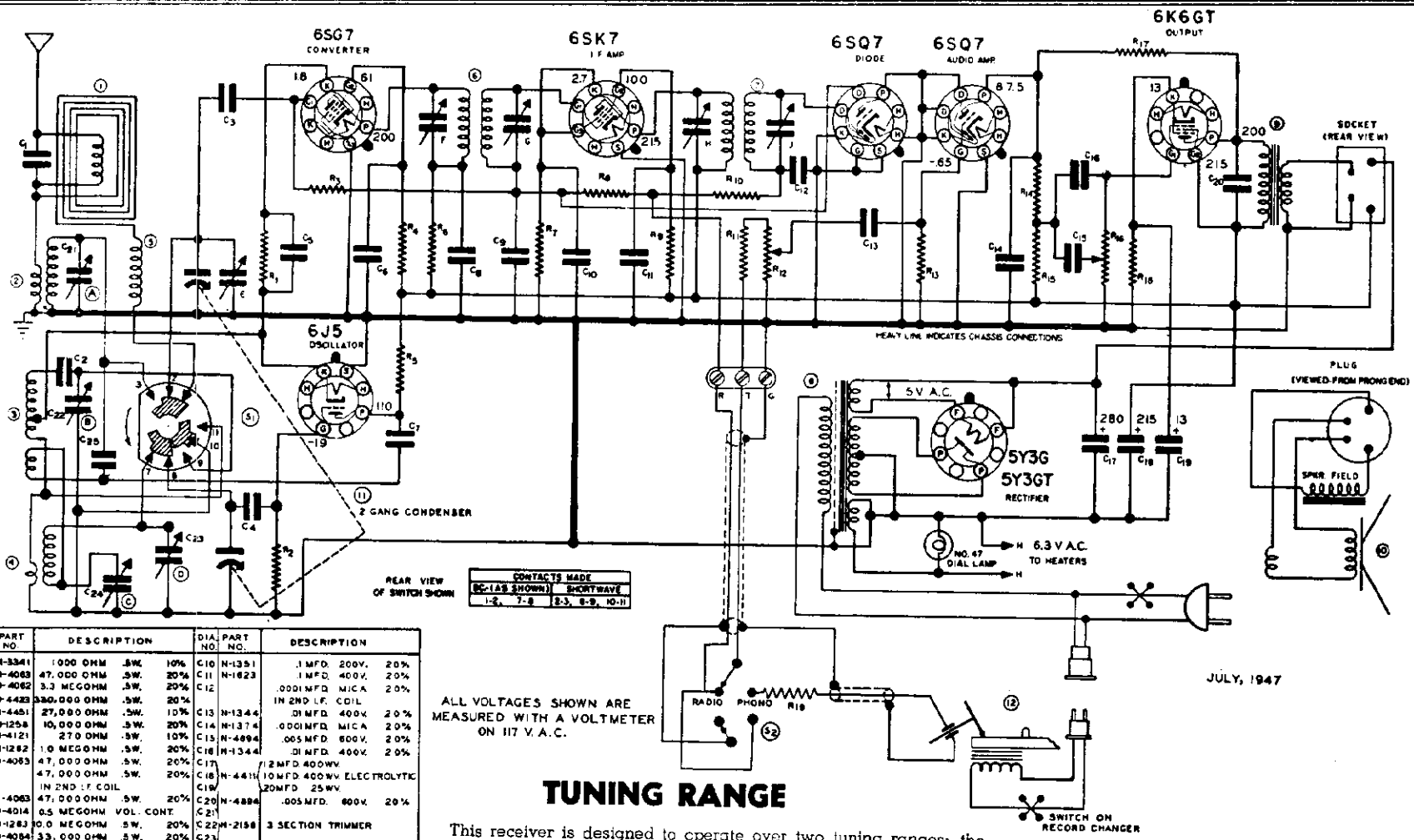


FIG. 2



OSCILLOSCOPE PATTERNS

FIG. 3



DIA NO	PART NO	DESCRIPTION			
R1	N-3341	1000 OHM	.5W.	10%
R2	N-4063	47,000 OHM	.5W.	20%
R3	N-4062	3.3 MEGOHM	.5W.	20%
R4	N-4423	330,000 OHM	.5W.	20%
R5	N-4451	27,000 OHM	.5W.	10%
R6	N-1258	10,000 OHM	.5W.	20%
R7	N-4121	270 OHM	.5W.	10%
R8	N-1282	1.0 MEGOHM	.5W.	20%
R9	N-4063	47,000 OHM	.5W.	20%
R10		47,000 OHM IN 2ND I.F. COIL	.5W.	20%
R11	N-4063	47,000 OHM	.5W.	20%
R12	N-4014	0.5 MEGOHM	VOL. CONT.	
R13	N-1283	10.0 MEGOHM	.5W.	20%
R14	N-4084	33,000 OHM	.5W.	20%
R15	N-4423	330,000 OHM	.5W.	20%
R16	N-5181	0.5 MEGOHM	TONE CONT.	
R17	N-4424	2.2 MEGOHM	.5W.	10%
R18	N-4421	470 OHM	1W.	10%
R19	N-5405	470,000 OHM	.5W.	20%
C1	N-1343	.00025 MFD.	MICA	20%
C2	N-1680	.004 MFD.	MICA	5%
C3	N-1343	.00025 MFD.	MICA	20%
C4	N-1342	.00005 MFD.	MICA	20%
C5	N-1345	.05 MFD.	200V.	20%
C6	N-1376	.02 MFD.	400V.	20%
C7	N-1344	.01 MFD.	400V.	20%
C8	N-1623	.1 MFD.	400V.	20%
C9	N-1345	.05 MFD.	200V.	20%

DIA NO	PART NO	DESCRIPTION			
C10	N-1351	.1 MFD.	200V.	20%
C11	N-1623	.1 MFD.	400V.	20%
C12		.0001 MFD. IN 2ND I.F. COIL	MICA	20%
C13	N-1344	.01 MFD.	400V.	20%
C14	N-1374	.0001 MFD.	MICA	20%
C15	N-4894	.005 MFD.	600V.	20%
C16	N-1344	.01 MFD.	400V.	20%
C17		12 MFD. 400WV.		
C18	N-4411	10 MFD. 400 WV. ELECTROLYTIC		
C19		20 MFD. 25 WV.		
C20	N-4894	.005 MFD.	600V.	20%
C21				
C22	N-2158	3 SECTION TRIMMER		
C23				
C24	N-1254	PADDER		
C25	N-5920	4.0 MMFD COPOLENE		
S1	N-4400	BANDSWITCH		
S2	N-5560	RADIO PHONO SWITCH		
1	N-4401	LOOP ANTENNA		
2	N-5921	SW ANTENNA COIL		
3	N-4404	SW OSCILLATOR COIL		
4	N-4403	BC OSCILLATOR COIL		
5	N-4407	LOOP SERIES COIL		
6	N-4405	1ST I.F. TRANSFORMER		
7	N-4406	2ND I.F. TRANSFORMER		
8	N-4398	POWER TRANSFORMER		
9	N-4395	OUTPUT TRANSFORMER		
10	N-6435	8" DYNAMIC SPEAKER		
11	N-4397	2 GANG CONDENSER		
12	N-6151	RECORD CHANGER		

ALL VOLTAGES SHOWN ARE MEASURED WITH A VOLTMETER ON 117 V. A.C.

JULY, 1947

TUNING RANGE

This receiver is designed to operate over two tuning ranges; the broadcast band which extends from 535 to 1720 Kilocycles (KC) (174 to 560 Meters), and the International Short Wave Band which extends from 5.65 to 18.3 Megacycles (MC) (16.4 to 53 Meters.)

DIAL CALIBRATION. (STANDARD BROADCAST BAND.) The outside scale is calibrated from 55 to 170 (Standard Broadcast.) This band covers all Standard Broadcast frequencies of the United States, Canada, Mexico, Cuba, and many Central and South American Countries. Add a zero to figures on the scale to obtain kilocycles.

DIAL CALIBRATION. (SHORT WAVE BAND.) The entire inside scale is devoted to short wave American and foreign broadcasts. This scale is calibrated from 6 to 18 megacycles (MC). Consult the Sonora Short-Wave Station list for the proper frequency and time for best short wave reception.

CLARI-SKEMATIX
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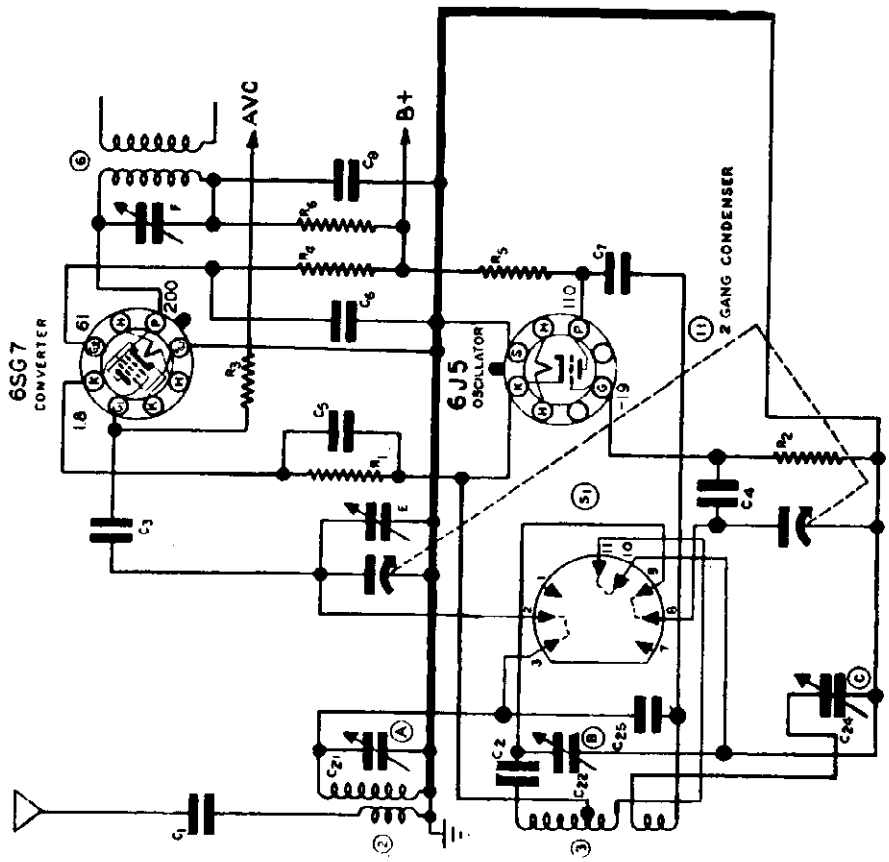
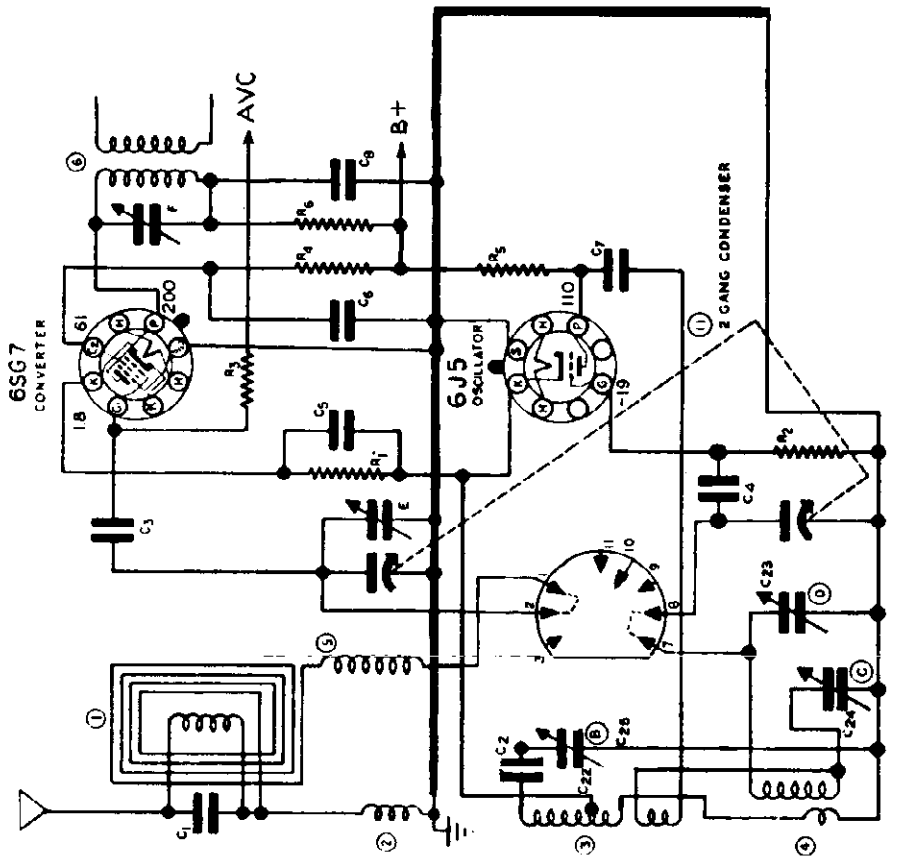
MODEL WTRU-254A

SONORA RADIO & TELEV. CORP.



BAND-SWITCH SHOWN
AT 2ND POSITION COUNTERCLOCKWISE.
SHORT WAVE BAND
5.65 - 18.3 MC



BAND-SWITCH SHOWN
AT 1ST POSITION.
BROADCAST BAND
535 - 1720 KC

ALIGNMENT PROCEDURE

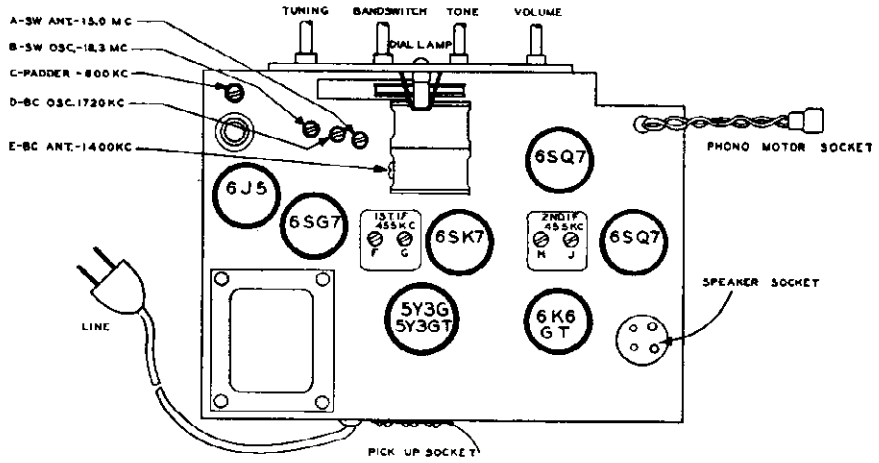
GENERAL DATA. The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 455, 600, 1400, 1720, 6000, 15000, and 18300 KC, and an output meter to be connected across the primary or secondary of the output transformer. If possible, all alignments should be made with the volume control on maximum and the test oscillator output as low as possible to prevent the AVC from operating and giving false readings.

CORRECT ALIGNMENT PROCEDURE. The intermediate frequency (I.F.) stages should be aligned properly as the first step. After the I.F. transformers have been properly adjusted and peaked, the Broadcast and Short Wave bands should be adjusted.

I.F. ALIGNMENT. Remove the chassis and loop antenna from the cabinet and set them up on the bench so that they occupy exactly the same respective positions on the bench as they did in the cabinet. Care should be taken to have no iron or other metal near the loop. Do not make this set-up on a metal bench. With the Band Switch set to the Broadcast Band and with the gang condenser set at minimum, adjust the test oscillator to 455 KC and connect the output to the grid of the first detector tube 6SG7 through a .05 or .1 mfd. condenser. The ground on the test oscillator should be connected to the receiver ground. Align all four I.F. trimmers to peak or maximum reading on the output meter.

SHORT WAVE BAND ALIGNMENT. With the band switch turned to the S.W. position, connect the test oscillator to the antenna with a 400 ohm dummy and the ground on the test oscillator to the ground connection on the receiver. Adjust the S.W. oscillator to give a maximum output with the dial at 18300 KC (extreme end.) Set the test oscillator at 15000 KC and tune in the signal with the dial. Adjust the antenna trimmer for maximum output. With a strong signal input turn the dial to approximately 1 M.C. lower in frequency and pick up the image frequency. If the image is not received, it will be necessary to return the dial to 18300 KC to reduce the capacity in the oscillator trimmer until a second signal is received. Proceed as before with the alignment of the antenna and recheck for image frequency. Check the sensitivity at 6000 KC to determine if the coils and mica pad are not defective.

BROADCAST BAND ALIGNMENT. With the Band Switch turned to the Broadcast Position, connect the test oscillator to the antenna of the set through a 100 mmfd. (.0001) condenser, and the ground on the test oscillator to the receiver ground. With the gang condenser set at minimum capacity, set the test oscillator at 1720 KC, and adjust the oscillator (or 1720 KC trimmer). For the antenna adjustment set the test oscillator at 1400 KC, and tune in the signal on the gang condenser. Adjust the antenna trimmer (or 1400 KC trimmer) for maximum signal. Next set the test oscillator at 600 KC, and tune in the signal on the condenser. Adjust the 600 KC Pad while rocking the gang to obtain maximum output.



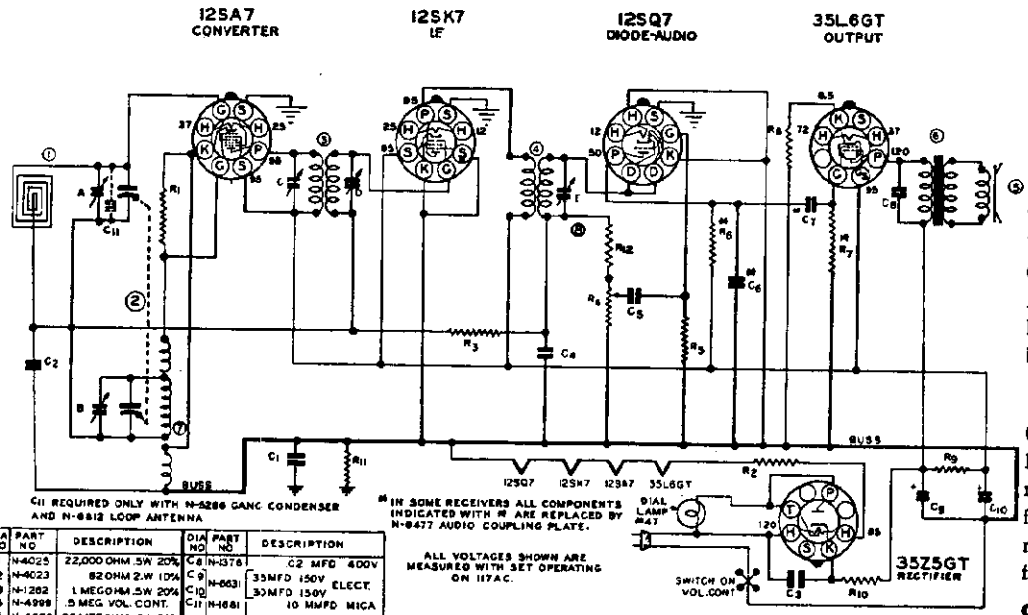
SERVICE DATA

Lack of sensitivity and poor tone quality may be due to any one or a combination of causes such as weak or defective tubes or speaker, open or grounded bias resistor, bypass condenser, etc. Never attempt to realign set until all other possible sources of trouble have been first thoroughly investigated and definitely proved not to be the cause.

NOTE: IT IS ABSOLUTELY NECESSARY THAT AN ACCURATELY CALIBRATED TEST OSCILLATOR WITH SOME TYPE OF OUTPUT MEASURING DEVICE BE USED WHEN ALIGNING THE RECEIVER AND THAT THE PROCEDURE BE CAREFULLY FOLLOWED. OTHERWISE THE RECEIVER WILL BE INSENSITIVE AND THE DIAL CALIBRATION WILL BE INCORRECT. THE TRIMMERS WILL BE REFERRED TO BY THEIR FUNCTION AS INDICATED ON THE PARTS DIAGRAM.

AERIAL SYSTEM

The receiver has a built-in "loop" aerial. Its excellent design is such as to increase pick-up from stations having wide variations in signal strength. The efficiency and selectivity of the loop provide outstanding reception without the use of an external aerial. The "loop" aerial used on this receiver is somewhat directional so reception from weak stations can be improved by turning the set in the proper direction. In or near metal buildings, iron ore deposits or steel structures or in localities remote from broadcasting stations, reception can be improved by using an outside aerial 50 feet to 100 feet in length including lead-in. Connect the outside aerial to the aerial lead. When using an outside aerial, use a good ground connection. Water pipes and steam or hot water radiators make a desirable ground connection. The ground wire should be connected to the black wire on the receiver. Although broadcast reception is satisfactory, the short wave band may require an additional aerial.

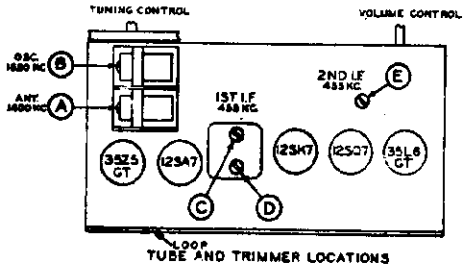


C11 REQUIRED ONLY WITH N-5286 GANG CONDENSER AND N-6812 LOOP ANTENNA

IN SOME RECEIVERS ALL COMPONENTS INDICATED WITH # ARE REPLACED BY N-8477 AUDIO COUPLING PLATE.

ALL VOLTAGES SHOWN ARE MEASURED WITH SET OPERATING ON 117 A.C.

DIA NO	PART NO	DESCRIPTION
R1	N-4025	22,000 OHM .5W 20%
R2	N-4023	82 OHM 2W 10%
R3	N-1282	1 MEGOHM .5W 20%
R4	N-4999	.5 MEG. VOL. CONT.
R5	N-4028	68 MEGOHM .5W 20%
R6	N-4026	220,000 OHM .5W 20%
R7	N-4027	470,000 OHM .5W 20%
R8	N-4024	220 OHM .5W 10%
R9	N-5358	1000 OHM 1.0W 10%
R10	N-4022	33 OHM .5W 20%
R11	N-4026	220,000 OHM .5W 20%
R12	N-4083	47,000 OHM .5W 20%
C1	N-1345	.05 MFD 200V
C2	N-1345	.05 MFD 200V
C3	N-1346	.03 MFD 400V
C4	N-1374	100 MMFD MICA
C5	N-4694	.005 MFD 600V
C6	N-4600	.0008 MFD 600V
C7	N-1344	.01 MFD 400V
C8	N-1376	.02 MFD 400V
C9	N-6631	35 MFD 150V ELECT.
C10		50 MFD 150V
C11	N-1681	10 MMFD MICA
1	N-6828	ANTENNA LOOP COIL
2	N-5036	2 GANG CONDENSER OR
1	N-6812	ANTENNA LOOP COIL
2	N-5286	2 GANG CONDENSER
3	N-4813	1ST I.F. TRANSFORMER
4	N-4046	2ND I.F. TRANSFORMER
5	N-4380	6" P.M. SPEAKER
6	N-3886	OUTPUT TRANSF.
7	N-4810	OSCILLATOR COIL
8	N-4048	TRIMMER
	#47	DIAL LAMP



TUBE AND TRIMMER LOCATIONS

TUNING RANGE

This receiver is designed to operate over the standard broadcast band which extends from 535 to 1620 Kilocycles (KC) (185 to 560 Meters).

DIAL CALIBRATION. The scale is calibrated from 55 to 160 (Standard Broadcast). This band covers all Standard Broadcast frequencies of the United States, Canada, Mexico, Cuba and many Central and South American Countries. Add a zero to figures on the scale to obtain kilocycles.

POWER SUPPLY. This receiver is designed to operate on any alternating current supply (AC) ranging from 110 to 120 volts, 50 to 60 cycles; or on any direct current supply (DC) ranging from 110 to 120 volts.

5 TUBE AC-DC

SUPERHETERODYNE SINGLE BAND

NOVEMBER, 1947

Lack of sensitivity and poor tone quality may be due to any one or a combination of causes such as weak or defective tubes or speaker, open or grounded bias resistor, bypass condenser, etc. Never attempt to realign set until all other possible sources of trouble have been first thoroughly investigated and definitely proved not to be the cause.

NOTE: IT IS ABSOLUTELY NECESSARY THAT AN ACCURATELY CALIBRATED TEST OSCILLATOR WITH SOME TYPE OF OUTPUT MEASURING DEVICE BE USED WHEN ALIGNING THE RECEIVER AND THAT THE PROCEDURE BE CAREFULLY FOLLOWED, OTHERWISE THE RECEIVER WILL BE INSENSITIVE AND THE DIAL CALIBRATION WILL BE INCORRECT. THE TRIMMERS WILL BE REFERRED TO BY THEIR FUNCTION AS INDICATED ON THE PARTS DIAGRAM.

ALIGNMENT PROCEDURE

GENERAL DATA. The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 455, 600, 1400 and 1620 KC and an output meter to be connected across the primary or secondary of the output transformer. If possible, all alignments should be made with the volume control on maximum and the test oscillator output as low as possible to prevent the AVC from operating and giving false readings.

CORRECT ALIGNMENT PROCEDURE. The intermediate frequency (I.F.) stage should be aligned properly as the first step. After the I.F. transformer has been properly adjusted and peaked, the broadcast band should be adjusted.

I.F. ALIGNMENT. Remove the chassis and loop antenna from the cabinet and set them up on the bench so that they occupy exactly the same respective position on the bench as they did in the cabinet. Care should be taken to have no iron or other metal near the loop. Do not make this set-up on a metal bench. With the gang condenser set at minimum, adjust the test oscillator to 455 KC and connect the output to the grid of the first detector tube (12SA7) through a .05 or .1 mfd. condenser. The ground on the test oscillator should be connected to the ground buss, indicated on the circuit diagram. Align all three I.F. trimmers to peak or maximum reading on the output meter.

BROADCAST BAND ALIGNMENT. Connect the test oscillator to a dummy loop which can be made by coiling 2 turns of hookup wire about 6" in diameter. Place this dummy loop about a foot from the loop on the receiver and in the same plane as the receiver loop. With the gang condenser set at minimum capacity, set the test oscillator at 1620 KC, and adjust the oscillator (or 1620 KC trimmer) on the gang condenser. Next—set the test oscillator at 1400 KC, and tune in the signal on the gang condenser. Adjust the antenna trimmer (or 1400 KC trimmer) for maximum signal. Next set the test oscillator at 600 KC, and tune in signal on condenser to check alignment of coils.

I.F. 455KC.

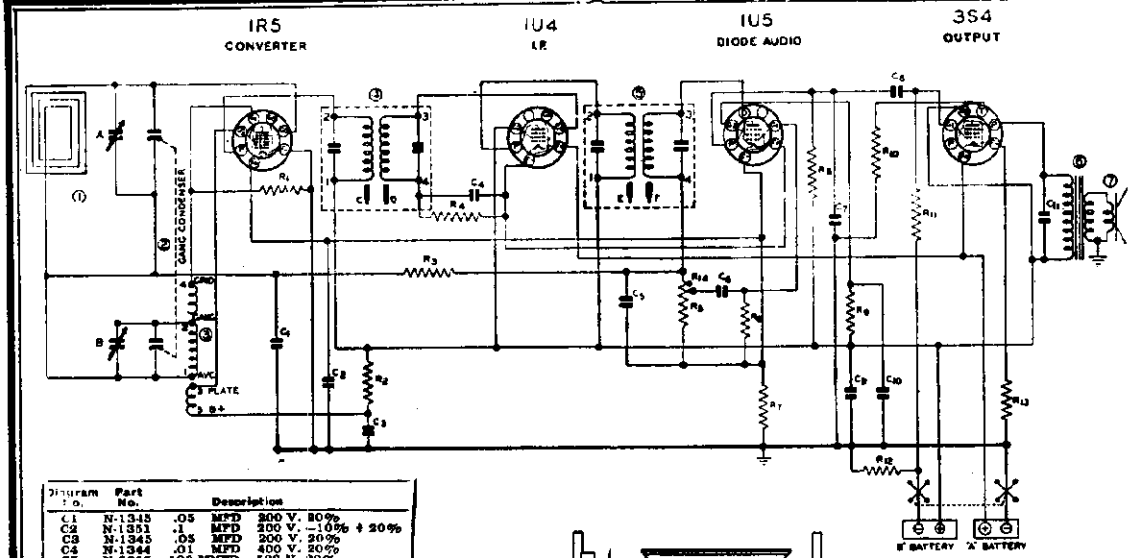
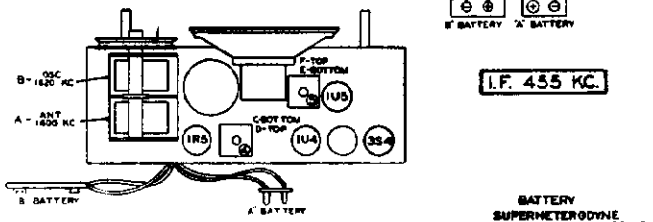


Diagram No.	Part No.	Description
C1	N-1345	.05 MFD 200 V. 80%
C2	N-1351	.1 MFD 200 V. —10% + 20%
C3	N-1345	.05 MFD 200 V. 20%
C4	N-1344	.01 MFD 400 V. 20%
C5	N-6015	100 MMFD 500 W. 20%
C6	N-4894	.005 MFD 600 V. —15% + 40%
C7	N-6015	100 MMFD 500 V. 20%
C8	N-4894	.005 MFD 600 V. —15% + 40%
C9	N-1387	8 MFD 150 V. Electrolytic
C10	N-1344	.01 MFD 400 V. 20%
C11	N-6377	.002 MFD 600 V. —15% + 40%
R1	N-2973	100,000 Ohm .5 W. 10%
R2	N-5930	12,000 Ohm .5 W. 10%
R3	N-4061	4.7 Megohm .5 W. 20%
R4	N-4028	6.8 Megohm .5 W. 20%
R5	N-6779	1.0 Megohm Volume Control
R6	N-4028	6.8 Megohm .5 W. 20%
R7	N-4279	820 Ohm .5 W. 10%
R8	N-1262	1.0 Megohm .5 W. 20%
R9	N-5473	3.9 Megohm .5 W. 10%
R10	N-6793	1,200 Ohm .5 W. 10%
R11	N-4277	2.2 Megohm .5 W. 20%
R12	N-4228	680 Ohm .5 W. 10%
R13	N-6792	27 Ohm .5 W. 10%
R14		47,000 Ohm (In Volume Control)
1	N-6781	Antenna Loop Coil
2	N-5936	2 Gang Capacitor
3	N-6003	Oscillator Coil
4	N-6805	Coil, 1st I.F.
5	N-6806	Coil, 2nd I.F.
6	N-6791	Output Transformer
7	N-6681	4" PM Speaker



I.F. 455 KC.

BATTERY
SUPERHETERODYNE
RANGE 535 KC.-1620 KC

BATTERY: To install new batteries or replace an old one, the following sequence should be followed. Attach the connector with the snap-on fasteners to the "B" battery (67½ V.) and insert battery into left side of battery compartment as viewed from rear of cabinet so that the connector faces the rear of cabinet. Secondly, insert the prongs of the other battery connector into the socket of the "A" battery (4½ V.) and insert battery into cabinet so that the socket of the "A" battery faces the "B" battery.

This receiver will accommodate any of the batteries listed below:

Manufacturer	Manufacturer's "A" Battery	Type Number "B" Battery
National Carbon	746	467
General Dry Battery	3H3	W45A
Ray-O-Vac	P83A	4387
Burgess Battery	G3	XX45

CAUTION: *Do not place receiver on hot objects such as stoves, radiators, etc. Heat will damage the internal components of the receiver and reduce the battery life.*

TUNING RANGE

This receiver is designed to operate over the standard broadcast band which extends from 535 to 1620 Kilocycles (KC) (185 to 560 Meters).

DIAL CALIBRATION. The scale is calibrated from 55 to 160 (Standard Broadcast). This band covers all Standard Broadcast frequencies of the United States, Canada, Mexico, Cuba and many Central and South American Countries. Add a zero to figures on the scale to obtain kilocycles.

Lack of sensitivity and poor tone quality may be due to any one or a combination of causes such as weak or defective tubes or speaker, open or grounded bias resistor, bypass condenser, etc. Never attempt to realign set until all other possible sources of trouble have been first thoroughly investigated and definitely proved not to be the cause.

NOTE: IT IS ABSOLUTELY NECESSARY THAT AN ACCURATELY CALIBRATED TEST OSCILLATOR WITH SOME TYPE OF OUTPUT MEASURING DEVICE BE USED WHEN ALIGNING THE RECEIVER AND THAT THE PROCEDURE BE CAREFULLY FOLLOWED, OTHERWISE THE RECEIVER WILL BE INSENSITIVE AND THE DIAL CALIBRATION WILL BE INCORRECT. THE TRIMMERS WILL BE REFERRED TO BY THEIR FUNCTION AS INDICATED ON THE PARTS DIAGRAM.

ALIGNMENT PROCEDURE

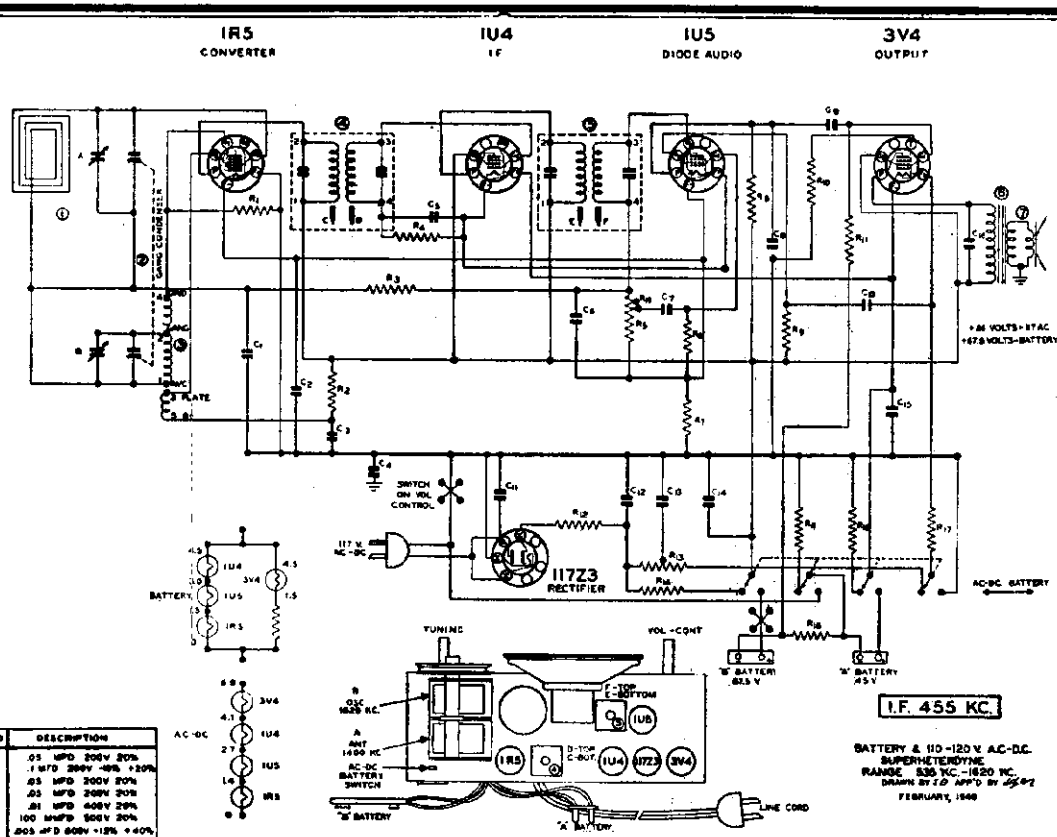
GENERAL DATA. The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 455, 600, 1400 and 1620 KC and an output meter to be connected across the primary or secondary of the output transformer. If possible, all alignments should be made with the volume control on maximum and the test oscillator output as low as possible to prevent the AVC from operating and giving false readings.

CORRECT ALIGNMENT PROCEDURE. The intermediate frequency (I.F.) stage should be aligned properly as the first step. After the I.F. transformer has been properly adjusted and peaked, the broadcast band should be adjusted.

I.F. ALIGNMENT: Remove the chassis and batteries from the cabinet and remove the bottom enclosure plate from the chassis. With the gang condenser set at minimum, adjust the test oscillator to 455 KC and connect the output to the grid of the first detector tube (1R5) through a .05 or .1 MFD condenser. The ground of the test oscillator should be connected to the chassis. Align all four I.F. slugs to peak or maximum reading on the output meter. Each I.F. has an adjustment at the top and bottom of the can. The peaks on the slugs must be the ones farthest out of the coils.

R.F. ALIGNMENT: Place the cabinet on its face and open cabinet back to a 90° angle. Lay a board across the body of cabinet ahead of the loop. Replace the bottom chassis enclosure and set the chassis and batteries on the board so that they occupy the same relative position to the loop as they do in the cabinet. Care should be taken to have no iron or other metal near the loop.

Connect the test oscillator to a dummy loop which can be made by coiling 2 turns of hookup wire about 6" in diameter. Place this dummy loop about a foot from the loop on the receiver and in the same plane as the receiver loop. With the gang condenser set at minimum capacity, set the test oscillator at 1620 KC, and adjust the oscillator (or 1620 KC trimmer) on the gang condenser. Next set the test oscillator at 1400 KC, and tune in the signal on the gang condenser. Adjust the antenna trimmer (or 1400 KC trimmer) for maximum signal. Next set the test oscillator at 600 KC, and tune in signal on condenser to check alignment of coils.



DIA. NO.	PART NO.	DESCRIPTION
C1	N-1345	.05 MFD 200V 20%
C2	N-1354	.1 MFD 200V -40% +20%
C3	N-1345	.05 MFD 200V 20%
C4	N-1345	.05 MFD 200V 20%
C5	N-1346	.01 MFD 400V 20%
C6	N-8845	100 MMFD 500V 20%
C7	N-8886	.005 MFD 600V -10% +40%
C8	N-8015	100 MMFD 500V 20%
C9	N-4888	.005 MFD 600V -10% +40%
C10	N-1346	.01 MFD 400V 20%
C11	N-1346	.05 MFD 400V 20%
C12	N-8861	50 MFD 150V ELECTRO LYTIC
C13		20 MFD 150V
C14		30 MFD 150V
C15		100 MFD 25V
C16	N-8377	.002 MFD 600V MICA +40%
R1	N-2973	100,000 OHM .5 W 10%
R2	N-3990	12,000 OHM .5 W 10%
R3	N-4661	.47 MEGOHM .5 W 20%
R4	N-4028	5.6 MEGOHM .5 W 20%
R5	N-8779	1.0 MEGOHM VOL. CONT.
R6	N-4028	5.6 MEGOHM .5 W 20%
R7	N-4066	470 OHM .5 W 10%
R8	N-2978	1.0 MEGOHM .5 W 10%
R9	N-5473	3.9 MEGOHM .5 W 10%
R10	N-8783	1200 OHM 2 W 10%
R11	N-4271	2.2 MEGOHM .5 W 20%
R12	N-8113	68 OHM 1.5 W 10%
R13	N-8862	1920 OHM 5.0 W
R14	N-8783	1200 OHM .5 W 10%
R15	N-4028	220,000 OHM .5 W 20%
R16	N-8783	1200 OHM .5 W 10%
R17	N-8782	27 OHM .5 W 10%
R18	N-6121	270 OHM .5 W 10%
R19		67,000 OHM IN VOL. CONT.
1	N-8781	ANTENNA LOOP COIL
2	N-3938	2 GANG CAPACITOR
3	N-8883	OSCILLATOR COIL
4	N-8885	1ST I.F. COIL
5	N-8888	2ND I.F. COIL
6	N-8791	OUTPUT TRANSFORMER
7	N-8881	6" P.M. SPEAKER

BATTERY. To operate this receiver on battery, it will first be necessary to insert one prong of power cord plug into the switch through the slot located at the lower left hand corner of the top of the Chassis Base.

Before installing new batteries or replacing old ones, turn the volume control to the extreme left or "OFF" position, then the following sequence should be followed. Attach the connector with the snap-on fasteners to the "B" battery (67½ V.) and insert battery into left side of battery compartment as viewed from rear of cabinet so that the connector faces the rear of cabinet. Insert the prongs of the other battery connector into the socket of the "A" battery (4½ V.) and place battery into cabinet so that the socket of the "A" battery faces the "B" battery.

This receiver will accommodate any of the batteries listed below:

Manufacturer	Manufacturer's Type Number "A" Battery	"B" Battery
National Carbon	**746**	**487**
General Dry Battery	**3H3**	**W45A**
Ray-O-Vac	**P83A**	**4367**
Burgess Battery	**G3**	**XX45**

CAUTION: *Do not place receiver on hot objects such as stoves, radiators, etc., or store in closed car during summer months, as the excessive heat will damage the internal components of the receiver and cabinet, and reduce the battery life.*

Lack of sensitivity and poor tone quality may be due to any one or a combination of causes such as weak or defective tubes or speaker, open or grounded bias resistor, bypass condenser, etc. Never attempt to realign set until all other possible sources of trouble have been first thoroughly investigated and definitely proved not to be the cause.

NOTE: IT IS ABSOLUTELY NECESSARY THAT AN ACCURATELY CALIBRATED TEST OSCILLATOR WITH SOME TYPE OF OUTPUT MEASURING DEVICE BE USED WHEN ALIGNING THE RECEIVER AND THAT THE PROCEDURE BE CAREFULLY FOLLOWED, OTHERWISE THE RECEIVER WILL BE INSENSITIVE AND THE DIAL CALIBRATION WILL BE INCORRECT. THE TRIMMERS WILL BE REFERRED TO BY THEIR FUNCTION AS INDICATED ON THE PARTS DIAGRAM.

ALIGNMENT PROCEDURE

GENERAL DATA. The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 455, 600, 1400 and 1620 KC and an output meter to be connected across the primary or secondary of the output transformer. If possible, all alignments should be made with the volume control on maximum and the test oscillator output as low as possible to prevent the AVC from operating and giving false readings.

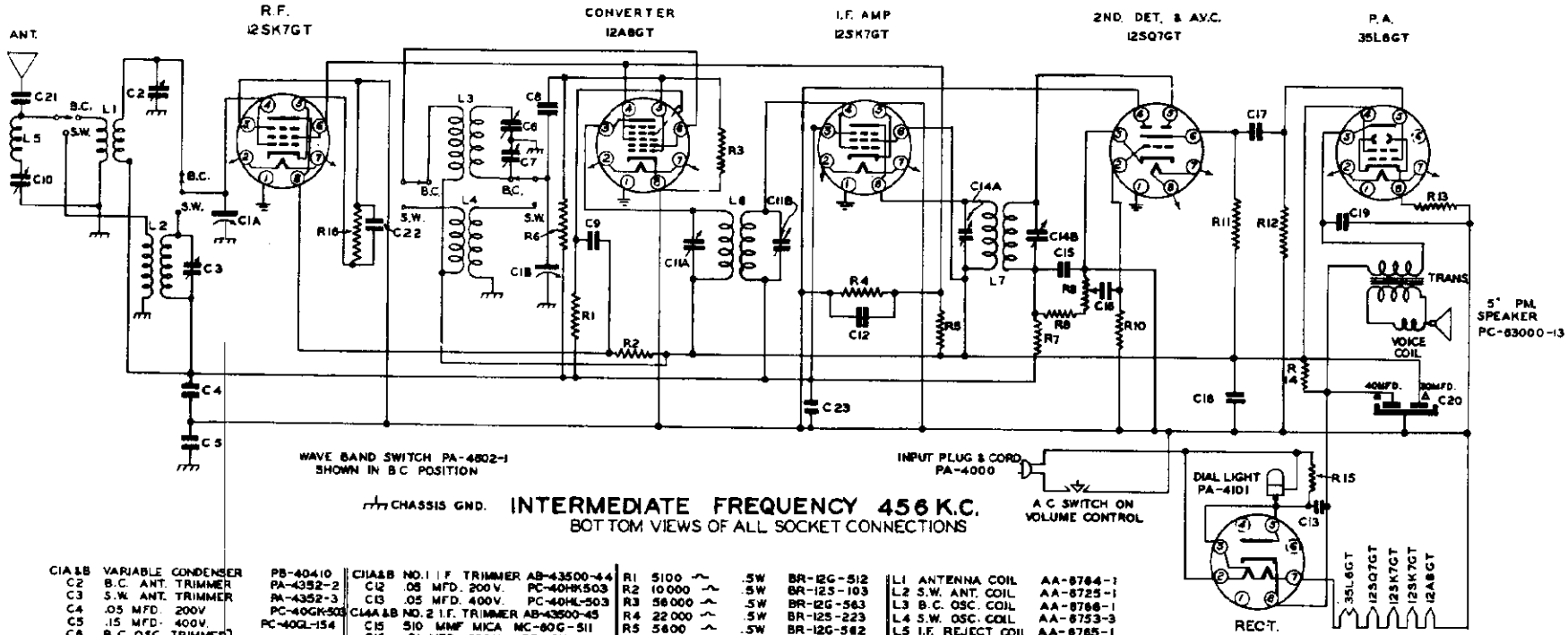
CORRECT ALIGNMENT PROCEDURE. The intermediate frequency (I.F.) stages should be aligned properly as the first step. After the I.F. transformers have been properly adjusted and peaked, the broadcast band should be adjusted.

I.F. ALIGNMENT: Remove the chassis and batteries from the cabinet and remove the bottom enclosure plate from the chassis. With the gang condenser set at minimum, adjust the test oscillator to 455 KC and connect the output to the grid of the first detector tube (1R5) through a .05 or .1 MFD condenser. The ground of the test oscillator should be connected to the buss. Align all four I.F. slugs to peak or maximum reading on the output meter. Each I.F. has an adjustment at the top and bottom of the can. The peaks on the slugs must be the ones farthest out of the coils.

R.F. ALIGNMENT: Place the cabinet on its face and open cabinet back to a 90° angle. Lay a board across the body of cabinet ahead of the loop. Replace the bottom chassis enclosure and set the chassis and batteries on the board so that they occupy the same relative position to the loop as they do in the cabinet. Care should be taken to have no iron or other metal near the loop.

Connect the test oscillator to a dummy loop which can be made by coiling 2 turns of hookup wire about 6" in diameter. Place this dummy loop about a foot from the loop on the receiver and in the same plane as the receiver loop. With the gang condenser set at minimum capacity, set the test oscillator at 1620 KC, and adjust the oscillator (or 1620 KC trimmer) on the gang condenser. Next set the test oscillator at 1400 KC, and tune in the signal on the gang condenser. Adjust the antenna trimmer (or 1400 KC trimmer) for maximum signal. Next set the test oscillator at 600 KC, and tune in signal on condenser to check alignment of coils.

POWER SUPPLY. This receiver is designed to operate on self-contained batteries or on either an AC or DC power supply when such a supply is available. (For battery information, see section on batteries.) The receiver will operate on either AC (50 to 60 cycles) with a voltage of 110 to 120 or DC with a voltage from 110 to 120.



CHASSIS GND.

INTERMEDIATE FREQUENCY 456 K.C.

BOTTOM VIEWS OF ALL SOCKET CONNECTIONS

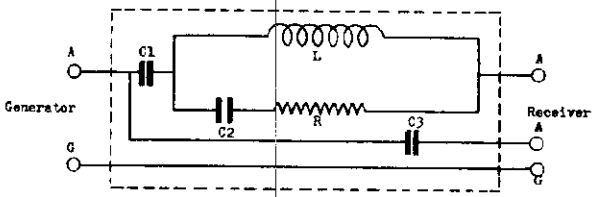
C1A&B	VARIABLE CONDENSER	PB-40410
C2	B.C. ANT. TRIMMER	PA-4352-2
C3	S.W. ANT. TRIMMER	PA-4352-3
C4	.05 MFD. 200V	PC-40GK-503
C5	.15 MFD. 400V.	PC-40GL-154
C6	B.C. OSC. TRIMMER	PA-4359
C7	B.C. OSC. PADDER	
C8	51 MMF. MICA	MC-60F-510
C9	100 MMF. MICA	MC-60F-101
C10	I.F. REJECT TRIMMER	PA-4352-4

C11A&B	NO.1 I.F. TRIMMER	AB-43500-44
C12	.05 MFD. 200 V.	PC-40HK503
C13	.05 MFD. 400V.	PC-40HL-503
C14A&B	NO. 2 I.F. TRIMMER	AB-43500-45
C15	510 MMF MICA	MC-60G-511
C16	.01 MFD 200 V	PC-40HK-103
C17	.01 MFD. 200 V	PC-40HK-103
C18	.05 MFD. 200 V	PC-40HK-503
C18	.03 MFD. 400 V	PC-40GL-303
C20	40-30 MFD ELECT.	PA-4304-1
C21	.001 MFD. 400V	PC-40GL-102
C22	.01 MFD 200V	PC-40HK-103
C23	.05 MFD 200V.	PC-40HK-503

R1	5100 ~	.5W	BR-12G-512
R2	10 000 ~	.5W	BR-12S-103
R3	56 000 ~	.5W	BR-12G-563
R4	22 000 ~	.5W	BR-12S-223
R5	5600 ~	.5W	BR-12G-562
R6	10 MEGOHM	.5W	BR-12S-106
R7	1 MEGOHM	.5W	BR-12S-105
R8	56 000 ~	.5W	BR-12G-563
R9	VOL. CONT. & SW.	.5MEG.	PA-4400-4
R10	10 MEGOHM	.5W	BR-12S-106
R11	270 000 ~	.5W	BR-12S-274
R12	680 000 ~	.5W	BR-12S-684
R13	180 ~	.5W	BR-12S-181
R14	1200 ~	.1W	CR-12S-122
R15	82 ~	.5W	BR-12S-820
R16	470 ~	.5W	BR-12G-471

L1	ANTENNA COIL	AA-8764-1
L2	S.W. ANT. COIL	AA-8725-1
L3	B.C. OSC. COIL	AA-8766-1
L4	S.W. OSC. COIL	AA-8753-3
L5	I.F. REJECT COIL	AA-8765-1
L6	NO. 1 I.F. COIL	AA-8600-1
L7	NO. 2 I.F. COIL	AA-8600-4

DUMMY ANTENNA



Note: When using this dummy antenna the generator output impedance should be 10 Ohms or lower.

C1 - 200 mmf. Condenser 400 V.D.C.
C2 - 400 mmf. Condenser 400 V.D.C.
C3 - .02 mmf. Condenser 400 V.D.C.
R - 100 Ohms Resistor 1/ 4 Watt
L - 20 Microhenryies Choke

----Case Shield
Choke Coil Specifications
Tubing-3/8" Diameter bakelite
Wire-No. 38 Enameled
Turns-59 closely wound(Impregnated)

VOLTAGE CHART

Line Voltage: 117 Volts AC

Position of volume control: Full with set tunned to quiet channel
Position of Band Switch: Broadcast

TUBE	FUNCTION	Voltage of Socket Prongs to Ground See Prong Nos. on schematic								
		No.1	No.2	No.3	No.4	No.5	No.6	No.7	No.8	Grid Cap
12SK7GT	R. F. Amp.	0	38 *	0	-.3	.35	50.3	23. *	58.	---
12A8GT	Converter	0	12 *	82.	52	-.24	81	0	0	-.26
12SK7GT	I. F. Amp.	0	23.3*	0	-.28	0	82	12 *	82	---
12SQ7GT	2nd. Det., AVC, 1st. AF	0	-.6	0	**	-.42	54	39 *	48.5*	---
35L6GT	Power Amp.	0	85. *	112	82	0	0	48 *	5.3	---
35Z5GT	Rectifier	0	117 *	112 *	0	112	0	87 *	117	---

Notes: All voltages are measured between tube pins and B- on Filter Condenser. (Chassis Base not ground postential). Voltage readings are for Schematic Diagram in this bulletin. Allow 15% + or - on all measurements. Always use meter scale which will give greatest deflection within scale limits. All D.C. measurements made with 20,000 ohms per volt voltmeter. All D.C. voltages made with rectifier type voltmeter. Unless designated otherwise, voltages in table are + D.C. voltages.

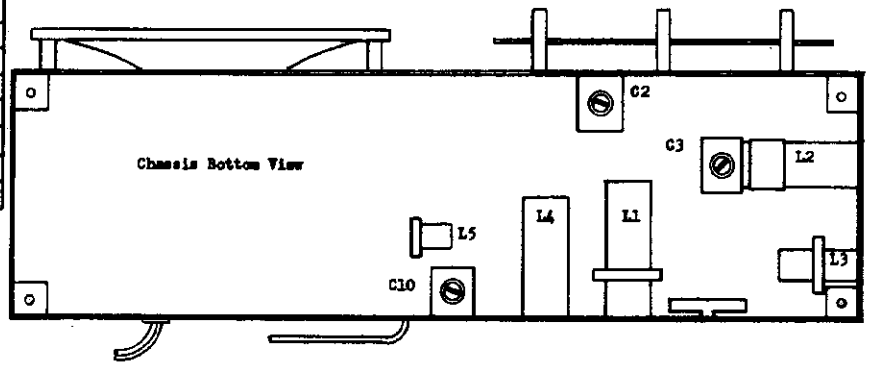
* A.C. Volts
** Cannot be measured with 20,000 ohms per volt voltmeter.

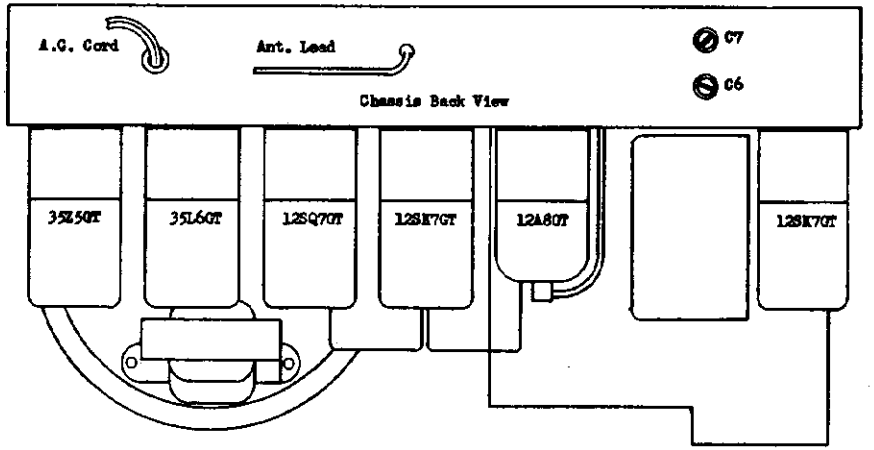
ALIGNMENT DATA

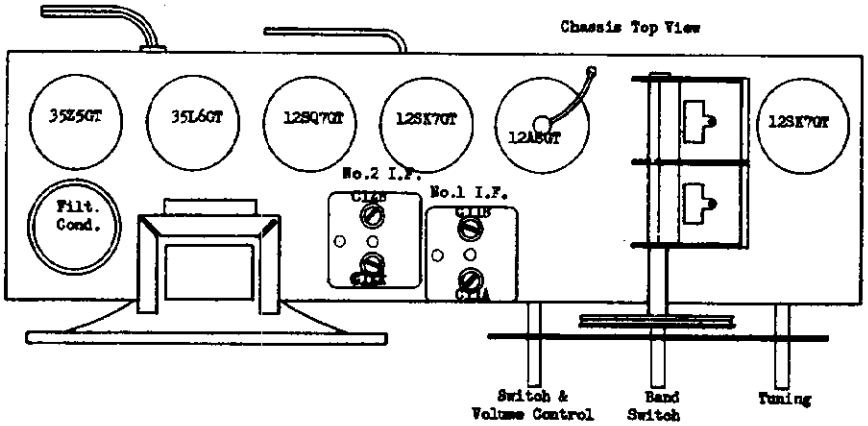
OPERATION	ALIGNMENT OF	GENERATOR CONNECTED TO	DUMMY ANTENNA	BAND SWITCH SETTING	GENERATOR FREQUENCY	TUNING COND. SETTING	TRIMMER	REMARKS
1	Set Dial Pointer to end of scale with condenser gang closed							
2	I.F.	*	.02 MFD. Cond.	BC.	456Kc.	OPEN	C14A & C14B	Peak Accurately
3							C11A & C11B	" "
4	Rejector	Ant.	* *	BC.	456Kc.	CLOSED	C10 Trim.	Adjust to Minimum
5	Broadcast Band	Ant.	* *	BC.	1500Kc	1500Kc.	C6 Osc.Trim.	Peak Accurately
							C2 Ant.Trim.	" "
6					600Kc.	600Kc.	C7 Osc.Pad.	***
7	Repeat operations 5 & 6							
8	Check calibration at 600Kc., 1000Kc. and 1500Kc.							
9	S.W.Band	Ant.	* *	S.W.Band	18.Mc.	18.Mc.	C3 Ant.Trim.	***
10	Check calibration at 18.Mc., 9.Mc. and 6.Mc.							
11	Check operations 1 to 8 inclusive.							

Notes: * Connect Generator to grid cap on 12A8GT Tube.
** Use dummy antenna as shown below.
*** Rock dial while adjusting for maximum output.

CHASSIS DIAGRAM







ALIGNMENT CHART

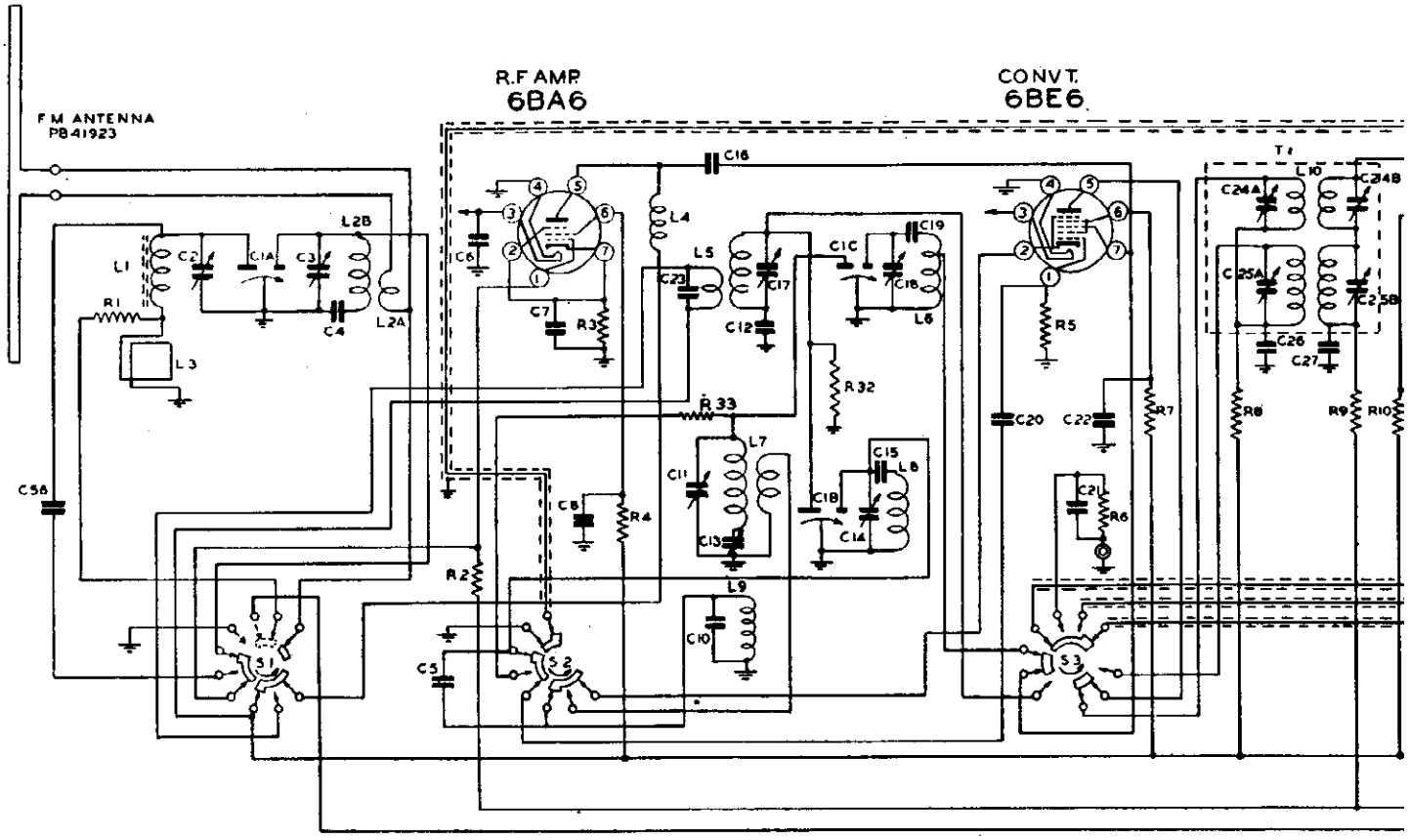
OPERATION	ALIGNMENT OF	GENERATOR CONNECTED TO	DUMMY ANT.	GENERATOR FREQUENCY	BAND SWITCH SETTING	TUNNING COND. SETTING	TRIMMER	REMARKS
1	Set dial pointer even with left-hand stop line with condenser gang closed.							
2	A.M.-I.F.	Pin #7 of 6BE6 Convt. Tube	.02 MFD. Cond.	456 KC.	BC.	Open	C34A & B	Peak Accurately
							C25A & B	" "
3	A.M.-R.F.	BC. Ant.	*	1500 KC.	BC.	1500 KC.	C11 Osc. Tr.	" "
							C17 R.F. Tr.	" "
							C2 Ant. Tr.	" "
4				600 KC.		600 KC.	C13 Osc. Pad.	**
5	Repeat operations 2, 3, and 4.							
6	Check calibrations at 600, 1000, and 1500 KC.							
7	SPECIAL NOTE: For complete F.M.-I.F. visual alignment instructions please refer to pages 5, 6, 7, 8, 9, and 10 of this bulletin.							
8	F.M.-I.F. alignment using A.M. generator and output meter.							
9	T3 F.M. Ratio Det.	Pin #6 on 2nd 7A7 I.F. Amp.	.05 MFD. Cond.	10.8 MC.	F.M.	Open 108 MC.	C46B Sec.	Peak Accurately
							L12 Slug	Max. Reading
							C46A Pri.	Peak Accurately
10	NOTE: Operation #9 must be made with generator output as low as possible with maximum reading on output meter.							
11	Connect a 15,000 ohm resistor (to prevent overcoupling) between pin #6 (grid) on 2nd 7A7 tube to ground. After operation #12 is completed leave resistor connected for operations to follow.							
12	T2 F.M.-I.F.	Pin #6 on 1st 7A7 I.F. Amp.	.05 MFD. Cond.	10.7 MC.	F.M.	Open 108 MC.	C33B Sec.	Peak Accurately
							C33A Pri.	" "
13	NOTE: Operation #12 must be made with generator output as low as possible with maximum reading on output meter.							
14	Connect another 15,000 ohm resistor between pin #6 (grid) on 1st 7A7 tube to ground.							
15	T1 F.M.-I.F.	Pin #7 on 6BE6 Tube or C.T. on L6 Coil	.05 MFD Cond.	10.7 MC.	F.M.	Open 108 MC.	C24B Sec.	Peak Accurately
							C24A Pri.	" "
16	NOTE: Operation #15 must be made with generator output as low as possible with maximum reading on output meter.							
17	Repeat operations 9, 12, and 15.							
18	Remove the two 15,000 ohm resistor dummies from pin #6 on the 7A7 tubes but leave generator coupled through .05 MFD. Cond. to pin #7 on 6BE6 tube (C.T. on L6 coil).							
19	Adjust C46B secondary trimmer on T3 ratio detector transformer to minimum deflection or dip on output meter. Under certain conditions it is possible to adjust C46B secondary trimmer to minimum noise with the receiver tuned to a weak station. This operation is very sharp and the receiver must be tuned to the center response only.							
20	Repeat operation #19.							
21	F.M.-R.F. alignment using an A.M. generator with frequency of 88 to 108 MC. and vacuum tube voltmeter, or D.C. voltmeter (20,000 ohms per volt).							
OPERATION	ALIGNMENT OF	GENERATOR CONNECTED TO	DUMMY ANT.	GENERATOR FREQUENCY	BAND SWITCH SETTING	TUNING COND. SETTING	TRIMMER	REMARKS
22	Place meter across C51 Elect. Condenser. (Meter reading approx. 1 volt).							
23	F.M.-R.F.	F.M. Ant.	Match to 300 Ohms	108 MC.	F.M.	108 MC.	C14 Osc. Tr.	Max. A.V.C. V.
							C18 R.F. Tr.	Peak Accurately
							C3 Ant. Tr.	" "
24	Repeat operation #23.							
25	Check calibration at 88 MC.							

* Use dummy antenna

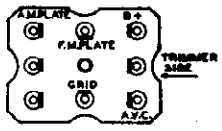
** Rock dial while adjusting for maximum output.

A.M. INTERMEDIATE FREQ
F.M. INTERMEDIATE FREQ

BOTTOM VIEWS OF ALL SOCI

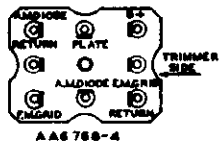


T1 NO.1 I.F. TRANS.



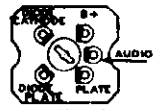
AA6768-3

T2 NO.2 I.F. TRANS.



AA6768-4

T3 RATIO DET. TRANS.



AA6734-3

TERMINAL HOOKUP FOR L10, L11 AND L13
BOTTOM VIEW

* SPECIAL SERVICE NOTE: THESE TRANSFORMERS SUPPLIED AS ASSEMBLIES COMPLETE ONLY.

C1 A,B,C, 3 GANG CONDENSER	PB40405
C2 A.M. ANT TRIMMER	PA4352-1
C3 F.M. ANT TRIMMER	PA4352-1
C4 F.M. ANT. PADDER 46MMF.	PA4328-2
C5 10MMF. CERAMIC	CC31H100K
C6 1000 MMF. MOLDED PAPER	PA4325-2
C7 10000 MMF. MOLDED PAPER	PA4325-1
C8 1000 MMF. MOLDED 200 V	PA4325-2
C9 1000 MMF. MOLDED 400 V.	PA4325-3
C10 15 MMF. CERAMIC	CC31H150K
C11 A.M. OSC. TRIMMER	PA4352-3
C12 .05 MFD 200 V TUBULAR	PC40GK-503
C13 B.C. OSC. PADDER	PA4352-6
C14 F.M. OSC. TRIMMER	PA4379-1
C15 F.M. OSC. PADDER 85 MMF.	PA4328-6
C16 5 MMF. CERAMIC	PA4328-5
C17 B.C. R.F. TRIMMER	PA4352-1
C18 F.M. R.F. TRIMMER	PA4352-1
C19 F.M. R.F. PADDER 46MMF	PA4328-2
C20 51 MMF. MOLDED MICA	MC60G-510
C21 100 MMF. " "	MC60G-101
C22 1000 MMF. " PAPER	PA4325-2
C23 51 MMF. CERAMIC	CC31H510K
C24 A,B NO.1 I.F. TRIMMER F.M. *	PA4359-1
C25 A,B NO.1 I.F. " A.M. *	PA4359-3
C26 .01 MFD. 400 V. TUBULAR	PC40GL-103
C27 .01 MFD. 200 V. "	PC40GK-103
C28 1000 MMF. MOLDED PAPER	PA4325-2
C29 .05 MFD. 200 V.	PC40GK-503
C30 .01 MFD. 400 V.	PC40GL-103
C31 .05 MFD. 400 V.	PC40GL-503
C32 .02 MFD. 200 V.	PC40GK-203
C33 NO.2 I.F. TRIMMER F.M. *	PA4359-1
C34 NO.2 I.F. TRIMMER A.M. *	PA4359-3
C35 100 MMF. MOLDED MICA	MC60G-101
C36 100 MMF. " "	MC60G-101
C37 001 MFD. 200V. MOLDED PAPER	PA4325-2
C38 1000 MMF. MOLDED PAPER	PA4325-2
C39 .01 MFD. 400V. TUBULAR	PC40GL-103
C40 .05 MFD. 200V. "	PC40GK-503
C41 100 MMF. MICA MOLDED	MC60G-101
C42 20 MMF. MICA MOLDED	MC65F-200
C43 .05 MFD. 400 V. PAPER	PC40GL-503
C44 .01 " 200 V.	PC40GK-103
C45 51 MMF. MOLDED MICA	MC60F-510
C46 A,B RATIO DET. TRIMMER *	PA4359-1
C47 .05 MFD. 400V. TUBULAR	PC40GL-503
C48 A,B 40-40 MFD. ELECT.	PA4302
C49 100 MMF. MOLDED MICA	MC60G-101
C50 .02 MFD. 200V. TUBULAR	PC40GK-203
C51 8 MFD. 150 V. ELECT.	PA4303-6
C52 .006 MFD. 1000V. TUBULAR	PC40GN-602
C53 20 " 25V. ELECT.	PA4303-2
C54 .02 " 400 V. TUBULAR	PC40GL-203
C55 .004 " 200 V.	PC40GK-402
C56 51 MMF. MICA	MC60G-510
C57 .05 400 V. "	PC40GL-503

L1 A.M. ANT. LOADING COIL	AA6780-2
L2A F.M. ANT. COIL PRI.	AA6786-1
L2B F.M. ANT. COIL SEC.	AA6767-6
L3 A.M. ANT. LOOP	AC67008-1
L4 F.M. R.F. CHOKE	AA6769-2
L5 B.C. R.F. COIL	AA8758-4
L6 F.M. R.F. COIL	AA8787-5
L7 B.C. OSC. COIL	AA6759-2
L8 F.M. OSC. COIL	AA6767-4
L9 F.M. CATHODE CHOKE	AA6798-1
L10 NO.1 I.F. COIL *	AA6803-2
L11 NO.2 I.F. COIL *	AA6803-2
L12 F.M. CHOKE	AA6785-2
L13 RATIO DETECTOR *	AA6805-2

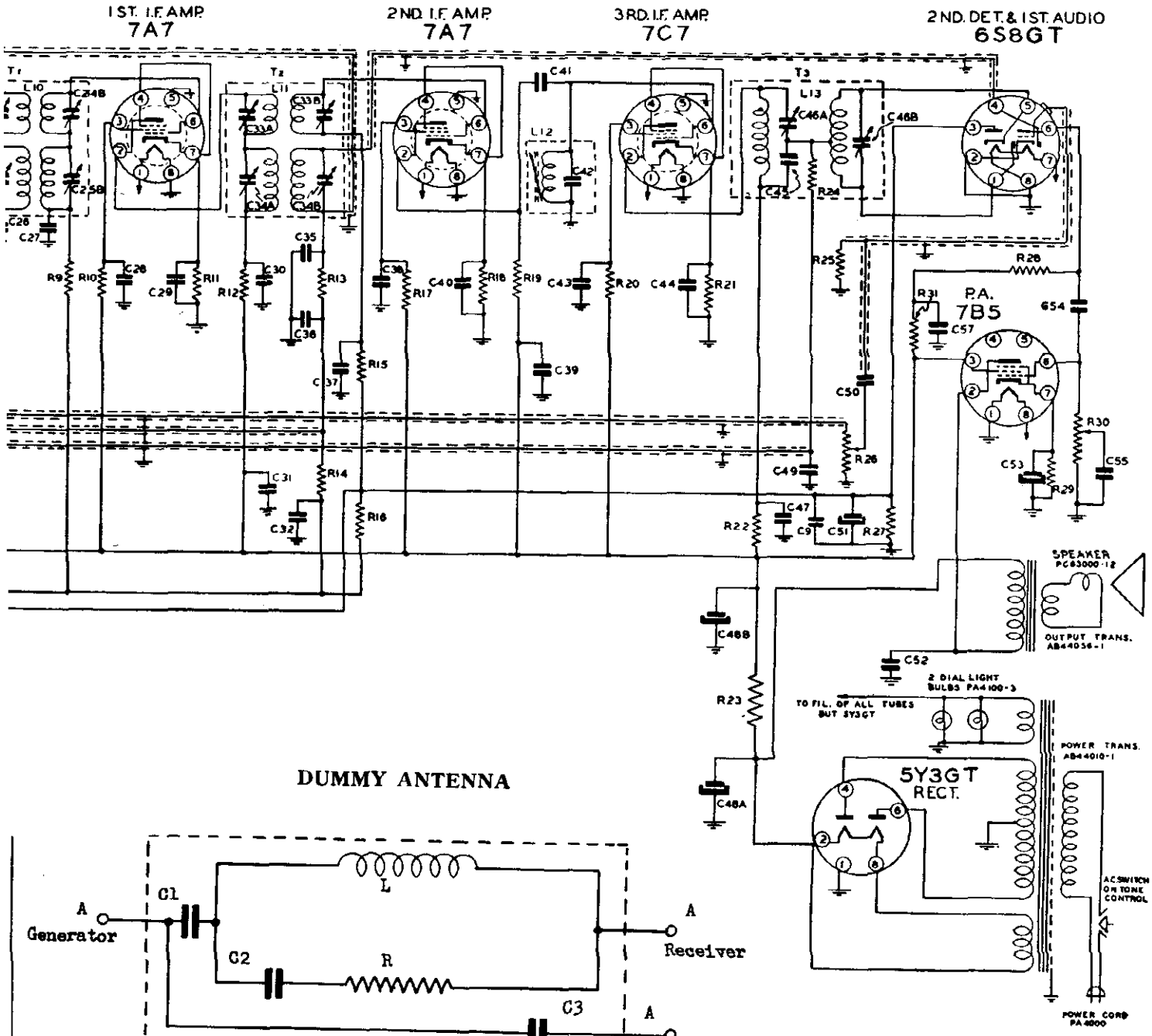
R1	2200 OHMS	1/2 WATT	BR12S-222
R2	1 MEG.	" "	BR12S-105
R3	68	" "	BR12S-680
R4	33000	" "	BR12S-333
R5	22,000	" "	BR12S-223
R6	1 MEG.	" "	BR12S-105
R7	22,000	" 2	DR12S-223
R8	1000	" 1/2	BR12S-102
R9	100,000	" "	BR12S-104
R10	82,000	" "	BR12S-823
R11	270	" "	BR12S-271
R12	1000	" "	BR12S-102
R13	56,000	" "	BR12S-563
R14	100,000	" "	BR12S-104
R15	1 MEG.	" "	BR12S-105
R16	330,000	" "	BR12S-334
R17	82,000	" "	BR12S-823
R18	270	" "	BR12S-271
R19	10,000	" 1	CR12S-103
R20	220,000	" 1/2	BR12S-224
R21	820	" "	BR12S-821
R22	1000	" "	BR12S-102
R23	650	" 10	PA4200-4
R24	10,000	" 1/2	BR12S-103
R25	10 MEG.	" "	BR12S-106
R26	1/2 MEG.	VOLUME CONTROL	PA4407-1
R27	51,000	" 1/2	BR12S-513
R28	220,000	" "	BR12S-224
R29	470	" 2	DR12S-471
R30	1/2 MEG.	TONE CONTROL & SWITCH	PA4400-7
R31	56,000 OHMS	1/2 WATT	BR12S-563
R32	1 MEGOHM	1/2 WATT	BR12S-105
R33	47 OHM	1 WATT	CR12S-470

T1 NO.1 I.F. TRANS. ASSEM. *	AA6768-3
T2 NO.2 I.F. TRANS. ASSEM. *	AA6768-4
T3 RATIO DET. TRANS. ASSEM. *	AA6734-3

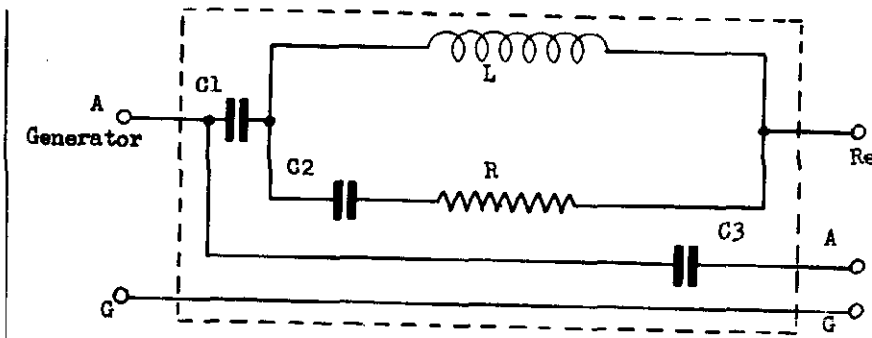
KS-WITHINGTON CO.

MODELS 1005, 6, 7, 8,
CHASSIS 8-57

E FREQUENCY 456 KC.
E FREQUENCY 10.7 MC.
)F ALL SOCKET CONNECTIONS



DUMMY ANTENNA



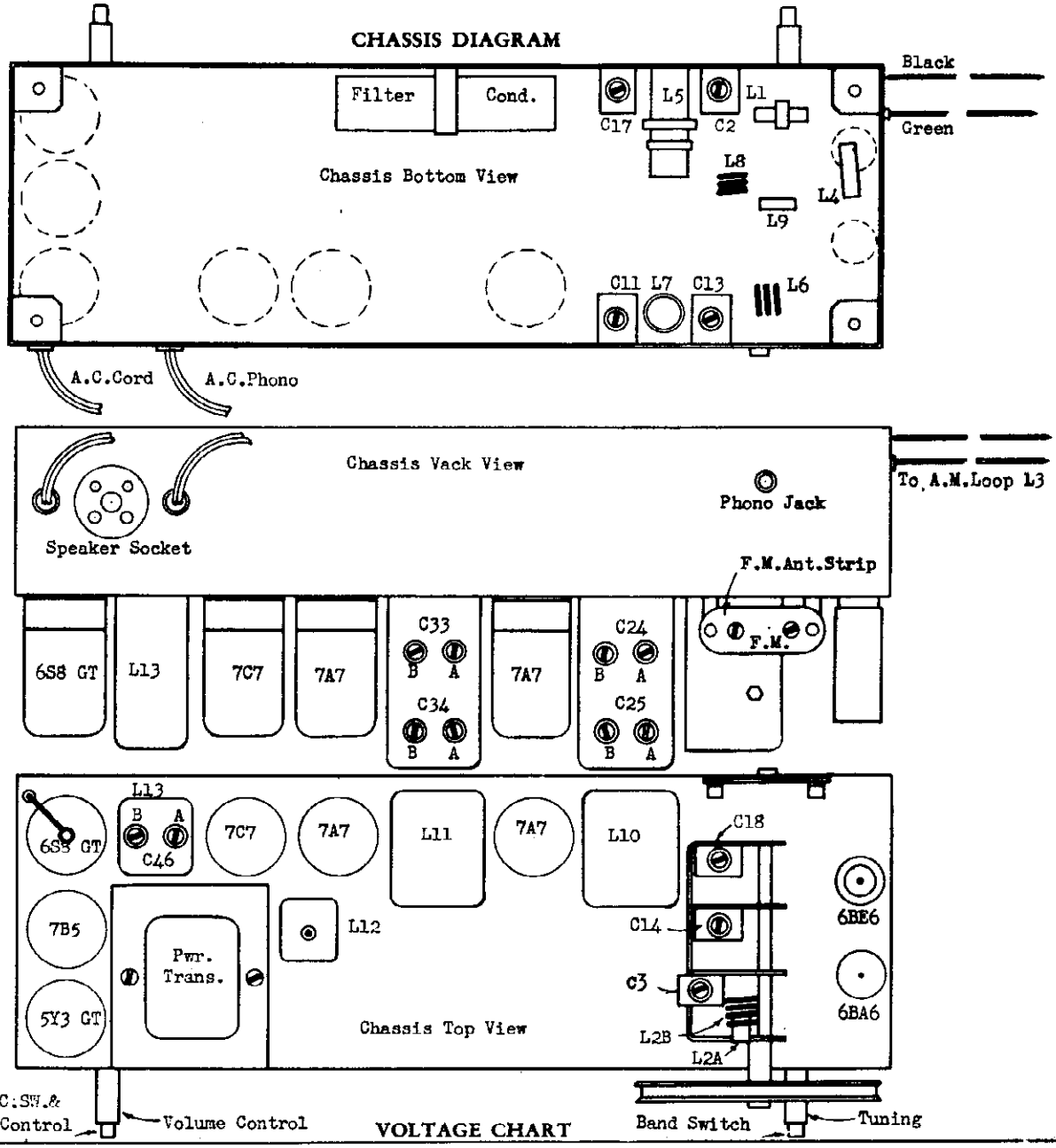
C1-200 mmf. Condenser 400 V.D.C.
C2-400 mmf. Condenser 400 V.D.C.
C3-.02 mmf. Condenser 400 V.D.C.
R-100 ohms Resistor 1/4 Watt
L-Choke Coil

----Case Shield
Choke Coil Specification
Tubing - 3/8" Diameter Bakelite
Wire - No. 38 Enameled
Turns - 59 closely wound (Impregnated)

NOTE: When using this dummy antenna the generator output impedance should be 10 ohms or lower.

MODELS 1005,6,7,8 THE SPARKS-WITHINGTON CO.

CHASSIS DIAGRAM



VOLTAGE CHART

Line Voltage: 117 Volts AC

Position of volume control: Full with set tuned to quiet channel.
Position of Band Switch: Broadcast

TUBE	FUNCTION	Voltage of Socket Prongs to Ground. See Prong Nos. on schematic.								
		No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	Grid Cap
6BA6	R. F. Amp.	* *	6	6.2*	0	238	115	.9		
6BE6	Convt.	.-15	0	6.2*	0	236	90	0		
7A7	1st I. F. Amp.	6.2*	230	87	2.38	0	* *	2.38	0	
7A7	2nd I. F. Amp.	6.2*	168	93	2.30	0	* *	2.30	0	
7C7	3rd I. F. Amp.	6.2*	235	110	2.45	0	* *	2.50	0	
6S8GT	2nd Det. 1st Audio	* *	0	0	0	.-15	111	6.2*	0	-.25
7B5	P.A.	0	260	237	0	0	* *	15	6.2*	
5&3GT	Rect.	0	260	0	245*	0	245*	0	260	

NOTES: Voltage readings are for schematic diagram on back of sheet. Allow 15% + or - on all measurements. Always use meter scale which will give greatest deflection within scale limits. All DC measurements made with 20,000 ohms per volt voltmeter. All AC voltages made with rectifier type voltmeter. Unless designated otherwise, voltages in table are + DC voltages.
* AC volts. ** Cannot be measured with 20,000 ohms per volt voltmeter.

VISUAL I. F.-F. M. ALIGNMENT DATA

1. Description of circuit used:

The I. F. channel in this model consists of 1 stage of amplification at 456 Kc. plus a diode detector used for AM reception on the BC band and a 10.7 Mc. amplifier consisting of two stages of amplification, one ratio detector and 1 ratio detector driver.

The tube complement is as follows, two 7A7 IF amplifiers only one of which is used for AM reception, one 7C7 ratio detector driver used on FM only and one 6S8GT detector and 1st audio amplifier. The 6S8GT tube contains three diodes and a triode and is there used as the diode detector and 1st audio amplifier on AM and as a ratio detector and 1st audio amplifier on FM. The various circuits are connected to the wave band switch where necessary to switch from AM to FM.

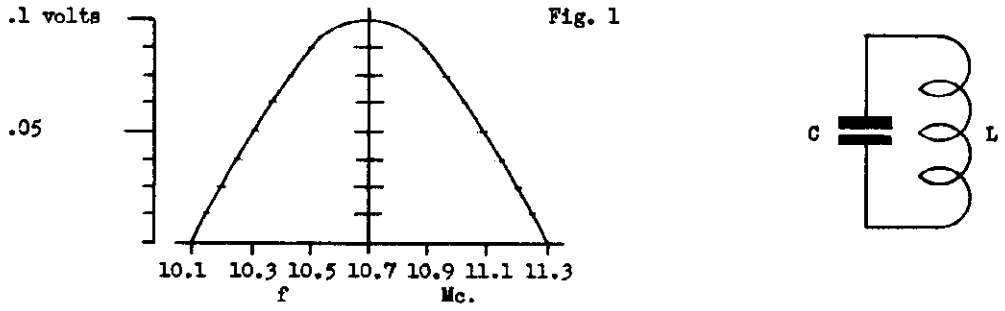
The IF transformers used are of the composite type wherein the 456 KC. circuits and the 10.7 circuits are constructed in the same shield can and is generally wired in series to obviate the need for switching. Only the converter plate connection on the model is switched when changing from FM to AM or vice versa. The ratio detector driver is tuned by an iron core, peaking coil tuned to 10.7 Mc. in the grid circuit of the 7C7 tube.

The ratio detector transformer is a special design made for this purpose and generally peculiar to the receiver in which it is used. Most of the noise rejecting characteristics and to a large extent the audio fidelity of the receiver hinges on the proper design and adjustment of this circuit. This adjustment together with the proper alignment of the other IF transformers determines the gain of the IF system and thus the overall sensitivity of the complete receiver. Thus the importance of properly making these adjustments is of the utmost importance.

2. Theory of Visual Alignment:

One of the characteristics of a tuned circuit is the fact that when it is excited or driven by a generator such as a vacuum tube or another tuned circuit, the voltage developed across it will vary with slight changes in frequency. This voltage will be greatest when the frequency is equal to the resonant frequency of the circuit and will be less if the frequency is higher or lower than the resonant frequency. Thus if we were to shift the frequency from high to low or low to high across the resonant frequency and make a record of the voltage across the tuned circuit, we could plot the voltage against frequency and obtain a curve which might look like Fig. 1.

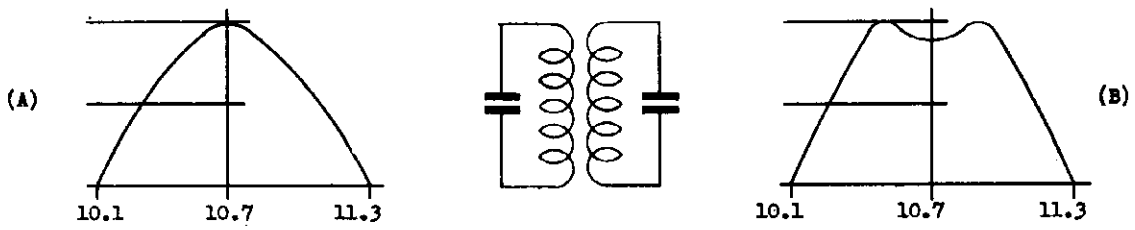
Fig. 1



This is the selectivity curve or response curve for the circuit under discussion.

This type of circuit may be aligned or adjusted to resonance by simply changing either L or C until maximum voltage is obtained at the resonant frequency. Now if another circuit tuned to the same resonant frequency is coupled to the simple case above, a number of things can happen. First, current flowing in one circuit will induce current in the second circuit, the magnitude of this current depending on the degree or amount of coupling between the two circuits. This coupling may be in the form of mutual inductance, mutual capacitance or any impedance common to the two circuits and its magnitude may be either controlable or uncontrolable or as is often the case only partly controlable in a production item. Most IF transformers in present day use are circuits of this type where the coupling is in the form of mutual inductance which may be controled in fabrication. However with the advent of 10.7 Mc. IF channels the effect of the stray capacity coupling always present becomes important and is usually difficult to control. Now if we repeat the procedure outlined for obtaining the response curve of a single tuned circuit using the voltage developed across the secondary of the coupled circuit while driving the primary, we may get either of two types of curves depending on the magnitude of the coupling, (a) in Fig. 2 is a typical curve for two circuits coupled below critical coupling and (b) is a representation of the curve for an overcoupled circuit.

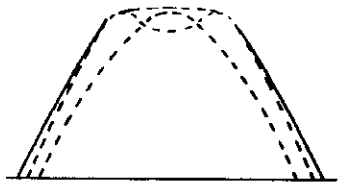
Fig. 2



VISUAL I. F.-F. M. ALIGNMENT DATA

Overcoupled circuits producing a response curve like (b) Fig. 2 are often employed where it is important that the response curve remain approximately flat over a narrow band of frequencies near the resonant frequency. They are also frequently combined with single peaked circuits to produce a response curve like Fig. 3.

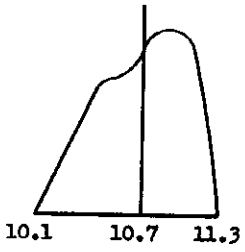
Fig. 3

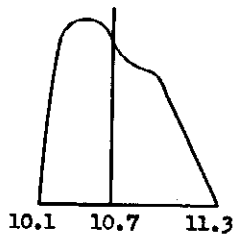


The dotted lines indicate the curves of the individual circuits and the solid curve shows the overall response of two or more pairs of coupled circuits. Circuits like the above or approaching them in form are desirable in a FM receiver where the pass band should be of the order of 200 Kc. Now from the above it is evident that simply peaking both sides of a circuit coupled below critical for maximum voltage will provide optimum alignment but if this procedure is followed with an overcoupled circuit it is almost a certainty that the two circuits will not be tuned to the resonant frequency but will instead be aligned so that either one or the other peak is accentuated. The response curve will then look like Fig. 4 (a) or (b).

Fig. 4

(A)

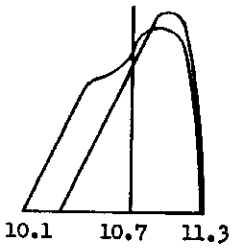




(B)

Now if this overcoupled circuit is combined with a single peaked circuit (where the coupling is below critical) the misalignment becomes worse, something like Fig. 5.

Fig. 5



From the above it appears that to properly align a receiver using overcoupled IF transformers it will be necessary to take a response curve of each stage and align the circuit so that the two peaks are symmetrical, that is, approximately equal in amplitude and displaced equally from the center frequency. To do this with a CW or AM signal would be laborious and time consuming whereas the use of visual equipment makes it nearly as simple as adjusting a simple single peaked amplifier.

Visual alignment test equipment performs the operation of plotting the response curve almost exactly as described above except that instead of manually changing the generator frequency, recording the voltage and then plotting the results, these operations are performed automatically and simultaneously by a combination of electronic circuits. The operation is briefly as follows.

In the signal generator a low AC voltage is applied to a reactance tube modulator which shifts the oscillator frequency from low to high or from high to low at a rate determined by the frequency of the AC voltage and by an amount determined by the AC voltage. The frequency at any instant is then dependant on the AC voltage present at that instant of time. An oscilloscope is provided which may be considered a voltmeter used to read the voltage across the tuned circuit, provided a detector is used to convert the RF to a low audio frequency. This voltage is then applied to the vertical plates and results in a vertical displacement of the spot on the screen. Some of the voltage used to shift the oscillator frequency is also applied to the horizontal plates of the oscilloscope providing a means of displacing the spot horizontally. It is now evident that since that for any given

VISUAL I. F.-F. M. ALIGNMENT DATA

AC voltage only one frequency may be obtained and since that AC voltage will result in an exact amount of spot deflection on the scope we can read the voltage across the circuit under examination by noticing the position of the spot at this exact instant.

Now if we consider the frequency as shifting from low to high 60 times per second and remember that the spot is moving across the screen of the scope 60 times per second at exact synchronization with the change in frequency it is only necessary to apply the voltage from our circuit to the vertical plates to obtain a replica of the response curve on the face of the cathode ray tube. This curve will be repeated 60 times per second if our sweep frequency is 60 cycles. Adjustments to the circuit may now be made and the effect on the response curve noted instantaneously.

EQUIPMENT REQUIRED

To align the IF stages in this receiver the following equipment will be necessary.

(a) A sweep signal generator with a center frequency of 10.7 Mc. and a total sweep width of at least 400 Kc. This generator should be equipped with filters to remove all spurious oscillator frequencies and limiters should be provided to remove all amplitude modulation. There should also be a crystal oscillator to provide a marker frequency at 10.7 Mc. for accurate determination of the center frequency.

(b) An amplitude modulated signal generator tuned to 456 Kc. This generator should be either crystal controlled or means should be provided for accurate frequency calibration.

(c) An oscilloscope with either a 3" or 5" tube equipped with both vertical and horizontal amplifiers.

(d) A power output meter with an internal impedance to match 3.2 ohms for use in 456 Kc. alignment.

(e) A diode detector for use in connection with the oscilloscope while aligning the FM IF channel. This diode detector may be either a IN34 crystal or a two element vacuum tube such as the 6H6. A diode load resistor, coupling condenser, etc. will also be necessary. A connection for this detector is supplied on the speaker socket.

(f) Connecting cables, from the generator to receiver, receiver to scope, etc.

Alignment of the 456 Kc. IF.

This alignment adjustment should be made before attempting to align the 10.7 IF circuit because of possible effects on the operation of the FM IF.

Connect the output meter, scope and speaker to the receiver by pluging the detector into the speaker socket. All output connections will be made automatically when this is done. Connect the signal generator output lead to the converter (6BE6) grid. Turn the wave band switch to BC and the generator to 456 Kc. Using the output meter as an indicator peak the AM IF trimmers for maximum output.

Alignment of the 10.7 IF.

Turn the wave band switch to FM and the generator switch to 10.7 Mc. Move the signal generator lead to the plate of the second 7A7 tube and turn the function switch on the scope to Det. Now proceed to align the ratio detector transformer for maximum linearity and minimum noise. This operation can be facilitated by applying a small amount of amplitude modulation along with the FM and then adjusting the secondary trimmer for minimum noise. Please note that the adjustment of the secondary circuit, controls to a large extent, the linearity of the pattern and adjustment of the primary is responsible for the gain in the circuit. Fig. 6 will represent a linear detector curve and Fig. 7, a detector curve with noise or AM present.

Fig. 6

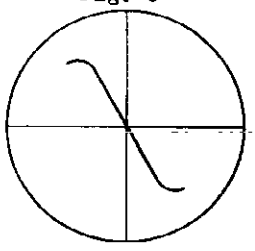
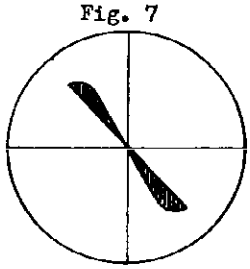


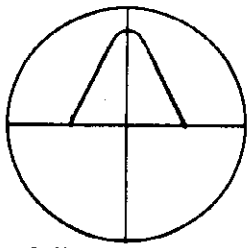
Fig. 7



With the generator output lead still connected to the grid of the second 7A7 tube, turn the function switch to IF. Align the core adjustment in the tuned choke for maximum output. Note that since this is a single tuned circuit, the response curve is single peaked. See Fig. 8.

VISUAL I. F.-F. M. ALIGNMENT DATA

Fig. 8

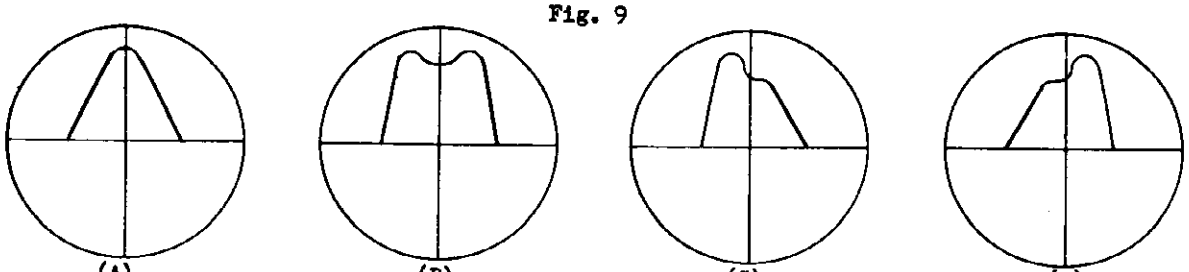


Move the generator lead to the grid of the first 7A7 tube and align the second IF transformer. Adjust both trimmer screws for maximum gain, meanwhile maintaining symmetry in the curve. Observe that by alternatly adjusting the primary and secondary trimmer, the vertical amplitude can be increased without allowing the response curve to become greatly distorted. This transformer is not supposed to be overcoupled and so should not present a double peaked curve, however, production variations in coupling may be large enough for the transformer to become overcoupled in which case final alignment should be so made that the two peaks are equally spaced about the center frequency and approximately equal in amplitude.

Move the generator lead to the grid of the 6BE6 tube and align No. 1 IF transformer following the same procedure as for #2 above.

Fig. 9, (a) (b) (c) (d) below represent response curves typical of those for #1 and #2 IF stages.

Fig. 9



(A) Not Overcoupled Properly Aligned (Right)

(B) Overcoupled Properly Aligned (Right)

(C) Overcoupled Improperly Aligned (Wrong)

(D) Overcoupled Improperly Aligned (Wrong)

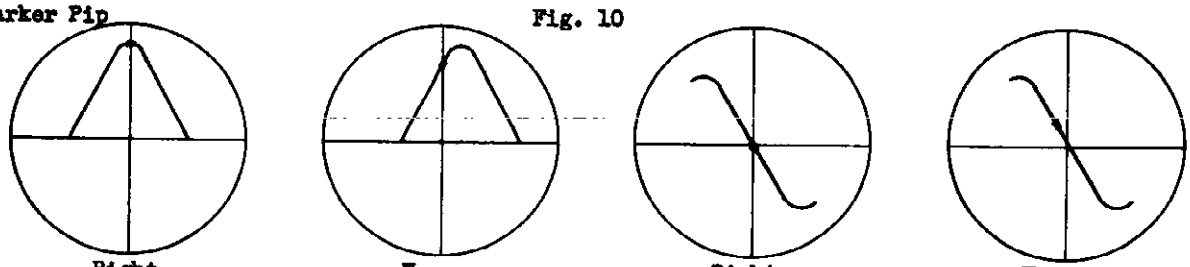
With the generator lead still connected to the 6BE6 grid, turn the function switch on the scope to Det. and check the detector curve for linearity and noise. Should this appear unsatisfactory, a very slight readjustment of the detector secondary alignment may be made at this time. If however the adjustment required is very great the entire alignment procedure should be repeated in that the need for adjustment is indication of incorrect alignment in one of the other stages.

Use of Marker Frequencies.

A crystal controlled marker frequency is provided at 10.7 Mc. This frequency may be turned on or off by means of the marker control and should be used only when necessary to check the calibration of the sweep oscillator. This is accomplished by simply turning on the marker and observing the position of the pip. When the frequency of the sweep oscillator is correct the pip will appear in the exact center of the sweep and so in the center of the resonance curve. See Fig. 10.

Marker Pip

Fig. 10



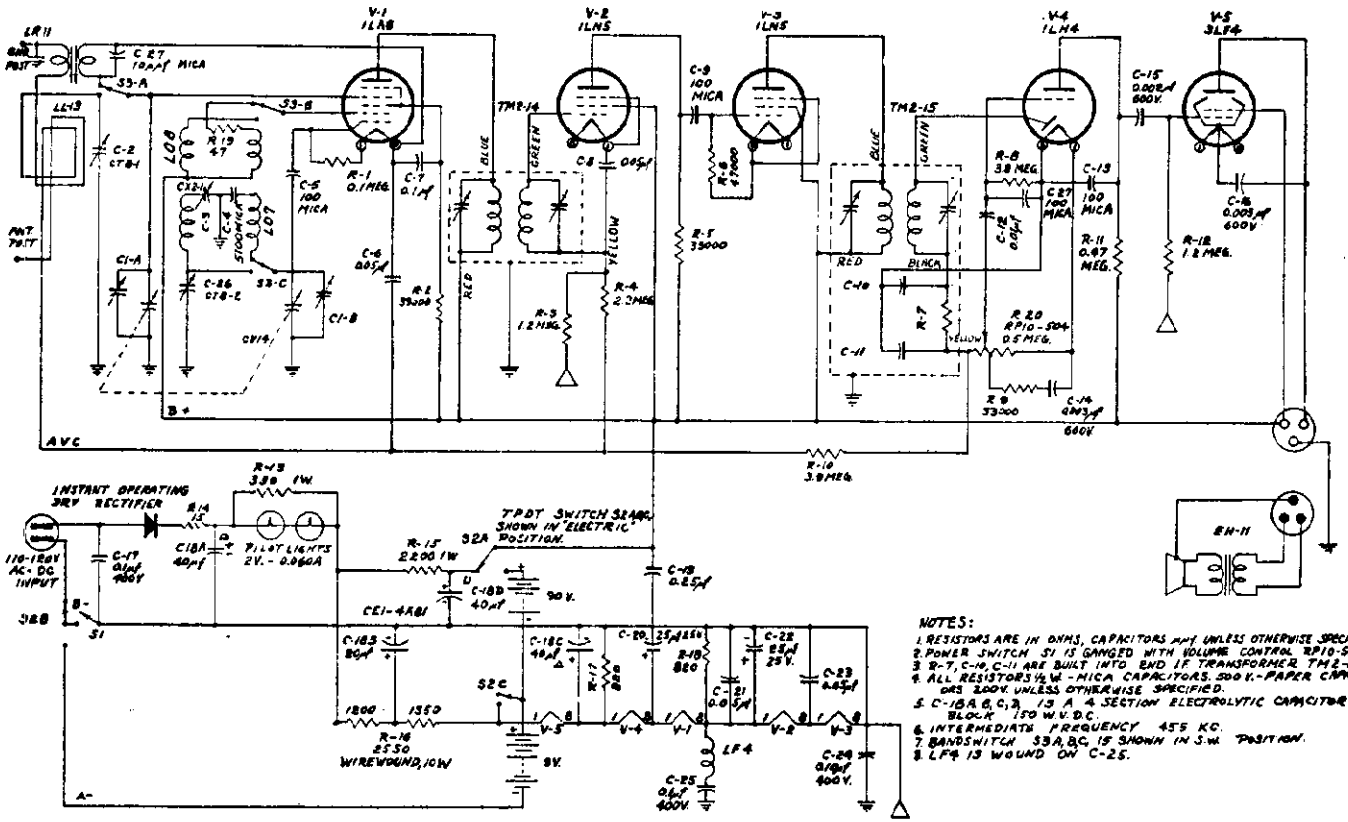
Right

Wrong Resonance Curve Off Frequency

Right

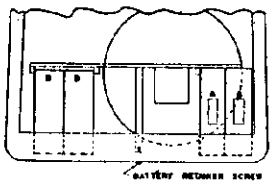
Wrong Sweep Oscillator Off Frequency

Note that either the sweep oscillator or the circuit alignment may be off frequency.



NOTES:

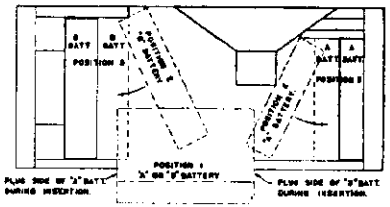
1. RESISTORS ARE IN OHMS, CAPACITORS µµf UNLESS OTHERWISE SPECIFIED.
2. POWER SWITCH S1 IS GANGED WITH VOLUME CONTROL RP10-504.
3. R-7, C-10, C-11 ARE BUILT INTO 2ND IF TRANSFORMER TM2-15.
4. ALL RESISTORS ½ W - MICA CAPACITORS 500 V. - PAPER CAPACITORS 200V. UNLESS OTHERWISE SPECIFIED.
5. C-18A, B, C, D IS A 4 SECTION ELECTROLYTIC CAPACITOR BLOCK 150 W.V.D.C.
6. INTERMEDIATE FREQUENCY 455 KC.
7. BANDSWITCH S3A, B, C, IS SHOWN IN S.W. POSITION.
8. LF4 IS WOUND ON C-25.



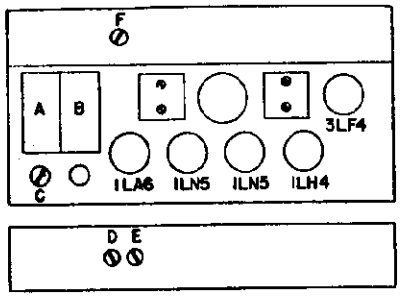
REAR VIEW SHOWING LOCATION OF "A" AND "B" BATTERIES

NOTE
WHEN REMOVING OR REPLACING BATTERIES, FIRST REMOVE BATTERY RETAINER BY UNSCREWING HOLDING SCREW AT BOTTOM OF CABINET

POSITION 1 - SLIDE BATTERY IN SIDEWAYS WITH PLUS AS INDICATED
POSITION 2 - ROTATE IN DIRECTION OF ARROW.
POSITION 3 - FINAL POSITION OF BATTERY.



TOP VIEW SHOWING REMOVAL AND INSTALLATION OF "A" AND "B" BATTERIES.



TUBE & TRIMMER LOCATION

SPIEGEL

Model G-521 has 5 tubes plus an instant operating dry disc rectifier. It is a three way portable superheterodyne receiver using the latest types of low drain electronic tubes.

Operation: The set operates on 105 to 120 volts 50 or 60 cycles A.C., 105 to 120 volts D.C., or from self contained batteries. Power drain is approximately 13 watts on electric operation. Because Model G-521 uses an instant operating dry disc rectifier, no warm up period is necessary on either A.C., D.C., or battery operation. The set will play immediately after the power switch is turned on. When operated on direct current (D.C.) if no reception is obtained, reverse the line plug in the power outlet.

Ranges: Model G-521 has both a broadcast and a short wave range. It covers the broadcast band from 535 to 1620 kilocycles. Since the broadcast dial scale is calibrated from 55 to 160 the actual frequency of the station may be obtained by adding a zero to the dial calibration. The range of the short wave band covered in Model G-521 is from 5.6 to 18.5 megacycles. The short wave dial scale is calibrated directly in megacycles.

Antenna: For normal reception on the broadcast band, no outside aerial is required, as more than adequate pickup is obtained by the self contained loop antenna. At installations remote from stations desired to be heard, improved results may be obtained by rotating the receiver for maximum response, as the loop antenna has a marked directional effect on weak signals.

For short wave or weak broadcast reception the whip antenna should be extended to its full length. This will provide sufficient signal for satisfactory reception in most locations.

Reception can be improved especially in poor receiving locations by attaching an external antenna and ground to the antenna and ground connections provided in the rear of the cabinet. The blue wire is the external antenna connection, the black wire is the external ground connection.

Batteries: The batteries comprise: Two 4½ volt "A" units, Eveready type 746 or equivalent, and two 45 volt "B" units, Eveready type 482 or equivalent.

They should be mounted in the compartment provided in the bottom of the cabinet as shown in the sketch. Batteries should be removed when they are dead or if the set is not to be used on battery operation for several months.

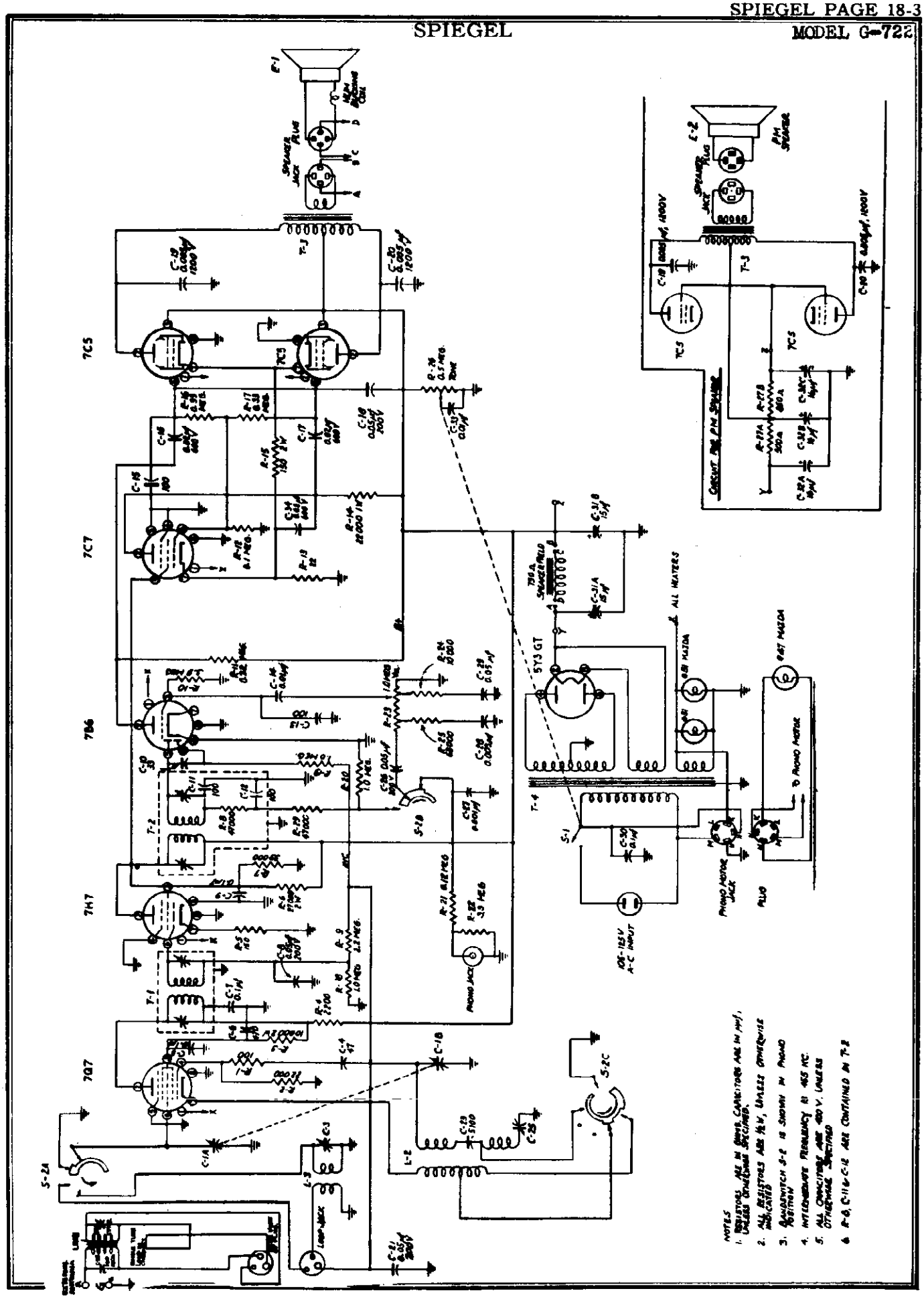
Alignment: No attempt should be made to realign this receiver until it has determined that a poor tube, or some local condition is not responsible for faulty reception. The Signal Generator may be connected through a 0.01 mf capacitor (used as a dummy antenna) to the lug on the R. F. section (B) of the tuning capacitor. Connect ground clip of generator to the common negative of the electrolytic capacitor. An output meter may be clipped across the voice coil lugs. Align the I. F. trimmers to 455 K.C. using the least possible input from the Signal Generator to avoid developing A.V.C. voltage which would make the tuning adjustments very broad.

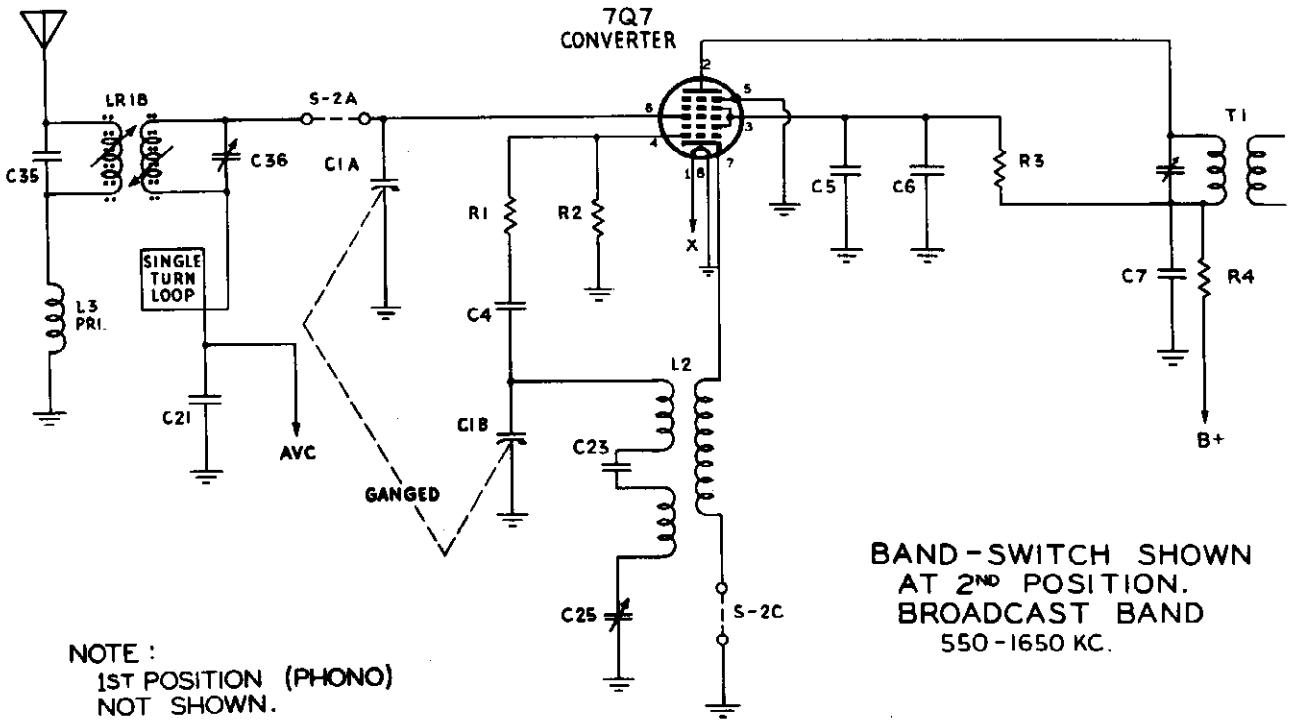
The short wave band trimmers must be aligned before attempting to align the broadcast band. To align the short wave band turn the bandswitch to the short wave position and connect the Signal Generator through a 0.01 mf capacitor and a 400 ohm resistor in series (used as a dummy antenna) to the antenna connection at the back of the cabinet. With the tuning capacitor plates completely out of mesh and the pointer at the extreme right end of travel, adjust the short wave oscillator trimmer (A) to 18.5 megacycles. With both tuning capacitor and Signal Generator adjusted to 6 megacycles, adjust the short wave antenna coil slug (C) for maximum response. Readjust both the Signal Generator and the tuning capacitor to 18 megacycles and tune the short wave R. F. trimmer (B) for maximum response.

With the short wave band aligned, the broadcast band trimmers may now be aligned. To align the broadcast band turn the bandswitch to the broadcast position. Remove the 0.01 mf capacitor and the 400 ohm resistor and connect the Signal Generator to two or three turns of heavy wire, forming a self supporting loop of about 7 or 8 inches diameter placed about a foot away from the receiver's loop antenna. Again use the least possible input from the Signal Generator. With the tuning capacitor completely out of mesh and the pointer at the extreme right end of travel, adjust the broadcast oscillator trimmer (E) to 1620 kilocycles. With the dial pointer set to 600 KC adjust the padder (F) while rocking the signal generator dial for maximum audio output. Readjust both Signal Generator and dial pointer to 1550 kilocycles and adjust the R. F. trimmer (D) for maximum response.

SPIEGEL

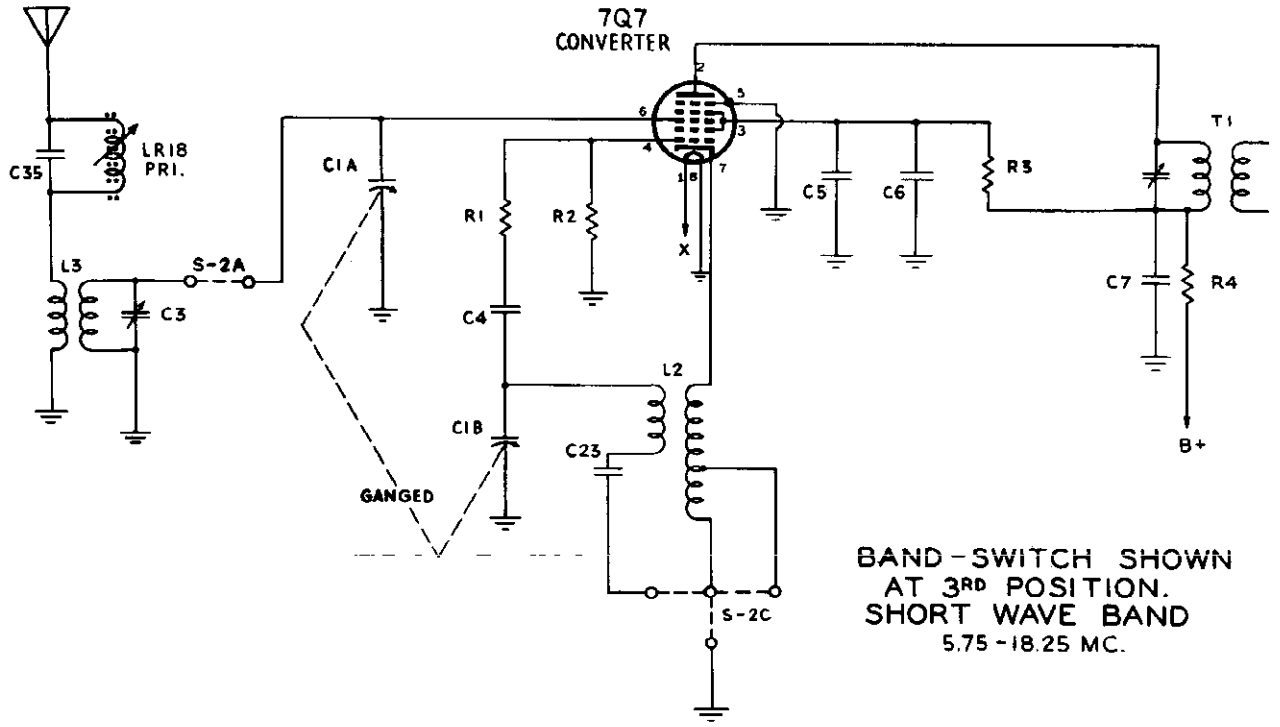
MODEL G-722





NOTE :
1ST POSITION (PHONO)
NOT SHOWN.

BAND-SWITCH SHOWN
AT 2ND POSITION.
BROADCAST BAND
550-1650 KC.



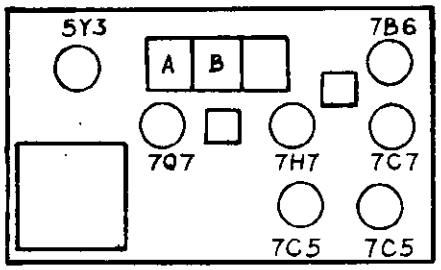
BAND-SWITCH SHOWN
AT 3RD POSITION.
SHORT WAVE BAND
5.75-18.25 MC.

Alignment: No attempt should be made to realign this receiver until it has been determined that a poor tube, or some local condition is not responsible for faulty reception. The Signal Generator may be connected through a 0.01 mf capacitor (used as a dummy antenna) to the lug on R. F. section (A) of tuning capacitor. Connect ground clip of generator directly to chassis. Align the I. F. trimmers to 455 K.C., using least possible input from the Signal Generator to avoid developing A.V.C. voltage which would make the tuning adjustments very broad. An output meter may be clipped across the voice coil lugs.

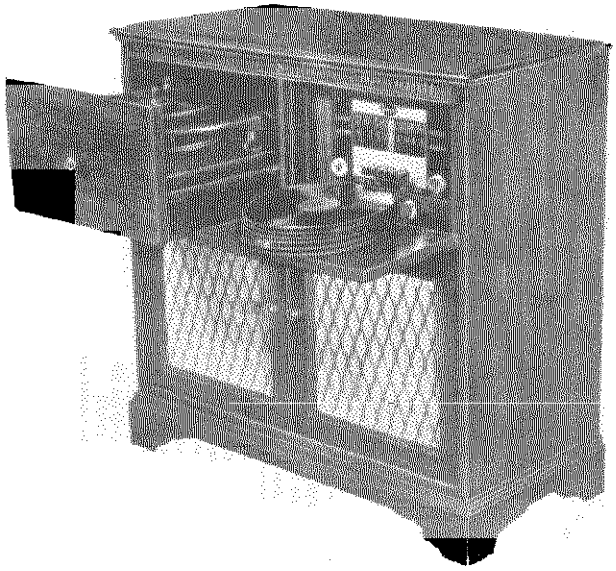
To align broadcast R. F. trimmers, remove the 0.01 mf capacitor and connect the Signal Generator leads to two or three turns of heavy wire, forming a self-supporting loop of about 7 or 8 inches diameter placed about a foot away from the receiver's loop antenna. Again, use the least possible input from the Signal Generator. With the tuning plates completely out of mesh and the pointer at the extreme right end of travel, adjust the broadcast oscillator trimmer, on the under side of the chassis, to 1650 K.C. With tuning capacitor fully meshed adjust the padder on the chassis deck to 535 K.C. Readjust both Signal Generator and tuning capacitor to 1550 K.C. and adjust the R. F. trimmer on the loop for maximum response.

To align the short wave band connect the Signal Generator through a 0.01 mf capacitor and a 400 ohm resistor in series (used as a dummy antenna) to the antenna connection on the loop antenna. With the tuning capacitor plates completely out of mesh, and pointer at the extreme right end of travel, adjust the short wave oscillator trimmer (on the under side of the chassis) to 18.25 magacycles. Readjust both Signal Generator and tuning capacitor to 16 megacycles and adjust short wave antenna coil trimmer for maximum response. With tuning capacitor fully meshed, the receiver should tune to 5.75 megacycles, however, no adjustment is required at this point.

For checking purposes five marks are engraved on the front of the dial plate. These represent, in order, the pointer position with the capacitor plates fully meshed and the pointer settings for 600 kc, 8 mc, 16 mc, and 1550 kc.



TUBE LOCATION



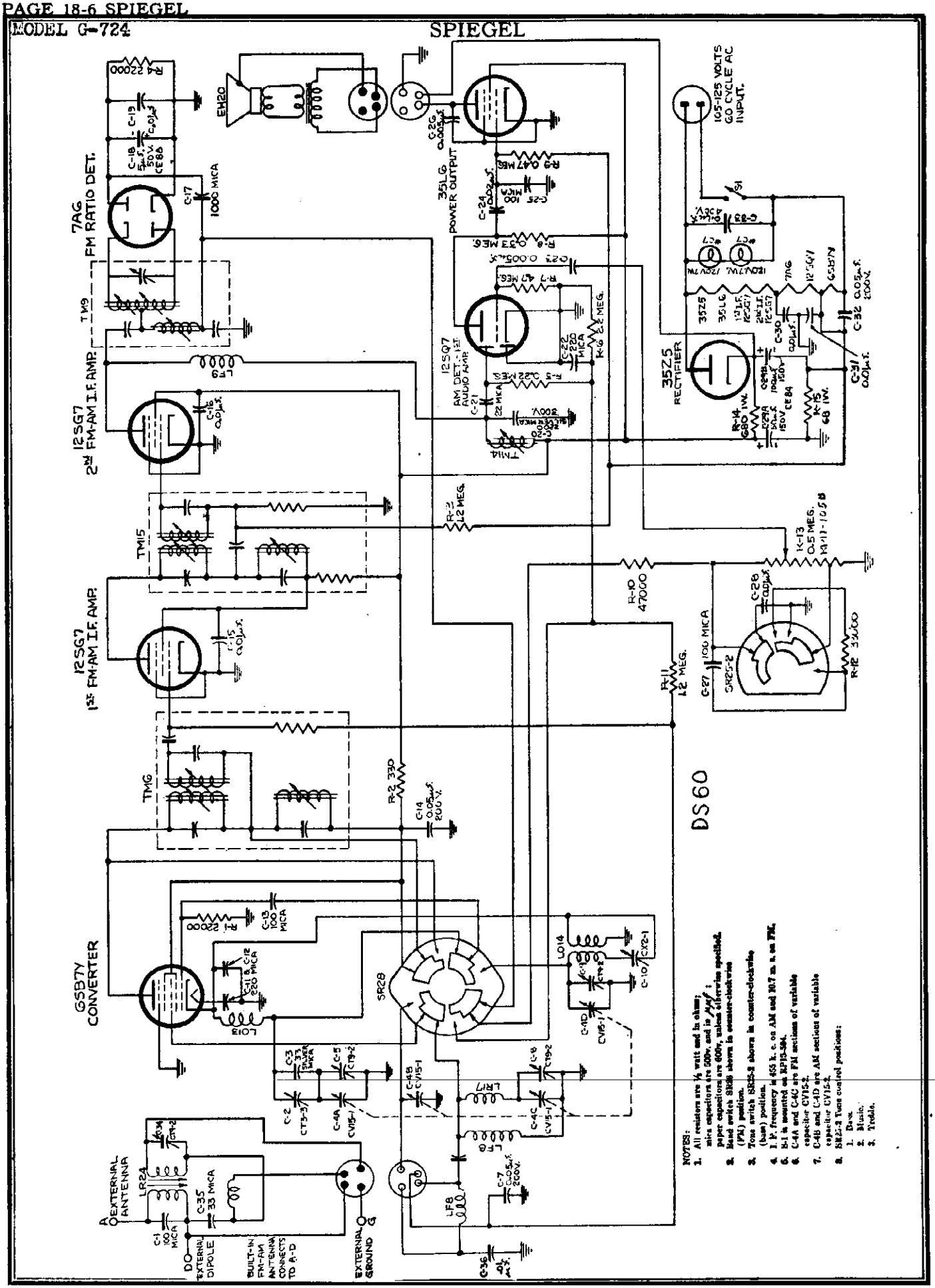
REPLACEMENT PARTS LIST

Circuit Symbol	Part Number	Item	Description
C-1 A & B	CV-9	Capacitor	Variable 2-gang, Push-button
C-2	CT1-1	Capacitor	Trimmer 1.5—15 MMF
C-3	CT1-2	Capacitor	Trimmer 2.2—40 MMF
C-22	CT1-2	Capacitor	Trimmer 2.2—40 MMF
C-23	CT1-2	Capacitor	Trimmer 2.2—40 MMF
C-25	CX2-1	Capacitor	Padder
E-1	EH-9	Speaker	10" Electrodynamic
E-2	EH-14	Speaker	10" P.M.
L-1	LL-9	Loop Antenna	
L-2	LO-4	Oscillator Coil Assembly	Broadcast & S.W. Osc. Coils
L-3	LR-4	S.W. Antenna Coil	
R-23	RP8-105	Potentiometer	1 Meg. with 2 taps, Volume Control
R-26	RP5-2	Potentiometer	0.5 Meg. with switch, Tone Control
R-27 A & B	RW3-1	Resistor	Wirewound 1350 Ohms 17 watt tapped at 500 Ohms
S-2 A, B & C	SR-9	Bandswitch	
T-1	TM2-4	Transformer	I. F. Input
T-2	TM2-5	Transformer	I. F. Output
T-3	TA-8	Transformer	Push-pull speaker output
T-4	TP-9	Transformer	Power

Operation: The set operates on 105 to 125 volts, 60 cycles A. C. only. Power drain is approximately 70 watts for the radio and about 20 watts additional for the record changer.

MODEL G-724

SPIEGEL



NOTES:

1. All resistors are ½ watt and in ohms; mica capacitors are 500v. and in μμf.; paper capacitors are 600v. unless otherwise specified.
2. Band switch SR28 shown in counter-clockwise (FM) position.
3. Tone switch SR25-2 shown in counter-clockwise (tone) position.
4. I. F. frequency is 455 k. c. on AM and 10.7 m. c. on FM.
5. R-1 is mounted on RP15-504.
6. C-4A and C-4C are FM sections of variable capacitor CV15-2.
7. C-4B and C-4D are AM sections of variable capacitor CV15-2.
8. SR25-2 Tone control positions:
   1. Bass.
   2. Music.
   3. Treble.

ALIGNMENT PROCEDURE:

Dummy Antenna	Signal Generator Connection	Signal Generator Frequency	Band Switch Position	Radio Dial Setting	Adjust	Remarks
0.01 MFD	Terminal T	455 KC AM	Broadcast	1625 KC	E G-1 F-1	Adjust for maximum output Repeat for fine adjustment
0.01 MFD	Pin 4 of 12SG7 2nd FM-AM IF with FM Signal Gen.	10.7 MC FM	FM	108 MC	H-2	Adjust for maximum output (Broad adjustment)
0.01 MFD	"	10.7 MC FM	FM	108 MC	H-4	Adjust for maximum output
0.01 MFD	"	10.7 MC AM	FM	108 MC	H-1 or H-3	Adjust whichever is required for minimum output
						Repeat last two steps for fine adjustment until settings for maximum FM output coincide with settings for minimum AM output.
0.01 MFD	Pin 8 of 6SB7Y Converter	10.7 MC FM	FM	108 MC	G-3 — G-2	Adjust for maximum output
0.01 MFD		"	FM	108 MC	F-3 — F-2	Adjust for maximum output
						Repeat last two steps for fine adjustment
			Broadcast	535 KC	Pointer	Adjust pointer to reference mark
100 MMFD	"A" Post on Cabinet	600 KC AM	"	600 KC	J and Core on Ant. Coil in Cab.	Adjust for maximum output
"	"	1550 KC AM	"	1550 KC	B and trimmer on Ant. Coil	Adjust for maximum output
300 OHM Resistor	"	92 MC FM	FM	92 MC	D	Adjust for maximum output
"	"	106 MC FM	FM	106 MC	A and C	Adjust for maximum output

MODEL G-724 SPIEGEL

Model G-724 Radio is a 7-tube including rectifier superheterodyne Frequency Modulation and Amplitude Modulation receiver using the latest type of low drain tubes.

Operation: The set is designed for operation on 105 to 125 volts, 60 cycles A. C. It will also operate on 120 D. C. Power drain is approximately 36 watts for the radio.

Ranges: Model G-724 has both a broadcast and FM range. It covers the broadcast band from 535 to 1625 kilocycles. Since the broadcast dial scale is calibrated from 53.5 to 160, the actual frequency of the station may be obtained by multiplying the dial calibration by ten. The range of the FM band covered in Model G-724 is from 87.6 to 108.4 megacycles. The FM dial scale is calibrated directly in megacycles.

Antenna: This radio will operate without an external antenna. For normal reception more than adequate pickup is obtained by the self contained antenna. At installations remote from station desired to be heard on the broadcast band, improved results may be obtained by attaching twenty or thirty feet of insulated wire to the antenna connection provided in the rear of the cabinet. The wire may be concealed under the rug or laid on the floor along one side of the room.

For normal reception on FM, no outside aerial is required as sufficient signal pickup is secured from the built-in FM antenna. However, in poor receiving locations provision is made for improved results, which may be obtained by the addition of an outside antenna of correct design, properly installed. (Your dealer can supply and install a suitable FM antenna for your FM Radio).

Alignment: No attempt should be made to realign this receiver until it has been determined that a poor tube or some local condition is not responsible for faulty reception. The following is a list of the minimum equipment necessary to realign this receiver.

1—AM signal generator covering 455 KC, 600 KC, 1550 KC and 10.7 MC

2—FM signal generator covering 10.7 MC, 92 MC and 106 MC

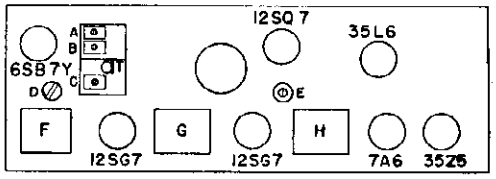
3—Output meter, rectifier type, approximately 0 to 2 volts RMS

4—Dummy antennas

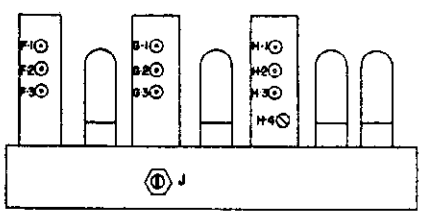
0.01 MFD Capacitor 100MMFD Mica Capacitor 300 Ohm Risistor

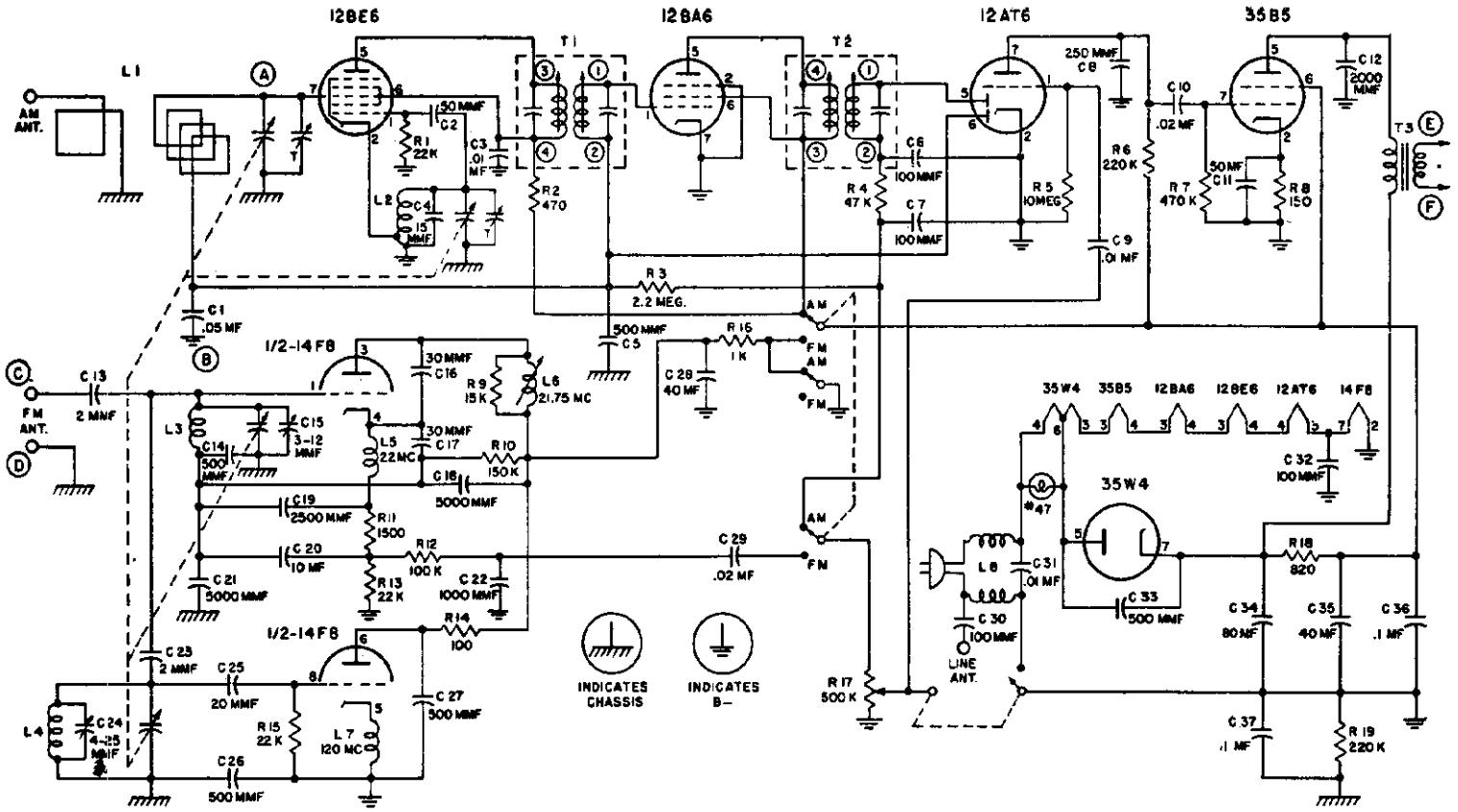
In the following alignment procedure the high side of the signal generator is connected to the terminal indicated in the "Signal Generator Coupling" column below. The ground side of the signal generator is connected directly to the chassis. The output meter should be connected across the voice coil of the speaker for all measurements.

In adjusting the radio frequency trimmers and padders it is advisable to "rock" the variable capacitor gang slightly across the signal being delivered by the signal generator until that particular signal has been accurately peaked.



TUBE AND TRIMMER LOCATION





POWER SOURCE:

This receiver may be operated from either an AC or DC line, between 105 and 125 volts. On AC lines the frequency must be 50 to 60 cycles.

TUBE COMPLEMENT:

1 12BE6 — AM converter.
1 12BA6 — AM intermediate frequency amplifier.
1 12AT6 — AM demodulator and AVC; AM-FM 1st audio amplifier.
1 14F8 — FM oscillator-mixer-Super Regenerative I.F. amp.
1 35B5 — Audio output amplifier.
1 35W4 — Power rectifier.

INSTALLATION:

1. Antenna Connection.

AM—A self contained loop antenna is provided, which will give satisfactory reception on the standard broadcast band without requiring any additional external antenna. However, if stronger signals are desired from weak or distant stations an external antenna may be connected to the wire extending from the loop.

FM—A self contained line antenna system is provided for reception of stations appearing in the FM band. To use this line antenna a short wire jumper should be connected between the two outside screw terminals of the FM antenna panel, which is mounted on the broadcast loop antenna form. Should poor reception conditions make it necessary, an FM dipole antenna may be connected to the left hand and center screw terminals of the FM antenna panel. In such a case, the line antenna link should be disconnected.

2. Ground.

This set has been designed to operate without an external ground, and the use of any ground connection is not recommended.

3. Power Connection.

After making certain that the power circuit is rated between 105 and 125 volts extend the line cord to its full length and insert the plug into the nearest convenient outlet. If the supply is DC, and the set fails to operate, it may be necessary to reverse the plug connection to secure operation of the set.

OPERATION:

The left hand knob controls the ON-OFF power switch and volume level. To turn receiver on, rotate this knob in a clockwise direction. Within a few degrees of rotation an audible click will be heard, and the dial will become luminous. After a half minute of warm up the receiver will be in an operating condition. Further advance of this control in a clockwise direction will provide an increase in volume level.

The center knob controls the selection of AM or FM stations. When rotated to the counterclockwise position, operation in the AM (standard broadcast) band is provided. When this control is rotated to the clockwise position, FM stations may be tuned in.

The right hand or tuning knob enables the selection of any desired station as indicated on the calibrated dial. The upper row of numbers is calibrated directly in megacycles and covers the FM band. The lower scale is used to tune in stations in the standard broadcast band. Add one zero to the numbers on this scale to obtain the station frequency in kilocycles.

SERVICE ADJUSTMENTS:

Alignment or adjustment of the various circuits of this receiver can only be made by a skilled radio technician with the proper equipment.

NOTE: Points A, B, C, D, E, and F are noted on the circuit diagram.

AM Equipment:

Equipment Required:

a) Broadcast Band Signal Generator.
b) Output Meter.

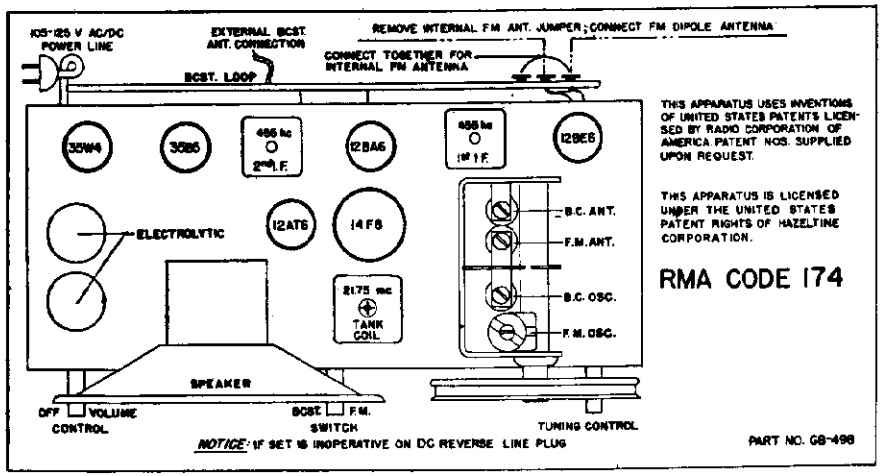
1. Set band switch at AM. Advance volume control to full volume setting.
2. Connect output meter across voice control at points "E" and "F".
3. Connect the "high" side of the Signal Generator to point "A" through a .01 mfd condenser. Connect the "ground" side to point "B". Adjust the Signal Generator to 455 kc and with the receiver switched on, adjust the first and second I.F. transformers for peak output as shown on the output meter. The signal injected into the receiver should be as small in magnitude as possible, consistent with a useful deflection on the output meter.
4. Connect the "high" side of the Generator to the antenna terminal with a 200 mmf condenser inserted in series. Connect the "ground" side of the Generator to point "B".
5. Tune receiver to 150 on the dial. Adjust Signal Generator to 1500 kc. Adjust BC oscillator and BC antenna trimmers for maximum output. Use a weak signal for final adjustment.

FM Equipment:

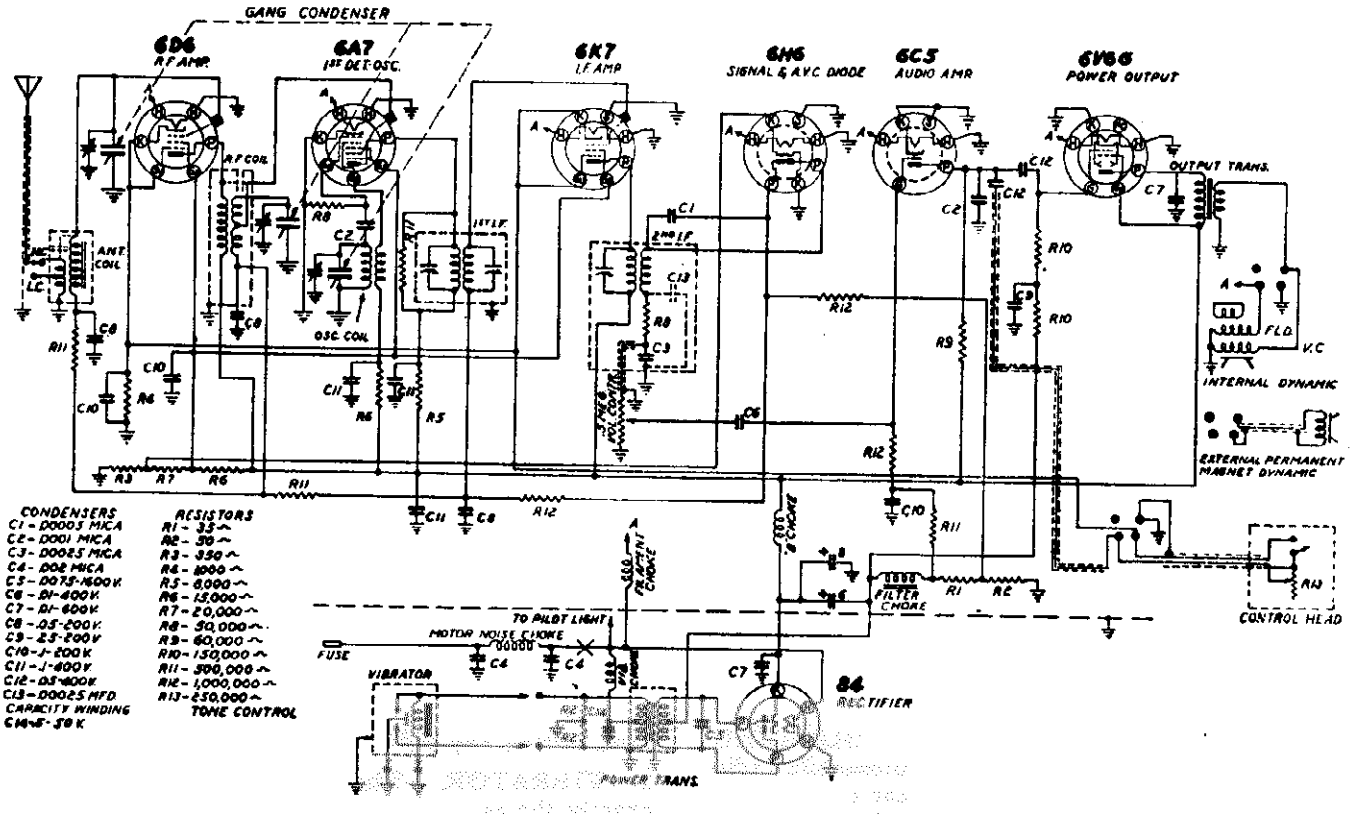
Equipment Required:

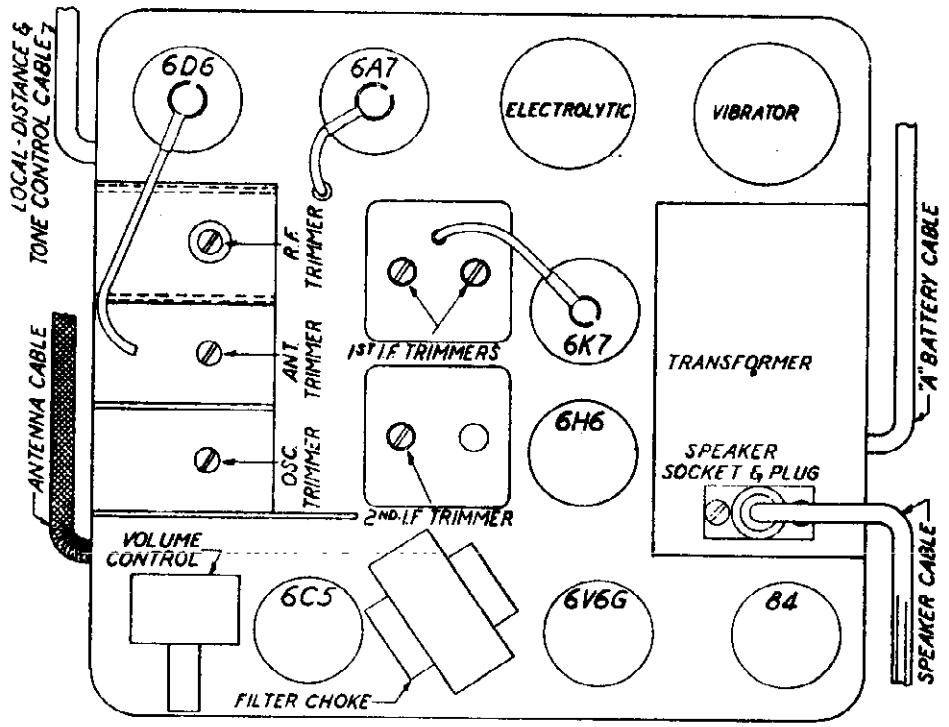
a) 21.75 kc oscillator.
b) FM Signal Generator for 88 to 108 megacycle range.
c) Output meter.

1. Connect output meter across points "E" and "F".
2. With set switched on and volume control at maximum, feed modulated 21.75 mc signal into terminals "C" and "D".
3. Adjust tank coil for maximum response on output meter.
4. Disconnect 21.75 kc oscillator and connect FM signal generator to points "C" and "D".
5. Set receiver dial to 88 megacycles and adjust Signal Generator for same frequency. Adjust spacing of FM oscillator coil for maximum signal response.
6. Tune receiver to 108 megacycles and adjust Signal Generator to same frequency. Adjust FM oscillator trimmer for maximum signal response.
7. Repeat operation 5 and 6.
8. Tune receiver to 90 megacycles and adjust Signal Generator for same frequency. Adjust spacing of the FM antenna coil for maximum signal response with minimum background noise. Slowly rock tuning control while performing this adjustment.
10. Repeat operations 8 and 9.



SPIEGEL MODELS 77, 770





1. CONTROLS. Two knobs appear on the control head. The one that moves the dial pointer is for tuning; the other controls volume and turns the receiver "On" and "Off".

2. TURNING THE RECEIVER "ON". Turn the volume control knob to the right. A click will be heard, and the pilot lamp will light. Wait thirty seconds for the tubes to heat up.

3. TUNING IN STATIONS. Put the volume on full by turning the volume control knob to the right as far as it will go. Next turn the station selector knob slowly until a station is heard. Reduce the volume by means of the volume control knob to below the desired intensity. Now turn the station selector knob very slowly back and forth until the signal is clearest and strongest. If the signal is not carefully tuned in, reception will be noisy and distorted. Then adjust the volume control until the desired intensity is obtained. Always reduce the volume by means of the volume control knob and never by turning the station selector knob. To get the kilocycle reading, multiply the scale reading by ten.

4. TONE CONTROL. The tone control is located on the control plate and is operated by means of a wing type knob directly behind volume control knob as shown in Figure 8. When the knob is turned to the right, a brilliant tone is obtained, and when it is turned to the left, a deep bass tone is produced.

5. LOCAL AND DISTANCE SWITCH. The local and distance switch is located directly behind the station selector and is operated by means of a wing knob. When tuning local stations, turn the wing knob to the extreme left to enjoy brilliant performance without the usual in-between station noises, and noise and static caused by high voltage lines. When tuning distant stations, turn wing knob to extreme right, and a click will be heard, and the set becomes very sensitive, bringing in far-away stations with surprising sharpness and clarity.

6. TURNING THE RECEIVER "OFF". Turn the volume control knob to the left as far as it will go. A click will be heard, and the pilot light will go out, indicating that the set is turned off.

CARE AND MAINTENANCE

1. ADVANCING GENERATOR CHARGING RATE. The installation of any automobile radio imposes an additional drain on the car storage battery. This can be compensated for by advancing the charging rate of the car generator. Check the state of charge of the storage battery about a week after the installation of the automobile radio is made and have the charging rate adjusted accordingly.

2. TUBES. The type of tubes used and location of these tubes in the chassis are shown in Fig. 8. These tubes are of a sturdy, rugged construction designed especially for an auto receiver. Most of them, under normal use, will last for many months and in some cases, years. Some of them, however, may become faulty after a few months of operation. For that reason it is advisable to secure a new set of tested tubes at intervals of three to six months and to have them inserted in the receiver one at a time, noting any difference in performance.

3. VIBRATOR. The vibrator unit is plugged in exactly the same as a tube. This unit may, in case of failure, be readily replaced in the same manner as replacing a tube.

4. PILOT LAMP. To replace the pilot lamp first turn the receiver off. Then pull out the pilot lamp assembly and replace the lamp. A 6-8 volt automobile type lamp is used (Bulb No. 51).

5. FUSE. A 20 ampere automobile fuse is used in the battery cable. This fuse is placed in an insulating shield and is in the receptacle provided for it at the chassis end of the battery cable.

CAUTION—Be sure the fuse insulator is on the fuse before the latter is inserted in the receptacle. If a fuse blows, do not replace it without first investigating the cause.

ALIGNMENT DATA AND SERVICING

GENERAL DATA. The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 175, 600 and 1400 K.C., and an output meter to be connected across the primary or secondary of the output transformer. If possible, all alignment should be made with the volume control on maximum and the test oscillator output as low as possible, to prevent the AVC from operating and giving false readings.

CORRECT ALIGNMENT PROCEDURE. The intermediate frequency (I.F.) transformers should be alligned properly as the first step.

I.F. ALIGNMENT. Adjust the test oscillator to 175 K.C. and connect the output directly to the grid of the first detector tube (6A7), without the use of any series condenser or resistor; the omission of series condenser and resistor to block out the AVC action. The ground on the test oscillator can be connected to the chassis ground. Align the trimmers of the first and second I.F. transformers to peak or maximum reading on the output meter.

OSCILLATOR ALIGNMENT. Adjust the test oscillator to 1400 K.C. and connect the output to the antenna through a .0001 mfd. mica condenser to give the equivalent of a low capacity type average auto antenna. Set the dial pointer to 1400 K.C. and adjust the oscillator trimmer to peak. (Front section of gang condenser.)

R.F. ALIGNMENT. The next step is to adjust the center and rear trimmers of the gang condenser to peak. The center section of the gang condenser tunes the antenna amplifier stage (6D6 tube), and the rear condenser section tunes the detector grid coil of the 6A7 tube.

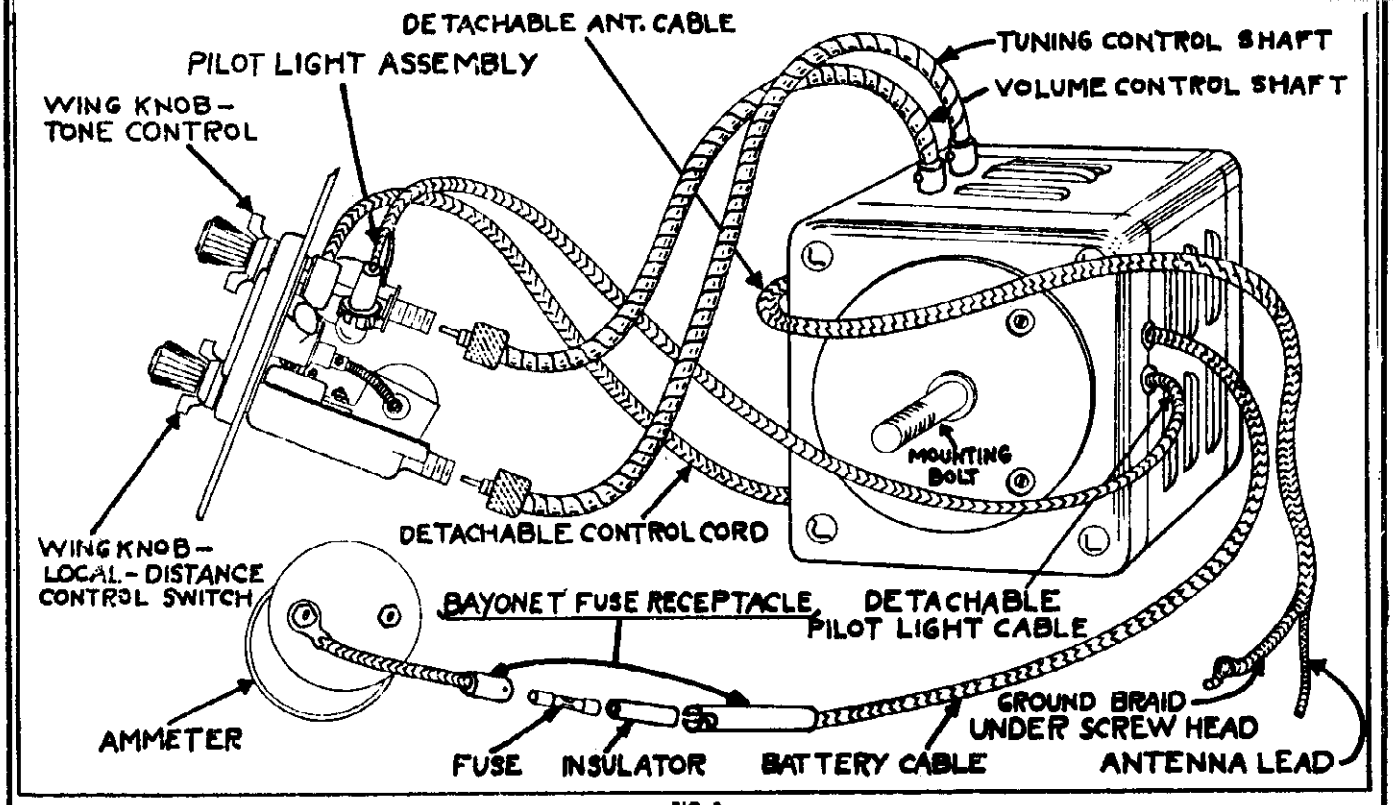


FIG. 8

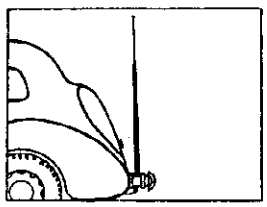


FIG. 9

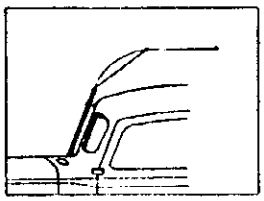


FIG. 10

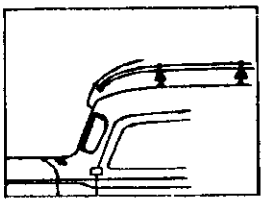


FIG. 11

FIG. 12

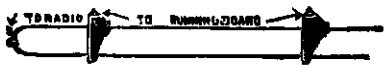


FIG. 14

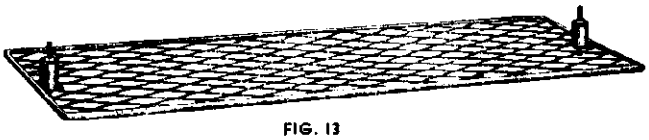


FIG. 13

Buick and Oldsmobile have what is known as insulated running board type antenna which is about 500 mmfd. These types of high capacity antennas can efficiently be coupled to the receiver by means of a special provision which provides proper matching.

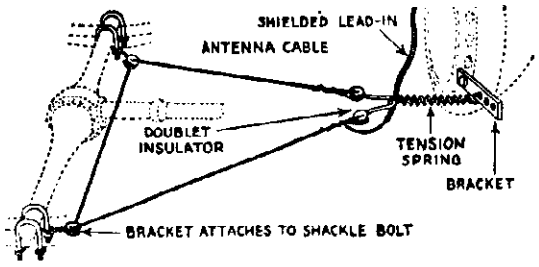


FIG. 15

COMPLETING THE WIRING CONNECTIONS

Now, with the receiver and control units mounted, and with flexible shafts attached, the next step is to complete the wiring connections. Supplied with the receiver: (1) a shielded antenna lead-in with two prong plug attached; (2) a shield pilot light lead with slip-on pilot light head at one end and tip jack connector at the other end; (3) a battery lead with built-in replaceable fuse (4) detachable control cord with a two prong plug at one end for chassis connection. (See Fig. 8).

1. ANTENNA CONNECTION. The shielded antenna lead should be soldered to the antenna lead-in as shown in Figure 16. The position in which the plug is inserted into the receiver depends upon the type of antenna used in the installation. The antenna lead plug has two tips, one soldered and one blank. If a low capacity antenna is used, the soldered tip of the plug is inserted in the hole specified in Figure 17. If a high capacity antenna is used, the soldered tip of the plug should be inserted in the hole indicated for high capacity antenna.

Keep the antenna cable as far away from car wiring as possible, and ground the pig tail of the antenna cable shield as close to the antenna end as possible. If a roof antenna is used the cable supplied will prove sufficiently long in practically all uses to reach the corner post or column at which the antenna lead comes down. The shielded cable should be pushed up into the column as far as possible to prevent ignition interference that may be picked up by any unshielded portion of the antenna cable.

Three connections are necessary. First, the antenna must be hooked up to the receiver unit; second the pilot light must be in the control head; third, the battery cable must be connected to the ammeter. (See Fig. 8).

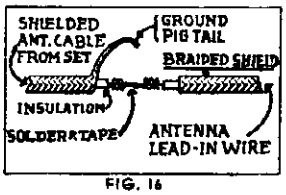


FIG. 16

If an under car or running board antenna is used. the shielding must be extended to the antenna in all cases. The pigtail on the end of the antenna cable shield must be well grounded at the extreme antenna end. If it is necessary to extend the antenna cable shielding as described below, be sure that a pigtail is put on the end of the shielded extension and that it is well grounded at the extreme antenna end. (See Fig. 16).

To extend the antenna cable shielding, the antenna lead wire should be covered with heavy insulation such as loom, to properly separate the shielding from the wire. Then connect the two wires together and connect the two shields together, care being taken that no strand of the shield touches the antenna wire.

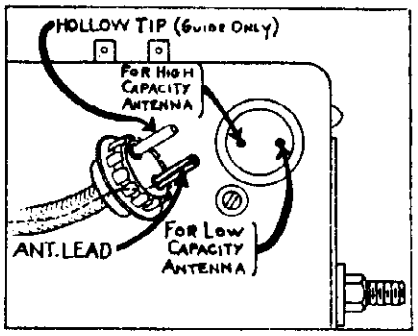


FIG. 17

2. PILOT LAMP CONNECTION. Connect the pilot lamp cable at the chassis by inserting the pin tip connector into the receptacle on the side of the chassis case indicated in Figure 8. Push the fitting all the way down. Then insert the pilot lamp assembly into the receptacle at the back of the control unit as indicated in Figure 8. In some cases the cable supplied will not be long enough and an extra length cable may be fitted.

3. BATTERY CABLE CONNECTION. The battery connection is made at the ammeter. The end of the battery cable should be soldered to a lug and secured to one of the posts at the back of the ammeter in the instrument panel. The other end of the battery cable has a fuse receptacle with bayonet fitting. Insert the fuse shield and fuse into the receptacle and connect it to the bayonet pin connector in the end of the battery lead coming from the chassis case as shown in Figure 8.

4. THE CONTROL CORD. Connect the control cord at the chassis by inserting the 3 prong plug into the receptacle on the side of the chassis case as indicated in figure 8. Push the fitting all the way down.

ADJUSTING THE DIAL POINTER FOR CORRECT CALIBRATION

After the control unit has been installed the dial pointer must be adjusted to provide a correct calibration of the receiver in operation. Tune in a station of known frequency around 700 K.C. Now reach back behind the control unit and loosen the knurled nut. This now makes it possible to rotate the flexible shaft by hand until the dial is set at the exact frequency of the station tuned in. Now tighten the knurled nut with fingers. (Do not use pliers or other tools). If this procedure is carefully followed the dial pointer will indicate 700 K.C. when a 700 K.C. station is being received. Once you adjust the dial pointer for correct calibration at any one frequency, all other points or calibrations on the dial scale will be found to be in agreement with frequencies tuned.

HOW TO SUPPRESS IGNITION AND GENERATOR NOISE

This radio incorporates all of the latest circuit developments for the elimination of motor noises.

Due to the use of special filter circuit, the set is inherently quiet, and only a few precautionary procedures are required. Cars of recent manufacture will not require the use of spark plug suppressors.

Even in older cars, suppressors should not be required providing the ignition system wiring has not developed high tension "leaks" due to aged, cracked or otherwise defective insulation.

There are a few units in every car that will require a little attention to provide absolute "noiseless motor" operation. The following automobile components are often not grounded or poorly grounded from a radio standpoint and should be investigated as suggested. It is advisable to pay particular attention to the first four causes listed below. In a majority of cases, if these are treated, no further noise suppression will be required. If the noise persists, the remaining seven points should be checked in the order recommended.

1. Distributor
2. Generator
3. Dome Light
4. Ammeter
5. Bonding of Cables
6. Coil Position
7. High and Low Tension Wires
8. Steering Columns, etc.
9. Grounding Engine and Other Parts
10. Loose Parts in Car
11. Weak Pick-up

HOW TO INSTALL THE RECEIVER AND CONNECT THE CONTROL UNIT

THE RECEIVER. After the receiver and control head positions have been selected, the installation of these two units should be completed. A single hole made by using a ½ inch or 9/16 inch drill is all that is necessary for mounting the receiver unit proper. The short threaded end of the stud bolt should be screwed into the rear mounting plate of the receiver, with the long threaded section of the bolt fitted through the hole in the car bulkhead. (See Fig. 7).

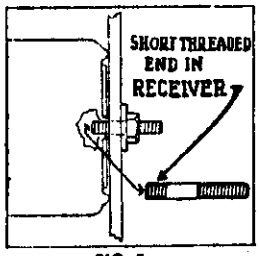


FIG. 7

IMPORTANT: Never screw the long threaded end of the stud bolt into the receiver as it is long enough to penetrate the interior of the chassis and cause serious damage to the wiring and components within. THE SHORT THREADED END ONLY should be screwed into the receiver mounting plate.

THE CONTROL UNIT. The control unit supplied with this receiver is custom built for your car, employing either aeroplane or porthole type dial assembly, as engineered by the car manufacturer. The mounting of the control head is easily accomplished. Remove the ash receiver or the ornamental plate designed to accommodate the radio control unit. In few 1937 cars it will be necessary to remove the ash receiver and the plate. There is no sawing, drilling or filing necessary in preparing for installation. Now assemble the control unit as per instruction sheet enclosed in each control unit package and proceed to clamp to the dash. Once the receiver unit and control unit have been mounted into position, the flexible shafts should be connected in the manner clearly indicated in figure 8. Figure No. 8 also shows the proper battery, control cord, pilot light and antenna connections.

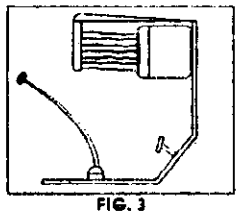


FIG. 3

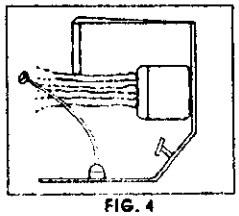


FIG. 4

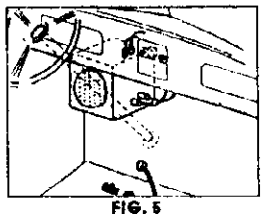


FIG. 5

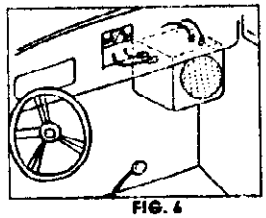


FIG. 6

REPLACEMENT PARTS LIST

Model 77-770

Part No.	Description
P536.	6D6 Socket.
P506.	6A7 Socket.
P824.	Vib. Socket.
P489.	6K7 Socket.
P490.	6H6 Socket.
P522.	6C5 Socket.
P1374.	6V6G Socket.
P815.	No. 84 Socket.
P852.	Pilot Light Socket.
P805.	Antenna Socket.
P1368.	Speaker Socket.
P1278.	Gang Condenser.
P1279.	Motor Noise Choke.
P1370.	B Filter Choke.
P1280.	1st I.F. Transformer.
P1281.	Filament Choke.
P854.	R.F. B Choke.
P1319.	Hash Choke Coil.
P1292.	Antenna Coil.
P1371.	Volume Control.
P1286.	Out Put Audio Transformer.

Part No.	Description
P1375.	Transformer.
P1289.	4 Prong Speaker Socket.
P1414.	Vibrator Unit.
P1293.	Electrolytic Condenser.
P1376.	2nd I.F. Transformer.
P1291.	R.F. Interstage Coil.
P836.	Oscillator Coil.
P1377.	Candohm Resistor.
G5207.	6 in. Dynamic Speaker.
P831.	Fuse.
P870.	Antenna Cable.
P806.	Generator Condenser.
P1300.	Ammeter Condenser.
P1388.	Control Head.
P851.	Drive Cable.
P1445.	External Speaker.
P1402.	External Speaker Cable.
P1378.	60,000 ohm ¼ watt Insulated.
P418A.	150,000 ohm ¼ watt Insulated.
P1308.	350 ohm ¼ watt Insulated.
P162A.	1 Meg. ohm ¼ watt Insulated.

Part No.	Description
P137A.	500,000 ohm ¼ watt Insulated.
P1380.	8,000 ohm ¼ watt Insulated.
P417A.	50,000 ohm ¼ watt Insulated.
P1381.	1,000 ohm ¼ watt Insulated.
P417.	50,000 ohm ¼ watt Insulated.
P1379.	20,000 ohm 1 watt Insulated.
P1309.	15,000 ohm ½ watt Insulated.
P1310.	15,000 ohm 1½ watt Insulated
P1324.	50 ohm ½ watt Insulated.
P817.	.00025 mica.
P480.	.0001 mica.
P1382.	.00005 mica.
P335.	.01—600V Condenser.
P1383.	.10-200—.05-400 Condenser.
P1315.	.25-200—.10-400 Condenser.
P1384.	.05-400—.05-200 Condenser.
P1314.	.10-400—.05-200 Condenser.
P1317.	.10-400—.05-200 Condenser.
P1385.	.10-200—.10-400 Condenser.
G867.	.0075-1600V Condenser.
P813.	.50-50V Condenser.
P818.	.002 mica Condenser.

1. DISTRIBUTOR ROTOR. Distributor rotors develop an unshielded spark and in practically all installations it will be necessary to install a distributor suppressor to squelch this interference. The intensity of this spark interference can be greatly reduced by "peening" the rotor blade. This operation reduces the gap between the rotor blade and the distributor head contact. Normally there is a gap of about twenty thousandths of an inch and the spark jumping this gap produces the most objectionable interference. Hammering the rotor blade which is made of copper will lengthen it and reduce the clearance to a few thousandths of an inch and consequently reduce proportionately the spark and interference. A more desirable and easier way of "peening" the rotor is to increase its length by building it up with solder. Sufficient solder, which is soft, can be added to completely close this space and a trial turn over the engine will scrape off any surplus so that the gap will be almost spaceless.

2. GENERATOR. Generators on new cars usually do not cause much interference, but as the car becomes older the brushes wear and spark, producing objectionable noise. The ½ microfarad condenser furnished with the receiver should be installed on the generator cut-out relay to prevent this source from causing interference. In some of the new cars, the generator relay is mounted on the front of the bulkhead or in some other location. It will be most convenient and advisable for best results to mount the generator condenser at the relay.

3. DOMELIGHT. To determine the amount of noise caused by the dome light, try a ¼ or ½ mfd. condenser from the end of the dome wire to ground.

The end of the dome light wire will usually be found at the ammeter or at a special connection terminal block. In cases where the condenser does not cure the noise it may be necessary to shield the dome light wire to the point where it enters the corner post running to the roof, and to ground the shield. If the noise still persists, disconnect this lead and remove it from the front cornerpost, at which point it is generally run down, and use one of the side posts in back of the door, connecting it directly to the storage battery. If done in this manner, this lead should be fused.

4. AMMETER. By-passing the ammeter with a ½ mfd. condenser should be tried in looking for the source of interference and permanently applied if a reduction in noise results.

5. BONDING OF CABLES. Try grounding to the dash all cables and tubing which pass through it, such as oil lines, gas lines, hand throttle, choke wire, etc. By means of a file, contact can be established between any of the lines and the dash, in order to determine whether such a ground will reduce the noise. To bond the cables to the dash, clean the point of contact, wrap a length of braided shielding around the cable and solder the connection.

Then solder the ends of the shielding to the dash or ground it under a screw head if one is convenient. Sufficient play should be left in the bonding shielding so that movement of the cables or tubing will not loosen this shielding from the dash.

6. COIL POSITION. If the receiver chassis and ignition coil are both in back of the dash (under the cowl) take off the coil and mount it on the front of the dash (in the engine compartment). Should the coil be moved, mount it as close to the distributor as possible. If the coil cannot be moved place a copper can over it and ground the can at the coil mounting. Shield the high tension lead from the coil to the dash, grounding this shield both to the metal can of the coil and to the dash. Considerable care must be exercised in shielding this lead to prevent short circuiting the high tension system. It should first be covered with loom or heavy insulation before the braided shielding is put on.

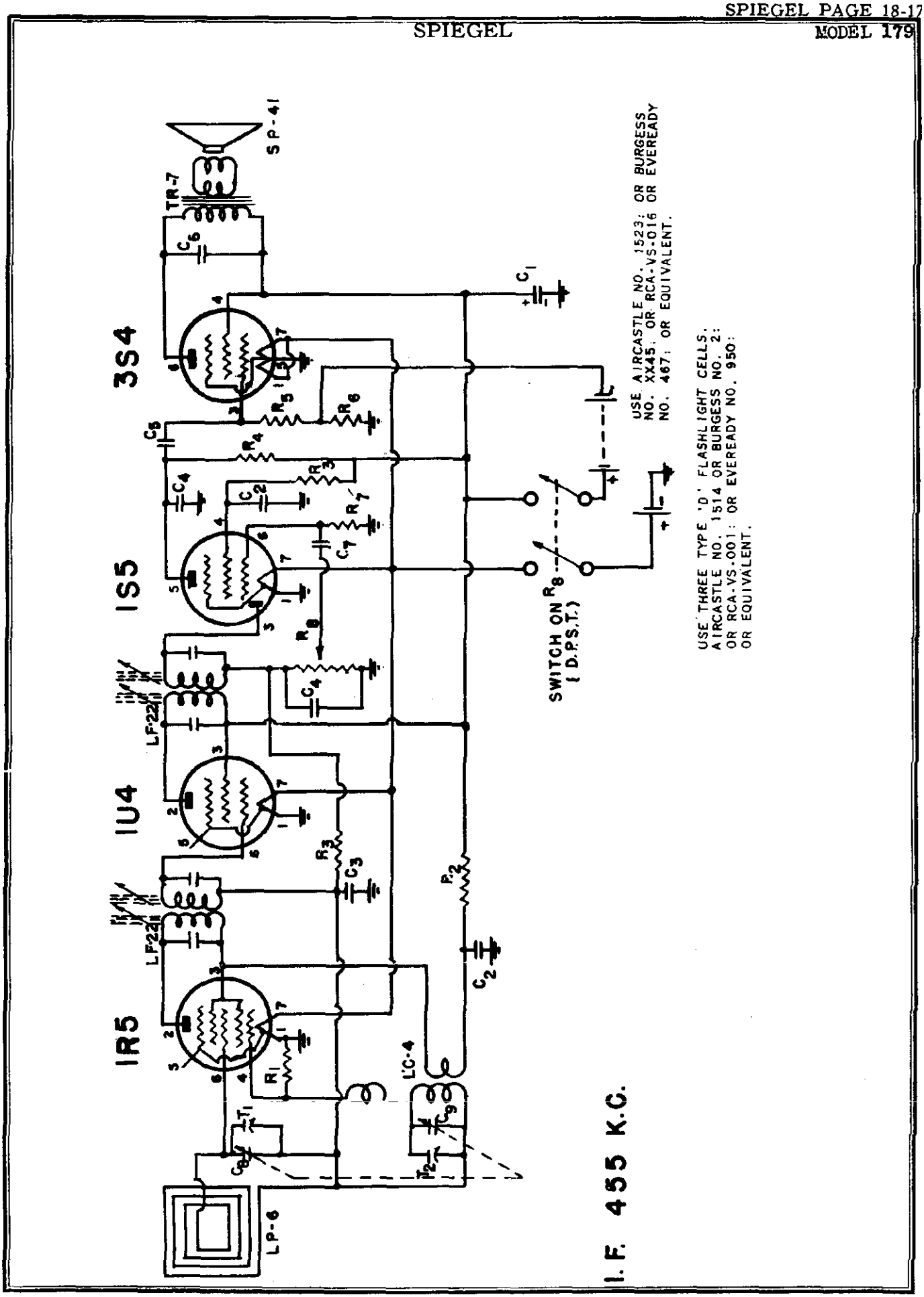
7. HIGH AND LOW TENSION LEADS. In some cases, the high and low tension leads between the coil and distributor are run close together. In some cars they are in the same conduit. If this is the case, remove the low tension lead from this conduit. In any event, keep the high and low tension leads as far apart from each other as possible. Shield and ground the shield of the low tension lead, if separating the two leads is not sufficient.

8. STEERING COLUMN, ETC. It is possible for the steering column, foot pedals and brake lever to carry interference to the back of the dash at which point it may affect the radio receiver. See if each of these are well grounded to the frame of the car. By means of a file or a braided shielding jumper, contact can be established between these points and the frame in order to determine whether such a ground will reduce the noise. A piece of one inch braided shielding should be used if a ground is necessary and this shielding may be grounded under a screw head, or nut, or may be soldered in position.

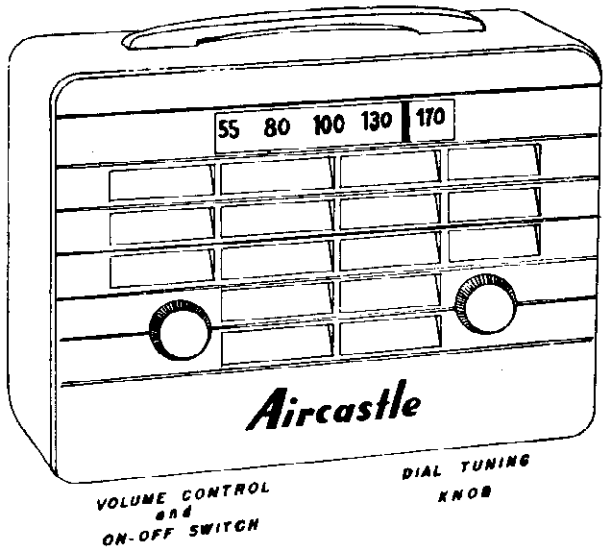
9. GROUNDING ENGINE AND OTHER PARTS. The engine must, in every case, be well grounded to the frame of the car. If it is not, use a very heavy braided lead for this purpose, similar to a storage battery ground lead. In like manner it may be necessary to check the grounding of the metal dash, instrument panel, radiator and hood to the frame of the automobile.

10. WEAK PICKUP. Noise, on occasion, may be caused by the automobile being in a shielded location or by a faulty antenna system. Automatic volume control, when counteracting weak pickup, causes the set to operate at its maximum sensitivity, thereby increasing the noise level. If the antenna instructions, previously outlined are carefully followed, weak pickup should not be experienced.

11. LOOSE PARTS IN CAR. Noisy operation is also caused in some instances by loose parts in the car body or frame. These loose parts rubbing together affect the grounding and cause noises. Tightening up the frame and body at all points and in some cases, using a copper jumper will eliminate noise of this nature.


SP-41
TR-7
3S4
1S5
1U4
1R5
LF-22
LF-22
LP-6
LC-4
I.F. 455 K.C.
SWITCH ON R8 (D.P.S.T.)
USE AIRCASTLE NO. 1523; OR BURGESS NO. XX45; OR RCA-VS-016 OR EVEREADY NO. 467; OR EQUIVALENT.
USE THREE TYPE 'D' FLASHLIGHT CELLS. AIRCASTLE NO. 1514 OR BURGESS NO. 2: OR RCA-VS-001: OR EVEREADY NO. 950: OR EQUIVALENT.

MODEL 179 SPIEGEL



ALIGNMENT PROCEDURE

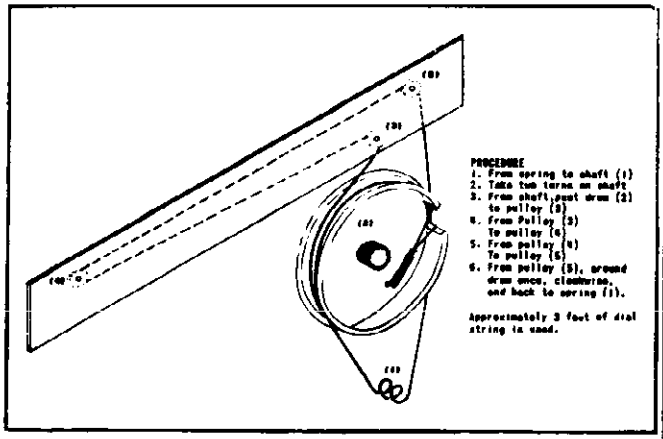
- Output meter across 3.5 ohm output load.
- Volume control at maximum for all adjustments.
- Align for maximum output. Reduce input as needed to keep output near 0.4 volts.

SIGNAL GENERATOR				*SETTING TUNER*	*ADJUST TRIMMERS TO MAXIMUM OUTPUT (in order shown)*
Frequency	*Coupling Factor*	*Connection to Receiver*	*Ground Connection*		
455 kc	.1 mfd	1R5 Grid	B—	Rotor full open (Plates out of mesh)	Input and output trimmers on IF cans
1700 kc	.1 mfd	1R5 Grid	B—	Rotor full open (Plates out of mesh)	Oscillator trimmer T2
1500 kc		Radiating Loop		1500 kc*	Antenna trimmer T1

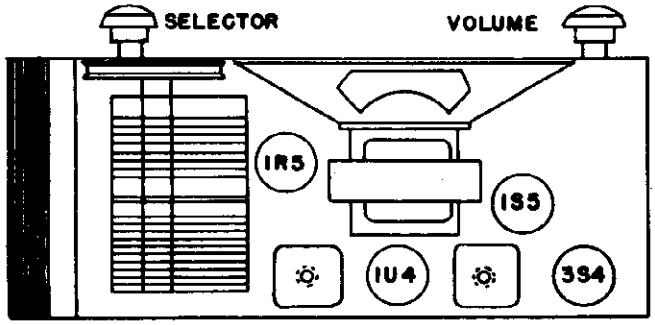
* Five markings on the dial bracket represent respectively 530 kc., 600 kc., 1000 kc., 1500 kc., and 1700 kc., reading from left to right. These points are to be used for the alignment of the receiver.

ELECTRICAL SPECIFICATIONS

Batteries..... A—1½ volts. 250 ma.
B—67½ volts. 8 ma. average.
Frequency Range..... 530 to 1700 kc.
Intermediate Freq...... 455 kc.
Tuning..... Two-gang capacitor
Antenna..... Built-in loop
Speaker..... 4 inch PM; voice coil impedance 3.5 ohms.
Power Output..... 80 milliwatts undistorted
140 milliwatts maximum
Sensitivity..... 800 microvolts per meter for 50 milliwatt output
Selectivity..... 55 kc broad at 1000 times signal at 1000 kc.



Replacement of Drive Cord



REPLACEMENT PARTS LIST

Ref. No. *Part No.* *Description*

CAPACITORS

C1	CE-14	16 mfd, 100 volt, Electrolytic
C2	CP-103-3	.01 mfd, 200 volt, paper
C3	CP-503-4	.05 mfd, 200 volt, paper
C4	CM-101-2	100 mmf, 500 volt, mica
C5	CP-202-2	.002 mfd, 200 volt, paper
C6	CP-502-1	.005 mfd, 400 volt, paper
C7	CP-102-3	.001 mfd, 200 volt, paper
C8, C9	CV-10	Variable condenser, two gang

RESISTORS

R1	RC-104-1	100,000 ohms	½ watt	20%
R2	RC-153-1	15,000 ohms	½ watt	20%
R3	RC-335-1	3.3 megohms	½ watt	20%
R4	RC-105-1	1 megohm	½ watt	20%
R5	RC-225-1	2.2 megohms	½ watt	20%
R6	RC-821-2	820 ohms	½ watt	10%
R7	RC-106-1	10 megohms	½ watt	20%
R8	VC-6	1 meg. Vol. control with switch		

COILS AND TRANSFORMERS

LC-4	Oscillator Coil
LF-22	I.F. Transformer
LP-6	Loop Antenna
TR-7	Output Transformer

MISCELLANEOUS

SP-41	4 inch P.M. Speaker
PN-6	Pointer (Specify Color)
CR-2	Drive Cord
SG-1	Spring for Drive Cord
KN-20-4	Knob
BK-20 BK-22	Cabinet Back with Hardware (Specify Color)
CB-104A CB-103	Assembled Cabinet without Back and Handle (Specify Color)
HA-2	Handle for Cabinet with Springs and Pins (Specify Color)
AS-3	Battery Holder

POWER SUPPLY

The battery supply to be used with this receiver is as follows:

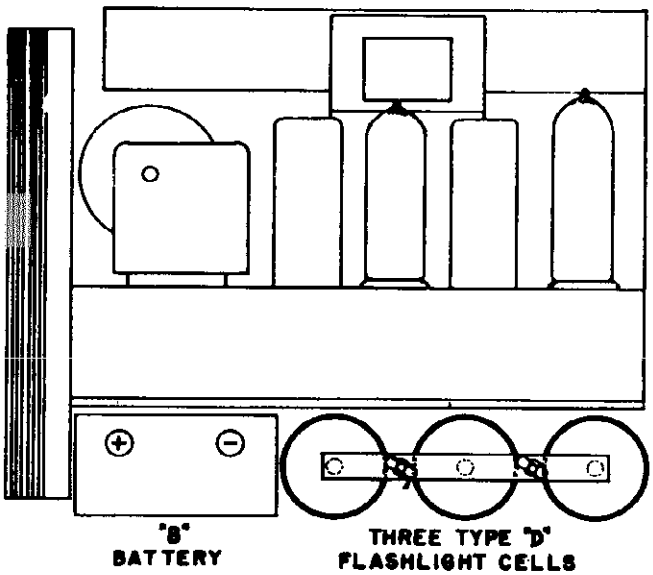
"A" supply ..... 1½ volts. Use three type "D" flashlight cells; Aircastle No. 1514, or Burgess No. 2, or RCA-VS-001, or Eveready No. 950 or equivalent.

Use Aircastle No. 1523 or Burgess No. XX45 or RCA-VS-016 or Eveready No. 467 or equivalent.

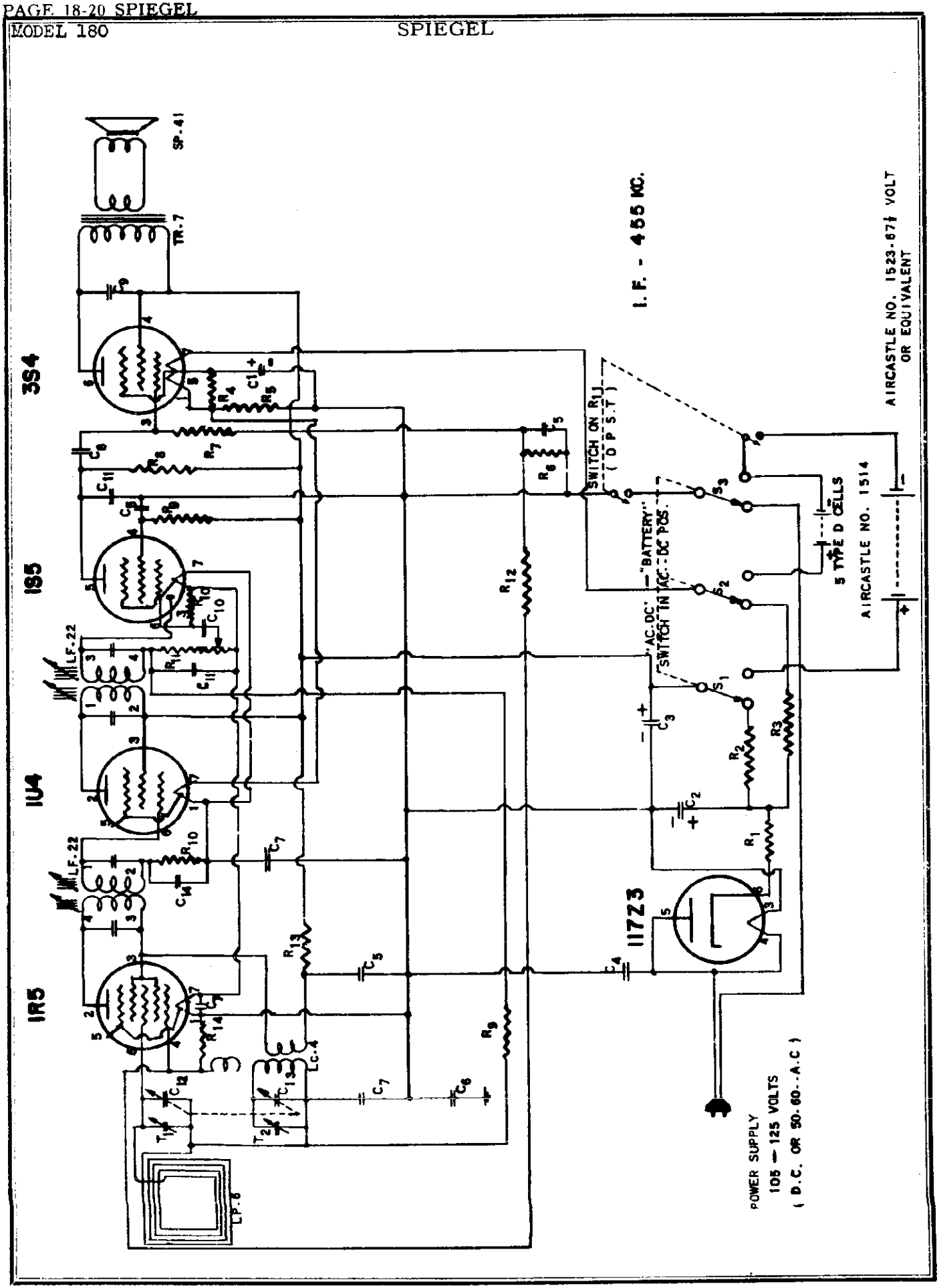
ANTENNA SYSTEM

This receiver is equipped with a built in Antenna System, which obviates the necessity of using an antenna connection for receiving most local and some distant stations.

When tuning Broadcast Stations, it may be found advisable to rotate the radio about its position of rest until the most distant station regularly enjoyed is heard the clearest. In some vicinities where there is a localized noise interference prevalent, it is best to rotate the radio cabinet to a position which gives a minimum of noise.



MODEL 180 SPIEGEL



ALIGNMENT PROCEDURE

- Output meter ac oss 3 5 ohm output load
- Volume control at maximum for all adjustments.
- Align for maximum output. Reduce input as needed to keep output near 0.4 volts.

SIGNAL GENERATOR				*SETTING TUNER*	*ADJUST TRIMMERS TO MAXIMUM OUTPUT (in order shown)*
Frequency	*Coupling Factor*	*Connection to Receiver*	*Ground Connection*		
455 kc	.1 mfd	1R5 Grid	B—	Rotor full open (Plates out of mesh)	Input and output trimmers on IF cans
1700 kc	.1 mfd	1R5 Grid	B—	Rotor full open (Plates out of mesh)	Oscillator trimmer T2
1500 kc		Radiating Loop		1500 kc*	Antenna trimmer T1

* Five markings on the dial bracket represent respectively 530 kc., 600 kc., 1000 kc., 1500 kc., and 1700 kc., reading from left to right. These points are to be used for the alignment of the receiver.

REPLACEMENT PARTS LIST

When ordering parts, specify part number, model number and series.

CAPACITORS

Ref. No.	*Part No.*	*Description*
C1, C2, C3,	CE-12	{125 mfd, 10 volt} Electrolytic {25 mfd, 150 volt} condenser
C4	CP-503-5	.05 mfd, 400 volt, paper
C5	CP-103-2	.01 mfd, 150 volt, paper
C6	CP-104-2	.1 mfd, 200 volt, paper
C7	CP-503-2	.05 mfd, 150 volt, paper
C8	CP-202-3	.002 mfd, 200 volt, paper
C9	CP-502-2	.005 mfd, 400 volt, paper
C10	CP-102-3	.001 mfd, 200 volt, paper
C11	CM-101-1	.0001 mfd, 300 volt, mica
C12, C13	CV-10	Variable condenser, 2 gang
C14	CP-103-4	.01 mfd, 100 volt, paper

RESISTORS

R1	RC-180-1	18 ohms,	½ watt 20%
R2	RC-682-5	6800 ohms,	1 watt 10%
R3	RP-3	2650 ohms,	10 watt 5%
R4	RC-471-1	470 ohms,	½ watt 20%
R5	RC-821-2	820 ohms,	½ watt 10%
R6	RC-274-2	270,000 ohms,	½ watt 10%
R7	RC-225-1	2.2 megohms,	½ watt 20%
R8	RC-105-1	1 megohm,	½ watt 20%
R9	RC-335-1	3.3 megohms,	½ watt 20%
R10	RC-106-1	10 megohms,	½ watt 20%
R11	VC-6	1 meg. vol. control with switch	
R12	RC-105-2	1 megohm,	½ watt 10%
R13	RC-153-1	15,000 ohms,	½ watt 20%
R14	RC-104-2	100,000 ohms,	½ watt 10%

POWER SUPPLY

This receiver is designed to operate on either an A.C. or D.C power supply. The following operation ratings should be observed:

Voltages ..... 105 - 125 Volts, A.C. or D.C.

COILS AND TRANSFORMERS

Ref. No.	*Part No.*	*Description*
	LC-4	Oscillator coil
	LF-22	IF transformer
	LP- 6	Loop antenna
	TR- 7	Output transformer

MISCELLANEOUS

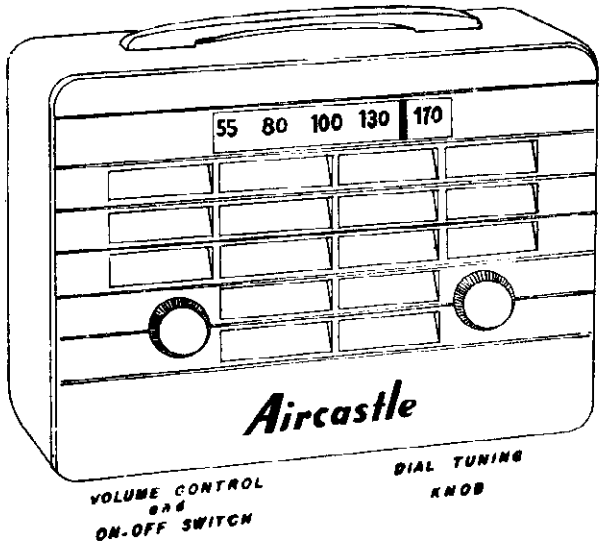
Ref. No.	*Part No.*	*Description*
S1, S2, S3	SW-10	Three Pole Single Throw Switch
	SP-41	4 inch P.M. speaker
	PN-6	Pointer
	CR-2	Drive cord
	SG-1	Spring for drive cord
	KN-20-4	Knob
	BK- 20	Cabinet back (with hardware)
	CB-104A	Assembled cabinet (without back and handle)
	HA-2	Handle for cabinet (with springs and pins)
	AS-1	Assembled battery box

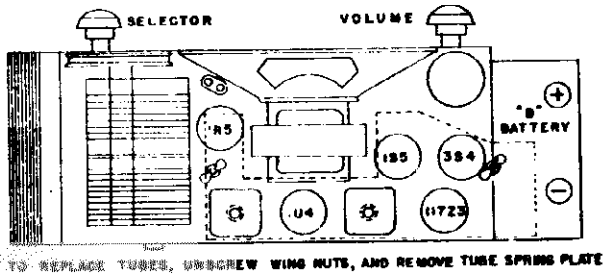
The battery supply to be used with this receiver is as follows:

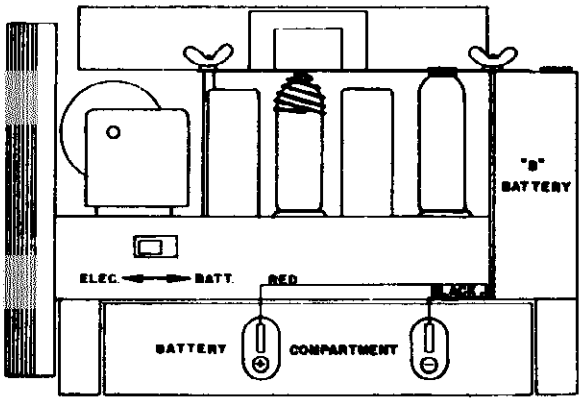
"A" supply ..... 7½ volts
Use five type "D" flashlight cells; Aircastle No. 1514, or RCA-VS-001, or Burgess No. 2 or Eveready No. 950 or equivalent.

"B" supply ..... 67½ volts.
Use Aircastle No. 1523 or Burgess No. XX45 or Eveready No. 467 or RCA-VS-016 or equivalent.

MODEL 180 SPIEGEL

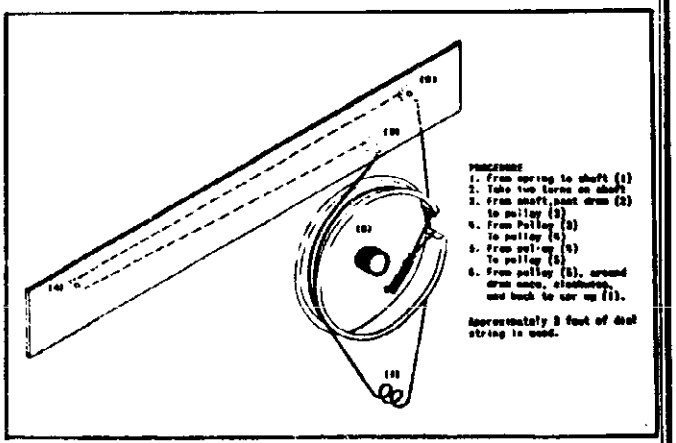




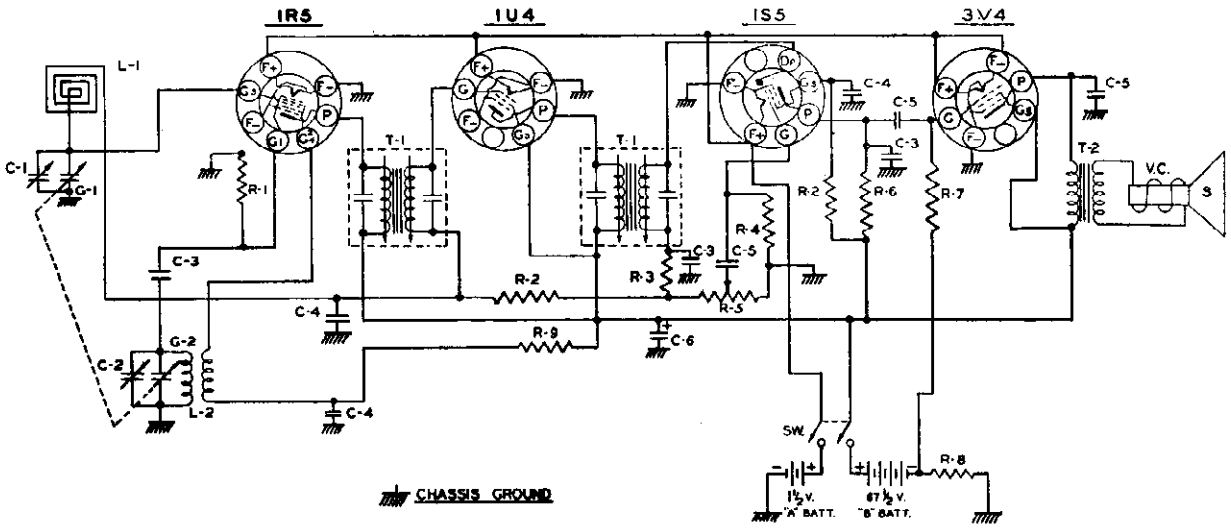


ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts DC or 50-60 cycles AC 15 watts
Batteries	A—7½ volts. 50 ma. B—67½ volts. 8 ma. average.
Frequency Range	530 to 1700 kc.
Intermediate Freq.	455 kc.
Tuning	Two-gang capacitor
Antenna	Built-in loop
Speaker	4 inch PM; voice coil impedance 3.5 ohms.
Power Output	80 milliwatts undistorted 140 milliwatts maximum
Sensitivity	500 microvolts per meter for 50 milliwatt output
Selectivity	55 kc broad at 1000 times signal at 1000 kc.



Replacement of Drive Cord



PART NO.		DESCRIPTION	PART NO.		DESCRIPTION
1R-20	R-1	220M Ω RESISTOR 1/2W. 20 %	GC-4	G-1	GANG CONDENSER
1R-23	R-2	3.3MEG. RESISTOR 1/2W. 20 %		G-2	
1R-31	R-3	.82M Ω RESISTOR 1/2W. 10 %	LL-13	L-1	LOOP ANTENNA
1R-3	R-4	10MEG. RESISTOR 1/2W 20 %	LO-12	L-2	OSC. COIL
VC-8	R-5	MEG. VOLUME CONTROL	LI-5	T-1	I.F. TRANSFORMER
1R-12	R-6	MEG. RESISTOR 1/2W 20 %	SW	SW	D.P.S.T. SWITCH ON VOLUME CONTROL
1R-13	R-7	2.2MEG. RESISTOR 1/2W. 20 %		T-2	SPEAKER TRANSFORMER
1R-39	R-8	Ω RESISTOR 1/2W. 5 %	SPK-8	VC	VOICE COIL
1R-37	R-9	Ω RESISTOR 1/2W. 20 %		S	P.M. SPEAKER
TC-7	C-1	ANT. TRIMMER	TU-30		1R5 - 1U4 - 1S5 - 3V4
	C-2	OSC. TRIMMER ON GANG			
MC-2	C-3	100 MMFD. MICA CONDENSER			
PC-7	C-4	.01 MFD. 400 V. CONDENSER			
PC-6	C-5	.005MFD. 600 V. CONDENSER			
EC-7	C-6	20MFD 80WV ELECTROLYTIC			

DRAWN BY: R.G.S.
APPROVED:
DATE: 3-28-47

ALIGNMENT AND SERVICE DATA

Remove chassis from cabinet for alignment. A signal generator is required having the following frequencies: 455 KC and 1400 KC. An output meter should be connected across the speaker.

FIRST STEP: Connect the hot lead from the generator to the ANT. section of the gang condenser, through a .1 MFD. condenser. The ground lead from the generator may be connected to any spot on the metal chassis. Turn the gang condenser to complete minimum capacity. Set the generator to 455 KC. Adjust the movable iron cores in the IF cans. These IF adjustments are made in the top and in the bottom of the can under the chassis. Adjust the cores until a maximum reading is noted on the output meter.

The volume control of the receiver should be turned to maximum during the IF and all subsequent alignment and the generator output as low as possible to prevent the AVC from working and giving false readings.

SECOND STEP: With the leads from the generator still connected as in IF alignment, adjust the generator to 1400 KC. Set the dial pointer to 1400 KC on the dial scale. Adjust the oscillator trimmer until the signal is tuned in.

THIRD STEP: Remove the generator leads from the gang condenser.

Replace the chassis in the cabinet. Loosely couple the generator to the receiver loop by making a complete turn over the outside of the cabinet. With the receiver and the generator still set at 1400 KC increase the generator output. Adjust the Antenna trimmer through the back of the chassis until a maximum signal is noted on the output meter.

No further adjustment should be necessary as the coils and gang condenser in this receiver have been specially handled at the factory to insure proper alignment at the lower frequencies.

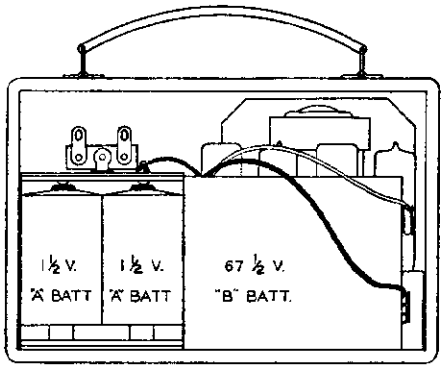
NOTE: When the antenna trimmer is adjusted at 1400 KC., the chassis as well as the "A" and "B" batteries must be in normal position in the cabinet to reflect the proper loop impedance.

For proper operation this receiver requires two "A" batteries and one "B" battery.

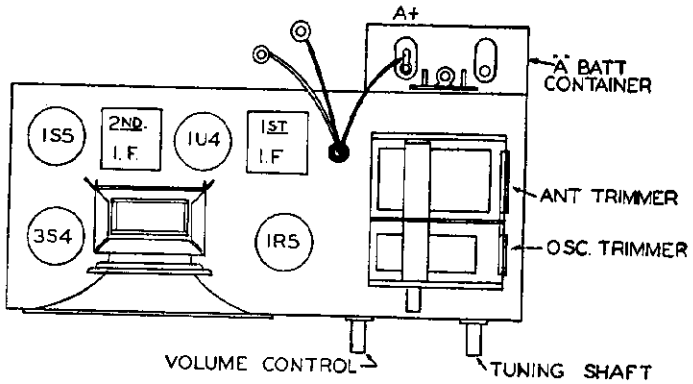
The "A" batteries are size "D" flashlight cells and are made by all battery manufacturers.

The "B" battery is a 67½ volt battery and is made by the following manufacturers:

Eveready	**67½ vlt.**	**#467**
Burgess	**67½ vlt.**	**#XX45**
General	**67½ vlt.**	**#W45A**
Ray-O-Vac	**67½ vlt.**	**#4367**



BATTERY LOCATION
FIGURE-1



MODEL 5029
TUBE AND TRIMMER LOCATION
TL-61

BATTERY SERVICING

(See Fig. No. 1)

To replace the batteries in this receiver:

Remove the back.

To the left, looking into the rear of the cabinet is the "A" or flashlight battery container. To the right is the "B" or 67½ volt battery.

To replace the "A" batteries, pull the old batteries out of the container. Replace with fresh batteries, making sure the batteries are inserted according to the diagram on the inside of the container.

To replace the "B" battery, disconnect the snap fastener connectors. Replace with a fresh battery and snap the connectors into place. Replace the battery in the cabinet as shown in Fig. No. 1, making sure that the connector end faces the right side of the cabinet.

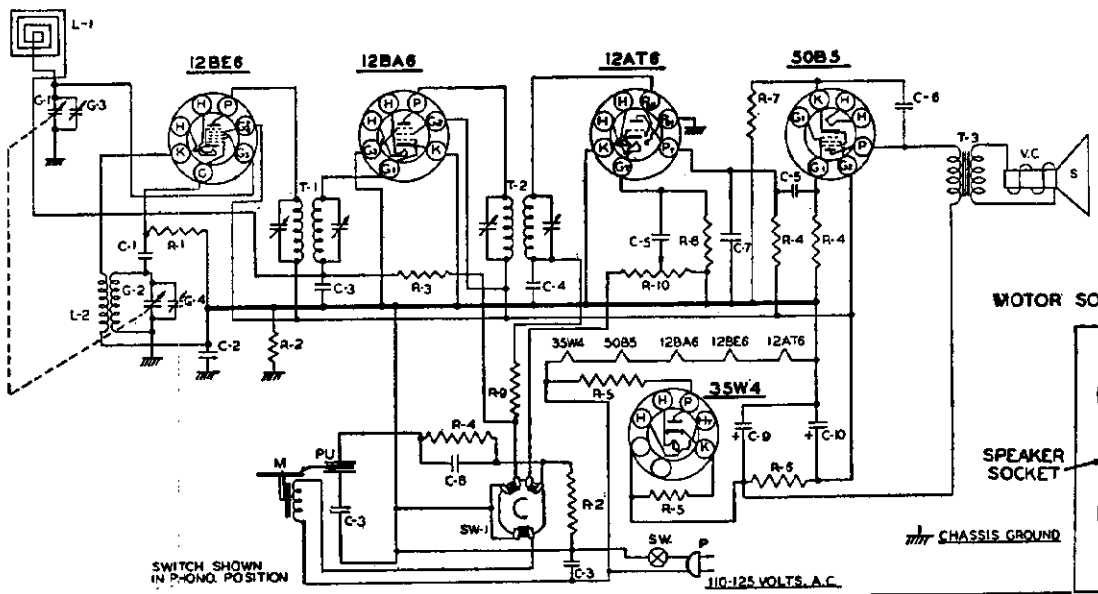
After the batteries have been installed, replace the back, making sure that the two washers in the bottom of the back fit into the slot near the bottom edge of the cabinet.

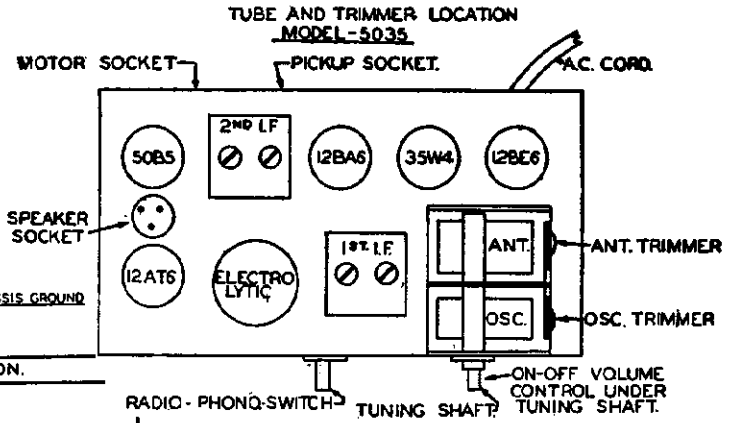
STATION SELECTOR: The right hand knob is the station selector or tuning control. Rotate this knob to the right or left to select your desired station. By mentally adding a zero to the figures on the dial the result will be read directly in kilocycles i.e., 140 plus 0 equals 1400 KC or 60 plus 0 equals 600 KC.

Rotate the tuning knob until the proper station has been selected, then adjust the volume control to the desired level.

ANTENNA: This receiver is equipped with a sensitive loop antenna and requires no external antenna wire. However, due to the directional qualities of the loop some stations may appear to be weak in reception. This condition may be remedied by rotating or changing the position of the receiver.

CAUTION: If the batteries in the receiver wear out from use and the receiver refuses to operate make sure that the volume control is turned all the way to the left in "OFF" position, until the batteries can be replaced. If the switch is left in the "ON" position this will cause the battery cells to burst and they will leak into the receiver which may ruin the component parts.





PART NO.		DESCRIPTION	PART NO.		DESCRIPTION	PART NO.		DESCRIPTION.
IR-9	R-1	22M Ω RESISTOR 1/2W. 20%	PC-5	C-3	.05MFD. CONDENSER 400 V		G-3	ANT. TRIMMER
IR-20	R-2	220M Ω RESISTOR 1/2W. 20%	MC-2	C-4	100MMFD. MICA.		G-4	OSC. TRIMMER
IR-23	R-3	3.3MEG Ω RESISTOR 1/2 W. 20%	PC-6	C-5	.005MFD. CONDENSER 600 V.	PU-5	PU	L-75 AS CRYSTAL CARTRIDGE
IR-11	R-4	470M Ω RESISTOR 1/2 W. 20%	PC-7	C-6	.01MFD. CONDENSER 400 V		SW	SPST. SWITCH ON VOLUME CONTROL
IR-17	R-5	33 Ω RESISTOR 1/2 W. 20%	MC-3	C-7	.00022 MFD. MICA.		T-3	OUTPUT TRANSFORMER
IR-25	R-6	2200 Ω RESISTOR 1W. 10%	MC-5	C-8	500 MMFD. MICA.	SPK-11	VC	VOICE COIL
IR-14	R-7	150 Ω RESISTOR 1/2W. 20%	EC-12	C-9	40 MFD. 150 V ELECTROLYTIC		S	P.M. SPEAKER
IR-13	R-8	2.2 MEG Ω RESISTOR 1/2W. 20%		C-10	20 MFD	CO-2	P	LINE CORD.
IR-19	R-9	100M Ω RESISTOR 1/2W 20%	LL-11	L-1	LOOP ANT.	M-1	M	110-125 V. 60~ A.C. PHONO. MOTOR
VC-9	R-10	1MEG. VOLUME CONTROL	LO-13	L-2	OSC. COIL	SW-7	SW-1	PHONO. RADIO SWITCH
MC-4	C-1	.000050 MFD. MICA.	GC-7 X	G-1	GANG CONDENSER	TU-18		12BE6 12BA6 12AT6 50B5 35W4
PC-8	C-2	.1 MFD. CONDENSER 400 V.		G-2				

ALIGNMENT AND SERVICE DATA

Remove chassis from cabinet for alignment.

A Signal Generator is required having the following frequencies: 455 KC, 1400 KC, 1650 KC. An output meter should be connected across the speaker.

The volume control of the receiver should be turned to maximum during the I. F. and all subsequent alignment and the generator output as low as possible to prevent the A. V. C. from working and giving false readings.

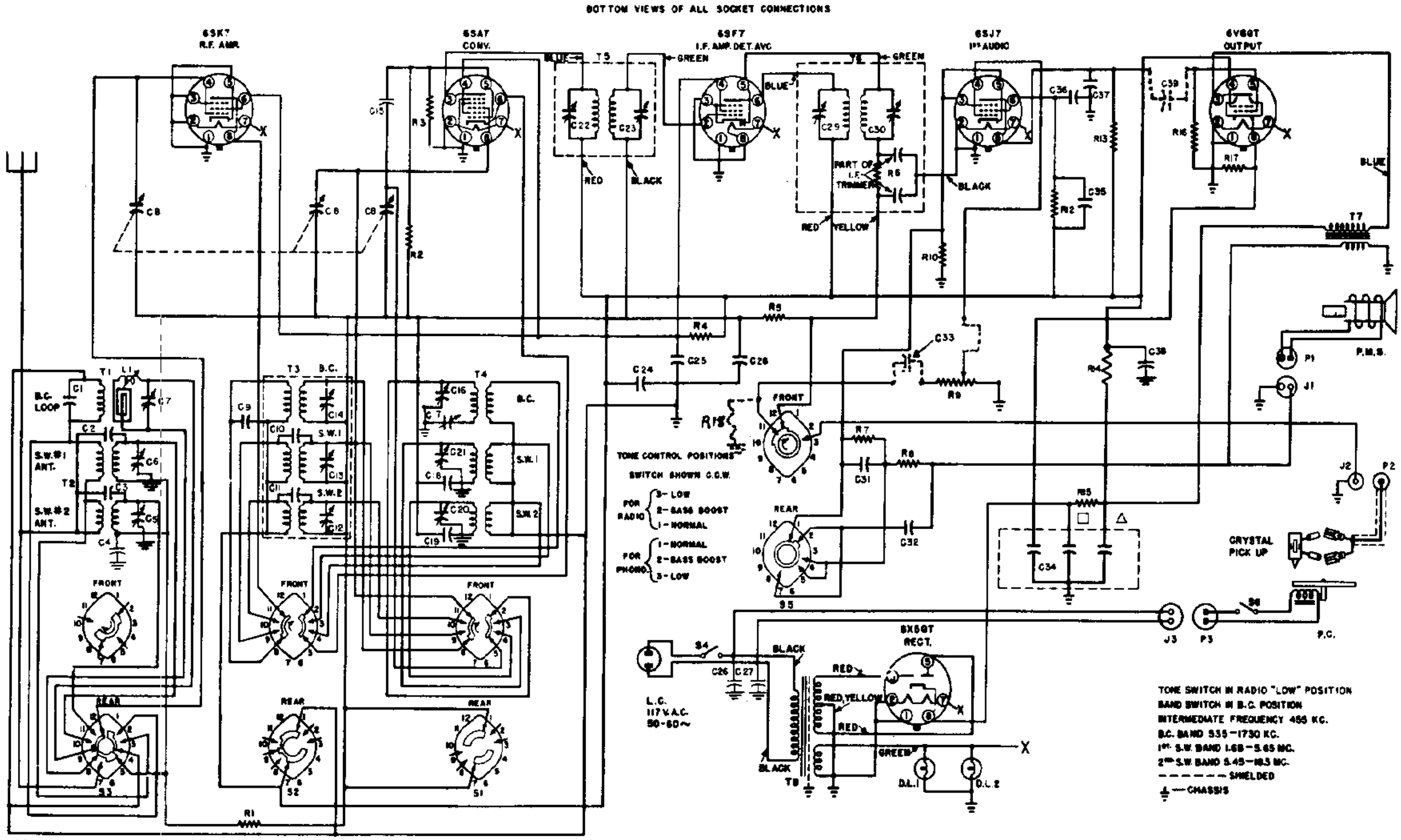
FIRST STEP: Connect the hot lead from the generator to the ANT. section of the gang condenser through the .1 MFD. condenser. The ground lead from the generator must be connected to "B" minus under the chassis. Turn the gang condenser to complete minimum capacity. Set the generator to 455 KC. Adjust the trimmers of the first and second I. F. transformers until a maximum reading is noted on the output meter.

SECOND STEP: With the leads from the generator still connected in the same manner, adjust the Signal Generator to 1650 KC. Adjust the OSC. trimmer until the 1650 KC signal is tuned in. The gang condenser must be at complete minimum capacity for this adjustment.

THIRD STEP: Remove the generator leads from the gang condenser. Loosely couple the generator to the receiver loop by using a complete turn of wire. With the receiver and generator set at 1400 KC, increase the generator output. Adjust the ANT. trimmer until a maximum signal is noted on the output meter. No further adjustment should be made as the coils and gang condenser in this receiver have been specially handled at the factory to insure proper alignment at the lower frequencies.

MODEL 6612

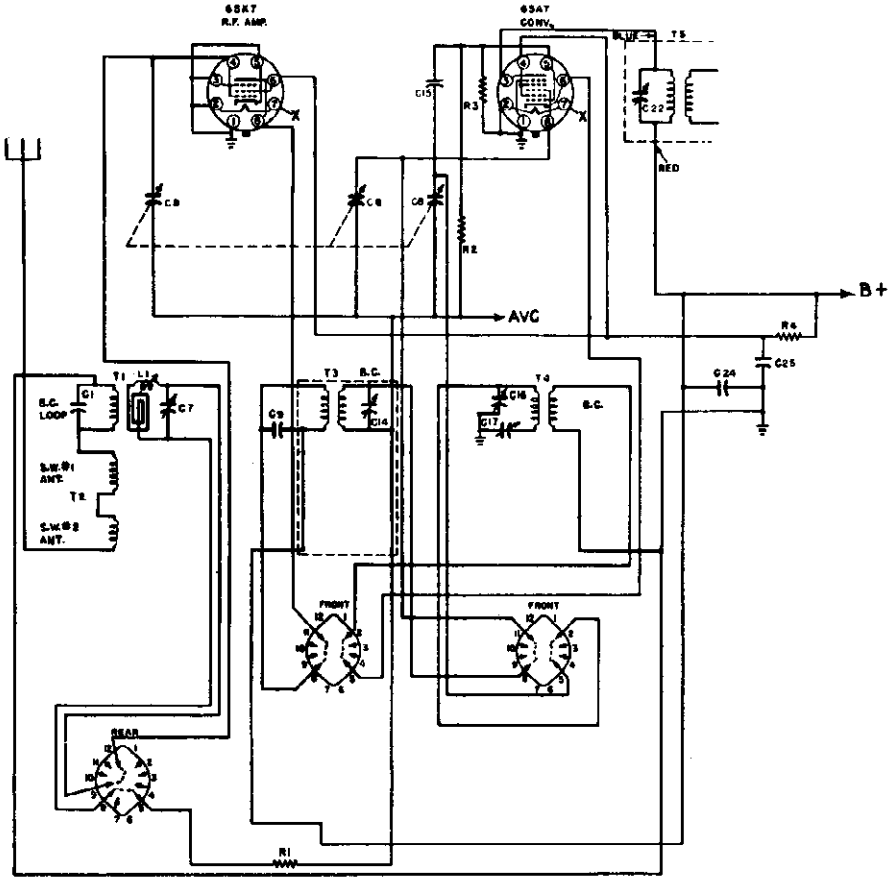
SPIEGEL



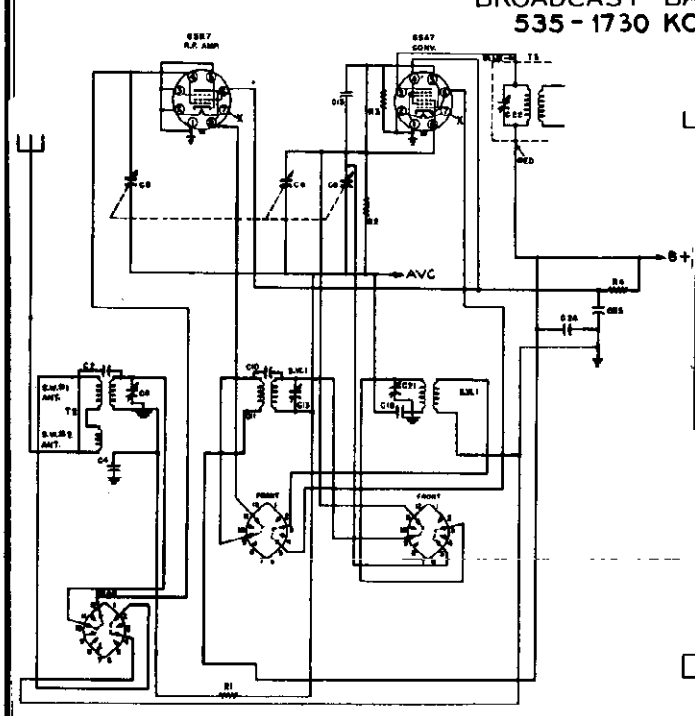
TONE SWITCH IN RADIO "LOW" POSITION
BAND SWITCH IN B.C. POSITION
INTERMEDIATE FREQUENCY 455 KC.
B.C. BAND 535—1730 KC.
1ST S.W. BAND 1.68—5.65 MC.
2ND S.W. BAND 5.45—18.3 MC.
– – – – – – SHIELDED
⏚ — CHASSIS

DWG. SYM.	PART NO.	DESCRIPTION
T1	B52651	B.C. LOOP ASSEMBLY
T2	B65025	S.W. BAND 1&2 ANT. COIL ASSEMBLY
T3	B65026	B.C.–S.W. 1&S.W. 2 R.F. " "
T4	B65022	" " " " " OSC. " "
T5	B53350	NO. 1 I.F. TRANSFORMER "
T6	B53341	" 2 " " "
T7	△ B53941	OUTPUT "
T8	B53942	POWER " "
C1	B56053	22 MMFD. MICA CAPACITOR
C2	A52655	3 MMFD FIXED "
C3	A52655	3MMFD. " "
C4	C56596	.02MFD 200V PAPER CAPACITOR
C5	A52664	SW. 2 ANT. TRIMMER ASSEMBLY
C6	A52664	" 1 " " "
C7	A52686	BC ANT TRIMMER ASSEMBLY
C8	B52642	3 GANG VARIABLE CAPACITOR & PULLEY
C9	B56057	100MMF MICA CAPACITOR
C10	A52674	3 MMFD. FIXED "
C11	A52674	3 " " "
C12	A52664	SW 2 R F TRIMMER ASSEMBLY
C13	A52664	" 1 " " "
C14	A52664	BC R F TRIMMER ASSEMBLY
C15	B56057	100MMF MICA CAPACITOR
C16	A52665	B.C OSC TRIMMER ASSEMBLY
C17	A52665	" " PADDER "
C18	A50235	1250MMFD MICA CAPACITOR TOL.±5%
C19	A51931	3900 " " " " "
C20	A52664	SW 2 OSC TRIMMER ASSEMBLY
C21	A52664	" 1 " " "
C22,C23		NO. 1 I.F. TRIMMER (PART OF ASS'Y)
C24	C56631	.01 MFD. 400V PAPER CAPACITOR
C25	A54146	10 " 350V. ELECTROLYTIC
C26	C56628	.05MFD 400V PAPER CAPACITOR
C27	C56628	.05 " " " "
C28	C56596	.02 " 200V " "
C29,C30		NO. 2 I.F. TRIMMER (PART OF ASS'Y)
C31	C56600	.05 MFD. 200V PAPER CAPACITOR
C32	C56594	.01 " " " "
C33	C56596	.02 MFD 200V PAPER CAPACITOR
C34	B53939	20 " 25V ELECTROLYTIC; 10△ " 350V "; 20□ " " "
C35	C56622	.01 " 400V PAPER CAPACITOR
C36	C56628	.05 " " " "
C37	C56613	.001 " " " "
C38	A54146	10 350V ELECTROLYTIC
C39	C56624	.02 MFD 400V PAPER CAPACITOR
R1	B55485	220,000 OHM 1/2W CARBON RESISTOR
R2	B55496	5 MEG " " "
R3	B55479	22,000 OHM " " "
R4	B55952	12,000 " 2W " "
R5	B55491	2.2 MEG 1/2W " "
R6	B55481	47,000 " " (PART OF I.F. ASS'Y)
R7	B55481	47,000 " " " "
R8	B55478	15,000 " " " "
R9,S4	D56340	500,000 OHM VOL. CONTROL & SWITCH
R10	B55472	1500 OHM 1/2W CARBON RESISTOR
R11	B55491	2.2 MEG 1/2W CARBON RESISTOR
R12	B55491	" " " " "
R13	B55487	470,000 OHM " "
R14	B55940	1200 OHM 2W. " "
R15	B55999	200 " 2W " "
R16	B55487	470,000 " 1/2W " "
R17	B55733	220 " 1W " "
D.L. 1,2	A70535	DIAL LIGHT TYPE 47
L1	B61752	LOADING COIL
L.C.	B54175	LINE CORD
P.M.S.	B53933	10" PERMANENT MAGNET SPEAKER
S1,S2,S3	B52646	BAND SWITCH ASS'Y
S5	A53940	RADIO-PHONO TONE CONTROL
S6	30834-03	PHONO SWITCH (PART OF CHANGER
P.C.	PC-206	RECORD CHANGER ASS'Y
P1		SPEAKER CONNECTOR (MALE)
J1		" " (FEMALE)
P2		PHONO PICK UP CONNECTOR (MALE)
J2		" " " " (FEMALE)
P3		" POWER " (MALE)
J3		" " " (FEMALE)

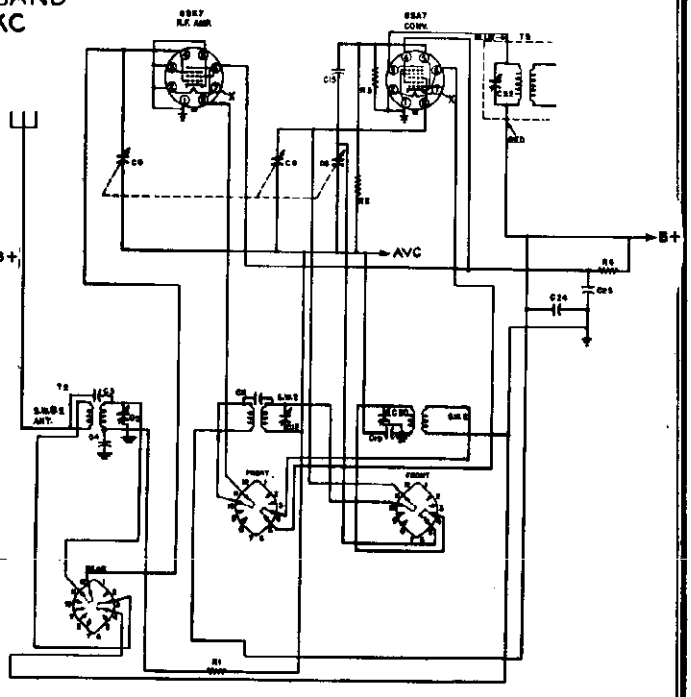
SPIEGEL MODEL 6612



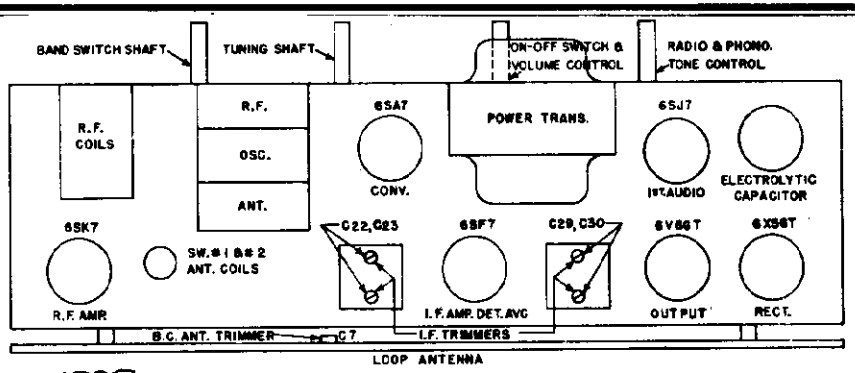
BAND-SWITCH SHOWN
AT 1ST POSITION.
BROADCAST BAND
535-1730 KC

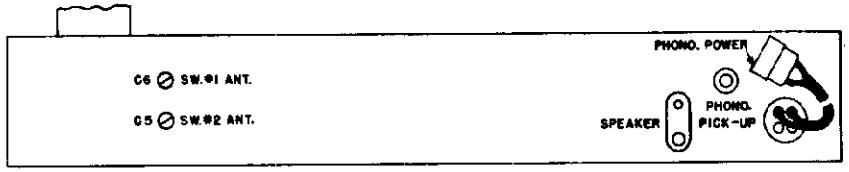


BAND-SWITCH SHOWN
AT 2ND POSITION.
SHORT WAVE 1 BAND
1.68-5.65 MC

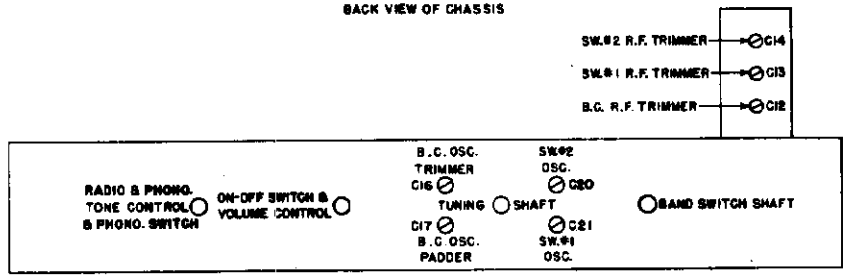


BAND-SWITCH SHOWN
AT 3RD POSITION.
SHORT WAVE 2 BAND
5.45-18.3 MC





BACK VIEW OF CHASSIS



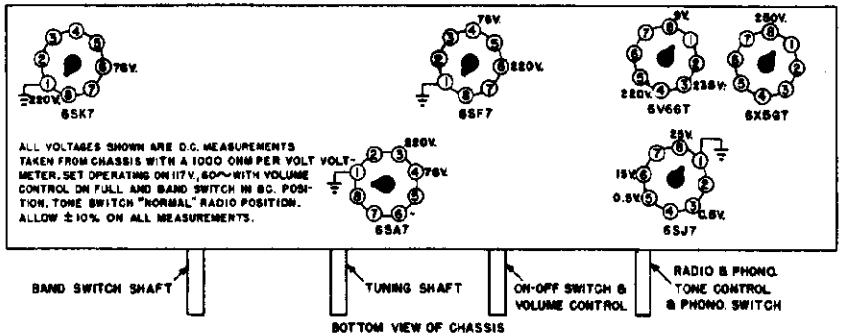
FRONT VIEW OF CHASSIS

ALIGNMENT CHART

OPERATION	ALIGNMENT OF	GENERATOR CONNECTED TO	DUMMY ANTENNA	GENERATOR FREQUENCY	BAND SWITCH SETTING	DIAL AND CONDENSER SETTING	TRIMMER	REMARKS
1	Set dial pointer to last mark at Low frequency end of dial with gang condenser closed.							
2	2nd. I.F.	6SA7 Grid and Gnd.	.05 Mf.	455 KC	BC	Open	C29 & C30	Max. Output
3	1st. I.F.						C22 & C23	Max. Output
4	BC	Antenna Lead & Gnd.	200 mmf.	1500 KC	BC	1500 KC	C16, C12, C7	Max. Output
5				600 KC		600 KC	C17	(osc. padder)
6				Repeat operations 4 and 5 until alignment frequencies fall on correct calibration points				
7				600	BC	600	L1	Max. Output
8				Recheck C7 at 1500 KC and L1 at 600 KC				Max. Output
9	SW1	Antenna Lead &Gnd.	400 ohms (res)	5 MC	1	5 MC	C21, C13, C6	Max. Output
10				1800 KC		1800 KC	* *	* *
11	SW 2	Antenna Lead &Gnd.	400 ohms (res)	16 MC	2	16 MC	C20* C14, C5	Max. Output
12				6 MC		6 MC	**	**

NOTES: * Rock dial while trimming C20 at 16 MC. ** Check sensitivity and dial calibration
C7 and L1 are located on Loop Antenna.

CHASSIS VOLTAGE CHART



BOTTOM VIEW OF CHASSIS

VOLTAGE CHART

Line Voltage: 117 volts, 60 cycles AC
Position of Band Switch: Broadcast Band
Position of Volume Control: Full (with no signal)
Position of Tone Switch: Radio - "Normal"

TUBE	FUNCTION	Voltage of each socket prong to Ground (Chassis)							
		No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8
6SK7	R-F Amplifier	0	0	0	0	0	76.B	6.1*	220.A
6SA7	Oscillator-Converter	0	0	220.A	76.B	0	0	6.1*	0
6SF7	I-F Amp. -Detector-AFC	0	0	0	76.B	0	220.A	6.1*	0
6SJ7	1st Audio Amplifier	0	0	.5D	0	.5D	15.A	6.1*	25.A
6V6GT	Beam Power Amplifier	0	0	235.A	220.A	0	--	6.1*	9.C
6X5GT	Rectifier	0	0	250. *	---	250.*	--	6.1*	250.A

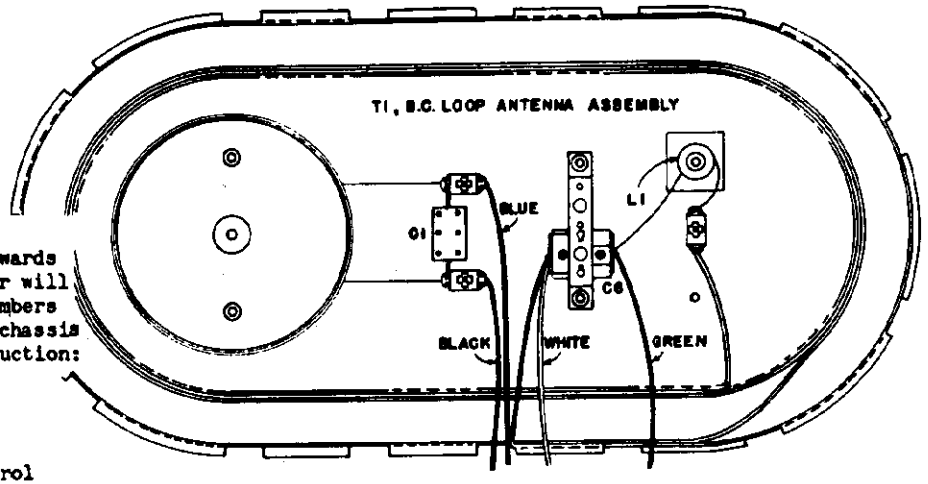
* AC Volts A-250 Volt Scale B-100 Volt Scale C-25 Volt Scale D-5 Volt Scale

Voltage readings are for schematic diagram in this bulletin. Allow 10% ± on all measurements

All DC voltages made with 1000 ohms per volt voltmeter

Voltages are DC unless otherwise specified.

LOOP WIRING DIAGRAM



These changes are incorporated in chassis bearing serial numbers upwards of No. 24000. A limited number of chassis beyond this serial number will not have these changes, and similarly, a few chassis with serial numbers somewhat under 24000 will have had the changes. Inspection of the chassis will readily determine whether these changes have been made in production:
These changes are shown in dotted lines on the schematic

1. The volume control circuit has been altered to:

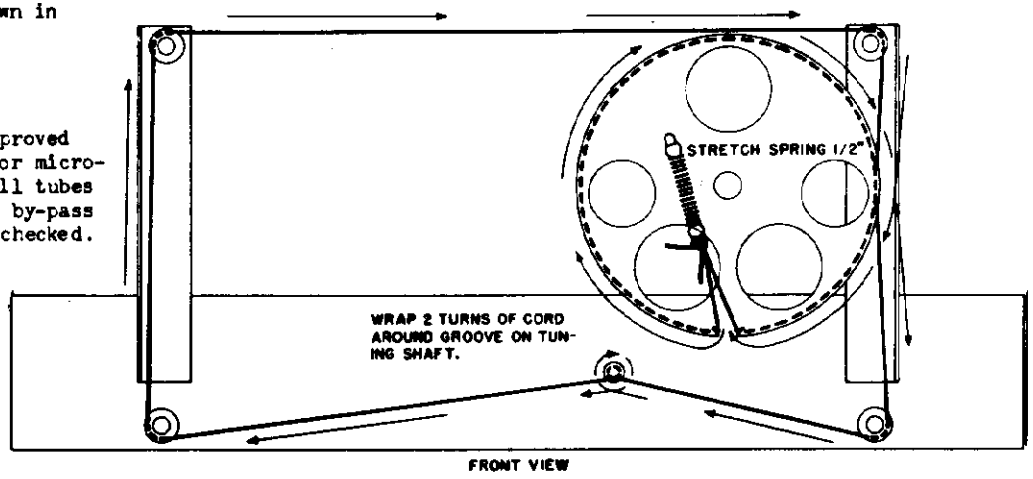
   a) Delete resistor R-11.
   b) Remove capacitor C-33 (.02 mfd. 200 volts) from volume control grid lead and substitute with .02 mfd. 400 volt or 600 volt capacitor to be connected in switch lead of volume control. Connect ground (outside foil) to switch as shown.
   c) Add resistor R-18 (470,000 ohms, 1/2 watt) as in diagram.

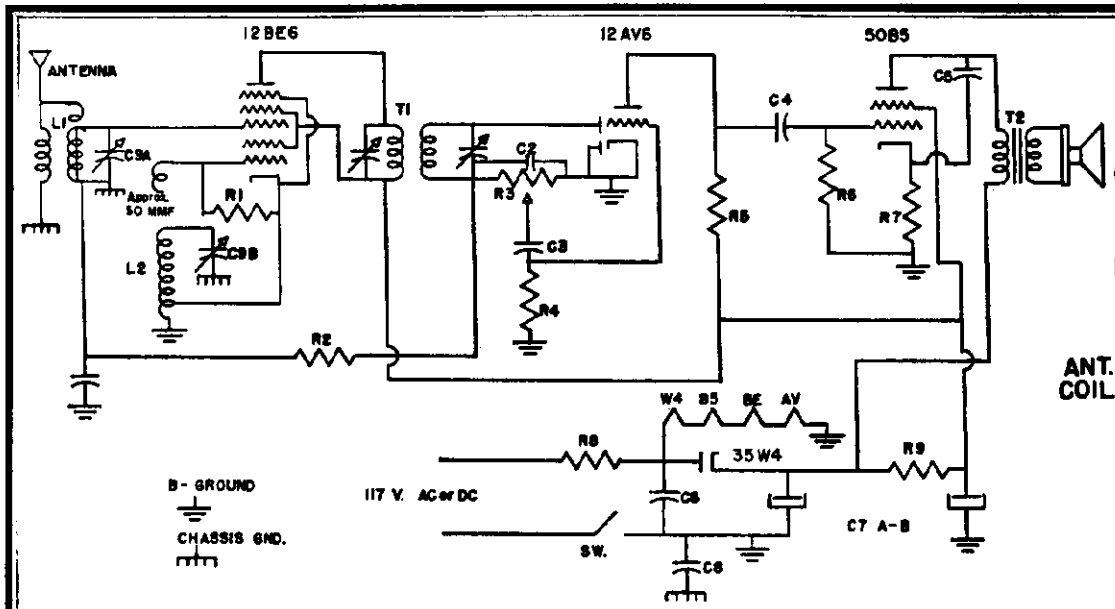
2. Substitute capacitor C-39 which couples the plate of 1st audio 6SJ7 tube to the grid of output 6V6GT tube with capacitor having 600 volt rating (no change in the capacity of .02 mfd.) and change polarity so that outside foil connects to plate, as shown in diagram.

NOTE:

These changes have been found to result in generally improved performance characteristics. In case of excessive hum or microphonism, it is recommended that: 1) the condition of all tubes be checked by substitution, 2) the correct polarity of by-pass capacitors be ascertained, 3) the filter capacitor be checked.

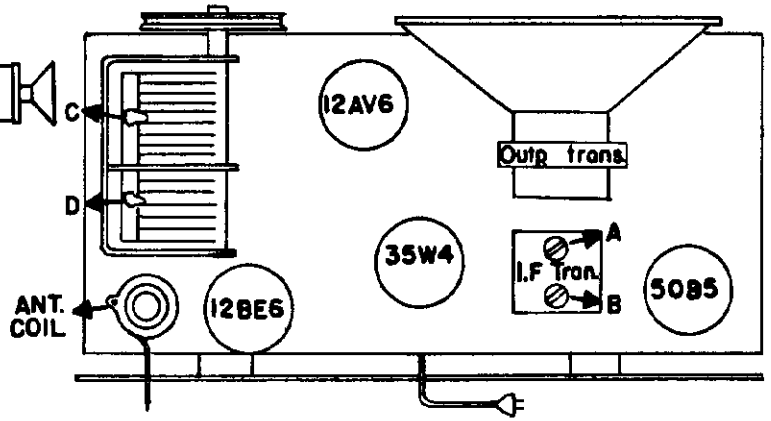
DIAL DRIVE DIAGRAM





CHASSIS MODEL 10001

TUBE LOCATION CHART



CIR. SYM.	PART NO.	DESCRIPTION
R1	RC-21002	RESISTOR CARBON 10,000 Ohm 1/3 W
R2	RC-22204	" 2.2 MEG Ohm 1/3 W
R3	VC-12106-C	VOLUME CONTROL 1 MEG WITH SWITCH
R4	RC-21005	RESISTOR CARBON 10 MEG Ohm 1/3 W
R5,6	RC-24703	" " 470,000 Ohm 1/3 W
R7	RC-21500	" " 150 Ohm 1/3 W
R8	RC-40220	" " 22 Ohm 1 W
R9	RC-21001	" " 1000 Ohm 1/3 W
T1	TS-10017A	TRANSFORMER I.F.
T2	TO-10000	TRANSFORMER OUTPUT
C1	CP-12203	CONDENSER PAPER .02 MFD 200 V.
C2	CM-25251	" MICA 250 MMF
C3,4	CP-12502	" PAPER .005 MFD 200 V.
C5	CP-14103	" PAPER .01 MFD 400 V.
C6,8	CP-12503	" PAPER .05 MFD 200 V.
C7	CL-10017	" ELECT. 30/20 MFD 150 V.
C9A-B	CV-10010	" VARIABLE
L1	TRF-10012	ANTENNA COIL
L2	TRC-10011A	OSCILLATOR COIL

OPERATION

Insert the power cord plug into the power receptacle. To turn the receiver on, turn the lower knob to the right until a click is heard. In about 30 seconds the set will be in operating condition.

The tuning range of this receiver is 540 to 1600 kilocycles, the standard broadcast band. The dial has the last 0 omitted so that 54 is 540 Kc. and 160 is 1600 Kc.

Rotate the tuning knob (upper knob) until the desired station has the deepest tone, and the background noise is at a minimum. Adjust the volume control (lower knob) for the desired volume. Do not reduce the volume by tuning the receiver off the station.

To turn the receiver off, turn the lower knob to the left until a click is heard and the receiver is switched off.

ANTENNA

A 20 foot antenna hank is attached to the receiver. In metropolitan areas it may be necessary to uncoil only a portion of the antenna to obtain satisfactory reception. For maximum pickup uncoil the antenna hank the full length. Do not attach it to a water pipe, radiator, or other grounded object. If you are located some distance from a broadcasting station, or if local noise from electrical equipment is high, reception will be greatly improved by the addition of an outside antenna which may be connected to the end of the hank.

This receiver is designed to operate without a ground connection and no attempt should be made to use one.

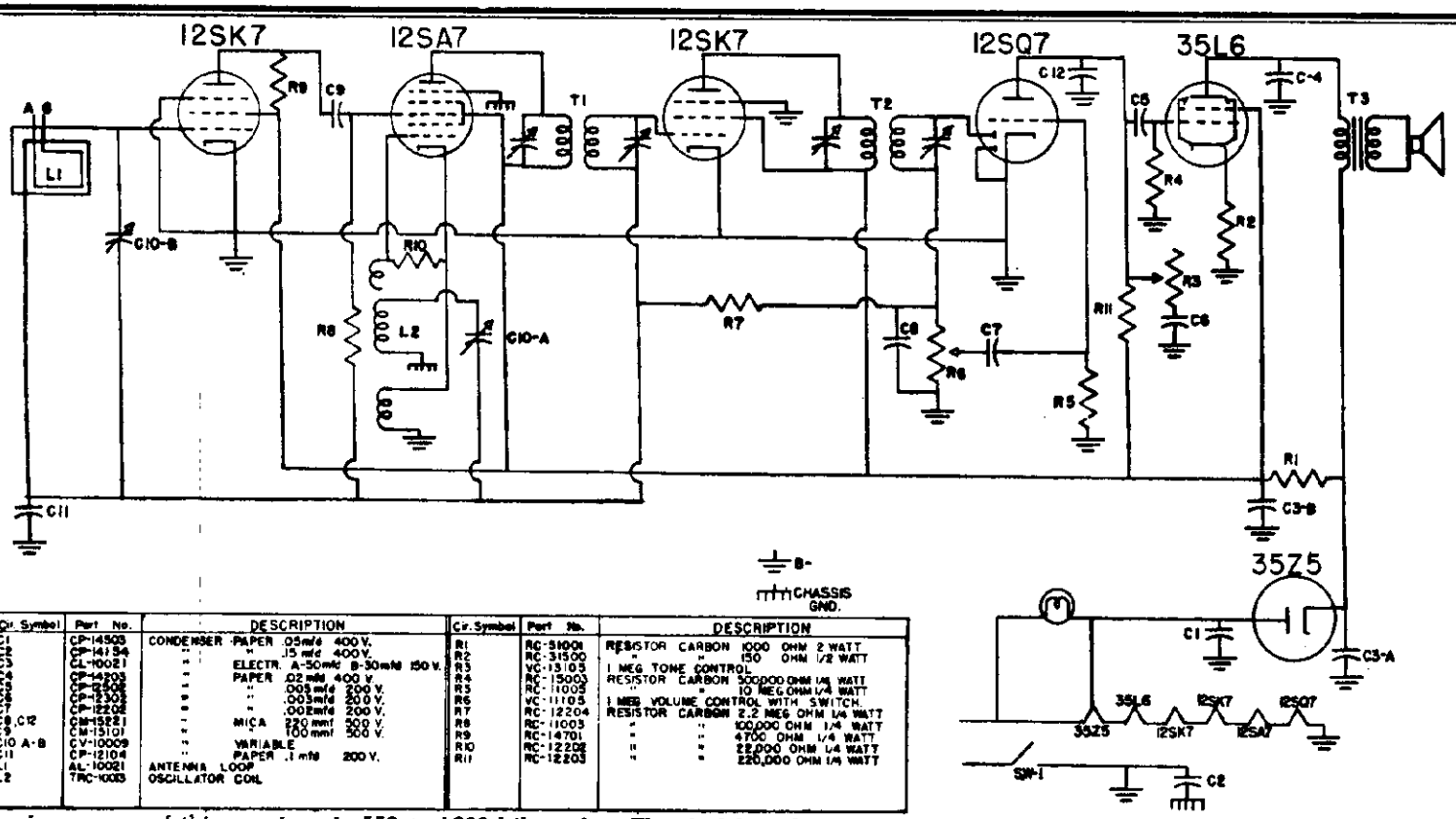
ALIGNMENT PROCEDURE

I. F. Alignment

1. Set variable condenser to high frequency end of dial.
2. Connect suitable output meter to voice coil of speaker.
3. Connect signal generator to grid of BE6 through .05 condenser. Connect ground side of generator to B-.
4. Adjust trimmers A and B for maximum output at 455 Kc.
5. Repeat trimmer adjustment for peak sensitivity.

R. F. Alignment

1. Set variable condenser to extreme high frequency end of dial.
2. Connect signal generator to antenna input terminal on antenna coil through 50 mmf. condenser.
3. Set generator to 1720 Kc.
4. Set trimmer C to 1720 Kc.
5. Set generator to 1400 Kc. and tune receiver dial to maximum response.
6. Adjust trimmer D for maximum output at 1400 Kc.
7. Check tracking and make necessary compensations.



Cir. Symbol	Part No.	DESCRIPTION
C1	CP-14503	CONDENSER PAPER .05 mfd 400 V.
C2	CP-14154	" " .15 mfd 400 V.
C3	CL-10021	" ELECTR. A-50 mfd B-30 mfd 150 V.
C4	CP-14203	" PAPER .02 mfd 400 V.
C5	CP-12405	" " .005 mfd 200 V.
C6	CP-12303	" " .003 mfd 200 V.
C7	CP-12202	" " .002 mfd 200 V.
C8,C12	CM-15281	" MICA 220 mmf 500 V.
C9	CM-15101	" " 100 mmf 500 V.
C10 A-B	CV-10009	" VARIABLE
C11	CP-12104	" PAPER .1 mfd 200 V.
L1	AL-10021	ANTENNA LOOP
L2	TRC-10013	OSCILLATOR COIL

Cir. Symbol	Part No.	DESCRIPTION
R1	RC-31001	RESISTOR CARBON 1000 OHM 2 WATT
R2	RC-31500	" " 150 OHM 1/2 WATT
R3	VC-13103	1 MEG TONE CONTROL
R4	RC-15003	RESISTOR CARBON 500,000 OHM 1/4 WATT
R5	RC-11005	" " 10 MEG OHM 1/4 WATT
R6	VC-11105	1 MEG VOLUME CONTROL WITH SWITCH
R7	RC-12204	RESISTOR CARBON 2.2 MEG OHM 1/4 WATT
R8	RC-11003	" " 100,000 OHM 1/4 WATT
R9	RC-14701	" " 4700 OHM 1/4 WATT
R10	RC-12202	" " 22,000 OHM 1/4 WATT
R11	RC-12203	" " 220,000 OHM 1/4 WATT

The tuning range of this receiver is 550 to 1600 kilocycles. The dial has the last 0 omitted so that 55 is 550 Kc. and 160 is 1600 Kc.

ALIGNMENT PROCEDURE

Connect a suitable signal generator to the R.F. section of the tuning condenser. Connect the ground side of the generator to the frame of the condenser. Use a .05 condenser to isolate the generator from the R.F. section.

Connect a suitable output meter to the voice coil leads of the speaker.

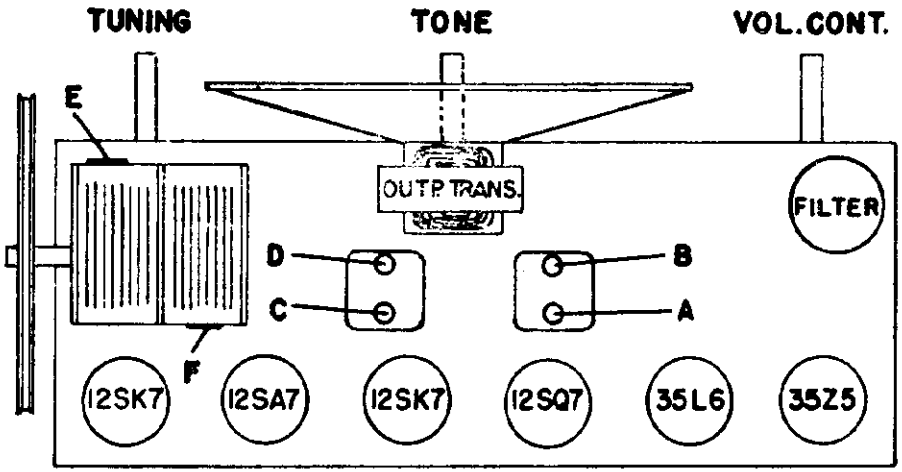
With the variable condenser open, apply a 455 Kc. signal. Use the lowest level consistent with good output indication.

Adjust trimmers A, B, C, and D for maximum response, reducing the input signal as required to keep the output meter on scale.

Connect the generator to terminals A & G through a 400 ohm dummy antenna. Apply a 1720 Kc. signal and adjust trimmer E to maximum.

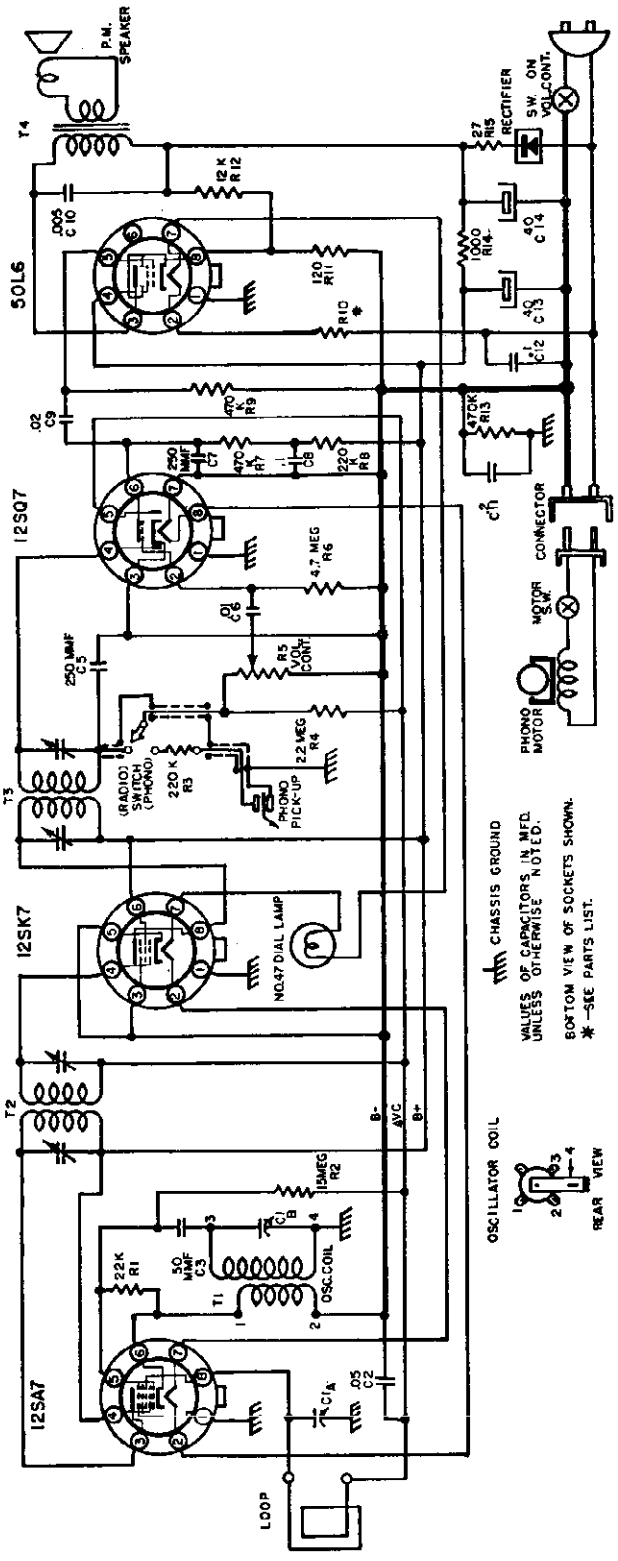
Set the signal generator to 1400 Kc. Tune the receiver dial to maximum response, then adjust trimmer F to maximum response. This completes the alignment.

TUBE LOCATION CHART



MODEL 11305

SPIEGEL



*** COMPENSATION CIRCUIT – PAT. APPLIED FOR**

PARTS LIST

Code	Part No.	DESCRIPTION
C1A, C1B	B18-189	Variable Condenser
C2	A18-152	.05 MFD. 200 volt Condenser
C3	A15-173	50 MMFD. Mica Condenser
C4	A18-150	.02 MFD. 400 volt Condenser
C5, C7	A15-176	250 MMFD. Mica Condenser
C6	A18-156	.01 MFD. 400 volt Condenser
C8	A18-157	.1 MFD. 200 volt Condenser
C10	A18-153	.005 MFD. 600 volt Condenser
C11	A18-154	.2 MFD. 400 volt Condenser
C12	A18-160	.1 MFD. 400 volt Condenser
C13, C14	A18-280	40 MFD. 150 volt Electrolytic Condenser
R1	A60-659	22K Ohm ½ watt 20% Resistor
R2	A60-664	15 Megohm ½ watt 20% Resistor
R3, R8	A60-667	220K Ohm ½ watt 20% Resistor
R4	A60-944	2.2 Megohm ½ watt 20% Resistor
R5	A14-184	500K Ohm Volume Control with Switch
R6	A60-669	4.7 Megohm ½ watt 20% Resistor
R7, R9, R13	A60-662	470K Ohm ½ watt 20% Resistor
R10	A60-719	Special Compensating Resistor, order only from the manufacturer
R11	A60-702	120 Ohm ½ watt 10% Resistor
R12	A60-720	12K Ohm 2 watt 10% Resistor
R14	A60-699	1000 Ohm 2 watt 10% Resistor
R15	A60-721	27 Ohm 1 watt 10% Resistor
T1	B10-411	Oscillator Coil
T2	A10-468	1st I. F. Transformer
T3	B10-454	2nd I. F. Transformer
T4	B80-250	Output Transformer
	A32-199	Knob, Volume
	A32-200	Knob, Tuning
	A32-201	Knob, Phono-Radio
	A68-172	Switch, Phono-Radio
	A39-278	Drum for Variable Condenser
	B79-352	5" P. M. Speaker
	A71-22	Cover for Volume Control
	A68-391	Selenium Rectifier
	A75-52	Tuning Shaft
	A83-308	Connector
	D42-407	Cabinet, Wood
	C71-47	Cover for Dial Plate
	B67-409	Dial Scale
	A58-53	Dial Pointer
	B83-408	Dial Scale Retainer
	C83-410	Cabinet Back
	C82-48	Loop Antenna
	A83-273	Dial Diffusing Plate

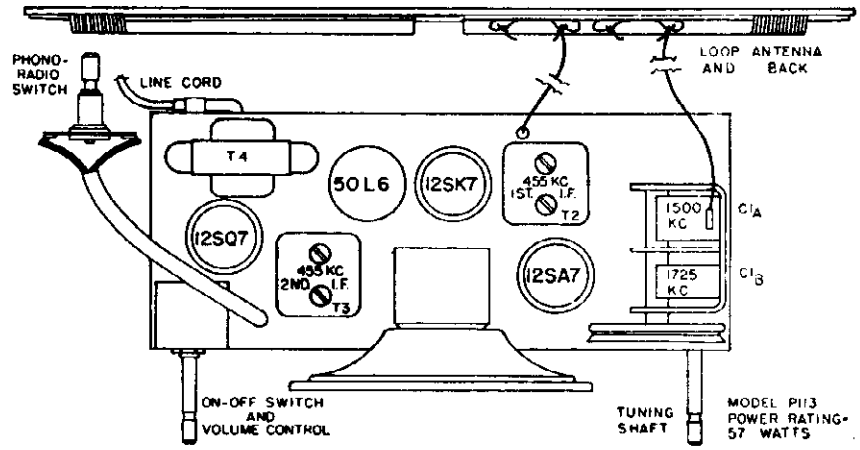
117 volt 60 cycle A.C. power supply.

The tubes used are:—

12SA7—Mixer, Oscillator
12SK7—I. F. Amplifier
12SQ7—Det., AVC, Audio
50L6—Power Output

No rectifier tube is required as a Selenium rectifier is used in its place.

This receiver covers the frequency range from 535 kilocycles to 1725 kilocycles (K.C.).



ALIGNMENT PROCEDURE

The following alignment procedure is for use only by competent servicemen having the proper equipment.

The alignment should be made with volume control fully on, and the output from the signal generator as low as possible, to prevent A.V.C. action from interfering with correct alignment.

With the output meter connected across the voice coil of the speaker, the output meter reading for 50 milliwatts is .4 volts using a signal which is modulated 400 c.p.s.

Adjust all trimmers for maximum output. Repeat alignment procedure given below as a final check.

CAUTION: This is an A.C.-D.C. receiver and when aligning the set it is necessary to isolate the Signal Generator or the Receiver from the line by use of a transformer, or place a .2 MFD. condenser in both test leads of the Signal Generator.

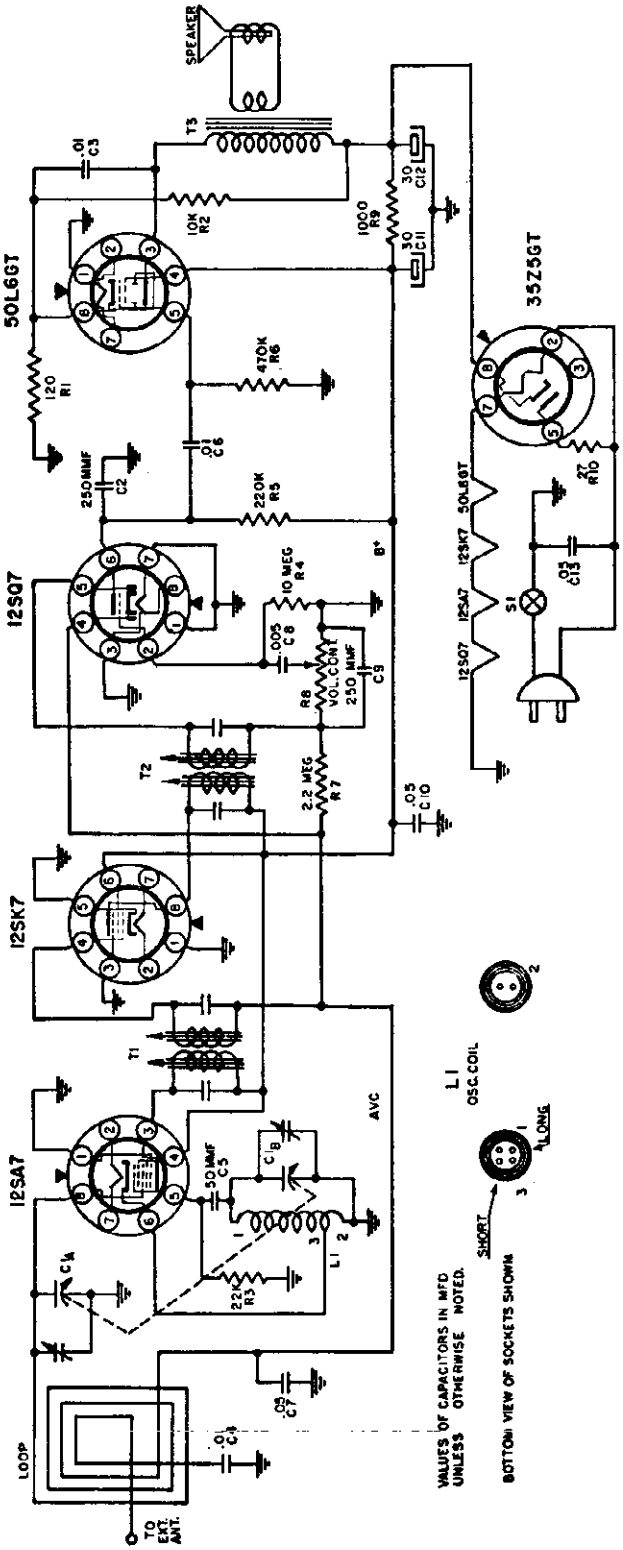
Position of Variable	Generator Frequency	Dummy Ant. Mid.	Generator Connections	Trimmer Adjustment	Trimmer Function
Fully open	455 KC	.1	* 12SA7 Grid (Stator of C1A)	T2	Input I.F.
Fully open	455 KC	.1	* 12SA7 Grid (Stator of C1A)	T3	Output I.F.
Fully open	1725 KC	.00025	* 12SA7 Grid (Stator of C1A)	C1B	Oscillator
Tune in signal from generator	1500 KC	.00025	**Loosely Coupled to Loop	C1A	Antenna

*Connect ground lead of signal generator to Common "B."

**Do not connect ground lead of signal generator.

MODEL 11802

SPIEGEL



PARTS LIST

CODE	PART NO.	DESCRIPTION
C1A, C1B	19-173	Variable Condenser
C2, C9	A15-176	250 MMFD. Mica Condenser
C3, C4, C6	A16-156	.01 MFD. 400 volt Condenser
C5	A15-175	50 MMFD. Mica Condenser
C7, C10	A16-152	.05 MFD. 200 volt Condenser
C8	A16-153	.005 MFD. 600 volt Condenser
C11, C12	B18-283	30 x 30 MFD. 150 volt Dual Electrolytic Condenser
C13	A16-158	.05 MFD. 400 volt Condenser
R1	A60-702	120 Ohm ½ watt Resistor
R2	A60-698	10K Ohm 1 watt Resistor
R3	A60-658	22K Ohm ½ watt Resistor
R4	A60-663	10 Megohm ½ watt Resistor
R5	A60-667	220K Ohm ½ watt Resistor
R6	A60-662	470K Ohm ½ watt Resistor
R7	A60-684	2.2 Megohm ½ watt Resistor
R8	24-157	Volume Control, 1 Megohm
R9	A60-732	1000 Ohm 1 watt Resistor
R10	A60-690	27 Ohm ½ watt Resistor
T1	A10-475	1st I. F. Transformer
T2	A10-479	2nd I. F. Transformer
T3	A80-233	Output Transformer
L1	B10-480	Oscillator Coil
	78-316	4" P.M. Speaker
	67-462	Dial Scale
	48-34	Dial Crystal
	58-37	Dial Pointer
	B82-46	Loop Antenna
	A42-432	Cabinet, Ivory
	C42-430	Cabinet, Walnut
	A52-222	Knob, Ivory
	A52-244	Knob, Maroon
	C83-508	Cabinet Back
	A38-123	Grille, Ivory
	C38-122	Grille, Maroon

117 volts 60 cycle AC or 117 volts DC power supply.

The tubes used are:—

1—12SA7	Oscillator Converter	1—12SQ7	AVC Detector and 1st Audio
1—12SK7	I.F. Amplifier		
1—35Z5GT	Power Rectifier	1—50L6GT	Power Output

This receiver covers the frequency range from 540 kilocycles to 1630 kilocycles (KC).

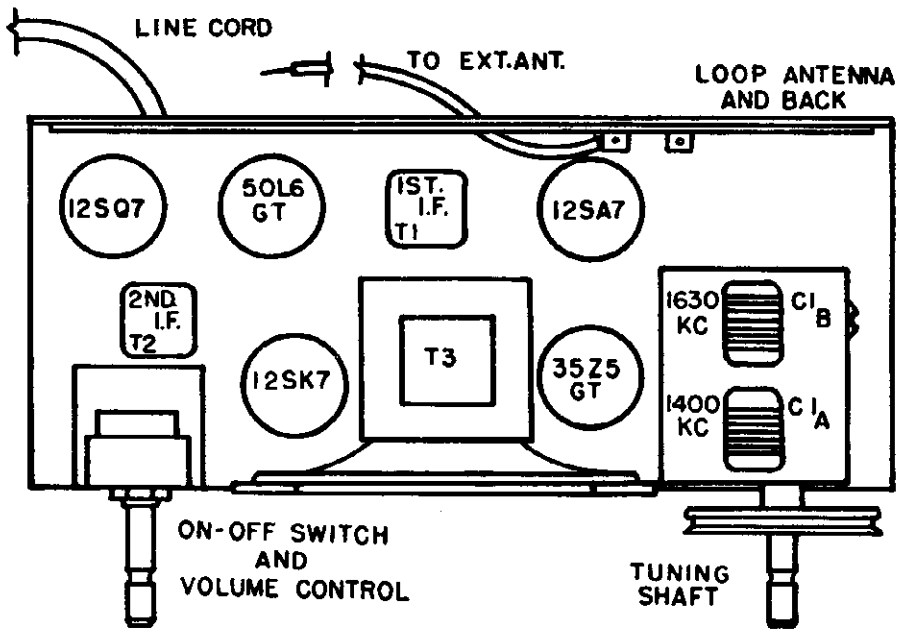
ALIGNMENT PROCEDURE

The following alignment procedure is for use only by competent servicemen having the proper equipment.

The alignment should be made with volume control fully on, and the output from the signal generator as low as possible, to prevent A.V.C. action from interfering with correct alignment.

With the output meter connected across the voice coil of the speaker, the output meter reading for 50 milli-watts is .4 volts using a signal which is modulated 400 c.p.s.

Adjust all trimmers for maximum output. Repeat alignment procedure given below as a final check.



ALIGNMENT PROCEDURE

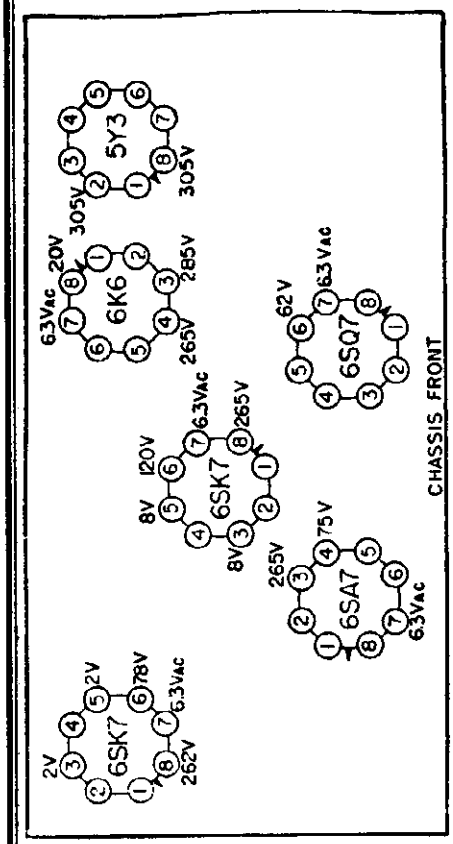
(Continued)

CAUTION: This is an A.C.-D.C. receiver and when aligning the set it is necessary to isolate the Signal Generator or the Receiver from the line by use of a transformer, or place a .2 MFD. condenser in both test leads of the Signal Generator.

Position of Variable	Generator Frequency	Dummy Ant. Mfd.	Generator Connections	Trimmer Adjustment	Trimmer Function
Fully open	455 KC	.1	*12SA7 Grid (Stator of C1A)	T1	Input I.F.
Fully open	455 KC	.1	*12SA7 Grid (Stator of C1A)	T2	Output I.F.
Fully open	1630 KC	.00025	*12SA7 Grid (Stator of C1A)	C1B	Oscillator
Tune in signal from generator	1400 KC	.00025	*Ant. lead from loop	C1A	Antenna

*Connect ground lead of signal generator to chassis.

SPIEGEL



SOCKET VOLTAGES

All voltages are measured with a 1000 ohm per volt meter on the 150 volt scale, with no signal. To obtain an accurate voltage check the A.C. line voltage must be 117 volts. Where no voltage is shown the voltage is O or cannot be read with this type of volt-meter.

Fig. 2 Chassis, Bottom View

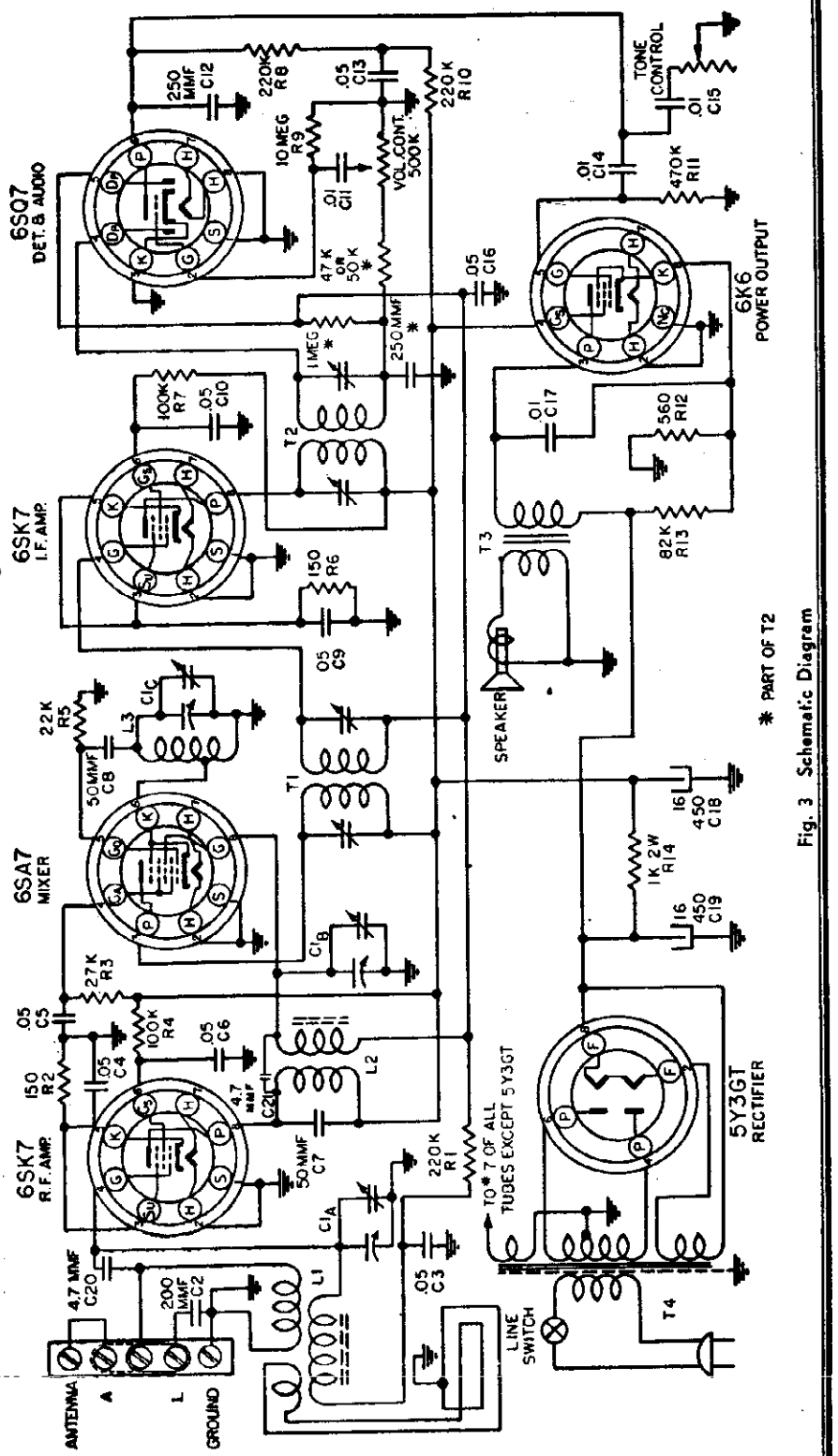


Fig. 3 Schematic Diagram

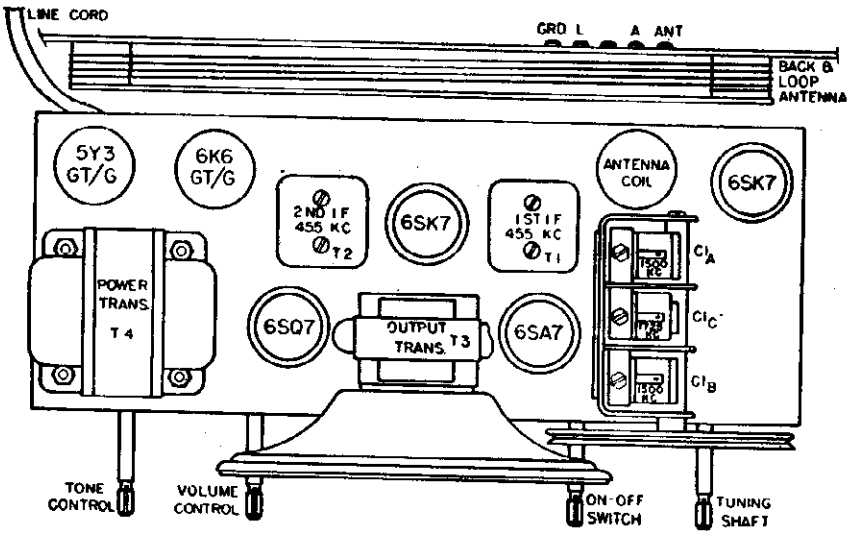


Fig. 1 Chassis, Top View

TUBE COMPLEMENT

The tube complement of this receiver consists of the following:

1—6SK7—R.F. Amplifier
1—6SA7—Mixer—OSC.
1—6SK7—I.F. Amplifier
1—6SQ7—Det. AVC—Audio
1—6K6—Power Output
1—5Y3—Rectifier

ALIGNMENT PROCEDURE

Volume control—Maximum: all adjustments.

Tone Control—Treble: Full Clockwise Rotation.

Connect ground lead of signal generator to radio chassis.

Connect dummy antenna in series with output lead of signal generator.

Connect output meter across voice coil of speaker.

The following equipment is necessary for proper alignment:

Signal generator that will provide the test frequencies as listed.

Output meter.

Non-metallic screwdriver.

Dummy antennas—.1 mfd., 00025 mfd.

Position of Variable	Generator Frequency	Dummy Ant. mfd.	Generator Connections	Trimmer Adjustment	Trimmer Function
Minimum Capacity (Fully Opened)	455 K.C.	.1	6SA7 Grid (Stator of C1B	T1 T2	I. F.
Minimum Capacity (Fully Opened)	1725 K.C.	.00025	*Ant. Terminal on Loop	C1C	Osc.
Tune in signal From Generator	1500 K.C.	.00025	*Ant. Terminal on Loop	C1B	R. F.
Tune in signal From Generator	1500 K.C.	.00025	*Ant. Terminal on Loop	C1A	Ant.

*Be sure coupling link is in correct position for external antenna operation. See illustration below (Fig. 4).

Repeat the above alignment procedure as a final check.

With an output meter connected across the voice coil of the speaker, the output meter reading for ½ watt is 1.25 volts using a signal which is modulated 400 c.p.s.

ANTENNA and GROUND CONNECTIONS

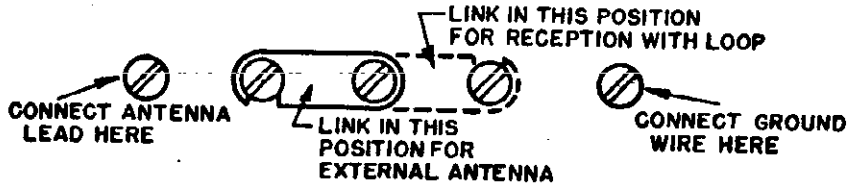


Fig. 4

POWER SUPPLY

This receiver is designed to operate from a power source of 117 volts A.C. 60 cycle current. If in doubt about the power rating in your location consult your local power company for this information. Never attempt to operate this radio on any current other than that specified.

CODE	PART NO.	DESCRIPTION
C1A, C1B	B19-193	Variable condenser
C2	A16-152	.05 MFD 200 volt condenser
C3	A15-175	50 MMFD mica condenser
C9	A16-150	.02 MFD 400 volt condenser
C5, C7	A15-176	250 MMFD mica condenser
C6	A16-156	.01 MFD 400 volt condenser
C8	A16-157	.1 MFD 200 volt condenser
C10	A16-153	.005 MFD 600 volt condenser
C11	A16-154	.2 MFD 400 volt condenser
C12	A16-160	.1 MFD 400 volt condenser
C13, C14	A18-280	40 MFD 150 volt electrolytic condenser
C15	A16-155	.002 MFD 600 volt condenser
R1	A60-659	22K Ohm ½ watt resistor
R2	A60-664	15 Megohm ½ watt resistor
R3, R8	A60-667	220K Ohm ½ watt resistor
R4	A60-684	2.2 Megohm ½ watt resistor
R5	A24-169	500K Ohm volume control
R6	A60-669	4.7 Megohm ½ watt resistor
R7, R9, R13	A60-662	470K Ohm ½ watt resistor
R10	A60-719	Special compensating resistor, order only from Spiegel.
R11	A60-702	120 Ohm ½ watt resistor
R12	A60-720	12K Ohm 2 watt resistor
R14	A60-699	1000 Ohm 2 watt resistor
R15	A60-721	27 Ohm 1 watt resistor
R16	A26-123	Tone control, 2 megohm
T1	B10-411	Oscillator coil
T2	B10-453	1st I.F. transformer
T3	B10-454	2nd I.F. transformer
T4	B80-230	Output transformer
T5	A10-503	Antenna loading coil
	A52-211	Knob, Phono-Radio
	A52-263	Knob, tuning
	A52-265	Knob, volume
	A52-266	Knob, on-off
	A52-264	Knob, tone
	A59-172	Switch, Phono-Radio
	A39-277	Drum for variable condenser
	B79-351	6" P.M. speaker
	A83-391	Selenium rectifier
	A84-41	Tuning shaft and pulley
	A83-308	Connector
	A71-30	Cover, dial plate assembly
	C67-528	Dial scale
	A58-54	Dial pointer
	A83-429	Retainer, dial scale
	B83-290	Dial diffusing plate
	A69-169	On-off switch
	10700	Record Changer

117 volt 60 cycle A.C. power supply.

The tubes used are:—
12SA7—Mixer, Oscillator
12SK7—I. F. Amplifier
12SQ7—Det., AVC, Audio
50L6—Power Output
A83-391—Selenium Rectifier

This receiver covers the frequency range from 535 kilocycles to 1725 kilocycles (K.C.).

PARTS LIST

Code No.	Part No.	Description
C1A,C1B,C1C	B19-186	Variable condenser
C2		200 MMF mica condenser (on Loop)
C3,C4,C9,C16	A16-152	.05 MFD. 200 volt tubular condenser
C5,C6,C10,C13	A16-158	.05 MFD. 400 volt tubular condenser
C7,C8	A16-175	50 MMF mica condenser
C11,C14,C15	A16-156	.01 MFD. 400 volt tubular condenser
C12	A15-176	250 MMF mica condenser
C17	A16-168	.01 MFD 1000 volt tubular condenser
C18	A18-279	16 MFD. 450 volt electrolytic condenser
C19	A18-274	16 MFD. 450 volt electrolytic condenser
C20,C21	A83-355	4.7 MMF condenser
R1,R8,R10	A60-667	220K ohm 1/3 watt resistor
R2,R6	A60-686	150 ohm 1/3 watt resistor
R3	A60-692	27K ohm 1 watt resistor
R4,R7	A60-671	100K ohm ½ watt resistor
R5	A60-659	22K ohm 1/3 watt resistor
R9	A60-663	10 megohm 1/3 watt resistor
R11	A60-662	470K ohm 1/3 watt resistor
R12	A60-701	560 ohm 1 watt resistor
R13	A60-700	82K ohm 1 watt resistor
R14	A60-699	1000 ohm 2 watt resistor
L1	B10-459	Antenna coil
L2	B10-452	R.F. coil
L3	A10-446	Oscillator coil
T1	B10-412	1st I.F. transformer
T2	B10-414	2nd I.F. transformer
T3	A80-222	Output transformer
T4	C80-223	Power transformer
	S84-252	Loop antenna assembly, for Model 108504
	S84-251	Loop antenna assembly, for Model 108014
	B83-325	Baffle, cardboard
	D42-379	Cabinet, bakelite, walnut, for Model 108504
	A42-401	Cabinet, bakelite, ivory, for Model 108014
	C67-535	Dial scale
	A98-4	Grille cloth
	A52-279	Knob, walnut, for Model 108504
	A52-280	Knob, ivory, for Model 108014
	A58-65	Dial Pointer
	A83-292	Dial scale retainer, right
	A83-293	Dial scale retainer, left
	B79-341	6" P.M. speaker

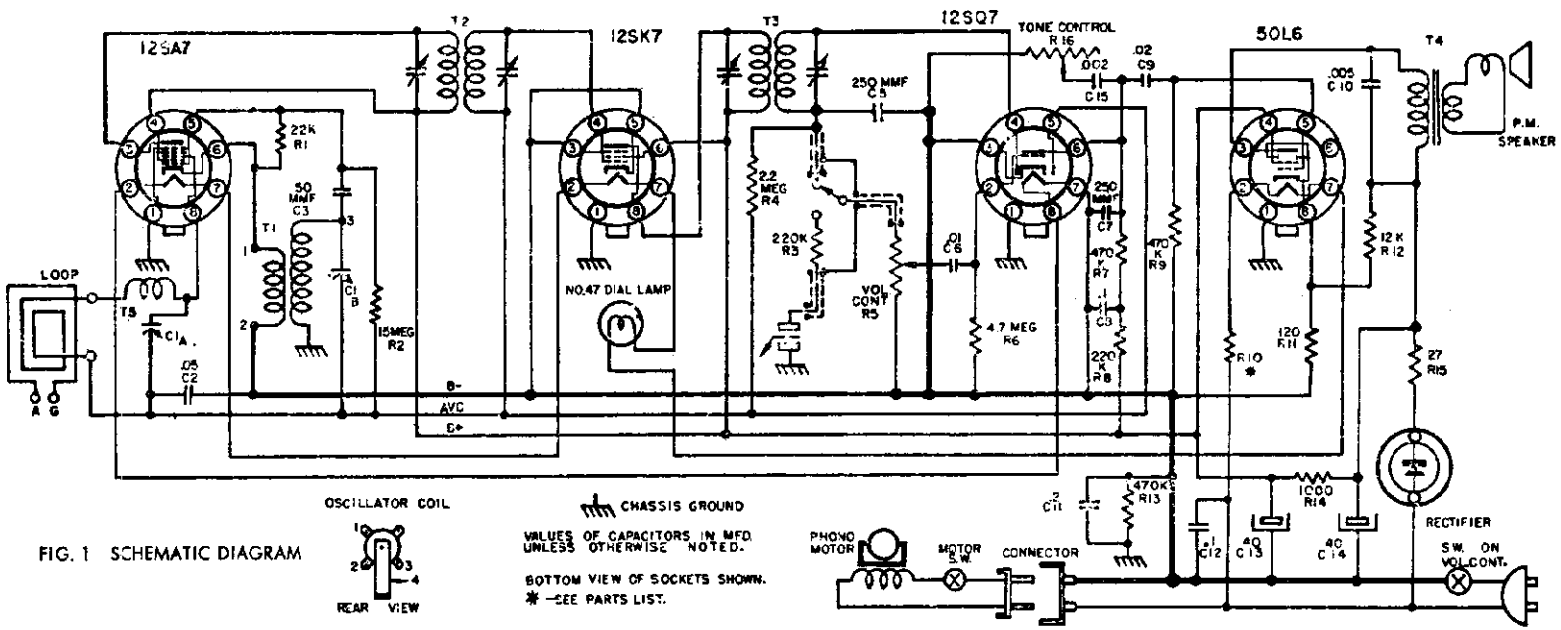


FIG. 1 SCHEMATIC DIAGRAM

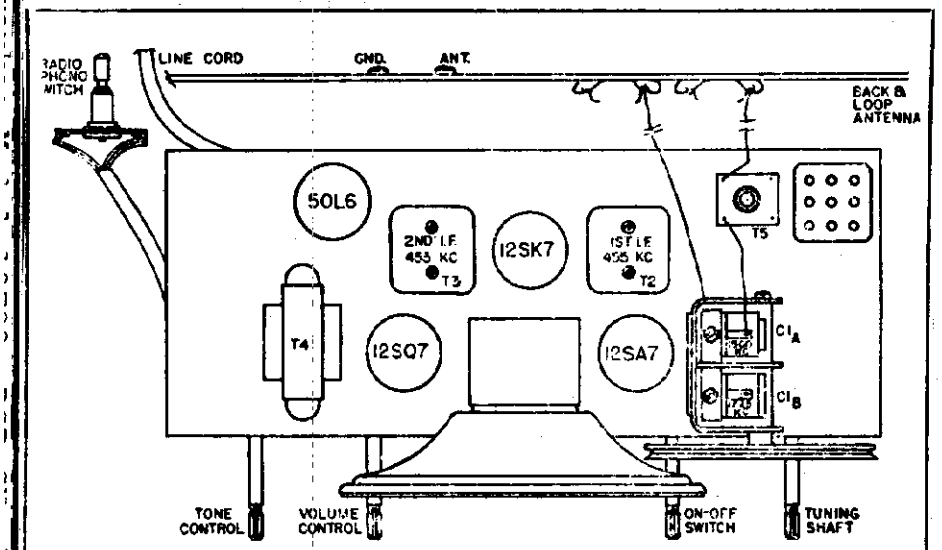


FIG. 2 PICTORIAL DIAGRAM

ALIGNMENT PROCEDURE

The following alignment procedure is for use only by competent servicemen having the proper equipment

The alignment should be made with volume control fully on, and the output from the signal generator as low as possible, to prevent A.V.C. action from interfering with correct alignment.

With the output meter connected across the voice coil of the speaker, the output meter reading for 50 milliwatts is .4 volts using a signal which is modulated 400 c.p.s.

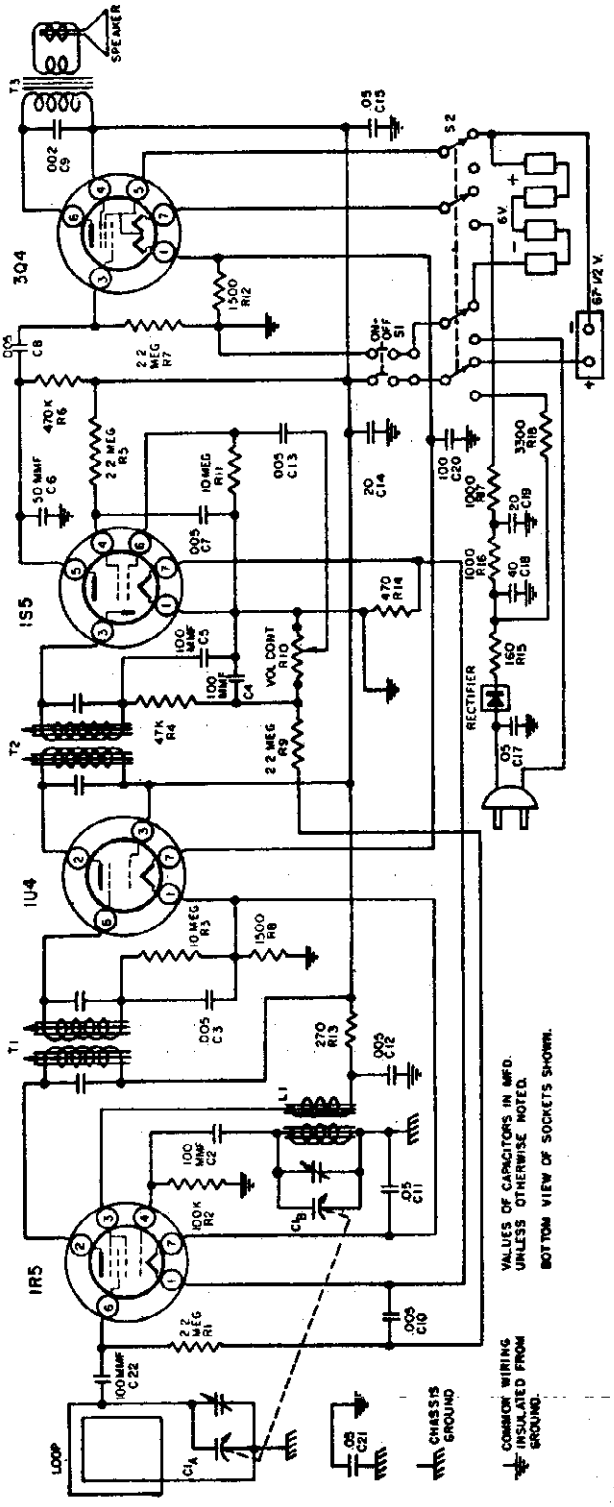
Adjust all trimmers for maximum output. Repeat alignment procedure given below as a final check.

Position of Variable	Generator Frequency	Dummy Ant. Mfd.	Generator Connections	Trimmer Adjustment	Trimmer Function
Fully open	455 KC	.1	* 12SA7 Grid (Stator of C1A)	T2	Input I.F.
Fully open	455 KC	.1	* 12SA7 Grid (Stator of C1A)	T3	Output I.F.
Fully open	1725 KC	.00025	* 12SA7 Grid (Stator of C1A)	C1B	Oscillator
Tune in Signal from generator	1500 KC	.00025	**Loosely Coupled to Loop	C1A	Antenna

*Connect ground lead of signal generator to Common "B."

**Do not connect ground lead of signal generator.

MODEL 114114 SPIEGEL



VOLTAGE CHART

All voltages are measured from minus "B" with a 20,000 ohm per volt meter, volume control at maximum, no signal applied, and the radio operating from a 117 volt AC power supply.

NOTE: Normal tolerance on component values may cause a plus or minus of 10% in voltage readings.

TUBE	Pin Numbers						
	1	2	3	4	5	6	7
1R5	1.6	65	67	—8	1.5	0	2.8
1U4	2.8	65	65	0	2.8	0	4.2
1S5	0	0	0	18	20	0	1.5
3Q4	4.2	64	0	65	5.9	64	6.8

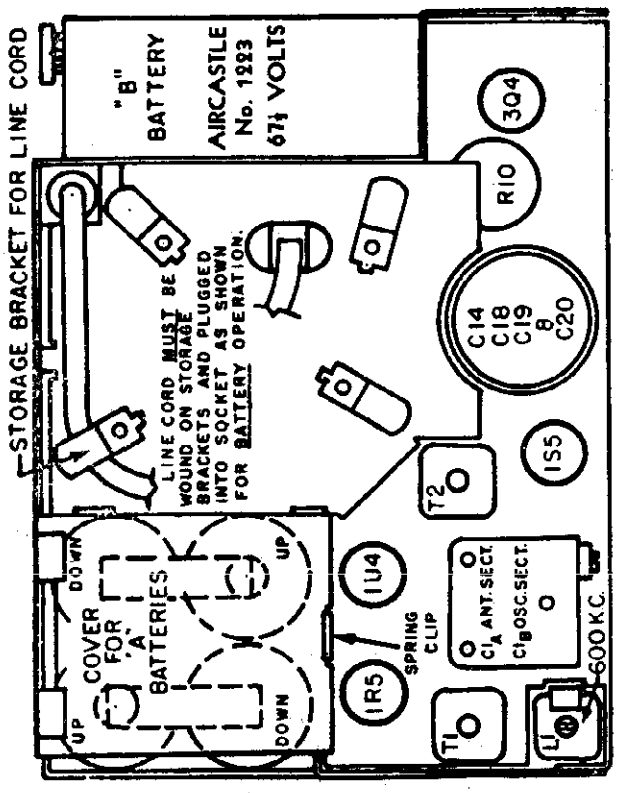


FIG. 2 PICTORIAL DIAGRAM

ALIGNMENT PROCEDURE

Volume control—Maximum: all adjustments.

Connect ground lead of signal generator to common "B."

Connect dummy antenna in series with output lead of signal generator.

Connect output meter across voice coil of speaker.

The following equipment is necessary for proper alignment:

Signal generator that will provide the test frequencies as listed, 30% modulated, 400 c.p.s.

Output meter.

Non-metallic screwdriver.

Dummy antennas— .1 mfd., .00025 mfd.

For alignment points refer to Figure No. 2.

CAUTION: This is an A.C.-D.C. receiver and if alignment is made with the receiver connected to 117 volts A.C. or D.C., it is necessary to isolate the signal generator or the receiver from the line by use of a transformer, or place a .2 M.F.D. condenser in both test leads of the Signal Generator.

Position of Variable	Generator Frequency	Dummy Ant. Mfd.	Generator Connections	Trimmer Adjustment	Trimmer Function
Fully open	455 KC	.1	*1R5 Grid (Stator of C1A)	T2	Output I.F.
Fully open	455 KC	.1	*1R5 Grid (Stator of C1A)	T1	Input I.F.
Fully open	1600 KC	.00025	*1R5 Grid (Stator of C1A)	C1B	Oscillator
Tune in signal from generator	1400 KC	—	Loosely coupled to loop	C1A	Antenna
**Tune in signal from generator	600 KC	—	Loosely coupled to loop	L1	600 KC Padder

*Connect ground lead of signal generator to chassis.

**When making this adjustment the variable should be rocked back and forth.

POWER SUPPLY

This receiver is designed to operate from self contained batteries, or from 105-125 volt AC or DC power supply. One 67½ volt "B" battery Aircastle No. 1223, and four (4) 1½ volt "A" batteries, Aircastle No. 1514, are used for battery operation.

PARTS LIST

Circuit Diagram Reference	Part No.	Description
C2, C4, C5, C22	A15-190	100 MMF Mica condenser
C1A, C1B	B19-190	Variable condenser
C3, C7, C8	A16-181	.005 MFD 150 volt condenser
C10, C12, C13		
C6	A15-191	50 MMF mica condenser
C11, C17, C21	A16-172	.05 MFD 400 volt condenser
C14, C19		
C18	A18-282	20 MFD 150 volt Electrolytic condenser 40 MFD 150 volt Electrolytic condenser 100 MFD 25 volt Electrolytic condenser
C20		
C15	A16-171	.05 MFD 200 volt condenser
C9	A16-182	.002 MFD 200 volt condenser
R1, R5, R7, R9	A60-726	2.2 Megohm ½ watt resistor
R2	A60-727	100K ohm ½ watt resistor
R3, R11	A60-728	10 Megohm ½ watt resistor
R4	A60-730	47K ohm ½ watt resistor
R6	A60-731	470K ohm ½ watt resistor
R8, R12	A60-729	1500 ohm ½ watt resistor
R10	A24-172	Volume control, 1 megohm
R13	A60-723	270 ohm ½ watt resistor
R14	A60-722	470 ohm ½ watt resistor
R15	A60-725	160 ohm 3 watt resistor
R16, R17	A60-713	2000 ohm 10 watt resistor (1000 ohms each section)
R18	A60-724	3300 ohm 1 watt resistor
T1, T2	C10-475	1st and 2nd I.F. Transformer
T3	A80-231	Output transformer
L1	B10-477	Oscillator coil
	S84-112	Cover assembly for "A" batteries
	S84-225	Front cover assembly for case, with loop
	S84-128	Rear cover assembly for case
	S84-111	Hub and Pointer assembly
	B52-218	Knob, On-Off switch
	C52-216	Knob, tuning
	B52-217	Knob, volume control
	A83-561	Selenium Rectifier
	B79-353	Speaker, P.M.
	A69-174	Switch, AC-DC—Battery
	A69-175	Switch, On-Off
	A76-34	Terminal for "B" battery
	B23-156	Line cord
	D21-108	End Cap, for handle
	B83-442	Handle

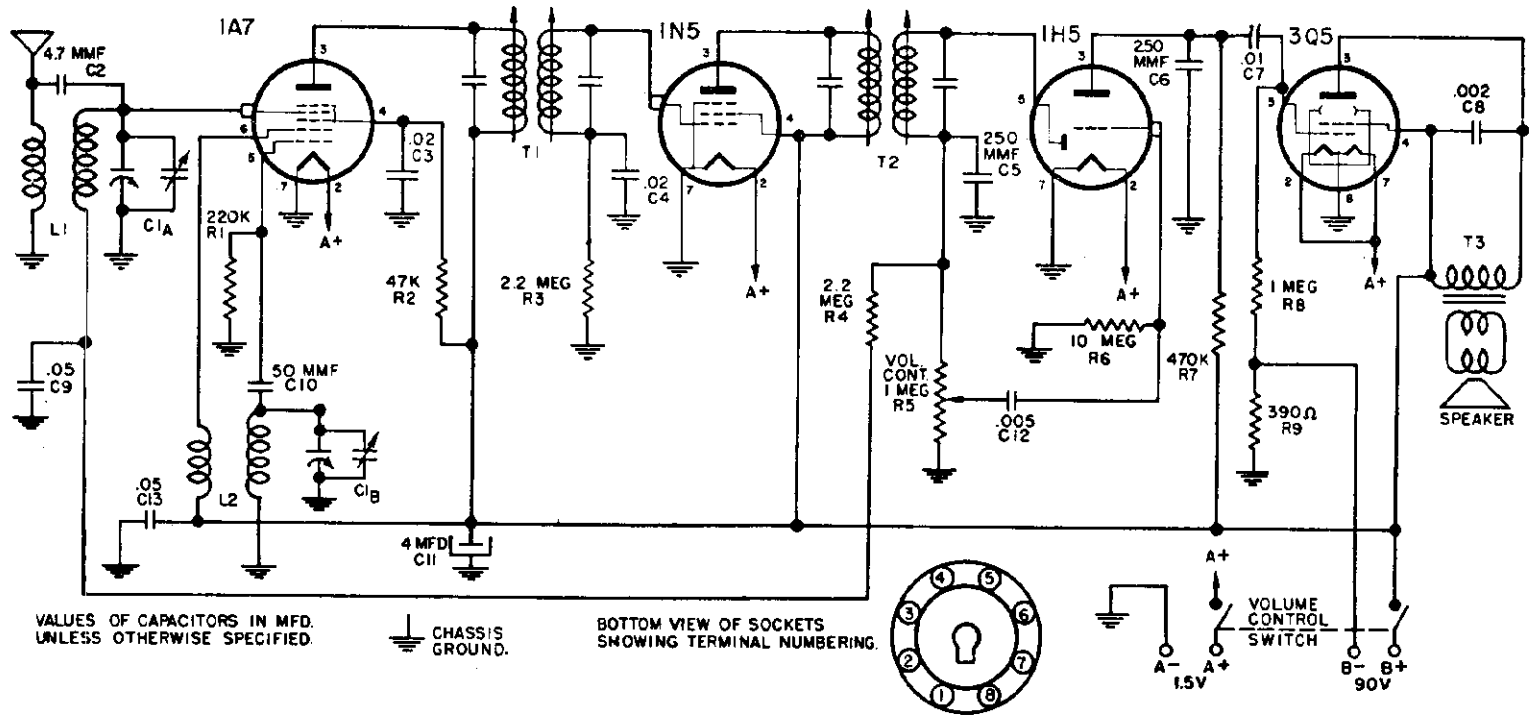


FIG. 1 SCHEMATIC DIAGRAM

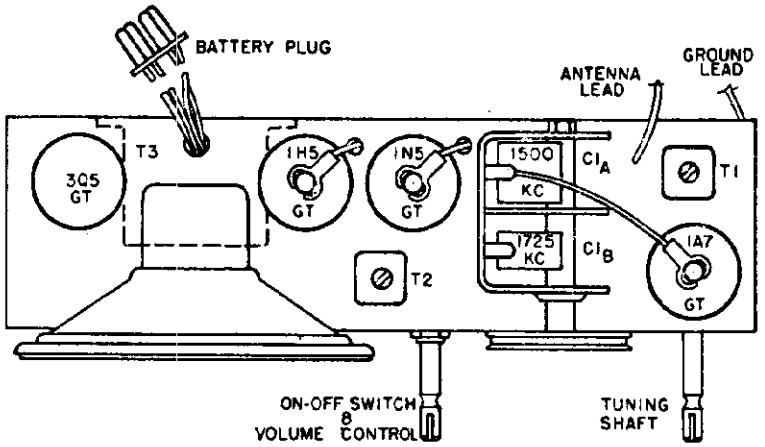


FIG. 2 TUBE AND TRIMMER LOCATIONS

VOLTAGE CHART

All voltages measured with a 1000 ohm per volt meter on the 150 volt scale. For the following voltages the "B" battery section of the power pack should read 90 volts under load, the "A" section 1½ volts.

TUBE	PIN NUMBERS							
	1	2	3	4	5	6	7	8
1A7	0	1.5	85	37	0	85	0	0
1N5	0	1.5	85	85	0	0	0	0
1H5	0	1.5	17	0	0	0	0	0
3Q5	0	1.5	83	85	0	5	1.5	

DESCRIPTION

Your New Aircastle Radio is a 4-Tube Superhetrodyne receiver designed to cover a frequency range of from 540 kilocycles to 1725 kilocycles (K.C.). The tubes used are—

1A7 GT—Osc. Converter
1N5 GT—I. F. Amplifier
1H5 GT—AVC Det. Audio Amplifier
3Q5 GT—Power Output

ALIGNMENT PROCEDURE

Volume control—Maximum: all adjustments.

Connect ground lead of signal generator to chassis.

Connect dummy antenna in series with output lead of signal generator.

Connect output meter across voice coil of speaker.

The following equipment is necessary for proper alignment:
Signal generator that will provide the test frequencies as listed, 30% modulated, 400 c.p.s.
Output meter.
Non-metallic screwdriver.
Dummy antennas— .1 mfd., .00025 mfd.

Position of Variable	Generator Frequency	Dummy Ant. Mfd.	Generator Connections	Trimmer Adjustment	Trimmer Function
Fully open	455 KC	.1	1A7 Grid (Stator of C1A)	T2	Output I.F.
Fully open	455 KC	.1	1A7 Grid (Stator of C1A)	T1	Input I.F.
Fully open	1725 KC	.00025	Antenna Lead	C1B	Oscillator
Tune in signal from generator	1400 KC	.00025	Antenna Lead	C1A	Antenna

INSTALLATION

This receiver has been designed to operate on a self-contained battery containing both the "B" battery (90 Volts) and the "A" battery (1½ Volts) Aircastle No. 1491.

After inserting the battery plug of the receiver into the socket on the battery, the battery may be placed inside the cabinet in the space provided.

Anyone of the following batteries may also be used with this receiver: Eveready No. 748, General No. 60DL-11 L, Burgess No. 17G-D60, Ray-O-Vac No. AB 82.

For best results an outside antenna about 75-100 feet long, including the lead-in, should be used. It should be erected as high as possible and as far away from surrounding objects as practical. When the receiver is used close to powerful broadcasting stations it may be desirable to use a shorter antenna. (For most ordinary instalations use Aircastle House Mast Arial No. 1396.)

To obtain the best possible performance a good ground should be used. This can be a water pipe, or a galvanized pipe driven into the ground. It should be connected to the ground lead (black) of the receiver. Connect the antenna wire to the other lead coming from the receiver.

PARTS LIST

Circuit Diagram Reference	Part No.	Description
C1A,C1B	B19-188	Variable Condenser
C2	A83-355	4.7 MMFD Condenser
C3,C4	A16-150	.02 MFD 400 volt condenser
C5,C6	A15-176	250 MMFD mica condenser
C7	A16-156	.01 MFD 400 volt condenser
C8	A16-155	.002 MFD 600 volt condenser
C9,C13	A16-152	.05 MFD mica condenser
C10	A15-175	50 MMFD mica condenser
C11	A18-273	4 MFD 150 volt electrolytic condenser
C12	A16-153	.005 MFD 600 volt condenser
R1	A60-667	220K ohm ½ watt resistor
R2	A60-685	47K ohm ½ watt resistor
R3,R4	A60-684	2.2 megohm ½ watt resistor
R5	A24-170	Volume control, 1 megohm
R6	A60-663	10 megohn, ½ watt resistor
R7	A60-662	470K ohm ½ watt resistor
R8	A60-668	1 megohm ½ watt resistor
R9	A60-665	390 ohm ½ watt resistor
L1	A10-485	Antenna coil
L2	A10-505	Oscillator coil
T1,T2	A10-506	1st and 2nd I.F. transformer
T3	B80-232	Output transformer
	B79-352	Speaker, 5" P.M.
	A75-60	Tuning Shaft
	A45-118	Battery plug
	B67-515	Dial scale
	58-31	Dial pointer
	48-21	Dial crystal
	D42-437	Cabinet, walnut, wood
	A52-245	Knob, walnut

FREQUENCY MODULATION

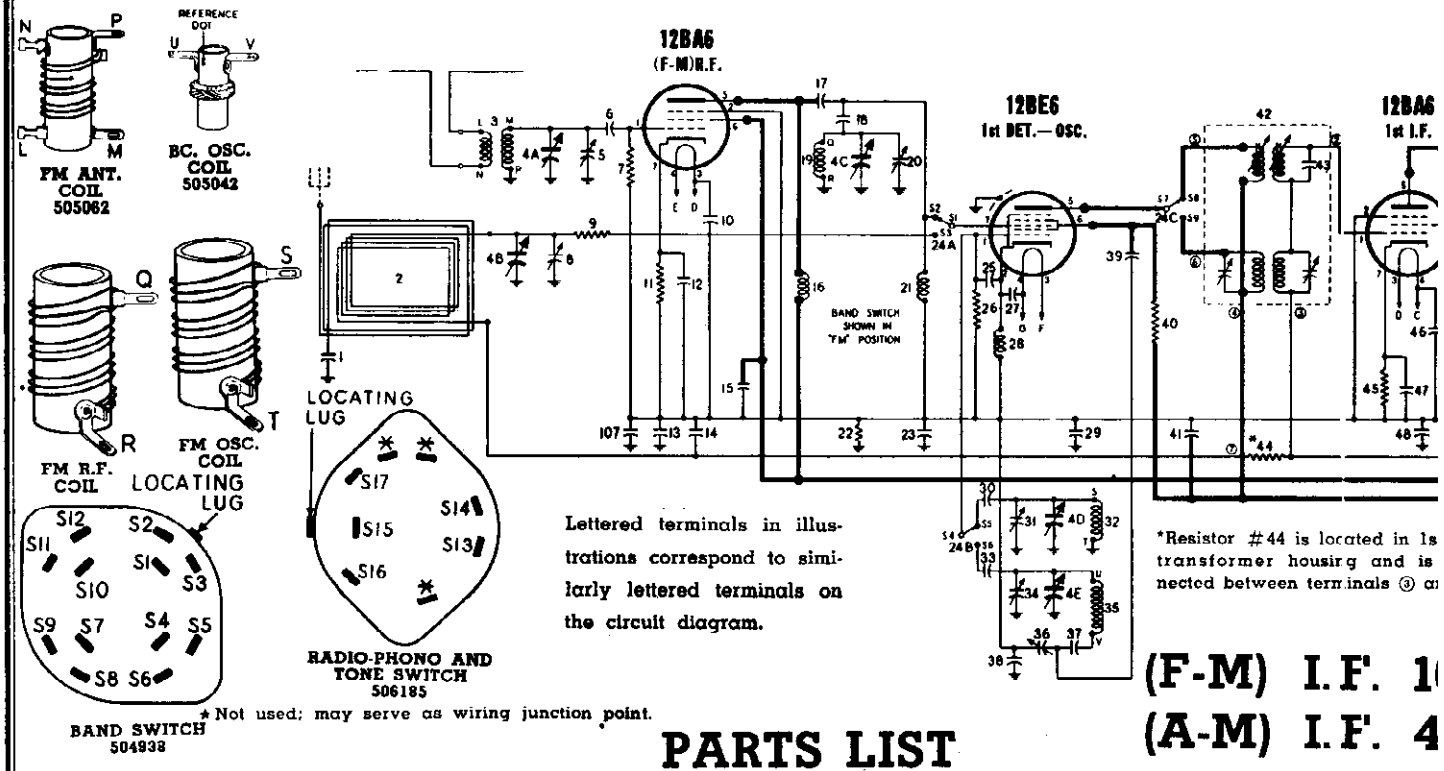
INSTRUMENTS: Alignment of the FM circuits in this receiver may be accomplished with either a conventional AM type signal generator o FM signal generator. The output indicator should be an oscilloscope or a vacuum tube voltmeter.

Although it is preferable to use an FM generator and an oscilloscope, reasonably accurate alignment is obtainable when using a conventi AM generator and a vacuum tube voltmeter providing proper care is exercised in adjusting the discriminator circuit trimmer condenser.

IMPORTANT: If an AM signal generator is used, it should be capable of producing fundamental frequencies of 10.7 and 88 to 108 MC. A using an AM generator which produces signals in the 88 to 108 MC range by using harmonics higher than the second. Generators which dependent upon third, fourth or fifth harmonics for frequencies of 88 to 108 MC will generally produce undesireable spurious beat signals the local oscillator in the receiver and alignment will be exceedingly difficult.

The following procedure is adaptable for use with either an AM or FM generator and oscilloscope or vacuum tube voltmeter merely fo the instructions that are applicable to the instruments that are used.

SIGNAL GENERATOR CONNECTIONS			V-T VOLTMETER OR OSCILLOSCOPE CONNECTIONS		
CONNECT HIGH SIDE OF SIGNAL GENERATOR TO	CONNECT GROUND LEAD OF SIGNAL GENERATOR TO	FREQUENCY & TYPE OF MODULATION	IF A V-T VOLTMETER IS USED, CONNECT IT AS FOLLOWS:	IF AN OSCILLOSCOPE IS USED, CONNECT IT AS FOLLOWS:	BAN SWIT POSIT
Pin ⏤7 of 12BE6 tube; use a .01 MFD. condenser in series with generator lead.	B in vicinity of 12BE6 tube. **CAUTION:** If your signal generator is designed with an AC-DC type power supply, connect ground lead of signal generator to B lug through a .25 Mfd. condenser.	**10.7 MC** AM signal must be 400 cycle modulated or FM signal should preferably be modulated ±300 KC.	Connect common (or ground) terminal of meter to B . D.C. probe lead of meter is then connected to pin ⏤3 of the 12H6 tube.	Connect vertical amplifier "high" lead in series with an 0.1 MFD. condenser to junction of resistor ⏤69 (33,000 ohms) and condenser ⏤70 (.05 MFD.) which are in the discriminator output circuit. Connect scope ground lead to B .	FM Maxim clockw positi
Same as above	Same as above	Same as above	Before connecting V-T voltmeter, it is necessary to connect two 68,000 ohm resistors (resistance of both units must compare within 1%) in series from pin ⏤3 of the 12H6 tube to B . Then connect common (or ground) terminal of V-T voltmeter to the junction of these two resistors. D.C. probe lead of meter is now connected to junction of resistor ⏤69 (33,000 ohms) and condenser ⏤70 (.05 MFD.) which are in the discriminator output circuit.	Same as above	Same as
Recheck the two preceding adjustments to be sure that both trimmers are set as accurately as possible to obain the specified output indication on v					
Same as above	Same as above	Same as above	Connect common (or ground) terminal of meter to B . D.C. probe lead of meter is then connected to Pin ⏤3 of the 12H6 tube.	Same as above	Same as
Same as above	Same as above	Same as above	Same as above	Same as above	Same as
Generator output leads must be connected to the two "External FM Antenna" terminals at back of loop antenna frame. Insert a 120 Ohm resistor in series with each of the generator leads before connecting to receiver antenna terminals.		**98 MC** AM signal may be 400 cycle modulated or FM signal should preferably be modulated ±300 KC.	Same as above	Same as above	Same as
Same as above		Same as above	Same as above	Same as above	Same as
Same as above		Same as above	Same as above	Same as above	Same as
Check calibration and tracking of receiver with input signals of 88 and 108 MC. If necessary, adjust spacing of gang condenser plates.					



Lettered terminals in illustrations correspond to similarly lettered terminals on the circuit diagram.

*Resistor #44 is located in 1s transformer housing and is nected between terminals ③ a

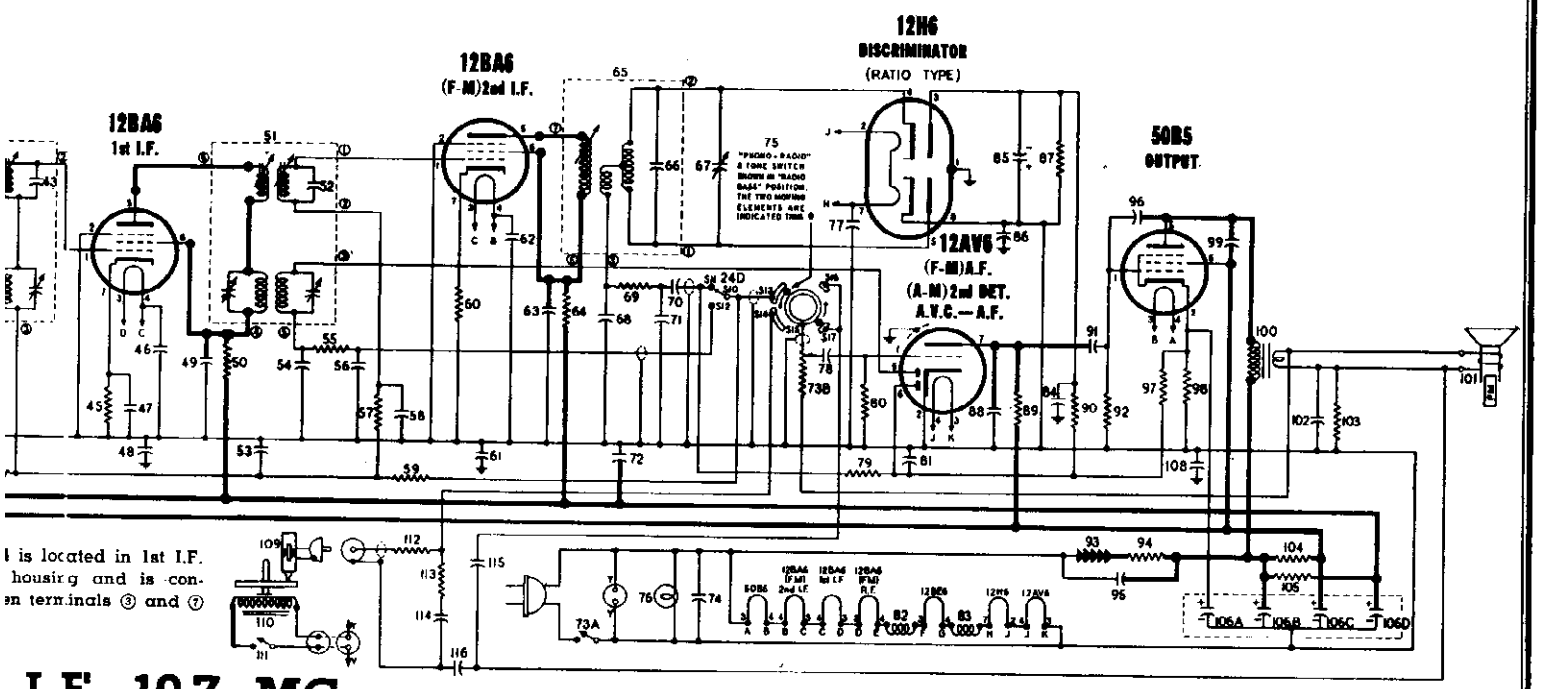
(F-M) I.F. 1
(A-M) I.F. 4

* Not used; may serve as wiring junction point.

PARTS LIST

WARNING: Some parts listed below have special characteristics. Do not use substitutes for replacement purposes.

DIAGRAM NO.	PART NO.	DESCRIPTION
		CONDENSERS
1	504725	Condenser—.02 Mfd. 200 volt
4-A to E	504955	Condenser—variable gang and drum
5	504954	Condenser—trimmer; 3 to 12 Mmfd.
6	504974	Condenser—ceramic 47 Mmfd. 500 volt
8	504069	Condenser—trimmer; 3 to 35 Mmfd.
10	504976	Condenser—ceramic 1500 Mmfd. 150 volt
12	505025	Condenser—ceramic 100 Mmfd. 350 volt
13	505052	Condenser—.002 Mfd. 400 volt
14	505073	Condenser—.05 Mfd. 400 volt
15	504975	Condenser—ceramic 470 Mmfd. 350 volt
17	502295	Condenser—ceramic 10 Mmfd. 500 volt
18	505053	Condenser—ceramic 15 Mmfd. 500 volt
20	504954	Condenser—trimmer; 3 to 12 Mmfd.
23	505073	Condenser—.05 Mfd. 400 volt
25	504730	Condenser—ceramic 3 Mmfd. 500 volt
27	504973	Condenser—ceramic 22 Mmfd. 500 volt
29	505454	Condenser—.05 Mfd. 400 volt (low impedance at 455 Kc.—do not substitute ordinary capacitor)
30	505072	Condenser—ceramic 33 Mmfd. 350 volt
31	504954	Condenser—trimmer; 3 to 12 Mmfd.
33	504974	Condenser—ceramic 47 Mmfd. 500 volt
34	119491	Condenser—trimmer; 10 to 90 Mmfd.
36	505051	Condenser—trimmer; 440 to 660 Mmfd.
37	504979	Condenser—ceramic .01 Mfd. 150 volt
38	504975	Condenser—ceramic 470 Mmfd. 350 volt
39	504979	Condenser—ceramic .01 Mfd. 150 volt
41	504979	Condenser—ceramic .01 Mfd. 150 volt
43	505068	Condenser—ceramic 91 Mmfd. 350 volt ± 5%
46	504976	Condenser—ceramic 1500 Mmfd. 150 volt
47	505028	Condenser—.05 Mfd. 150 volt
48	504979	Condenser—ceramic .01 Mfd. 150 volt
49	505211	Condenser—.08 Mfd. 400 volt
52	505068	Condenser—ceramic 91 Mmfd. 350 volt ± 5%
53	505028	Condenser—.05 Mfd. 150 volt
54	505026	Condenser—ceramic 150 Mmfd. 350 volt
56	505026	Condenser—ceramic 150 Mmfd. 350 volt
58	504978	Condenser—ceramic .005 Mfd. 150 volt
61	504979	Condenser—ceramic .01 Mfd. 150 volt
62	504976	Condenser—ceramic 1500 Mmfd. 150 volt
63	504978	Condenser—ceramic .005 Mfd. 150 volt
66	505074	Condenser—ceramic 43 Mmfd. 350 volt ± 5%
67	504954	Condenser—trimmer; 3 to 12 Mmfd.
68	505025	Condenser—ceramic 100 Mmfd. 350 volt
70	505028	Condenser—.05 Mfd. 150 volt
71	504976	Condenser—ceramic 1500 Mmfd. 150 volt
72	504979	Condenser—ceramic .01 Mfd. 150 volt
74	505083	Condenser—.02 Mfd. 400 volt
77	504976	Condenser—ceramic 1500 Mmfd. 150 volt
78	504977	Condenser—ceramic .002 Mfd. 150 volt
81	505082	Condenser—.02 Mfd. 150 volt
84	505027	Condenser—.01 Mfd. 400 volt
85	504937	Condenser—electrolytic 5 Mfd. 50 volt
86	504979	Condenser—ceramic .01 Mfd. 150 volt
88	505025	Condenser—ceramic 100 Mmfd. 350 volt
91	505028	Condenser—.05 Mfd. 150 volt
95	505073	Condenser—.05 Mfd. 400 volt
96	504973	Condenser—ceramic 22 Mmfd. 500 volt
99	505027	Condenser—.01 Mfd. 400 volt
102	505071	Condenser—.2 Mfd. 400 volt
106-A, B, C, D	504980	Condenser—electrolytic: A—20 Mfd. 25 volt; B—60 Mfd. 150 volt; C—40 Mfd. 150 volt; D—40 Mfd. 150 volt
107	504975	Condenser—ceramic 470 Mmfd. 350 volt
108	504979	Condenser—ceramic .01 Mfd. 150 volt
114	504450	Condenser—.01 Mfd. 150 volt
115	504978	Condenser—ceramic .005 Mfd. 150 volt
116	505071	Condenser—.2 Mfd. 400 volt
		RESISTORS
7	502134	Resistor—carbon 470,000 Ohms ¼ watt
9	504969	Resistor—carbon 33 Ohms ¼ watt
11	502794	Resistor—carbon 68 Ohms ¼ watt
22	502133	Resistor—carbon 220,000 Ohms ¼ watt
26	502130	Resistor—carbon 22,000 Ohms ¼ watt
40	502406	Resistor—carbon 1,500 Ohms ¼ watt
44	502134	Resistor—carbon 470,000 Ohms ¼ watt
45	502794	Resistor—carbon 68 Ohms ¼ watt
50	502287	Resistor—carbon 680 Ohms ¼ watt
55	504710	Resistor—carbon 33,000 Ohms ¼ watt
57	502134	Resistor—carbon 470,000 Ohms ¼ watt
59	502268	Resistor—carbon 1 Meg. ¼ watt
60	504968	Resistor—carbon 10 Ohms ¼ watt
64	502287	Resistor—carbon 680 Ohms ¼ watt
69	504710	Resistor—carbon 33,000 Ohms ¼ watt
73-A, B	504967	Resistor—Volume control 1 Meg (with Switch)
79	502134	Resistor—carbon 470,000 Ohms ¼ watt
80	502136	Resistor—carbon 10 Meg. ¼ watt
87	502408	Resistor—carbon 68,000 Ohms ¼ watt
89, 90	502134	Resistor—carbon 470,000 Ohms ¼ watt
92	502134	Resistor—carbon 470,000 Ohms ¼ watt
94	505023	Resistor—carbon 33 Ohms 1 watt
97	502135	Resistor—carbon 2.2 Meg. ¼ watt
98	504437	Resistor—carbon 150 Ohms ½ watt ± 10%
103	502132	Resistor—carbon 100,000 Ohms ¼ watt
104	504971	Resistor—carbon 2,200 Ohms ½ watt
105	504970	Resistor—carbon 470 Ohms, 2 watt
112	510073	Resistor—carbon 100,000 Ohms ¼ watt
113	502408	Resistor—carbon 68,000 Ohms ¼ watt
		COILS AND TRANSFORMERS
2	505054	Loop Antenna
3	505062	Coil—P.M. antenna
16	505075	Coil—R.F. choke (FM)
19	505060	Coil—FM R.F.
21	505076	Coil—R.F. choke (FM)
28	505076	Coil—R.F. choke (FM)
32	505060	Coil—FM oscill
35	505042	Coil—BC oscilla
42	505066	Transformer—I
51	505067	Transformer—2
65	505391	Transformer—d
82, 83	505392	Coil—R.F. chok
100	506184	Transformer—o
		OTHER ELECTR
24-A, B, C, D	504938	Switch—band
75	506185	Switch—radio,
76	506183	Lamp—dial, 11
93	504972	Rectifier—seleni
101	505342	Speaker—P.M.
109	505100	Crystal cartridg
110	505750	Motor—phono;
	505758	Motor—phono;
111	505759	Switch—phono;
		MISCELLA
	506240	Back for cabin
	504598	Base for tube s
	504981	Base for mounti
	505368	Base for tube s spring
	114955	Clip—retainer c
	112764	Clip—retains I
	117057	Cord—dial driv
	506191	Dial scale
	506235	Drawer record (less hard
	506233	Handle for dra
	505344	Knob—tuning
	505345	Knob—"VOLUM
	505346	Knob—"RADIO-
	506192	Knob—"FM-AM
	506278	Light diffusing
	502690	Pointer
	506234	Rail for drawer
	81145	Retaining ring
	113007	Ring for dial co
	113463	Rubber stop for
	114914	Screw—No. 2 x
	83047	Screw—No. 3 x
	501777	Screw—No. 4 x
	505045	Shaft—tuning
	504599	Shield—tube; h
	505367	Shield—tube; h
	506181	Shield—light
	116690	Socket—octal h
	501182	Socket—phono
	504597	Socket—miniatu
	505654	Socket—phono
	506182	Socket—dial lig
	161384	Spring—dial co
	506277	Trim strip for



l is located in 1st I.F.
housing and is con-
en terminals ③ and ⑦

I.F. 10.7 MC.
I.F. 455 KC.

AUDIO OSCILLATION

The audio system of this receiver utilizes a two stage type of inverse feed-back arrangement and, should it ever be necessary to replace the speaker or output transformer, it is important to maintain a definite phase relationship in the feed-back circuit. If the connections to the output transformer are reversed or if the feed-back connection is made to the wrong side of the output transformer secondary, the system will become regenerative instead of degenerative. Under those conditions audio oscillation may result. If that occurs, oscillation may be prevented by reversing the connections to the secondary of the output transformer.

DESCRIPTION

Coil—FM oscillator	
Coil—BC oscillator	
Transformer—1st I.F.	
Transformer—2nd I.F.	
Transformer—discriminator	
Coil R.F. choke (FM)	
Transformer—output	

OTHER ELECTRICAL PARTS

Switch band	
Switch—radio, phono and tone	
Lamp dial, 115 volt 10 watt	
Rectifier—selenium	
Speaker P.M. dynamic (8 inch)	
Crystal cartridge	
Motor—phono; 115 volt 50 cycle	
Motor—phono; 115 volt 60 cycle	
Switch—phono; "On-Off"	

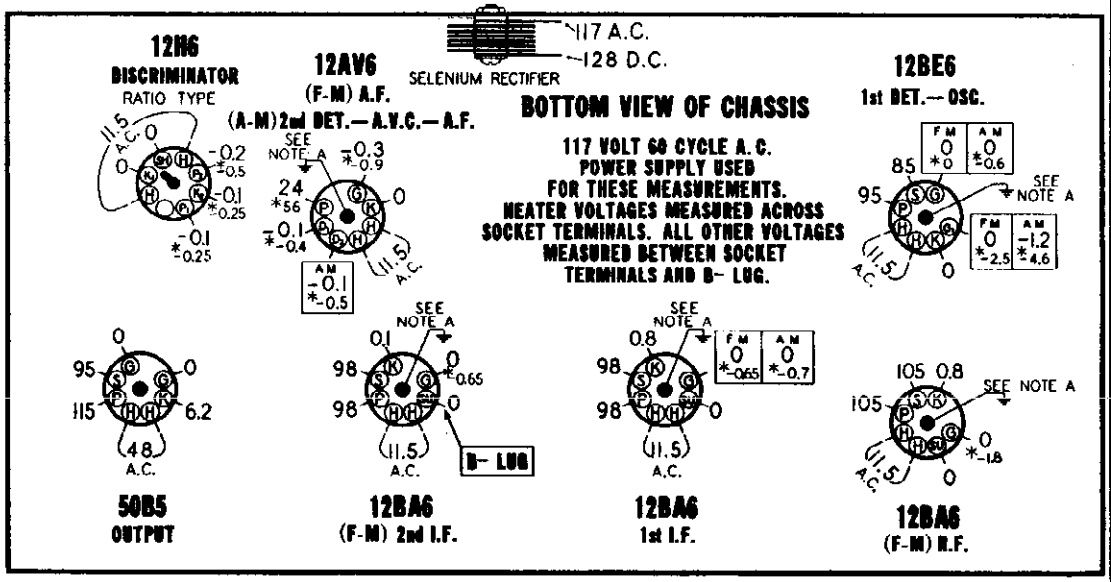
MISCELLANEOUS

Back for cabinet	
Base for tube shield with internal spring	
Base for mounting electrolytic condenser	
Base for tube shield without internal spring	
Clip—retainer on end of dial cord	
Clip—retains light shield	
Cord—dial drive (6 ft. required)	per ft.
Dial scale	
Drawer—record changer compartment (less hardware)	
Handle for drawer	
Knob—tuning	
Knob—"VOLUME"	
Knob—"RADIO-PHONO"	
Knob—"FM-AM"	
Light diffusing strip	
Pointer	
Rail for drawer (supplied in sets)	
Retaining ring for tuning shaft	
Ring for dial cord	
Rubber stop for drawer	
Screw—No. 2 x 3/8"; for mtg. dial scale	
Screw—No. 3 x 7/8"; chassis mtg.	
Screw—No. 4 x 1/2"; for mtg. back	
Shaft—tuning	
Shield—tube; has internal spring	
Shield—tube; has no internal spring	
Shield—light	
Socket—octal base	
Socket—phono motor cable	
Socket—miniature	
Socket—phono pickup cable	
Socket—dial light	
Spring—dial cord tension	
Trim strip for dial	

SOCKET VOLTAGES

Measured with voltmeter having sensitivity of 1000 ohms per volt except where indicated by (*). The (*) symbol designates a vacuum tube voltmeter measurement.

ALL MEASUREMENTS MADE WITH BAND SWITCH IN "FM" POSITION UNLESS OTHERWISE INDICATED
DIAL TUNED TO 108MC. FOR "FM" MEASUREMENTS
DIAL TUNED TO 540KC. FOR "AM" MEASUREMENTS
VOLUME CONTROL SET TO MINIMUM WITH NO SIGNAL
"PHONO-RADIO" AND TONE SWITCH SET "RADIO-BASS" POSITION

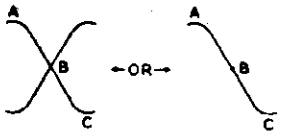


REAR OF CHASSIS

NOTE A: Grounding of center stud on tube socket is necessary to reduce capacity coupling between other pins. Oscillation may result if this ground is omitted.

— "FM" — ALIGNMENT PROCEDURE

1. If alignment of both AM and FM channels is required it is necessary to align the AM channel first, then align the FM channel as instructed in the following chart (AM alignment procedure is given on page 7).
2. During alignment of this receiver, it will be necessary to set the dial pointer to 98 MC. In order to avoid replacing the chassis in the cabinet, it will be found convenient to mark this frequency point on the dial background before starting the alignment.
3. Do not attempt to reposition pointer by releasing it from clip on dial cord as this is done only during AM alignment.
4. Disconnect leads from built-in FM antenna (do not disturb connections to built-in AM loop antenna); also disconnect phono-plugs and speaker.
5. Remove chassis and AM loop antenna from cabinet. Reconnect speaker.
6. Set "PHONO-RADIO" and Tone switch to "Radio-Bass" position (extreme counter-clockwise).
7. Set the receiver volume control to the maximum volume position.
8. Dress FM circuit leads as short and straight as possible, particularly those in the oscillator circuit. I.F. plate and grid leads should also be kept short and straight.
9. Alignment of receiver circuits may now be accomplished by using the procedure in the chart below.

RECEIVER			TYPE OF ADJUSTMENT AND OUTPUT INDICATION	
DIAL SETTING	TRIMMER OR SLUG NUMBER	TRIMMER DESCRIPTION	ADJUSTMENT AND OUTPUT INDICATION WHEN USING A V-T VOLTMETER	ADJUSTMENT AND OUTPUT INDICATION WHEN USING AN OSCILLOSCOPE
Any position where it does not affect the signal.	8	Discriminator Primary	Set meter to a low D.C. voltage range and adjust trimmer ⌭8 for maximum meter reading. (This voltage will be negative.)	Set vertical amplifier of scope for maximum amplification. Where FM signal generator provides an output voltage for synchronization, connect this voltage to "sync" terminals of the scope. Then adjust setting of trimmer ⌭9, before attempting to adjust trimmer ⌭8, until a pattern similar to the following appears on the screen. Should the pattern fail to appear on screen or be of insufficient amplitude, adjust trimmers ⌭10, 11, 12 and 13 for maximum sound output from speaker. Then readjust trimmer ⌭9 for approximately correct pattern and trimmer ⌭8 for maximum amplitude and steepness of that portion of the curve between "A" and "C". If pattern does not remain stationary operate sweep frequency control on scope and also "sync" control until desired result is obtained.  This double "S" curve pattern results when 'scope uses properly phased "Sawtooth" horizontal deflection voltage whose frequency is twice the modulation frequency of signal generator. This single "S" curve pattern results when 'scope uses properly phased "sine wave" horizontal deflection voltage.
Same as above	9	Discriminator Secondary Use an insulated phasing tool to adjust this trimmer.	Set meter for operation on its lowest D.C. voltage range. Note that as trimmer ⌭9 is rotated a point will be found where voltmeter will swing rather sharply from a positive to a negative reading or vice versa. Correct setting of trimmer ⌭9 is obtained when meter reads zero as trimmer is moved through this point. The adjustment is somewhat critical and considerable care must be exercised to set the trimmer for a zero meter indication.	With the 'scope set up as described above, adjust trimmer ⌭9 until the cross-over point "B" is centrally located in both the horizontal and vertical directions; in addition, the portion of the curve between "A" and "C" should be as linear (straight) as possible.
uum tube voltmeter or oscilloscope. Then disconnect and remove the two 68,000 ohm resistors that were used for the vacuum tube voltmeter connection in the 2nd step.				
Same as above	10 and 11	2nd I.F.	Adjust trimmers ⌭10 and ⌭11 for maximum meter reading.	With 'scope set up as described above, adjust trimmers ⌭10 and ⌭11 for maximum amplitude and steepness of that portion of the pattern between "A" and "C".
Same as above	12 and 13	1st I.F.	Adjust trimmers ⌭12 and ⌭13 for maximum meter reading.	Adjust trimmers ⌭12 and ⌭13 for maximum amplitude and steepness of pattern as described above. If the enlarged pattern now indicates a lack of symmetry, readjust trimmer ⌭9 for correct cross-over point.
98 MC	14	Oscillator Trimmer	Set trimmer ⌭14 to receive 98 MC. signal as indicated by maximum meter reading.	Adjust trimmer ⌭14 to obtain the symmetrical pattern shown above. Correct setting of trimmer ⌭14 is obtained when cross-over point in pattern is centrally located.
98 MC	15	R.F. Trimmer	Adjust trimmer ⌭15 for maximum meter reading.	Adjust trimmer ⌭15 for maximum amplitude of pattern.
	12 and 13	1st I.F.	Recheck adjustment of these trimmers for maximum meter reading.	Recheck adjustment of these trimmers for maximum amplitude and symmetry of pattern.
98 MC	16	Antenna Trimmer	Adjust trimmer ⌭16 for maximum meter reading.	Adjust trimmer ⌭16 for maximum amplitude of pattern.

STEWART-WARNER CORP. MODELS B72CR1, 9038B

FREQUENCY RANGES
- **Broadcast** ..... 540-1600 KC
- **FM** ..... 88-108 MC

POWER OUTPUT
- **Undistorted** ..... 1 watt
- **Maximum** ..... 2.5 watts

SPEAKER ..... 8" PM Dynamic

INTERMEDIATE FREQUENCY ..... FM—10.7 MC; AM—455 KC

CIRCUIT DESCRIPTION

This receiver operates on 60 cycle Alternating Current (A.C.) at 105 to 125 volts. Rectified B+ voltage is obtained by using a miniature selenium type rectifier which is noted for reliability and long life.

The built-in antenna used for AM reception is a high impedance loop that is mounted at the rear of the chassis. Two 18" lengths of wire, arranged to form a dipole, serve as the built-in FM antenna.

Tuning of the radio frequency circuits of the receiver is accomplished by a 5 section gang condenser. Two sections are used to tune the AM antenna and oscillator circuits, and three sections are used to tune the FM antenna, R.F., and oscillator circuits.

An R.F. amplifier stage is utilized to give maximum sensitivity and selectivity as well as high image rejection on FM reception. Although this stage is switched out of the circuit on AM reception, overall receiver sensitivity is adequate for highly satisfactory reception where station signals are of moderate strength.

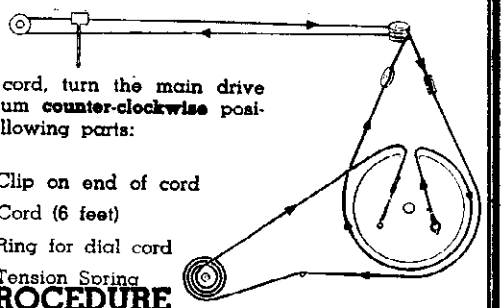
Both transformer coupled I.F. stages are used for FM and one stage is used for AM. The first and second I.F. transformers have two sets of windings; one set is tuned to 455 KC for AM operation and the other is tuned to 10.7 MC for FM operation. Switching of the windings, to alleviate undesired beat frequencies, is necessary only in the first I.F. transformer.

Detection of amplitude modulated 455 KC signals is accomplished by the 12AV6 diode rectification circuit.

Frequency modulation detection is accomplished by an entirely new circuit that is known as the "RATIO DISCRIMINATOR." This FM detector circuit has the unusual ability to reject noise or other brief variations in amplitude of the signal. The relative insensitivity of the Ratio Discriminator to signal amplitude variation makes it possible to eliminate the use of a "limiter" stage that usually precedes the discriminator in other types of FM detector systems. It will therefore be noted that this receiver utilizes a normal I.F. amplifier stage instead of a low gain limiter stage preceding the FM discriminator.

Audio frequency output from both AM and FM detectors is amplified through the triode section of the 12AV6. The audio power amplifier stage incorporates a 50B5 tube which is coupled to a permanent magnet dynamic speaker. A special inverse feedback arrangement is used which reduces distortion and contributes to exceptionally good tone quality.

DIAL AND POINTER DRIVE CORD ARRANGEMENT



To string dial cord, turn the main drive drum to maximum **counter-clockwise** position and use following parts:

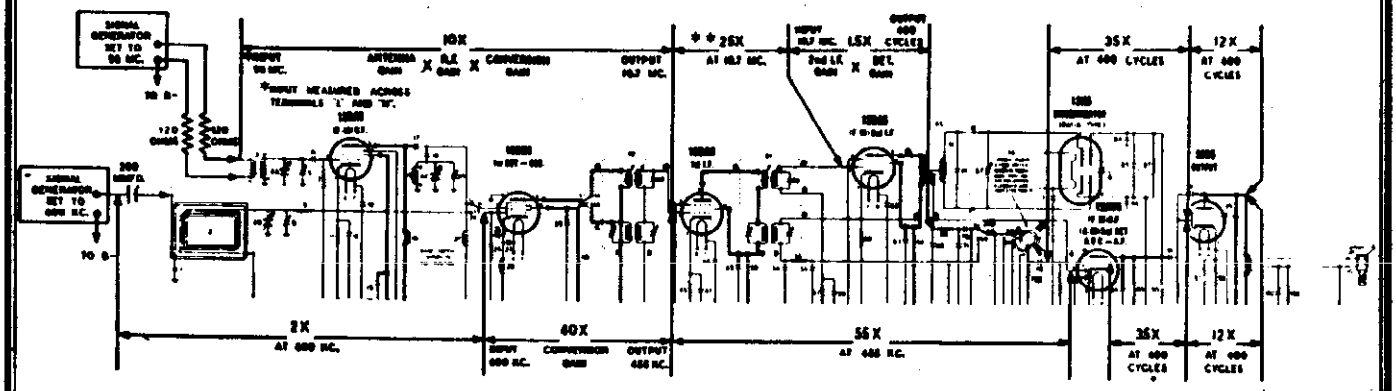
114955—Clip on end of cord
117057—Cord (6 feet)
119087—Ring for dial cord
161384—Tension Spring

STAGE GAIN MEASUREMENT PROCEDURE

REQUIRED INSTRUMENTS: The amount of amplification or "gain" of each of the stages of this receiver should be measured with an A. C. Vacuum Tube Voltmeter of the high frequency type (uniform response up to 100 MC). A conventional "AM" type signal generator may be used but it must be capable of producing **fundamental** frequencies of 600 KC. and 98 MC—**avoid using a generator that produces the 98 MC. signal by means of harmonics.**

PROCEDURE: It is exceedingly important to adhere to the procedure outlined below since the accuracy of these measurements will be affected to a considerable extent by the failure to establish proper operating conditions.

1. Be sure that R.F., I.F. and Discriminator stages are carefully and accurately aligned by utilizing the alignment procedure given in this manual.
2. Connect Signal Generator as shown below. Note that generator connections differ for "AM" and "FM" measurements.
3. For "AM" measurements, set signal generator to 600 KC. and then carefully tune radio receiver to this signal by using an output meter to indicate peak output. If a local station interferes, set generator to a nearby frequency and re-tune the receiver.
4. For "FM" measurements, set signal generator to 98 MC. and then carefully tune radio receiver to this signal by using a D. C. Vacuum Tube Voltmeter as an output indicator—meter must be connected between pin #3 of 12H6 tube and B—. If a local station interferes, set generator to a nearby frequency and re-tune the receiver.
5. The values of stage gain which are given here were measured with a fixed bias of 1.5 volts on the control grids of all R.F. and I.F. tubes which are connected to the A.V.C. circuit. Therefore, these values are not intended to indicate the full capability of a stage but they will serve as a convenient basis for determining proper operation. In order to duplicate the fixed bias voltage, connect the negative terminal of a 1.5 volt battery to A.V.C. at terminal 7 of the 1st I.F. transformer and connect the positive battery lead to B—.
6. R.F. and I.F. circuits are slightly de-tuned when contact is made with an instrument probe and this action, which is indicated by a change in the output meter reading, may seriously affect the gain measurement. Therefore, it is important to adjust the associated circuit trimmer for a maximum output meter reading and to set the input signal level to a convenient reference point on the gain measuring instrument while the probe is making contact. After removing the probe it is again necessary to adjust the trimmer so as to obtain the same output meter reading and thereby assure that the signal voltage at the specified point has not changed as a result of circuit de-tuning.



** When measuring the gain of this stage with a vacuum tube voltmeter the input signal level for minimum meter indication may cause overloading. Under those conditions the measured gain will be found to be approximately 14X.

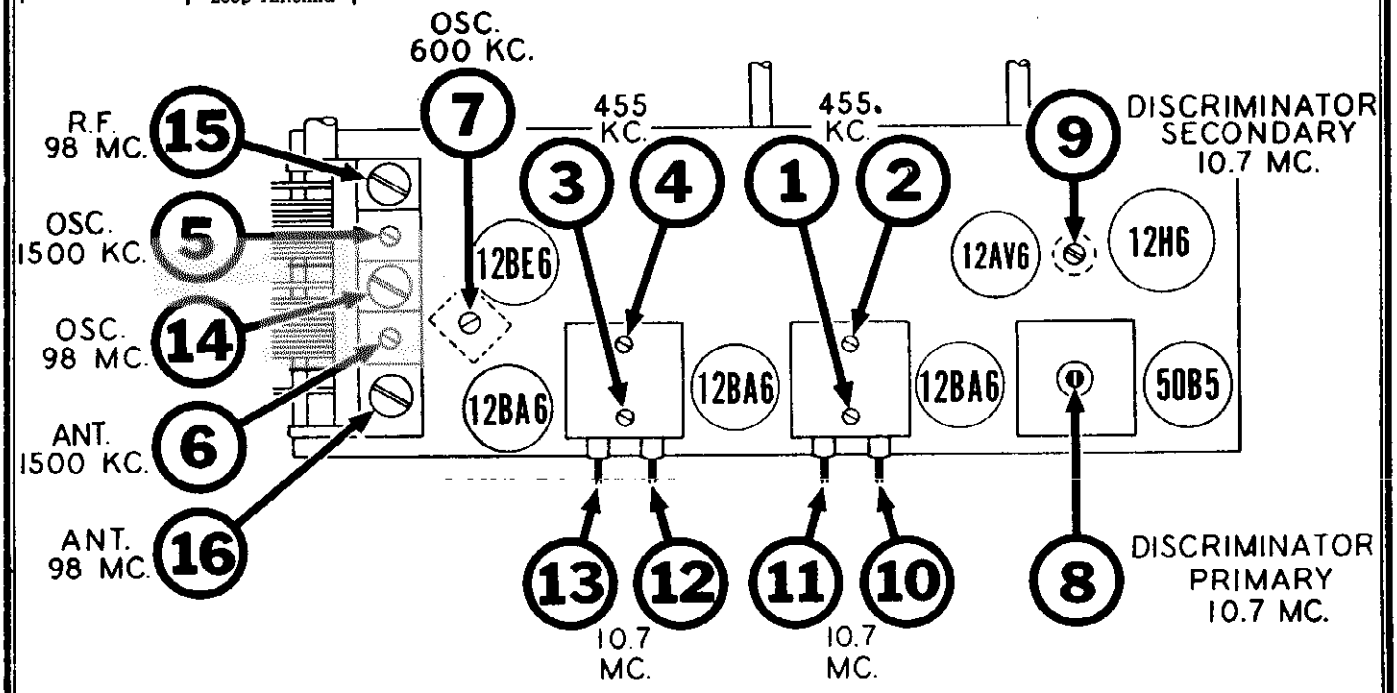
DIFFERENCES in tube characteristics, tolerance of parts, adjustment of tuned circuits and variations in line voltage will influence stage gain. These factors should be given due attention in event the gain of a stage varies extensively from the values shown above.

MODELS B72CR1, 9038B STEWART-WARNER CORP.

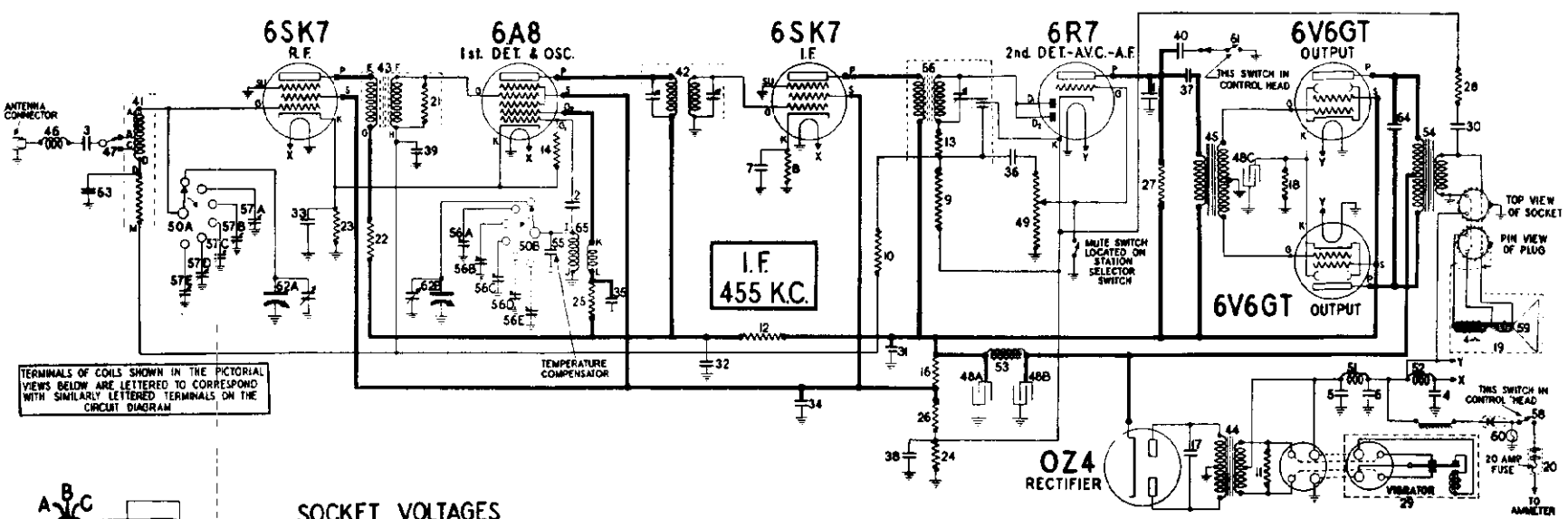
BROADCAST BAND — "AM" — ALIGNMENT PROCEDURE

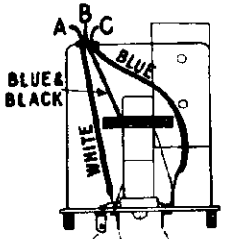
1. With the gang fully meshed, the dial pointer should be in the position indicated by the last mark below 55 on the dial. If it is set incorrectly, release the pointer clip on the dial cord and reposition pointer.
2. During the alignment of this receiver, it will be necessary to set the dial pointer to the following frequencies: 1500 Kc., and 600 Kc. In order to avoid replacing the chassis in the cabinet each time a dial setting is required, it will be found more convenient to mark the required frequency points on the dial background before starting the alignment.
3. Disconnect leads from built-in FM antenna (do not disturb connections to built-in AM loop antenna); also disconnect phono plugs and speaker.
4. Remove chassis and AM loop antenna from cabinet. Place loop antenna in same position with respect to the chassis as is maintained when both units are mounted in the cabinet. Reconnect speaker.
5. Connect an output meter across speaker voice coil or from plate of the 50B5 tube to B through a 0.1 Mfd. condenser (see voltage chart for convenient B— connection).
6. Connect ground lead of signal generator to B— lug.
   CAUTION: If your signal generator is designed with an AC-DC type power supply, connect ground lead of signal generator to B— lug through a .25 Mfd. condenser.
7. Set "PHONO-RADIO" and Tone switch to "Radio-Bass" position (extreme counter-clockwise).
8. Set volume control to the maximum volume position and use a weak signal from the signal generator.
9. If alignment of both AM and FM channels is required, it is necessary to align the AM channel first; then align the FM channel as instructed in the preceding section.

DUMMY ANT. IN SERIES WITH SIGNAL GENERATOR	CONNECT HIGH SIDE OF SIGNAL GENERATOR TO	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RECEIVER DIAL SETTING	TRIMMER NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT
200 MMFD. Mica Condenser	Pin #7 of 12BE6 tube.	455 KC	Broadcast (counter-clockwise)	Any point where it does not affect the signal.	1-2	2nd I.F.	Adjust for maximum output. Then repeat adjustment.
					3-4	1st I.F.	
200 MMFD. Mica Condenser	External Antenna Terminal (AM) on Loop Antenna	1500 KC	Broadcast (counter-clockwise)	1500 KC	5	Broadcast Oscillator	Adjust for maximum output.
200 MMFD. Mica Condenser	External Antenna Terminal (AM) on Loop Antenna	1500 KC	Broadcast (counter-clockwise)	Tune to 1500 KC Generator Signal	6	Broadcast Antenna	Adjust for maximum output.
200 MMFD. Mica Condenser	External Antenna Terminal (AM) on Loop Antenna	600 KC	Broadcast (counter-clockwise)	Tune to 600 KC Generator Signal	7	Broadcast Oscillator (Series Pad)	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.
200 MMFD. Mica Condenser	External Antenna Terminal (AM) on Loop Antenna	Repeat adjustment of trimmers 5 and 6 at 1500 Kc. Then re-check adjustment of trimmer 7 at 600 Kc.					

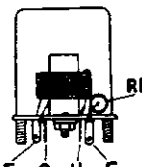


TRIMMER LOCATION CHART





ANTENNA COIL
PART NO. 117276



R.F. COIL
PART NO. 117284

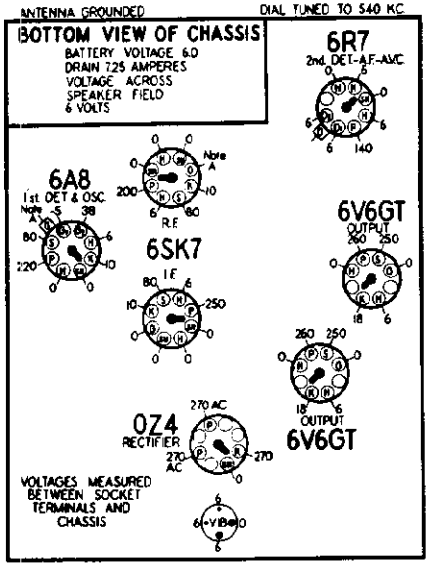
OSCILLATOR COIL
PART NO. 117637

SOCKET VOLTAGES

ANTENNA GROUNDED — DIAL TUNED TO 540 KC

BOTTOM VIEW OF CHASSIS

BATTERY VOLTAGE 6.0
DRAIN 7.25 AMPERES
VOLTAGE ACROSS SPEAKER FIELD 6 VOLTS



Use a voltmeter of at least 1000 ohms per volt.

NOTE A: Due to the high resistance of the A.V.C. circuit, accurate voltage measurements cannot be made at these points.

ELECTRICAL PARTS LIST

Diagram No.	Stewart Warner Part No.	Description
1-2	83539	Condenser—mica 260 mmfd.
3	88205	Condenser—mica 2100 mmfd.
4	88298	Condenser—.25 mfd. 150 volt
5-6-7	113561	Condenser—paper .5 mfd. 150 volt
8	112963	Resistor—insulated 330 ohms ¼ watt
9	112970	Resistor—insulated 330,000 ohms ¼ watt
10	112973	Resistor—insulated 1.5 meg. ¼ watt
11	112976	Resistor—wire wound 220 ohms ½ watt
12	112980	Resistor—insulated 1000 ohms ¼ watt
13	112982	Resistor—insulated 27,000 ohms ¼ watt
14	112987	Resistor—insulated 220,000 ohms ¼ watt
15	112993	Resistor—carbon 470,000 ohms 1/10 watt
16	112998	Resistor—insulated 22,000 ohms 2 watts
17	114277	Condenser—oil filled .01 mfd. 2000 volts
18	114335	Resistor—wire wound 450 ohms 2 watts
19	M-115065	Speaker—dynamic
20	116049	Fuse—20 amp. 25 volt
21	116052	Resistor—carbon 33,000 ohms 1/10 watt
22	116063	Resistor—10,000 ohms ¼ watt
23-24	116072	Resistor—1,000 ohms ¼ watt
25-26	116074	Resistor—22,000 ohms 1 watt
27	116075	Resistor—27,000 ohms 1 watt
28	116082	Resistor—1,500 ohms ¼ watt
29	116202	Vibrator
30-31-32-33-34	116625	Condenser—.1 mfd. 600 volt
35-36	116640	Condenser—.01 mfd. 600 volt
37-38	116706	Condenser—.2 mfd. 600 volt
39	116819	Condenser—.05 mfd. 600 volt
40	116893	Condenser—.02 mfd. 600 volt
41	117276	Coil—antenna (in shield)
42	117281	Transformer—1st I. F.
43	117284	Coil—R. F.
44	117297	Transformer—power
45	117306	Transformer—input
46	117308	Antenna Motor Noise choke coil
47	117313	Switch—antenna
48A to 48C	117314	Condenser—multiple electrolytic: Section A—10 mfd. 450 volt; Section B—10 mfd. 450 volt; Section C—10 mfd. 35 volt
49	117321	Volume control—1 meg. without switch.
50A-50B	117331	Switch for station selector
51-52	117332	Choke coil in "A" line
53	117334	Choke—filter
54	117339	Transformer—output
55	117341	Condenser (temperature compensating)
56A to 56E	117345	Push button trimmer 5 sec. for oscillator
57A to 57E	117346	Push button trimmer 5 sec. for antenna
58	117402	Switch—"on"—"off"
59	M-117487	Cone and voice coil assembly for M-115065 speaker
60	117499	Dial lamp—6 to 8 volt mazda 55
61	117501	Switch for tone control
62A-62B	117547	Condenser—variable gang
63-64	117571	Condenser—.008 mfd. 600 volt
65	117637	Coil—oscillator
66	117638	Transformer—2nd I. F.

MODELS R-3271,R-3271C STEWART-WARNER CORP.

ALIGNMENT PROCEDURE

1. Remove the top cover and connect output meter. If the meter has a 2 volt scale or less, connect from chassis to the lug with the white wire on the back of the speaker socket. If a less sensitive meter is used, it should be connected in series with a .1 mfd. condenser across the plates of the 6V6GT output tubes.

2. The volume control should be turned to maximum and the bottom of the receiver must be in place during alignment.

3. DIAL CALIBRATION: Before connecting the tuning cable, close the gang condenser (fully meshed). Turn the tuning knob on the control head clockwise until you reach appreciable resistance, then turn the knob counter-clockwise one whole turn. Now connect the tuning control cable as well as all other cables to the chassis and place the control head in a position where it will not be necessary to move it until the alignment procedure is completed. Turn the tuning knob clockwise as far as possible. At this time the last dial division below 55 should be in line with the center of the tuning shaft. If it is not, the dial may easily be moved to the correct position. IMPORTANT. Do not move the control head or radio again until the alignment is complete as this has a tendency to shift the dial position with respect to the tuning condenser position and the setting of the dial will no longer be correct.

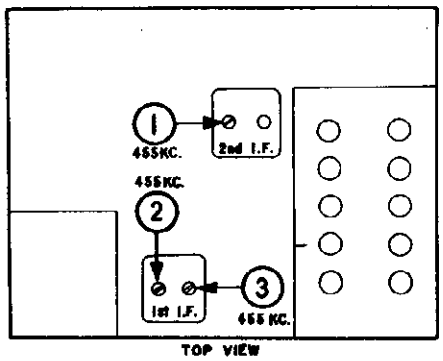
4. The station selector push button should be pushed until a position is reached where the set can be tuned manually with the tuning knob.

5. Remove the small chrome button on side of receiver case and turn the antenna switch so that the slot points toward the WHITE dot on the receiver case. This is the position for the cowl type antenna.

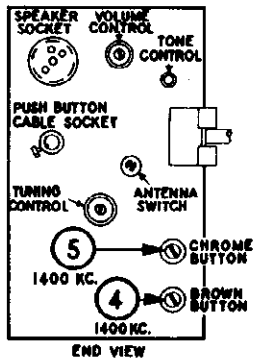
Dummy Ant. in Series With Sig. Gen.	Connection of Sig. Generator Output to Receiver	Signal Generator Frequency	Receiver Dial Setting	Trimmer Number	Trimmer Description	Type of Adjustment
.1 MFD. CONDENSER	Control Grid of 6A8 Tube (do not remove grid cap)	455 KC	Any Point Where It Does Not Affect Signal	1	2nd I.F.	Adjust for maximum output, then repeat.
				2-3	1st I.F.	
*60 MMFD. MICA CONDENSER	Clip to Lug on Back of Antenna Socket	1400 KC	Exactly 1400 KC	4	Oscillator Shunt	Adjust for maximum output.
				5	Antenna Shunt	

After the set has been installed, the antenna switch under the small chrome button should be turned so that the slot points toward the red dot if an under car antenna is used, or to the white dot for a cowl antenna. Then tune in a weak signal at about 1360 to 1450 KC. and adjust the antenna shunt condenser, No. 5 (under the large chrome button) until maximum volume is obtained.

*If you do not have a 60 mmfd. mica condenser available, use a 250 mmfd. and turn antenna switch described in No. 5 to the red dot.



TOP VIEW



END VIEW

PARTS LIST

Stewart-Warner Part Number — *Description*

IGNITION NOISE SUPPRESSION PARTS

117251—Distributor Suppressor (screw type) 5000 ohms
117301—Condenser—1 mfd. 200 volt (generator)
117302—Condenser—.5 mfd. 200 volt (ignition)

CONTROL HEAD PARTS

117462—"A" cable & socket (from control head to set; 16 inch)
117494—Ammeter cable with bayonet tip
117496—Ammeter cable with fuse housing
117493—Cable for tone control
111658—Clip—for dial drum retainer
114851—Clip—hairpin type; on control shafts
117451—Clutch spring—for tuning dial drum
116948—Cord—dial drive (supplied in 6 ft. lengths)
117486—Dial drive drum (less scale)
117499—Dial lamp 6 to 8 volt (Mazda 55)
117503—Dial scale & disc assembly (less drive drum)
117468—Flexible drive shaft & housing (tuning)
117473—Flexible drive shaft & housing (volume)
83319—Fuse insulator tube
117256—Gland nut
117257—Gland nut cover
117255—Knob—metal for tuning or volume
117453—Light shield- felt pad on push button shaft
117465—Pawl assembly for station indicator dial drum
117492—Pilot light socket assembly
117480—Push button control cable housing
117482—Push button control cable with tip

PARTS LIST (Continued)

Stewart-Warner Part Number — *Description*

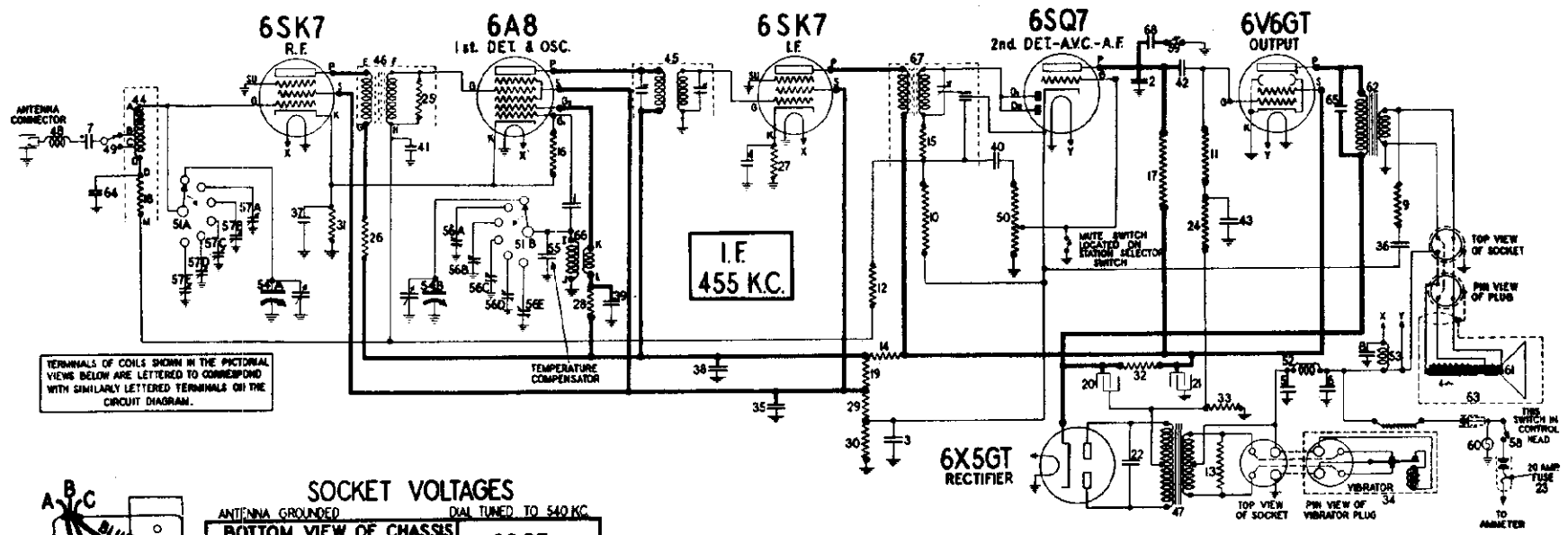
117397—Push button (station selector)
117416—Push button (tone)
85827—Set screw—8-32 square head
117258—Spacer—on control shaft
113177—Spring—dial cord tension
117497—Spring—tension
117498—Spring—tension
117464—Station indicator dial assembly
117402—Switch—"on"-"off"
117417—Trip—for "on"-"off" switch
111456—Washer—spring washer

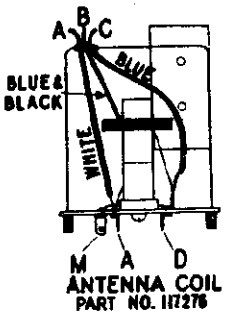
CASE SECTIONS AND SPEAKER SHELL

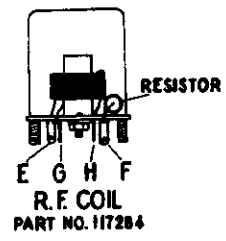
110236—Anti Rattle Clips for case
117320—Bottom cover for case
117330—Case for speaker (less back cover)
117342—Cover for back of speaker
117344—Grill cloth for speaker
117329—Grill screen for speaker shell
117435 Plug button (brown finish)
110413—Plug button—chrome plate
117436—Plug button (nickel plated)
117438—Receiver case—wrap around section only
117443—Top cover & monogram

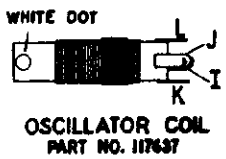
MISCELLANEOUS PARTS

117377—"A" cable (bayonet tip)
117434—Antenna lead & socket
117548—Brass & fibre gear assembly—condenser drive
117328—Cable for speaker
117254—Call letter tabs
114253—Clamp—for vibrator
112745—Clip—coil mounting
110189—Coupling for drive shaft
79106—Lockwasher for mounting set to bulkhead
79105—Lockwasher for mounting speaker
12387—Nut—5/16 Hex. for mtg. speaker
79107—Nut for mounting set to bulkhead
64459—Nut for retaining "A" cable to ammeter terminal
85040—Screw—No. 6 Hex. Hd.
117347—Socket—for speaker plug
116690—Socket (octal base) (small)
117253—Stud—for speaker mounting
117252—"T" bolt—for mounting case
110237 Tube shield cap (for metal tube)
88262—Vibrator socket (4 prong)
45233—Washer for mounting speaker
77477—Washer for mounting set to bulkhead
117549—Worm gear with set screw—condenser drive



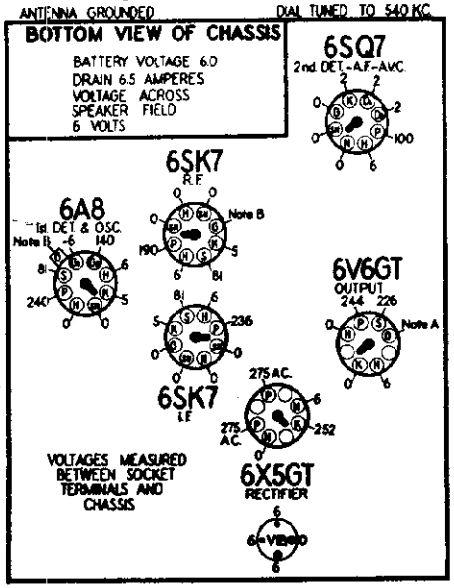






SOCKET VOLTAGES

ANTENNA GROUNDED — DIAL TUNED TO 540 KC.



Use a voltmeter of at least 1000 ohms per volt.

NOTE A—The voltage appearing at this point is measured across resistor number 33 and is -14.5 volts.

NOTE B—Due to the high resistance of the A.V.C. circuit, accurate voltage measurements cannot be made at these points.

ELECTRICAL PARTS LIST

Diagram No.	Stewart Warner Part No.	Description
1-2	83539	Condenser—mica 260 mmfd.
3	83784	Condenser—mica, 110 mmf.
4-5-6	113561	Condenser—paper .5 mfd. 150 volt.
7	88205	Condenser—mica 2100 mmfd.
8	88298	Condenser—.25 mfd. 150 volt (low loss).
9	112964	Resistor—insulated 1500 ohm ¼ watt.
10	112970	Resistor—insulated 330,000 ohms ¼ watt
11	112971	Resistor—insulated 470,000 ohms ¼ watt
12	112973	Resistor—insulated 1.5 megohm ¼ watt.
13	112976	Resistor—wire wound 220 ohms ½ watt.
14	112980	Resistor—insulated 1,000 ohm ¼ watt.
15	112982	Resistor—insulated 27,000 ¼ watt.
16-17	112987	Resistor—insulated 220,000 ohms ¼ watt
18	112993	Resistor—carbon 470,000 ohms 1/10 watt.
19	112998	Resistor—insulated 22,000 ohms 2 watt.
20-21	114258	Condenser—electrolytic 8 mfd. 450 volts.
22	114277	Condenser—oil filled .01 mfd. 2000 volts.
23	116049	Fuse—20 amp. 25 volt.
24	116051	Resistor—insulated 33,000 ohms ¼ watt.
25	116052	Resistor—carbon 33,000 ohms 1/10 watt.
26	116063	Resistor—insulated 10,000 ohms ¼ watt
27	116072	Resistor—insulated 1000 ohms ¼ watt 10%
28	116074	Resistor—22,000 ohms 1 watt.
29	116075	Resistor—insulated 27,000 ohms 1 watt.
30	116078	Resistor—560 ohms ¼ watt.
31	116080	Resistor—insulated 680 ohms ¼ watt.
32	116081	Resistor—insulated 1,500 ohms 2 watts.
33	116083	Resistor—insulated 300 ohms 2 watts wire wound

Diagram No.	Stewart Warner Part No.	Description
34	116202	Vibrator
35-36-37-38	116625	Condenser—.1 mfd. 600 volt.
39-40	116640	Condenser—.01 mfd. 600 volt.
41	116819	Condenser—.05 mfd. 600 volt.
42-43	116893	Condenser—.02 mfd. 600 volt.
44	117276	Coil—antenna (in shield)
45	117281	Transformer—1st I.F.
46	117284	Transformer—R.F.
47	117297	Transformer—power
48	117308	Antenna motor noise choke coil.
49	117313	Switch—antenna
50	117321	Volume control—1 meg. without switch.
51A-51B	117331	Switch for station selector.
52-53	117332	Choke coil in "A" line.
54A-54B	117338	Condenser—variable gang
55	117341	Condenser—temperature compensating
56A to 56E	117345	Push button trimmer gang oscillator section
57A to 57E	117346	Push button trimmer gang antenna section.
58	117402	Switch—"ON-OFF"
59	117491	Tone switch & cover assembly.
60	117499	Dial lamp 6-8 volt (Mazda 55).
61	U-117509	Cone & voice coil assembly for U-115067 speaker
62	117565	Output transformer
63	U-115067	Speaker—dynamic 6 inch.
64-65	117571	Condenser—.008 mfd. 600 volt.
66	117637	Coil—oscillator
67	117723	Transformer—2nd I.F.
68	117725	Condenser—.015 mfd. 600 volt.

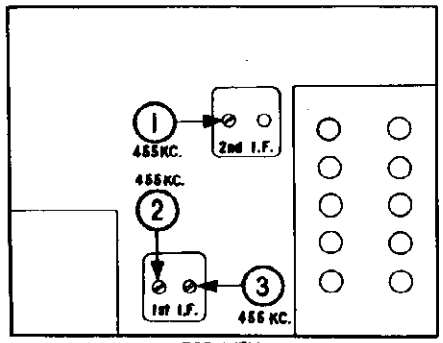
ALIGNMENT PROCEDURE

1. Remove the top cover and connect output meter. If the meter has a 2 volt scale or less, connect from chassis to the lug with the white wire on the back of the speaker socket. If a less sensitive meter is used, it should be connected in series with a .1 mfd. condenser from the 6V6GT plate to chassis.
2. The volume control should be turned to maximum and the bottom of the receiver must be in place during alignment.
3. DIAL CALIBRATION: Before connecting the tuning cable, close the gang condenser (fully meshed). Turn the tuning knob on the control head clockwise until you reach appreciable resistance, then turn the knob counter-clockwise one whole turn. Now connect the tuning control cable as well as all other cables to the chassis and place the control head in a position where it will not be necessary to move it until the alignment procedure is completed. Turn the tuning knob clockwise as far as possible. At this time the last dial division below 55 should be in line with the center of the tuning shaft. If it is not, the dial may easily be moved to the correct position. IMPORTANT. Do not move the control head or radio again until the alignment is complete as this has a tendency to shift the dial position with respect to the tuning condenser position and the setting of the dial will no longer be correct.
4. The station selector push button should be pushed until a position is reached where the set can be tuned manually with the tuning knob.
5. Remove the small chrome button on side of receiver case and turn the antenna switch so that the slot points toward the WHITE dot on the receiver case. This is the position for the cowl type antenna.

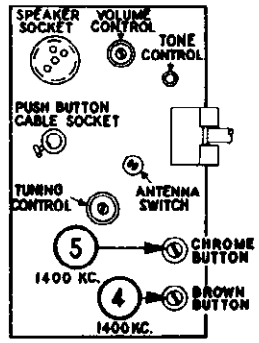
Dummy Ant. in Series With Sig. Gen.	Connection of Sig. Generator Output to Receiver	Signal Generator Frequency	Receiver Dial Setting	Trimmer Number	Trimmer Description	Type of Adjustment
.1 MFD. CONDENSER	Control grid of 6A8 tube (do not remove grid cap)	455 KC	Any point where it does not affect signal	1	2nd I.F.	Adjust for maximum output, then repeat.
				2-3	1st I.F.	
*60 MMFD. MICA CONDENSER	Clip to lug on back of antenna socket	1400 KC	Exactly 1400 KC	4	Oscillator Shunt	Adjust for maximum output.
				5	Antenna Shunt *	

After the set has been installed, the antenna switch under the small chrome button should be turned so that the slot points toward the red dot if an under car antenna is used or to the white dot for a cowl antenna. Then tune in a weak signal at about 1360 to 1450 KC. and adjust the antenna shunt condenser, No. 5 (under the large chrome button) until maximum volume is obtained.

*If you do not have a 60 mmfd. mica condenser available, use a 250 mmfd. and turn antenna switch described in No. 5 to the red dot.



TOP VIEW



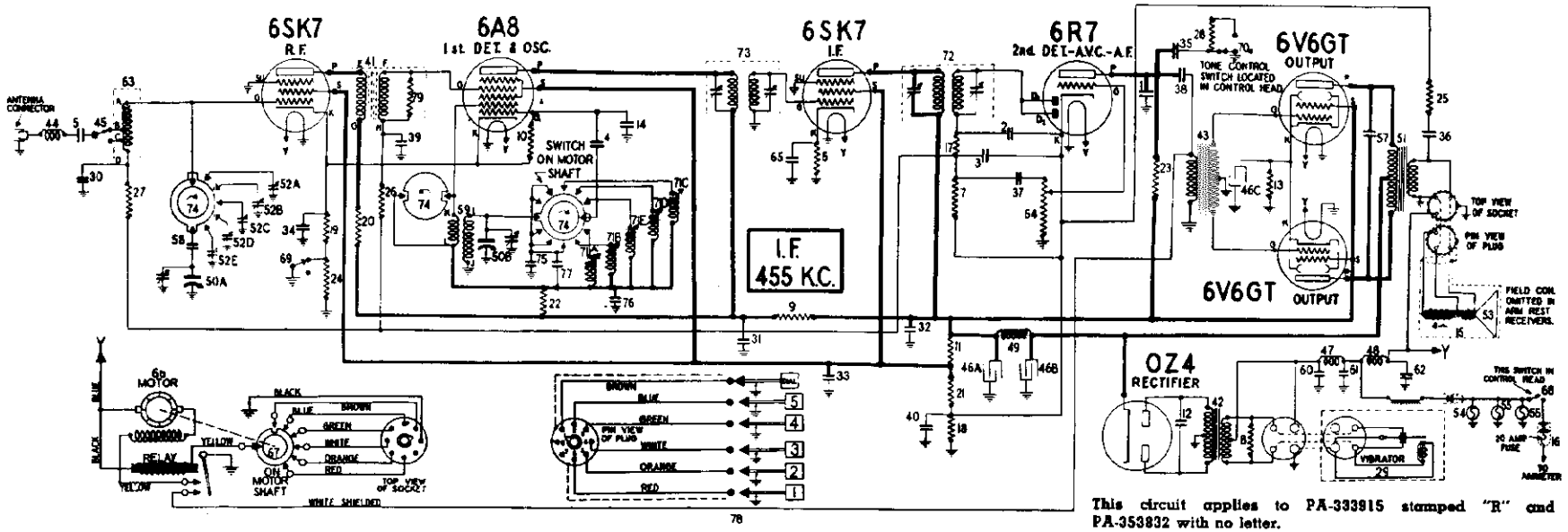
END VIEW

PARTS LIST

Stewart-Warner Part Number	Description
	IGNITION NOISE SUPPRESSION PARTS
117251	Distributor Suppressor (screw type) 5000 ohms
117301	Condenser—1 mfd. 200 volt (generator)
117302	Condenser—.5 mfd. 200 volt (ignition)
	CONTROL HEAD PARTS
117462	"A" cable & socket (from control head to set; 16 inch)
117494	Ammeter cable with bayonet tip
117496	Ammeter cable with fuse housing
111658	Clip—for dial drum retainer
114851	Clip—hairpin type; on control shafts
117451	Clutch spring—for tuning dial drum
116948	Cord—dial drive (supplied in 6 ft. lengths)
117465	Dial drive drum (less scale)
117499	Dial lamp 6 to 8 volt (Mazda 55)
117503	Dial scale & disc assembly (less drive drum)
117468	Flexible drive shaft & housing (tuning)
117473	Flexible drive shaft & housing (volume)
83319	Fuse insulator tube
117256	Gland nut
117257	Gland nut cover
117255	Knob—metal for tuning or volume
117512	Light shield felt pad on push button shaft
117465	Pawl assembly for station indicator dial drum
117492	Pilot light socket assembly
117490	Push button control cable housing
117482	Push button control cable with tip
117397	Push button (station selector)

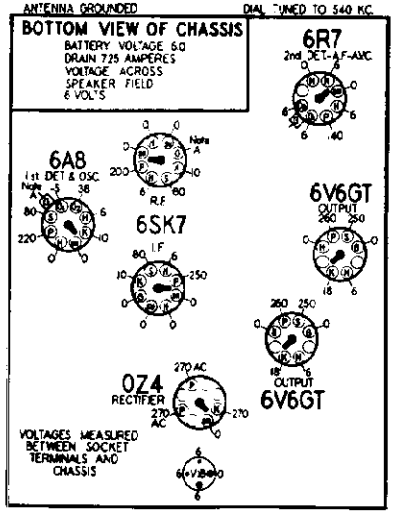
PARTS LIST (Continued)

Stewart-Warner Part Number	Description
85827	Set Screw—8-32 square head
117258	Spacer—on control shaft
113177	Spring—dial cord tension
117497	Spring—tension
117498	Spring—tension
117464	Station indicator dial assembly
117402	Switch "on"-"off"
117417	Trip—for "on"-"off" switch
111456	Washer—spring washer
	CASE SECTIONS AND SPEAKER SHELL
110236	Anti Rattle Clips for case
117542	Back cover for speaker (with dust seal)
117320	Bottom cover for case
117545	Case for speaker (less back cover)
117540	Grill cloth for speaker
117541	Grill screen for speaker shell
117435	Plug button (brown finish)
110413	Plug button—chrome plate
117436	Plug button (nickel plated)
117515	Receiver case—wrap around section only
117444	Top cover & monogram
	MISCELLANEOUS PARTS
117377	"A" cable (bayonet tip)
117434	Antenna lead & socket
117548	Brass & fibre gear assembly—condenser drive
117636	Cable for speaker
117254	Call letter tabs
114253	Clamp—for vibrator
112745	Clip—coil mounting
110189	Coupling for drive shaft
79106	Lockwasher for mounting set to bulkhead
79105	Lockwasher for mounting speaker
12387	Nut—5/16 Hex. for mtg. speaker
79107	Nut for mounting set to bulkhead
64459	Nut for retaining "A" cable to ammeter terminal
85040	Screw—No. 6 Hex. Hd.
117347	Socket—for speaker plug
116690	Socket (octal base) (small)
117538	Stud—for speaker mounting
117252	"T" bolt—for mounting case
110237	Tube shield cap (for metal tube)
88262	Vibrator socket (4 prong)
77477	Washer for mtg. set to bulkhead
117549	Worm Gear with set screw—condenser drive



This circuit applies to PA-333915 stamped "R" and PA-353832 with no letter.

SOCKET VOLTAGES



Use a voltmeter of at least 1000 ohms per volt. **NOTE A:** Due to the high resistance of the A.V.C. circuit, accurate voltage measurements cannot be made at these points. This chart applies to both circuit diagrams.

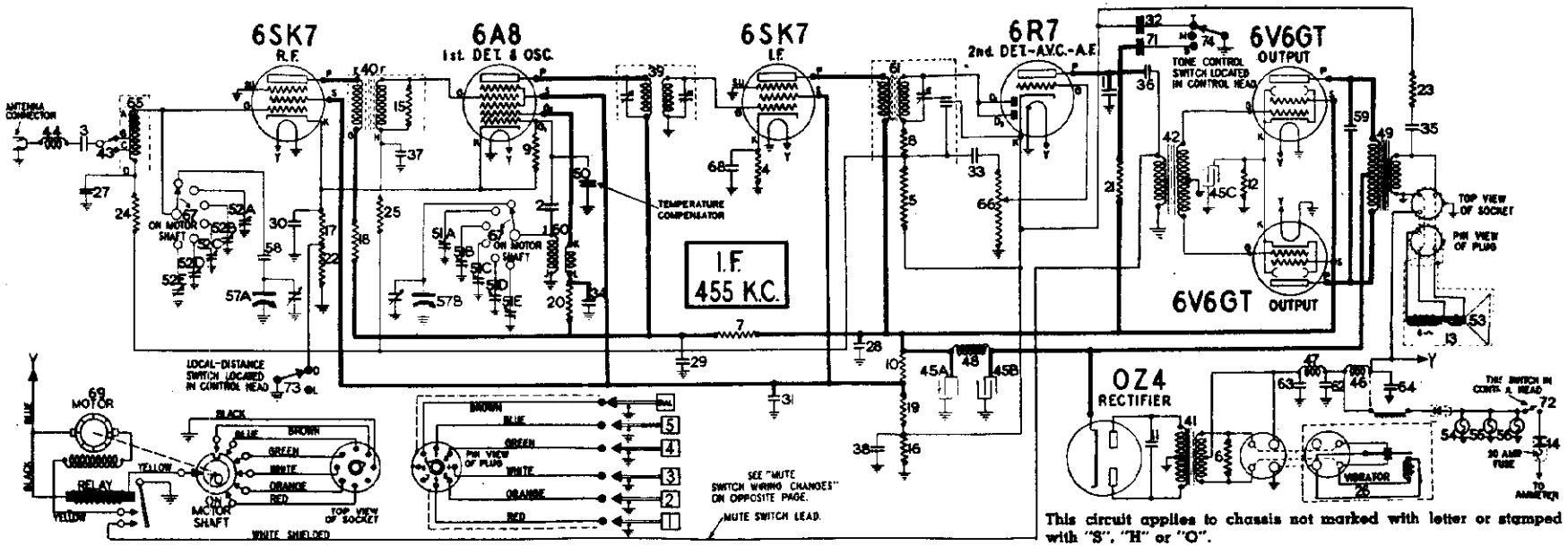
ELECTRICAL PARTS LIST

Diagram Number	Stewart-Warner Part Number	Description
1	83539	Condenser—mica 260 mmfd.
2-3	83783	Condenser—mica 110 mmfd.
4	85061	Condenser—mica 51 mmfd.
5	88205	Condenser—mica 2,100 mmfd.
6	112963	Resistor—insulated—330 ohms ½ watt
7	112970	Resistor—insulated—330,000 ohms ¼ watt
8	112975	Resistor—wire wound—220 ohms ½ watt
9	112980	Resistor—insulated—1,000 ohms ¼ watt
10	112987	Resistor—insulated—220,000 ohms ¼ watt
11	112998	Resistor—insulated—22,000 ohms 2 watts
12	114277	Condenser—oil filled, .01 mfd. 2,000 volts
13	114335	Resistor—wire wound 430 ohms 2 watts
14	114499	Condenser—temperature compensating for oscillator
15	M-115065	Speaker—dynamic 8" (Custom Models Only)
	P-115079	Speaker—dynamic 6" (Arm Rest Models Only)
16	116049	Fuse—20 amp. 25 volt
17	116059	Resistor—insulated 22,000 ohms ¼ watt
18-19	116072	Resistor—1,000 ohms ¼ watt
20	116073	Resistor—insulated—10,000 ohms ½ watt
21-22	116074	Resistor—insulated—22,000 ohms 1 watt
23	116075	Resistor—27,000 ohms 1 watt
24	116080	Resistor—insulated—680 ohms ¼ watt (Resistor No. 24 omitted in Arm Rest Model)
25	116082	Resistor—insulated—1,500 ohms ¼ watt
26-27	116090	Resistor—insulated—3.3 megohms ¼ watt
28	116099	Resistor—insulated—4,700 ohms ¼ watt
29	116202	Vibrator—6 volt
30 to 35	116625	Condenser—.1 mfd. 600 volt
36	116625	Condenser—.1 mfd. 600 volt (Custom Models Only)
	116819	Condenser—.05 mfd. 600 v. (Arm Rest Models Only)
37	116640	Condenser—.01 mfd. 600 volt
38	116706	Condenser—.2 mfd. 600 volt
39	116819	Condenser—.05 mfd. 600 volt
40	116893	Condenser—.02 mfd. 600 volt
41	117284	Transformer—R.F.
42	117297	Transformer—power
43	117306	Transformer—input
44	117308	Antenna Noise Choke Coil
45	117313	Switch—antenna
46A to 46C	117314	Condenser—multiple electrolytic Section A—10 mfd. 450 volt Section B—10 mfd. 450 volt Section C—10 mfd. 35 volt

Diagram Number	Stewart-Warner Part Number	Description
47-48	117332	Choke coil in "A" line
49	117334	Choke—filter
50A-50B	117338	Condenser—variable gang
51	117339	Transformer—output
52A to 52E	117346	Push button trimmer gang—antenna section
53	117487	Cone & Voice coil assembly for M-115065 speaker
	117499	Dial lamp—6 to 8 volt Mazda 55 (Custom Models Only)
54-55	85296	Dial lamps—6 to 8 volt Mazda 51 (Arm Rest Models Only)
56	117499	Dial lamp—6 to 8 volt Mazda 55 (Custom Models Only)
57-58	117571	Condenser—.008 mfd. 600 volt
59	117637	Coil—oscillator
60-61	118225	Condenser—.5 mfd. 150 volt
62	118231	Condenser—.25 mfd. 150 volt
63	118256	Antenna Coil—with shield
64	118270	Volume Control—1 megohm
65	118280	Condenser—.5 mfd. 150 volt
66	118289	Motor and switch assembly
67	118338	Motor control switch on motor
68	118550	Switch—"On"-"Off" (Custom Models Only)
	118790	Switch—"On"-"Off" (Arm Rest Models Only)
69	118551	Switch—Local Distance (Switch No. 69 omitted in Arm Rest Models)
70	118552	Switch—Tone Control (Custom Models Only)
	118894	Switch—Tone Control (Arm Rest Models Only)
71A to 71E	118756	Permeability Tuned Oscillator coil assembly
71A-71B	118888	Oscillator Coil—coil only (550-950 KC)
71C	118889	Oscillator Coil—coil only (700-1250 KC)
71D-71E	118890	Oscillator Coil—coil only (950-1580 KC)
	118891	Coil Plunger assembly (used on 118756 coil assembly)
72	118762	Transformer—2nd I.F.
73	118765	Transformer—1st I.F.
74	118770	Switch—station selector
75	118771	Condenser—silver mica—.0003 mfd.
76	118772	Condenser—silver mica—.00039 mfd.
77	118787	Condenser—temperature compensator
78	118793	Control Head Station Selector Switch (Arm Rest Models Only)
79	116052	Resistor—carbon—33,000 ohms 1/10 watt

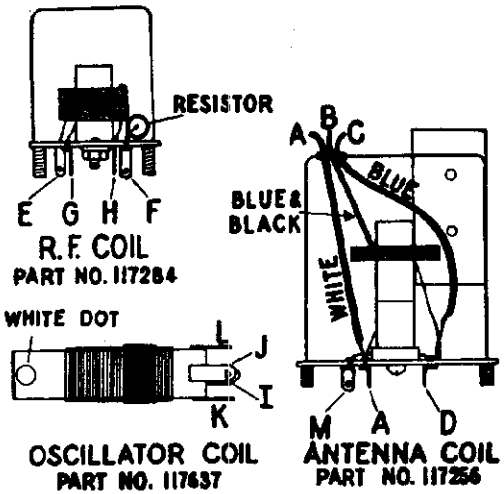
INTERACTION BETWEEN TUNING COILS

When setting up stations on either the inductance-tuned Custom or Arm Rest receivers, the adjustment of an adjacent coil plunger may affect the tuning of a station previously set up. Therefore, after all five stations have been set up, it is advisable to check the setting of all coils. Repeat this adjustment until no further change in tuning is experienced.



This circuit applies to chassis not marked with letter or stamped with "S", "H" or "O".

Terminal letters in illustrations correspond to letters on circuit diagrams.



ELECTRICAL PARTS LIST

Diagram Number	Stewart-Warner Part Number	Description
1	83539	Condenser—mica 260 mmfd.
2	85061	Condenser—mica 51 mfd.
3	88205	Condenser—mica 2100 mmfd.
4	112963	Resistor—insulated 330 ohms ¼ watt.
5	112970	Resistor—insulated 330,000 ohms ¼ watt.
6	112976	Resistor—wire wound 220 ohms ½ watt.
7	112980	Resistor—insulated 1,000 ohms ¼ watt.
8	112982	Resistor—insulated 27,000 ohms ¼ watt.
9	112987	Resistor—insulated 220,000 ohms ¼ watt.
10	112998	Resistor—insulated 22,000 ohms 2 watts.
11	114277	Condenser—oil filled .01 mfd. 2,000 volts.
12	114335	Resistor—wire wound 430 ohms 2 watts.
13	M-115065	Speaker—dynamic 8"
14	116049	Fuse—20 amp. 25 volt.
15	116052	Resistor—carbon 33,000 ohms 1/10 watt.
16-17	116072	Resistor—1,000 ohms ¼ watt.
18	116073	Resistor—insulated 10,000 ohms ½ watt.
19-20	116074	Resistor—insulated 22,000 ohms 1 watt.
21	116075	Resistor—27,000 ohms 1 watt.
22	116080	Resistor—insulated 680 ohms ¼ watt.
23	116082	Resistor—insulated 1,500 ohms ¼ watt.
24-25	116090	Resistor—insulated 3.3 meg. ¼ watt.
26	116202	Vibrator—6 volt
27-28-29 30-31-32	116625	Condenser—.1 mfd. 600 volt.
33-34	116640	Condenser—.01 mfd. 600 volt.
35-36	116706	Condenser—.2 mfd. 600 volt.
37	116819	Condenser—.05 mfd. 600 volt.
38	116893	Condenser—.02 mfd. 600 volt.
39	117281	Transformer—1st I.F.
40	117284	Transformer—R.F.

Diagram Number	Stewart-Warner Part Number	Description
41	117297	Transformer—power
42	117306	Transformer—input
43	117308	Antenna meter noise choke coil.
44	117313	Switch—antenna
45A to 45C	117314	Condenser—multiple electrolytic Section A—10 mfd. 450 volt Section B—10 mfd. 450 volt Section C—10 mfd. 35 volt
46-47	117332	Choke coil in "A" line.
48	117334	Choke—filter
49	117339	Transformer—output
50	117341	Condenser—temperature compensating
51A to 51E	117345	Push button trimmer gang oscillator section.
52A to 52E	117346	Push button trimmer gang antenna section.
53	M-117487	Cone and Voice coil assembly for M-115065 speaker.
54-55-56	117499	Dial Lamp—6 to 8 volt Mazda 55.
57	117547	Condenser—variable gang
58-59	117571	Condenser—.008 mfd. 600 volt.
60	117637	Coil—oscillator
61	117638	Transformer—2nd I.F.
62-63	118225	Condenser—.5 mfd. 150 volt.
64	118231	Condenser—.25 mfd. 150 volt.
65	118256	Antenna coil—with shield.
66	118270	Volume control—1 megohm
67A to 67B	118284	Switch—station selector
68	118290	Condenser—5 mfd. 150 volt.
69	118299	Motor and Switch assembly.
70	118330	Motor control switch—on motor.
71	118487	Condenser—.07 mfd. 600 volt.
72	118550	Switch—"on"—"off"
73	118551	Switch—Local distance
74	118552	Switch—Tone control

MUTE SWITCH WIRING CHANGE

In chassis not marked with a change letter on the power transformer housing, the mute switch connects to the center terminal of the volume control and the red wire of the push-pull input transformer connects to B plus.

PACKARD MODELS PA-333915 Early, PA-333915 Late, PA-353832 — STEWART-WARNER CORP. MODELS 3341, 3341-R (Late), 3371

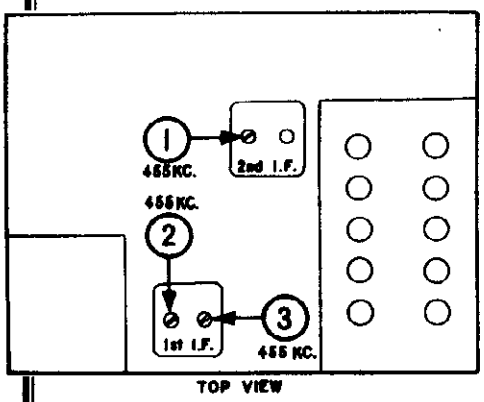
ALIGNMENT PROCEDURE

1. Remove the top cover and connect output meter. If the meter has a 2 volt scale or less, connect from chassis to the lug with the white wire on the back of the speaker socket. If a less sensitive meter is used, it should be connected in series with a .1 mfd. condenser across the plates of the 6V6GT output tubes.
2. The volume control should be turned to maximum and the bottom of the receiver must be in place during alignment.
3. DIAL CALIBRATION: In Custom Models with 6-button control head, hold down "DIAL" button until tuning motor stops running. Now tune in a station whose frequency in kilocycles is known. Hold the tuning control knob and with the eraser on the end of a lead pencil, move the dial until the correct frequency is indicated. In Arm Rest Models push the Automatic Station Selector Button until the word "DIAL" appears in the window of the control head escutcheon. Now tune in a station whose frequency is known. Pull off the tuning knob and loosen the set-screw underneath this knob. Now turn the tuning control until the dial indicates the frequency of the station you have tuned in, then retighten set-screw, and replace knob. IMPORTANT: Do not move the control head again until the alignment is complete as this has a tendency to shift the dial position with respect to the tuning condenser position and the setting of the dial will no longer be correct.
4. Remove the small chrome button on side of receiver case and turn the antenna switch so that the slot points toward the WHITE dot on the receiver case. This is the position for the cowl type antenna.

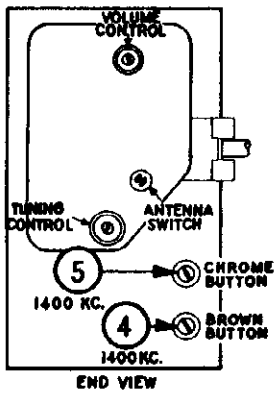
Dummy Ant. in Series With Sig. Gen.	Connection of Sig. Generator Output to Receiver	Signal Generator Frequency	Receiver Dial Setting	Trimmer Number	Trimmer Description	Type of Adjustment
.1 MFD. CONDENSER	Control Grid of 6A8 Tube (do not remove grid cap)	455 KC	Any Point Where It Does Not Affect Signal	1-6	2nd I.F.	Adjust for maximum output, then repeat. **NOTE: Trimmer No. 6 is used on late radios only. It is adjacent to No. 1 on 2nd I.F. Transformer.**
				2-3	1st I.F.	
*60 MMFD. MICA CONDENSER	Clip to Lug on Back of Antenna Socket	1400 KC	Exactly 1400 KC	4	Oscillator Shunt	Adjust for maximum output.
				5	Antenna Shunt	

After the set has been installed, the antenna switch under the small chrome button should be turned so that the slot points toward the red dot if an under car antenna is used, or to the white dot for a cowl antenna. Then tune in a weak signal at about 1360 to 1450 KC. and adjust the antenna shunt condenser, No. 5 (under the large chrome button) until maximum volume is obtained.

*If you do not have a 60 mmfd. mica condenser available, use a 250 mmfd. and turn antenna switch described in No. 4 to the red dot.



TOP VIEW



END VIEW

MOTOR SHAFT BINDING

If the shafts of the tuning motor and the station selector switch are not in perfect alignment, binding of the shafts will result. Such binding may cause the motor to stall or else to run continuously, without changing stations.

If such binding occurs, it will be necessary to realign the motor and station selector switch shafts. Loosen the four screws holding the motor to the case. Then set the radio receiver on end so that the motor housing is on top. Remove the top cover and observe the shaft alignment between the end of the case and the R. F. housing while the motor is running. Now shift the position of the motor until the shafts line up and turn freely, then retighten the motor mounting screws.

If the shafts cannot be brought into alignment by shifting only the motor, it will be necessary to shift the position of the receiver chassis with respect to the case. Loosen the four screws mounting the chassis to the case and shift the chassis until the shafts can be brought into alignment.

CHIPS IN TUNING MOTOR

If metal chips or filings are present in the motor housing, they will eventually work their way into the drive gears, into the relay or into the air gap between the armature and field poles thus causing the motor to stall or operate erratically. These chips can best be removed by blowing them out with a blast of compressed air, although they can be removed using a small brush or similar device.

TONE CONTROL CIRCUIT CHANGES

The tone control circuit of the early and late Custom receiver differs. The latter circuit reduces high note response somewhat, thus reducing hiss and background noises. If a reduction in high note response is desired in the early sets, merely change condenser No. 35 to .05 mfd. This condenser is the one on the top of the output transformer.

MODELS 3341, 3341-R (late), STEWART-WARNER CORP. PACKARD MODELS PA-333915 Early, 3371 PA-333915 late, PA-353832

MISCELLANEOUS PARTS LIST

IGNITION NOISE SUPPRESSION PARTS

Stewart-Warner Part Number	Description	List Price
117251	Distributor Suppressor (screw type) 5000 ohms	$0.30
117301	Condenser—1 mfd. 200 volt (generator)	.70
117302	Condenser—.5 mfd. 200 volt (ignition)	.56

CONTROL HEAD PARTS FOR CUSTOM MODELS

(6 button type)

118576	"A" lead with fuse housing
118572	Automatic tuning cable—with plug
118580	Bezel—chrome
118562	Bracket for mounting dial drum
118559	Bushing—dial drum shaft (brass eyelet)
118582	Casting for tuning mechanism
118575	Clamp—cable retaining
118433	Clamp—control mounting
118432	Clip—cable mounting
111658	Clip—for small gear
111160	Collar—drive cable retaining
118553	Control head assembly, complete with gland nuts and knobs
118581	Cover for tuning mechanism
118557	Dial drum
118558	Dial drum shaft—with gear
118571	Dial lamp socket—with lead
118404	Flexible drive shaft and housing (tuning)
118403	Flexible drive shaft and housing (volume)
118449	Gasket—push button ..... Per C
118563	Gear—on dial support brackets
118566	Gear—on tuning shaft
118451	Gland nut
117257	Gland nut cover
117430	Knob—metal—for tuning or volume
118588	Light shield—metal bracket
118589	Metal grounding clips
118554	Push button body
118555	Push button cap—(chrome)
118577	Push button retainer bar
118578	Push button switch (3 section)
118579	Push button switch housing
118561	Retaining clip—for dial drum
118583	Retaining clip (small) in front of gear on tuning shaft
118567	Retaining clip—on tuning and volume shafts (½" O.D.)
79138	Screw—for mounting control head (No. 8-32 x 5/16 R.H.M.S.) ..... Per C
85827	Set Screw—for trip; also control cable retaining
117258	Spacer washers
118560	Spring—on dial drum shaft
118584	Spring—(rectangular) in front of gear on tuning shaft
118568	Spring washer—on tuning shaft (½" O.D.)
118551	Switch—"Local Distance"
118550	Switch—"ON-OFF"
118552	Switch—tone control
118585	Toggle button for tone or local distance switch
118573	Tone control cable—with plug
118569	Trip—for on-off switch—with set screw
118565	Washer—on dial drum shaft (1 inch O.D.)
79146	Washer—under gland nut

CONTROL HEAD PARTS FOR ARM REST MODELS

118895	Cable—Station Selector
118796	Clamp—Cable
118856	Cover—Push Button Switch
118852	Dial Scale
118885	Escutcheon—for control head
118868	Flexible Shaft—tuning
118867	Flexible Shaft—volume
118786	Gear—(1" Diam.)—on station selector switch
118789	Idler gear and bracket assembly
118799	Knob—Push Button

CONTROL HEAD PARTS FOR ARM REST MODELS —(Continued)

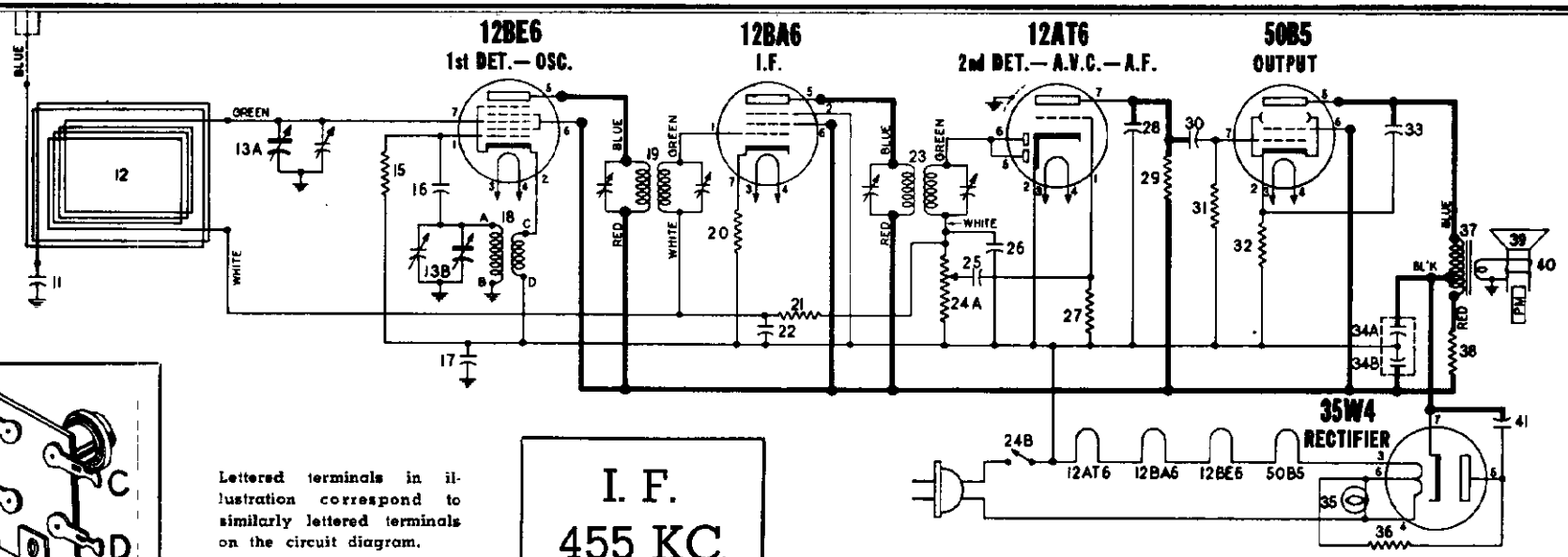
Stewart-Warner Part Number	Description
118892	Knob—Tone Control
118798	Knob—Tuning or Volume
118797	Light Shield
118851	Rear Plate and Bushings for Control Head
118859	Screw—Chrome head—for mounting escutcheon
118861	Screw (No. 4-40 x 3/16) Retains 1" gear to station selector switch
118876	Screw No. 6 x ¼" Self-Tapping
88360	Set Screw—No. 8-32 x ⅛"
118853	Shaft and Trip Arm Assembly
118778	Shaft—Tuning
118878	Socket—Dial Lamp
118855	Station Indicator Dial and Gear
118793	Switch—Control Head Station Selector
118790	Switch—"On"-"Off"
118894	Switch—Tone Control

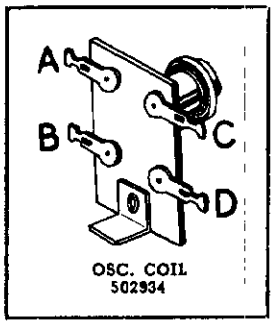
CASE SECTIONS AND SPEAKER PARTS

110236	Anti rattle clips for case
117320	Bottom cover for case
118276	Case cover for motor assembly
117330	Case for speaker (custom)
117342	Back cover for speaker case (custom)
117344	Grille Cloth for speaker (custom)
118884	Grille Ring—Speaker (arm rest)
119091	Grille Screen and Cloth (arm rest)
117329	Grille Screen for Speaker Shell (custom)
117435	Plug button (brown finish)
110413	Plug button—chrome plate
117436	Plug button—nickel plated
118265	Receiver case and motor case assembly less covers
118269	Top cover and monogram

MISCELLANEOUS PARTS

117377	"A" cable (bayonet tip) (custom)
118880	"A" Cable and Fuse Retainer (arm rest)
117434	Antenna lead and socket
118877	Antenna Lead Extension (arm rest)
117548	Brass and Fiber gear assembly—condenser drive
118590	Brush, carbon—for motor
117328	Cable for speaker (24") (custom)
118875	Cable—for speaker (arm rest)
118879	Cable—tone control (arm rest)
118441	Call letter tabs (custom)
118858	Tabs—station call letters (arm rest)
114253	Clamp—for vibrator
118432	Clip—Control Cable Mounting (arm rest)
112745	Clip—coil mounting
110189	Coupling for drive shaft
118470	"Dial" tab (custom)
83721	Grommet—for lead-in (arm rest)
79106	Lockwasher for mounting set to bulkhead
79105	Lockwasher for mounting speaker (custom)
12387	Nut—5/16 Hex. for mounting speaker (custom)
79107	Nut for mounting set to bulkhead
64459	Nut for retaining "A" cable to ammeter terminals
85040	Screw—No. 6 Hex. Hd. ..... Per C
118886	Screw—No. 8 x 1" Self Tapping (for mtg. speaker) (arm rest)
116690	Socket—octal (small)
117347	Socket—for speaker plug
118297	Socket—for tone control plug
118331	Spacer—for mounting motor switch
117253	Studs—for mounting speaker (custom)
117252	"T" bolt—for mounting case (custom)
118899	"T" bolt—for mounting receiver case (arm rest)
110237	Tube shield cap (for metal tube)
77477	Washer for mounting set
118469	Window—for push button (custom)
117549	Worm gear with set screw—condenser drive
88262	Vibrator socket (4 prong)





OSC. COIL
502934

Lettered terminals in illustration correspond to similarly lettered terminals on the circuit diagram.

I. F. 455 KC.

SOCKET VOLTAGES

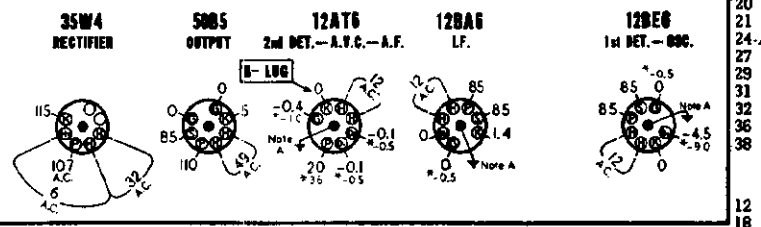
Measured with voltmeter having sensitivity of 1000 ohms per volt except where indicated by (*). The (*) symbol designates a vacuum tube voltmeter measurement.

VOLUME ON FULL WITH NO SIGNAL — DIAL TUNED TO 540 KC.

BOTTOM VIEW OF CHASSIS

HEATER VOLTAGES MEASURED ACROSS SOCKET TERMINALS. ALL OTHER VOLTAGES MEASURED BETWEEN SOCKET TERMINALS AND B- LUG.

117 VOLT 60 CYCLE A.C. POWER SUPPLY USED FOR THESE MEASUREMENTS.



REAR OF CHASSIS

NOTE A: Grounding of center stud on tube socket is necessary to reduce capacity coupling between other pins. Oscillation may result if this ground is omitted.

PARTS LIST

CONDENSERS

11	502151	Condenser—.01 Mfd. 400 volt
13-A, B	502925	Condenser—variable gang (with drum)
16	502929	Condenser—mica 47 Mmfd. 500 volt
17	502158	Condenser—.2 Mfd. 400 volt
22	502153	Condenser—.05 Mfd. 200 volt
25	502156	Condenser—.004 Mfd. 400 volt
26	502882	Condenser—220 Mmfd. 500 volt
28	502470	Condenser—.0008 Mfd. 400 volt
30	502156	Condenser—.004 Mfd. 400 volt
33	502152	Condenser—.02 Mfd. 400 volt
34-A, B	500256	Condenser—electrolytic A-40 Mfd. 150 volt, B-20 Mfd. 150 volt
41	502157	Condenser—.05 Mfd. 400 volt

RESISTORS

15	502130	Resistor—carbon 22,000 ohms ¼ watt
20	502456	Resistor—carbon 220 ohms ¼ watt
21	502135	Resistor—carbon 2.2 Meg. ¼ watt
24-A, B	502928	Volume control—with switch; 1 Meg.
27	502136	Resistor—carbon 10 Meg. ¼ watt
29	502134	Resistor—carbon 470,000 ohms ¼ watt
31	502134	Resistor—carbon 470,000 ohms ¼ watt
32	502932	Resistor—carbon 150 ohms 1 watt
36	502574	Resistor—carbon 33 ohms ½ watt
38	502933	Resistor—carbon 1500 ohms 1 watt

COILS AND TRANSFORMERS

12	502937	Loop antenna
18	502934	Coil—oscillator
19	502926	Transformer—1st I.F.
23	502927	Transformer—2nd I.F.
37	502817	Transformer—output for C-502816 spkr.
	504583	Transformer—output for W-502816 spkr

OTHER ELECTRICAL PARTS

35	118921	Lamp—dial (Mazda 47) 6-8V. 150 Ma.
39	504584	Cone & voice coil for W-502816 speaker
	502818	Cone & voice coil for C-502816 speaker
40	502816	Speaker—P.M. dynamic (4 inch)

MISCELLANEOUS PARTS

	504556	Back for cabinet—(Models 51T126, 51T136, 51T146)
	502940	Back for cabinet (Model 51T176)
	116467	Base for mtg. electrolytic condenser
	504598	Base—tube shield
	500383	Cabinet—ivory (Model 51T176)
	500261	Clamp—dial scale m't'g. (Model 51T176)
	114955	Clip—retainer on end of dial cord
	500497	Clip—retainer for cabinet back
	117057	Cord—dial drive (4½ ft. required) per ft.
	500324	Cover—cardboard for elect. condenser
	504774	Dial scale glass (Models 51T126, 51T136, 51T146)
	504912	Dial scale glass (Model 51T176)
	502564	Knob—ivory (Models 51T126, 51T146, 51T176)
	502563	Knob—mahogany (Model 51T136)
	502367	Pointer
	81145	Retaining ring for tuning shaft
	119087	Ring for dial cord
	17064	Screw No. 4 x 3/16; for mtg. dial scale
	83047	Screw No. 8 x 7/8; chassis mtg.
	114628	Screw No. 8 x ½; chassis mtg.
	501777	Screw No. 4 x ½; for mtg. back
	502173	Shaft—tuning control
	504599	Shield—tube
	500499	Socket—dial lamp (with leads)
	504397	Socket—miniature (black bakelite)
	504597	Socket—miniature (wafer type)
	161384	Spring—dial cord tension

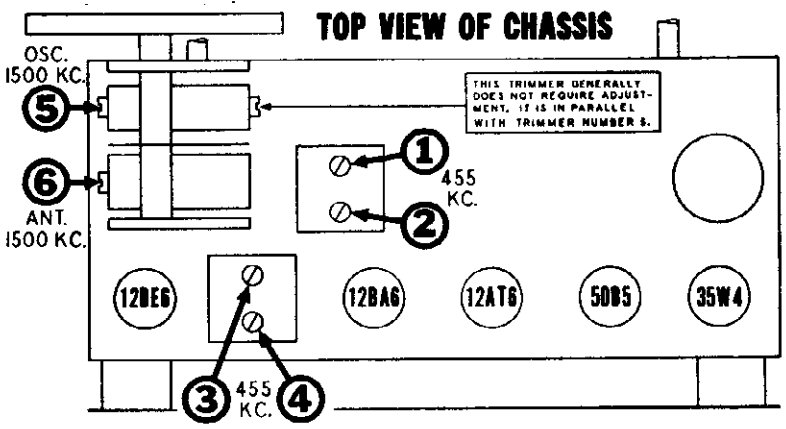
MODELS 51T126, 51T136, 51T146, 51T176, 9018-B, 9018-C, 9018-F, 9018-H

STEWART-WARNER CORP.

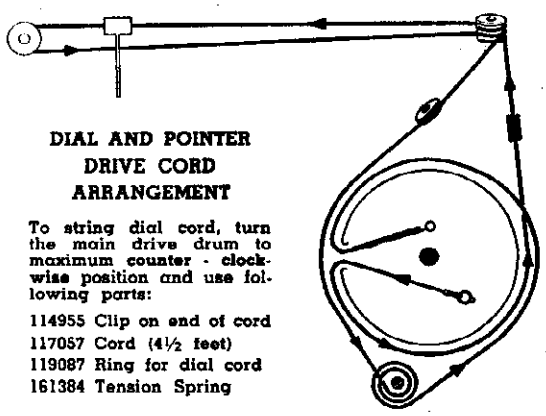
ALIGNMENT PROCEDURE

1. With the gang condenser fully meshed, the dial pointer should be in the position indicated by the last mark below 55 on the dial. If it is set incorrectly, release the pointer clip on the dial cord and reposition pointer.
2. Remove chassis from cabinet by taking out two screws which hold chassis to bottom of cabinet. Solder approximately 8" of insulated wire to any B— connection (see voltage chart on opposite side for convenient B— location).
3. Connect ground lead to signal generator to B— through a 0.25 Mfd. condenser.
4. Connect output meter across speaker voice coil (terminals at back of speaker) or from plate of 50B5 tube to B— through a 0.1 Mfd. condenser.
5. Set volume control at maximum volume position and use a weak signal from the signal generator.

DUMMY ANT. IN SERIES WITH SIGNAL GENERATOR	CONNECT HIGH SIDE OF GENERATOR TO	SIGNAL GENERATOR FREQUENCY	RECEIVER DIAL SETTING	TRIMMER NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT
200 MMFD. Mica Condenser	Trimmer on rear section of gang.	455 KC	Any point where it does not affect the signal.	1-2	2nd I.F.	Adjust for maximum output. Then repeat adjustment.
				3-4	1st I.F.	
200 MMFD. Mica Condenser	External antenna lead on loop.	1500 KC	1500 KC	5	Broadcast Oscillator	Adjust for maximum output.
200 MMFD. Mica Condenser	External antenna lead on loop.	1500 KC	Tune to 1500 KC generator signal.	6	Broadcast Antenna	Adjust for maximum output.



TRIMMER LOCATIONS



DIAL AND POINTER DRIVE CORD ARRANGEMENT

To string dial cord, turn the main drive drum to maximum counter - clockwise position and use following parts:

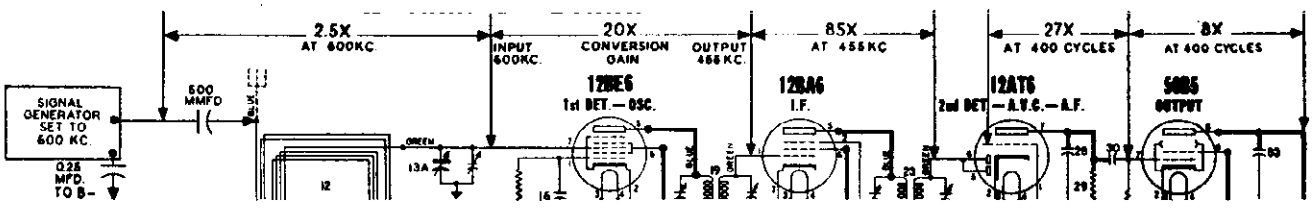
114955 Clip on end of cord
117057 Cord (4½ feet)
119087 Ring for dial cord
161384 Tension Spring

APPROXIMATE STAGE GAIN DATA

Be sure R.F. and I.F. stages are accurately aligned before measuring gain. R.F. gains can be measured with a "channel" type instrument containing a tuned and calibrated R.F. amplifier. A vacuum tube voltmeter may be used for audio gain measurements. Observe following precautions:

1. For all gain measurements connect signal generator as shown. Use 600 KC. signal with 400 cycle modulation (use nearby frequency if local station interferes.)
2. For R.F. and I.F. measurements connect negative terminal of a 3 volt battery (two 1½ volt cells in series) to A.V.C. connection at loop antenna (white wire) and connect positive battery terminal to B —. This provides a definite operating point.
3. Be sure radio is carefully tuned to generator signal (use weak signal for sharp tuning.)
4. When using a "channel" type instrument carefully tune it for maximum output at desired frequency before making measurements.

The R.F. and I.F. stage gains shown below are less than under normal operating conditions due to the use of 3 volts fixed bias in order to establish a definite operating point. Therefore, these values are not intended to indicate the full capability of a stage.



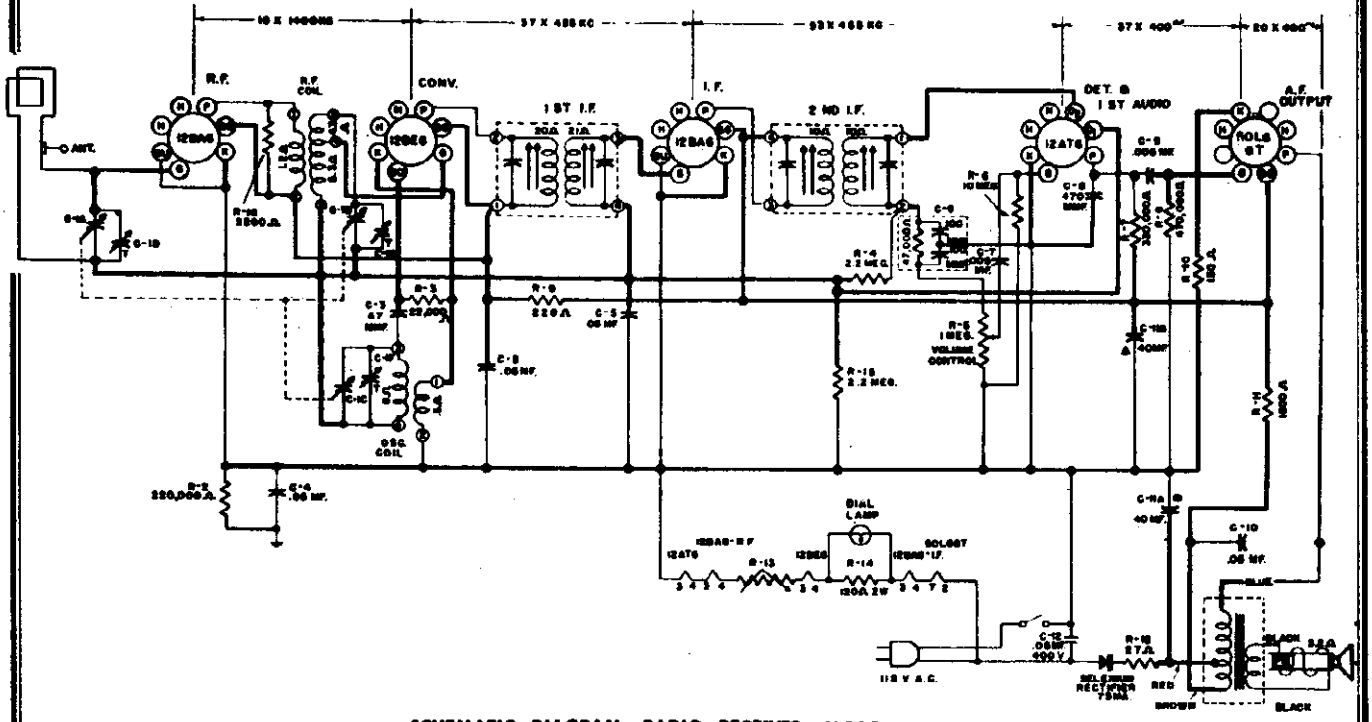
Differences in tube characteristics, tolerance of parts, adjustment of tuned circuits, and variations of line voltage will influence stage gain. Accuracy of measurements is dependent upon careful tuning of receiver to generator signal and experience in using your test equipment. These factors may create considerable variation in gain measurements.

a John F. Rider

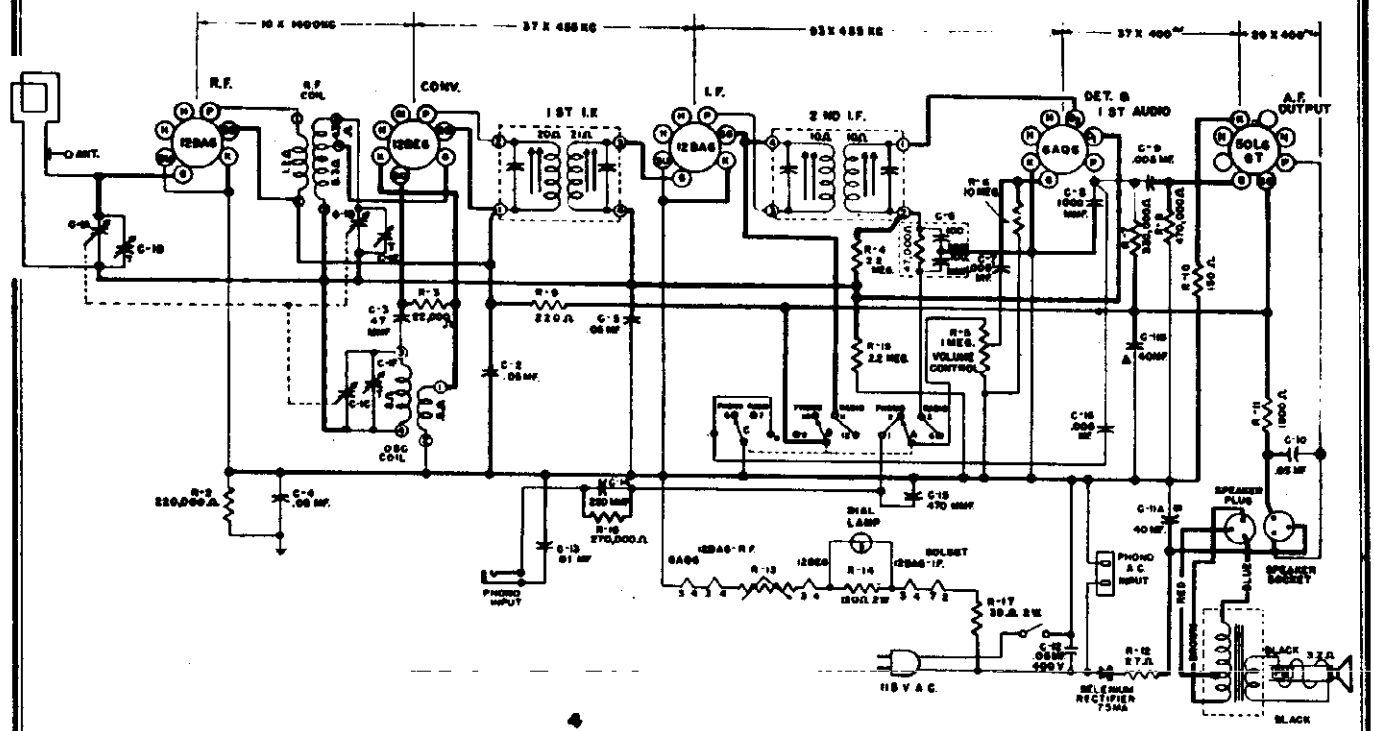
STROMBERG-CARLSON CO.

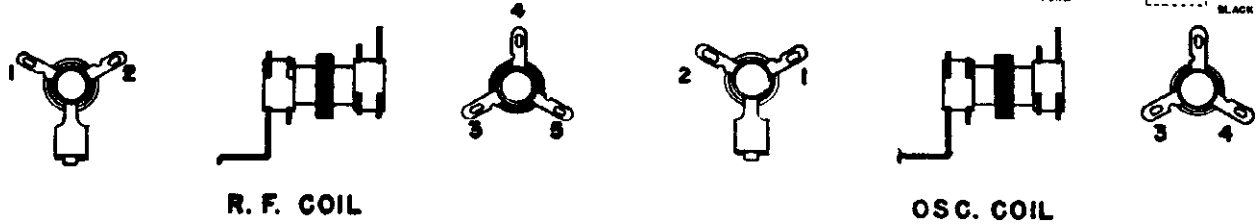
MODEL 1200
MODEL 1202

SCHEMATIC DIAGRAM, RADIO RECEIVER, MODEL 1200



SCHEMATIC DIAGRAM, RADIO RECEIVER, MODEL 1202





R. F. COIL

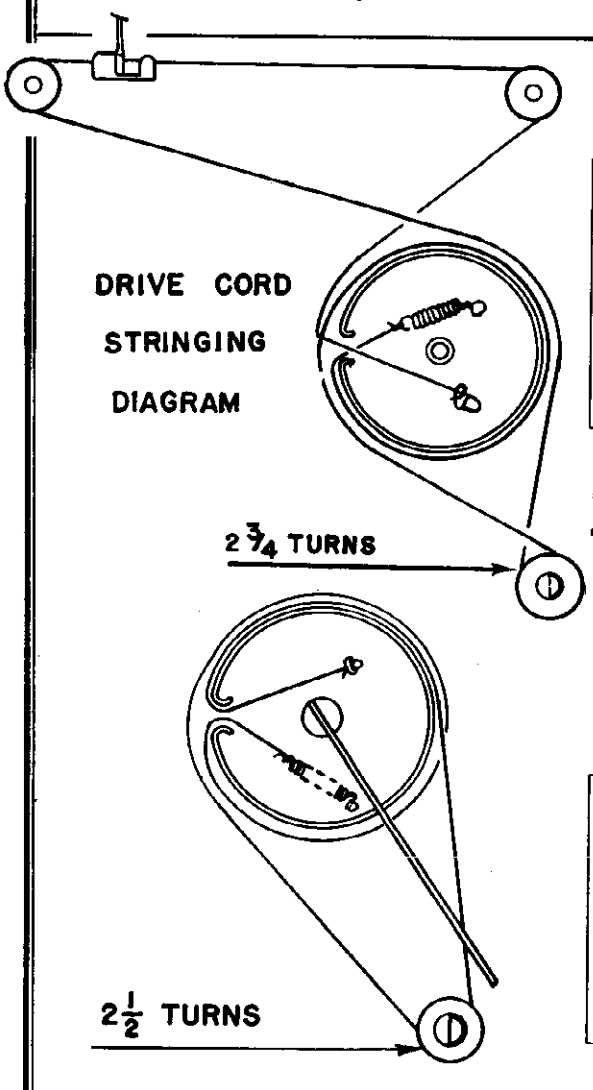
OSC. COIL

MODELS 1200, 1202 STROMBERG-CARLSON CO.

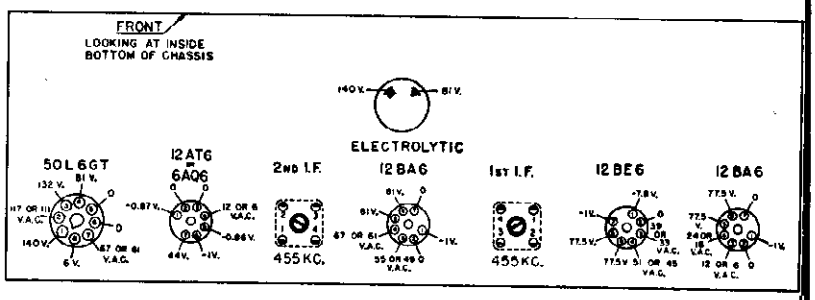
ALIGNMENT PROCEDURE

CAUTION: As this is a transformless Receiver, observe all usual precautions. The Black-White (B-) lead is common to one side of the 117 Volt Power Line Cord.

	Pointer Setting	Generator Setting	Input and Dummy	VTVM and Scope Connection and Scale	Adj. and Notes
			I. F. ADJUSTMENT		
(1)	Low frequency end of dial	455 kc. 400 cy. mod.	Pin #7, 12BE6 tube 0.01 mfd. dummy	-3V DC Scale Green-White (AVC) lead and Black-White (B-) lead.	Adj. top and bottom cores of each I. F. transformer with non-metallic screwdriver for maximum voltage.
(2)	"	455 kc. Swept 15 kc.	"	Scope to Junction C-6 and Volume Control	Adj. same cores as above for best over-lapping curve on scope.
			R. F. ADJUSTMENT		
(1)	1650 kc. Condenser plates all way out	1650 kc. 400 cy. mod.	Ant. terminal 0.01 mfd dummy	"	Adj. Osc. (front) trimmer on variable condenser for maximum voltage.
(2)	1400 kc.	1400 kc. 400 cy. mod.	"	"	Adj. R. F. and Loop trimmers on variable condenser for maximum voltage.

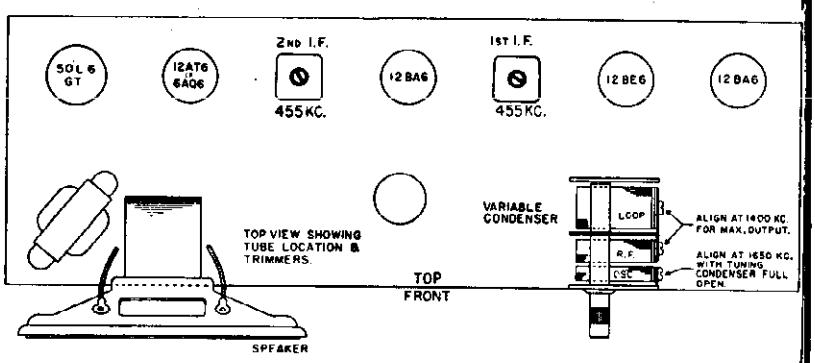


Voltage and Tube Location Chart



*Where two tube types or voltage values are shown, the first is for the 1200 chassis, the second is for the 1202 chassis.

Measurements are made at 117V line, using electronic Voltmeter. Except where otherwise indicated, voltages are D.C. and are positive with respect to the reference point which is the common Black-White lead.



STROMBERG-CARLSON CO. MODELS 1200, 1202

SPECIFICATIONS

Voltage Rating — Radio	117 Volts AC-DC
Voltage Rating — Phono Motor	117 Volts AC Only
Type of Circuit	Superheterodyne
Tuning Range	540-1640 Kc
Input Power Rating	30 Watts
Intermediate Frequency	455 Kc
Speaker Voice Coil Impedence	3 Ohm
Power Output	1.5 Watts at 10% Distortion

TUBE COMPLEMENT

2 12BA6 Miniature RF and IF Amplifier
1 12BE6 Miniature Converter
1 12AT6 Miniature (1200 only) Detector, AVC and Audio Driver
1 6AQ6 Miniature (1202 only) Detector, AVC and Audio Driver
1 50L6GT Power Output

REPLACEMENT PARTS

Resistors

	1200 Model	1202	
28162	R-16		2200 Ohm
28184		R-16	0.27 Meg.
145032	R-5	R-5	Volume Cont. 1.0 Meg.
149030		R-17	39 Ohm 2 W
149035	R-14	R-14	120 Ohm 2 W
149047	R-11	R-11	1800 Ohm 2 W
149097	R-9	R-9	220 Ohm
149109	R-3	R-3	22000 Ohm
149115	R-2	R-2	0.22 Meg.
149116	R-7	R-7	0.33 Meg.
149117	R-8	R-8	0.47 Meg.
149121	R-4, 15	R-4, 15	2.2 Meg.
149125	R-6	R-6	10.0 Meg.
149168	R-10	R-10	150 Ohm
149243	R-13	R-13	Special N-T-C
149244	R-12	R-12	27 Ohm 2 W

Capacitors

	1200 Model	1202	
25376		C-14	250 mmf. mica
27760	C-9	C-9	.005 mf. 600 V
40632	C-2, 4, 5, 10, 12	C-2,4,5,10,12	.05 mf. 400 V
110026	C-1	C-1	Variable
110209		C-15	470 mmf. mica
110419	C-7	C-7,16	.005 mf. 500 V
110420		C-13	.01 mf. 500 V
110425		C-8	.001 mf. Ceramic
110458	C-3	C-3	47 mmf. Ceramic
110464	C-8		470 mmf. Ceramic
110478	C-6	C-6	Diode Filter
111032	C-11 A, B	C-11 A, B	2, 40 mf. 200 V Electrolytic

Coils—Transformers—Speakers

	1200 Model	1202	
114046	X	X	RF Coil Assem.
114047	X	X	Osc. Coil Assem.
114336	X	X	1st. I. F. Transf.
114337	X	X	2nd. I. F. Transf.
139020	X		Loop Assembly
139022		X	Loop Assembly
155013	X		Speaker Assem.
155029		X	Speaker Only
155052		X	Speaker Assem.
161413	X	X	Output Transformer

Miscellaneous

	1200 Model	1202	
33218	X	X	Power Cord
34421		X	Phono Socket
122022	X		Dial
122025		X	Dial
124014	X		Dial Drive Cord
124016		X	Dial Drive Cord
143012		X	Speaker Plug
144013	X		Pointer
144015		X	Pointer
150034	X	X	Tuning Shaft Assembly
152001	X		Pilot Socket
152038		X	Phono Motor Power Socket*
152040	X	X	Miniature Socket
152041	X	X	Octal Socket
152044		X	Speaker Socket Assem.
152045		X	Pilot Socket
156032	X	X	Tube Hold Down Spring
158015		X	Radio-Phono Switch
162034	X	X	Rectifier

*The Phono Motor is for use on AC only.

Cabinets and Parts

	1200 Model	1202	
108065	X		Brown Cabinet
108066	X		Ivory Cabinet
108078		X	Cabinet
125013		X	Escutcheon and Grille
134004	X		Brown Knob
134005	X		Ivory Knob
134029		X	Volume and Station Knob
134056		X	Radio-Phono Knob
138008	X		Dial Lens
163062	X		Chassis hold down screw
200624		X	Chassis hold down screw

NOTE—When ordering replacement parts always specify series number as well as model and part number. Series number is stamped on back of chassis.

STROMBERG-CARLSON CO.

ALIGNMENT PROCEDURE 1204

MODELS 1204HB, 1204HI, 1204HME, 1204HMG, CHASSIS 112021

	Band and Pointer Setting	Generator Setting	Input and Dummy	VTVM Connection and Scale	Trimmer Adj. and Notes
			A.M. I.F. ALIGNMENT		
(1)	AM-Pointer near middle of dial	455 kc. 400 cy. mod.	Junction C-13, 6 and L-8 200 mmf. dummy	Junction C-31, 35 3VDC scale	Adj. Pri. and Sec. cores two AM IF transformers top of chassis. Highest voltage
			F.M. I.F. ALIGNMENT		
(1)	FM-Pointer near middle of dial	10.7 mc 400 cy mod.	Junction C-10, 16 and L-3	AVC buss (Green and White Wire) —3VDC scale	Detune Sec. Ratio Det. Transformer adjust four FM IF cores, bottom of chassis, in following order counting from band switch—One, Four, Two Three for highest voltage. DO NOT REPEAT
(2)	"	"	"	"	Adjust Pri. Ratio Det. Transformer for highest voltage.
(3)	"	"	"	Center terminal audio switch —3 VDC scale	Adjust Sec. Ratio Det. Transformer for ZERO voltage.
(4)	Repeat (2) and (3)				
			A.M. R.F. ALIGNMENT		
(1)	AM-600 kc	600 kc 400 cy. mod.	Loop and link connected 200 mmf dummy to Ant. terminal	Junction C-31, 35 —3 VDC scale	Adjust C-12, 6 and 1 for highest voltage.
(2)	AM-1600 kc Repeat (1) and (2)	1600 kc	"	"	Align L-8, 11 for highest voltage.
			F.M. R.F. ALIGNMENT		
	FM Pointer at 98 to 100 mc.	98 to 100 mc. 400 cy mod.	"	AVC buss (Green and White Wire) —3 VDC scale	Adjust C-7, 10 and core L-6 and 7 for highest voltage.

SPECIFICATIONS

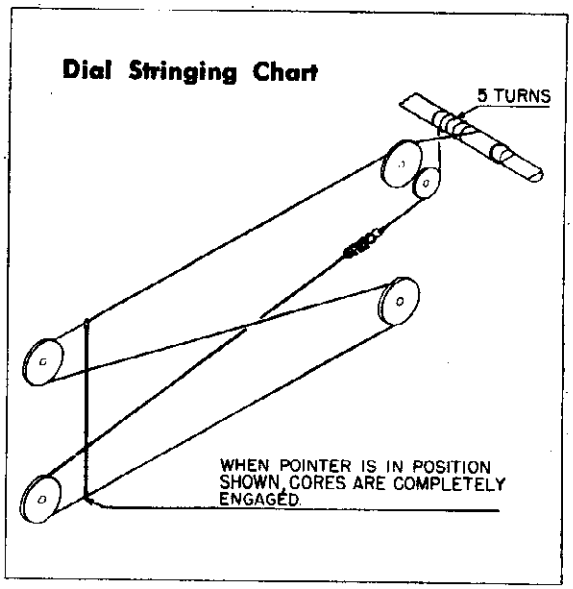
Voltage Rating.....105-125 Volts AC-DC
Type of Circuit.....Superheterodyne
Tuning Range.....A.M.—540 KC.—1600 KC.
F.M.—88 MC.—108 MC.
Number & Type of Tubes—7

- 3—12BA6..... R.F. Amp. and two I.F. Amp.
- 1—12BE6.....Convertor
- 1—6AQ6.....1st Audio Amp.—A.M. Det. & AVC
- 1—12H6..... F.M. Det.
- 1—50L6GT.....Power Output

Input Power Rating..... 40 Watts
Intermediate Frequency.....A.M. 455 KC. F.M. 10.7 MC.
Speaker Voice Coil Impedance (PM).....3 Ohms
Power Output.....1.25 Watts at less than 10% distortion

Cabinet Parts

	HB	HI	HME	HMG	
108044	X				Cabinet
108056		X			Cabinet
108062				X	Cabinet
108063			X		Cabinet
122015	X	X			Dial
122021			X	X	Dial
125019			X	X	Escutcheon
130029	X				Grille Cloth Assem.
130037		X			Grille Metal
138014	X	X			Lens
138015			X	X	Lens
139013	X	X			Loop and Back Assem.
139019	X	X	X	X	Loop and Back Assem.
154030	X	X	X	X	Fibre Knob Spacer
508051	X	X	X	X	Screw, Chassis to cabinet



IDENTIFICATION TABLE

MODEL	CHASSIS	CABINET	SPEAKER
HI	112021	108056	155030
HB	112021	108044	155030
HME	112021	108063	155030
HMG	112021	108062	155030

MODELS 1204HB, 1204HI, 1204HME, 1204HMG, CHASSIS 112021

STROMBERG-CARLSON CO.

REPLACEMENT PARTS

Resistors

28144	R-5, 20, 22	68 Ohms
28156	R-7, 9, 10, 21, 24, 34	680 Ohms
28162	R-2	2200 Ohms
28163	R-6	2700 Ohms
149089	R-3	10 Ohms
149109	R-8, 26	22000 Ohms
149111	R-13	47000 Ohms
149113	R-1, 11	0.1 Meg.
149116	R-18	0.33 Meg.
149117	R-19, 27, 29	0.47 Meg.
149119	R-4, 33	1.0 Meg.
149121	R-16, 23	2.2 Meg.
149124	R-17	6.8 Meg.
149167	R-30	100 Ohms 1W
149168	R-28	150 Ohms 1W
149219	R-15	15 Ohms 1W (Glusohm)
149229	R-14	300 Ohms 1W
149250	R-31,32	15000 Ohms 5%

NOTE—When ordering replacement parts always specify series number as well as model and part number. Series number is stamped on back of chassis.

Capacitors

25484	C-44	.02-600V
29891	C-25,33	.05-600V
110017	C-6, 12.	Trimmer
110024	C-1 .	Trimmer
110025	C-7, 10	Trimmer
110208	C-15	270 mmf
110403	C-14, 18	24 mmf
110407	C-17	33 mmf
110419	C-22, 31, 32, 43	.005-500V
110420	C-8, 13, 24, 28, 30, 34, 36, 37, 38, 39, 40, 47, 51	.01-500V
110425	C-3, 5, 52	1000 mmf
110451	C-4, 9, 19, 20, 26, 29, 41	100 mmf
110455	C-23	470 mmf
110468	C-16	15 mmf
110478	C-35	Diode filter, includes 47000 Ohms resistor
110483	C-49, 50	75 mmf.
110485	C-11	27 mmf.
110486	C-21	33 mmf.
110488	C-42, 46	.003-500V
110491	C-2	5000 mmf.
111027	C-45a, b, c, d	3-50 MF 200V, 1-25 MF 25V
111030	C-48	5 MF

Transformers—Coils

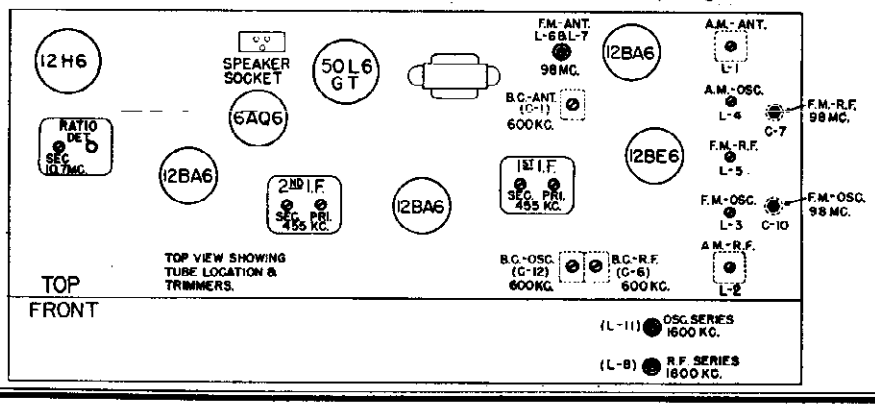
114029	L-5	RF Tuning Coil F.M.
114036	L-6 and 7	Ant. Coil F.M.
114041	L-1, 2, 4	Ant., RF, Osc Tuning Coils A.M.
114042	L-3	Osc. Tuning Coil F.M.
114043	L-11	Osc. Coil, A.M. Aligning
114044	L-8	RF Coil, A.M. Aligning
114045	L-14	Osc. Coil, A.M. Shunt
114311	T-1	1st I.F. transformer
114323	T-2	2nd I.F. transformer
114616	L-9 and 10	Ant. choke coil
114620	L-13, 15	R.F. choke
114621	L-16, 17	Heater choke
114622	L-18	R.F. choke
161004	L-12	Filter choke
161228	T-3	Ratio Detector Transformer
161410	T-4	Output Transformer

Controls—Switches—Knobs

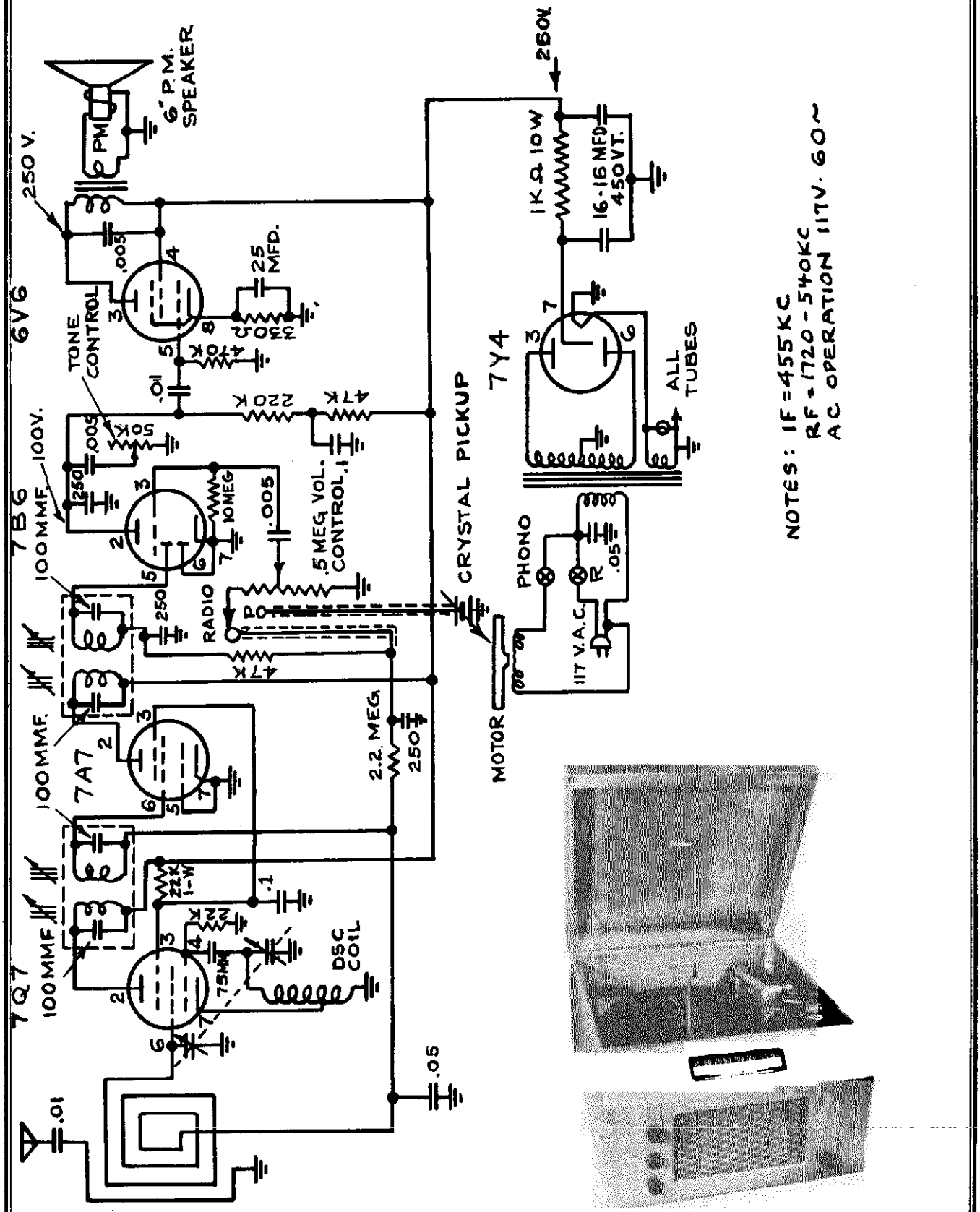
134031	Knob Assem. (dot)	HB
134032	Knob Assem (no dot)	HB
134046	Knob Assem. (dot)	HI
134047	Knob Assem. (no dot)	HI
134050	Knob Assem.	HMG
134051	Knob Assem.	HME
145031	R-12	1 Meg. Volume Control and Switch
158016		Range Switch
158017		Tone Control Switch
158018		Interlock Smitch
158028		Audio Switch (A.M.-F.M.)

Miscellaneous

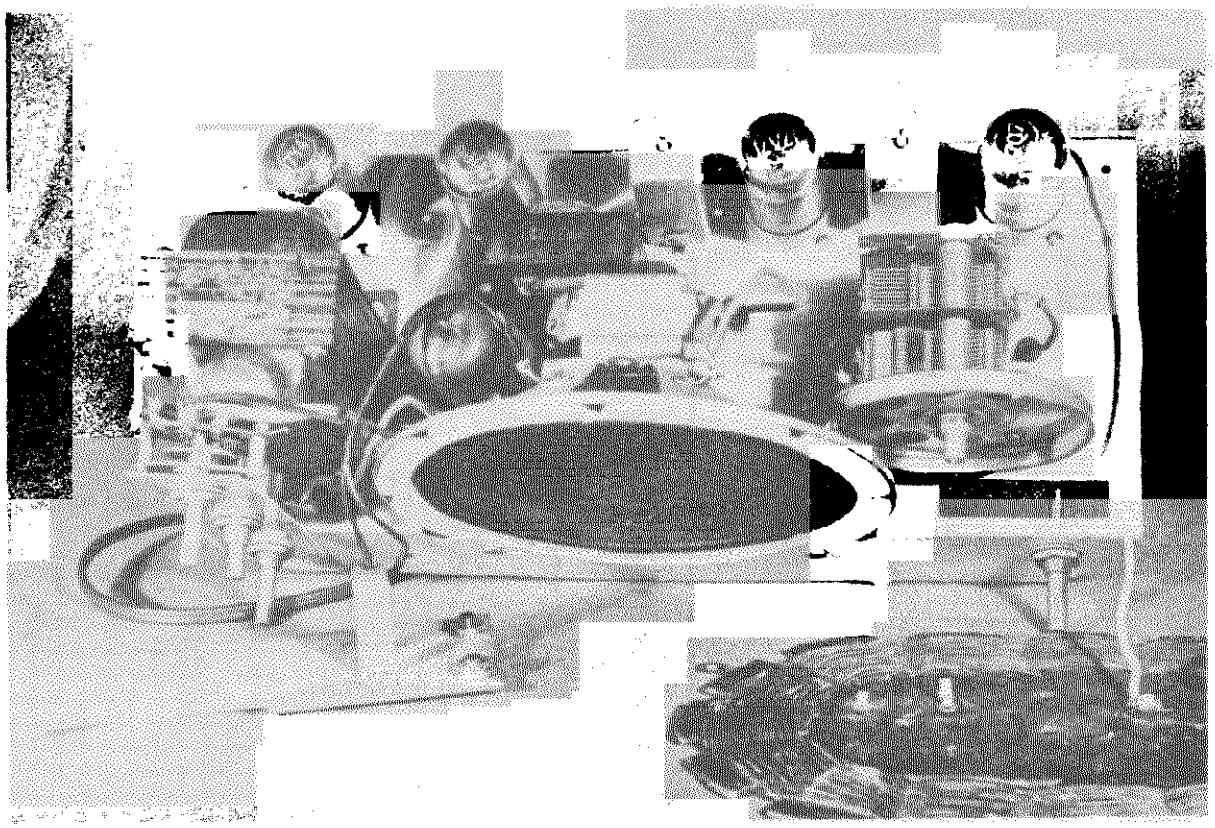
31969	Dial Pointer
32046	Speaker Socket
32164	Speaker Plug
33218	A.C. Cord
124012	Dial Drive Cord Assem.
142026	Dial Plate Assem.
147016	Range Switch Hub
151021	Miniature Socket
151036	Converter Tube Shield
152014	Octal Socket
152037	Miniature Socket, Convérter Tube
155006	Speaker Cone
155029	Speaker—Less Transformer
155030	Speaker, Complete
156032	Tube Hold-down Spring
162058	Selenium Rectifier
164004	Tuning Unit (Mechanical Assem.)
165007	Connector, Range Switch to Audio Switch



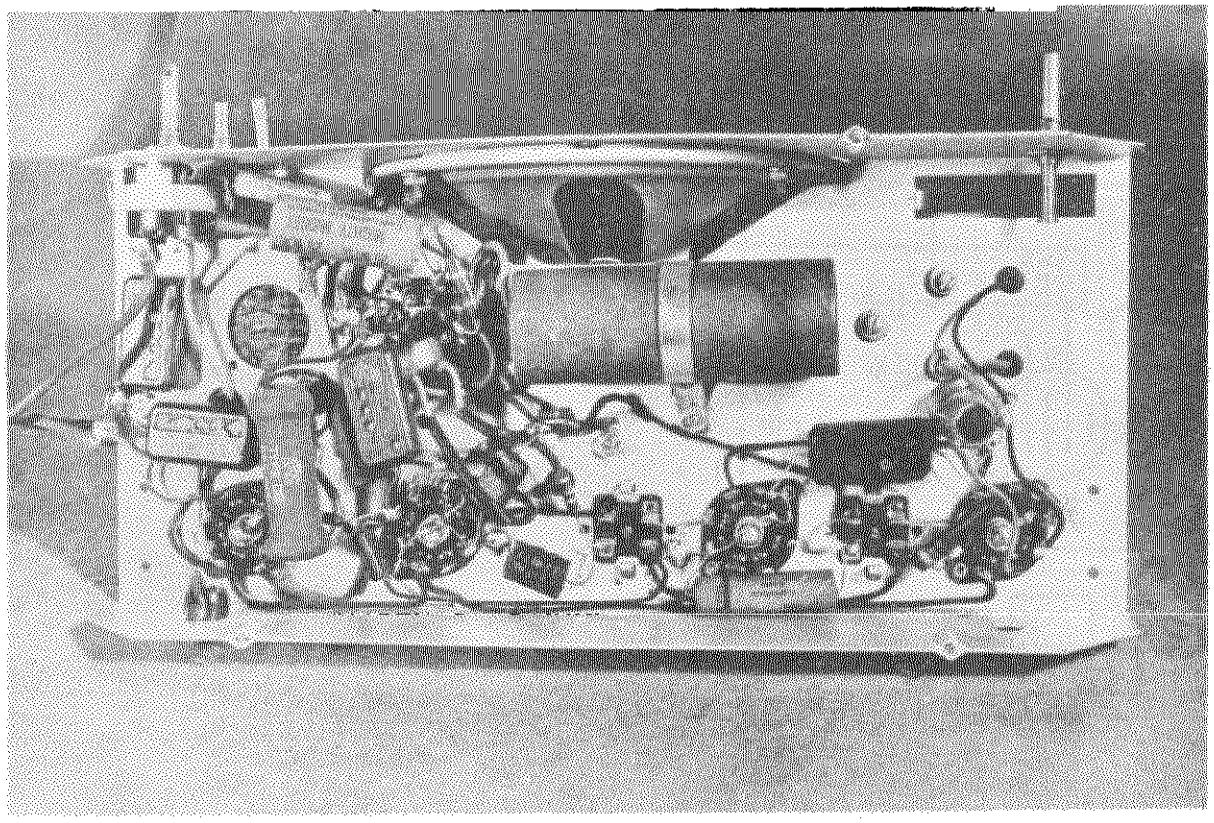
SYMPHONY RADIO & TELEV. CORP. MODEL "BILTMORE"



MODEL "BILTMORE" SYMPHONY RADIO & TELEV. CORP.

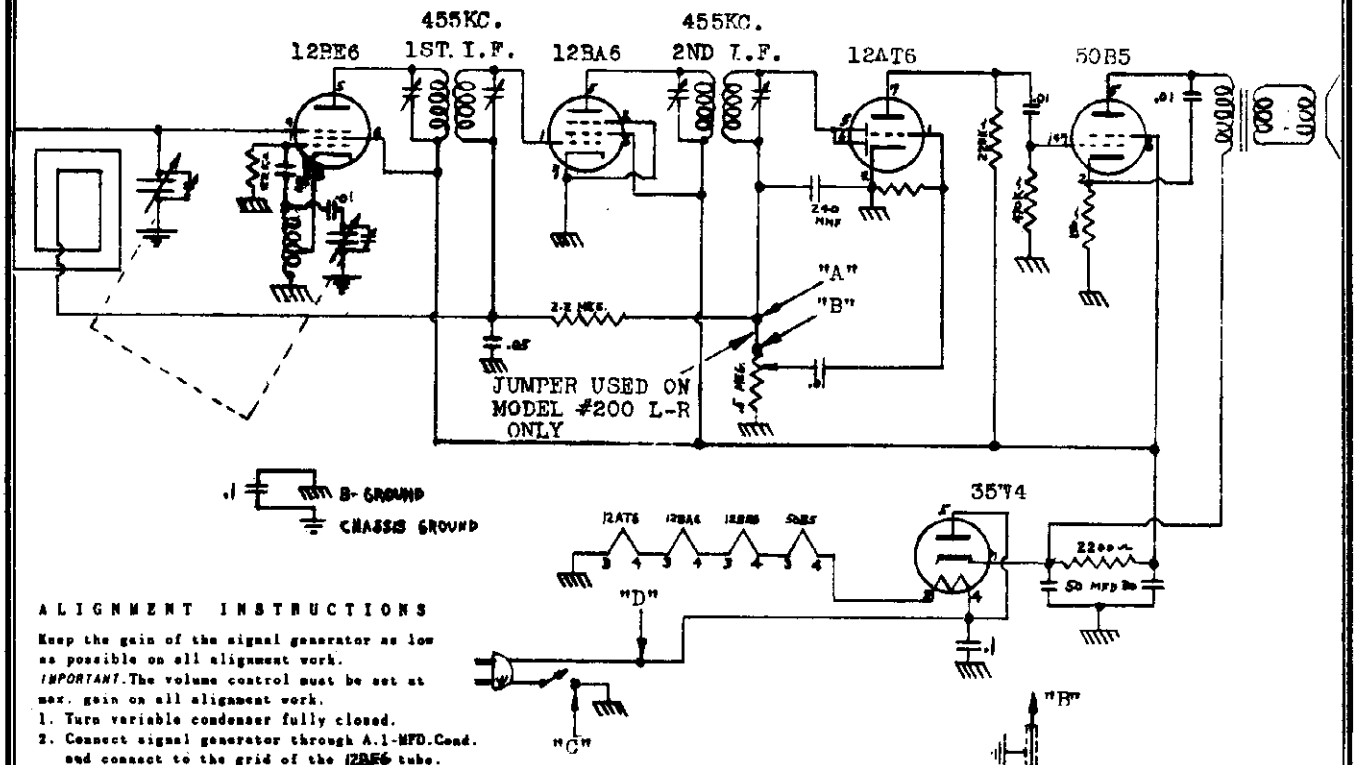


TOP CHASSIS VIEW



BOTTOM CHASSIS VIEW

SYMPHONY RADIO & TELEV. CORP. MODELS 200, 200L-R



ALIGNMENT INSTRUCTIONS

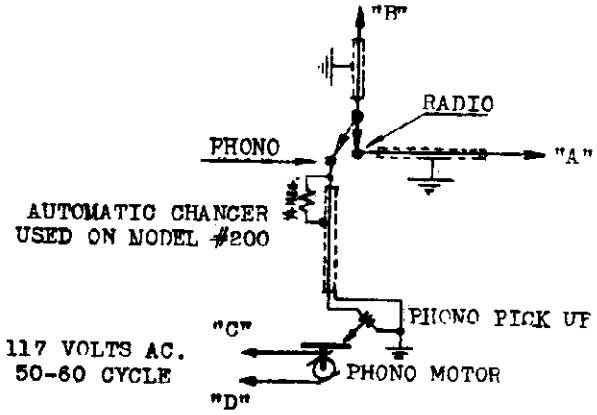
Keep the gain of the signal generator as low as possible on all alignment work.

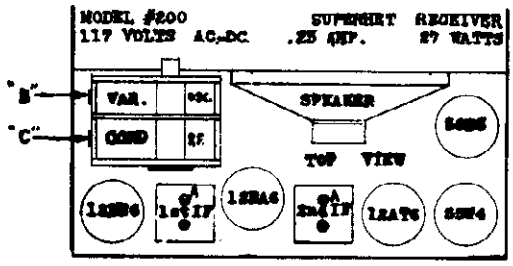
IMPORTANT. The volume control must be set at max. gain on all alignment work.

1. Turn variable condenser fully closed.
2. Connect signal generator through A.1-MFD.Cond. and connect to the grid of the 12BE6 tube.
3. Align IF's to 455 K.C. max. reading. (A)

RF CALIBRATION

1. Turn variable condenser fully open.
2. Place signal generator leads near loop antenna.
3. Set signal generator to 1720 K.C.
4. Align osc. section (B) of variable condenser for max. reading.
5. Set signal generator to 1500 K.C.
6. Turn variable condenser to 150 on dial and align RF (C) section of var. cond. for max. reading.

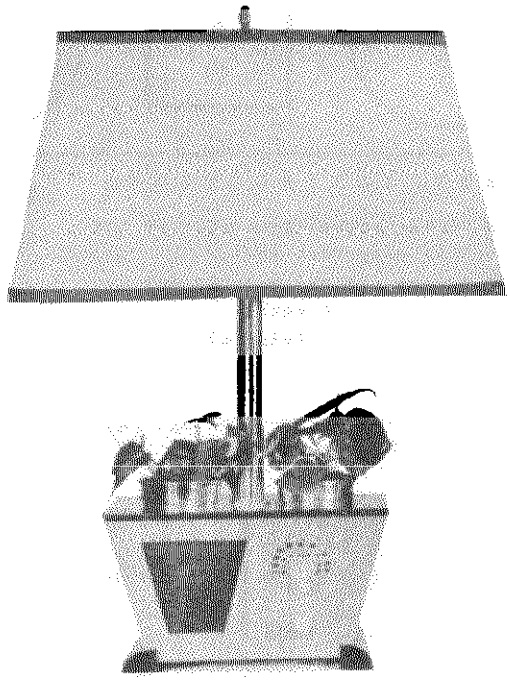




NOTE

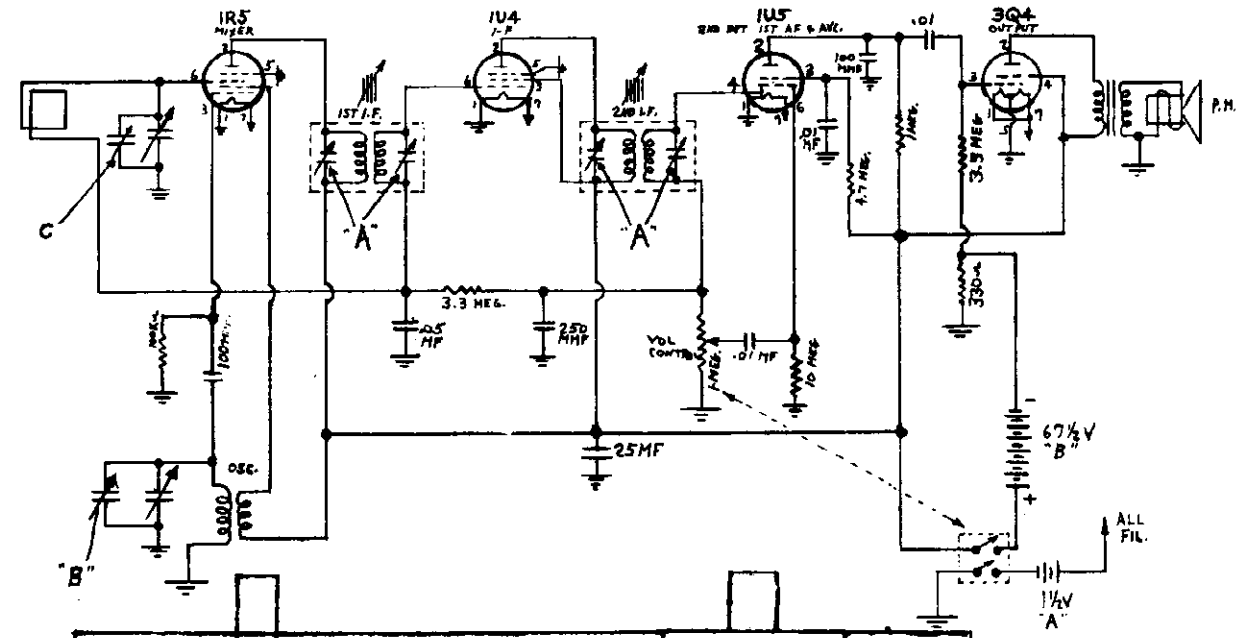
FOR MODEL #200 ONLY
117 VOLTS AC. 60-50 CYCLES

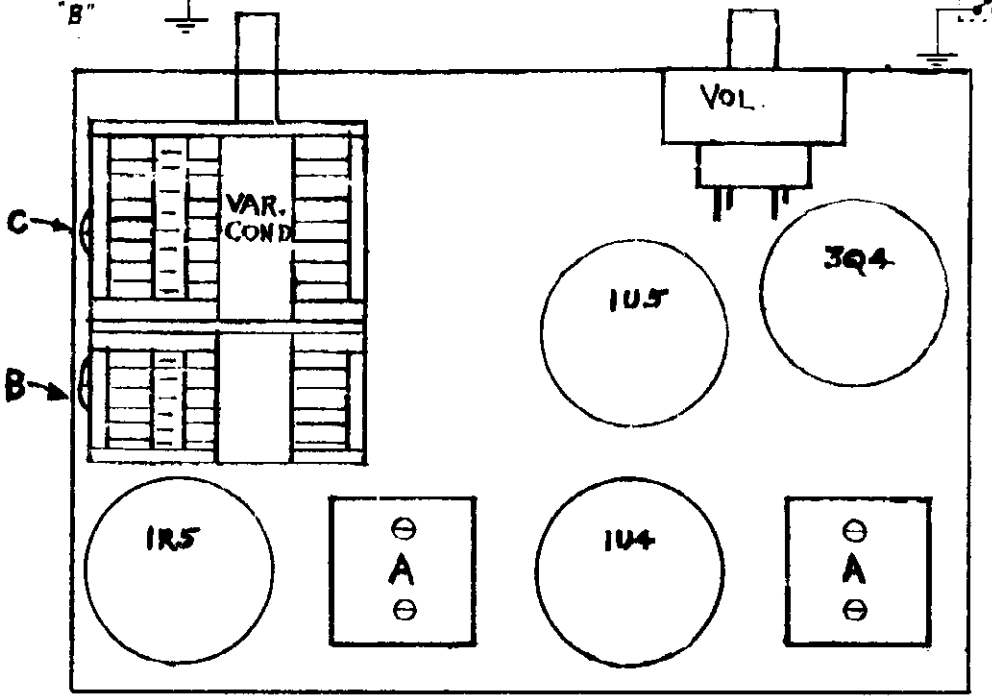
FOR MODEL #200 L-R
117 VOLTS AC-DC



MODEL 200L-R

MODEL 260 SYMPHONY RADIO & TELEV. CORP.





ALIGNMENT INSTRUCTIONS

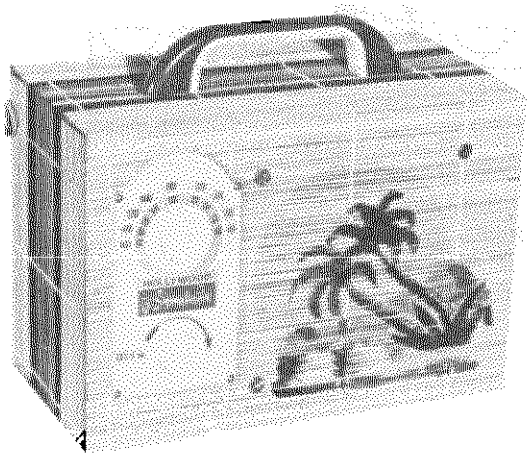
Keep the gain of the signal generator as low as possible on all alignment work.

IMPORTANT. The volume control must be set at max. gain on all alignment work.

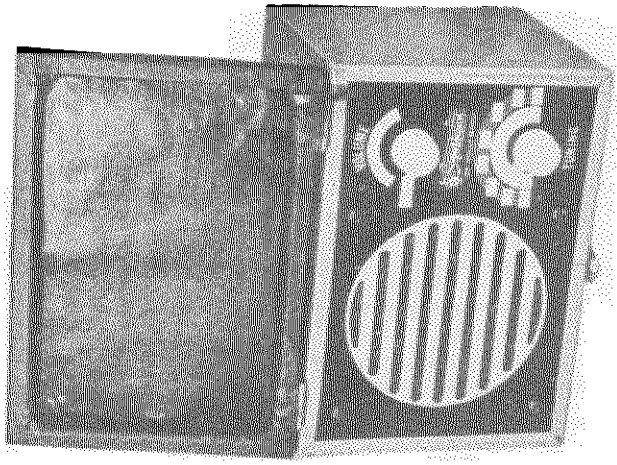
1. Turn variable condenser fully closed.
2. Connect signal generator through A.1-MFD.Cond. and connect to the grid of the 1R5 tube.
3. Align IF's to 455 K.C. max. reading. (A)

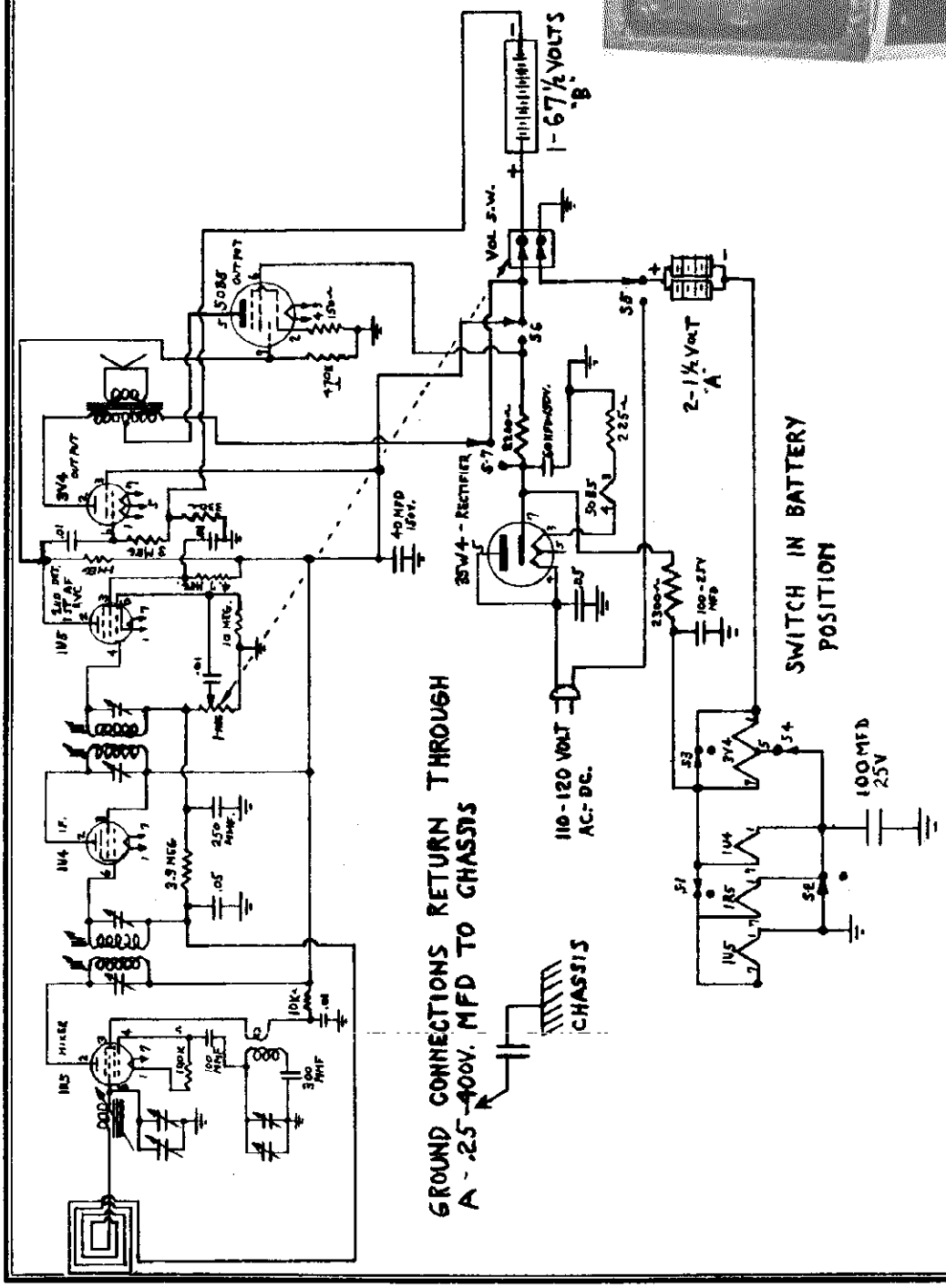
RF CALIBRATION

1. Turn variable condenser fully open.
2. Place signal generator leads near loop antenna.
3. Set signal generator to 1600 K.C.
4. Align osc. section (B) of variable condenser for max. reading.
5. Set signal generator to 1400 K.C.
6. Turn variable condenser to 140 on dial and align RF (C) section of var. cond. for max. reading

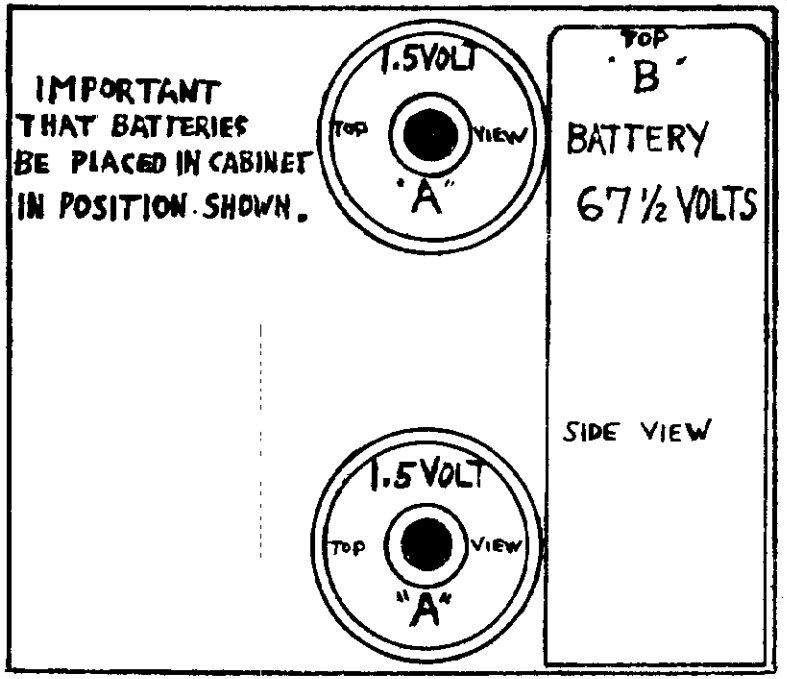


SYMPHONY RADIO & TELEV. CORP. MODEL 348

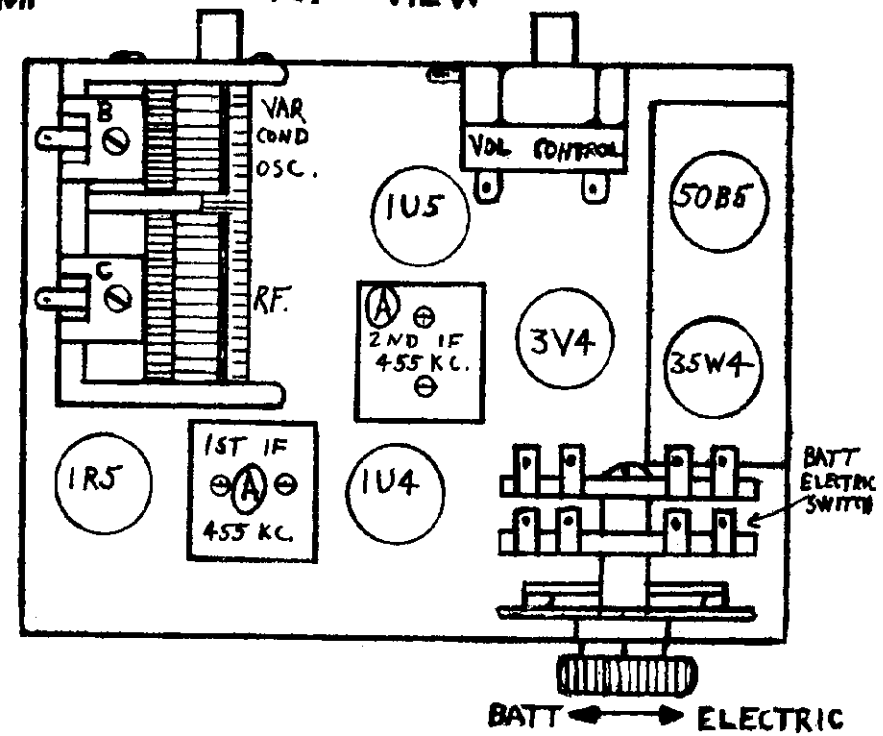




INSIDE VIEW FOR "A" AND "B" BATTERY POSITION



TOP VIEW



ALIGNMENT INSTRUCTIONS

Keep the gain of the signal generator as low as possible on all alignment work.

IMPORTANT. The volume control must be set at max. gain on all alignment work.

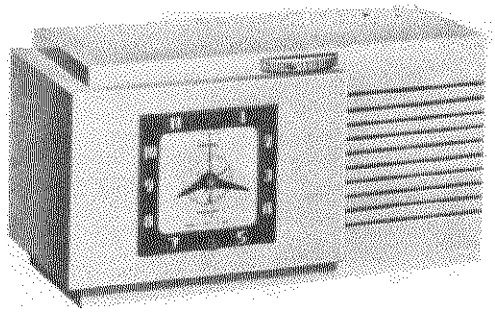
1. Turn variable condenser fully closed.
2. Connect signal generator through A.1-MFD.Cond. and connect to the grid of the 1R5 tube.
3. Align IF's to 455 K.C. max. reading. (A)

RF CALIBRATION

1. Turn variable condenser fully open.
2. Place signal generator leads near loop antenna.
3. Set signal generator to 1600 K.C.
4. Align osc. section (B) of variable condenser for max. reading.
5. Set signal generator to 1400 K.C.
6. Turn variable condenser to 140 on dial and align RF (C) section of var. cond. for max. reading.
7. Set signal generator to 600 K.C. Turn var. cond. to 60 on dial and adjust the iron core loop loading coil screw for max. reading.

TELECHRON INC.

MODEL 8H67
MUSALARM



SPECIFICATIONS

CABINET:

Model	8H67
Color	Fawn
Height	6⅜ inches
Width	11¼ inches
Depth	6 inches

ELECTRICAL RATING (INPUT):

Voltage	105-125 volts, a-c
Frequency	60 cycles
Wattage	35 watts

OPERATING FREQUENCIES:

Intermediate Frequency	455 kc
Broadcast Band	540-1600 kc

POWER OUTPUT:

Undistorted	1.0 watt
Maximum	1.7 watts

LOUDSPEAKER:

Type	Alnico PM
Outside Cone Diameter	4-inch
Voice Coil Impedance (400 cycles)	3.5 ohms

TUBE COMPLEMENT:

Oscillator-Converter	Type 12SA7
I-F Amplifier	Type 12SK7
Detector and 1st Audio	Type 12SQ7
Power Output	Type 50L6GT
Rectifier	Type 35Z5GT

CAUTION — One side of the power line is connected to B–. Avoid any ground connections direct to B–. Use an isolating transformer when making service adjustments with the chassis removed from the cabinet, or be certain that the cord plug is connected to the power line so that B– is on the ground side of the power line.

RADIO CIRCUIT ALIGNMENT

ALIGNMENT FREQUENCIES:

R-F	1620 kc and 1500 kc.
I-F	455 kc

EQUIPMENT REQUIRED:

1. Signal generator, 450 kc to 1620 kc, with 400 cycle tone modulation.
2. A-C voltmeter, 3 volts full scale at 1000. ohms/volt, or vacuum tube voltmeter.
3. 0.05 mfd. paper capacitor.
4. 200 mmfd. mica capacitor.
5. Insulated screwdriver.

ALIGNMENT PROCEDURE–GENERAL:

1. With the tuning scale control wheel turned so that the gang condenser plates are fully meshed, the index should read approximately ⅛-inch to the right of the 550 kc scale calibration mark. If it does not, remove the control wheel from the gang condenser shaft and replace it for correct position. CAUTION—Do not attempt to correct the position by rotating the wheel on the shaft as this will cause the knob to slip.
2. For i-f alignment, it is necessary to remove the chassis from the cabinet.
3. Connect the output voltmeter across the loudspeaker voice coil terminals.
4. Keep radio volume control at maximum and attenuate the signal generator output so that the output voltmeter reading never exceeds 1.0 volt.
5. Connect the capacitor as listed in column 2 between the output "High Side" of the test oscillator and the point of input specified.
6. Figure 3 shows the locations of all trimmers listed in the alignment chart.

ALIGNMENT CHART

Step	Connect Test Oscillator to—	Test Osc. Setting	Dial Drum Setting	Adjust Trimmers for Maximum Output
1	12SK7 grid (4) in series with 0.05 mfd. cap.	455 kc	1600 kc	2nd i-f trans. trimmers, C14 and C15
2	12SA7 grid (8) in series with 0.05 mfd. cap.	455 kc	1600 kc	1st i-f trans. trimmers, C8 and C9
3	Antenna Post in series with 200 mmfd. cap.	1620 kc	(Full Open)	C4 (oscillator)
4	Antenna Post in series with 200 mmfd. cap.	1500 kc	1500 kc	C3 (antenna)

STAGE GAIN AND VOLTAGE CHECKS

Stage gain measurements by vacuum tube voltmeter or similar measuring devices may be used to check circuit performance and isolate trouble. The gain values listed may have tolerances of 20%. Readings should be taken with low signal input so that AVC is not effective.

(1) R-F and I-F Stage Gains

Antenna Post to 12SA7 Grid	2 at 1000 kc
12SA7 Grid to 12SK7 Grid	50 at 455 kc
12SK7 Grid to 12SQ7 Diode Plate	70 at 455 kc

(2) Audio Gain
.15 volts at 400 cycles across the volume control (R11) with control set at maximum will give approximately ½-watt output across the loudspeaker, LS1, voice coil.

(3) Oscillator Grid Bias
D-C voltage developed across the oscillator grid leak (R1) averages 7.0 volts at 1000 kc.

(4) Socket Pin Voltages
Figure 2 shows voltages from all tube pins to B–. Voltage readings much higher or lower than those specified may help localize defective components or tubes.

MODEL 8H67

MUSALARM

TELECHRON INC.

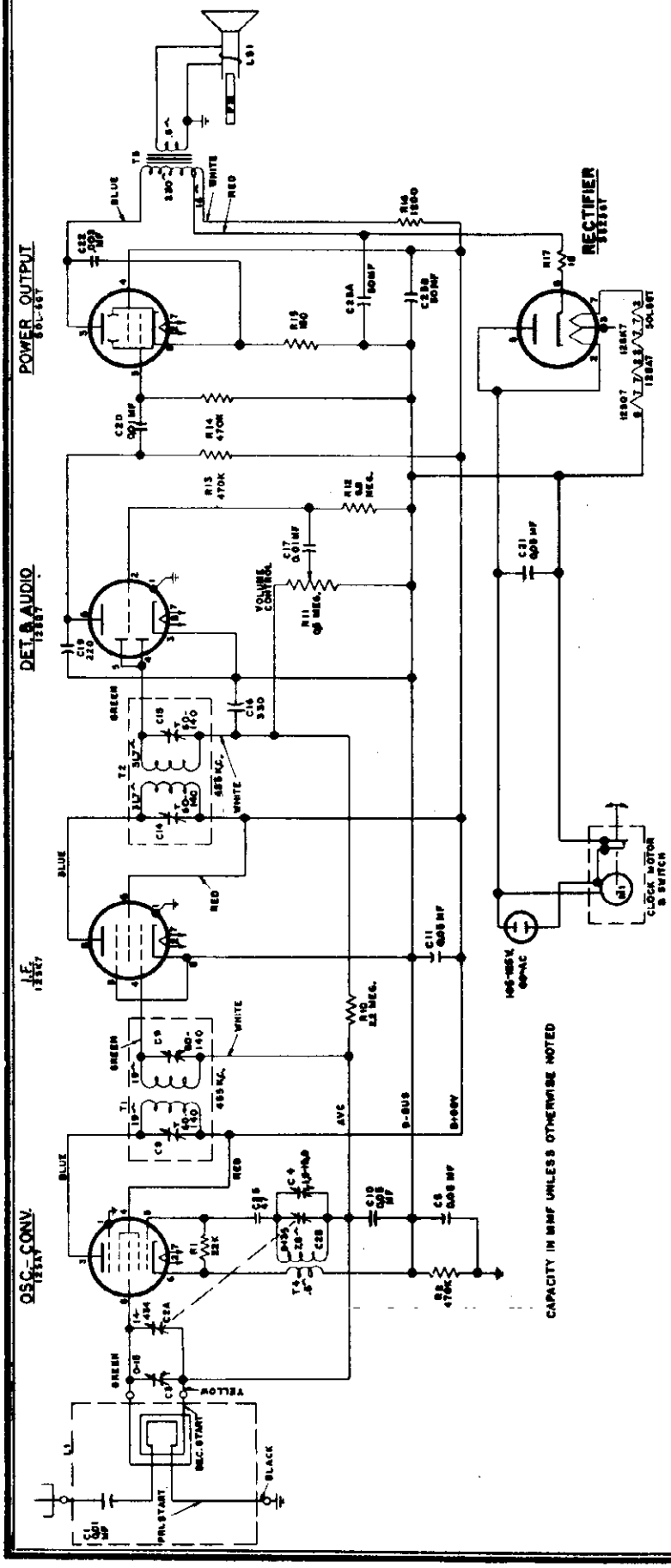


FIG. I - SCHEMATIC DIAGRAM MODEL 8H67

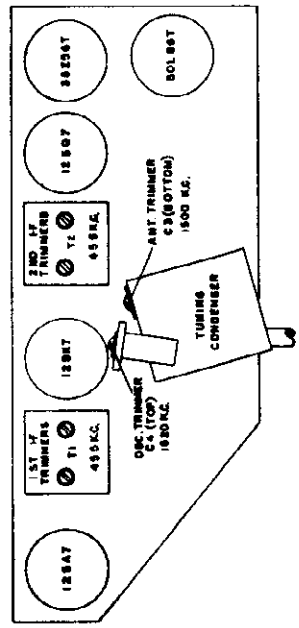


FIG. 3 - TUBE & TRIMMER LOCATION (TOP VIEW)

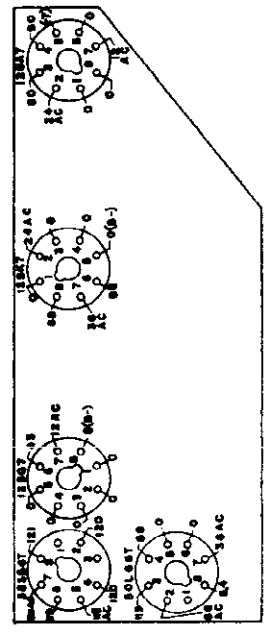
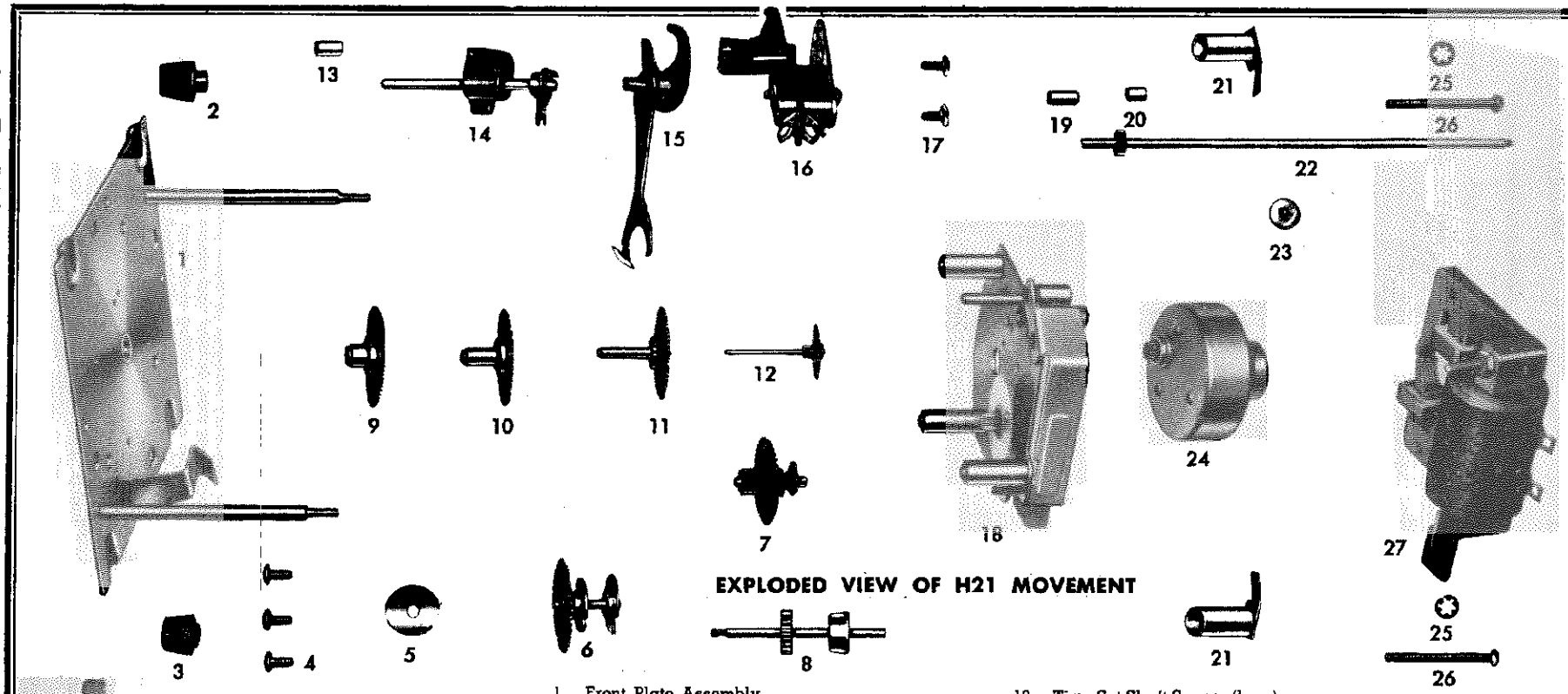
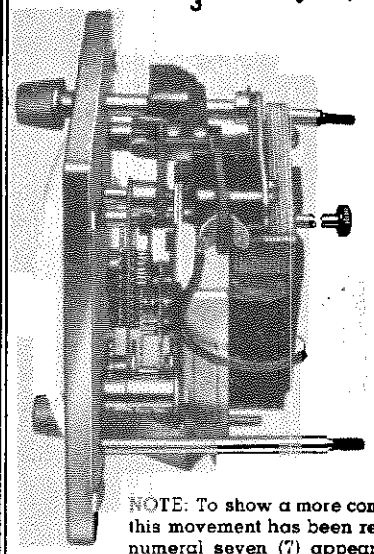


FIG. 2 - SOCKET VOLTAGES (BOTTOM VIEW) TO B-BUS
DC MEASURED WITH 20,000 OHM/VOLT METER
AC MEASURED WITH VACUUM TUBE METER



EXPLODED VIEW OF H21 MOVEMENT



NOTE: To show a more complete and detailed view this movement has been reversed so that the bezel numeral seven (7) appears in the normal twelve (12) o'clock position.

1. Front Plate Assembly
2. Switch Knob
3. Alarm Set Knob
4. Front Plate Screws
5. Cam Shaft Washer
6. Cam Shaft Assembly
7. Intermediate Gear Assembly
8. Alarm Set Shaft Assembly
9. Alarm Hand Sleeve Assembly
10. Hour Hand Sleeve Assembly
11. Minute Hand Sleeve Assembly
12. Sweep Second Shaft Assembly
13. Switch Shaft Spacer
14. Switch Shaft Assembly
15. Switch Lever Assembly
16. Switch Assembly
17. Switch Bracket Screws
18. Base Plate Assembly
19. Time Set Shaft Spacer (long)
20. Time Set Shaft Spacer (short)
21. Spreader Posts
22. Time Set Shaft Assembly
23. Time Set Knob
24. Rotor Unit M1630
25. #1204 Lockwashers
26. Field Screws
27. Field & Coil Assembly

"Vistac" has been applied to the following parts of the clock movement:

1. Time set shaft before assembling, and time set shaft spacers where they touch front plate and base plate.
2. Base plate stud where the switch lever touches it.
3. Both ends of the shaft for the intermediate gear and shaft assembly.
4. Switch lever assembly where it touches the front plate.

If it is necessary to replace any of the above parts, a very small amount of "Vistac" should be applied.

MODEL 8H67
MUSALARM

TELECHRON INC.

UNIVERSAL RADIO REPLACEMENT PARTS

CAT. NO.	SYMBOL	DESCRIPTION
UCC-623	C22	CAPACITOR—.003 mfd., 600 v., paper
UCC-630	C1, 17, 20	CAPACITOR—.01 mfd., 600 v., paper
UCC-635	C5, 10, 11, 21	CAPACITOR—.05 mfd., 600 v., paper
UCU-036	C19	CAPACITOR—220 mmfd., mica
UCU-040	C16	CAPACITOR—330 mmfd., mica
UCW-020	C25	CAPACITOR—47 mmfd., ceramic
UOP-418	LS1	SPEAKER—4-inch PM speaker
URD-029	R15	RESISTOR—150 ohms, ½ w., carbon
URD-081	R1	RESISTOR—22,000 ohms, ½ w., carbon
URD-113	R2, 13, 14	RESISTOR—470,000 ohms, ½ w., carbon
URD-129	R10	RESISTOR—2.2 meg., ½ w., carbon
URD-141	R12	RESISTOR—6.8 meg., ½ w., carbon
URF-051	R16	RESISTOR—1200 ohms, 2 w., carbon

NOTE: See page 1 for tube complement

SPECIALIZED RADIO REPLACEMENT PARTS

CAT. NO.	SYMBOL	DESCRIPTION
RAB-056	L1	BACK—Cabinet back cover (includes loop antenna)
RAU-022		CABINET—Plastic cabinet (Model 61)
RCE-050	C23A, B	CAPACITOR—50 mfd., 150 v.; 50 mfd., 150 v.; dry electrolytic
RCT-021	C2A, B	CONDENSER—Tuning condenser oscillator, and r-f section
RDK-093		KNOB—Volume control knob
RDK-094		KNOB—Tuning dial wheel
RDS-046		SCALE—Dial scale
RJS-003		SOCKET—Octal tube socket (Type 12SA7)
RJS-006		SOCKET—Octal tube socket
RLC-051	T4	COIL—Oscillator coil
RRC-053	R11	POTENTIOMETER—0.5 megohm, volume control
RRW-008	R17	RESISTOR—18 ohms, 1 watt, wire wound
RTL-050	T1	TRANSFORMER—1st I-F transformer
RTL-051	T2	TRANSFORMER—2nd I-F transformer
RTO-036	T3	TRANSFORMER—Output transformer
RWL-009		CORD—Power cord, brown

CLOCK REPLACEMENT PARTS LIST—MODEL No. 8H67

CAT. NO.	SYMBOL	DESCRIPTION
		CASE PARTS
C53X97		Bezel—Venus Bronze
C59X233		Bezel Color Ring—White
C58X15		Crystal
C61X825		Dial
C4X16	3	Knob—Alarm Set
C59X714	2	Knob—Switch
C3X49	23	Knob—Time Set
C59X707		Wire Lead 2 1/16" long
		HANDS
C55X10		Alarm Disc
C32X159		Hour and Minute
C31X48		Sweep Second
		MOVEMENT PARTS
C15X3	9	Alarm Hand Sleeve
C11X11	8	Alarm Set Shaft
C35X39	18	Base Plate Assembly
C17X10	6	Cam Shaft Assembly
C40X252	5	Cam Shaft Washer
C46X12		Coil Only
C45X73	27	Field and Coil
C34X134	1	Front Plate Assembly
C13X11	10	Hour Hand Sleeve
C40X87	7	Intermediate Gear Assembly
C14X17	11	Minute Hand Sleeve

CAT. NO.	SYMBOL	DESCRIPTION
		MOVEMENT PARTS (Cont'd)
C44X38	24	Rotor Unit—M1630
C64X1	4	Screw—Front Plate (3)
C40X201	21	Spreader Post (2)
C16X14	12	Sweep Second Hand Shaft
C40X76	16	Switch Assembly
C40X88	15	Switch Lever Assembly
C59X699	14	Switch Shaft Assembly
C40X265	13	Switch Shaft Spacer
C10X129	22	Time Set Shaft Assembly
C40X220	19	Time Set Shaft Spacer (Long)
C40X219	20	Time Set Shaft Spacer (Short)

PARTS OF SWITCH ASSEMBLY

C40X83		Switch Bracket
C40X26		Lower Contact Block
C40X99		Lower Contact Spring
C40X85		Contact Spring Insulator
C40X138		Upper Contact Spring
C40X84		Upper Contact Block
C1X43		No. 4-40 Hex Nut
C1X68		No. 4-40 x 1/4" Rd. Hd. M/S

CLOCK INSTRUCTIONS

1. CONTACT ADJUSTMENT

A. Set switch to "Alarm" position so that cam follower rests on timing cam. Contacts shall be adjusted to .017" min. gap.
B. With switch in "Off" position, contacts shall remain open as in "A" and there shall be clearance between cam follower and cam.
C. With switch in "On" position, contacts shall be closed.
D. Set switch to "Alarm" position, turn alarm set knob until cam follower drops into slot of timing cam. The contacts shall be closed.
E. Check for proper contact pressure by depressing lower contact strip, using a small pointed tool. If upper contact strip follows the lower a noticeable amount before the contacts separate, the pressure is sufficient.
F. To insure that contacts close, connect a small lamp in series with the switch assembly when testing.

2. TIMING

A. Set minute and hour hands to 12 o'clock.
B. Set timer dial so that the 12 o'clock mark lines up with small line on the dial. In this position the indicator on the hour hand should also line up with the line on the dial.
C. Adjust timer for contact closure at 6:55 o'clock when dial is set for alarm to operate at 7:00 o'clock. On repeat tests the contacts shall close at 6:55, plus or minus 3 minutes. At all other settings, the contacts shall close within 12 minutes ahead or 2 minutes after the time for which the dial is set.

3. VIBRATOR ADJUSTMENT

A. Vibrator shall start buzzing 10 minutes plus or minus 5 minutes after contact closure occurs.
B. When vibrator is in "Shut-off" position the shut-off spring shall lift the vibrator sufficiently above the cam, so that the cam will not contact vibrator in any position.
C. Adjust vibrator for maximum sound.
D. Vibrator shall be shut off before completion of buzzing period.

4. NOISE PREVENTION

Vistac has been applied to such parts as are specified in notes under exploded view of movement. When the parts specified are replaced, a very small amount of Vistac should be applied.

5. GENERAL

A. Alarm set knob to be sufficiently tight on shaft to permit setting of "Alarm" disc in clockwise or counter-clockwise direction, but shall loosen when cam is turned against vibrator.
B. Switch knob shall turn freely.
C. Alarm disc shall not rub against the dial in any position. Prongs must be fully seated in alarm set groove.

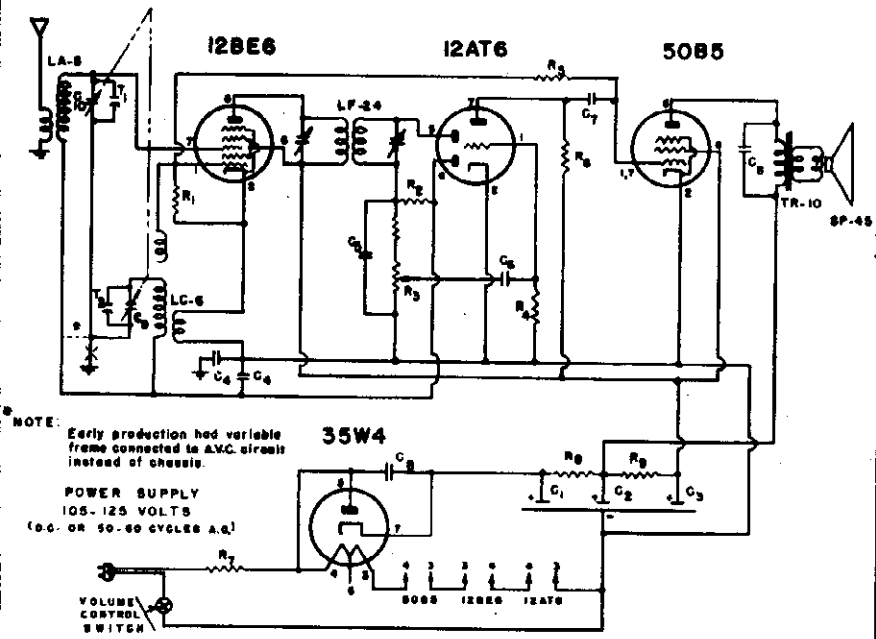
6. CAUTION

A. This radio alarm clock will operate satisfactorily only on a circuit supplied with regulated alternating current of the voltage and frequency stamped on name plate.
B. If clock loses time, or hour and minute hands fail to rotate, check clearance of time setting shaft from case back or any obstruction behind the Musalarm. This shaft must be allowed to rotate while clock is in operation.
C. It is common practice for people to disconnect their radios during a thunder storm, or to use the outlet for a vacuum cleaner, or when moving furniture in housecleaning. The clock will, of course, stop when disconnected and start immediately when plugged in again. However, it will be necessary to reset the clock to the proper time if disconnected for any reason.

TELE-TONE RADIO CORP.

MODEL 165 Early,
CHASSIS AD
MODEL 148,
CHASSIS S

MODEL 165 Early



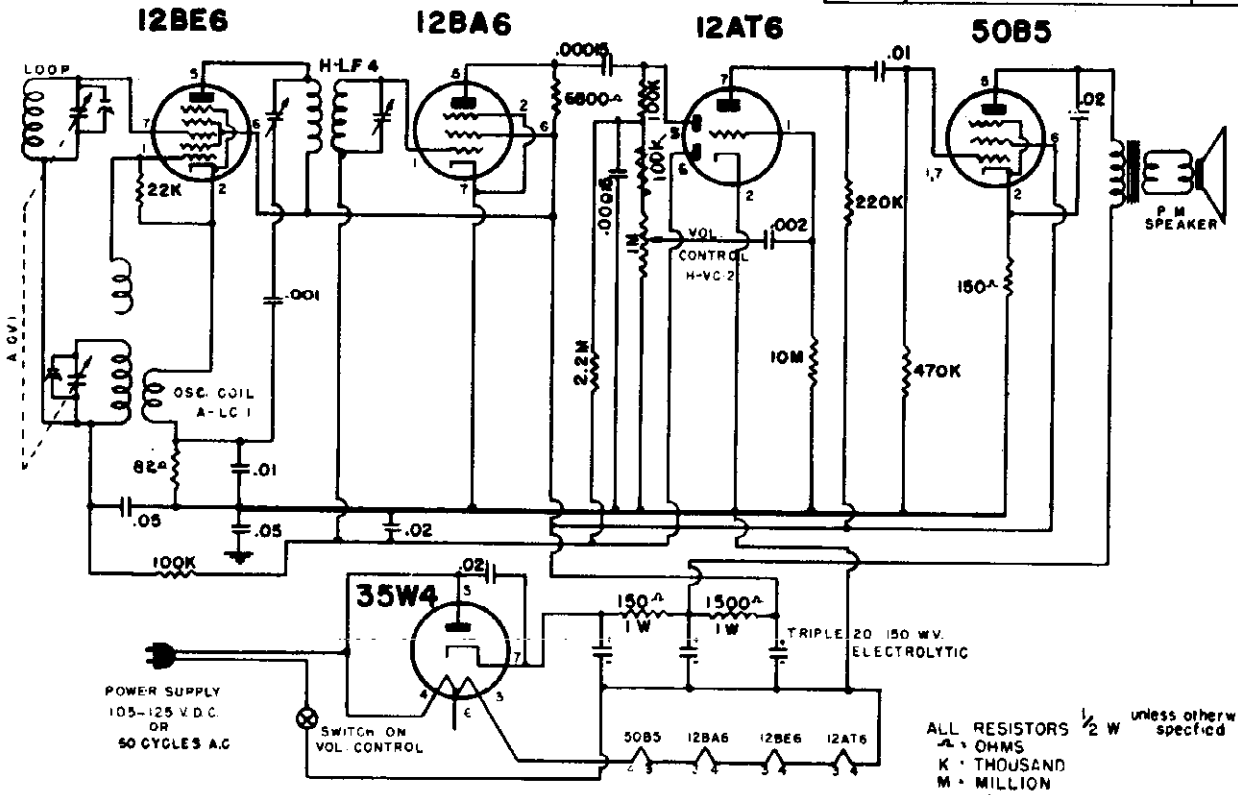
*NOTE: Early production had variable frame connected to A.V.C. circuit instead of chassis.

I.F 455 K.C.
FREQ RANGE - 1620 KC.-532.5 KC.
ALIGN T_2 - 1620 KC.
T_1 - 1400 KC.
TRACK - 600 KC.

ITEM	DESCRIPTION	PT. NO.
C_1 C_2 C_3	3X20 MFD 150 VOLT ELECTROLYTIC	CE-11
C_4	.05 MFD. 200 VOLT PAPER COND.	CP-508-4
C_5	.00015 MFD. 500 VOLT MICA COND.	CM-151-1
C_6	.002 MFD. 400 VOLT PAPER COND.	CP-202-2
C_7	.005 MFD. 200 VOLT PAPER COND.	CP-508-3
C_8	.02 MFD. 400 VOLT PAPER COND.	CP-203-1
LA-5	ANTENNA COIL	LA-5
LC-6	OSCILLATOR COIL	LC-6
LF-24	I.F. TRANSFORMER	LF-24
R_1	22,000 OHMS 2 W. RESISTOR	RC-223-2
R_2	4.7 MEG. OHMS 1/2 W. RESISTOR	RC-475-1
R_3	2 MEG. VOL CONTROL-100K STOP	VC-11
R_4	10 MEG. OHMS 1/2 W. RESISTOR	RC-106-1
R_5	330,000 OHMS 1/2 W. RESISTOR	RC-334-1
R_6	220,000 OHMS 1/2 W. RESISTOR	RC-224-1
R_7	33 OHMS 2 W. WIRE WOUND RES.	RW-330-8
R_8	120 OHMS 1/2 W RESISTOR	RC-121-2
R_9	1500 OHMS 1/2 W. RESISTOR	RC-152-1
SP-45	SPEAKER	SP-45
TR-10	OUTPUT TRANSFORMER	TR-10
C_9 C_{10}	VARIABLE CONDENSER	CV-14
T_1 T_2	TRIMMERS	

CHASSIS SERIES "AD"

MODEL 148



CHASSIS SERIES "S"

ALL RESISTORS 1/2 W unless otherwise specified
Ω - OHMS
K - THOUSAND
M - MILLION
ALL CONDENSERS IN MICRO-FARAD

I.F. - 455 KC
FREQ RANGE - 530-1700 KC
ALIGN AT - 1500 KC
TRACK AT - 600 KC

MODEL 165 Early
CHASSIS AD

TELE-TONE RADIO CORP.

ELECTRICAL SPECIFICATIONS

Power Supply ..... 105-125 Volts D.C. or 50-60 Cycles A.C. 30 Watts

Frequency Range ..... 532.5 to 1620 kc.

Intermediate Freq. ..... 455 kc.

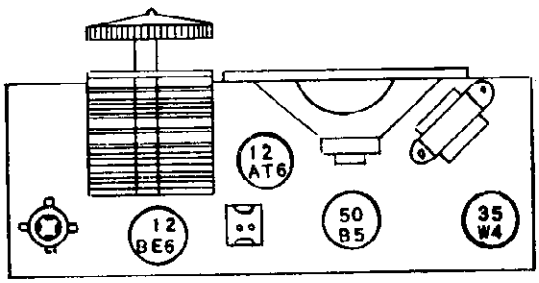
Tuning ..... Two gang capacitor

Speaker ..... 4 inch PM 3.5 ohm voice coil impedance

Power Output ..... 1 watt undistorted 1.5 watt maximum

Sensitivity ..... 800 Microvolts at 50 milliwatts Output

Selectivity ..... 120 kc broad at 1000 times signal at 1000 kc.



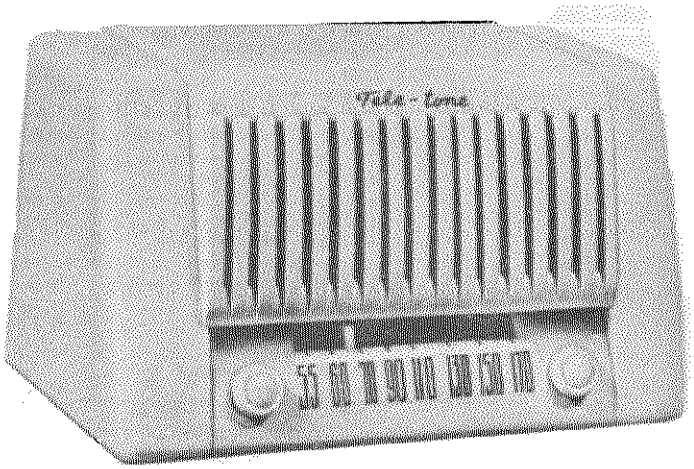
Remove back to replace tubes

ALIGNMENT PROCEDURE

- Output meter across 3.5 ohm output load.
- Volume control at maximum for all adjustments.
- Align for maximum output. Reduce input as needed to keep output near 0.4 volts.

SIGNAL GENERATOR				*SETTING TUNER*	*ADJUST TRIMMERS TO MAXIMUM OUTPUT (in order shown)*
Frequency	*Coupling Factor*	*Connection to Receiver*	*Ground Connection*		
455 kc	.1 mfd	12BE6 Grid	B—	Rotor full open (Plates out of mesh)	Input and output trimmers on IF cans
1620 kc	.1 mfd	12BE6 Grid	B—	Rotor full open (Plates out of mesh)	Oscillator trimmer T2
1400 kc	75 mmf	Hank	B—	1400 kc	Antenna trimmer T1

TELE-TONE RADIO CORP. MODELS 159 Early, 159 Late
CHASSIS AA, AB



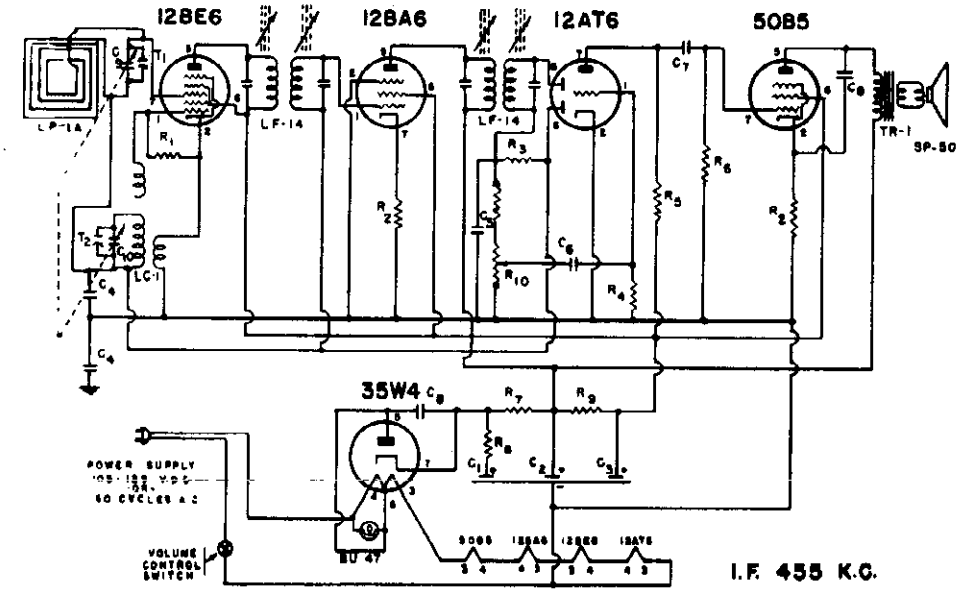
MODEL 159 EARLY

ITEM	DESCRIPTION	PART NO
C_1 C_2 C_3	3 X 20 MFD - 150 VOLT ELECTROLYTIC	CE - 11
C_4	.05 MFD - 400 VOLT PAPER COND.	CP - 503-1
C_5	.00015 MFD - 500 VOLT MICA COND.	CM - 151-1
C_6	.002 MFD - 200 VOLT PAPER COND.	CP - 202-4
C_7	.01 MFD - 400 VOLT PAPER COND.	CP - 103-1
C_8	.02 MFD - 400 VOLT PAPER COND.	CP - 203-1
C9, C10	VARIABLE CONDENSER	CV - 10
LF-14	I.F. TRANSFORMER	LF-14
LP-1A	LOOP	LP-1A
R_1	22,000 OHMS ½ W. RESISTOR	RC-223-1
R_2	150 OHMS ½ W. RESISTOR	RC-151-1
R_3	2.2 MEG. ½ W. RESISTOR	RC-225-1
R_4	10 MEG. ½ W. RESISTOR	RC-106-1
R_5	220,000 OHMS ½ W. RESISTOR	RC-224-1
R_6	470,000 OHMS ½ W. RESISTOR	RC-474-1
R7	150 OHMS 1 W. RESISTOR	RC-151-4
R_8	18 OHMS ½ W. RESISTOR	RC-180-2
R_9	1500 OHMS ½ W. RESISTOR	RC-152-1
R_{10}	1 MEG. VOL. CONTROL with 100 K STOP	VC-9
SP-50	SPEAKER	SP-50
TR-1	OUTPUT TRANSFORMER	TR-1
LC-1	OSCILLATOR COIL	LC-1
T1, T2	TRIMMERS ON VARIABLE	
BU-47	#47 PILOT LIGHT	BU-47

FREQ. RANGE - 530 - 1700 KC.
ALIGN T_2 - 1700 K.C.
T_1 - 1500 K.C.
TRACK AT - 600 K.C.

Late series have component changes as follows:

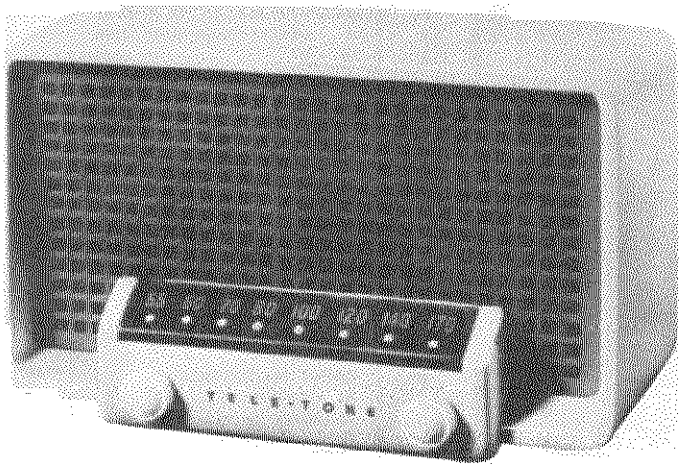
ITEM	DESCRIPTION	PART NO
LP-8	LOOP	LP-8
R_{10}	1 MEG. VOL CONTROL with 100 K STOP	VC-10
SP-43	SPEAKER	SP-43



CHASSIS SERIES "A A"

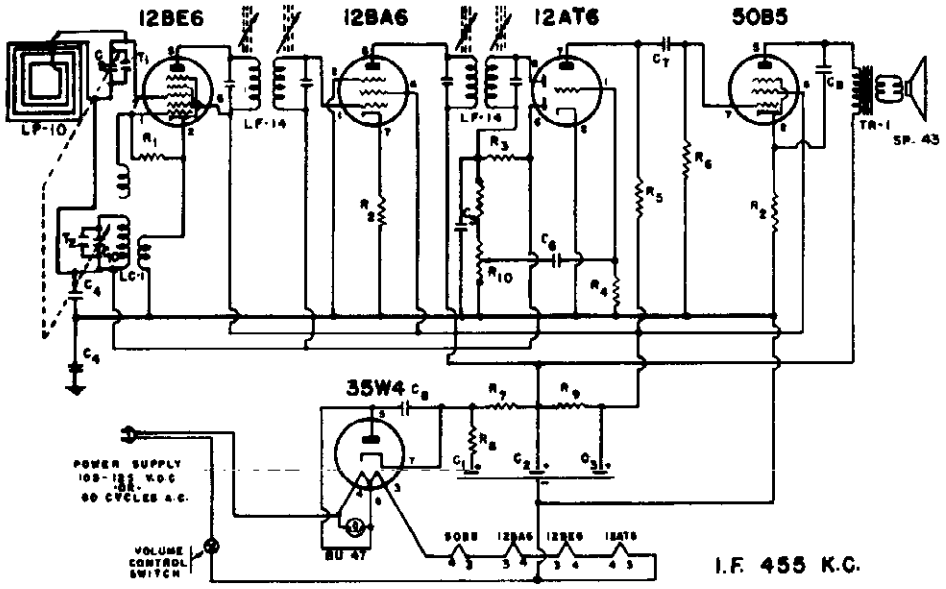
MODEL 160
CHASSIS Y

TELE-TONE RADIO CORP.



ITEM	DESCRIPTION	PART NO.
C_1 C_2 C_3	3 x 20 MFD - 150 VOLT ELECTROLYTIC	CE - 11
C_4	.05 MFD - 400 VOLT PAPER COND	CP - 503-1
C_5	.00015 MFD - 500 VOLT MICA COND.	CM - 151-1
C_6	.002 MFD - 200 VOLT PAPER COND.	CP - 202-4
C_7	.01 MFD - 400 VOLT PAPER COND	CP - 103-1
C_8	.02 MFD 400 VOLT PAPER COND.	CP - 203-1
C9, C10	VARIABLE CONDENSER	CV - 10
LF-14	I.F. TRANSFORMER	LF-14
LP-10	LOOP	LP-10
R_1	22,000 OHMS ½ W. RESISTOR	RC - 223 - 1
R_2	150 OHMS ½ W. RESISTOR	RC - 151 - 1
R_3	2.2 MEG ½ W. RESISTOR	RC - 225 - 1
R_4	10 MEG ½ W. RESISTOR	RC - 106 - 1
R_5	220,000 OHMS ½ W. RESISTOR	RC - 224 - 1
R_6	470,000 OHMS ½ W RESISTOR	RC - 474 - 1
R7	150 OHMS 1 W. RESISTOR	RC - 151 - 4
R_8	18 OHMS ½ W. RESISTOR	RC - 180 - 2
R_9	1500 OHMS ½ W. RESISTOR	RC - 152 - 1
R_{10}	1 MEG. VOL CONTROL with 100 R STOP	VC - 8
SP-43	SPEAKER	SP - 43
TR-1	OUTPUT TRANSFORMER	TR - 1
LC-1	OSCILLATOR COIL	LC - 1
T1, T2	TRIMMERS ON VARIABLE	
BU-47	#47 PILOT LIGHT	BU - 47

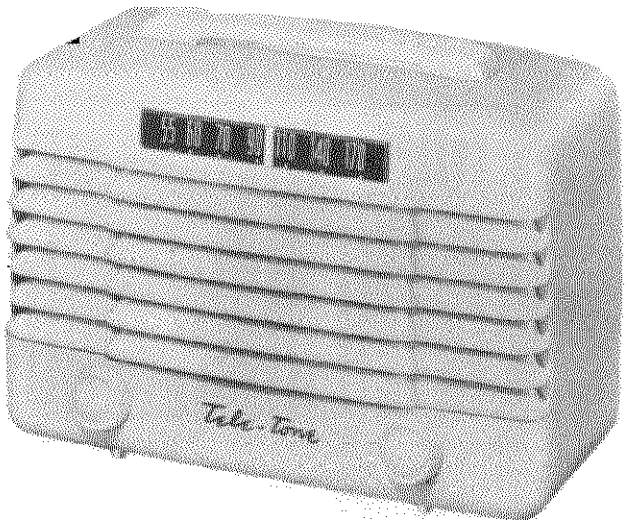
FREQ. RANGE - 530 - 1700 KC
ALIGN T_2 - 1700 K.C.
T_1 - 1500 K.C.
TRACK AT - 600 K.C.



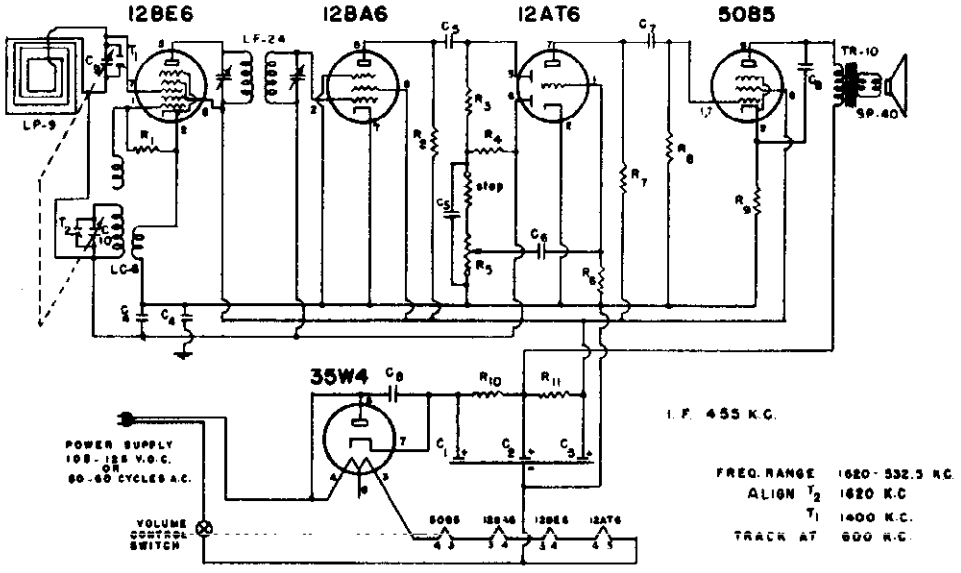
CHASSIS SERIES "Y"

TELE-TONE RADIO CORP.

MODEL 166 Early
CHASSIS AE



ITEM	DESCRIPTION	PART NO.
C_1 C_2 C_3	3-20 MFD 150 VOLT ELECTROLTIC	CE-11
C_4	.05 MFD 200 VOLT PAPER COND.	CP-503-4
C_5	.00015 MFD. 500 VOLT MICA COND.	CM-151-1
C_6	.002 MFD. 400 VOLT PAPER COND.	CP-202-2
C_7	.01 MFD. 150 VOLT MOLDED COND.	CP-103-5
C_8	.02 MFD. 400 VOLT PAPER COND.	CP-203-1
C_9 C_{10}	VARIABLE CONDENSER	CV-10
LC-6	OSCILLATOR COIL	LC-6
LF-24	I.F. TRANSFORMER	LF-24
LP-9	LOOP	LP-9
R_1	22,000 OHMS ½ W. RESISTOR 10%	RC-223-2
R_2	6800 OHMS ½ W. RESISTOR	RC-682-1
R_3	100,000 OHMS ½ W. RESISTOR	RC-104-1
R_4	4.7 MEG. OHMS ½ W. RESISTOR	RC-475-1
R_5	2 MEG. VOL. CONTROL with 100 K stop	VC-12
R_6	10 MEG. OHMS ½ W. RESISTOR	RC-106-1
R_7	220,000 OHMS ½ W. RESISTOR	RC-224-1
R_8	470,000 OHMS ½ W. RESISTOR	RC-474-1
R_9	150 OHMS ½ W. RESISTOR	RC-151-1
R_{10}	150 OHMS 1 W. RESISTOR	RC-151-4
R_{11}	1500 OHMS 1 W. RESISTOR	RC-152-4
SP-40	SPEAKER	SP-40
TR-10	OUTPUT TRANSFORMER	TR-10
T_1 T_2	TRIMMERS ON VARIABLE	

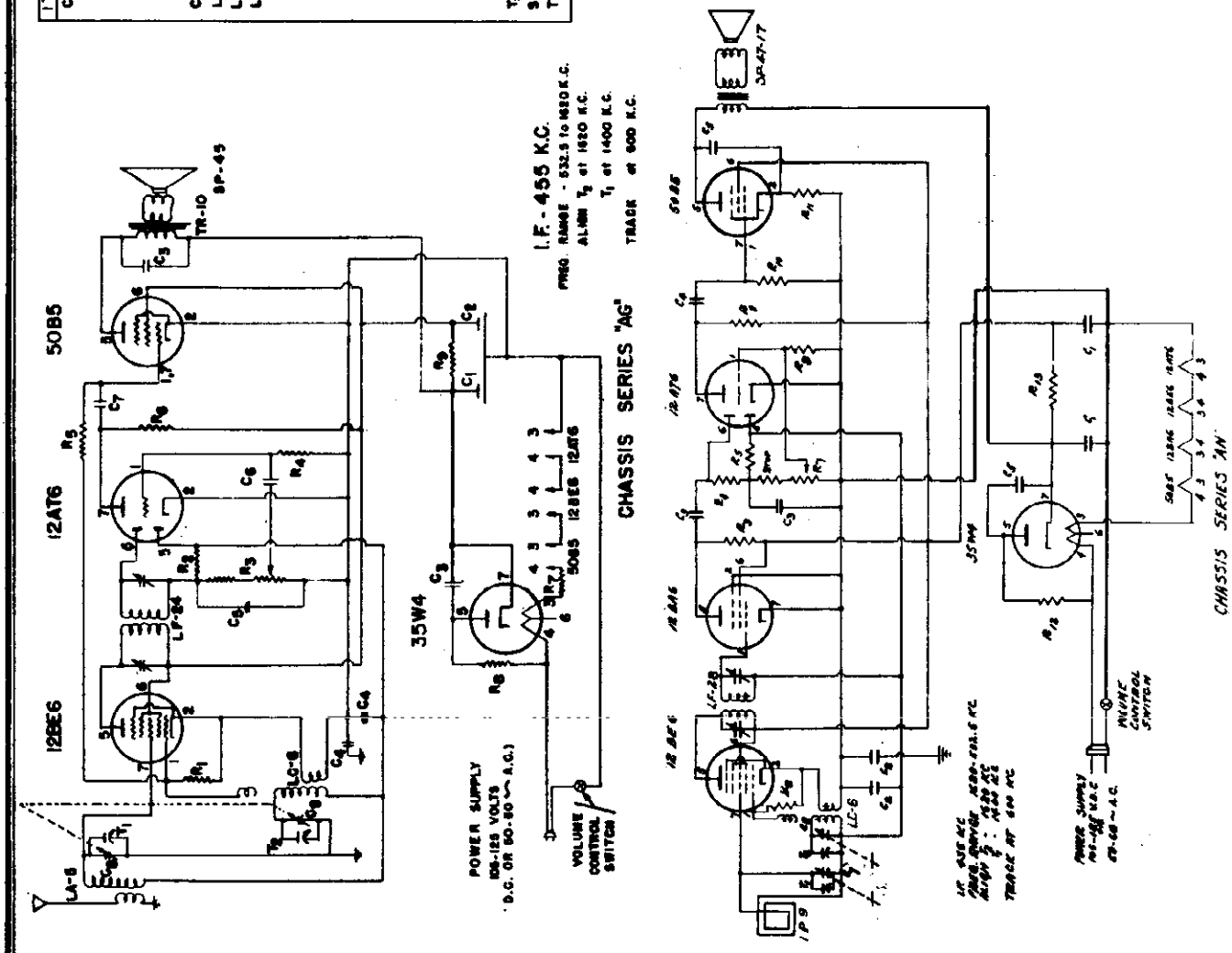


CHASSIS SERIES "AE"

TELE-TONE RADIO CORP.

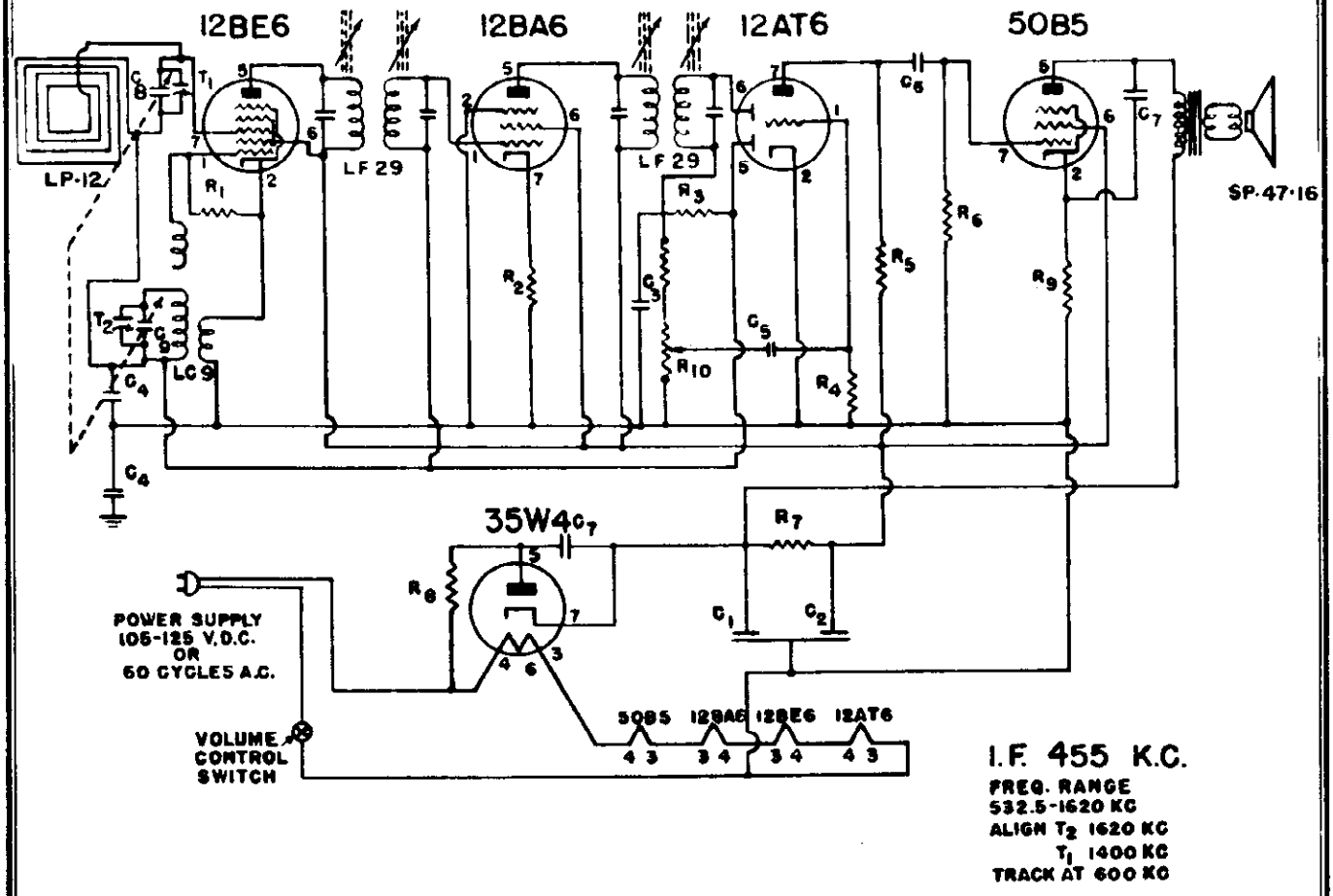
ITEM	DESCRIPTION	PART NO.
C_1, C_2	2 X 40 MFD. 150 VOLT ELECT.	CE-15
C_3	.02 MFD. 400 V. PAPER COND.	CP-203-1
C_4	.05 MFD. 200 V. PAPER COND.	CP-503-4
C_5	.0005 MFD. 500 V. MICA COND.	CM-151-1
C_6	.002 MFD. 400 V. PAPER COND.	CP-202-2
C_7	.005 MFD. 200 V. PAPER COND.	CP-502-3
C_8, C_9	VARIABLE CONDENSER	CV-14
LC-6	OSCILLATOR COIL	LC-6
LA-6	ANTENNA COIL	LA-6
LF-24	I. F. TRANSFORMER	LF-24
R_1	10,000 OHMS $\frac{1}{2}$ W. 10%	RC-153-2
R_2	4.7 MEGOHMS $\frac{1}{2}$ W. RESISTOR	RC-479-1
R_3	2 MEG. VOL. CONTROL, LOOK STOP	VC-11
R_4	10 MEGOHMS $\frac{1}{2}$ W. RESISTOR	RC-106-1
R_5	330,000 OHMS $\frac{1}{2}$ WATT	RC-334-1
R_6	220,000 OHMS $\frac{1}{2}$ WATT	RC-224-1
R_7	39 OHMS 1 WATT RESISTOR	RC-390-4
R_8	18 OHMS $\frac{1}{2}$ W. RESISTOR	RC-180-1
R_9	2200 OHMS 1 W. RESISTOR	RC-222-4
T_1, T_2	TRIMMERS	
SP-45	SPEAKER	SP-45
TR-10	OUTPUT TRANSFORMER	TR-10

ITEM	DESCRIPTION	PART NO.
C-1	.01 MF 1500 V. ELECT. COND.	CE-15
C-2	.05 MF 200 V. PAPER -20%	CP-503-4
C-3	150 MMF MICA COND	CM-151-1
C-4	.005 MF 200 V. PAPER +20%	CP-502-3
C-5	.02 MF 400 V. PAPER +20%	CP-203-1
C-6	.002 MF 400 V. PAPER MIN.	CP-202-2
C-7, C-8	VARIABLE CONDENSER	CV-14
T-1, T-2	TRIMMERS ON VARIABLES	CV-10
R-2	22,000 Ω ½ W. -10%	RC-223-4
R-3	6800 Ω ½ W. -20%	RC-682-1
R-4	100,000 Ω ½ W. -20%	RC-104-1
R-5	4.7 Meg. ½ W. -20%	RC-475-1
R-7	2 Meg. V.C. WITH 100,000 Ω STOP	VC-12
R-8	10 Meg. ½ W. -20%	RC-106-1
R-9	220,000 Ω ½ W. -20%	RC-224-1
R-10	470,000 Ω ½ W. -20%	RC-474-1
R-11	150 Ω ½ W. -20%	RC-151-1
R-12	18 Ω ½ W. -20%	RC-180-1
R-13	2200 Ω 1 W -20%	RC-222-4
LP-9	ANTENNA LOOP	LP-9
LC-6	OSCILLATOR COIL	LC-6
SP-41-17	4" SPEAKER WITH 45 ms. FIELD	3041-17
LF-24	I.F. TRANSFORMER	LF-24

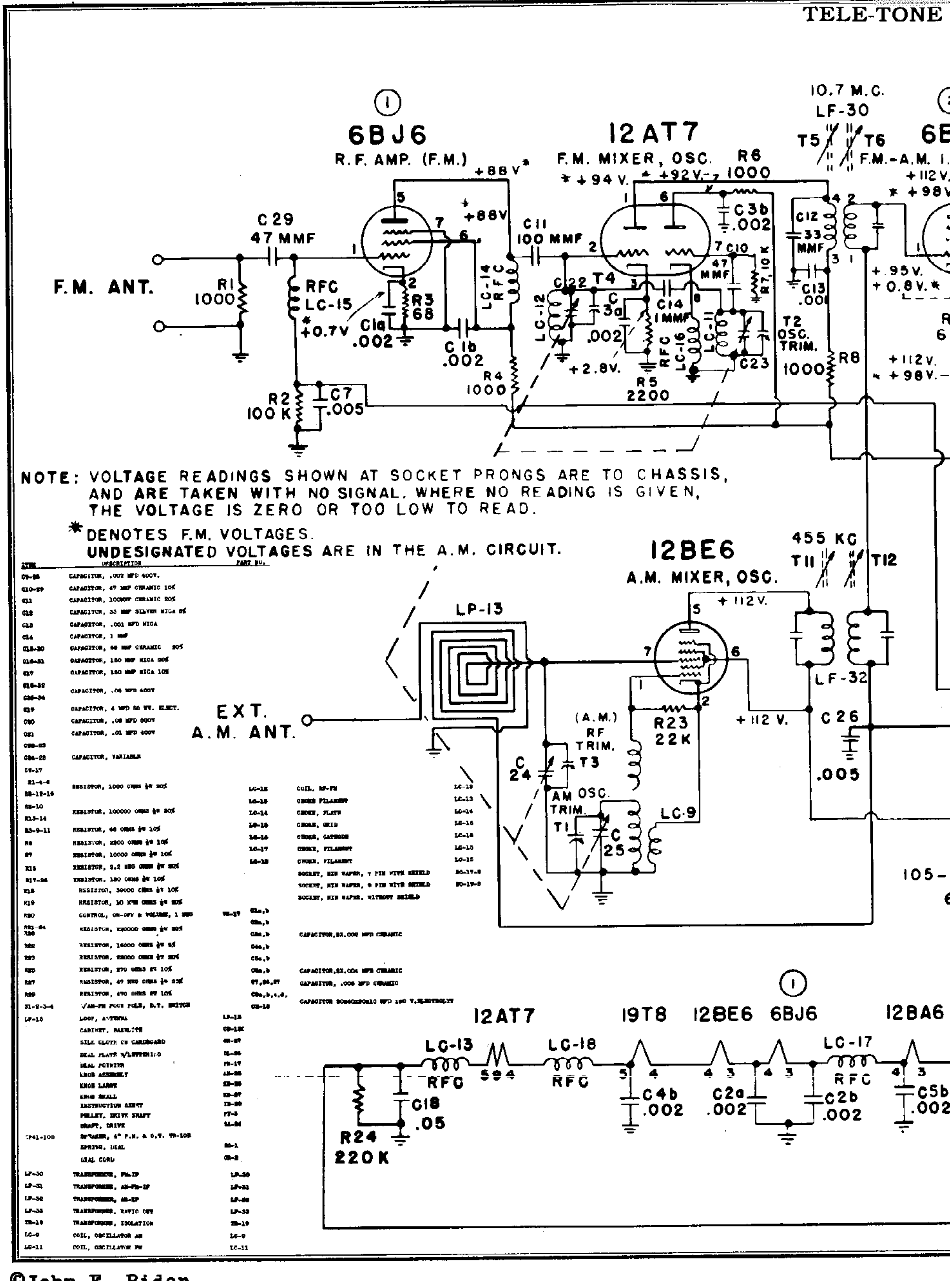


TELE-TONE RADIO CORP.

MODEL 184
CHASSIS AM



ITEM	DESCRIPTION	PART NO
C_1 C_2	40-40-150 V. ELECTROLYTIC CONDENS.	CE-15
C_3	150 MMF MICA CONDENSER	CM-151-1
C_4	.05 MFD 400 V. PAPER CONDENSER	CP-503-1
C_5	.002 MFD 200 V. PAPER CONDENSER	CP-202-4
C_6	.005 MFD 200 V. PAPER CONDENSER	CP-502-3
C_7	.02 MFD 400 V. PAPER CONDENSER	CP-203-1
C_8 C_9	VARIABLE CONDENSER	CV-15
R_1	22,000 OHMS 1/2W RESISTOR	RC-223-1
R_2	180 OHMS 1/2W RESISTOR	RC-181-2
R_3	2.2 MEG 1/2W RESISTOR	RC-225-1
R_4	10 MEG 1/2W RESISTOR	RC-106-1
R_5	220,000 OHMS 1/2W RESISTOR	RC-224-1
R_6	470,000 OHMS 1/2W RESISTOR	RC-474-1
R_7	2200 OHMS 1 W RESISTOR	RC-222-4
R_8	18 OHMS 1/2W ±10% RESISTOR	RC-180-2
R_9	150 OHMS 1/2W RESISTOR	RC-151-1
R_{10}	VOLUME CONTROL	VC-8
LC-9	OSCILLATOR COIL	LC-9
LF-29	I.F. TRANSFORMER	LF-29
LP-12	LOOP	LP-12
SP-47-16	SPEAKER WITH OUTPUT TRANSF. MTD.	SP-47-16
T_1 T_2	TRIMMERS ON VARIABLE	T_1 T_2



NOTE: VOLTAGE READINGS SHOWN AT SOCKET PRONGS ARE TO CHASSIS, AND ARE TAKEN WITH NO SIGNAL. WHERE NO READING IS GIVEN, THE VOLTAGE IS ZERO OR TOO LOW TO READ.

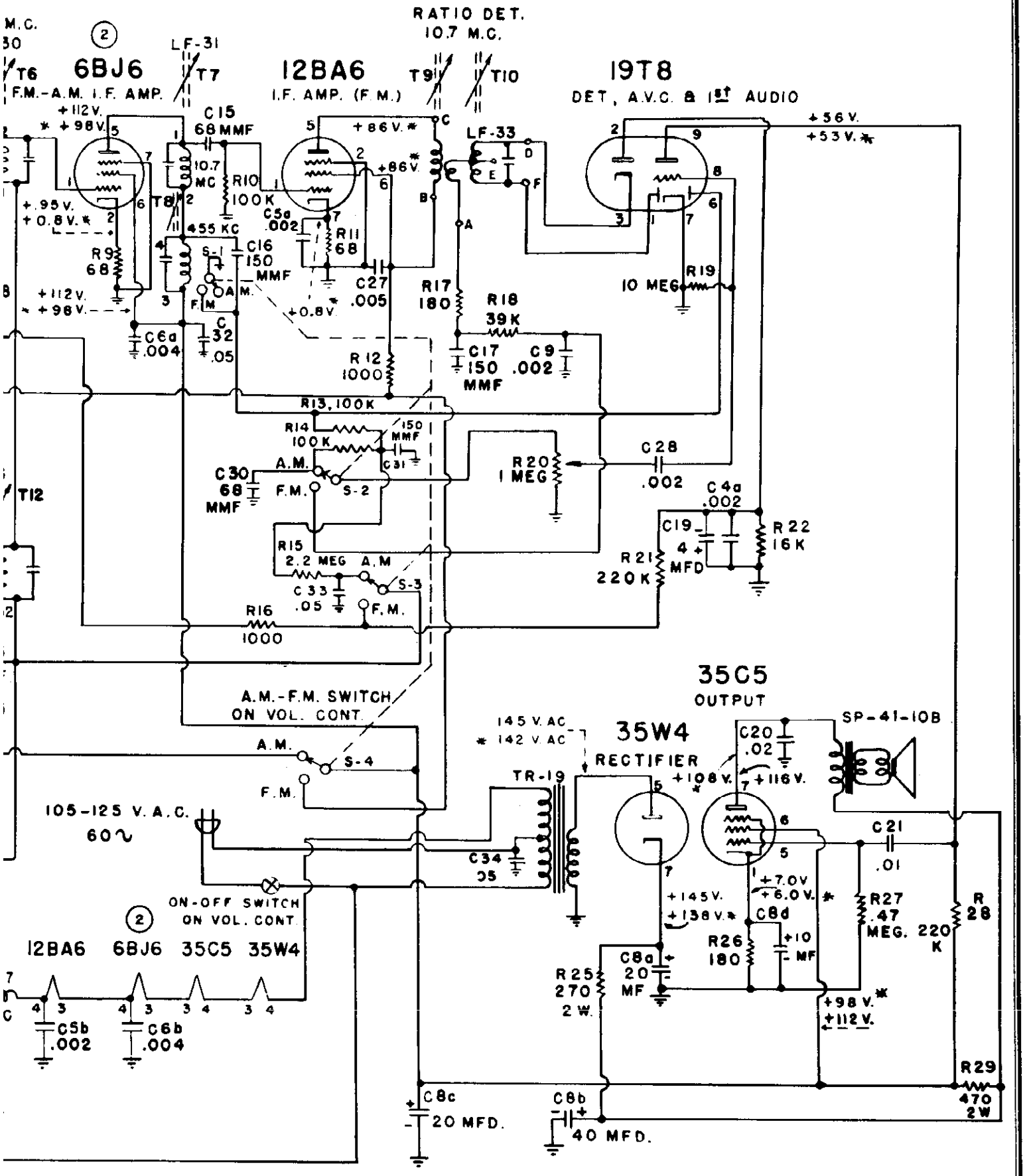
* DENOTES F.M. VOLTAGES.
UNDESIGNATED VOLTAGES ARE IN THE A.M. CIRCUIT.

ITEM	DESCRIPTION	PART NO.
C9-28	CAPACITOR, .002 MFD 400V.	
C10-29	CAPACITOR, 47 MMF CERAMIC 10%	
C11	CAPACITOR, 100MMF CERAMIC 20%	
C12	CAPACITOR, 33 MMF SILVER MICA 5%	
C13	CAPACITOR, .001 MFD MICA	
C14	CAPACITOR, 1 MMF	
C15-30	CAPACITOR, 68 MMF CERAMIC 20%	
C16-31	CAPACITOR, 150 MMF MICA 20%	
C17	CAPACITOR, 150 MMF MICA 10%	
C18-32 C33-34	CAPACITOR, .05 MFD 400V	
C19	CAPACITOR, 4 MFD 50 WV. ELECT.	
C20	CAPACITOR, .05 MFD 600V	
C21	CAPACITOR, .01 MFD 400V	
C22-23 C24-25 C7-37	CAPACITOR, VARIABLE	
R1-4-6 R8-12-16	RESISTOR, 1000 OHMS ½W 20%	
R2-10 R13-14	RESISTOR, 100000 OHMS ½W 20%	
R3-9-11	RESISTOR, 68 OHMS ½W 10%	
R5	RESISTOR, 2200 OHMS ½W 10%	
R7	RESISTOR, 10000 OHMS ½W 10%	
R15	RESISTOR, 2.2 MEG OHMS ½W 20%	
R17-26	RESISTOR, 150 OHMS ½W 10%	
R18	RESISTOR, 39000 OHMS ½W 10%	
R19	RESISTOR, 10 MEG OHMS ½W 20%	
R20	CONTROL, ON-OFF & VOLUME, 1 MEG	VR-19
R21-24 R26	RESISTOR, 220000 OHMS ½W 20%	
R22	RESISTOR, 15000 OHMS ½W 5%	
R23	RESISTOR, 22000 OHMS ½W 20%	
R25	RESISTOR, 270 OHMS 2W 10%	
R27	RESISTOR, 47 MEG OHMS ½W 20%	
R29	RESISTOR, 470 OHMS 2W 10%	
S1-2-3-4	AM-FM FOUR POLE, D.T. SWITCH	
LP-13	LOOP, ANTENNA	LP-13
	CABINET, BAKELITE	CB-13C
	SILK CLOTH ON CARDBOARD	GR-27
	DIAL PLATE W/LETTERING	DL-26
	DIAL POINTER	PN-17
	KNOB ASSEMBLY	AN-26
	KNOB LARGE	KB-26
	KNOB SMALL	KB-27
	INSTRUCTION SHEET	IB-20
	PULLEY, DRIVE SHAFT	PY-5
	SHAFT, DRIVE	SA-24
SP41-100	SPEAKER, 4" P.M. & O.T. TR-108	
	SPRING, DIAL	SG-1
	DIAL CORD	CR-2
LF-30	TRANSFORMER, FM-IF	LF-30
LF-31	TRANSFORMER, AM-FM-IF	LF-31
LF-32	TRANSFORMER, AM-IF	LF-32
LF-33	TRANSFORMER, RATIO DET	LF-33
TR-19	TRANSFORMER, ISOLATION	TR-19
LC-9	COIL, OSCILLATOR AM	LC-9
LC-11	COIL, OSCILLATOR FM	LC-11

ITEM	DESCRIPTION	PART NO.
LC-12	COIL, RF-FM	LC-12
LC-13	CHOKE FILAMENT	LC-13
LC-14	CHOKE, PLATE	LC-14
LC-15	CHOKE, GRID	LC-15
LC-16	CHOKE, CATHODE	LC-16
LC-17	CHOKE, FILAMENT	LC-17
LC-18	CHOKE, FILAMENT	LC-18
	SOCKET, MIN WAFER, 7 PIN WITH SHIELD	SO-17-8
	SOCKET, MIN WAFER, 9 PIN WITH SHIELD	SO-19-8
	SOCKET, MIN WAFER, WITHOUT SHIELD	
C1a,b C2a,b C3a,b	CAPACITOR, 2X.002 MFD CERAMIC	
C4a,b C5a,b C6a,b	CAPACITOR, 2X.004 MFD CERAMIC	
C7,26,27	CAPACITOR, .005 MFD CERAMIC	
C35a,b,c,d, CE-16	CAPACITOR 30-30-20-10 MFD 150 V. ELECTROLYT	

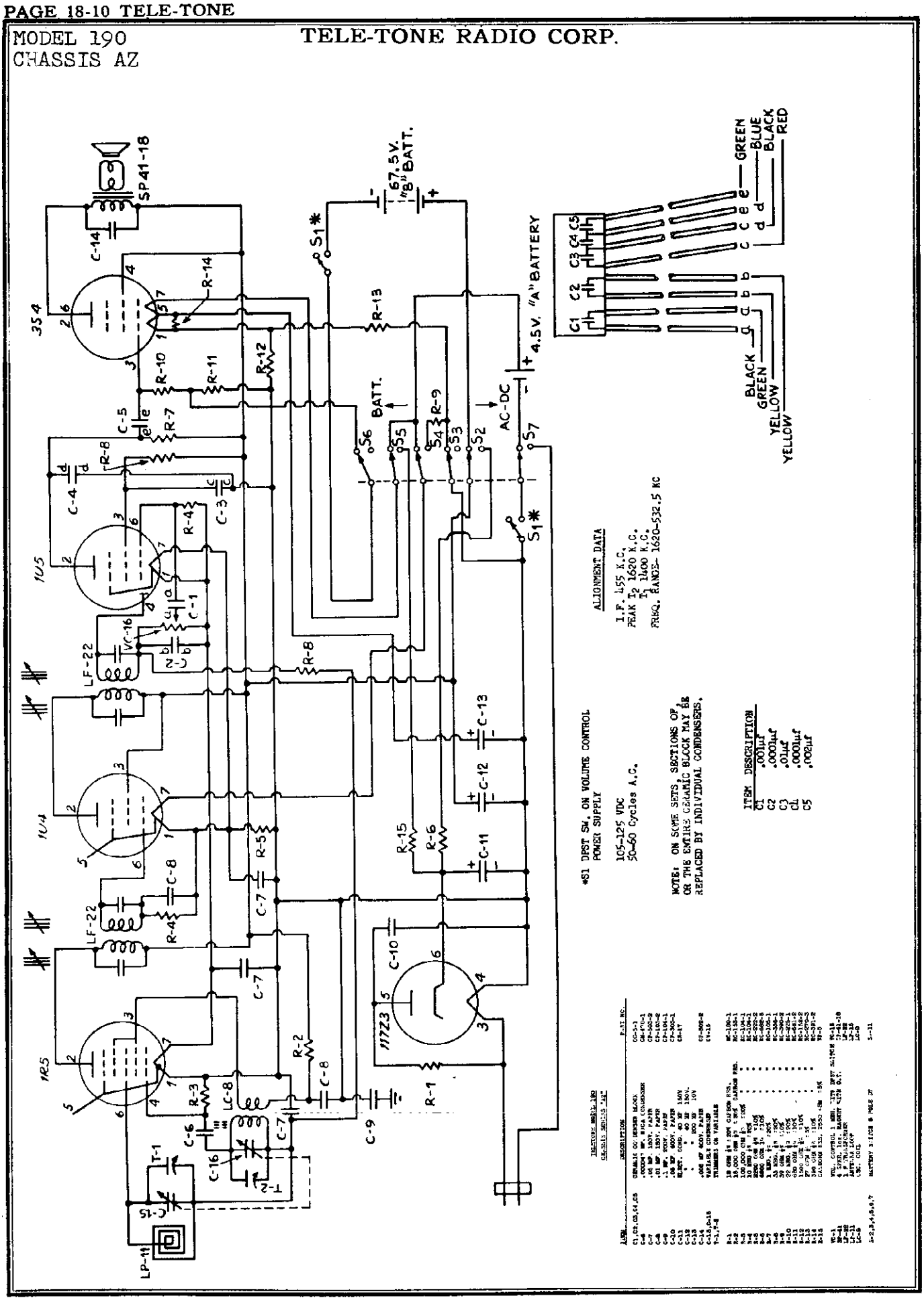
E-TONE RADIO CORP.

MODELS 158, 198
CHASSIS AT

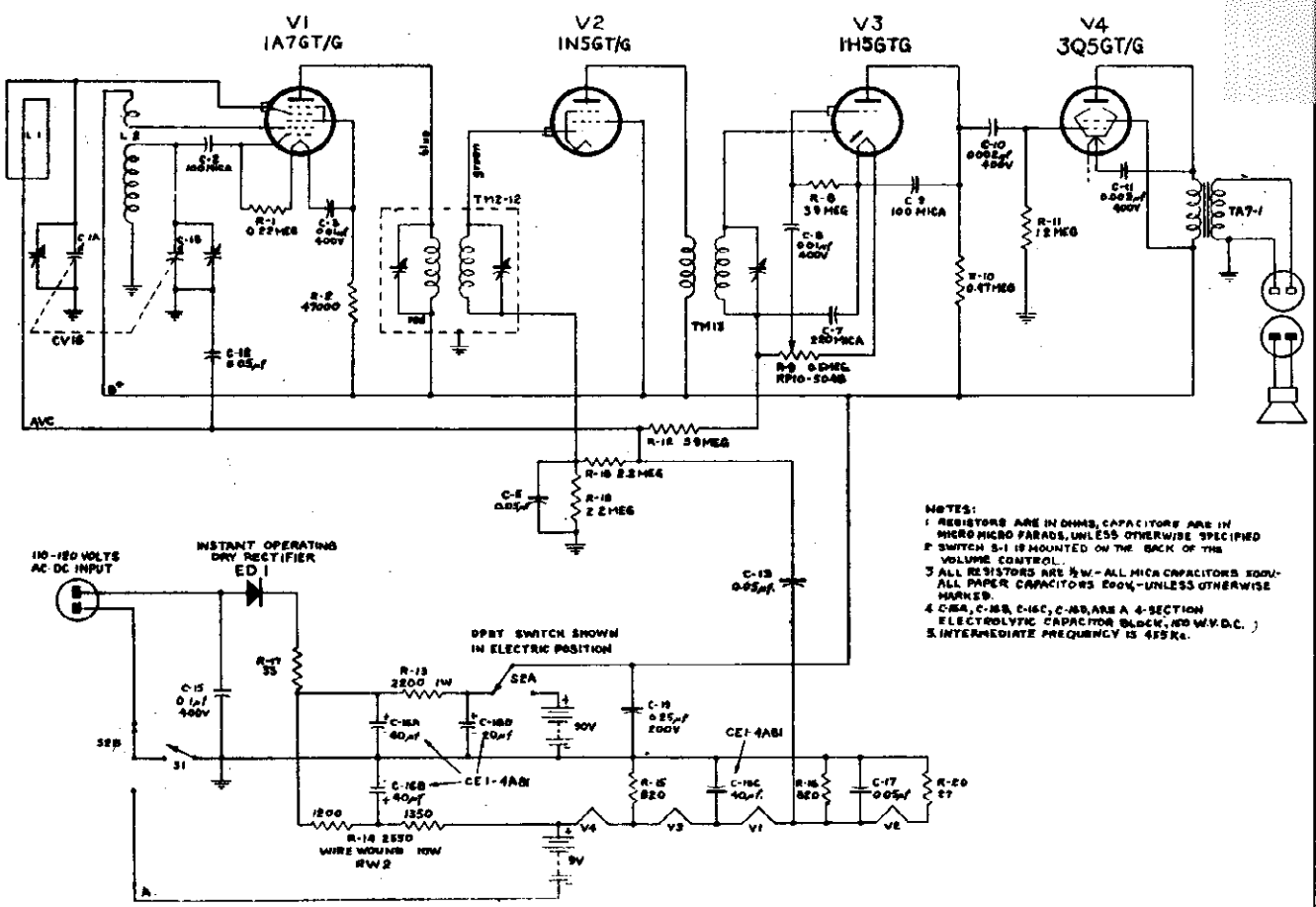


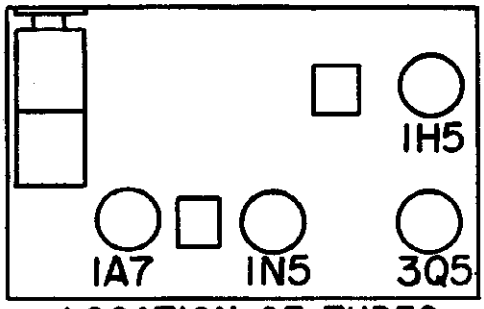
MODEL 190
CHASSIS AZ

TELE-TONE RADIO CORP.



TEMPLETONE RADIO MFG. CORP. MODEL 6-A10





LOCATION OF TUBES

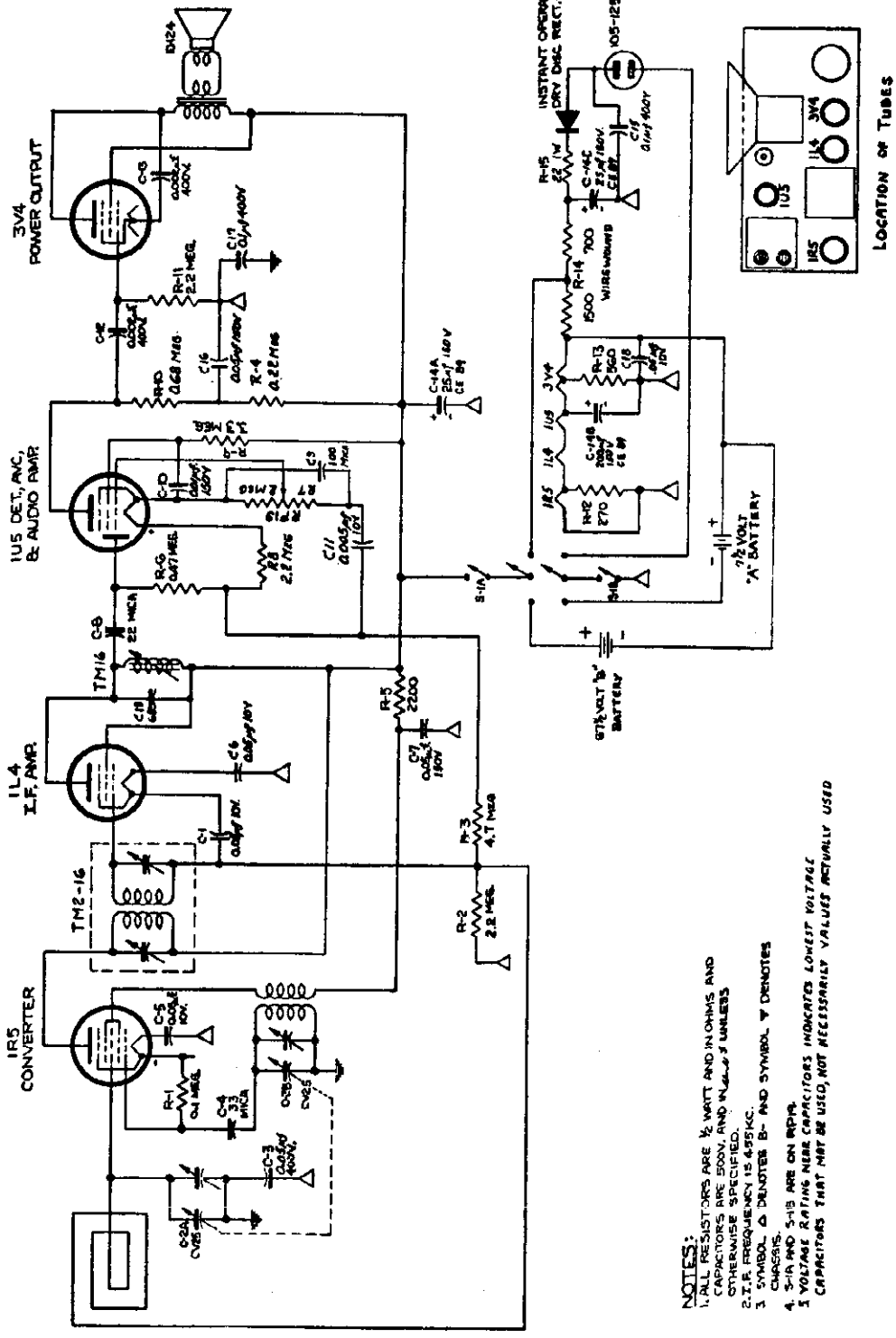
Battery: The battery is an Eveready type 753 battery pack or equivalent. It should be mounted in the compartment provided in the bottom of the cabinet, with plug facing front of cabinet. Battery should be removed when it is dead or if the set is not to be used on battery operation for several months.

Alignment: No attempt should be made to realign this receiver until it has been determined that a poor tube, or some local condition is not responsible for faulty reception.

The Signal Generator may be connected through a 0.01 mf capacitor (used as dummy antenna) to the lug on RF section (A) of tuning capacitor. Connect ground clip of generator to the chassis. An output meter may be clipped directly across the voice coil lugs. Align the I.F. trimmers to 455 kc, using least possible input from Signal Generator to avoid developing A.V.C. voltage which would make the tuning adjustments very broad.

To align RF trimmers, remove the 0.01 mf capacitor and connect the Signal Generator leads to two or three turns of heavy wire, forming a self-supporting loop of about 7 or 8 inches diameter, placed about a foot away from the receiver's loop antenna. Again, use the least possible input from the Signal Generator. With the tuning capacitor plates completely out of mesh, and pointer at extreme right end of travel, adjust the oscillator trimmer (B) (on front section of tuning capacitor) to 1700 kc. Readjust both Signal Generator and tuning capacitor to 1550 kc and adjust the RF trimmer (A) (on rear section) for maximum response.

MODELS G-415, H-415 TEMPLETONE RADIO MFG. CORP.



TEMPLETONE RADIO MFG. CORP. MODELS G-415, H-415

This Radio has 4 tubes plus an instant operating dry disc rectifier. It is a 3-way portable superheterodyne receiver using the latest octal type of low-drain electronic miniature tubes.

Operation: The set operates from 105 to 120 volts, A.C. or D.C. power supply or from self-contained batteries. Power drain is approximately 18 watts on electric operation. Because it uses an instant operating dry disc rectifier, no warm up time is necessary on either A.C., D.C., or battery operation. The set will play immediately after the power switch is turned on. When operated on direct current (D.C.), if no reception is obtained, reverse the line plug in the power outlet.

Range: This Radio covers the broadcast band from 540 to 1625 kilocycles. Since the scale is calibrated 55 to 160, the actual frequency of the station received is obtained by adding a zero to the dial calibration.

Controls: Three controls are provided. The left-hand control puts the set into operation and increases the volume with clockwise rotation. The right-hand control tunes the dial to the desired station. The slide switch selects electric operation in the upper position, and battery operation in the lower position.

Antenna: No outside aerial is required as adequate pickup is obtained by the self-contained loop antenna. In areas of poor reception or for weak or distant stations the loop antenna has a directional effect. The set or loop antenna may be turned to the direction of maximum reception.

Battery: The batteries comprise: one 7½ volt "A" unit Temple #GB1 or equivalent and one 67½ volt "B" unit Eveready type 467, Burgess #XX45, Ray-O-Vac #4367, Winchester #1710 or equivalent. They should be mounted in the spaces provided in the cabinet. Batteries should be removed when they are dead or if the set is not to be used on battery operation for several months.

This receiver uses a new "A" battery with the latest type construction, the Temple GB1, that eliminates the need for using five (5) flashlight cells and the attendant difficulties with the ten (10) contacts required for the flashlight batteries. Since it may not at once be readily available all over, it is suggested that a spare GB1 be kept on hand.

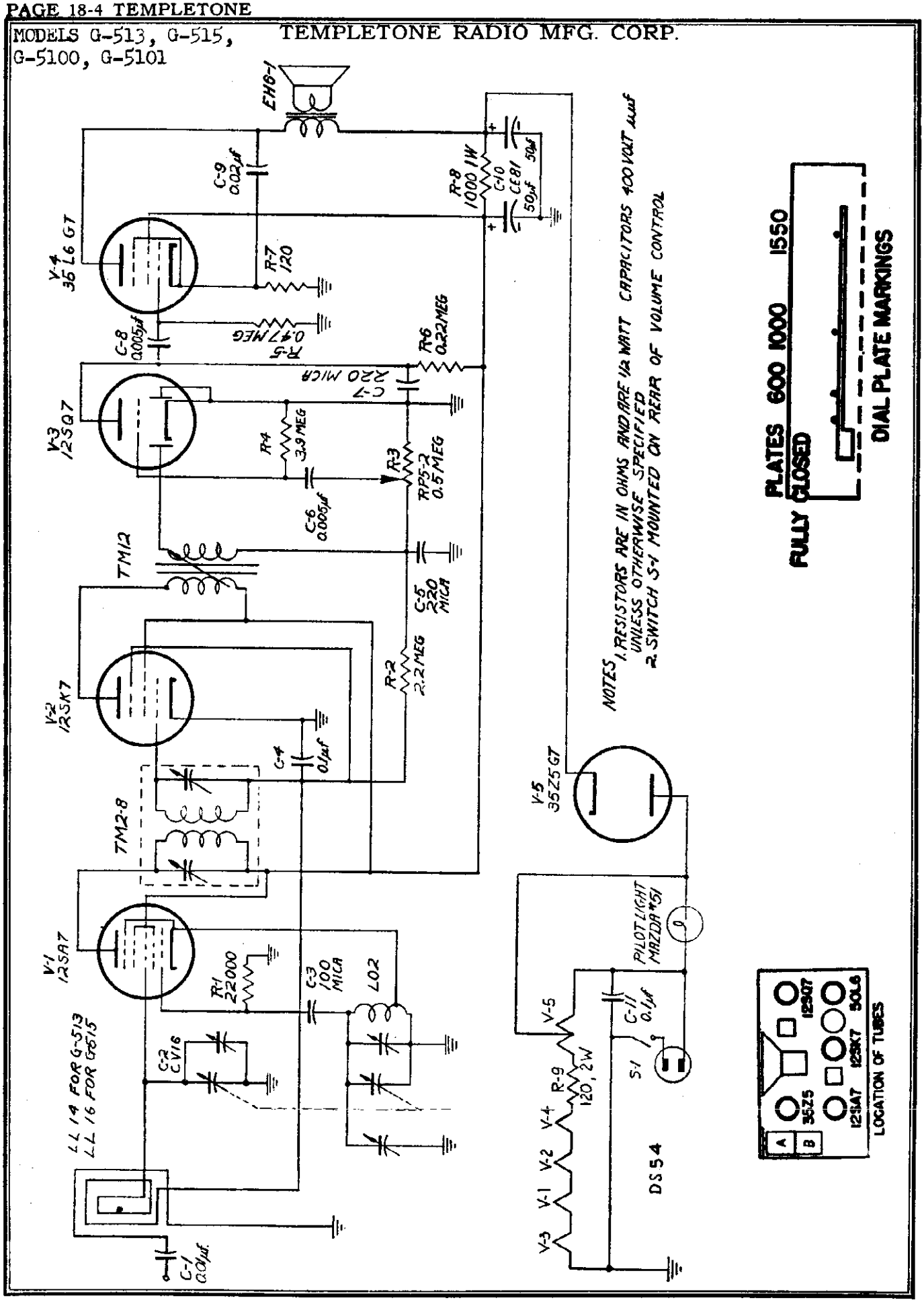
Alignment: No attempt should be made to realign this receiver until it has been determined that a poor tube, or some local condition is not responsible for faulty reception.

The Signal Generator may be connected throught a 0.01 mf capacitor (used as dummy antenna) to the lug on RF section of the tuning capacitor. Connect ground clip of generator to the B— terminal. An output meter may be clipped directly across the voice coil lugs. Align the I.F. trimmers and iron core to 455 kc, using least possible input from Signal Generator to avoid developing A.V.C. voltage which would make the tuning adjustments broad.

Provisions are made to align the R.F. trimmers with the receiver in the metal cabinet. Remove the two plug buttons on the right side of the cabinet and connect the Signal Generator leads to two or three turns of heavy wire, forming a self-supporting loop of about 7 or 8 inches diameter, placed about a foot away from the receiver's loop antenna. Again, use the least possible input from the Signal Generator. With the tuning capacitor plates completely out of mesh, and the pointer at the extreme right end of its travel, adjust the oscillator trimmer (on front section of tuning capacitor) to 1625 kc. Readjust both Signal Generator and tuning capacitor to 1550 kc and adjust the RF trimmer (on rear section) for maximum response.

MODELS G-513, G-515, G-5100, G-5101

TEMPLETONE RADIO MFG. CORP.



radio is a 5-tube super-heterodyne receiver using the latest type of low-drain electronic tubes.

Operation: The set operates on 110 to 120 volts, 50 or 60 cycles A. C. and 110 to 120 volts D. C. Power drain is approximately 25 watts.

When operated on direct current (D.C.), if no reception is obtained after approximately one minute of warm-up time, reverse the line plug in the power outlet.

Range: covers the broadcast band from 540 to 1620 kilocycles. Since the scale is calibrated 54 to 160, the actual frequency of the station received is obtained by adding a zero to the dial calibration.

Controls: Only two controls are required for operation. The left-hand control puts set into operation, increases the volume with clockwise rotation, and includes the power switch. The right-hand control tunes the dial to the desired station.

Antenna: For normal reception, no outside aerial is required, as more than adequate pickup is obtained by the self-contained loop antenna.

At installations remote from the stations desired to be heard, improved results may be obtained by rotating the receiver for maximum response, as the loop antenna has a marked directional effect on weak signals. Reception can also be improved, and the directional effect reduced, by attaching a length of insulated wire approximately 15 to 25 feet long, to the antenna connection provided at the back of the cabinet. This wire may be laid on the floor along one side of the room, or concealed under the rug. **Under no circumstances should a ground be attached to the chassis—such ground is automatically provided through the power lines.**

Alignment: No attempt should be made to realign this receiver until it has been determined that a poor tube, or some local condition is not responsible for faulty reception. An output meter may be clipped directly across the voice coil lugs.

The Signal Generator may be connected through a 0.01 mf capacitor (used as dummy antenna) to the lug on RF section (B) of tuning capacitor. Connect ground clip of generator directly to chassis. Align the I. F. trimmers to 455 kc, using least possible input from Signal Generator to avoid developing A.V.C. voltage which would make the tuning adjustments very broad.

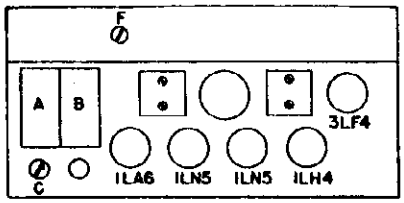
To align RF trimmers remove the 0.01 mf capacitor and connect the Signal Generator leads or two or three turns of heavy wire, forming a self-supporting loop of about 7 or 8 inches diameter, placed about a foot away from the receiver's loop antenna. Again, use the least possible input from the Signal Generator. With the tuning capacitor plates completely out of mesh, and pointer at extreme right end of travel, adjust the oscillator trimmer (A) (on front section of tuning capacitor) to 1700 kc. Readjust both Signal Generator and tuning capacitor to 1550 kc and adjust the RF trimmer (B) (on rear section) for maximum response.. With tuning capacitor plates fully meshed, the receiver should tune to 532 kc; however, no adjustment is required at this point. For checking purposes, four fine marks are engraved on the dial plate. These represent, in order, the pointer position with capacitor plates fully meshed, and the pointer settings for 600, 1000 and 1550 kc.

MODEL G-521 TEMPLETONE RADIO MFG. CORP.

Alignment: No attempt should be made to realign this receiver until it has determined that a poor tube, or some local condition is not responsible for faulty reception. The Signal Generator may be connected through a 0.01 mf capacitor (used as a dummy antenna) to the lug on the R. F. section (B) of the tuning capacitor. Connect ground clip of generator to the common negative of the electrolytic capacitor. An output meter may be clipped across the voice coil lugs. Align the I. F. trimmers to 455 K.C. using the least possible input from the Signal Generator to avoid developing A.V.C. voltage which would make the tuning adjustments very broad.

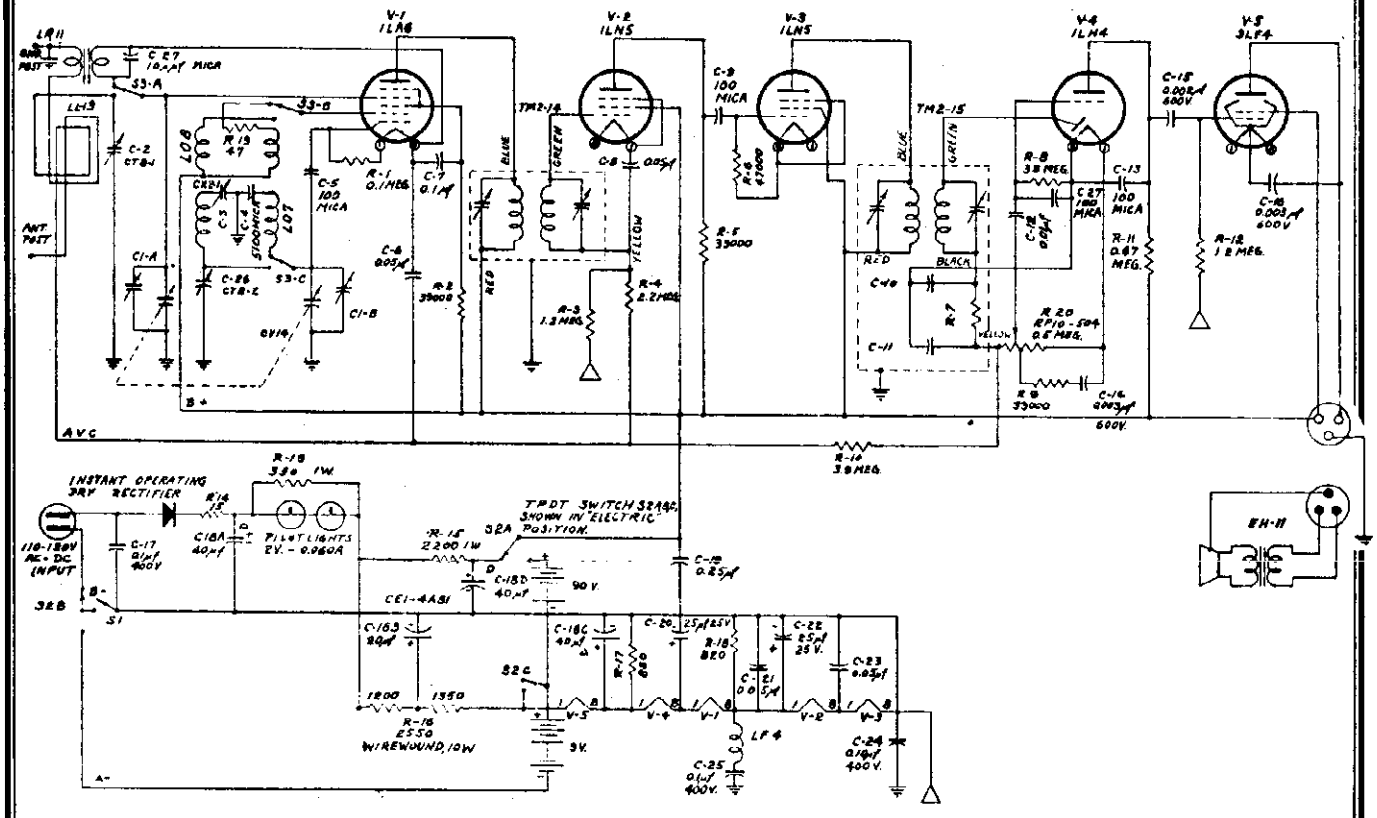
The short wave band trimmers must be aligned before attempting to align the broadcast band. To align the short wave band turn the bandswitch to the short wave position and connect the Signal Generator through a 0.01 mf capacitor and a 400 ohm resistor in series (used as a dummy antenna) to the antenna connection at the back of the cabinet. With the tuning capacitor plates completely out of mesh and the pointer at the extreme right end of travel, adjust the short wave oscillator trimmer (A) to 18.5 megacycles. With both tuning capacitor and Signal Generator adjusted to 6 megacycles, adjust the short wave antenna coil slug (C) for maximum response. Readjust both the Signal Generator and the tuning capacitor to 18 megacycles and tune the short wave R. F. trimmer (B) for maximum response.

With the short wave band aligned, the broadcast band trimmers may now be aligned. To align the broadcast band turn the bandswitch to the broadcast position. Remove the 0.01 mf capacitor and the 400 ohm resistor and connect the Signal Generator to two or three turns of heavy wire, forming a self supporting loop of about 7 or 8 inches diameter placed about a foot away from the receiver's loop antenna. Again use the least possible input from the Signal Generator. With the tuning capacitor completely out of mesh and the pointer at the extreme right end of travel, adjust the broadcast oscillator trimmer (E) to 1620 kilocycles. With the dial pointer set to 600 KC adjust the padder (F) while rocking the signal generator dial for maximum audio output. Readjust both Signal Generator and dial pointer to 1550 kilocycles and adjust the R. F. trimmer (D) for maximum response.

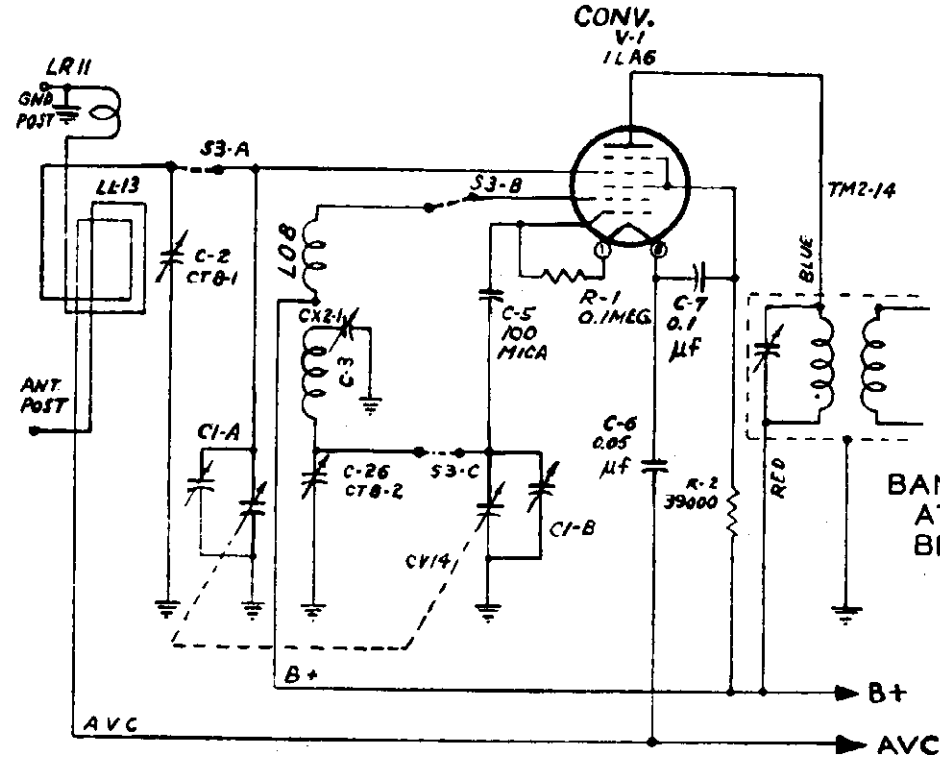


TUBE & TRIMMER LOCATION

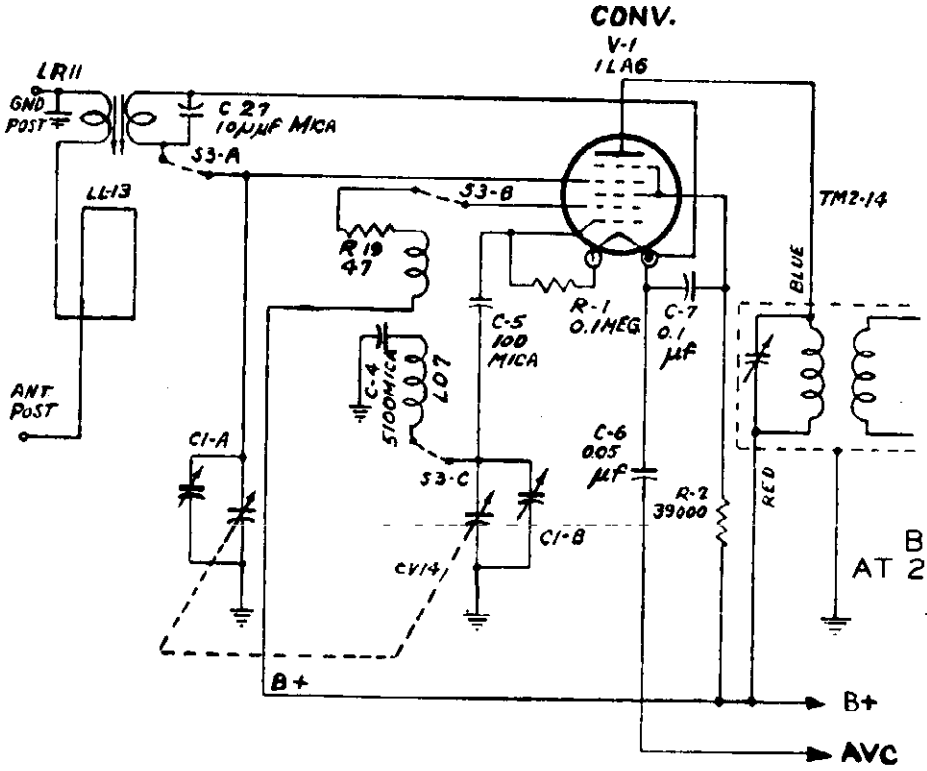
NOTES:
1. RESISTORS ARE IN OHMS, CAPACITORS IN MF UNLESS OTHERWISE SPECIFIED.
2. POWER SWITCH S1 IS GANGED WITH VOLUME CONTROL. RP10-504.
3. R-7, C-14, C-11 ARE BUILT INTO 2ND I.F. TRANSFORMER TM2-15.
4. ALL RESISTORS ½ W. - MICA CAPACITORS 500 V. - PAPER CAPACITORS 200V UNLESS OTHERWISE SPECIFIED.
5. C-15A, B, C, D, 15 A. 4 SECTION ELECTROLYTIC CAPACITOR BLOCK 150 W.V.D.C.
6. INTERMEDIATE FREQUENCY 455 KC.
7. BANDSWITCH S3A, B, C, IS SHOWN IN S.W. POSITION.
8. LF4 IS WOUND ON C-25.



TEMPLETONE RADIO MFG. CORP. MODEL G-521



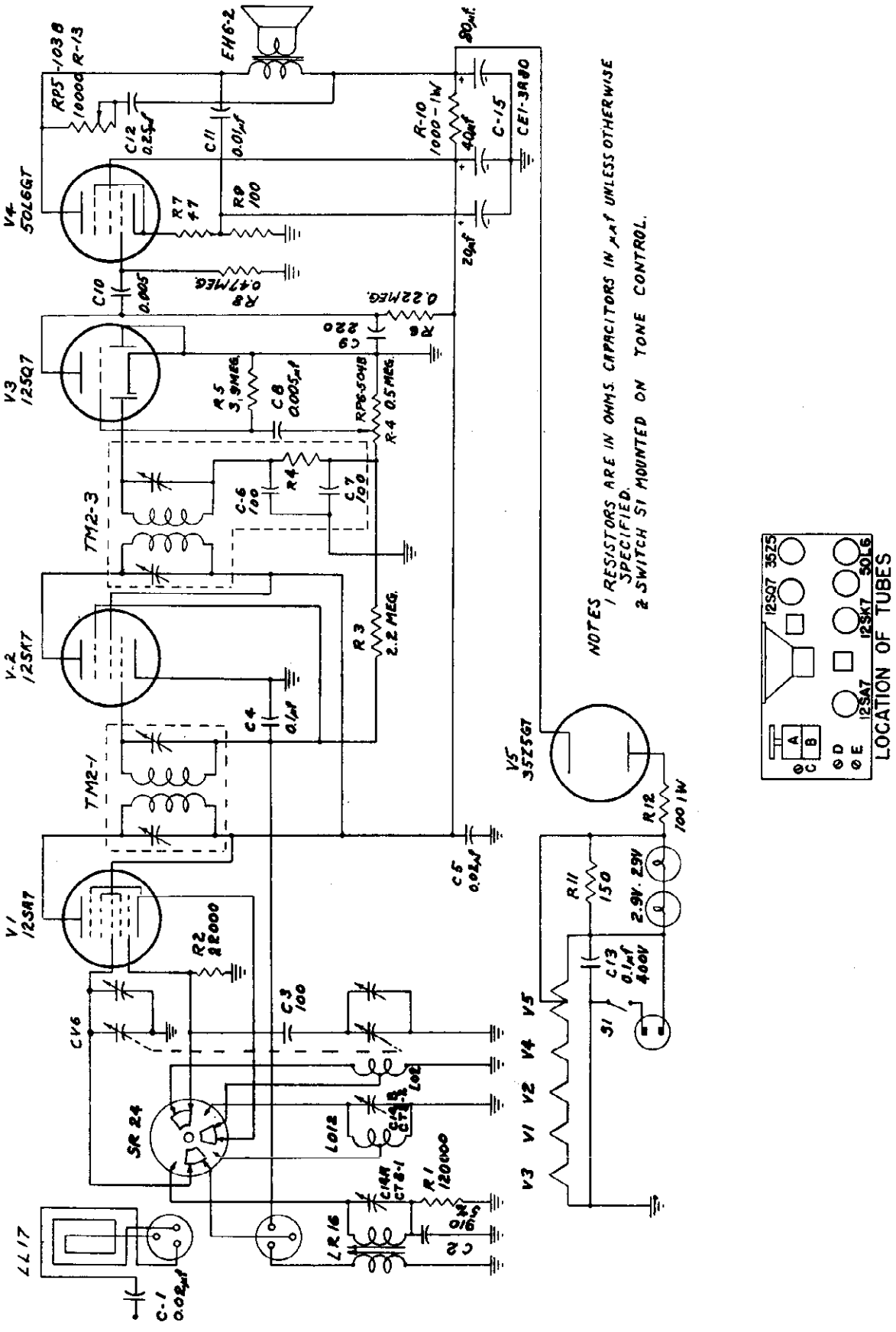
BAND-SWITCH SHOWN AT 1ST POSITION. BROADCAST BAND 535-1620 KC



BAND-SWITCH SHOWN AT 2ND POSITION CLOCKWISE SHORT WAVE BAND 5.6-18.5 MC.

MODEL G-522

TEMPLETONE RADIO MFG. CORP.



OPERATING INSTRUCTIONS and SERVICE NOTES.

Model G-522 is a 5-tube, two band superheterodyne receiver using the latest types of low drain electronic tubes.

Operation: The set operates on 105 to 120 volts 50 or 60 cycles A. C. and 105 to 120 volts D. C. Power drain is approximately 30 watts.

When operated on direct current (D. C.) if no reception is obtained after approximately one minute of warm up time, reverse the line plug in the power outlet.

Ranges: Model G-522 has both a broadcast and a short wave range. It covers the broadcast band from 532 to 1700 kilocycles. Since the broadcast dial scale is calibrated from 55 to 160 the actual frequency of the station may be obtained by adding zero to the dial calibration. The range of the short wave band covered in Model G-522 is from 5.6 to 12.5 megacycles. The short wave dial scale is calibrated directly in megacycles.

Controls: Four controls are provided for the operation of the radio set. The control at the extreme left includes the power switch and the tone control; this turns the set on with clockwise rotation and provides a continuous variation in tone from full base at the counter-clockwise end to full treble in the extreme clockwise position. The second control is the volume control; this increases the volume with clockwise rotation. The third control is the bandswitch. In its counter-clockwise position it selects broadcast band operation. In its clockwise position it switches to operation on the short-wave band. The last control is the tuning control which permits accurate tuning of the slide rule dial through a smooth vernier action.

Antenna: For normal reception, no outside aerial is required, as more than adequate pickup is obtained by the self contained loop antenna. On the broadcast band, at installations remote from stations desired to be heard, improved results may be obtained by rotating the receiver for maximum response, as the loop antenna has a marked directional effect on weak signals. Reception can also be improved, especially on the short wave band, by attaching a length of insulated wire approximately 15 to 25 feet long, to the antenna connection provided at the back of the cabinet. This wire may be laid on the floor along one side of the room, or concealed under the rug. **Under no circumstances** should a ground be attached to the chassis — such ground is automatically provided through the power lines.

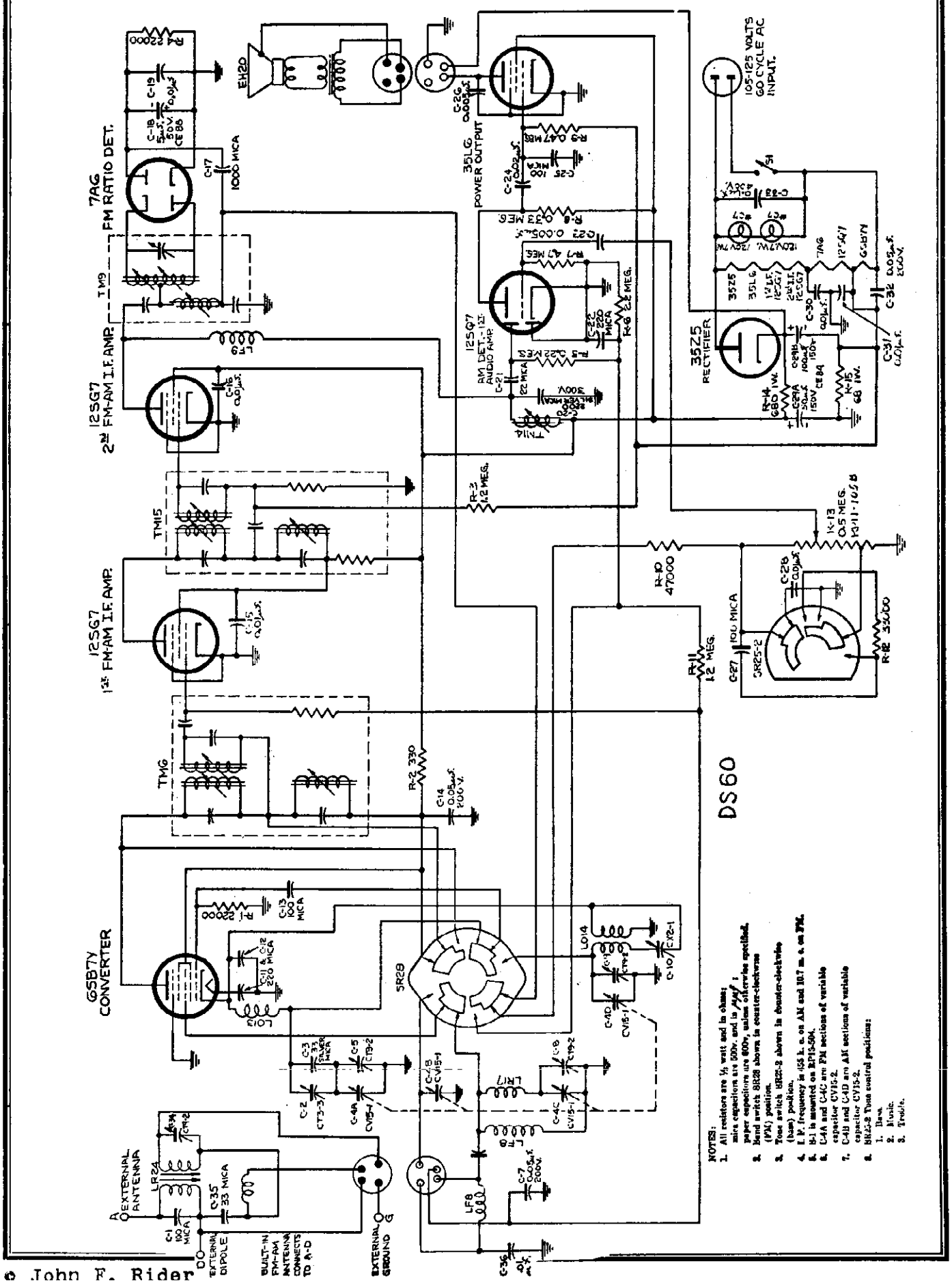
Alignment: No attempt should be made to realign this receiver until it has been determined that a poor tube, or some local condition is not responsible for faulty reception. The Signal Generator may be connected through a 0.01 mf capacitor (used as a dummy antenna) to the lug on the R. F. section (B) of the tuning capacitor. Connect ground clip of generator directly to chassis. An output meter may be clipped across the voice coil lugs. Align the I. F. trimmers to 455 kc using the least possible input from the Signal Generator to avoid developing A. V. C. voltage which would make the tuning adjustments very broad.

To align broadcast R. F. trimmers, remove the 0.01 mf capacitor and connect the Signal Generator to two or three turns of heavy wire, forming a self-supporting loop of about 7 or 8 inches diameter placed about a foot away from the receiver's loop antenna. Again use the least possible input from the Signal Generator. Turn the bandswitch to the broadcast position. With the tuning capacitor plates completely out of mesh and the pointer at the extreme right end of travel, adjust the broadcast oscillator trimmer (A) to 1700 kc. Re-adjust both Signal Generator and tuning capacitor to 1550 kc and adjust R. F. trimmer (B) for maximum response. With tuning capacitor plates fully meshed, the receiver should tune to 532 kc, however, no adjustment is required at this point.

To align the short wave band, turn the bandswitch to the short wave position and connect the Signal Generator through a 0.01 capacitor and a 400 ohm resistor in series (used as a dummy antenna) to the antenna connection at the back of the cabinet. With the tuning capacitor plates completely out of mesh and the pointer at the extreme right end of travel, adjust the short wave oscillator trimmer (E) to 12.5 megacycles. With both tuning capacitor and Signal Generator adjusted to 6 megacycles adjust the short wave antenna coil slug (C) for maximum response. Re-adjust both the Signal Generator and the tuning capacitor to 10.5 megacycles and tune the short wave antenna trimmer (D) for maximum response. With tuning capacitor fully meshed, the receiver should tune to 5.6 megacycles, however, no adjustment is required at this point.

For checking purposes five marks are engraved on the front of the dial plate. These represent in order, the pointer position with the capacitor plates fully meshed and the pointer settings for 600 kc or 6 mc, 1000 kc 10.5 mc, and 1550 kc.

MODEL G-724 TEMPLETONE RADIO MFG. CORP.



ALIGNMENT PROCEDURE:

Dummy Antenna	Signal Generator Connection	Signal Generator Frequency	Band Switch Position	Radio Dial Setting	Adjust	Remarks
0.01 MFD	Terminal T	455 KC AM	Broadcast	1625 KC	E G-1 F-1	Adjust for maximum output Repeat for fine adjustment
0.01 MFD	Pin 4 of 12SG7 2nd FM-AM IF with FM Signal Gen.	10.7 MC FM	FM	108 MC	H-2	Adjust for maximum output (Broad adjustment)
0.01 MFD	"	10.7 MC FM	FM	108 MC	H-4	Adjust for maximum output
0.01 MFD	"	10.7 MC AM	FM	108 MC	H-1 or H-3	Adjust whichever is required for minimum output
						Repeat last two steps for fine adjustment until settings for maximum FM output coincide with settings for minimum AM output.
0.01 MFD	Pin 8 of 6SB7Y Converter	10.7 MC FM	FM	108 MC	G-3 — G-2	Adjust for maximum output
0.01 MFD		"	FM	108 MC	F-3 — F-2	Adjust for maximum output
						Repeat last two steps for fine adjustment
			Broadcast	535 KC	Pointer	Adjust pointer to reference mark
100 MMFD	"A" Post on Cabinet	600 KC AM	"	600 KC	J and Core on Ant. Coil in Cab.	Adjust for maximum output
"	"	1550 KC AM	"	1550 KC	B and trimmer on Ant. Coil	Adjust for maximum output
300 OHM Resistor	"	92 MC FM	FM	92 MC	D	Adjust for maximum output
"	"	106 MC FM	FM	106 MC	A and C	Adjust for maximum output

Operation: The set is designed for operation on 105 to 125 volts, 60 cycles A. C. It will also operate on 120 D. C. Power drain is approximately 36 watts for the radio.

Ranges: Model G-724 has both a broadcast and FM range. It covers the broadcast band from 535 to 1625 kilocycles. Since the broadcast dial scale is calibrated from 53.5 to 160, the actual frequency of the station may be obtained by multiplying the dial calibration by ten. The range of the FM band covered in Model G-724 is from 87.6 to 108.4 megacycles. The FM dial scale is calibrated directly in megacycles.

MODEL G-724 TEMPLETONE RADIO MFG. CORP.

Antenna: This radio will operate without an external antenna. For normal reception more than adequate pickup is obtained by the self contained antenna. .At installations remote from station desired to be heard on the broadcast band, improved results may be obtained by attaching twenty or thirty feet of insulated wire to the antenna connection provided in the rear of the cabinet. The wire may be concealed under the rug or laid on the floor along one side of the room.

For normal reception on FM, no outside aerial is required as sufficient signal pickup is secured from the built-in FM antenna. However, in poor receiving locations provision is made for improved results, which may be obtained by the addition of an outside antenna of correct design, properly installed. (Your dealer can supply and install a suitable FM antenna for your FM Radio).

Alignment: No attempt should be made to realign this receiver until it has been determined that a poor tube or some local condition is not responsible for faulty reception. The following is a list of the minimum equipment necessary to realign this receiver.

1—AM signal generator covering 455 KC, 600 KC, 1550 KC and 10.7 MC

2—FM signal generator covering 10.7 MC, 92 MC and 106 MC

3—Output meter, rectifier type, approximately 0 to 2 volts RMS

4—Dummy antennas

0.01 MFD Capacitor

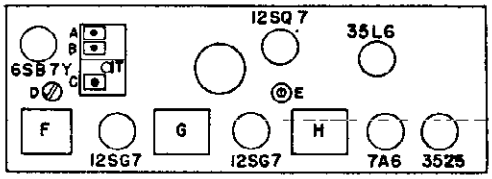
300 Ohm Risistor

100MMFD Mica Capacitor

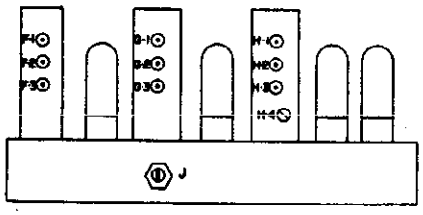
In the following alignment procedure the high side of the signal generator is connected to the terminal indicated in the "Signal Generator Coupling" column below. The ground side of the signal generator is connected directly to the chassis. The output meter should be connected across the voice coil of the speaker for all measurements.

In adjusting the radio frequency trimmers and padders it is advisable to "rock" the variable capacitor gang slightly across the signal being delivered by the signal generator until that particular signal has been accurately peaked.

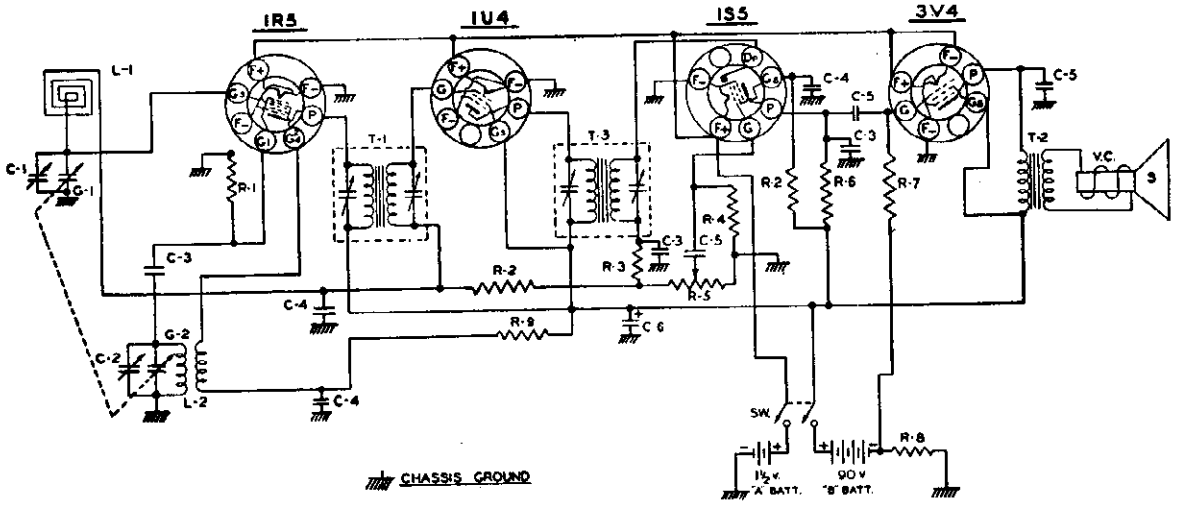
The location of the trimmers, padders and slugs referred to in the alignment procedure chart on page three are shown in the tube and trimmer location diagram below.



TUBE AND TRIMMER LOCATION



TRAV-LER RADIO CORP. MODEL 5021



ALIGNMENT AND SERVICE DATA

PART NO.		DESCRIPTION
IR-20	R-1	220M Ω RESISTOR 1/2W. 20 %
IR-23	R-2	3.3MEG. RESISTOR 1/2W. 20 %
IR-31	R-3	1.82M Ω RESISTOR 1/2W. 10 %
IR-3	R-4	10MEG. RESISTOR 1/2W. 20 %
VC-8	R-5	1MEG. VOLUME CONTROL
IR-12	R-6	1MEG. RESISTOR 1/2W. 20 %
IR-15	R-7	2.2MEG. RESISTOR 1/2W. 20 %
IR-36	R-8	6.20 Ω RESISTOR 1/2W. 5 %
IR-37	R-9	10M Ω RESISTOR 1/2W. 20 %
TC-7	C-1	ANT. TRIMMER
	C-2	OSC. TRIMMER ON GANG
MC-2	C-3	100MMFD MICA CONDENSER
PC-7	C-4	.01 MFD 400 V. CONDENSER
PC-6	C-5	.005 MFD 600 V. CONDENSER
EC-7	C-6	20MFD 80WV ELECTROLYTIC
GC-5	G-1	GANG CONDENSER
	G-2	
LL-5	L-1	LOOP ANTENNA
LO-12	L-2	OSC. COIL
LI-3	T-1	I.F. TRANSFORMER INPUT
	SW	DPST SWITCH ON VOLUME CONTROL
SPK-5	T-2	SPEAKER TRANSFORMER
	V.C.	VOICE COIL
	S	P.M. SPEAKER
LI-4	T-3	I.F. TRANSFORMER OUTPUT
TU-30		1R5 - 1U4 - 1S5 - 3V4

Remove chassis from cabinet for alignment. A signal generator is required having the following frequencies: 455 KC and 1400 KC. An output meter should be connected across the speaker.

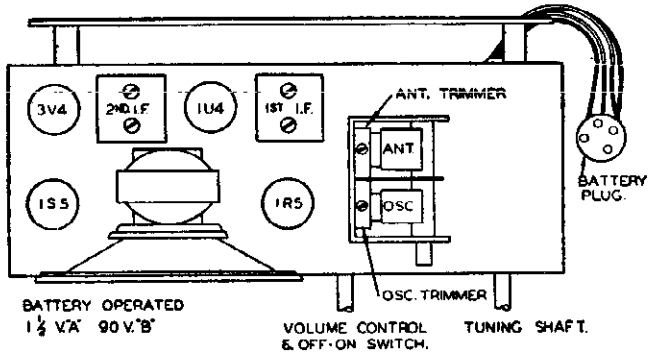
FIRST STEP: Connect the hot lead from the generator to the ANT. section of the gang condenser, through a .1 MFD. condenser. The ground lead from the generator may be connected to any spot on the metal chassis. Turn the gang condenser to complete minimum capacity. Set the generator to 455 KC. Adjust the movable trimmers in the IF cans, until a maximum reading is noted on the output meter.

The volume control of the receiver should be turned to maximum during the IF and all subsequent alignment and the generator output as low as possible to prevent the AVC from working and giving false readings.

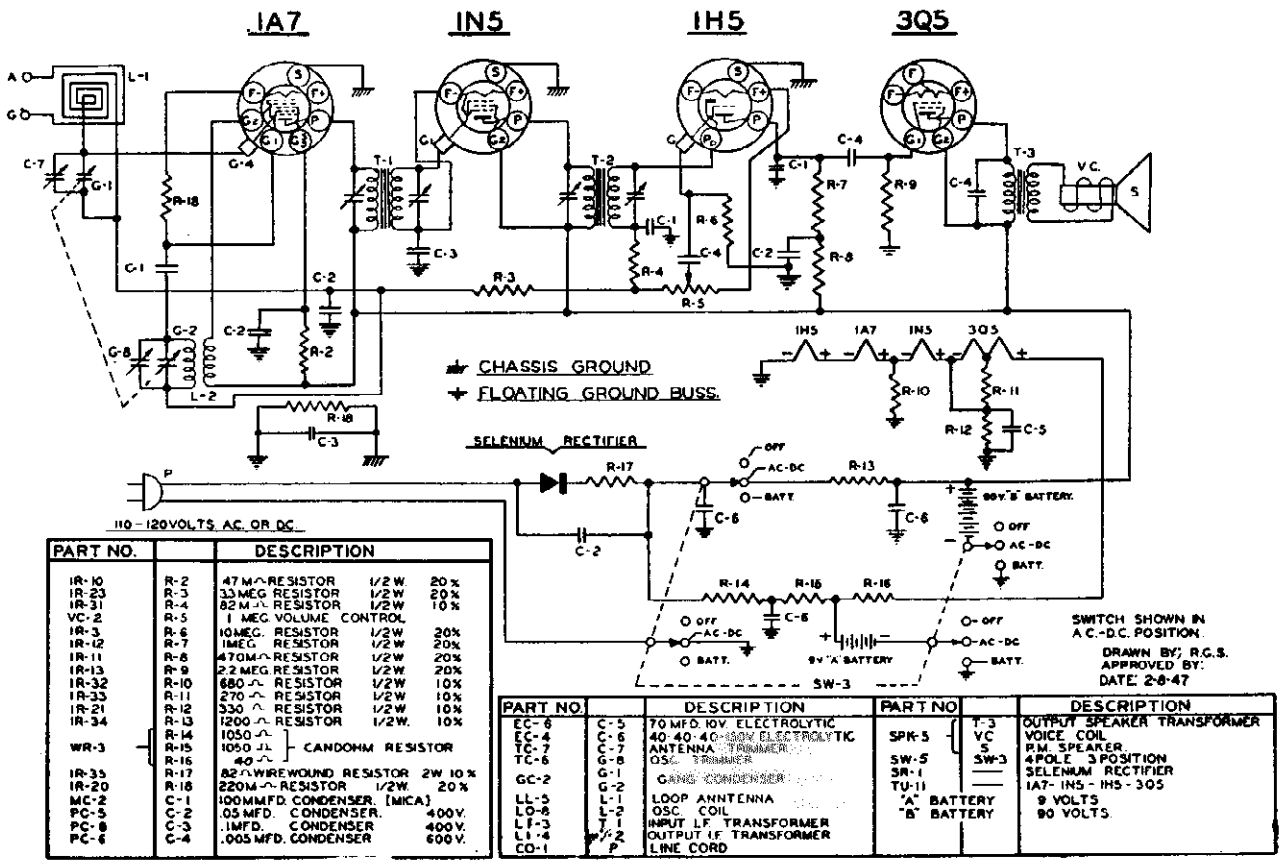
SECOND STEP: With the leads from the generator still connected as in IF alignment, adjust the generator to 400 KC. Set the dial pointer to 1400 KC on the dial scale. Adjust the oscillator trimmer until the signal is tuned in.

THIRD STEP: Remove the generator leads from the condenser. Connect the hot lead from the generator through a 200 MMFD. condenser to one of the leads which project from the back of the loop antenna. Connect the ground lead of the generator to the remaining lead. With the generator and the receiver still tuned to 1400 KC, adjust the antenna trimmer until a maximum reading is noted on the output meter.

TUBE AND TRIMMER LOCATION



MODEL 5025 TRAV-LER RADIO CORP.



PART NO.		DESCRIPTION
IR-10	R-2	47 M RESISTOR 1/2 W. 20%
IR-23	R-3	33 MEG. RESISTOR 1/2 W 20%
IR-31	R-4	82 M RESISTOR 1/2 W 10%
VC-2	R-5	1 MEG. VOLUME CONTROL
IR-3	R-6	10 MEG. RESISTOR 1/2 W 20%
IR-12	R-7	1 MEG. RESISTOR 1/2 W 20%
IR-11	R-8	470 M RESISTOR 1/2 W 20%
IR-13	R-9	2.2 MEG. RESISTOR 1/2 W 20%
IR-32	R-10	680 RESISTOR 1/2 W 10%
IR-33	R-11	270 RESISTOR 1/2 W 10%
IR-21	R-12	330 RESISTOR 1/2 W 10%
IR-34	R-13	1200 RESISTOR 1/2 W. 10%
WR-3	R-14	1050
	R-15	1050 — CANDOHM RESISTOR
	R-16	40
IR-35	R-17	82 WIREWOUND RESISTOR 2W 10%
IR-20	R-18	220 M RESISTOR 1/2 W. 20%
MC-2	C-1	100 MMFD. CONDENSER. (MICA)
PC-5	C-2	.05 MFD. CONDENSER. 400 V.
PC-8	C-3	.1 MFD. CONDENSER 400 V.
PC-6	C-4	.005 MFD. CONDENSER 600 V.

PART NO.		DESCRIPTION
EC-6	C-5	70 MFD. 10 V. ELECTROLYTIC
EC-4	C-6	40-40-40-250 V. ELECTROLYTIC
TC-7	C-7	ANTENNA TRIMMER
TC-6	G-8	OSC. TRIMMER
GC-2	G-1	GANG CONDENSER
	G-2	
LL-5	L-1	LOOP ANNTENNA
LO-8	L-2	OSC. COIL
LF-3	T-1	INPUT I.F. TRANSFORMER
LF-4	T-2	OUTPUT I.F. TRANSFORMER
CO-1	P	LINE CORD

PART NO		DESCRIPTION
	T-3	OUTPUT SPEAKER TRANSFORMER
SPK-5	VC	VOICE COIL
	S	P.M. SPEAKER
SW-5	SW-3	4 POLE 3 POSITION
SR-1		SELENIUM RECTIFIER
TU-11		1A7 - 1N5 - 1H5 - 3Q5
"A" BATTERY		9 VOLTS
"B" BATTERY		90 VOLTS

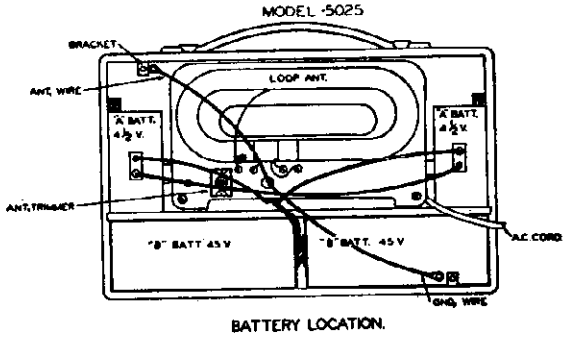
The following is a table of manufacturers and their battery type number.

"B" BATTERIES
(2 Required)

Mfgr.	Volts	Type No.
Burgess	45 "B"	M30
General	45 "B"	W30B
Bright Star	45 "B"	3033
Usalite	45 "B"	640
Rayovac	45 "B"	P7830
Eveready	45 "B"	482

"A" BATTERIES
(2 Required)

Burgess	4½ "A"	G3
General	4½ "A"	3H3
Bright Star	4½ "A"	361
Usalite	4½ "A"	683
Rayovac	4½ "A"	P83A
Eveready	4½ "A"	746



BATTERY LOCATION.

BATTERY SERVICING

(See Figure No. 1)

To replace batteries, loosen and remove the two screws at the left and right hand corners of the cabinet back. Remove the back and pull out the plug from each battery. Never pull on the wires connected to the plugs as they may break. Always grasp the plug form between the fingers, or use a flat blade to pry out the plug. Observe with care the position of the batteries and plugs when replacing. Be sure that batteries and plugs are replaced as shown in the "Battery Location" diagram. (Figure No. 1)

After the batteries have been installed, replace the back. Make sure that the two wires from the loop antenna are held in place between the brackets of the cabinet and the back by the two fastening screws.

UNITED MOTORS SERVICE
DIV. OF GENERAL MOTORS CORP.

MODEL 986241

SERVICE PARTS LIST

ELECTRICAL PARTS

COILS

Illus. No.	Service Part No.	Production Part No.	Description
1		1218664	Coils-Permeability Tuning
1A			Antenna Coil
1B			R. F. Coil
1C			Oscillator Coil
2		1218639	Antenna Spark Choke
3		1218660	1st I. F. Assembly
4		1218661	2nd I. F. Assembly
4A			47,000 Ohm ½ Watt
4B			.00018 Mfd. Molded Condenser
4C			.00018 Mfd. Molded Condenser
5		1218643	Hash Choke

CONDENSERS

13		1218634	Antenna Trimmer
14	G100	7234242	.00001 Mfd. Molded
15	G271	1215553	.0003 Mfd. Molded
16	G470	7236141	.00005 Mfd. Molded
17		7233608	.01 Mfd. 100 V. Tubular
18		7230592	.05 Mfd. 200 V. Tubular
19		7230767	.005 Mfd. 100 V. Tubular
20	G471	1216881	.0005 Mfd. Molded
21		1218633	Electrolytic Condenser
21A			20 Mfd. 350 V.
21B			20 Mfd. 350 V.
21C			20 Mfd. 25 V.
22	E103	7233608	.01 Mfd. 600 V. Tubular
23		7230592	.05 Mfd. 200 V. Tubular
24		7230592	.05 Mfd. 200 V. Tubular
25		1218636	R.F. Trimmer
26		1218632	.0005 Mfd.—Temperature Compensating
27		1218635	Oscillator Trimmer
28		1218631	.00142 Mfd. Silver Mica
29		7230767	.005 Mfd. 100 V. Tubular
30		1218629	Spark Plate
31	H402	1218630	.004 Mfd. 1600 V. Tubular
32		7240248	.5 Mfd. 100 V. Tubular
33		7240248	.5 Mfd. 100 V. Tubular

RESISTORS

40	B223	1216156	22,000 Ohm 1 W. Insulated
41	A156		15 Megohm ⅛ W. Insulated
42	A223	1214550	22,000 Ohm ½ W. Insulated
43	A332		3,300 Ohm ½ W. Insulated
44	A156		15 Megohm ⅛ W. Insulated
45	A105	1213282	1 Megohm ½ W. Insulated
46	A224		220,000 Ohm ⅛ W. Insulated
47	B271	1213846	270 Ohm 1 W. Insulated
48	C182	1214573	1,800 Ohm 2 W. Insulated
49	A105		1 Megohm ⅛ W. Insulated
50	B333	7242447	33,000 Ohm 1 W. Insulated
51	A105		1 Megohm ⅛ W. Insulated
52	A823	1214554	82,000 Ohm ½ W. Insulated
53	B151	1211005	150 Ohm 1 W. Insulated

TUBES

5290	1213562	7A7—R. F. Amplifier
5301	1213981	7Q7—Oscillator—Translator
5290	1213562	7A7—I. F. Amplifier
5292	1213565	7B6—Detector AVC—1st Audio
5295	1213568	7C5—Audio Output
5302	1213570	7Y4—Rectifier

TUNING RANGE — 540 KC to 1720 KC

Read aud follow instructions carefully before attempting operation of this receiver.

POWER SOURCES: This receiver is designed for operation on either an external power source or on the enclosed batteries.

AC OR DC OPERATION: This receiver may be operated on 50 to 60 cycle, 110 to 125 volt AC current or 110 to 125 DC current.

CAUTION: Never plug this receiver into a 220 volt line as this will seriously damage the component parts which hae been designed for 110 to 125 volt operation only.

To operate on AC or DC open the small door at the lower right hand corner in the back of the cabinet. Pull out the power cord and plug into a convenient outlet of the proper voltage and current. Follow instructions under "Controls."

To operate on the enclosed batteries, follow instructions under "Control."

CONTROLS: This receiver has three control knobs which are located on the front panel of the cabinet.

STATION SELECTOR KNOB: The right hand knob is the station selector. Rotate this knob to the right or left to select your desired station. The dial scale is calibrated in kilocycles. By mentally adding a zero to the numbers on the scale, the result will be read directly in (KC) kilocycles. (i.e., 60 plus 0 equals 600 KC or 140 plus 0 equals 1400 KC).

POWER SELECTOR SWITCH: The center knob is the power selector. It has three positions which are indicated on the front panel. The extreme left hand position is the "OFF" position. The small dot on this knob must point to "OFF" when the receiver is not in use. The center position is "AC-DC" and is used when it is desired to operate the receiver from a power line source. The extreme right hand position is "BATT" and is used when it is desired to operate on the enclosed batteries.

AC OPERATION: When an AC power source is used, set the power selector knob to "AC-DC" after the power cord has been plugged into a convenient outlet. The receiver is now ready for operation.

DC OPERATION: If the receiver does not operate after a few seconds, reverse the power cord plug in the outlet and it will operate properly.

ALIGNMENT AND SERVICE DATA

Remove chassis from cabinet for alignment.

A Signal Generator is required having the following frequencies: 455 KC, 1400 KC, 1720 KC. An output meter should be connected across the speaker.

The receiver volume control should be turned to maximum during the I.F. and all subsequent alignments to keep the AVC from working and giving false readings. Keep the generator output as low as possible to prevent overloading.

FIRST STEP: Connect the hot lead from the generator to the ANT. section of the gang condenser, through a .1 MFD condenser. The ground lead from the generator must be connected to the floating ground buss under the chassis. Turn the gang condenser to complete minimum capacity. Adjust the generator to 455KC and adjust the trimmers of the 1st and 2nd I.F. transformers until a maximum reading is noted on the output meter.

SECOND STEP: With the leads from the generator still connected in the same manner, adjust the Signal Generator to 1720 KC. The OSC. trimmer is located on the front of the chassis. Adjust this trimmer until the 1720 KC signal is tuned in.

THIRD STEP: Remove the hot lead of the generator from the ANT section of the gang condenser. Connect this lead to the primary of the loop antenna through a 200 MMFD condenser. Adjust the Signal Generator to 1400 KC. Rotate the tuning control until this signal is tuned in. The ANT trimmer is located on the top of the ANT. section of the gang condenser. Adjust this trimmer until a maximum reading is noted on the output meter. No further adjustment should be necessary, unless the set has been damaged, as the coils and condenser in this receiver have been specially handled at the factory to insure proper alignment at the lower frequencies.

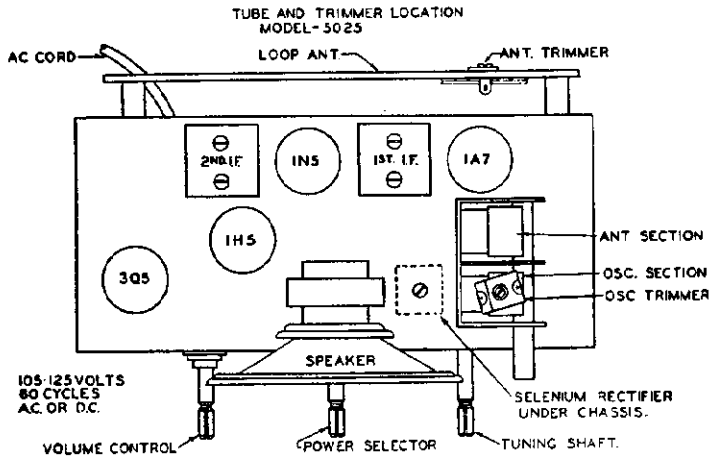
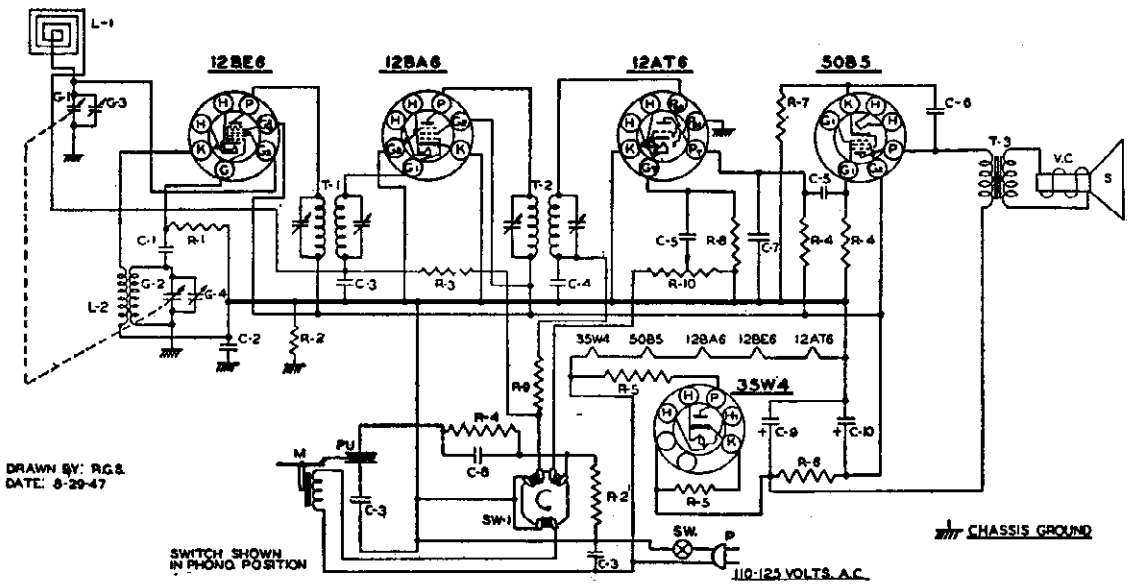


FIGURE-1

MODEL 5035,
CHASSIS SD54

TRAV-LER RADIO CORP.



ALIGNMENT AND SERVICE DATA

Remove chassis from cabinet for alignment.

A Signal Generator is required having the following frequencies; 455 KC, 1400 KC, 1650 KC. An output meter should be connected across the speaker.

The volume control of the receiver should be turned to maximum during the I. F. and all subsequent alignment and the generator output as low as possible to prevent the A. V. C. from working and giving false readings.

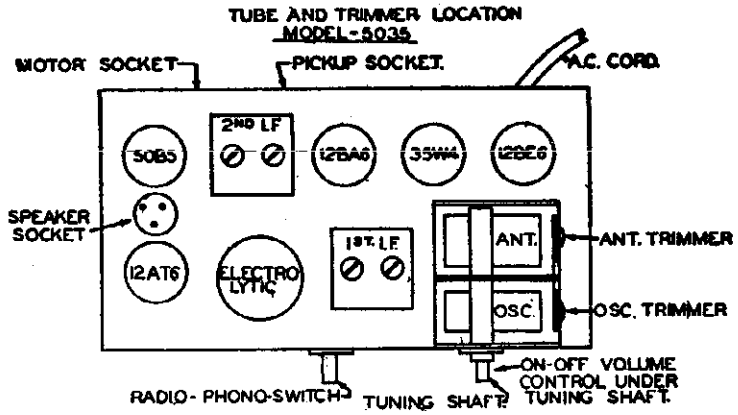
FIRST STEP: Connect the hot lead from the generator to the ANT. section of the gang condenser through the .1 MFD. condenser. The ground lead from the generator must be connected to "B" minus under the chassis. Turn the gang condenser to complete minimum capacity. Set the generator to 455 KC. Adjust the trimmers of the first and second I. F. transformers until a maximum reading is noted on the output meter.

SECOND STEP: With the leads from the generator still connected in the same manner, adjust the Signal Generator to 1650 KC. Adjust the OSC. trimmer until the 1650 KC signal is tuned in. The gang condenser must be at complete minimum capacity for this adjustment.

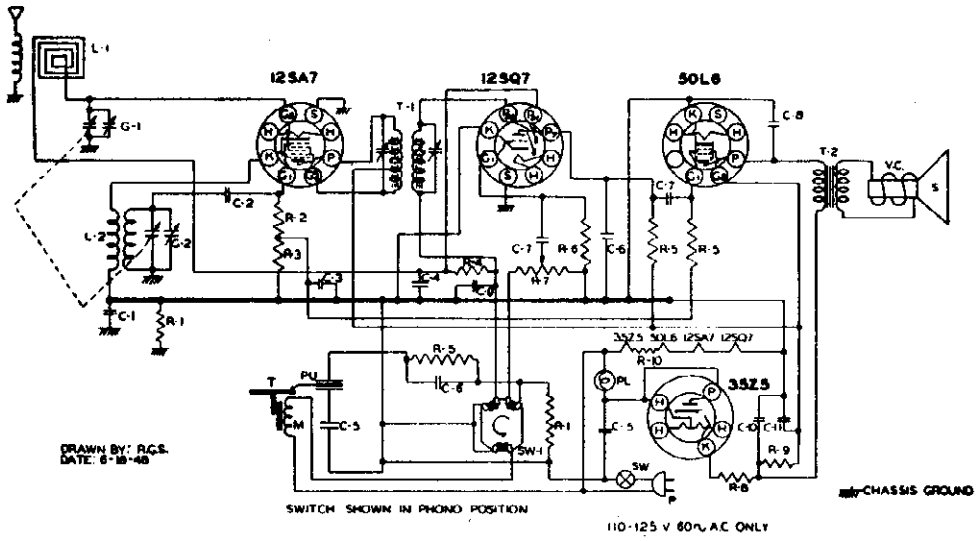
THIRD STEP: Remove the generator leads from the gang condenser. Loosely couple the generator to the receiver loop by using a complete turn of wire. With the receiver and generator set at 1400 KC, increase the generator output. Adjust the ANT. trimmer until a maximum signal is noted on the output meter. No further adjustment should be made as the coils and gang condenser in this receiver have been specially handled at the factory to insure proper alignment at the lower frequencies.

PART NO.		DESCRIPTION
IR-9	R-1	22M RESISTOR 1/2W. 20 %
IR-20	R-2	220M RESISTOR 1/2W. 20 %
IR-23	R-3	3.3MEG RESISTOR 1/2 W. 20 %
IR-11	R-4	470M RESISTOR 1/2 W. 20%
IR-17	R-5	33 RESISTOR 1/2 W. 20%
IR-25	R-6	2200 RESISTOR 1W. 10 %
IR-14	R-7	150 RESISTOR 1/2W. 20%
IR-13	R-8	2.2 MEG RESISTOR 1/2W. 20%
IR-19	R-9	100M RESISTOR 1/2W 20 %
VC-9	R-10	1 MEG. VOLUME CONTROL
MC-4	C-1	.000050 MFD. MICA
PC-8	C-2	.1 MFD. CONDENSER 400 V.
PC-5	C-3	.05 MFD. CONDENSER 400 V
MC-2	C-4	100 MMFD. MICA
PC-6	C-5	.005 MFD. CONDENSER 600 V.
PC-7	C-6	.01 MFD. CONDENSER 400 V
MC-3	C-7	.00022 MFD. MICA
MC-5	C-8	500 MMFD. MICA
EC-12	C-9	40 MFD. 150 V ELECTROLYTIC
	C-10	20 MFD
LL-11	L-1	LOOP ANT.
LO-13	L-2	OSC COIL
GC-7 X	G-1	GANG CONDENSER
	G-2	
	G-3	ANT TRIMMER
	G-4	OSC. TRIMMER
PU-5	PU	L-75AS CRYSTAL CARTRIDGE
	SW	SRS.T. SWITCH ON VOLUME CONTROL
SPK-11	T-3	OUTPUT TRANSFORMER
	VC	VOICE COIL
	S	P.M. SPEAKER
CO-2	P	LINE CORD.
M-1	M	110-125 V. 60~ A.C. PHONO MOTOR
SW-7	SW-1	PHONO RADIO SWITCH
TU-18		12BE6 12BA6 12AT6 50B5 35W4

TUBE AND TRIMMER LOCATION
MODEL-5035



TRAV-LER RADIO CORP. MODEL 5036



ALIGNMENT AND SERVICE DATA

Remove chassis from cabinet for alignment.

A Signal Generator is required having the following frequencies: 455 KC, 1400 KC, 1720 KC. An output meter should be connected across the speaker.

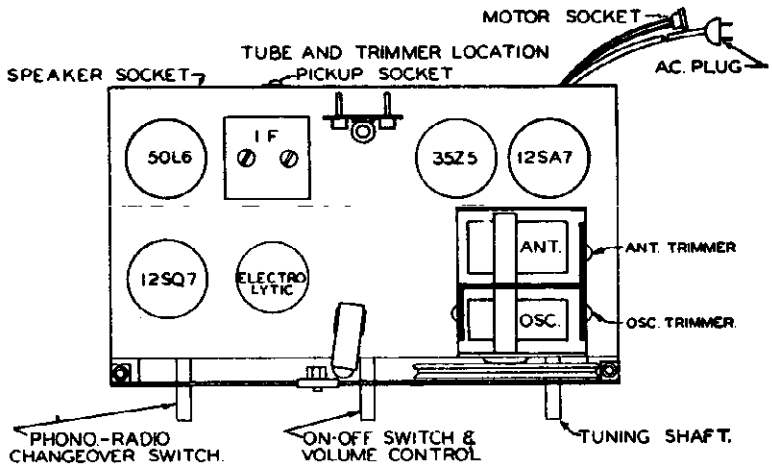
The receiver volume control should be turned to maximum during the I.F. and all subsequent alignments to keep the AVC from working and giving false readings. Keep the generator output as low as possible to prevent overloading.

FIRST STEP: Connect the hot lead from the generator to the ANT. section of the gang condenser, through a .1 MFD condenser. The ground lead from the generator must be connected to the floating ground buss under the chassis. Turn the gang condenser to complete minimum capacity. Adjust the generator to 455KC and adjust the trimmers of the 1st and 2nd I.F. transformers until a maximum reading is noted on the output meter.

SECOND STEP: With the leads from the generator still connected in the same manner, adjust the Signal Generator to 1720 KC. The OSC. trimmer is located on the front of the chassis. Adjust this trimmer until the 1720 KC signal is tuned in.

THIRD STEP: Remove the hot lead of the generator from the ANT section of the gang condenser. Connect this lead to the primary of the loop antenna through a 200 MMFD condenser. Adjust the Signal Generator to 1400 KC. Rotate the tuning control until this signal is tuned in. The ANT trimmer is located on the top of the ANT. section of the gang condenser. Adjust this trimmer until a maximum reading is noted on the output meter. No further adjustment should be necessary, unless the set has been damaged, as the coils and condenser in this receiver have been specially handled at the factory to insure proper alignment at the lower frequencies.

PART NO.		DESCRIPTION
1R-20	R-1	220M RESISTOR 1/2W 20%
1R-9	R-2	22M RESISTOR 1/2W 20%
1R-10	R-3	47M RESISTOR 1/2W 20%
1R-23	R-4	3.3MEG RESISTOR 1/2W 20%
1R-11	R-5	470M RESISTOR 1/2W 20%
1R-3	R-6	10MEG RESISTOR 1/2W 20%
VC-4	R-7	1 MEG. VOLUME CONTROL
1R-17	R-8	33 RESISTOR 1/2 W 20%
1R-25	R-9	2200 RESISTOR 1 W 10%
1R-41	R-10	47 RESISTOR 1 W 10%
PC-8	C-1	.1 MFD. CONDENSER 400 V.
MC-4	C-2	50MMFD. MICA
PC-4	C-3	.25MFD. CONDENSER 200 V.
PC-2	C-4	.05MFD. CONDENSER 200 V.
PC-5	C-5	.05MFD. CONDENSER 400 V
MC-8	C-6	500MMFD. MICA
PC-10	C-7	.005 MFD CONDENSER 400 V
PC-7	C-8	.01MFD. CONDENSER 400 V
MC-2	C-9	100MMFD. MICA
EC-12	C-10	40MFD. ELECTROLYTIC
	C-11	20MFD.
	SW	SWITCH ON VOLUME CONTROL
SW-1	SW-1	RADIO-PHONO SWITCH
LI-8	T-1	I.F. TRANSFORMER
	T-2	OUTPUT TRANSFORMER
SPK-19	V.C.	VOICE COIL
	S	4" PM SPEAKER
LL-19	L-1	LOOP ANT
LO-14	L-2	OSC. COIL
M-2	M-2	110 V. 60 CYCLES MOTOR
PU-5	PU	TONE ARM WITH L-75 CARTRIDGE
PB-1	PL	#47 PILOT BULB
CO-1A	P	LINE CORD
TT-2	T	8" TURNTABLE
GC-6	G-1	GANG CONDENSER
	G-2	



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MODEL R-705,
Electro-Tuner

THEORY OF OPERATION

(The switch numbers in this discussion refer to Fig. 1)

The Delco model R-705 is an auto radio receiver using a conventional superheterodyne circuit, but which introduces an entirely new method of automatic station selection. Depressing a single push button will automatically select and tune in any broadcast station of satisfactory signal strength without requiring a previous push button set-up. This automatic tuning is accomplished by electronically controlling a motor driven permeability tuned tuner. Rectified voltage from the received broadcast signal actuates a 6SN7 tube which in turn instantaneously operates a relay and a solenoid switch disconnecting the motor and stopping the tuner on the frequency of the station.

The Electro-Tuner of this radio sweeps the broadcast band first in one direction and then in the other. In order to do this the tuner driving motor is reversed at each end of the broadcast band. The tuner sliding mechanism trips the reversing switch (5) each time the tuner reaches the end of its movement. This switch (5) alternately grounds opposite ends of the motor's center tapped field coil.

The nature of the Electro-Tuner's circuit is such that unless prevented the tuner would hunt for a broadcast signal after the radio is turned on until the receiver is warmed up and stations can be received. This would cause additional wear on the motor and would cause a change in stations when a change might not be desired. A mechanical interlock switch (6) prevents this hunting when the radio is turned on. It accomplishes this by keeping the motor circuit open when the radio is turned on until the tuning control is operated. When the tuning control is operated for the first time after the radio is turned on the interlock switch (6) is closed. It remains closed until the radio is turned off which causes the switch to open. The interlock switch will then remain open until the radio is turned on and the tuning control button is depressed.

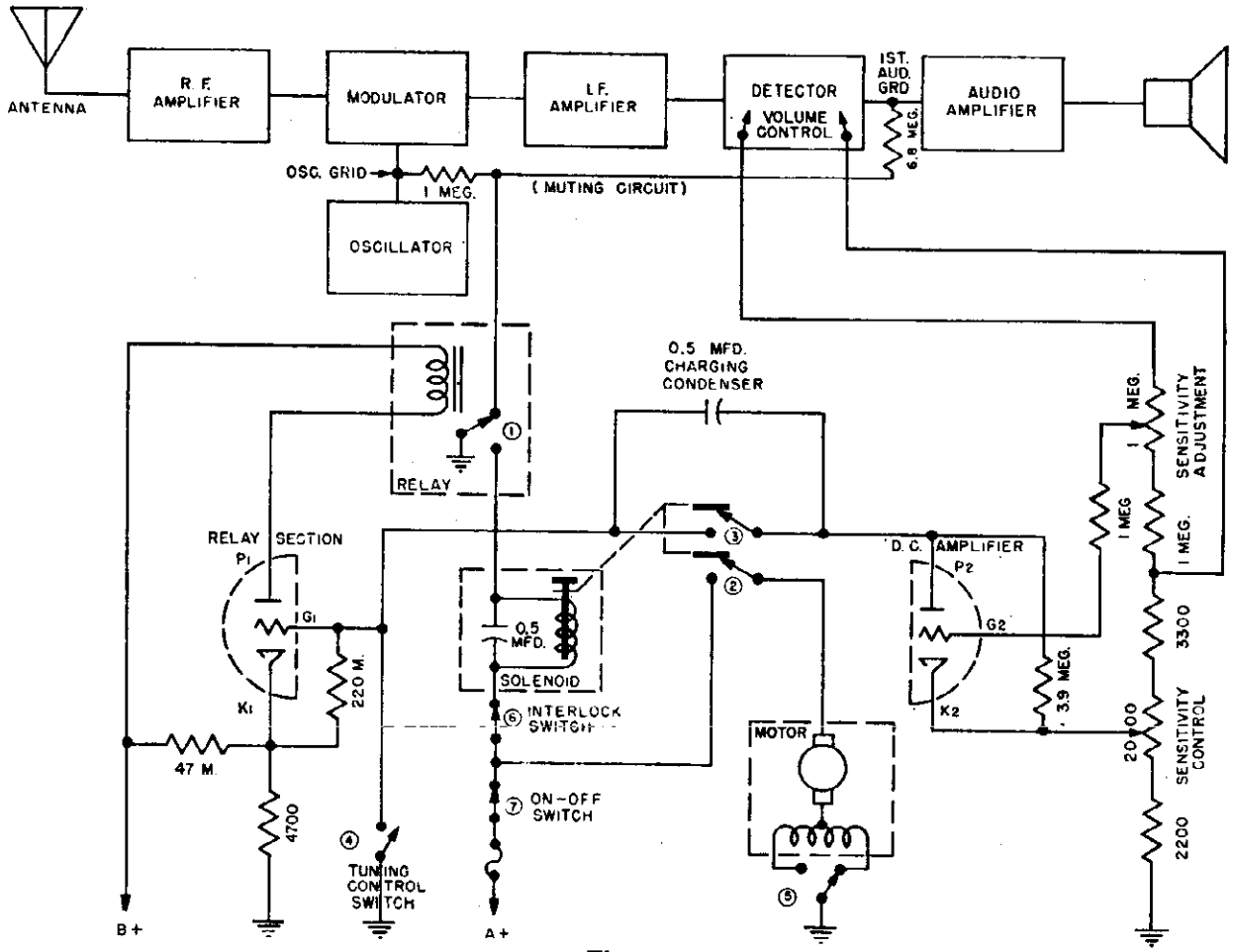

Fig. 1

Model R-705, see Vol. 17-1

MODEL R-705,
Electro-Tuner

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Circuit Operation

The heart of the electrotuner is the 6SN7 twin triode tube and to more readily understand this explanation of the operation, assume the radio is warmed up, the tuner has been operated, and a station is being received. The wiring diagram, Fig. 1, is arranged to show these conditions.

A. With a signal being received, plate current flows in the relay section of the 6SN7 tube and through the coil of the relay switch, holding the relay switch contact (1) in the position shown.

1. The muting voltage is grounded and audio reaches the speaker.
2. The solenoid coil circuit is open and —
   a. The motor is not engaged.
   b. The motor circuit contacts (2) of the solenoid switch are open.
   c. The 6SN7 D. C. amplifier plate circuit contacts (3) of the solenoid switch are open.

B. The electrotuner is actuated by momentarily depressing the tuning knob, thereby setting off a chain of events which happen almost simultaneously.

1. The tuning control switch (4), ganged to the tuning knob, is closed when the tuning knob is depressed, thereby grounding the grid G_1 of the relay section of the 6SN7 tube which stops the plate current flow in the relay section.
   a. With no current flowing through the coil of the relay switch (1) the spring loaded contact arm of this switch opens which permits approximately —10 volts to be applied to the grid of the first audio tube, silencing the radio.
   b. With the solenoid coil circuit grounded at the relay switch contact (1) the solenoid coil is energized and pulls the plunger into the coil which:
      (1) Mechanically engages the motor clutch.
      (2) Closes the motor circuit contacts (2) of the solenoid switch which starts the motor driving the tuner.
      (3) Closes the D. C. amplifier plate circuit contacts (3) of the solenoid, connecting the plate (P_2) of the D. C. amplifier section to the grid (G_1) in the relay section of the 6SN7 tube.
   c. As the motor drives the tuner away from the received signal, the rectified voltage supplied from the detector stage to the grid (G_2) of the D. C. amplifier section of the 6SN7 tube disappears. This rectified voltage is negative in polarity with respect to the cathode voltage and is picked up from the detected signal at the input of the volume control in the detector stage through a potentiometer (sensitivity adjuster). The removal of this negative voltage from the grid (G_2) of the D. C. amplifier section of the 6SN7 tube drives it well above the cutoff voltage.
2. The tuning control switch (4) is opened when the tuning knob is released. This removes the ground from the grid (G_1) of the relay section of the 6SN7 tube and allows voltage to reach the plate (P_2) of the D. C. amplifier section.
   a. Plate current flows in the D. C. amplifier section since the grid (G_2) of the D. C. amplifier is well above the cutoff voltage.
   b. The plate current flows through the 220M ohm resistor and the resultant voltage drop keeps the grid (G_1) of the relay section of the 6SN7 tube biased below cutoff and current does not flow in the relay section.
   c. The motor continues driving the tuning mechanism across the broadcast frequencies and control of the motor and clutch is transferred from the tuning control switch to the D. C. amplifier section of the 6SN7 tube so that the tuner will stop on the first station with sufficient signal strength.

C. The Electro-Tuner is stopped by and on the first station of sufficient signal strength with another chain of events that are almost simultaneous.

1. As the tuning mechanism sweeps into a receivable signal the rectified signal appears across the sensitivity adjuster.

a. A portion of this rectified voltage is applied to the grid G_2 of the D. C. amplifier. Since this voltage is negative with respect to the cathode the D. C. amplifier is biased near cutoff, which reduces the plate current flow in this section. This low current reduces the voltage drop across the 220M ohm resistor allowing the grid G_1 of the relay section to rise above cutoff. The relay section of the 6SN7 tube starts conducting.

2. As the relay section of the 6SN7 tube starts conducting, it actuates the relay switch coil and pulls the contact arm (1) back to the position shown in the diagram.

   a. The muting voltage is removed from the audio circuit by grounding it through the contact arm of the relay switch.

   b. The solenoid circuit opens thus de-energizing the solenoid.

      (1.) The motor is mechanically declutched stopping the tuning mechanism on the received signal.

      (2.) The motor circuit contacts (2) of the solenoid switch are opened stopping the motor.

      (3.) The 6SN7 D. C. amplifier plate contacts (3) are opened removing the D. C. amplifier from the control circuit.

The Electro-Tuner has now tuned the radio to a station and when another station is desired, it is only necessary to depress tuning control momentarily.

Sensitivity Control

The sensitivity control is a continuously variable potentiometer located on the steering column control unit.

Electrically the sensitivity control is located in the cathode circuit of the 6SQ7 detector tube. When the potentiometer arm is in the position nearest ground the cathode of the D. C. amplifier section of the 6SN7 tube has the lowest possible applied cathode voltage. This means that the relative potential between the cathode and the grid of the D. C. amplifier is a minimum resulting in maximum plate current flow in this section.

Assume that the plate current in the D. C. amplifier section becomes low enough to stop the tuner when the grid (G_2) is two volts below the cathode. When the tuner is sweeping between stations and no signal is being received the grid (G_2) of the D. C. amplifier is approximately + 12 volts and the cathode is approximately + 7 volts when the sensitivity control is adjusted to the maximum voltage position. Our voltage differential from cathode to grid is now + 5 volts. To stop the tuner we need a rectified signal voltage of -7 volts which drives the grid two volts below the cathode.

If the sensitivity control is at the minimum voltage position with no signal the grid (G_2) is again + 12 volts and the cathode is approximately + 4 volts, making the differential from cathode to grid + 8 volts. Now, to stop the tuner we need a rectified signal voltage of -10 volts.

The local signal strength of the received station is proportional to the value of the rectified signal; the stronger the station the more negative the rectified signal voltage. Therefore, when the sensitivity control feeds maximum voltage to the cathode (K_2) it is in the position of maximum tuner sensitivity and the tuner will stop on relatively weak signals. When the sensitivity control is feeding the minimum voltage to the cathode (K_2) the tuner will stop only on relatively strong stations.

Sensitivity Adjuster

Local reception conditions vary so greatly over the U. S. A. that an additional adjustment is necessary so the tuner can be made to select only the locally strong stations at minimum position of the steering column sensitivity control. This adjustment has negligible effect on tuner operation when the sensitivity control is set so the tuner will stop on a maximum number of stations.

Electrically the sensitivity adjuster is a potentiometer which governs the amount of rectified signal voltage impressed on the grid (G_2) of the D. C. amplifier. Therefore it establishes the maximum signal strength necessary to stop the tuner when the sensitivity control is positioned to stop the tuner only on very strong stations.

MODEL R-705,
Electro-Tuner

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Charging Condenser

No matter where the sensitivity controls are set, there will always be a few weak stations which will produce enough signal to stop the tuner but will not be strong enough to insure those stations being tuned in accurately. In order to prevent the tuner from stopping on such borderline signal strength stations, a charging condenser has been placed across the switch (3) coupling the plate (P_2) of the D. C. amplifier and the Grid (G_1) of the relay section of 6SN7 tube. Whenever the tuner stops on a station the rectified signal voltage must be maintained during the charging time of this condenser or the condenser will pass sufficient current to bias the grid (G_1) of the relay section beyond cut off causing the relay to open and the tuner to move on to the next station. This action will make the relay appear to chatter on some stations. This condition is normal and merely indicates that the received signal is not quite strong enough to stop the tuner accurately.

TROUBLE SHOOTING THE ELECTRO-TUNER

NOTE: This radio will appear to have many operating troubles if the correct "A" voltage is not used. This radio should be operated with "A" voltage between 5.5 and 7.5 volts measured at the fuse on the power supply. It is recommended that bench power supply leads be no smaller than #14 wire.

I. THE TUNER WILL NOT STOP ON ANY STATIONS.

A. When the sensitivity control (illustration #94) is at minimum sensitivity.
NOTE: Proper operation should receive at least one strong local station.
1. The tuner sensitivity needs adjusting (see page #1).

B. When the sensitivity control is at maximum sensitivity.
1. Insufficient rectified signal voltage reaches the tuner from the detector stage of the receiver. Sufficient rectified signal voltage will give a VTVM reading of 5 or more DC volts negative from grid to cathode of the DC amplifier section of 6SN7 tube.
a. Stations cannot be tuned in manually.
(1) Receiver is not operating. Service the radio and antenna in the conventional manner.
b. Stations can be received manually.
(1) The tuner sensitivity needs adjusting (See Page 1).
(2) The radio sensitivity needs adjusting.
(3) The antenna trimmer needs peaking. If trimmer will not peak use antenna adapter #4278.
(4) Open circuit between receiver and tuner.
(5) Antenna is faulty.
2. Sufficient rectified voltage reaches the tuner.
a. The 6SN7 tube is faulty.
b. The relay is not operating. The relay should operate with 7MA current.

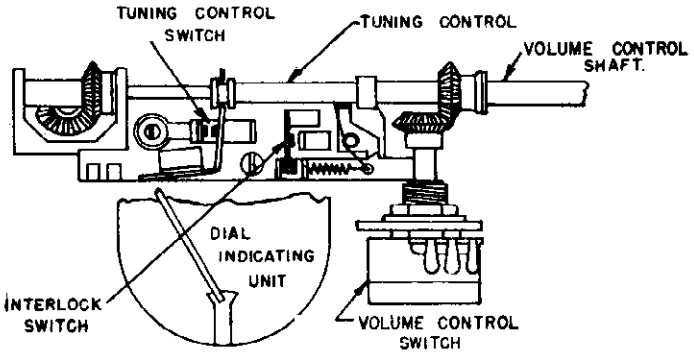

Fig. 2

II. THE TUNER WILL NOT START.

A. The tuner is completely inoperative.
1. The tuning control switch does not close when the tuning control is operated. (See Fig. 2)
2. The interlock switch does not close when the tuning control is operated. (See Fig. 2)
3. The reversing switch is open. (See Fig. 3)
4. The relay tension spring is disconnected. (See Fig. 4)
5. The 6SN7 tube is faulty.
6. The motor switch (Illus. No. 113B) does not close properly. This switch should close before the clutch fingers engage the slotted disc on the motor drive gear. (See Fig. 5). It should open before the clutch fingers engage the manual drive slotted disc. This may appear as intermittent trouble.

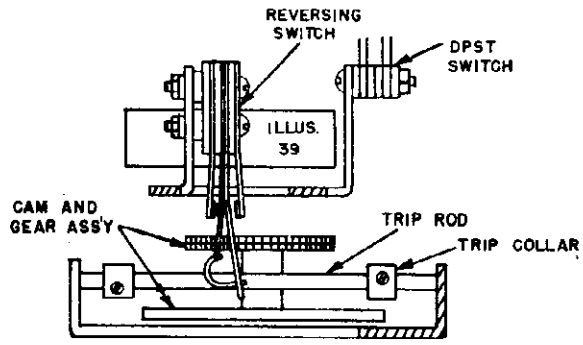

Fig. 3

B. The motor runs without driving the tuning mechanism.

1. The motor clutch does not engage.
   a. The motor drive gear slotted disc or the clutch fingers are worn.
   b. The clutch engaging yoke does not have enough travel. Adjust the solenoid core "hat" so that the clutch fingers extend into the slotted disc but not through it when the solenoid plunger is all the way in. Check the screw under the solenoid that holds the two pieces that make up the clutch yoke. If this screw is loose tighten it with the linkage in its extended position and solder these securely in place. (See Fig. 5)

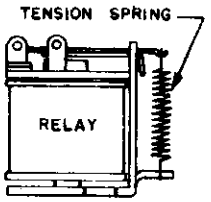

Fig. 4

2. One of the gears has failed.
   a. The motor drive gear friction safety clutch has failed. (See Fig. 5)
   b. The gear teeth are worn. (See Fig. 5)
   c. The gears are out of alignment or mesh. The three mounting screws that mount the gear housing to the motor control the position of these gears. (See Fig. 5)
3. The reversing switch has failed. The switch will not reverse or continually reverses.
   a. The switch is fouled on the trip rod. (See Fig. 3)
   b. The trip collars are improperly positioned. They should reverse the motor just before the cam follower reaches the point of the cam. (See Figs. 3 and 6)
4. There is backlash in the tuner slide mechanism.
   a. The tuner slide anti-backlash spring is disconnected. (See Fig. 6)
   b. The tuner sliding mechanism is binding. (See Fig. 6)

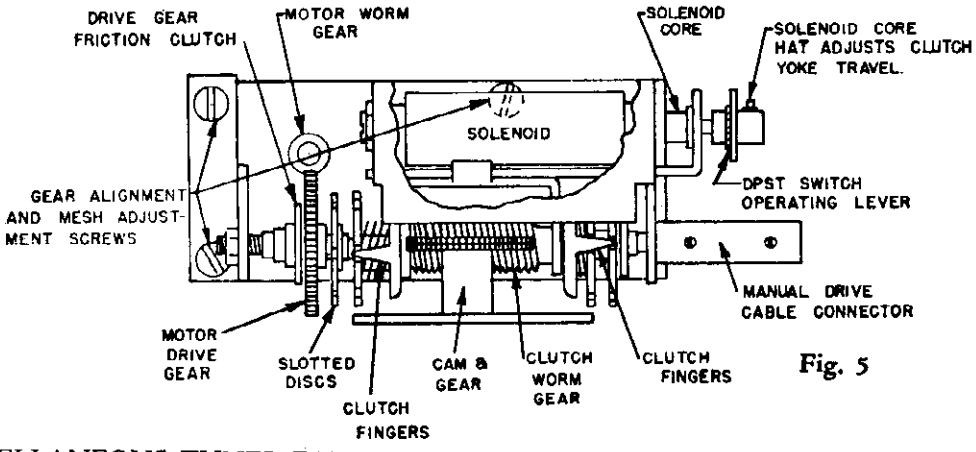

Fig. 5

III. MISCELLANEOUS TUNER FAILURES.

A. The tuner operates when the radio is turned on and before the tuning control is operated.
   1. The interlock is continuously closed. (See Fig. 2)

B. The tuner reverses before reaching the end of the broadcast band.
   1. The reversing switch is fouled on the trip rod. (See Fig. 3)
   2. The trip collars are improperly positioned. (See paragraph II, Part B, 3, b.)

C. The tuner will not tune stations accurately.
   1. There is mechanical loosening or binding if no stations are tuned in accurately.
   2. The 0.5 mfd. charging condenser is open if only weak stations are tuned in inaccurately.

D. The motor runs after stations have been tuned in and tuner has stopped.
   1. The motor switch (Illustration #113B) is continuously closed or shorted.
   2. The motor switch (Illus. #113B) does not open before the clutch fingers engage the manual drive slotted disc.

E. The tuner changes stations when the signal is decreased (viaducts, power lines, large buildings, etc.)
   1. The 0.5 mfd. charging condenser is shorted.

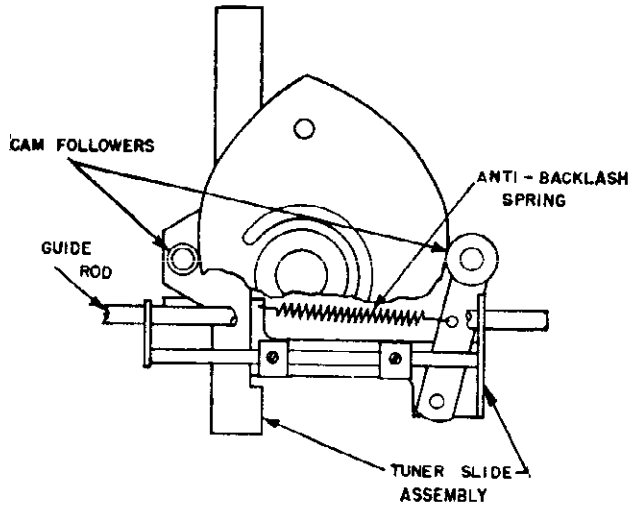

Fig. 6

MODEL R-1226

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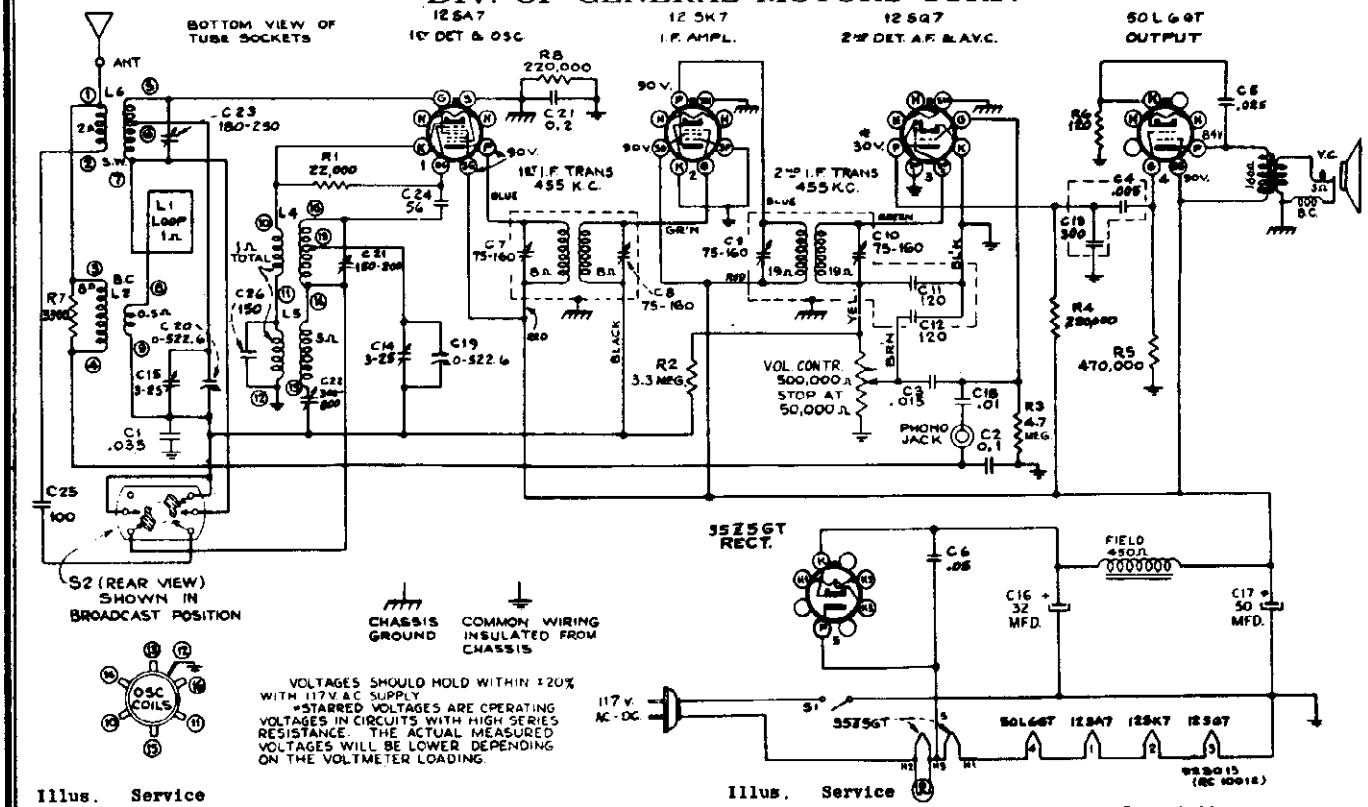


VOLTAGES SHOULD HOLD WITHIN ±20% WITH 117 V A.C. SUPPLY
*STARRED VOLTAGES ARE OPERATING VOLTAGES IN CIRCUITS WITH HIGH SERIES RESISTANCE. THE ACTUAL MEASURED VOLTAGES WILL BE LOWER DEPENDING ON THE VOLTMETER LOADING.

Illus. No.	Service Part No.	Part Name	Description
C1	E403	Condenser	.035 mfd., 400 V., tubular
C3	E203	Condenser	.02 mfd., 600 V., tubular
C4		Condenser	.005 mfd., 300 mmfd., dual
C13		Condenser	.0003 mfd., 300 mmfd., dual
C5	E203	Condenser	.02 mfd., 600 V., tubular
C6	E503	Condenser	.05 mfd., 600 V., tubular
C14		Condenser	Trimmer
C15		Condenser	Trimmer
C19		Condenser	Tuning
C20		Condenser	Tuning
C16		Condenser	Electrolytic, 30 mfd., 150 V.
C17		Condenser	Electrolytic, 20 mfd., 150 V.
C18	E103	Condenser	.01 mfd., 600 V., tubular
C21	E104	Condenser	0.1 mfd., 400 V., tubular
C21A		Condenser	Trimmer
C22		Condenser	Trimmer
C23		Condenser	Trimmer
C24	G470	Condenser	.00005 mfd., moulded
C25	G101	Condenser	.0001 mfd., 600 V., moulded
L1		Loop	Antenna loop
L2-R7		Coil	Loop coupling
L4	1216399	Coil	Oscillator coil
L5		Coil	Oscillator coil
L6		Coil	Antenna coil
R1	A183	Resistor	20,000 ohms, ½ watt
R2	A275	Resistor	3 megohm, ½ watt
R3	A475	Resistor	4.7 megohm, ½ watt
R4	A184	Resistor	200,000 ohms, ½ watt
R5	A474	Resistor	500,000 ohms, ½ watt

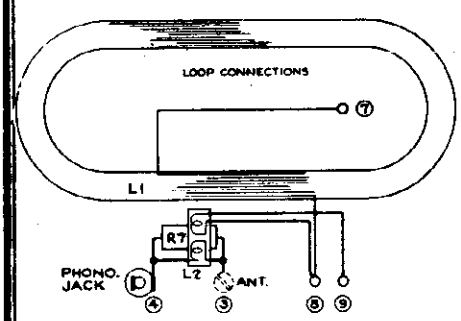
Illus. No.	Service Part No.	Part Name	Description
R6	A101	Resistor	100 ohms, ½ watt
R8	A184	Resistor	200,000 ohms, ½ watt
S2		Switch	Range switch
T1		Transformer	First I.F. transformer
T2		Transformer	Second I.F. transformer
T3		Transformer	Output transformer
V1	8070	Control	Volume control
	8200	Switch	Power switch on vol. control
	1216366	Speaker	5 inch E. M. (stamped RL86-B1 or RL86-B4)

Tubes

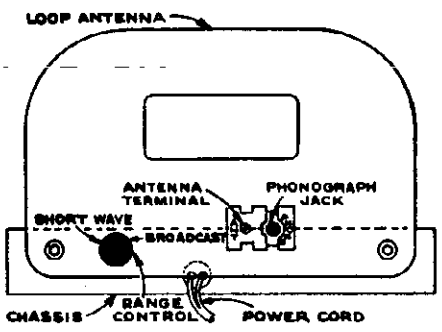
5341	12SA7	First Detector--Oscillator
5348	12SK7	I.F.
5350	12SQ7	Second Detector--A.E.&A.V.C.
5451	50L6GT	Output
5408	35Z5GT	Rectifier

Chassis Miscellaneous Parts

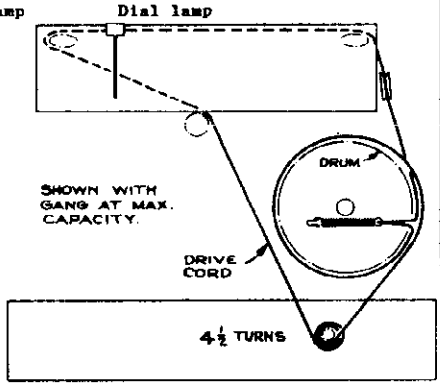
1212233	Cord	Drive cord (approx. 33 inch, overall lgth.)
1216403	Dial	Glass dial scale
1215740	Knob	Volume control or tuning
51.....	Lamp	Dial lamp



Loop Antenna Connections



Rear View



Dial Cord Layout

GENERAL

Tubes ..... Five
Speaker ..... 5-inch Electrodynamic
Antenna ..... Built-in Loop or External
Tuning ..... Manual
Tuning Range ..... 540-1,720 kc, 9-12 mc
Power Supply. 105-125 AC, 50/60 cycles or DC—30 watts

ALIGNMENT PROCEDURE

Volume Control maximum, Signal Generator output minimum for satisfactory output indication.

POWER-SUPPLY POLARITY

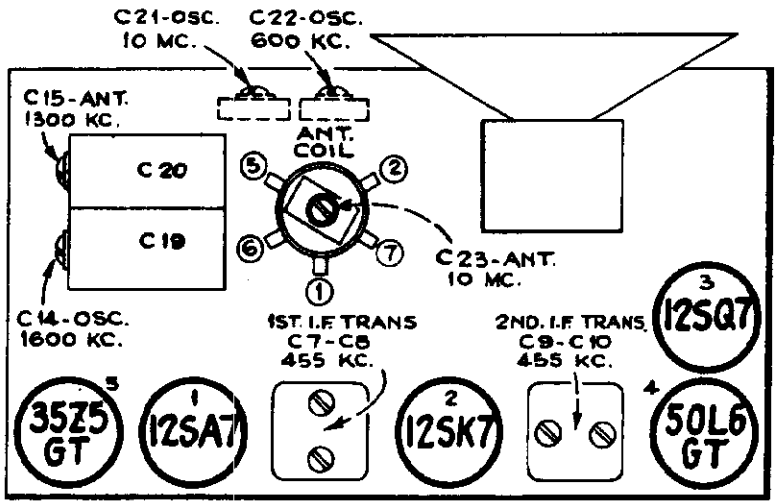
For operation on d-c, the power plug must be inserted in the outlet for correct polarity. If the set does not function, reverse the plug. On a-c, reversal of the plug may reduce hum.

CALIBRATION SCALE

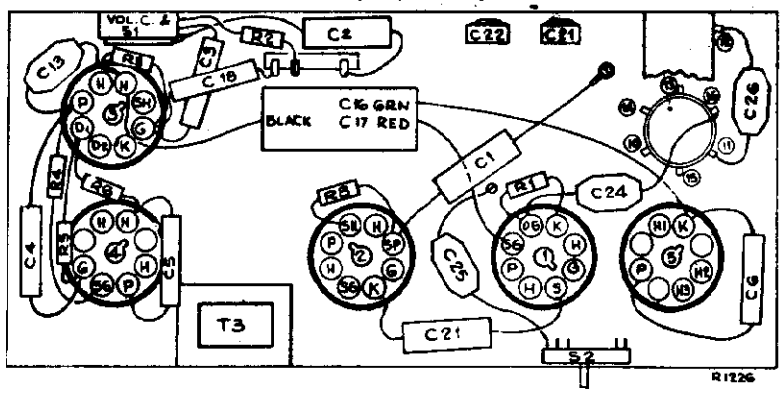
The glass tuning dial may be easily removed from the cabinet and temporarily attached to the dial backing plate for quick reference during alignment.

Steps	Connect the high side of test-oscillator to—	Tune test-osc. to—	Turn radio dial to—	Adjust the following for max. peak output—
1	12SK7 grid in series with 0.1 mfd.	455 kc	Quiet point at 1,600 kc end of dial	C10, C9 2nd I-F Transformer
2	12SA7 grid in series with 0.1 mfd.			C8, C7 1st I-F Transformer
3	Antenna term. in series with 47 mmf.	10 mc*	10 mc	C21 (osc.)** C23 (ant.)
4	Antenna term. in series with 200 mmfd.	1,600 kc	1,600 kc	C14 (osc.)
5	Radiation loop consisting of two turns of wire 18 inches in diameter located 4 to 6 feet from receiver	1,300 kc	Resonance on signal	C15 (ant.)
6		600 kc	600 kc	C22 (osc.) Rock in

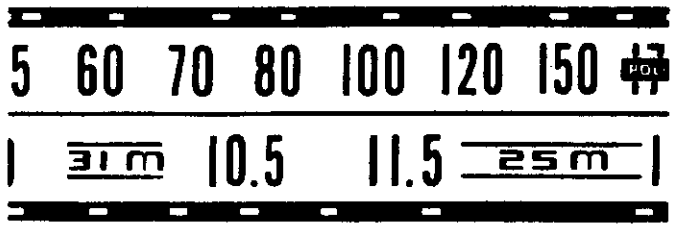
* It is recommended that this step be repeated using a received station of known frequency.
** Use minimum capacity if two peaks can be obtained.



Parts Layout—Top View



Parts Layout—Bottom View



The dial scale drawing shown is a full size reproduction. It can be used as a direct substitute for regular dial scale in alignment procedure.

MODEL R-1233

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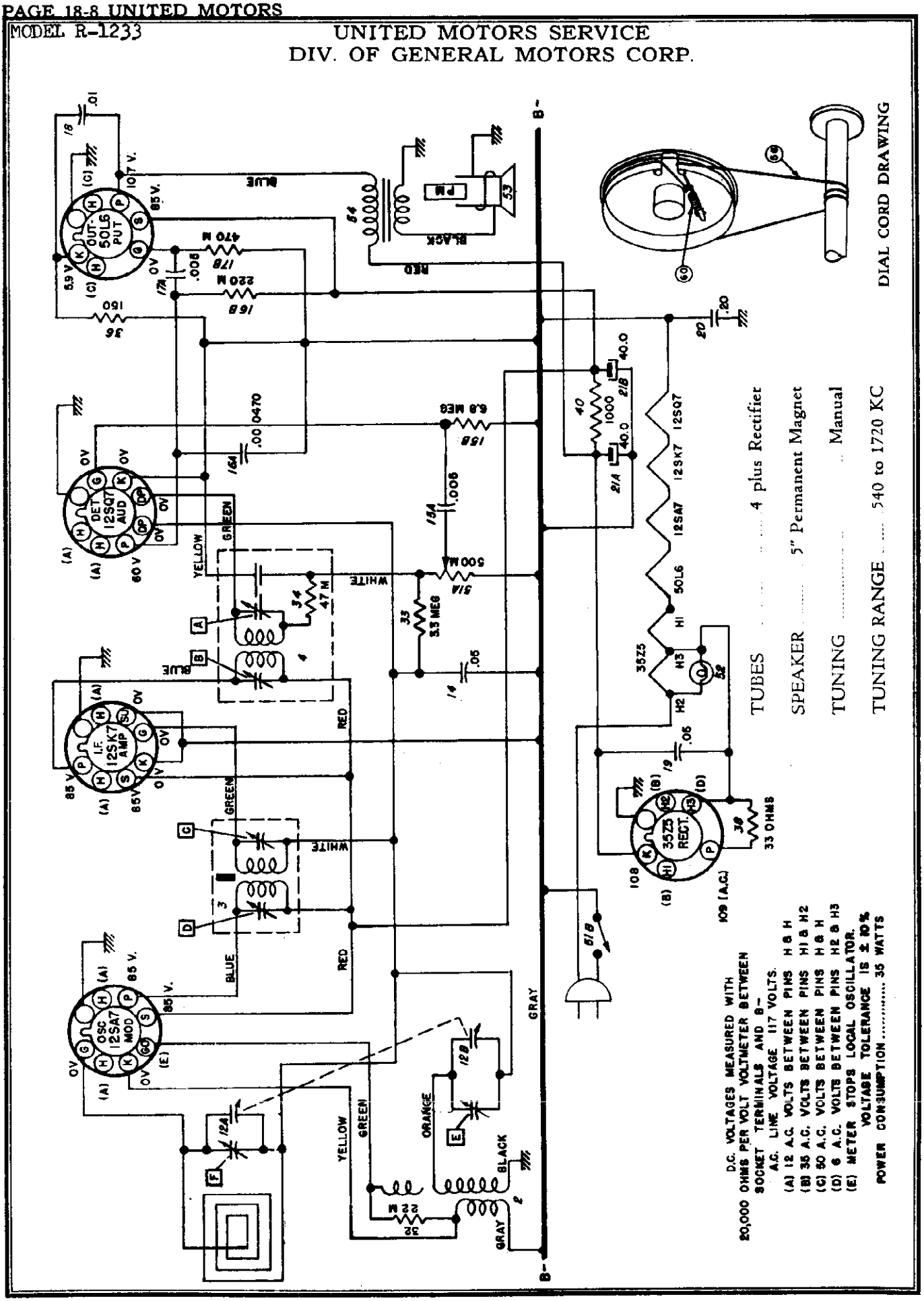

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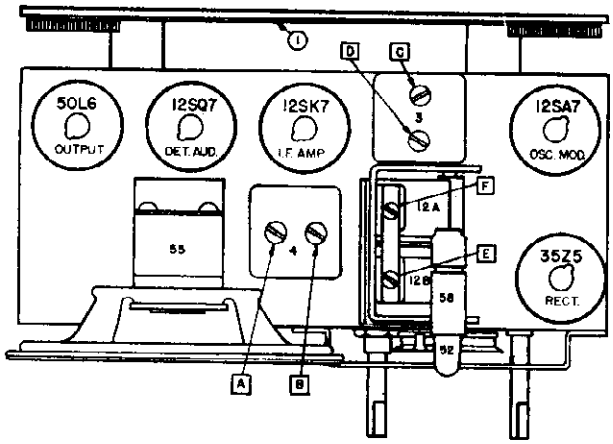
MODEL R-1233

ALIGNMENT PROCEDURE:

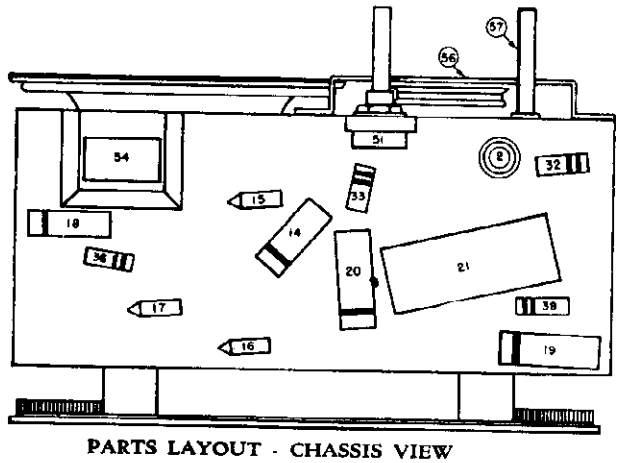
Output Meter Connections ..... Across Voice Coil
Generator Return ..... To Chassis Through 0.1 Mfd.
Dummy Antenna ..... In Series With Generator
Volume Control Position ..... Maximum Volume
Generator Output ..... Minimum for Readable Indication

Steps	Series Condenser or Dummy Antenna	Connect Signal Generator To	Signal Generator Frequency	Tune Receiver To	Adjust In Sequence For Max. Output
1	0.000220 Mfd.	12SA7 Grid (Pin #8)	456 KC	High Frequency Stop	A, B, C, D
2	0.000220 Mfd.	*12SA7 Grid (Pin #8)	1720 KC	Signal Generator Signal	E
3	0.000220 Mfd.	*Clip to Loop Mtg Board	1400 KC	Signal Generator Signal	F

*The signal generator may be coupled to the receiver by placing a loop electrically across the output of the signal generator and physically near the receiver loop. This loop may be a loop from another radio, a home made loop of 10 or 15 turns, etc.

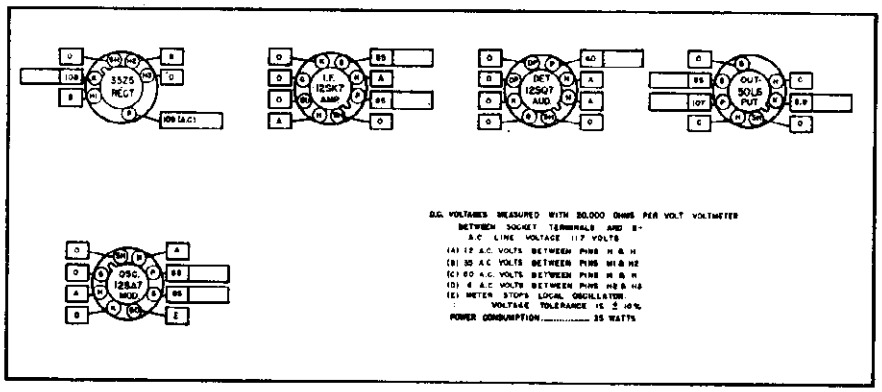


PARTS LAYOUT - TUBE VIEW



PARTS LAYOUT - CHASSIS VIEW

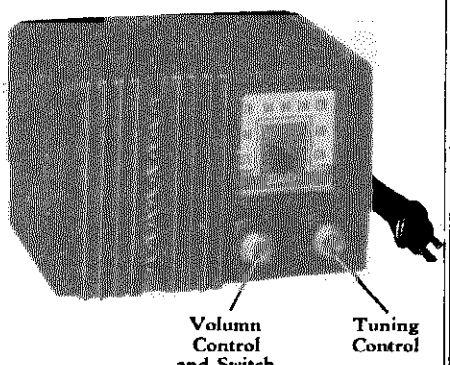
TUBE SOCKET VOLTAGE CHART

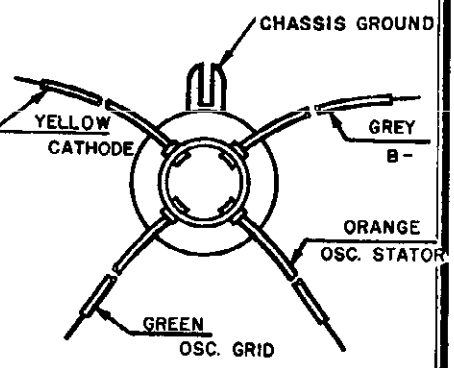


D.C. VOLTAGES MEASURED WITH 20,000 OHMS PER VOLT VOLTMETER
BETWEEN SOCKET TERMINALS AND B-
A.C. LINE VOLTAGE 117 VOLTS
(A) 12 A.C. VOLTS BETWEEN PINS H & H
(B) 30 A.C. VOLTS BETWEEN PINS H1 & H2
(C) 60 A.C. VOLTS BETWEEN PINS H & H
(D) 6 A.C. VOLTS BETWEEN PINS H2 & H3
(E) METER STOPS LOCAL OSCILLATOR.
VOLTAGE TOLERANCE IS ± 10%
POWER CONSUMPTION..... 35 WATTS

The tube socket voltages as measured at the factory are shown above. The blank spaces are provided so the service man may fill in actual readings as taken with his own equiqment. A normal operating radio should be used for these measurements.

Voltmeter Resistance is ..... Ohms Per Volt
Reading Taken with .....AC Volts Line Voltage
Tolerance on Readings is ± 10%
Tubes are viewed from the Terminal Side of the Socket





OSCILLATOR COIL CONNECTIONS

MODEL R-1233

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SERVICE PARTS LIST

Illus. No.	Production Part No.	Service Part No.	Description
			ELECTRICAL PARTS
			COILS
1	1218286	1218286	Loop and Rear Cover Assy.
2	1216518	1216518	Oscillator
3	1218248	1217972	1st I. F. Assy.
4	1218250	1217973	2nd I. F. Assy.
			CONDENSERS
12	1217391	1217391	Variable Condenser Package
			Variable Condenser
12A			R. F. Section
12B			Osc. Section
	1218252	1218252	Pulley
			Grommet -3 Spacer Sleeve -3 Screw -3
14	7236842	E 503	0.05 Mfd. 200V Tubular
15	1218258		Capristor — 0.005 Mfd; 6.8 Megohms
15A		E 502	0.005 Mfd. 600V Tubular
15B		A 685	6.8 Megohms ½W Insulated
16	1218260		Capristor — 0.000470 Mfd; 220,000 Ohms
16A		G 471	0.000470 Mfd. Molded
16B		A 224	220,000 Ohms ½W Insulated
17	1218259		Capristor — 0.0005 Mfd; 470,000 Ohms
17A		E 502	0.005 Mfd. 600V Tubular
17B		A 474	470,000 Ohms ½W Insulated
18	1216513	E 103	0.01 Mfd. 600V Tubular
19	7230592	E 503	0.05 Mfd. 600V Tubular
20	7238787	E 204	0.2 Mfd. 400V Tubular
21	1217027	J 908	Electrolytic
21A			40 Mfd. 150V
21B			40 Mfd. 150V
			RESISTORS
15	1218258		Capristor — 0.005 Mfd. 6.8 Megohm
15A		E 502	0.005 Mfd. 600V Tubular
15B		A 685	6.8 Megohms ½W Insulated
16	1218260		Capristor — 0.000470 Mfd. 220,000 Ohms
16A		G 471	0.000470 Mfd. Molded
16B		A 224	220,000 Ohms ½W Insulated
17	1218259		Capristor — 0.005 Mfd. 470,000 Ohms
17A		E 502	0.005 Mfd. 600V Tubular
17B		A 474	470,000 Ohms ½W Insulated
32	1214550	A 223	22,000 Ohms ½W Insulated
33	1214564	A 335	3.3 Megohm ½W Insulated
34	1214553	A 473	47,000 Ohms ½W Insulated
			(In 2nd I. F. Coil Assy.)
36	1213220	A 151	150 Ohms ½W Insulated
38	1214538	A 330	33 Ohms ½W Insulated
40	1211037	B 102	1000 Ohms 1W Insulated
			MISCELLANEOUS ELECTRICAL PARTS
51	1216477		Control — Volume and Switch
51A		8071	Volume Control
51B		8201	Switch
52	435433	47	Lamp, Dial Light
53	1217405	1216563	Speaker — 5" Permanent Magnet
54	1216571	1216571	Transformer — Output
			TUBES
	1214889	5342	12SA7GT
	1214890	5349	12SK7GT
	1214891	5351	12SQ7GT
	1214366	5451	50L6GT
	1213848	5408	35L5GT — Rectifier
			MECHANICAL PARTS
			CHASSIS
	1216512	1216512	Cord — Power
55		6040	Cord — Pointer Drive (120 Ft. Spool)
56	1217421	1217421	Dial and Plate Assy.
	1218253	1218253	Pointer
57	1216479	1216479	Shaft — Tuning
58	1217839	1217839	Socket — Dial Light
	7236279	7236279	Socket — Octal Tube
59	1217323	1217323	Spring — Cord Tension

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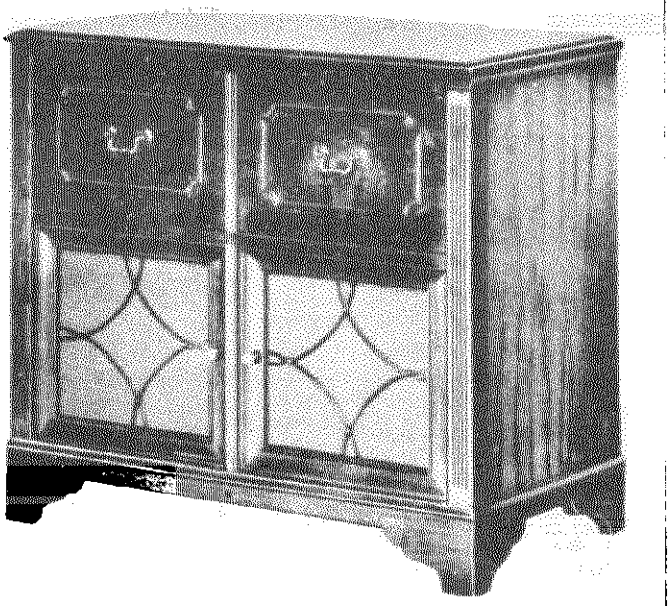
MODELS R-1253, R-1254

GENERAL

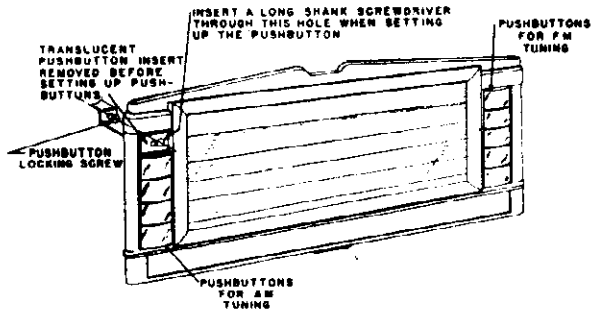
TUBES	Eleven plus rectifier
SPEAKER	12 inch P.M.
TUNING	Manual and mechanical push-buttons; five P.B. for "AM", five P.B. for "FM"
TUNING RANGE	(BC) 550 KC - 1700 KC (SW) 5.8 MC - 18 MC (FM) 88 MC - 108 MC
ANTENNA	Built-in loop, (BC); built-in dipole, (FM) and (SW); Provisions for external antennas
POWER SUPPLY	105-125 V. AC, 60 Cycles
POWER CONSUMPTION	120 Watts (140 watts with changer)



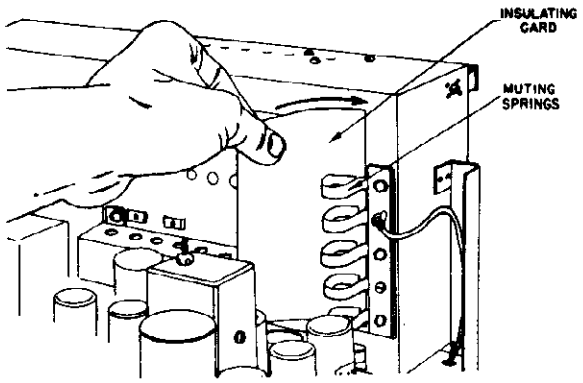
BUTTON SETTING

Insulate the muting switch contacts with the instruction card or a similar 4 x 6 inch paper card as shown before setting the left hand group of "AM" push buttons. The right hand group of "FM" push buttons do not require this treatment.

1. Select any one push button.
2. Pull translucent insert straight out.
3. Insert screw driver blade through large hole of push button into slot of locking screw.
4. Loosen locking screw about one-half turn. (Not more than one full turn.)
5. With push button depressed, carefully tune in desired station with the manual control and tighten the locking screw.
6. Replace the translucent insert with the proper station call letters inserted as follows.



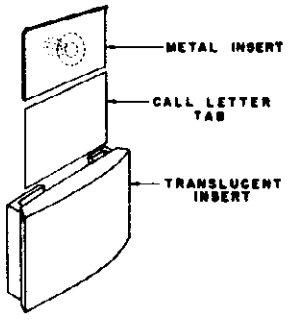
Setting the Push Buttons



Insulating the Muting Switch Contacts

INSERTING CALL LETTERS

1. Slide out metal insert from translucent insert assembly.
2. Insert desired call letter tab.
3. Replace metal insert behind call letter tab.
4. Replace translucent insert assembly into push button mechanism.



Call Letter Installation

MODELS R-1253, R-1254

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DIAL AND PILOT LAMP REPLACEMENT

The two dial lamps are made accessible by removing the dial escutcheon at the front of the cabinet. The pilot lamp at the base of the cabinet is removed from the front of the cabinet by reaching under the cabinet directly behind the jewel. Slip the socket assembly straight back a short distance, releasing it from its mounting tongue. The socket and defective lamp may now be brought out in the open for replacement. Replace all lamps with 6-8 volt Mazda No. 44 or equivalent.

ALIGNMENT PROCEDURE

Removal of the receiver chassis from the cabinet requires the use of other calibration means than the dial glass. Calibration strips mounted on the pointer rails are provided for alignment purposes.

To use these calibration strips, it is necessary to remove the dial plate (brown metal cover) in the following manner:

1. Remove dial pointers. Pull them straight out of their spring clips.
2. Remove the two dial lamp sockets.
3. Remove dial plate fastened to the chassis with seven sheet metal schews.

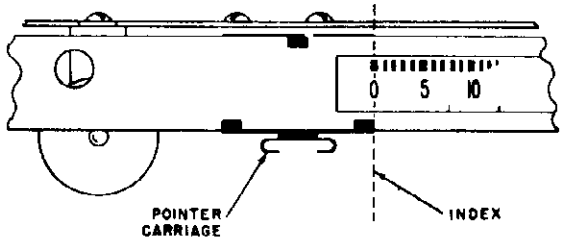
With the variable condensers fully meshed, the right hand side of the pointer carriage will be indexed to zero on the calibration strips.

The receiver is equipped with AUTOMATIC FREQUENCY CONTROL on the "FM" band to compensate for mechanical variations in the push button mechanism. The correction factor is approximately 5 times: AFC takes hold 100 kc before the station frequency is reached and releases before tuning 450 kc beyond the station frequency when receiving a 0.1 volt signal.

The standard RMA dummy specified in the alignment chart consists of a 200 mmf condenser in series with a 20 uh r-f choke which is shunted by a 400 mmf condenser in series with a 400 ohm carbon resistor.

NOTE —

Output Meter Connections....Across Voice Coil
Generator Ground....To Chassis
Dummy Antenna....In Series with Generator
Volume Control Position....Maximum
Tone Control Position....."VOICE"

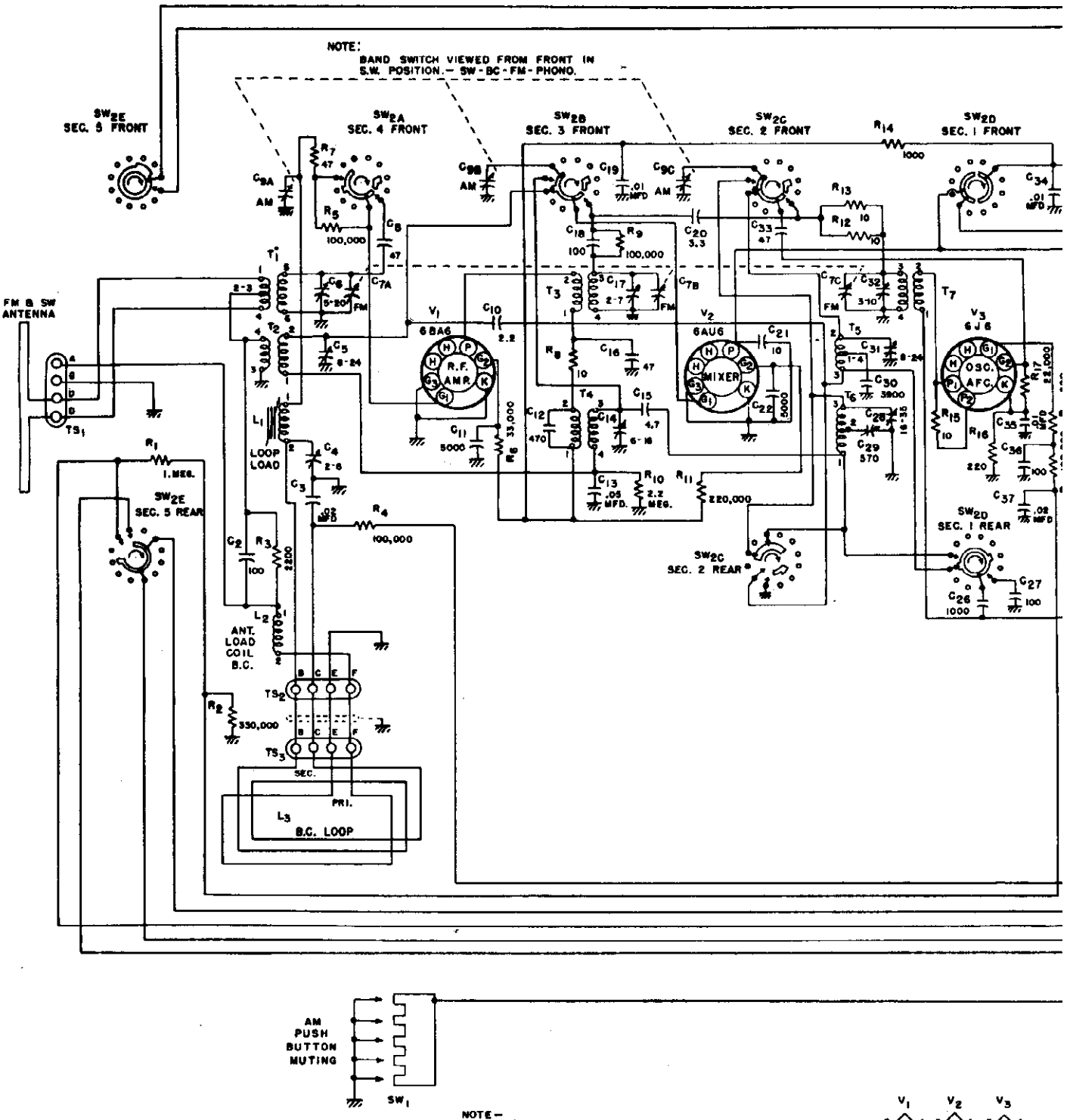


Calibration Strip Detail

ALIGNMENT CHART

Step	Dummy Antenna	Signal Generator Connection	Signal Generator Frequency	Band Switch Pos.	Radio Dial Setting	Cal. No.	Adjust	Remarks
1	0.01 mfd. cap.	To stator plates of center section of "AM" tuning cond.	455 kc	"BC"	1000 kc	55	S1, S2, S3, S4, S5	Adjust for max. output.
2	0.01 mfd. cap.	To stator plates of center section of "FM" tuning cond.	10.7 mc (No modulation)	"FM"	Mid-scale	55	S6, S7, S8, S9 S10, S11	Adjust for max. AVC voltage as measured between pin No. 7 of 6AL5 and ground with a 20,000-ohm per volt meter.
3	0.01 mfd. cap.	To stator plates of center section of "FM" tuning cond.	10.7 mc (No modulation)	"FM"	Mid-scale	55	S12	Adjust for zero voltage as measured between the junction of C55 and C58 and ground with a 20,000-ohm per volt meter.
4	Std. RMA dummy	To terminals "A" and "G" on ant. term. strip.	1500 kc 600 kc	"BC" "BC"	1500 kc 600 kc	82 15.5	A*, B and C D* and S13	Adjust for max. output.
5	Std. RMA dummy	To terminals "A" and "G" on ant. term. strip.	16 mc	"SW"	16 mc	84	E* and F	Adjust for max. output.
6	Two 150 ohm carbon resistors	To terminals "D" and D" on ant. term. strip; one 150 ohm resistor in each lead.	108 mc	"FM"	108 mc	83.5	G*, H and I	Adjust for max. limiter grid voltage as measured between the junction of R33 and R34 and ground with a 20,000-ohm per volt meter.

* Note—Calibration Adjustments.


NOTE:
BAND SWITCH VIEWED FROM FRONT IN S.W. POSITION.— SW - BC - FM - PHONO.
SW2E SEC. 5 FRONT
SW2A SEC. 4 FRONT
SW2B SEC. 3 FRONT
SW2C SEC. 2 FRONT
SW2D SEC. 1 FRONT
FM & SW ANTENNA
TS1
L1 LOOP LOAD
L2 ANT. LOAD COIL B.C.
TS2
TS3
L3 B.C. LOOP
SEC.
PRI.
V1 6BA6 R.F. AMP.
V2 6AU6 MIXER
V3 6J6 OSC. AFC.
SW2E SEC. 5 REAR
SW2D SEC. 1 REAR
SW2C SEC. 2 REAR
AM PUSH BUTTON MUTING
SW1
NOTE—
ALL RESISTOR VALUES ARE IN OHMS.
ALL CAPACITOR VALUES ARE IN MMF. UNLESS OTHERWISE INDICATED.
ALL SWITCHES VIEWED FROM THE FRONT.
TONE CONTROL IN "VOICE" POSITION. REMAINING TWO POSITIONS ARE "BASS" AND "HI-FI" RESPECTIVELY.
TUNER

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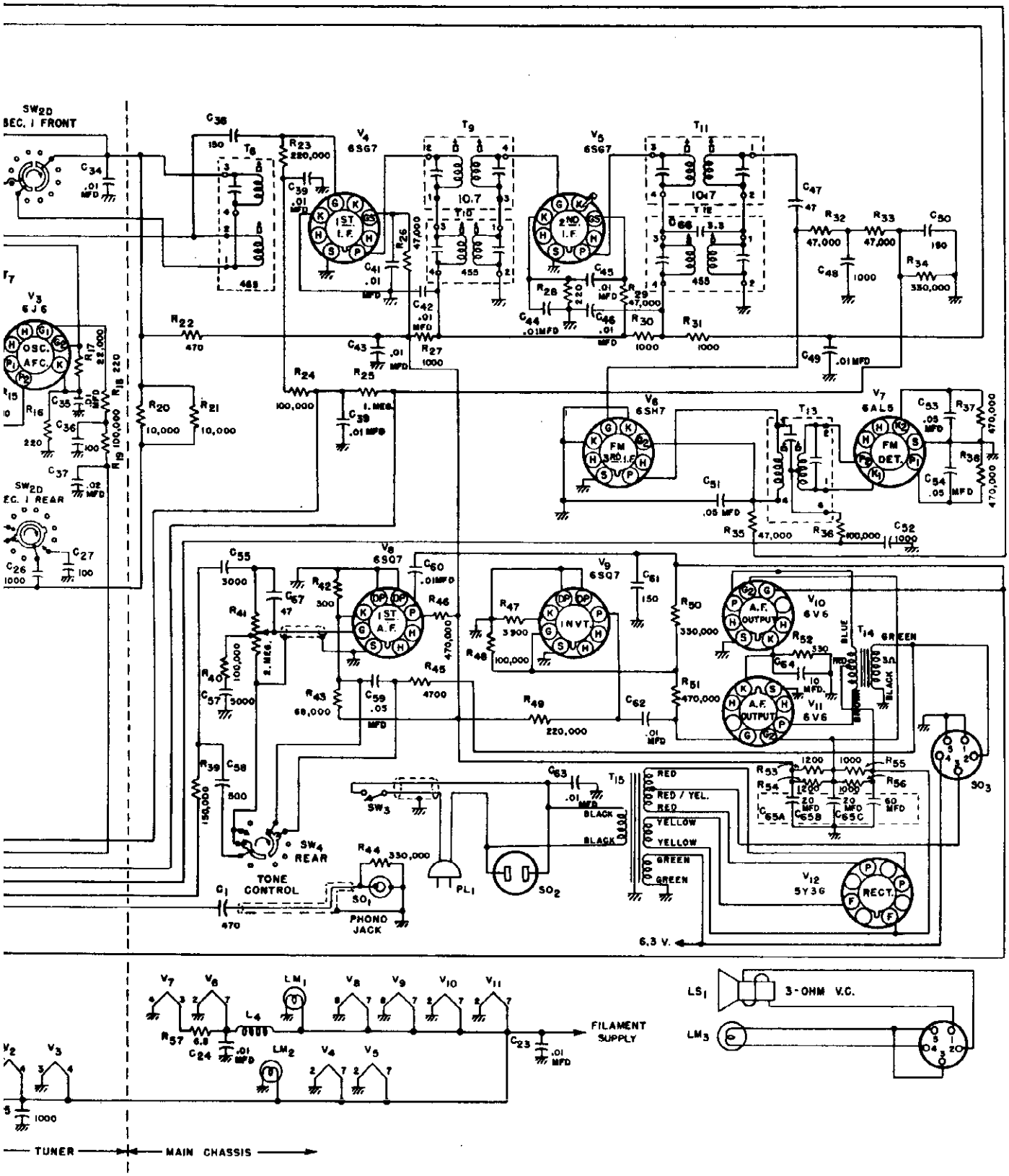
MODELS R-1253,
R-1254



Circuit Diagram

RECORD CHANGER: Seeburg Model L, RCD.CH. 15-18

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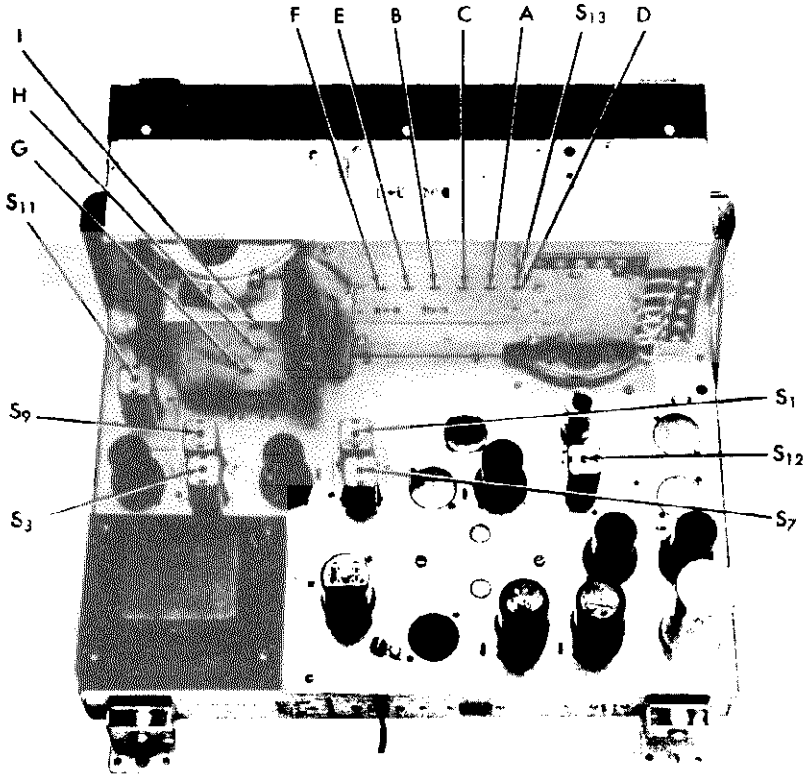
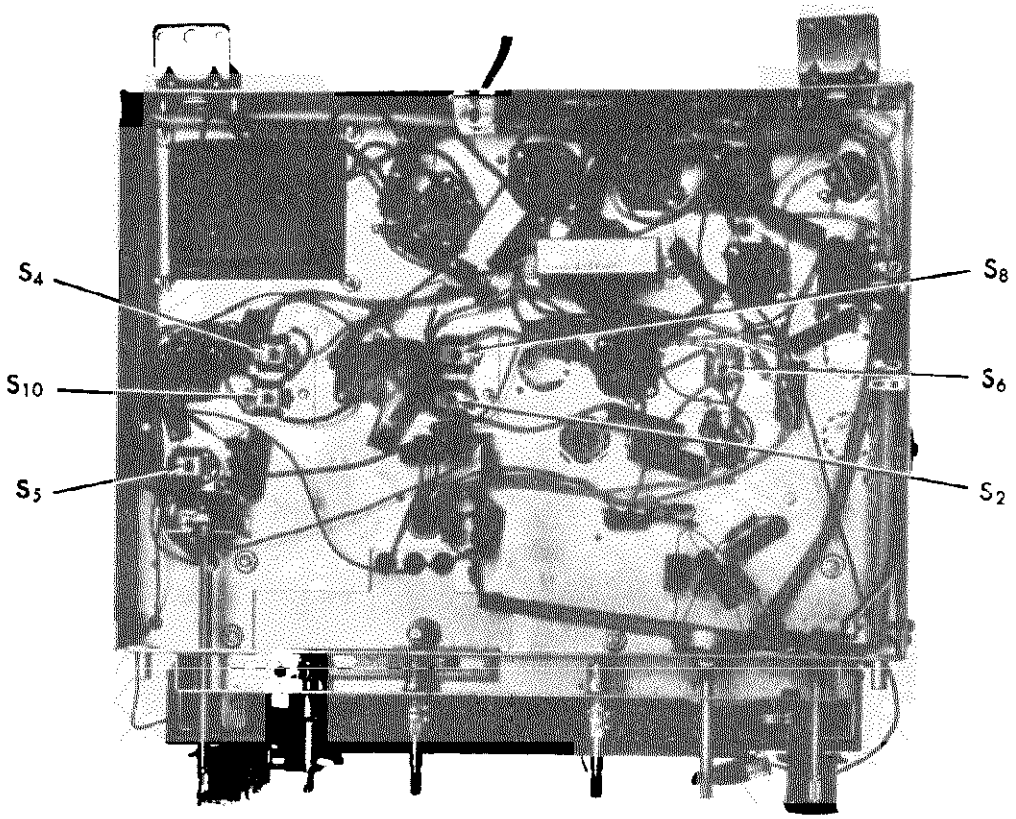
MODELS R-1253, R-1254



Alignment Adjustments—*Top View*



Alignment Adjustments—*Bottom View*

MODELS R-1253, R-1254

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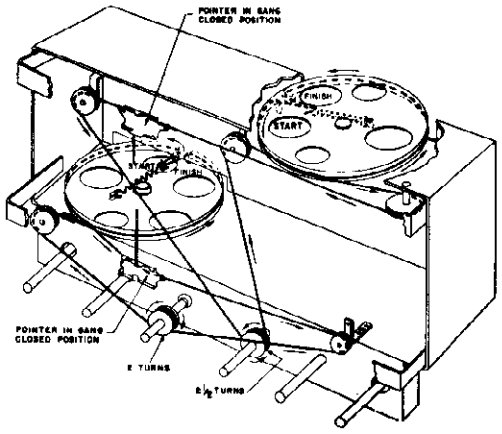
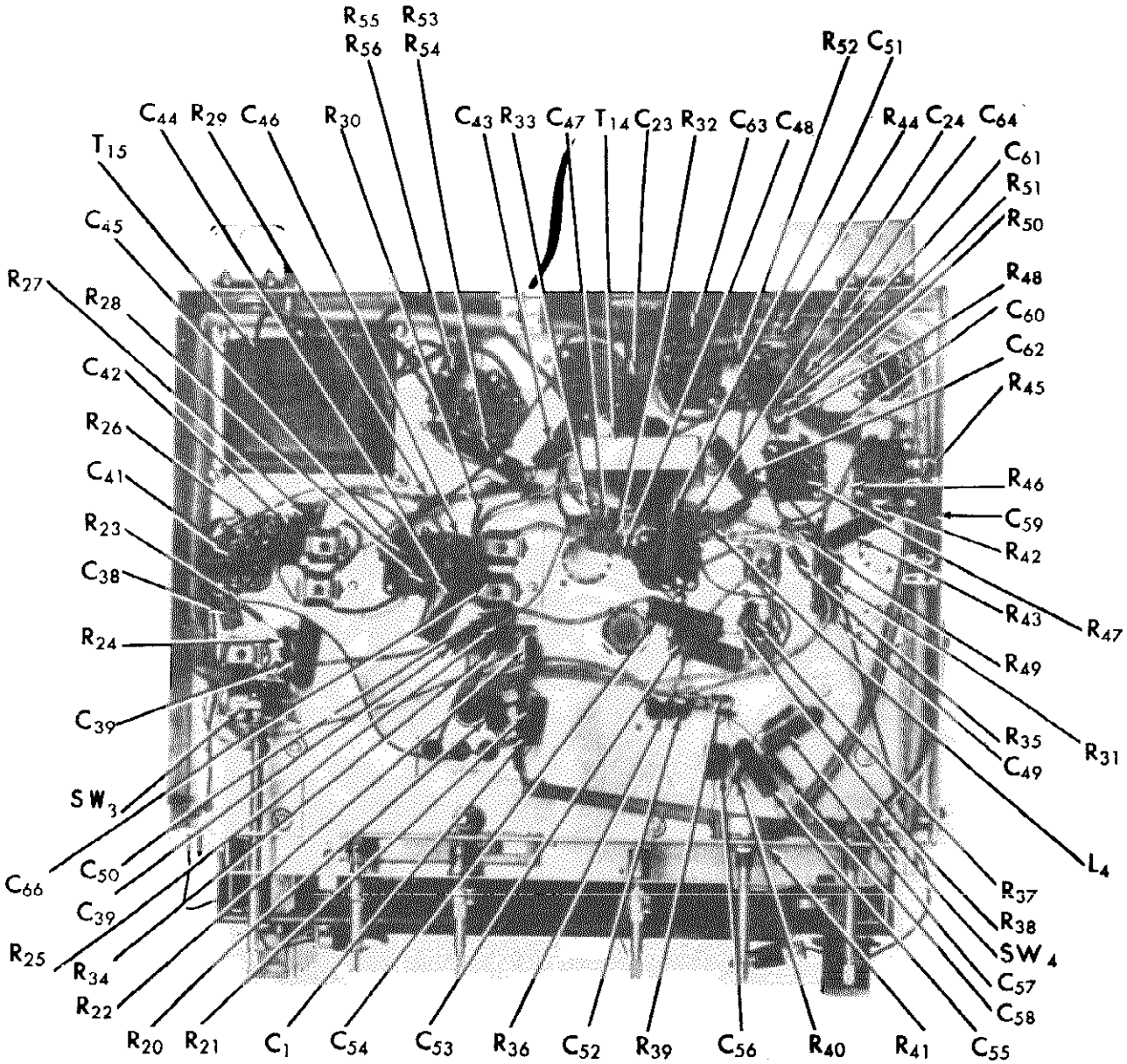


Dial Cord Layout

RESTRINGING DIAL CORD

To restring either the "FM" or "AM" dial drive system, cut a five foot length of 9 lb. test dial cord and follow the stringing procedure as illustrated. Note that the start and finish of both drives are located at the tension spring on the large driven pulley.

Index the pointer by closing the gang and attaching the pointer carriage so that the right hand side of the pointer carriage falls at the zero mark on the calibration strip. Refer to the calibration strip detail shown in the alignment procedure.



Parts Layout—*Bottom View*

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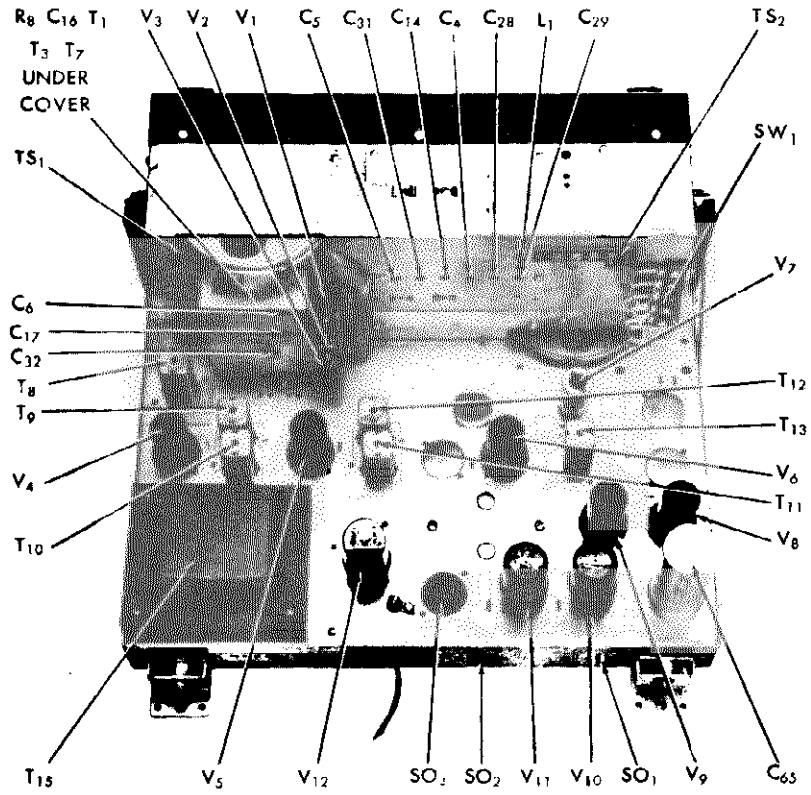
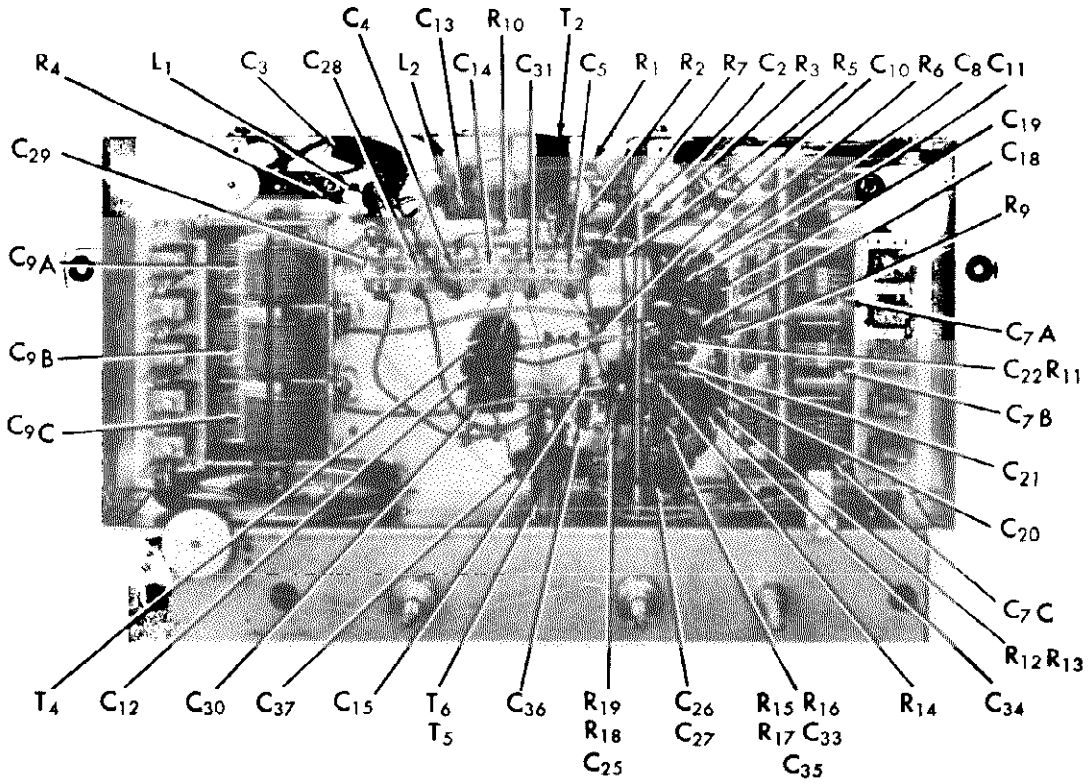
MODELS R-1253, R-1254



Parts Layout—*Top View*



Parts Layout—*Front View*

MODELS R-1253, R-1254

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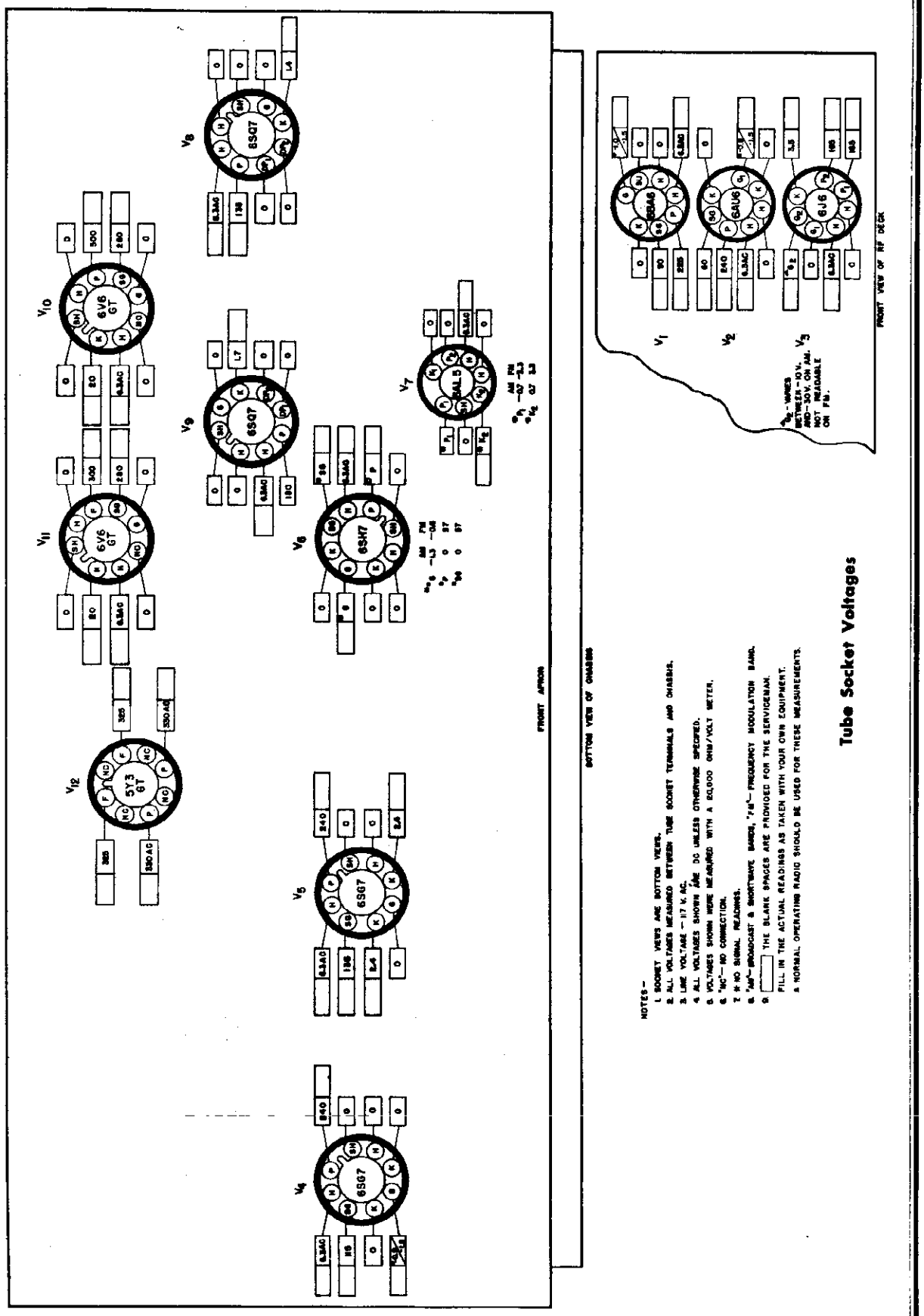

UNITED MOTORS SERVICE
DIV. OF GENERAL MOTORS CORP.

MODELS R-1253, R-1254

SERVICE PARTS LIST

Illustration No.	Production Part No.	Service Part No.	Description
			ELECTRICAL PARTS
			COILS AND TRANSFORMERS
L-1	51B907	1217643	Coil, loop loading
L-2	51A994	1218351	Coil, antenna loading
L-4	53B009	1218362	Coil, R.F. choke
T-1	51B916	1217649	Transformer, FM, antenna stage
T-2	51B993	1218355	Transformer, SW, antenna stage
T-3	51B915	1217718	Transformer, FM, mixer stage
T-4	51B910	1217646	Transformer, BC, mixer stage
T-5	51B908	1217644	Transformer, SW, osc. stage
T-6	51B911	1217647	Transformer, BC, osc. stage
T-7	51B914	1217648	Transformer, FM, osc. stage
T-8	50C298	1218413	Transformer, 1st I.F.
T-9, 11	50C237	1218414	Transformer, FM, interstage I.F.
T-10	50C236	1216416	Transformer, AM, interstage I.F.
T-12	50C235	1218415	Transformer, AM, detector stage I.F.
T-13	50C263	1218265	Transformer, FM, detector stage I.F.
T-14	55B105	1218418	Transformer, audio output
T-15	52C153	1218417	Transformer, power
			CONDENSERS
C-1, 12	CM20A471K	G471	470 mmf. 500 V., mica
C-2, 36	CM20A101M	G101	100 mmf. 500 V., mica
C-3, 37	46AY203F	E203	.02 mfd. 600 V., tubular paper
C-4, 5, 14, 28, 29, 31	44B348	1218365	Trimmer assembly
C-6	44A194	1217707	Trimmer, FM, ant. stage
C-7	48C175	1217716	Tuning condenser, FM
C-8, 33	47A150	1217715	47 mmf. 500 V., ceramic
C-9	48C176	1217717	Tuning condenser, AM
C-10	47A160-4	1218407	2.2 mmf., ceramic
C-11, 22	47A168	1218298	5000 mmf. 500 V., ceramic
C-13, 51, 53, 54	46AY503F	E503	.05 mfd. 600 V., tubular paper
C-15	47A160-6	1218408	4.7 mmf., ceramic
C-16, 47	CM20A470M	G470	47 mmf. 500 V., mica
C-17	44A192	1217705	Trimmer, FM, mixer stage
C-18, 27	47A045	1218411	100 mmf. 500 V., ceramic
C-19, 23, 24, 34, 39, 40, 41, 42, 43, 44, 45, 46, 49, 60, 62	46AZ103F	E103	.01 mfd. 600 V., tubular paper
C-20	47A160-5	1218409	3.3 mmf., ceramic
C-21	47A149	1217714	10 mmf. 500 V., ceramic
C-25, 26, 48, 52	47A148	1217713	1000 mmf. 500 V., ceramic
C-30	CM35A392J	G392	3900 mmf. 500 V., mica
C-32	44A218	1218352	Trimmer, FM, osc. stage
C-35	47B32103NI	1218329	.01 mfd. 150 V., ceramic
C-38, 50, 56, 61	CM20A151M	G151	150 mmf. 500 V., mica
C-55	46AZ302J	E302	.003 mfd. 600 V., tubular paper
C-57	46AZ502J	E502	.005 mfd. 600 V., tubular paper
C-58	47A147	1217712	500 mmf. 350 V., ceramic
C-59	46AU503J	E503	.05 mfd. 200 V., tubular paper
C-63	46AG103J	1217227	.01 mfd. 600 V., molded paper
C-64	45A121	J100	10 mfd. 25 V., electrolytic
C-65	45B113	1217457	60-20 mfd., 450 V.; 20 mfd., 400 V., electrolytic
C-66	47A160-5	1218409	3.3 mmf., ceramic
R-1, 25	RC20AE105M	A105	1 megohm ½ watt, carbon
R-2, 34, 44, 50	RC20AE334K	A334	330,000 ohms ½ watt, carbon
R-3	RC20AE222M	A222	2200 ohms ½ watt, carbon
R-4, 5, 9, 19, 24, 36, 40, 48	RC20AE104K	A104	100,000 ohms ½ watt, carbon
R-6	RC30AE333M	B333	33,000 ohms 1 watt, carbon
R-7	RC20AE470M	A470	47 ohms ½ watt, carbon
R-8, 12, 13, 15	RC20AE100M	A100	10 ohms ½ watt, carbon
R-10	RC20AE225M	A225	2.2 megohms ½ watt, carbon
R-11, 23, 49	RC20AE224M	A224	220,000 ohms ½ watt, carbon
R-14, 27, 30, 31	RC20AE102M	A102	1000 ohms ½ watt, carbon
R-16, 18, 28	RC20AE221M	A221	220 ohms ½ watt, carbon
R-17	RC20AE223M	A223	22,000 ohms ½ watt, carbon
R-20, 21	RC30AE103M	C103	10,000 ohms 2 watts, carbon
R-22	RC30AE471M	B471	470 ohms 1 watt, carbon
R-26, 29, 35	RC30AE473M	B473	47,000 ohms 1 watt, carbon
R-32, 33	RC20AE473M	A473	47,000 ohms ½ watt, carbon
R-37, 39, 51, 46	RC20AE474K	A474	470,000 ohms ½ watt, carbon
R-39	RC20AE154M	A154	150,000 ohms ½ watt, carbon
R-41	25B622	1218361	Resistor, variable, 2 megohms (tapped)
R-42	RC20AE301J	A301	300 ohms ½ watt, carbon
R-43	RC40AE683K	C683	68,000 ohms 2 watts, carbon
R-45	RC20AE472K	A472	4700 ohms ½ watt, carbon
R-47	RC20AE392K	A392	3900 ohms ½ watt, carbon

SERVICE PARTS LIST (Continued)

Illustration No.	Production Part No.	Service Part No.	Description
			CONDENSERS (Continued)
R-52	RC20AE331M	C331	330 ohms 2 watts, carbon
R-53, 54	24BV122E	C122	1200 ohms 2 watts, WW
R-55, 56	24BV102E	C102	1000 ohms 2 watts, WW
			TUBE COMPLEMENT
V-1	90X6BA6	5252	Type 6BA6, antenna
V-2	90X6AU6	5260	Type 6AU6, mixer
V-3	90X6J6	5254	Type 6J6, osc.
V-4, 5	90X6SG7	5226	Type 6SG7, 1st & 2nd I.F.
V-6	90X6SH7	5255	Type 6SH7, FM limiter, AM detector
V-7	90X6AL5	5251	Type 6AL5, FM detector
V-8, 9	90X6SQ7	5231	Type 6SQ7, audio amp.
V-10, 11	90X6V6GT/G	5241	Type 6V6GT/G, power amp.
V-12	90X5Y3GT	5123	Type 5Y3GT, rectifier
			MISCELLANEOUS ELECTRICAL PARTS
L-3	57C114	1217986	Loop antenna
SW-1	18A092	1217977	Switch, muting
SW-2	60C308	1218369	Band switch assembly
SW-3	60B309	1218358	Switch, power
SW-4	60B310	1218359	Switch, tone control
PL-1	87B1625	1218366	Line cord and plug
LM-1, 2, 3	39A003	187189	Lamp, dial light—Mazda No. 44
	87A1615-1	1217680	Transmission line, loop
	57C108-1	1217983	FM folded doublet antenna
LS-1	85C069	1218367	Speaker assembly
			MECHANICAL PARTS
			CHASSIS PARTS
SO-1	36A034	1217634	Receptacle, phono pickup
SO-2	10A015	1217633	Receptacle, phono motor
SO-3	6A277	1217682	Socket, speaker (5 pin)
	6A190	1217684	Socket, octal (tube)
	6B296	1218360	Socket, octal (6V6GT tubes)
	6A276	1217683	Socket, miniature (tube)
	86B046	1217629	Socket & bracket, dial light, L.H.
	86B047	1217628	Socket & bracket, dial light, R.H.
	69A169	1217688	Shield, tube base (miniature tube)
	69A104	1217685	Shield, tube (miniature tube)
	75A076	1217623	Spring, tube retainer
	86A037	1218353	Shield, dial light
	69C172	1218368	Shield, FM coil section
	67B645	1217653	Carriage, pointer
	82B145	1218357	Pointer, FM
	82B146	1218363	Pointer, AM
	75A132	1218354	Spring, pointer
	75A006	1217624	Spring, dial drive
	38A017	.....	Cord, dial drive
	83D300	1217719	Plate, dial drive cover
TS-1	88A277	1217652	Terminal strip, antenna
TS-2	88A278	1217651	Terminal strip, loop
	76A356	1217616	Clamp, speaker
			CABINET PARTS
	85B050-2	1218364	Socket, cabinet pilot light
	69A197	1217938	Shield, pilot light
	69B209	1218356	Shield assembly, cabinet
	17B028	1217666	Push-button (brown)
	17A027	1217631	Insert, push-button, lucite
	17A029	1217936	Insert, push-button, metal
	17A025	1217632	Call letters
	7D039	1217830	Escutcheon
	22D195	1217985	Dial glass, upper
	22B194	1217982	Dial glass, lower
	69A212	1218349	Shield, escutcheon
	76A331	1217980	Clips, dial glass
	15B096	1217627	Knob, power switch & tone control
	15B093	1217626	Knob, tuning & volume controls
	15A129	1217935	Knob & pin assembly bandswitch
	86A057	1217981	Jewel, pilot lamp
	67A765	1217937	Bracket, pilot lamp
			Record changer (see Bulletin 15D505)
	14A161	1217933	Pad, push-button (felt)
	66D409	1217987	Cabinet, console (walnut)
	66D409-1	1217988	Cabinet, console (mahogany)

MODELS 980797, 980798, BUICK

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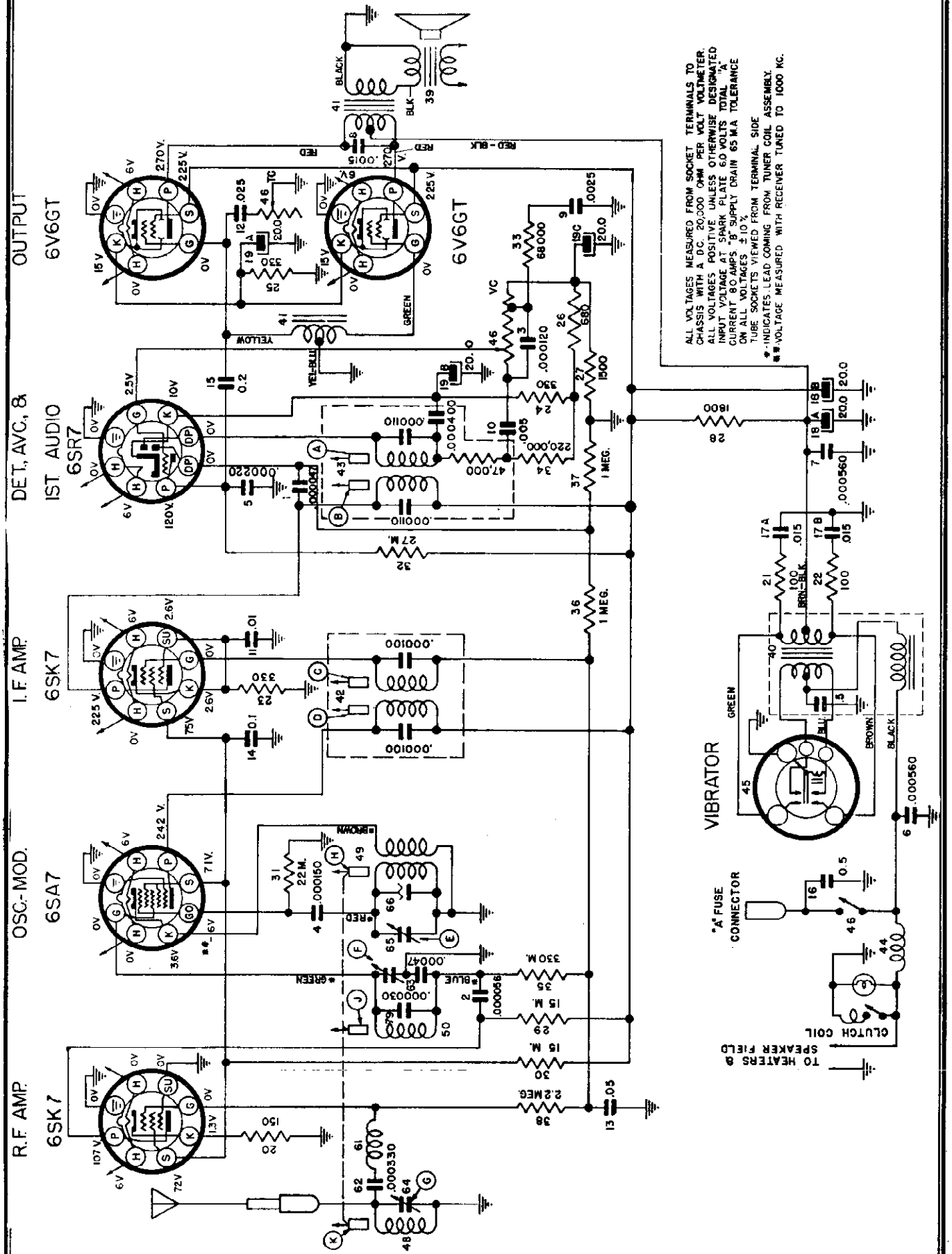

For additional information on Model 980797 see 980744; Buick 15-1

UNITED MOTORS SERVICE
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MODELS 980797, 980798, BUICK

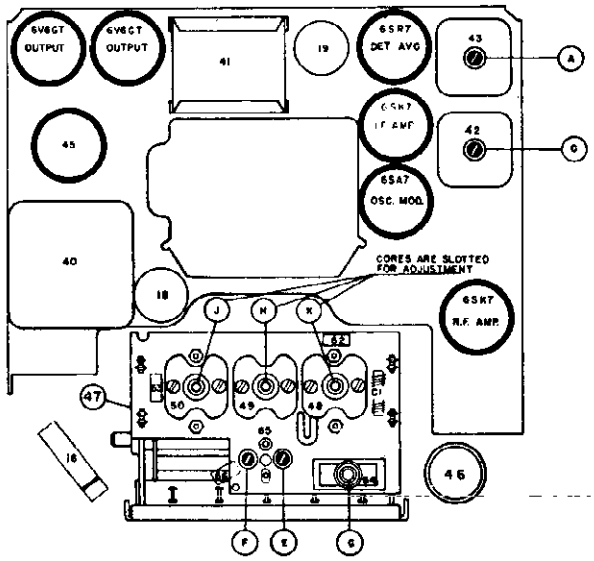
GENERAL:

Mounting—Model 980797 on all 1948 series 40-60-90 Buick cars.
Model 980798 on all 1948 series 50-70

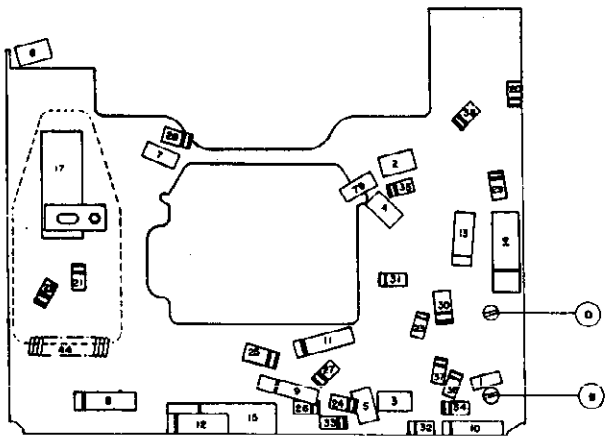
The model 980797 is similar to model 980744 and model 980798 is similar to model 980745. With the exception of parts and illustrations shown in this bulletin, all other information in Bulletin 6D-923 is applicable to models 980797 and 980798.

SERVICE PARTS LIST

Illus. No.	Production Part No.	Service Part No.	Description	
20	1213220	A151	150 Ohms ½ W. Insulated Resistor	
39	7255895	7255895	Speaker—8" Permanent Magnet	
40	7256939	7256939	Power Transformer	
	1217841	1217841	Dial Light Socket (Less Lamp)	
47	7257817	7257817	Tuner Assembly Complete—980797	
47A	7257797	7257797	Tuner Assembly Complete—980798	
		6040	Pointer Cord Pkg. (100' length)	
	7238860	7238860	Spring-Pointer Cord Tension	
69	7257811	7257811	Escutcheon	Parts included in Tuner Assy. 7257817
70	7257765	7257765	Dial	
71	7257766	7257766	Dial Shield	
72	7257803	7257803	Backplate Assembly	
74	7257779	7257779	"B" Pushbutton	
75	7257780	7257780	"U" Pushbutton	
76	7257781	7257781	"I" Pushbutton	
77	7257782	7257782	"C" Pushbutton	
78	7257783	7257783	"K" Pushbutton	
69A	7257818	7257818	Escutcheon	Parts included in Tuner Assy. 7257797
70A	7257755	7257755	Dial	
71A	7257756	7257756	Dial Shield	
72A	7257796	7257796	Backplate Assembly	
74A	7257786	7257786	"B" Pushbutton	
75A	7257787	7257787	"U" Pushbutton	
76A	7257788	7257788	"I" Pushbutton	
77A	7257789	7257789	"C" Pushbutton	
78A	7257790	7257790	"K" Pushbutton	
	1334393	1334393	Tuning Knob	
	1320577	1320577	Dummy Knob	
	1320576	1320576	Tone Control Knob	
	1336763	6015	Generator Condenser	
	120375	120375	Hex Nut	
79	1217735	G330	0.000033 Mfd. Molded Condenser	



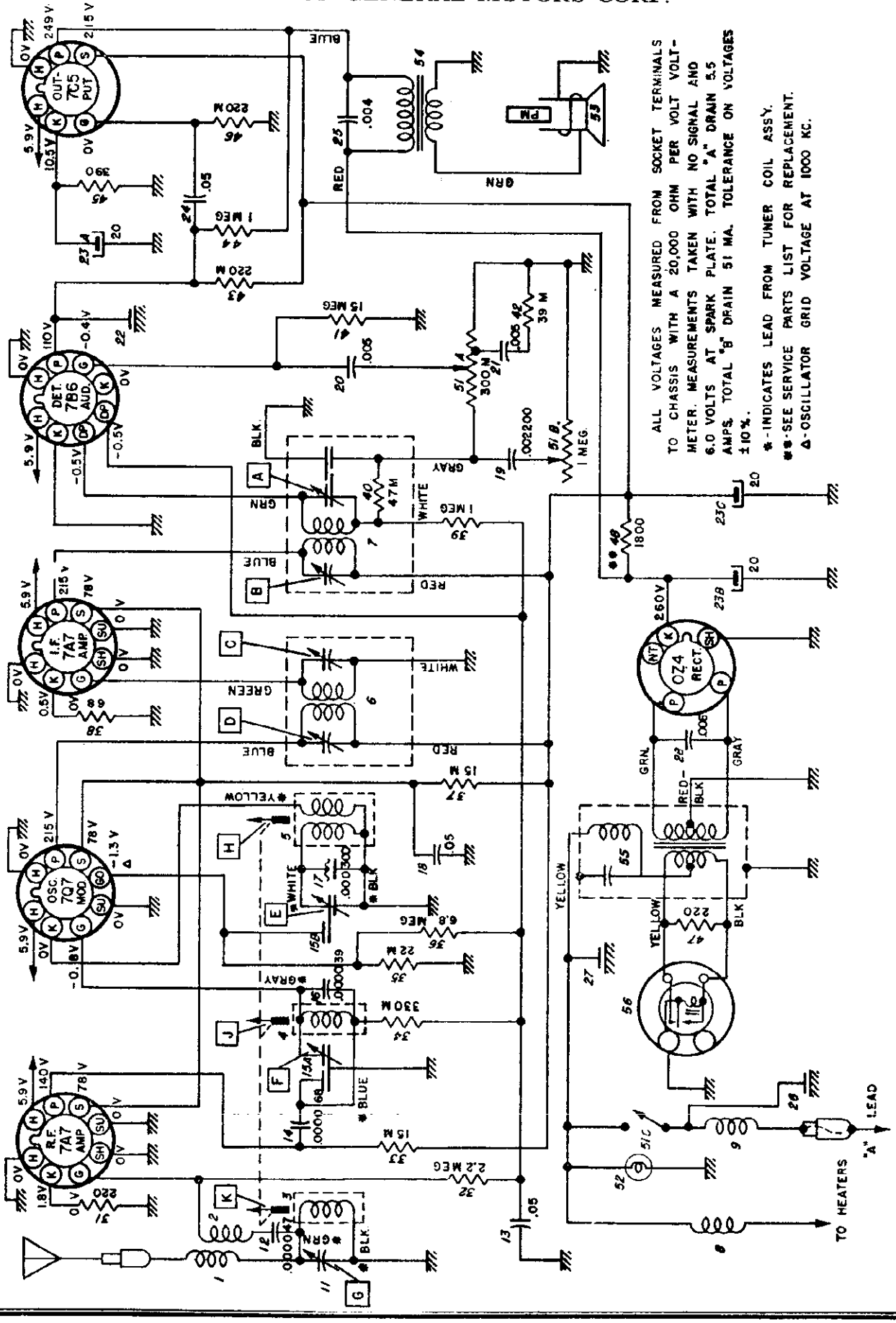
PARTS LAYOUT — CHASSIS VIEW



PARTS LAYOUT — TUBE VIEW

MODEL 982400
OLDSMOBILE

UNITED MOTORS SERVICE
DIV. OF GENERAL MOTORS CORP.



UNITED MOTORS SERVICE
DIV. OF GENERAL MOTORS CORP.

MODEL 982400
OLDSMOBILE

GENERAL

MOUNTING — All 1949 Oldsmobile Cars.

TUBES—Five, plus rectifier.

SPEAKER—6"x 9" Elliptical, Permanent Magnet.

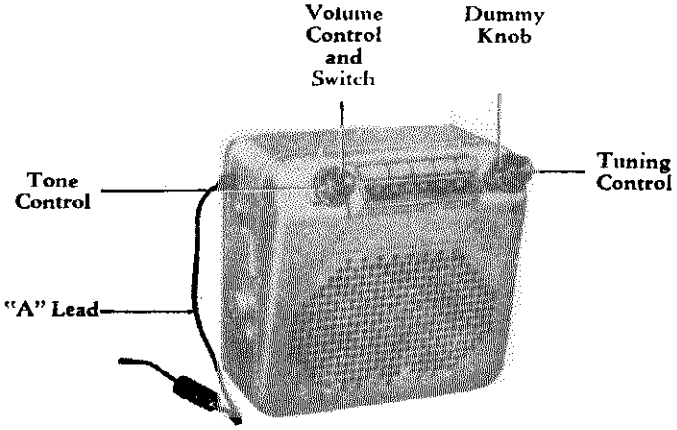
TUNING—Manual and 5 P. B. Mechanical.

ANTENNA TRIMMER COMPENSATION—For Antennas Between 0.000050 - 0.000070 Mfd.

TUNING RANGE—550-1600 KC.

PUSH BUTTON SETUP PROCEDURE

Pull Push Button to the left and out. Tune in desired station manually. Push button all the way in.



MODEL 982400

ALIGNMENT PROCEDURE

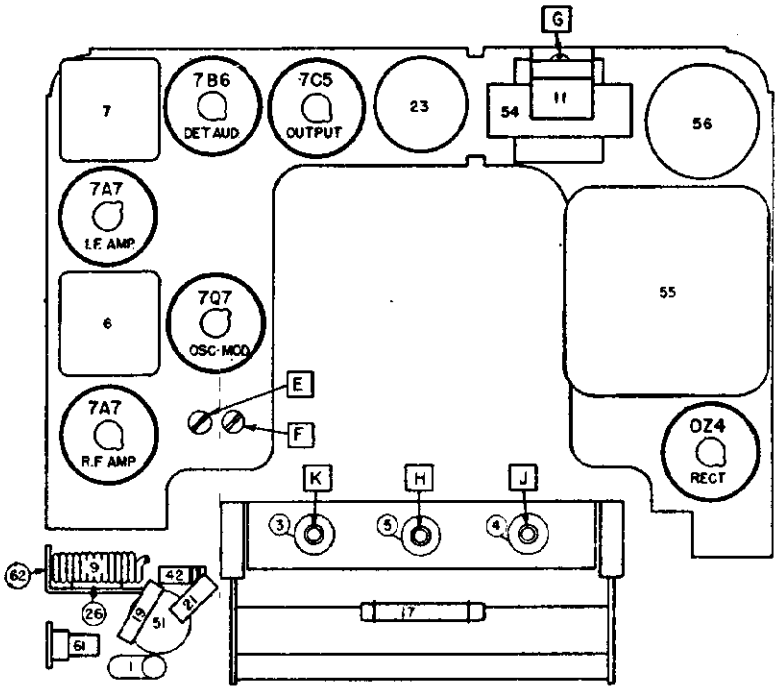
Output Meter Connections	Across Voice Coil
Generator Return	To Receiver Chassis
Dummy Antenna	In Series With Generator
Volume Control Position	Maximum Volume
Tone Control Position	Treble
Generator Output	Minimum for Readable Indication

Steps	Series Condenser or Dummy Antenna	Connect Signal Generator to	Signal Generator Frequency	Tune Receiver to	Adjust in Sequence For Max. Output
1	0.1 Mfd.	7Q7 Grid (Pin #6)	260 KC	High Frequency Stop	A, B, C, D
2	0.000068 Mfd.	Antenna Connector	1615 KC	High Frequency Stop	*E, F, G
3	0.000068 Mfd.	Antenna Connector	1400 KC	Signal Generator Signal	J, K
4	0.000068 Mfd.	Antenna Connector	1615 KC	High Frequency Stop	F, G
5	0.000068 Mfd.	Antenna Connector	1000 KC	Signal Generator Signal	L**

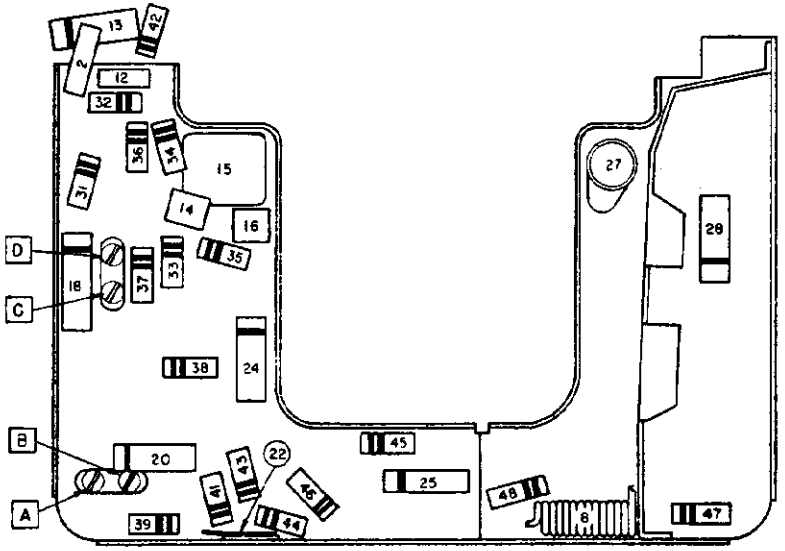
*Before making this adjustment check mechanical setting of oscillator core "H." The rear of the core should be 1 25/32" from the mounting end of the coil form. (This measurement is readily made by inserting a suitable plug in the mounting end of the coil form.) Core adjustments should be made with an insulated screw driver, and core studs should be cemented in place with glyptal or household cement after alignment.

**L is the pointer adjustment screw which is on the connecting link, Illus. #88, between the pointer assembly and the parallel guide bar. It should be adjusted so that the dial pointer corresponds with the 1000 KC mark on the dial. (On the 1st "0")

With the radio installed and the car antenna plugged in adjust the antenna trimmer "G" for maximum volume with the radio tuned to a weak station near 1400 KC (see sticker on case).



PARTS LAYOUT — TUBE VIEW

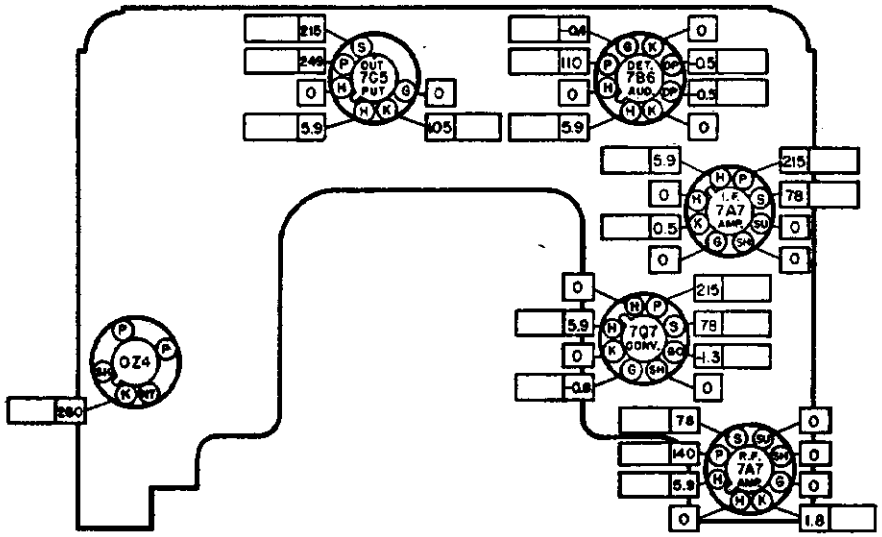


PARTS LAYOUT — CHASSIS VIEW

TUBE SOCKET VOLTAGE CHART

The tube socket voltages, as measured at the factory and under the conditions shown on the schematic diagram on Page 3 are shown.

The blank spaces are provided so the service man may fill in the actual voltage readings as taken with his own equipment. A normal operating radio should be used for these measurements.



VOLT METER RESISTANCE ..... OHMS PER VOLT. READINGS TAKEN WITH ..... VOLTS AT SPARK PLATE. VOLTAGES MEASURED FROM SOCKET TERMINALS TO CHASSIS AND ARE POSITIVE UNLESS MARKED OTHERWISE.

UNITED MOTORS SERVICE
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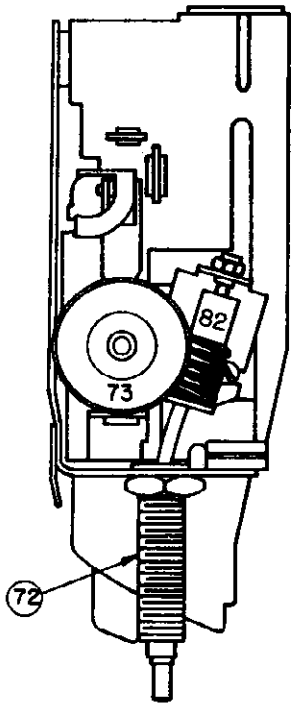
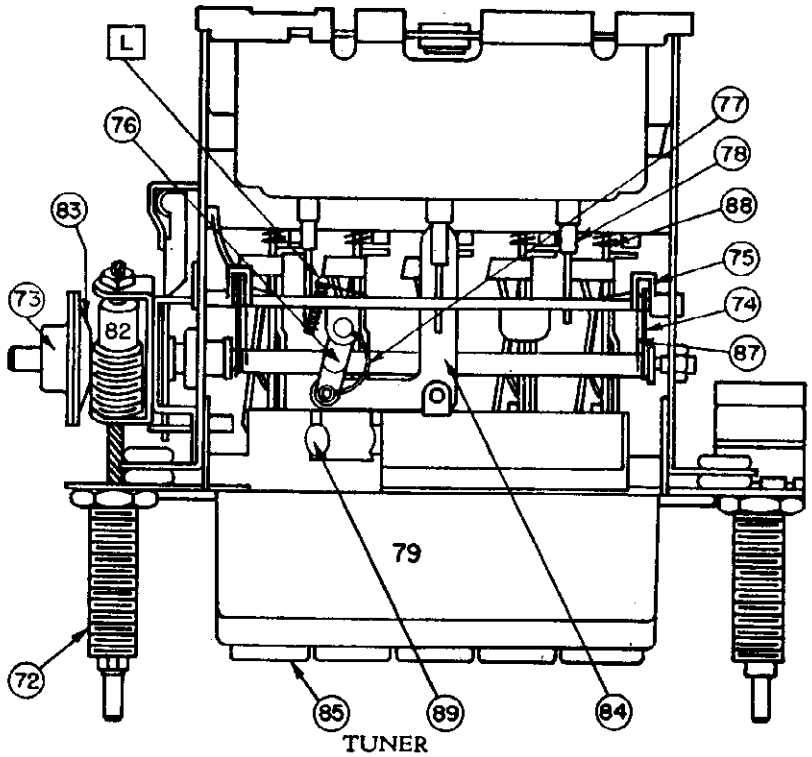
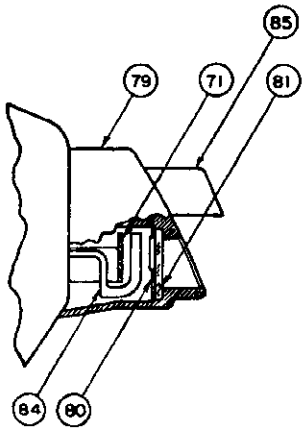
MODEL 982400
OLDSMOBILE



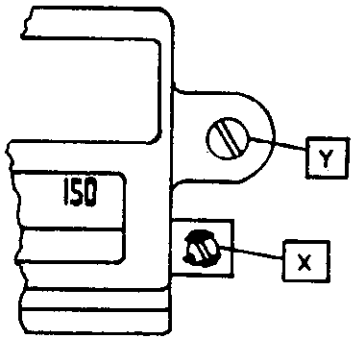
ESCUTCHEON MOUNTING



TUNER



ESCUTCHEON CROSS SECTION



ESCUTCHEON MOUNTING

SPECIAL INSTRUCTIONS

Unless special precautions are taken in removing the dial escutcheon, there is a possibility that the dial pointer tip will be broken. Therefore in removal of the escutcheon the following procedure is recommended.

1. **Loosen but do not remove the two screws holding the pointer back plate ("X" in Escutcheon Mounting Drawing Above) and loosen the shellac so that the back plate is free to move.**
2. **Remove the escutcheon mounting screws "Y" (see Escutcheon Mounting).**
3. **Carefully lift off the escutcheon (DO NOT FORCE). If the dial backplate is free to move slightly downward the escutcheon will come off easily.**

The same caution should be exercised when replacing the escutcheon.

MODEL 982400
OLDSMOBILE

UNITED MOTORS SERVICE
DIV. OF GENERAL MOTORS CORP:

SERVICE PARTS LIST

Illus. No	Production Part No.	Service Part No.	Description
			ELECTRICAL PARTS
			Coils
1	7255738	7255738	Antenna series choke
2	7240251	7240251	Antenna spark choke
3	7257979	7257979	Antenna
4	7257979	7257979	R. F.
5	7257977	7257977	Oscillator
6	7257832	7257832	1st I. F. Assy.
7	7258139	7258139	2nd I. F. Assy.
8	1217846	1217846	Hash choke
9	7258434	7258434	"A" spark choke, fuse connector female, and "A" spark condenser
			Condensers
11	7258161	7258161	Antenna trimmer
12	1218505	G 470	0.000047 mfd. ceramic
13	7236842	E 503	0.05 mfd. 200 V tubular
14	7236109	G 680	0.000068 mfd. molded
15	7242454	7242454	Dual trimmer
15A			R. F. section
15B			Oscillator section
16	7258221	G 390	0.000039 mfd. ceramic
17	7258162	7258162	0.000300 mfd. compensating
18	7230892	E 503	0.05 mfd. 400 V tubular
19	1217436	G 222	0.002200 mfd. molded
20	7232956	E 502	0.005 mfd. 400 V tubular
21	7232956	E 502	0.005 mfd. 400 V tubular
22	1217848	1217848	Chassis plate condenser
23	7241198	7241198	Electrolytic
23A			20 mfd. 25 V
23B			20 mfd. 400 V
23C			20 mfd. 400 V
24	7230892	E 503	0.05 mfd. 400 V tubular
25	7233243	H 402	0.004 mfd. 800 V tubular
26	1212278	1212278	"A" spark condenser
27	1217848	1217848	Chassis plate condenser.
28	7240906	H 602	0.006 mfd. 1600 V buffer
			Resistors
31	7237835	A 221	220 ohms ½ W insulated
32	1214563	A 225	2.2 megohms ½ W insulated
33	7237595	B 153	15,000 ohms 1 W insulated
34	1214557	A 334	330,000 ohms ½ W insulated
35	1214550	A 223	22,000 ohms ½ W insulated
36	1215563	A 685	6.8 megohms ½ W insulated
37	7233653	C 153	15,000 ohms 2 W insulated
38	1214563	A 680	68 ohms ½ W insulated
39	1213282	A 105	1 megohm ½ W insulated
40	1214553	A 473	47,000 ohms ½ W insulated
41	1213289	A 156	15 megohms ½ W insulated
42	1213480	A 393	39,000 ohms ½ W insulated
43	1214555	A 224	220,000 ohms ½ W insulated
44	1213282	A 105	1 megohm ½ W insulated
45	1216149	B 391	390 ohms 1 W insulated
46	1214555	A 224	220,000 ohms ½ W insulated
47	7237994	B 221	220 ohms 1 W insulated
48	1214573	C 272 B 562	1800 ohms { Replace with 2700 ohm 2 W and 5600 ohm 1 W in parallel
			Tubes
	1211924	5003	OZ4—Rectifier
	1213565	5292	7B6
	1213568	5295	7C5
	1213562	5290	7A7
	1213981	5301	7Q7

UNITED MOTORS SERVICE
DIV. OF GENERAL MOTORS CORP.

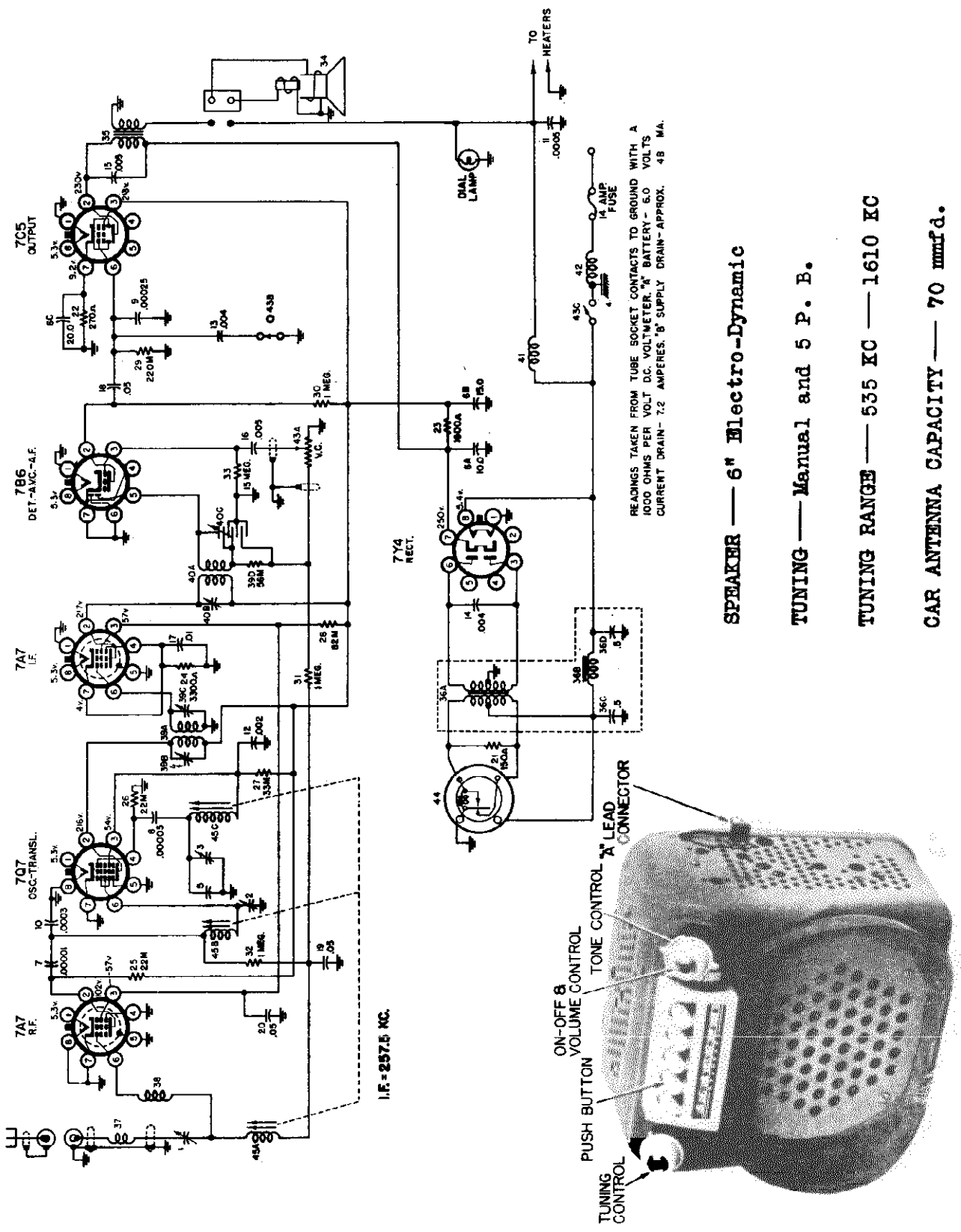
MODEL 982400
OLDSMOBILE

SERVICE PARTS LIST (Cont.)

Illus. No	Production Part No.	Service Part No.	Description
			Miscellaneous Electrical
51	7256697	7256697	Control—Volume, tone, and switch
51A			Volume control
51B			Tone control
51C			Switch
52	.187189	44	Lamp, Mazda #44
53	7257645	7257645	Speaker, 6 x 9 elliptical, PM
54	7256664	7256664	Transformer, output
55	7255881	7255881	Transformer, power
56	7239124	8542	Vibrator, non-synchronous
			MECHANICAL PARTS
			Chassis
61	7256742	7256742	Connector—Antenna
62	7258434	7258434	Connector—Fuse female, "A" spark choke, and spark condenser
	7241356	7241356	Socket—Loctal tube
	7236279	7236279	Socket—Octal tube
	7239125	7239125	Socket—Vibrator
			Tuner
71	7256688	7256688	Backplate, Pointer
72	7258492	7258492	Bushing and manual drive shaft
73	7258072	7258072	Clutch disc—Driven
74	7258203	7258203	Connecting link—Core bar
75	7258211	7258211	Core guide bar—Parallel
76	7256271	7256271	Pointer connecting link
77	7255992	7255992	Spring—Pointer connecting link
78	7258468	7258468	Core—Powdered iron
79	7256722	7256722	Escutcheon assy.
80	7258423	7258423	Dial backplate
81	7258152	7258152	Dial
82	7256705	7256705	Gear and Bracket—Worm
83	7256495	7256495	Gear and Bushing—Clutch
84	7256707	7256707	Pointer assy.
	1219174	1219174	Pointer tip package
85	1219175	1219175	Pushbutton and slide assy.
	7256488	7256488	Spring—Clutch
87	7257415	7257415	Spring—Core bar connecting link
88	7255984	7255984	Spring—Slide return
89	1217820	1217820	Socket—Dial light
			INSTALLATION PARTS
	554691	554691	"A" Lead, condenser, and fuse connector male
	7258476	6016	Condenser, "A" Lead
	1911095	6015	Condenser, generator
	1912757	6015	Condenser, ignition coil
	120151	120151	Fuse, 15 amperes
	555348	555348	Hood ground clip
	7256702	7256702	Knob—Control
	554515	554515	Knob—Tone and dummy
	7240138	6013	Static collector
	7257239	7257239	Suppressor—Distributor
	414237	414237	Suppressor insulator
	554339	554339	Trim plate—Instrument panel
	1912900	1912900	Condenser—Regulator

MODEL 984247
PONTIAC

UNITED MOTORS SERVICE
DIV. OF GENERAL MOTORS CORP.



SPEAKER — 6" Electro-Dynamic

TUNING — Manual and 5 P. B.

TUNING RANGE — 535 KC — 1610 KC

CAR ANTENNA CAPACITY — 70 mmfd.

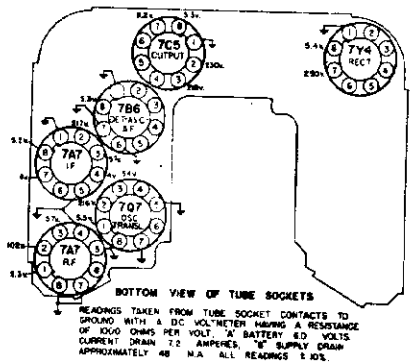
ALIGNMENT PROCEDURE

Volume Control maximum.
Tone Control on high position.
Signal Generator Output minimum for satisfactory output indication.

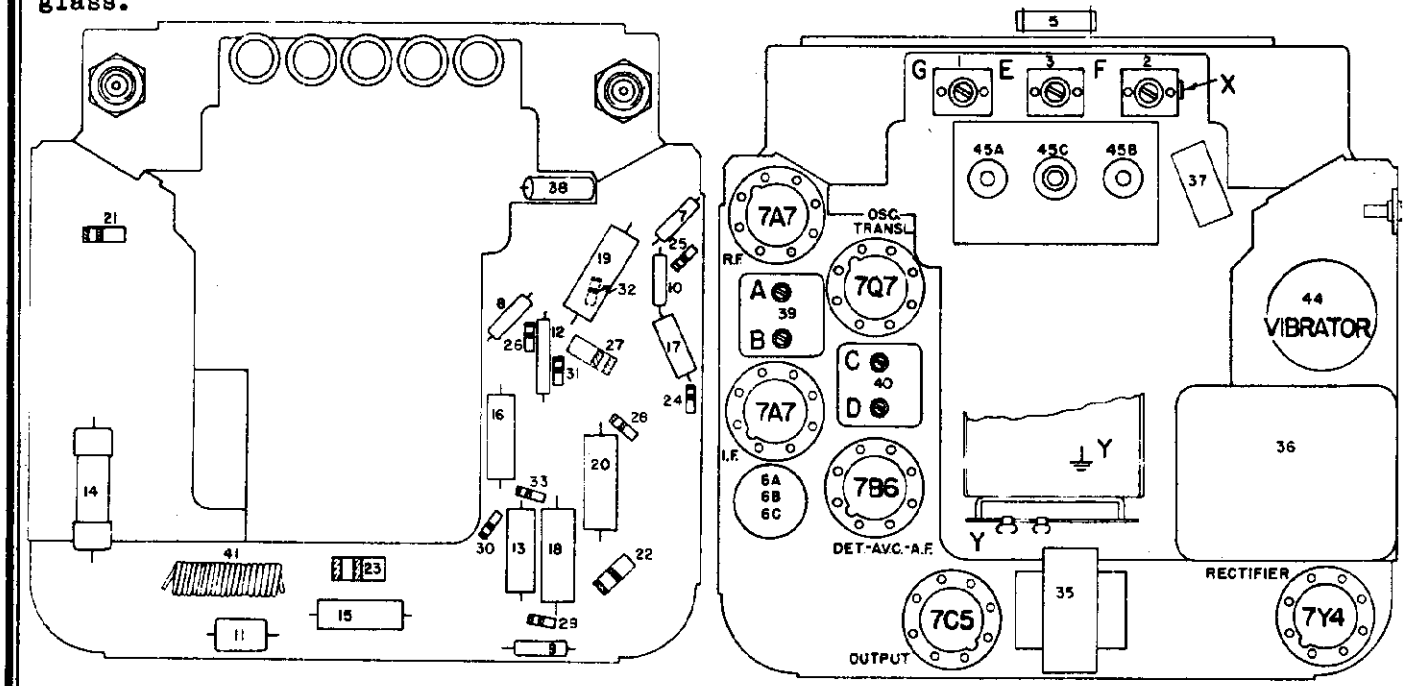
Series Capacitor Or Dummy Antenna	Connect To	Signal Generator Frequency	Adjust Screws In Order
0.1 mfd.	Terminal X (See Parts Layout)	257.5 KC	A, B, C, D
.000070 mfd.	Antenna Terminal	1610 KC †	E, F, G

Low frequency alignment not required.
Adjust Trimmer F to match car antenna (1400 KC †) when radio is installed.

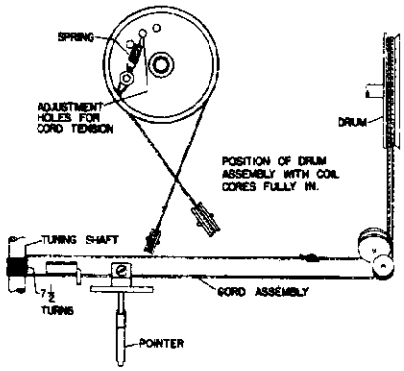
† Calibration marks for given frequencies are found on upper side of dial glass.



SOCKET VOLTAGES



PARTS LAYOUT



DIAL CORD HOOKUP

MODEL 984247
PONTIAC

UNITED MOTORS SERVICE
DIV. OF GENERAL MOTORS CORP.
PUSH BUTTON SET-UP

Turn counter clockwise - tune in manually - depress loosened button - turn button clockwise to tighten.

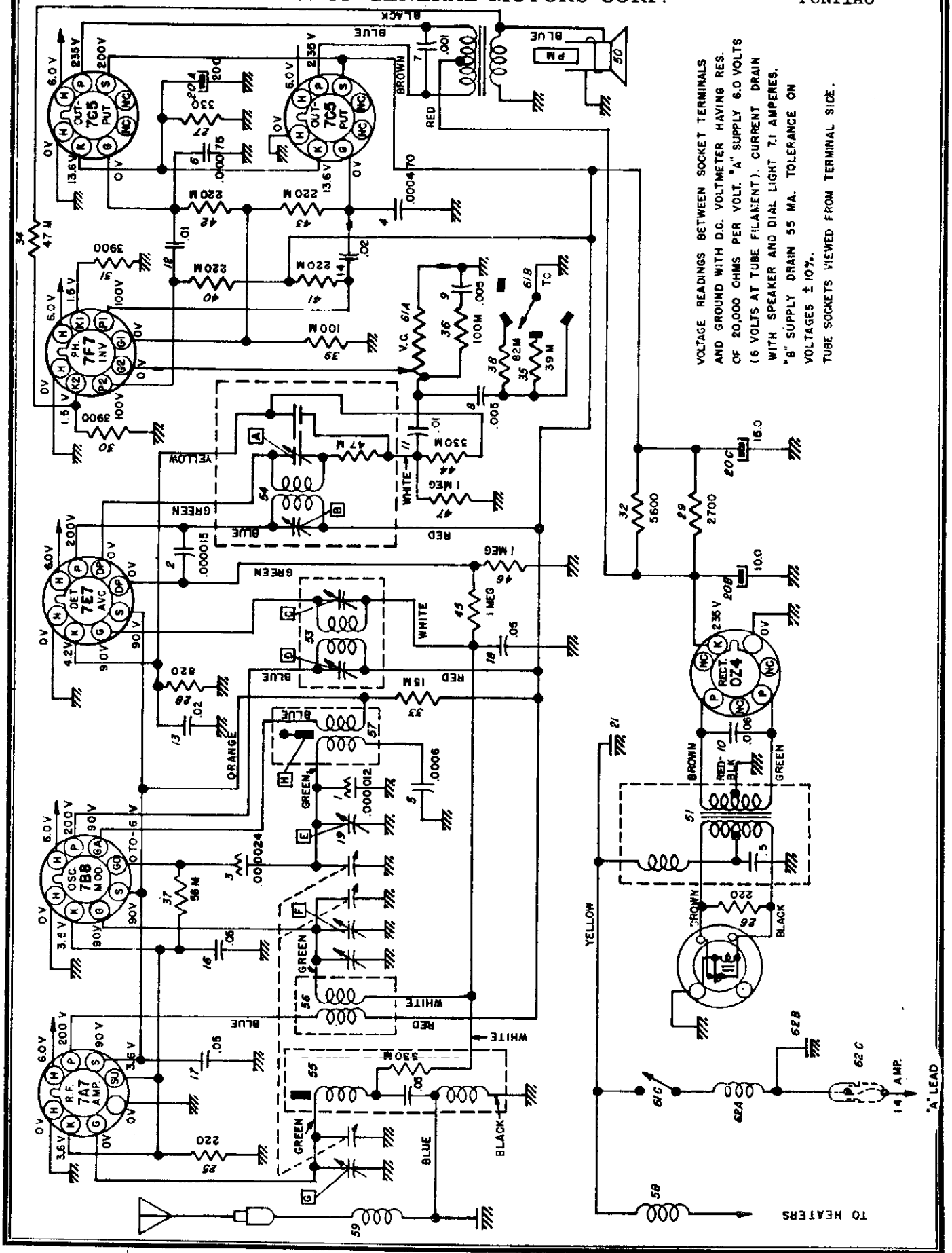
Illus. No.	Service * Part No.	Production Part No.	Description
			CAPACITORS
1		1216671	Antenna Trimmer
2		1216672	R. F. Coil Trimmer
3		1215925	Oscillator Trimmer
4		1218017	Spark Plate
5		1218049	270 Mfd. Compensating Capacitor
6		1213868	Electrolytic
6A			10 Mfd. 350 Volt
6B			15 Mfd. 300 Volt
6C			20 Mfd. 25 Volt
7	G100	7234242	.00001 Mfd. Moulded
8	G470	1207625	.00005 Mfd. Moulded
9	G221	1209055	.00025 Mfd. Moulded
10	G271	1215553	.0003 Mfd. Moulded
11	G471	7238879	.0005 Mfd. Moulded
12		1218112	.002 Mfd. Silver Mica
13	H402	1212098	.004 Mfd. 600 Volt
14	H402	1217875	.004 Mfd. 1500 Volt
15	H502	7230912	.005 Mfd. 600 Volt
16	H502	7230912	.005 Mfd. 600 Volt
17	H103	1208600	.01 Mfd. 600 Volt
18	H503	7230592	.05 Mfd. 600 Volt
19	H503	7230592	.05 Mfd. 600 Volt
20	H503	7230592	.05 Mfd. 600 Volt
			RESISTORS
21	B151	1211005	150 Ohm - 1 Watt
22	B271	1213646	270 Ohm - 1 Watt
23	C182	1214573	1800 Ohm - 2 Watt
24	A332	1213481	3300 Ohm - 1/2 Watt
25	A223	1214550	22,000 Ohm - 1/2 Watt
26	A223	1214550	22,000 Ohm - 1/2 Watt
27	A333	7242447	33,000 Ohm - 1 Watt
28	A823	1214554	82,000 Ohm - 1/2 Watt
29	A224	1214555	220,000 Ohm - 1/2 Watt
30	A105	1213282	1 Megohm - 1/2 Watt
31	A105	1213282	1 Megohm - 1/2 Watt
32	A105	1213282	1 Megohm - 1/2 Watt
33	A156	1213289	15 Megohm - 1/2 Watt
			MISCELLANEOUS ELECTRICAL PARTS
34		1214389	Speaker - 6" Electro-Dynamic
34		1217417	Speaker - 6" P.M. (Alternate)
35		1218021	Transformer - Audio Output
36		1218022	Power Transformer & Filter Assembly
36A			Transformer - Power
36B			Hash Choke Coil Assembly
36C			Capacitor - .5 Mfd. 100 Volt
36D			Capacitor - .5 Mfd. 100 Volt
37		1218405	Antenna Spark Choke
38		1214382	Antenna Spark Choke
39		1218034	1st I. F. Transformer Assembly
39A			I. F. Coil Assembly
39B			Primary Trimmer
39C			Secondary Trimmer
40		1218032	2nd I. F. Transformer Assembly
40A			I. F. Coil Assembly
40B			Primary Trimmer
40C			Secondary Trimmer
40D			Resistor - 56,000 Ohm 1/2 Watt
41		1218026	Filament Choke
42		1218048	Spark Choke
43		1218020	Control - Volume - Tone - On-Off Switch
43A			Volume Control
43B			Tone Switch
43C			Off-On Switch
44	8542	1218006	Vibrator

Illus. No.	Service * Part No.	Production Part No.	Description
			TUNER UNIT AND PARTS
45		1218024	Unit - Perm. Tuning Coils
45A			Antenna Coil
45B			R. F. Coil
45C			Oscillator Coil
		1215926	Bushing - Station Selector Shaft
		1218041	Connector Assembly - Antenna
		1218014	Connector Assembly - "A" Lead
		1218023	Cover Assembly - Case Back
		1217919	Dial Pointer & Slide Assembly
		1218003	Dial & Escutcheon Assembly
		1216041	Socket - Vibrator
		7242463	Nut - 1/2"-28 Hex. Mtg. Spacer
		1863407	Pin Connector - Speaker
		1218019	Shaft Assembly - Rear Drive
		1213685	Screw - Cover Retaining
		1215932	Shaft Assembly - Front
		1218031	Clip - Pilot Lamp
		1218013	Socket - 8 Prong Lock-In
		1214399	Speaker Gasket - Rubber
		1216036	Spring - Core Driving
		1214386	Spring & String Assembly - Pointer
		1218016	Spring - Actuating Arm
		1216538	Tuner Unit Assembly - Push Buttons Included
		1218012	Spring - Rocker Bar Tension
		1216587	Push Button Assembly
		1218018	Drum Assembly - Drive
		187189	Lamp - Pilot (Mazda #44)
			TUBES
5290		1213583	7A7 - R. F. Amplifier
5301		1213863	7Q7 - Oscillator - Translator
5290		1213583	7A7 - I. F. Amplifier
5292		1213762	7B6 - Detector AVC - 1st Audio
5295		1213586	7C5 - Audio Output
5302		1213570	7Y4 - Rectifier
			INSTALLATION AND MOUNTING PARTS
		507505	Knob - Tuning & Volume Control
		507510	Knob - Dummy
		507511	Knob - Tone Control
6015		1911095	Capacitor - Generator
6016		1865292	Capacitor - Ammeter
		1869573	Clamp - Condenser Ammeter
		511057	"A" Lead Assembly
		7235968	Nut 1/2"-28 Hex. Radio Mtg. (Front)
		505630	Washer - Tone Control - Felt
		7238755	Washer - Dummy Knob - Spring
		505629	Bolt - 1/4"-20 x 5/8 Hex. Hd.
		1299232	Washer - 1/4" Flat
		121753	Washer - 1/4" Ext. Tooth Shakeproof
		443882	Screw - #8-15 x 3/8" (Self Tapping)
		147685	Tube - Fuse Insulating
6000		1207821	Suppressor - Distributor
6008		1853686	Adaptor - Distributor Suppressor
		509129	Insulator - Distributor Suppressor
		508583	Plate - Control Finish

Order parts, using service part number where shown, otherwise use production part number for service.

UNITED MOTORS SERVICE
DIV. OF GENERAL MOTORS CORP.

MODEL 984248,
PONTIAC

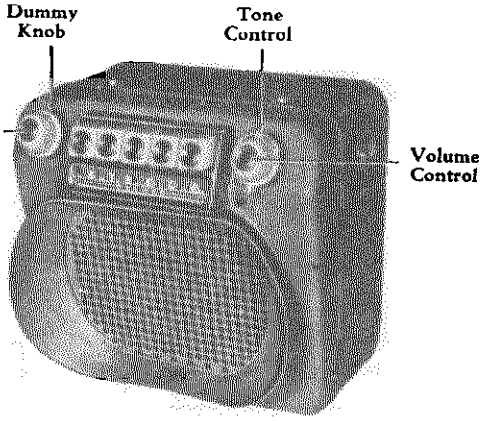


MODEL 984248,
PONTIAC

UNITED MOTORS SERVICE
DIV. OF GENERAL MOTORS CORP.

GENERAL

MOUNTING ..... All 1948 Pontiac Cars
TUBES ..... Six, Plus Rectifier
SPEAKER ..... 8" Round Permanent Magnet
TUNING ..... Manual and 5 P. B. Mechanical
ANTENNA TRIMMER COMPENSATION
For Antennas Between 0.000055 - 0.000075 Mfd.
TUNING RANGE ..... 550-1600 KC.



MODEL 984248

PUSHBUTTON SET-UP PROCEDURE

Move spring on bottom of button to the left and pull button off. Turn reset screw one turn counterclockwise and push all the way in. Hold the reset screw in and tune in the desired station manually. Carefully release and tighten the reset screw. Replace button. Repeat procedure to set up other buttons.

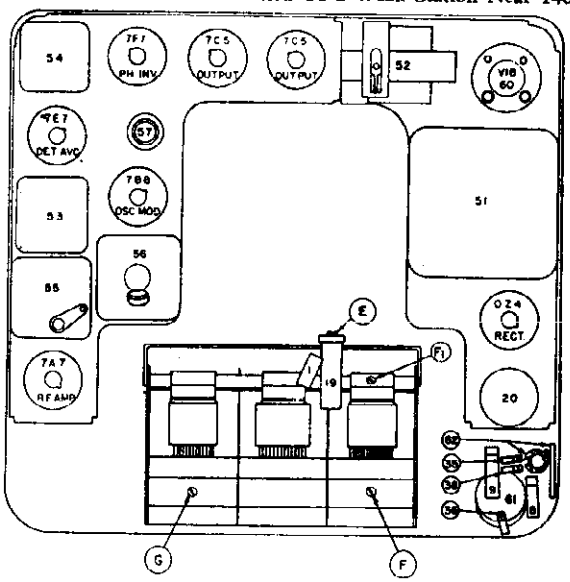
ALIGNMENT PROCEDURE

Output Meter Connections ..... Across Voice Coil
Generator Return ..... Receiver Chassis
Dummy Antenna ..... In Series With Generator
Volume Control Position ..... Maximum Volume
Tone Control Position ..... Treble
Generator Output ..... Minimum for Readable Indication

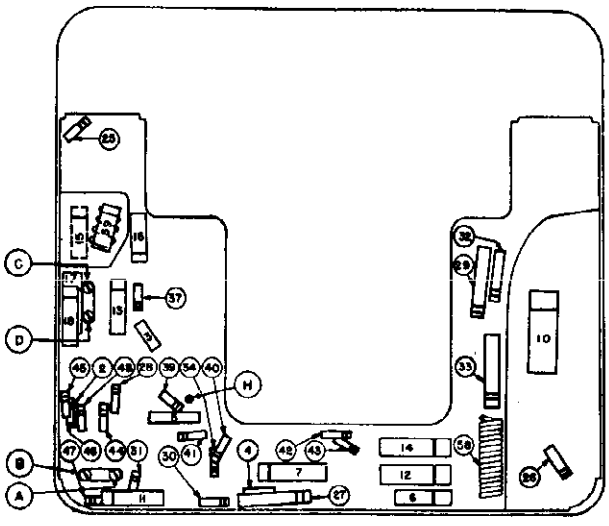
Steps	Series Condenser or Dummy Antenna	Connect To	Signal Generator Frequency	Tune Receiver To	Adjust In Sequence For Max. Output
1	0.1 Mfd.	Grid Side R. F. Trimmer "F_1" (See Parts Layout)	260 KC.	High Frequency Stop	A, B, C, D
2	0.000068 Mfd.	Antenna Connector	1615 KC.	High Frequency Stop	E
3	0.000068 Mfd.	Antenna Connector	1430 KC.	Signal Generator Signal	F, G
4	0.000068 Mfd.	Antenna Connector	600 KC.	Signal Generator Signal	*H
5	0.000068 Mfd.	Antenna Connector	1615 KC.	High Frequency Stop	E
6	0.000068 Mfd.	Antenna Connector	1430 KC.	Signal Generator Signal	F, G

*Rock Gang Condenser Back and Forth Through Signal During This Adjustment.

With the Radio Installed and the Car Antenna Plugged In Adjust the Antenna Trimmer "G" for Maximum Volume With the Radio Tuned To a Weak Station Near 1400 KC. (See Sticker On Case).



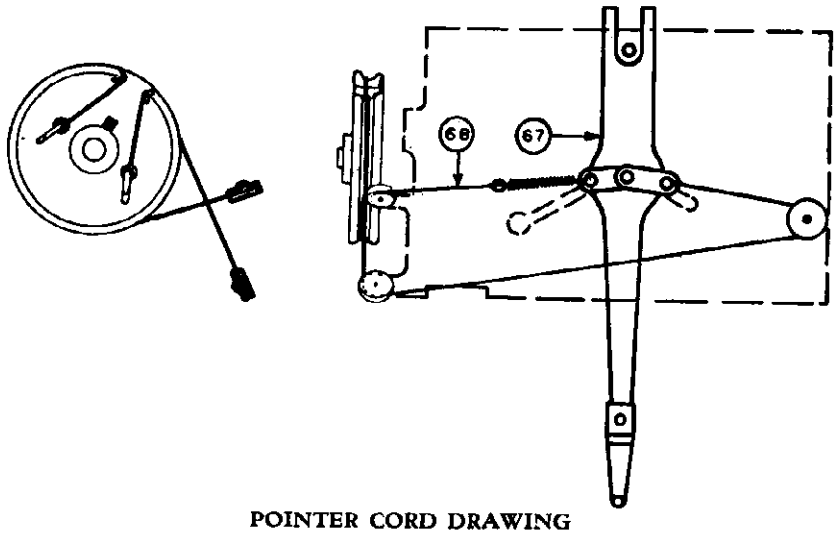
PARTS LAYOUT — TUBE VIEW



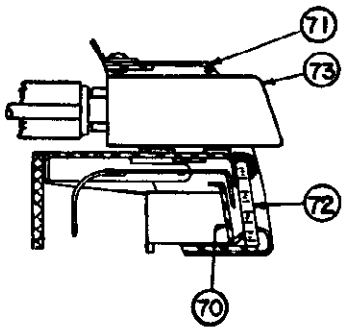
PARTS LAYOUT — CHASSIS VIEW

UNITED MOTORS SERVICE
DIV. OF GENERAL MOTORS CORP.

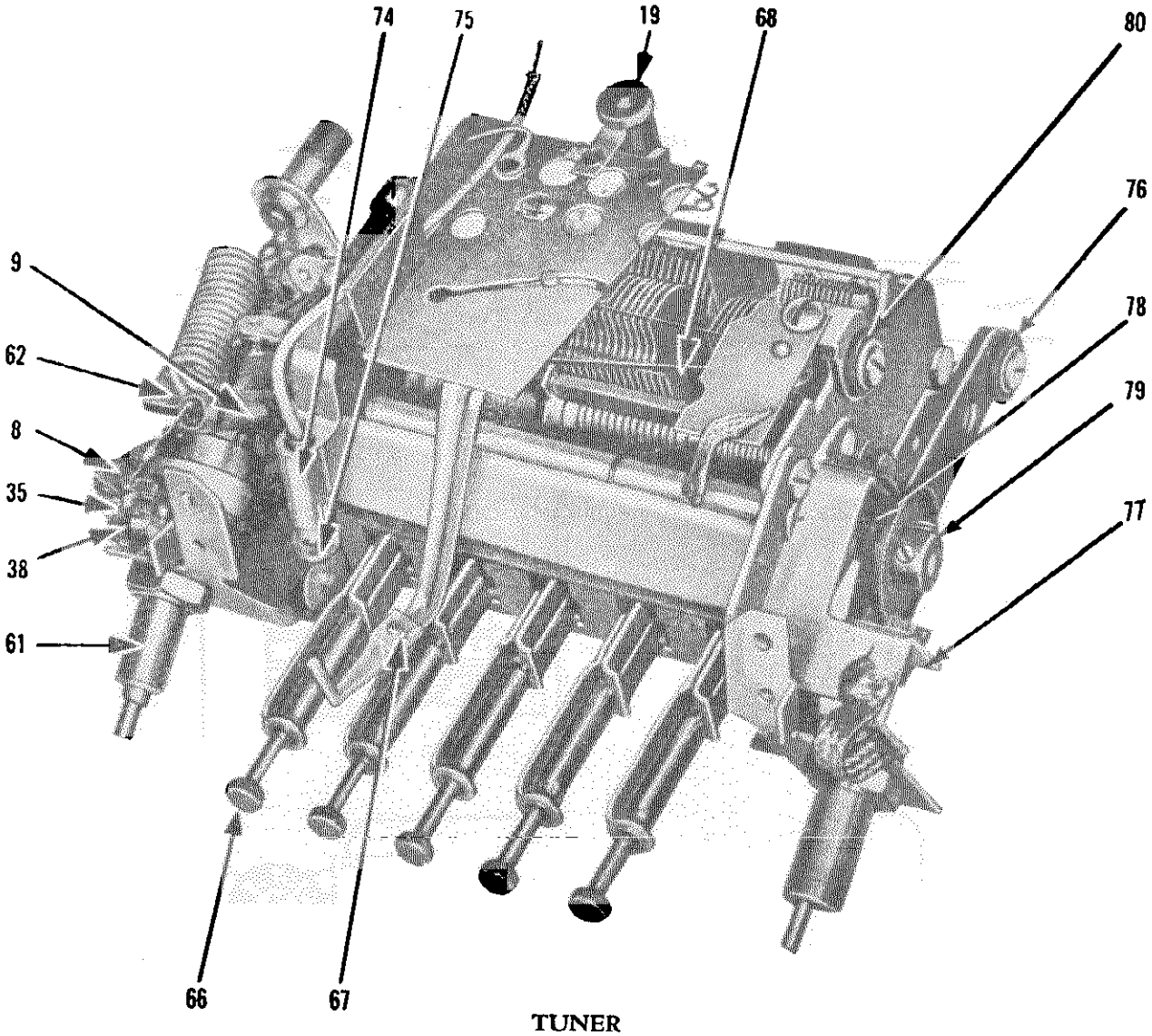
MODEL 984248,
PONTIAC



POINTER CORD DRAWING



ESCUTCHEON CROSS SECTION



TUNER

MODEL 984248,
PONTIAC

UNITED MOTORS SERVICE
DIV. OF GENERAL MOTORS CORP.

TUNER UNIT AND ESCUTCHEON PARTS

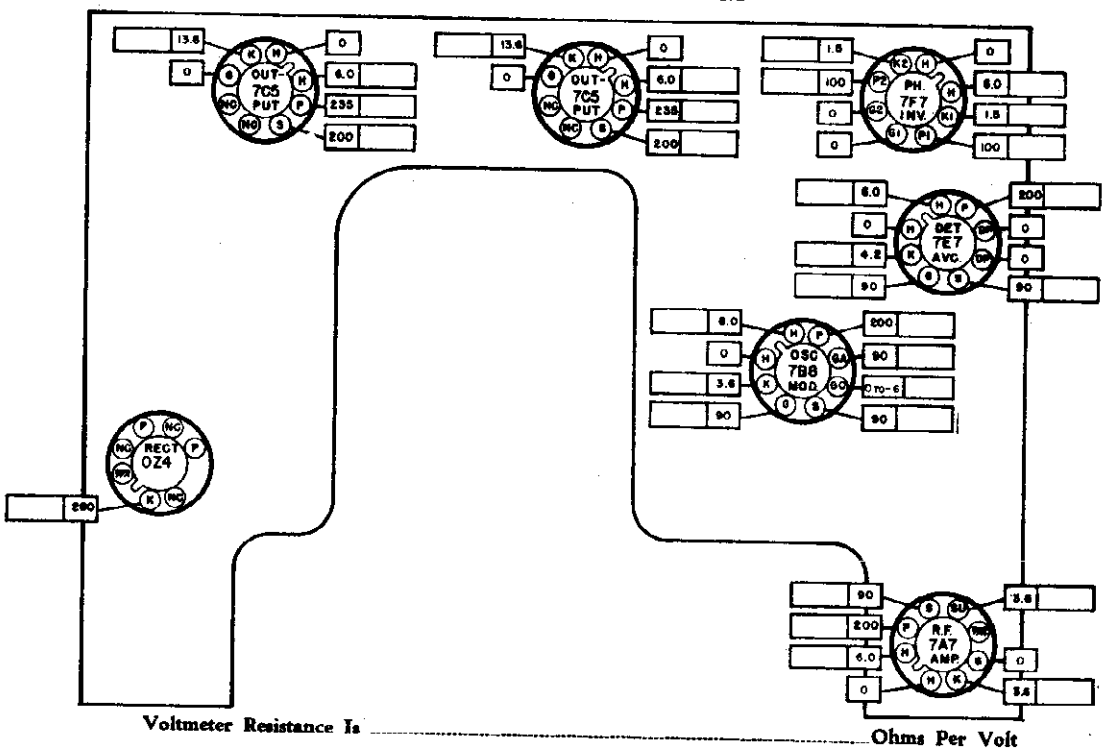
Illus. No.	Production Part No.	Service Part No.	Description
	7257485	7257485	Tuner Unit Complete (Includes Illus. Nos. 1, 3, 9, 19, 35, 36, 38, 61)
	7242020	7242020	Variable Condenser Assy.
66	7240368	7240368	Reset Screw
	7242354	7242354	Rubber Bumper
	1217323	1217323	Spring — Slide Return
67	7244084	7244084	Pointer Assy.
	7238860	7238860	Spring — Cord Tension
68	1212233	1212233	Cord — 48 Inches
70	7257473	7257473	Dial Backplate
71	7257648	7257648	Escutcheon Assy. (Die Cast)
72	7257472	7257472	Dial
71A	7257484	7257484	Escutcheon Assy. (Sheet Metal)
72A	7257752	7257752	Dial
73	7242136	7242136	Pushbutton
74	1217842	1217842	Socket — Dial light
75	115273	51	Lamp — Dial (Mazda #51)
76	7237172	7237172	Grommet — Tuner Mtg.
77	7242076	7242076	Manual Drive Assy.
78	7241207	7241207	Brake and Spring Assy.
79	7241590	7241590	Crown Gear
80	7241627	7241627	Grommet — Pointer Plate Mtg.
81	7240795	7240795	Pulley — Pointer Drive

INSTALLATION PARTS

	1911095	6015	Condenser — Generator
	1885292	6015	Condenser — "A" Lead
	507505	507505	Knob — Control
	507511	507511	Knob — Tone Control
	507510	507510	Knob — Dummy
	508583	508583	Trim Plate
	147685	147685	Fuse — 14 Amperes
	5273906	5273906	"A" Lead and Fuse Connector
	*1207821	6000	Distributor Suppressor
	*1853686	6008	Suppressor Adaptor
	*509129	509129	Suppressor Insulator

*Cars having a distributor with the center tower of the distributor cap 1⅝" high instead of ⅞" high have a built-in distributor suppressor and should not have an external suppressor installed. These distributors are marked "Radio" on the lower flange.

TUBE SOCKET VOLTAGE CHART



Voltmeter Resistance Is _____ Ohms Per Volt

Readings Taken With _____ Volts At Spark Plate

The voltages are measured from tube socket terminals to chassis.

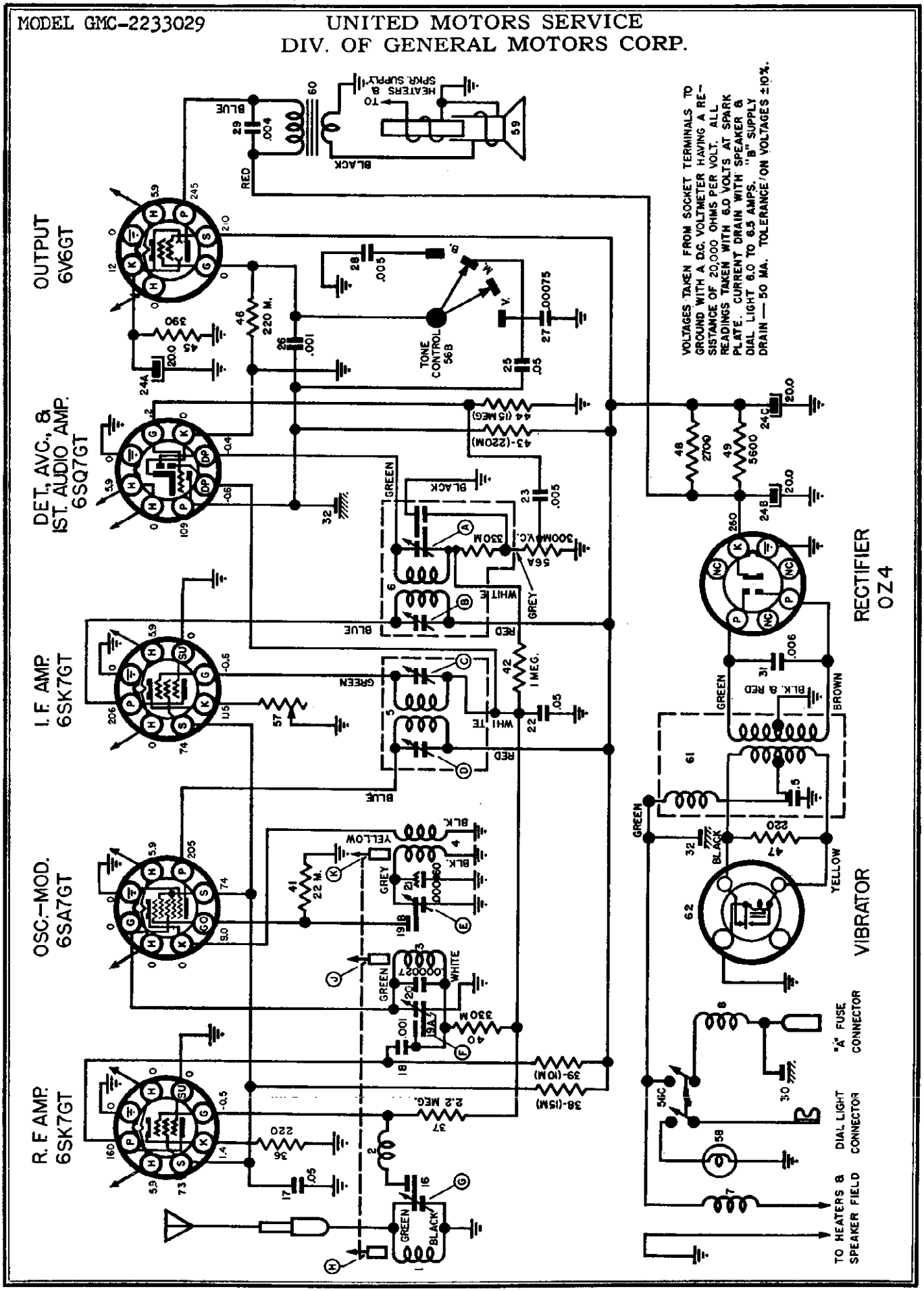
UNITED MOTORS SERVICE
DIV. OF GENERAL MOTORS CORP.
SERVICE PARTS LIST

MODEL 984248, PONTIAC

Illus. No.	Production Part No.	Service Part No.	Description
			CONDENSERS
3	7236178	7242450	.000012 Mfd. Compensating
1	7242450	G150	.000015 Mfd. Molded
2	7238891	7236178	.000024 Mfd. Compensating
4	7238879	G471	.000470 Mfd. Molded
5	7236156	7236156	.000600 Mfd. Silver Mica
6	7240738	7240738	.00075 Mfd. 400 V Tubular
7	7240905	H102	.001 Mfd. 1600 V Tubular
8	7232956	E502	.005 Mfd. 600 V Tubular
9	7232956	E502	.005 Mfd. 600 V Tubular
10	7240906	H602	.006 Mfd. 1600 V Tubular
11	1209309	E103	.01 Mfd. 400 V Tubular
12	1209309	E103	.01 Mfd. 400 V Tubular
13	7236845	E203	.02 Mfd. 200 V Tubular
14	7231542	E203	.02 Mfd. 400 V Tubular
16	7236842	E503	.05 Mfd. 200 V Tubular
17	7236841	E503	.05 Mfd. 400 V Tubular
18	7236842	E503	.05 Mfd. 200 V Tubular
19	7242317	7242317	Air Trimmer
20	7238830	M908	3 Section Electrolytic
20A			20 Mfd. 25 V
20B			10 Mfd. 400 V
20C			15 Mfd. 400 V
21	1217848	1217848	Chassis Plate Condenser
			RESISTORS
25	7237835	A221	220 Ohms ½ W Insulated
26	7237994	B221	220 Ohms 1 W Insulated
27	7233773	B331	330 Ohms 1 W Insulated
28	1214544	A821	820 Ohms ½ W Insulated
29	7242844	C272	2700 Ohms 2 W Insulated
30	1214546	A392	3900 Ohms ½ W Insulated
31	1214546	A392	3900 Ohms ½ W Insulated
32	7240918	B562	5600 Ohms 1 W Insulated
33	7233653	C153	15,000 Ohms 2 W Insulated
34	1214553	A473	47,000 Ohms ½ W Insulated
35	1213480	A393	39,000 Ohms ½ W Insulated
36	1213270	A104	100,000 Ohms ½ W Insulated
37	1213267	A563	56,000 Ohms ½ W Insulated
38	1214554	A823	82,000 Ohms ½ W Insulated
39	1213270	A104	100,000 Ohms ½ W Insulated
40	1214555	A224	220,000 Ohms ½ W Insulated
41	1214555	A224	220,000 Ohms ½ W Insulated
42	1214555	A224	220,000 Ohms ½ W Insulated
43	1214555	A224	220,000 Ohms ½ W Insulated
44	1214557	A334	330,000 Ohms ½ W Insulated
45	1213282	A105	1 Megohm ½ W Insulated
46	1213282	A105	1 Megohm ½ W Insulated
47	1213282	A105	1 Megohm ½ W Insulated
			MISCELLANEOUS ELECTRICAL PARTS
50	7241120	7241120	Speaker — 8" Round Permanent Magnet
51	7255881	7255881	Transformer — Power
52	7240453	7240453	Transformer — Output
53	7242079	7242079	Coil — 1st I. F.
54	7242533	7242533	Coil — 2nd I. F.
55	7242504	7242504	Coil — Antenna
56	7242506	7242506	Coil — R. F.
57	7242527	7242527	Coil — Oscillator (Includes Illus. #3 and 5)
58	7241708	7241708	Coil — Hash Choke
59	7255738	7255738	Coil — Antenna Choke
60	7239124	8542	Vibrator
61	7242017	7242017	Control — Volume, Tone and Switch
61A			Volume Control
61B			Tone Control
61C			Switch
62	7240797	7240797	Spark Plate, "A" Choke and "A" Connector
62A	7241701	7241701	"A" Choke
62B			Spark Plate
62C			"A" Connector
	7236279	7236279	Socket — Octal Tube
	7241356	7241356	Socket — Loctal Tube
	7239125	7239125	Socket — Vibrator
	7239475	7239475	Socket — Antenna

MODEL GMC-2233029

UNITED MOTORS SERVICE
DIV. OF GENERAL MOTORS CORP.



UNITED MOTORS SERVICE
DIV. OF GENERAL MOTORS CORP.

MODEL GMC-2233029

GENERAL

MOUNTING—All 1947 GMC F. C. Trucks.

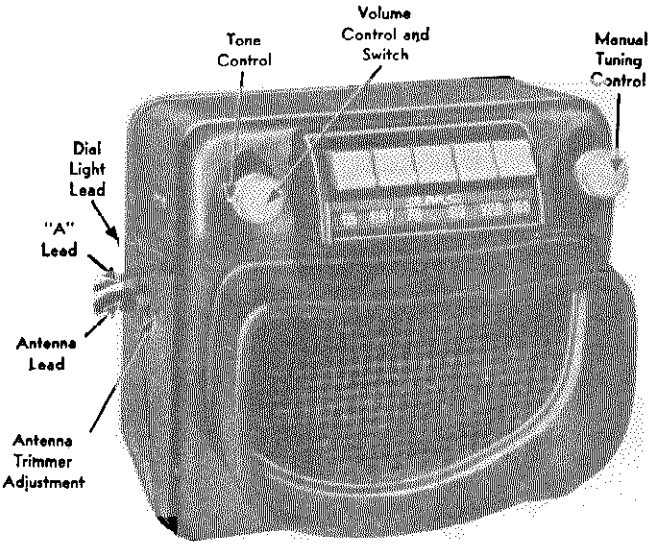
TUBES—Five, Plus Rectifier.

SPEAKER—6" x 9" Elliptical Electrodynamic.

TUNING—Manual and 5 P. B. Mechanical.

ANTENNA TRIMMER COMPENSATION—
.000058-.000090 Mfd.

TUNING RANGE—550-1600 KC.



MODEL 2233029

PUSHBUTTON SET-UP

Press pushbutton to the left and pull out. Tune in desired station manually. Push button all the way in.

ALIGNMENT PROCEDURE

Volume Control Maximum.

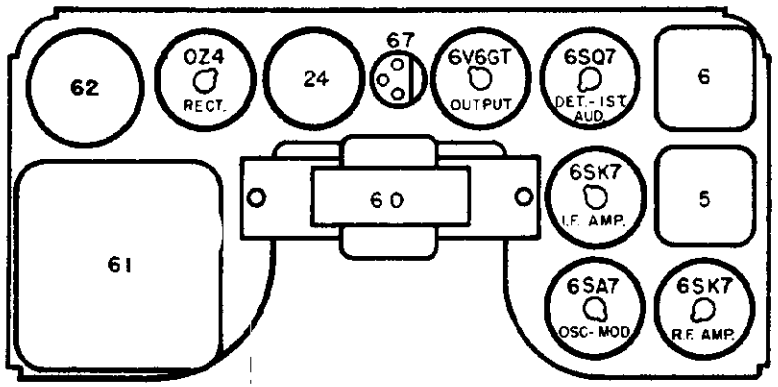
Signal generator output set to minimum.

Series Condenser Or Dummy Antenna	Connect To	Signal Generator Frequency	Tune Receiver To	Adjust Screws In Order
0.1 Mfd.	6SA7 Pin #8	262 KC	No broadcast Signal	A B C D
.000070 Mfd.	Antenna Connector	1615 KC	Extreme H. F. end of dial	*E F G
.000070 Mfd.	Antenna Connector	1400 KC	Signal generator	J H
.000070 Mfd.	Antenna Connector	1615 KC	Extreme H. F. end of dial	F G
.000070 Mfd.	Antenna Connector	1400 KC	Signal generator	J H

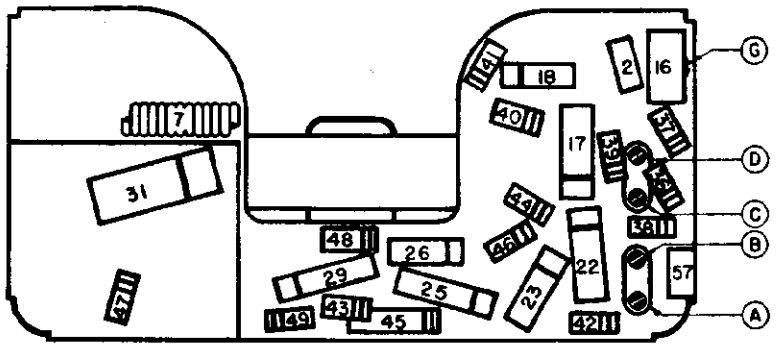
* Before making this adjustment check setting of oscillator core "K" with pointer against high frequency stop. The rear of the iron core should be 1¾" from the mounting end of the coil form. (This measurement is readily made by inserting a suitable plug in the mounting end of the coil form.) Core adjustments are made by a bakelite screwdriver in slot in rear end of core. Reseal core studs to guide bar with glyptal.

Pointer calibration is made by tuning signal generator to 800 KC and the receiver to the signal. Adjust pointer to 800 KC with screw on pointer connecting link assembly.

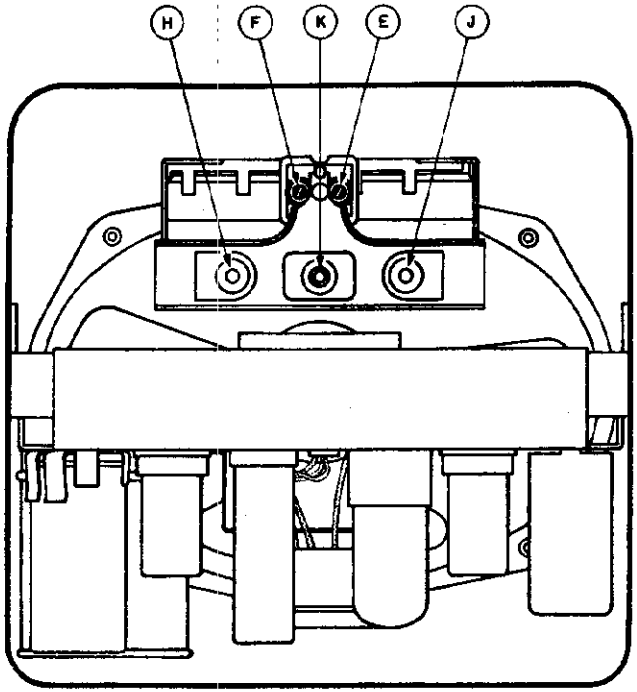
When radio is installed, adjust trimmer "G" to match car antenna at approximately 1400 KC.



PARTS LAYOUT — TUBE VIEW



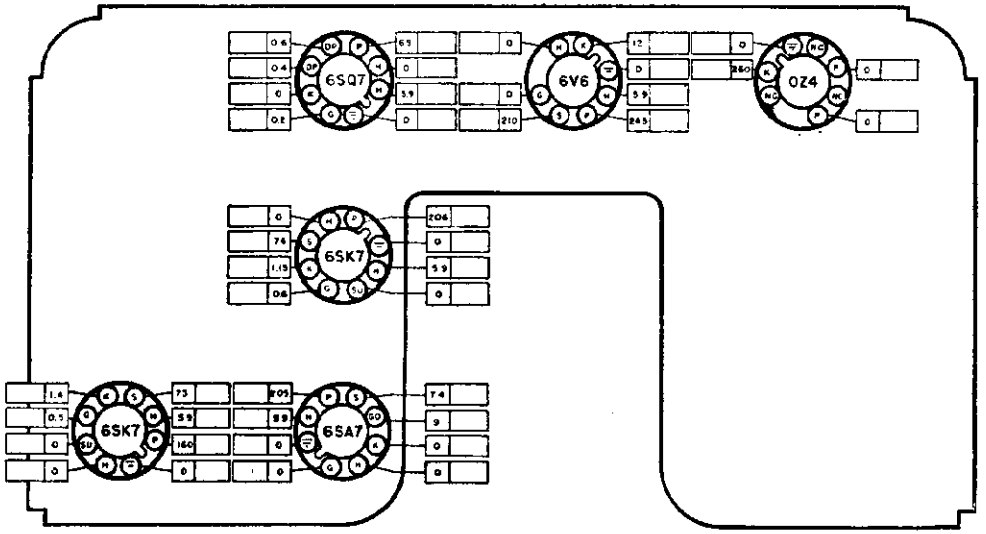
PARTS LAYOUT — CHASSIS VIEW



TRIMMER CHART

TUBE SOCKET VOLTAGE CHART

The tube socket voltages, as measured at the factory and under the conditions shown on the schematic diagram on page 3 are shown below. The blank spaces are provided so the serviceman may fill in actual voltage readings as taken with his own equipment. A normal operating radio should be used for these measurements.



Voltages measured from socket terminals to ground. Voltmeter resistance .....ohms per volt. All readings taken with .....volts at spark plate. "A" current drain 6 to 6.5 amps with 6.0 volts at spark plate. "B" current drain 50 MA. with 6 volts at spark plate, voltage tolerance ±10%.

UNITED MOTORS SERVICE
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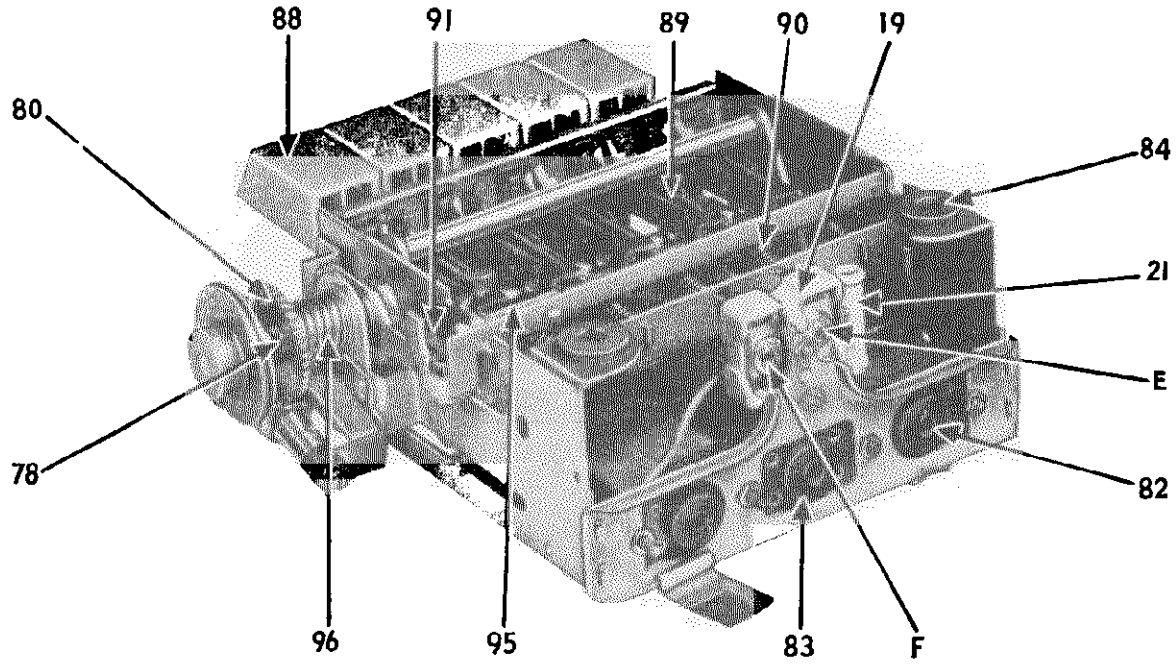
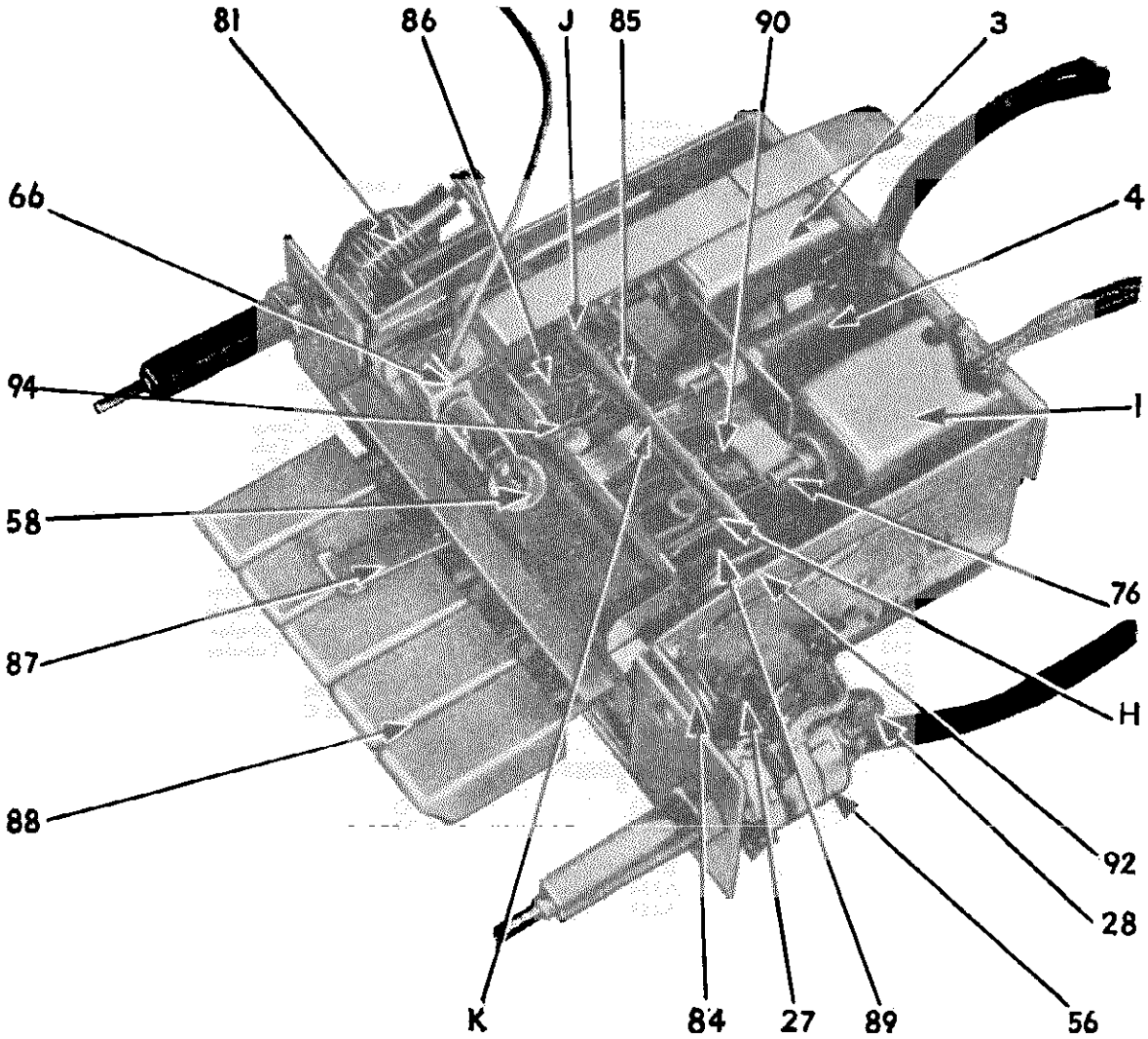
MODEL GMC-2233029



TUNER PICTURE — TOP VIEW



TUNER PICTURE — BOTTOM VIEW

MODEL GMC-2233029

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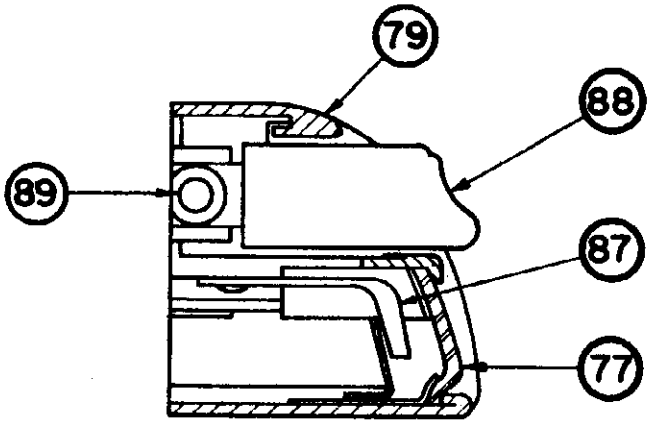


ESCUTCHEON CROSS SECTION

SERVICE PARTS LIST

Illus. No.	Production Part No.	Service Part No.	Description
			ELECTRICAL PARTS
			COILS
1	7256233	7256233	Antenna
2	7240251	7240251	Antenna Choke
3	7256233	7256233	R. F.
4	7256235	7256235	Oscillator
5	7256011	7256011	1st I. F.
6	7256012	7256012	2nd I. F.
7	7241708	7241708	Hash Choke
8	1217846	1217846	"A" Choke
			CONDENSERS
16	7255907	7255907	Antenna Trimmer, fixed capacity .000200 Mfd.
17	7236841	E503	.05 Mfd. 400V Tubular
18	7242942	E102	.001 Mfd. 600V Tubular
19	7242454	7242454	Dual Trimmer
19A			R. F. Section, fixed capacity .000300 Mfd.
19B			Oscillator Section, fixed capacity .000100 Mfd.
20	7256348	G270	.0000270 Mfd. Molded
21	7256276	7256276	.000160 Mfd. Compensating
22	7236842	E503	.05 Mfd. 400V Tubular
23	7230767	E502	.005 Mfd. 600V Tubular
24	7240724	M908	3 Section Electrolytic
24A			20 Mfd. 25V
24B			20 Mfd. 400V
24C			20 Mfd. 400V
25	7230892	E503	.05 Mfd. 400V Tubular
26	7239188	E102	.001 Mfd. 600V Tubular
27	7240738	7240738	.0075 Mfd. 400V Tubular
28	7232956	E502	.005 Mfd. 600V Tubular
29	7233243	H402	.004 Mfd. 800V Tubular
30	7241259	7241259	Spark Plate
31	7240906	H602	.006 Mfd. 1600V Tubular
32	1217848	1217848	Chassis Plate Condenser
			RESISTORS
36	7237835	A221	220 Ohms ½W Insulated
37	1214563	A225	2.2 Megohms ½W Insulated
38	7233653	C153	15,000 Ohms 2W Insulated
39	1211085	B103	10,000 Ohms 1W Insulated
40	1214557	A334	330,000 Ohms ½W Insulated
41	1214550	A223	22,000 Ohms ½W Insulated
42	1213282	A105	1 Megohm ½W Insulated
43	1214555	A224	220,000 Ohms ½W Insulated
44	1213289	A156	15 Megohms ½W Insulated
45	1216149	B391	390 Ohms 1W Insulated
46	1214555	A224	220,000 Ohms ½W Insulated
47	7237994	B221	220 Ohms 1W Insulated
48	7242844	C272	2700 Ohms 2W Insulated
49	7240918	B562	5600 Ohms 1W Insulated

UNITED MOTORS SERVICE
DIV. OF GENERAL MOTORS CORP.

MODEL GMC-2233029

SERVICE PARTS LIST

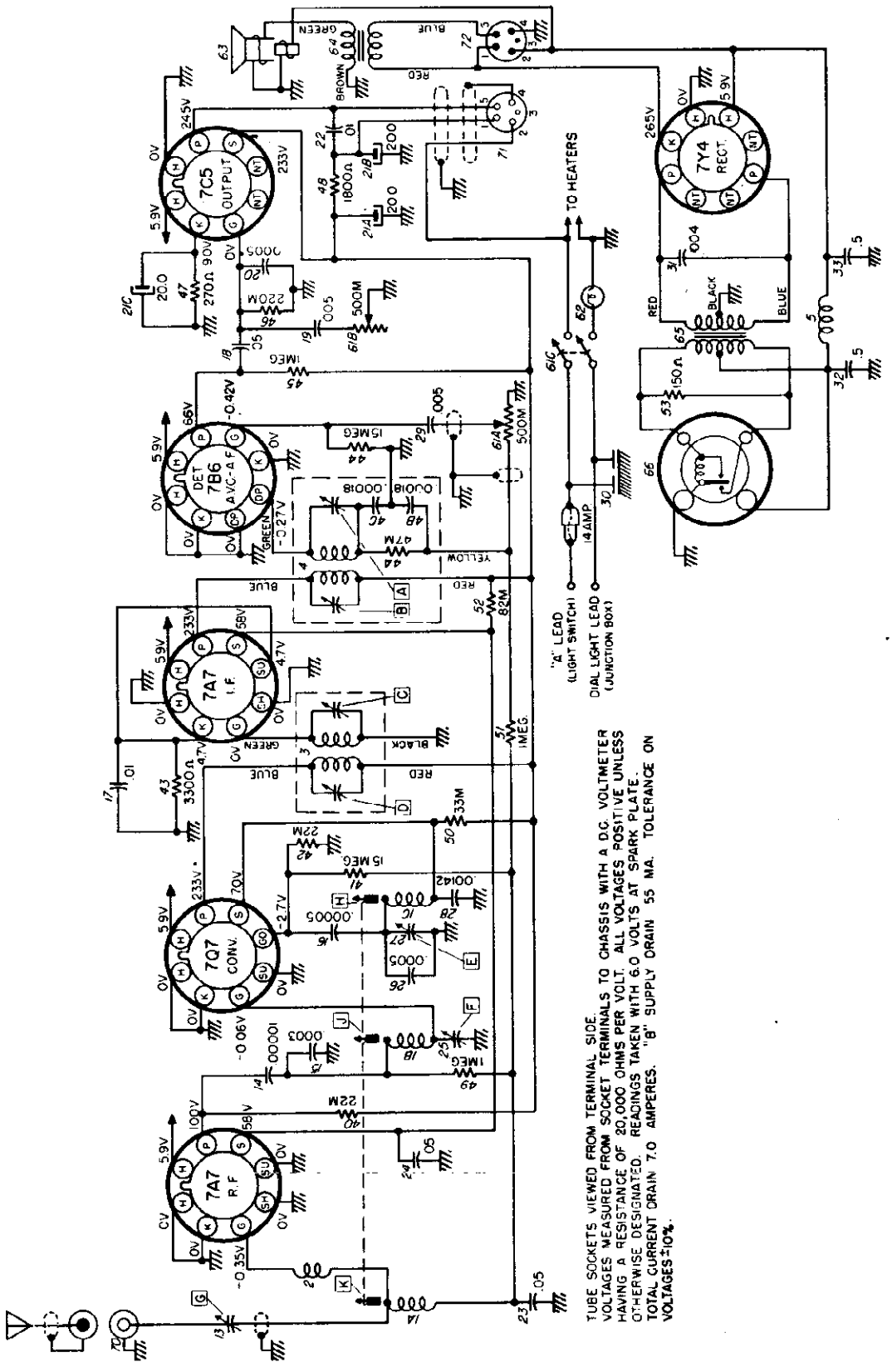
(Continued)

Illus. No.	Production Part No.	Service Part No.	Description
		TUBE COMPLEMENT	
	1213764	5230	6SK7GT
	1213763	5223	6SA7GT
	1213765	5232	6SQ7GT
	1213637	5241	6V6GT
	7237180	5003	OZ4—Rectifier
		MISCELLANEOUS ELECTRICAL PARTS	
56	7256188	7256188	Control—Volume, tone and switch
56A			Volume control
56B			Tone control
56C			Switch
57	7242204	7242204	Sensitivity Control
58	125588	125588	Lamp—Mazda #55
59	7241312	7241312	Speaker—6" x 9" Elliptical
60	7256009	7256009	Transformer—Output
61	7255881	7255881	Transformer—Power
62	7239124	8542	Vibrator
		MECHANICAL PARTS	
		CHASSIS	
	7255920	7255920	Cable and Plug—Speaker
	7239475	7239475	Socket—Antenna
66	1217838	1217838	Socket—Dial light
	7236279	7236279	Socket—Octal tube
67	1216962	1216962	Socket—Speaker
	7239125	7239125	Socket—Vibrator
		TUNER	
76	7256112	7256112	Core—Iron
77	7256730	7256730	Dial (included in Escutcheon)
78	7256105	7256105	Disc—Clutch Driven
79	7256729	7256729	Escutcheon Assy.
80	7256102	7256102	Gear and Bushing
81	7256100	7256100	Gear and Bracket—Worm
82	7244021	7244021	Grommet—Antenna and R. F. Coil
83	7244020	7244020	Grommet—Oscillator Coil
84	7237172	7237172	Grommet—Tuner Mounting
85	7256179	7256179	Guide Bar—Core
86	7256271	7256271	Link—Pointer Connecting Assy.
87	7256175	7256175	Pointer Assy.
88	7255985	7255985	Pushbutton
	7256099	7256099	Shaft—Manual Drive
89	1217837	1217837	Slide and Pushbutton Assy.
90	7255984	7255984	Spring—Slide Return
*91	7255989	7255989	Spring—Cam Return
*91A	7257434	7257434	Pin and Spring Assy.—Cam Return
†92	7255990	7255990	Spring—Treadle Bar Connecting Link (coil type)
†92A	7257415	7257415	Spring—Treadle Bar Connecting Link (wire type)
94	7255992	7255992	Spring—Pointer Connecting Link
95	7255987	7255987	Spring—Declutch Lever
96	7255991	7255991	Spring—Clutch
		INSTALLATION PARTS	
	494786	6009	Collector—Static
	1849161	6016	Condenser—Ammeter
	1908848	1908848	Condenser—Generator
	1910147	1910147	Condenser—Ignition Coil
	147685	147685	Fuse—14 Amperes
	1217950	1217950	Fuse Holder
	7255936	7255936	Knob—Wing
	7255935	7255935	Knob—Dummy
	7256148	7256148	Knob—Control
	1888204	1888204	Nipple—Rubber
	1887829	6003	Suppressor—Distributor

†*NOTE: Both of these parts have been used in production. The type part to be replaced is the part that should be ordered.

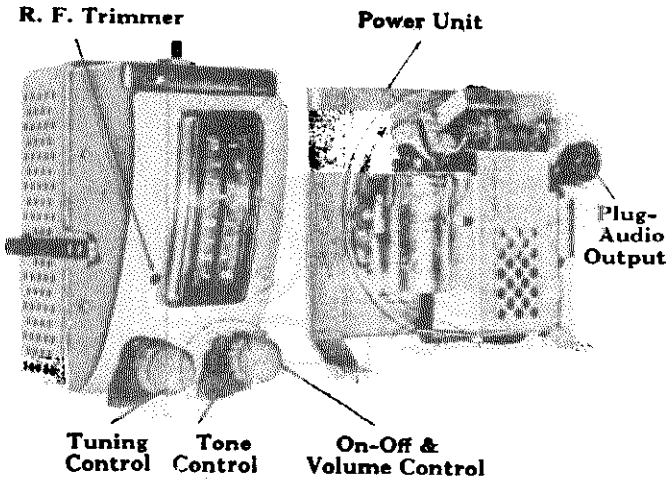
MODEL 986241

UNITED MOTORS SERVICE
DIV. OF GENERAL MOTORS CORP.



UNITED MOTORS SERVICE
DIV. OF GENERAL MOTORS CORP.

MODEL 986241



ALIGNMENT PROCEDURE:

Output Meter Connection ..... Across Voice Coil

Generator Return ..... To Receiver Chassis

Dummy Antenna ..... In Series With Generator

Volume Control Position ..... Maximum Volume

Tone Control Position ..... Treble

Generator Output ..... Minimum for Readable Indication

Steps	Series Condenser or Dummy Antenna	Connect To	Signal Generator Frequency	Tune Receiver To	Adjust In Sequence For Max. Output
1	0.02 Mfd.	7Q7 Grid (Pin #6)	257.5 KC.	High Frequency Stop	A, B, C, D
2	0.000065 Mfd.	Antenna Connector	1610 KC	High Frequency Stop	E, F, G
3	0.000065 Mfd.	Antenna Connector	1400 KC	Signal Generator Signal	H, J, K
4	0.000065 Mfd.	Antenna Connector	1610 KC	High Frequency Stop	F, G
5	0.000065 Mfd.	Antenna Connector	1400 KC	Signal Generator Signal	*Pointer Adjust. Screw

*Refer to the Pointer String Hookup drawing This should be adjusted so the pointer reads 1400 KC.

With the radio installed and the car antenna plugged in adjust the antenna trimmer "G" for maximum volume with the radio tuned to a weak station near 1400 KC.

MODEL 986241

UNITED MOTORS SERVICE
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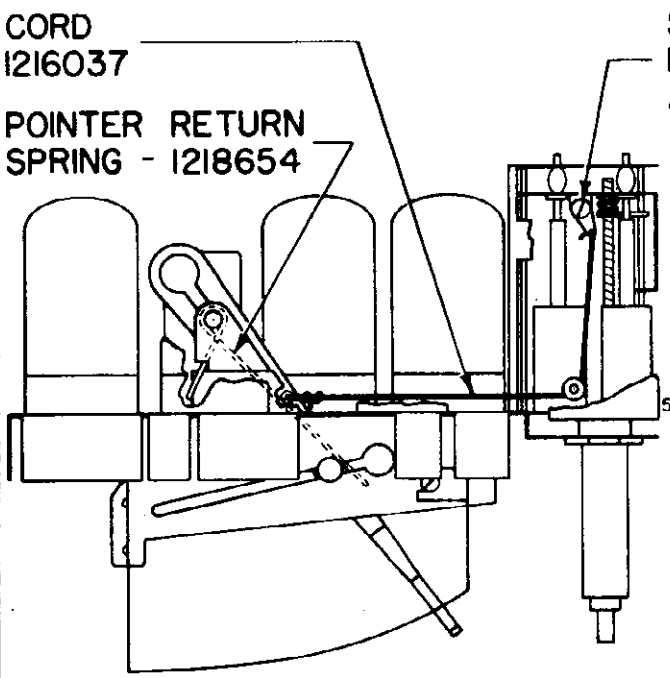
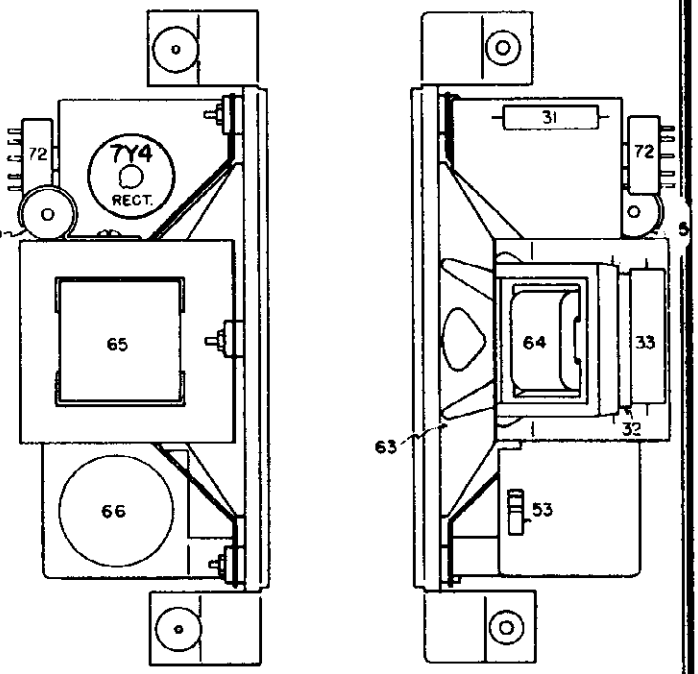
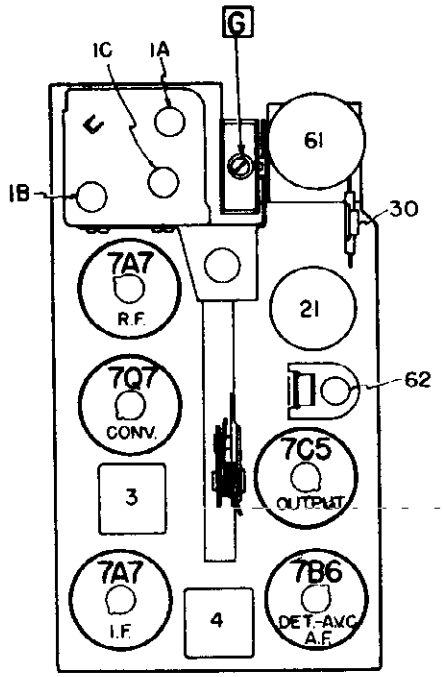


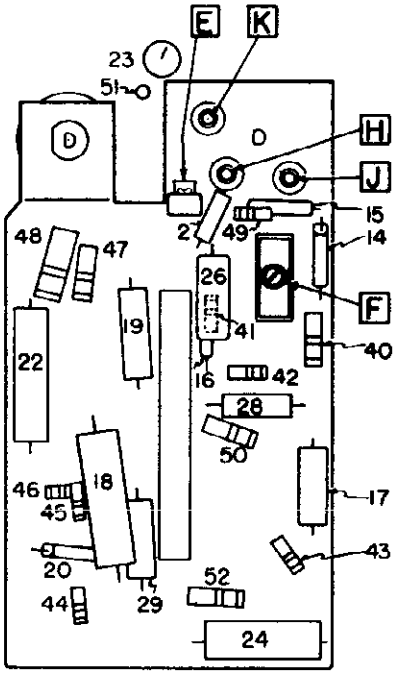
POINTER STRING HOOKUP



PARTS LAYOUT—POWER UNIT



PARTS LAYOUT—TUBE VIEW



PARTS LAYOUT—CHASSIS VIEW

MISCELLANEOUS ELECTRICAL PARTS

Illus. No.	Service Part No.	Production Part No.	Description
61		1218641	Control-Volume, Tone and Switch
61A			Volume Control
61B			Tone Control
61C			On-Off Switch
62		125588	Lamp, Dial (Mazda 55)
63		1218657	Speaker—6" Electro-Magnetic
64		1218662	Transformer—Output
65		1218663	Transformer—Power
66		1218006	Vibrator

MECHANICAL PARTS

CHASSIS

70		1218651	Socket—Antenna Connector
		1218013	Socket—Loctal Tube
		1218653	Socket—Rectifier
		1218652	Socket—Vibrator
		1218638	Cover—Rectifier Socket
		1218640	Clip—Pilot Lamp
71		1218642	Cable & Socket—Power
		1218645	Lead Assy.—Dimmer
		1218649	Plug & Leads Assy.—Power Supply & Speaker
72		1218650	Plug—Plug & Leads Assy.
		1218655	Spring—Case Assembly Cover
		1218622	"A" Connector Assembly
		1218628	Case—Front

TUNER PARTS

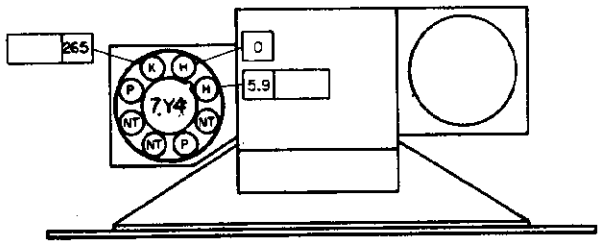
		1218621	Pointer Arm
		1218623	Pointer Arm Assembly
		1218624	Background—Dial
		1218625	Background—Pointer
		1218644	Dial
		1218646	Link & Stud Assy.—Pointer
		1218647	Nut—Speed—Dial & Background Mtg.
		1218648	Pointer—Dial
		1218654	Spring—Pointer Return
		1218659	Stud—Top Mounting

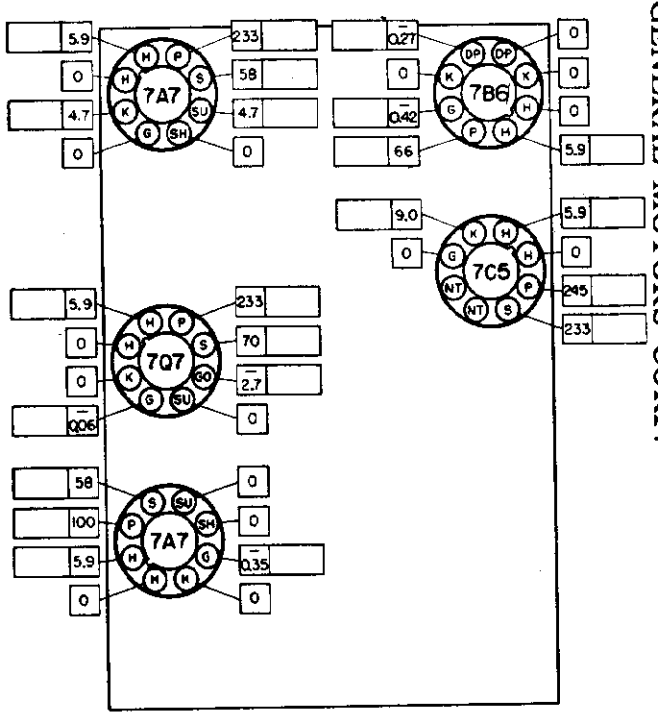
INSTALLATION PARTS

		3690332	Bracket—Receiver Mounting-Top
		7257984	Block—Serrated—Radio Mtg.
		7257922	Bushing—Control
		3690333	Trim Plate
		147685	Fuse—14 Amp.—25 Volt
		7257930	Knob—Tone
		7257929	Knob—Dummy
		7257928	Knob (Includes Set Screw)—Volume & Tuning
	6015	1911095	Condenser—Generator
		7257919	Condenser—Ammeter
		1910147	Condenser—Ignition Coil
		1912900	Condenser—Voltage Regulator
		7257917	Stud—Power Supply Mtg.
		1887829	Suppressor—Distributor
		1888204	Nipple—Suppressor
		494786	Static Collector Assembly

TUBE SOCKETS VIEWED FROM BOTTOM OF CHASSIS.

READINGS TAKEN FROM TUBE SOCKET CONTACTS TO GROUND WITH A D.C. VOLTMETER HAVING A RESISTANCE OF 20,000 OHMS PER VOLT.
"A" SUPPLY AT SPARK PLATE 6.0 VOLTS
"B" SUPPLY DRAIN APPROXIMATELY 55 MA.

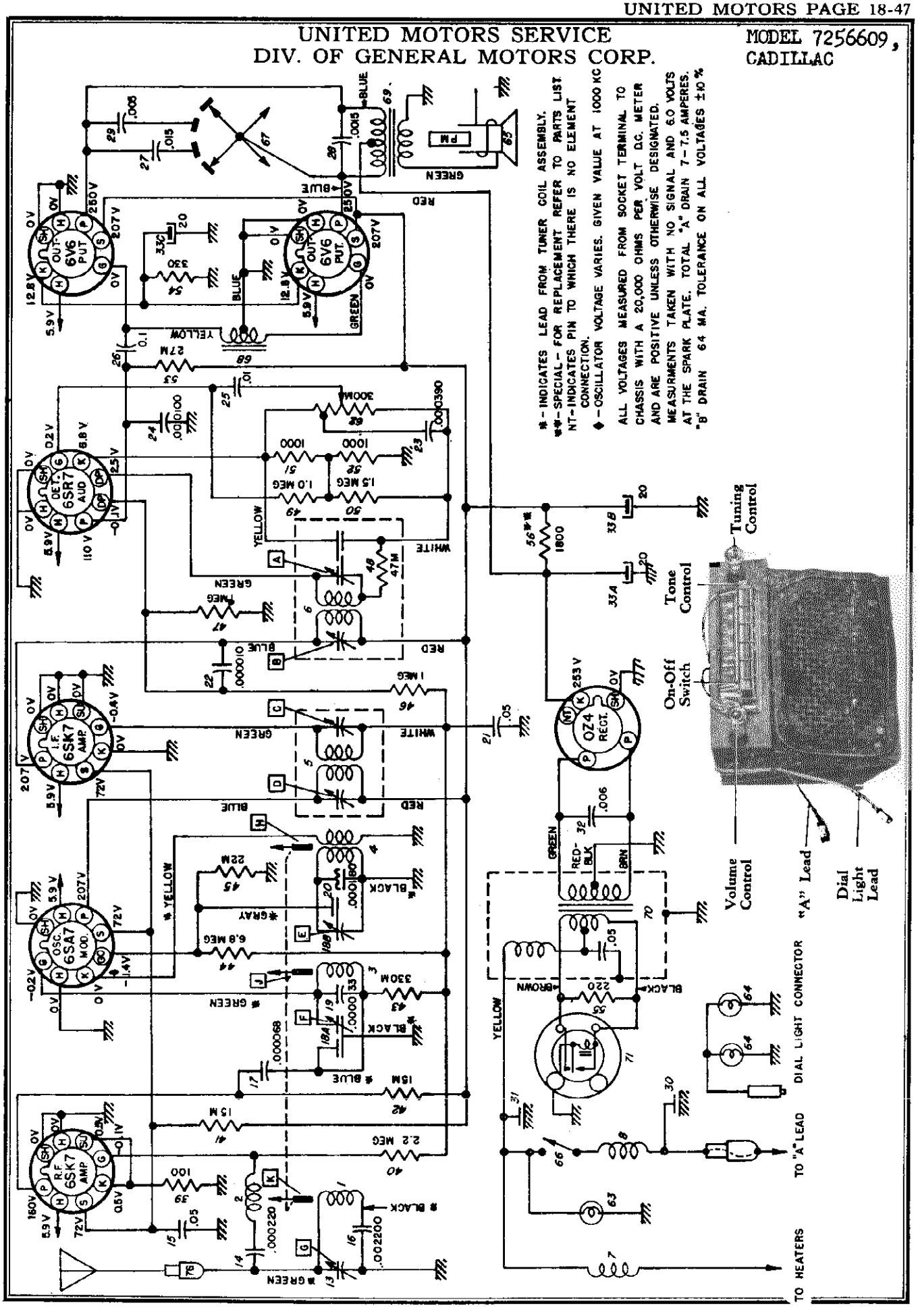




TUBE SOCKET VOLTAGE CHART

UNITED MOTORS SERVICE
DIV. OF GENERAL MOTORS CORP.

MODEL 7256609,
CADILLAC

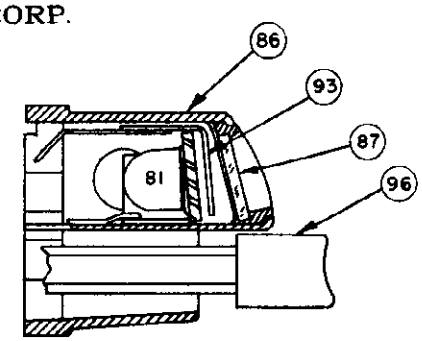


MODEL 7256609,
CADILLAC

UNITED MOTORS SERVICE
DIV. OF GENERAL MOTORS CORP.

ALIGNMENT PROCEDURE:

Output Meter Connection ..... Across Voice Coil
Signal Generator Return ..... To Chassis
Dummy Antenna ..... In Series with Generator
Volume Control ..... Maximum Volune
Tone Control ..... Treble
Generator Output ..... Minimum for Readable Indication



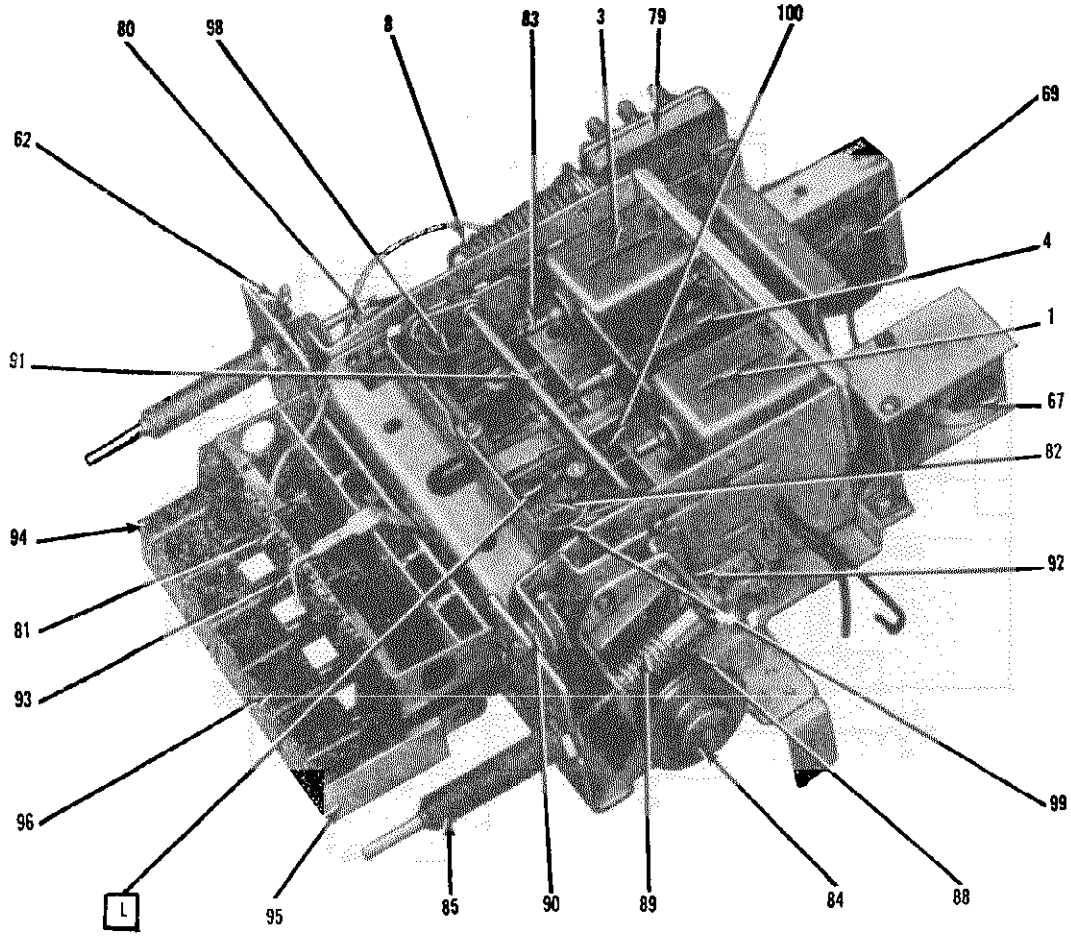
ESCUTCHEON CROSS SECTION

Steps	Series Condenser or Dummy Antenna	Connect To	Signal Generator Frequency	Tune Receiver To	Adjust In Sequence for Max. Output
1	0.1 Mfd.	6SA7 Grid (Pin #8)	260 KC	High Freq. Stop	A, B, C, D
2	0.000068 Mfd.	Antenna Connector	1615 KC	High Freq. Stop	*E, F, G
3	0.000068 Mfd.	Antenna Connector	600 KC	Signal Gen. Signal	J, K
4	0.000068 Mfd.	Antenna Connector	1615 KC	High Freq. Stop	F, G
5	0.000068 Mfd.	Antenna Connector	1430 KC	Signal Gen. Signal	L**

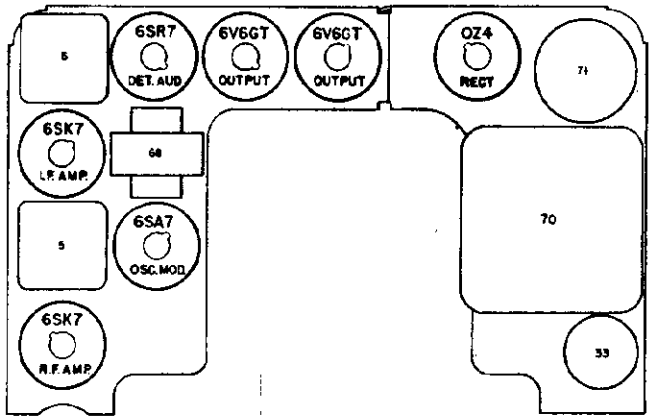
*Before making this adjustment check the mechanical setting of the oscillator core "H." The slotted end of the core should be 1¾" from the mounting end of the coil form. (This measurement is readily made by inserting a suitable plug in the mounting end of the coil form). Core adjustments are made from the mounting end of the coil form with an insulated screwdriver, and core studs should be sealed with glyptal or household cement after alignment.

**"L" is the pointer adjustment screw on the pointer connecting link (See tuner picture). Adjust so pointer reads 1430 KC.

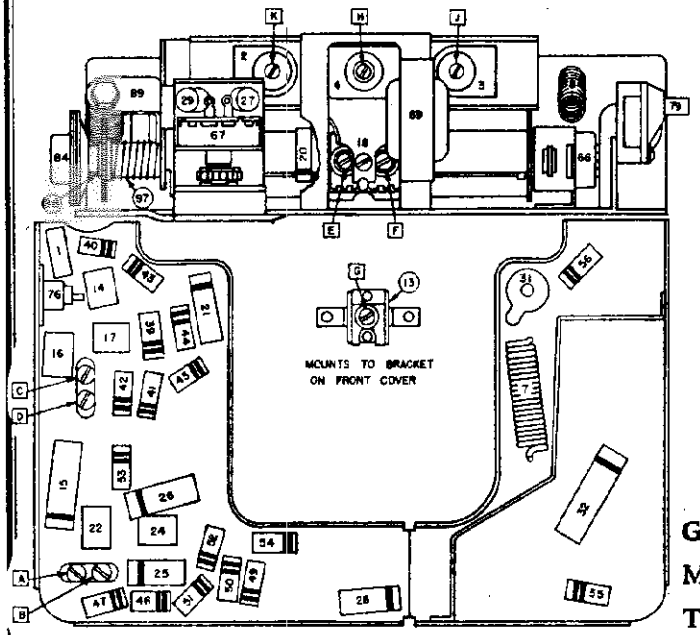
With the radio installed and the car antenna plugged in adjust antenna trimmer "G" (See sticker on case) for maximum volume with the radio tuned to a weak station near 1400 KC.



TUNER

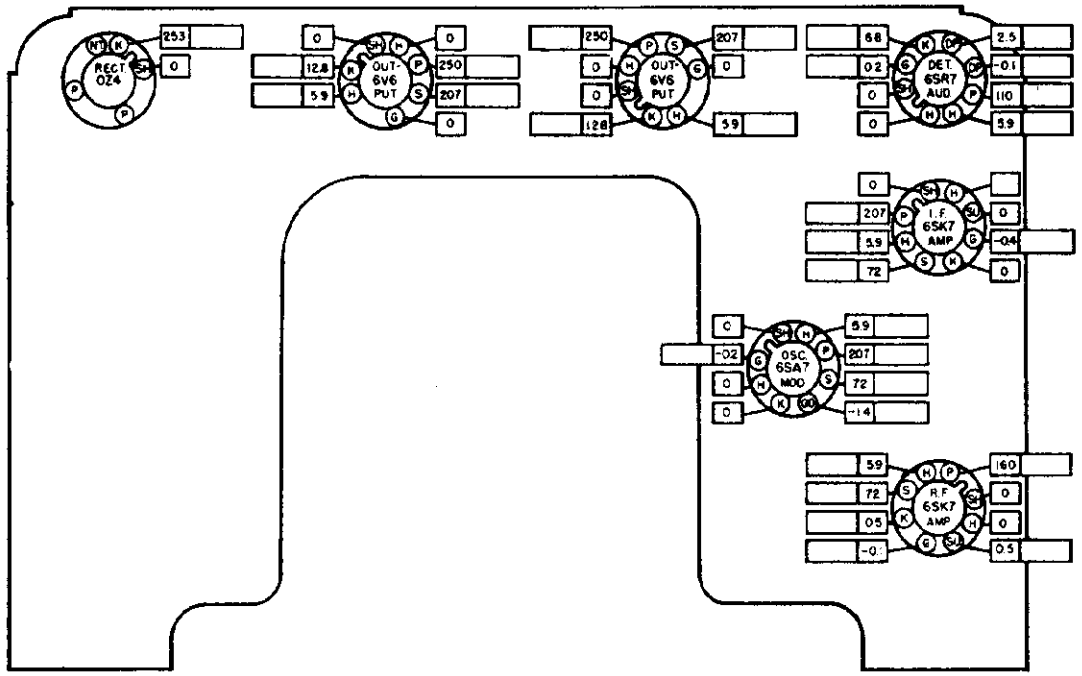


PARTS LAYOUT — TUBE VIEW



PARTS LAYOUT — CHASSIS VIEW

TUBE SOCKET VOLTAGE CHART



The tube socket voltages, as measured at the factory and under the conditions shown on the schematic diagram, are shown above. The blank spaces are provided so that the serviceman may fill in actual voltage readings as taken with his own equipment. A normal operating radio should be used for these measurements.

Voltmeter resistance..... Ohms Per Volt.

Readings taken with .....Volts At Spark Plate.

All voltages measured from socket terminals to chassis.

GENERAL

MOUNTING—All 1948 Cadillac Cars.

TUBES—Six, Plus Rectifier.

SPEAKER — 6" x 9" Elliptical, Permanent Magnet.

TUNING—Manual and 5 P. B. Mechanical.

ANTENNA TRIMMER COMPENSATION — 0.000060 - 0.000085 Mfd.

TUNING RANGE—550-1600 KC.

PUSHBUTTON SET-UP

Pull pushbutton to the right and out. Tune in desired station manually. Push button all the way in.

MODEL 7256609,
CADILLAC

UNITED MOTORS SERVICE
DIV. OF GENERAL MOTORS CORP.

SERVICE PARTS LIST

Illus. No.	Production Part No.	Service Part No.	Description
			ELECTRICAL PARTS
			COILS
1	7257391	7257391	Antenna Coil
2	7240251	7240251	Antenna Choke
3	7257391	7257391	R. F. Coil
4	7256750	7256750	Oscillator Coil
5	7257832	7257832	1st I. F. Assy.
6	7256932	7256932	2nd I. F. Assy.
7	7241708	7241708	Hash Choke
8	1217846	1217846	Spark Noise Choke
			CONDENSERS
13	7256949	7256949	Antenna Trimmer and Bracket
14	7236105	7236105	0.000220 Mfd. Molded
15	7230892	7230592	0.05 Mfd. 400 V. Tubular
16	1217744	1217744	0.002200 Mfd. Ceramic
17	1212359	1212359	0.000068 Mfd. Molded
18	7242454	7242454	Dual Trimmer
18A			R. F. Trimmer, Fixed Capacity 0.000300 Mfd.
18B			Osc. Trimmer, Fixed Capacity 0.000100 Mfd.
19	1217735	1217735	0.000033 Mfd. Molded (Included in R. F. Coil Shield Can)
20	7257424	7257424	0.000180 Mfd. — Temperature Compensating
21	7236842	7230592	0.05 Mfd. 200 V. Tubular
22	1215189	1215189	0.000010 Mfd. Molded
23	1217740	1217740	0.000390 Mfd. Molded (On Volume Control)
24	1210275	1210275	0.000100 Mfd. Molded
25	7237870	1208600	0.01 Mfd. 400 V. Tubular
26	7238788	7231536	0.1 Mfd. 400 V. Tubular
27	7237719	7237719	0.015 Mfd. 600 V. Tubular
28	7236134	7236134	0.0015 Mfd. 800 V. Tubular
29	7233769	7233769	0.005 Mfd. 1000 V. Tubular
30	7241259	7241259	Spark Plate (On case at entrance of "A" Lead)
31	1217848	1217848	Chassis Plate Condenser
32	7240906	7240906	0.006 Mfd. 1600 V. Buffer
33	7240724	7240724	Electrolytic Condenser
33A			20 Mfd. 400 V.
33B			20 Mfd. 400 V.
33C			20 Mfd. 25 V.
			RESISTORS
39	1213217	1213217	100 Ohms ½ W. Insulated
40	1214563	1214563	2.2 Megohms ½ W. Insulated
41	7233653	7233653	15,000 Ohms 2 W. Insulated
42	7237595	7237595	15,000 Ohms 1 W. Insulated
43	1214557	1214557	330,000 Ohms ½ W. Insulated
44	1215563	1215563	6.8 Megohms ½ W. Insulated
45	1214550	1214550	22,000 Ohms ½ W. Insulated
46	1213282	1213282	1 Megohm ½ W. Insulated
47	1213282	1213282	1 Megohm ½ W. Insulated
48	1214553	1214553	47,000 Ohms ½ W. Insulated (In Illus. 6)
49	1213282	1213282	1 Megohm ½ W. Insulated
50	1213285	1213285	1.5 Megohms ½ W. Insulated
51	1213235	1213235	1000 Ohms ½ W. Insulated
52	1213235	1213235	1000 Ohms ½ W. Insulated
53	1213342	1213342	27,000 Ohms 1 W. Insulated
54	7233773	7233773	330 Ohms 1 W. Insulated
55	7237994	7237994	220 Ohms 1 W. Insulated
56	1214573	{ 7240918 } { 7242844 }	{ 5600 Ohms 1 W. } { 2700 Ohms 2 W. } Replace in Parallel
			MISCELLANEOUS ELECTRICAL PARTS
62	7257791	7257791	Control, Volume
63	115273	115273	Lamp, Dial Light
64	187189	187189	Lamp, Dial Light
65	7257248	7257248	Speaker 6" x 9" Elliptical, Permanent Magnet
66	7256915	7256915	Switch and Bracket, On-off
67	1218056	1218056	Switch, Tone Control
68	7256432	7256432	Transformer, Input
69	7256907	7256907	Transformer, Output
70	7255881	7255881	Transformer Assy., Power
71	7239124	7239124	Vibrator, Non-synchronous

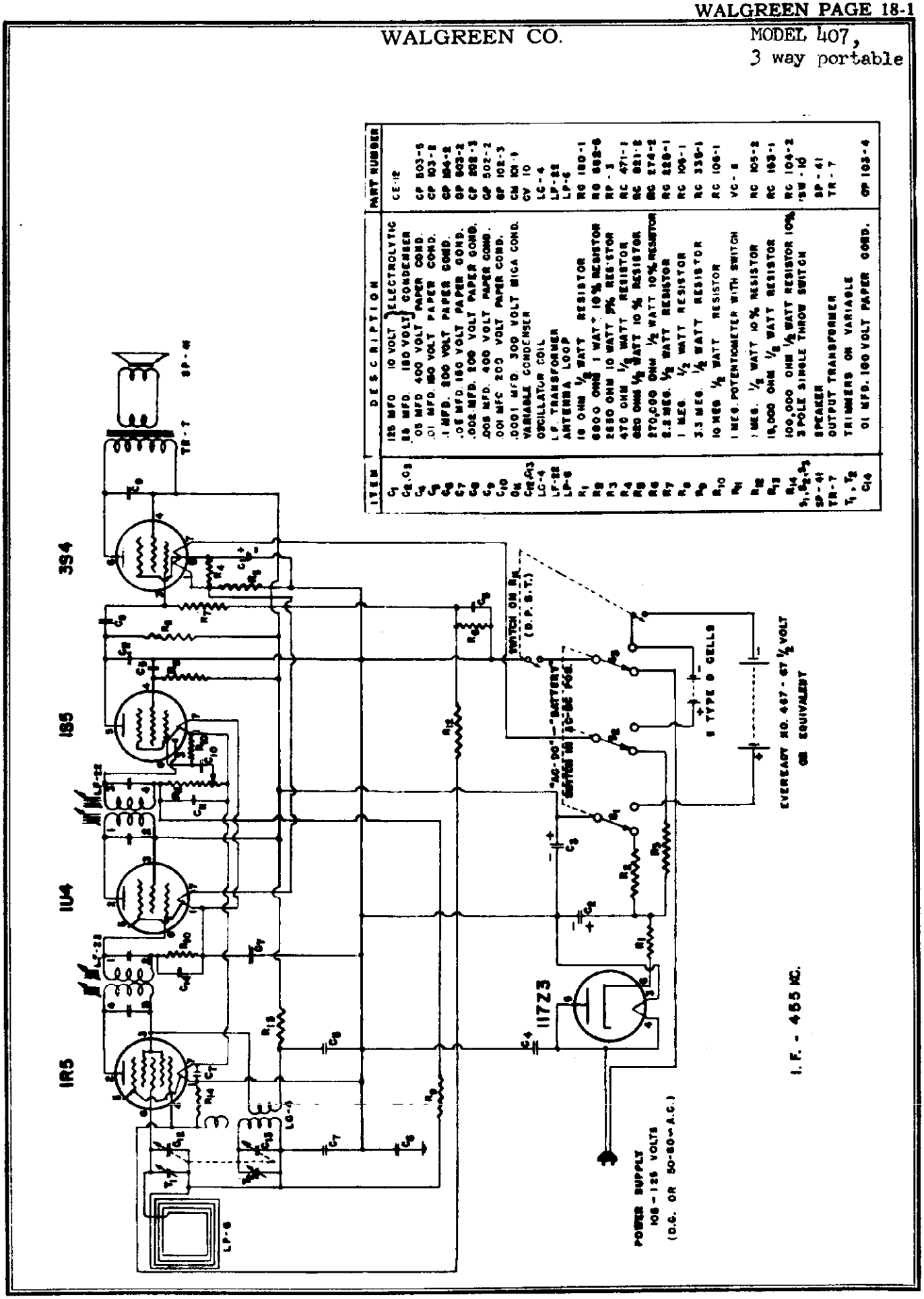
UNITED MOTORS SERVICE
DIV. OF GENERAL MOTORS CORP.

MODEL 7256609, CADILLAC

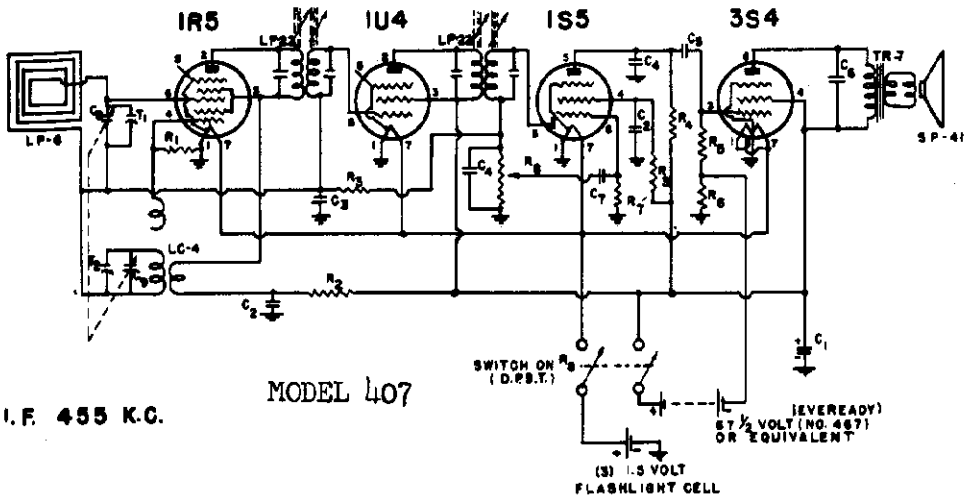
Illus. No.	Production Part No.	Service Part No.	Description
			MECHANICAL PARTS
			CHASSIS
76	7256944	7256944	Connector, Antenna
	1860926	1860926	Ferrule, Dial Light Connector
	1836869	1836869	Shell, Dial Light Connector
77	1218055	1218055	Socket, Dial Light with Lead
	7236279	7236279	Socket, Octal Tube
	7239125	7239125	Socket, Vibrator
78	7257280	7257280	Spring, Vacuum Valve Yoke
79	7256773	7256773	Valve, Vacuum
80	7257279	7257279	Yoke, Drive, Vacuum Valve
			TUNER
81	1218054	1218054	Backplate, Dial and Socket Assy.
82	7256271	7256271	Connecting Link, Pointer
83	7257353	7257353	Core, Powered Iron Tuning
84	7256105	7256105	Disc, Clutch Driven
85	1218343	1218343	Driveshaft and Bushing, Manual Tuning
86	7256806	7256806	Escutcheon Assy.
87	7256783	7256783	Glass, Dial
88	7256760	7256760	Gear and Bushing
89	7256758	7256758	Gear, Worm and Bracket
90	7237172	7237172	Grommet, Tuner Mounting
91	7256504	7256504	Guide Bar, Parallel
92	7257434	7257434	Pin and Spring Assy.
93	7256787	7256787	Pointer, Dial and Bracket
94	1218053	1218053	Push Button and Plunger (On-off)
95	1218052	1218052	Push Button and Plunger (Tone Control)
96	1218051	1218051	Push Button and Slide Assy. (Tuning)
97	7256761	7256761	Spring, Clutch
98	7257415	7257415	Spring, Guide Bar Connecting Link
99	7255992	7255992	Spring, Pointer Connecting Link
100	7255984	7255984	Spring, Slide Return
	7257361	7257361	Spring, On-off Switch — Return
	7257361	7257361	Spring, On-off Switch — Anti-Rattle
	7244115	7244115	Spring, Tone Control Switch — Return
	7241042	7241042	Spring, Tone Control Switch — Anti-Rattle
			INSTALLATION PARTS
	7256637	7256637	Bracket, Support
	7242478	7242478	Cap, "A" Lead
	1911095	1911095	Condenser, Generator
	1910147	1910147	Condenser, Ignition Coil
	1872486	1872486	Connector
	7240808	7240808	Ferrule, Suppressor Insulating
	147685	147685	Fuse
	7242024	7242024	Fuseholder, Complete
	7257502	7257502	Gasket, Anti-Squeak
	7256784	7256784	Knob, Control
	7257501	7257501	Nut, Mounting
	443370	443370	Screw, Mounting, Condenser to Coil
	415204	415204	Screw, Engine to Dash Ground Strap
	7257406	7257406	Spring, Ground, Hood to Cowl
	7240138	7240138	Static Collector
	5274049	5274049	Strap, Ground, Engine to Dash
	1435482	1435482	Suppressor, Distributor
	7255849	7255849	Suppressor, Spark Plug
	7256636	7256636	Trim Plate
	120388	120388	Washer, Plain, Ground Strap to Outer Cushion Screw
	120395	120395	Washer, Plain, Ground Strap to Outer Cushion Screw
			TUBES
	7237751	7237751	6SK7
	7237752	7237752	6SA7
	1218149	1218149	6SR7
	1213793	1213793	6V6
	1211924	1211924	0Z4

WALGREEN CO.

MODEL 407,
3 way portable

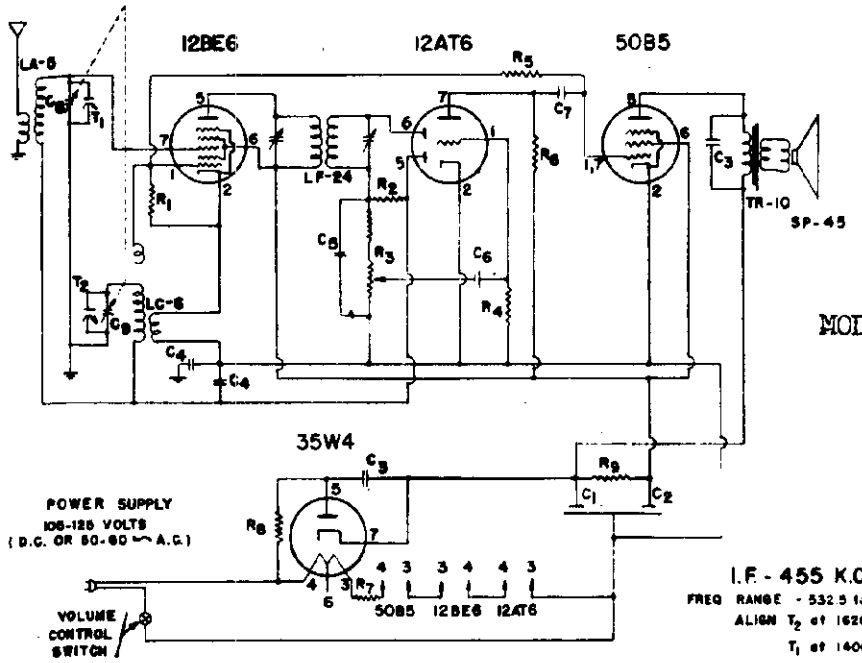


ITEM	DESCRIPTION	PART NUMBER
C_1	125 MFD 10 VOLT ELECTROLYTIC	CE-12
C_2, C_3	25 MFD. 150 VOLT CONDENSER	CP 803-5
C_4	.05 MFD 400 VOLT PAPER COND.	CP 803-2
C_5	.01 MFD. 150 VOLT PAPER COND.	CP 804-2
C_6	.1 MFD. 200 VOLT PAPER COND.	CP 803-2
C_7	.05 MFD. 150 VOLT PAPER COND.	CP 802-3
C_8	.002 MFD. 600 VOLT PAPER COND.	CP 502-2
C_9	.005 MFD. 400 VOLT PAPER COND.	CP 102-3
C_{10}	.001 MFD. 200 VOLT PAPER COND.	CM 101-1
C_{11}	.0001 MFD. 300 VOLT MICA COND.	CM 101-1
C_{12}-A_{13}	VARIABLE CONDENSER	CV 110
LC-4	OSCILLATOR COIL	LC-4
LF-22	I.F. TRANSFORMER	LF-22
LP-6	ANTENNA LOOP	LP-6
R_1	10 OHM ½ WATT RESISTOR	RC 110-1
R_2	6800 OHM 1 WATT 10% RESISTOR	RB 668-6
R_3	2200 OHM 10 WATT 5% RESISTOR	RP - 3
R_4	470 OHM ½ WATT RESISTOR	RC 471-1
R_5	820 OHM ½ WATT 10% RESISTOR	RC 821-2
R_6	270,000 OHM ½ WATT 10% RESISTOR	RC 274-2
R_7	2.2 MEG. ½ WATT RESISTOR	RC 225-1
R_8	1 MEG. ½ WATT RESISTOR	RC 106-1
R_9	3.3 MEG. ½ WATT RESISTOR	RC 336-1
R_{10}	10 MEG ½ WATT RESISTOR	RC 106-1
R_{11}	1 MEG. POTENTIOMETER WITH SWITCH	VC - 8
R_{12}	1 MEG. ½ WATT 10% RESISTOR	RC 105-2
R_{13}	15,000 OHM ½ WATT RESISTOR	RC 153-1
R_{14}	100,000 OHM ½ WATT RESISTOR 10%	RC 104-2
S_1, S_2, S_3	3 POLE SINGLE THROW SWITCH	SW-10
SP-41	SPEAKER	SP-41
TR-7	OUTPUT TRANSFORMER	TR-7
T_1, T_2	TRIMMERS ON VARIABLE	
C_{14}	.01 MFD. 100 VOLT PAPER COND.	CP 103-4



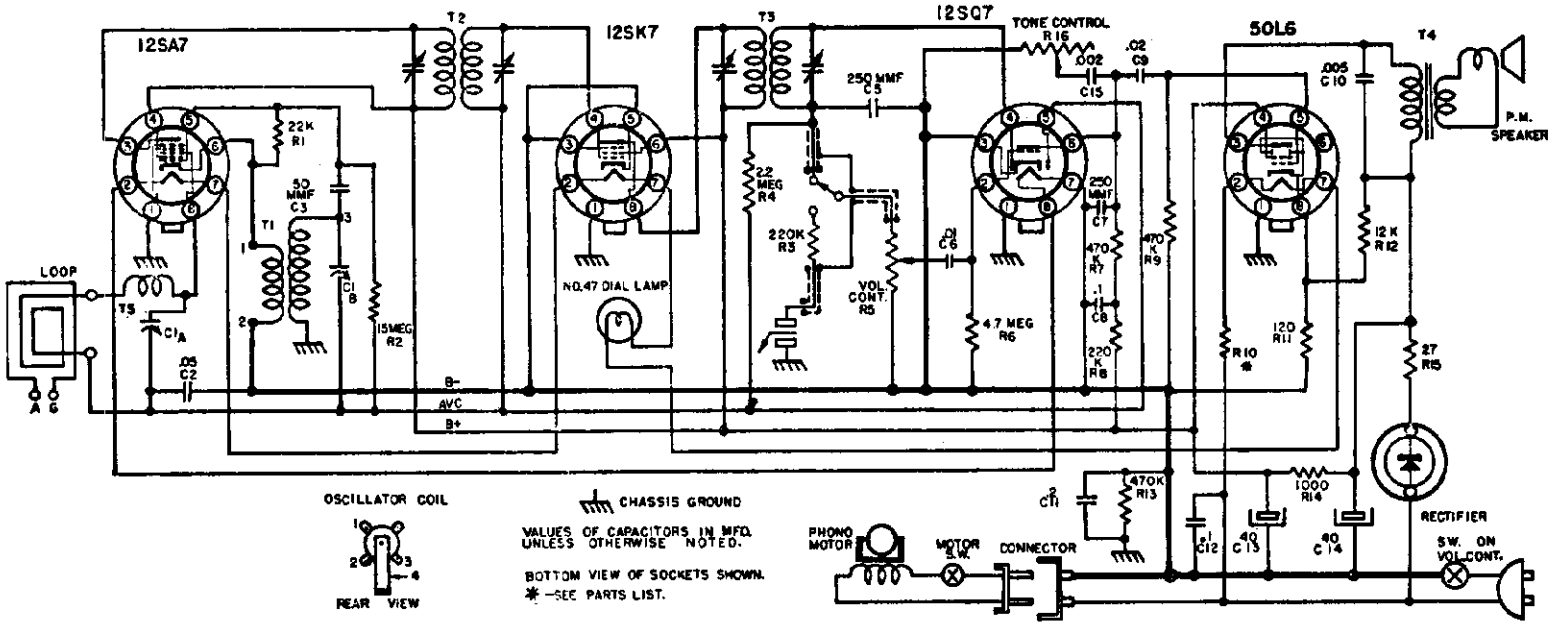
ITEM	DESCRIPTION	PART NO.
C_1	16 MFD. 100 VOLT ELECTROLYTIC	CE-14
C_2	.01 MFD. 200 VOLT PAPER COND.	CP-103-3
C_3	.05 MFD. 200 VOLT PAPER COND.	CP-503-4
C_4	.0001 MFD. 500 VOLT MICA COND.	CM-101-2
C_5	.002 MFD. 200 VOLT PAPER COND.	CP-202-2
C_6	.005 MFD. 400 VOLT PAPER COND.	CP-502-1
C_7	.001 MFD. 200 VOLT PAPER COND.	CP-102-3
LC-4	OSCILLATOR COIL	LC-4
LF-22	I.F. TRANSFORMER	LF-22
LP-6	ANTENNA LOOP	LP-6
R_1	100,000 OHM ½ WATT RESISTOR	RC-104-1
R_2	15,000 OHM ½ WATT RESISTOR	RC-153-1
R_3	3.3 MEG. ½ WATT RESISTOR	RC-335-1
R_4	1 MEG. ½ WATT RESISTOR	RC-105-1
R_5	2.2 MEG. ½ WATT RESISTOR	RC-225-1
R_6	820 OHM ½ WATT RESISTOR 10%	RC-821-2
R_7	10 MEG. ½ WATT RESISTOR	RC-106-1
SP-41	SPEAKER	SP-41
R_8	1 MEG. POTENTIONETER WITH SWITCH	VC-6
TR-7	OUTPUT TRANSFORMER	TR-7
C8, C9	VARIABLE CONDENSER	CV-10
T1, T2	TRIMMERS ON VARIABLE	

FREQ. RANGE - 530 - 1700 K.C.
ALIGN T_2 - 1700 K.C.
T_1 - 1500 K.C.
TRACK AT - 600 K.C.



I.F. - 455 K.C.
FREQ RANGE - 532.5 to 1620 K.C.
ALIGN T_2 at 1620 K.C.
T_1 at 1400 K.C.
TRACK at 600 K.C.

ITEM	DESCRIPTION	PART NO.
C_1, C_2	2 X 40 MFD. 150 VOLT ELECT.	CE-15
C_3	.02 MFD. 400 V. PAPER COND.	CP-203-1
C_4	.05 MFD. 200 V. PAPER COND.	CP-503-4
C_5	.00015 MFD. 500 V. MICA COND.	CM-151-1
C_6	.002 MFD. 400 V. PAPER COND.	CP-202-2
C_7	.005 MFD. 200 V. PAPER COND.	CP-502-3
C_8, C_9	VARIABLE CONDENSER	CV-14
LC-6	OSCILLATOR COIL	LC-6
LA-5	ANTENNA COIL	LA-5
LF-24	I. F. TRANSFORMER	LF-24
R_1	18,000 OHMS ½W. 10%	RC-183-2
R_2	4.7 MEGOHMS ½W. RESISTOR	RC-475-1
R_3	2 MEG. VOL. CONTROL, 100K STOP	VC-11
R_4	10 MEGOHMS ½ W. RESISTOR	RC-106-1
R_5	330,000 OHMS ½ WATT	RC-334-1
R_6	220,000 OHMS ½ WATT	RC-224-1
R_7	39 OHMS 1 WATT RESISTOR	RC-390-4
R_8	18 OHMS ½ W. RESISTOR	RC-180-1
R_9	2200 OHMS 1 W. RESISTOR	RC-222-4
T_1, T_2	TRIMMERS	
SP-45	SPEAKER	SP-45
TR-10	OUTPUT TRANSFORMER	TR-10



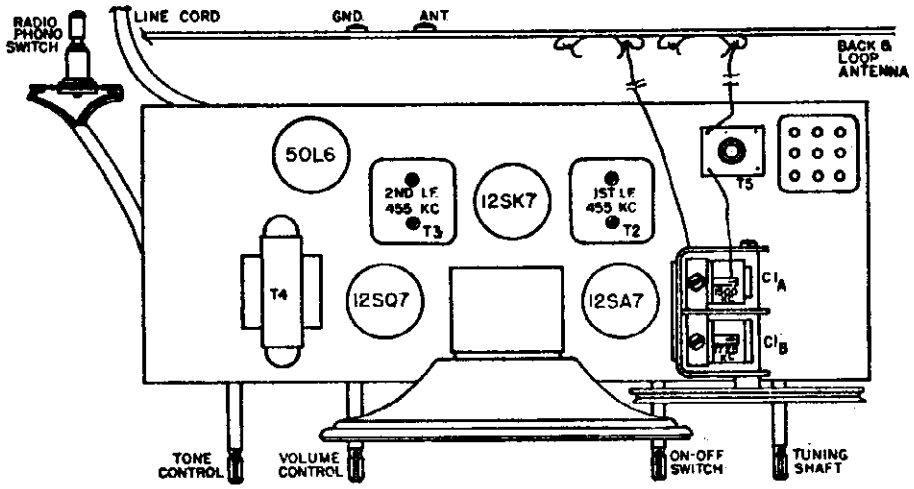
PARTS LIST

Code	Part No.	DESCRIPTION
C1A, C1B	B19-193	Variable Condenser
C2	A16-152	.05 MFD. 200 Volt Condenser
C3	A15-175	50 MMFD. Mica Condenser
C9	A16-150	.02 MFD. 400 Volt Condenser
C5, C7	A15-176	250 MMFD. Mica Condenser
C6	A16-156	.01 MFD. 400 Volt Condenser
C8	A16-157	.1 MFD. 200 Volt Condenser
C10	A16-153	.005 MFD. 600 Volt Condenser
C11	A16-154	.2 MFD. 400 Volt Condenser
C12	A16-160	.1 MFD. 400 Volt Condenser
C13, C14	A18-280	40 MFD. 150 Volt Electrolytic Condenser
C15	A16-155	.002 MFD. 600 Volt Condenser
R1	A60-659	22K Ohm ½ Watt 20% Resistor
R2	A60-664	15 Megohm ½ Watt 20% Resistor
R3, R8	A60-667	220K Ohm ½ Watt 20% Resistor
R4	A60-684	2.2 Megohm ½ Watt 20% Resistor

CODE	PART NO.	DESCRIPTION
R5	A24-169	500K Ohm Volume Control with Switch
R6	A60-669	4.7 Megohm ½ Watt 20% Resistor
R7, R9, R13	A60-662	470K Ohm ½ Watt 20% Resistor
R10	A60-719	Special Compensating Resistor, order only from the manufacturer
R11	A60-702	120 Ohm ½ Watt 10% Resistor
R12	A60-720	12K Ohm 2 Watt 10% Resistor
R14	A60-699	1000 Ohm 2 Watt 10% Resistor
R15	A60-721	27 Ohm 1 Watt 10% Resistor
R16	A26-123	Tone Control, 2 Megohm
T1	B10-411	Oscillator Coil
T2	B10-453	1st I. F. Transformer
T3	B10-454	2nd I. F. Transformer
T4	B80-238	Output Transformer
T5	A10-503	Loading Coil

PART NO.	DESCRIPTION
A52-211	Knob, Phono-Radio
A52-203	Knob, Tuning
A52-208	Knob, Volume
A52-209	Knob, On-Off
A52-207	Knob, Tone
A69-172	Switch, Phono-Radio
A39-277	Drum for Variable Condenser
B79-356	6½" P.M. Speaker
A83-391	Selenium Rectifier
A84-41	Tuning Shaft and Pulley
A83-308	Connector
A71-30	Cover, Dial Plate Assembly
C67-502	Dial Scale
A58-54	Dial Pointer
A83-429	Retainer, Dial Scale
C82-50	Loop Antenna
B83-290	Dial Diffusing Plate
A69-169	On-Off Switch

MODEL 12708 WARWICK MFG. CORP.



ALIGNMENT PROCEDURE

The following alignment procedure is for use only by competent servicemen having the proper **equipment.**

The alignment should be made with volume control fully on, and the output from the signal **generator as low as** possible, to prevent A.V.C. action from interfering with correct alignment.

With the output meter connected across the voice coil of the speaker, the output meter reading for 50 **milliwatts is** .4 volts using a signal which is modulated 400 c.p.s.

Adjust all trimmers for maximum output. Repeat alignment procedure given below as a final **check.**

Position of Variable	Generator Frequency	Dummy Ant. Mid.	Generator Connections	Trimmer Adjustment	Trimmer Function
Fully open	455 KC	.1	* 12SA7 Grid (Stator of C1A)	T2	Input I.F.
Fully open	455 KC	.1	* 12SA7 Grid (Stator of C1A)	T3	Output I.F.
Fully open	1725 KC	.00025	* 12SA7 Grid (Stator of C1A)	C1B	Oscillator
Tune in signal from generator	1500 KC	.00025	**Loosely Coupled to Loop	C1A	Antenna

*Connect ground lead of signal generator to Common "B."

**Do not correct ground lead of signal generator.

DESCRIPTION

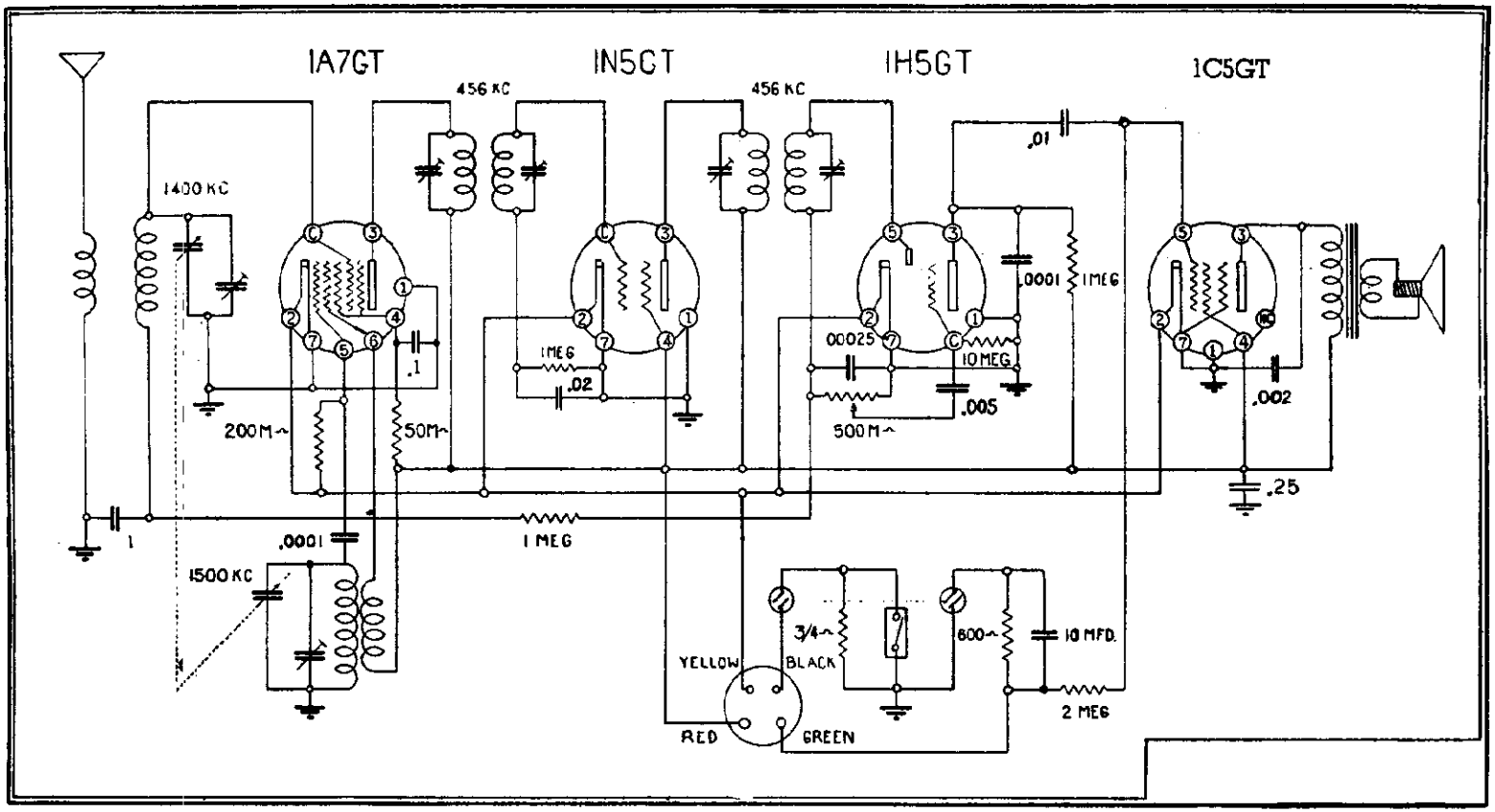
Model 12708 is a superhetrodyne radio receiver and phonograph combination designed for operation on a 117 volt 60 cycle A.C. power supply.

The tubes used are:—

12SA7—Mixer, Oscillator
12SK7—I. F. Amplifier
12SQ7—Det., AVC, Audio
50L6—Power Output
A83-391—Selenium Rectifier

This receiver covers the frequency range from 535 kilocycles to 1725 kilocycles (K.C.).

The record player used is the automatic type, capable of playing up to twelve 10 inch or ten 12 inch records automatically.

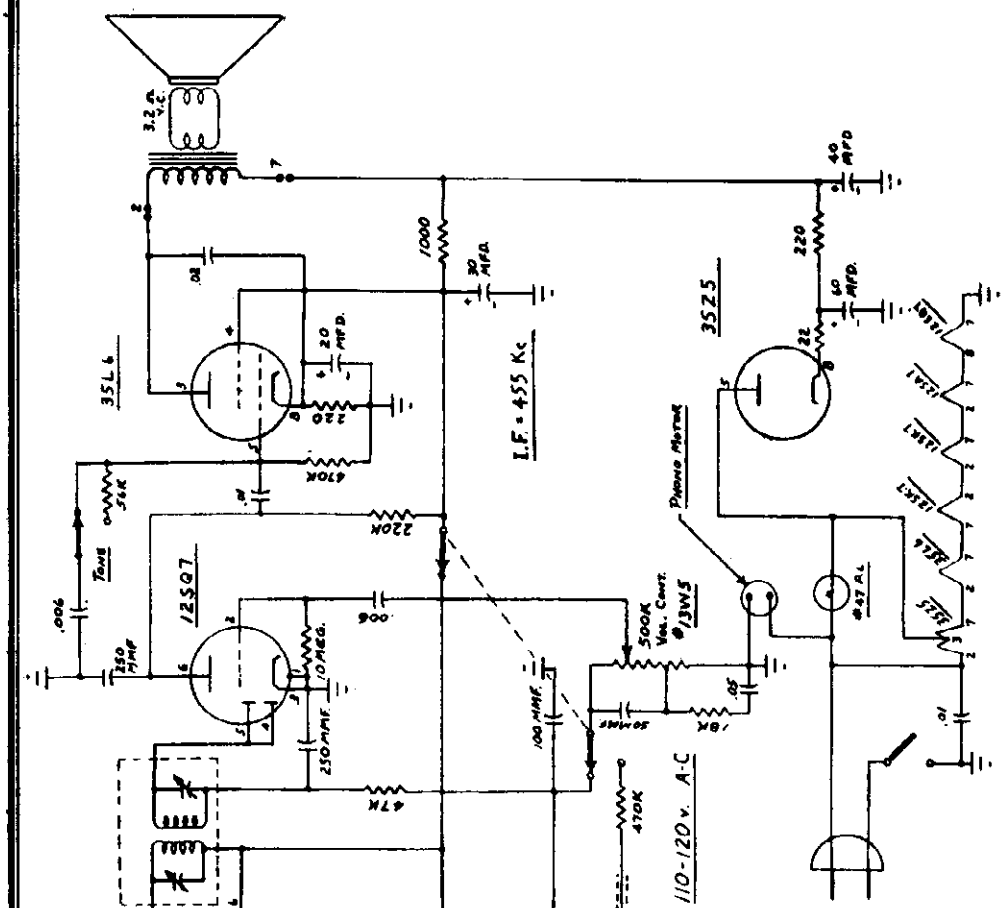


ALIGNMENT PROCEEDURE

I. F. ALIGNMENT: Turn volume control to FULL ON, connect signal generator to grid of the 1A7 tube through a .25 condenser. Connect ground of the signal generator to the ground lead of the receiver, set dial at 1000 K. C. and feed in a 456 K. C. signal and adjust first and second I. F. to maximum, then recheck first I. F.

R. F. ALIGNMENT: Turn dial to high frequency end, feed in a 1500 K. C. Signal to the receiver antenna lead through a .00025 mica condenser, adjust the 1500 K. C. oscillator trimmer until the maximum output is shown. Now, set generator at 1400 K. C. and tune in this signal on the receiver, then adjust the antenna trimmer to maximum output. This completes the alignment.

MODEL 4801 WATTERSON RADIO MFG. CORP.



The Watterson Model 4801 Receiver is a six tube (including rectifier) superheterodyne. The tubes used are a 12SA7 converter; two 12SK7 I. F. amplifiers; a 12SQ7 detector, AVC, and audio amplifier; a 35L6 beam power output; and a 35Z5 rectifier. The receiver tunes the broadcast band from 540 kc. to 1620 kc. A three position tone control is employed.

R. F. Alignment

Set signal generator to 600 kc. and receiver dial to approximately 600 kc. While "rocking" receiver dial, adjust oscillator padder for maximum output. Recheck adjustments at 1400 kc.

Connect "high" side of signal generator to the antenna lead of the receiver. Set gang to full open position and peak the oscillator trimmer using a 1620 kc. signal. Set the signal generator to 1400 kc., and tune receiver for maximum output. Now peak the antenna trimmer.

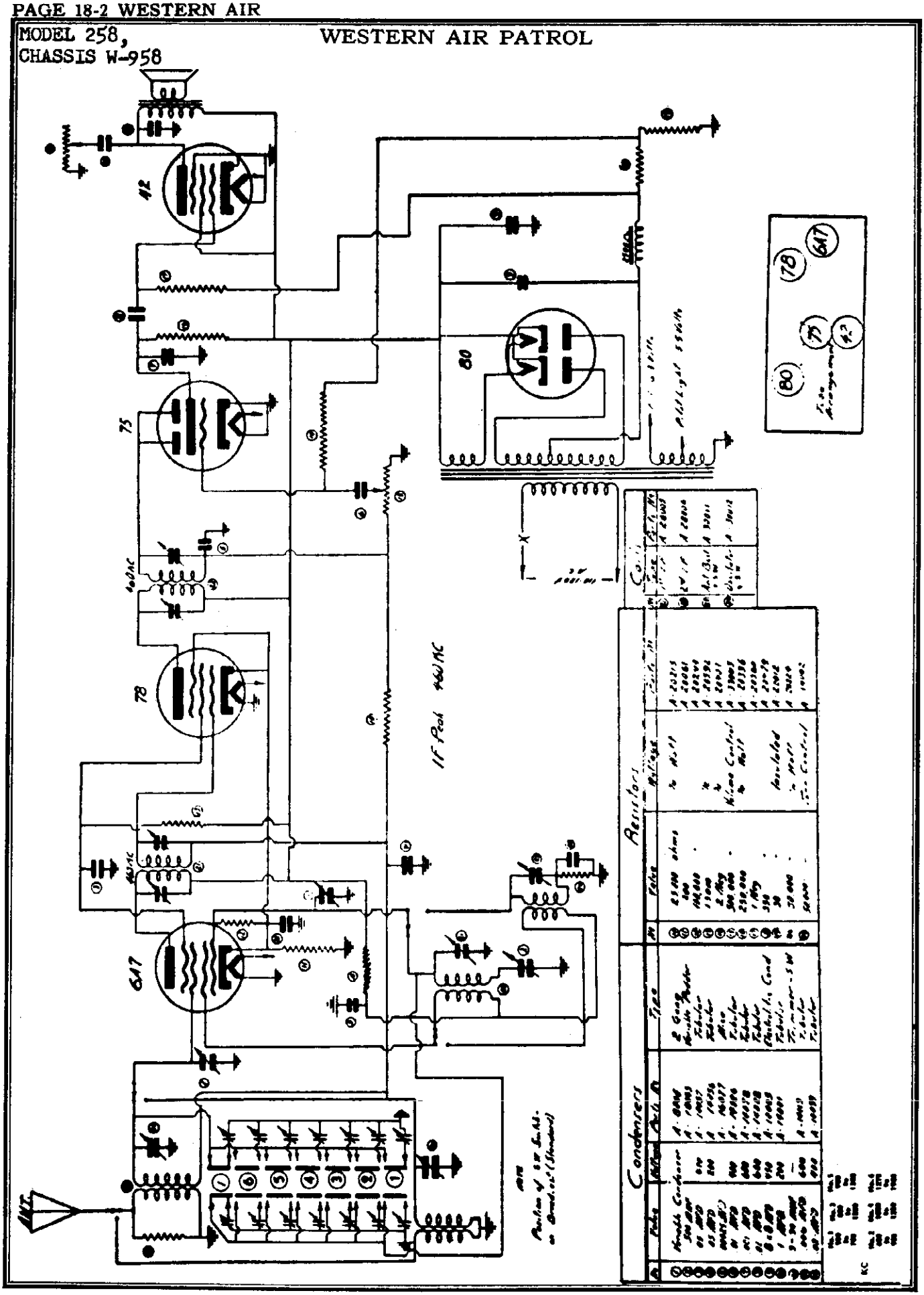
I. F. Alignment

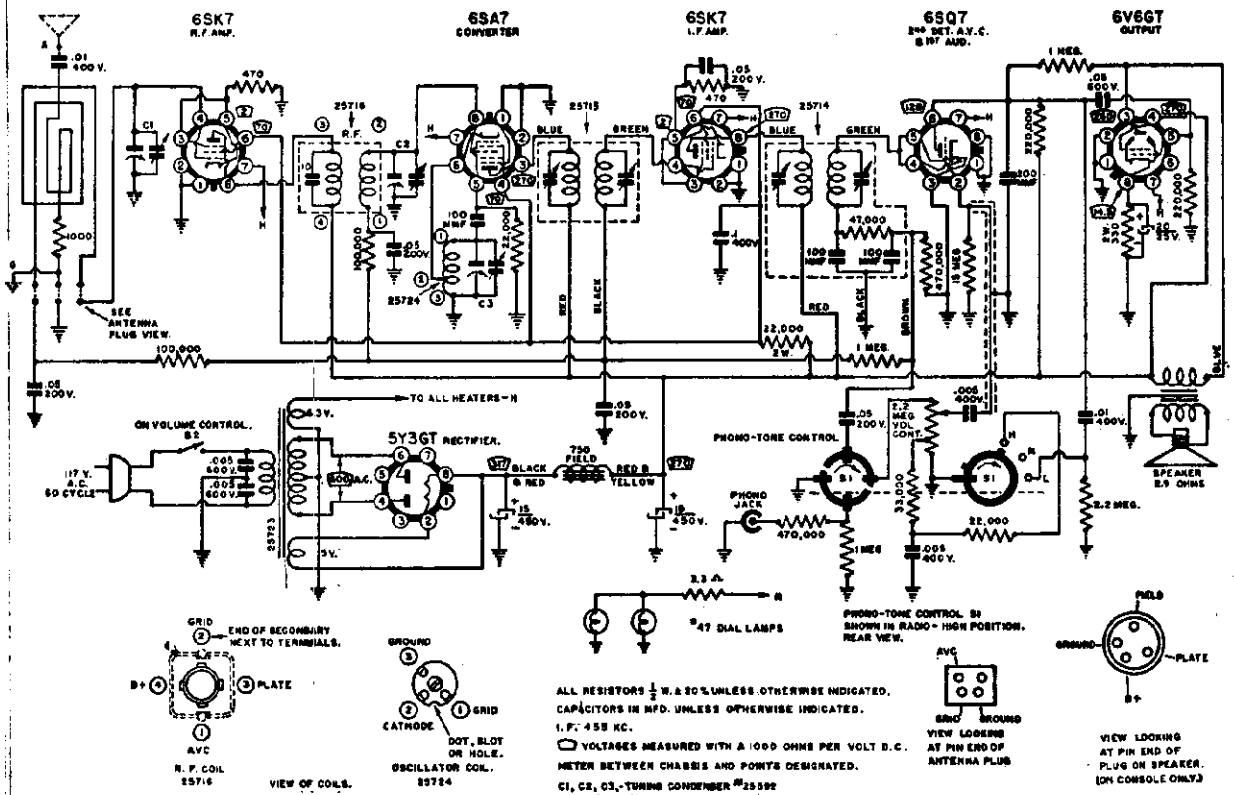
Connect the low side of an accurately calibrated signal generator through a .1 mfd. condenser to the chassis of the receiver and the "high" side of the generator through a .1 mfd. condenser to the R. F. grid (pin 8) of the 12SA7 converter tube. Set the signal generator to 455 Kc. with just enough signal to be audible in the speaker with the receiver volume control full on. If possible, an output meter should be used.

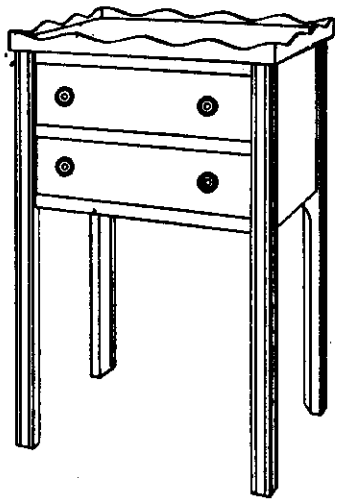
Adjust the second I. F. transformer and then the first I. F. transformer for maximum output. Recheck all adjustments.

MODEL 258,
CHASSIS W-958

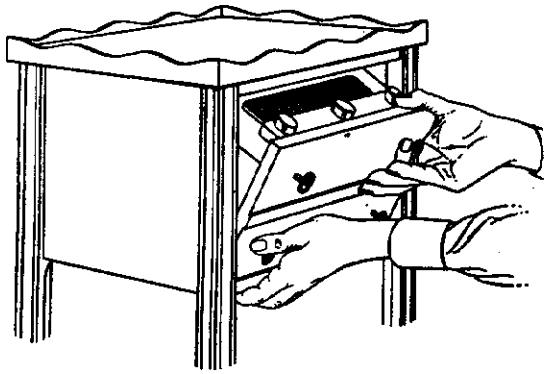
WESTERN AIR PATROL







DIAL SCALE REPLACEMENT—Remove chassis. Remove pointer track by removing the two wood screws holding it to the cabinet. Dial scale may now be lifted out from front of cabinet. When installing new scale —see that long screws in track bracket engage the notches in the ends of the scale.



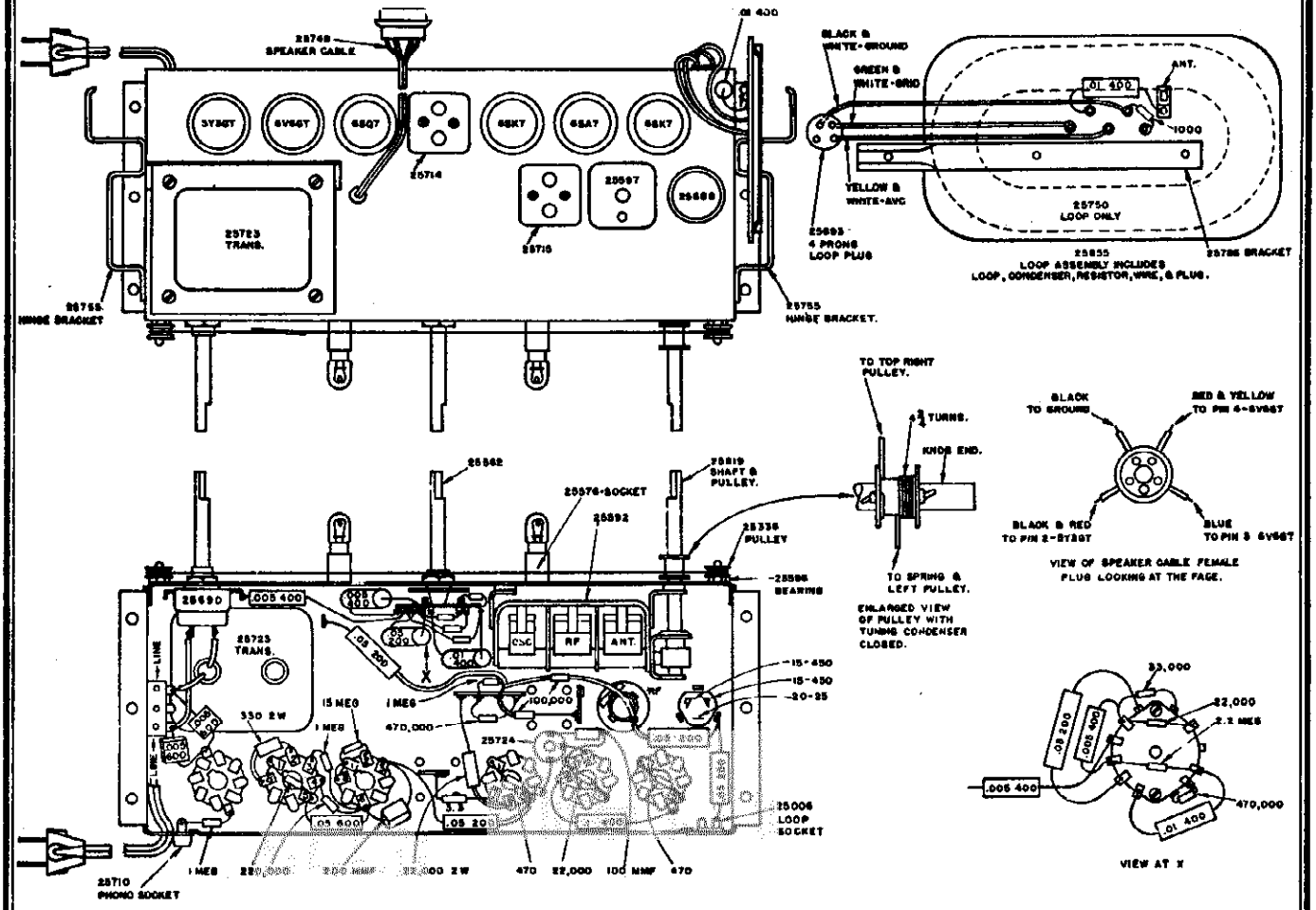
Part No.	Description
25750	Antenna—Loop—Consolette Model
25596	Bearings—For Wood Pulleys
25572	Bracket—Tuning Condenser—Front
25573	Bracket—Tuning Condenser—Rear
25755	Bracket—Hinge
25765	Bracket—Pointer Track
25728	Cabinet
25597	Coil—R. F.
25724	Coil—Oscillator
25688	Condenser—Filter 15-450, 15-450, 20-25
25592	Condenser—Tuning C-1, C-2, C-3
25690	Control—Volume (with AC Switch S-2)
25068	Cord—AC and Plug
25834	Cord—Dial (includes Spring and Pointer Coupling)
25779	Dial Scale—Glass
25578	Dial Pointer
25829	Knob—Tone
25696	Knob—Volume and Tuning
25710	Phono—Pick-Up Socket
25693	Plug—For Loop

Part No.	Description
25336	Pulley—Wood—Small
25819	Pulley—Manual Drive With Shaft
25607	Rubber—Grommets
25774	Screw—Set For Worm Gear (Tuning Condenser)
25576	Socket—Dial Lamp
25620	Socket—Octal
25006	Socket—For Loop
25754	Speaker—With Transformer
25562	Switch—Tone S-1,
25711	Track—Pointer
25715	Transformer—I. F. Input
25714	Transformer—I. F. Output
25713	Transformer—Output—Speaker
25723	Transformer—Power 60 Cycles

Note: Resistors and condensers not listed will be supplied on order—specify value.

MODEL D1612

WESTERN AUTO SUPPLY CO.



Generator to antenna clip through a .0001 Mfd. condenser. Adjust oscillator trimmer condenser (located on left top) to 1620 KC with tuning condenser at minimum capacity (complete out of mesh). The antenna and R. F. sections are trimmed at 1400 KC. Antenna trimmer is top right; R. F. trimmer is below at right. Dial pointer may be adjusted to scale by slipping pointer coupling on dial cord.

DIAL CORD REPLACEMENT—Is best accomplished by replacing complete cord assembly No. 25834 which is made up to correct length. In an emergency 30 lb. fish line may be used. See picture of chassis for correct installation.

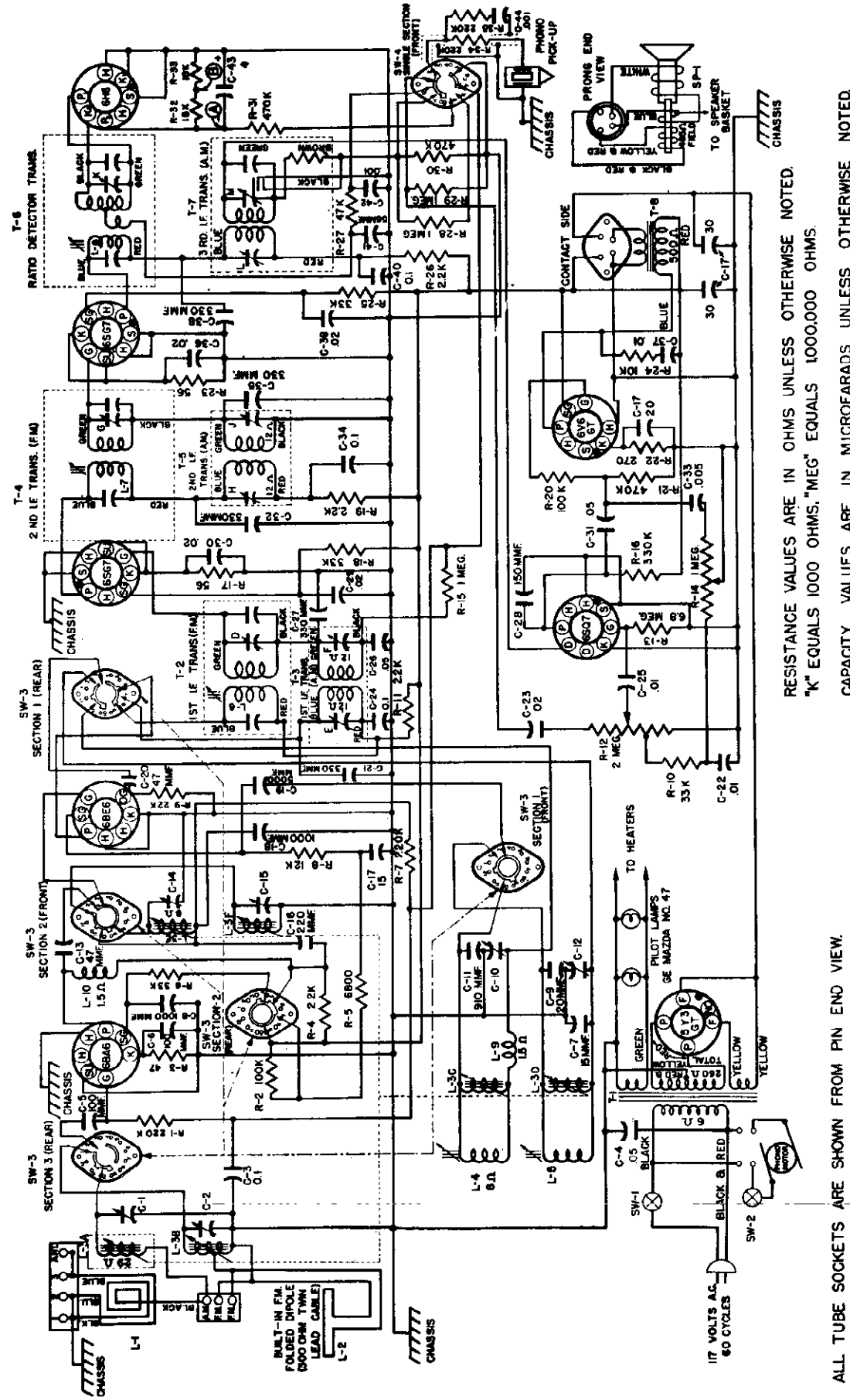
INSTALLING CHASSIS AND FRONT ASSEMBLY IN CABINET—Just reverse the procedure given above for removal of chassis—connect speaker socket, carefully place set in position shown in the picture, and it will then drop down on the hinge pins and be ready to operate in normal manner.

ALIGNMENT—Sets are properly aligned at the factory with precision equipment and the adjustments should not be disturbed unless a coil, tuning condenser or IF transformer has to be replaced or the set has been subject to damage or tampering. Alignment should only be done with the aid of an accurate signal generator and output indicating instrument.

TO PROPERLY ALIGN—Remove chassis from cabinet, and align I. F. Transformers in the conventional manner with a Signal Generator adjusted to 455 KC, connected to the grid of the 6SA7 through a .1 Mfd. condenser, with the tuning condenser set at minimum capacity. To align tuning condenser, carefully place loop in normal relation to chassis, connect Signal

REMOVAL OF CHASSIS FROM CABINET—The chassis proper is mounted to the cabinet front and the assembly is supported on "hook" hinges within the cabinet. For general inspection and tube replacement, the assembly may be removed. First remove the power cord from the wall outlet. Tilt the front to the partial open position shown in the picture, then carefully lift up and slightly forward until the assembly is "free." While holding the assembly just below and in front of the cabinet, reach inside and disconnect the speaker cable by pulling forward on the cable and plug. The assembly may then be placed on the floor or a table for inspection.

WESTERN AUTO SUPPLY CO. MODEL D1752



MODEL D1752 WESTERN AUTO SUPPLY CO.

ALIGNMENT PROCEDURE

First determine if factory adjustments of the permeability tuner cores have been altered. This may be done by checking core positions against dimensions shown in tuner illustration. Broken wax seals on the core adjustments may also indicate altering. If the slug adjustments have been changed, it will be necessary to first adjust them in accordance with the dimensions given in tuner illustration before proceeding with alignment.

The following equipment is necessary to properly align this receiver:

1. AM signal generator with frequency coverage from 455 kc. to 1700 kc.
2. FM or CW signal generator covering the FM band from 87.25 mc. to 108.75 mc. and the 10.7 mc. frequency for FM IF alignment.
3. Vacuum Tube Voltmeter (VTVM).
4. Output meter—to match 4 ohms, 5 watts maximum.
5. Insulated alignment screwdriver.
6. Dummy antenna—0.1 mfd. capacitor, 300 ohm carbon resistor and inductive loop (fashioned from several turns of wire).

NOTE: **Oscilloscope equipment not required if aligned according to the following procedure:**
The accuracy of the AM RF and AM antenna slug adjustments may be determined by noting the trimmer adjustment at each end of the band when the oscillator is set for proper coverage. The proper setting of the AM or FM oscillator slugs is indicated by proper tracking of the receiver at the center of the respective band. The FM RF and FM antenna slugs must be adjusted to dimensions given in the permeability tuner illustration.

Reference Notes to Alignment Chart on Following Page.

Note 1—If 1620 kc. signal is received lower in frequency than the 1620 kc. dial calibration, turn BC oscillator shunt tracking adjustment (L-4) outward. Retrack at 535 kc. (Step 2). If higher than the 1620 kc. dial calibration, screw adjustment inward and retrack at 535 kc. Repeat until 535 kc. and 1620 kc. signals coincide with their respective dial calibrations.

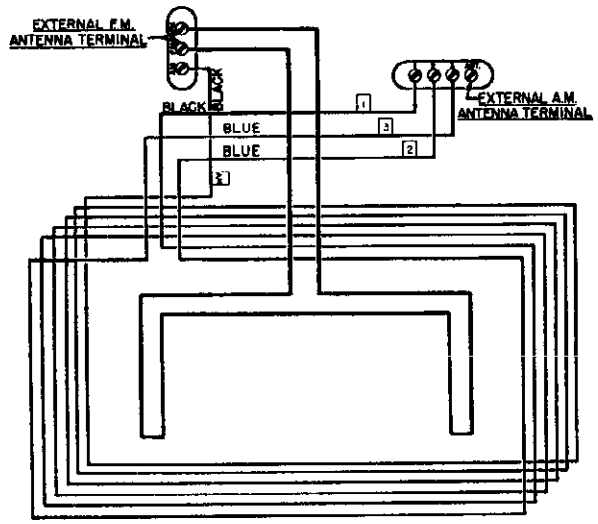
Note 2—Adjust input voltage to give approximately 5 volts AVC before final adjustment is made.

For STEPS 6 and 8A—Voltmeter "common" lead to chassis.

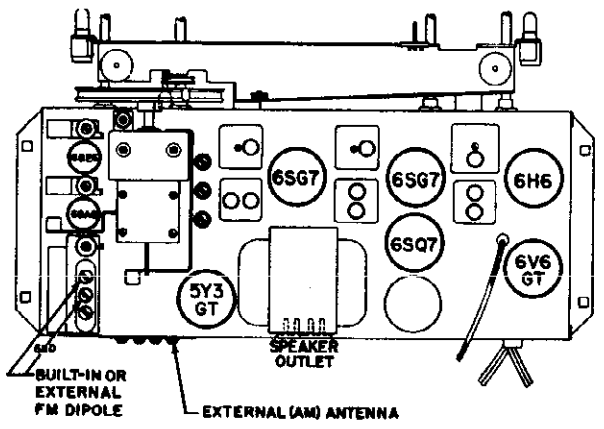
For STEP 7—Voltmeter "common" lead to point "B" on wiring diagram. The desired zero position is at the point where the meter indicates a polarity change from plus to minus or vice-versa.

Note 3—For all tests requiring an FM signal, the generator output (22.5 kc. deviation, 400 cycles) must be adjusted to give approximately one-half watt receiver output before final adjustments are made. Either STEP 8A or 8B may be used depending on equipment available.

Note 4—If 108.75 mc. signal is received lower in frequency than the 108.75 mc. dial calibration, turn FM oscillator shunt tracking adjustment (L-5) outward. Retrack at 87.25 mc. (STEP 9). If higher than the 108.75 mc. dial calibration, screw adjustment inward and retrack at 87.25 mc. Repeat until 87.25 mc. and 108.75 mc. signals coincide with their respective dial calibrations.



Loop Antenna Connections



Tube Layout

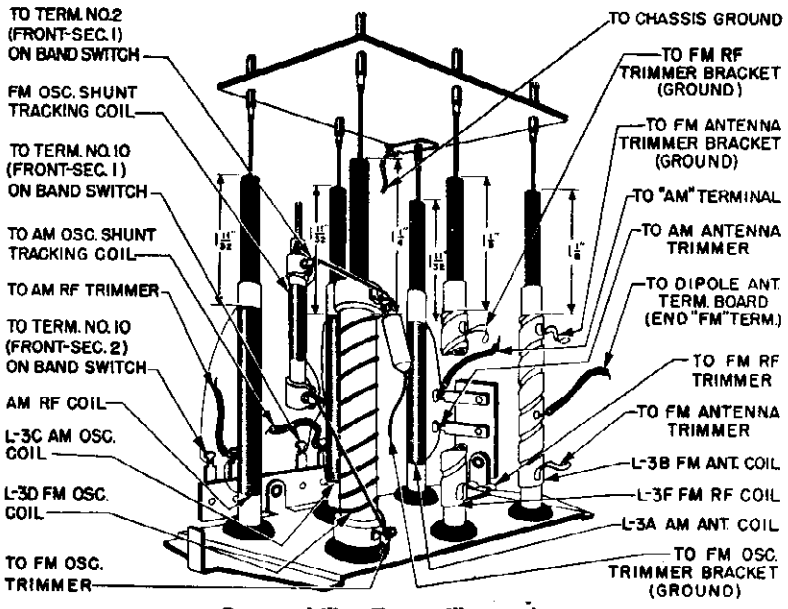
WESTERN AUTO SUPPLY CO. MODEL D1752

ALIGNMENT CHART

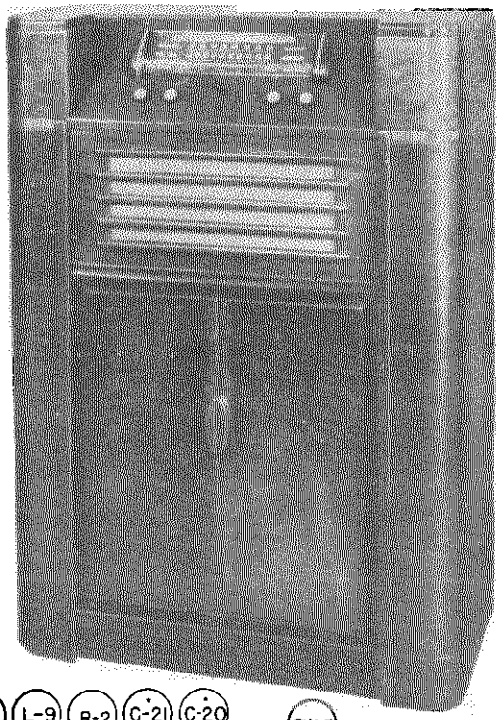
Step No.	Band Switch Position	Signal Generator	Connection at Receiver	Dummy Antenna	Dial Setting	Adjust Trimmer	Remarks
1	AM	455 kc.	6BE6 Converter Grid Pin No. 7	0.1 mfd.	HF end	E, F, H, J, L, M, AM IF Trimmers	Adjust for Maximum Output.
2	AM	535 kc.	6BA6 Grid Pin No. 1	0.1 mfd.	LF end	C-10 AM Osc. Trimmer	Adjust for Maximum Output.
3	AM	1620 kc.	6BA6 Grid Pin No. 1	0.1 mfd.	HF end	L-4 AM Osc. Shunt Tracking Adjustment. (Remove Flywheel from Shaft of Tuning Control.)	Adjust for Band Coverage. (See Note 1.)
4	AM	535 kc.	6BA6 Grid Pin No. 1	0.1 mfd.	LF end	C-14 AM RF Trimmer	Adjust for Maximum Output.
5	AM	1400 kc.	Thru Loop (With Receiver Loop Connected to Set.)	Inductive Loop	1400 kc.	C-1 AM Antenna Trimmer	Adjust for Maximum Output.
6	FM	10.7 mc. (CW Signal)	6SG7 Driver Grid Pin No. 4	0.1 mfd.	HF end	L-8 Ratio Detector Primary	Adjust for Maximum AVC between Point "A" on Wiring Diagram and Chassis using Electronic Voltmeter. See Notes 2 and 3.
7	FM	10.7 mc. (CW Signal)	6SG7 Driver Grid Pin No. 4	0.1 mfd.	HF end	K Ratio Detector Secondary	See Note 2. Adjust for Zero Position (Using Electronic Voltmeter) from No. 12 Position on Single Section Switch and Point "B" on Wiring Diagram.
8A	FM	10.7 mc. (CW Signal)	6BE6 Converter Grid Pin No. 7	0.1 mfd.	HF end	L-6, D, L-7, G 1st and 2nd FM IF	See Note 2. Adjust for Maximum AVC.
8B	FM	10.7 mc. (CW Signal)	6BE6 Converter Grid Pin No. 7	0.1 mfd.	HF end	L-6, D, L-7, G 1st and 2nd FM IF	See Note 3. Adjust for Maximum Output.
9	FM	87.25 mc. (FM Signal)	6BA6 Grid Pin No. 1	0.1 mfd.	LF end	C-12 FM Osc. Trimmer	Adjust for Maximum Output.
10	FM	108.75 mc. (FM Signal)	6BA6 Grid Pin No. 1	0.1 mfd.	HF end	L-5 FM Osc. Shunt Tracking Adjustment	Adjust for Band Coverage. (See Note 4.)
11	FM	87.25 mc. (FM Signal)	6BA6 Grid Pin No. 1	0.1 mfd.	LF end	C-15 FM RF Trimmer	Adjust for Maximum Output.
12	FM	87.25 mc. (FM Signal)	Thru 300 ohm Carbon Resistor to End FM Antenna Terminal and Center FM Antenna Terminal.	300 ohm Carbon Resistor	87.25 mc.	C-2 FM Antenna Trimmer	Adjust for Maximum Output.

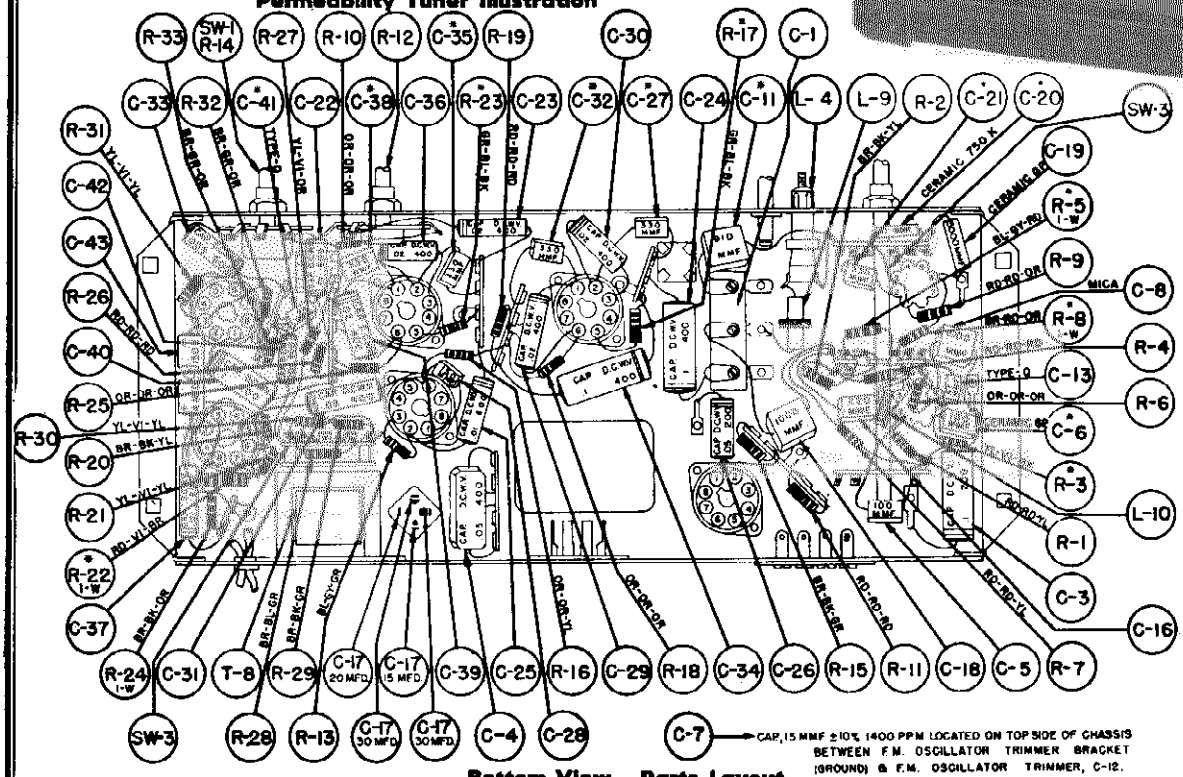
MODEL D1752

WESTERN AUTO SUPPLY CO.

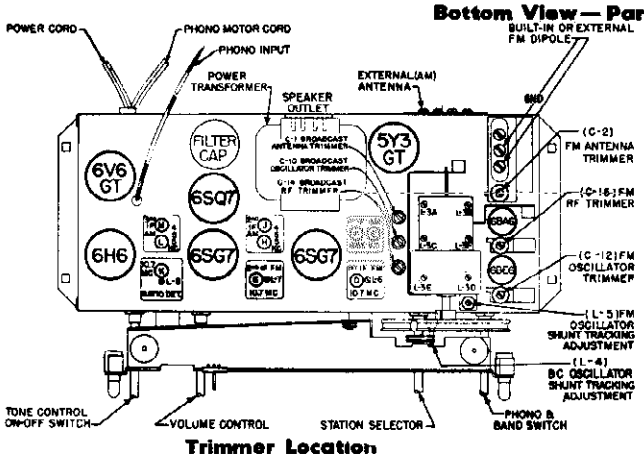


Permeability Tuner Illustration

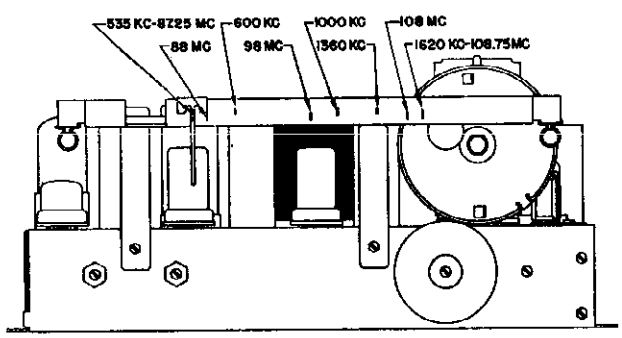




Bottom View—Parts Layout



Trimmer Location

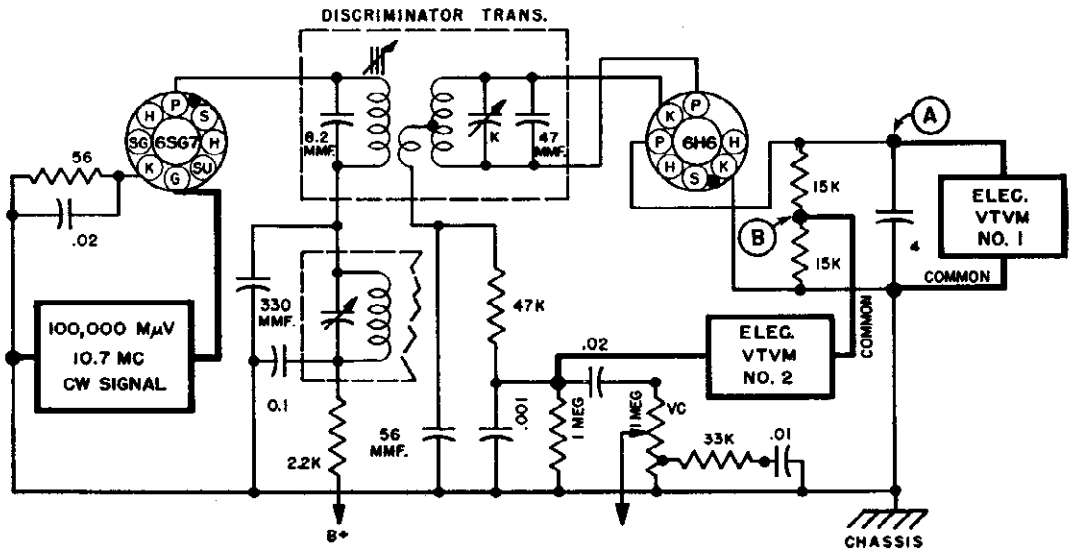


Calibration Points

RATIO DETECTOR

Proper operation of the ratio detector stage is extremely important for best performance on the FM band of this receiver.

The performance of the ratio detector stage may be checked by closely following the procedure and diagram given below.



Wiring Diagram—Ratio Detector

1. After setting up the signal generator and VTVM, turn the trimmer adjustment screw "K" until tight. Turn the core adjustment "L" to maximum counterclockwise position. These two adjustments are on the top of the Ratio Detector transformer. (See Trimmer Location diagram.)

2. Now turn adjustment "L" clockwise until VTVM in No. 1 position indicates maximum voltage. This maximum value should be from five to seven volts with input as indicated in above diagram. Then slowly turn adjustment "K" in a counterclockwise direction, observing VTVM in No. 2 position. It will approach a maximum value and then rapidly drop to zero. If adjustment "K" is turned beyond this point, VTVM in No. 2 position will indicate a polarity change. The proper adjustment of "K" is at the point where the VTVM indicates zero volts between the polarity change.

3. Shift the 10.7 mc. signal to 10.725 mc. (10.7 mc. +25 kc.). VTVM in No. 2 position should now indicate a plus .3 volts minimum.

4. Change the 10.725 mc. signal to 10.675 mc. (10.7 mc. —25 kc.). VTVM in No. 2 position should indicate a minus .3 volts minimum. STEPS 3 and 4 constitute a sensitivity check on the ratio detector transformer.

5. Place the polarity switch of VTVM in No. 2 position to "plus" position and observe VTVM as the frequency of the signal generator is increased above 10.7 mc. It should indicate an increasing positive voltage. Continue increasing the frequency until the meter indicates a peak and begins to decrease. Reduce the generator frequency slightly until the peak is obtained. Record the generator frequency.

6. Set the polarity switch of VTVM to "minus" position. Repeat STEP 5, reducing the generator frequency from 10.7 mc. instead of increasing. Record the generator frequency when VTVM in No. 2 position indicates a peak.

7. The difference between the generator frequencies noted in STEPS 5 and 6 is the "Static Band Width" of the Ratio Detector transformer. This should be approximately 220 kc.

MODEL D1752 WESTERN AUTO SUPPLY CO.

ELECTRICAL AND MECHANICAL DATA

Frequency Range.....(AM) 535 KC to 1620 KC
Intermediate (FM) 87.25 MC to 108.75 MC
Frequency.....(AM) 455 KC (FM) 10.7 MC
Power Supply.....105 to 125 volts AC, 60 cycles
Speaker .....8 inch, Electro-Dynamic
V.C. Impedance.....3.2 ohms at 400 cycles
Power Output (Undistorted).....3.5 watts
Power Output (Maximum) .....5 watts

TUBE COMPLEMENT

1	6BA6	RF Amplifier
1	6BE6	Oscillator-Converter
1	6SG7	1st IF Amplifier
1	6SG7	2nd IF Amplifier
1	6SQ7	AM Detector—AVC—1st Audio (AM-FM)
1	6H6	FM Detector
1	6V6GT	Power Output
1	5Y3GT	Rectifier

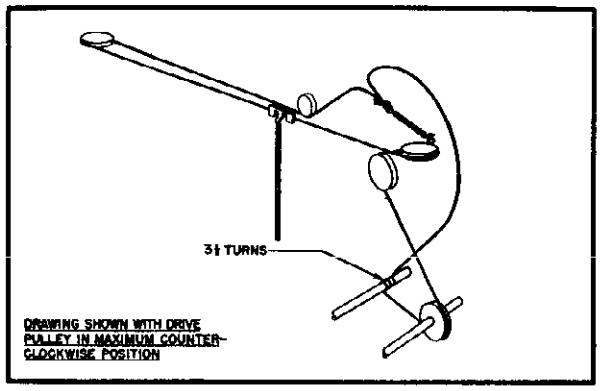
SOCKET VOLTAGES

TUBE	POSITION	1	2	3	4	5	6	7	8
6BA6	RF Amplifier	0	0	6.3 AC	0	250	100	.6	
6BE6	Oscillator-Converter	0	0	6.3 AC	0	250	90	0	
6SG7	1st IF Amplifier	0	0	.6	0	.6	125	6.3 AC	250
6SG7	2nd IF Amplifier	0	0	.6	0	.6	125	6.3 AC	250
6SQ7	AM Detector—AVC—1st Audio (AM-FM)	0	0	0	0	0	90	6.3 AC	0
6H6	FM Detector	0	6.3 AC	0	0	0	0	0	0
6V6GT	Power Output	NC	0	240	260	0	260	6.3 AC	14
5Y3GT	Rectifier	NC	325	NC	325 AC	NC	325	NC	325

NOTE: All DC voltages measured with a 1000 ohm-per-volt meter from B— to socket contact indicated. All voltages are positive DC unless otherwise marked. Volume control full on. Zero signal input. Tone control in clockwise position. Band switch in "AM" position. Line voltage 117 volts, 60 cycle AC.

CHASSIS REMOVAL – Remove the receiver power cord from the electrical outlet before starting to remove chassis.

1. Turn the tuning control so that the dial pointer is in the extreme left-hand position (low frequency end).
2. Unhook the dial cable from dial pointer and slide the pointer to center of cutout in the pointer track. The dial pointer may be removed, if necessary, by turning it clockwise and clearing it through the cutout.
3. Remove the loop and dipole antennae leads from their respective terminals.
4. Detach the phono-motor cord (plug and socket connection).
5. Remove the phono input leads at the terminal board on the chassis shelf and remove the speaker plug from receptacle at back of chassis.
6. Remove knobs and the four chassis mounting screws. The chassis can now be removed from the cabinet.

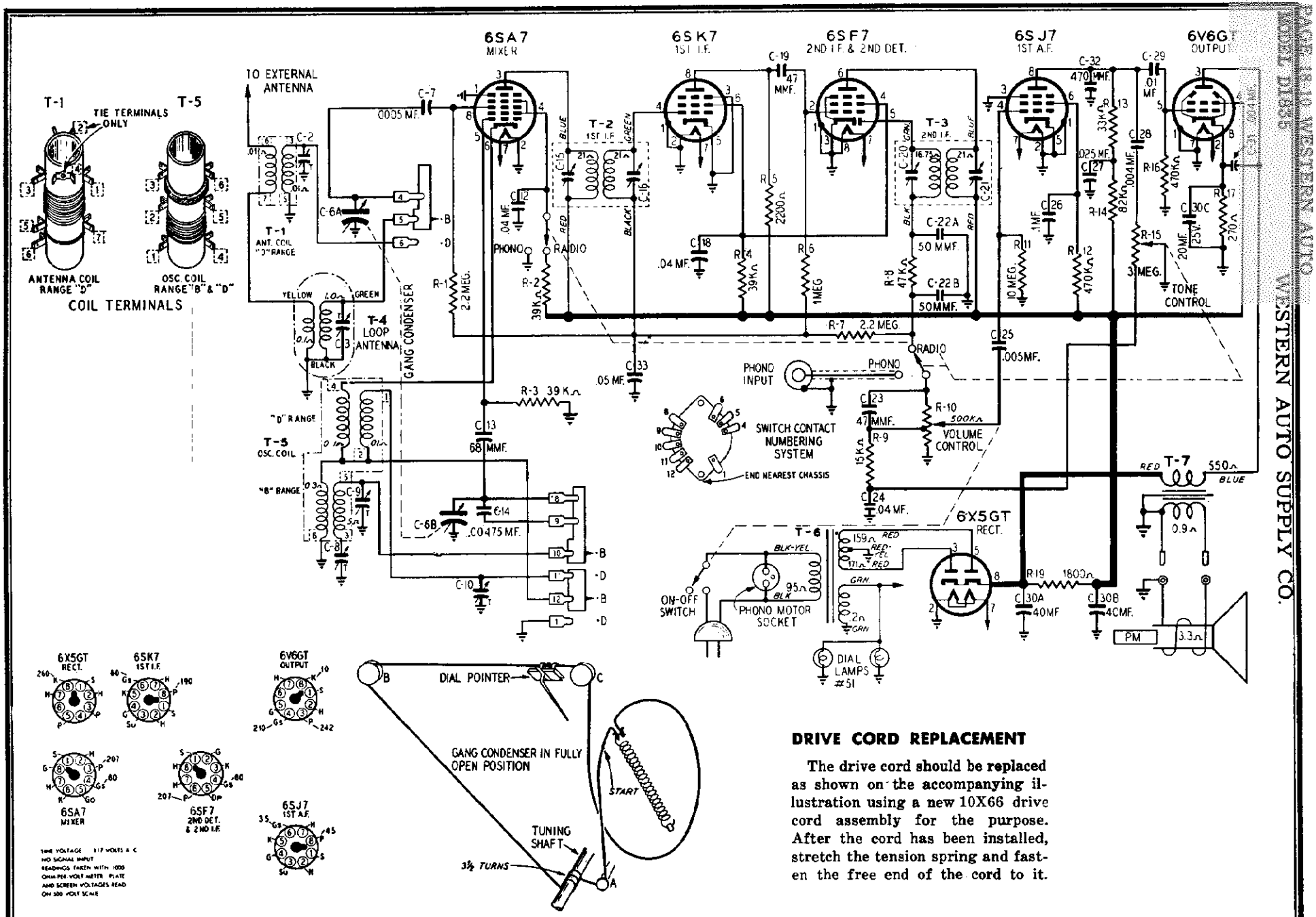


Dial Stringing

WESTERN AUTO SUPPLY CO. MODEL D1752

SERVICE PARTS LIST

Symbol	Part No.	Description
	A-51729	Bushing, Shaft
	A-54848	Bushing, Strain Relief
	E-57941-1	Cabinet
	A-58341	Cable, Dial
C-33	BD610502	Capacitor, .005 mfd., 600 v.
C-42, 44	BD610102	Capacitor, .001 mfd., 600 v.
C-22, 35, 37	BD610103	Capacitor, .01 mfd., 600 v.
C-23, 29, 30, 36, 39	BD410203	Capacitor, .02 mfd., 400 v.
C-26	BD210503	Capacitor, .05 mfd., 200 v.
C-31	BD410503	Capacitor, .05 mfd., 400 v.
C-4	BC31B503	Capacitor, .05 mfd., 400 v.
C-3	BD210104	Capacitor, .1 mfd., 200 v.
C-24, 34, 40	BD410104	Capacitor, .1 mfd., 400 v.
C-1	B-57942-1	Capacitor Assy., Trimmer (3 sec.)
C-19	B-58802-11	Capacitor, Ceramic, 5000 mmf., G.P.
C-5	B-58801-18	Capacitor, Ceramic, 100 mmf., G.P.
C-20	B-58800-27	Capacitor, Ceramic, 47 mmf. (—750 ppm)
C-7	B-58803-16	Capacitor, Ceramic, 15 mmf. (—1400 ppm)
C-43	B-55520-1	Cap., Electro., 4 mfd., 150 v.
C-17	A-57950	Cap., Electro., 30-30-75 mfd., 400 v.—20 mfd., 25 v.
C-8, 18	BM74A102	Capacitor, Mica, 1000 mmf.
C-11	BM64A911	Capacitor, Mica, 910 mmf.
C-21, 27, 32, 35, 38	BM64A331	Capacitor, Mica, 330 mmf.
C-16	BM74A221	Capacitor, Mica, 220 mmf.
C-28	BM74A151	Capacitor, Mica, 150 mmf.
C-6	BM74A101	Capacitor, Mica, 100 mmf.
C-41	B-58902-11	Capacitor, Mica Mold., Type Q, 56 mmf.
C-13	B-58900-6	Capacitor, Mica Mold., Type Q, 47 mmf.
C-2	B-57939-2	Cap., Trimmer, 10-25 mmf.
C-12, 15	B-57939-1	Cap., Trimmer, 1.5—14 mmf.
	B-55260-1	Clip, Capacitor Mtg.
	A-57925	Cup, Spring
L-10	A-57931	Coil Assy., R.F. Choke
L-9	B-57933	Coil Assy., Series Track. BC Osc.
L-4	B-57929	Coil Assy., Shunt Track. BC Osc.
R-14	B-58219-1	Control, Pot. and Sw., 1 megohm (T.C.)
R-12	B-58218-1	Control, Pot., 2 meg. (V.C.)
	B-57262-7	Cord, AC-Phono.
	B-58069-2	Cord, Power
	A-57999	Crank, Switch Lever
	C-59317-1	Crystal and Indicator, Dial
	A-59321	Flywheel, Tuning Shaft
	B-59315-1	Holder, Crystal, Right-Hand
	B-59315-2	Holder, Crystal, Left-Hand
	B-57998	Hub Crank
	C-57872-1	Knob, Magnifying Insert
	C-59338-1	Knob, Magnifying Insert (Indicator)
	A-6158	Lamp, Pilot No. 47
	B-51524-4	Lead, Shielded
	B-57922	Link, Band Switch
L-3A, 3B, 3C, 3D, 3E, 3F, and L-5	D-57920	Permeability Tuner Assy.
		Perm. Tuner Assembly (on exchange basis only)
	A-59316-1	Pointer, Dial
R-3	BR16B470	Resistor, 47 ohm, ½ w.
R-17, 23	BR16B560	Resistor, 56 ohm, ½ w.
R-22	BR16E271	Resistor, 270 ohm, 1 w.
R-4, 11, 19, 26	BR17B222	Resistor, 2,200 ohm, ½ w.
R-5	BR16E682	Resistor, 6,800 ohm, 1 w.
R-24	BR17E103	Resistor, 10,000 ohm, 1 w.
R-8	BR16E123	Resistor, 12,000 ohm, 1 w.
R-32, 33	BR17B153	Resistor, 15,000 ohm, ½ w.
R-9	BR17B223	Resistor, 22,000 ohm, ½ w.
R-6, 10, 18, 25	BR17B333	Resistor, 33,000 ohm, ½ w.
R-27	BR17B473	Resistor, 47,000 ohm, ½ w.
R-2, 20	BR17B104	Resistor, 100,000 ohm, ½ w.
R-1, 7, 34, 35	BR17B224	Resistor, 220,000 ohm, ½ w.
R-16	BR17B334	Resistor, 330,000 ohm, ½ w.
R-21, 30, 31	BR17B474	Resistor, 470,000 ohm, ½ w.
R-15, 28 29	BR17B105	Resistor, 1 megohm, ½ w.
R-13	BR17B685	Resistor, 6.8 megohm, ½ w.
	A-51801	Rivet, Pronged
	B-55280-1	Shaft, Drive
	B-51469-3	Socket, Dial Light
	A-57996	Socket, Miniature
	A-54726	Socket, Octal
	A-51403	Socket, Speaker
	B-55180-3	Spacer, Metal
SP-1	C-59310	Speaker, 8-inch Electro-Dyn.
	A-51787	Spring, Cable
	A-50147	Spring, Conical
	A-59333	Strip, Crystal Holder (Trim)
T-3	B-57954-1	Transformer Assembly, 1st IF AM
T-5	B-57958-1	Transformer Assembly, 2nd IF AM
T-7	B-57963-1	Transformer Assembly, 3rd IF AM
T-2	B-57972-1	Transformer Assembly, 1st IF FM
T-4	B-57976-1	Transformer Assembly, 2nd IF FM
T-6	B-57994-1	Transformer Assembly, Ratio Det.
T-8	B-57997-1	Transformer, Output
T-1	C-57934	Transformer, Power



DRIVE CORD REPLACEMENT

The drive cord should be replaced as shown on the accompanying illustration using a new 10X66 drive cord assembly for the purpose. After the cord has been installed, stretch the tension spring and fasten the free end of the cord to it.

ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.

Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.

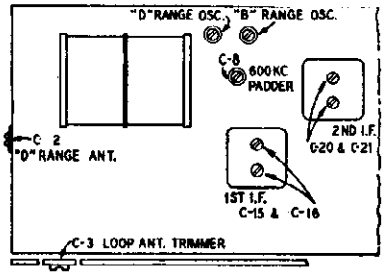
Allow Chassis and Signal Generator to "Heat Up" for several minutes.

The following equipment is required for aligning: An All Wave Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.

Output Indicating Meter—Non-Metallic Screwdriver.

Dummy Antennas—.1 mf., 50 mmf., and 400 ohms.

	SIGNAL GENERATOR FREQUENCY SETTING	SIGNAL GENERATOR CONNECTION AT RADIO	DUMMY ANTENNA	BAND SWITCH SETTING	CONDENSER SETTING	ADJUST TRIMMERS TO MAXIMUM
I.F.	455 KC	Grid of 6SA7 Pin 8	.1 mf.	B Range	Turn Rotor to Full Open	1st I.F. (C15) & (C16) 2nd I.F. (C20) & (C21)
RANGE B	1620 KC	Antenna Lead	50 mmf.	B Range	Turn Rotor to Full Open	Oscillator Range B (C9)
	1400 KC	Antenna Lead	50 mmf.	B Range	Tune Rotor to Max. Output	Ant. Range B (C3)
	600 KC	Antenna Lead	50 mmf.	B Range	Tune Rotor to Max. Output	600 KC (C8) See Note B
	Repeat above steps at 1620 and 600 KC until readjusting the oscillator Range B Trimmer (C9) causes no further improvement in output.					
RANGE D	18.3 MC	Antenna Lead	400 Ohm	D Range	Turn Rotor to Full Open	Oscillator Range D (C10)
	16 MC	Antenna Lead	400 Ohm	D Range	Tune Rotor to Max. Output	Ant. Range D (C2) Rock Rotor—See Note B
LOOP RANGE B	Reassemble chassis in cabinet. 1400 KC	Antenna Lead	50 mmf.	B Range	Tune Rotor to Max. Output See Note A	Ant. Range B (C3)



NOTE A—Set pointer at the 1400 KC mark on the dial scale. Attach pointer to drive cord.

NOTE B—Turn rotor back and forth and adjust the trimmer until peak of greatest intensity is obtained.

SPECIFICATIONS

Power Consumption .....45 Watts (At 117 volts AC)

Power Output .....4 Watts Maximum 2.3 Watt 10% Harmonics

Selectivity .....40KC Broad at 1000 times Signal

Intermediate Frequency .....455 KC

Speaker .....12" PM Dynamic

Tuning Frequency Range

B Range .....540 to 1600 KC

D Range .....5.75 to18.3 MC

Sensitivity (For .05 watt output—External Antenna).

B Range .....9 Microvolts Average

D Range .....20 Microvolts Average

REMOVAL OF CHASSIS FROM CABINET

Before removing the chassis from the cabinet it will be necessary to detach the dial pointer from the dial string. To do this, spread the tabs on the pointer and pull the dial string off the pointer.

The dial lamp socket assemblies may be disengaged from the cabinet mounting by squeezing together and pulling away from the cabinet mounting, the spring bracket to which the dial lamp socket is mounted. Take care not to bend or damage the large drive pulley on the gang condenser while doing this.

When replacing the chassis in the cabinet it will be necessary to tune in a station of a known frequency and move the dial pointer until that frequency is indicated on the dial and then attach the pointer to the dial string. Take care not to scuff or cut the dial string or bend the pointer during this operation.

MISCELLANEOUS

12A486	12" P.M. Speaker	
3A303	Tube Socket—Octal (8 prong) Moulded	
3A304	Phono Motor Socket	
3A305	Phono Socket—Single Pin Tip	
10A467	Knob (Tuning)	
10A468	Knob (Off-On Volume)	
10A634	Knob (SW-BC)	
10A529	Knob (Tone—R.P.)	
2A372	Band Change Switch	
13X328	Line Cord and Plug Assembly	
	No. 856 Console Cabinet	

TRANSFORMERS AND COILS

T-1	9A1917	"D" Range Antenna Coil Assembly	
T-2	9A1814	1st I-F Coil Assembly	
T-3	9A1815	2nd I-F Coil Assembly	
T-4	26A474	"B" Range Loop Antenna	
T-5	9A1918	Oscillator Coil Assembly	
T-6	53X282	Power Transformer	
T-7	51X134	Output Transformer	

CAPACITORS

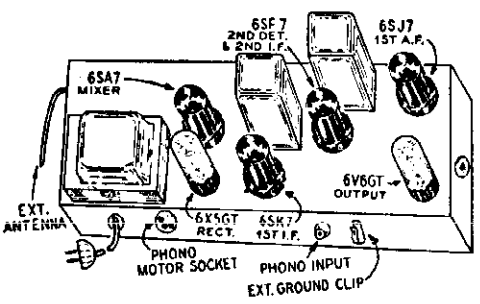
C-2	17A164	5-50 mmf			Trimmer
C-3	17A235	2-24 mmf			Trimmer
C-6A, C-6B	14A184	Gang Condenser with			Drive Pulley
C-7	B66501	.0005 mf		200 V	Tubular
C-8	17A155	350-430 mmf			Trimmer
C-9, C-10	17A109	2.5-35 mmf			Dual Trimmer
C-12, C-18	D66403	.04 mf		400 V	Tubular
C-13	47X466	68 mmf			Moulded
C-14	46X289	.00475 mf		180 V	Tubular
C-15, C-16	Part of T-2 (1st I-F Coil Assembly)				
C-19, C-23	47X463	.47 mmf			Moulded
C-20, C-21	Part of T-3 (2nd I-F Coil Assembly)				
C-22A, C-22B	47X112	50-50 mmf			Dual Mica
C-24	D54403	.04 mf		400 V	Tubular
C-25	D66502	.005 mf		400 V	Tubular
C-26	D67104	.10 mf		400 V	Tubular
C-27	D64253	.025 mf		400 V	Tubular
C-28	D66402	.004 mf		400 V	Tubular
C-29	D66103	.01 mf		400 V	Tubular
C-30A, C-30B, C-30C	45X346	40 mf 40 mf 20 mf		450 V 450 V 25 V	3 Section Electrolytic
C-31	H66402	.004		800 V	Tubular
C-32	47X467	470 mmf			Moulded
C-33	B66503	.05 mf		200 V	Tubular

RESISTORS

B85225	R-1, R-7	2.2 megohms	0.5 W	Carbon
C84393	R-2, R-4	39 K ohms	1.0 W	Carbon
B84393	R-3	39 K ohms	0.5 W	Carbon
B84222	R-5	2200 ohms	0.5 W	Carbon
B85105	R-6	1 megohm	0.5 W	Carbon
B85473	R-8	47 K ohms	0.5 W	Carbon
B84153	R-9	15 K ohms	0.5 W	Carbon
36X358	R-10	500 K ohms	Volume Control and Line Switch	
B85106	R-11	10 megohms	0.5 W	Carbon
B85474	R-12, R-16	470 K ohms	0.5 W	Carbon
B84333	R-13	33 K ohms	0.5 W	Carbon
B84823	R-14	82 K ohms	0.5 W	Carbon
40X276	R-15	3.0 megohms	Tone Control & Radio Phono Switch	
C84271	R-17	270 ohms	1.0 W	Carbon
D84182	R-19	1800 ohms	2.0 W	Carbon

DIAL AND DRIVE ASSEMBLY

6X21	Rubber Grommet	Mtg. Gang Condenser
20X329	Cond. Cushion Stud	Mtg. Gang Condenser
25X1489	Pulley Bracket (Right)	
25X1490	Pulley Bracket (Left)	
26X485	Drive Shaft	
19X192	"C" Washer	
25X1491	Pointer Bracket	
15X229	Pointer	
10X66	Drive Cord Assembly	
28X113	Drive Cord Tension Spring	
30X517	Dial Clamp	
4X915	Escutcheon, Dial (Right)	
4X916	Escutcheon, Dial (Left)	
4X931	Escutcheon Insert	
58X694	Dial Gloss	
7A100	Pilot Light Socket Assembly	
7A32	Pilot Light Bulb No. 51	



SUPPLEMENTARY SERVICE DATA

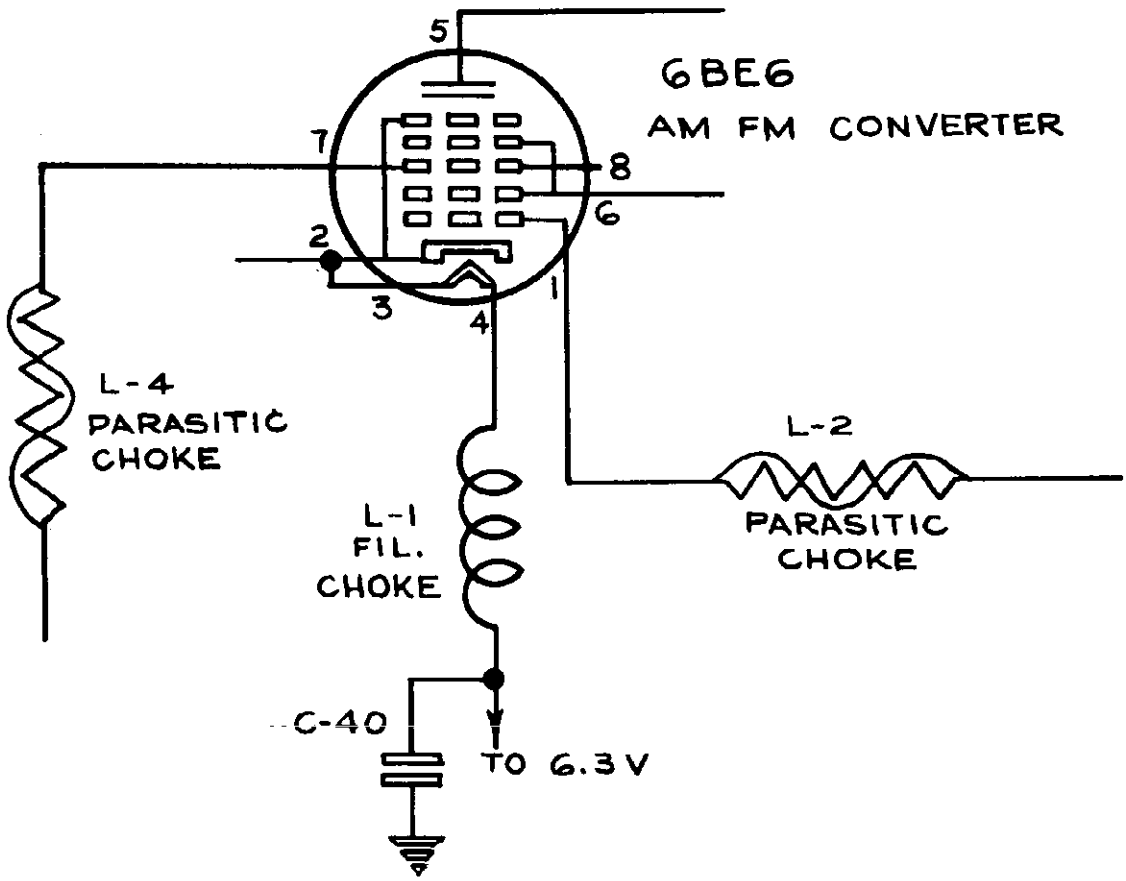
TRUETONE MODEL D1836A

A choke has been added to the circuit to eliminate parasitic oscillation on the FM Band.

PARTS LIST ADDITION

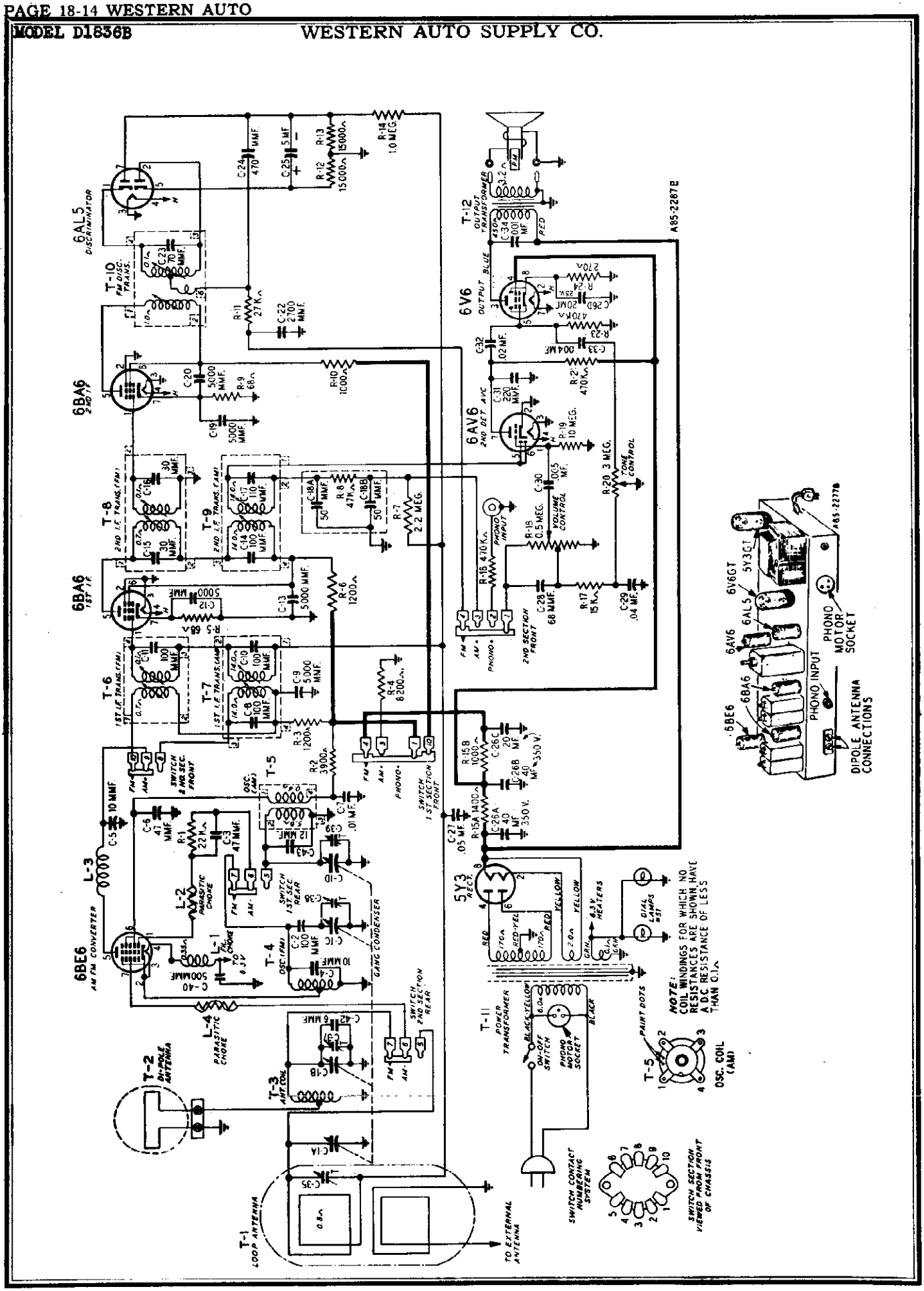
Ref.#	Part #	Description
L-4	9A1967	Parasitic Choke

The circuit connection of L-4 is shown in the partial schematic below.

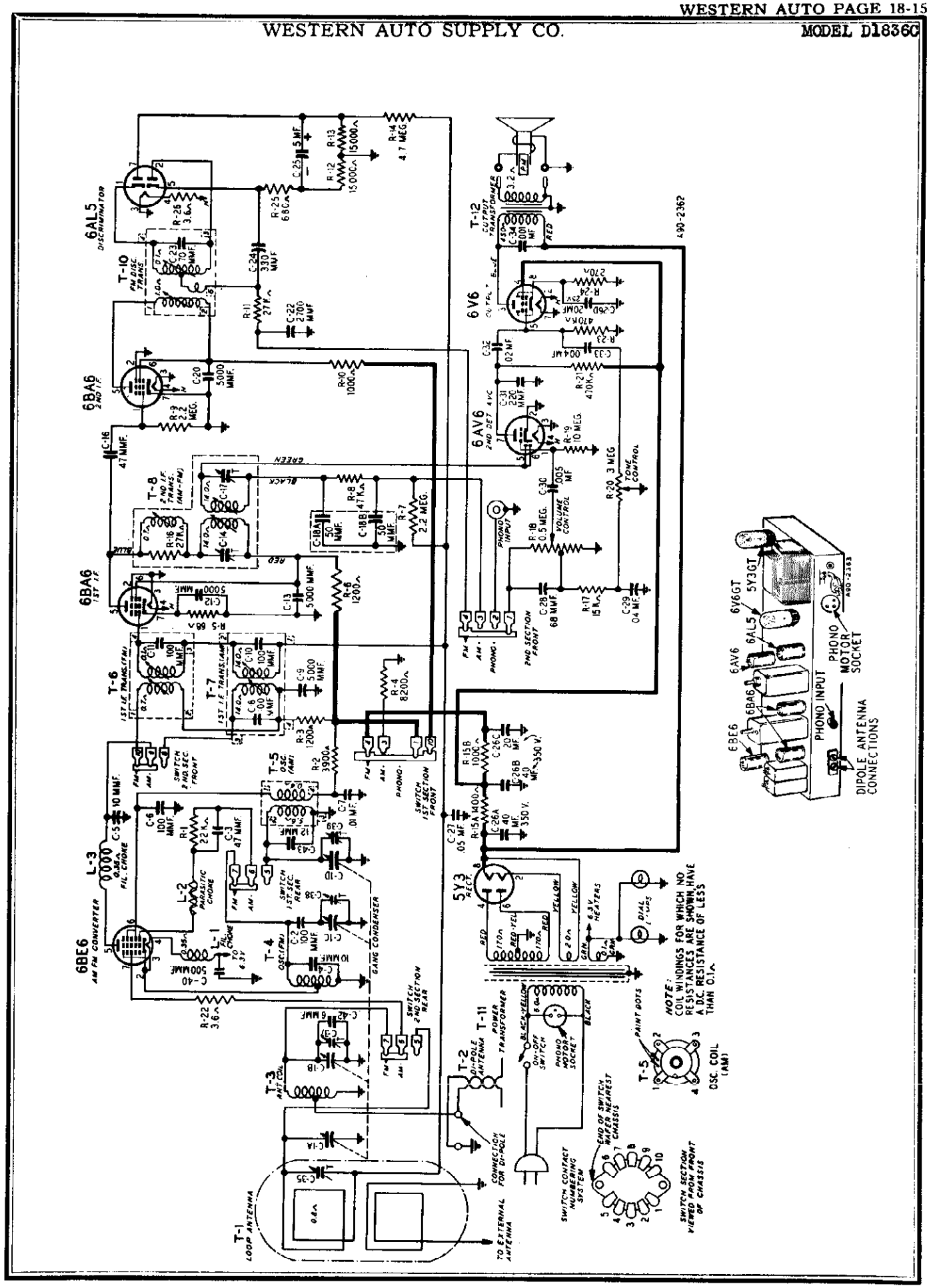


MODEL D1836B

WESTERN AUTO SUPPLY CO.



WESTERN AUTO SUPPLY CO. MODEL D1836C



ALIGNMENT PROCEDURES

AM STAGES

Volume Control Maximum all Adjustments.

Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.

Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.

The following is required for aligning:

An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.

Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas — .1 mf, and 50 mmf.

SIGNAL GENERATOR					
FREQUENCY SETTING	CONNECTION AT RADIO	GROUND CONNECTION	DUMMY ANTENNA	GANG CONDENSER SETTING	ADJUST TUNING SLUGS (I-F ONLY) TRIMMERS (OSC. & ANT.)
455 KC	Control Grid 1st 6BA6 Pin No. 1	Chassis Base	.1 mf	Turn Rotor to Full Open	2nd I.F. Pri. & Sec.
455 KC	Control Grid 6BE6 Pin No. 7 1st Det.	Same as above	.1 mf	Turn Rotor to Full Open	1st I.F. Pri. & Sec.
1620 KC	Control Grid 6BE6 Pin No. 7	Same as above	.1 mf	Turn Rotor to Full Open	Oscillator C-39
1400 KC	External Antenna Lead	Same as above	50 mmf	Turn Dial to 1400 KC. See Note A	Antenna C-35

NOTE A—Set pointer at the 1400 KC mark on the dial scale. Attach pointer to drive cord.

FM STAGES

Allow chassis and signal generator to warm up for several minutes. The following equipment is required for aligning:

An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.

Non-metallic screwdriver.

Dummy Antennas and I-F Loading Resistor—.01 mf, 300 ohms and 100 K ohms.

Zero center scale DC vacuum tube voltmeter having a range of approximately 3 volts.

(If a zero center scale meter is not available, a standard scale vacuum tube voltmeter may be used by reversing the meter connections for negative readings.)

	SIGNAL GENERATOR					
	FREQUENCY SETTING	CONNECTION AT RADIO	DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUSTMENT FOR MAX. METER DEFLECTION
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 & Chassis	.01 mf	FM	Rotor to Full Open	Disc. Pri. Note A
	10.7 MC	Same as above	.01 mf	FM	Same as above	Disc. Sec. Note B
	10.7 MC	Same as above	.01 mf	FM	Same as above	Disc. Pri. Note A
	10.7 MC	Same as above	.01 mf	FM	Same as above	Disc. Sec. Note B
I-F	10.7 MC	6BA6 1st IF Pin 1 & Chassis	.01 mf	FM	Same as above	2nd I-F Pri. 2nd I-F Sec. Note C
	10.7 MC	Unsolder lead from Pin 7 to band switch. Insert 100K ohm resistor between Pin 7 & Ground and feed signal into Pin 7 of 6BE6	.01 mf	FM	Same as above	1st I-F Pri. Note C
	10.7 MC	Same as above	.01 mf	FM	Same as above	1st I-F Sec. Note C
	RECHECK I-F ADJUSTMENTS IN ORDER GIVEN					
Ant. & Osc.	108.5 Note D	Disconnect dipole and connect generator to dipole terminals with resistor in series.	300 ohms	FM	Rotor to Full Open	Osc. C-38
	104.5	Same as above	300 ohms	FM	Tune rotor for max. AVC voltage	Ant. C-37
	RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN					

FM ALIGNMENT NOTES

NOTE A—The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the A.V.C. line at the 27 K. ohm resistor (R-11) and its junction with terminal strip. A signal of .1 volt must be fed into the receiver for this adjustment.
Note output voltage on the zero center DC vacuum tube voltmeter.

NOTE B—Disconnect zero center DC vacuum tube voltmeter from A.V.C. and connect it to the audio takeoff point at the 1 megohm resistor (R-14) and its junction with the terminal strip. Adjust for zero voltage indication.

NOTE C—Connect zero center DC vacuum tube voltmeter as in Note A. Adjust input to give same output on the zero center DC vacuum tube voltmeter as in Note A.

NOTE D—Remove the 100 K ohm load resistor and solder the lead from pin 7 of 6BE6 tube to the band switch before attempting to check the antenna and oscillator adjustments.

ALIGNMENT PROCEDURES

AM STAGES

Volume Control Maximum all Adjustments.

Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.

Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.

The following is required for aligning:

An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.

Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas — .1 mf, and 50 mmf.

SIGNAL GENERATOR					
FREQUENCY SETTING	CONNECTION AT RADIO	GROUND CONNECTION	DUMMY ANTENNA	GANG CONDENSER SETTING	ADJUST TUNING SLUGS AND TRIMMERS
455 KC	Control Grid 1st 6BA6 Pin No. 1	Chassis Base	.1 mf	Turn Rotor to Full Open	2nd I.F. C-14 & C-17
455 KC	Control Grid 6BE6 Pin No. 7 1st Det.	Same as above	.1 mf	Turn Rotor to Full Open	1st I.F. Pri. & Sec.
1620 KC	Control Grid 6BE6 Pin No. 7	Same as above	.1 mf	Turn Rotor to Full Open	Oscillator C-39
1400 KC	External Antenna Lead	Same as above	50 mmf	Turn Dial to 1400 KC. See Note A	Antenna C-35

NOTE A—Set pointer at the 1400 KC mark on the dial scale. Attach pointer to drive cord.

FM STAGES

Allow chassis and signal generator to warm up for several minutes. The following equipment is required for aligning:

An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.

Non-metallic screwdriver.

Dummy Antennas and I-F Loading Resistor—.01 mf, 300 ohms and 100 K ohms.

Zero center scale DC voccum tube voltmeter having a range of approximately 3 volts.

(If a zero center scale meter is not available, a standard scale vacuum tube voltmeter may be used by reversing the meter connections for negative readings.)

	SIGNAL GENERATOR					
	FREQUENCY SETTING	CONNECTION AT RADIO	DUMMY ANTENNA	BAND SWITCH SETTING	CONDENSER SETTING	ADJUSTMENT FOR MAX. METER DEFLECTION
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 & Chassis	.01 mf	FM	Rotor to Full Open	Disc. Pri. Note A
	10.7 MC	Same as above	.01 mf	FM	Same as above	Disd. Sec. Note B
	10.7 MC	Same as above	.01 mf	FM	Same as above	Disc. Pri. Note A
	10.7 MC	Same as above	.01 mf	FM	Same as above	Disc. Sec. Note B
I-F	10.7 MC Note E	6BA6 1st IF Pin 1 & Chassis	.01 mf	FM	Same as above	2nd I-F Note C
	10.7 MC	Unsolder lead from Pin 7 to band switch. Insert 100K ohm resistor between Pin 7 & Ground and feed signal into Pin 7 of 6BE6	.01 mf	FM	Same as above	1st I-F Pri. Note C
	10.7 MC	Same as above	.01 mf	FM	Same as above	1st I-F Sec. Note C
	RECHECK I-F ADJUSTMENTS IN ORDER GIVEN					
Ant. & Osc.	108.5 Note D	Disconnect dipole antenna and connect generator to dipole terminals with resistor in series.	300 ohms	FM	Rotor to Full Open	Osc. C-38
	104.5	Same as above	300 ohms	FM	Tune rotor for max. AVC voltage	Ant. C-37
	RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN					

FM ALIGNMENT NOTES

NOTE A—The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line. A signal of .1 volt must be fed into the receiver for this adjustment.
Note output voltage on the zero center DC vacuum tube voltmeter.

NOTE B—Disconnect zero center DC vacuum tube voltmeter from AVC and connect it to the audio takeoff point at the 27 K ohm resistor (R-11) and its junction with the terminal strip. Adjust for zero voltage indication.

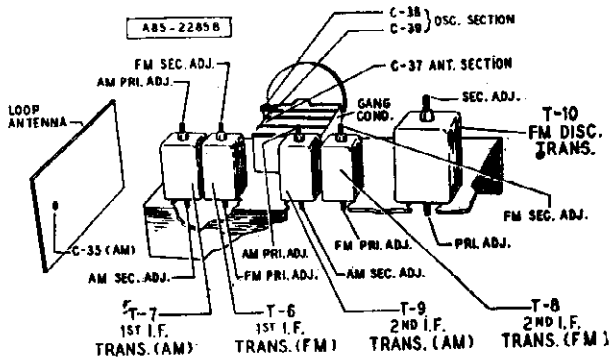
NOTE C—Connect zero center DC vacuum tube voltmeter as in Note A. Adjust input to give same output on the zero center DC vacuum tube voltmeter as in Note A.

NOTE D—Remove the 100 K ohm load resistor and solder the lead from pin 7 of 6BE6 tube to the band switch before attempting to check the antenna and oscillator adjustments.

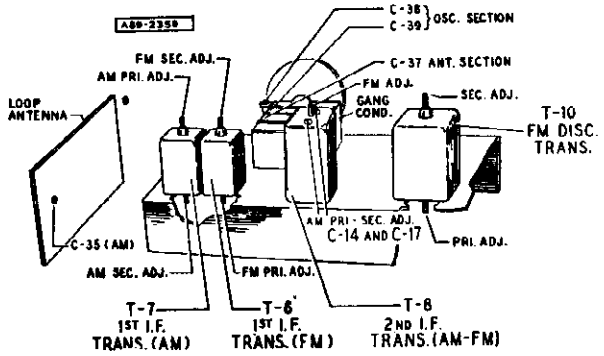
NOTE E—2nd I-F Trimmers (AM) must be aligned before attempting to adjust 2nd I-F (FM) tuning slug.

MODELS D1836A, D1836B, D1836C

WESTERN AUTO SUPPLY CO.



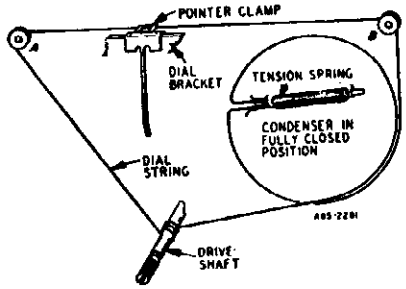
MODEL D1836A
MODEL D1836B



MODEL D1836C

DRIVE CORD REPLACEMENT

Replacement of the drive cord may be accomplished as shown in the illustration. For this purpose use the new drive cord assembly listed in the Replacement Parts List. Turn the gang condenser until the plates are fully meshed. Then install the string as shown, winding three turns clockwise around the tuning shaft with the turns progressing away from the chassis. After the cord is installed, rotate the tuning shaft several times in order to take up any slack in the cord.



REMOVAL OF CHASSIS FROM CABINET

Before removing the chassis from the cabinet it will be necessary to detach the dial pointer from the dial string. To do this, spread the tabs on the pointer and pull the dial string off the pointer.

The dial lamp socket assembly may be disengaged from the cabinet mounting by squeezing together and pulling away from the cabinet mounting, the spring bracket to which the dial lamp socket is mounted. Take care not to bend or damage the large drive pulley on the gang condenser while doing this.

When replacing the chassis in the cabinet it will be necessary to tune in a station of a known frequency and move the dial pointer until that frequency is indicated on the dial and then attach the pointer to the dial string. Take care not to scuff or cut the dial string or bend the pointer during this operation.

ELECTRICAL SPECIFICATIONS

Power Consumption—
117 volts AC 60 watts

Power Output—
4.5 watts maximum
2.5 watts 10% distortion

Speaker—12" PM dynamic

Frequency Ranges—
Broadcast 540-1600 KC
Frequency Modulation 88-108 MC

Intermediate Frequency—
AM 455 KC — FM 10.7 MC

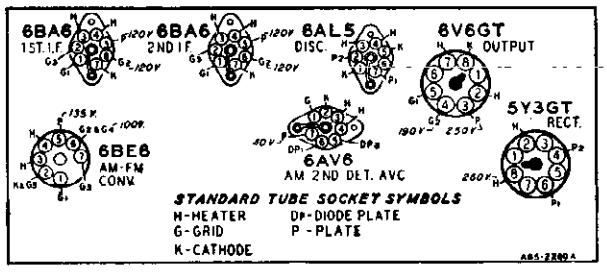
Selectivity — AM — 50 KC broad at 1000 times signal, measured at 1000 KC

I.F. FM—200 KC broad at 2 times down

I.F. FM—700 KC broad at 200 times down

AM Sensitivity—(For .5 watt output with external antenna)
20 microvolts average

FM Sensitivity—(For .5 watt output)
200 microvolts average



Use only No. 51 dial lamps.

TUBE SOCKET VOLTAGES

Socket voltages are shown on the Bottom Socket diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube volt-meter. Conditions of measurement are:

Line voltage .....117 Volts AC
Signal Input .....None
A Variation of ±10% is usually permissible.

WESTERN AUTO SUPPLY CO.

MODEL D1836A

NOTICE: There is a model number label on the chassis. This label identifies the radio as to chassis, dial and issue letter. When ordering parts or writing, give ALL information on this label.

MISCELLANEOUS

12A486	12" PM Speaker
2A373	Band Change Switch
3A303	Molded Octal Tube Socket
3A305	Phono Input Jack
3A304	Phono Motor Jack
3A426	Miniature Tube Socket
3A427	Miniature Tube Socket (For AM-FM Converter Tube)
10A679	Knob (Tuning)
10A680	Knob (Off-On Volume)
10A681	Knob (Tone)
10A682	Knob (AM-FM Phono)
13X546	Line Cord and Plug
30X547	Line Cord Clamp
76X1	Resistor-Capacitor Combination

CAPACITORS

C-1A, C-1B, C-1C, C-1D	14A201	Gang Condenser Assembly		
C-2	47X511	100 mmf		Ceramic
C-3	47X517	47 mmf		Ceramic
C-4	47X513	5 mmf		Ceramic
C-5	47X512	10 mmf		Ceramic
C-6	47X463	47 mmf		Ceramic
C-7	D66103	.01 mf	400 V	Tubular
C-8, C-10		Part of T-7 1st I-F Trans. (AM)		
C-11		Part of T-6 1st I-F Trans. (FM)		
C-9, C-12, C-13, C-19, C-20	47X507	5000 mmf		Silvered Ceramic
C-14, C-17		Part of T-9 2nd I-F Trans. (AM)		
C-15, C-16		Part of T-8 2nd I-F Trans (FM)		
C-18A, C-18B		Part of 76X1 Resistor-Capacitor Comb.		
C-21, C-23		Part of T-10 Discriminator Coil Assem.		
C-22	47X492	2700 mmf		Molded
C-24	47X510	470 mmf		Silvered Mica
C-25	45X361	5 mf	100 V	Dry Electrolytic
C-26A	45X359	40 mf	350 V	Dry Electrolytic
C-26B		40 mf	350 V	
C-26C		20 mf	350 V	
C-26D		20 mf	25 V	
C-27	B66503	.05 mf	200 V	Tubular
C-28	47X471	68 mmf		Molded
C-29	B66403	.04 mf	200 V	Tubular
C-30	D66502	.005 mf	400 V	Tubular
C-31	47X468	220 mmf		Ceramic
C-32	D66203	.02 mf	400 V	Tubular
C-33	B66402	.004 mf	200 V	Tubular
C-34	H66102	.001 mf	800 V	Tubular
C-35	17A235	2-24 mmf		Trimmer
C-36, C-37, C-39		Part of C-1 Gang Condenser		
C-38	17A247	3-12 mmf		Trimmer
C-40	47X508	500 mmf		Ceramic

RESISTORS

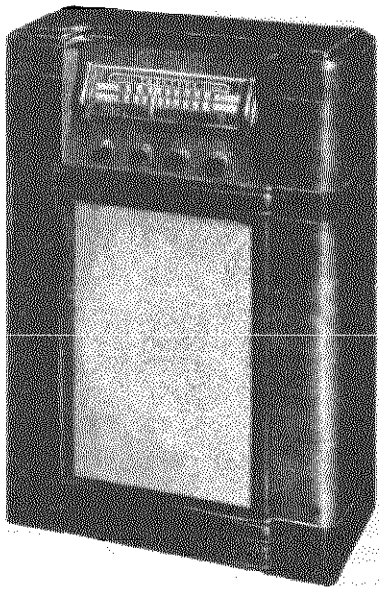
		Ohms	Watts	
R-1	B84223	22 K	.5	Carbon
R-2	B83392	3900	.5	Carbon
R-3, R-6	B84122	1200	.5	Carbon
R-4	D84822	8200	2.0	Carbon
R-5, R-9	B83680	68	.5	Carbon
R-7	B85225	2.2 meg	.5	Carbon
R-8		47 K		Part of 76X1 Resistor-Capacitor Combination
R-10	B84102	1000	.5	Carbon
R-11	B84273	27 K	.5	Carbon
R-12, R-13	B84682	6800	.5	Carbon
R-14	B85105	1 meg	.5	Carbon
R-15A	43X224	1400	6.0	Wire
R-15B		1000	4.0	Wound
R-16, R-21, R-23	B85474	470 K	.5	Carbon
R-17	B84153	15 K	.5	Carbon
R-18	36X371	.5 meg		Volume Control & Switch
R-19	B85106	10 meg	.5	Carbon
R-20	40X284	3 meg		Tone Control
R-24	B84271	270	.5	Carbon

TRANSFORMERS AND COILS

T-1	26A478	"B" Range Loop Antenna Assembly
T-2	9A1962	Di-Pole Antenna Assembly
T-3	9A1956	Antenna Coil Assembly
T-4	9A1938	Oscillator Coil (FM)
T-5	9A1929	Oscillator Coil (AM)
T-6	9A1932	1st I.F. Transformer (FM)
T-7	9A1934	1st I.F. Transformer (AM)
T-8	9A1933	2nd I.F. Transformer (FM)
T-9	9A1935	2nd I.F. Transformer (AM)
T-10	9A1936	Discriminator Coil Assembly
T-11	53X290	Power Transformer
T-12	51X134	Output Transformer
L-1, L-3	9A1882	Choke Assembly
L-2	9A1940	Parasitic Choke

DIAL AND DRIVE ASSEMBLY

15X229	Pointer
6X21	Rubber Grommet } Mtg. Gang Condenser
20X260	Condenser Cushion Stud } Mtg. Gang Condenser
58X697	Dial
28X113	Drive Cord Tension Spring
26X507	Drive Shaft
19X192	"C" Washer (For drive shaft)
10X66	Drive Cord Assembly
7A215	Pilot Light Socket Assembly
7A32	No. 51 Pilot Light
25X1491	Pointer Bracket
4X915	Escutcheon (Right)
4X916	Escutcheon (Left)
30X517	Dial Clamp
25X1571	Idler Bracket
4X931	Escutcheon Inserts



MODELS D1836A, D1836B, D1836C

REPLACEMENT PARTS LIST

NOTICE: There is a Model Number label on the chassis. This label identifies the radio as to chassis, dial and issue letter. When ordering parts or writing, give ALL information appearing on this label.

MISCELLANEOUS

12A486	12" PM Speaker
2A373	Band Change Switch
3A303	Molded Octal Tube Socket
3A304	Phono Motor Jack
3A305	Phono Input Jack
3A426	Miniature Tube Socket
3A427	Miniature Tube Socket (For AM-FM Converter Tube)
10A691	Knob (Tuning)
10A692	Knob (Off-On Volume)
10A693	Knob (Tone)
10A694	Knob (AM-FM Phono)
13X546	Line Cord and Plug
30X547	Line Cord Clamp
76X1	Resistor-Capacitor Combination

CAPACITORS

C-1A, C-1B, C-1C, C-1D	14A204	Gang Condenser Assembly		
C-2	47X511	100 mmf		Ceramic
C-3	47X517	47 mmf		Ceramic
C-4	47X523	10 mmf		Ceramic
C-5	47X512	10 mmf		Ceramic
C-6	47X476	100 mmf		Molded Mica
C-7	D66103	.01 mf	400 V	Tubular
C-8, C-10		Part of T-7 1st I-F Trans. (AM)		
C-11		Part of T-6 1st I-F Trans. (FM)		
C-9, C-12, C-13, C-19, C-20	47X507	5000 mmf		Silvered Ceramic
C-14, C-17		Part of T-9 2nd I-F Trans. (AM)		
C-15, C-16		Part of T-8 2nd I-F Trans (FM)		
C-18A, C-18B		Part of 76X1 Resistor-Capacitor Comb.		
C-23		Part of T-10 Discriminator Coil Assem.		
C-22	47X492	2700 mmf		Molded
C-24	47X510	470 mmf		Silvered Mica
C-25	45X361	5 mf	100 V	Dry Electrolytic
C-26A	45X359	40 mf	350 V	Dry Electrolytic
C-26B		40 mf	350 V	
C-26C		20 mf	350 V	
C-26D		20 mf	25 V	
C-27	B66503	.05 mf	200 V	Tubular
C-28	47X471	68 mmf		Molded
C-29	B66403	.04 mf	200 V	Tubular
C-30	D66502	.005 mf	400 V	Tubular
C-31	47X468	220 mmf		Ceramic
C-32	D66203	.02 mf	400 V	Tubular
C-33	B66402	.004 mf	200 V	Tubular
C-34	H66102	.001 mf	800 V	Tubular
C-35	17A235	2-24 mmf		Trimmer
C-37, C-39		Part of C-1 Gang Condenser		
C-38	26A489	1-8 mmf		Trimmer Assembly
C-40	47X508	500 mmf		Ceramic
C-42	47X521	6 mmf		Ceramic
C-43	47X522	12 mmf		Ceramic

RESISTORS

		Ohms	Watts	
R-1	B84223	22 K	.5	Carbon
R-2	B83392	3900	.5	Carbon
R-3, R-6	B84122	1200	.5	Carbon
R-4	D84822	8200	2.0	Carbon
R-5, R-9	B83680	68	.5	Carbon
R-7	B85225	2.2 meg	.5	Carbon
R-8		47 K		Part of 76X1 Resistor-Capacitor Combination
R-10	B84102	1000	.5	Carbon
R-11	B84273	27 K	.5	Carbon
R-12, R-13, R-17	B84153	15 K	.5	Carbon
R-14	B85105	1 meg	.5	Carbon
R-15A	43X224	1400	6.0	Wire
R-15B		1000	4.0	Wound
R-15, R-21, R-23	B85474	470 K	.5	Carbon
R-18	36X371	.5 meg		Volume Control & Switch
R-19	B85106	10 meg	.5	Carbon
R-20	40X284	3 meg		Tone Control
R-24	B84271	270	.5	Carbon

TRANSFORMERS AND COILS

T-1	26A478	"B" Range Loop Antenna Assembly
T-2	9A1962	Dipole Antenna Assembly
T-3	9A1956	Antenna Coil Assembly
T-4	9A1938	Oscillator Coil (FM)
T-5	9A1929	Oscillator Coil (AM)
T-6	9A1932	1st I.F. Transformer (FM)
T-7	9A1934	1st I.F. Transformer (AM)
T-8	9A1969	2nd I.F. Transformer (FM)
T-9	9A1935	2nd I.F. Transformer (AM)
T-10	9A1970	Discriminator Coil Assembly
T-11	53X290	Power Transformer
T-12	51X134	Output Transformer
L-1, L-3	9A1882	Choke Assembly
L-2	9A1940	Parasitic Choke
L-4	9A1967	Parasitic Choke

DIAL AND DRIVE ASSEMBLY

15X229	Pointer
6X21	Rubber Grommet
20X260	Condenser Cushion Stud } Mtg. Gang Condenser
58X697	Dial
28X113	Drive Cord Tension Spring
26X507	Drive Shaft
19X192	"C" Washer (For drive shaft)
10X66	Drive Cord Assembly
7A215	Pilot Light Socket Assembly
7A32	No. 51 Pilot Light
25X1491	Pointer Bracket
4X915	Escutcheon (Right)
4X916	Escutcheon (Left)
30X517	Dial Clamp
25X1571	Idler Bracket
4X931	Escutcheon Inserts

REPLACEMENT PARTS LIST

NOTICE: There is a Model Number label on the chassis. This label identifies the radio as to chassis, dial and issue letter. When ordering parts or writing, give ALL information appearing on this label.

MISCELLANEOUS

12A486	12" PM Speaker
2A373	Band Change Switch
3A303	Molded Octal Tube Socket
3A304	Phono Motor Jack
3A305	Phono Input Jack
3A426	Miniature Tube Socket
3A427	Miniature Tube Socket (For AM-FM Converter Tube)
10A691	Knob (Tuning)
10A692	Knob (Off-On Volume)
10A693	Knob (Tone)
10A694	Knob (AM-FM Phono)
13X546	Line Cord and Plug
30X547	Line Cord Clamp

CAPACITORS

C-1A, C-1B, C-1C, C-1D	14A204	Gang Condenser Assembly		
C-2	47X511	100 mmf		Ceramic
C-3	47X517	47 mmf		Ceramic
C-4	47X523	10 mmf		Ceramic
C-5	47X512	10 mmf		Ceramic
C-6	47X476	100 mmf		Molded
C-7	D66103	.01 mf	400 V	Tubular
C-8, C-10		Part of T-7 (1st I-F Trans. AM)		
C-11		Part of T-6 (1st I-F Trans. FM)		
C-9, C-12, C-13 C20	47X507	5000 mmf		Silvered Ceramic
C-14, C-17		Part of T-8 (2nd I-F Trans AM-FM)		
C-16	47X463	47 mmf		Ceramic
C-18A, C-18B	47X112	50-50 mmf		Dual Mica
C-22	47X492	2700 mmf		Molded
C-23		Part of T-10 (Discriminator Coil Assem.)		
C-24	47X529	330 mmf		Silvered Mica
C-25	45X361	5 mf	100 V	Dry Electrolytic
C-26A	45X359	40 mf	350 V	Dry Electrolytic
C-26B		40 mf	350 V	
C-26C		20 mf	350 V	
C-26D		20 mf	25 V	
C-27	B66503	.05 mf	200 V	Tubular
C-28	47X471	68 mmf		Molded
C-29	B66403	.04 mf	200 V	Tubular
C-30	D66502	.005 mf	400 V	Tubular
C-31	47X468	220 mmf		Ceramic
C-32	D66203	.02 mf	400 V	Tubular
C-33	B66402	.004 mf	200 V	Tubular
C-34	H66102	.001 mf	800 V	Tubular
C-35	17A235	2-24 mmf		Trimmer
C-37, C-39		Part of C-1 Gang Condenser		
C-38	26A489	1-8 mmf		Trimmer Assembly
C-40	47X508	500 mmf		Ceramic
C-42	47X521	6 mmf		Ceramic
C-43	47X522	12 mmf		Ceramic

RESISTORS

		Ohms	Watts	
R-1	B84223	22 K	.5	Carbon
R-2	B83392	3900	.5	Carbon
R-3, R-6	B84122	1200	.5	Carbon
R-4	D84822	8200	2.0	Carbon
R-5	B83680	68	.5	Carbon
R-7, R-9	B85225	2.2 meg	.5	Carbon
R-8	B85473	47 K	.5	Carbon
R-10	B84102	1000	.5	Carbon
R-11	B84273	27 K	.5	Carbon
R-12, R-13, R-17	B84153	15 K	.5	Carbon
R-14	B85105	1 meg	.5	Carbon
R-15A	43X224	1400	6.0	Wire
R-15B		1000	4.0	Wound
R-16		Part of T-8 (2nd I-F Trans. AM-FM)		
R-18	36X371	.5 meg		Volume Control & Switch
R-19	B85106	10 meg	.5	Carbon
R-20	40X284	3 meg		Tone Control
R-21, R-23	B85474	470 K	.5	Carbon
R-22, R-26	43X233	3.6	.5	Wire Wound
R-24	B84271	270	.5	Carbon
R-25	B84681	680	.5	Carbon

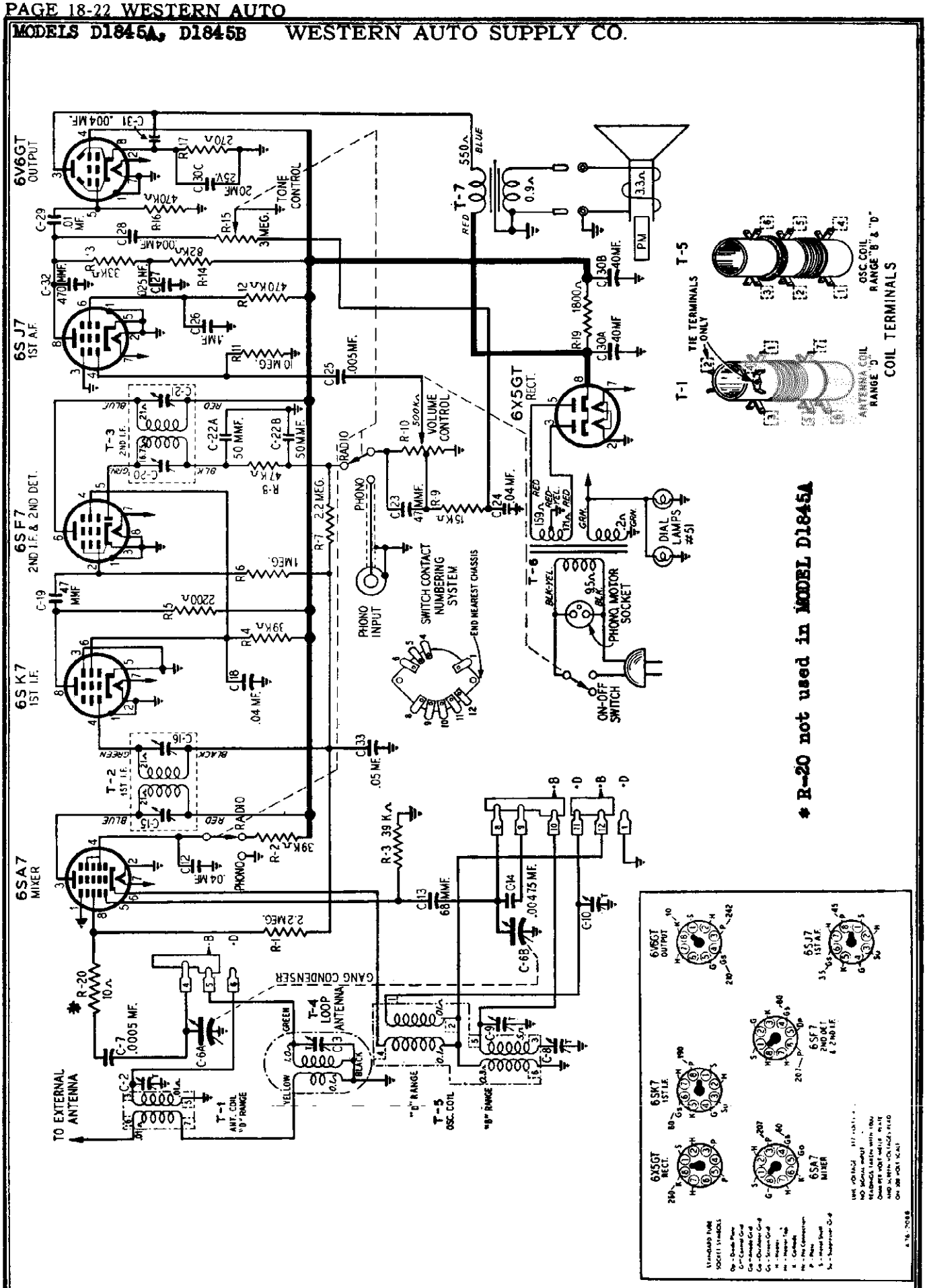
TRANSFORMERS AND COILS

T-1	26A478	"B" Range Loop Antenna Assembly
T-2	9A1962	Dipole Antenna Assembly
T-3	9A1956	Antenna Coil Assembly
T-4	9A1938	Oscillator Coil (FM)
T-5	9A1929	Oscillator Coil (AM)
T-6	9A1932	1st I.F. Transformer (FM)
T-7	9A1934	1st I.F. Transformer (AM)
T-8	9A1973	2nd I.F. Transformer (AM-FM)
T-10	9A1970	Discriminator Coil Assembly
T-11	53X290	Power Transformer
T-12	51X134	Output Transformer
L-1, L-3	9A1882	Choke Assembly
L-2	9A1940	Parasitic Choke

DIAL AND DRIVE ASSEMBLY

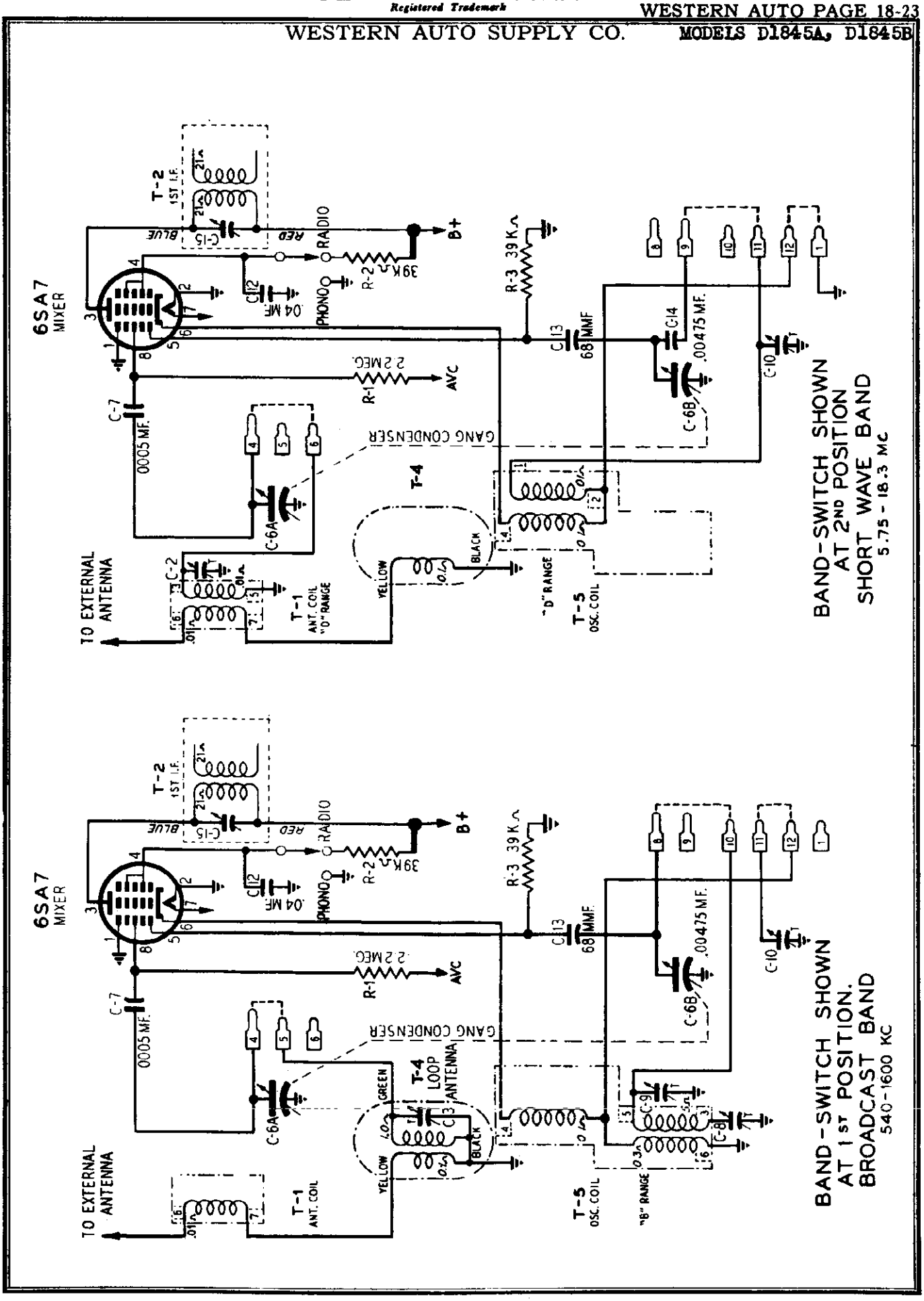
15X229	Pointer	
6X21	Rubber Grommet	Mtg. Gang Condenser
20X260	Condenser Cushion Stud	Mtg. Gang Condenser
58X697	Dial	
28X113	Drive Cord Tension Spring	
26X507	Drive Shaft	
19X192	"C" Washer (For drive shaft)	
10X66	Drive Cord Assembly	
7A215	Pilot Light Socket Assembly	
7A32	No. 51 Pilot Light	
25X1491	Pointer Bracket	
4X915	Escutcheon (Right)	
4X916	Escutcheon (Left)	
30X517	Dial Clamp	
25X1571	Idler Bracket	
4X931	Escutcheon Inserts	

MODELS D1845A, D1845B WESTERN AUTO SUPPLY CO.



RECORD CHANGER: Oak Model 6666, RCD.CH. 15-1

WESTERN AUTO SUPPLY CO. MODELS D1845A, D1845B



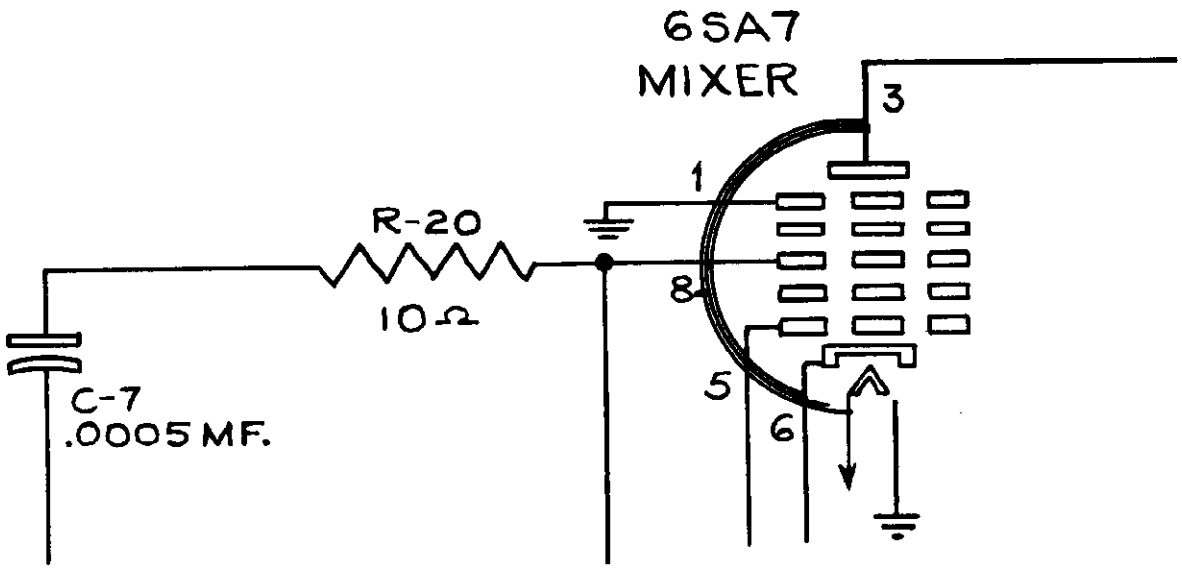
SUPPLEMENTARY SERVICE DATA

TRUETONE MODEL D1845B

A resistor has been added to the circuit to eliminate parasitics in the 6SA7 tube.

Ref. No.	Part No.		Description
R-20	B85100	10 ohm	carbon

The addition is shown in the partial schematic below:



ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.

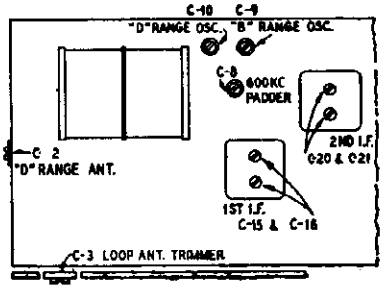
Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.

Allow Chassis and Signal Generator to "Heat Up" for several minutes.

The following equipment is required for aligning: An All Wave Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.

Output Indicating Meter—Non-Metallic Screwdriver. Dummy Antennas—.1 mf., 50 mmf., and 400 ohms.

	SIGNAL GENERATOR FREQUENCY SETTING	CONNECTION AT RADIO	DUMMY ANTENNA	BAND SWITCH SETTING	CONDENSER SETTING	ADJUST TRIMMERS TO MAXIMUM
I.F.	455 KC	Grid of 6SA7 Pin 8	.1 mf.	B Range	Turn Rotor to Full Open	1st I.F. (C15) & (C16) 2nd I.F. (C20) & (C21)
RANGE B	1620 KC	Antenna Lead	50 mmf.	B Range	Turn Rotor to Full Open	Oscillator Range B (C9)
	1400 KC	Antenna Lead	50 mmf.	B Range	Tune Rotor to Max. Output	Ant. Range B (C3)
	600 KC	Antenna Lead	50 mmf.	B Range	Tune Rotor to Max. Output	600 KC (C8) See Note B
	Repeat above steps at 1620 and 600 KC until readjusting the oscillator Range B Trimmer (C9) causes no further improvement in output.					
RANGE D	18.3 MC	Antenna Lead	400 Ohm	D Range	Turn Rotor to Full Open	Oscillator Range D (C10)
	16 MC	Antenna Lead	400 Ohm	D Range	Tune Rotor to Max. Output	Ant. Range D (C2) Rock Rotor—See Note B
LOOP RANGE B	Reassemble chassis in cabinet. 1400 KC	Antenna Lead	50 mmf.	B Range	Tune Rotor to Max. Output	Ant. Range B (C3) See Note A



NOTE A—Set pointer at the 1400 KC mark on the dial scale. Attach pointer to drive cord.

NOTE B—Turn rotor back and forth and adjust the trimmer until peak of greatest intensity is obtained.

MISCELLANEOUS

12A477	8" P.M. Speaker	T-1
3A303	Tube Socket—Octal (8 prong) Moulded	T-2
3A304	Phono Motor Socket	T-3
3A305	Phono Socket—Single Pin Tip	T-4
10A689	Knob (Tuning)	T-5
10A690	Knob (Off-On Volume)	T-6
10A687	Knob (SW-BC)	T-7
10A688	Knob (Tone—R.P.)	
2A372	Band Change Switch	
13X328	Line Cord and Plug Assembly No. 750 Phono-Console Cabinet	

TRANSFORMERS AND COILS

9A1917	"D" Range Antenna Coil Assembly
9A1814	1st I-F Coil Assembly
9A1815	2nd I-F Coil Assembly
26A442	"B" Range Loop Antenna
9A1918	Oscillator Coil Assembly
53X282	Power Transformer
51X134	Output Transformer

CAPACITORS

C-2	17A164	5-50 mmf		Trimmer
C-3	17A235	2-24 mmf		Trimmer
C-6A, C-6B	14A184	Gang Condenser with Drive Pulley		
C-7	B66501	.0005 mf	200 V	Tubular
C-8	17A155	350-430 mmf		Trimmer
C-9, C-10	17A109	2.5-35 mmf		Dual Trimmer
C-12, C-18	D66403	.04 mf	400 V	Tubular
C-13	47X466	68 mmf		Moulded
C-14	46X289	.00475 mf	180 V	Tubular
C-15, C-16	Part of T-2 (1st I-F Coil Assembly)			
C-19, C-23	47X463	47 mmf		Moulded
C-20, C-21	Part of T-3 (2nd I-F Coil Assembly)			
C-22A, C-22B	47X112	50-50 mmf		Dual Mica
C-24	D64403	.04 mf	400 V	Tubular
C-25	D66502	.005 mf	400 V	Tubular
C-26	D67104	.10 mf	400 V	Tubular
C-27	D64253	.325 mf	400 V	Tubular
C-28	D66402	.004 mf	400 V	Tubular
C-29	D66103	.01 mf	400 V	Tubular
C-30A		40 mf	450 V	
C-30B	45X346	40 mf	450 V	3 Section Electrolytic
C-30C		20 mf	25 V	
C-31	H66402	.004	800 V	Tubular
C-32	47X467	470 mmf		Moulded
C-33	B66503	.05 mf	200 V	Tubular

DIAL AND DRIVE ASSEMBLY

6X21	Rubber Grommet } Mtg. Gang Condenser
20X329	Cond. Cushion Stud }
25X1489	Pulley Bracket (Right)
25X1490	Pulley Bracket (Left)
26X485	Drive Shaft
19X192	"C" Washer
25X1491	Pointer Bracket
15X229	Pointer
10X66	Drive Cord Assembly
28X113	Drive Cord Tension Spring
30X517	Dial Clamp
4X915	Escutcheon, Dial (Right)
4X916	Escutcheon, Dial (Left)
4X931	Escutcheon Insert
58X694	Dial Glass
7A200	Pilot Light Socket Assembly
7A32	Pilot Light Bulb No. 51

RESISTORS

B85225	R-1, R-7	2.2 megohms	0.5 W	Carbon
C84393	R-2, R-4	39 K ohms	1.0 W	Carbon
B84393	R-3	39 K ohms	0.5 W	Carbon
B84222	R-5	2200 ohms	0.5 W	Carbon
B85105	R-6	1 megohm	0.5 W	Carbon
B85473	R-8	47 K ohms	0.5 W	Carbon
B84153	R-9	15 K ohms	0.5 W	Carbon
36X358	R-10	500 K ohms	Volume Control and Line Switch	
B85106	R-11	10 megohms	0.5 W	Carbon
B85474	R-12, R-16	470 K ohms	0.5 W	Carbon
B84333	R-13	33 K ohms	0.5 W	Carbon
B84823	R-14	82 K ohms	0.5 W	Carbon
40X276	R-15	3.0 megohms	Tone Control & Radio Phono Switch	
C84271	R-17	270 ohms	1.0 W	Carbon
D84182	R-19	1800 ohms	2.0 W	Carbon
B85100	R-20	10 ohms	0.5 W	Carbon

REMOVAL OF CHASSIS FROM CABINET

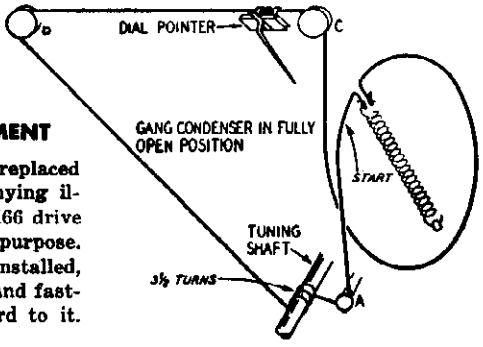
Before removing the chassis from the cabinet it will be necessary to detach the dial pointer from the dial string. To do this, spread the tabs on the pointer and pull the dial string off the pointer.

The dial lamp socket assemblies may be disengaged from the cabinet mounting by squeezing together and pulling away from the cabinet mounting, the spring bracket to which the dial lamp socket is mounted. Take care not to bend or damage the large drive pulley on the gang condenser while doing this.

When replacing the chassis in the cabinet it will be necessary to tune in a station of a known frequency and move the dial pointer until that frequency is indicated on the dial and then attach the pointer to the dial string. Take care not to scuff or cut the dial string or bend the pointer during this operation.

DRIVE CORD REPLACEMENT

The drive cord should be replaced as shown on the accompanying illustration using a new 10X66 drive cord assembly for the purpose. After the cord has been installed, stretch the tension spring and fasten the free end of the cord to it.



SPECIFICATIONS

Power Consumption (at 117 Volts AC) ..... 45 Watts (normal) 70 Watts (phono operating)

Power Output ..... 4 Watts, Maximum 2.3 Watts, 10% Harmonics

Tuning Frequency Range

B Range ..... 540-1600 Kilocycles

D Range ..... 5.75-18.3 Megacycles

Speaker ..... 8" PM Dynamic

Intermediate Frequency ..... 455 KC

Selectivity ..... 40 KC Broad at 1000 Times Signal

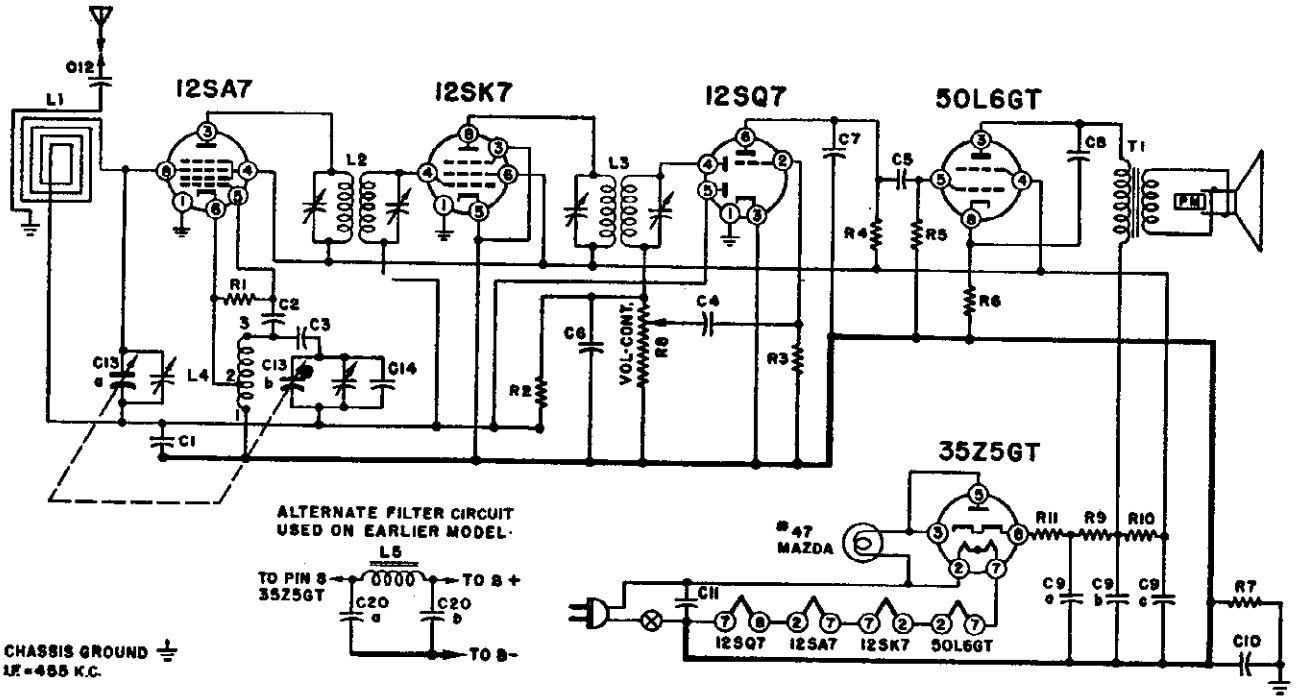
Sensitivity (For 0.5 Watt Output, with External Antenna)

B Range ..... 9 Microvolts Average

D Range ..... 20 Microvolts Average

MODEL D2622

WESTERN AUTO SUPPLY CO.



CONDENSERS

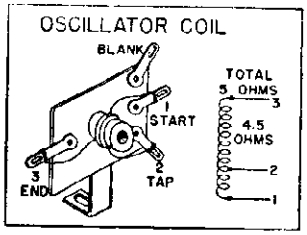
Symbol	Capacity		Type
C1	.1	mfd.	200 V.
C2	.00005	mfd.	Mica
C3	.02	mfd.	400 V.
C4	.01	mfd.	400 V.
C5	.01	mfd.	400 V.
C6	.00025	mfd.	Mica
C7	.0005	mfd.	Mica
C8	.02	mfd.	400 V.
C9a	30.	mfd.	(Elect.) 150 V.
C9b	30.	mfd.	(Elect.) 150 V.
C9c	20.	mfd.	(Elect.) 150 V.
C10	.2	mfd.	400 V.
C11	.05	mfd.	400 V.
C12	.005	mfd.	600 V.
C13a	.00042	mfd.	(max.) Var.
C13b	.00018	mfd.	(max.) Var.
C14	.00002	mfd.	Mica
C20a	30.	mfd.	(Elect.) 150 V.
C20b	50.	mfd.	(Elect.) 150 V.

RESISTORS

Symbol	Resistance	Type
R1	22,000 ohms	C½W
R2	470,000 ohms	C½W
R3	10 megohms	C½W
R4	220,000 ohms	C½W
R5	470,000 ohms	C½W
R6	150 ohms	C½W
R7	150,000 ohms	C½W
R8	1 megohm	Volume Control
R9	150 ohms	C1W
R10	1,000 ohms	C1W
R11	33 ohms	C1W

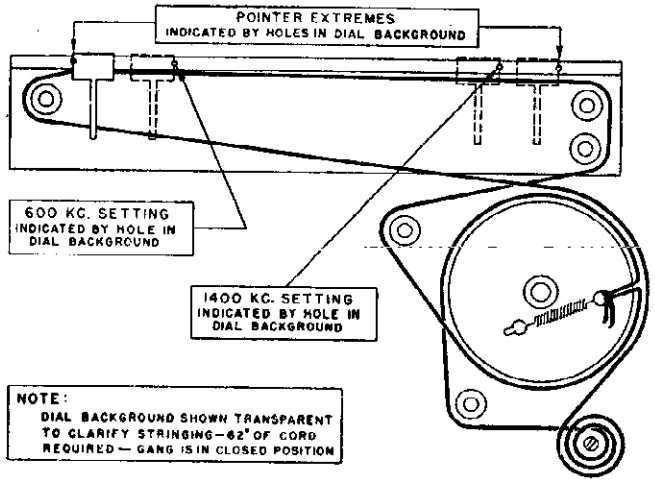
COILS

Symbol	Description
L1	Loop
L2	1st I. F. Trans.
L3	2nd I. F. Trans.
L4	Osc. Coil
L5	Choke, Filter



TUNING RANGE
540KC.- 1630KC.

DIAL STRINGING AND POINTER SETTINGS:—

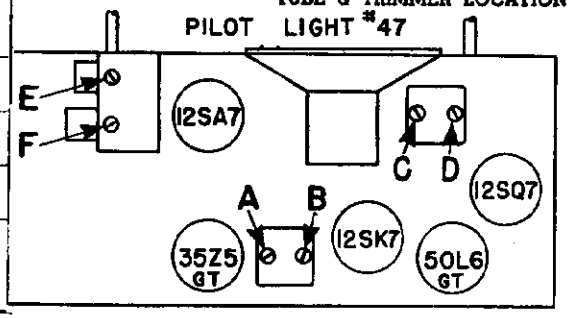


POWER SUPPLY:—

110-120 Volts A.C. or D.C. U.L. approved.
Frequency—50 to 60 cycles.
Power consumption—30 watts.

Step	Dummy Antenna between Radio and Signal Generator	Connect Signal Generator to	Signal Generator Frequency	Gang Condenser Setting	Trimmers Adjusted for Maximum Output
1	250 mmfd. Condenser	Gang Condenser Antenna Stator	455 KC.	Rotor full open (Plates out of mesh)	C and D—2nd I.F.
2	250 mmfd. Condenser	Gang Condenser Antenna Stator	455 KC.	Rotor full open (Plates out of mesh)	A and B—1st I.F.
3	250 mmfd. Condenser	Gang Condenser Antenna Stator	1630 KC.	Rotor full open (Plates out of mesh)	E—Oscillator
4	No actual connection between set and generator.	Loop radiator (or place pickup lead from generator close to loop of set to obtain adequate signal).	1400 KC.	Set Gang to tune in Generator Signal	F—Antenna

TUBE & TRIMMER LOCATION



CONDENSERS

Symbol	Description	Part No.
C1	Paper, .1 mfd. 200 V.	64B1-30
C2	Mica, 50 mmf. ±20%	65B5-11
C3	Paper, .02 mfd. 400 V.	64B1-24
C4	Paper, .01 mfd. 400 V.	64B1-25
C5	Paper, .01 mfd. 400 V.	64B1-25
C6	Mica, 250 mmf. ±20%	65B7-22
C7	Mica, 500 mmf. ±20%	65B7-27
C8	Paper, .02 mfd. 400 V.	64B1-24
C9a, C9b, C9c	Elect., 30 mfd. 150 V., Elect., 30 mfd. 150 V., Elect., 20 mfd. 150 V.	67A8
C10	Paper, .2 mfd. 400 V.	64A2-1
C11	Paper, .05 mfd. 400 V.	64B1-22
C12	Paper, .005 mfd. 600 V.	64B1-12
C13a, C13b	Gang Condenser (2 Section)	68A2
C14	Mica, 20 mmf. ±10%	65B5-5
C20a, C20b	Elect., 30 mfd. 150 V., Elect., 50 mfd. 150 V.	67A3

RESISTORS

R1	22,000 ohm ±10%, ½W.	60B8-223
R2	1 megohm ±10%, ½W.	60B8-105
R3	10 megohm ±10%, ½W.	60B8-106
R4	220,000 ohm ±10%, ½W.	60B8-224
R5	470,000 ohm ±10%, ½W.	60B8-474
R6	150 ohm ±10%, ½W.	60B8-151
R7	150,000 ohm ±10%, ½W.	60B8-154
R8	1 megohm Volume Control & Switch	75B1-6
R9	150 ohm ±10%, 1W.	60B28-1
R10	1000 ohm ±10%, 1W.	60B28-2
R11	33 ohm ±10%, 1W.	60B28-3

TRANSFORMERS AND COILS

Symbol	Description	Part No.
L1	Antenna, Loop	69B4
L2	Transformer, 1st I. F.	72B3
L3	Transformer, 2nd I. F.	72B4
L4	Oscillator Coil	69A5
L5	Choke Coil (Filter)	74A1
T1	Transformer, Output	*

*When ordering, specify all numbers on speaker and transformer.

MISCELLANEOUS

Description	Part No.
Background, Dial	X22C3-1
Bracket, Loop Retainer	15A14
Buttons (Cabinet Back), Snap	13A1-2-47
Cover, Back	43B21-1
Drum and Hub Assembly	A1012
Grommet, Rubber 7/16" x 3/16" (Gang Mtg.)	12A1-2
Knob, Mahogany	33A10-2
Pilot Light #47	81A1-8
Pilot Light Socket and Leads	82A2-1
Pointer	25A4-1
Pulley, Fibre Dial	17A1-3
Scale, Dial	21B26
Shaft, Tuning	28A1-1
Socket, Octal Tube	87A10-2
Speaker (5" PM) and Output Transformer	78B4-4
Spring, Dial Cord Tension	19A1-3
Washer, Flat Fibre Insulating	5A1-6
Washer, Offset Fibre Insulating	5A2-5
Washer, C	4A4-1
Washer, Spring	4A8-3-0

IMPORTANT—Check to see that dial pointer reaches each end of dial scale when Station Selector Control is turned from one end to the other.

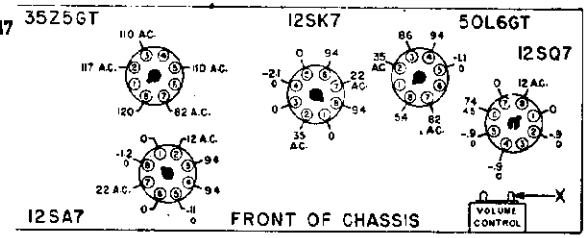
Volume control—Maximum for all adjustments.

Connect radio chassis to ground post of signal generator with a short heavy lead.

Connect output meter across voice coil of speaker.

Allow chassis and signal generator to warm up for several minutes.

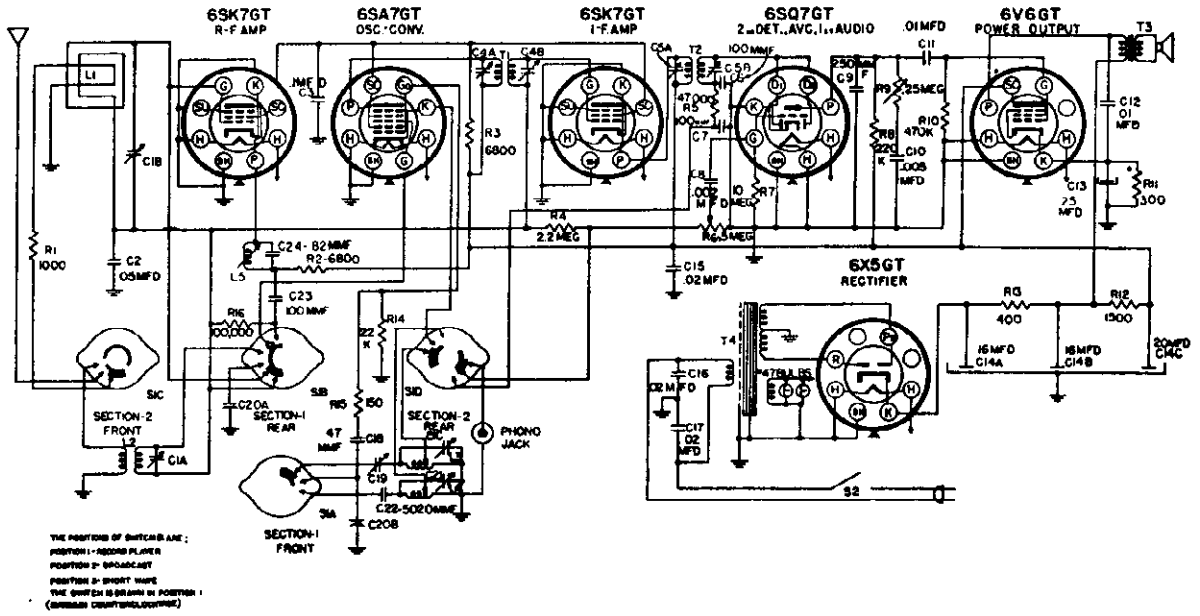
Use lowest Output setting of Signal Generator capable of producing adequate Output Meter indication and then proceed in the following sequence.



Bottom View of Chassis, Showing Voltages

All readings made between Tube Socket Terminals and Switch Lug on volume control (Point "X" on drawing).
Measured on a 117 Volt A.C. line.
Volume control full on.
Dial tuned to low frequency end, no signal.
Voltages indicated obtained on Vacuum Tube voltmeter.
A second voltage reading is shown made with a 1000 ohm-per-volt meter when use of this instrument would result in appreciably lower readings.

SERVICING INFORMATION



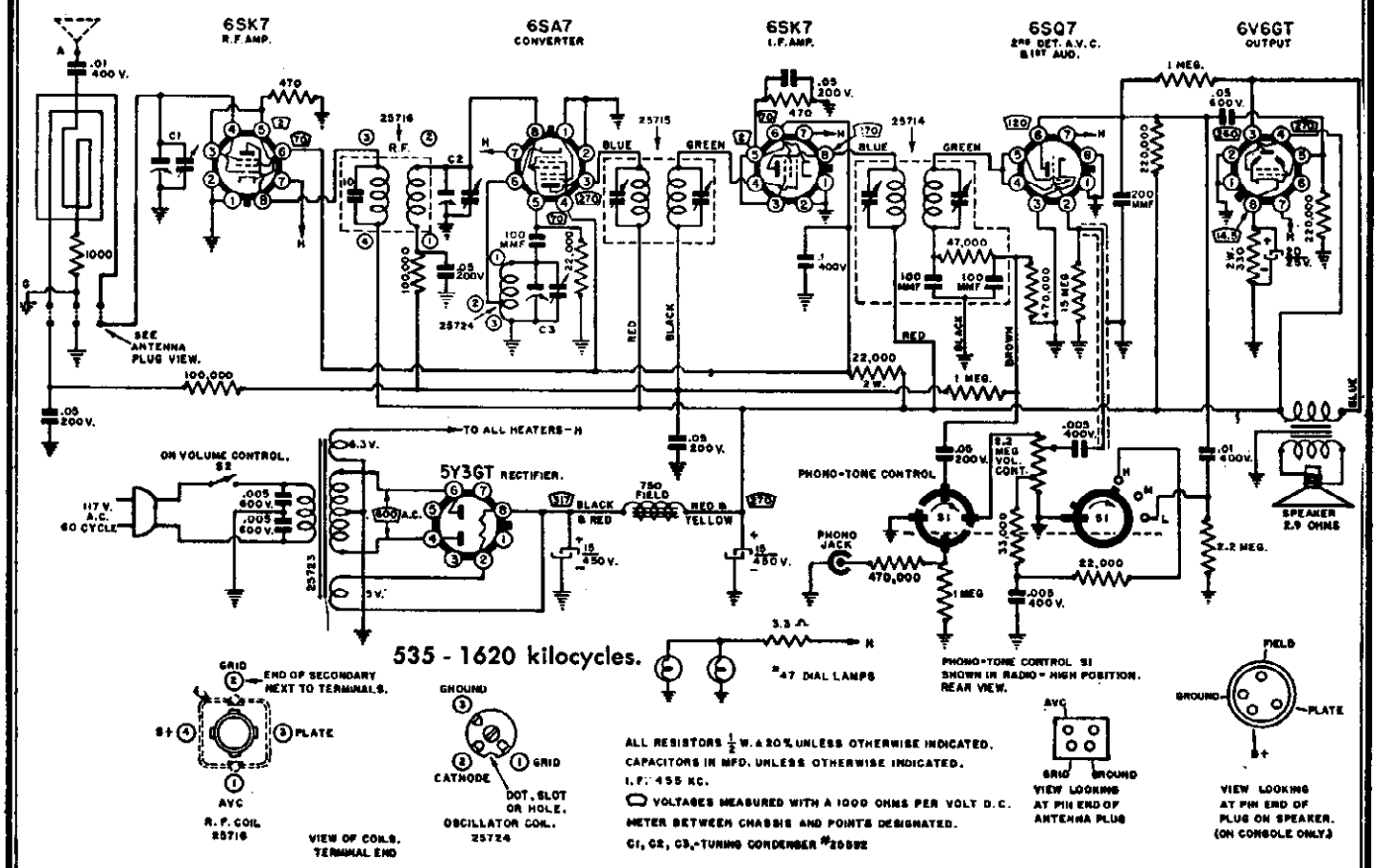
PARTS LIST

Location Schematic	Part No.	Description
	T-457-2	Cabinet
	62189	Cabinet Back
C-20	1668	Condenser, Variable
C14	A20102	Condenser, Electrolytic 20-16-16 mfd. x 350 V.
C13	20105	Condenser, Electrolytic 25 mfd. x 25 VDC.
C1	A1725	Condenser, Trimmer, 3 Section, 3-30mmfd.
C18		Condenser, Mica 47 mmfd.
C6, C7, C23		Condenser, Mica 100 mmfd.
C9		Condenser, Mica 250 mmfd.
C22		Condenser, Mica 5020 mmfd.
C24		Condenser, Mica 82 mmfd.
C2		Condenser, Paper .05 mfd. 600 V.
C3		Condenser, Paper .1 mfd. 400 V.
C8		Condenser, Paper .002 mfd. 400 V.
C10		Condenser, Paper .005 mfd. 400 V.
C11		Condenser, Paper .01 mfd. 600 V.
C12		Condenser, Paper .01 mfd. 800 V.
C15		Condenser, Paper .02 mfd. 400 V.
C16, C17	1975	Condenser, Oil filled metal case .02 mfd. 600V.
R6	2470-A	Control, Volume .5 Meg
R9	2521	Control, Tone .25 Meg with switch
		Cord, Line
L1	28170	Coil, Loop
L2	28167	Coil, S.W. Antenna

Location Schematic	Part No.	Description
L3	28169	Coil, B.C. Oscillator
L4	28168	Coil, S.W. Oscillator
L5	28175	Coil, Wave Trap
		Knob, Tone-off-on
		Knob, Volume
		Knob, Tuning
		Knob, (RP, BC, SW)
		Pilot Lamp #47
R1		Resistor, 1,000 ohms ½ W.
R2, R3		Resistor, 6,800 ohms 2 W.
R14		Resistor, 22,000 ohms ½ W.
R4		Resistor, 2.2 Megohms ½ W.
R5		Resistor, 47,000 ohms ½ W.
R7		Resistor, 10 Meg ohms ½ W.
R8		Resistor, 220,000 ohms ½ W.
R10		Resistor, 470,000 ohms ½ W.
R11		Resistor, 300 ohms 2 W. Wirewound
R12		Resistor, 1500 ohms 2 W. Wirewound
R13		Resistor, 400 ohms 2 W. Wirewound
R15		Resistor, 150 ohms ½ W. Wirewound
R16		Resistor, 100,000 ohms ½ W.
	5866	Speaker, P. M.
T1	3360	Transformer, I.F. Input
T2	3530	Transformer, I.F. Output
T3	1333	Transformer, Output
T4	1020	Transformer, Power

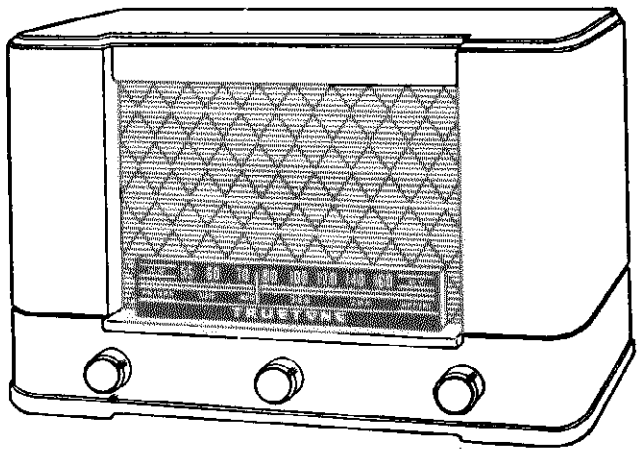
For 110-125 Volt AC Operation

WESTERN AUTO SUPPLY CO. MODEL D2634



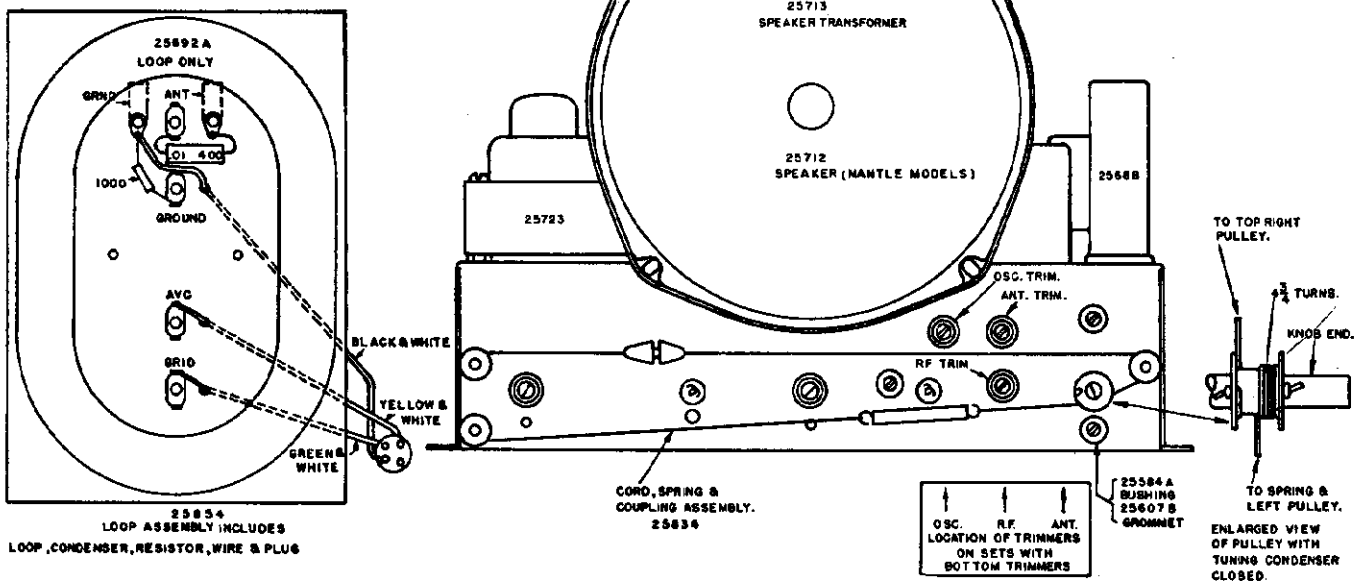
Part No.	Description
25692	Antenna—Loop
25596	Bearings—For Wood Pulleys
25572	Bracket—Tuning Condenser—Front
25573	Bracket—Tuning Condenser—Rear
25574	Bracket—Speaker
25765	Bracket—Pointer Track
25733	Cabinet
25597	Coil—R. F.
25724	Coil—Oscillator
25688	Condenser—Filter 15-450, 15-450, 20-25
25592	Condenser—Tuning C-1, C-2, C-3
25690	Control—Volume (with AC Switch S-2)
25068	Cord—AC and Plug
25834	Cord—Dial (includes Spring and Pointer Coupling)
25752	Dial Scale—Glass
25578	Dial Pointer
25829	Knob—Tone
25696	Knob—Volume and Tuning
25710	Phono—Pick-Up Socket
25693	Plug—For Loop
25336	Pulley—Wood—Small
25819	Pulley—Manual Drive With Shaft
25607	Rubber—Grommets
25774	Screw—Set For Worm Gear (Tuning Condenser)
25576	Socket—Dial Lamp
25620	Socket—Octal
25006	Socket—For Loop
25712	Speaker—With Transformer
25562	Switch—Tone S-1,
25711	Track—Pointer
25715	Transformer—I. F. Input
25714	Transformer—I. F. Output
25713	Transformer—Output—Speaker
25723	Transformer—Power 60 Cycles

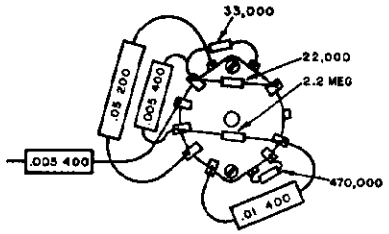
Note: Resistors and condensers not listed will be supplied on order—specify value.
We cannot supply speaker cones. We can replace or repair a damaged speaker for a nominal price if it is returned to our factory, transportation charges prepaid.

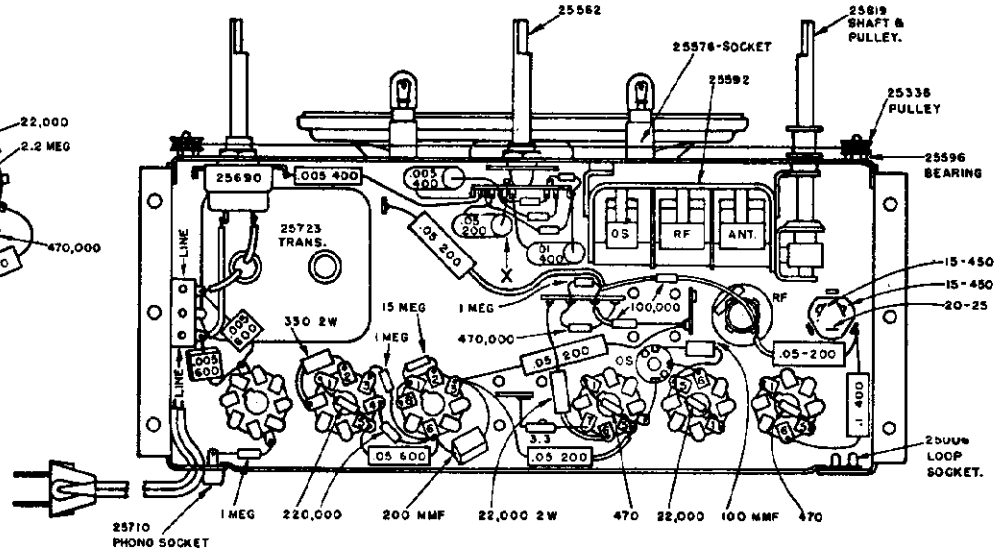


TO PROPERLY ALIGN—Remove chassis from cabinet, and align I. F. Transformers in the conventional manner with a Signal Generator adjusted to 455 KC, connected to the grid of the 6SA7 through a .1 Mfd. condenser, with the tuning condenser set at minimum capacity. To align tuning condenser, carefully place loop in normal relation to chassis, connect Signal Generator to antenna clip through a .0001 Mfd. condenser. Adjust oscillator trimmer condenser (located on left top) to 1620 KC with tuning condenser at minimum capacity (complete out of mesh). The antenna and R. F. sections are trimmed at 1400 KC. Antenna trimmer is top right; R. F. trimmer is below at right. Dial pointer may be adjusted to scale by slipping pointer coupling on dial cord.

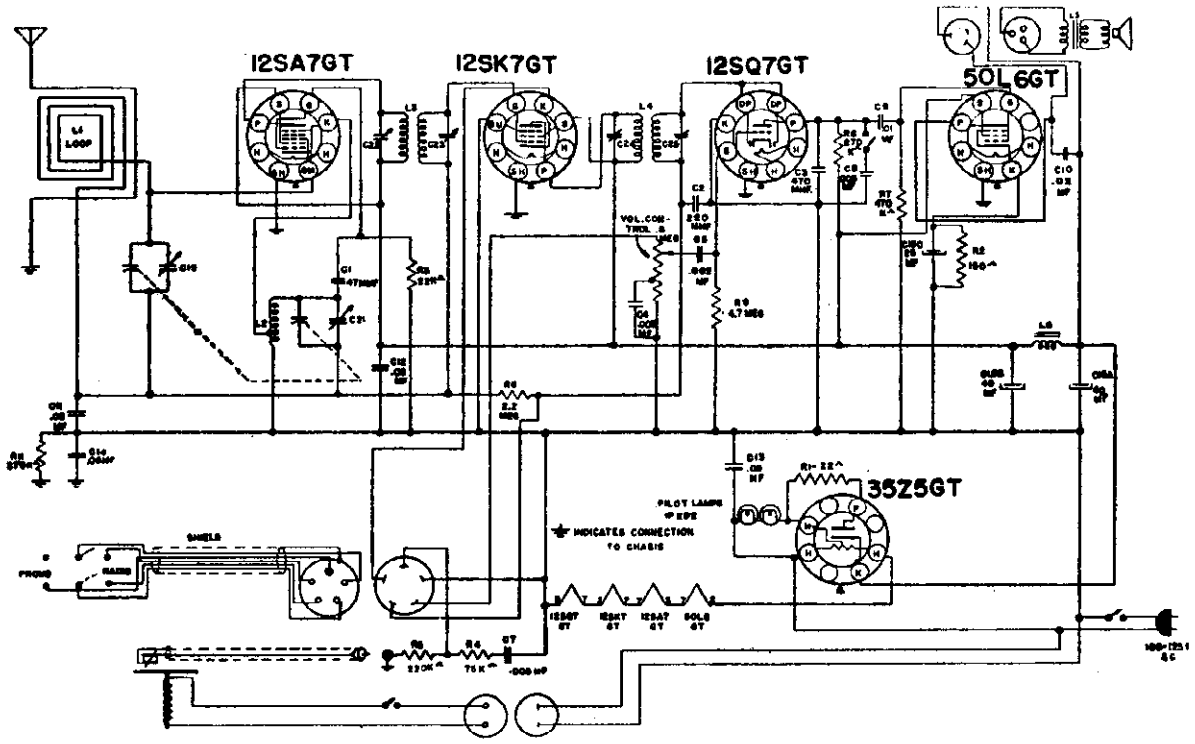
DIAL CORD REPLACEMENT—Is best accomplished by replacing complete cord assembly No. 25834 which is made up to correct length. In an emergency 30 lb. fish line may be used. See picture of chassis for correct installation.







SERVICING INFORMATION



PARTS LIST

Schematic Location	Part No.	Description
	T-459	Cabinet
	62188	Back Cover
C1		Condenser, Mica 47 mmfd. 500 V.
C2		Condenser, Mica 220 mmfd. 500 V.
C3		Condenser, Mica 470 mmfd. 500 V.
C5		Condenser, Paper .002 mfd. 400 V.
C4, C7, C8		Condenser, Paper .005 mfd. 400 V.
C9		Condenser, Paper .01 mfd. 400 V.
C10		Condenser, Paper .02 mfd. 400 V.
C11, C12, C13		Condenser, Paper .05 mfd. 400 V.
C15A,B,C,	2072	Condenser, Electrolytic, 40-40 mfd. 150 V., 25 mfd. 25 V.
	1693	Condenser, Variable Air, 2 Gang
C14		Condenser, Paper .08 mfd. 400 V.
R10	2466	Control, Volume with switch .5 megohms
		Cord, Line
	28148-A	Coil, Loop

Schematic Location	Part No.	Description
	28165	Coil, Oscillator
	3368	Choke, Filter
	39148	Knobs
		Pilot Lamp #282
R1		Resistor, 22 ohms, ½ W.
R2		Resistor, 150 ohms, ½ W.
R3		Resistor, 22K ohms, ½ W.
R4		Resistor, 75K ohms, ½ W.
R5		Resistor, 220K ohms, ½ W.
R6, R11		Resistor, 270K ohms, ½ W.
R7		Resistor, 470K ohms, ½ W.
R8		Resistor, 2.2 Megohms ½ W.
R9		Resistor, 4.7 Megohms ½ W.
	5873	Speaker and #1335 output transformer.
	3360	Transformer, 1st I. F.
	3530	Transformer, 2nd I. F.

MODEL D2663 WESTERN AUTO SUPPLY CO.

CONDENSERS

Symbol	Capacity		Type
C1	.01	mfd.	400 V.
C2	.0008	mfd.	Mica
C3	.00016	mfd. (max.)	Trimmer
C4	.00024	mfd. (max.)	Trimmer
C5	.0001	mfd.	Mica
C6	.0008	mfd.	Mica
C7	.01	mfd.	400 V.
C8	.002	mfd.	600 V.
C9	4.	mfd. (Elect.)	150 V.
C10	.05	mfd.	200 V.
C11	.00025	mfd.	Mica
C12	.00025	mfd.	Mica
C13	.01	mfd.	400 V.
C14	.01	mfd.	400 V.
C15	.005	mfd.	600 V.
C16	.01	mfd.	400 V.

RESISTORS

Symbol	Resistance	Type
R1	15,000 ohms	C1/2W
R2	470,000 ohms	C1/4W
R3	220,000 ohms	C1/2W
R4	33,000 ohms	C1/2W
R5	4.7 megohm	C1/4W
R6	2.2 megohm	C1/4W
R7	1. megohm	Vol. Con.
R8	4.7 megohm	C1/4W
R9	1. megohm	C1/4W
R10	1. megohm	C1/4W
R11	390 ohms	C1/4W
R12	.75 ohms	W.W.1/2W
R13	2200 ohms	C1/4W

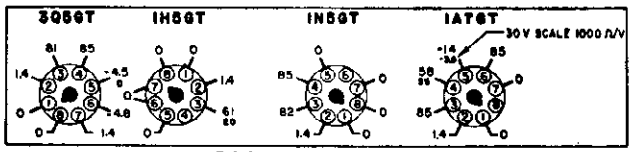
COILS

Symbol	Description
L1	Antenna Coil (3 ohms)
L2	Oscillator Coil (3 ohms)
L3	1st I.F. Transformer
L4	2nd I.F. Transformer
L5	R.F. Choke (14.5 ohms)
T1	Output Transformer

VOLTAGE DATA

All readings made between tube socket terminals and chassis. Voltages indicated have been obtained using a Vacuum Tube Voltmeter. A second voltage reading is shown made with a 1000 ohm-per-volt meter, when use of this instrument would result in appreciably lower readings. The voltages were measured using a fresh battery, volume control full on, dial at the high frequency end, and no signal.

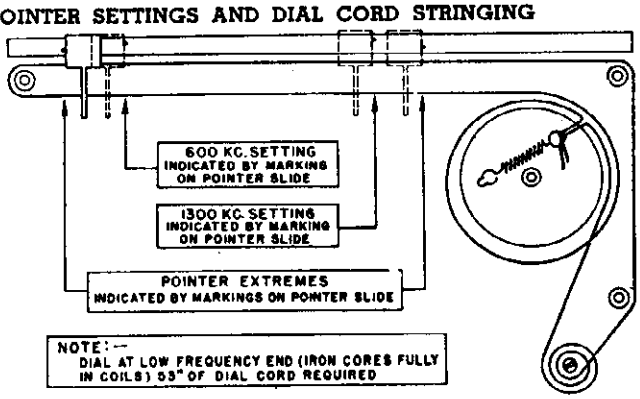
VOLTAGE CHART — BOTTOM VIEW

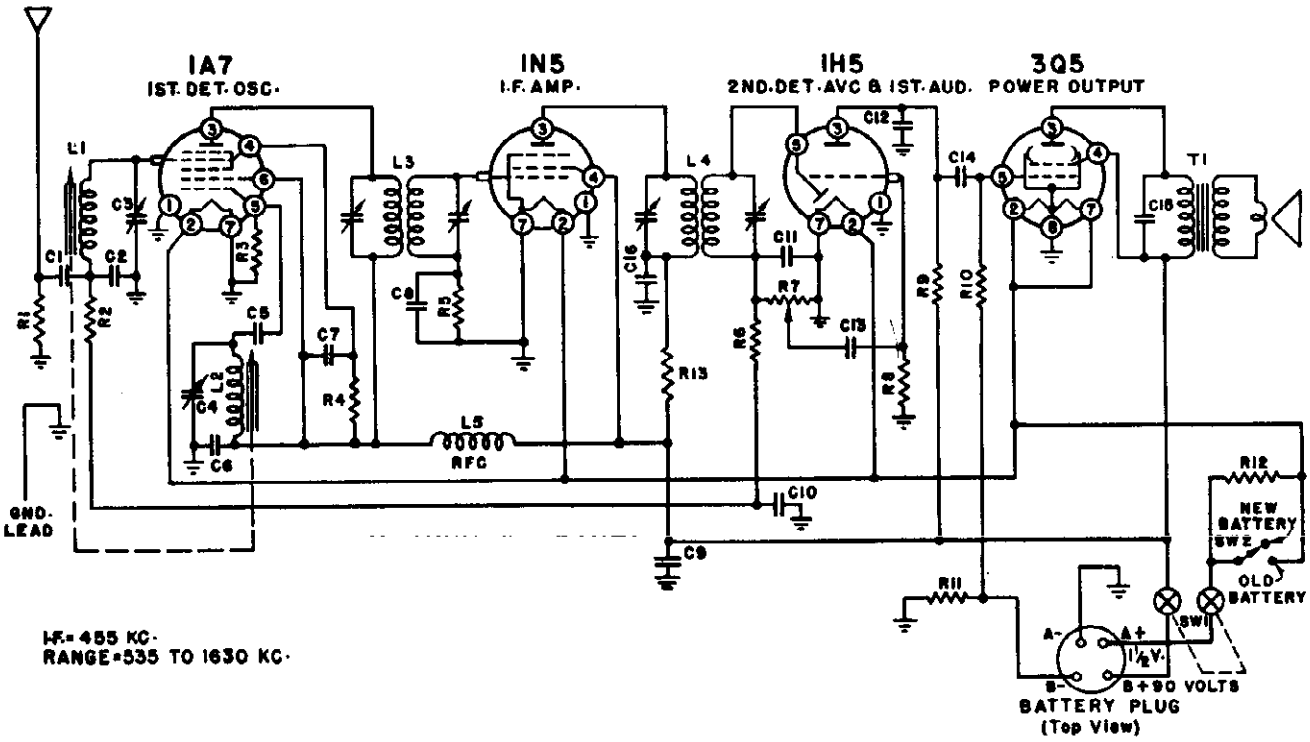


TRUETONE TUBES USED

1A7—1st Det. Osc.
1H5—2nd Det., A.V.C. and 1st Audio
1N5—I. F. Amplifier
3Q5—Power Output.

POINTER SETTINGS AND DIAL CORD STRINGING





REPLACEMENT PARTS — MODEL D-2663

PAPER CONDENSERS

Part No.	Symbol	Description
64B1-14	C8	Condenser, Tubular, .002 mfd., 600 Volt
64B1-12	C15	Condenser, Tubular, .005 mfd., 600 Volt
64B1-25	C1, C7, C13, C14, C16	Condenser, Tubular, .01 mfd., 400 Volt
64B1-32	C10	Condenser, Tubular, .05 mfd., 200 Volt

MICA CONDENSERS

65B7-17	C5	Condenser, Mica, .0001 mfd. ±20%
65B7-22	C11, C12	Condenser, Mica, .00025 mfd. ±20%
65B5-31	C2, C6	Condenser, Mica, .0008 mfd. ±10%

ELECTROLYTIC CONDENSER

67A4-2	C9	Condenser, Electrolytic, 4. mfd., 150 V.

TRIMMER CONDENSER

66A9-1	C3, C4	Condenser, Dual Trimmer

RESISTORS

61A2-1	R12	.75 ohm ±10%, ½ W. (wire)
60B2-391	R11	390. ohm ±10%, ¼ W.
60B2-222	R13	2200 ohm ±10%, ¼ W.
60B8-153	R1	15,000 ohm ±10%, ½ W.
60B8-333	R4	33,000 ohm ±10%, ½ W.
60B8-224	R3	220,000 ohm ±10%, ½ W.
60B2-474	R2	470,000 ohm ±10%, ¼ W.
60B2-105	R9, R10	1,000,000 ohm ±10%, ¼ W.
60B2-225	R6	2,200,000 ohm ±10%, ¼ W.
60B2-475	R5, R8	4,700,000 ohm ±10%, ¼ W.

VOLUME CONTROL

75B1-1	R7	1 Megohm Volume Control & Switch

TRANSFORMERS, COILS, AND CORES

AC105-1	L1	Antenna coil, specify color code
71B1-4		Iron Core, with wire (Ant.), specify color code
AB104-4	L2	Oscillator coil, specify color code
71B1-3		Iron Core, with wire (Osc.), specify color code
72B5	L3	1st I.F. Transformer
72B6	L4	2nd I.F. Transformer

TRANSFORMERS, COILS, AND CORES (Cont'd)

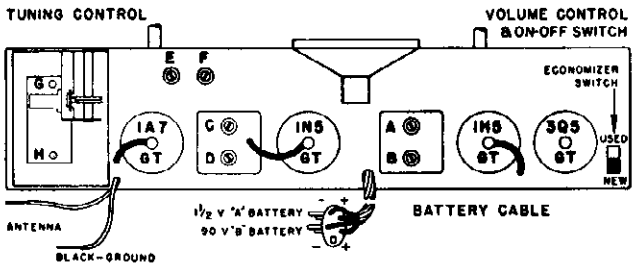
Part No.	Symbol	Description
AB103-1	L5	Choke coil (RF)
	T1	Output Transformer (Specify full speaker part no. including mfg. code when ordering)

MISCELLANEOUS (Alphabetical)

Part No.	Description
35C20	Cabinet, D-2663
A1026	Cable, Battery (complete with plug)
90A1-2	Cap, Grid
50A1-1	Cord, Dial (5" on tuner and 53" on dial drive)
A1035	Drum and Hub, Tuning
23A7-1	Escutcheon
33A10-2	Knob
88A4-4	Plug, Battery, 5 Prong
25A10-1	Pointer, Dial
17A1-3	Pulley, Fibre Dial
21B14-1	Scale, Glass Dial
27A4	Screw studs (for iron cores)
28A11-1	Shaft, Tuning
A1040	Shaft and pulley (Tuner)
87A8	Shield, Tube
87A10-2	Socket, Octal Tube
78B10	Speaker and Output Transformer (Specify complete part number including mfg. code when ordering.)
19A1-5	Spring, Dial Drum Cord Tension
19A3-1	Spring, Hairpin (To hold Ant.-Osc. coils)
19A6	Spring, Tuner, back bearing takeup
19A5	Spring, Tuner, front bearing takeup
19A1-4	Spring, Tuner Slide Cord Tension
18A1	Spring, Tuner Slide Pressure
77A1-6	Switch, SPST (Economizer)
9A8-1	Terminal, Tuner Slide Cord
4A4-1	Washer, C
4A6-5-0	Washer, Spring (coils)
4A6-3-0	Washer, Spring (shaft)

C. R. & T. C. Form 41A5-1

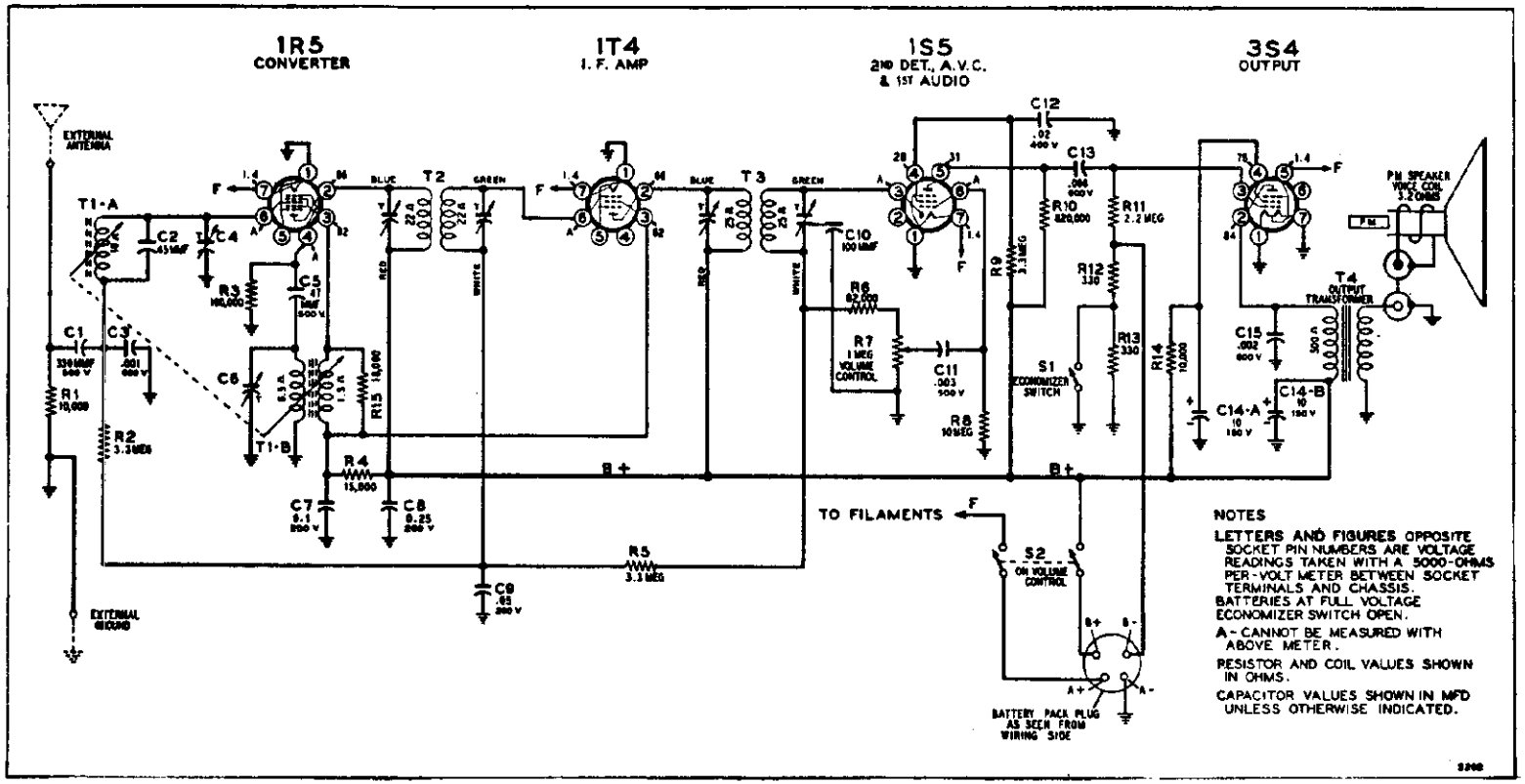
- **IMPORTANT—Check to see that dial pointer reaches each end of dial scale when Station Selector Control is turned from one end to the other.**
- Volume control—Maximum for all adjustments.
- Connect radio chassis to ground post of signal generator with a short heavy lead.
- Connect dummy antenna value in series with generator output lead, when needed (see below).
- Connect output meter across voice coil of speaker.
- Allow chassis and signal generator to "heat up" for several minutes.

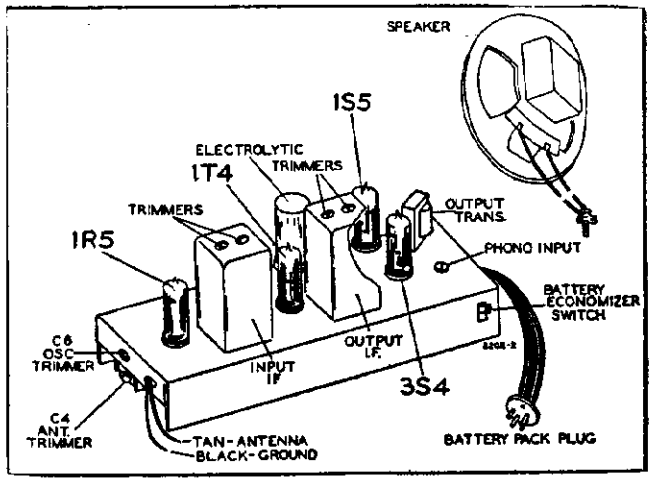


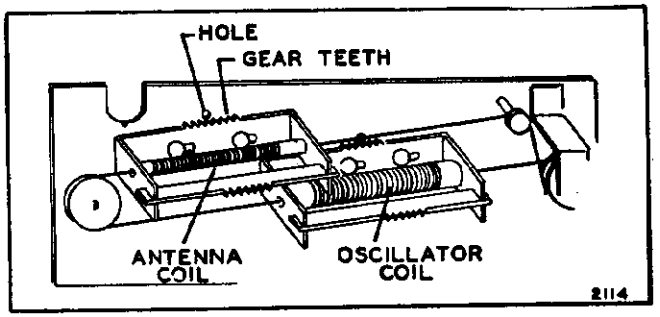
- **Use lowest Output setting of Signal Generator capable of producing adequate Output Meter indication and then proceed in the following sequence.**

BAND	SIGNAL GENERATOR Frequency Setting	Dummy Antenna	Connection to Radio	Receiver Dial Setting	Trimmers Adjusted (In Order Shown)	Trimmer Function	Type of Adjustment
I. F.	455 KC.	.1 MFD.	Grid of 1A7 (Cap)	High frequency end of dial	C-D—2nd I.F.	Output I.F.	Adjust to maximum output
	455 KC.	.1 MFD.	Grid of 1A7 (Cap)	High frequency end of dial	A-B—1st I.F.	Input I.F.	Adjust to maximum output
BROAD-CAST	1630 KC.	.0002 MFD.	Antenna Lead	High frequency end of dial	E—(See note below) F—(See note below)	Oscillator Antenna	Adjust to maximum output
	1300 KC.	.0002 MFD.	Antenna Lead	1300 KC.	G H	Oscillator Antenna	Adjust to maximum output

NOTE: Before adjusting trimmers "E" and "F", make sure that each iron core is 1⅝" or more outside of its coil form. If necessary, turn adjustments "G" and "H" to accomplish this.

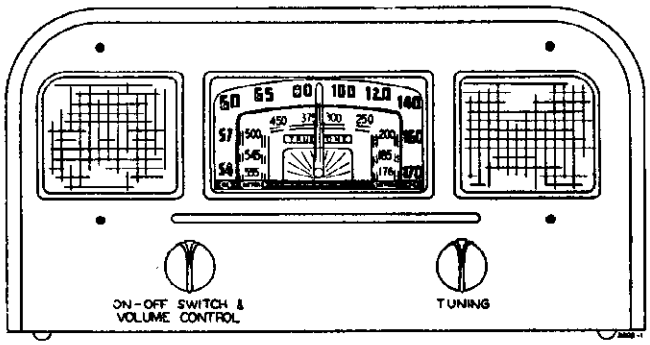






The antenna coil assembly is movable left or right. When making the adjustment as required in the alignment procedure, move the coil assembly very slowly, either by hand or by pivoting one edge of a screwdriver blade in the hole and engaging the blade in the gear teeth of the coil form.

WESTERN AUTO SUPPLY CO. MODEL D2665



If the battery pack needs replacement, use Wizard Battery Pack No. B-6411 (500 hours), No. B-6420 (750 hours), or No. B-6430 (1000 hours). Each of these packs contains a 1½-volt "A" battery and a 90-volt "B" battery.

ALIGNMENT PROCEDURE

- Output meter across 3.2-ohm output load.
- Align for maximum output. Reduce input as needed to keep output near 0.4 volts.
- Volume control at maximum for all adjustments.
- Connect ground post of signal generator to radio chassis.

SIGNAL GENERATOR			Tuner Setting	Adjust for Maximum Output (in order shown)
Frequency	Coupling Capacitor	Connection to Radio		
455 kc	.1 mf	Grid (pin 6) of 1R5	Iron cores all the way out	Trimmers on output and input I.F. cans
1700 kc	.1 mf	Grid (pin 6) of 1R5	Iron cores all the way out	Oscillator trimmer C6
1700 kc	200 mmf	Antenna lead	Iron cores all the way out	Antenna trimmer C4
1400 kc	200 mmf	Antenna lead	Turn dial to 1400 kc	Adjust position of ant. coil (see coil view)*

*This adjustment and the previous adjustment are interlocking; therefore repeat the two adjustments alternately for best results.

RECEIVER STAGE SENSITIVITIES

The table below lists the sensitivities at the input of each stage. The receiver should be tuned to 1000 KC for all readings. All measurements are based on an output of 50 milliwatts. This may be measured by disconnecting the speaker voice coil and substituting a 3.2-ohm, 5-watt resistor across the secondary winding of the output transformer. A reading of .4 volts AC across this resistor will be equivalent to a 50-milliwatt output with speaker connected.

The volume control must be set to maximum.

The signal source must be an accurately calibrated signal generator capable of supplying both 1000 kc and 455 kc signals modulated 30% with a 400-cycle audio signal.

Variations in sensitivities of plus or minus 25% are usually permissible.

SIGNAL GENERATOR				Input for 50-Milliwatt Iutput
Frequency	Coupling Capacitor	Connection to Radio	Ground Connection	
1000 kc	200 mmf	External antenna lead	Chassis	45 microvolts
1000 kc	.1 mf	Converter 1R5 (pin 6)	Chassis	129 microvolts
455 kc	.1 mf	Converter 1R5 (pin 6)	Chassis	120 microvolts
455 kc	.1 mf	IF amp. 1T4 (pin 6)	Chassis	3400 microvolts
400 cycles	.1 mf	AF amp. 1S5 (pin 6)	Chassis	.027 volts
400 cycles	.1 mf	Power amp. 3S4 (pin 3)	Chassis	2.5 volts

LIST OF REPLACEMENT PARTS

When ordering parts, specify number, model number, and series

Ref. No.	Part No.	Description
	CAPACITORS	
C1	C-8F3-11	330 mmf, 500 volts, 20%, mica
C2	B-8G-10426	45mmf, 10%, ceramic
C3	C-8D-10787	.001 mf, 600 volts, 20%
C4, C6	A-8H-10320	Dual trimmer, antenna and oscillator. Range of each: 84-156 mmf each
C5	C-8F3-6	47 mmf, 500 volts, 20%, mica
C7	C-8D-10771	.1 mf, 200 volts, +20%−10%
C8	C-8D-10775	.25 mf, 200 volts, +20% −10%
C9	C-8D-10770	.05 mf, 200 volts, 20%
C10		Approx. 100 mmf. Part of I.F. can
C11	C-8D-10786	.003 mf, 600 volts, 20%
C12	C-8D-10774	.02 mf, 400 volts, 20%
C13	C-8D-10785	.006 mf, 600 volts, 20%
C14-A,-B	A-8C-10258	Dual electrolytic, 10 mf x 150 volts each section
C15	C-8D-10784	.002 mf, 600 volts, 25%
	RESISTORS	
R1, R14	C-9B1-74	10,000 ohms, ½ watt, 10%
R2, R5, R9	C-9B1-34	3.3 megohms, ½ watt, 20%
R3	C-9B1-86	100,000 ohms, ½ watt, 10%
R4	C-9B1-76	15,000 ohms, ½ watt, 10%
R6	C-9B1-85	82,000 ohms, ½ watt, 10%
R7, S2	A-10B-10368	Volume control (1 megohm) and on-off switch
R8	C-9B1-37	10 megohms, ½ watt, 20%
R10	C-9B1-97	820,000 ohms, ½ watt, 10%
R11	C-9B1-33	2.2 megohms, ½ watt, 20%
R12, R13	C-9B1-56	330 ohms, ½ watt, 10%
R15	C-9B1-77	18,000 ohms, ½ watt, 10%
	COILS AND TRANSFORMERS	
T1-A,-B	C-211-10403	Tuner assembly complete, including antenna and oscillator coils
T2	B-13A-10333	Input I. F. transformer, complete in can. Range of trimmers: 53-97 mmf each
T3, C10	B-13B-10334	Output I. F. transformer, complete in can. Range of trimmers: 39-71 mmf each
T4	B-12C-10328	Output transformer
	MICELLANEOUS	
	A-55A-7386-1	Speaker socket
	B-18A-11453	Speaker, 5-inch, P.M.
	A-15B-10326	Tube socket
S1	A-20C-10317	Economizer switch
	B-14A-10386	Battery cable assembly
	B-6D-11457	Dial scale
	B-6D-10290	Dial crystal
	B-2G-10118	Pointer
	A-53A-11340	Cord for dial pointer drive
	A-49A-10078	Spring for drive cord
	B-2M7758	Snap-in rivet for dial scale
	D-2B-11313	Cabinet
	A-5B-11456-14	Knob

ELECTRICAL SPECIFICATIONS

Power Supply.....Battery: See types above
"A"-1½-volts, 250 milliamperes
"B"-90 volts, 10.5 milliamperes

Frequency Range....540 to 1700 kc.

Intermediate Freq...455 kc.

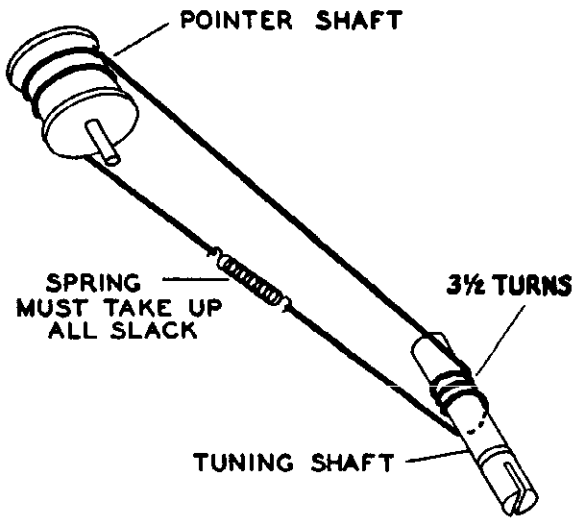
Selectivity.....At 1000 kc, 49 kc at 1000 x signal

Sensitivity.....40 microvolts average for 50-milliwatt output.

Power Output.....0.120 watt undistorted.
0.140 watt maximum.

Loud Speaker.....5-inch; P. M.; voice coil impedance 3.2 ohms.

Tube Complement....1R5, converter
1T4, I. F. amplifier
1S5, detector, AVC, audio
3S4, output amplifier



Replacement of Dial Pointer Drive Cord

RADIO RECEIVER

This is a 5-tube superhetrodyne radio receiver for operation on a 105-125 volt A.C. or D.C. power supply. The tubes used are a 12SA7 as an oscillator-converter, a 12SK7 as an I.F. amplifier, a 12SQ7 as an AVC, detector and 1st audio amplifier, a 50L6GT as an output and a 35Z5GT as a power amplifier.

This receiver covers the broadcast band (from 530 to 1620 kilocycles). The dial calibrations read in kilocycles (KC) (less the final zero)

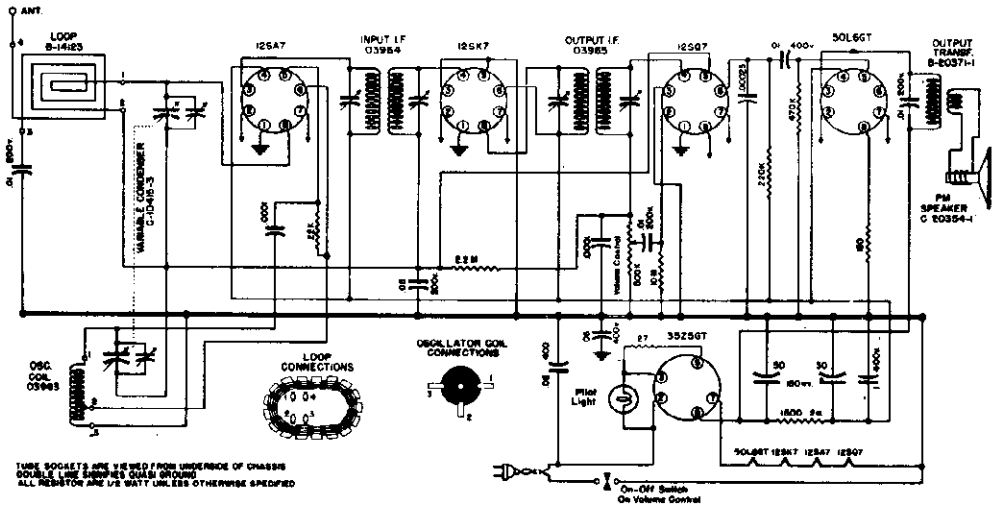
CONTROLS

VOLUME CONTROL: (Bottom knob)

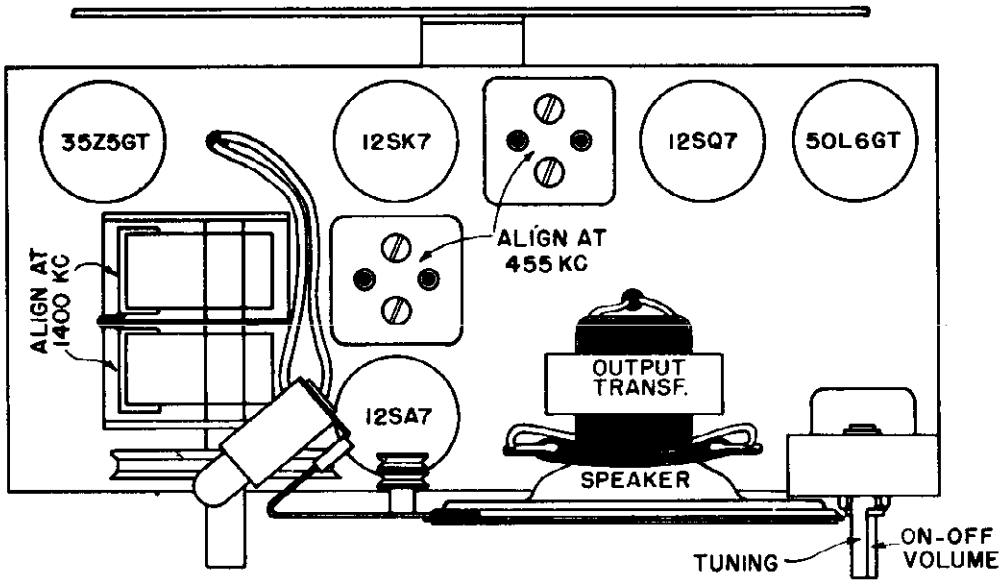
Turning knob clockwise turn the receiver on and turning further increases the volume.

TUNING CONTROL: (Top knob)

This knob is used to select stations. Tune station until it is at maximum clearness. Never attempt to reduce volume by de-tuning station -- always use the volume control.



TUBE LAYOUT

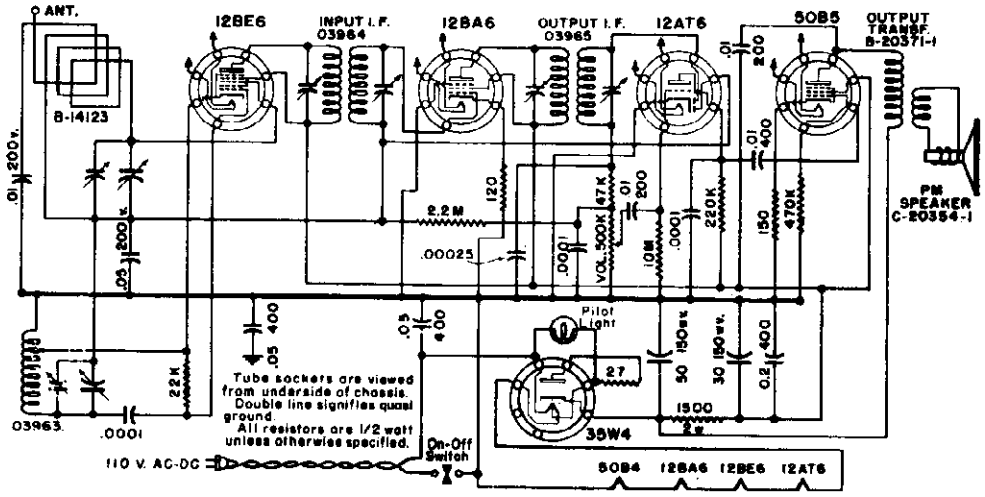


MODEL D2693B

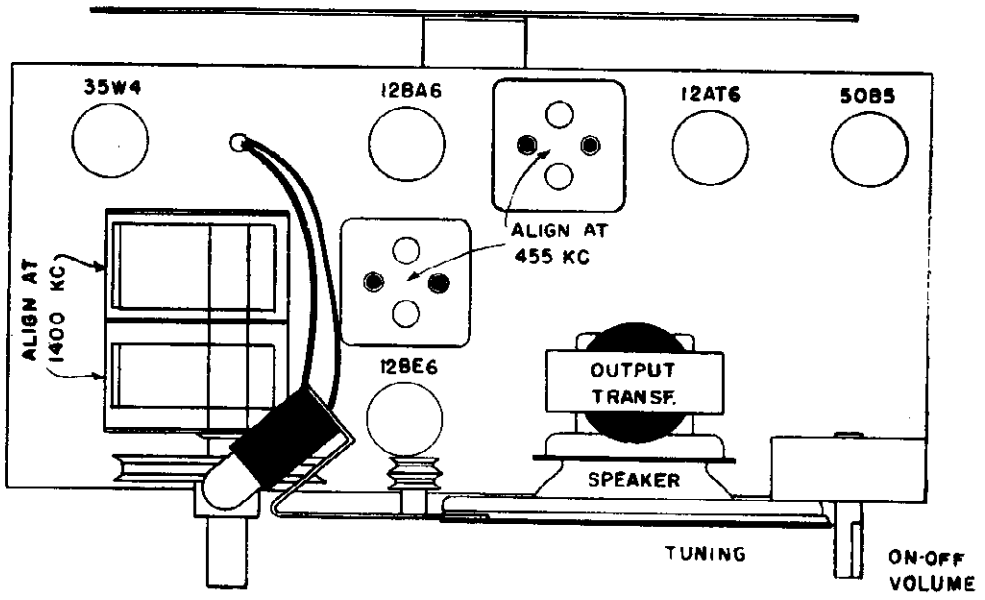
WESTERN AUTO SUPPLY CO.

This is a 5-tube superhetrodyne radio receiver for operation on a 105-125 volt A.C. or D.C. power supply. The tubes used are a 12BE6 as an oscillator converter, a 12BA6 as an I.F. amplifier, a 12AT6 as an AVC, detector and 1st audio amplifier, a 50B5 as an output and a 35B4 as a power rectifier.

This receiver covers the broadcast band (from 530 to 1620 kilocycles) The dial calibrations read in kilocycles (KC) (less the final zero)



TUBE LAYOUT



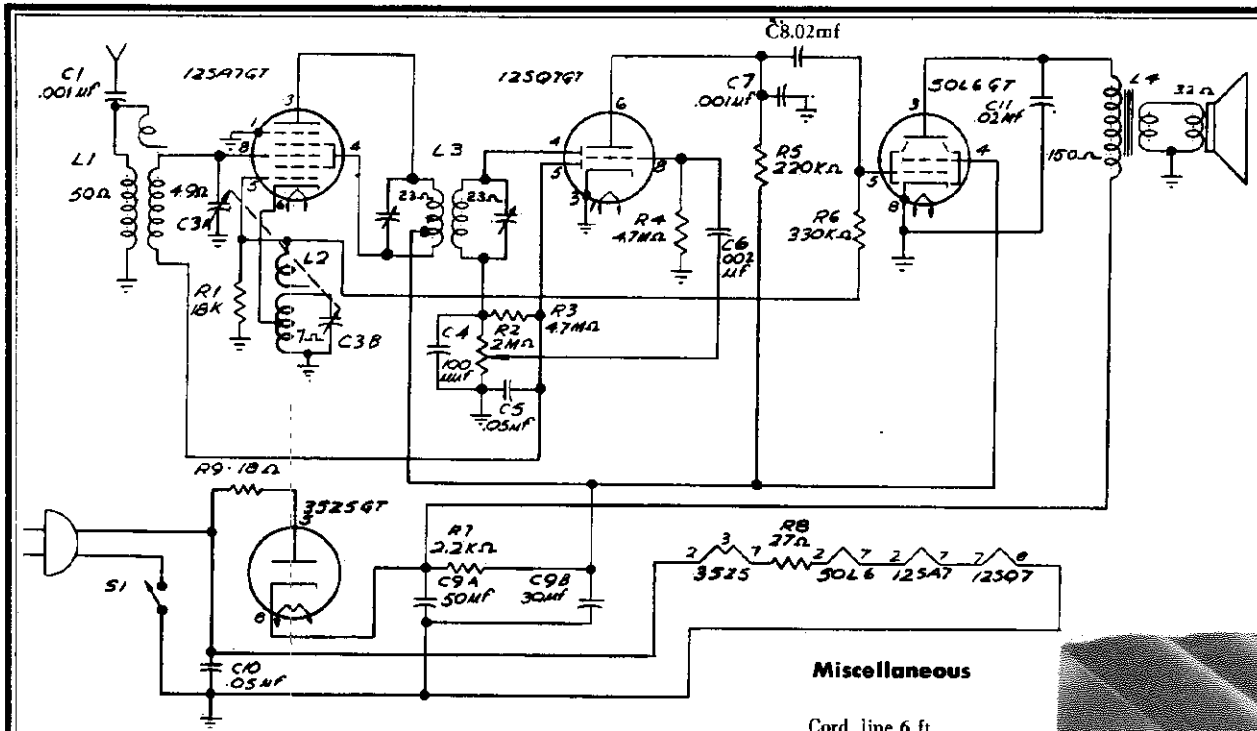
CONTROLS

VOLUME CONTROL: (Bottom knob)

Turning knob clockwise turn the receiver on and turning further increases the volume.

TUNING CONTROL: (Top knob)

This knob is used to select stations. Tune station until it is at maximum clearness. Never attempt to reduce volume by de-tuning station -- always use the volume control.



Sensitivity (for 0.5 watt output) ..... 600 microvolts average

Power output (in voice coil):

Undistorted ..... 0.8 watts

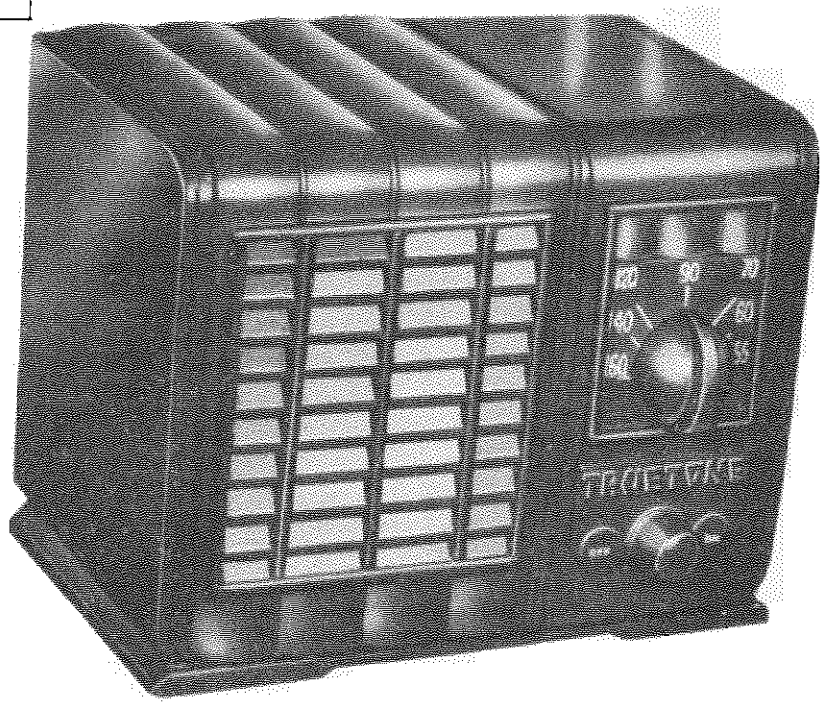
Maximum ..... 2.5 watts

Tuning range ..... 520 to 1590 kc

Intermediate frequency ..... 455 kc

Power consumption ..... 30 watts

Selectivity ..... 1. A.C.A.—3 to 1. 2. A.C.A.—12.5 to 1



Ref. No.	*Part No.*	*Description*
		Capacitors
C1		Paper, .001 mfd 400 volts
C6		Paper, .002 mfd 400 volts
C8-C11		Paper, .02 mfd 400 volts
C5		Paper, .05 mfd 200 volts
C7		Paper, .001 mfd 500 volts
C4		Ceramic 100 mmfd 500 volts
C2	1675	Variable Air—2 gang
C9	2073	Electrolytic, 50-30 mfd 150 volts
C10		Paper, .05 mfd 400 volts
		Coils and Transformers
L2	28184	Oscillator coil
L3	3376	I.F. transformer
L4	1300	Output transformer
L1	28185	Antenna coil

		Miscellaneous
		Cord, line 6 ft.
	39160	Knob, tuning
	39161	Knob, volume
	5877	Speaker
	54314	Tuning knob washer
	18110	Sockets, wafer octal
	62194	Back cover

		Resistors
R2	2480	Control, volume with switch, 2 meg-ohms
R1		18000 ohms, ¼ watt
R3, R4		4.7 meg ohms, ¼ watt
R5		220,000 ohms, ¼ watt
R6		330,000 ohms, ¼ watt
R7		2200 ohms, 2 watts
R8		27 ohms, ½ watt
R9		18 ohms, ½ watt

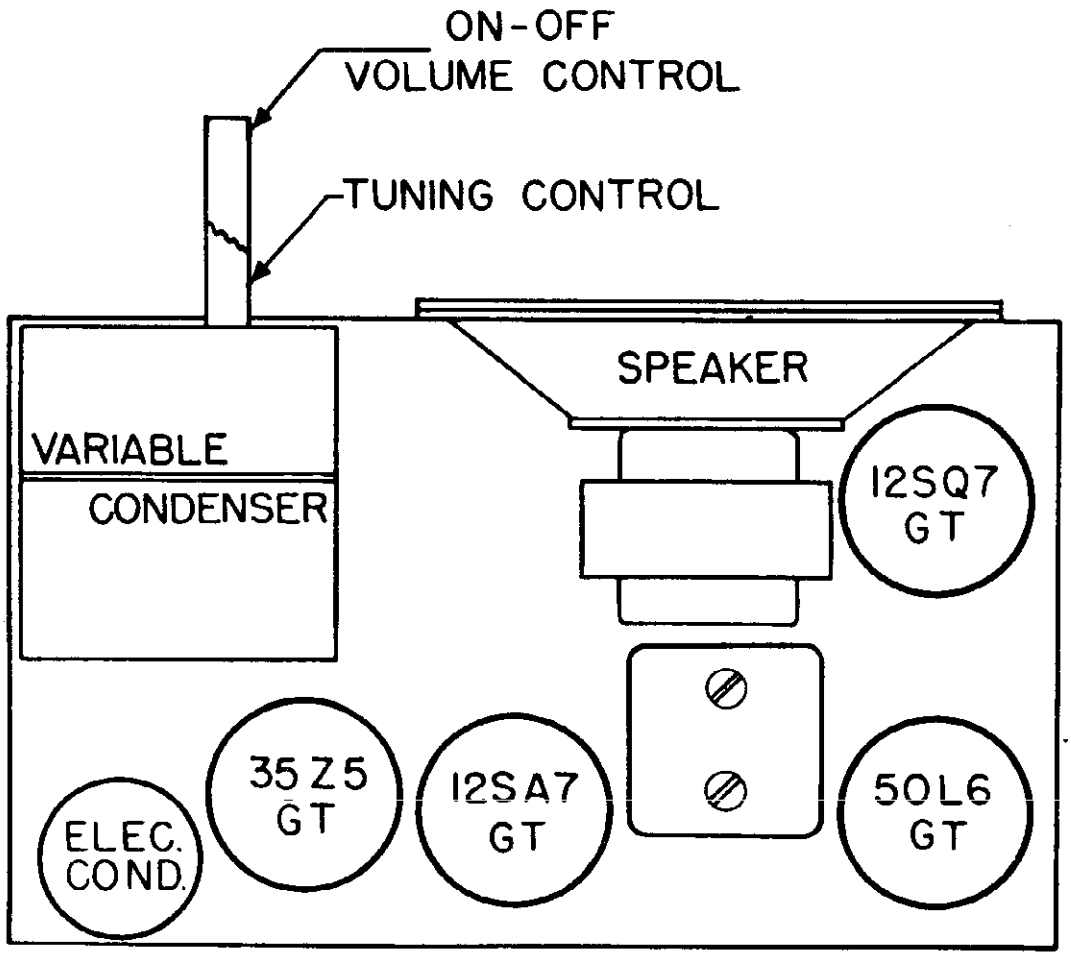
ALIGNMENT PROCEDURE

(Refer to Chassis View)

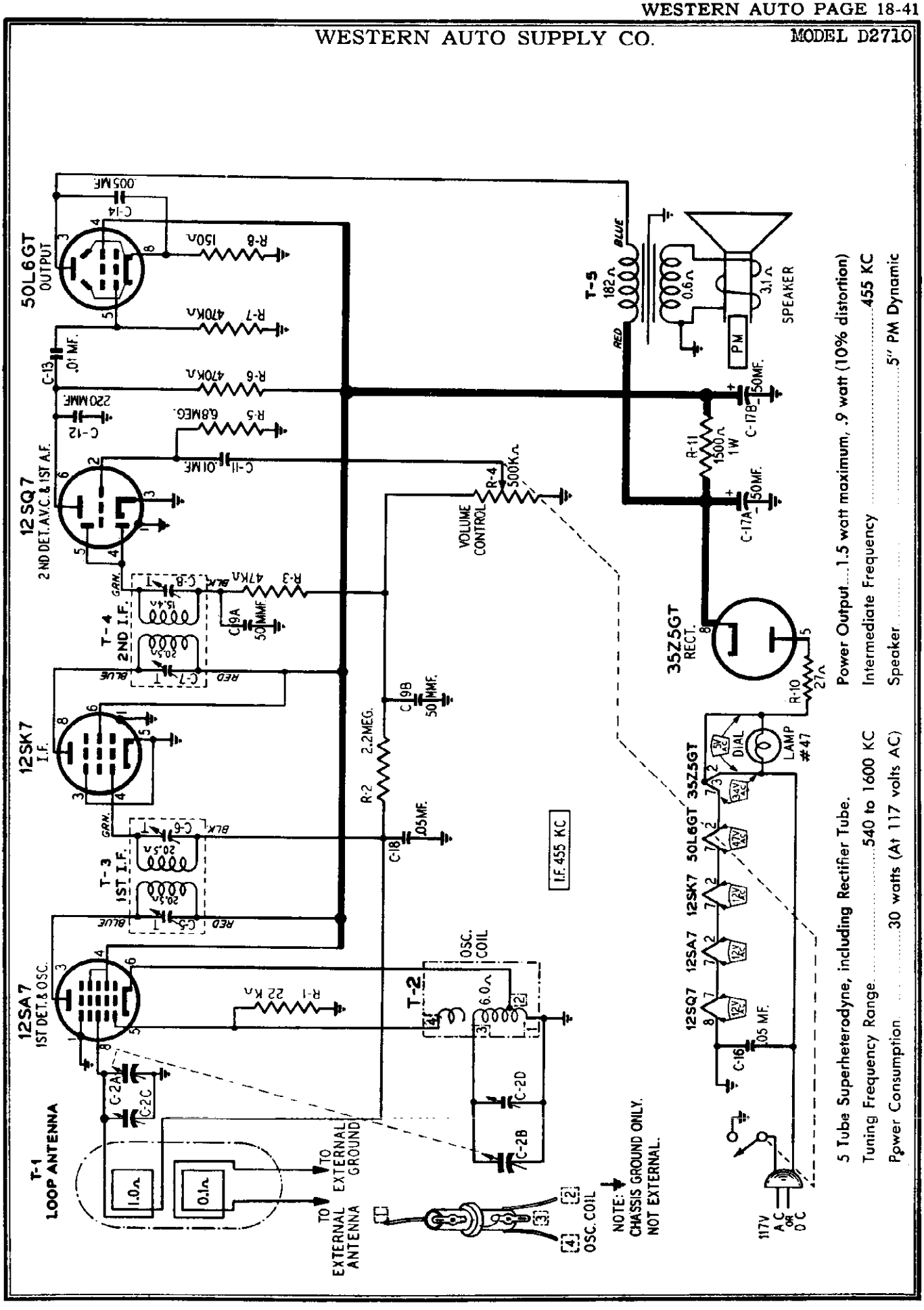
- Output meter across 3.2-ohm output load.
- Volume control at maximum.
- Align for maximum output. Reduce input as needed to keep output near 0.4 volts.
- Connect ground post of signal generator to chassis.

SIGNAL GENERATOR			*TUNER SETTING*	*ADJUST FOR MAXIMUM OUTPUT (in order shown)*
Frequency	*Dummy Antenna*	*Connection to Radio*		
455 kc	0.1 mf	Stator of antenna section of gang	Any	Trimmers on I.F. can
1590 kc	50 mmfd	Primary of antenna coil	Rotor full open (plates out of mesh)	Oscillator trimmer
1590 kc	50 mmfd	Primary of antenna coil	Rotor full open (plates out of mesh)	Antenna trimmer

TUBE LOCATION



WESTERN AUTO SUPPLY CO. MODEL D2710



5 Tube Superheterodyne, including Rectifier Tube.

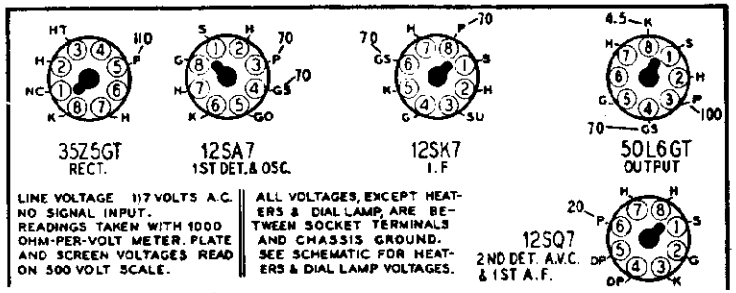
Tuning Frequency Range ..... 540 to 1600 KC

Power Consumption ..... 30 watts (At 117 volts AC)

Power Output ..... 1.5 watt maximum, .9 watt (10% distortion)

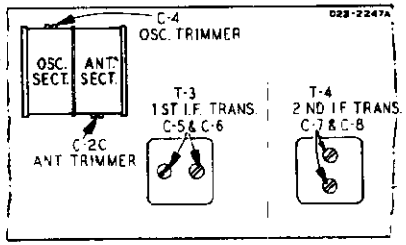
Intermediate Frequency ..... 455 KC

Speaker ..... 5" PM Dynamic

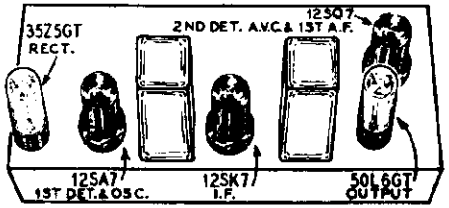


LINE VOLTAGE 117 VOLTS A.C. NO SIGNAL INPUT. READINGS TAKEN WITH 1000 OHM-PER-VOLT METER. PLATE AND SCREEN VOLTAGES READ ON 500 VOLT SCALE.

ALL VOLTAGES, EXCEPT HEATERS & DIAL LAMP, ARE BETWEEN SOCKET TERMINALS AND CHASSIS GROUND. SEE SCHEMATIC FOR HEATERS & DIAL LAMP VOLTAGES.

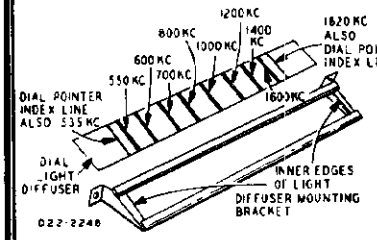


Note A—Use 1400 KC Index line on dial light diffuser. See DIAL CALIBRATION paragraph.



NOTICE: There is a model number label on the chassis. This label identifies the radio as to chassis, dial and issue letter. When ordering parts or writing, give ALL information appearing on this label.

DIAL CALIBRATION



MISCELLANEOUS

12A473		5" P.M. Speaker
		Cone and Voice Coil Assembly (Specify Part Number and Letters Stamped on Speaker)
3A303		Tube Socket (8 Prong) Molded
55X262		Cabinet, Plastic
14X411		Grille Cloth
10A297		Knob
2X289		Felt Washer
13X328		Line Cord and Plug Assembly

TRANSFORMERS AND COILS

9A1912	T-1	"B" Rnge Loop Antenna Assembly
9A1914	T-2	Oscillator Coil Assembly
9A1808	T-3	1st I-F Coil Assembly
9A1809	T-4	2nd I-F Coil Assembly
51X132	T-5	Output Transformer

CAPACITORS

14A194	C-2A, C-2B, C-2C, C-2D	Gang Condenser Assembly		
	C-5, C-6	Part of T-3 (1st I-F Coil Assembly		
	C-7, C-8	Part of T-4 (2nd I-F Coil Assembly)		
47X112	C-9A, C-9B	50-50 mmf		Dual Mica
B66103	C-11, C-13	.01 mf	200 V	Tubular
47X468	C-12	220 mmf		Molded
D66502	C-14	.005 mf	400 V	Tubular
D66503	C-16	.05 mf	400 V	Tubular
45X341	C-17A	50 mf	150 V	Dry
	C-17B	50 mf	150 V	Electrolytic
B66503	C-18	.05 mf	200 V	Tubular

RESISTORS

B84223	R-1	22,000 ohms	0.5 watt	Carbon
B85225	R-2	2.2 meg.	0.5 watt	Carbon
B85473	R-3	47,000 ohms	0.5 watt	Carbon
36X352	R-4	500,000 ohms	Volume control and switch	
B85685	R-5	6.8 meg.	0.5 watt	Carbon
B84474	R-6	470,000 ohms	0.5 watt	Carbon
B85474	R-7	470,000 ohms	0.5 watt	Carbon
B84151	R-8	150 ohms	0.5 watt	Carbon
B84270	R-10	27 ohms	0.5 watt	Carbon
C85152	R-11	1500 ohms	1.0 watt	Carbon

DIAL AND DRIVE ASSEMBLY

26A464	Pointer Bracket Assembly complete with light diffuser holder, string guide, idler pulleys, etc.
15X223	Pointer
6X21	Rubber Grommet (Mtg. gang
20X329	Cond. Cushion Stud) condenser
26X482	Drive shaft
19X192	"C" Washer
10X36	Drive cord assembly
28X95	Drive cord tension spring
7A213	Pilot light socket assembly No. 47 Pilot light
58X683	Dial
30X539	Dial clamp (upper)
30X540	Dial clamp (lower)

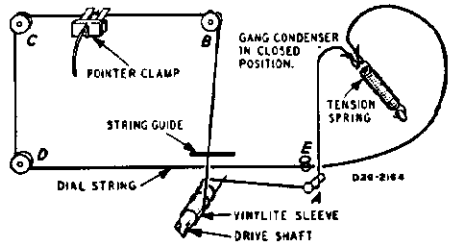
ALIGNMENT PROCEDURE

Check dial pointer position, see DIAL CALIBRATION paragraph.
Volume Control—Maximum All Adjustments.
Allow Chassis and Signal Generator to "Heat Up" for several Minutes.
The equipment in column at right is required for aligning:
Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.
Output Indicating Meter: Non-Metallic Screwdriver.
Dummy Antennas—.1 mf., 50 mmf.
Blocking Condenser—.1 mf.

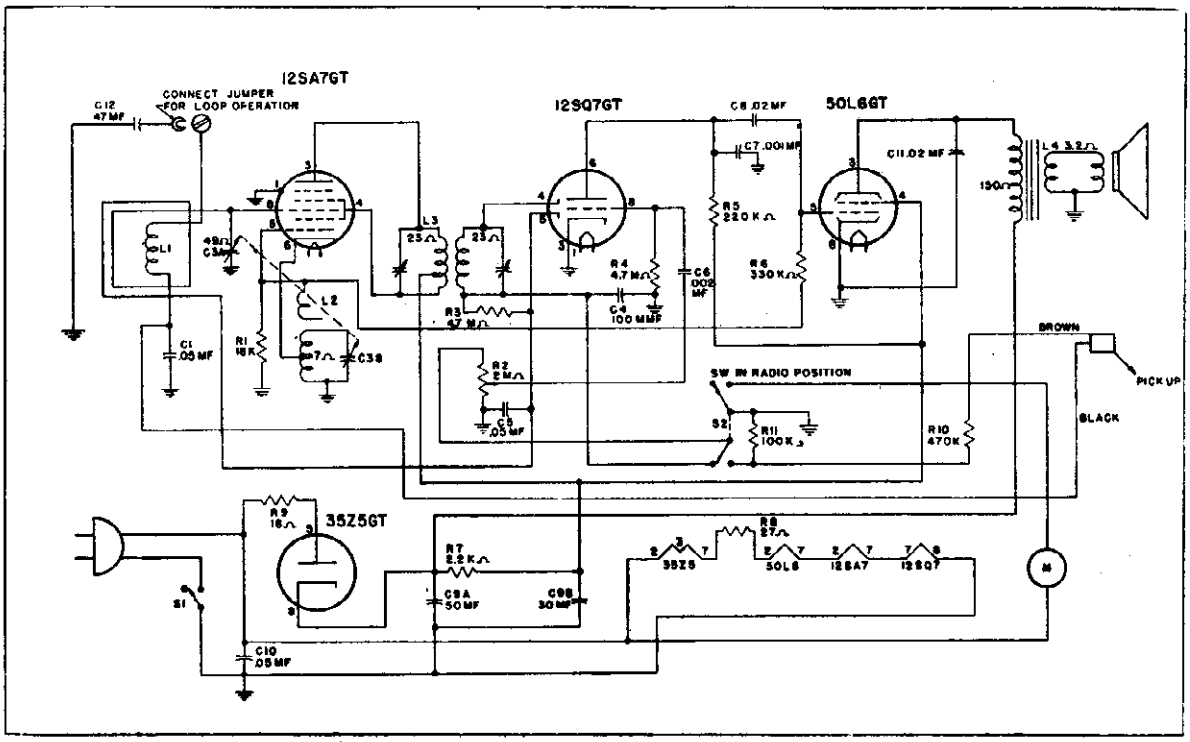
SIGNAL GENERATOR FREQUENCY SETTING	SIGNAL GENERATOR ANTENNA CONNECTION	SIGNAL GENERATOR GROUND CONNECTION	DUMMY ANTENNA	GANG CONDENSER SETTING	ADJUST TRIMMERS TO MAXIMUM (See Trimmer Illustration)
455 KC	Control Grid 12SK7—I.F. Prong No. 4	Chassis Base Through .1 mf. Condenser	.1 mf.	Turn Rotor to full open	2nd I.F. (C7) & (C8)
455 KC	Control Grid 12SA7—1st Det. Prong No. 8	Same As Above	.1 mf.	Turn Rotor to full open	1st I.F. (C5) & (C6)
1620 KC	Control Grid 12SA7—1st Det. Prong No. 8	External Ground Clip On Loop	.1 mf.	Turn Rotor to full open	Oscillator (C-4)
1400 KC	External Antenna Clip On Loop	Same As Above	50 mmf.	Turn dial to 1400 KC. See Note A	Antenna (C-2C)

DRIVE CORD REPLACEMENT

Turn the large drive pulley to the maximum counterclockwise position. Use a new 10x36 drive cord assembly or a piece of cord 53 inches long and tie one end to the tension spring and fasten the other end of the spring to the drive pulley. Install the cord as shown in the illustration. Wind 2¾ turns counterclockwise around the tuning shaft with the turns progres-



WESTERN AUTO SUPPLY CO. MODEL D2743



REPLACEMENT PARTS LIST

When ordering, specify part number, model number, and manual issue

Ref. No.	*Part No.*	*Description*
		Capacitors
C1-C10		Paper, .05 mfd 400 volts
C6		Paper, .002 mfd 400 volts
C8-C11		Paper, .02 mfd 400 volts
C5		Paper, .05 mfd 200 volts
C7		Paper, .001 mfd 500 volts
C4		Ceramic 100 mmfd 500 volts
C12		Ceramic 47 mmfd 500 volts
C3	1675	Variable Air—2 gang
C9	2073	Electrolytic, 50-30 mfd 150 volts
		Resistors
R2	2480	Control, volume with switch, 2 meg-ohms
R1		18,000 ohms, ¼ watt
R3, R4		4.7 meg ohms, ¼ watt
R5, R10		220,000 ohms, ¼ watt
R6		330,000 ohms, ¼ watt
R7		2200 ohms, 2 watts
R8		27 ohms, ½ watt
R9		18 ohms, ½-watt
R11		100,000 ohms, ¼ watt

Ref. No.	*Part No.*	*Description*
		Coils and Transformers
L1	28186	Back cover with loop
L2	28184	Oscillator coil
L3	3376	I.F. transformer
L4	1300	Output transformer
		Miscellaneous
		Cord, line 6 ft.
	39160	Knob, tuning
	39161	Knob, volume or phono radio
	5877	Speaker
	T470	Cabinet, wood
	54314	Tuning knob washer
		Phono-needle
	346-5	Walsco back clips
	18110	Sockets, wafer octal
	3828	Switch, phono-radio
		Phono motor and 8-inch turntable
		Phono crystal, L-26

ALIGNMENT PROCEDURE

(Refer to Chassis View)

- Output meter across 3.2-ohm output load.
- Volume control at maximum.
- Align for **maximum output. Reduce input as needed to keep output near 0.4 volts.**
- Connect ground post of signal generator to chassis.

SIGNAL GENERATOR			*TUNER SETTING*	*ADJUST FOR MAXIMUM OUTPUT (in order shown)*
Frequency	*Dummy Antenna*	*Connection to Radio*		
455 kc	0.1 mf	Stator of antenna section of gang	Any	**Trimmers** on I.F. can
1590 kc	* *	* *	Rotor full open (plates out of mesh)	**Oscillator trimmer**
1590 kc	* *	* *	Rotor full open (plates out of mesh)	Antenna trimmer

* Run a wire from output terminal of the generator near the receiver. However, no connection is made between the signal generator and the receiver.

TECHNICAL DATA

Tuning range ..... 530 to 1600 kc

Intermediate frequency ..... 455 kc

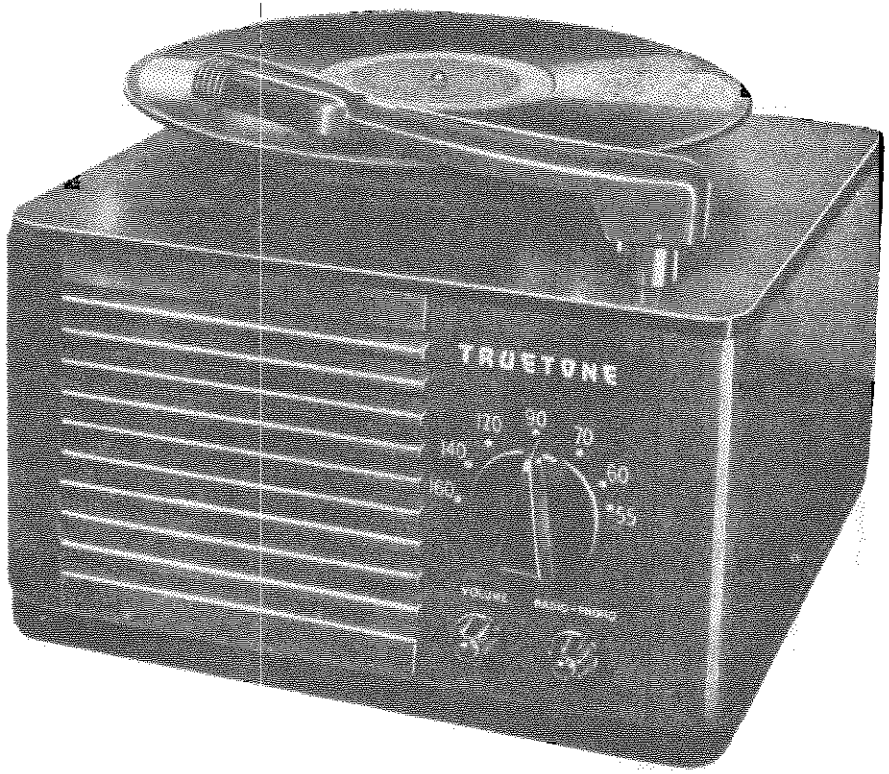
Power consumption ..... 30 watts

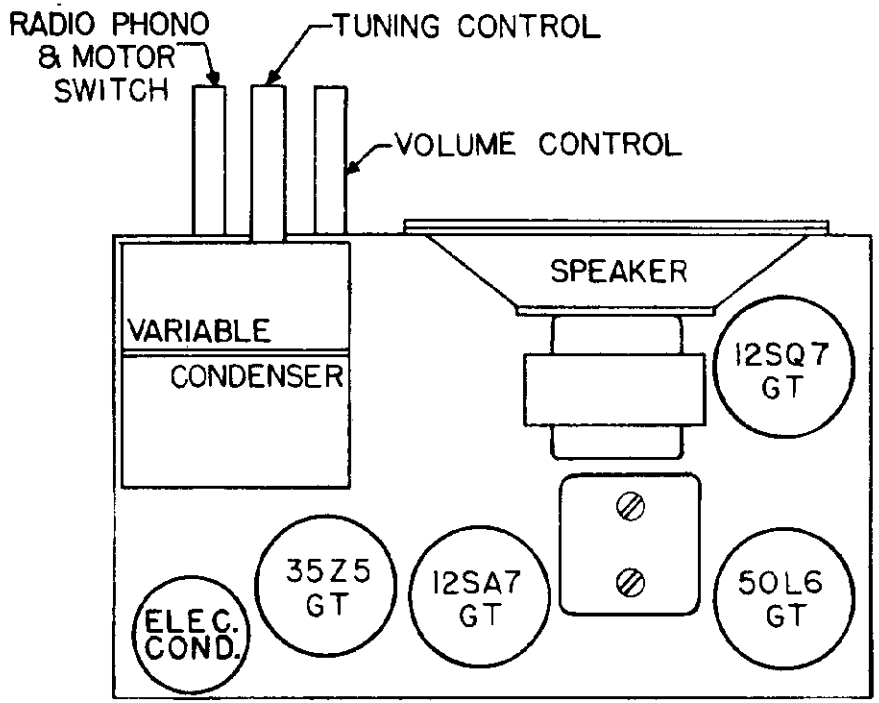
Selectivity ..... 1. A.C.A.—3 to 1. 2. A.C.A.—12.5 to 1

Sensitivity (for 0.5 watt output):
- Loop ..... 8000 microvolts per meter average
- Antenna ..... 800 microvolts average

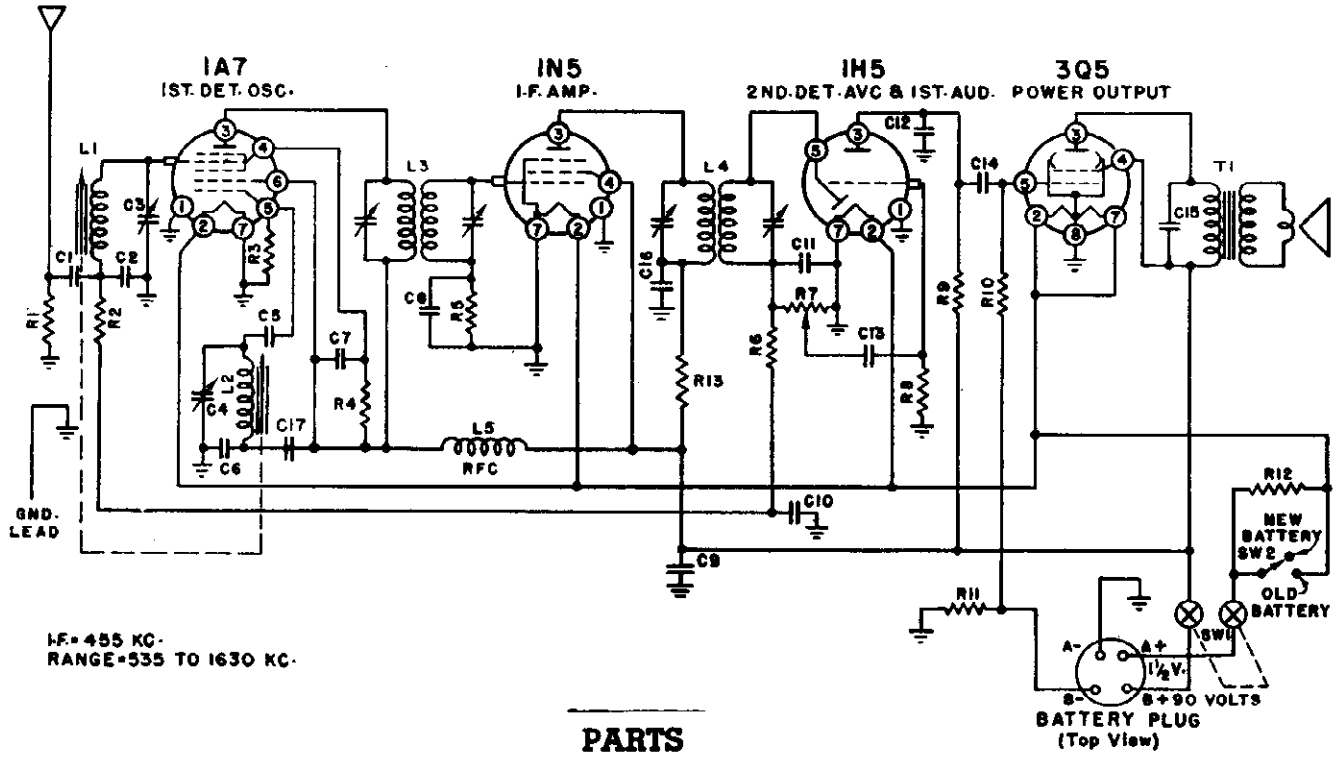
Power output (in voice coil):
- Undistorted ..... 0.8 watts
- Maximum ..... 2.5 watts

TUBE LOCATION





WESTERN AUTO SUPPLY CO. MODEL D2762



PARTS

CONDENSERS

Symbol	Description	Part No.
C1	Paper, .01 mfd. 400 Volts	64B1-25
C2	Mica, .0008 mfd. ±10%	65B5-31
C3, C4	Trimmer, Antenna / Trimmer, Oscillator	66A23-1
C5	Mica, .0001 mfd. ±20%	65B7-17
C6	Mica, .0008 mfd. ±10%	65B5-31
C7	Paper, .01 mfd., 400 Volts	64B1-25
C8	Paper, .002 mfd., 600 Volts	64B1-14
C9	Elect., 4. mfd., 150 Volts	67A4-2
C10	Paper, .05 mfd., 200 Volts	64B1-32
C11	Mica, .00025 mfd. ±20%	65B7-22
C12	Mica, .00025 mfd. ±20%	65B7-22
C13	Paper, .01 mfd. 400 Volts	64B1-25
C14	Paper, .01 mfd. 400 Volts	64B1-25
C15	Paper, .005 mfd., 600 Volts	64B1-12
C16	Paper, .01 mfd., 400 Volts	64B1-25
C17	Paper, .01 mfd., 400 Volts	64B1-25

RESISTORS

R1	15,000 ohm ±10%, ½w	60B8-153
R2	470,000 ohm ±10%, ¼w	60B2-474
R3	220,000 ohm ±10%, ½w	60B8-224
R4	33,000 ohm ±10%, ½w	60B8-333
R5	4,700,000 ohm ±10%, ¼w	60B2-475
R6	2,200,000 ohm ±10%, ¼w	60B2-225
R7	1 Megohm Volume Control and Switch	75B1-1
R8	4,700,000 ohm ±10%, ¼w	60B2-475
R9	1,000,000 ohm ±10%, ¼w	60B2-105
R10	1,000,000 ohm ±10%, ¼w	60B2-105
R11	390 ohm ±10%, ¼w	60B2-391
R12	0.75 ohm ±10%, ½w (wire)	61A2-1
R13	2200 ohm ±10%, ¼w	60B2-222

TRANSFORMERS and COILS

L1	Antenna Coil	AC105-1
L2	Oscillator Coil	A1020
L3	1st I.F. Transformer	72B5
L4	2nd I.F. Transformer	72B6
L5	Choke Coil (RF)	AB103-1
T1	Output Transformer	98A5

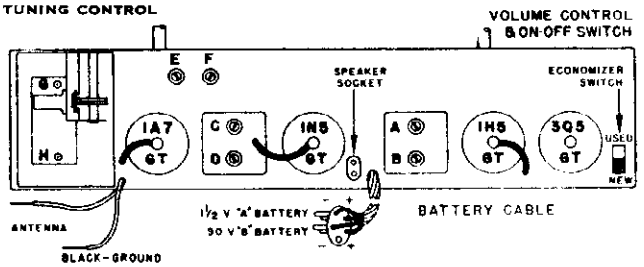
MISCELLANEOUS

Description	Part No.
Background, Dial	X22C5-1
Cabinet, D2762 (Plastic)	34D9
Cable, Battery (complete with plug)	A1026
Cap, Grid	90A1-2
Clip, Dial Glass	18A2
Cord, Dial (5" on tuner and 63" on dial drive)	50A1-3
Dial Scale, Glass	21B24
Drum and Hub, Tuning	A1035
Grille Cloth	36B3-1
Iron Slug, with wire (Oscillator)	71B1-3
Iron Slug, with wire (Antenna)	71B1-4
Knob	33A10-2
Plug, Battery, 5 Prong	88A4-4
Pointer, Dial	25A9-1
Pulley, Fibre Dial	17A1-3
Screw Studs (for iron cores)	27A4
Shaft, Tuning	28A1-1
Shaft and Pulley (Tuner)	A1040
Shield, Tube	87A8
Socket, Octal Tube	87A5-1
Socket, Speaker	87A4-3
Speaker and Output Transformer	78B15-2
Speaker Guard	36A5-2
Spring, Dial Drum Cord Tension	19B1-7
Spring, Hairpin (To hold Ant. or Osc. Coils)	19A3-1
Spring, Tuner Slide Cord Tension	19A1-4
Spring, Tuner, back bearing takeup	19A6
Spring, Tuner, front bearing takeup	19A5
Spring, Tuner Slide Pressure	18A9
Switch, SPST (Economizer) SW2	77B1-6 or 77B1-15
Washer, C	4A4-1
Washer, spring (coils)	4A6-12-0
Washer, spring (shaft)	4A6-3-0

MODEL D2762 WESTERN AUTO SUPPLY CO.

ALIGNMENT PROCEDURE

- **IMPORTANT—Check to see that dial pointer reaches each end of dial scale when Station Selector Control is turned from one end to the other.**
- **Volume control—Maximum for all adjustments.**
- **Connect dummy antenna valve in series with generator with a short heavy lead.**
- **Connect dummy antenna valve in series with generator output lead, when needed (see below).**
- **Connect output meter across voice coil of speaker.**
- **Allow chassis and signal generator to warm up for several minutes.**



- **Use lowest Output setting of Signal Generator capable of producing adequate Output Meter indication and then proceed as indicated in the chart below.**

Band	Signal Generator Frequency	Dummy Antenna	Connection to Radio	Receiver Dial Setting	Trimmers Adjusted (In Order Shown)	Trimmer Function	Type of Adjustment
I. F.	455 KC.	.1 MFD.	Grid of 1A7 (Cap)	High frequency end of dial	C-D—2nd I.F.	Output I.F.	Adjust to maximum output
	455 KC.	.1 MFD.	Grid of 1A7 (Cap)	High frequency end of dial	A-B—1st I.F.	Input I.F.	Adjust to maximum output
BROAD-CAST	1630 KC.	.0002 MFD.	Antenna Lead	High frequency end of dial	E—(See note below) F—(See note below)	Oscillator Antenna	Adjust to maximum output
	1300 KC.	.0002 MFD.	Antenna Lead	1300 KC.	G H	Oscillator Antenna	Adjust to maximum output

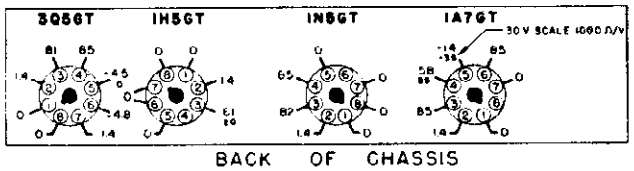
NOTE: Before adjusting trimmers "E" and "F", make sure that each iron core is 1⅜" or more outside of its coil form. If necessary, turn adjustments "G" and "H" to accomplish this.

VOLTAGE DATA

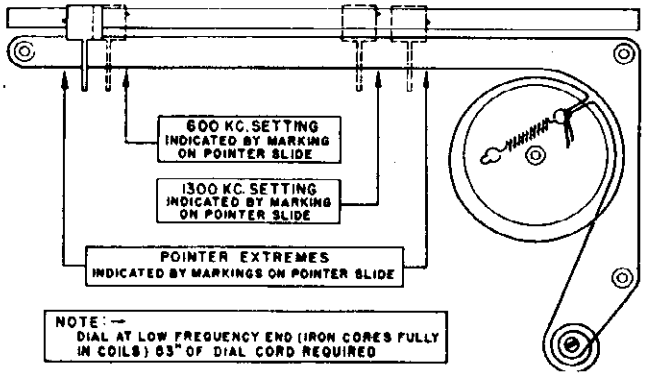
All readings made between tube socket terminals and chassis. Voltages indicated have been obtained using a Vacuum Tube Voltmeter. A second voltage reading is shown made with a 1000 ohm-per-volt meter, when use of this instrument would result in appreciably lower readings. The voltages were measured using a fresh battery, volume control full on, dial at the high frequency end, and no signal.

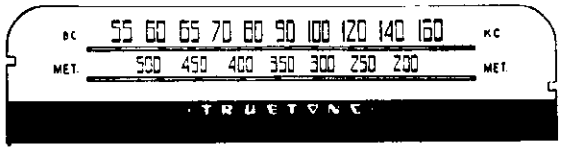
1A7—1st Det. Osc. 1H5—2nd Det., A.V.C. and 1st Audio.
1N5—I. F. Amplifier 3Q5—Power Output.

VOLTAGE CHART BOTTOM VIEW



POINTER SETTINGS AND DIAL CORD STRINGING

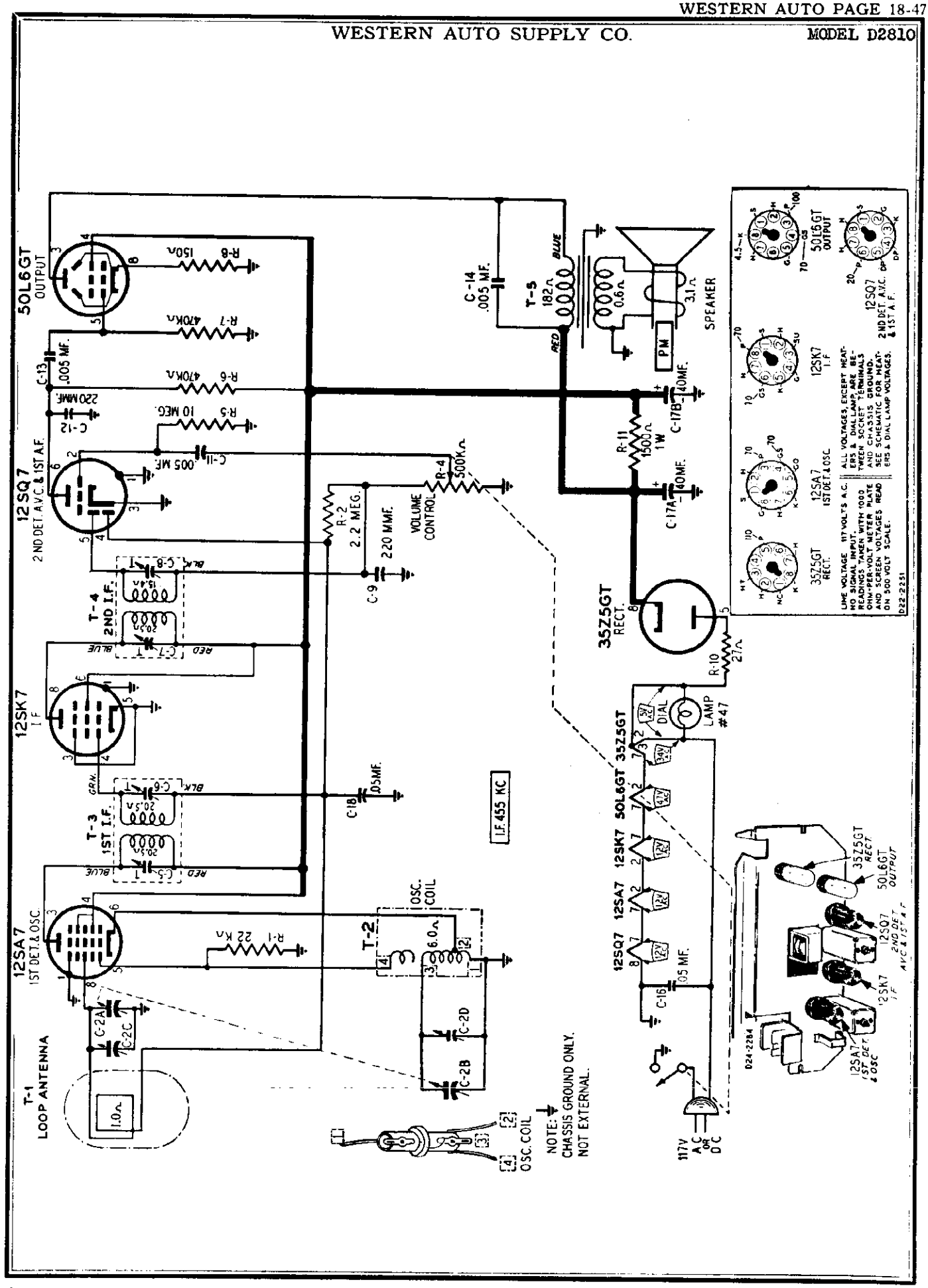




POWER SUPPLY

This receiver is designed to operate on a single unit Ensign AB48, Ray-O-Vac No. AB-82, Burgess 17G-D60, Eveready 748, Bond 0528 or General 60DL-11L Battery. No other batteries are required as this battery is a combination 90 volt "B" battery and a 1½ volt "A" battery. The life of this battery is approximately 750 hours. The "A" and "B" sections are so proportioned that equal life may be expected from both. The "A" section will give satisfactory performance as low as 1.2 volts and the "B" section as low as 68 volts. This battery life may be expected with an average usage of several hours daily. If the reception becomes weak when the Economizer Switch is in the "USED" position, a new battery should be installed. A battery compartment is provided in the rear of the cabinet, and the battery cable simply plugs into the battery.

WESTERN AUTO SUPPLY CO. MODEL D2810



MODEL D2810 WESTERN AUTO SUPPLY CO.

SPECIFICATIONS

Power Output....1.5 watt maximum, .9 watt (10% distortion)
Intermediate Frequency.....455 KC
Speaker.....5" PM Dynamic

5 Tube Superheterodyne, including Rectifier Tube.
Tuning Frequency Range.....540 to 1600 KC
Power Consumption.....30 watts (At 117 volts AC)

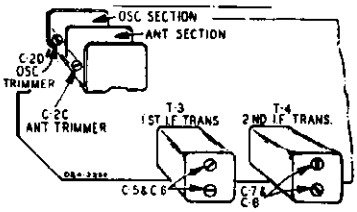
ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.
Allow Chassis and Signal Generator to "Heat Up" for several Minutes.

The equipment in column at right is required for aligning:

Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.
Output Indicating Meter: Non-Metallic Screwdriver.
Dummy Antennas—.1 mf., 50 mmf.
Blocking Condenser—.1 mf.

SIGNAL GENERATOR					
FREQUENCY SETTING	ANTENNA CONNECTION	GROUND CONNECTION	DUMMY ANTENNA	GANG CONDENSER SETTING	ADJUST TRIMMERS TO MAXIMUM (See Trimmer Illustration)
455 KC	Control Grid 12SK7—I.F. Prong No. 4	Chassis Base Through .1 mf. Condenser	.1 mf.	Turn Rotor to full open	2nd I.F. (C7) & (C8)
455 KC	Control Grid 12SA7—1st Det. Prong No. 8	Same As Above	.1 mf.	Turn Rotor to full open	1st I.F. (C5) & (C6)
1620 KC	Control Grid 12SA7—1st Det. Prong No. 8	Same as Above	.1 mf.	Turn Rotor to full open	Oscillator (C-2D)
1400 KC	Reassemble chassis in cabinet See Note B	Same As Above	50 mmf.	Set pointer to 1400 KC. See Note A	Antenna (C-2C)

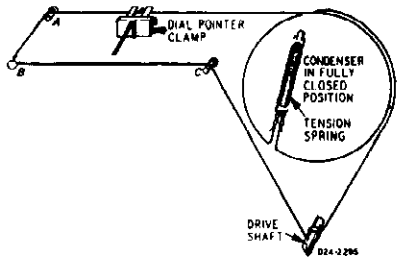


Note A—Attach pointer to drive cord and position at 1400 KC mark on dial scale.

Note B—Wind 2 turn loop of heavy enameled wire 6" diameter. Connect to signal generator. Place loop of wire 6" from loop on set and in the same plane.

DRIVE CORD REPLACEMENT

Turn the large drive pulley to the fully closed position. Use a new 10X66 drive cord assembly or a piece of cord 45 inches long and fasten one end to the tension spring and fasten the other end of the spring to the drive pulley. Install the cord as shown in the illustration. Wind 2¾ turns counterclockwise around the tuning shaft with the turns progressing toward the front of the chassis. After string is installed, stretch the tension spring and fasten free end of cord to spring.



REPLACEMENT PARTS LIST

NOTICE: There is a model number label on the chassis. This label identifies the radio as to chassis, dial and issue letter. When ordering parts or writing, give ALL information appearing on this label.

MISCELLANEOUS

			LIST PRICE
12A479		5" PM Speaker	$4.40
3A435		Molded Octal Tube Socket	.15
55X321		Cabinet, Plastic	4.90
14X411		Grille Cloth	.25
10A297		Knob	.10
13X328		Line Cord and Plug Assembly	.85

TRANSFORMERS AND COILS

T-1	9A1943	Loop Antenna Assembly	1.35
T-2	9A1914	Oscillator Coil Assembly	.85
T-3	9A1941	1st I-F Trans. Assembly	1.65
T-4	9A1942	2nd I-F Trans. Assembly	1.65
T-5	51X135	Output Transformer	1.50

R-4	36X373	500 K	Volume Control & Switch	
R-5	B85106	10 meg	0.5	Carbon
R-6, R-7	B84474	470 K	0.5	Carbon
R-8	B83151	150	0.5	Carbon
R-10	B83270	27	0.5	Carbon
R-11	C85152	1500	1.0	Carbon

DIAL AND DRIVE ASSEMBLY

15X242	Pointer
26X508	Drive Shaft
19X192	"C" Washer
10X66	Drive Cord Assembly
28X113	Drive Cord Tension Spring
7A217	Pilot Light Socket Assembly
7A103	No. 47 Pilot Light
58X701	Dial Glass

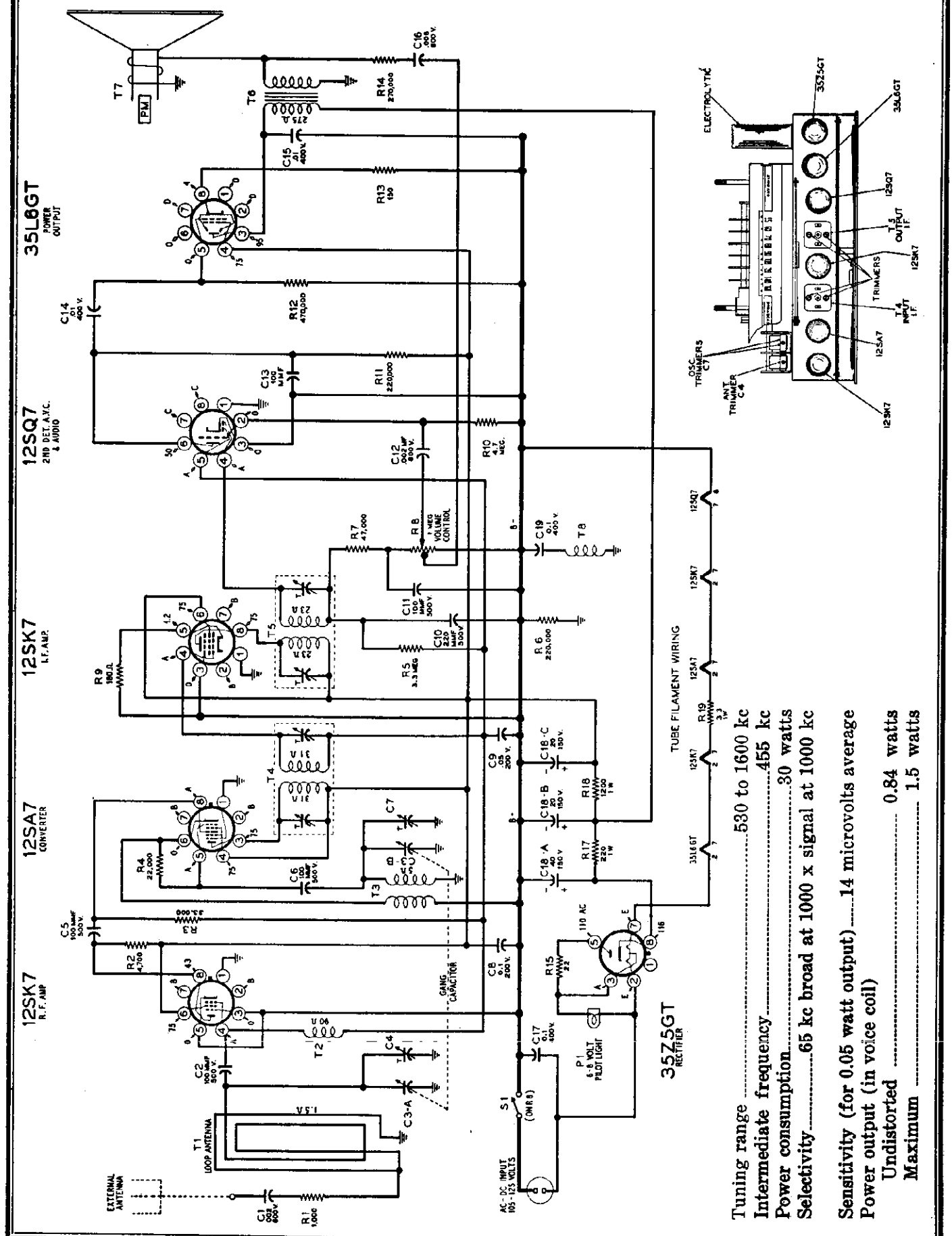
CAPACITORS

C-2A, C-2B } C-2C, C-2D }	14A199	Gang Condenser Assembly	
C-5, C-6		Part of T-3 (1st I-F Trans. Assembly)	
C-7, C-8		Part of T-4 (2nd I-F Trans. Assembly)	
C-9, C-12	47X468	220 mmf	Molded
C-11, C-13	B66502	.005 mf 200 V	Tubular
C-14	D66502	.005 mf 400 V	Tubular
C-16	D66503	.05 mf 400 V	Tubular
C-17A } C-17B }	45X363	40 mf 150 V Dry 40 mf 150 V Electrolytic Con.	
C-18	B66503	.05 mf 200 V	Tubular

RESISTORS

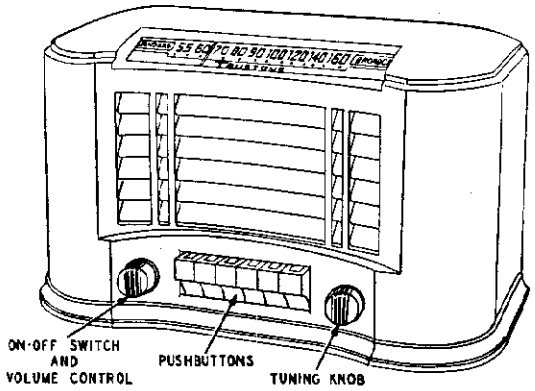
		OHMS	WATTS	
R-1	B84223	22 K	0.5	Carbon
R-2	B85225	2.2 meg.	0.5	Carbon

WESTERN AUTO SUPPLY CO. MODEL D2815



Tuning range ..... 530 to 1600 kc
Intermediate frequency ..... 455 kc
Power consumption ..... 30 watts
Selectivity ..... 65 kc broad at 1000 x signal at 1000 kc

Sensitivity (for 0.05 watt output) ..... 14 microvolts average
Power output (in voice coil)
Undistorted ..... 0.84 watts
Maximum ..... 1.5 watts

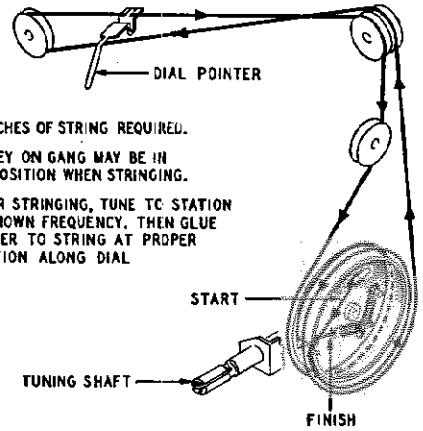


ALIGNMENT PROCEDURE

(Refer to Chassis View)

- Output meter across 3.2-ohm output load.
- Volume control at maximum.
- Connect ground post of signal generator to B— of radio.
- Align for maximum output. Reduce input as needed to keep output near 0.4 volts.

SIGNAL GENERATOR			*TUNER SETTING*	*ADJUST FOR MAXIMUM OUTPUT (in order shown)*
Frequency	*Dummy Antenna*	*Connection to Radio*		
455 kc	0.1 mf	Stator of antenna section of gang	Rotor full open (plates out of mesh)	Trimmers on output and input I.F. cans
1600 kc	0.1 mf	Stator of antenna section of gang	Rotor full open (plates out of mesh)	Oscillator trimmer C7
1400 kc	200 mmf	External antenna clip	1400 kc	Antenna trimmer C4



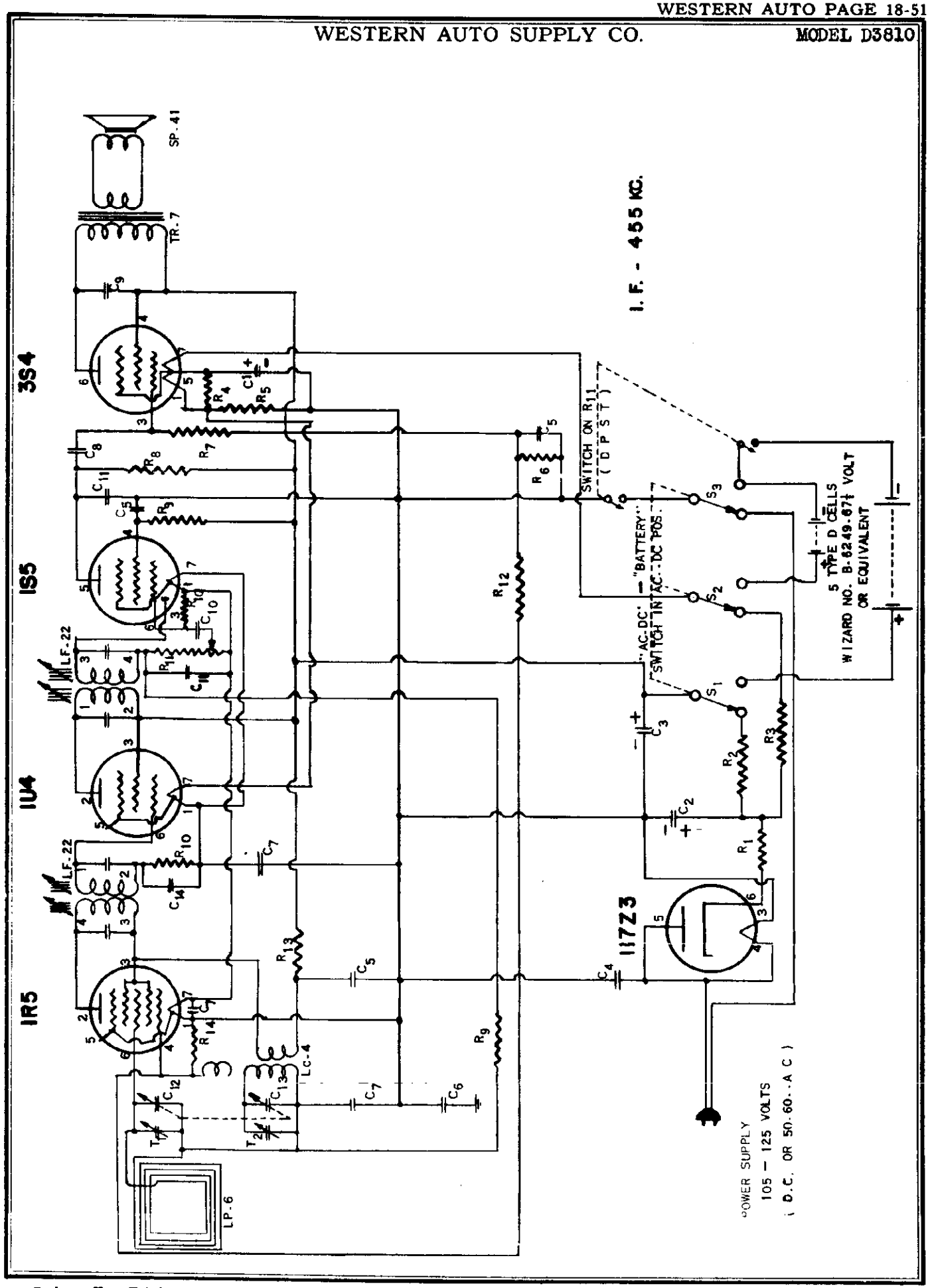
COILS AND TRANSFORMERS

T1	C-201-10908-1	Loop antenna assembly (includes cabinet back, capacitor C1 and resistor R1) Specify color
T2	A-16A-10792	R.F. choke coil
T3	A-13D-10661	Oscillator coil
		or
	A-13D-12082	Oscillator Coil
T4	B-13B-10091-1	Input I.F. transformer complete in can. Range of trimmers: 45-85 mmf each.
T5	B-13B-10092-1	Output I.F. transformer complete in can. Range of trimmers: 43-79 mmf each.
	B-2H-12121	Shield can—Fits over can on output I.F. coil above.
T6	B-12C-10623	Output transformer for speaker
T7	A-16A-12164	I.F. choke coil

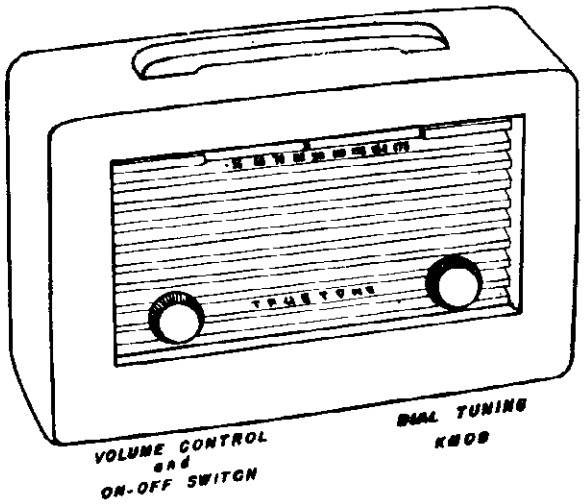
Ref. No.	*Part No.*	*Description*
		CAPACITORS*
C3A,B, C4,C7	B-8A-10827	Two gang condenser assembly, including antenna and oscillator trimmers. Range of gang: 15-452 mmf (ant.), 10-162 mmf (osc.).
C18-A,B,C	A-8C-10077	Electrolytic, for 60 cycles; 40 mf x 150 volts, 20 mf x 150 volts, 20 mf x 150 volts.
C9	C-8D-10770	.05 mf x 200 volts tubular.
C8	C-8D-10771	.1 mf x 200 volts tubular.
C17-19	C-8D-10760	.1 mf x 400 volts tubular.
C16	C-8D-10785	.006 mf x 600 volts tubular.
C1,12	C-8D-10773	.002 mf x 600 volts tubular.
C14,15	C-8D-10761	.01 mf x 400 volts tubular.
C10	C-8F3-10	220 mmf x 500 volts mica.
C2,5,6,11,13	C-8F3-8	100 mmf x 500 volts mica.
		RESISTORS*
R8,S1	A-10A-11603	Volume control (1 megohm) and switch
R2	C-9B1-70	4700 ohms, ½ watt, 10%
R4	C-9B1-78	22K ohms, ½watt, 10%
R5	C-9B1-34	3.3 megohms, ½ watt, 20%
R11	C-9B1-90	220K ohms, ½ watt, 10%
R3	C-9B1-80	33K ohms, ½ watt, 10%
R14	C-9B1-91	270K ohms, ½ watt, 10%
R9	C-9B1-53	180 ohms, ½ watt, 10%
R15	C-9B1-3	22 ohms, ½ watt, 20%
R18	C-9B2-62	1200 ohms, 1 watt, 10%
R19	C-9B2-44	33 ohms, 1 watt, 10%
R12	C-9B1-94	470K ohms, ½ watt, 10%
R7	C-9B1-82	47K ohms, ½ watt, 10%
R17	C-9B2-54	220 ohms, 1 watt, 10%
R10	C-9B1-35	4-7 megohms, ½ watt, 20%
R13	C-9B2-52	150 ohms, ½ watt, 10%
R6	C-9B1-90	220K ohms, ½watt, 10%
R1	C-9B1-62	100 ohms, ½ watt, 10%

Ref. No.	*Part No.*	*Description*
		DIAL AND TUNING PARTS
	B-6D-13065-1	Dial scale
	A-6A-10609	Diffuser
	B-2M-7758	Snap-in rivet, for diffuser (2 used)
	A-2G-10639	Dial pointer
	B-53A-10939	String for dial pointer (60").
	A-49A-10837	Spring for dial pointer string
	A-55A-10093	Socket assembly, for dial light
P1	A-46A-10793	Dial light bulb, 6-8 volts, T-47
	A-3C-10641	Spacer, brass (on extreme left)
	A-3C-10640	Spacer, brass (5 used)
	A-2C-10658	Cam
	A-2C-10611	Washer, D-D, on sides of cams
	29E-1812	Spring washer, on cam shaft
	A-3F-10656	Locking screw for cams
	A-2C-10654	Retainer yoke
	A-2C-10655	Cam yoke
	A-2L-10610	Stop arm
	200-10653	Lever assembly (arm and roller)
	A-2C-10607	Gear segment
	A-3B-10643	Gear bushing
	A-3C-10636	Coupling pin on gear segment
	A-49A-10646	Drum spring, on gear coupling pin
	A-3A-10651	Tuning shaft
	A-3L-7192	Pinion gear on tuning shaft
	A-49A-12403	Lever spring
		MISCELLANEOUS
T7	B-18A-10647	P.M., 6" x 4' oval
	A-15B-10440	Socket, octal (for all tubes but 12SK7)
	A-15C-11201	Socket, octal, laminated (for 12SK7)
	B-15B-10076	Mounting plate, for electrolytic
	B-14M-13395	Line cord and plug
	B-2M-11205	Snap-in rivets, for mounting back (4 used)
	A-2M-10096	Split tee-pins, for mounting back (2 used)
	5C-10010-36	Cabinet, Walnut
	B-5B-10016-37	Knob, volume and tuning, walnut
	B-5A-10648-37	Pushbutton, walnut
	A-25B-10736	Rubber feet for cabinet
	A-23L-10934	Station call letters, one set
	A-6C-10819	Acetate tabs, for pushbuttons
	A-2H-10715	Tube shield (used with metal-base 12SA7GT tube)
	A-2H-11271	Tube shield (used with bakelite-base 12SA7GT tube)

WESTERN AUTO SUPPLY CO. MODEL D3810



MODEL D3810 WESTERN AUTO SUPPLY CO.



ALIGNMENT PROCEDURE

- Output meter across 3.5 ohm output load.
- Volume control at maximum for all adjustments.
- Align for maximum output. Reduce input as needed to keep output near 0.4 volts.

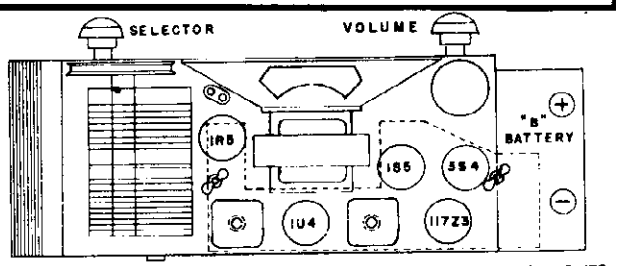
SIGNAL GENERATOR				*SETTING TUNER*	*ADJUST TRIMMERS TO MAXIMUM OUTPUT (in order shown)*
Frequency	*Coupling Factor*	*Connection to Receiver*	*Ground Connection*		
455 kc	.1 mfd	1R5 Grid	B—	Rotor full open (Plates out of mesh)	Input and output trimmers on IF cans
1700 kc	.1 mfd	1R5 Grid	B—	Rotor full open (Plates out of mesh)	Oscillator trimmer T2
1500 kc		Radiating Loop		1500 kc*	Antenna trimmer T1

* Five markings on the dial bracket represent respectively 530 kc., 600 kc., 1000 kc., 1500 kc., and 1700 kc., reading from left to right. These points are to be used for the alignment of the receiver.

POWER SUPPLY

This receiver is designed to operate on either an A.C. or D.C. power supply. The following operation ratings should be observed:

Voltages.....105 - 125 Volts, A.C. or D.C.

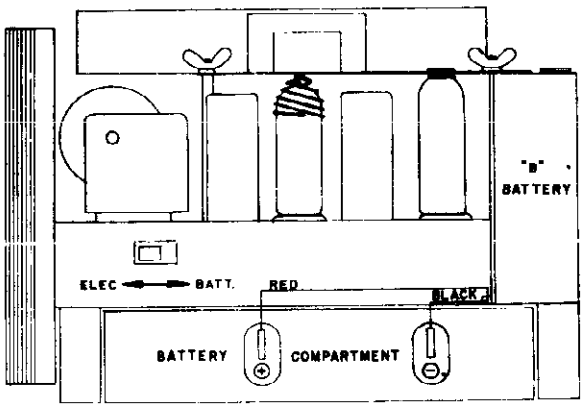


TO REPLACE TUBES, UNSCREW WING NUTS, AND REMOVE TUBE SPRING PLATE

The battery supply to be used with this receiver is as follows:

"A" supply ..... 7½ volts. Use five type "D" flashlight cells; Wizard No. B-6732 or Burgess No. 2 or Eveready No. 950 or equivalent.

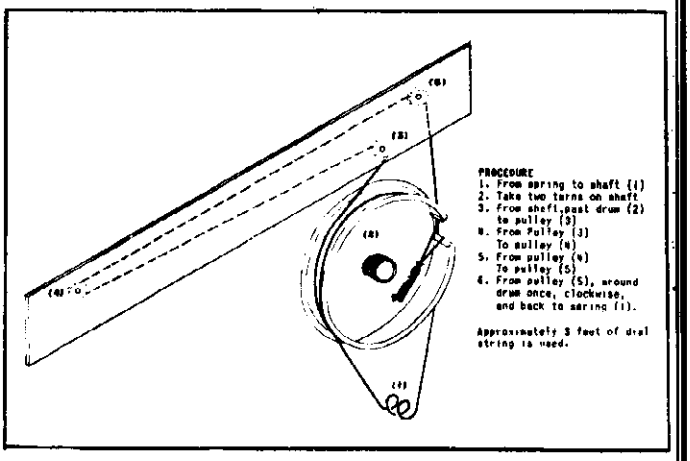
"B" supply ..... 67½ volts. Use Wizard No. B-6249 or Burgess No. XX45 or Eveready No. 467 or equivalent.



WESTERN AUTO SUPPLY CO. MODEL D3810

ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts DC or 50-60 cycles AC 15 watts
Batteries	A—7½ volts. 50 ma. B—67½ volts. 8 ma. average.
Frequency Range	530 to 1700 kc.
Intermediate Freq.	455 kc.
Tuning	Two-gang capacitor
Antenna	Built-in loop
Speaker	4 inch PM; voice coil Impedance 3.5 ohms.
Power Output	80 milliwatts undistorted 140 milliwatts maximum
Sensitivity	500 microvolts per meter for 50 milliwatt output
Selectivity	55 kc broad at 1000 times signal at 1000 kc.



Replacement of Drive Cord

REPLACEMENT PARTS LIST

When ordering parts, specify part number, model number and series.

CAPACITORS

Ref. No.	*Part No.*	*Description*
C1, C2, C3,	CE 12	{125 mfd, 10 volt} Electrolytic {25 mfd, 150 volt} condenser
C4	CP 503-5	.05 mfd, 400 volt, paper
C5	CP 103-2	.01 mfd, 150 volt, paper
C6	CP 104-2	.1 mfd, 200 volt, paper
C7	CP 503-2	.05 mfd, 150 volt, paper
C8	CP 202-3	.002 mfd, 200 volt, paper
C9	CP 502-2	.005 mfd, 400 volt, paper
C10	CP 102-3	.001 mfd, 200 volt, paper
C11	CM 101-1	.0001 mfd, 300 volt, mica
C12, C13	CV 10	Variable condenser, 2 gang
C14	CP 103-4	.01 mfd, 100 volt, paper

RESISTORS

R1	RC 180-1	18 ohms,	½ watt 20%
R2	RC 682-5	6800 ohms,	1 watt 10%
R3	RP 3	7650 ohms,	10 watt 5%
R4	RC 471-1	470 ohms,	½ watt 20%
R5	RC 821-2	820 ohms,	½ watt 10%
R6	RC 274-2	270,000 ohms,	½ watt 10%
R7	RC 225-1	2.2 megohms,	½ watt 20%
R8	RC 105-1	1 megohm,	½ watt 20%
R9	RC 335-1	3.3 megohms,	½ watt 20%
R10	RC 106-1	10 megohms,	½ watt 20%
R11	VC 6	1 meg·vol. control with switch	
R12	RC 105-2	1 megohm,	½ watt 10%
R13	RC 153-1	15,000 ohms,	½ watt 20%
R14	RC 104-2	100,000 ohms,	½ watt 10%

Ref. No.	*Part No.*	*Description*

COILS AND TRANSFORMERS

	LC-4	Oscillator coil
	LF-22	IF transformer
	LP- 6	Loop antenna
	TR- 7	Output transformer

MISCELLANEOUS

S1, S2, S3	SW-10	Three Pole Single Throw Switch
	SP-41	4 inch P.M. speaker
	PN-6	Pointer
	CR-2	Drive cord
	SG-1	Spring for drive cord
	KN-20-4	Knob
	BK- 20	Cabinet back (with hardware)
	CB-104A	Assembled cabinet (without back and handle)
	HA-2	Handle for cabinet (with springs and pins)
	AS-1	Assembled battery box

MODEL D4630A

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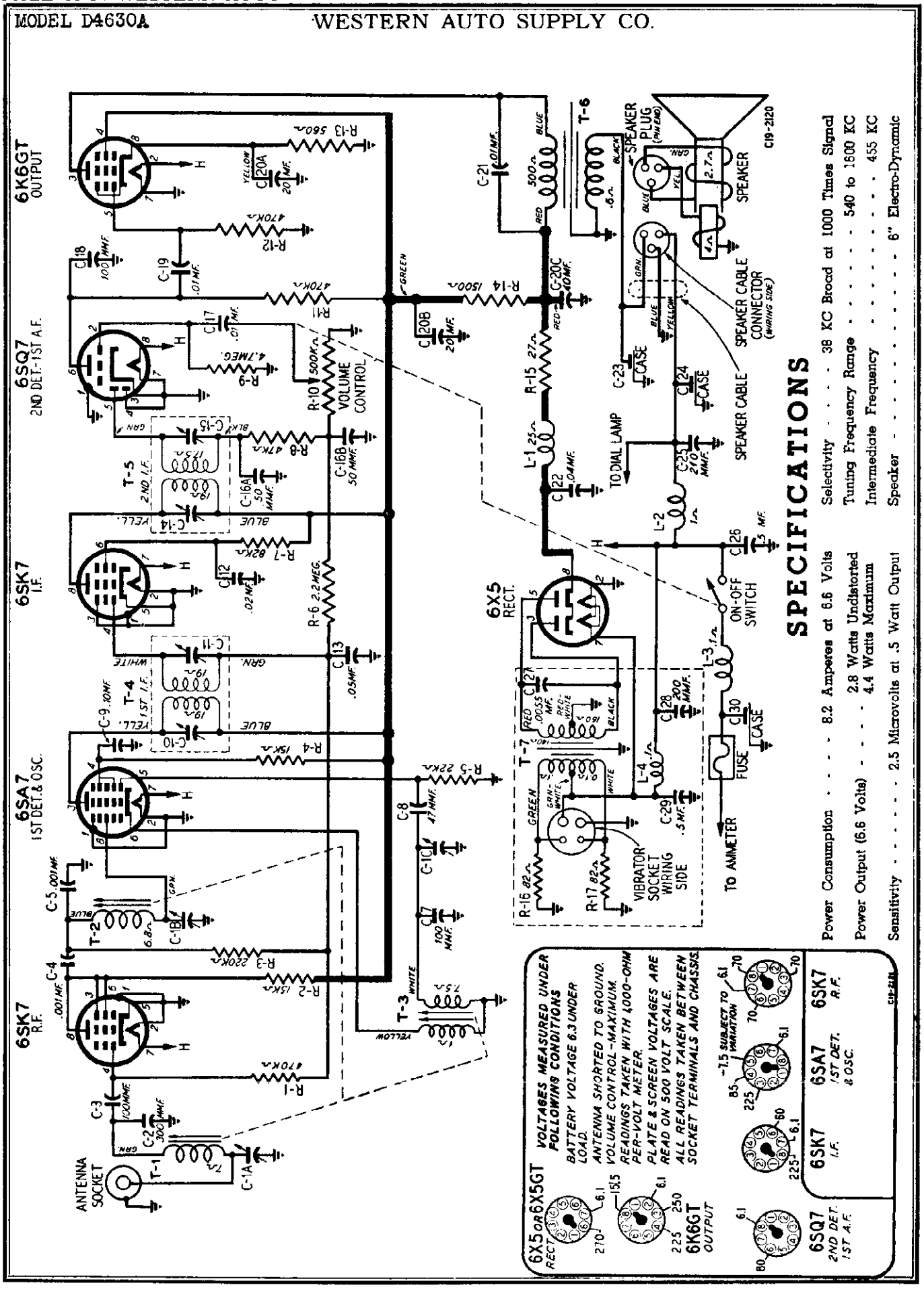


SPECIFICATIONS

Power Consumption - - - - - 8.2 Amperes at 6.6 Volts	Selectivity - - - - - 38 KC Broad at 1000 Times Signal
Power Output (6.6 Volts) - - - - - 2.8 Watts Undistorted 4.4 Watts Maximum	Tuning Frequency Range - - - - - - - 540 to 1600 KC
	Intermediate Frequency - - - - - - - - - - 455 KC
Sensitivity - - - - - 2.5 Microvolts at .5 Watt Output	Speaker - - - - - - - - - - - - - - 6" Electro-Dynamic

WESTERN AUTO SUPPLY CO.

MODEL D4630A
MODEL D4630B

SUPPLEMENTARY SERVICE DATA

TRUETONE MODEL D4630A

A 6" PM Dynamic speaker is used with some of the model "A" receivers. This speaker, complete with cable and plug is directly interchangeable with the 12A386 Electro Dynamic speaker listed in the Replacement Parts List.

The new speaker is shipped with some receivers in place of the speaker listed in the parts list.

DESCRIPTION OF NEW PART:

12A472 6" PM Dynamic Speaker complete with Cable & Plug

SUPPLEMENTARY SERVICE DATA

TRUETONE MODEL D4630B

Model "B" receivers of the above model use either an Electro Dynamic speaker 12A467 and Chassis Speaker Cable 13X556 or a PM Dynamic speaker 12A471 and Chassis Speaker Cable 13X556 in place of the Electro Dynamic speaker 12A386 and Chassis Speaker Cable 13X424 used with model "A" models.

The two new speakers are directly interchangeable when used with model "B" receivers.

DESCRIPTION OF NEW PARTS:

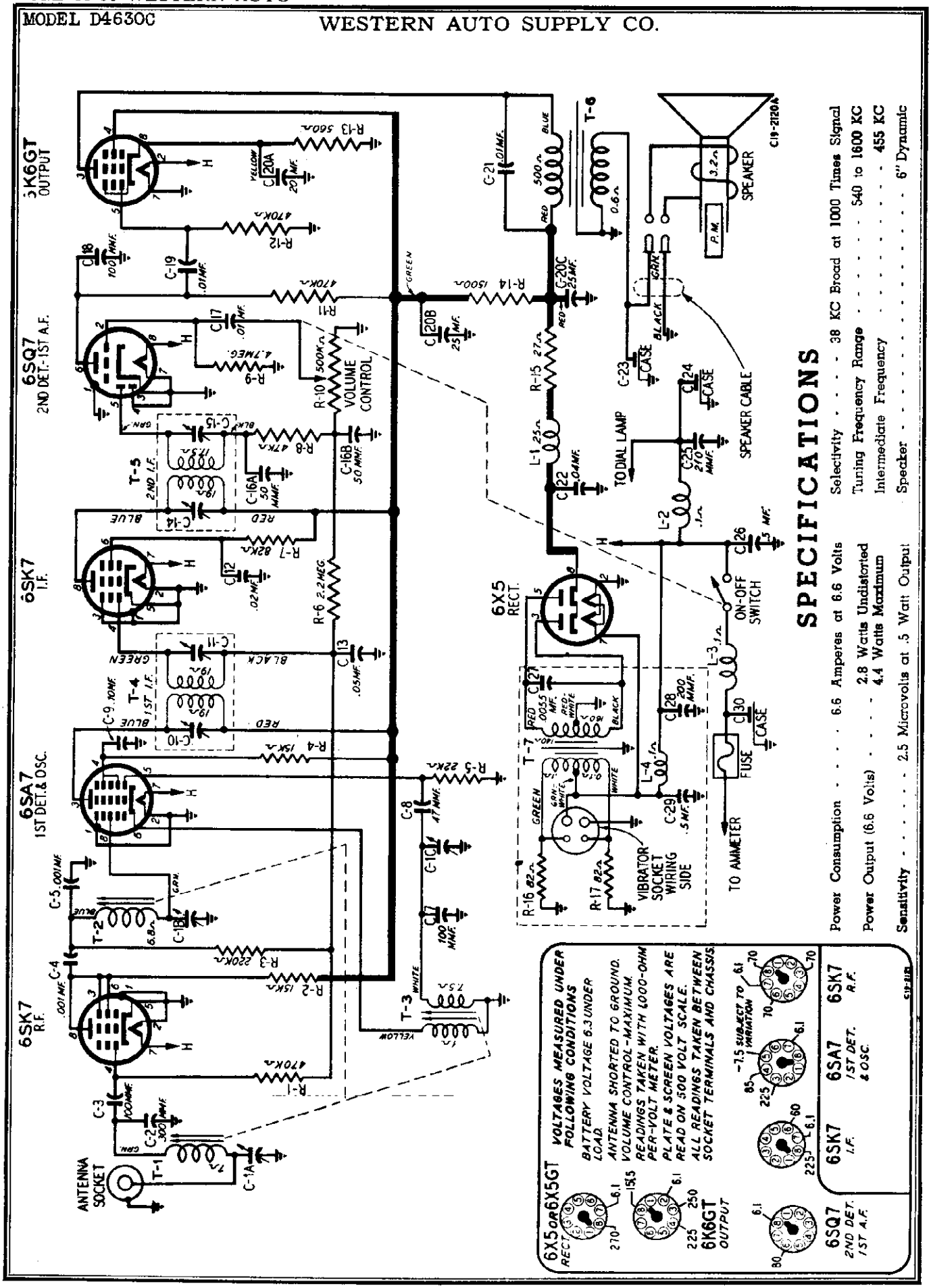
12A467 6" Electro Dynamic Speaker complete with Cable and Plug.

12A471 6" PM Dynamic Speaker complete with Cable and Plug.

13X556 10" Chassis Speaker Cable complete with Socket.

MODEL D4630C

WESTERN AUTO SUPPLY CO.



SPECIFICATIONS

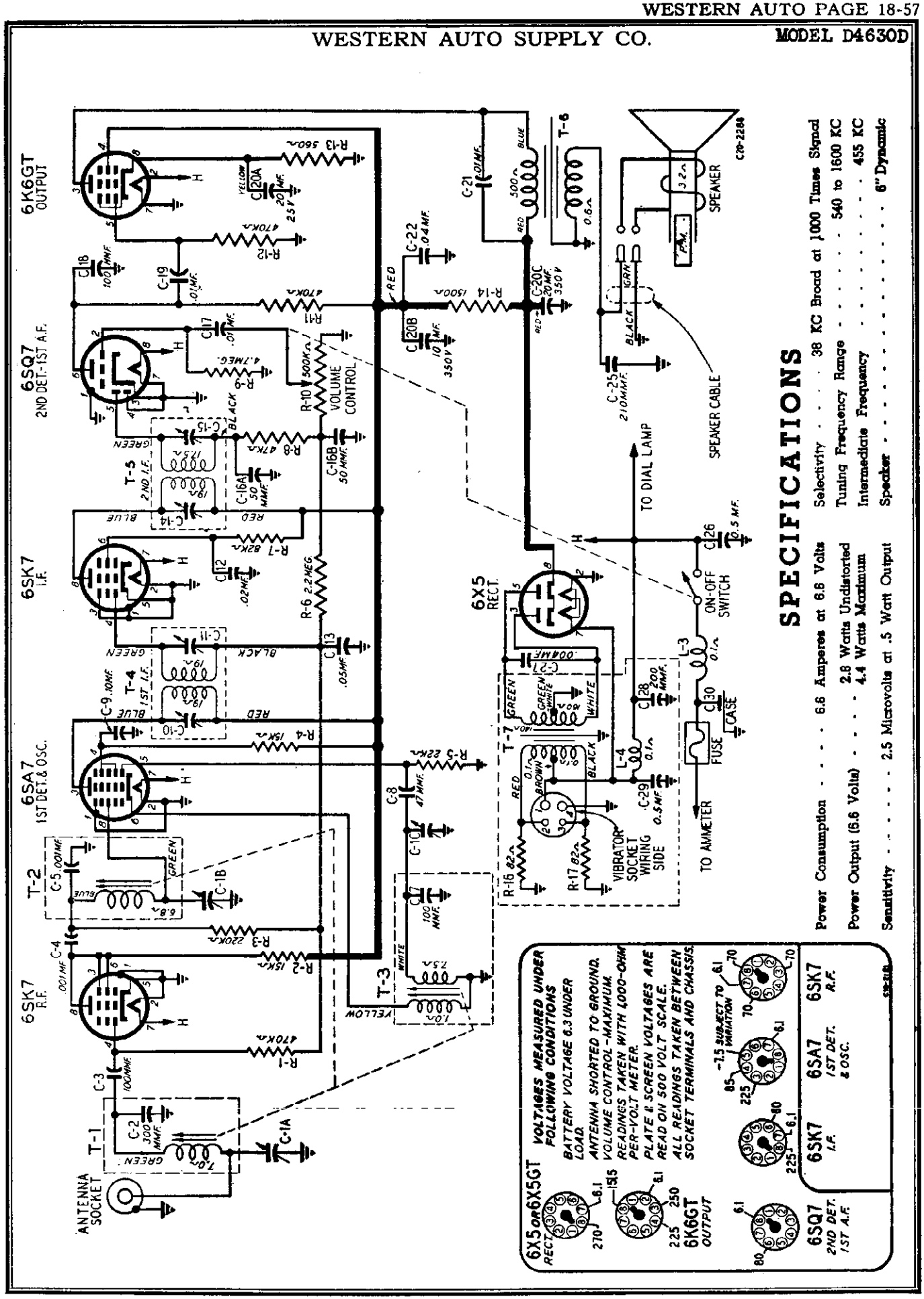
Power Consumption	6.6 Amperes at 6.6 Volts
Power Output (6.6 Volts)	2.8 Watts Undistorted 4.4 Watts Maximum
Sensitivity	2.5 Microvolts at .5 Watt Output
Selectivity	38 KC Broad at 1000 Times Signal
Tuning Frequency Range	540 to 1600 KC
Intermediate Frequency	455 KC
Speaker	6" Dynamic

VOLTAGES MEASURED UNDER FOLLOWING CONDITIONS

BATTERY VOLTAGE 6.3 UNDER LOAD.
ANTENNA SHORTED TO GROUND.
VOLUME CONTROL-MAXIMUM.
READINGS TAKEN WITH 1000-OHM PER-VOLT METER.
PLATE & SCREEN VOLTAGES ARE READ ON 500 VOLT SCALE.
ALL READINGS TAKEN BETWEEN SOCKET TERMINALS AND CHASSIS.

6X5 OR 6X5GT RECT.
6K6GT OUTPUT
6SQ7 2ND DET. 1ST A.F.
6SK7 I.F.
6SA7 1ST DET. & OSC.
6SK7 R.F.

WESTERN AUTO SUPPLY CO. MODEL D4630D

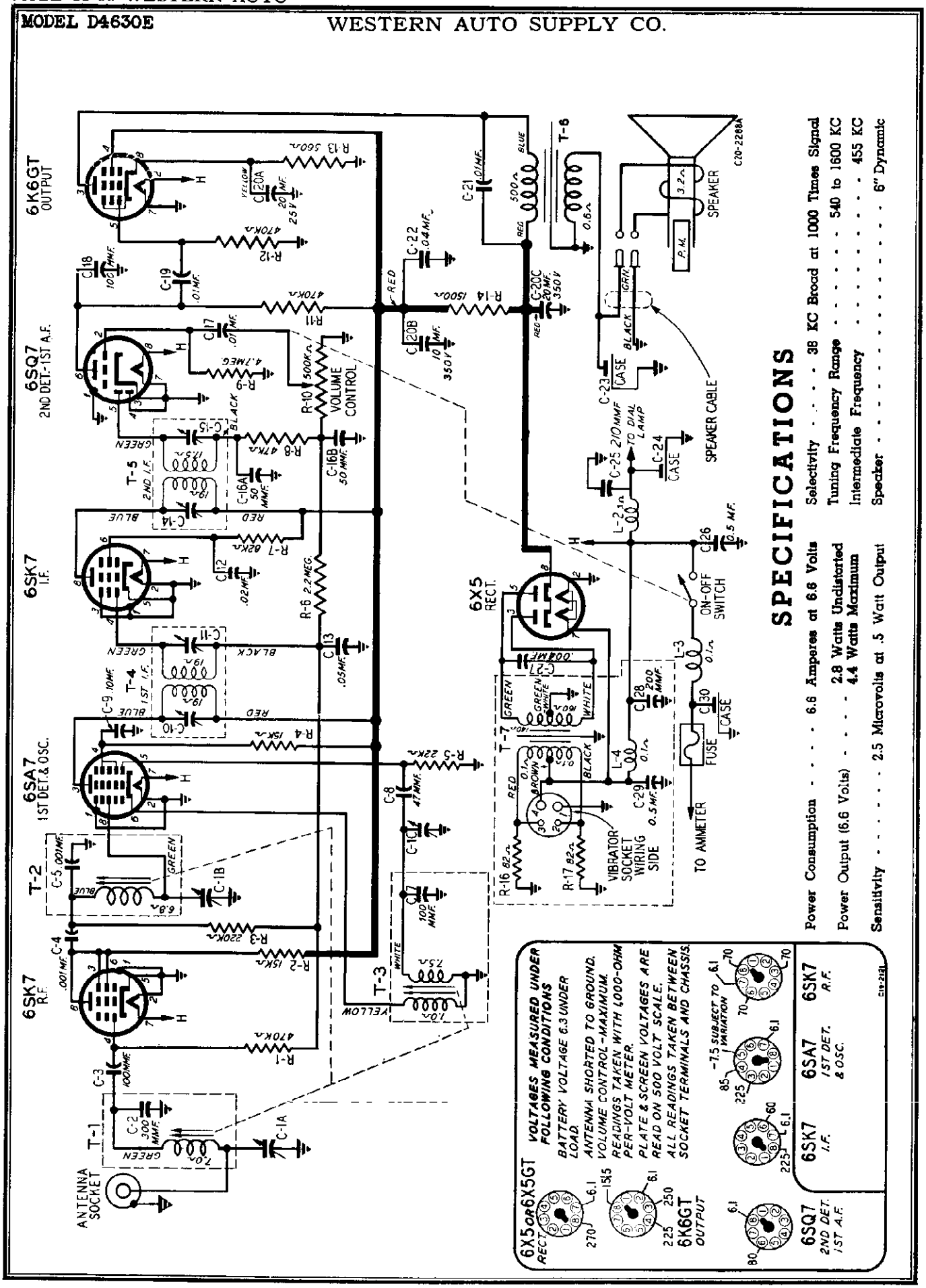


SPECIFICATIONS

Power Consumption	6.6 Amperes at 6.6 Volts
Power Output (6.6 Volts)	2.8 Watts Undistorted 4.4 Watts Maximum
Sensitivity	2.5 Microvolts at .5 Watt Output
Selectivity	38 KC Broad at 1000 Times Signal
Tuning Frequency Range	540 to 1600 KC
Intermediate Frequency	455 KC
Speaker	6" Dynamic

MODEL D4630E

WESTERN AUTO SUPPLY CO.



SPECIFICATIONS

Power Consumption	6.6 Amperes at 6.6 Volts
Power Output (6.6 Volts)	2.8 Watts Undistorted 4.4 Watts Maximum
Sensitivity	2.5 Microvolts at .5 Watt Output
Selectivity	38 KC Broad at 1000 Times Signal
Tuning Frequency Range	540 to 1600 KC
Intermediate Frequency	455 KC
Speaker	6" Dynamic

WESTERN AUTO SUPPLY CO.

MODEL D4630E
MODEL D4630F

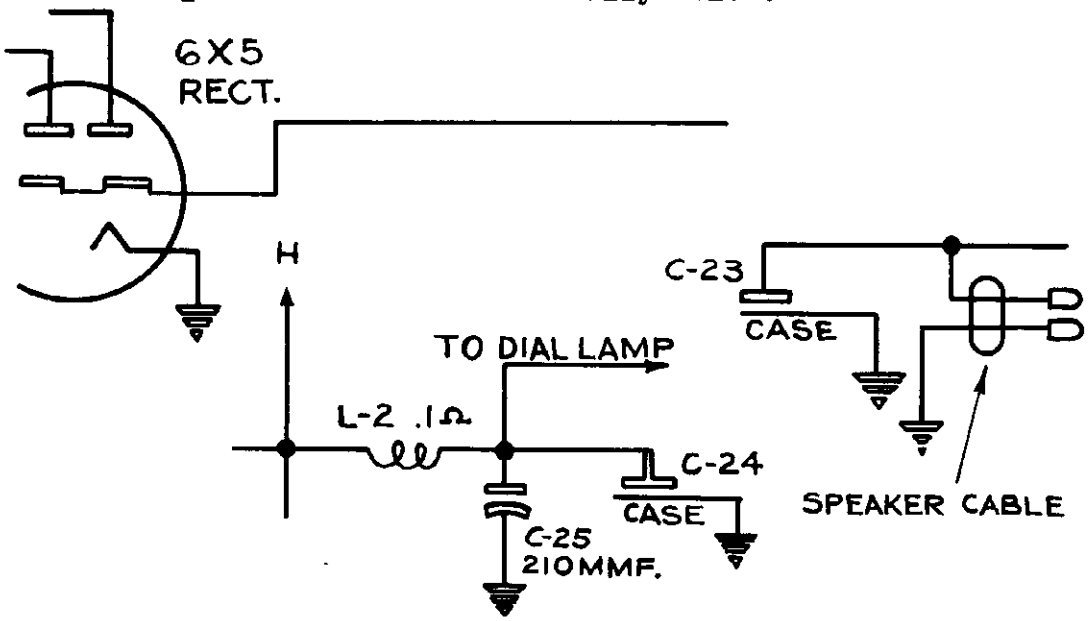
SUPPLEMENTARY SERVICE DATA
TRUETONE MODEL D4630-E

Model "E" chassis of this model differ from the Model "D" of this model by the addition of the following changes:

Parts List Changes:

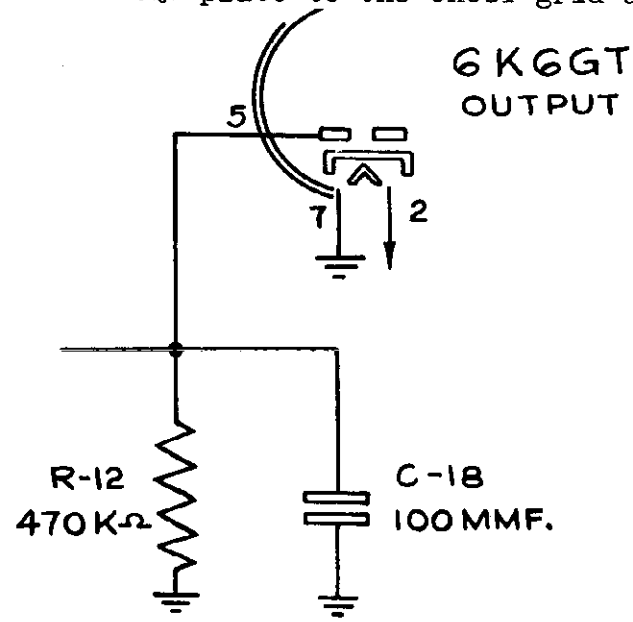
9A1369 - L-2 Field & Pilot Light Filter Reactor
C-23, C-24 (Part of chassis case)

The changes are shown schematically below:



SUPPLEMENTARY SERVICE DATA
TRUETONE MODEL D4630-F

Model "F" chassis of this model differ from the Model "E" of this model by the repositioning of the 100 mmf condenser (C-18) from the 6SQ7 plate to the 6K6GT grid as shown below.



MODELS D4630A, D4630B, D4630C, D4630D, D4630E, D4630F

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ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.

Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.

Allow Chassis and Signal Generator to "Heat Up" for several minutes.

The following equipment is required for aligning:

A Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.

Output Indicating Meter—Non-Metallic Screwdriver.

Dummy Antenna—.05 mf., See Note A.

SIGNAL GENERATOR FREQUENCY SETTING	SIGNAL GENERATOR CONNECTION AT RADIO	DUMMY ANTENNA	IRON CORE SETTING	ADJUST TRIMMERS TO MAXIMUM (See Figs. 3 and 4)
I.F. 455 KC	Control Grid (prong No. 8) 6SA7 1st Det. Tube	.05 mf.	Extreme Position out of Coil	1st I.F. (C10 & (C11) 2nd I.F. (C14) & (C15)
OSCILLATOR 1600 KC	Antenna Cable See Note A	See Note A	Extreme Position out of Coil	Oscillator (C1C)
1400 KC ADJUSTMENT 1400 KC	Antenna Cable	See Note A	Tune to Max. Output with Tuning Knob	Int. (C1B) Ant. (C1A)

Reassemble Radio—Install in Car—Connect Car Antenna to Radio.

Car Antenna Readjustment—Tune in weak signal near 1400 KC—Readjust Antenna Trimmer C1A for maximum output.

Attenuate the signal from the signal generator to prevent the leveling-off action of the AVC.

NOTE A—Insert the antenna cable plug in the antenna socket on the chassis. The total capacity of the antenna cable and dummy antenna should be 60 mmf. If the cable, for example, has a capacity of 30 mmf., use a 30 mmf. condenser for a dummy antenna. Connect the other end of the antenna cable through the dummy antenna capacity to the output of the signal generator.

CALIBRATION—To calibrate the radio see article "Calibrating the Radio"

LOCATING THE CONTROL UNIT ASSEMBLY

This auto radio is supplied with a Crowe control. This control, in conjunction with suitable control plates and mounting brackets, can be mounted in the instrument panel of practically all widely sold automobiles. If the control cannot be mounted in the instrument panel of the car, it may be mounted under the panel or on the steering column.

The control plates, dial assembly, brackets, knobs, and small items such as screws are put up in kit form for each make of automobile.

The tuning control unit, volume control fitting, and flexible shafts are packed with each radio.

Two 27 inch flexible shaft assemblies are supplied unless otherwise specified. Two 20 inch or 36 inch flexible shaft assemblies are available if needed.

First Attach Flexible Shafts to Control Units and Mount Units and Control Plate

The control plate and control units are mounted as explained in the instructions packed with the plate kit. The flexible shafts must be attached to the control units before they are attached to the radio. Attach the shafts by means of the knurled couplings.

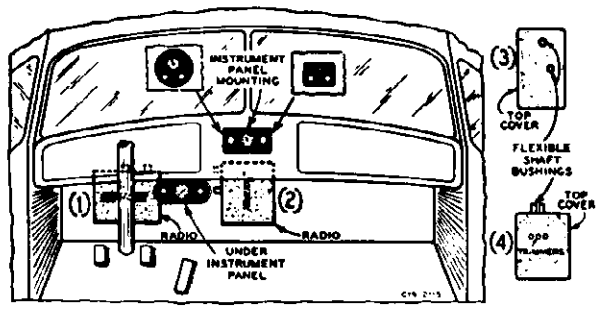


Fig. 1 Control Unit and Chassis Mountings

LOCATING THE RADIO AND DRILLING MOUNTING HOLES

The radio is to be mounted on the fire wall, as shown in Fig. 1, and is generally located over the steering column.

Position 1 is most desirable, position 2 is next best. Mounting positions 3 and 4 should be used only when absolutely necessary.

POSITION 1 — Radio mounted horizontally, with back cover against the fire wall and located over the steering column.

POSITION 2 — Radio mounted vertically, with back cover against the fire wall and located at middle of fire wall.

POSITION 3 — Radio mounted vertically, with side opposite shaft bushings against the fire wall. The radio may also be mounted horizontally in this position.

POSITION 4 — Radio mounted vertically, with small end against the fire wall. The radio may also be mounted horizontally in this position.

If the radio is located over the steering column (Position 1), it may be mounted vertically. Likewise, if the radio is located at the middle of the fire wall (Position 2) it may be mounted horizontally. If necessary to do so, the radio may be mounted on the right side of the fire wall, although this is generally not advisable.

In the middle position, the 27 inch flexible shaft assemblies furnished may be too long and it will be necessary to order the 20 inch shaft assemblies. The first step is to inspect the fire wall to determine at which point there is space available. The contours of the fire wall and the location of the car controls, wires, etc., will determine to a great extent the position of the radio. Lift the radio case up and temporarily hold it in the proposed position.

The radio should be mounted in such a way that the flexible shaft bushings are convenient to the control unit, and as high as possible.

SUPPRESSION OF MOTOR NOISE

The following procedure has been found to be effective in reducing motor noise to a satisfactory level in most cars. Follow the steps in the order given. Additional procedure, which may be required in exceptional cases of motor noise, is not covered here and will be found by referring to current literature on this subject.

GENERATOR CONDENSER — A generator condenser is required in all cases. Connect the condenser lead to the battery terminal of the generator. The case and mounting strap connect the other side of the condenser to ground. This unit must, therefore, be well grounded at its mounting.

CAUTION—In cars with automatic regulators, it is important not to connect the condenser across the field terminal. Most manufacturers at the present time have a recommendation for the proper post at which to connect the condenser.

DISTRIBUTOR SUPPRESSOR — A distributor suppressor will be required in most cases. Remove the high tension lead to the distributor. Insert a distributor suppressor and connect the wire to the other end of the suppressor (See Fig. 5). If this is not practical, cut the high tension lead close to the distributor and use a wood screw end type distributor suppressor in this line.

Withdraw Antenna Cable Plug

Turn on the radio and start the motor.

If motor noise is heard, proceed as follows:

BONDING CABLES, STEERING COLUMN, ETC.—Try grounding to the fire wall all cables and tubing which pass through it such as oil lines, gas lines, etc. It is also possible for the steering column, foot pedals, and brake lever to carry interference to the back of the fire wall at which point it may affect the radio. By means of a file, contact can be established between any of these parts and the fire wall or frame in order to determine whether such a ground will reduce the noise. To bond the parts to the fire wall or frame, clean the point of contact, wrap a length of one inch braided shielding around the part, and solder the connection. Then solder the end of the shielding to the fire wall or frame or ground it under a screw head if one is convenient.

Sufficient play should be left in the bonding shielding so that movement of the parts will not loosen this shielding.

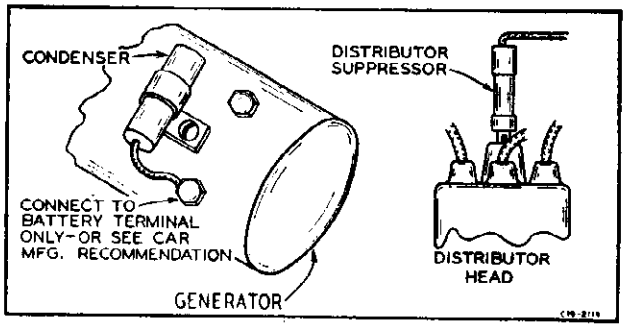


Fig. 5—Generator Condenser and Distributor Suppressor

Then Reinsert Antenna Cable Plug

If motor noise is heard when the antenna cable is reconnected, proceed as follows until the noise is satisfactorily reduced:

BYPASS CONDENSERS — Try a .5 mfd. bypass condenser from the ammeter to ground and see if interference is reduced. Install this condenser permanently if there is an improvement.

In like manner, try a .5 mfd. condenser from car fuse to ground, switch to ground, tail light and stop light connections to ground, windshield wiper and various other 6 volt connections to ground, noting what effect these condensers have on the noise pickup.

Try a .5 mfd. condenser between the point at which the dome light lead leaves the pillar post and ground.

Try a .5 mfd. condenser from the "Hot" side of the coil primary to ground.

The electric gauges used for oil, water, and gas are often a source of interference and bypass condensers should be tried. The condenser should usually be connected to the end of the line nearest the measuring device rather than at the instrument panel.

HIGH AND LOW TENSION LEADS—In some cases, the high and low tension leads between the coil and distributor are run close together. In some cars, they are in the same conduit. If this is the case, remove the low tension lead from this conduit. In any event, keep the high and low tension leads as far apart from each other as possible. If separating the two leads is not sufficient, shield and ground the shield of the low tension lead.

GROUNDING MOTOR AND OTHER PARTS—The motor must, in every case, be well grounded to the frame of the car. If it is not, use a very heavy braided lead for this purpose, similar to a storage battery ground lead. In like manner, it may be necessary to check the grounding of the metal fire wall, instrument panel, transmission, radiator, hood, and muffler to the frame of the automobile. To obtain a good electrical connection, scrape off the paint, if necessary, at the point where ground contact is made.

PEENING ROTOR ARM—In extreme cases of motor noise, it is advisable to peen the distributor rotor arm, that is, increase the length of the arm by using a small machinist's hammer. This will lessen the gap between the rotor arm and the stationary contacts thus reducing the spark. Be sure, after peening the arm, that it does not strike the stationary contacts.

SPARK PLUG SUPPRESSORS—If motor noise persists, spark plug suppressors must be installed. One suppressor is put on each plug. These are not regularly supplied with the radio and must be purchased extra. Ninety-five percent of all cars will not require spark plug suppressors.

Care should be taken that a good mechanical and electrical connection is made between the spark plugs, suppressors, and plug wires.

WHEEL OR BRAKE STATIC—To determine if noise is being caused from this source, set the car in motion; then with the motor shut off and the clutch disengaged, apply the brakes. If the noise stops, the source of the static is in the wheels. The use of a front or rear wheel static eliminator will generally end the trouble.

MODELS D4630A, D4630B, D4630C, D4630D, D4630E, D4630F

WESTERN AUTO SUPPLY CO.

IMPORTANT—Locate the chassis in such a manner that the flexible shafts will have a minimum amount of bending. In general, there should not be more than two bends. The bends should be of a large radius. The larger the radius of the bends, the easier the controls will operate.

Other points to consider in choosing the radio location are as follows: Mount the radio case as high as possible to avoid interference with the feet of the people in the front compartment. Mount it also in such a way as to avoid interference with the pedals, cowl ventilator, etc.

Locating and Drilling the Mounting Holes

Having decided on the position of the radio, next locate the mounting holes. There are 8 mounting holes provided in the radio case, 2 in each side and 2 in each end, to which the "J" mounting bolts can be attached. Since only 2 holes are used, there are various ways the radio can be mounted.

In all types of mountings, the "J" bolts must always be on opposite sides of the radio case.

For mountings 1 and 2 (with back cover against fire wall), the "J" bolts should be positioned diagonally. By that is meant if one is mounted at the left and over the radio case, the other should be at the right, under the case.

For mountings 3 and 4, the "J" bolts should be fastened to the holes nearest the fire wall.

When it is determined which mounting holes are to be used and which position the radio is to be mounted in, select the proper two holes as indicated on the template. For example, if the radio is to be mounted in position 1, use the template holes joined by either of the lines numbered 1.

Hold the template in position on the fire wall and punch mark the centers for the desired mounting holes. Before drilling the holes, make sure there is nothing on the motor side of the fire wall that will be damaged by the drilling. Then drill the two 5/16 inch holes.

If there is insulating material such as cardboard or paint on the engine side of the fire wall, the cardboard should be cut away and paint should be scraped away so that the lock washer on the mounting bolt makes good electrical contact with the metal portion of the fire wall.

DO NOT MOUNT THE RADIO AT THIS TIME.

Attaching Flexible Shafts to Radio

The flexible shafts MUST BE ATTACHED TO THE CONTROL UNITS ON THE INSTRUMENT PANEL BEFORE THEY ARE ATTACHED TO THE RADIO.

Insert the spade ends (without coupling) of the flexible shafts into the correct shaft bushings (See Fig. 3) after loosening the 4 set screws in the bushings. Make sure that the spade ends of the shafts are properly fitted into the slotted receptacles. Do this by turning the control unit knob until it is felt that the spade end of the shaft has dropped all the way into position. Then tighten the set screws in the shaft bushings until they hold the casing of the flexible shaft securely.

ANTENNA

A shielded antenna cable (30 mmf. capacity) with bayonet connector plug is required.

The plug on the antenna cable is inserted in the socket at the side of the radio case as shown in Fig. 3. The wire at the other end of the cable is connected to the antenna.

LOW CAPACITY ANTENNA

This radio is designed for a low capacity car antenna. The total capacity of antenna and shielded cable should be 40 to 70 mmf.

Types of Low Capacity Antennas—"Fishpole" type, such as door hinge and cowl; over-the-roof types which are short and are mounted quite a distance from the metal roof of the car.

Mount the antenna on the same side of the car as the radio.

HIGH CAPACITY ANTENNA

If this radio is to be installed with a high capacity car antenna (70 to 500 mmf. total capacity of antenna and shielded cable), a 24 inch shielded adapter extension cable is necessary. The adapter is inserted in the socket at the side of the radio case. Then the antenna cable plug is inserted in the socket at the other end of the adapter.

Types of High Capacity Antennas—Over-the-roof types which are long and are mounted close to the metal roof of the car; ordinary built-in roof antennas (not metal roof). Under-car antennas (these are usually high capacity) are not recommended for this radio.

ANTENNA CABLE

CAUTION—Be careful not to bend the antenna cable too sharply or to clamp it tightly as the small wire inside the cable may be broken.

Keep the antenna cable as far away from car wiring as possible and ground the pigtail of the antenna cable shield at the antenna end, otherwise ignition noise may be picked up. The length of the pigtail from the grounding point to the end of the antenna cable should be kept as short as possible, preferably not over one inch.

For the "fish pole" and over-the-roof type antennas, the antenna lead must be shielded the entire distance from the radio to the point where the lead goes through the car body to the outside.

When the antenna cable is connected to an antenna lead coming down the pillar post, the shielded cable should be pushed several inches up into the pillar post.

MOUNTING SPEAKER BEHIND INSTRUMENT PANEL GRILLE OR ON FIRE WALL

Instrument Panel Mounting

Most late model automobiles have a grille in the instrument panel behind which a speaker can be mounted. The speaker of this radio is intended to be mounted in this manner.

In Fig. 2 is shown methods of mounting which are applicable, with minor changes, to most cars. The strap bracket, only a part of which is

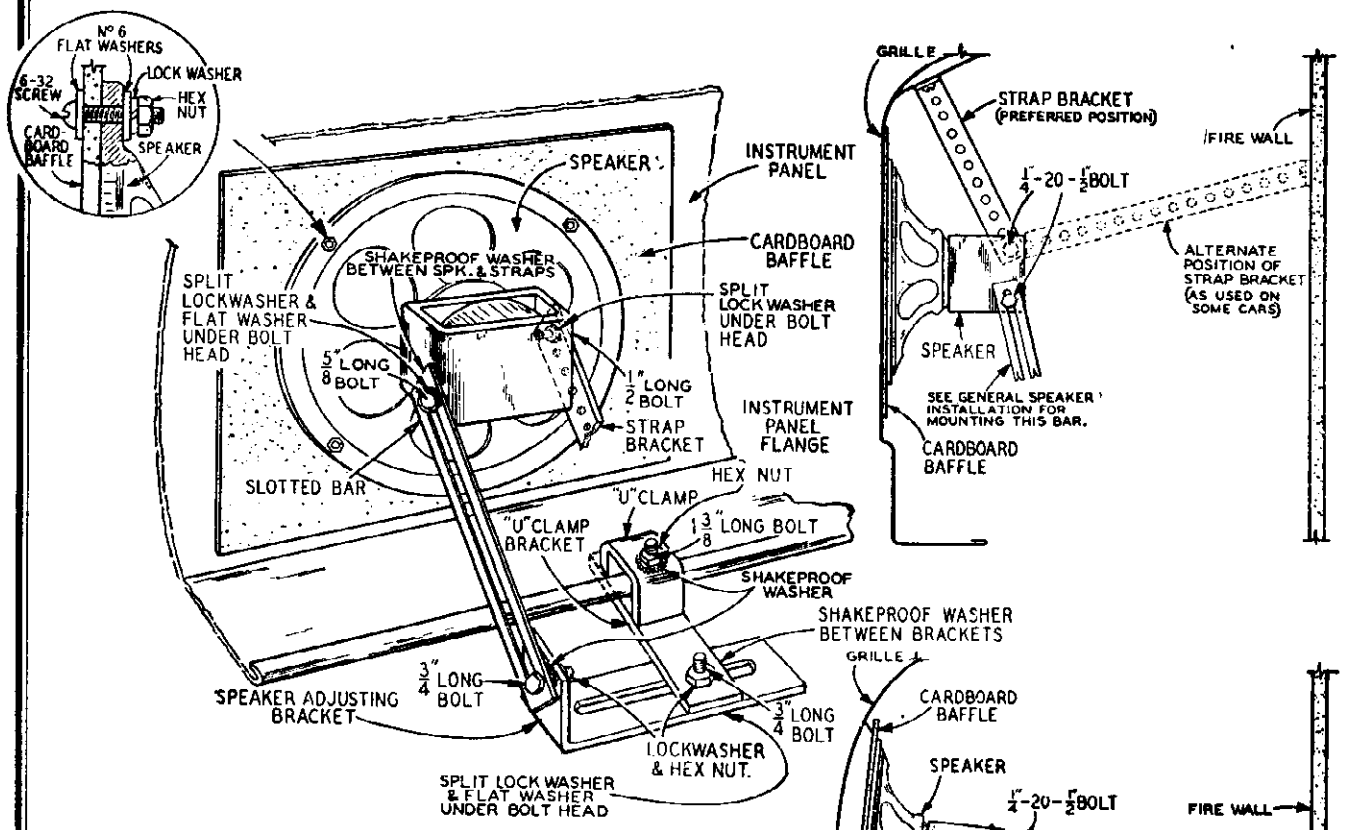


Fig. 2—Typical Methods of Mounting Speaker Behind Instrument Panel Grille

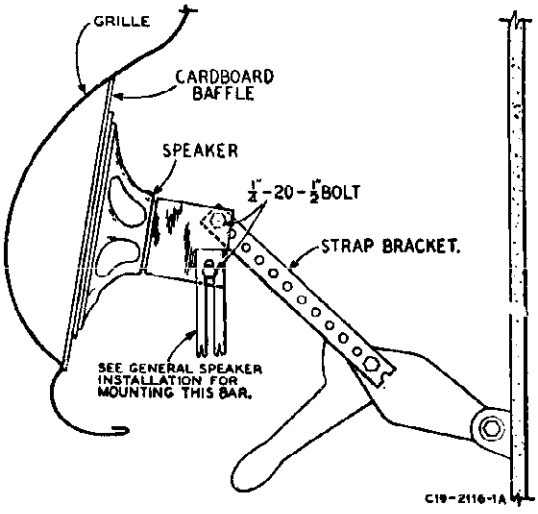
shown, may be cut to any desired length and attached to the fire wall or any convenient part behind the instrument panel. In some installations it will also be necessary to cut the slotted bar at the score mark because of space requirements.

The cardboard speaker baffle should be cut to a size necessary to cover the entire grille opening. The speaker is then attached to the baffle by means of the 4 screws, a flat washer being placed under the head of the screw to prevent it from tearing through the cardboard. Place a flat washer, lock washer, and hex nut on the other end of the screw in the order named. The sponge rubber strip may be attached to the cardboard baffle by means of the adhesive edge in order to prevent rattle between the baffle and the grille. In some cars, the grille opening may be so small the cardboard baffle cannot be used. In this case, the sponge rubber strip should be attached around the edge of the speaker rim.

Connect the 3 prong plug on the speaker cable to the 3 hole socket on the speaker cable coming from the chassis.

Mounting Speaker on Fire Wall

On cars where it is impossible to mount the speaker behind the instrument panel, a kit of parts is available to enable the speaker to be mounted on the fire wall. The part number of this kit will be found in the Replacement Parts List. Complete instructions for mounting are supplied with the kit.



MODELS D4630A, D4630B, D4630C, D4630D, D4630E, D4630F

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FINAL INSTALLATION ITEMS

Before Mounting Radio

Before mounting the radio to the fire wall, it is advisable in most cases to complete the wiring connections.

Battery Cable and Fuse

The battery connection is made at the ammeter. The end of the battery cable with the connecting lug is secured to one of the posts at the back of the ammeter in the instrument panel. The other end of the cable with the fuse receptacle connects to the battery cable from the radio after the fuse has been inserted. A 14 ampere fuse is used.

Dial Lamp Cable

Insert the dial lamp assembly in the receptacle as indicated in Fig. 3. The dial lamp used in this unit is a 6-8 volt automobile type lamp (Bulb No. 51).

Adjusting Antenna Trimmer

After the antenna is connected, tune in a weak signal at approximately 1400 KC with the volume control about three-fourths on. Turn the adjusting screw of the antenna trimmer (C1A) up or down until maximum output is obtained. See Fig. 3 for location of this trimmer.

Bolting Radio in Place

Insert the "J" mounting bolts through the mounting holes from the driver's side of the fire wall. Then from the motor side, place a lock-washer, flat washer, hex nut, and lock nut loosely on one bolt (See Fig. 3). On the other bolt, place the same parts except for the lock-washer.

Now raise the radio into position and hook the two "J" bolts into the mounting holes in the case.

Tighten the nut on one bolt until it just begins to feel snug. Then tighten the nut on the other bolt a like amount.

Then from the inside, position the radio. Next tighten one of the nuts a slight additional amount and then the other nut a like amount. See if radio is still properly positioned and then complete the tightening of the nut on both mounting bolts.

After the radio is in place, fasten the flexible shafts and electrical cables in position at the nearest convenient point.

Calibrating the Radio

To calibrate the radio, tune in a station of known frequency, loosen the knurled nut at the tuning control clamp fitting and turn the flexible shaft with the fingers until the dial pointer indicates the frequency of the station being received.

Slide the flexible shaft in or out of the tuning control clamp fitting until a smooth action with a minimum of backlash is obtained.

The knurled nut should then be tightened with the fingers.

Readjusting Flexible Shafts

When the radio is in position on the fire wall, loosen the flexible shaft casing set screws on the chassis. Allow the casing to position itself so that it does not bind. Then retighten the set screws.

Replacing Tubes and Vibrator

To replace the tubes or vibrator, remove the screw at each end of the top cover. Pry off the cover. The tubes and vibrator are now accessible for replacement.

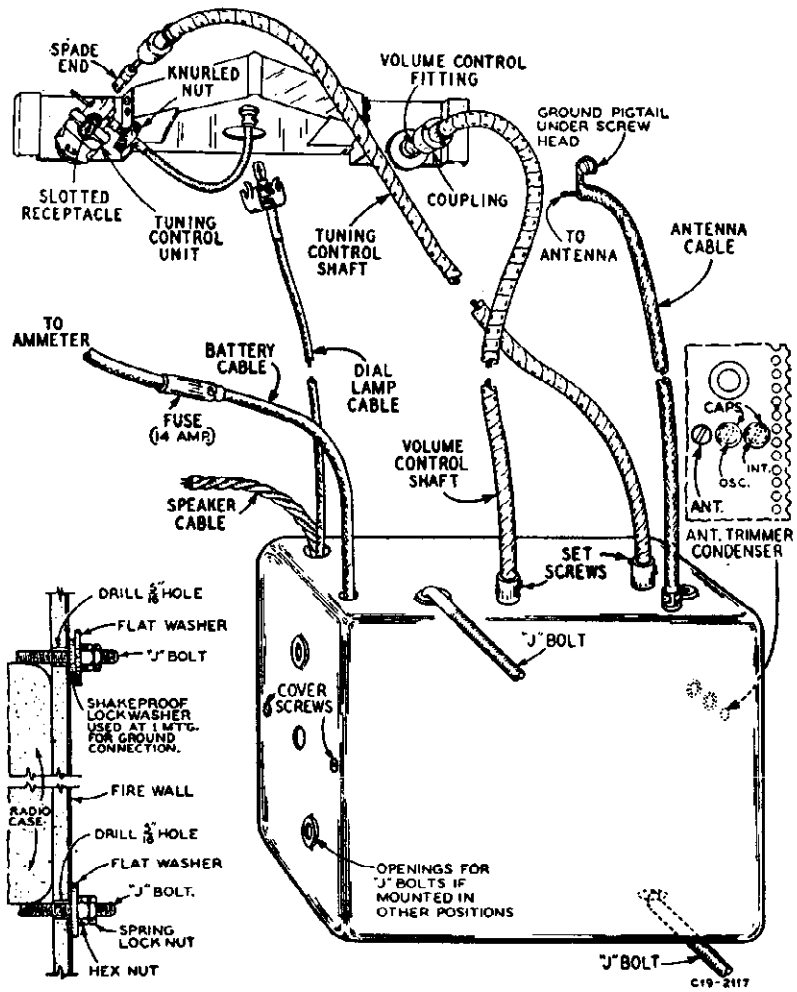
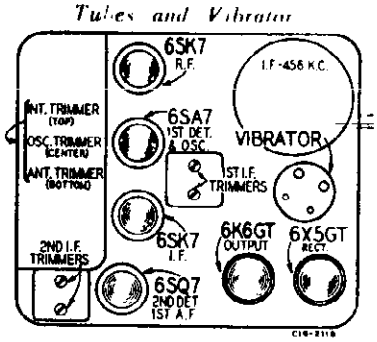


Fig. 3—General Installation View

Fig. 4—Location of Tubes and Vibrator



REPLACEMENT PARTS LIST

NOTICE: There is a power rating label on the radio. This label specifies the power supply on which the radio may be used, and identifies the radio as to series, dial and issue letter. When ordering parts or writing, give ALL information appearing on this label.

MISCELLANEOUS

12A386	6" Electro-Dynamic Speaker, complete with Cable and Plug
	Cone and Voice Coil Assembly (Specify part number of Speaker and letters preceding part number stamped on the speaker)
12A384	5¼" Electro-Dynamic Speaker, complete with Cable and Plug
	Cone and Voice Coil Assembly (Specify part number of speaker and letters preceding part number stamped on the speaker)
3A303	Tube Socket—Octal (8 prong)
3A316	Vibrator Socket (4 prong) moulded
19A37	Vibrator
28X52	Spring Clamp for Vibrator
32X134	Shield for Filter Assembly
32X105	Shield for Power Transformer
34X300	Top Cover for Chassis Case less Name Plate
34X301	Bottom Cover for Chassis Case
28X48	Spring Clips to Ground Covers to Case

TRANSFORMERS AND COILS

9A1115	L-1	R-F Plate Reactor
9A1369	L-2	Field and Pilot Light Filter Reactor
9A1194	L-3	"A" Line Reactor
9A911	L-4	Vibrator "A" Line Reactor
	T-1, T-2, T-3	Antenna, Interstage, Oscillator Coils and Iron Cores are a part of the Tuning Assembly. Entire assembly must be ordered. See Tuning Assembly
9A1368	T-4	1st I-F Transformer and Can Assembly
9A1359	T-5	2nd I-F Transformer and Can Assembly
51X89	T-6	Output Transformer
53X232	T-7	Power Transformer

CAPACITORS

		CAPACITY	VOLTAGE	
17A159	C-1A, C-1B, C-1C	2.8-35 mmf, 10-90 mmf, 2.8-25 mmf	Antenna, Interstage, Oscillator	Trimmer
47X479	C-2	300 mmf		Silvered mica
47X476	C-3, C-18	100 mmf		Moulded
D56102	C-4	.001 mf	400 V	Tubular
46X317	C-5	.001 mf	200 V	Polystyrene
47X167	C-7	100 mmf		Ceramic
47X463	C-8	47 mmf		Moulded
D56104	C-9	.10 mf	400 V	Tubular
	C-10, C-11	Part of T-4 (1st I-F Transformer Assembly)		
D56203	C-12	.02 mf	400 V	Tubular
B56503	C-13	.05 mf	200 V	Tubular
	C-14, C-15	Part of T-5 (2nd I-F Transformer Assembly)		
47X112	C-16A, C-16B	.50 mmf, .50 mmf		Dual mica
B56103	C-17	.01 mf	200 V	Tubular
D56103	C-19	.01 mf	400 V	Tubular
45X296	C-20A	20 mf	25 V	Dry Electrolytic Capacitor
	C-20B	20 mf	350 V	
	C-20C	40 mf	350 V	
F56103	C-21	.01 mf	600 V	Tubular
F56403	C-22	.04 mf	600 V	Tubular
	C-23, C-24, C-30	Part of Chassis Case		
47X129	C25	200 mmf		Fixed mica
46X297	C-26, C-29	.50 mf	180 V	Tubular
R54552	C-27	.0055	1800 V	Tubular
47X114	C-28	210 mmf		Fixed mica

RESISTORS

		OHMS	WATTS	
B85474	R-1 R-11, R-12	470 K	0.5	Carbon
C85153	R-2	15 K	1.0	Carbon
B85224	R-3	220 K	0.5	Carbon
D84153	R-4	15 K	2.0	Carbon
B84223	R-5	22 K	0.5	Carbon
B85225	R-6	2.2 meg	0.5	Carbon
B84823	R-7	82 K	0.5	Carbon
B85473	R-8	47 K	0.5	Carbon
B85475	R-9	4.7 meg	0.5	Carbon
36X296	R-10	500 K	Volume control and switch	
C84561	R-13	560	1.0	Carbon
C85152	R-14	1500	1.0	Carbon
B84270	R-15	27	0.5	Carbon
B84820	R-16, R-17	82	0.5	Carbon

TUNING ASSEMBLY

26A388	Tuning Assembly complete with Coil Cans, Coils, Iron Cores, and Drive Assembly
42X140	Coil Cans
28X305	Clamp Springs to hold Coil Cans to Tuner Mounting Plate
28X184	Clamp Springs for mounting Antenna, Interstage, and Oscillator Coils
28X309	Slotted Brass Tension Spring
37X202	Bakelite Coupling for Tuning Control Shaft

CONTROL UNIT ASSEMBLY PARTS

	Quantity Used	
*20A92	1	Tuning Control Unit
*20A91	1	Volume Control Fitting
†	2	Control Knobs, Specify Name of Car, Year, and Model.
		Molded Type
		Chromium Type

* Shipped with each radio. † Shipped with each panel kit.

INSTALLATION ITEMS

CABLE AND FLEXIBLE SHAFT ASSEMBLIES

	Quantity Used	
18A53	2	27" Tuning Control and Volume Control Flexible Drive Shafts
18A54	2	20" Same as above
18A55	2	36" Same as above
13X390	1	Battery Cable (long section with Fuse Receptacle)
7A162	1	Dial Lamp Socket and Cable
13X357	1	"A" Cable (Short Section connected to Chassis)
13X424	1	Speaker Cable Assembly (on Chassis) complete with Socket
3A310	1	Socket for Speaker Cable

INSTRUMENT PANEL SPEAKER MOUNTING PARTS

26A276	1	Speaker Mounting Kit (For mounting speaker on Instrument Panel) complete with Speaker Baffle, Brackets, Clamps, Nuts, Bolts, and Washers
25X789	1	Strap Bracket only
25X787	1	Speaker Adjusting Bracket ("L" Shaped)
30X154	1	"U" Clamp
25X786	1	Bracket for "U" Clamp
25X785	1	9" Slotted Speaker Bar
14X256	1	Cardboard Speaker Baffle
BX108	1	Sponge Rubber Strip

FIRE WALL SPEAKER MOUNTING PARTS

26A274	1	Speaker Mounting Kit (for mounting speaker on Fire Wall) complete with Speaker Housing, Grille Cloth, Speaker Screen, Washers, and Nuts
14X271	1	Speaker Housing only
14X205	1	Grille Cloth
14X204	1	Speaker Screen

MISCELLANEOUS ITEMS

26A277	1	Radio Mounting Bolt Kit complete with "J" Bolts, Nuts, and Washers
20X339	2	"J" Bolts only
16X27	1	14 Ampere Fuse
21A6	1	Distributor Suppressor
48X27	1	Generator Condenser
	1	Dial Lamp (No. 51)
21A7		Spark Plug Suppressors (Not shipped with Radio)
21A5	1	Choke-Condenser Unit (Not shipped with Radio)

MODEL D4630C WESTERN AUTO SUPPLY CO.

REPLACEMENT PARTS LIST

NOTICE: There is a model number label on the radio. This label identifies the radio as to chassis, dial and issue letter. When ordering parts or writing, give ALL information appearing on this label.

MISCELLANEOUS

12A474	6" PM Speaker	
	Cone and Voice Coil Assembly (Specify part number and letters stamped on speaker)	
3A303	Tube Socket—Octal (8 prong)	
3A316	Vibrator Socket (4 prong) moulded	
19A37	Vibrator	
28X52	Spring Clamp for Vibrator	
32X134	Shield for Filter Assembly	
32X105	Shield for Power Transformer	
34X300	Top Cover for Chassis Case less Name Plate	
34X301	Bottom Cover for Chassis Case	
28X48	Spring Clips to Ground Covers to Case	

TRANSFORMERS AND COILS

9A1115	L-1	R-F Plate Reactor
9A1369	L-2	Field and Pilot Light Filter Reactor
9A1194	L-3	"A" Line Reactor
9A911	L-4	Vibrator "A" Line Reactor
	T-1, T-2, T-3	Antenna, Interstage, Oscillator Coils and Iron Cores are a part of the Tuning Assembly. Entire assembly must be ordered. See Tuning Assembly
9A1907	T-4	1st I-F Transformer and Can Assembly
9A1908	T-5	2nd I-F Transformer and Can Assembly
51X89	T-6	Output Transformer
53X232	T-7	Power Transformer

CAPACITORS

		CAPACITY	VOLTAGE		
17A159	C-1A, C-1B, C-1C	2.8-35 mmf, 10-90 mmf, 2.8-25 mmf	Antenna, Interstage, Oscillator		Trimmer
47X479	C-2	300 mmf			Silvered mica
47X476	C-3, C-18	100 mmf			Moulded
D56102	C-4	.001 mf	400 V		Tubular
46X317	C-5	.001 mf	200 V		Polystyrene
47X167	C-7	100 mmf			Ceramic
47X463	C-8	47 mmf			Moulded
D56104	C-9	.10 mf	400 V		Tubular
	C-10, C-11	Part of T-4 (1st I-F Transformer Assembly)			
D56203	C-12	.02 mf	400 V		Tubular
B56503	C-13	.05 mf	200 V		Tubular
	C-14, C-15	Part of T-5 (2nd I-F Transformer Assembly)			
47X112	C-16A, C-16B	50 mmf, 50 mmf			Dual mica
B56103	C-17	.01 mf	200 V		Tubular
D56103	C-19	.01 mf	400 V		Tubular
45X296	C-20A, C-20B, C-20C	20 mf, 25 mf, 25 mf	25 V, 350 V, 350 V		Dry Electrolytic Capacitor
F56103	C-21	.01 mf	600 V		Tubular
F56403	C-22	.04 mf	600 V		Tubular
	C-23, C-24, C-30	Part of Chassis Case			
47X129	C25	200 mmf			Fixed mica
46X297	C-26, C-29	.50 mf	180 V		Tubular
R54552	C-27	.0055 mf	1800 V		Tubular
47X114	C-28	210 mmf			Fixed mica

RESISTORS

		OHMS	WATTS	
B85474	R-1, R-11, R-12	470 K	0.5	Carbon
C85153	R-2	15 K	1.0	Carbon
B85224	R-3	220 K	0.5	Carbon
D84153	R-4	15 K	2.0	Carbon
B84223	R-5	22 K	0.5	Carbon
B85225	R-6	2.2 meg	0.5	Carbon
B84823	R-7	82 K	0.5	Carbon
B85473	R-8	47 K	0.5	Carbon
B85475	R-9	4.7 meg	0.5	Carbon
36X296	R-10	500 K	Volume control and switch	
C84561	R-13	560	1.0	Carbon
C85152	R-14	1500	1.0	Carbon
B84270	R-15	27	0.5	Carbon
B84820	R-16, R-17	82	0.5	Carbon

TUNING ASSEMBLY

26A388	Tuning Assembly complete with Coil Cans, Coils, Iron Cores, and Drive Assembly
42X140	Coil Cans
28X305	Clamp Springs to hold Coil Cans to Tuner Mounting Plate
28X184	Clamp Springs for mounting Antenna, Interstage, and Oscillator Coils
28X309	Slotted Brass Tension Spring
37X202	Bakelite Coupling for Tuning Control Shaft

CONTROL UNIT ASSEMBLY PARTS

	Quantity Used	
*20A92	1	Tuning Control Unit
*20A91	1	Volume Control Fitting
†	2	Control Knobs, Specify Name of Car, Year, and Model.
		Molded Type
		Chromium Type

* Shipped with each radio. † Shipped with each panel kit.

INSTALLATION ITEMS

CABLE AND FLEXIBLE SHAFT ASSEMBLIES

	Quantity Used	
18A53	2	27" Tuning Control and Volume Control Flexible Drive Shafts
18A54	2	20" Same as above
18A55	2	36" Same as above
13X390	1	Battery Cable (long section with Fuse Receptacle)
7A162	1	Dial Lamp Socket and Cable Assembly
13X336	1	"A" Cable (Short Section connected to Chassis)
13X582	1	Speaker Cable Assembly (on chassis)

INSTRUMENT PANEL SPEAKER MOUNTING PARTS

26A276	1	Speaker Mounting Kit (For mounting speaker on Instrument Panel) complete with Speaker Baffle, Brackets, Clamps, Nuts, Bolts, and Washers
25X789	1	Strap Bracket only
25X787	1	Speaker Adjusting Bracket ("L" Shaped)
30X154	1	"U" Clamp
25X786	1	Bracket for "U" Clamp
25X785	1	9" Slotted Speaker Bar
14X256	1	Cardboard Speaker Baffle
8X108	1	Sponge Rubber Strip

FIRE WALL SPEAKER MOUNTING PARTS

26A380	1	Speaker Mounting Kit (for mounting speaker on Fire Wall) complete with Speaker Housing, Grille Cloth, Speaker Screen, Washers, and Nuts
14X321	1	Speaker Housing only
14X322	1	Grille Cloth
14X320	1	Speaker Screen

MISCELLANEOUS ITEMS

26A277	1	Radio Mounting Bolt Kit complete with "J" Bolts, Nuts, and Washers
20X339	2	"J" Bolts only
16X27	1	14 Ampere Fuse
21A6	1	Distributor Suppressor
48X27	1	Generator Condenser
	1	Dial Lamp (No. 51)
21A7		Spark Plug Suppressors (Not shipped with Radio)
21A5	1	Choke-Condenser Unit (Not shipped with Radio)

REPLACEMENT PARTS LIST

NOTICE: There is a model number label on the radio. This label identifies the radio as to chassis, dial and issue letter. When ordering parts or writing, give ALL information appearing on this label.

MISCELLANEOUS

12A474	6" PM Speaker
3A303	Tube Socket—Octal (8 prong)
3A316	Vibrator Socket (4 prong) moulded
19A41	Vibrator
28X52	Spring Clamp for Vibrator
32X134	Shield for Filter Assembly
32X105	Shield for Power Transformer
34X300	Top Cover for Chassis Case less Name Plate
34X301	Bottom Cover for Chassis Case
28X48	Spring Clips to Ground Covers to Case

TRANSFORMERS AND COILS

9A1194	L-3	"A" Line Reactor
9A911	L-4	Vibrator "A" Line Reactor
	T-1, T-2, T-3	Antenna, Interstage, Oscillator Coils and Iron Cores are a part of the Tuning Assembly. Entire assembly must be ordered. See Tuning Assembly
9A1907	T-4	1st I-F Transformer and Can Assembly
9A1908	T-5	2nd I-F Transformer and Can Assembly
51X89	T-6	Output Transformer
53X292	T-7	Power Transformer

CAPACITORS

		CAPACITY	VOLTAGE	
17A159	C-1A C-1B C-1C	2.8-35 mmf Antenna 10-90 mmf Interstage 2.8-25 mmf Oscillator		Trimmer
47X479	C-2	300 mmf		Silvered mica
47X476	C-3, C-18	100 mmf		Moulded
D56102	C-4	.001 mf	400 V	Tubular
46X317	C-5	.001 mf	200 V	Polystyrene
47X167	C-7	100 mmf		Ceramic
47X463	C-8	47 mmf		Moulded
D56104	C-9	.10 mf	400 V	Tubular
	C-10, C-11	Part of T-4 (1st I-F Transformer Assembly)		
D56203	C-12	.02 mf	400 V	Tubular
B56503	C-13	.05 mf	200 V	Tubular
	C-14, C-15	Part of T-5 (2nd I-F Transformer Assembly)		
47X112	C-16A C-16B	50 mmf 50 mmf		Dual mica
B56103	C-17	.01 mf	200 V	Tubular
D56103	C-19	.01 mf	400 V	Tubular
45X364	C-20A C-20B C-20C	20 mf 10 mf 20 mf	25 V 350 V 350 V	Dry Electrolytic Capacitor
F56103	C-21	.01 mf	600 V	Tubular
F56403	C-22	.04 mf	600 V	Tubular
47X114	C-25	210 mmf		Fixed mica
46X297	C-26, C-29	.50 mf	120 V	Tubular
P54402	C-27	.004 mf	1600 V	Tubular
47X129	C-28	200 mmf		Fixed mica
	C-30	Part of Chassis Case		

RESISTORS

		OHMS	WATTS	
B85474	R-1, R-11, R-12	470 K	0.5	Carbon
C85153	R-2	15 K	1.0	Carbon
B85224	R-3	220 K	0.5	Carbon
D84153	R-4	15 K	2.0	Carbon
B84223	R-5	22 K	0.5	Carbon
B85225	R-6	2.2 meg	0.5	Carbon
B84823	R-7	82 K	0.5	Carbon
B85473	R-8	47 K	0.5	Carbon
B85475	R-9	4.7 meg	0.5	Carbon
36X296	R-10	500 K	Volume control and switch	
C84561	R-13	560	1.0	Carbon
D85152	R-14	1500	2.0	Carbon
B84820	R-16, R-17	82	0.5	Carbon

TUNING ASSEMBLY

20A99	Iron Core Tuning Assembly complete with Coil Cans, Coils, Iron Cores, and Drive Assembly
42X140	Coil Cans
28X305	Clamp Springs to hold Coil Cans to Tuner Mounting Plate
28X184	Clamp Springs for mounting Antenna, Interstage, and Oscillator Coils
28X309	Slotted Brass Tension Spring
37X202	Bakelite Coupling for Tuning Control Shaft

CONTROL UNIT ASSEMBLY PARTS

	Quantity Used	
*20A92	1	Tuning Control Unit
*20A91	1	Volume Control Fittings
†	2	Control Knobs, Specify Name of Car, Year, and Model. Molded Type Chromium Type

* Shipped with each radio. † Shipped with each panel kit.

INSTALLATION ITEMS

CABLE AND FLEXIBLE SHAFT ASSEMBLIES

	Quantity Used	
18A53	2	27" Tuning Control and Volume Control Flexible Drive Shafts
18A54	2	20" Same as above
18A55	2	36" Same as above
13X390	1	Battery Cable (long section with Fuse Receptacle)
7A162	1	Dial Lamp Socket and Cable Assembly
13X336	1	"A" Cable (Short Section connected to Chassis)
13X582	1	Speaker Cable Assembly (on chassis)

INSTRUMENT PANEL SPEAKER MOUNTING PARTS

26A276	1	Speaker Mounting Kit (For mounting speaker on Instrument Panel) complete with Speaker Baffle, Brackets, Clamps, Nuts, Bolts, and Washers
25X789	1	Strap Bracket only
25X787	1	Speaker Adjusting Bracket ("L" Shaped)
30X154	1	"U" Clamp
25X786	1	Bracket for "U" Clamp
25X785	1	9" Slotted Speaker Bar
14X256	1	Cardboard Speaker Baffle
8X108	1	Sponge Rubber Strip

FIRE WALL SPEAKER MOUNTING PARTS

26A380	1	Speaker Mounting Kit (for mounting speaker on Fire Wall) complete with Speaker Housing, Grille Cloth, Speaker Screen, Washers, and Nuts
14X321	1	Speaker Housing only
14X322	1	Grille Cloth
14X320	1	Speaker Screen

MISCELLANEOUS ITEMS

26A277	1	Radio Mounting Bolt Kit complete with "J" Bolts, Nuts, and Washers
20X339	2	"J" Bolts only
16X27	1	14 Ampere Fuse
21A6	1	Distributor Suppressor
48X27	1	Generator Condenser
7A32	1	No. 51 Pilot Light Bulb
21A7		Spark Plug Suppressors (Not shipped with Radio)
21A5	1	Choke-Condenser Unit (Not shipped with Radio)

MODEL D4630E — WESTERN AUTO SUPPLY CO.

REPLACEMENT PARTS LIST

NOTICE: There is a model number label on the radio. This label identifies the radio as to chassis, dial and issue letter. When ordering parts or writing, give ALL information appearing on this label.

MISCELLANEOUS

12A474	6" PM Speaker
3A303	Tube Socket—Octal (8 prong)
3A316	Vibrator Socket (4 prong) moulded
19A41	Vibrator
28X52	Spring Clamp for Vibrator
32X134	Shield for Filter Assembly
32X105	Shield for Power Transformer
34X300	Top Cover for Chassis Case less Name Plate
34X301	Bottom Cover for Chassis Case
28X48	Spring Clips to Ground Covers to Case

TRANSFORMERS AND COILS

9A1369	L-2	Pilot light Filter Reactor
9A1194	L-3	"A" Line Reactor
9A911	L-4	Vibrator "A" Line Reactor
	T-1, T-2, T-3	Antenna, Interstage, Oscillator Coils and Iron Cores are a part of the Tuning Assembly. Entire assembly must be ordered. See Tuning Assembly
9A1907	T-4	1st I-F Transformer and Can Assembly
9A1908	T-5	2nd I-F Transformer and Can Assembly
51X89	T-6	Output Transformer
53X292	T-7	Power Transformer

CAPACITORS

		CAPACITY	VOLTAGE	
17A159	C-1A	2.8-35 mmf	Antenna	Trimmer
	C-1B	10-90 mmf	Interstage	
	C-1C	2.8-25 mmf	Oscillator	
47X479	C-2	300 mmf		Silvered mica
47X476	C-3, C-18	100 mmf		Moulded
D56102	C-4	.001 mf	400 V	Tubular
46X317	C-5	.001 mf	200 V	Polystyrene
47X167	C-7	100 mmf		Ceramic
47X463	C-8	47 mmf		Moulded
D56104	C-9	.10 mf	400 V	Tubular
	C-10, C-11	Part of T-4 (1st I-F Transformer Assembly)		
D56203	C-12	.02 mf	400 V	Tubular
B56503	C-13	.05 mf	200 V	Tubular
	C-14, C-15	Part of T-5 (2nd I-F Transformer Assembly)		
47X112	C-16A	50 mmf		Dual mica
	C-16B	50 mmf		
B56103	C-17	.01 mf	200 V	Tubular
D56103	C-19	.01 mf	400 V	Tubular
45X364	C-20A	20 mf	25 V	Dry Electrolytic Capacitor
	C-20B	10 mf	350 V	
	C-20C	20 mf	350 V	
F56103	C-21	.01 mf	600 V	Tubular
F56403	C-22	.04 mf	600 V	Tubular
47X114	C-25	210 mmf		Fixed mica
46X297	C-26, C-29	.50 mf	120 V	Tubular
P54402	C-27	.004 mf	1600 V	Tubular
47X129	C-28	200 mmf		Fixed mica
	C-23, C-24, C-30	Part of Chassis Case		

RESISTORS

		OHMS	WATTS	
B85474	R-1, R-11, R-12	470 K	0.5	Carbon
C85153	R-2	15 K	1.0	Carbon
B85224	R-3	220 K	0.5	Carbon
D84153	R-4	15 K	2.0	Carbon
B84223	R-5	22 K	0.5	Carbon
B85225	R-6	2.2 meg	0.5	Carbon
B84823	R-7	82 K	0.5	Carbon
B85473	R-8	47 K	0.5	Carbon
B85475	R-9	4.7 meg	0.5	Carbon
36X296	R-10	500 K		Volume control and switch
C84561	R-13	560	1.0	Carbon
D85152	R-14	1500	2.0	Carbon
B84820	R-16, R-17	82	0.5	Carbon

TUNING ASSEMBLY

20A99	Iron Core Tuning Assembly complete with Coil Cans, Coils, Iron Cores, and Drive Assembly
42X140	Coil Cans
28X305	Clamp Springs to hold Coil Cans to Tuner Mounting Plate
28X184	Clamp Springs for mounting Antenna, Interstage, and Oscillator Coils
28X309	Slotted Brass Tension Spring
37X202	Bakelite Coupling for Tuning Control Shaft

CONTROL UNIT ASSEMBLY PARTS

	Quantity Used	
*20A92	1	Tuning Control Unit
*20A91	1	Volume Control Fittings
†	2	Control Knobs, Specify Name of Car, Year, and Model. Molded Type. Chromium Type

* Shipped with each radio. † Shipped with each panel kit.

INSTALLATION ITEMS

CABLE AND FLEXIBLE SHAFT ASSEMBLIES

	Quantity Used	
18A53	2	27" Tuning Control and Volume Control Flexible Drive Shafts
18A54	2	20" Same as above
18A55	2	36" Same as above
13X390	1	Battery Cable (long section with Fuse Receptacle)
7A162	1	Dial Lamp Socket and Cable Assembly
13X336	1	"A" Cable (Short Section connected to Chassis)
13X582	1	Speaker Cable Assembly (on chassis)

INSTRUMENT PANEL SPEAKER MOUNTING PARTS

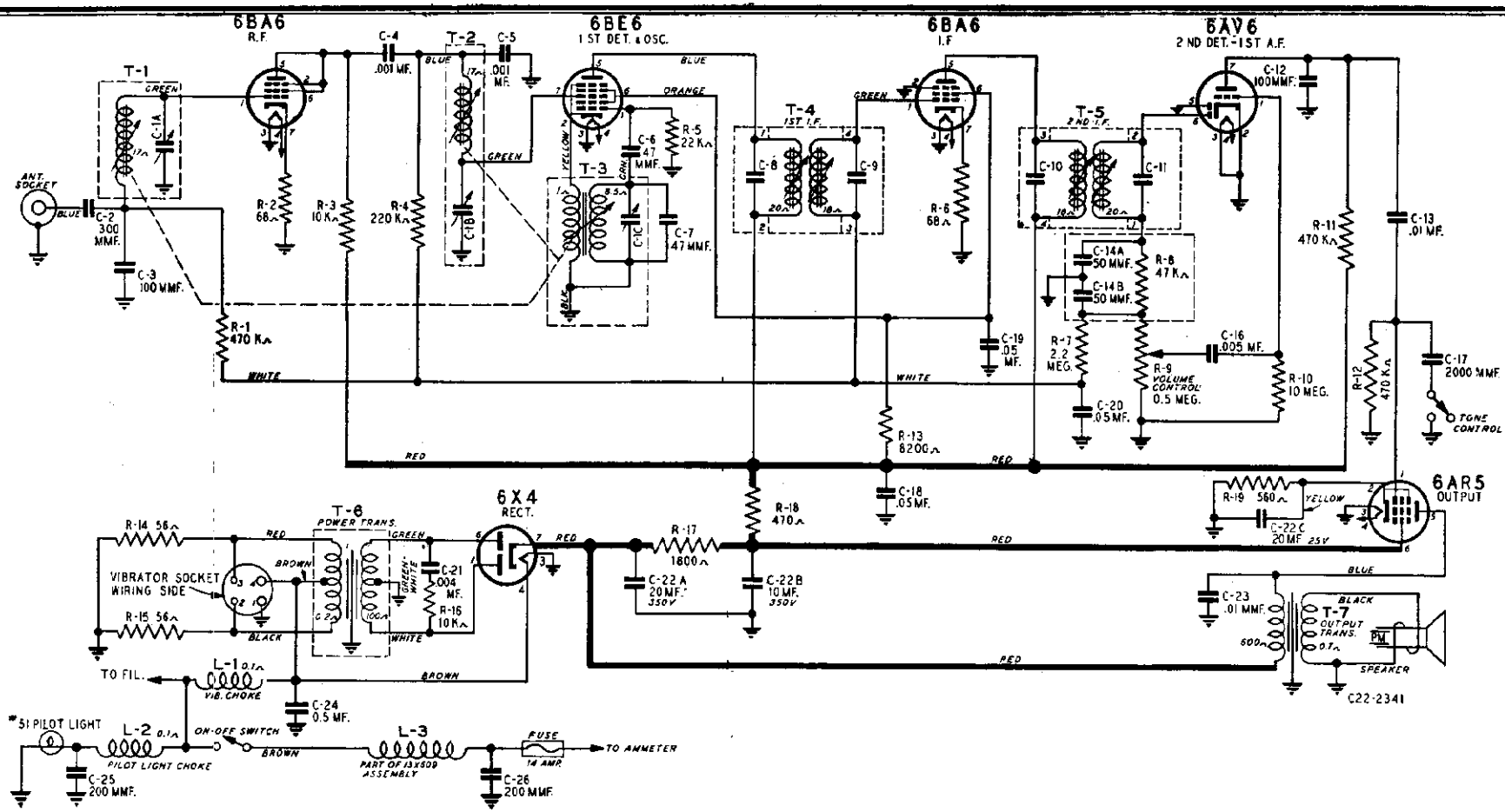
26A276	1	Speaker Mounting Kit (For mounting speaker on Instrument Panel) complete with Speaker Baffle, Brackets, Clamps, Nuts, Bolts, and Washers
25X789	1	Strap Bracket only
25X787	1	Speaker Adjusting Bracket ("L" Shaped)
30X154	1	"U" Clamp
25X786	1	Bracket for "U" Clamp
25X785	1	9" Slotted Speaker Bar
14X25C	1	Cardboard Speaker Baffle
8X108	1	Sponge Rubber Strip

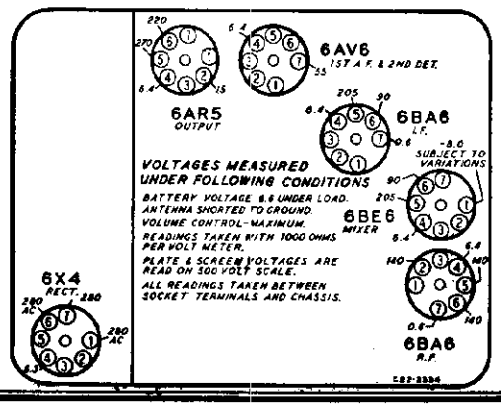
FIRE WALL SPEAKER MOUNTING PARTS

26A380	1	Speaker Mounting Kit (for mounting speaker on Fire Wall) complete with Speaker Housing, Grille Cloth, Speaker Screen, Washers, and Nuts
14X321	1	Speaker Housing only
14X322	1	Grille Cloth
14X320	1	Speaker Screen

MISCELLANEOUS ITEMS

26A277	1	Radio Mounting Bolt Kit complete with "J" Bolts, Nuts, and Washers
20X339	2	"J" Bolts only
16X27	1	14 Ampere Fuse
21A6	1	Distributor Suppressor
48X27	1	Generator Condenser
7A32	1	No. 51 Pilot Light Bulb
21A7		Spark Plug Suppressors (Not shipped with Radio)
21A5	1	Choke-Condenser Unit (Not shipped with Radio)





SPECIFICATIONS

Power Consumption 6.6 Amperes at 6.6 Volts

Power Output (6.6 Volts) 2.2 Watts Undistorted
4.0 Watts Maximum

Sensitivity.....4 Microvolts at 1 Watt Output

Selectivity.....55 KC Broad at 1000 Times Signal

Tuning Frequency Range.....540 to 1600 KC

Intermediate Frequency.....455 KC

Speaker .....5¼" Dynamic

Attenuate the signal from the signal generator to prevent the leveling-off action of the AVC.

NOTE A—Insert the antenna cable plug in the antenna socket on the chassis. The total capacity of the antenna cable and dummy antenna should be 60 mmf. If the cable, for example, has a capacity of 30 mmf., use a 30 mmf. condenser for a dummy antenna. Connect the other end of the antenna cable through the dummy antenna capacity to the output of the signal generator.

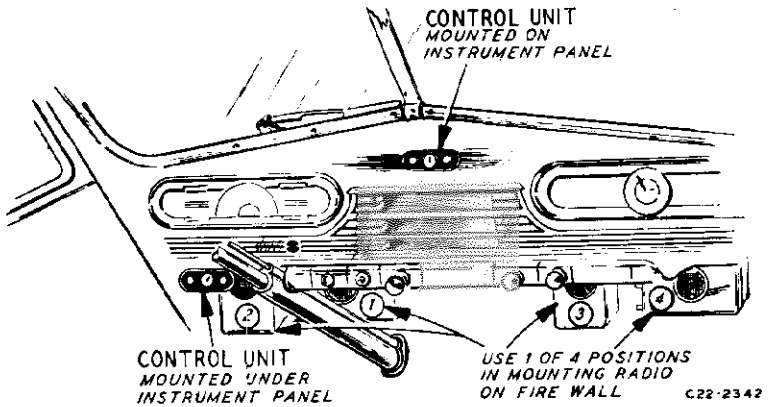


Fig. 1—Control Unit and Chassis Mountings

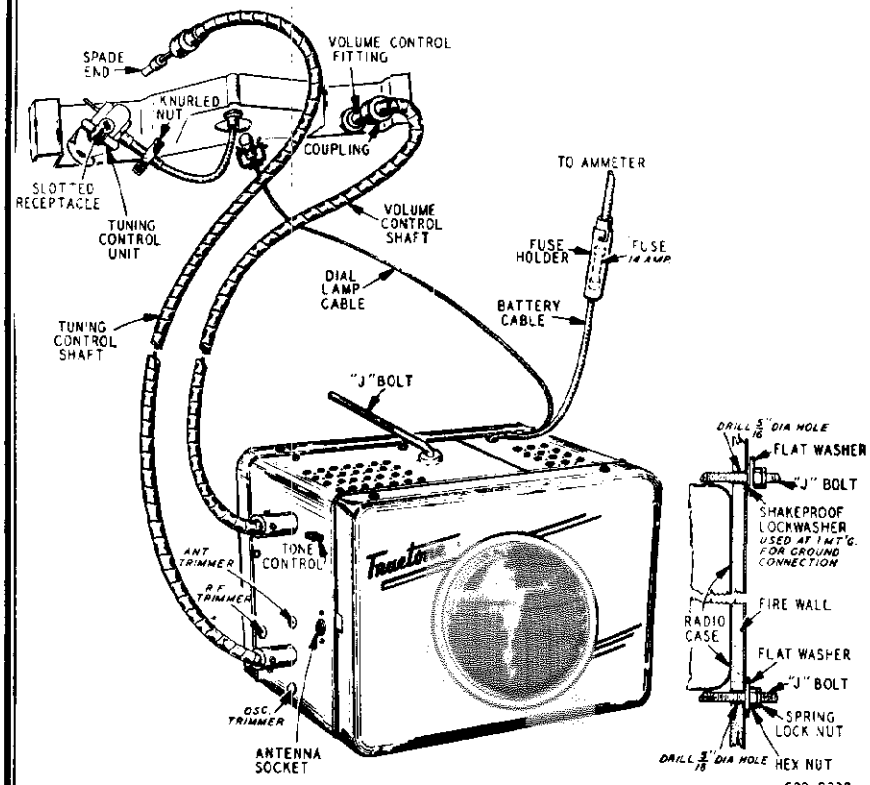


Fig. 2—General Installation View

ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.
Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.
Allow Chassis and Signal Generator to "Heat Up" for several minutes.
The following equipment is required for aligning:

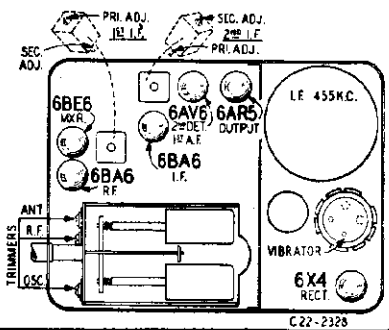
A Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.
Output Indicating Meter—Non-Metallic Screwdriver.
Dummy Antenna—.05 mf., See Note A.

SIGNAL GENERATOR FREQUENCY SETTING	CONNECTION AT RADIO	DUMMY ANTENNA	IRON CORE SETTING	ADJUST TUNING SLUGS (IF) AND TRIMMERS TO MAXIMUM (See Fig. 3)
I.F.	Control Grid (prong No. 7)		Extreme Position	1st I.F. PRI. & SEC. ADJ
455 KC	6BE6 Mixer Tube	.05 mf.	out of Coil	2nd I.F. PRI. & SEC. ADJ
OSCILLATOR				
1600 KC	Antenna Cable See Note A	See Note A	Extreme Position out of Coil	Oscillator (C1C)
1400 KC ADJUSTMENT				
1400 KC	Antenna Cable	See Note A	Tune to Max. Output with Tuning Knob	R.F. (C1B) Ant. (C1A)

Reassemble Radio—Install in Car—Connect Car Antenna to Radio.

Car Antenna Readjustment—Tune in weak signal near 1400 KC—Readjust Antenna Trimmer C1A for maximum output.

Fig. 3—Location of Tubes and Vibrator



Calibrating the Radio

To calibrate the radio, tune in a station of known frequency, loosen the knurled nut at the tuning control clamp fitting and turn the flexible shaft with the fingers until the dial pointer indicates the frequency of the station being received.

Slide the flexible shaft in or out of the tuning control clamp fitting until a smooth action with a minimum of backlash is obtained.

The knurled nut should then be tightened with the fingers.

SUPPRESSION OF MOTOR NOISE

The following procedure has been found to be effective in reducing motor noise to a satisfactory level in most cars. Follow the steps in the order given. Additional procedure, which may be required in exceptional cases of motor noise, is not covered here and will be found by referring to current literature on this subject.

GENERATOR CONDENSER — A generator condenser is required in all cases. Connect the condenser lead to the battery terminal of the generator. The case and mounting strap connect the other side of the condenser to ground. This unit must, therefore, be well grounded at its mounting.

CAUTION—In cars with automatic regulators, it is important not to connect the condenser across the field terminal. Most manufacturers at the present time have a recommendation for the proper post at which to connect the condenser.

DISTRIBUTOR SUPPRESSOR—A distributor suppressor will be required in most cases. Remove the high tension lead to the distributor. Insert a distributor suppressor and connect the wire to the other end of the suppressor (See Fig. 4). If this is not practical, cut the high tension lead close to the distributor and use a wood screw end type distributor suppressor in this line.

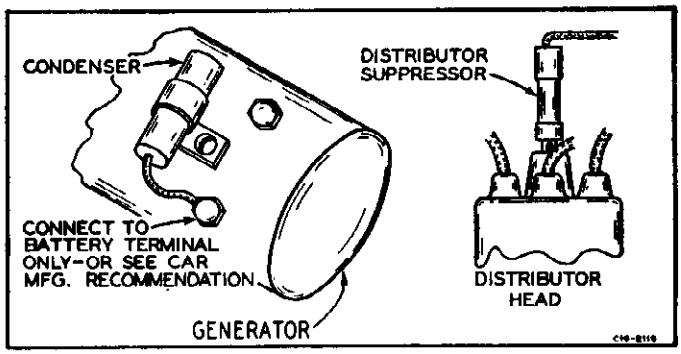


Fig. 4—Generator Condenser and Distributor Suppressor

Withdraw Antenna Cable Plug

Turn on the radio and start the motor.

If motor noise is heard, proceed as follows:

BONDING CABLES, STEERING COLUMN, ETC.—Try grounding to the fire wall all cables and tubing which pass through it such as oil lines, gas lines, etc. It is also possible for the steering column, foot pedals, and brake lever to carry interference to the back of the fire wall at which point it may effect the radio. By means of a file, contact can be established between any of these parts and the fire wall or frame in order to determine whether such a ground will reduce the noise. To bond the parts to the fire wall or frame, clean the point of contact, wrap a length of one inch braided shielding around the part, and solder the connection. Then solder the end of the shielding to the fire wall or frame or ground it under a screw head if one is convenient.

Sufficient play should be left in the bonding shielding so that movement of the parts will not loosen this shielding.

Then Re-insert Antenna Cable Plug

If motor noise is heard when the antenna cable is reconnected, proceed as follows until the noise is satisfactorily reduced:

BYPASS CONDENSERS — Try a .5 mfd. bypass condenser from the ammeter to ground and see if interference is reduced, Install this condenser permanently if there is an improvement.

In like manner, try a .5 mfd. condenser from car fuse to ground, switch to ground, tail light and stop light connections to ground, windshield wiper and various other 6 volt connections to ground, noting what effect these condensers have on the noise pickup.

Try a .5 mfd. condenser between the point at which the dome light lead leaves the pillar post and ground.

Try a .5 mfd. condenser from the "Hot" side of the coil primary to ground.

The electric gauges used for oil, water, and gas are often a source of interference and bypass condensers should be tried. The condenser should usually be connected to the end of the line nearest the measuring device rather than at the instrument panel.

HIGH AND LOW TENSION LEADS—In some cases, the high and low tension leads between the coil and distributor are run close together. In some cars, they are in the same conduit. If this is the case, remove the low tension lead from this conduit. In any event, keep the high and low tension leads as far apart from each other as possible. If separating the two leads is not sufficient, shield and ground the shield of the low tension lead.

GROUNDING MOTOR AND OTHER PARTS—The motor must, in every case, be well grounded to the frame of the car. If it is not, use a very heavy braided lead for this purpose, similar to a storage battery ground lead. In like manner, it may be necessary to check the grounding of the metal fire wall, instrument panel, transmission, radiator, hood, and muffler to the frame of the automobile. To obtain a good electrical connection, scrape off the paint, if necessary, at the point where ground contact is made.

PEENING ROTOR ARM — In extreme cases of motor noise, it is advisable to peen the distributor rotor arm, that is, increase the length of the arm by using a small machinist's hammer. This will lessen the gap between the rotor arm and the stationary contacts thus reducing the spark. Be sure, after peening the arm, that it does not strike the stationary contacts.

SPARK PLUG SUPPRESSORS—If motor noise persists, spark plug suppressors must be installed. One suppressor is put on each plug. These are not regularly supplied with the radio and must be purchased extra. Ninety-five percent of all cars will not require spark plug suppressors.

Care should be taken that a good mechanical and electrical connection is made between the spark plugs, suppressors, and plug wires.

WHEEL OR BRAKE STATIC—To determine if noise is being caused from this source, set the car in motion; then with the motor shut off and the clutch disengaged, apply the brakes. *If the noise* stops, the source of the static is in the wheels. The use of a front or rear wheel static eliminator will generally end the trouble.

MODELS D4832A, D4832B WESTERN AUTO SUPPLY CO.

REPLACEMENT PARTS LIST

NOTICE: There is a model number label on the radio. This label identifies the radio as to chassis, dial and issue letter. When ordering parts or writing, give ALL information appearing on this label.

MISCELLANEOUS

12A485	5¼" P.M. Speaker
3A441	Tube Socket — Miniature
2A175	Tone Control Switch
3A316	Vibrator Socket (4 prong) molded
19A41	Vibrator
28X52	Vibrator Spring Clamp
32X105	Shield for Power Transformer
34X537	Top Cover for Chassis Case
34X538	Bottom Cover for Chassis Case
28X48	Spring Clips to Ground Covers to Case
20A100	Iron Core Tuning Assembly, Complete with Coils, Trimmers, Etc.
76X1	Resistor Capacitor Combination

TRANSFORMERS AND COILS

L-1, L-2	9A1958	Choke
L-3	13X609	Twisted Lead & Coil Assembly
T-1, T-2, T-3		Antenna, R-F, Oscillator Coils and Iron Cores are a part of the 20A100 Tuning Assembly. Entire Assembly must be ordered. (See Miscellaneous.)
T-4	9A1961	1st I.F. Transformer and Can Assembly
T-5	9A1959	2nd I.F. Transformer and Can Assembly
T-6	53X294	Power Transformer
T-7	51X137	Output Transformer

CAPACITORS

C-1A, C-1B, C-1C		Part of Iron Core Tuning Assembly (See Miscellaneous)		
C-2	47X479	300 mmf		Mica
C-3, C-12	47X497	100 mmf		Ceramic
C-4, C-5	46X399	.001 mf	400 V	Tubular
C-6	47X495	47 mmf		Ceramic
C-7	47X517	47 mmf		Ceramic
C-8, C-9		Part of T-4 (1st I. F. Transformer)		
C-10, C-11		Part of T-5 (2nd I. F. Transformer)		
C-13	46X402	.01 mf	1000 V	Tubular
C-14A, C-14B		Part of 76X1 Resistor-Capacitor Combination (See Miscellaneous)		
C-16	46X400	.005 mf	200 V	Tubular
C-17	47X520	2000 mmf		Ceramic
C-18, C-19	46X397	.05 mf	400 V	Tubular
C-20	46X398	.05 mf	200 V	Tubular
C-21	P54402	.004 mf	1600 V	Tubular
C-22A		20 mf	350 V	
C-22B	45X365	10 mf	350 V	Dry Electrolytic
C-22C		20 mf	25 V	
C-23	46X401	.01 mf	400 V	Tubular
C-24	46X395	.5 mf	100 V	Tubular
C-25, C-26	47X129	200 mmf		Mica

RESISTORS

		Ohms	Watts	
R-1, R-11, R-12	B85474	470 K	0.5	Carbon
R-2, R-6	B85680	68	0.5	Carbon
R-3	C85103	10 K	1.0	Carbon
R-4	B85224	220 K	0.5	Carbon
R-5	B85223	22 K	0.5	Carbon
R-7	B85225	2.2 meg.	0.5	Carbon
R-8		47 K Capacitor Combination (See Miscellaneous)	Part of 76X1 Resistor	
R-9	36X296	.5 meg	Volume Control & Switch	
R-10	B85106	10 meg.	0.5	Carbon
R-13	C84822	8200	1.0	Carbon
R-14, R-15	C85560	56	1.0	Carbon
R-16	B85103	10 K	0.5	Carbon
R-17	D84182	1800	2.0	Carbon
R-18	B85471	470	0.5	Carbon
R-19	C84561	560	1.0	Carbon

CONTROL UNIT ASSEMBLY PARTS

	Quantity Used	
*20A92	1	Tuning Control Unit
*20A91	1	Volume Control Fittings
†	2	Control Knobs, Specify Name of Car, Year, and Model. Molded Type. Chromium Type.

* Shipped with each radio. † Shipped with each panel kit.

INSTALLATION ITEMS

CABLE AND FLEXIBLE SHAFT ASSEMBLIES

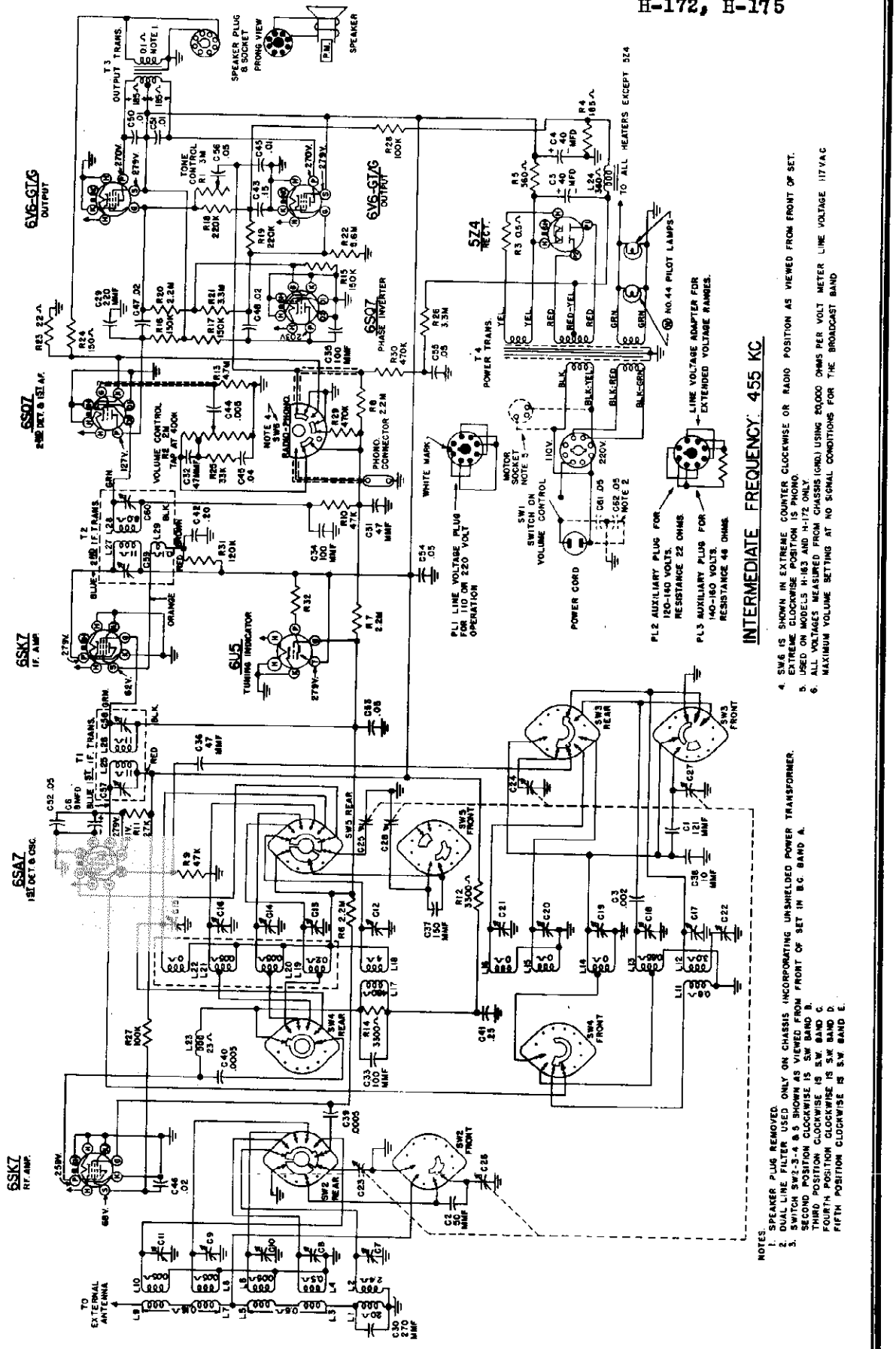
	Quantity Used	
18A53	2	27" Tuning Control and Volume Control Flexible Drive Shafts
18A54	2	20" Same as above
18A55	2	36" Same as above
13X390	1	Battery Cable (long section with Fuse Receptacle)
7A162	1	Dial Lamp Socket and Cable Assembly
13X336	1	"A" Cable (Short Section connected to Chassis)
13X601	1	Speaker Cable Assembly (on chassis)

MISCELLANEOUS ITEMS

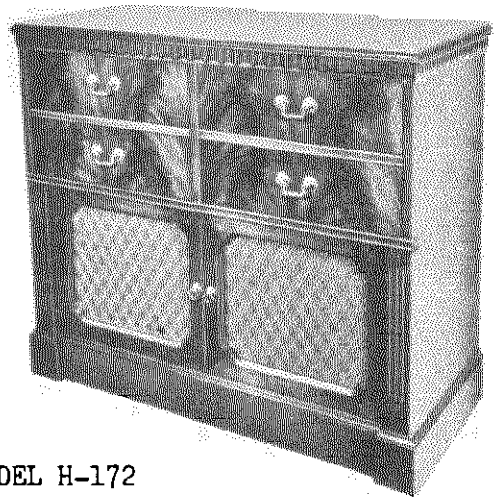
26A490	1	Radio Mounting Bolt Kit complete with "J" Bolts, Nuts, and Washers
20X339	2	"J" Bolts only
16X27	1	14 Ampere Fuse
21A6	1	Distributor Suppressor
48X27	1	Generator Condenser
7A32	1	No. 51 Pilot Light Bulb
21A7		Spark Plug Suppressors (Not shipped with Radio)
21A5	1	Choke-Condenser Unit (Not shipped with Radio)

WESTINGHOUSE ELECTRIC CORP.

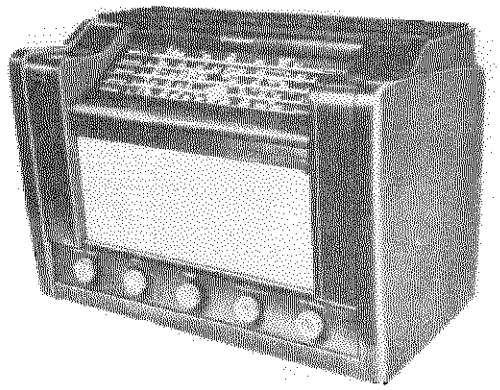
MODELS H-142, H-163, H-172, H-175



MODELS H-142, H-163, H-172, H-175 WESTINGHOUSE ELECTRIC CORP.



MODEL H-172

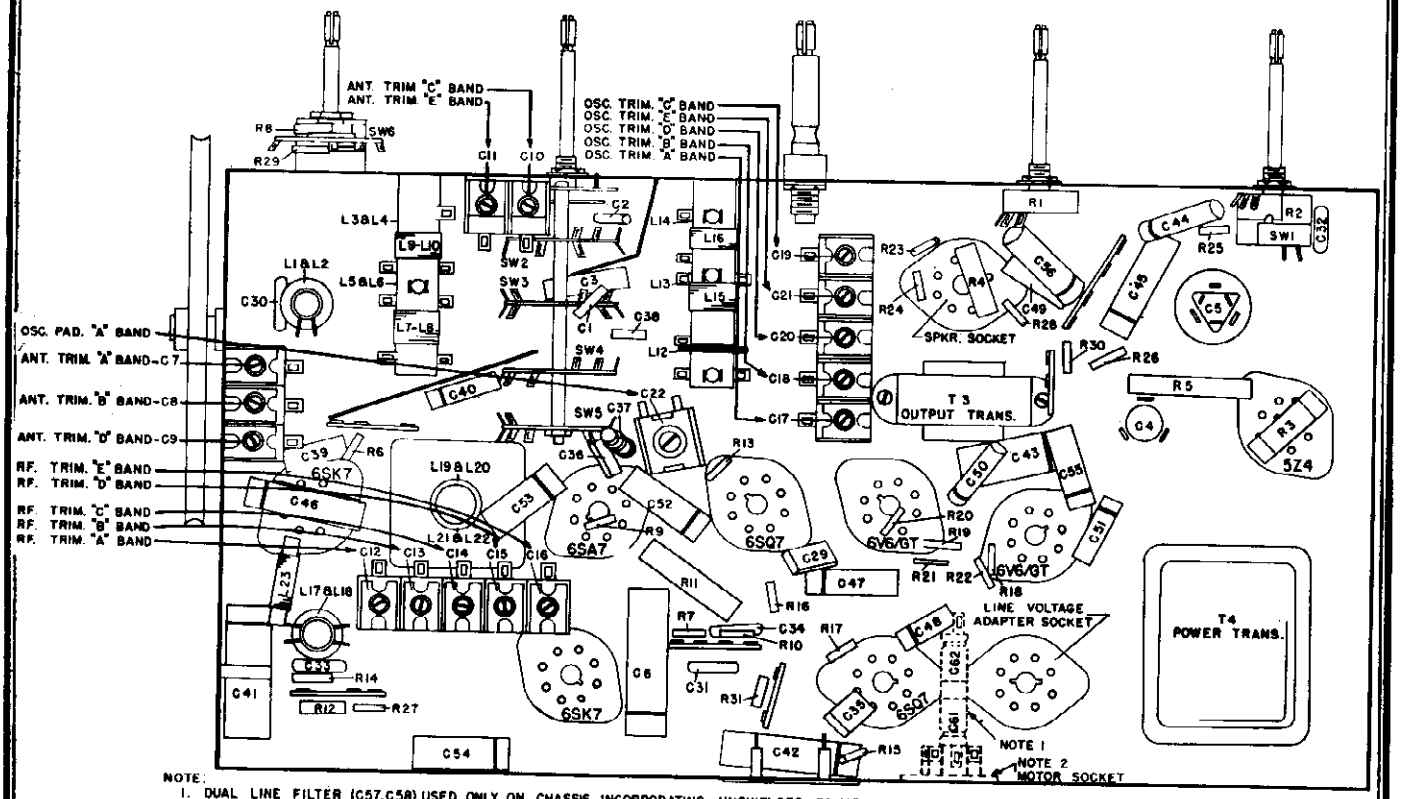


MODEL H-142

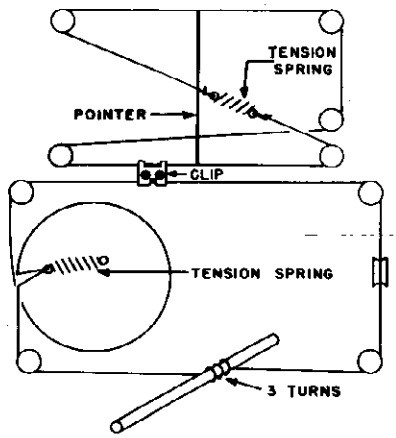
Step	Band Switch Position	Connect Signal Generator to—	Signal Generator Frequency	Radio Setting	Adjust
1	A	6SK7, 1st I-F control grid through 0.1 mfd. capacitor	455 kc	550 kc 166°	Secondary and primary trimmers of 2nd I-F trans. (T2) for maximum output.
2	A	6SA7, converter, control grid through a 0.1 mfd. capacitor	455 kc	550 kc 166°	Secondary and primary trimmers of 1st I-F trans. (T1) for maximum output.
3	A	6SA7, converter, control grid through a 0.1 mfd. capacitor	455 kc	550 kc 166°	Carefully "peak" all I-F transformer trimmers for maximum output.
4	A	Antenna lead through a 200 mmf. capacitor	1615 kc	minimum capacity 0°	"A" band oscillator trimmer (C17) for maximum output.
5	A	Antenna lead through a 200 mmf. capacitor	600 kc	600 kc 145°	"A" band oscillator padder (C22) for maximum output.
6	A	Recheck steps 4 and 5.			
7	A	Antenna lead through a 200 mmf. capacitor	1400 kc	1400 kc 29°	"A" band R-F (C12) and antenna (C7) trimmers for maximum output.
8	B	Antenna lead through a 400 ohm resistor	7.5 mc	minimum capacity 0°	"B" band oscillator trimmer (C18) for maximum output.
9	B	Antenna lead through a 400 ohm resistor	7.0 mc	7.0 mc 18°	"B" band R-F (C13) and antenna (C8) trimmers for maximum output.*
10	C	Antenna lead through a 400 ohm resistor	12.0 mc	minimum capacity 0°	"C" band oscillator trimmer (C19) for maximum output.
11	C	Antenna lead through a 400 ohm resistor	11.5 mc	11.5 mc 51°	"C" band R-F (C14) and antenna (C10) trimmers for maximum output.*
12	D	Antenna lead through a 400 ohm resistor	15.4 mc	minimum capacity 0°	"D" band oscillator trimmer (C20) for maximum output.
13	D	Antenna lead through a 400 ohm resistor	15.0 mc	15.0 mc 51°	"D" band R-F (C15) and antenna (C9) trimmers for maximum output.*
14	E	Antenna lead through a 400 ohm resistor	21.8 mc	minimum capacity 0°	"E" band oscillator trimmer (C21) for maximum output.
15	E	Antenna lead through a 400 ohm resistor	21.5 mc	21.5 mc 35°	"E" band R-F (C16) and antenna (C11) trimmers for maximum output.*

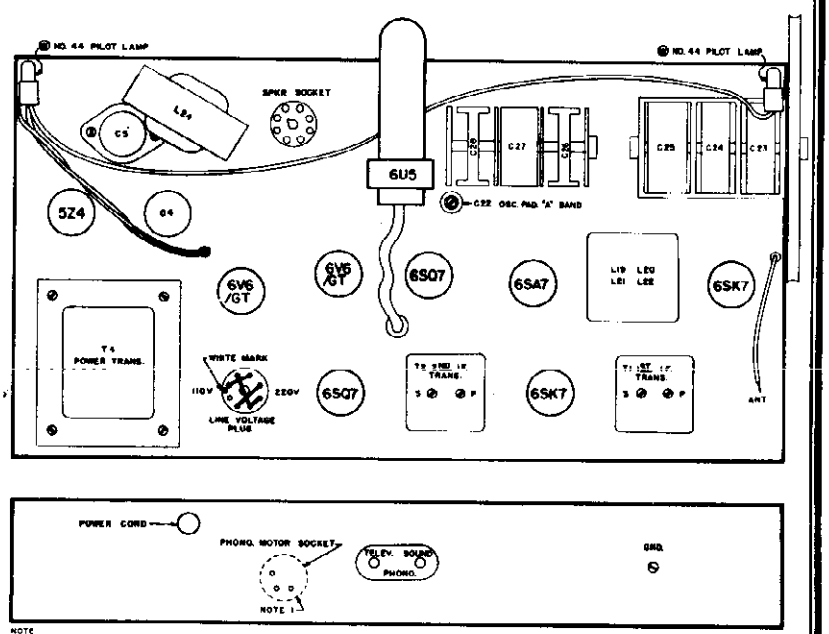
WESTINGHOUSE ELECTRIC CORP.

MODELS H-142, H-163, H-172, H-175



NOTE:
1. DUAL LINE FILTER (C57,C58) USED ONLY ON CHASSIS INCORPORATING UNSHIELDED POWER TRANSFORMER.
2. USED ON MODELS H-163 AND H-172.





NOTE
1. USED ON MODELS H-163 AND H-172

MODELS H-142, H-163, H-172, H-175 — WESTINGHOUSE ELECTRIC CORP.

Part No.	Description
RCM20A470M	Capacitor, 47 mmf mica (C31, C32)
RCM20A101M	Capacitor, 100 mmf mica (C33, C34, C35)
RCM20A470K	Capacitor, 47 mmf mica (C36)
CC40UH151G	Capacitor, 150 mmf ceramic (C37)
CC25UJ100M	Capacitor, 10 mmf ceramic (C38)
V-3782S-22W	Capacitor, .0005 mfd 450 v. (C39, C40)
V-4953	Capacitor, .25 mfd 400 v. (C41)
V-3782S-30W	Capacitor, 0.2 mfd 400 v. (C42)
V-3782S-27W	Capacitor, .15 mfd 400 v. (C43)
V-3782S-29W	Capacitor, .005 mfd 400 v. (C44)
V-3782S-28W	Capacitor, .04 mfd 400 v. (C45)
V-3782S-21W	Capacitor, .02 mfd 480 v. (C46, C47, C48)
V-3782S-24W	Capacitor, .01 mfd 400 v. (C49, C50, C51)
V-3782S-25W	Capacitor, .05 mfd 400 v. (C52, C53, C54, C55, C56)
V-3241	Capacitor, dual .05 mfd 600 v. (C61, C62)
V-5064-1	Catch, bullet (H-172)
V-4468	Clamp, tuning eye
V-4453	Clamp, dial drive
V-4467	Clamp, glass plate mounting
V-4412	Coil, antenna, A band (L1, L2)
V-4413	Coil, antenna, B and C bands (L3, L4, L5, L6)
V-4414	Coil, antenna, D and E bands (L7, L8, L9, L10)
V-4416	Coil, oscillator, A, B and C bands (L11, L12, L13, L14)
V-4417	Coil, oscillator, D and E bands (L15, L16)
V-4415	Coil, R-F, A band (L17, L18)
V-4418	Coil, R-F interstage, B, C, D and E bands (L19, L20, L21, L22)
V-4419	Coil, R-F reactor (L23)
V-4200	Connector, phono
V-4421	Control, tone, 3.0 megohms (R1)
V-4420	Control, volume, 2.0 megohms tapped at 400K (R2) and switch (SW1)
V-3879	Cord, A-C power
V-4304S-4	Cord, dial drive
V-4479	Cover, back (H-142)
V-4525-2	Cushion, chassis
V-4469	Decal, Band A, B, C, D, E (H-142)
V-4470	Decal, off-volume (H-142, H-172)
V-4471	Decal, radio-phono (H-142, H-172)
V-4472	Decal, tone — bass-treble (H-142 H-172)
V-4473	Decal, tuning (H-142, H-172)
V-4474	Decal, Westinghouse (H-142, H-172)
V-5267	Decal, Band A, B, C, D, E (H-172)
V-4727	Dial Glass Assembly
V-4728	Dial Assembly (with pulleys)
V-4726	Disc, decorative
V-4721	Drive Shaft Assembly
	V-4401 Bushing, drive shaft
	V-4438 Shaft, drive
V-3371	Foot, recessed (H-142)
V-4902	Glide, furniture (H-172)
V-5196	Grille, metal (H-172)
V-5167	Grille Cloth (H-172)
V-4906	Grille Cloth (H-142)

Part No.	Description
V-7046	Adapter, resistance unit, for 120-140 volt line (PL2)
V-7047	Adapter, resistance unit, for 140-160 volt line (PL3)
V-4300-1	Adapter, phono motor (60 cycle) (H-172)
V-4462	Background, dial
V-4396	Band, rubber
V-4463-2	Bolt, chassis mounting
V-4511	Bracket, brace right (H-163, H-172)
V-4512	Bracket, brace left (H-163, H-172)
V-4713	Bracket Assy., idler, L.H.
V-4480	Bracket Assy., idler, R.H. (H-142, H-175)
V-4714	Bracket Assy., idler, upper R.H. (H-163, H-172)
V-4715	Bracket Assy., idler, lower R.H. (H-163, H-172)
V-4717	Bracket Assy., idler pulley (H-163, H-172)
V-4524	Bracket Assy., idler pulley (H-142, H-175)
V-4397	Bracket, brace (H-142, H-175)
V-4400	Bracket, radio-phono switch
V-4424	Bracket, foot mounting
V-4893	Bumper, recessed (H-163, H-172)
V-4241	Button, back cover (H-142)
V-1130	Cabinet (H-142)
V-4395	Cable, speaker (with plug)
V-4501-1	Capacitor, 120 mmfd ceramic (C1)
V-4501-2	Capacitor, 51 mmfd ceramic (C2)
V-4500-1	Capacitor, .002 mfd 180 v. polystyrene (C3)
V-4403	Capacitor, dry electrolytic, 40 mfd 450 v. (C4, C5)
V-4404	Capacitor, dry electrolytic, 8 mfd 250 v. (C6)
V-4405	Capacitor, trimmer, 3 gang (C7, C8, C9)
V-4406	Capacitor, trimmer, 2 gang (C10, C11)
V-4407	Capacitor, trimmer, 5 gang (C12, C13, C14, C15, C16, C17, C18, C19, C20, C21)
V-4408	Capacitor, padder, "A" band oscillator (C22)
V-4716	Capacitor Assy., variable tuning
	V-4409 Capacitor, variable 3 gang, L.F. (C23, C24, C25)
	V-4410 Capacitor, variable 3 gang, H.F. (C26, C27, C28)
	V-4460 Coupling Assy.
	V-4425 Grommet
	V-4427 Link, coupling
	V-4436 Screw, No. 6—32 slab head, cup point
	V-4437 Screw, No. 8—32 slab head, cup point
	V-4447 Spring, coupling
	V-4718 Drum Assy., tuning drive
	V-4431 Drum, drive
	V-4435 Scale, rotation
	V-4426 Hub, brass collar
RCM20A221M	Capacitor, 220 mmf mica (C29)
RCM20A271K	Capacitor, 270 mmf mica (C30)

MECHANICAL SPECIFICATIONS:

	Height	Width	Depth
Cabinet Dimensions (inches):			
H-142	15½	21½	12¾
H-172	34½	40	17¾
Overall Dimensions packed for Shipment (inches):			
H-142	18¾	27	17
H-172	39	44	22

Shipping Weight:

H-142 (approx.)	75 lbs.
H-172 (approx.)	190 lbs.
Tuning Drive Ratio	16 to 1

WESTINGHOUSE ELECTRIC CORP. MODELS H-142, H-163, H-172, H-175

Part No.	Description
V-5363-5	Hinge, upper L.H. (H-172)
V-5363-6	Hinge, upper R.H. (H-172)
V-5272-1	Hinge, reversible (H-172)
V-3437	Insulator, electrolytic capacitor
V-4246	Knob, band
V-4477	Knob, radio-phono
V-4478	Knob, volume, tone and tuning
No. 44	Lamp, pilot
V-3333S-2	Medallion, Westinghouse (H-163, H-172)
V-4527	Plate, pilot lamp mounting (H-163, H-172)
V-4430	Plug, octal (PL1)
V-4483	Pointer
V-5195	Pull, door (H-172)
V-5194	Pull, drawer (H-172)
V-4432	Pulley, idler
V-4538	Reactor, filter (L24)
V-4433	Resistor, 0.5 ohms 2 w. (R3)
V-4434	Resistor, 185 ohms 5 w. (R4)
V-4545	Resistor, 560 ohms 10 w. (R5)
RC20AE225M	Resistor, 2.2 megohms ½ w. (R6, R7, R8)
RC20AE473M	Resistor, 47K ½ w. (R9, R10)
RC41AE273K	Resistor, 27K 2 w. (R11)
RC30AE332M	Resistor, 3300 ohms 1 w. (R12)
RC20AE475M	Resistor, 4.7 megohms ½ w. (R13)
RC20AE332M	Resistor, 3300 ohms ½ w. (R14)
RC20AE154M	Resistor, 150K ½ w. (R15)
RC20AE154K	Resistor, 150K ½ w. (R16, R17)
RC20AE224K	Resistor, 220K ½ w. (R18, R19)
RC20AE225K	Resistor, 2.2 megohms ½ w. (R20)
RC20AE335K	Resistor, 3.3 megohms ½ w. (R21)
RC20AE565K	Resistor, 5.6 megohms ½ w. (R22)
RC20AE220K	Resistor, 22 ohms ½ w. (R23)
RC20AE151K	Resistor, 150 ohms ½ w. (R24)
RC20AE333K	Resistor, 33K ½ w. (R25)
RC20AE335M	Resistor, 3.3 megohms ½ w. (R26)
RC20AE104M	Resistor, 100K ½ w. (R27, R28)
RC20AE474M	Resistor, 470K ½ w. (R29, R30)
RC20AE124M	Resistor, 120K ½ w. (R31)
V-4485-11	Screw, Hex head, chassis mtg. (H-142)
V-3755-2	Screw, No. 6 Phillips head, self-tapping ¼ inch
V-3755-4	Screw, No. 6 Phillips head, self-tapping ⅜ inch
V-4439	Shield, fin, 1⅝ inch high
V-4440	Shield, fin, 2⅜ inch high
V-4168	Shield, socket
V-3353-7	Slide Mechanism, L.H. (H-172)
V-3353-8	Slide Mechanism, R.H. (H-172)
V-4444	Sockets, pilot light (2 assembled)
V-4461	Socket, tuning eye
V-4441	Socket, voltage selector
V-4514	Socket, molded octal tube
V-4499	Socket, motor (H-163, H-172)
V-4488	Spacer, cardboard, dial
V-4489	Speaker, 8" P.M.
V-4489-2	Cone and Voice Coil Assy. for V-4489 speaker
V-4334	Speaker, 12" P.M.
V-4334-1	Cone and Voice Coil Assy. for V-4334 speaker
V-4445	Spring, coil mounting, small
V-4446	Spring, coil mounting, large
V-4448	Spring, dial drive (H-163, H-172)
V-4490	Spring, dial drive (H-142, H-175)
V-5065-1	Strike, bullet catch (H-172)
V-4494	Stud, pulley
V-4449	Stud, variable capacitor mounting
V-4451	Switch, band (SW2, SW3, SW4, SW5)
V-4452	Switch, radio-phono (SW6)
V-3643	Teenut, phono mounting (H-172)
V-4196	Terminal Board, 1 lug
V-4443	Terminal Board, 2 lugs
V-4442	Terminal Board, 3 lugs
V-4454	Terminal Board, 4 lugs
V-4456	Transformer, 1st I-F (L25, L26, C57, C58)
V-4457	Transformer, 2nd I-F (L27, L28, L29, C59, C60)
V-4458	Transformer, output (T3)
V-4459	Transformer, power (T4)
V-3267S-8	Washer, flat, chassis mounting
V-4252-2	Washer, felt
V-3506S-1	Washer, Neoprene, chassis mounting

FREQUENCY RANGES:

Broadcast	535 to 1610 kc.
Short Wave (1)	2.4 to 7.5 mc.
Short Wave (2)	8.5 to 12.0 mc.
Short Wave (3)	12.6 to 15.4 mc.
Short Wave (4)	18.0 to 21.8 mc.

INTERMEDIATE FREQUENCY: 455 kc.

TUBE COMPLEMENT:

1	6SK7	R-F Amplifier
1	6SA7	Converter
1	6SK7	I-F Amplifier
1	6SQ7	Det., A.V.C., A-F Amp.
1	6SQ7	Phase Inverter
2	6V6GT/G	Power Output Amp.
1	6U5	Tuning Eye
1	5Z4	Rectifier

PILOT LAMPS:

2 Westinghouse No. 44 ..... 6.3 v., 0.25 amp.

POWER OUTPUT:

Undistorted	8 watts
Maximum	11 watts

LOUDSPEAKER:

Type	P.M. dynamic
Voice Coil Impedance at 400 cycles	3.2 ohms
Size (H-142)	8 inches
Size (H-163, H-172, H-175)	12 inches

OPERATING VOLTAGES (40-60 cycles A-C):

100 to 120 volts—Insert line voltage plug beside power transformer in 110 v position.

120 to 140 volts—Insert adapter V-7046 in place of line voltage plug.

140 to 160 volts—Insert adapter V-7047 in place of line voltage plug.

200 to 240 volts—Insert line voltage plug beside power transformer in 220 v. position.

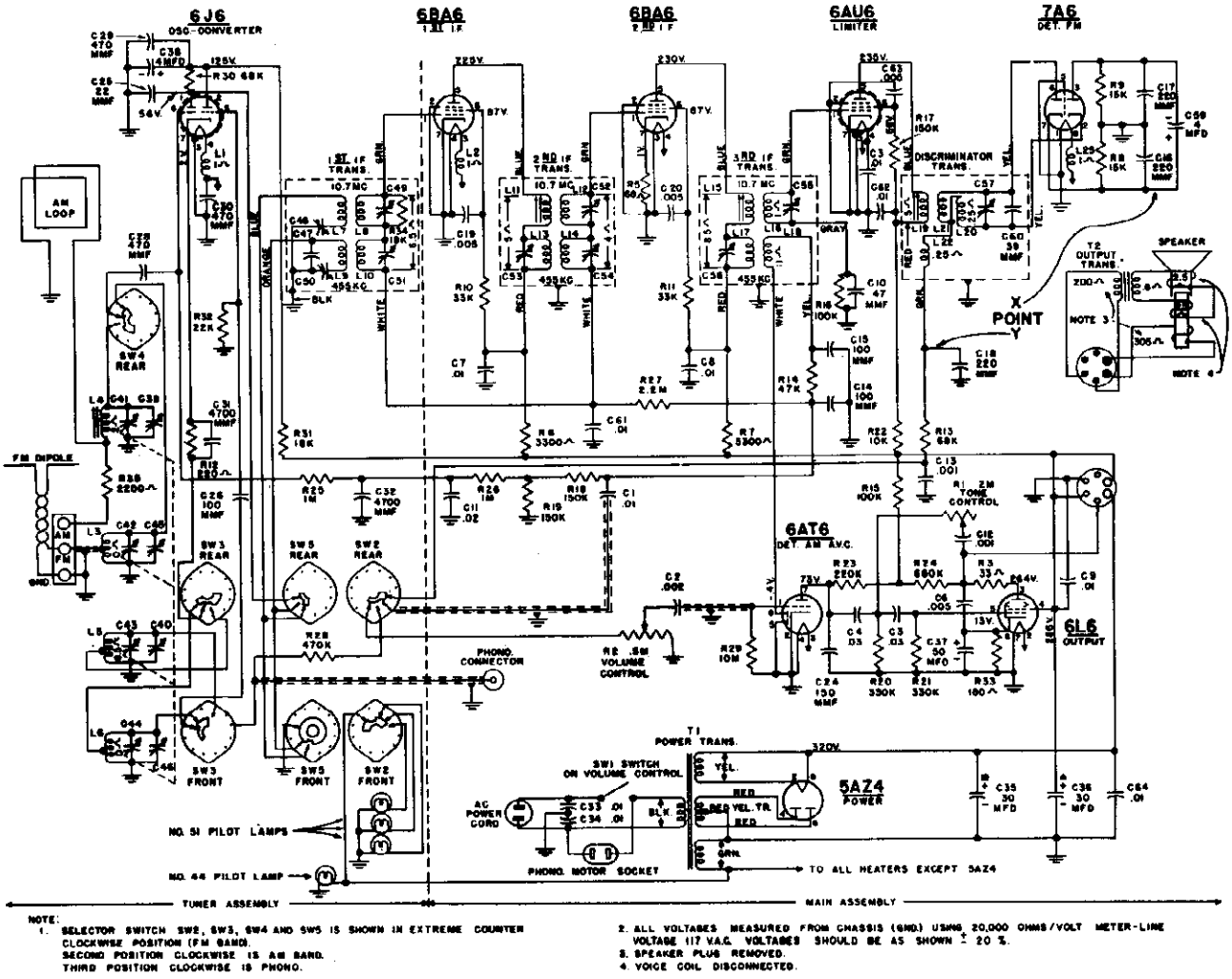
POWER CONSUMPTION (at 110 volts, 60 cycles): 100 watts

SPECIAL PROVISION (H-163 and H-172):

110 volts A-C is supplied to the phono motor socket on rear of chassis, regardless of line voltage.

MODELS H-161, H-168, H-168A, H-168B Revised

WESTINGHOUSE ELECTRIC CORP.



NOTE:
1. SELECTOR SWITCH SW2, SW3, SW4 AND SW5 IS SHOWN IN EXTREME COUNTER CLOCKWISE POSITION (FM BAND). SECOND POSITION CLOCKWISE IS AM BAND. THIRD POSITION CLOCKWISE IS PHONO.
2. ALL VOLTAGES MEASURED FROM CHASSIS (GND.) USING 20,000 OHMS/VOLT METER-LINE VOLTAGE 117 V.A.C. VOLTAGES SHOULD BE AS SHOWN ± 20 %.
3. SPEAKER PLUG REMOVED.
4. VOICE COIL DISCONNECTED.

CHANGES IN V-2118 CHASSIS

Improved performance was obtained in later production of the V-2118 chassis by incorporating the changes listed below. A schematic diagram of the revised chassis is shown on the back of this sheet, and parts list additions appear below.

1. The connection between the antenna loading coil (L4) and the bandswitch (SW4) was moved to the top of the coil.
2. A resistor (R35) was inserted in place of C27 in the AM antenna circuit.
3. Capacitor (C58) in the AM antenna circuit was deleted.
4. R32 now connects between the 6J6 oscillator grid and ground instead of between the 6J6 oscillator grid and cathode.
5. Filament choke (L25) was added to the 7A6 heater circuit.
6. C64 was added across the power supply filter circuit.
7. C6 now connects between resistor (R3) and 6L6 cathode instead of between 6L6 plate and cathode.
8. A phono motor power socket was mounted on the rear of the chassis.

These parts should be added to the parts list in the original service notes. The list will then apply to both the original and the revised chassis.

PARTS LIST ADDITIONS

Part No.	Description
RC10AE222M	Resistor, 2200 ohms 1/4 w. (R35) .....
V-5040-15	Capacitor, .01 mfd 600 v. (C61, C62) .
V-5040-11	Capacitor, .005 mfd 600 v. (C63) .....
RCP10W6103M	Capacitor, .01 mfd 600 v. (C64) .....
V-4638	Choke, filament (L25) .....
V-5405	Socket, phono motor power .....

WESTINGHOUSE ELECTRIC CORP. MODELS H-161, H-168, H-168A, H-168B CHASSIS V2118

ALIGNMENT

BROADCAST BAND—AMPLITUDE MODULATION

Connect an output meter across the speaker voice coil.

While making the following adjustments, keep the volume control set for maximum output, the tone control set on treble, and the signal generator output attenuated to avoid AVC action.

Step	*Connect Signal Generator to—*	*Signal Gen. Freq.*	*Radio Dial*	*Adjust for Maximum Output*
1.	Set Phono-Band Switch to "AM"			
2.	6bA6, 2nd I-F, control grid through a 0.1 mfd capacitor	455 kc	540 kc	455 kc primary trimmer of 3rd I-F transformer.
3.	6BA6, 1st I-F, control grid through a 0.1 mfd capacitor	455 kc	540 kc	455 kc primary and secondary trimmers of 2nd I-F trans.
4.	6J6, converter, control grid through a 0.1 mfd capacitor	455 kc	540 kc	455 kc primary and secondary trimmers of 1st I-F trans.
5.	6J6, converter, control grid through a 0.1 mfd capacitor	455 kc	540 kc	Peak all 455 kc I-F transformer trimmers.
6.	Radiated signal (no actual connection)	1600 kc	1600 kc	AM oscillator trimmer.
7.	Radiated signal	600 kc	600 kc	AM antenna padder.
8.	Radiated signal	1400 kc	1400 kc	AM antenna trimmer.
9.	Recheck steps 7 and 8 in order given. "Rock" tuning capacitor while adjusting AM antenna trimmer.			

FM BAND—FREQUENCY MODULATION

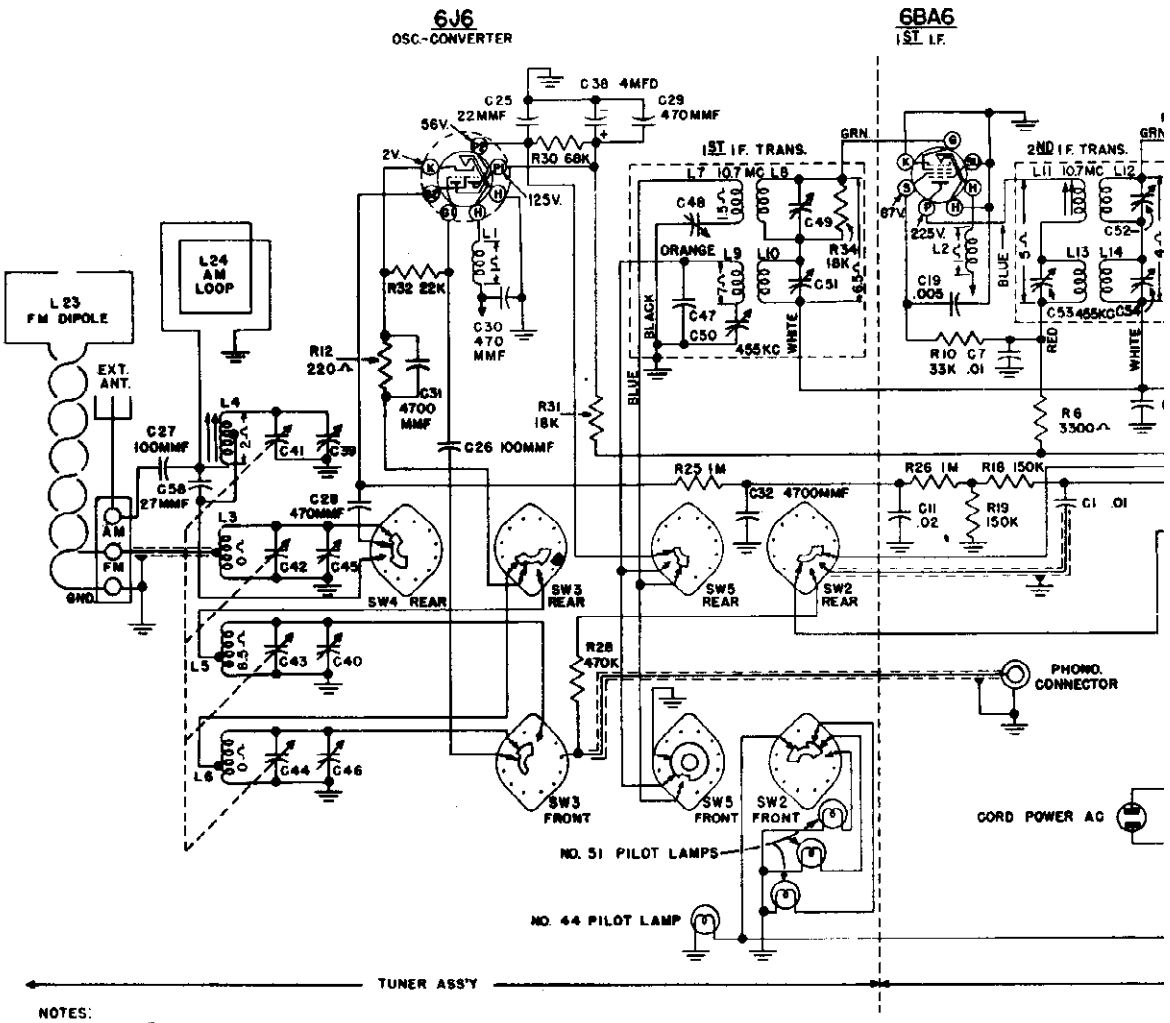
Do not align the 10.7 mc I-F circuits until all 455 kc I-F adjustments have been completed.

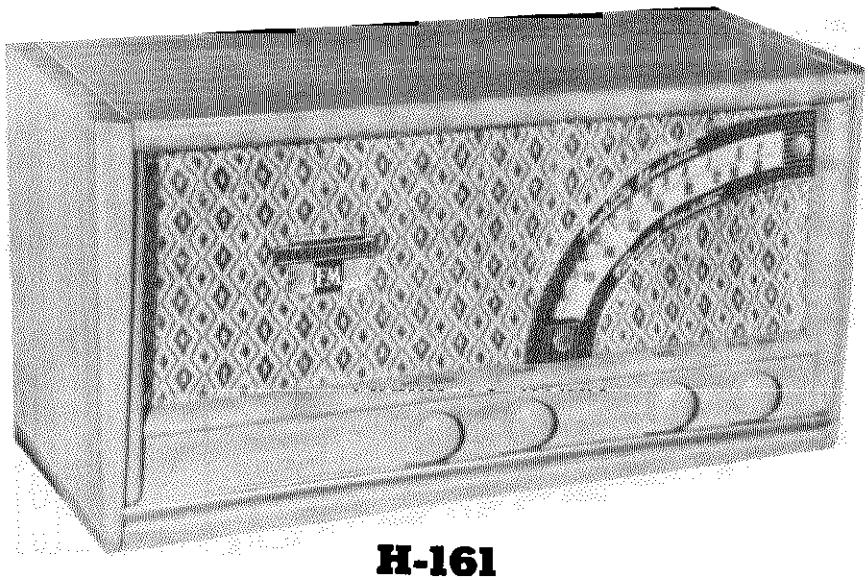
Step	*Connect Signal Generator to—*	*Signal Gen. Freq.*	*Radio Dial*	*Adjust—*
1.	Set Phono-Band switch to "FM."			
2.	Connect a vacuum tube voltmeter between point X (see Figs. 3 and 4) and ground (chassis).			
3.	6BA6, 2nd I-F, control grid through a .001 mfd mica capacitor	Unmodulated 10.7 mc	88 mc	10.7 mc primary and secondary of 3rd I-F trans. and primary of discriminator trans. for max. voltage.
4.	6BA6, 1st I-F, control grid through a .001 mfd mica capacitor	Unmodulated 10.7 mc	88 mc	10.7 mc primary and secondary of 2nd I-F trans. for max. voltage.
5.	Stator of FM tuning capacitor (C42) through a .01 mfd mica capacitor	Unmodulated 10.7 mc	88 mc	10.7 mc primary and secondary of 1st I-F trans. for max. voltage.
6.	Connect the vacuum tube voltmeter between point Y (Figs. 3 and 4) and chassis.			
7.	Stator of FM tuning capacitor (C42) through a .01 mfd mica capacitor	Unmodulated 10.7 mc	88 mc	Secondary of discriminator trans. for zero voltage. The voltage will change polarity as the trimmer is tuned through resonance. Tune carefully for zero voltage.
8.	Connect the vacuum tube voltmeter between point X and chassis.			
9.	Stator of FM tuning capacitor (C42) through a .01 mfd mica capacitor	Unmodulated 10.7 mc	88 mc	Primary of discriminator trans. for max. voltage.
10.	FM antenna terminal through a 72 ohm non-inductive resistor	Unmodulated 105 mc	105 mc	FM oscillator trimmer for max. voltage.*
11.	FM antenna terminal through a 72 ohm non-inductive resistor	Unmodulated 105 mc	105 mc	FM antenna trimmer for max. voltage *— "rock" tuning capacitor while adjusting.
12.	Check dial calibration and tracking at 90 mc.**			

* The FM oscillator and antenna trimmers can be adjusted by using the thumb and forefinger to rotate the outside drum of the capacitor. Hand capacity effects may be reduced by holding the heel of the hand against the 1st I-F trans. can.

** After the radio has been aligned at 105 mc., check calibration by tuning to a 90 mc. signal from the generator. If the dial pointer indicates 90 mc., no further adjustments are necessary. If the pointer is on the high frequency side of 90 mc., slightly *expand* the length of oscillator coil (L6) and repeat steps 10, 11, and 12 above until dial calibration is correct. If the pointer is on the low frequency side of 90 mc., slightly *compress* length of oscillator coil (L6) and repeat steps 10, 11, and 12 until dial calibration is correct.

After calibration has been checked and the antenna circuit has been "peaked" at 105 mc., check the antenna circuit tracking by tuning to a 90 mc. signal and rotating the FM antenna trimmer. If the "peak" setting is the same at 90 mc. as it was at 105 mc., no further adjustments are necessary. If the trimmer capacitance must be increased to obtain maximum output at 90 mc., slightly compress the length of antenna coil (L3) and repeat steps 11 and 12 until correct tracking is obtained. If the trimmer capacitance must be decreased to obtain maximum output at 90 mc., slightly expand the length of antenna coil (L3) and repeat steps 11 and 12 until correct tracking is obtained.





H-161

MAHOGANY AND BLONDE

FREQUENCY RANGES:

Standard Broadcast .....
Frequency Modulation .....

INTERMEDIATE FREQUENCIES:

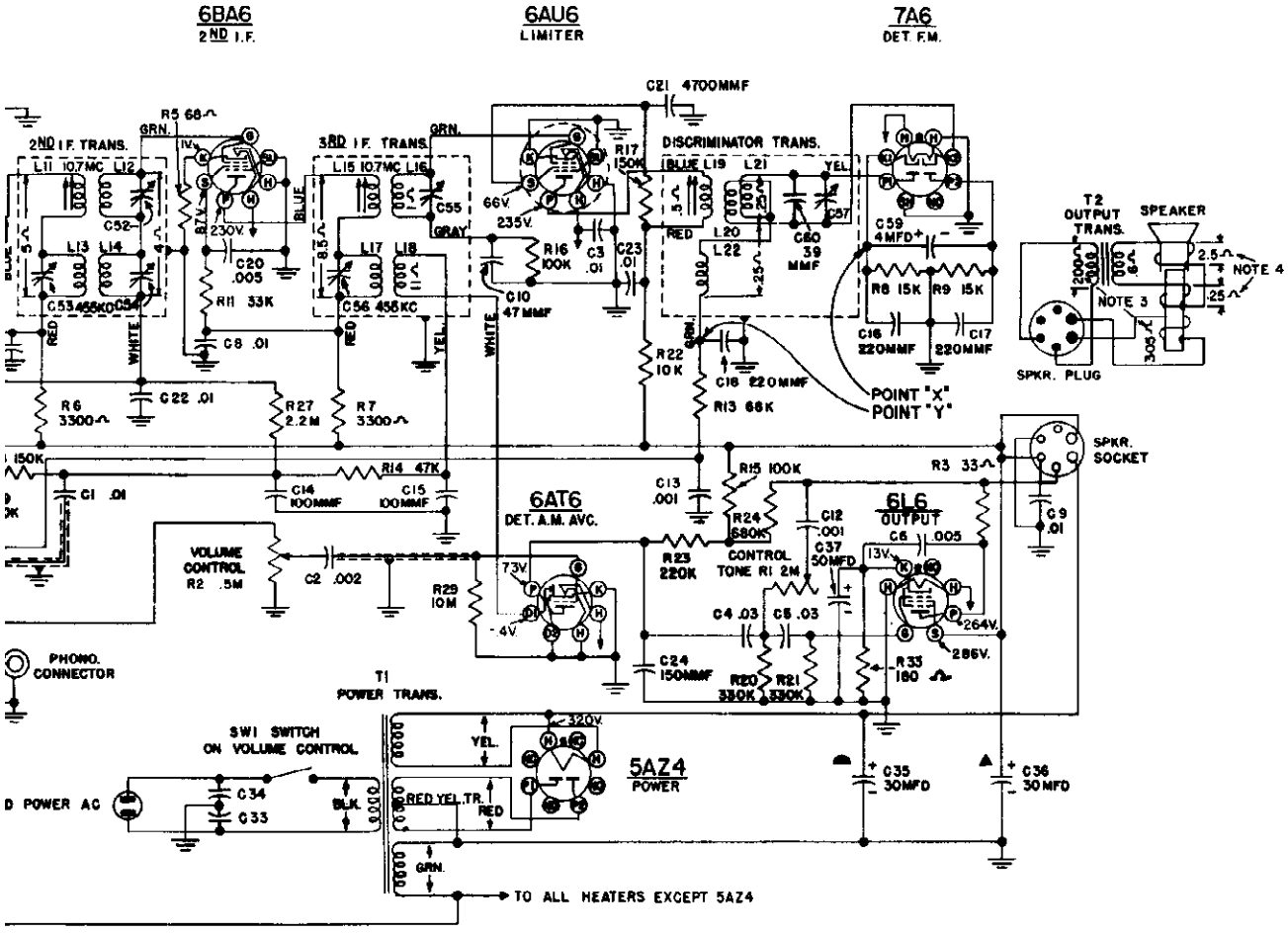
Amplitude Modulation .....
Frequency Modulation .....

TUBE COMPLEMENT:

1 6J6 .....
2 6BA6 ..... 1st a
1 6AU6 .....
1 7A6 .....
1 6AT6 ..... Det. (AM), AVC
1 6L6 or 6L6G .....
1 5AZ4 .....

INGHOUSE ELECTRIC CORP.

MODELS H-161, H-168,
H-168A, H-168B
CHASSIS V2118



2. ALL VOLTAGES MEASURED FROM CHASSIS (GND) USING 20,000 OHMS/VOLT METER—LINE VOLTAGE 117 V.A.C. VOLTAGES SHOULD BE AS SHOWN ± 20 PERCENT.
3. SPEAKER PLUG REMOVED.
4. VOICE COIL DISCONNECTED.

SPECIFICATIONS

.....540 to 1615 kc.
.....88 to 108 mc.

IES:

.....455 kc.
.....10.7 mc.

.....Converter
.....1st and 2nd I-F Amp.
.....Limiter (FM)
.....Ratio Det. (FM)
l. (AM), AVC and 1st A-F Amp.
.....Output Amp.
.....Rectifier

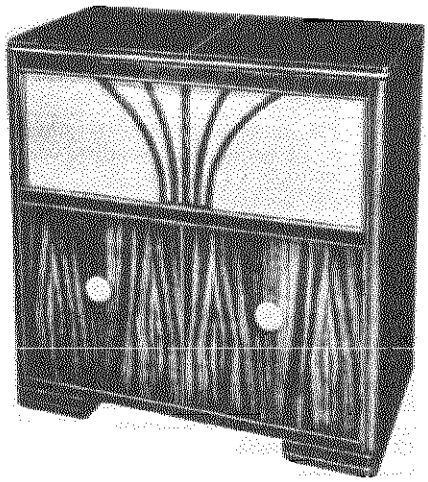
PILOT LAMPS:
1 Westinghouse No. 44 ..... 6.3 v., 0.25 amp.
3 Westinghouse No. 51 ..... 6.3 v., 0.20 amp.

POWER OUTPUT:
Undistorted ..... 6 watts
Maximum ..... 9 watts

LOUDSPEAKER:
Size and Type (H-161) ..... 8" Electro Dynamic
Size and Type (H-168 and H-168A) ..10" Electro Dynamic
Field Resistance ..... 305 ohms
Voice Coil Impedance ..... 3.2 ohms

OPERATING VOLTAGE...105 to 120 volts, 50-60 cycles A-C

POWER CONSUMPTION (radio section) .....110 watts



H-168 and H-168A

MAHOGANY AND BLONDE

RECORD CHANGERS: For H-168, V-M Model 800, RCD.CH. 17-1; for H-168A, Webster Model 56

MODELS H-161, H-168,
H-168A, H-168B
CHASSIS V2118

WESTINGHOUSE ELECTRIC CORP.

PARTS LIST FOR MODELS H-161, H-168 AND H-168A

Part No.	Description
V-4924-1	Antenna, FM Dipole (L23) (H-161)
V-4924-2	Antenna, FM Dipole (L23) (H-168 and H-168A)
V-4686	Antenna, AM Loop (L24) (H-161)
V-4951	Antenna, AM Loop (L24) (H-168 and H-168A)
V-4687	Background, front glass plate (H-161)
V-5293	Background, front glass plate (H-168 and H-168A)
V-4688	Baffle & Grille Cloth Assy. (H-161)
V-4169-1	Base, shield, miniature tube
V-4668	Bearing, tuning shaft and plate assy.
V-4631	Bracket, left dial mounting
V-4632	Bracket, right dial mounting
V-4633	Bracket Assy., main dial mounting
V-4657	Bracket Assy., pointer mounting
V-4689	Bracket, speaker mounting (H-161)
V-5070	Bracket, shock mounting (H-168 and H-168A)
V-4655	Bracket, dial light
V-4836S-4	Button, hole plug
V-1131-1	Cabinet (H-161 Mahogany)
V-1131-2	Cabinet (H-161 Blonde)
V-1137-1	Cabinet (H-168 Mahogany)
V-1137-2	Cabinet (H-168 Blonde)
V-1148-1	Cabinet (H-168A Mahogany)
RCP10W4103A	Capacitor, .01 mfd 400 v. (C1)
RCP10W6202A	Capacitor, .002 mfd 600 v. (C2)
V-5040-13	Capacitor, .01 mfd 200 v. (C3)
RCP10W4303A	Capacitor, .03 mfd 400 v. (C4, C5)
RCP10M6S02A	Capacitor, .005 mfd 600 v. (C6)
V-5040-15	Capacitor, .01 mfd 600 v. (C7, C8, C9)
RCM20A470M	Capacitor, 47 mmf mica (C10)
RCP10W4203A	Capacitor, .02 mfd 400 v. (C11)
RCP10W6102A	Capacitor, .001 mfd 600 v. (C12, C13)
RCM20A101M	Capacitor, 100 mmf mica (C14, C15)
RCM20A221K	Capacitor, 220 mmf mica (C16, C17, C18)
V-5040-11	Capacitor, .005 mfd 600 v. (C19, C20)
RCM30A472M	Capacitor, 4700 mmf mica (C21)
RCM30A103M	Capacitor, .01 mfd mica (C22, C23)
RCM20A151M	Capacitor, 150 mmf mica (C24)
RCM20B220K	Capacitor, 22 mmf mica (C25)
R3CC32CG101K	Capacitor, 100 mmf ceramic (C26)
R3CC26SL101M	Capacitor, 100 mmf ceramic (C27)
RCM20A471M	Capacitor, 470 mmf mica (C28)
R5CC20ZY471M	Capacitor, 470 mmf ceramic (C29 C30)
R5CC36ZY472M	Capacitor, 4700 mmf ceramic (C31, C32)
V-4634	Capacitor, dual line filter .01-.01 mfd 600 v. (C33, C34)
V-4635	Capacitor, dual filter, electrolytic 30-30 mfd 450 v. (C35, C36)
V-4636	Capacitor, electrolytic 50 mfd 25 v. C37
V-4885	Capacitor, electrolytic 4 mfd 450 v. (C38, C59)
V-4671	Capacitor, AM antenna trimmer (C39)
V-4672	Capacitor, AM oscillator trimmer (C40)
V-4673	Capacitor, variable 2 gang (C41, C42, C43, C44, C45, C46)
R3CC25CG270J	Capacitor, 27 mmf ceramic (C58)
V-5307-1	Cardboard & Grille Cloth Assy., L.H. side (H-168, H-168A Mahogany)
V-5307-2	Cardboard & Grille Cloth Assy., L.H. side (H-168 Blonde)
V-4898	Catch, bullet
V-5071	Channel, rubber (H-168, H-168A)
V-4638	Choke, filament, 1.1 microhenries (L1, L2)
V-4877	Clamp, power cord, closed
V-3337S	Clamp, power cord, open

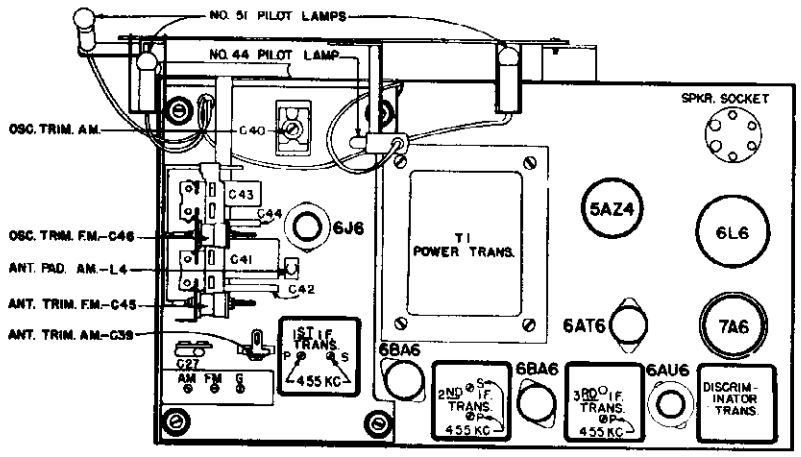


FIG. 1—CHASSIS LAYOUT

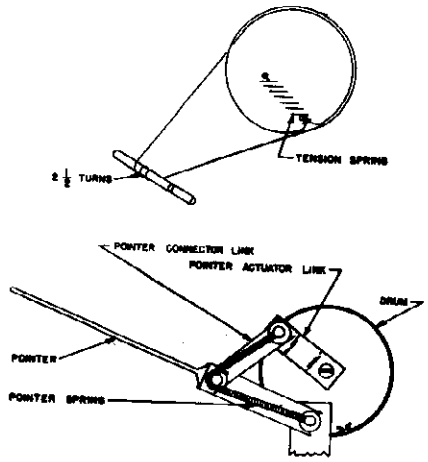


FIG. 2—DIAL DRIVE MECHANISM

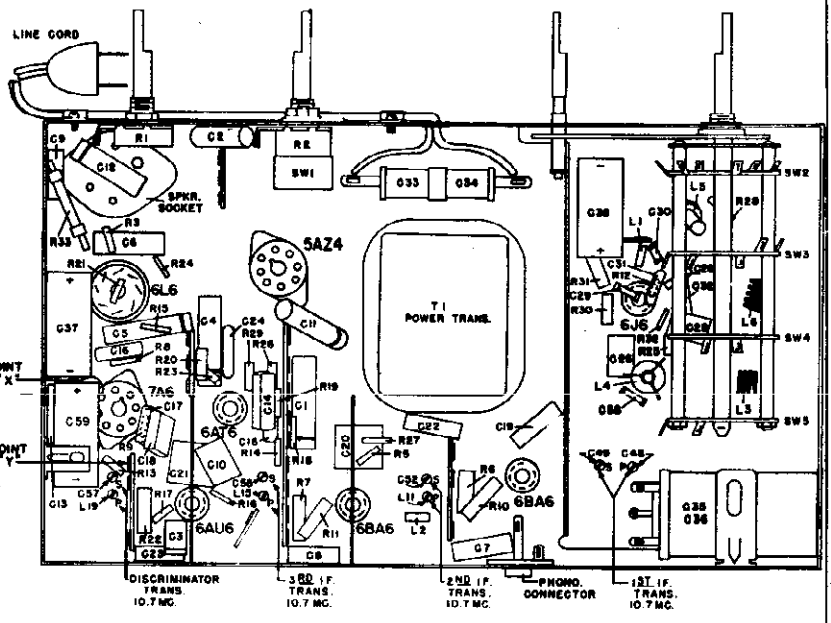


FIG. 3—BOTTOM VIEW OF CHASSIS

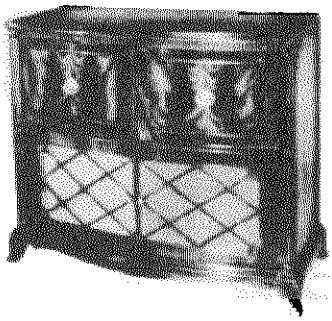
WESTINGHOUSE ELECTRIC CORP. MODELS H-161, H-168, H-168A, H-168B CHASSIS V2118

PARTS LIST FOR MODELS H-161, H-168 AND H-168A

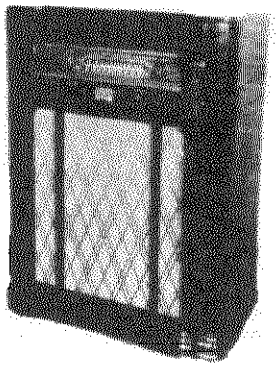
Part No.	Description
RC30AE103K	Resistor, 10,000 ohms 1 w. (R22)
RC10AE224K	Resistor, 220,000 ohms ¼ w. (R23)
RC10AE684K	Resistor, 680,000 ohms ¼ w. (R24)
RC10AE105M	Resistor, 1 megohm ¼ w. (R25, R26)
RC10AE225M	Resistor, 2.2 megohms ¼ w. (R27)
RC10AE474M	Resistor, 470,000 ohms ¼ w. (R28)
RC10AE106M	Resistor, 10 megohms ¼ w. (R29)
RC20AE683K	Resistor, 68,000 ohms ½ w. (R30)
RC30AE183K	Resistor, 18,000 ohms 1 w. (R31)
RC10AE223K	Resistor, 22,000 ohms ¼ w. (R32)
V-4648	Resistor, cathode 180 ohms 2 w. (R33)
V-3755S-11	Screw, chassis mounting (H-161)
V-3570S-5	Screw, tuner assembly mounting
V-3570S-11	Screw, Hex head, chassis mtg. (H-168 and H-168A)
V-3755S-9	Screw, Phillips head, chassis mtg. (H-168 and H-168A)
V-4678	Shaft, tuning
V-4649-3	Shield, spiral (2¾ inches long)
V-4649-2	Shield, spiral (7½ inches long)
V-4884	Shield, loktal tube
V-4861	Shield, flat steel (under chassis)
V-4169-2	Shield, miniature tube
V-3344S-2	Sleeve, spacer, tuner assy. mounting
V-3288S	Socket, speaker
V-3870-1	Socket, lock-in tube
V-3275S	Socket, molded octal tube
V-4292S-1	Socket, miniature molded
V-4679	Socket, dial light
**V-4702	Speaker, 8" Electro Dynamic for H-161
**V-4945	Speaker, 10" Electro Dynamic for H-168 and H-168A
V-4650	Spring, pointer
V-4057	Spring, dial drive
V-3258S	Spring, knob
V-4900	Strike, bullet catch
V-4651	Stud, trimount, plastic dial mounting
V-5295-1	Support, lid, L.H. (Mahogany)
V-5295-2	Support, lid, L.H. (Blonde)
V-5295-3	Support, lid, R.H. (Mahogany)
V-5295-4	Support, lid, R.H. (Blonde)
V-4682	Switch, selector (SW2, SW3, SW4, SW5)
V-4704	Tab, AM
V-4705	Tab, FM
V-3643	Teenut, record changer mounting
V-4684	Terminal Board, ANT-GND
V-4667	Terminal Board, 1 lug
V-4664	Terminal Board, 2 lugs
V-3486	Terminal Board, 3 lugs
V-4665	Terminal Board, 9 lugs
V-4627	Transformer, 1st I-F (L7, L8, L9, L10, R34, C47, C48, C49, C50, C51)
V-4628	Transformer, 2nd I-F (L11, L12, L13, L14, C52, C53, C54)
V-4629	Transformer, 3rd I-F (L15, L16, L17, L18, C55, C56)
V-4630	Transformer, discriminator (L19, L20, L21, L22, C57, C60)
V-4653	Transformer, power (T1)
V-4945-1	Transformer, output for V-4945 speaker stamped 285
V-4945-3	Transformer, output for V-4945 speaker stamped 191
V-4702-1	Transformer, output for V-4702 speaker stamped 285
V-3267S-1	Washer, chassis mounting, small
V-3267S-6	Washer, chassis mounting, large
V-3267S-10	Washer, record changer mounting
V-3668S	Washer, felt
V-4904-1	Washer, finishing (H-168 and H-168A Mahogany)
V-4904-2	Washer, finishing (H-168 Blonde)

Part No.	Description
V-4685	Clamp, spring, filter capacitor mtg.
V-5296	Clip, front glass plate mtg.
V-4883	Coil, FM antenna (L3)
V-4675	Coil, antenna loading (L4)
V-4676	Coil, AM oscillator (L5)
V-4882	Coil, FM oscillator (L6)
V-4945-2	Cone & Voice Coil Assy. for V-4945 speaker stamped 285
V-4945-4	Cone & Voice Coil Assy. for V-4945 speaker stamped 191
V-4702-2	Cone & Voice Coil Assy. for V-4702 speaker stamped 285
V-3254S	Connector, phono
V-4639	Control, tone, 2 megohms (R1)
V-4640	Control, volume, .5 megohms (R2) and switch (SW1)
V-4349-2	Cord, Power A-C
V-4304S-7	Cord Assembly, dial drive
V-4958	Cord, A-C power assy. (H-168 and H-168A)
V-4525-3	Cushion, chassis (H-168 and H-168A)
V-3885	Cushion, lid (H-168 and H-168A)
V-4690	Decal, band
V-4691	Decal, tone
V-4692	Decal, tuning
V-4693	Decal, volume
V-4642	Dial, plastic
V-4643	Eyelet, chassis mtg. (H-161)
V-3371	Foot, recessed (H-161)
V-4902	Glide, furniture (H-168 and H-168A)
V-4948-1	Grille Cloth, R.H. side (H-168 and H-168A)
V-3345S-4	Grommet, tuner assembly mounting
V-4644	Grommet, plain, chassis mounting
V-4852	Grommet, chassis mounting (T shaped)
V-4903-1	Hinge, door (H-168 and H-168A Mahogany)
V-4903-2	Hinge, door (H-168 Blonde)
V-3510	Hinge, lid (H-168 and H-168A Mahogany)
V-4321	Hinge, lid (H-168 Blonde)
V-4697S-1	Knob, volume, tuning and tone (Mahogany)
V-4697S-3	Knob, volume, tuning and tone (Blonde)
V-4697S-2	Knob, band (Mahogany)
V-4697S-4	Knob, band (Blonde)
No. 44	Lamp, pilot, background
No. 51	Lamp, pilot, AM, FM, edge
V-4645	Link, pointer connector
V-4660	Link Assembly, pointer actuator
V-4696	Nameplate, Westinghouse FM
V-5303	Needle, phono, sapphire tip
V-3926	Nut, speed, ⅛ inch, nameplate mtg.
V-4701	Plate, front glass (H-161)
V-5297	Plate, front glass (H-168 and H-168A)
V-4647	Pointer Assembly
V-5294	Pull, door (H-168 and H-168A)
RC10AE330K	Resistor, 33 ohms ¼ w. (R3)
RC10AE680K	Resistor, 68 ohms ¼ w. (R5)
RC30AE332K	Resistor, 3300 ohms 1 w. (R6, R7)
RC10AE153J	Resistor, 15,000 ohms ¼ w. (R8, R9)
RC30AE333K	Resistor, 33,000 ohms 1 w. (R10, R11)
RC10AE221K	Resistor, 220 ohms ¼ w. (R12)
RC10AE683M	Resistor, 68,000 ohms ¼ w. (R13)
RC10AE473M	Resistor, 47,000 ohms ¼ w. (R14)
RC10AE104K	Resistor, 100,000 ohms ¼ w. (R15, R16)
RC20AE154K	Resistor, 150,000 ohms ½ w. (R17)
RC10AE154M	Resistor, 150,000 ohms ¼ w. (R18, R19)
RC10AE334K	Resistor, 330,000 ohms ¼ w. (R20, R21)

MODELS H-164, H-166, H-167, H-166A WESTINGHOUSE ELECTRIC CORP.



H-166 & H-166A



H-164

H-167

For H-166 and H-167 record changer information, refer to V-4914 Automatic Record Changer Service Notes.

For information on the V-5699 record changer used in the Model H-166A, refer to V-4944 Automatic Record Changer Service Notes. The V-5699 and V-4944 record changers are similar except that the pickup arms, pickup cartridges, and power cords are different.

SPECIFICATIONS

FREQUENCY RANGES:
- Standard Broadcast ..... 540 to 1600 kc.
- Frequency Modulation ..... 88 to 108 mc.

INTERMEDIATE FREQUENCIES:
- Amplitude Modulation ..... 455 kc.
- Frequency Modulation ..... 10.7 mc.

TUBE COMPLEMENT:
- 1 7F8 ..... R-F Amp. (FM)
- 1 7F8 ..... Osc.-converter
- 2 6BA6 ..... 1st and 2nd I-F Amp.
- 1 6AU6 ..... Limiter (FM)
- 1 6H6GT ..... Ratio Det. (FM)
- 1 6AT6 ... Det. (AM), AVC and 1st A-F Amp.
- 1 6AT6 ..... Phase Inverter
- 2 6Y6G ..... Output Amp.
- 1 5U4G ..... Rectifier
- 1 6SC7 Phono. Pre-Amp. (H-166, H-166A and (H-167)

PILOT LAMPS:
- 2 Westinghouse No. 44 .... 6.3 v., 0.25 amp.

POWER OUTPUT:
- Undistorted ..... 15 watts
- Maximum ..... 18 watts

LOUDSPEAKER: ..... 12" Electro-dynamic

OPERATING VOLTAGE: 105 to 120 volts, 50-60 cycles A-C

POWER CONSUMPTION(radio section): 150 watts

WESTINGHOUSE ELECTRIC CORP. MODELS H-164, H-166, H-167, H-166A

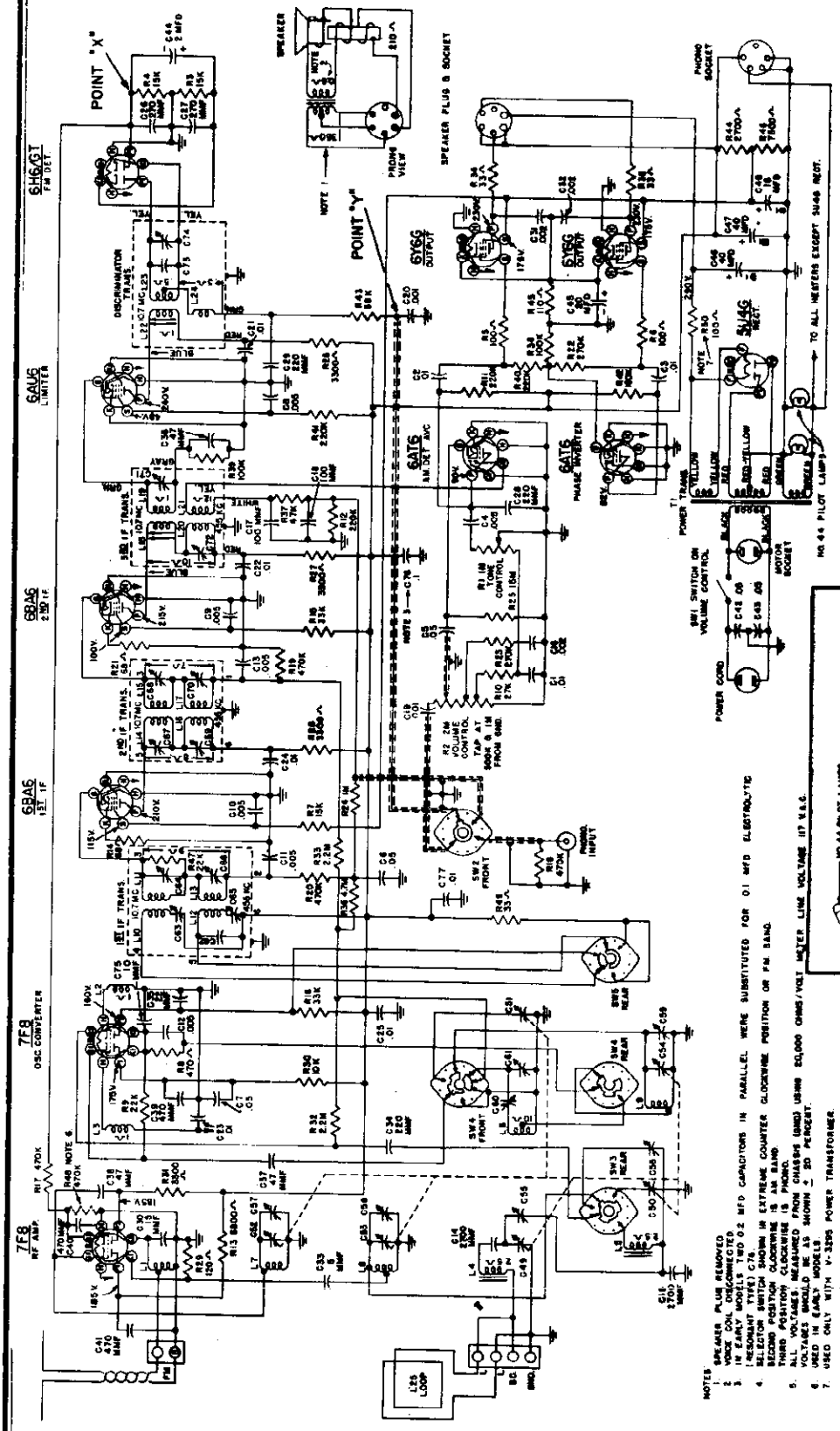


Fig. 3 - REAR VIEW OF MAIN CHASSIS

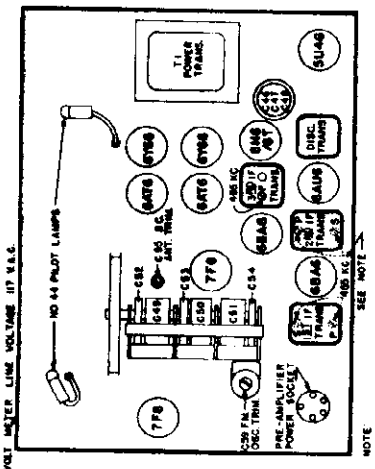


Fig. 4 - TOP VIEW OF MAIN CHASSIS

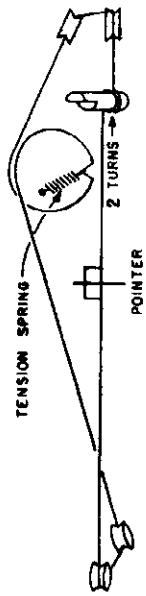


Fig. 5 - DIAL DRIVE MECHANISM

MODELS H-164, H-166, H-167, H-166A

WESTINGHOUSE ELECTRIC CORP.

ALIGNMENT

BROADCAST BAND — AMPLITUDE MODULATION

Connect an output meter across the speaker voice coil

While making the following adjustments, keep the volume control set for maximum output, the tone control set on treble, and the signal generator output attenuated to avoid AVC action.

Step	Connect Signal Generator to —	Signal Generator Frequency	Radio Dial	Adjust for Maximum Output
1.	Set PHONO-BAND switch to "AM"			
2.	Pin No. 1 of 6BA6, 2nd I-F, through a 0.1 mfd capacitor	455 kc	550 kc	455 kc primary trimmer of 3rd I-F trans.
3.	Pin No. 1 of 6BA6, 1st I-F, through a 0.1 mfd capacitor	455 kc	550 kc	455 kc secondary and primary trimmers of 2nd I-F trans.
4.	Pin No. 1 of 7F8, converter, through a 0.1 mfd capacitor	455 kc	550 kc	455 kc secondary and primary trimmers of 1st I-F trans.
5.	Radiated signal (no actual connection)	1500 kc	1500 kc	BC osc. trimmer (C61) (make certain that loop antenna is connected to "L" terminals)
6.	Radiated signal (no actual connection)	1400 kc	1400 kc	BC converter (C56) and BC antenna (C55) trimmers
7.	Radiated signal (no actual connection)	600 kc	600 kc	BC oscillator padder (C60) ("rock-in" adjustment)
8.	Repeat steps 5, 6, and 7			

FM BAND — FREQUENCY MODULATION

Do not align the 10.7 mc. I-F circuits until all 455 kc I-F adjustments have been completed.

Step	Connect Signal Generator to —	Signal Generator Frequency	Radio Dial	Adjust
1.	Set PHONO-BAND switch to "FM"			
2.	Connect a vacuum tube voltmeter between point "X" (See Figs. 1 and 2) and ground (chassis).			
3.	Place a temporary short between rotor and stator of FM osc. section of tuning capacitor (C54).			
4.	*Detune* 10.7 mc. secondary trimmers of 1st, 2nd, and 3rd I-F transformers and secondary trimmer of discriminator transformer by turning screws ½ turn toward tight position.			

FM BAND — FREQUENCY MODULATION — CONTINUED

Step	Connect Signal Generator to —	Signal Generator Frequency	Radio Dial	Adjust
5.	Stator of FM converter tuning capacitor (C53) through a .001 mfd mica capacitor	UNMODULATED 10.7 mc	88 mc	10.7 mc primary trimmers of discriminator, 3rd I-F, 2nd I-F, and 1st I-F transformers (in order given) for maximum voltage
6.	Stator of FM converter tuning capacitor (C53) through a .001 mfd mica capacitor	UNMODULATED 10.7 mc	88 mc	10.7 mc secondary trimmers of 1st, 2nd, and 3rd I-F transformers (in order given for maximum voltage. NOTE: *Do not* re-peak the primary trimmers.
7.	Connect the vacuum tube voltmeter between point "Y" (Figs. 1 and 2) and chassis.			
8.	Stator of FM converter tuning capacitor (C53) through a .001 mfd mica capacitor	UNMODULATED 10.7 mc	88 mc	Secondary of discriminator trans. for zero voltage. The voltage will change polarity as the trimmer is tuned through resonance. Tune carefully for zero voltage.
9.	Connect the vacuum tube voltmeter between point "X" and chassis.			
10.	Remove the short from the FM oscillator tuning capacitor.			
11.	FM antenna terminal through a 72 ohm resistor	UNMODULATED 105 mc	105 mc	FM oscillator trimmer (C59) for max. voltage*
12.	FM antenna terminal through a 72 ohm resistor	UNMODULATED 98 mc	98 mc	FM converter (C58) and FM R-F (C57) trimmers for max. voltage**

* After adjusting the oscillator trimmer at 105 mc., check dial calibration by tuning the receiver to a 90 mc. signal from the generator. If the dial pointer indicates 90 mc., no further oscillator adjustments are necessary. If the pointer is on the high frequency side of 90 mc., slightly expand the length of the oscillator coil (L9); if the pointer is on the low frequency side of 90 mc., slightly compress the oscillator coil. Re-adjust the oscillator trimmer (C59) at 105 mc., and again check the calibration. Repeat this process until calibration is correct.

** After adjusting the trimmers at 98 mc., check tracking by tuning the receiver to a 90 mc. signal from the generator and re-adjusting the trimmers for max. voltage. If the "peak" setting is the same at 90 mc. as it was at 98 mc., no further adjustments are necessary. If the capacitance of either trimmer must be increased to obtain maximum output at 90 mc., slightly compress the coil across that trimmer (either L7 or L8); if the capacitance of either trimmer must be decreased to obtain maximum output at 90 mc., slightly expand the coil across that trimmer. Re-adjust the converter and R-F trimmers (C57 and C58) at 98 mc., and again check the tracking. Repeat this process until tracking is correct.

MODELS H-164, H-166, H-167, H-166A

WESTINGHOUSE ELECTRIC CORP.

PRE-AMPLIFIERS

A phonograph pre-amplifier is used in Models H-166, H-166A and H-167. Either of the pre-amplifier chassis shown below may be used. The chassis number is stamped on the chassis of all pre-amplifiers for identification.

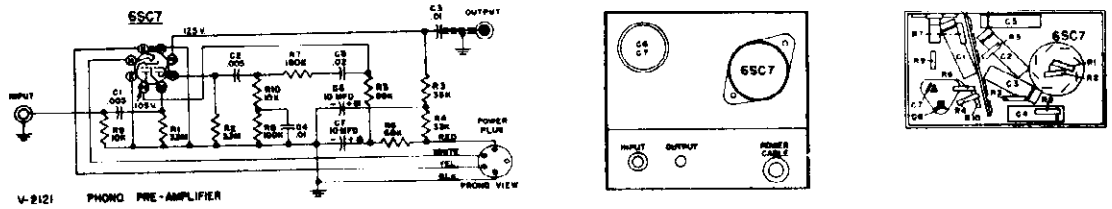


Fig. 6 - V-2121 PHONOGRAPH PRE-AMPLIFIER

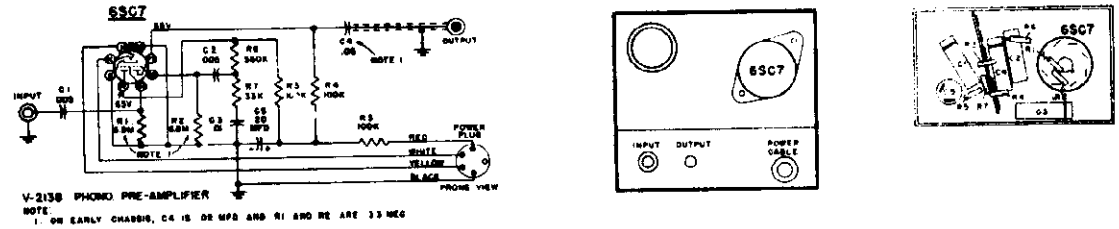
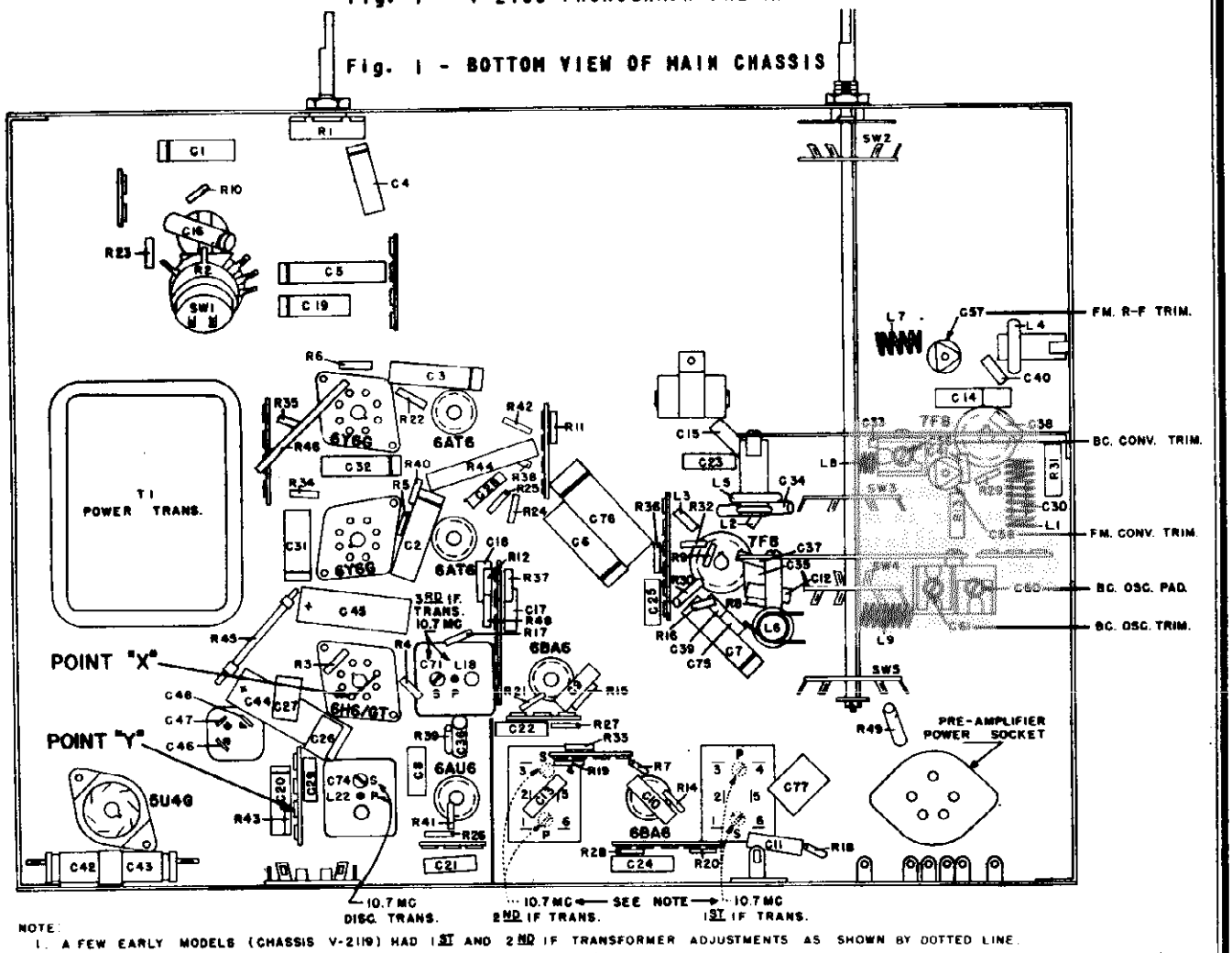


Fig. 7 - V-2138 PHONOGRAPH PRE-AMPLIFIER

Fig. 1 - BOTTOM VIEW OF MAIN CHASSIS



NOTE:
1. A FEW EARLY MODELS (CHASSIS V-2119) HAD 1ST AND 2ND IF TRANSFORMER ADJUSTMENTS AS SHOWN BY DOTTED LINE.

WESTINGHOUSE ELECTRIC CORP. MODELS H-164, H-166, H-167, H-166A

MAIN CHASSIS AND CABINET LIST

Part No.	Description of Part	List price Each
	40 mfd 400 v. (C47) 16 mfd 350 v. (C48)	
V-4750	Capacitor, variable 3 gang (with brackets) (C49, C50, C51, C52, C53, C54)	
V-4746	Capacitor, trimmer, B.C. antenna (C55)	
V-4747	Capacitor, trimmer, B.C. converter (56)	
V-4748	Capacitor, trimmer, F.M. antenna (C57, C58, C59)	
V-4749	Capacitor, 2 gang B.C. oscillator padder (C60) B.C. oscillator trimmer (C61)	
R2CC21UJ100F	Capacitor, fixed ceramic 10 mmf (C75)	
V-5442-1	Capacitor, resonant type .1 mfd 400 v. (C76)	
V-5040-15	Capacitor, .01 mfd 600 v. (C77)	
V-4898	Catch, bullet, blonde (H-166, H-167)	
V-5064-1	Catch, bullet, cordovan (H-167)	
V-5312	Choke Assembly Antenna input, F.M. (L1) R2CC21CH150J Capacitor, ceramic 15 mmf (C30)	
V-4686	Choke, filament (L2, L3)	
V-4763	Clamp, dial	
V-4193S	Clamp, dial drive	
V-4785	Clamp, dial moulding	
V-3337S	Clamp, power cord, for pre-amplifier (H-166, H-167)	
V-4764	Clip, spring, dial mounting	
V-4751	Coil, B.C. antenna (L4)	
V-4752	Coil, B.C. converter (L5)	
V-4753	Coil, B.C. oscillator (L6)	
V-5048	Coil, F.M. R-F (L7)	
V-4755	Coil, F.M. converter	
V-4756	Coil, F.M. oscillator (L9)	
V-4784-2	Cone and voice coil assembly, for V-4784 speaker stamped 252	
V-4784-4	Cone and voice coil assembly, for V-4784 speaker stamped 189	
V-4784-6	Cone and voice coil assembly, for V-4784 speaker stamped 285	
V-3254S	Connector, phono	
V-3305	Control, tone, 1 megohm (R1)	
V-3293	Control, volume, 2 megohms (R2) with switch (SW1)	
V-4304S	Cord, dial drive, with clamp	
V-3239	Cord, power A-C	
V-4966-1	Cord, record changer, A-C power (H-166, H-167)	
V-4525-2	Cushion, chassis mounting	
V-4690	Decal, band	
V-4691	Decal, tone	
V-4765	Dial, glass	
V-4902	Glide, furniture	
V-5298-5	Grille Cloth Assembly, record storage, cordovan (H-167)	
V-4934	Grille Cloth Assembly, record storage (H-166)	
V-5298-1	Grille Cloth Assembly, record storage, blonde (H-167)	
V-5298-3	Grille cloth assembly, record storage, silver walnut (H-167)	
V-5298-6	Grille cloth assembly, speaker, cordovan (H-167)	
V-4954	Grille cloth assembly, speaker (H-166)	
V-5298-2	Grille cloth assembly, speaker, blonde (H-167)	
V-5298-4	Grille cloth assembly, speaker, silver walnut (H-167)	
V-4778-1	Grille cloth assembly, speaker (H-164)	
V-3345S-5	Grommet, rubber	
V-3345-10	Grommet, socket mounting	
V-3345S-4	Grommet, variable capacitor mounting	
V-5358-1	Hinge, upper L.H. (H-166)	
V-5359-1	Hinge, upper R.H. (H-166)	
V-5066-1	Hinge, upper L.H. blonde (H-167)	
V-5066-2	Hinge, upper R.H. blonde (H-167)	
V-5066-5	Hinge, upper L.H. cordovan (H-167)	
V-5066-6	Hinge, upper R.H. cordovan (H-167)	
V-4697S-2	Knob, band switch, cordovan (H-166, H-167) and mahogany (H-164)	
V-4697S-4	Knob, band switch, blonde and silver walnut (H-167)	
V-5316	Knob, door (H-166)	
V-4910	Knob, door, lower, blonde and silver walnut (H-167)	
V-5301	Knob, door, upper, blonde and silver walnut (H-167)	
V-4697S-3	Knob, tone, blonde and silver walnut (H-167)	
V-4697S-1	Knob, tone, mahogany and cordovan	
V-4888S-2	Knob, volume and tuning, blonde and silver walnut (H-167)	
V-4888S-1	Knob, volume and tuning, mahogany and cordovan	
No. 44	Lamp, pilot	
V-3283-3	Loop, B.C. (L25)	
V-4781	Moulding dial	
V-4786	Moulding, dial	
V-4696	Nameplate, Westinghouse-FM	
V-3926	Nut, speed, FM-nameplate mounting	
V-4783-1	Plate, front glass, mahogany (H-164, H-166), walnut (H-164) and cordovan (H-167)	
V-4783-2	Plate, front glass, blonde and silver walnut (H-167)	
V-3399	Pointer assembly	
V-4967	Pull, drawer (H-166)	
V-3166S	Pulley, 7/16 dia.	
V-3181	Rail, pointer	
RC20AE153J	Resistor, 15,000 ohms ½ w. (R3, R4)	
RC20AE101M	Resistor, 100 ohms ½ w. (R5, R6)	
RC20AE153K	Resistor, 15,000 ohms ½ w. (R7)	

MODELS H-164, H-166, H-167, H-166A — WESTINGHOUSE ELECTRIC CORP.

MAIN CHASSIS AND CABINET PARTS LIST

Part No.	Description of Part
RC20AE471K	Resistor, 470 ohms ½ w. (R8)
RC20AE223K	Resistor, 22,000 ohms ½ w. (R9)
RC20AE273K	Resistor, 27,000 ohms ½ w. (R10)
RC20AE224M	Resistor, 220,000 ohms ½ w. (R11, R12)
RC30AE682K	Resistor, 6800 ohms 1 w. (R13, R31)
RC20AE680K	Resistor, 68 ohms ½ w. (R14, R21)
RC20AE333K	Resistor, 33,000 ohms ½ w. (R15, R16)
RC20AE474M	Resistor, 470,000 ohms ½ w. (R17, R18, R19, R20, R48)
RC20AE274K	Resistor, 270,000 ohms ½ w. (R22, R23)
RC20AE105M	Resistor, 1.0 megohms ½ w. (R24)
RC20AE156M	Resistor, 15 megohms ½ w. (R25)
RC20AE332M	Resistor, 3300 ohms ½ w. (R26, R27, R28)
RC20AE121K	Resistor, 120 ohms ½ w. (R29)
RC30AE103M	Resistor, 10,000 ohms 1 w. (R30)
RC20AE225M	Resistor, 2.2 megohms ½ w. (R32, R33)
RC20AE330M	Resistor, 33 ohms ½ w. (R34, R35, R49)
RC20AE475M	Resistor, 4.7 megohms ½ w. (R36)
RC20AE473M	Resistor, 47,000 ohms ½ w. (R37)
RC20AE104K	Resistor, 100,000 ohms ½ w. (R38, R39)
RC20AE224K	Resistor, 220,000 ohms ½ w. (R40, R41)
RC20AE154M	Resistor, 150,000 ohms ½ w. (R42)
RC20AE683M	Resistor, 68,000 ohms ½ w. (R43)
RC41AE272K	Resistor, 2700 ohms 2 w. (R44)
V-4758	Resistor, 110 ohms 3 w. (R45)
V-4759	Resistor, 7500 ohms 5 w. (R46)
V-3429S-9	Screw, #10-32 chassis mounting
V-3806S-5	Screw, speaker mounting
V-3164	Shaft, tuning
V-5595	Shield, plate
V-4168	Shield, tube socket
V-3344S-2	Sleeve, spacer, variable capacitor mounting
V-3353-3	Slide mechanism, left hand
V-3353-4	Slide mechanism, right hand
V-3252-2	Socket, pilot light (10-3/4" lead)
V-3252-4	Socket, pilot light (8½" lead)
V-3162S	Socket, 5 contact
V-3288S	Socket, 6 contact
V-4832-1	Socket, lock-in tube
V-4292S-1	Socket, miniature molded
V-3275S	Socket, molded octal tube
V-3246S	Socket, octal tube
V-3393-2	Socket, phono, A-C power
V-4784	Speaker, 12" Electro-dynamic
V-3258S	Spring, knobs
V-3248S	Spring, dial drive
V-3740S-1	Strap, ground flexible
V-4900	Strike, bullet catch, mahogany (H-166) and blonde and silver walnut (H-167)
V-5065-1	Strike, bullet catch, cordovan (H-167)
V-3167S-1	Stud, pulley, threaded
V-3430	Support, volume control shaft
V-4760	Switch, selector (SW2, SW3, SW4, SW5)
V-4771	Terminal board, ANT.-GND.
V-3417	Terminal board, FM antenna
V-4784-1	Transformer, output for V-4784 speaker stamped 252
V-4784-3	Transformer, output for V-4784 speaker stamped 189
V-4784-5	Transformer, output for V-4784 speaker stamped 285
V-5367	Transformer, 1st I-F (V-2119-1 chassis only) (C62, C63, C64 C65, C66, L10, L11, L12, L13, R47)
V-4621	Transformer, 1st I-F (V-2119 chassis only) (C62, C63, C64, C65, C66, L10, L11, L12, L13, R47
V-5368	Transformer, 2nd I-F (V-2119-1 chassis only) (C67, C68, C69, C70, L14, L15, L16, L17)
V-4622	Transformer, 2nd I-F (V-2119 chassis only (C67, C68, C69, C70, L14, L15, L16, L17)
V-4623	Transformer, 3rd I-F (C71, C72, L18, L19, L20, L21)
V-4624	Transformer, discriminator (C73, C74, L22, L23, L24)
V-4761	Transformer, power (T1)
V-3295	Transformer, power (T1) (used on *some* V-2119 chassis)
V-3274S	Tube holder
V-3506S-1	Washer, chassis mounting, Neoprene
V-5055	Washer, capacitor trimmer, Phenolic
V-3668S	Washer, felt (knobs)
V-3267S-3	Washer, flat, chassis mounting
V-3267S-10	Washer, flat, 1" dia.
V-3267S-1	Washer, front glass plate mounting

PARTS FOR V-5699 RECORD CHANGER

(Used in Model H-166A —

When ordering replacement parts for the V-5699 record changer, order these parts rather than the parts shown under these Loc. numbers in the V-4944 Record Changer Service Notes.

Loc.	Part No.	Description
9	V-7342	Cable, pickup
10	V-7341	Pickup arm assembly Pickup, magnetic (13) Cable, pickup (9) Arm, pickup (10) Strengthener, pickup arm (3) Screws
10	V-4976	Arm, pickup
13	V-7017	Pickup, magnetic (with mtg. screws)

PARTS LIST FOR MODELS H-164, H-166, H-166A AND H-167

When ordering parts, specify model number of set in addition to part number and description of part.

V-2121 PHONO PRE-AMPLIFIER PARTS LIST

Part No.	Description of Part
V-4931	Cable, output
V-4930	Cable, power
RCP10W6502A	Capacitor, .005 mfd 600 v. (C1, C2)
RCP10W4103A	Capacitor, .01 mfd 400 v. (C3, C4)
RCP10W4203A	Capacitor, .02 mfd 400 v. (C5)
V-4928	Capacitor, dry electrolytic, dual 10 mfd 450 v. (C6, C7)
V-3254S	Connector, phono
V-3345S-5	Grommet, power cord
V-3345S-10	Grommet, socket mounting
RC20AE335M	Resistor, 3.3 megohms ½ w. (R1, R2)
RC20AE333K	Resistor, 33,000 ohms ½ w. (R3, R4)
RC20AE683K	Resistor, 68,000 ohms ½ w. (R5, R6)
RC20AE184K	Resistor, 180,000 ohms ½ w. (R7)
RC20AE104K	Resistor, 100,000 ohms ½ w. (R8)
RC20AE103M	Resistor, 10,000 ohms ½ w. (R9)
RC20AE103K	Resistor, 10,000 ohms ½ w. (R10)
V-4933	Socket, molded octal

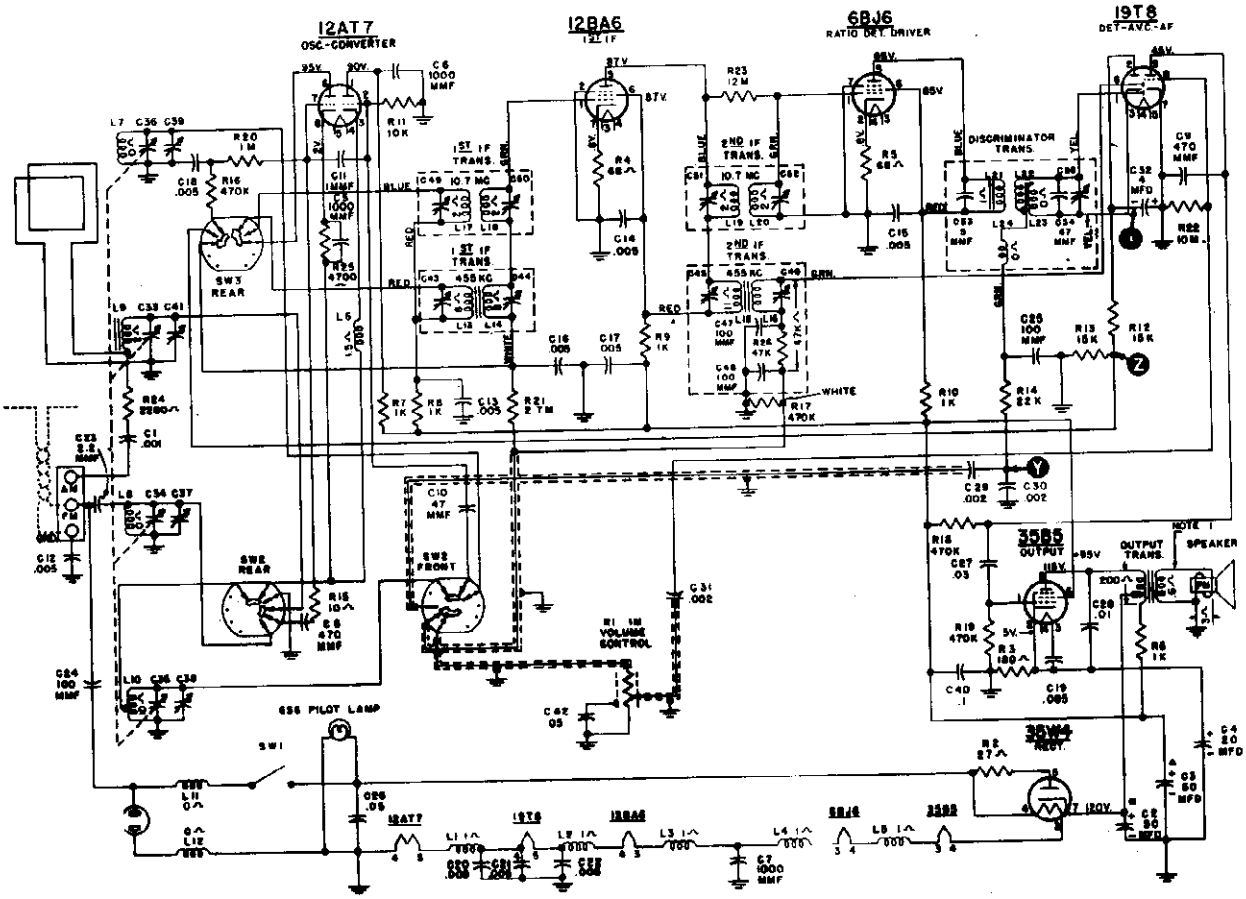
V-2138 PHONO PRE-AMPLIFIER PARTS LIST

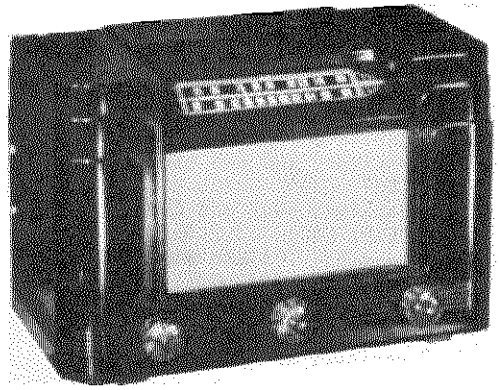
Part No.	Description of Part
V-4931	Cable, output
V-4930	Cable, power
RCP10W6502A	Capacitor, .005 mfd 600 v. (C1, C2)
RCP10W4103A	Capacitor, .01 mfd 400 v. (C3)
RCP10W4503A	Capacitor, .05 mfd 400 v. (C4)
V-5765	Capacitor, dry electrolytic, 20 mfd 300 v. (C5)
V-3254S	Connector, phono
V-3345S-5	Grommet, power cord
V-3345S-10	Grommet, socket mounting
RC20AE685M	Resistor, 6.8 megohms ½ w. (R1, R2)
RC20AE104M	Resistor, 100,000 ohms ½ w. (R3, R4, R5)
RC20AE564K	Resistor, 560,000 ohms ½ w. (R6)
RC20AE333M	Resistor, 33,000 ohms ½ w. (R7)
V-4933	Socket, molded octal

MAIN CHASSIS AND CABINET PARTS LIST

V-4777-2	Antenna Assembly, FM dipole (H-166, H-167)
V-4777-1	Antenna Assembly, FM dipole (built-in H-164)
V-4762	Background, felt
V-4745	Bracket Assembly, dial background
V-3409	Bracket and Stud Assembly, dial background
V-3415	Bracket and Tuning Shaft Assembly
V-3672	Bracket, capacitor mounting (front)
V-3671	Bracket, capacitor mounting (rear)
V-3185	Bracket, dial light
V-3357	Bracket, dial light (large)
V-3374	Bracket, volume control mounting
V-4965-1	Cable, record changer to pre-amp., phono (H-166, H-167)
RCP10W4103A	Capacitor, .01 mfd 400 v. (C1)
RCP10M4103A	Capacitor, .01 mfd 400 v. (C2, C3)
RCP10W6502A	Capacitor, .005 mfd 600 v. (C4)
RCP10W4503A	Capacitor, .05 mfd 400 v. (C5, C6, C7)
RCM30B512M	Capacitor, .005 mfd mica (C8, C9, C10, C11, C12, C13)
RCM30C272G	Capacitor, 2700 mmf mica (C14, C15)
RCP10W6202M	Capacitor, .002 mfd 600 v. (C16)
RCM20B101M	Capacitor, 100 mmf mica (C17, C18)
RCP10W6102K	Capacitor, .001 mfd 600 v. (C19, C20)
RCM30B103M	Capacitor, .01 mfd mica (C21, C22, C23, C24, C25)
RCM20B271J	Capacitor, 270 mmf mica (C26, C27)
RCM20B221M	Capacitor, 220 mmf mica (C28, C29)
RCP10M6202M	Capacitor, .002 mfd 600 v. (C31, C32)
R2CC21CH050D	Capacitor, fixed ceramic 5 mmf (C33)
R2CC36SL221M	Capacitor, fixed ceramic 220 mmf (C34)
R2CC21PJ220K	Capacitor, fixed ceramic 22 mmf (C35)
R2CC26PJ470K	Capacitor, fixed ceramic 47 mmf (C36, C37, C38)
R5CC21ZY471M	Capacitor, fixed ceramic 470 mmf (C39, C40, C41)
V-3241	Capacitor, dual line filter .05-.05 mfd 600 v. (C42, C43)
V-4880	Capacitor, electrolytic 2.0 mfd 50 v. (C44)
V-3236	Capacitor, electrolytic cartridge, 20 mfd 25 v. (C45)
V-3302	Capacitor, electrolytic 40 mfd 450 v. (C46)

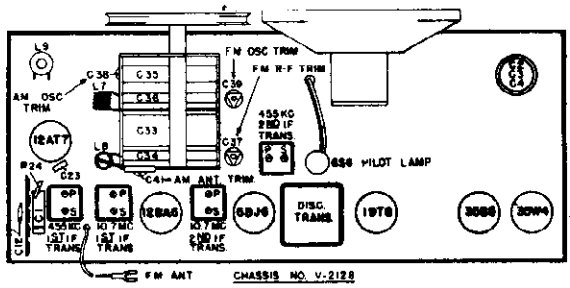
MODEL H-182 WESTINGHOUSE ELECTRIC CORP.





NOTE
1. VOICE COIL DISCONNECTED.
2. SELECTOR SWITCH SW2 AND SW3 IS SHOWN IN EXTREME COUNTER-CLOCKWISE POSITION OR AM BAND. SECOND POSITION CLOCKWISE IS FM BAND.
3. ALL VOLTAGES MEASURED FROM CHASSIS BAND USING 20,000 OHMS/VOLT METER—LINE VOLTAGE 117 VAC. READINGS SHOULD BE AS SHOWN ± 20%.
4. THE RATINGS OF SOME COMPONENTS USED IN PRODUCTION MAY VARY SLIGHTLY FROM THOSE SHOWN ABOVE.

CHASSIS NO V-2128



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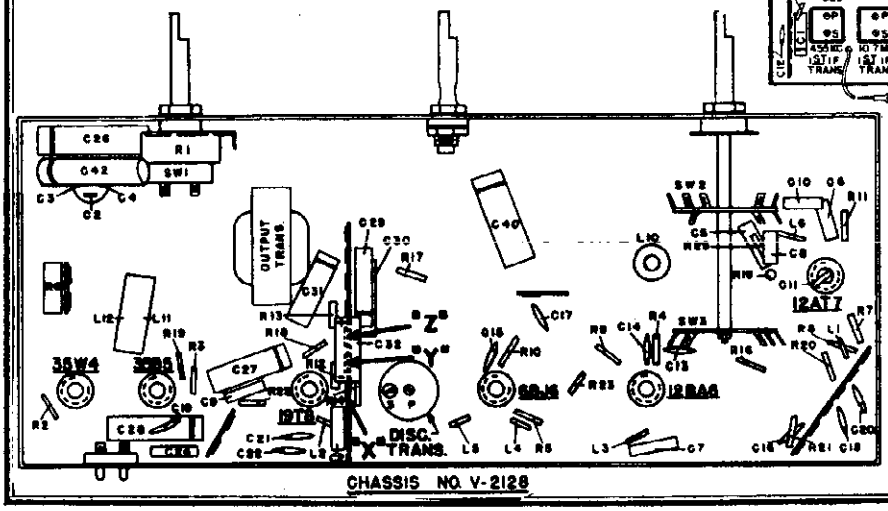

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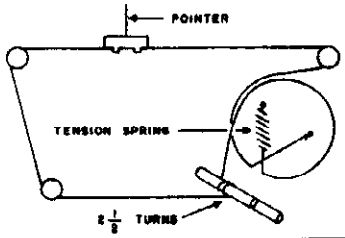


WESTINGHOUSE ELECTRIC CORP. MODEL H-182

ALIGNMENT

BROADCAST BAND

Connect an output meter across the speaker voice coil

While making the following adjustments, keep the volume control set for maximum output and the signal generator output attenuated to avoid AVC action.

Step	Connect Signal Generator to —	Signal Generator Frequency	Radio Dial Setting	Adjust
1.	Set Band Switch to AM			
2.	Pin #1 of 12BA6 tube through a 0.1 mfd capacitor	455 kc	1615 kc	Pri. and sec. of 455 kc 2nd I-F trans. for max. output
3.	Stator of tuning capacitor (C33) through a 0.1 mfd capacitor	455 kc	1615 kc	Pri. and sec. of 455 kc 1st I-F trans. for max. output
4.	Radiated signal (no actual connection)	1400 kc	1400 kc	AM osc. trimmer for max. output
5.	Radiated signal (no actual connection)	1400 kc	1400 kc	AM ant. trimmer for max. output (rock in adjustment)
6.	Recheck steps 4 and 5			

FM BAND

Do not align 10.7 mc I-F circuits until all 455 kc I-F adjustments have been completed.

1.	Set Band Switch to FM			
2.	Connect a VTVM between point "X" and ground. (See Figs. 1 and 3.)			
3.	Pin #1 of 12BA6 tube through a .002 mfd mica capacitor	UNMODULATED 10.7 mc	108 mc	Discriminator trans. primary and 10.7 mc. 2nd I-F trans. pri. and sec. for max. voltage.
4.	Reconnect VTVM between points "Y" and "Z". (See Figs. 1 and 3.)			
5.	Pin #1 of 12BA6 tube through a .002 mfd mica capacitor	UNMODULATED 10.7 mc	108 mc	Discriminator trans. secondary for *zero* voltage. The voltage will change polarity as the trimmer is tuned through resonance — tune carefully for zero.
6.	Reconnect VTVM between point "X" and ground.			
7.	Pin #1 of 12BA6 tube through a .002 mfd mica capacitor	UNMODULATED 10.7 mc	108 mc	Discriminator trans. primary and 10.7 mc. 2nd I-F trans. pri. and sec. for max. voltage.
8.	Place a temporary short across C34 (FM R-F tuning capacitor).			
9.	Pin #7 of 12AT7 tube through a .002 mfd mica capacitor	UNMODULATED 10.7 mc	108 mc	Pri. and sec. of 10.7 mc 1st I-F trans. for max. output
10.	Remove short from C34.			
11.	FM ant. terminals through a 300 ohm non-inductive resistor	UNMODULATED 108 mc	108 mc	FM osc. trimmer for max. output
12.	FM ant. terminals through a 300 ohm non-inductive resistor	UNMODULATED 98 mc	98 mc	FM R-F trimmer for max. output (rock in adjustment).
13.	Place a dab of thermal cement on the FM osc. and R-F trimmers to lock adjustment.			

TUBE COMPLEMENT:

1 12AT7 ..... Osc.-Converter
1 12BA6 ..... I-F Amp.
1 6BJ6 ..... Ratio Det. Driver (FM)
1 19T8 ..... Det., AVC, A-F Amp.
1 35B5 ..... Output Amp.
1 35W4 ..... Rectifier

OPERATING VOLTAGE:

105 to 120 volts 50-60 cycles A-C or 105 to 120 volts D-C.

POWER CONSUMPTION: ..... 30 watts

MODEL H-182

WESTINGHOUSE ELECTRIC CORP.

Part No.	Description
V-5608	Background, dial .....
V-5528-1 ..	Baffle and Grille Cloth Assembly .....
V-5607	Bracket Assembly, dial background .....
V-5600	Bracket, cover, back .....
V-5599	Bracket, dial .....
V-5527	Bushing, insulator, control
V-5437S-1 ..	Button, plug .....
V-1153-2 ..	Cabinet, plastic, brown ...
V-1153-1 ..	Cabinet, plastic, ivory ...
RCP10M6102M	Capacitor, .001 mfd 600 v. (C1)
V-5493	Capacitor, dry electrolytic, 50 mfd 150 v. (C2) ..... 50 mfd 150 v. (C3) 20 mfd 25 v. (C4)
R5CC26ZY102M	Capacitor, ceramicon, 1000 mmf (C5, C6, C7) .....
R5CC21ZY471M	Capacitor, ceramicon, 470 mmfd (C8, C9) .....
R1CC21SL470K	Capacitor, ceramicon, 47 mmf (C10) .....
V-5658-1 ..	Capacitor, 1 mmf (C11) ....
V-5596	Capacitor, Hi-Kap .005 mfd (C12, C13, C14, C15, C16, C17, C18, C19, C20, C21, C22)
V-5658-2 ...	Capacitor, 2.2 mmfd (C23) .
RCM20A101K .	Capacitor, mica, 100 mmf (C24, C25) .....
RCP10M6503M	Capacitor, .05 mfd 600 v. (C26) .....
RCP10M4303M	Capacitor, .03 mfd 400 v. (C27)
RCP10M6103M	Capacitor, .01 mfd 600 v. (C28)
RCP10M6202M	Capacitor, .002 mfd 600 v. (C29, C30, C31) .....
V-4637	Capacitor, electrolytic 4 mfd 50 v. (C32) .....
V-5494	Capacitor, variable, 2 gang (C33, C34, C35, C36, C37, C38, C39) .....
RCP10M4104M	Capacitor, 0.1 mfd 400 v. (C40)
V-4992	Capacitor, trimmer (C41) .
RCP10M4503M	Capacitor, .05 mfd 400 v. (C42)
V-4638	Choke, filament (L1, L2, L3, L4, L5) .....
V-4193S-1 ..	Clamp, dial cord .....
V-4886	Coil, filament (L6) .....
V-5545	Coil, oscillator, FM (L7) .
V-5546	Coil, RF, FM (L8) .....
V-5605	Coil, antenna loading (L9)
V-5514	Coil, oscillator, AM (L10)
V-5743	Coil, choke, antenna (L11, L12)
V-5517	Control, volume, 1.0 megohm (R1) and switch (SW1)
V-4304-14 ..	Cord Assembly, dial drive
V-5522	Cord, power, A-C (including socket) .....
V-5610-1 ..	Cover Assembly, back for brown cabinet (including loop, hinge, terminals, cord and socket)
V-5610-2 ..	Cover Assembly, back for ivory cabinet (including loop, hinge, terminals, cord and socket
V-5523	Dial .....
V-4236	Gasket, felt, speaker .....

Part No.	Description
V-5602-1 ..	Hinge, cover, for brown cabinet .....
V-5602-2 ..	Hinge, cover, for ivory cabinet .....
V-5603	Insulator, retainer for power cord .....
V-5560-1 ..	Knob, FM-AM .....
V-5558-1 ..	Knob, tuning .....
V-5559-1 ..	Knob, volume .....
No. 6S6 ...	Lamp, pilot light .....
V-5638	Loop Assembly, antenna .....
V-3891	Nut, speed, baffle mounting
V-5721S ...	Palnut, 3/8-32 .....
V-5549	Plug, power cord (mounted on chassis) .....
V-4213	Pointer, dial .....
V-4187	Pulley .....
RC20AE270K .	Resistor, 27 ohms ½ w. (R2)
RC20AE181J .	Resistor, 180 ohms ½ w. (R3)
RC20AE680J .	Resistor, 68 ohms ½ w. (R4, R5)
RC40AE102M .	Resistor, 1000 ohms 2 w. (R6)
RC20AE102M .	Resistor, 1000 ohms ½ w. (R7, R8, R9, R10) .....
RC20AE103K .	Resistor, 10,000 ohms ½ w. (R11)
RC20AE153J .	Resistor, 15,000 ohms ½ w. (R12, R13) .....
RC20AE223M .	Resistor, 22,000 ohms ½ w. (R14)
RC20AE100K .	Resistor, 10 ohms ½ w. (R15)
RC20AE474M .	Resistor, 470,000 ohms ½ w. (R16, R17, R18, R19) .....
RC20AE105M .	Resistor, 1 megohm ½ w. (R20)
RC20AE275M .	Resistor, 2.7 megohms ½ w. (R21)
RC20AE106M .	Resistor, 10 megohms ½ w. (R22)
RC20AE126K .	Resistor, 12 megohms ½ w. (R23)
RC20AE222K .	Resistor, 2200 ohms ½ w. (R24)
RC20AE472K .	Resistor, 4700 ohms ½ w. (R25)
V-5050S-101	Screw #10-32, chassis mounting
V-5530	Shaft Assembly, dial drive
V-3344-2 ..	Sleeve, spacer, variable capacitor mounting .....
V-4292S-1 .	Socket, miniature molded, 7 prong .....
V-5556-1 ..	Socket, miniature molded, 9 prong .....
V-4989	Socket, pilot light .....
V-5533	Speaker, 5" P.M. .....
V-3248S	Spring, dial drive .....
V-5534	Switch, selector (SW2, SW3)
V-5587	Teenut .....
V-4684	Terminal Board, ANT-GND ....
V-5537	Transformer, output .....
V-5535	Transformer, 1st I-F, AM (C43, C44, L13, L14) .....
V-5539	Transformer, 2nd I-F, AM (C45, C46, C47, C48, L15, L16, R26) .....
V-5540	Transformer, 1st I-F, FM (C49, C50, L17, L18) ....
V-5540	Transformer, 2nd I-F, FM (C51, C52, L19, L20) .....
V-5538	Transformer, discriminator (C53, C54, C55, L21, L22, L23, L24) .....
V-5606-1 ..	Washer, felt, for knobs ....
V-5526	Washer, insulator, for controls

CAUTION: One side of the power line is connected directly to the chassis in this model. Care must be exercised to avoid contacting the radio chassis and ground at the same time — ***serious shock may result.*** When making repairs or adjustments to the radio, it is recommended that the chassis be isolated from the power line by means of an isolation transformer.

WESTINGHOUSE ELECTRIC CORP. MODELS H-185, H-195

H-185

H-195

SPECIFICATIONS

FREQUENCY RANGE: ..... 540 to 1600 kc.

INTERMEDIATE FREQUENCY: ..... 455 kc.

TUBE COMPLEMENT:

1	1R5	Converter
1	1T4	I-F Amp.
1	1U5	Det., AVC and 1st A-F Amp.
1	3S4	Power Output Amp.

POWER OUTPUT:

Maximum (line):	.175 watt
Maximum (battery):	.15 watt
Undistorted (line):	.08 watt
Undistorted (battery):	.02 watt

LOUDSPEAKER: ..... 4" P.M.

POWER SUPPLY:

Battery Operation:
1 Westinghouse V-5009 "B" battery (67½ v.)
5 Westinghouse V-5696-1 "A" batteries (1½ v. each)

LINE OPERATION:

105 to 120 volts, 50 — 60 cycles A-C, or D-C

CURRENT CONSUMPTION (Battery Operation):

"A" Batteries	.05 amp.
"B" Battery	.01 amp.

POWER CONSUMPTION (Line Operation): 17 watts

ALIGNMENT

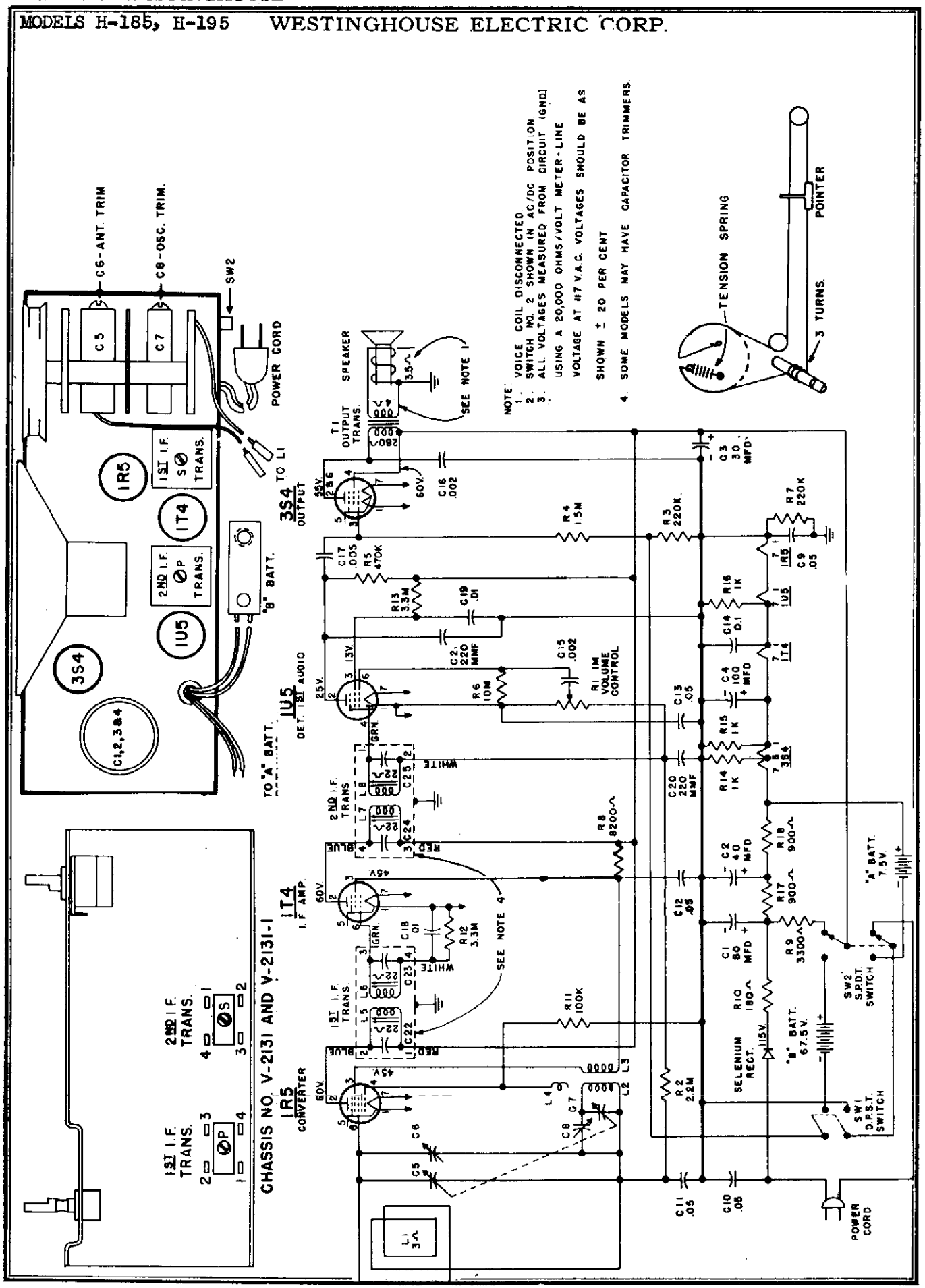
It is recommended that the chassis be isolated from the power line by means of an isolation transformer.

Make certain that the dial pointer is correctly orientated with respect to the dial scale.

While making the following adjustments, keep the volume control set for maximum output and the signal generator output attenuated to avoid AVC action.

Step	Connect Signal Generator to -	Signal Generator Frequency	Radio Dial	Adjust for Maximum Output
1	Stator of R-F tuning capacitor (C5) through a 200 mmf capacitor	455 kc	455 kc	Pri. and Sec. of 2nd I-F trans.
2	Stator of R-F tuning capacitor (C5) through a 200 mmf capacitor	455 kc	455 kc	Pri. and Sec. of 1st I-F trans.
3	Recheck steps 1 and 2			
4	Radiated Signal	1615 kc	1615 kc	Oscillator Trimmer (C8)
5	Radiated Signal	1400 kc	1400 kc	R-F Trimmer (C6)

MODELS H-185, H-195 WESTINGHOUSE ELECTRIC CORP.

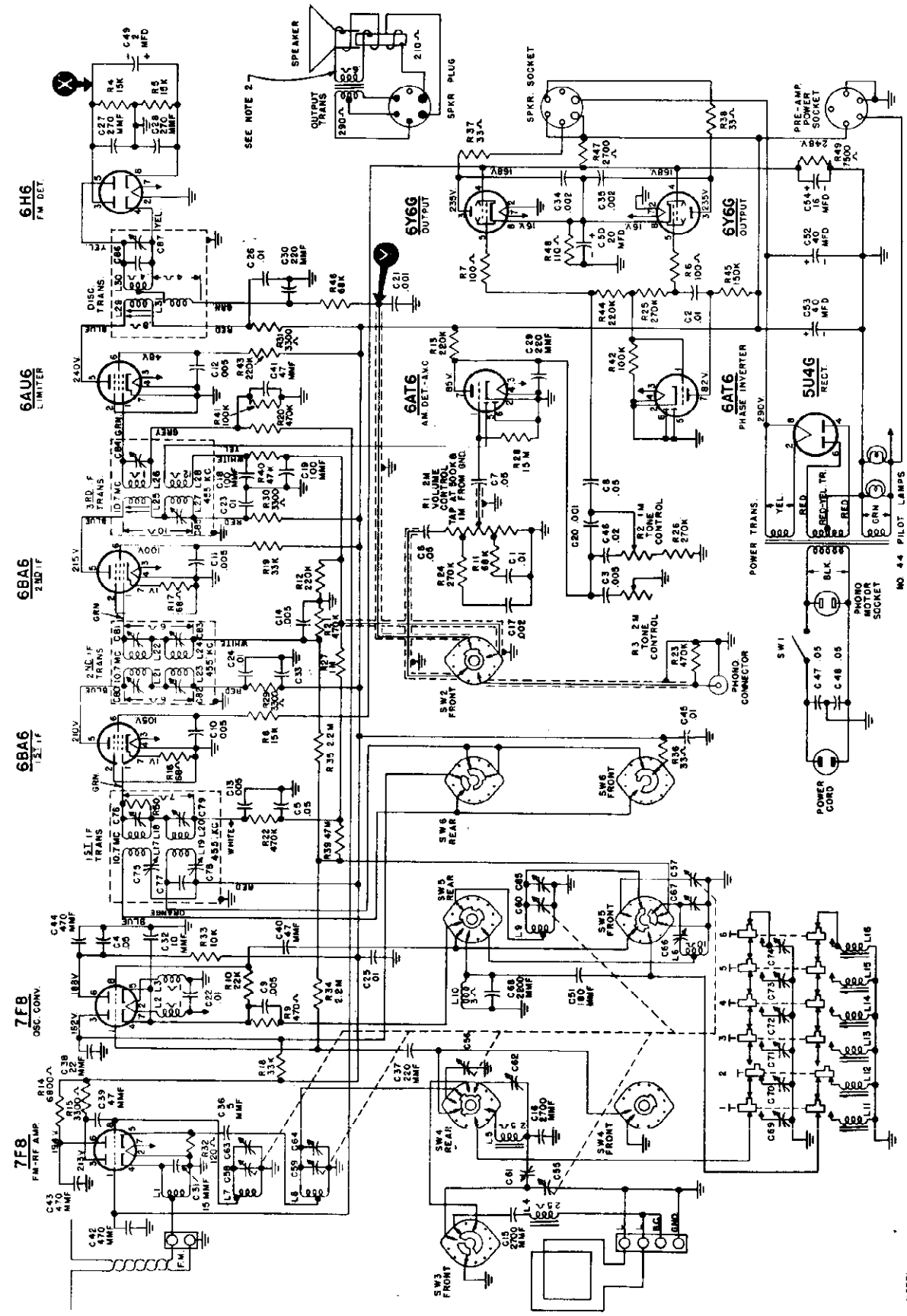


WESTINGHOUSE ELECTRIC CORP. MODELS H-185, H-195

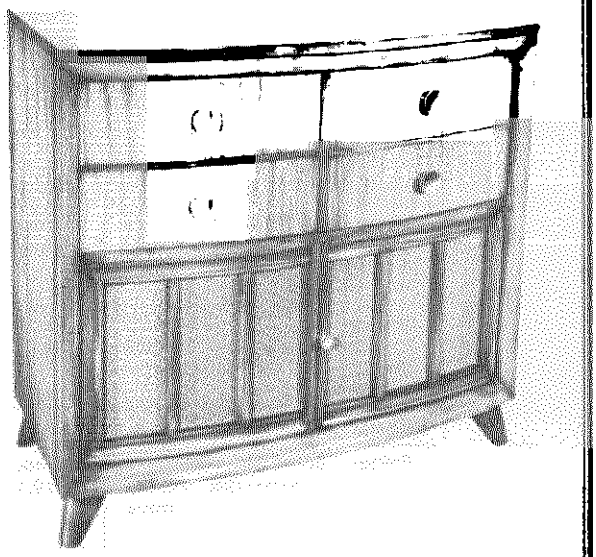
Part No.	Description
V-5830-1	Handle (H-195 Blue)
V-5830-2	Handle (H-195 Brown)
V-5830-3	Handle (H-195 Ivory)
V-5698-1	Knob (H-185)
V-3667-2	Knob (H-195 Brown)
V-7779	Knob (H-195 Blue or Ivory)
V-5648	Lever, switch (V-2131) (H-185)
*V-5681-1	Loop, antenna (H-185) (L1)
*V-5681-2	Loop, antenna (H-195) (L1)
V-5650	Pointer
V-5398-1	Pulley, dial drive
V-4115	Rectifier, selenium
V-5659-2	Resistor, ballast
RC10AE225M	Resistor, 2.2 megohms ¼ w. (R2)
RC10AE221K	Resistor, 220 ohms ¼ w. (R3)
RC10AE155M	Resistor, 1.5 megohms ¼ w. (R4)
RC10AE474M	Resistor, 470K ¼ w. (R5)
RC10AE106M	Resistor, 10 megohms ¼ w. (R6)
RC10AE224M	Resistor, 220K ¼ w. (R7)
RC20AE822K	Resistor, 8200 ohms ½ w. (R8)
RC20AE332M	Resistor, 3300 ohms ½ w. (R9)
V-6067-1	Resistor, Glasohm 180 ohms 4 w. (R10)
RC10AE104M	Resistor, 100K ¼ w. (R11)
RC10AE335M	Resistor, 3.3 megohms ¼ w. (R12, R13)
RC10AE102K	Resistor, 1000 ohms ¼ w. (R14, R15, R16)
V-5689	Retainer, battery
V-5693	Retainer, spring
V-5702-1	Shaft, tuning (V-2131) (H-185)
V-5702-2	Shaft, tuning (V-2131-1) (H-195)
V-5764	Shelf, battery support
V-5670	Socket, miniature wafer, shielded
V-5673	Socket, miniature wafer, unshielded
*V-5654	Speaker, 4" PM
V-4057	Spring, dial drive
V-5687	Spring, hinge (H-185)
V-3258S	Spring, knob
V-5834	Spring, shelf retainer (H-195)
V-4651	Stud, trimount (H-185)
V-5406	Switch, battery, AC/DC
V-5663-2	Transformer, 1st and 2nd I-F (C22, C23, C24, C25, L5, L6, L7, L8)
V-5656	Transformer, output (T1)
V-5421-2	Washer, felt, for knobs

Part No.	Description
V-5652	Background, dial
V-5675-1	Baffle and Grille Cloth Assembly (H-185)
V-5825	Baffle, cardboard (H-195)
V-5696-1	Battery, "A"
V-5009	Battery, "B"
V-5826	Bracket, chassis mounting (H-195)
V-5827	Bracket, handle (H-195)
*V-1157-1	Cabinet, plastic (H-185)
*V-1159-1	Cabinet, leatherette (H-195 Blue)
*V-1159-2	Cabinet, leatherette (H-195 Brown)
*V-1159-3	Cabinet, leatherette (H-195 Ivory)
V-5662	Cable, "B" battery
V-5665	Capacitor, electrolytic (C1, C2, C3, C4)
V-5651	Capacitor, variable 2-gang (C5, C6, C7, C8)
V-5618-1	Capacitor, .05 mfd 400 v. (C9)
RCP10W4503A	Capacitor, .05 mfd 400 v. (C10)
RCP10W2503A	Capacitor, .05 mfd 200 v. (C11, C12, C13)
RCP10W2104A	Capacitor, 0.1 mfd 200 v. (C14)
RCP10W6202A	Capacitor, .002 mfd 600 v. (C15, C16)
RCP10W6502A	Capacitor, .005 mfd 600 v. (C17)
RCP10W4103A	Capacitor, .01 mfd 400 v. (C18, C19)
RCM20A221M	Capacitor, 220 mmf mica (C20, C21)
V-5828	Catch, back cover (H-195)
V-6009	Clamp, retainer spring
V-5684	Clip, back cover mounting (H-185)
V-5426	Clip, I-F mounting
V-5661	Coil, oscillator (L2, L3)
V-5688	Contact Assembly, "A" battery
V-5666-1	Control, volume (V-2131) (R1)
V-5666-2	Control, volume (V-2131-1) (R1)
V-4349-4	Cord, A-C power
V-4304-16	Cord Assembly, dial
V-5832-1	Dial (H-195)
V-5829-1	Eyelet, back cover opening (H-195)
V-3885	Foot, felt (H-195)
V-6026	Gasket, baffle (H-195)
V-5835	Grille (H-195)
V-5678-1	Handle (H-185)

MODELS H-186, H-187 WESTINGHOUSE ELECTRIC CORP.



H-186



H-187

ALIGNMENT

BROADCAST BAND—AMPLITUDE MODULATION

Connect an output meter across the speaker voice coil.

While making the following adjustments, keep the volume control set for maximum output, the tone control set on treble, and the signal generator output attenuated to avoid AVC action.

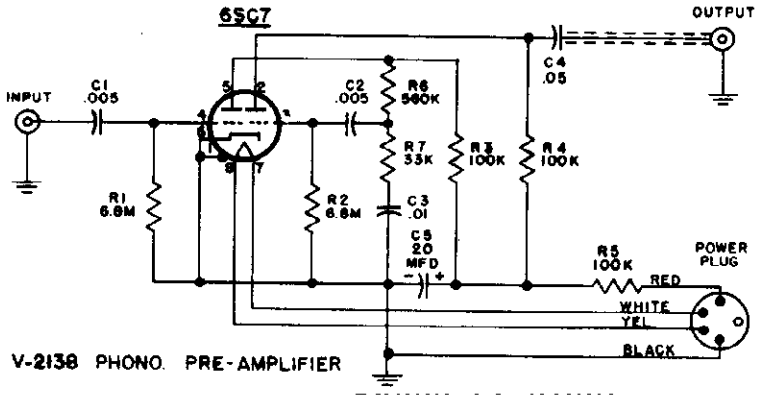
Step	*Connect Signal Generator to—*	*Signal Generator Frequency*	*Radio Dial Setting*	*Adjust for maximum output*
1	Set PHONO-BAND switch to "AM".			
2	Pin No. 1 of 6BA6, 2nd I-F, through a 0.1 mfd capacitor	455 kc	550 kc	455 kc primary trimmer of 3rd I-F trans.
3	Pin No. 1 of 6BA6, 1st I-F, through a 0.1 mfd capacitor	455 kc	550 kc	455 kc secondary and primary trimmers of 2nd I-F trans.
4	Pin No. 1 of 7F8, converter, through a 0.1 mfd capacitor	455 kc	550 kc	455 kc secondary and primary trimmers of 1st I-F trans.
5	Radiated signal (no actual connection)	1500 kc	1500 kc	Bc osc. trimmer (C67) (make certain that loop antenna is connected to "L" terminals).
6	Radiated signal (no actual connection)	1400 kc	1400 kc	Bc converter (C62) and BC antenna (C61) trimmers.
7	Radiated signal (no actual connection)	600 kc	600 kc	BC oscillator padder (C66) ("rock-in" adjustment).
8	Repeat Steps 5, 6 and 7			

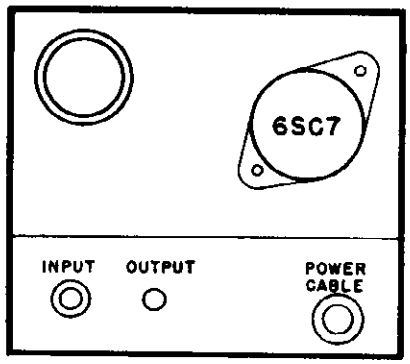
MODELS H-186, H-187 WESTINGHOUSE ELECTRIC CORP.

Step	Connect Signal Generator to—	Signal Generator Frequency	Radio Dial Setting	Adjust
1	Set PHONO-BAND switch to "FM".			
2	Connect a vacuum tube voltmeter between point "X" (see Figs. 2 and 3) and ground (chassis).			
3	Place a temporary short between rotor and stator of FM osc. section of tuning capacitor (C60).			
4	*Detune* 10.7 mc. secondary trimmers of 1st, 2nd, and 3rd I-F transformers and secondary trimmer of discriminator transformer by turning screws ¼ turn toward tight position.			
5	Stator of FM convertor tuning capacitor (C59) through a .001 mfd mica capacitor	Unmodulated 10.7 mc	88 mc	10.7 mc primary trimmers of discriminator, 3rd I-F, 2nd I-F, and 1st I-F transformers (in order given) for maximum voltage.
6	Stator of FM converter tuning capacitor (C59) through a .001 mfd mica capacitor	Unmodulated 10.7 mc	88 mc	10.7 mc secondary trimmers of 1st, 2nd, and 3rd I-F transformers for maximum voltage. NOTE: *Do not* re-peak the primary trimmers.
7	Connect the vacuum tube voltmeter between "Y" (Figs. 2 and 3) and chassis.			
8	Stator of FM converter tuning capacitor (C59) through a .001 mfd mica capacitor	Unmodulated 10.7 mc	88 mc	Secondary of discriminator trans. for zero voltage. The voltage will change polarity as the trimmer is tuned through resonance. Tune carefully for zero voltage.
9	Connect the vacuum tube voltmeter between point "X" and chassis.			
10	Remove the short from the FM oscillator tuning capacitor.			
11	FM. antenna terminal through a 72 ohm resistor	Unmodulated 105 mc	105 mc	FM oscillator trimmer (C65) for max. voltage.*
12	FM antenna terminal through a 72 ohm resistor	Unmodulated 98 mc	98 mc	FM converter (C64) and FM R-F (C63) trimmers for max. voltage.**

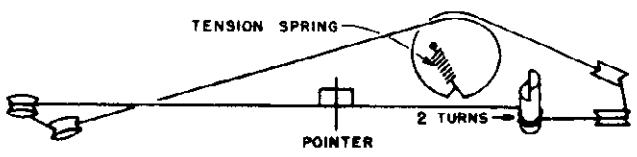
*After adjusting the oscillator trimmer at 105 mc., check dial calibration by tuning the receiver to a 90 mc. signal from the generator. If the dial pointer indicates 90 mc., no further oscillator adjustments are necessary. If the pointer is on the high frequency side of 90 mc., slightly expand the length of the oscillator coil (L9); if the pointer is on the low frequency side of 90 mc., slightly compress the oscillator coil. Re-adjust the oscillator trimmer (C65) at 105 mc., and again check the calibration. Repeat this process until calibration is correct.

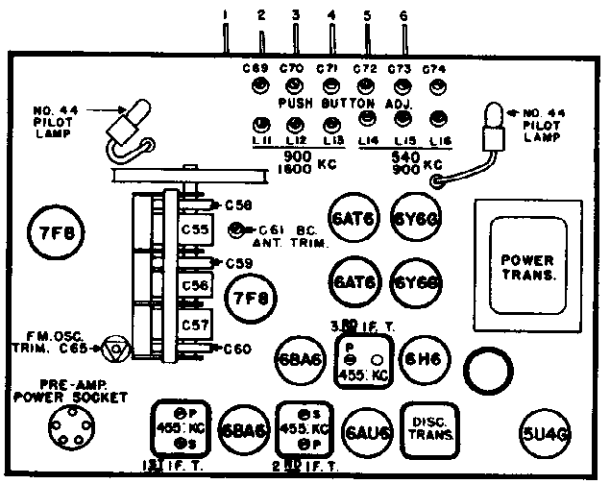
**After adjusting the trimmers at 98 mc., check tracking by tuning the receiver to a 90 mc. signal from the generator and re-adjusting the trimmers for max. voltage. If the "peak" setting is the same at 90 mc. as it was at 98 mc., no further adjustments are necessary. If the capacitance of either trimmer must be increased to obtain maximum output at 90 mc., slightly compress the coil across that trimmer (either L7 or L8); if the capacitance of either trimmer must be decreased to obtain maximum output at 90 mc., slightly expand the coil across that trimmer. Re-adjust the converter and R-F trimmers (C63 and C64) at 98 mc., and again check the tracking. Repeat this process until tracking is correct.

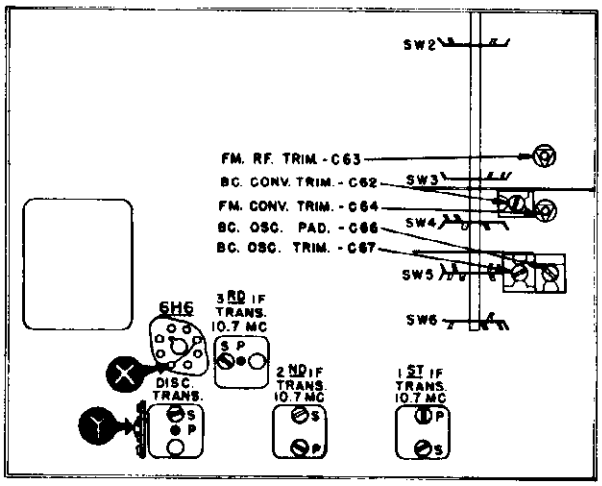




V-2138 PHONOGRAPH PRE-AMPLIFIER







V-4931	Cable, output	V-3345S-10	Grommet, socket mounting
V-4930	Cable, power	RC20AE685M	Resistor, 6.8 megohms ½ w. (R1, R2)
RCP10W6502A	Capacitor, .005 mfd 600 v. (C1, C2)	RC20AE104M	Resistor, 100,000 ohms ½ w. (R3, R4, R5)
RCP10W4103A	Capacitor, .01 mfd 400 v. (C3)	RC20AE564K	Resistor, 560,000 ohms ½ w. (R6)
RCP10W4503A	Capacitor, .05 mfd 400 v. (C4)	RC20AE333M	Resistor, 33,000 ohms ½ w. (R7)
V-5765	Capacitor, dry electrolytic, 20 mfd 300 v. (C5)	V-4933	Socket, molded octal
V-3254S	Connector, phono		
V-3345S-5	Grommet, power cord		

V-2138 PHONO PRE-AMPLIFIER PARTS LIST

Description	*Part No.*	*Part No.*	*Description*
RC20AE332M	Resistor, 3300 ohms ½ w. (R29 R30, R31)	V-4292S-1	Socket, miniature molded
RC20AE121K	Resistor, 120 ohms ½ w. (R32)	V-3275S	Socket, molded octal tube
RC30AE103M	Resistor, 10,000 ohms 1 w. (R33)	V-3246S	Socket, octal tube
RC20AE225M	Resistor, 2.2 megohms ½ w. (R34, R35)	V-3252-2	Socket, pilot light (10¾" lead)
RC20AE330M	Resistor, 33 ohms ½ w. (R36, R37, R38)	V-3252-4	Socket, pilot light (8½" lead)
RC20AE475M	Resistor, 4.7 megohms ½ w. (R39)	V-5405	Socket, record changer, power
RC20AE473M	Resistor, 47,000 ohms ½ w. (R40)	V-5769**	Speaker, 12" Electro-Dynamic
RC20AE104K	Resistor, 100,000 ohms ½ w. (R41, R42)	V-3248S	Spring, dial drive
RC20AE224K	Resistor, 220,000 ohms ½ w. (R43, R44)	V-4900-2	Strike, bullet catch (H-186 and H-187 Blonde)
RC20AE154M	Resistor, 150,000 ohms ½ w. (R45)	V-4900-1	Strike, bullet catch (H-187 Mah.)
RC20AE683M	Resistor, 68,000 ohms ½ w. (R46)	V-3167S-1	Stud, pulley, threaded
RC41AE272K	Resistor, 2700 ohms 2 w. (R47)	V-3261-3	Switch Assembly, push button
V-4758	Resistor, 110 ohms 3 w. (R48)	V-5759	Switch, band (SW2, SW3, SW4, SW5, SW6)
V-4759	Resistor, 7500 ohms 5 w. (R49)	V-5174	Tabs, station, for push buttons
V-5705-1	Screw, escutcheon mounting	V-4771	Terminal Board, ANT.-GND.
V-5715	Shaft, tuning	V-3417	Terminal Board, FM antenna
V-5595	Shield, plate	V-4621	Transformer, 1st I-F (C75, C76, C77, C78, C79, L17, L18, L19, L20, R50)
V-4168	Shield, tube socket	V-4622	Transformer, 2nd I-F (C80, C81, C82, C83, L21, L22, L23, L24)
V-3344-2	Sleeve, spacer, variable capacitor mounting	V-4623	Transformer, 3rd I-F (C84, C85, L25, L26, L27, L28)
V-3353-3	Slide Mechanism, left hand	V-4624	Transformer, discriminator (C86, C87, L29, L30, L31)
V-3353-4	Slide Mechanism, right hand	V-4761	Transformer, power
V-3162S	Socket, 5 contact, phono power	V-3274S	Tube Holder
V-3288S	Socket, 6 contact, speaker	V-3317	Tuner Assembly, push button (C69, C70, C71, C72, C73, C74, L11, L12, L13, L14, L15, L16)
V-4832-1	Socket, lock-in tube		

Part No.	Description
V-4777-2**	Antenna Assembly, FM dipole
V-4762	Background, felt
V-4965-1	Cable, phono input (record changer to pre-amplifier)
RCP10W4103A	Capacitor, .01 mfd 400 v. (C1)
RCP10M4103A	Capacitor, .01 mfd 400 v. (C2)
RCP10W6502A	Capacitor, .005 mfd 600 v. (C3)
RCP10W4503A	Capacitor, .05 mfd 400 v. (C4, C5, C6, C7, C8)
RCM30B512M	Capacitor, .005 mfd mica (C9, C10, C11, C12, C13, C14)
RCM30C272G	Capacitor, 2700 mmf mica (C15, C16)
RCP10W6202M	Capacitor, .002 mfd 600 v. (C17)
RCM20B101M	Capacitor, 100 mmf mica (C18, C19)
RCP10W6102K	Capacitor, .001 mfd 600 v. (C20, C21)
RCM30B103M	Capacitor, .01 mfd mica (C22, C23, C24, C25, C26)
RCM20B271J	Capacitor, 270 mmf mica (C27, C28)
RCM20B221M	Capacitor, 220 mmf mica (C29, C30)
R2CC21CH150J	Capacitor, 15 mmf ceramic
V-4750	Capacitor, variable 3-gang (C55, C56, C57, C58, C59, C60)
V-4746	Capacitor, trimmer, B.C. antenna (C61)
V-4747	Capacitor, trimmer, B.C. converter (C62)
V-4748	Capacitor, trimmer, FM (C63, C64, C65)
V-4749	Capacitor, dual trimmer
	B.C. oscillator pad (C66)
	B.C. oscillator trimmer (C67)
RCM30B222M	Capacitor, .0022 mfd mica (C68)
V-4887	Choke, FM antenna input (L1)
V-4763	Clamp, dial
V-4764	Clip, spring, dial mounting
V-4751	Coil, B.C. antenna (L4)
V-4752	Coil, B.C. converter (L5)
V-4753	Coil, B.C. oscillator (L6)
V-4767	Coil, FM (L7, L8)
V-4768	Coil, FM oscillator (L9)
V-3313	Coil, oscillator-cathode (L10)

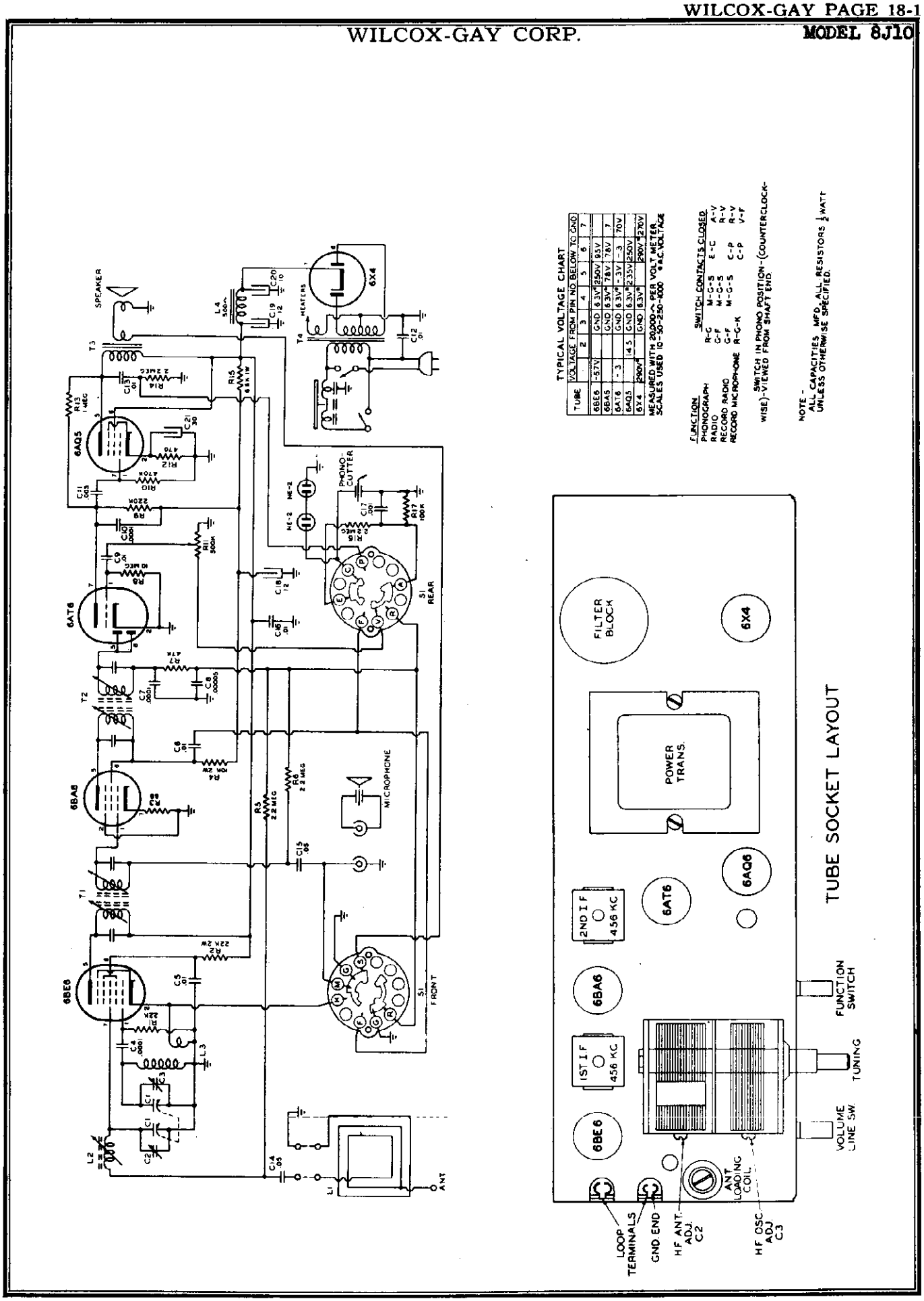
Part No.	Description
R2CC21UJ100F	Capacitor, 10 mmf ceramic (C32)
V-5442-1	Capacitor, resonant type, 0.1 mfd 400 v. (C33)
RCP10M6202M	Capacitor, .002 mfd 600 v. (C34, C35)
R2CC21CH050D	Capacitor, 5 mmf ceramic (C36)
R2CC36SL221M	Capacitor, 220 mmf ceramic (C37)
R2CC21PJ220K	Capacitor, 22 mmf ceramic (C38)
R2CC26PJ470K	Capacitor, 47 mmf ceramic (C39, C40, C41)
R5CC21ZY471M	Capacitor, 470 mmf ceramic (C42, C43, C44)
V-5040-15	Capacitor, .01 mfd 600 v. (C45)
RCP10W4203A	Capacitor, .02 mfd 400 v. (C46)
V-3241	Capacitor, dual line filter, .05-.05 mfd 600 v. (C47, C48)
V-4880	Capacitor, electrolytic 2 mfd 50 v. (C49)
V-3236	Capacitor, electrolytic 20 mfd 25 v. (C50)
RCM20C181J	Capacitor, 180 mmf mica (C51)
V-3302	Capacitor, electrolytic
	40 mfd 450 v. (C52)
	40 mfd 450 v. (C53)
	16 mfd 350 v. (C54)
V-3254S	Connector, phono
V-5130	Control, dual tone (R2, R3)
V-3293	Control, volume (R1) and switch (SW1)
V-4304-8	Cord, dial drive
V-3239	Cord, power, A-C
V-4966-1	Cord, record changer, A-C power
V-4525-2	Cushion, chassis mounting
V-4765	Dial, glass
V-5171	Escutcheon, push button
V-4902	Glide, furniture
V-5298-1	Grille Cloth Assembly, door, L.H. (H-187 Blonde)
V-5298-5	Grille Cloth Assembly, door, L.H. (H-187 Mah.)
V-5298-2	Grille Cloth Assembly, door, R.H. (H-187 Blonde)
V-5298-6	Grille Cloth Assembly, door, R.H. (H-187 Mah.)
V-4934	Grille Cloth Assembly, record storage (H-186)

Part No.	Description
V-5028-3	Knob, bass tone (H-186 and H-187 Mah.)
V-5028-4	Knob, bass tone (H-187 Blonde)
V-5316	Knob, door (H-186)
V-4910	Knob, door, lower (H-187)
V-5301	Knob, door, upper (H-187)
V-4362-4	Knob, treble tone (H-186 and H-187 Mah.)
V-4362-5	Knob, treble tone (H-187 Blonde)
V-4888-1	Knob, volume and tuning (H-186 and H-187 Mah.)
V-4888-2	Knob, volume and tuning (H-187 Blonde)
No. 44	Lamp, pilot
V-3283-3	Loop, B.C. antenna
V-4781	Molding Assembly, dial
V-5747	Molding Assembly, dial, lettered
V-4696	Nameplate, Westinghouse-FM
V-4783-1	Plate, front glass (H-186 and H-187 Mah.)
V-4783-2	Plate, front glass (H-187 Blonde)
V-3399	Pointer Assembly, dial
V-4967	Pull, drawer (H-186)
V-3166S	Pulley, 7/16" dia.
V-5166-1	Push Button
V-3181	Rail, pointer
V-4886-1	Reactor, R-F (L2, L3)
RC20AE153J	Resistor, 15,000 ohms ½ w. (R4, R5)
RC20AE101M	Resistor, 100 ohms ½ w. (R6, R7)
RC20AE153K	Resistor, 15,000 ohms ½ w. (R8)
RC20AE471K	Resistor, 470 ohms ½ w. (R9)
RC20AE223K	Resistor, 22,000 ohms ½ w. (R10)
RC20AE683K	Resistor, 68,000 ohms ½ w. (R11)
RC20AE224M	Resistor, 220,000 ohms ½ w. (R12, R13)
RC30AE682K	Resistor, 6800 ohms 1 w. (R14)
RC30AE332K	Resistor, 3300 ohms 1 w. (R15)
RC20AE680K	Resistor, 68 ohms ½ w. (R16, R17)
RC20AE333K	Resistor, 33,000 ohms ½ w. (R18, R19)

Part No.	Description
V-4954	Grille Cloth Assembly, speaker (H-186)
V-5358-1	Hinge, left (H-186)
V-5066-1	Hinge, left (H-187 Blonde)
V-5066-5	Hinge, left (H-187 Mah.)
V-5359-1	Hinge, right (H-186)
V-5066-2	Hinge, right (H-187 Blonde)
V-5066-6	Hinge, right (H-187 Mah.)
V-5745-1	Knob, band (H-186 and H-187 Mah.)
V-5745-2	Knob. band (H-187 Blonde)
RC20AE474M	Resistor, 470,000 ohms ½ w. (R20, R21, R22, R23)
RC20AE274K	Resistor, 270,000 ohms ½ w. (R24, R25, R26)
RC20AE105M	Resistor, 1 megohm ½ w. (R27)
RC20AE156M	Resistor, 15 megohms ½ w.

WILCOX-GAY CORP.

MODEL 8J10



MODEL 8J10 WILCOX-GAY CORP.

PART NO.	NAME
5-3103	Arm Rest Bracket
8-2311-1	Cabinet with loop antenna (Portable)
147-1	Capristor .01 mfd. 10 megohms Res. +20% Cap. —20% +50%
147-2	Capristor .0001 mfd. 22,000 ohms Res. +20% Cap. —20% +50%
147-4	Capristor .0001 mfd. 220,000 ohms Res. +20% Cap. —20% +50%
147-5	Capristor .005 mfd. 470,000 ohms Res. +20% Cap. —20% +50%
14-2100	Capristor—Diode Filter
16-2076	Cartridge Clip
114-54	Chassis Vent Screen
18-2049	Condenser Electrolytic
23-2144	Crystal Cartridge Phono-Cutter
28-2063	Escutcheon & Dial
57-3266	Feed Screw
14-2103	Filter Choke (L4)
2-3072-A	Follower Arm Assembly
68-3009	1st or 2nd I.F. Transformer K-Trans
51-3081	Idler Slip Plate
51-3085-A	Idler Slip Plate Assembly
97-2029	Idler Tension Spring
79-2010	Idler Wheel
40-2126-1	Knob
40-2123-3	Knob
70-2115	Light Weight 10" Turntable
17-3036-A	Loop Loading Coil Assembly (L2)
108-15-4	Microphone
5-3112-A	Microphone Bracket Assembly
35-2018	Motor Mounting Grommets
97-3034	Needle Holder Spring
69-2174-A	Neon Limiter Assembly
17-3041-A	Osc. Coil Assembly (L3)
81-2106	Output Transformer — T3
39-2023	Pointer
80-2186	Power Transformer — T4
57-2056	Retaining screw — needle
47-2066	Rim Drive Recording Motor
7-2053	Shaving Collector Brush
66-3014	Slide Switch with Cover
64-2092	Speaker
73-2281	Turntable Holding Clip
77-2098	Variable Capacitor — C1
19-2194	Volume Control
66-3020	Wafer Switch — (S1)

An OUTPUT METER, connected to the speaker voice coil terminals, should be used for accuracy in making ganging adjustments.

The voice coil terminals, as well as the I.F. trimmers, may be made accessible by removing the screws by which the motor panel is mounted in the cabinet. Before lifting off the phono-recorder unit, MOVE THE PHONO. ARM TO THE CENTER OF THE TURNTABLE, and permit the arm to maintain this position until after the unit has been restored to the cabinet. In this way, the follower arm which engages the lateral feed screw will be protected against damage.

The R.F. trimmers and loop loading coil may be reached by raising front edge of panel.

Connect signal generator to control grid of 6BE6 tube.*

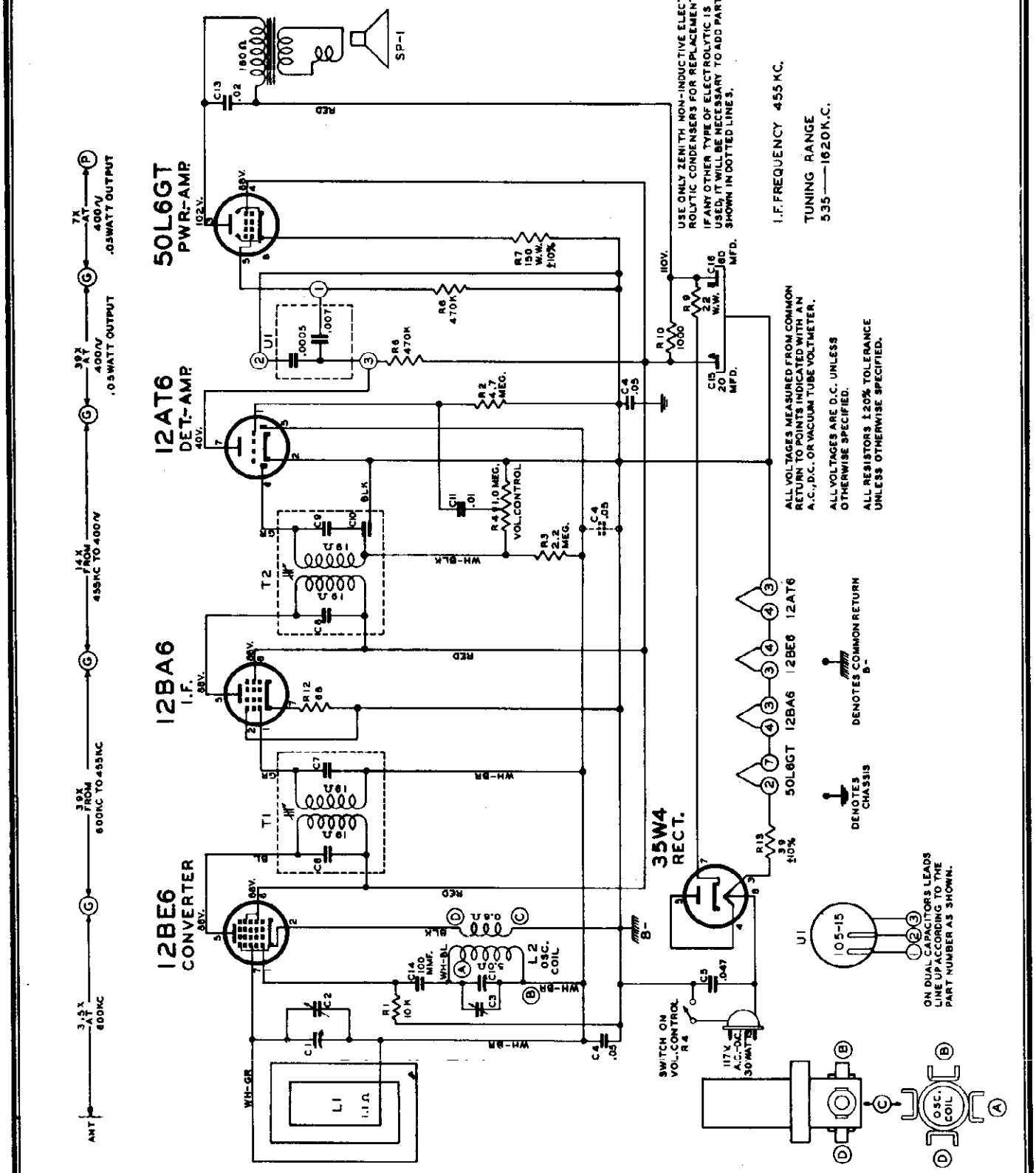
SIGNAL GENERATOR FREQUENCY	DIAL POSITION	TRIMMER
456 K.C.	1400 K.C.	T2-S** (Top Screw)
456 K.C.	1400 K.C.	T2-P** (Bottom Screw)
456 K.C.	1400 K.C.	T1-S** (Bottom Screw)
456 K.C.	1400 K.C.	T1-P** (Top Screw)

Connect signal generator to ANT. and GND. terminals.

1400 K.C.	1400 K.C.	C-3 OSC.
1400 K.C.	1400 K.C.	C-2 ANT.
600 K.C.	600 K.C.	L-2 Loop Loading Coil

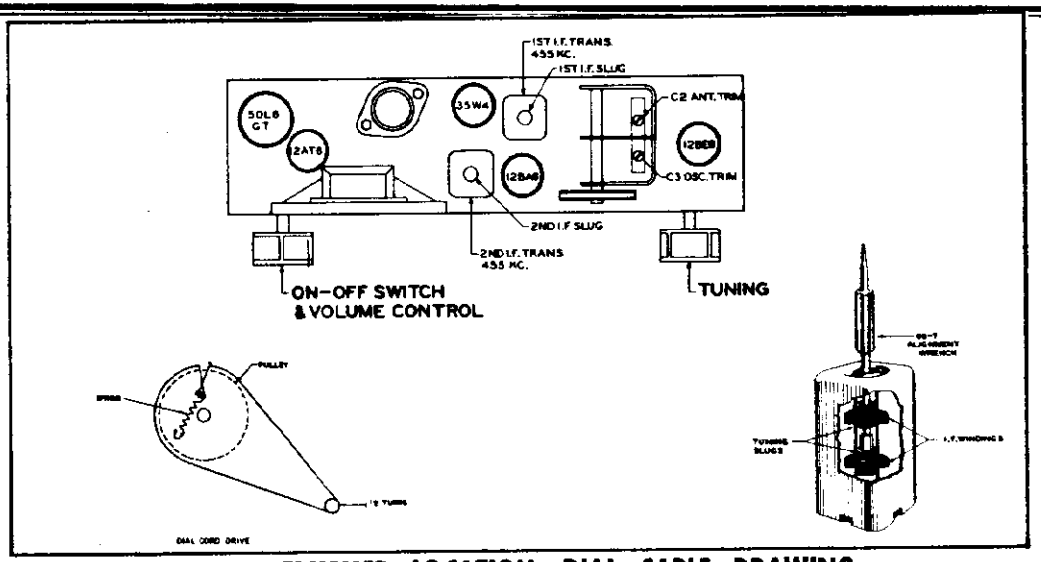
ZENITH RADIO CORP.

MODEL 5D810,
CHASSIS 5E02



PARTS LIST

PART NO.			
		DIAL ASSEMBLY	
26-415		Dial Scale	
59-222		Dial Pointer	
76-515		Tuning Shaft	
80-209		Dial Cord Tension Spring	
188-32		Retaining Ring	
188-54		Retaining Ring (Pointer)	
S14843		Dial Cord & Eyelet Assem.	
		COILS & CHOKES	
95-1101	T-1	1st. I. F. Transformer	
95-1102	T-2	2nd. I. F. Transformer	
S14842	L-2	Oscillator Coil Assem.	
		CONDENSERS	
22-162	C-14	100 Mfd. (or 22-1669)	500V.
22-829	C-4	.05 Mfd.	200V.
22-854		.0005 Mfd.	600V.
22-1158	C-4	.05 Mfd.	200V.
22-1379	C-13	.02 Mfd.	400V.
22-1775	C-5	.047 Mfd.	400V.
22-1804	C15, 16	Dry Electrolytic 60 x 20 Mfd.	150V.
22-1807	C-1	Two Section Gang	
105-14	U-1	Dual Ceramic	
		RESISTORS	
63-686	R-7	150 Ohm W.W. Insl.	1/2W
63-1219	R-9	22 Ohm W.W. Insl.	1/2W
63-1574	R-10	1 M Ohm Insl.	1W
63-1575	R-13	39 Ohm W.W. Insl.	2W
63-1660	R-4	Vol. Con. & Sw.	
63-1737	R-12	68 Ohm Insl.	1/2W
63-1782		820 Ohm Insl.	1/2W
63-1814		4700 Ohm Insl.	1/2W
63-1828	R-1	10M Ohm Insl.	1/2W
63-1898	R-6	470M Ohm Insl.	1/2W
63-1926	R-3	2.2 Megohm Insl.	1/2W
63-1940	R-2	4.7 Megohm Insl.	1/2W
		MISCELLANEOUS	
11-79		Line Cord & Plug (6 Ft.)	
14-1010		Model 810Y Plastic Cabinet	
46-745Y		Tuning & Vol. Con. Knob (2 Used)	
49-645	SP-1	4" P.M. Speaker	
		206-645 Output Trans.	
		208-645 Cone & Voice Coil	
54-139		#3/8-32 x 9/16 Palnut	
54-211		Speed Nut	
54-267		#6-32 x 5/16 Palnut	
57-1407		Cabinet Front Plate	
78-275		Socket - Electrolytic	
78-611		Socket - Octal Tube (8 Contact)	
78-806		Socket - Miniature Tube	
78-807		Socket - Miniature Tube (3 Used)	
83-1057		Line Cord Insulating Strip	
94-334		Gang Cond. Mtg. Bushing	
112-697		#6 x 7/16 Straight Side B.H.S.T. Screw	
114-67		#6-32 x 7/16 Hex Acorn Hd. M.S.	
114-217		#8 x 1/4 Hex Hd. Slotted S. T. Screw	
125-17		Rubber Grommet	
139-73		Spk. Baffle	
159-69		Trimount Stud (Cab. Back Mtg.)	
166-44		Rubber Bumper (or 166-41)	
202-665		Instruction Book	
S14879	L-1	Wavemagnet Assem.	
S14951		Front Plate & Spk. Baffle Assem.	



TUBE, TRIMMER LOCATION, DIAL CABLE DRAWING AND DETAILED VIEW OF I. F. TRANSFORMERS.

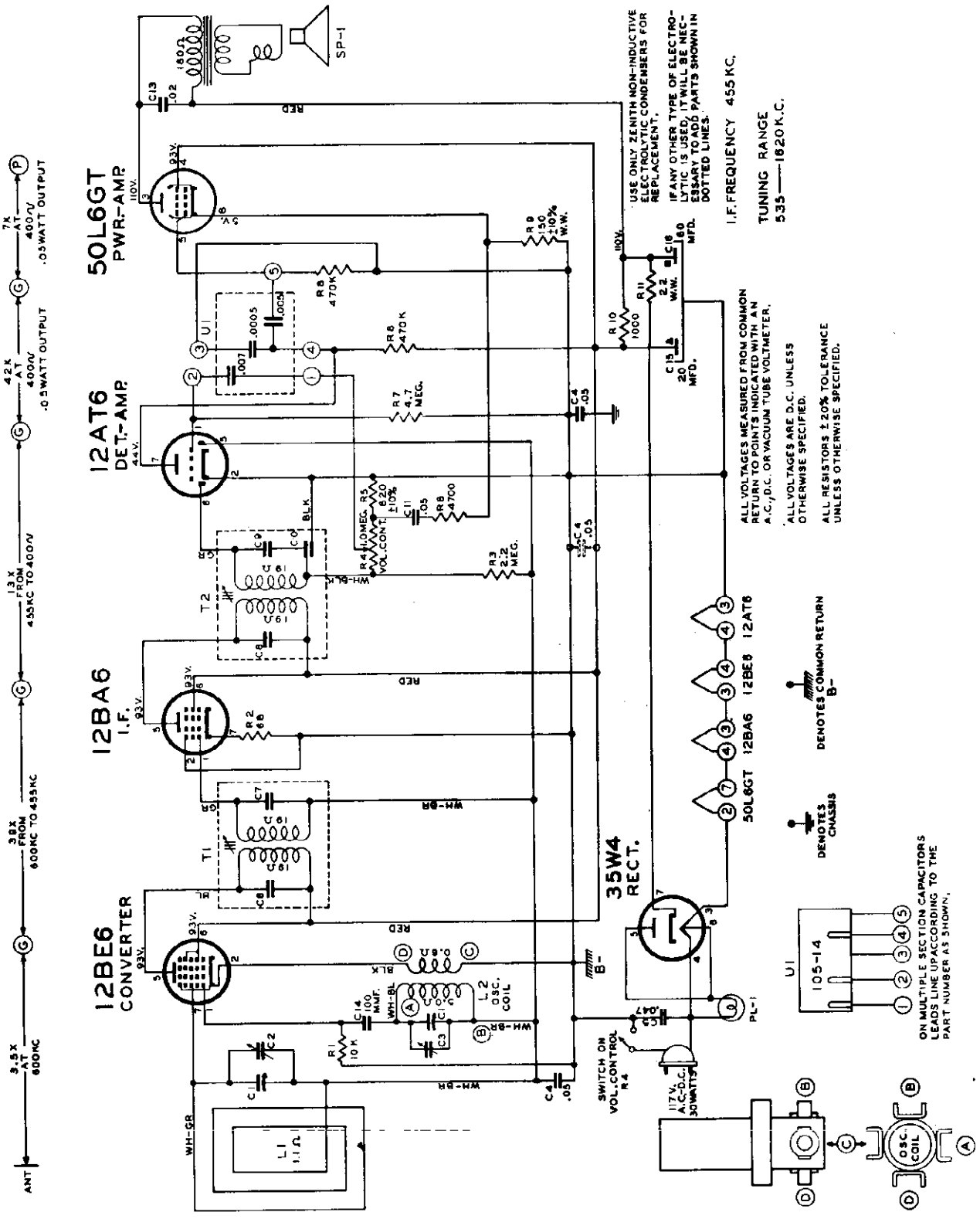
The I.F. transformers incorporated in this receiver are of the new permeability tuned type. The advantage of an I. F. transformer of this type is its extreme stability under various humidity and temperature conditions. The upper coil is the secondary and the lower the primary. When adjusting these I. F. transformers the tuning wrench 68-7 can be inserted into the top slug, rotated until maximum output is obtained and then dropped down to the lower slug and the same operation repeated. The tuning wrench is so designed that turning one slug does not affect the adjustment of the other.

ALIGNMENT PROCEDURE

OPERATION	CONNECT OSCILLATOR TO	DUMMY ANTENNA	INPUT SIG. FREQUENCY	SET DIAL AT	TRIMMERS	PURPOSE
1	Converter Grid	.5 Mfd.	455 Kc.	600 Kc.	Adjust Primary & Secondary Slugs	For I. F. Alignment
2	One Turn Loop Coupled Loosely to Wave Magnet	--	1600 Kc.	1600 Kc.	C-3	Set Oscillator to Dial Scale.
3		--	1400 Kc.	1400 Kc.	C-2	Align Antenna Stage

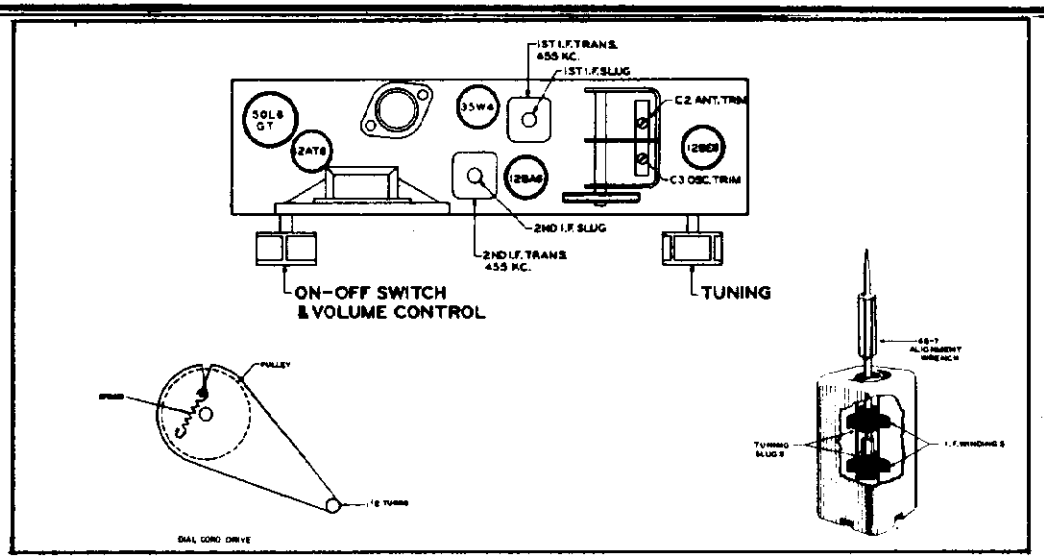
ZENITH RADIO CORP.

MODEL 5D811,
CHASSIS 5E01



PARTS LIST

PART NO.			
		DIAL ASSEMBLY	
26-414		Dial Scale	
59-222		Dial Pointer	
76-515		Tuning Shaft	
78-820		Pilot Light Socket & Wire	
80-209		Dial Cord Tension Spring	
100-67		Dial Light Bulb - 6.3V. -.15 Amp.	
188-32		Retaining Ring	
188-56		Retaining Ring (Pointer)	
S14843		Dial Cord & Eyelet Assem.	
		COILS & CHOKES	
95-1101		1st I.F. Transformer	
95-1102		2nd I.F. Transformer	
S14842		Osc. Coil Assem.	
		CONDENSERS	
22-162	C-14	100 Mmfd. (or 22-1669)	500V.
22-829	C-4	.05 Mfd.	200V.
22-854		.0005 Mfd.	600V.
22-1158	C-11	.05 Mfd.	200V.
22-1379	C-13	.02 Mfd.	400V.
22-1775	C-5	.047 Mfd.	400V.
22-1804	C15, 16	Dry Electrolytic 60 x 20 Mfd.	150V.
22-1807	C-1	Two Section Gang	
105-14	U-1	Dual Ceramic	
		RESISTORS	
63-686	R-9	150 Ohm W.W. Insl.	1/2W
63-1219	R-11	22 Ohm W.W. Insl.	1/2W
63-1574	R-10	10000 Ohm Insl.	1W
63-1660	R-4	Vol. Con. & Sw.	
63-1737	R-2	68 Ohm Insl.	1/2W
63-1782	R-5	820 Ohm Insl.	1/2W
63-1814	R-6	4700 Ohm Insl.	1/2W
63-1828	R-1	10M Ohm Insl.	1/2W
63-1898	R-8	470M Ohm Insl.	1/2W
63-1926	R-3	2.2 Megohm Insl.	1/2W
63-1940	R-7	4.7 Megohm Insl.	1/2W
		MISCELLANEOUS	
11-79		Line Cord & Plug (6 Ft.)	
14-1011		Model 811 Plastic Cabinet	
14-1011W		Model 811W Plastic Cabinet	
14-1011Y		Model 811Y Plastic Cabinet	
43-165		Handle Housing	
46-744		Tuning & Vol. Con. Knob (2 Used) (5D811)	
46-744Y		Tuning & Vol. Con. Knob (2 Used) (5D811W - 811Y)	
49-645	SP-1	4" P.M. Speaker	
		206-645 Output Trans.	
		208-645 Cone & Voice Coil	
54-211		Speed Nut	
57-1488		Cabinet Front Plate	
78-275		Socket - Electrolytic	
78-611		Socket - Octal Tube (8 Contact)	
78-806		Socket - Miniature Tube	
78-807		Socket - Miniature Tube	
83-1057		Line Cord Insulating Strip	
83-1393		Rubber Strip (Handle)	
93-487		1/16 x .144 x 3/8 Steel Washer	
94-334		Gang Cond. Mtg. Bushing	
102-543		Insignia Label	
112-407		#6 x 3/8 R.H.S.T. Screw	
112-697		#6 x 7/16 Straight Side R.H.S.T. Screw	
114-67		#6-32 x 7/16 Hex Acorn Hd. M.S. (3 Used)	
114-217		#8 x 1/4 Hex Hd. Slotted S. T. Screw (2 Used)	
125-17		Rubber Grommet	
139-74		Spk. Baffle	
159-69		Trimount Stud (Cab. Back Mtg.)	
166-44		Rubber Bumper (or 166-41)	
199-103		Flexible Handle Sleeve (5D811)	
199-103Y		Flexible Handle Sleeve (5D811W-811Y)	
202-665		Instruction Book	
S13210		Strip & Rivet Assem. (Handle Strap)	
S14952		Front Plate & Spk. Baffle Assem.	
S14976	L-1	Wavemagnet Assem. (5D811-811Y)	
S14977	L-1	Wavemagnet Assem. (5D811W)	



TUBE, TRIMMER LOCATION, DIAL CABLE DRAWING AND DETAILED VIEW OF I. F. TRANSFORMERS.

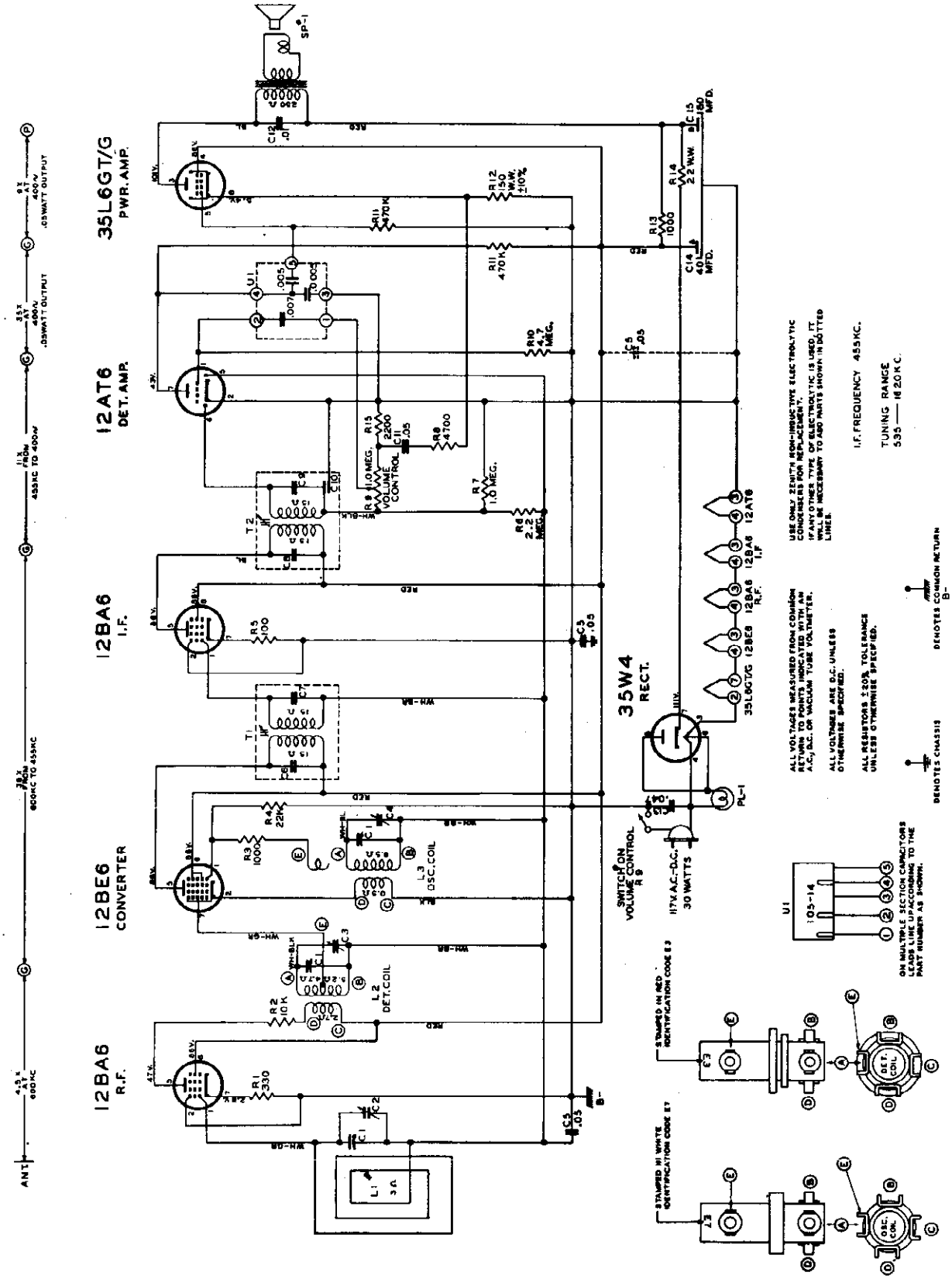
The I.F. transformers incorporated in this receiver are of the new permeability tuned type. The advantage of an I. F. transformer of this type is its extreme stability under various humidity and temperature conditions. The upper coil is the secondary and the lower the primary. When adjusting these I. F. transformers the tuning wrench 68-7 can be inserted into the top slug, rotated until maximum output is obtained and then dropped down to the lower slug and the same operation repeated. The tuning wrench is so designed that turning one slug does not affect the adjustment of the other.

ALIGNMENT PROCEDURE

OPERATION	CONNECT OSCILLATOR TO	DUMMY ANTENNA	INPUT SIG. FREQUENCY	SET DIAL AT	TRIMMERS	PURPOSE
1	Converter Grid	.5 Mfd.	455 Kc.	600 Kc.	Adjust Primary & Secondary Slugs	For I. F. Alignment
2	One Turn Loop Coupled Loosely to Wave Magnet	--	1600 Kc.	1600 Kc.	C-3	Set Oscillator to Dial Scale.
3		--	1400 Kc.	1400 Kc.	C-2	Align Antenna Stage

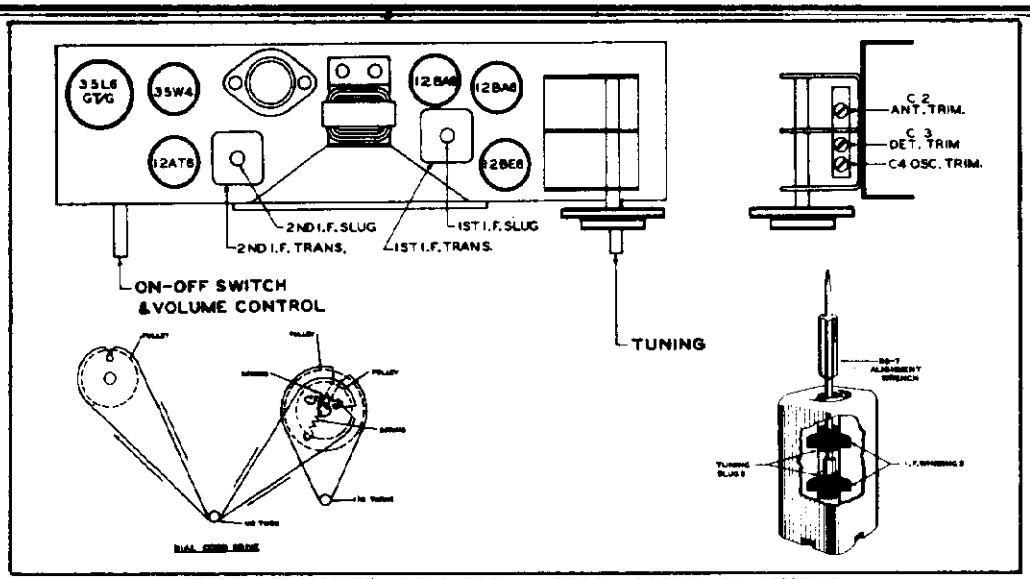
ZENITH RADIO CORP.

MODEL 6D815,
CHASSIS 6E05



PARTS LIST

PART NO.	REF. NO.	DESCRIPTION
		DIAL ASSEMBLY
26-411		Dial Scale
59-219		Dial Pointer
76-519		Tuning Shaft
78-622		Dial Light Socket and Wire
80-69		Dial Cord Tension Spring
80-209		Dial Cord Tension Spring
97-284		Dial Cord Guide Stud
100-67	PL-1	Dial Light Bulb - 6.3 VC .35 Amp.
188-32		Retaining Ring
188-60		Retaining Ring
S-14834		Dial Cord and Eyelet Assembly (Short)
S-14866		Dial Cord and Eyelet Assembly (Long)
S-14867		Pointer Pulley and Bushing Assembly
S-14868		Pointer Pulley Bracket and Stud Assembly
		COILS AND CHOKES
95-1101	T1	1st I. F. Transformer
95-1102	T2	2nd I. F. Transformer
S-14832	L2	Detector Coil Assembly
S-14833	L3	Oscillator Coil Assembly
		CONDENSERS
22-178	C-11	.05 MFD ..... 200 V
22-829	C-9	.05 MFD ..... 200 V
22-1182	C-12	.01 MFD ..... 400 V
22-1775	C-13	.047 MFD ..... 400 V
22-1805	C-1	Three Section Gang
22-1808	C-14, C-15	Dry Electrolytic 80 x 40 MFD 150 V
105-14	U-1	Multiple Capacitor Unit
		RESISTORS
63-686	R12	150 Ohm W.W. Insulated ..... 1/2 W
63-1219	R14	22 Ohm W.W. Insulated ..... 1/2 W
63-1574	R13	1M Ohm Insulated ..... 1 W
63-1664	R9	Vol. Con. and Switch
63-1744	R5	100 Ohm Insulated
63-1765	R1	330 Ohm Insulated ..... 1/2 W
63-1786	R3	1M Ohm Insulated ..... 1/2 W
63-1814	R8	4700 Ohm Insulated ..... 1/2 W
63-1826	R2	10M Ohm Insulated ..... 1/2 W
63-1842	R4	22M Ohm Insulated ..... 1/2 W
63-1858	R11	470M Ohm Insulated ..... 1/2 W
63-1912	R7	1 Megohm Insulated ..... 1/2 W
63-1926	R6	2.2 Megohm Insulated ..... 1/2 W
63-1940	R10	4.7 Megohm Insulated ..... 1/2 W
63-1800	R15	2200 Ohm Insulated ..... 1/2 W
		MISCELLANEOUS
11-85		Line Cord and Plug
14-1015		Model 815 Plastic Cabinet
14-1015W		Model 815W Plastic Cabinet
14-1015Y		Model 815Y Plastic Cabinet
43-165		Handle Housing
46-744		Tuning and Vol. Con. Knob (2 used)
46-744Y		Tuning and Vol. Con. Knob (2 used) (815W & 815Y)
49-643	SP1	5 1/4" P.M. Speaker
		206-643 Output Trans.
		206-643 Cone and Voice Coil
54-30		8-32 x 5/16 Hex Nut (Spk. Mtg.)
54-129		Speed Nut (Used on 26-411 and 57-1409)
57-1409		Cabinet Front Plate
78-275		Socket Electrolytic
78-611		Socket Octal Tube (8 Contact)
78-806		Socket Miniature Tube
78-807		Socket Miniature Tube (4 used)
83-1057		Line Cord Insulating Strip
83-1165		Handle Strap
83-1166		Handle Strap (Slotted)
83-1393		Handle Strip (Rubber)
93-766		Steel Washer
93-906		Block Felt Washer
93-941		Bakelite Washer
94-295		Gang Cond. Mtg. Bushing
112-607		#6 x 3/8 R.H.S.T. Screw (2 Used on 43-165)
112-697		#6 x 7/16 Straight Side R.H.S.T. Screw
114-217		#8 x 1/4 Hex Hd. Slotted S.T. Screw (Spk. Mtg.)
114-291		#8-32 x 7/16 Hex Hd. Slotted M.S. (Spk. Mtg.)
125-17		Rubber Grommet
139-71		Speaker Baffle
139-75		Baffle Board
159-69		Trimount Stud (Cab Back Mtg.) (4 used)
166-44		Rubber Bumper (for 166-41)
171-10		Pilot Light Lens
199-103		Flexible Handle Sleeve
199-103Y		Flexible Handle Sleeve (6D815W & 815Y)
202-666		Instruction Book
S-14888	L1	Wavemagnet Assembly
S-14918		Wavemagnet Assembly (6D815W only)



TUBE, TRIMMER LOCATION, DIAL CABLE DRAWING AND DETAILED VIEW OF I. F. TRANSFORMERS.

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ALIGNMENT PROCEDURE

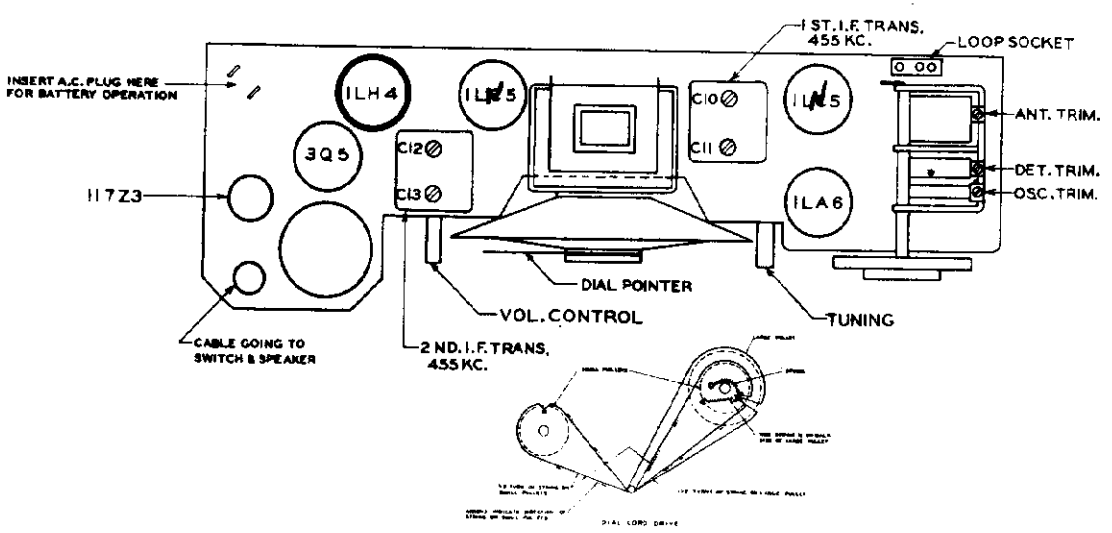
OPERATION	CONNECT OSCILLATOR TO	DUMMY ANTENNA	INPUT SIG. FREQUENCY	SET DIAL AT	TRIMMERS	PURPOSE
1	Convertor Grid	.5 Mfd.	455 Kc.	600 Kc.	Adjust Primary & Secondary Slugs	For I.F. Alignment
2	Single Turn Loosely Coupled to Wave Magnet	--	1600 Kc.	1600 Kc.	C-4	Set Oscillator to Dial Scale.
3		--	1400 Kc.	1400 Kc.	C-3	Detector Alignment
4		--	1400 Kc.	1400 Kc.	C-2	Antenna Alignment

The 6E40 chassis is an AC, DC or battery operated superheterodyne circuit with a stage of RF amplification. The chassis is isolated from the DC circuit, and all measurements must be made from a common negative point. The most convenient place to reach this negative point is the terminal strip to which C5 is connected. The DC resistance from chassis to any circuit must be almost infinite. If any circuit becomes grounded a hum will appear. Microphonic tubes will cause audio howl. Check 1LA6.

The wavemagnet is connected to the chassis with a two wire cable. If the R.F. becomes weak or dead, check the D.C. resistance of the wavemagnet and connecting cable. This D.C. resistance should be approximately 1.75 ohms. If it is open check the cable and wavemagnet.

IF Alignment: Remove the chassis from the cabinet and arrange the units so that the wavemagnet can be plugged in. All the connections and adjustments can be made from the top of the chassis. Connect a signal generator, through a .1 mfd. dummy antenna, to the lug on top of the center section of the gang condenser (converter grid) and condenser gang frame. Connect an output meter across the voice coil of the speaker (two lugs provided). Set the signal generator to 455 Kc. and adjust C10, C11, C12 and C13 for maximum indication on the output meter. Always keep the signal output from the generator just high enough to get an indication, otherwise excessive loading may result. Remove the signal generator leads from the gang.

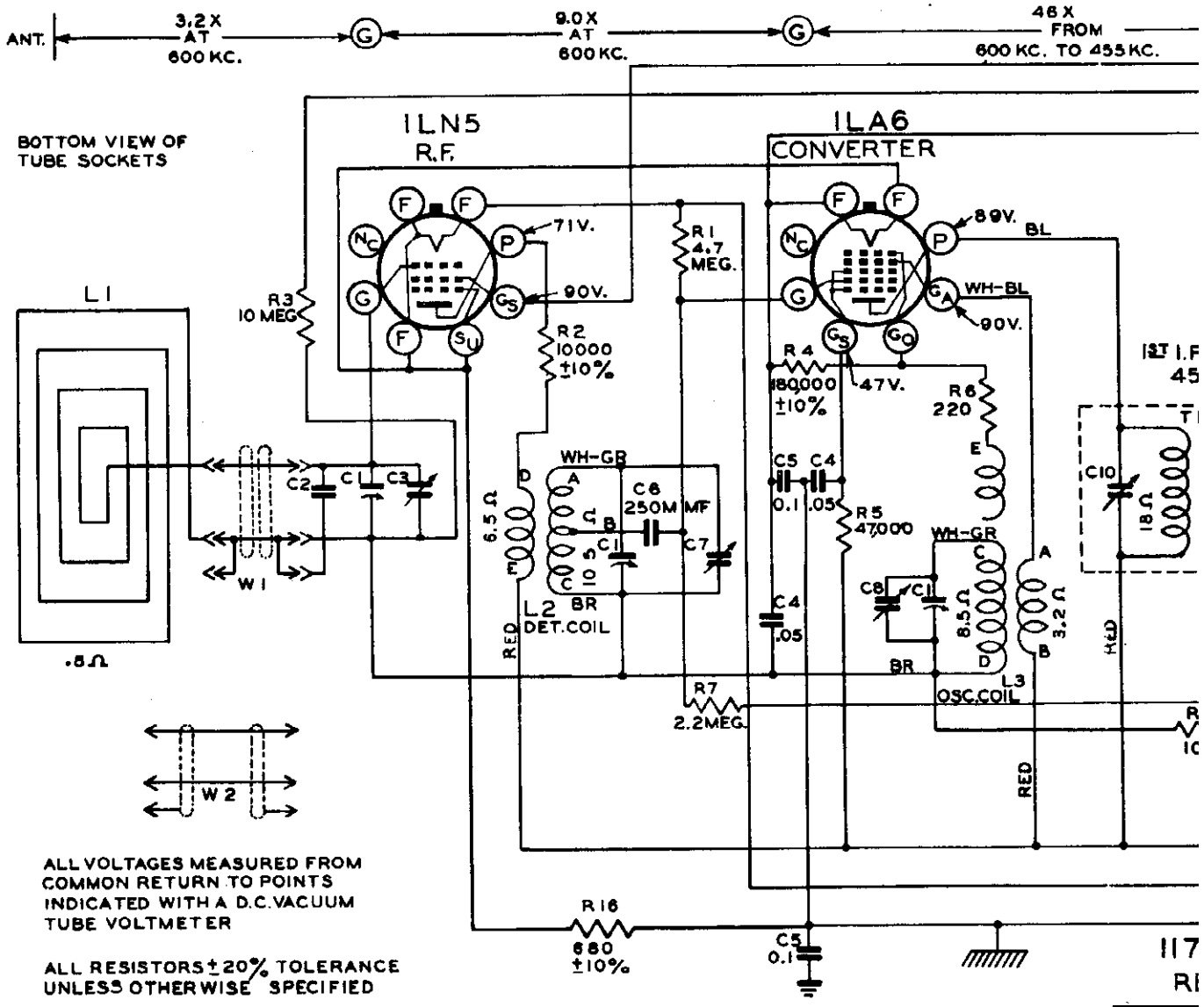
RF Alignment: Connect a two turn loop across the leads of the signal generator, loosely couple this loop to the wavemagnet. Set the signal generator and the dial pointer of the receiver to 1600 Kc. and adjust oscillator trimmer to resonance. Set the signal generator and dial pointer to 1400 and adjust detector trimmer and antenna trimmer to resonance. These trimmers are on the top of gang condenser. Check operation and re-install set in cabinet. Tune in a weak station near 1400 Kc. or use background noise and readjust antenna trimmer for maximum sensitivity.



TUBE, TRIMMER LOCATION AND DIAL CABLE DRAWING

ALIGNMENT PROCEDURE

OPERATION	CONNECT OSCILLATOR TO	DUMMY ANTENNA	INPUT SIG. FREQUENCY	BAND	SET DIAL TO	TRIMMERS	PURPOSE
1	Converter Grid	.1 Mfd	455 Kc.	BC	600 Kc.	C-10-11-12-13	I.F. Alignment
2	Two turns loosely coupled to Wavemagnet		1600 Kc.	BC	1600 Kc.	Osc. Trim.	Set Oscillator to scale
3	Two turns loosely coupled to Wavemagent		1400 Kc.	BC	1400 Kc.	Det. Trim.	Align Det.
4	Two turns loosely coupled to Wavemagnet		1400 Kc.	BC	1400 Kc.	Ant. Trim.	Align Wavemagnet



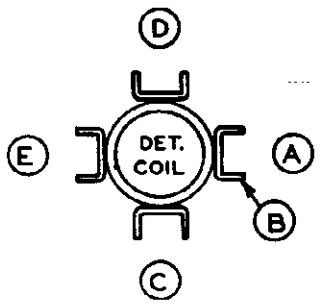
ALL VOLTAGES MEASURED FROM COMMON RETURN TO POINTS INDICATED WITH A D.C. VACUUM TUBE VOLTMETER

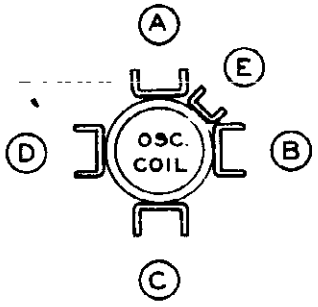
ALL RESISTORS ±20% TOLERANCE UNLESS OTHERWISE SPECIFIED

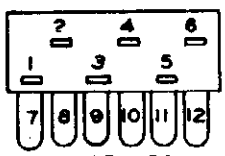
I.F. FREQUENCY 455KC.

TUNING RANGE 535-1620 KC.

BATTERY PACK NO. Z909

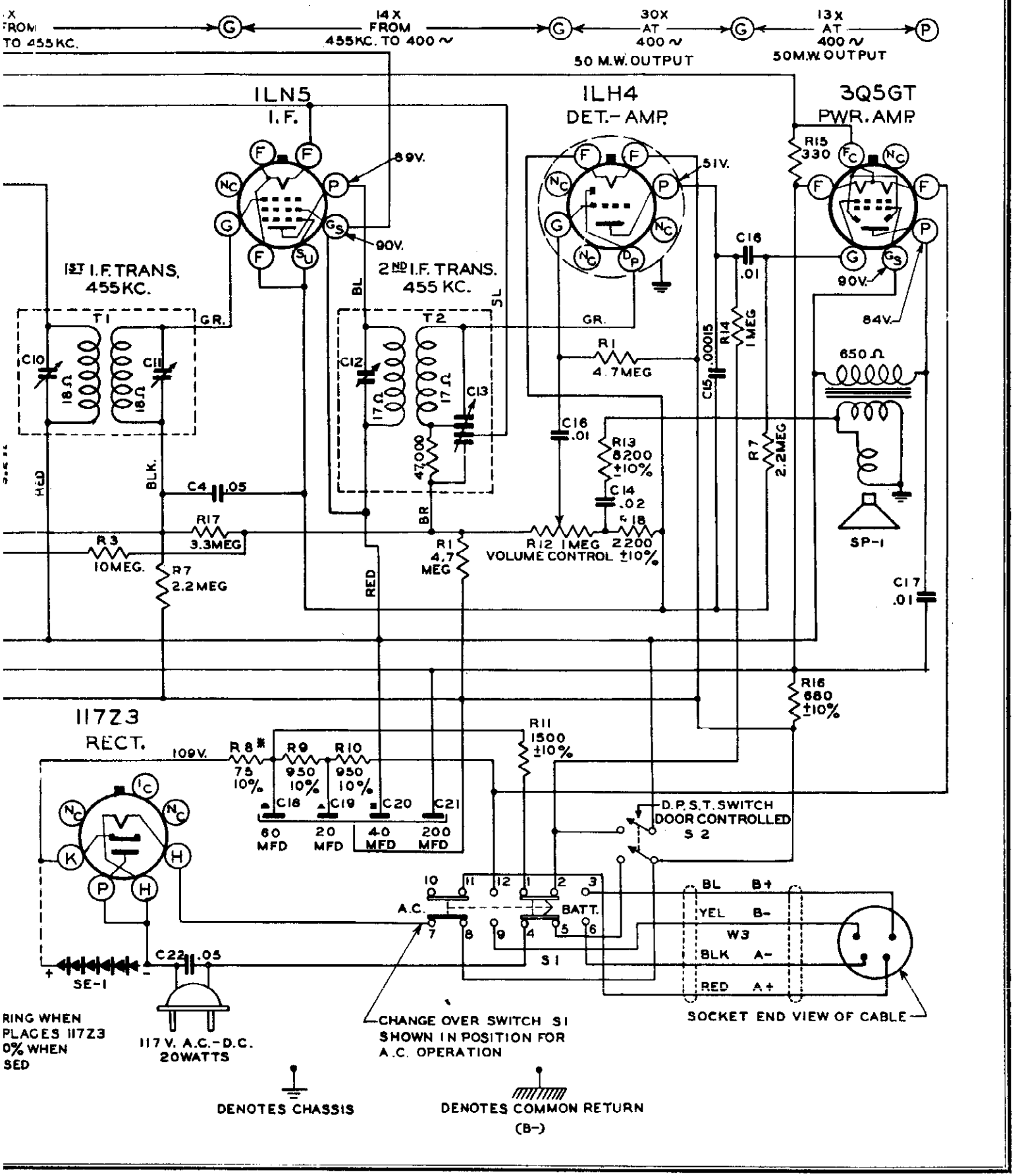






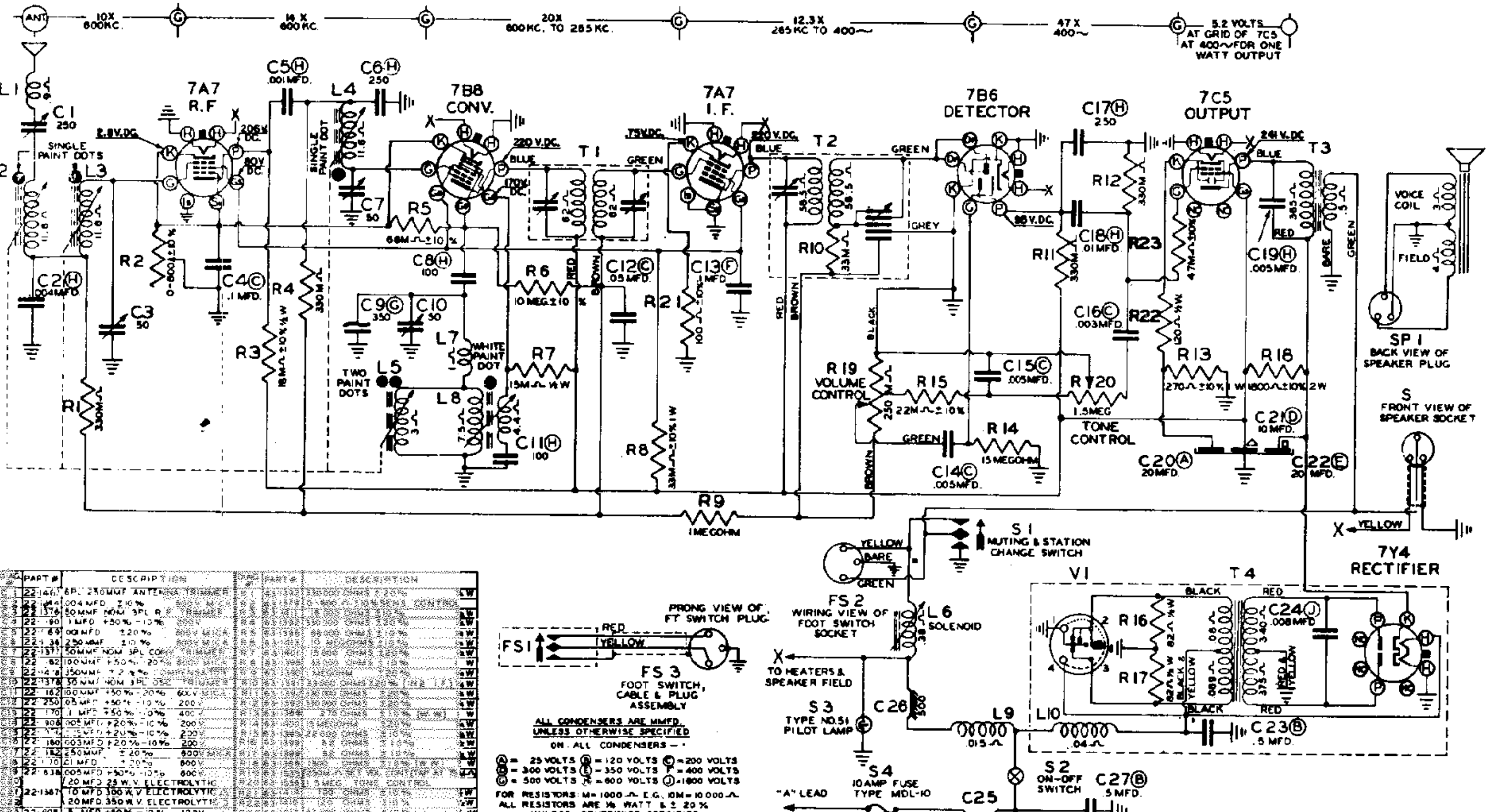
POSITION OF TERMINALS SWITCH S1

*NOTE: DOTTED LINES SHOW WIRING WHEN SELENIUM RECTIFIER REPLACES 117Z3 R8 BECOMES 140 OHMS ±10% WHEN SELENIUM RECTIFIER IS USED


X FROM TO 455 KC.
14 X FROM 455KC. TO 400 ~
30X AT 400 ~ 50 M.W. OUTPUT
13 X AT 400 ~ 50M.W. OUTPUT
1LN5 I.F.
1LH4 DET.-AMP.
3Q5GT PWR.AMP
89V.
90V.
51V.
84V.
1ST I.F. TRANS. 455KC.
2ND I.F. TRANS. 455 KC.
T1
T2
C10
C11
C12
C13
18Ω
17Ω
GR.
BL
SL
BLK.
RED
BR
C4 .05
R17 3.3MEG
R3 10MEG.
R7 2.2MEG
R1 4.7 MEG
4700Ω
R1 4.7MEG
C16 .01
R13 8200 ±10%
C14 .02
C18 2200
R12 1MEG VOLUME CONTROL ±10%
C15 .00015
R14 1MEG
R7 2.2MEG
C16 .01
650Ω
SP-1
C17 .01
R15 330
R16 680 ±10%
117Z3 RECT.
109V.
R8* 75 10%
R9 950 10%
R10 950 10%
R11 1500 ±10%
C18 60 MFD
C19 20 MFD
C20 40 MFD
C21 200 MFD
D.P.S.T. SWITCH DOOR CONTROLLED S 2
A.C.
BATT.
S1
BL B+
YEL B-
W3
BLK A-
RED A+
SE-1
C22 .05
SOCKET END VIEW OF CABLE
CHANGE OVER SWITCH S1 SHOWN IN POSITION FOR A.C. OPERATION
117 V. A.C.-D.C. 20WATTS
RING WHEN PLACES 117Z3
0% WHEN SED
DENOTES CHASSIS
DENOTES COMMON RETURN (B-)

PART NO.	REF. NO.	DESCRIPTION
		DIAL ASSEMBLY
26-399		Louver dial
54-262		Speed nut (4 used on 26-399)
76-500		Tuning Control Shaft
80-69		Dial Cord Tension Spring
80-209		Dial Cord Tension Spring
188-32		Retaining Ring (76-500)
188-75		Retaining Ring (S-13829)
S-13829		Dial Pointer & Pulley Assembly (59-201)
S-13830		Condenser Pulley & Bushing Assembly
S-13838		Pulley Mtg. Bracket & Stud Assembly
S-14407		Dial Cord & Eyelet Assembly (Long)
S-1440b		Dial Cord & Eyelet Assembly (Short)
		COILS AND CHOKES
95-1085	T1	1st I.F. Transformer
95-1086	T2	2nd I.F. Transformer
S-14385	L2	Detector Coil Assembly
S-14389	L3	Oscillator Coil Assembly
		CONDENSERS
22-182	C6	.00025 MFD. (or 22-1666) .500 V.
22-196	C16	.01 MFD .600 V.
22-327	C14	.02 MFD .200 V.
22-470	C15	150 MMFD. (or 22-1675) .500 V.
22-827	C5	.1 MFD .200 V.
22-829	C4	.05 MFD .200 V.
22-1017	C22	.05 MFD .400 V.
22-1182	C17	.01 MFD .400 V.
22-1726	C3,7,8	Single Section Trimmer (use with 22-1352)
22-1727	C1	Three Gang Variable (or 22-1352)
22-1741	C18,19, 20,21	Four Section Electrolytic 20-40-60 MFD.-150V. x 200 MFD. *10V
22-1763	C2	2.2 MMFD. Ceramic .500 V.
		RESISTORS
63-1362	R9,10	Two Section Candohm
63-1562	R8	75 ohm W. W. (Insulated) .2 W.
63-1642	R12	Volume Control
63-1758	R6	220 ohm . . .(Insulated) . ½ W.
63-1765	R15	330 ohm . . .(Insulated) . ½ W.
63-1778	R16	680 ohm . . .(Insulated) . ½ W.
63-1792	R11	1500 ohm. . .(Insulated) . ½ W.
63-1799	R18	2200 ohm. . .(Insulated) . ½ W.
63-1824	R13	8200 ohm. . .(Insulated) . ½ W.
63-1827	R2	10 K ohm. . .(Insulated) . ½ W.
63-1856	R5	47 K ohm. . .(Insulated) . ½ W.
63-1880	R4	180 K ohm . .(Insulated) . ½ W.
63-1912	R14	1 Megohm. . .(Insulated) . ½ W.
63-1926	R7	2.2 Megohm. .(Insulated) . ½ W.
63-1933	R17	3.3 Megohm. .(Insulated) . ½ W.
63-1940	R1	4.7 Megohm. .(Insulated) . ½ W.
63-1954	R3	10 Megohm . .(Insulated) . ½ W.
11-104		Line Cord & Plug - 7 ft
15-51		Plug Cap & Insulator
17-103		Battery Cable Clamp
24-458		Switch Cover
28-23		Cabinet Door (R.H.)
28-24		Cabinet Door (L.H.)
40-74		Door Hinge (4 used)
40-78		Cabinet Rear Cover Hinge (2 used on S-14412)
43-159		Handle End Piece (2 used)
46-731		Door Release Knob
46-732		Tuning & Volume Control Knob (2 used)
49-631	SP-1	P.M. Speaker (5¼")
		206-631 Output Transformer
		208-631 Cone & Voice Coil
52-475	W1	Wavemagnet Cable
52-476	W2	Wavemagnet Extension Cable
54-30		#8-32 x 5/16" Hex. Nut - Steel - N.P
54-139		#3/8 - 32 x 9/16" Palnut - Cad.
54-141		Tinnerman Speed Nut (used on 52-475)
54-211		Tinnerman Speed Nut (8 used on S-14417)
54-261		Spring Nut (used on 80-600)
54-263		Speed Nut (used on 80-603)
54-267		#6-32 x 5/16" Palnut Steel-N.P.
56-236		Hinge Pin (4 used) (2 on 28-23) (2 on 28-24)
57-1360		Chassis Front Plate
57-1384		Chassis Civer Plate
73-35		#8-32 x 3/16" Hex. Hd. Slotted Set Screw- Cup point
78-274		Socket- Electrolytic Capacitor
78-488		Socket - Loktal Tube
78-543		Socket - Battery Cable (4 Contact)
78-596		Socket - Loktal Tube (or 78-762) (8 Contact)
78-781		Socket - Miniature Tube
78-801		Socket - Octal Tube
78-802		Socket - Wavemagnet Plug (3 Contact)
80-597		Door Release Knob Spring
80-598		Door Catch Spring
80-599		Cover Catch Spring (2 used on S-14412)
80-600		Door Hinge Retaining Spring (2 used on S-14417)
80-601		Lock Lever Spring (Used on S-14424)
80-602		Latch Bar Spring (used on S-14424)
80-603		Wavemagnet Release Spring
80-626		Pressure Spring (2 used on S-14424)
80-629		Link Lever Spring
83-1482		Rubber Strip (Handle)
83-1487		Chassis Insulating Strip
83-1510		Gang Condenser Shield Strip (used with 22-1352)
83-1512		Rubber Strip (Handle)
83-1524		Wavemagnet Cable Spacer Strip
83-1525		Wavemagnet Cable Spacer Strip
83-1531		Cushion Strip
85-311	S1	Battery Change-Over Switch
85-426	S2	D.P.S.T. Switch
		MISCELLANEOUS
		MISCELLANEOUS--Continued
93-35		.032 x .144 x 3/8" Steel Washer - N.P
93-125		#6 Int. Shakeproof Lockwasher #1206
93-126		#8 Int. Shakeproof Lockwasher #1208
93-179		.031 x .140 x 5/16" Steel Washer - Cad. Pl.
93-282		Fibre Shoulder Washer
93-321		Fibre Washer (used on 52-475)
93-525		1/16" x .127 x 5/16" Fibre Washer
93-609		.015 x .134 x ¼" Steel Washer - N.P
93-721		Black Felt Washer (used on 80-603)
93-906		Black Felt Washer (used on 80-603)
93-911		Spring Washer (4 used)
93-912		.010 x 9/64" x 5/16" Steel Washer N.P.
93-913		.020 x .182 x 5/16" Steel Washer - Black Zinc Finish
94-295		Condenser Mounting Bushing
110-131		Grille Cloth
112-713		#4-40 x ¼" Rd. Phillips Hd. M.S. (Lockwasher attached)
112-714		#4 x ¼" Flat Hd. Self Tapping Screw (2 used)
114-26		#8 x ¼" Hex. Hd. Self Tapping Screw (6 used)
114-48		#6-32 x ¼" Hex. Acorn Hd. M.S. - Steel - N.P
114-50		#8-32 x ¼" Hex. Acorn Hd. M.S. - Steel - N.P
114-248		#6-20 x 5/16" Hex. Hd. Slotted Self Tapping Screw (8 used)
114-251		#10-32 x 5/8" Hex. Washer Hd. Slotted M. Screw (2 used)
114-291		#8-32 x 7/16" Hex. Hd. Slotted M.S. - Steel - N.P
114-298		#6-32 x 3/8" Hex. Hd. Slotted M.S. (Lockwasher attached) (4 used)
125-17		Rubber Grommet (3 used)
125-26		Rubber Grommet (4 used)
125-39		Rubber Grommet (2 used)
126-572		Wavemagnet Shield (used on S-14563)
126-573		Tube Shield
139-72		Speaker Baffle
159-49		Snap Button
159-57		Snap Button (2 used on S-14563)
197-18		Rubber Suction Cup (used on S-14563)
197-22		Rubber Suction Cup (used on S-14563)
199-83		Flexible Handle Sleeve
202-589		Instruction Book
212-3	SE-1	Selenium Rectifier
S-14412		Cabinet Frame Assembly
S-14414		Cabinet Door Latch, Release Knob & Spring Assembly
S-14416		Switch Mounting Bracket & Lever Assembly
S-14417		Cabinet Front Cover Assembly
S-14420		Cabinet Rear Cover & Rivet Assembly
S-14421		Handle Strap Assembly
S-14422		Wavemagnet Assembly
S-14424		Cover Strip & Latch Bar Assembly
S-14563		Wavemagnet Shield Assembly

ZENITH RADIO CORP.



SYM	PART #	DESCRIPTION	SYM	PART #	DESCRIPTION	
C1	22-1461	6PL 250MMF ANTENNA TRIMMER	R1	[illegible]	330,000 OHMS ±20%	[illegible]
C2	22-1444	.004 MFD ±10% 600V MICA	R2	[illegible]	[illegible] CONTROL	
C3	22-1376	50MMF NOM 3PL R.F. TRIMMER	R3	[illegible]	[illegible]	[illegible]
C4	22-190	.1 MFD +50% −10% 200V	R4	[illegible]	330,000 OHMS ±20%	[illegible]
C5	22-169	.001 MFD ±20% 600V MICA	R5	[illegible]	[illegible]	[illegible]
C6	22-136	250 MMF ±10% 600V MICA	R6	[illegible]	10 MEGOHMS ±10%	[illegible]
C7	22-1377	50MMF NOM 3PL CONV. TRIMMER	R7	[illegible]	15,000 OHMS ±20%	[illegible]
C8	22-182	100MMF +50% −20% 600V MICA	R8	[illegible]	[illegible]	W
C9	22-1418	350MMF ±2½% [illegible]	R9	[illegible]	1 MEGOHM ±20%	[illegible]
C10	22-1378	50 MMF NOM 3PL OSC. TRIMMER	R10	[illegible]	[illegible]	[illegible]
C11	22-162	100 MMF +50% −20% 600V MICA	R11	[illegible]	330,000 OHMS ±20%	[illegible]
C12	22-250	.05 MFD +50% −10% 200V	R12	[illegible]	330,000 OHMS ±20%	[illegible]
C13	22-170	.1 MFD +50% −10% 400V	R13	[illegible]	270 OHMS ±10%	W
C14	22-906	.005 MFD +20% −10% 200V	R14	[illegible]	15 MEGOHMS ±20%	[illegible]
C15	22-[illegible]	.005 MFD +20% −10% 200V	R15	[illegible]	22,000 OHMS ±10%	[illegible]
C16	22-180	.003 MFD +20% −10% 200V	R16	[illegible]	82 OHMS ±10%	[illegible]
C17	22-182	250 MMF ±20% 600V MICA	R17	[illegible]	82 OHMS ±10%	[illegible]
C18	22-170	.01 MFD ±20% 600V	R18	[illegible]	1800 OHMS ±10%	W
C19	22-838	.005 MFD +50% −10% 600V	R19	[illegible]	[illegible] VOL. CONTROL [illegible]	[illegible]
C20	22-1387	20 MFD 25 W.V. ELECTROLYTIC	R20	[illegible]	1.5 MEG. TONE CONTROL	
C21		10 MFD 300 W.V. ELECTROLYTIC	R21	[illegible]	100 OHMS ±10%	[illegible]
C22		20 MFD 350 W.V. ELECTROLYTIC	R22	[illegible]	120 OHMS ±10%	[illegible]
C23	22-908	.5 MFD +50% −10% 120V	R23	[illegible]	47,000 OHMS ±10%	[illegible]
C24	22-1446	.008 MFD +20% −10% 1600V				
C25	21-87	500MMF SPARK PLATE				
C26	21-87	500MMF SPARK PLATE	T1	[illegible]	FIRST I.F. TRANSFORMER	
C27	22-908	.5 MFD +50% −10% 120V	T2	[illegible]	2ND I.F. TRANSFORMER	
			T3	[illegible]	OUTPUT TRANSFORMER	
			T4	[illegible]	VIBRATOR POWER TRANSFORMER	
L1	S-8819	ANTENNA MOTOR NOISE CHOKE				
L2	S-12080	ANT. TUNING COIL (TUNING UNIT)				
L3	COLOR	R.F. TUNING COIL (TUNING UNIT)	FS1	S-11140	FOOT SWITCH & PLATE ASSEMBLY	
L4	OF DOT	CONV. TUNING COIL (TUNING UNIT)	FS2	78-646	FOOT SWITCH CONTROL SOCKET	
L5	S-12053	OSC. TUNING COIL (TUNING UNIT)	FS3	S-13246	FOOT CONTROL SWITCH, CABLE (& PLUG ASSEMBLY	
L6	S-0829	SOLENOID (PART OF TUNING UNIT)				
L7	S-11229	OSC. SERIES COIL				
L8	S-11231	OSC. SHUNT COIL	S1	S-11272	HAND SELECTOR & MUTING SWITCH	
L9	S-11232	MOTOR NOISE CHOKE	S2	85-838	ON-OFF SWITCH	
L10	20-213	HASH CHOKE	S3	100-32	TYPE NO.51 PILOT LAMP	
			S4	136-14	10AMP. FUSE TYPE MDL-10	
SP1	49-584	SPEAKER & PLUG				
S	52-279	SPEAKER CABLE & SOCKET				
			V1	190-20	VIBRATOR (NONSYNCHRONOUS)	

ALL CONDENSERS ARE MMFD. UNLESS OTHERWISE SPECIFIED

ON ALL CONDENSERS —

Ⓐ = 25 VOLTS Ⓑ = 120 VOLTS Ⓒ = 200 VOLTS
Ⓓ = 300 VOLTS Ⓔ = 350 VOLTS Ⓕ = 400 VOLTS
Ⓖ = 500 VOLTS Ⓗ = 600 VOLTS Ⓙ = 1600 VOLTS

FOR RESISTORS: M = 1000 Ω E.G. 10M = 10,000 Ω.
ALL RESISTORS ARE ½ WATT & ± 20% UNLESS OTHERWISE SPECIFIED

⏚ = DESIGNATES CHASSIS GROUND

ALL TUBE SOCKETS ARE BOTTOM VIEWS

STAGE GAINS

TAKEN AT ANT. SOCKET AT R.F. GRID AT 600KC & TAKEN AT CONV GRID AT 265KC.

DUMMY ANTENNA

MMFD SERIES & MMFD SHUNT AT ANT. SOCKET & 0.1 MFD. SERIES TO CONVERTER GRID

BATTERY CONDITIONS

6.3 VOLTS AT STORAGE BATTERY TERMINALS WITH POSITIVE GROUNDED

TEST CONDITIONS

VOL CONTROL SET AT "MAX" TONE CONTROL SET ON "HIGH", WITH NO INCOMING SIGNAL

VOLTAGES READ FROM POINT SHOWN TO CHASSIS WITH 1000 OHM PER VOLT METER

I. F. 265 KC.
TUNING RANGE 540KC. TO 1600 KC.

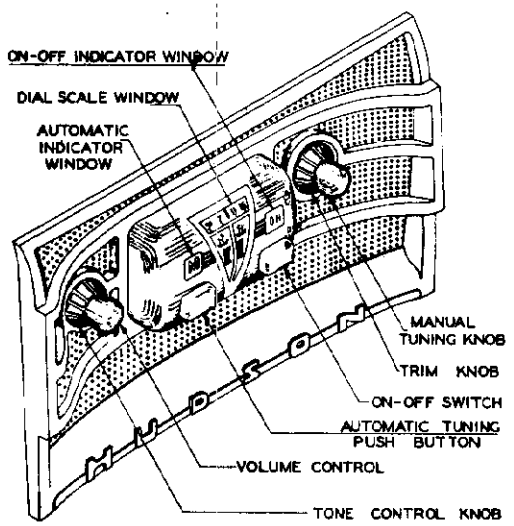
Automatic Tuning

There are five automatic tuning positions which may be adjusted to five desired stations. If these positions have not been previously adjusted proceed as follows:

1. Press the automatic tuning push button (on the left side) until Number 1 appears in the automatic indicator window.
2. Pull the manual tuning knob OUTWARD to engage the automatic mechanism.
3. Select the station desired and tune to its frequency by turning the tuning knob. Tune very carefully for clearest reception.

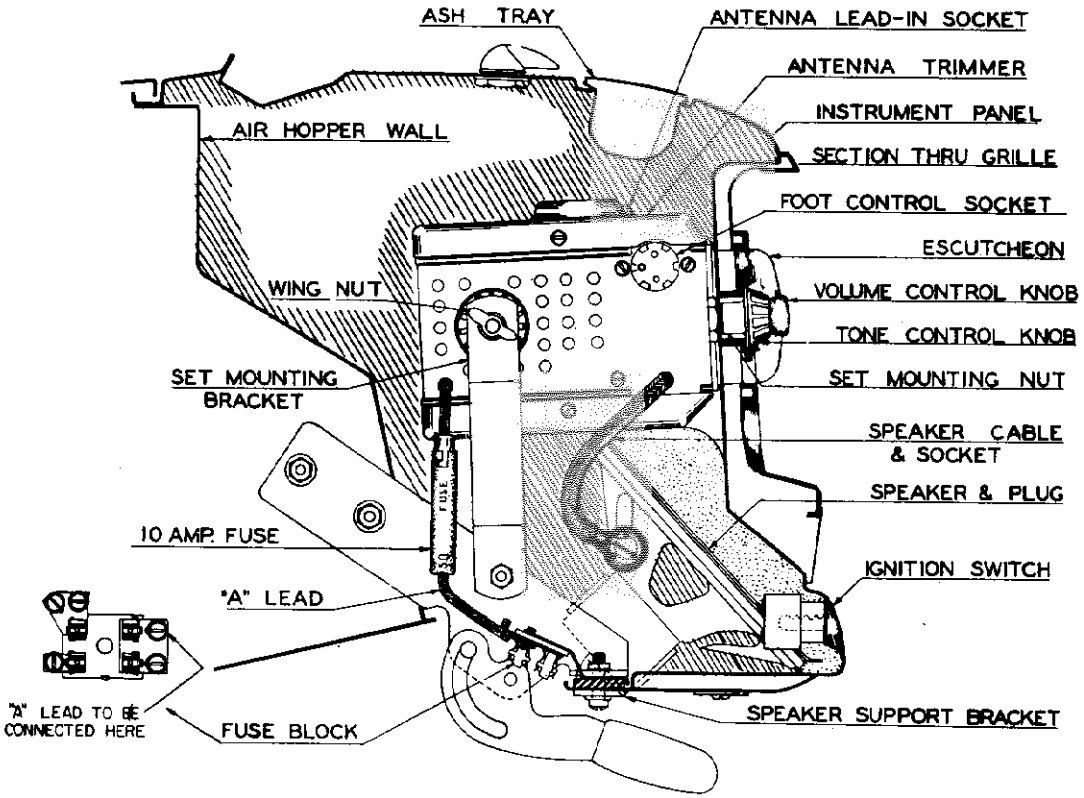
   CAUTION: DO NOT ATTEMPT TO FORCE THE KNOB IN. The knob will automatically return to the "IN" position when the automatic tuning push button or the foot switch is operated.
4. Press the automatic tuning push button, pull manual tuning knob outward, and tune in station desired for No. 2 position. Use the same procedure for positions No. 3, 4 and 5.

When the five automatic positions have been adjusted to the five desired stations as instructed, it is only necessary to press the AUTOMATIC button to return to MANUAL tuning, or to any one of the stations selected on the Automatic.

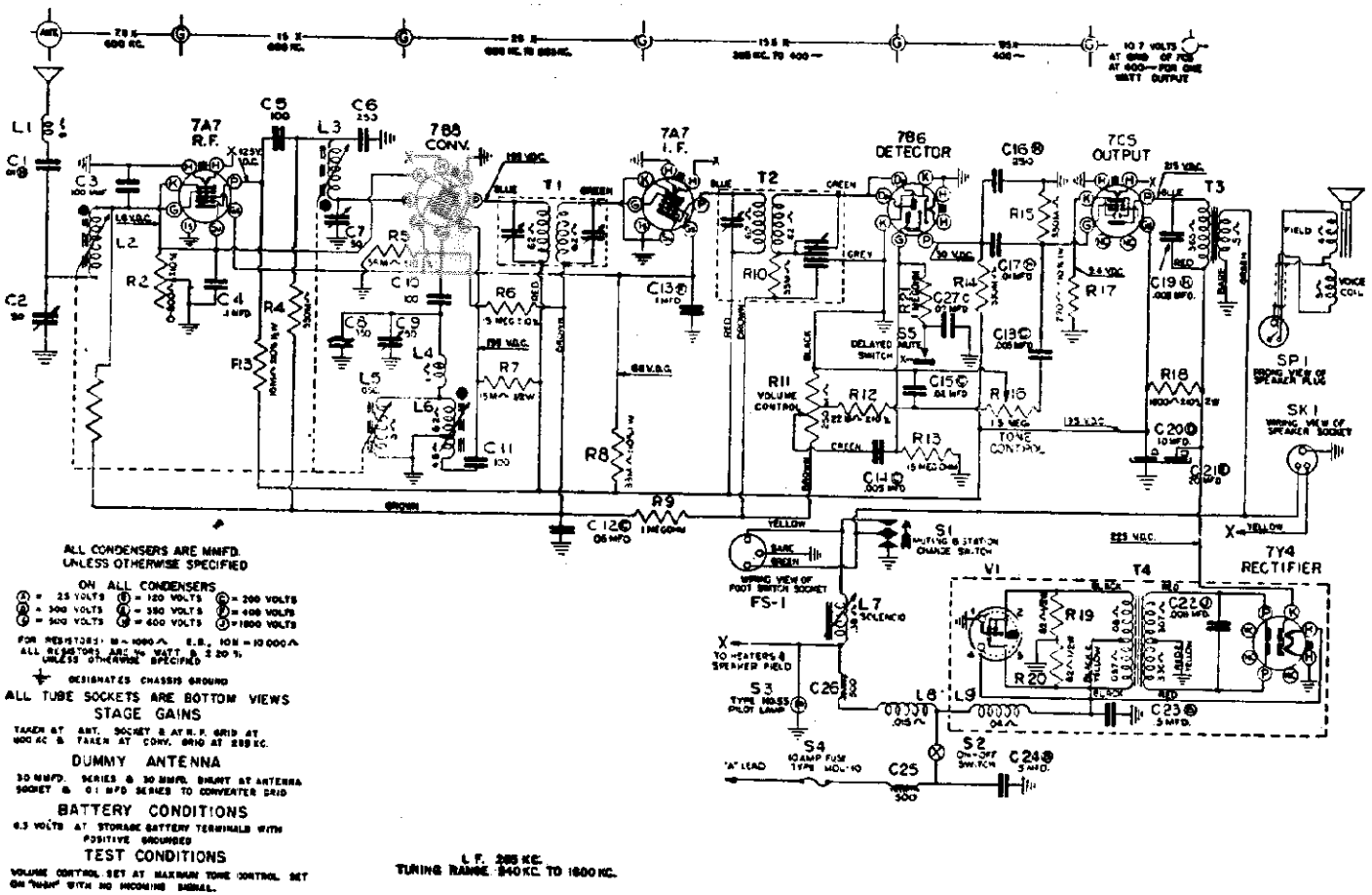


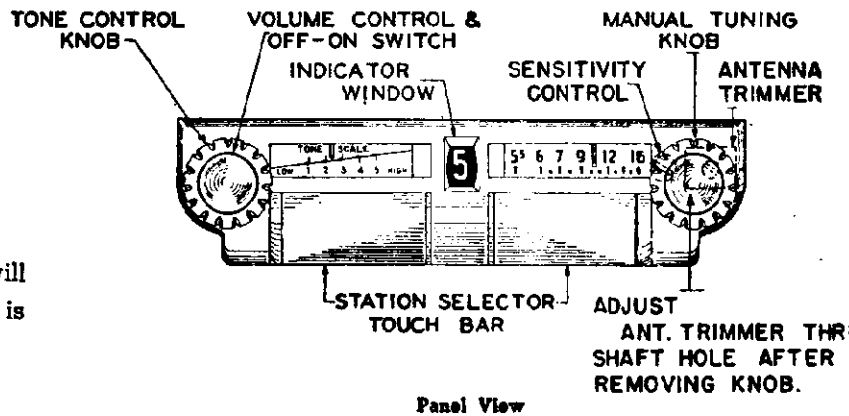
Operating Controls.

INSTALLATION INSTRUCTIONS



Mounting Details and Connections





Panel View

CAUTION: Do not attempt to force the tuning knob in. The knob will return to the "in" position when the station selector touch bar is depressed.

Setting The Adjust-O-Matic Tuning

Pressing the station selector touch-bar six times will cause the tuning mechanism to change through a cycle of six positions. Five of these Adjust-O-Matic positions, at which numbers appear in the station indicator window, may be set for five favorite local stations while the sixth position, at which the letter M appears in the station indicator window, may be used for selecting stations manually.

The five positions, at which numbers appear in the station indicator window, may be adjusted in succession to any desired dial settings. However, in order to simplify the identification of the stations, it is advisable to set the Adjust-O-Matic mechanism in sequence according to frequencies of the stations, beginning with the station broadcasting on the lowest frequency, and progressing to the station broadcasting on the highest frequency.

Turn the receiver on and allow it to operate for at least fifteen minutes in order for each part to reach normal operating temperature before making the following Adjust-O-Matic settings:

1—Press the station selector touch bar repeatedly until No. 1 appears in the station indicator window.

2—Pull the manual tuning knob outward engaging the Adjust-O-Matic mechanism with the dial. (Fig. 1.)

3—Select the station desired and tune it in by turning the tuning knob in the same manner as when tuning the radio manually. Tune very carefully for clearest reception.

CAUTION: Do not attempt to force the tuning knob in. The knob will return to the "in" position when the station selector touch bar is again depressed.

4—Press the station selector touch bar, pull the manual tuning knob outward, and tune in the station desired for No. 2 position. Use the same procedure for adjusting positions Nos. 3, 4, and 5.

When the five positions have been adjusted to the five desired stations, it is only necessary to press the station selector touch bar to return to manual tuning or to any one of the stations on the Adjust-O-Matic.

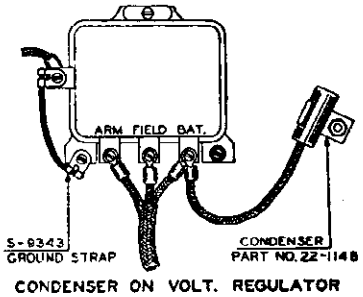
NOTE: When the letter M appears in the station indicator window, the manual tuning knob must be pulled outward and turned in order to select stations manually.

Interference Elimination

Important

Use the utmost care in the following operations to insure freedom from interference. Clean away paint and dirt to make good contacts between condensers and the car. Tighten all bolts and nuts securely.

1—Install a condenser, Part No. 22-1148, and a ground strap, Part No. S-9343, on the voltage regulator (Fig. 4.)



CONDENSER ON VOLT. REGULATOR

Fig. 4

2—Mount a condenser, Part No. 22-1326, on the ignition coil and connect the lead to the battery terminal (Fig. 5.)

3—Cut the high tension wire, that runs from the ignition coil to the distributor, three quarters of an inch from the point where it enters the soft rubber high tension wire housing. Shorten the wire one inch. Remove the wire from the coil, and screw the suppressor into the wire ends (Fig. 6). Replace the wire in the coil.

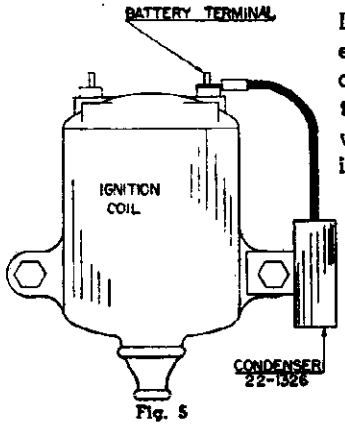


Fig. 5

If ignition interference is still present, check to make sure that the inside center windshield trim strip is grounded to the car body, and does not touch the antenna roof tube nut. Be certain the antenna wing nut and all the instrument panel bolts are tight.

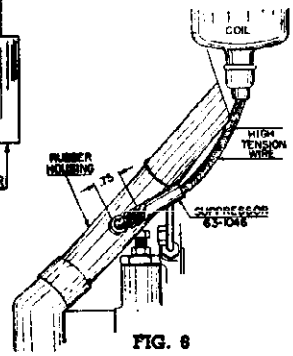


FIG. 6

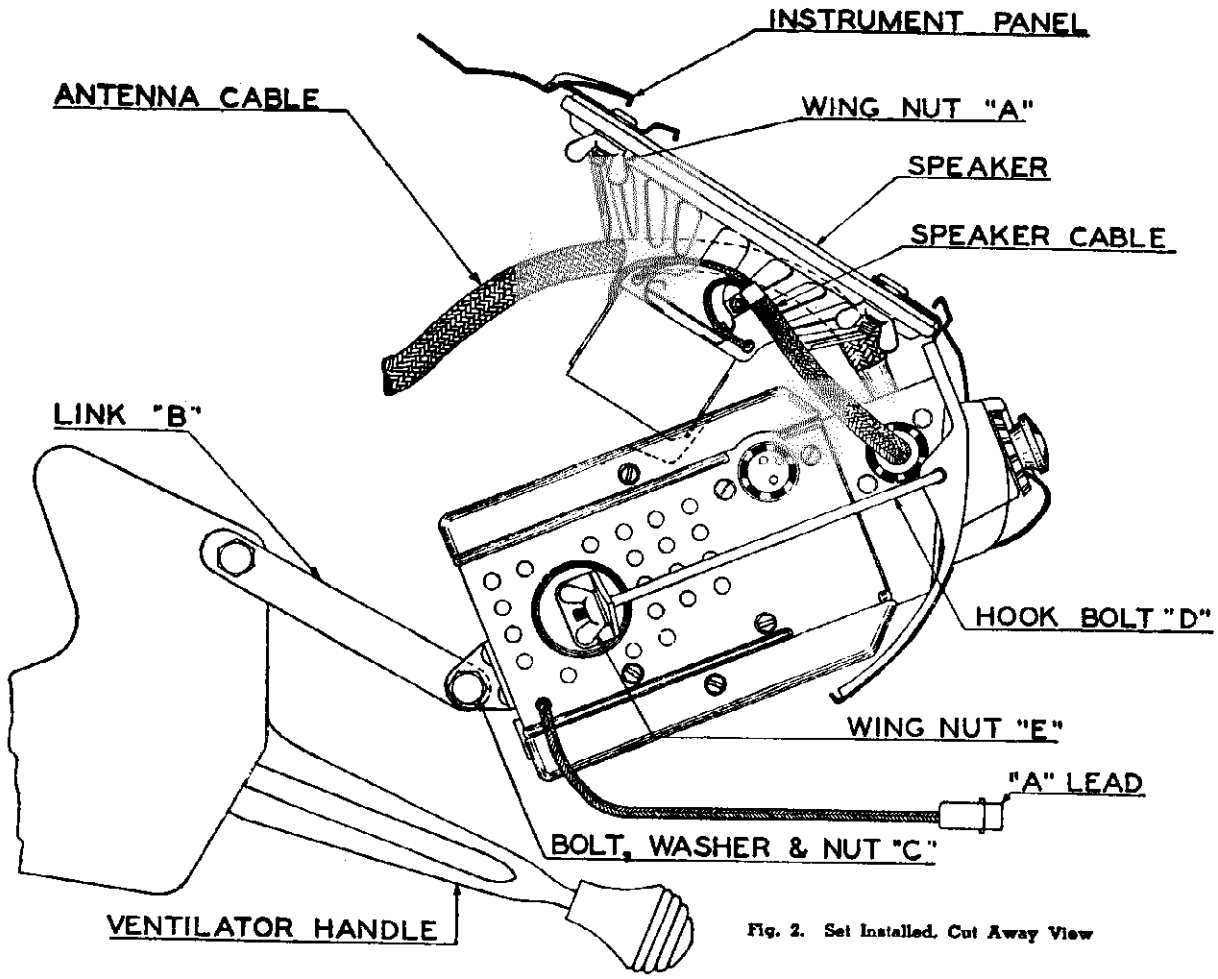


Fig. 2. Set Installed. Cut Away View

1—Install the antenna and antenna cable. Complete installation instructions are packed with each antenna kit.

2—Remove the radio opening cover plate from the instrument panel.

3—Place the speaker over the studs on the rear of the instrument panel, with the cable to the left. Fasten securely with the four wing nuts No. 54-189, furnished in the installation kit.

4—Start the wing nuts "E" on the hook bolts "D" (Fig. 2). Place the receiver in position. Slip the end of the hook bolts through the receiver brackets with the hooks turned toward the center. Hook the bolts in the holes provided on the instrument panel. Tighten the wing nuts sufficiently to hold the receiver in place while the supporting link "B" is connected between the rear hanger bracket of the receiver and the ventilator bracket of the car, with bolts, lock-washers and nuts ("C." Fig. 2.)

5—Tighten all nuts and bolts to hold the receiver firmly in place.

6—Connect "A" lead to circuit breaker. (Fig. 3.)

7—Connect the speaker cable and antenna lead to the receiver.

8—IMPORTANT: Turn the receiver on and allow it to operate for approximately fifteen minutes in order for each part to reach normal operating temperature. Tune in a weak station near 1200 Kc. With a small screwdriver adjust the antenna trimmer (Fig. 1), for maximum volume.

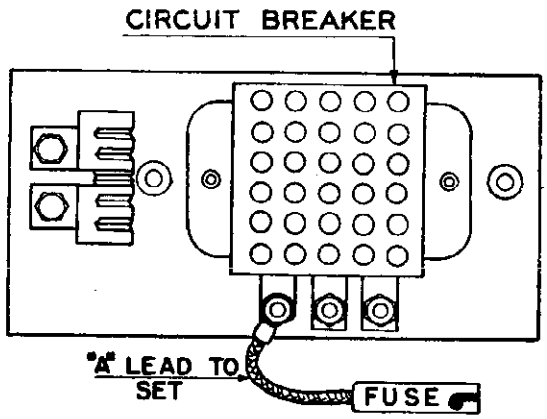
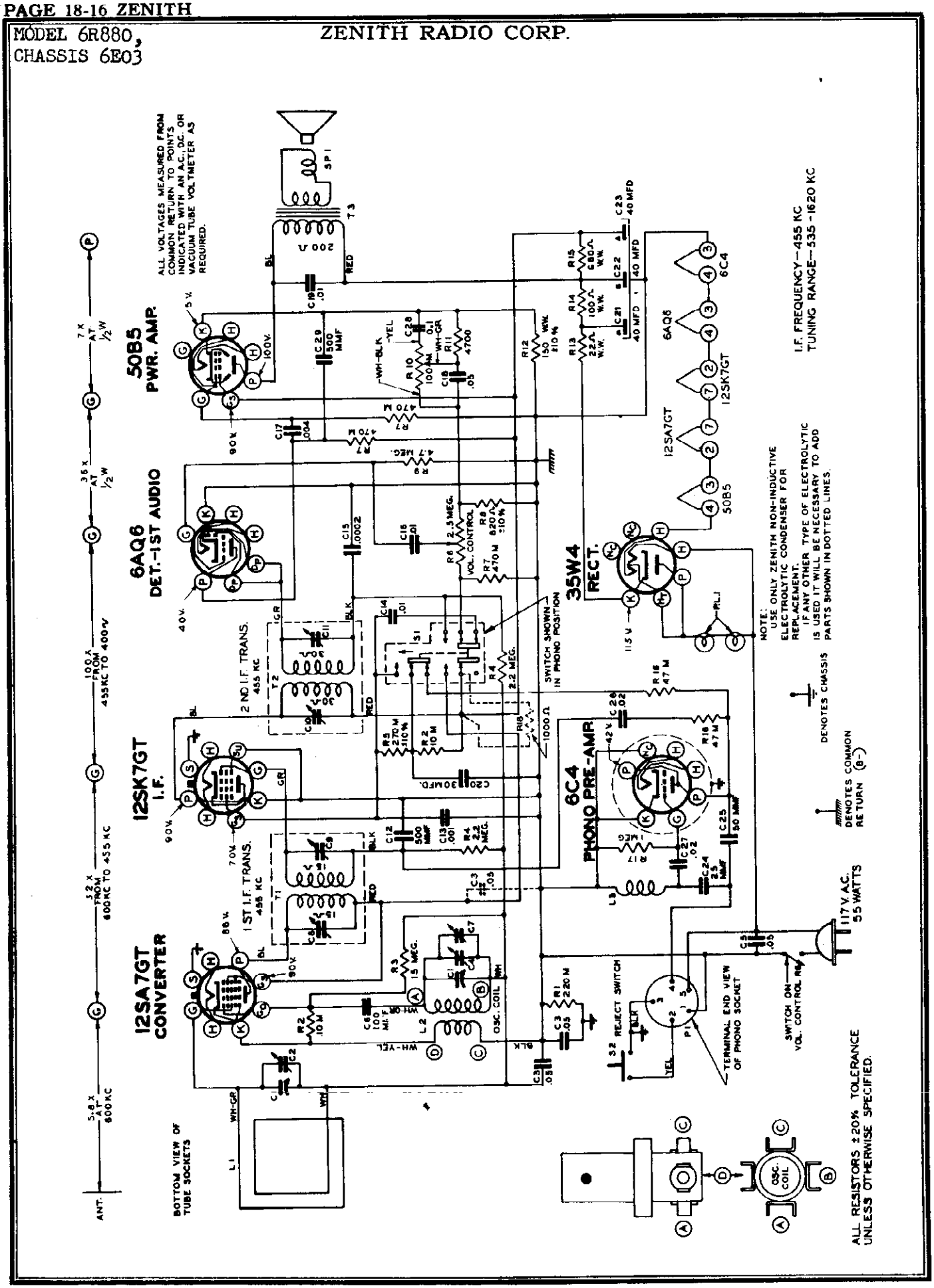
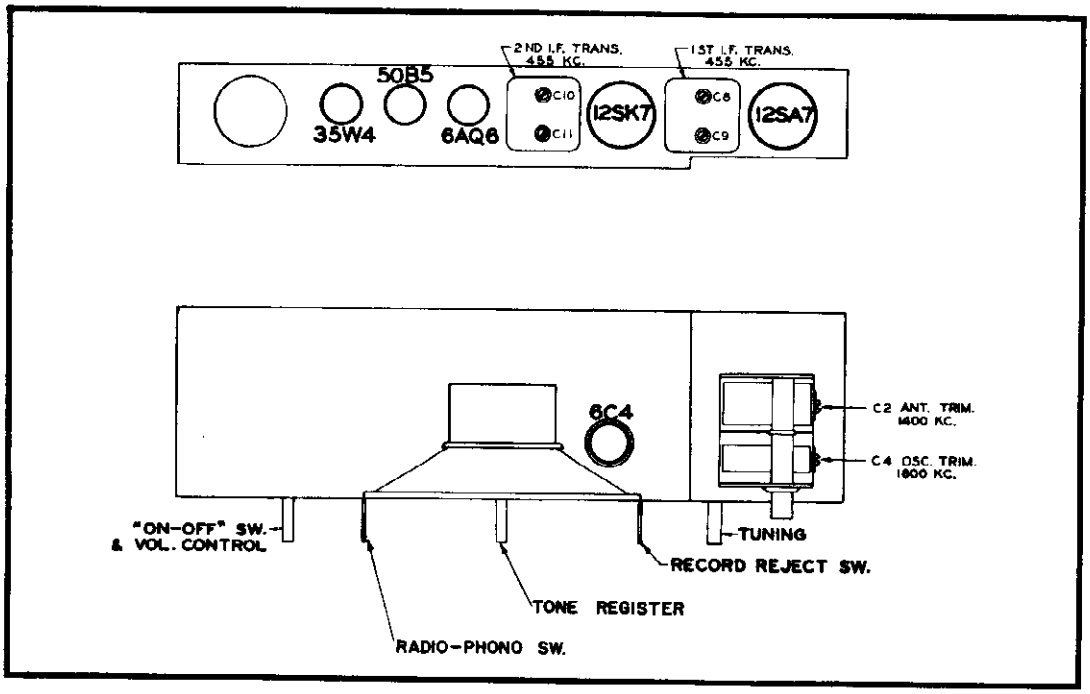


Fig. 3

MODEL 6R880,
CHASSIS 6E03

ZENITH RADIO CORP.





TUBE AND TRIMMER LOCATION

The alignment of chassis 6E03 is conventional, however the adjustments interlock to some degree, therefore, the procedure must be followed exactly. Since this chassis is of the AC/DC type, care must be exercised when making measurements. Chassis 6E03 has a phono-radio push button switch of the double acting type. When in the "In" position this connects the radio for playing records. Socket P1 is used to connect the changer to the receiver chassis.

ALIGNMENT PROCEDURE

OPERATION	CONNECT OSCILLATOR TO	DUMMY ANTENNA	INPUT SIG. FREQUENCY	SET DIAL AT	TRIMMERS	PURPOSE
1	Converter Grid	.5 MFD	455 Kc.	600 Kc.	C8, C9, C10, C11	Align I.F.
2	Single Turn Loop Loosely Coupled to Wavemagnet	-------	1600 Kc.	1600 Kc.	C4	Set Oscillator to Dial Scale.
3		-------	1400 Kc.	1400 Kc.	C2	Align Antenna.

PARTS LIST

MISCELLANEOUS

2-135		Cabinet Back
2-136		Cabinet Back (6R880GO only)
11-104		Line Cord Plug - 7 ft.
12-1468		Tone Control Mounting Bracket
12-1486		Shield Support Bracket
19-123		Record Changer Mounting Clip (4 used)
46-687		Tuning & Volume Control Knob
46-688		Tone Control Knob
46-689		Phono Switch Knob
49-602	SP-1	P. M. Speaker (5 1/4")
		208-602 Cone & Voice Coil
54-30		#8-32 X 5/16" Hex Nut Steel N.P. (2 used)
54-139		#3/8 - 32 X 9/16" Palnut Type 9N -Steel Cad. (2 used)
54-143		Speed Nut
54-228		Speed Nut (Used on 26-387)
54-267		#6-32 X 5/16" Hex Palnut - Inverted Type (4 used)
57-1105		Wavemagnet Lead Spacer Strip
57-1398		Dial Escutcheon
57-1402		Chassis Cover Plate
70-117		#6 X 5/16" Phillips Rd. Hd. Wood Screw-Steel - Statuary Bronze (7 used)
70-128		#5 X 3/8" Washer Hd. Wood Screw-Steel-Statuary Bronze (6 used) (Cabinet Back Mtg.)
72-74		#4 X 3/8" Phillips Flat Hd Wood Screw-Steel Brass Plate (Escutcheon Mtg.)
78-274		Socket - Electrolytic Capacitor
78-436		Socket - Miniature Tube
78-792	P-1	Socket - Phono (5 contact)
78-793		Socket - Octal Tube (2 used)
78-794		Socket Miniature Tube (7 contact)
78-795		Socket - Miniature Tube (7 contact) (2 used)
80-407		Record Changer Mounting Spring (4 used)
84-70		Tone Arm Support
85-421	S-1	Phono - Radio Switch (or 85-438)
85-422	S-2	Reject Switch
93-125		#6 Int. Shakeproof Lockwasher (4 used)
93-126		#8 Int. Shakeproof Lockwasher (2 used)
93-721		Felt Washer (2 used)
94-295		Capacitor Mounting Bushing (5 used)
95-1025	T-3	Output Transformer
110-129		Grille Cloth
112-544		Record Changer Mounting Screw (4 used)
112-721		#6 X 7/16" Straight Binding Hd. Wood Screw Steel Statuary Bronze (8 used)
114-58		#6-32 X 3/8" Hex Acorn Hd. M.S. Steel N.P. (2 used)
114-67		#6-32 x 7/16" Hex Acorn Hd. M. S. Steel N.P. (3 used)
114-128		#10 X 1 1/16" Hex Washer Hd. Self Tapping Screw
114-217		#8 X 1/4" Hex Hd. Slotted Self Tapping Screw-Cad (9 used)
114-291		#8-32 X 7/16" Hex Hd. Slotted M. Screw - Steel N.P.
125-17		Rubber Grommet (5 used)
125-66		Rubber Grommet (2 used)
139-71		Speaker Baffle
166-44		Rubber Bumper (or 166-41)
202-662		Instruction Book (Phono & Chassis)
S-14958	L-1	Wavemagnet Assembly - Type 26 FR
S-14007		Non-Intermixer Record Changer
S-14657		Hinge Assembly

DIAL ASSEMBLY

12-1383		Dial Light Bracket (2 used)
26-387		Dial Scale
76-492		Tuning Control Shaft
78-769		Dual Dial Light Socket & Wire
80-69		Dial Cord Tension Spring
80-209		Dial Cord Tension Spring
97-284		Dial Cord Guide Stud
100-90	PL-1	Dial Light Bulb (2 used)
188-32		Retaining Ring
188-34		Retaining Ring
S-13827		Dial Cord Assembly (Short)
S-13828		Dial Cord Assembly (Long)
S-13830		Tuning Pulley & Bushing Assembly
S-14667		Dial Pointer & Pulley Assembly (59-214)

COIL & CHOKES

95-906	T-2	2nd I. F. Transformer
95-919	T-1	1st I. F. Transformer
S-12603	L-3	Phono Oscillator Coil Assembly (FM-Phono)
S-13799	L-2	Oscillator Coil Assembly

CONDENSERS

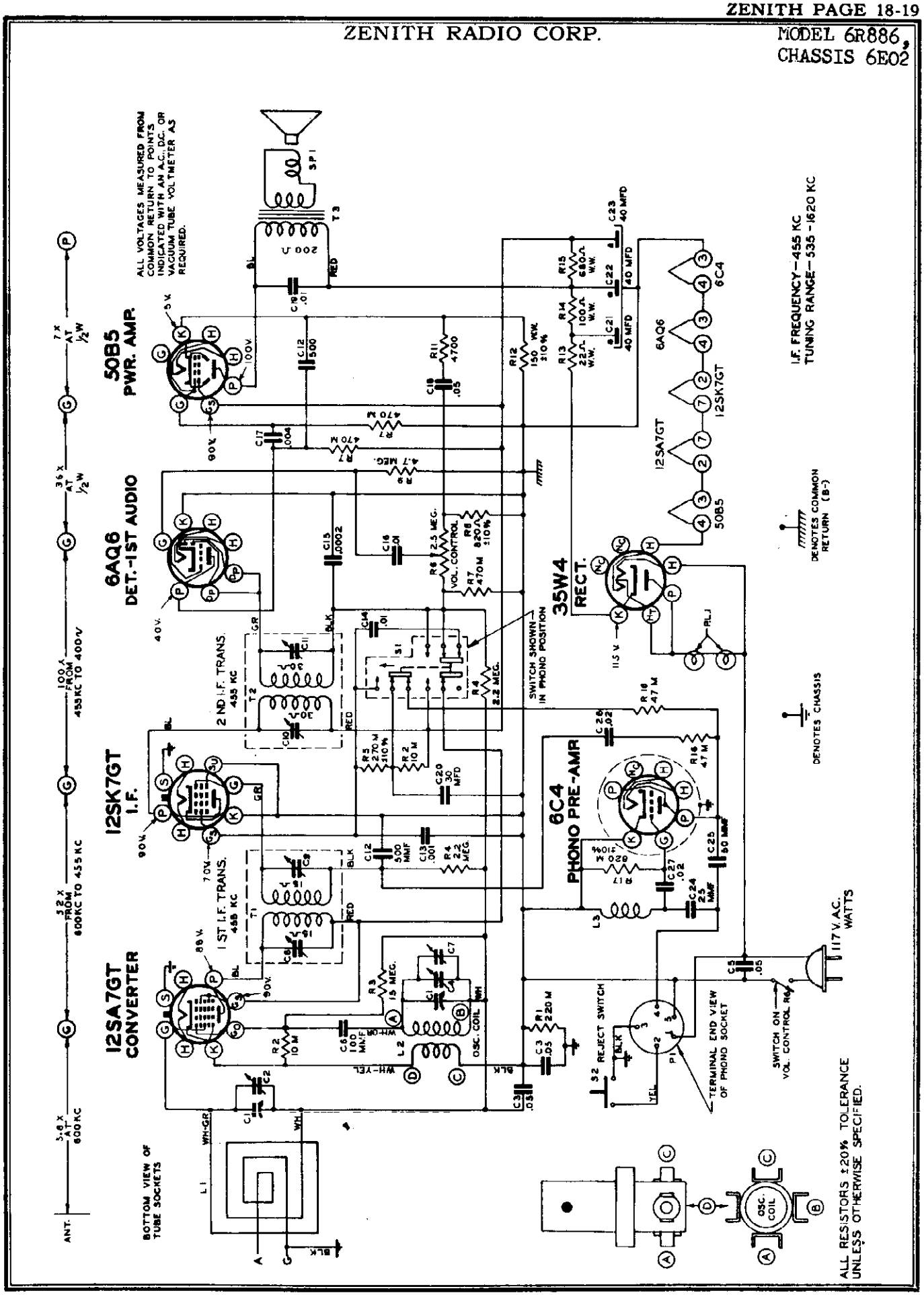
22-162	C-6	.0001 MFD (or 22-1669)	500 V.
22-178	C-18	.05 MFD	200 V.
22-188	C-26	.02 MFD	400 V.
22-196	C-16	.01 MFD	600 V.
22-243	C-14	.01 MFD	400 V.
22-327	C-27	.02 MFD	200 V.
22-448	C-17	.004 MFD	600 V.
22-716	C-29	.0005 MFD	500 V.
22-827	C-28	.1 MFD	200 V.
22-829	C-3	.05 MFD	200 V.
22-854	C-12	.0005 MFD	600 V.
22-953	C-15	.0002 MFD (or 22-1668)	500 V.
22-1017	C-5	.05 MFD	400 V.
22-1182	C-19	.01 MFD	400 V.
22-1444	C-13	.001 MFD	200 V.
22-1532	C-25	50 MMFD (or 22-1674)	500 V.
22-1657	C-1	Two Gang Variable	
22-1707	C20,21,22,23	Dry Electrolytic 40-40-40-30 MFD	150 V.
22-1758	C-24	25 MMFD Ceramic	500 V.

RESISTORS

63-686	R-12	150 ohm W. W.		1/2 W.
63-1219	R-13	22 ohm W. W.		1/2 W.
63-1220	R-14	100 ohm W. W.		1 W.
63-1221	R-15	680 ohm W. W.		1 W.
63-1555	R-6	Volume Control & Switch		
63-1653	R-10	Tone Control		
63-1782	R-8	820 ohm	(Insulated)	1/2 W.
63-1814	R-11	4700 ohm	(Insulated)	1/2 W.
63-1828	R-2	10 M ohm	(Insulated)	1/2 W.
63-1856	R-16	47 M ohm	(Insulated)	1/2 W.
63-1884	R-1	220 M ohm	(Insulated)	1/2 W.
63-1887	R-5	270 M ohm	(Insulated)	1/2 W.
63-1898	R-7	470 M ohm	(Insulated)	1/2 W.
63-1911	R-17	1 Megohm	(Insulated)	1/2 W.
63-1926	R-4	2.2 Megohm	(Insulated)	1/2 W.
63-1940	R-9	4.7 Megohm	(Insulated)	1/2 W.
63-1961	R-3	15 Megohm	(Insulated)	1/2 W.

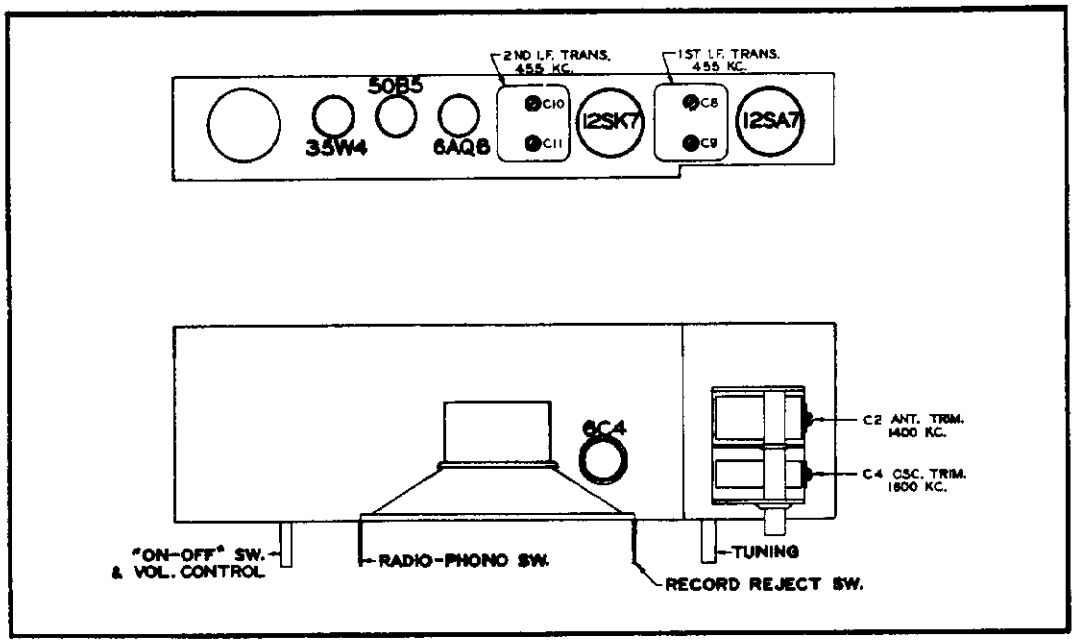
ZENITH RADIO CORP.

MODEL 6R886,
CHASSIS 6E02



PARTS LIST

REFERENCE NUMBER	DIAGRAM NUMBER	DESCRIPTION
		CONDENSERS
22-1657	C1	2-Gang Variable
ON C1	C2	Bc. Ant. Trim
22-829	C3	.05 Mfd .200 V.
ON C1	C4	Bc. Osc. Trimmer
22-1017	C5	.05 Mfd .400 V.
22-162	C6	100 Mmfd. .500 V.
ON C1	C7	Bc. Osc. Trim
ON T1	C8	1st. I.F. Trans. Pri. Trim.
ON T1	C9	1st. IIF. Trans. Sec. Trim.
ON T2	C10	2nd. I.F. Trans. Pri. Trim.
ON T2	C11	2nd. I.F. Trans. Sec. Trim.
22-716	C12	.0005 Mfd .500 V.
22-1444	C13	.001 Mfd. .200 V.
22-248	C14	.01 Mfd .400 V.
22-953	C15	.0002 Mfd .600 V.
22-196	C16	.01 Mfd .600 V.
22-448	C17	.004 Mfd. .600 V.
22-178	C18	.05 Mfd .200 V.
22-1182	C19	.01 Mfd .400 V.
	C20	20 Mfd. Electro .150 V.
	C21	40 Mfd. Electro .150 V.
22-1707	C22	40 Mfd. Electro .150 V.
	C23	40 Mfd. Electro .150 V.
22-127	C24	25 Mmfd .500 V.
22-1532	C25	50 Mmfd .500 V.
22-188	C26	.02 Mfd .400 V.
22-327	C27	.02 Mfd .200 V.
		RESISTORS
63-1884	R1	220 M Ohm .1/2 W.
63-1828	R2	10 M Ohm. .1/2 W.
63-1981	R3	15 Megohm .1/2 W.
63-1926	R4	3.2 Megohm. .1/2 W.
63-1887	R5	270 M Ohm .1/2 W.
63-1555	R6	3.3 Meg. Vol. Control
63-1898	R7	470 M Ohm .1/2 W.
63-1782	R8	820 Ohm .1/2 W.
63-1940	R9	4.7 Megohm. .1/2 W.
63-1814	R11	4700 Ohm. .1/2 W.
63-686	R12	150 Ohm W. W. .1/2 W.
63-1219	R13	22 Ohm W. W .1/2 W.
63-1220	R14	100 Ohm W. W. 1 W.
63-1221	R15	680 Ohm W. W. 1 W.
63-1856	R16	47 M Ohm. .1/2 W.
63-1908	R17	820 M Ohm .1/2 W.
		COILS
813817	L1	Wavemagnet Assem.
813799	L2	Osc. Coil Assem
812603	L3	Osc. Coil Assem
95-919	T1	1st. I.F. Trans
95-905	T2	2nd. I.F. Trans
95-1025	T3	Output Trans.
		MISCELLANEOUS
100-90	P.L.1	Pilot Light 3.2 V
78-592	P1	8 Prong Phono Socket.
85-421	S1	Phono-Radio Switch.
85-422	S2	Reject Switch
49-602	SP1	8-1/4" P.M. Speaker
813815		Hinge Assembly.
813829		Dial Pointer and Pulley Assembly.
814196		Escutcheon and Grille Cloth Assembly.
2-122		Cabinet Back.
13-1382		Hinge Support Bracket
14-1086		Table Cabinet
28-387		Dial Scale.
27-99		Felt Disc
46-687		Tuning Control Knob
46-688		Phono Switch Knob
57-1105		Wavemagnet Lead Spacer Strip.
57-1320		Chassis Cover Plate
80-407		Record Changer Mounting Spring.
80-569		Dial Scale Retaining Spring
110-129		Grille Cloth.
112-544		Record Changer Mounting Screw
139-71		Speaker Baffle.
166-13		Rubber Bumper



TUBE AND TRIMMER LOCATION

TO THE SERVICEMAN:

Chassis 6E02 has a Record Reject push button switch on the receiver control panel to reject records.

The socket P1 is used to connect the automatic record changer to the receiver. The record player is connected to the receiver by a shielded cable and socket arrangement.

The Phono-Radio switch is a two position double acting push-button switch and when in the "in" position connects the changer for playing records.

ALIGNMENT PROCEDURE

OPERATION	CONNECT OSCILLATOR TO	DUMMY ANTENNA	INPUT SIG. FREQUENCY	SET DIAL AT	TRIMMERS	PURPOSE
1	Converter Grid	.5 MFD	455 Kc.	1600 Kc.	C8, C9, C10, C11	Align I.F.
2	Single Turn Loop Loosely Coupled to Wavemagnet	------	1600 Kc.	1600 Kc.	C4	Set Oscillator to Dial Scale.
3		------	1400 Kc.	1400 Kc.	C2	Align Antenna.

ALIGNMENT PROCEDURE

Operation	Connect Oscillator to	Dummy Antenna	Input Signal Frequency	Band	Set Dial To	Adj. Trimmers	Purpose
1	Pin 7 12BE6 Converter	.05 Mfd.	455 KC. Modulated	BC	600 Kc.	L8, 9, 12, 13	Align I. F. channel for maximum output.
2	2 turns loosely cpld. to wavemagnet		1600 Kc. Modulated	BC	1600 Kc.	C6	Set oscillator to dial scale.
3	2 turns loosely cpld. to wavemagnet		1400 Kc. Modulated	BC	1400 Kc.	C5	Align antenna stage.
4 (a)	Pin 1 (grid) on 12AU6 limiter.	.05 Mfd.	10.7 Mc. Unmodulated	FM 100		L15 coil slug Primary discr.	Align primary of discriminator for maximum reading.
5 (b)	Pin 1 (grid) on 12AU6 limiter.	.05 Mfd.	10.7 Mc. Unmodulated	FM 100		L16 coil slug sec. of discr.	Adjust secondary of discriminator for zero reading.
6 (c)	Pin 1 (grid) on 12BA6 2nd IF.	.05 Mfd.	10.7 Mc. Unmodulated	FM 100		L14 Prim. of 3rd IF trans.	Align 3rd IF transformer for maximum reading.
7 (c)	Pin 1 (grid) on 12BA6 1st IF.	.05 Mfd.	10.7 Mc. Unmodulated	FM 100		L10 and L11 Prim. and Sec. of 2nd IF transformer	Align 2nd IF transformer for maximum reading.
8 (c)	Pin 7 (grid) on 12BE6 converter tube socket.	.05 Mfd.	10.7 Mc. Unmodulated	FM 100		L6 and L7 Prim. and Sec. of 1st IF transformer.	Align 1st IF transformer for maximum reading.
9 (c)	Antenna Post FM (Remove line ant.)	270 ohms	98 Mc. Unmodulated	FM 100	98 Mc.	L3 Osc. Coil Slug	Set Oscillator to dial scale.
10 (c) (d)		270 ohms	98 Mc. Unmodulated	FM 100	98 Mc.	L4 Det. Coil Slug	Align det. stage to maximum reading.

IMPORTANT

Alignment of this chassis will in most cases be unnecessary unless an IF or RF transformer is replaced or the adjustments have been tampered with.

Correct alignment can only be made if the following procedure is followed:

A vacuum tube voltmeter with an isolation resistor of 2,000,000 ohms in series with the hot lead will serve for FM adjustments. This lead should be shielded.

An AC output meter connected across the primary or secondary of the output transformer will be satisfactory for all AM adjustments.

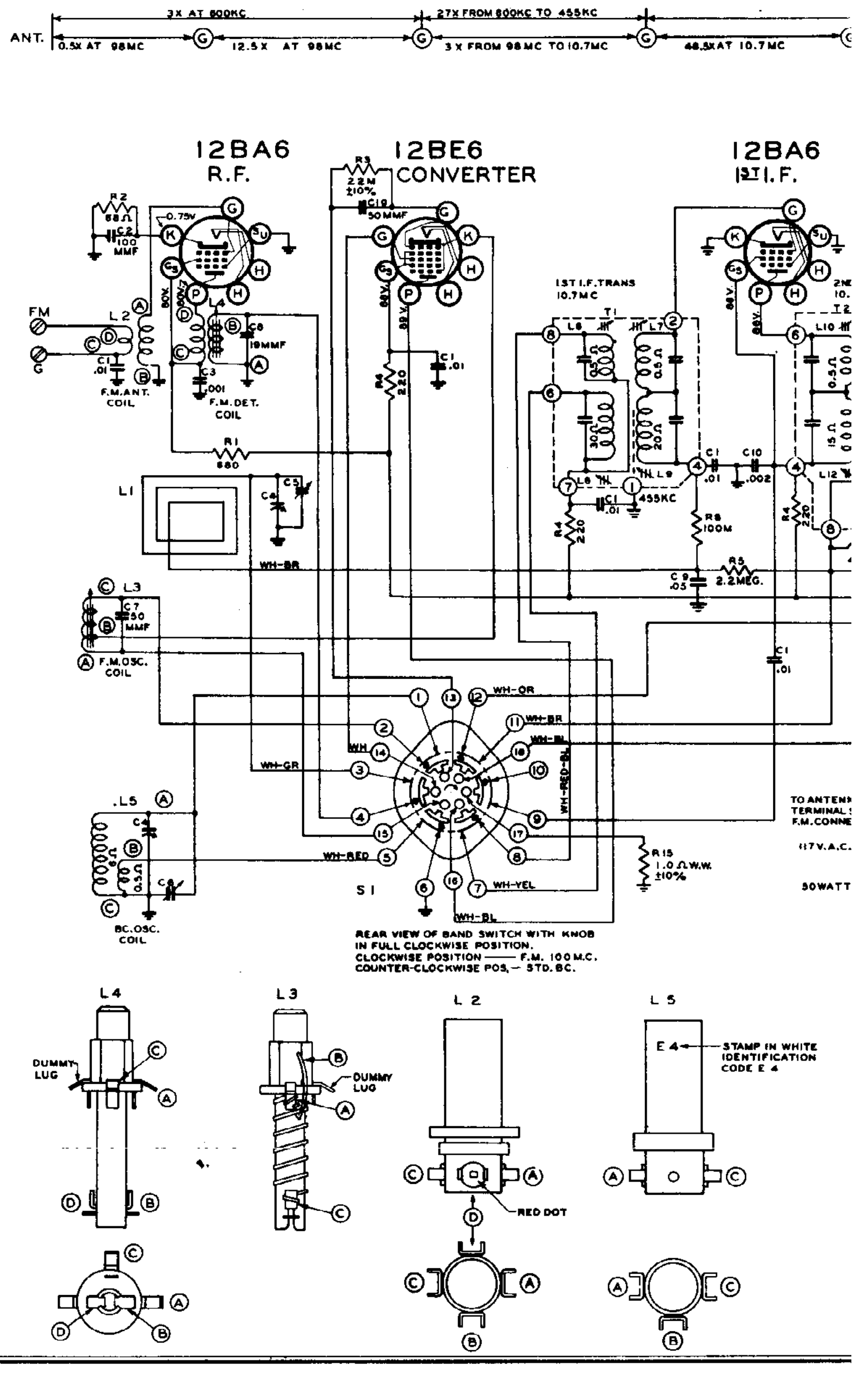
The signal generator output should be kept just high enough to get an indication on the meter.

(a) Vacuum Tube Voltmeter Lug 6 on discriminator transformer to chassis (half discriminator load).

(b) Vacuum Tube Voltmeter Lug 3 on discriminator transformer to chassis (full discriminator load).

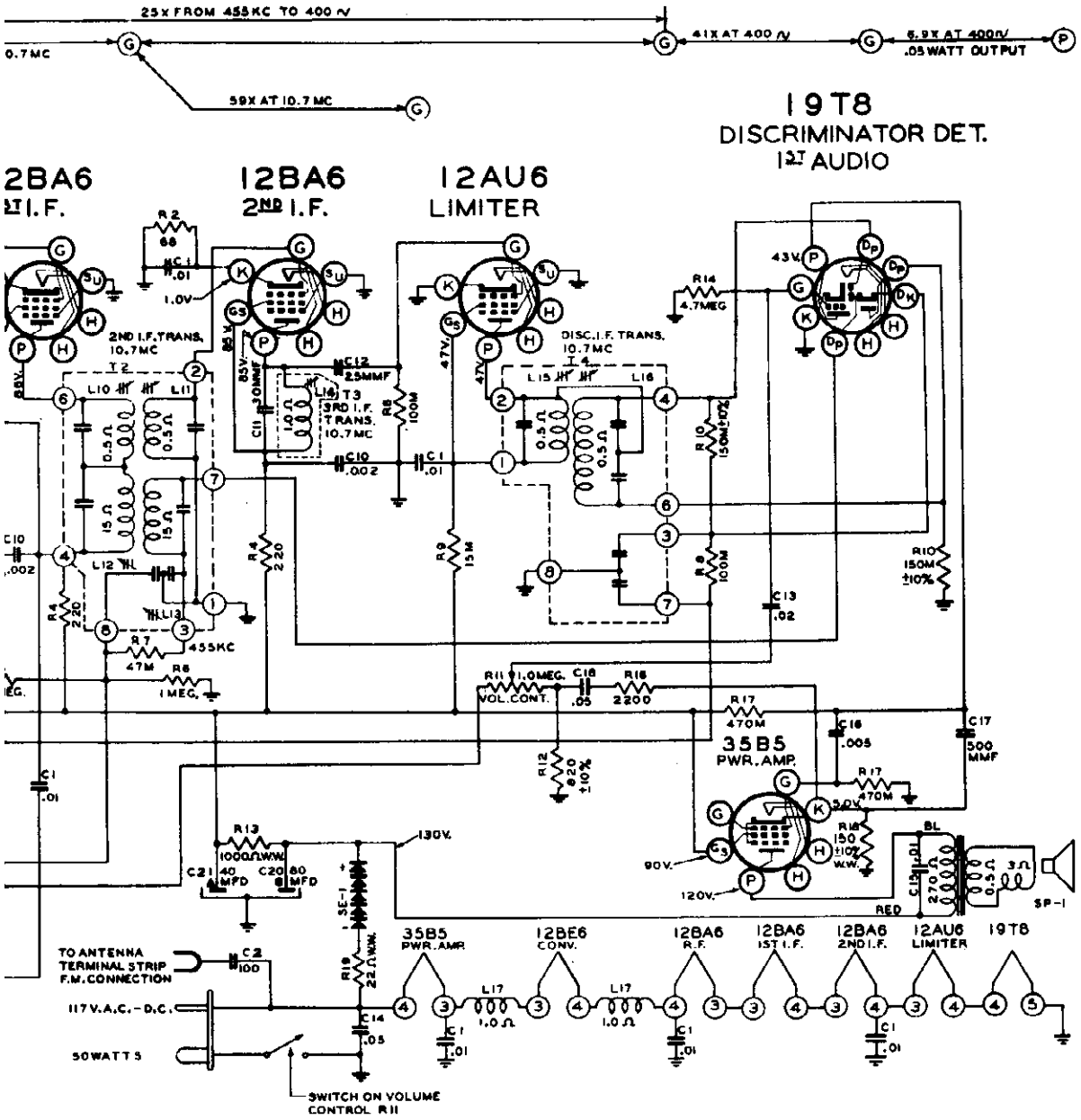
(c) Vacuum Tube Voltmeter from Limiter Grid to Chassis.

(d) Loosen Slugs by applying a hot iron to the cement.


ANT.
3X AT 600KC
0.5X AT 98MC
12.5X AT 98MC
27X FROM 600KC TO 455KC
3 X FROM 98MC TO 10.7MC
48.5X AT 10.7MC
12BA6
R.F.
12BE6
CONVERTER
12BA6
1ST I.F.
R2
68 Ω
C2
100
MMF
0.75V
R3
2.2M
±10%
C19
50 MMF
FM
G
L 2
C1
.01
F.M.ANT.
COIL
L4
C8
19MMF
C3
.001
F.M.DET.
COIL
R4
220
C1
.01
R1
680
1ST I.F.TRANS
10.7MC
T1
L6
L7
L8
L9
30Ω
455KC
R8
100M
C10
.002
R5
2.2MEG.
C9
.05
L1
C4
C5
WH-BR
L3
C7
50
MMF
F.M.OSC.
COIL
L5
BC.OSC.
COIL
WH-OR
WH-BR
WH-BL
WH-GR
WH-RED
WH-YEL
WH-RED-BL
R15
1.0 Ω W.W.
±10%
S 1
REAR VIEW OF BAND SWITCH WITH KNOB
IN FULL CLOCKWISE POSITION.
CLOCKWISE POSITION —— F.M. 100 M.C.
COUNTER-CLOCKWISE POS. — STD. BC.
117V.A.C.
50WATT
DUMMY
LUG
RED DOT
E 4
STAMP IN WHITE
IDENTIFICATION
CODE E 4

ITH RADIO CORP.

MODEL 7H822,
CHASSIS 7E02



ALL VOLTAGES MEASURED FROM COMMON RETURN TO POINTS INDICATED WITH AN A.C., D.C. OR VACUUM TUBE VOLTMETER

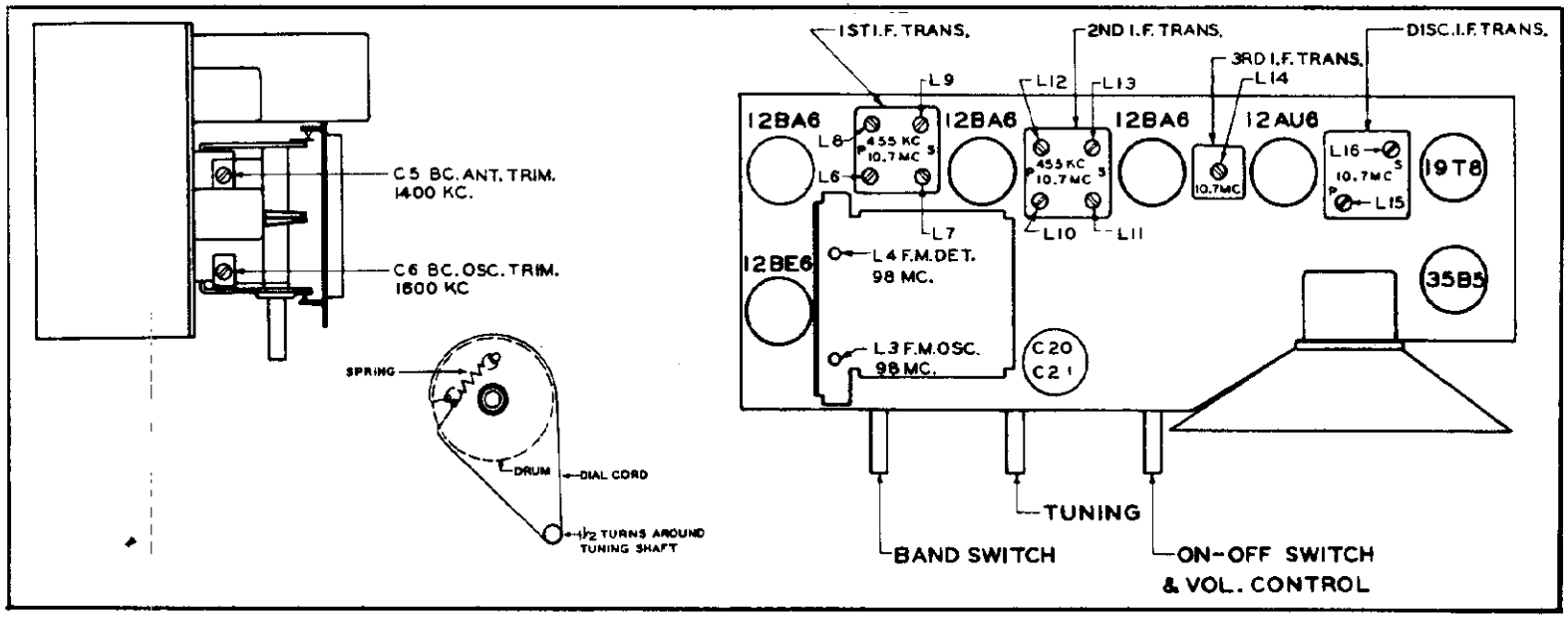
ALL VOLTAGES ARE D.C. UNLESS OTHERWISE SPECIFIED

ALL RESISTORS ±20% TOLERANCE UNLESS OTHERWISE SPECIFIED

AMP. MOD. I.F. FREQUENCY 455 K.C.
FREQ. MOD. I.F. FREQUENCY 10.7 M.C.

TUNING RANGES
540-1620 K.C. STD. BC.
88-108 M.C. F.M. 100

DENOTES CHASSIS



TUBE AND TRIMMER LOCATION

TO THE SERVICE MAN:

The 7E02 chassis incorporates a superheterodyne circuit with two stages of IF, on the FM Band, and one stage on the AM Band. There is one stage of RF amplification on all bands.

When adjustments are made on the 7E02 or any AC-DC chassis, a line isolation transformer (110 V input to 110 V output) is recommended in order to avoid a "hot" chassis. If an isolation transformer is not available, check the AC voltage between chassis and bench ground, and if there is any indication of voltage, reverse the plug before handling the set.

AM Alignment: The alignment of this chassis on the standard broadcast band is conventional. The alignment slugs in the IF transformers are threaded and screw into the coil forms. The slugs are slotted for a small size fiber screw driver. Do not press hard on the aligning tool or the threads in the coil forms will strip and adjustment will be impossible.

FM RF Alignment: The tuning slugs are attached to threaded shafts and the slugs are varied in the field of the coils by turning the shafts clockwise or counter-clockwise. After adjustment the shafts must be secured with a drop of speaker cement.

FM IF Alignment: The same type of tuning slugs for aligning the AM IF Amplifier are used for the FM IF's. Observe the same precautions when making adjustments.

FM IF Alignment: Because of the wide band pass, it is desirable to use a FM signal generator and a cathode ray oscilloscope when aligning the FM IF channel. The instruction book for the Zenith Model 800 Signal Generator (Form Z8001) covers complete FM alignment procedure. If visual alignment equipment is unavailable, reasonably accurate alignment can be made by following the procedure outlined below.

FM Discriminator Alignment: When the secondary of the discriminator is aligned (operation 5) use sufficient signal input to get a good positive and negative indication before setting the slug for zero reading. A center zero indicating meter is recommended for this adjustment, but is not absolutely necessary. Reversing the leads of a non-zero center meter, or observing closely when the meter starts to go to the left (negative) of zero will give the same results.

ZENITH RADIO CORP.

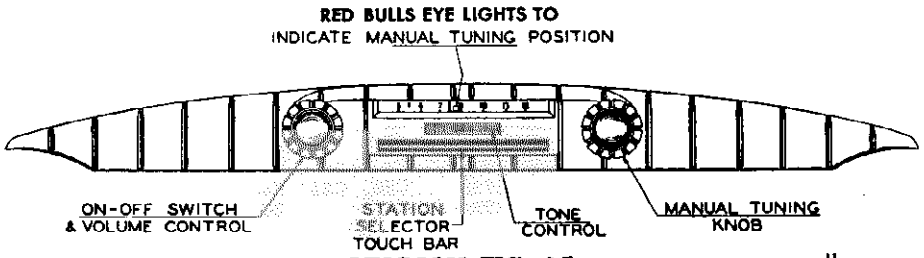
MODEL 7H822,
CHASSIS 7E02

PARTS LIST

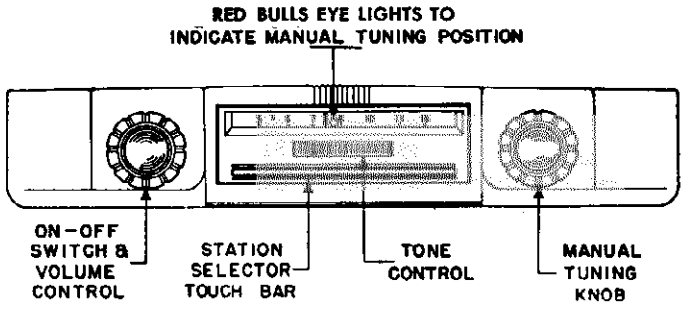
PART NO.	REF. NO.	DESCRIPTION
		DIAL ASSEMBLY
26-403		Dial Scale
46-734		Volume and Tuning Control Knob (2 used)
46-735		Band Switch Knob
54-268		Speed Nut (Cabinet Plate Mtg.)
57-1378		Cabinet Emblem Plate
59-146		Dial Pointer
76-506		Tuning Control Shaft
80-69		Dial Cord Tension Spring
80-444		Tuner Arm Tension Spring
80-580		Tuner Arm Stop Spring
80-581		Tuner Arm Pressure Spring
93-956		1/16" x 9/32 x 3/4" Black Felt Washer (59-146)
94-295		Dial Spacer Bushing
188-32		Retaining Ring
S14523		Tuning Shaft Bracket and Insulating Strip Assembly
S14524		Condenser Pulley and Cam Assembly
S14525		Tuner Arm Assembly
S14526		Dial Cord and Eyelet Assembly
		COILS AND CHOKES
S13871	L5	F. M. Detector Coil Assembly
S13973	T4	Discriminator Transformer Assembly
S13997	L17	Filament Choke Assembly (2 Used)
S14480	L2	F. M. Antenna Coil Assembly
S14481	L5	Broadcast Oscillator Coil Assembly
S14509	T3	3rd. I. F. Coil Assembly
S14521	T1	1st. I. F. Transformer Assembly
S14522	T2	2nd. I. F. Transformer Assembly
S14695	L3	F. M. Oscillator Coil Assembly
		CONDENSERS
22-162	C2	100 MMFD (Or 22-1669) .500 V.
22-229	C16	.005 Mfd. .600 V.
22-829	C9	.05 MFD .200 V.
		MISCELLANEOUS--Continued
49-634	SP1	P.M. Speaker - 5-1/4".
		206-634 Output Transformer
		208-634 Cone and Voice Coil
54-30		#8-32X5/16" Hex. Nut-Steel-N.P.
54-139		3/8-32 X 9/16" Palnut-Cads
54-226		Speed Nuts (2 Used)
57-1269		I.F. Transformer Terminal Plate
58-128		Two Prong Plug
73-30		#6-32 X 1/4" Hex. Slotted Set Screw-Cuppoint (2 Used)
78-787		Socket-Two Contact
78-788		Socket-Miniature Tube (9 Contact)
78-806		Socket-Miniature Tube
78-807		Socket-Miniature Tube
83-1056		Wavemagnet Mtg. Strip
83-1063		Threaded Insert (Used on all I.F. Transformers
83-1064		Threaded Insert (Used on all I.F. Transformers
83-1090		Insulating Strip
83-1498		Insulating Strip
83-1520		Rectifier Insulating Strip
83-1545		Insulating Strip (3 Used)
85-430	S1	Band Switch
93-94		Insulating Shoulder Strip
93-125		#6 Int. Lockwasher
93-126		#8 Int. Lockwasher
93-665		Fibre Washer
93-910		Felt Washer-Brown (3 Used)
22-830	C13	.02 MFD. .690 V.
22-854	C17	500 MMFD .600 V.
22-1017	C14	.05 MFD. .400 V.
22-1126	C15	.01 MFD. .400 V.
22-1158	C18	.05 MFD. .200 V.
22-1220	C10	.002 MFD .600 V.
22-1367	C19	50 MMFD. (Ceramic) .500 V.
22-1385	C1	.01 MFD. .200 V.
22-1492	C7	50 MMFD. (Ceramic) .500 V.
22-1507	C12	25 MMFD. (Ceramic) .500 V.
22-1676	C3	.001 MFD. (Ceramic) .500 V.
22-1688	C8	19 MMFD. (Ceramic) .500 V.
22-1742	C4	Two Section Variable .500 V.
22-1757	C20, C21	Electrolytic 80-40 MFD.-150 V.
22-1768	C11	30 MMFD. (Ceramic) .500 V
		RESISTORS
63-686	R18	150 Ohm W. W. (Insulated) .1/2 W.
63-1223	R15	1 Ohm W. W. (Insulated) .1/2 W.
63-1450	R19	22 Ohm W. W. (Insulated) .1 W.
63-1527	R13	1000 Ohm W. W. (Insulated) .3 W.
63-1646	R11	Volume Control and Switch
63-1737	R2	68 Ohm (Insulated) .1/2 W.
63-1758	R4	220 Ohm (Insulated) .1/2 W.
63-1779	R1	680 Ohm (Insulated) .1/2 W.
63-1782	R12	820 Ohm (Insulated) .1/2 W.
63-1800	R16	2200 Ohm (Insulated) .1/2 W.
63-1835	R9	15M Ohm (Insulated) .1/2 W.
63-1842	R3	22M Ohm (Insulated) .1/2 W.
63-1856	R7	47M Ohm (Insulated) .1/2 W.
63-1870	R8	100M Ohm (Insulated) .1/2 W.
63-1876	R10	150M Ohm (Insulated) .1/2 W.
63-1898	R17	470M Ohm (Insulated) .1/2 W.
63-1912	R6	1 Megohm (Insulated) .1/2 W.
63-1926	R5	2.2 Megohm (Insulated) .1/2 W.
63-1940	R14	4.7 Megohm (Insulated) .1/2 W.
		MISCELLANEOUS
12-1070		Wavemagnet Mounting Bracket
14-1022		Model 822-Plastic Cabinet
97-293		Chassis Mtg. Stud
112-281		#10 X 3/4" Oval Binding Hd. Self Tapping Screw Statuary Bronze
112-697		#6 X 7/16" Straight Side B.H. Self Tapping Sc.-Steel-Cad (Cabt. Back Mtg.)
114-48		#6-32 X 1/4" Hex. Acorn Hd. M.S. Steel - N.P.
114-58		#6-32 X 3/8" Hex. Acorn Hd. M.S.-Steel-N.P.
114-78		#8 X 5/16" Hex. Hd. Slotted Self Tapping Sc. Steel N.P.
114-92		#6 X 1-1/8" Hex. Hd. Slotted Self Tapping Sc. Cad
114-271		#6 X 1/2" Hex. Hd. Slotted Self Tapping Sc. Type Z Cad
149-39		Iron Core (Used on all I.F. Transformers)
149-64		Iron Core & Spring (2 Used)
149-66		Iron Core (Used on all I.F. Transformers)
159-50		Plug Button
192-117		Dial Crystal
196-111		Speaker Gasket
202-506		F. M. Instruction Book
202-663		Instruction Book
212-3	SE1	Selenium Rectifier (or 212-4)
S14527		Wavemagnet Lead & Stop Assembly
S14549		Cabinet Back, Socket, & A.C. Cord Assembly
S14957	L1	Wavemagnet Assembly-Type 26GR

MODEL 7ML780, Lincoln; ZENITH RADIO CORP.
7ML781 Lincoln Continental

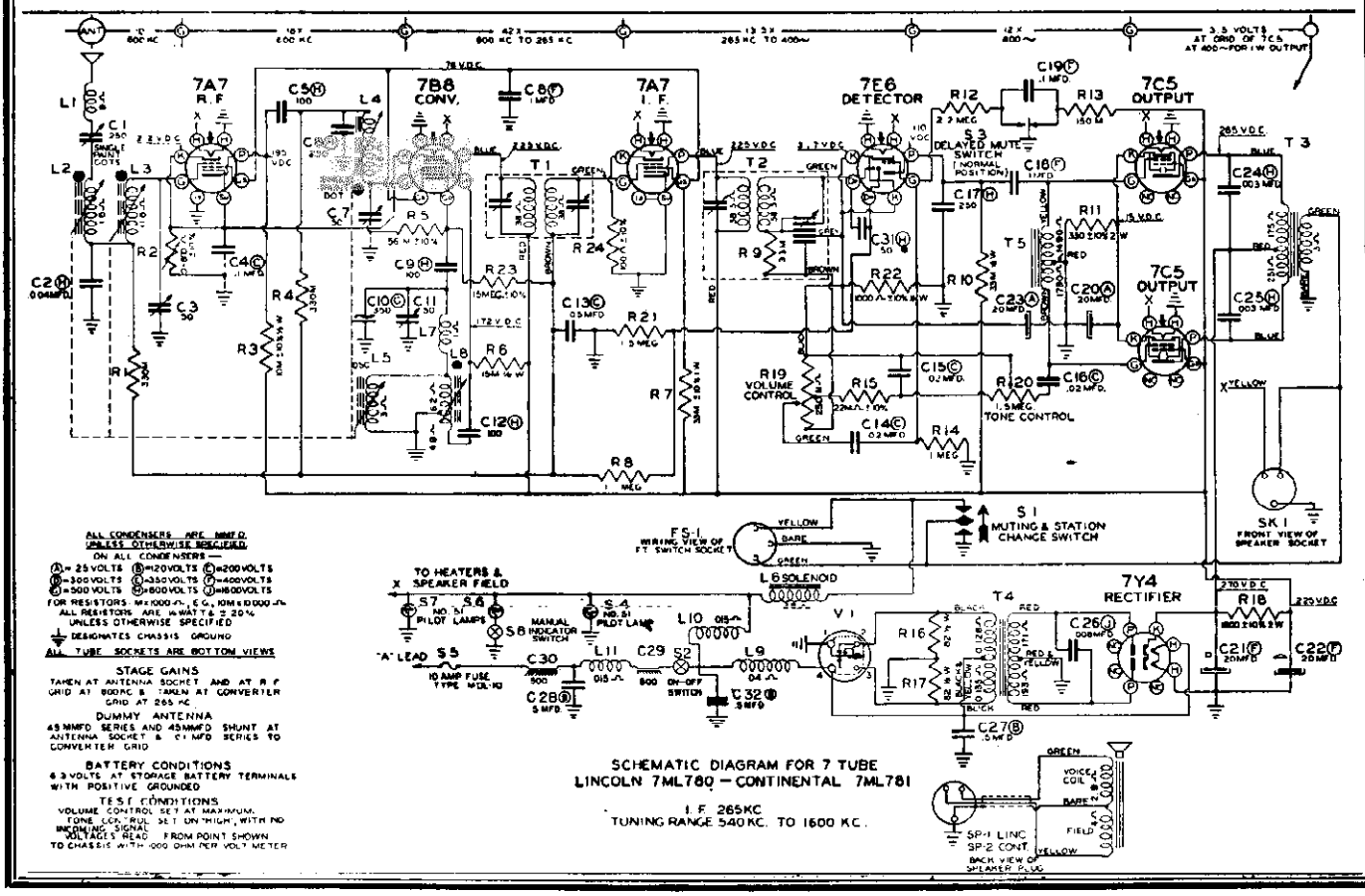
OPERATING INSTRUCTIONS



LINCOLN FIG. 1A



LINCOLN CONTINENTAL FIG. 1B



ZENITH RADIO CORP. MODEL 7ML780, Lincoln; 7ML781 Lincoln Continental

INSTALLATION INSTRUCTIONS

ANTENNA. The new Lincoln antenna is especially designed to work satisfactorily with this receiver. The installation instructions are included with the antenna.

IMPORTANT: 1200 K.C. ANTENNA ADJUSTMENT. After the receiver has operated for approximately 15 minutes, tune in a weak station near 1200 Kc. Adjust the antenna trimmer (C1, Fig. 2) for maximum signal.

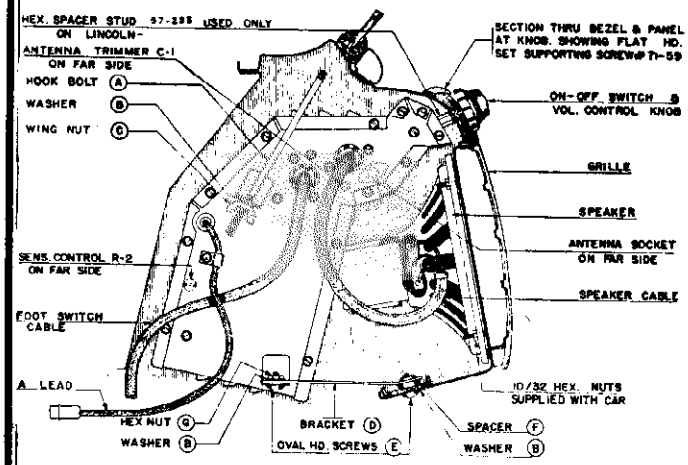


FIG. 2

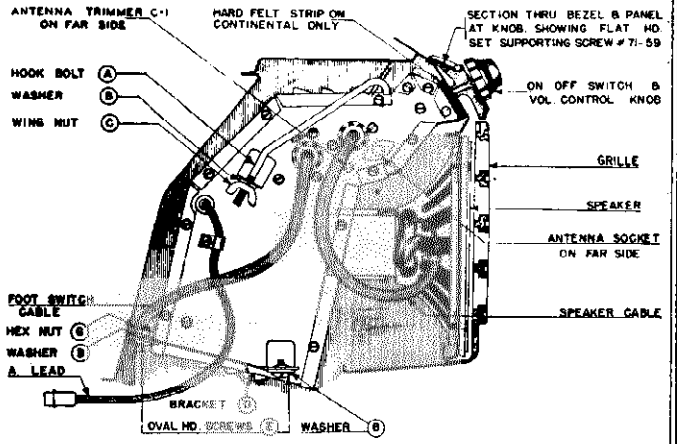


FIG. 2A

Lincoln Receiver Installation

1—Remove the cardboard cover from the speaker hole in the center of the instrument panel. Do not discard the nuts. Remove the bezel from the instrument panel by loosening the nuts on the underside.

2—Remove the protective cover from the speaker. Install the speaker on the rear of the grille so the cable is toward the left. Use the nuts that held the instrument panel hole cover in place.

3—Hang the hook bolts "A" in the holes provided for them in the dash so that the hooks are turned away from the receiver.

4—Place the receiver in position and slip the threaded end of the hook bolts through the upper hanger brackets.

5—Apply lock washers "B" and wing nuts "C" to the hook bolts and tighten them sufficiently to hold the receiver in place while installing the lower support brackets "D." Fasten the tapped end of the brackets to the instrument panel, using spacer washers "F," lock washers "B", and oval head screws "E." Fasten the other end of the bracket to the lower angle bracket of the receiver. Tighten all screws and nuts so that the receiver is held firmly in place (Fig. 2).

6—Connect the "A" lead to the battery terminal of the circuit breaker on the firewall. (Fig. 3.)

7—Connect the speaker cable and the antenna lead-in cable to the receiver and turn the power on.

8—Place the escutcheon plate, furnished with the receiver, over the tuning and volume control shafts and fasten it in place with the two 8/32" flat head screws furnished in the installation kit.

9—Fit tuning and volume control knobs to their respective shafts.

NOTE: Tuning control knob is fastened to the shaft with a set screw. Shaft has a milled recess for the screw.

Lincoln Continental Receiver Installation

The Continental Radio installation is similar to the Lincoln installation with the exception of the speaker.

To install the Continental speaker, remove the speaker grille which is held in place by four nuts on the back of the instrument panel. Place the speaker in position through the front of instrument panel so the cable is to the left. Fasten securely with the four No. 10/32 machine screws and lock washers. Replace the grille and proceed with the installation of the receiver as instructed under Lincoln Receiver installation. Note position of bracket D in figure 2A.

Foot Control Switch Installation

1—Remove the floor mat around the clutch and brake pedals.

2—Drill a hole in each of the three extrusions in the floor, between the clutch and brake pedals, with a No. 27 drill. (Fig. 3.)

3—Fasten the foot control switch in place with the sheet metal screws furnished. Dress the cable so that the plug can be inserted into the foot switch cable receptacle at the left side of the receiver as shown in figure 2.

4—Cut a hole in the floor mat for the foot switch button. Install the foot switch eyelet (furnished in the installation kit) in the hole. Replace the floor mat. A piece of 1⅛" pipe that has been sharpened on the inside of one end may be used to cut the hole.

MODELS 7ML780, Lincoln; 7ML781 Lincoln Continental

ZENITH RADIO CORP.

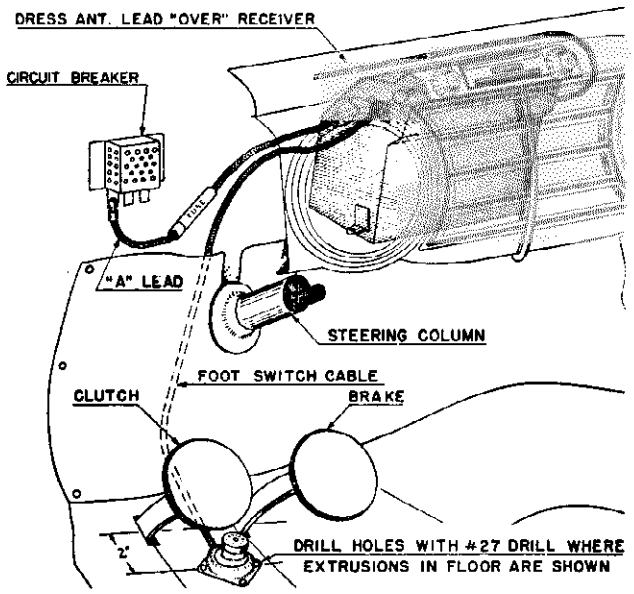


FIG. 3

Setting the Touch-Bar Tuning

Pressing the station selector touch-bar six times will cause the tuning mechanism to change through a cycle of six positions. Five of the Adjust-O-Matic positions may be set for favorite local stations. A red dot will appear in the tuning scale background when the Adjust-O-Matic is in the sixth position. This position may be used for selecting stations manually.

Using the manual (DIAL) position as a reference point, the remaining five positions may be adjusted in succession to any desired dial settings. Setting the stations in sequence according to their frequencies, beginning at the low frequency and progressing through to the high frequency end of the dial, is the recommended practice for simplifying the identification of each Adjust-O-Matic station.

Turn the receiver on and allow it to operate for at least fifteen minutes to bring the temperature up to normal before making the following Adjust-O-Matic settings.

1—Press station selector touch-bar (Figs. 1A and 1B) until red dot appears in dial scale background. Press the touch-bar once more to advance Adjust-O-Matic mechanism to No. 1 position.

2—Pull manual tuning knob outward to engage the Adjust-O-Matic mechanism.

3—Select the station desired and tune to its frequency by turning the tuning knob. Tune very carefully for clearest reception.

CAUTION: DO NOT ATTEMPT TO FORCE THE KNOB IN. The knob will automatically return to the "IN" position when the station selector touch bar or the foot switch is operated.

4—Press station selector bar, pull tuning knob outward, and tune in station desired for No. 2 position. Use same procedure for positions No. 3, 4 and 5. Note: When the green dot appears in the tuning scale background, the manual tuning knob must be pulled outward and rotated to select the stations manually.

Interference Elimination

IMPORTANT: Use the utmost care in the following operations to insure freedom from interference. Be sure that clean contacts are made when connecting condensers in the car. If necessary, clean away paint or dirt with emery paper to make good ground. Tighten all bolts and nuts securely.

1. Mount the voltage regulator condenser No. 22-1192 and the ground strap No. S-9343 on "ground" terminal of the voltage regulator. (Fig. 4.) Connect the lead of the condenser to the ARM. terminal of the voltage regulator. Connect the end of the ground strap to the lower, left hand voltage regulator mounting screw. (Fig. 4.)

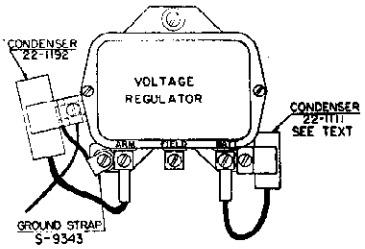


FIG. 4

2. Mount condenser No. 22-1111 under the lower right hand voltage regulator mounting bolt, and connect the lead to the BATT. terminal of the voltage regulator. (Fig. 4).

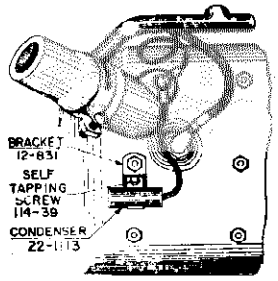


FIG. 5

3. Install the water temperature gauge condenser No. 22-1113 with its separate bracket (which fastens under one of the cylinder head nuts.) (Fig. 5.)

4. Install the condenser No. 22-1113 on the oil gauge unit. (Fig. 6.)

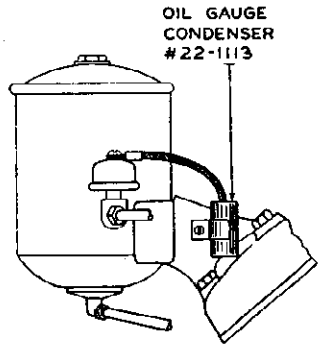


FIG. 6

5. Install the motor hood grounding spring. (Fig. 7.)

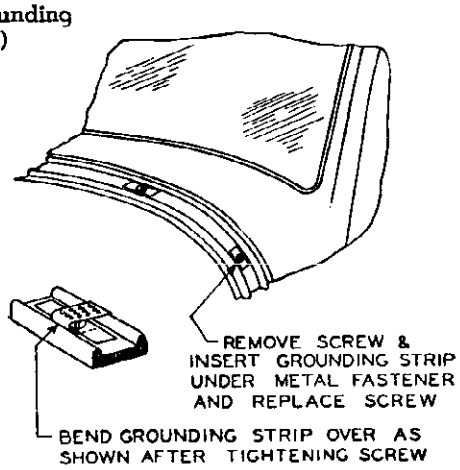


FIG. 7

ZENITH RADIO CORP.

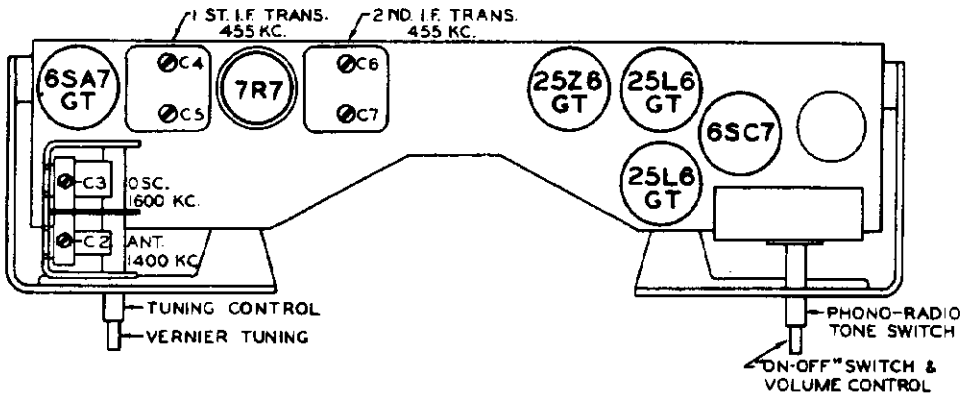
MODEL 7R070
CHASSIS 6C06

PARTS LIST

PART NO.	REF. NO.	DESCRIPTION
		DIAL ASSEMBLY
46-610		Tuning Control Knob
46-611		Volume Control Knob
46-612		Phono-Radio Knob
46-613		Tuning Control Knob (Vernier)
46-614		Phono-Reject Knob
78-582		Socket-Phono (9 Contact)
188-53		Retaining Ring (Used on Volume Control and Phono-Radio Switch)
188-54		Knob Retaining Ring (2 used)
188-93		Knob Retaining Ring (1 used on 46-613)
196-83		Speaker Gasket
S12732		Control Linkage Assembly
		COILS AND CHOKES
95-970	T1	1st I.F. Transformer
95-971	T2	2nd I.F. Transformer
S12389	L4	Antenna Loading Coil Assem.
S12733	L2	Oscillator Coil Assembly
		CONDENSERS
22-188	C10	.02 Mfd .400 V.
22-196	C15	.01 Mfd .600 V.
22-326	C14	.003 Mfd .400 V.
22-327	C12	.02 Mfd .200 V.
22-827	C28	.1 Mfd .200 V.
22-829	C4	.05 Mfd .200 V.
22-953	C9	.0002 Mfd .600 V.
22-954	C13	350 Mmfd .600 V.
22-1017	C17	.05 Mfd .400 V.
22-1049	C16	.03 Mfd .400 V.
22-1362	C11	.004 Mfd .600 V.
22-1381	C18,19,20	Electrolytic 40-40-40 Mfd .150 V.
22-1541	C1	Two Gang Variable
22-1775	C21	.047 Mfd .400 V
		RESISTORS
63-311	R6	15M Ohm .1/4 W.
63-583	R1	1000 Ohm .1/4 W.
63-589	R2	10M Ohm .1/4 W.
63-597	R7	470M Ohm .1/4 W.
63-600	R4	2.2 Megohm .1/4 W.
63-641	R9	10M Ohm .1/4 W.
63-658	R8	390M Ohm .1/4 W.
63-976	R3	15 Megohm .1/4 W.
63-1070	R12	680 Ohm (Wirewound) (Insulated) .1 W.
63-1366	R10	140 Ohm (Zipohm) .2-1/2 W.
63-1474	R5	Volume Control & Switch
63-1475	R11	100 Ohm (Wirewound) (Insulated) .2 W.
63-1511	R13, R14	Candohm 22 ohm 1 W (WW), 60 Ohm, 7W (WW)
		PRE-AMP PHONO UNIT
S14605	L3	Oscillator Coil Assembly (FM Phono)
S13198		Pre-Amp Phono Cable Assem.
S13201		Pre-Amp Phono Unit (Compl.)
22-162	C25	100 Mmfd .500 V.
22-448	C24	.004 Mfd .600 V.
22-829	C4	.05 Mfd .200 V.
22-1532	C23	50 Mmfd (Mica) .500 V.
22-1610	C26	40 Mfd. Electrolytic .150 V.
22-1673	C27	20 Mmfd. (Ceramic) .500 V.
58-133	P1, P2	Phono Plug (Used on S13198)
63-591	R21	22M Ohm .1/4 W.
63-597	R7	470M Ohm .1/4 W
63-604	R16	10 Megohm .1/4 W.
63-648	R20	47M Ohm .1/4 W.
63-659	R18	470M Ohm .1/4 W.
63-710	R19	15M Ohm (Insulated) .1/4 W.
63-976	R3	15 Megohm .1/4 W.
78-229		Electrolytic Socket
78-401		Tube Socket (or 78-596) (8 contact)
80-469		Mounting Spring (3 used)
126-523		Chassis Shield
		RECORD CHANGER
141-104	B1	Phono Motor, 60 Cycle
S12575	S3A	Trip Contact Assembly
S12579	S3B	Insulator Strip Assembly
S11458	S4	Solenoid
85-372	S5	3 Position Switch
78-582	Soc 1, 2	Phono Socket
		MISCELLANEOUS
11-87		Line Cord and Plug (8 ft.)
12-1350		Line Cord Support Bracket
15-65		Plug Shield (used on S12734)
15-67		Plug Cap and Insulator (used on S12734)
17-86		Record Locking Clamp. (2 - 17-86 must be used with 188-99)
19-99		Coil Mounting Clip
19-123		Phono Mounting Clip
24-392		Volume Control and Switch Cover
36-34		Cabinet Handle
36-35		Cabinet Handle Insert for 36-34
40-38		Cabinet Lid Support
49-559	SP1	6½" P.M. Speaker. 206-559 Output Transformer. 208-559 Cone and Voice Coil
52-372		Speaker Socket and Cable
54-245		#8-32 Speed Nut
57-1195		Ventilation Plate
57-1196		Front Panel (Plastic)
57-1197		Chassis Front Plate
70-133		#6 x 3/8" Phillips R. H. Wood Screw - Steel - Statuary Bronze (5 used)
72-68		#4 x 1/2" Phillips F. H. Wood Screw (8 used) (Front Panel Mtg. Screw)
72-69		#6 x 3/4" Flat Hd. W. Screw (10 used) Steel - Black Oxidize
78-229		Socket - Electrolytic Cond.
78-401		Socket - Loktal (or 78-596) (8 contact)
78-611		Socket - Tube (Octal - 8 contact)
80-512		Phono Unit Mounting Spring (Top) (4 used)
80-541		Tone Arm Retaining Spring
83-1228		Pin Jack Terminal Strip (Gang Condenser)
83-1347		Handle Name Strip
83-1350		Insulating Strip (for 63-1511)
83-1491		Felt Strip
84-66		Record Locking Clamp Support
85-388	S1	4 Position Switch (Phono-Radio)
85-389	S2	Reject Switch
93-125		#6 Internal Shakeproof Lockwasher #1206 (7 used)
93-127		#10 Internal Shakeproof Lockwasher (4 used)
93-833		Shoulder Washer (Rubber) (4 used)
93-853		#6 Countersunk Washer (10 used)
94-295		Condenser Mounting Bushing (3 used)
110-120		Grille Cloth
112-187		#10-32 x 1-1/4" Phillips Oval Hd. M. Screw. Steel - Bronze (4 used) (Chassis Mtg.)
112-544		Phono Unit Mounting Screw
114-265		#10-32 x 1-1/4" Slotted Hex Acorn Hd. M.S. - N.P. (4 used) (Handle Mtg.)
125-54		Rubber Grommet
126-379		Tube Shield (7R7)
156-22		Cover Latch (Upper Half)
156-23		Cover Latch (Lower Half)
166-40		Recess Bumper (4 used)
188-99		Clamp Ring
202-450		Instruction Book
S12734	W1	Phono Cable Assembly
S12740	L1	Wavemagnet Assem. - Type 29C
S13200		Non-Intermixer Record Changer
S13270		Handle & Name Strip Assem.

The alignment of chassis 6C06 is conventional. None of the adjustments interlock, however, the most accurate alignment will be accomplished if the procedure is followed exactly. The IF frequency is 455 KC and all measurements, voltage, and resistance have been taken with an electronic voltohm meter.

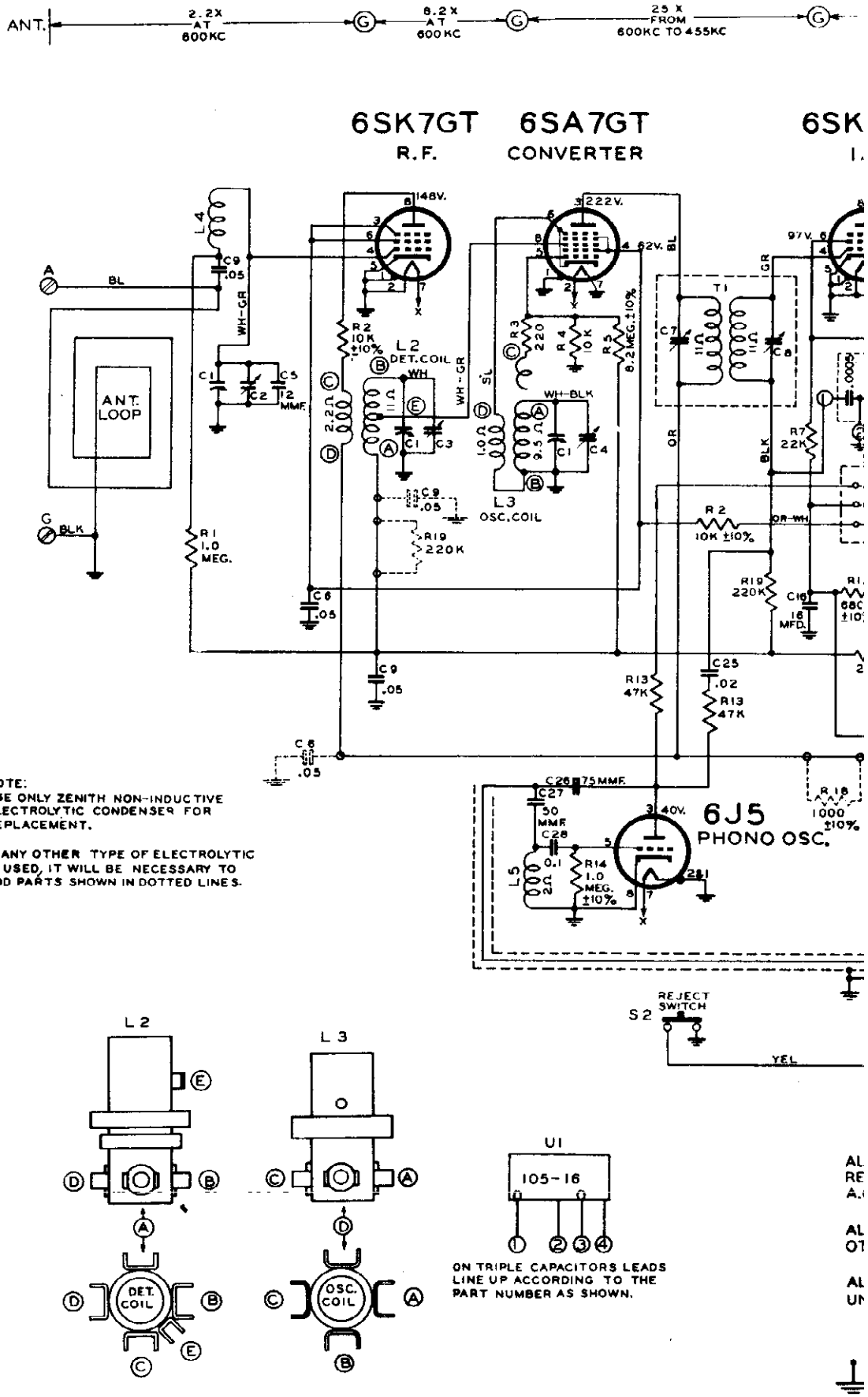
Stage by stage gain measurements are for reference purposes only. Gain measurements can seldom be duplicated, and are used only for comparison purposes.

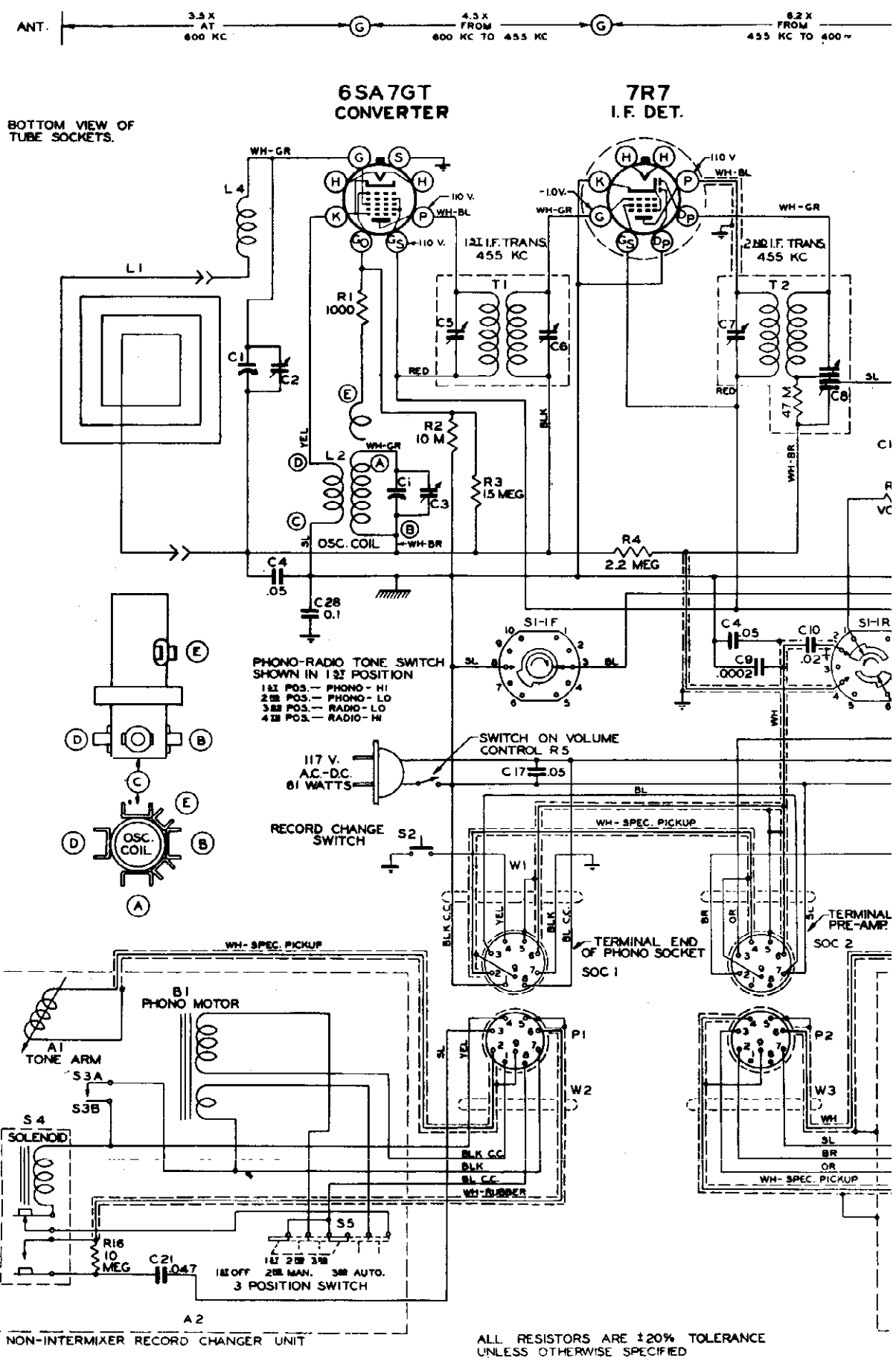


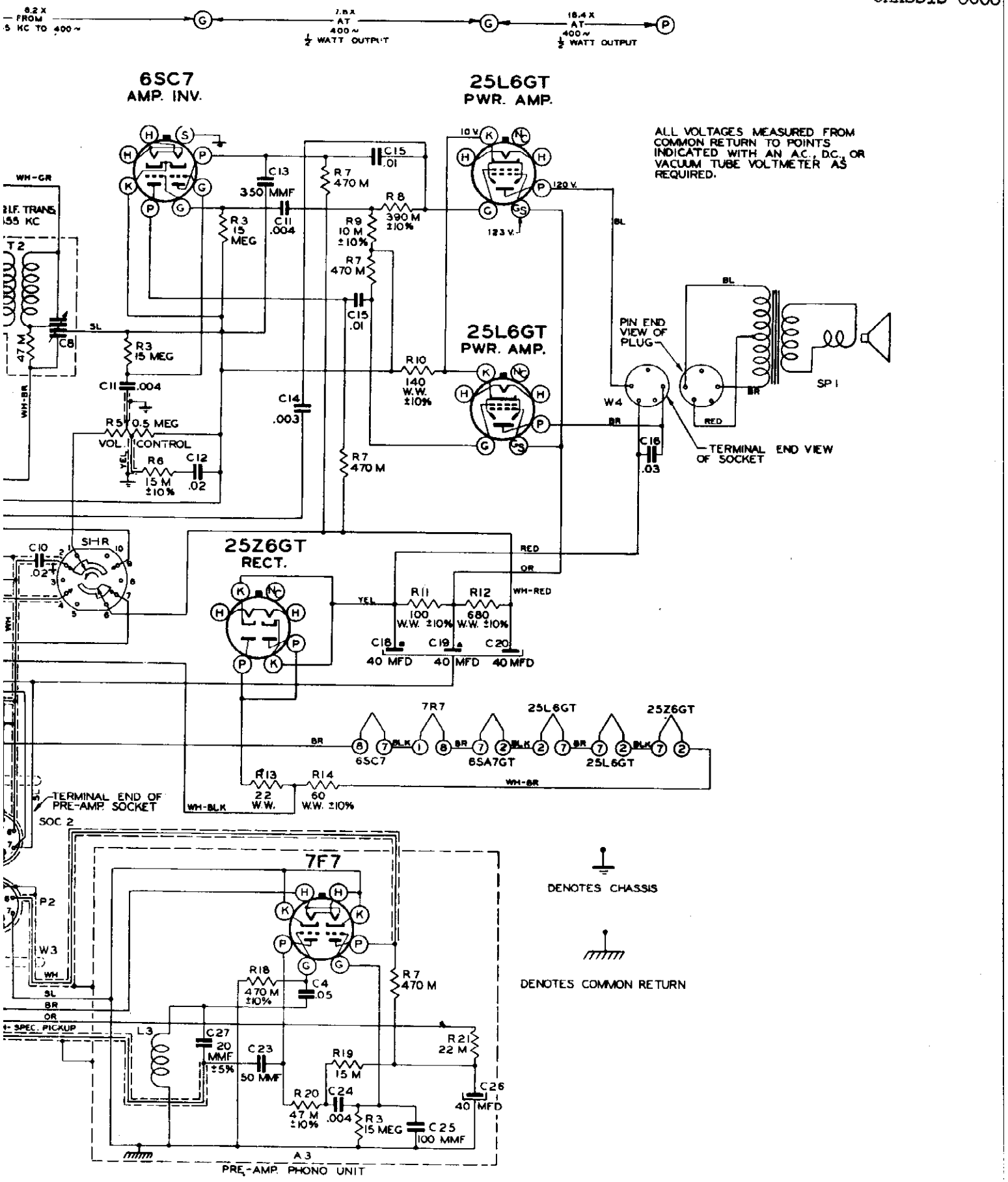
TUBE AND TRIMMER LOCATION

ALIGNMENT PROCEDURE

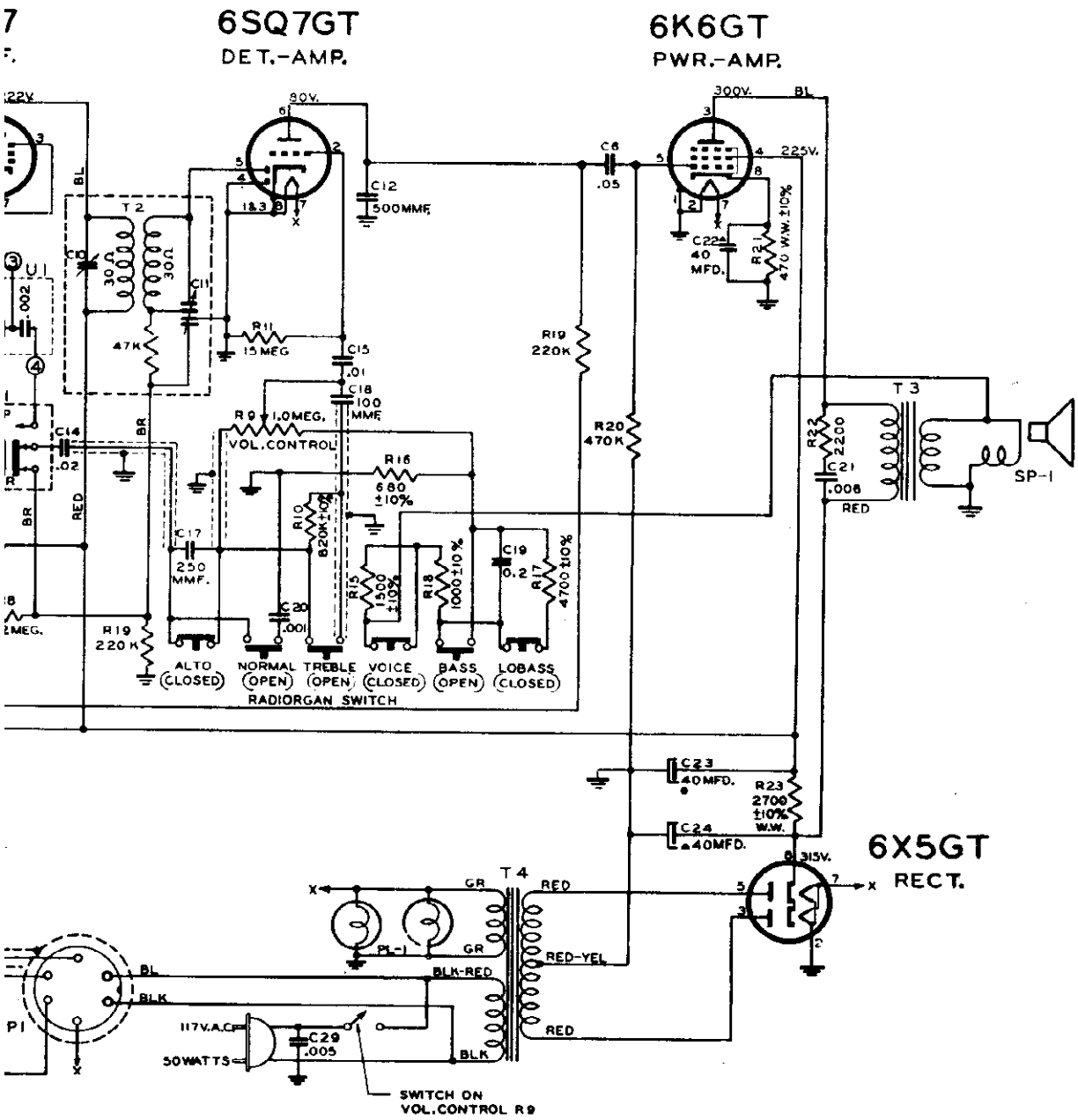
OPERATION	CONNECT OSCILLATOR TO	DUMMY ANTENNA	INPUT SIG. FREQUENCY	SET DIAL AT	TRIMMERS	PURPOSE
1	Converter Grid	.5 MFD	455 KC	600 KC	C4,5,6,7	Align IF
2	One turn Coupled to Loop		1600 KC	1600 KC	C3	Set Oscillator to Dial Scale
3			1400 KC	1400 KC	C2	Align Antenna


ANT.
2.2X AT 600KC
8.2X AT 600KC
25 X FROM 600KC TO 455KC
6SK7GT 6SA7GT
R.F. CONVERTER
6SK
I.
ANT. LOOP
L4
L2 DET. COIL
L3 OSC. COIL
T1
R1 1.0 MEG.
R2 10K ±10%
R3 220
R4 10K
R5 8.2 MEG. ±10%
R7 22K
R19 220K
R13 47K
C25 .02
C26 75 MMF.
C27 50 MMF
C28 .01
R14 1.0 MEG. ±10%
L5 2Ω
6J5
PHONO OSC.
S2 REJECT SWITCH
NOTE:
USE ONLY ZENITH NON-INDUCTIVE ELECTROLYTIC CONDENSER FOR REPLACEMENT.
IF ANY OTHER TYPE OF ELECTROLYTIC IS USED, IT WILL BE NECESSARY TO ADD PARTS SHOWN IN DOTTED LINES.
L2
L3
DET. COIL
OSC. COIL
U1
105-16
ON TRIPLE CAPACITORS LEADS LINE UP ACCORDING TO THE PART NUMBER AS SHOWN.


ANT.
3.9 X AT 600 KC
4.3 X FROM 600 KC TO 455 KC
8.2 X FROM 455 KC TO 400 ~
6SA7GT
CONVERTER
7R7
I.F. DET.
BOTTOM VIEW OF TUBE SOCKETS.
1ST I.F. TRANS. 455 KC
2ND I.F. TRANS. 455 KC
L1
L2
L4
T1
T2
R1 1000
R2 10 M
R3 1.5 MEG
R4 2.2 MEG
47
C1
C2
C3
C4 .05
C5
C6
C7
C8
C9 .0002
C10 .02
C17 .05
C28 0.1
OSC. COIL
PHONO-RADIO TONE SWITCH SHOWN IN 1ST POSITION
1ST POS.— PHONO - HI
2ND POS.— PHONO - LO
3RD POS.— RADIO - LO
4TH POS.— RADIO - HI
S1-F
S1-R
SWITCH ON VOLUME CONTROL R5
117 V. A.C.-D.C. 61 WATTS
RECORD CHANGE SWITCH S2
TERMINAL END OF PHONO SOCKET
SOC 1
SOC 2
TERMINAL PRE-AMP.
WH- SPEC. PICKUP
A1 TONE ARM
B1 PHONO MOTOR
S3A
S3B
S4 SOLENOID
S5
R16 10 MEG
C21 .047
1ST OFF 2ND MAN. 3RD AUTO.
3 POSITION SWITCH
P1
P2
W1
W2
W3
A2
NON-INTERMIXER RECORD CHANGER UNIT
ALL RESISTORS ARE ±20% TOLERANCE UNLESS OTHERWISE SPECIFIED


8.2 X
FROM
5 KC TO 400 ~
7.8 X
AT
400 ~
½ WATT OUTPUT
18.4 X
AT
400 ~
½ WATT OUTPUT
6SC7
AMP. INV.
25L6GT
PWR. AMP.
ALL VOLTAGES MEASURED FROM COMMON RETURN TO POINTS INDICATED WITH AN A.C., D.C., OR VACUUM TUBE VOLTMETER AS REQUIRED.
25L6GT
PWR. AMP.
25Z6GT
RECT.
PIN END VIEW OF PLUG
TERMINAL END VIEW OF SOCKET
SP 1
W4
SHR
7R7
25L6GT
25Z6GT
6SC7
6SA7GT
25L6GT
TERMINAL END OF PRE-AMP. SOCKET
SOC 2
7F7
P2
W3
SPEC. PICKUP
DENOTES CHASSIS
DENOTES COMMON RETURN
A 3
PRE-AMP. PHONO UNIT

15 X FROM 455KC TO 400~ → (G) 51X AT 400~ 1 WATT OUTPUT → (G) 16X AT 400~ 1 WATT OUTPUT → (P)



. VOLTAGES MEASURED FROM COMMON URN TO POINTS INDICATED WITH AN , D.C. OR VACUUM TUBE VOLTMETER

. VOLTAGES ARE D.C. UNLESS IERWISE SPECIFIED

. RESISTORS ±20% TOLERANCE LESS OTHERWISE SPECIFIED

ENOTES CHASSIS

I.F. FREQUENCY 455K.C.

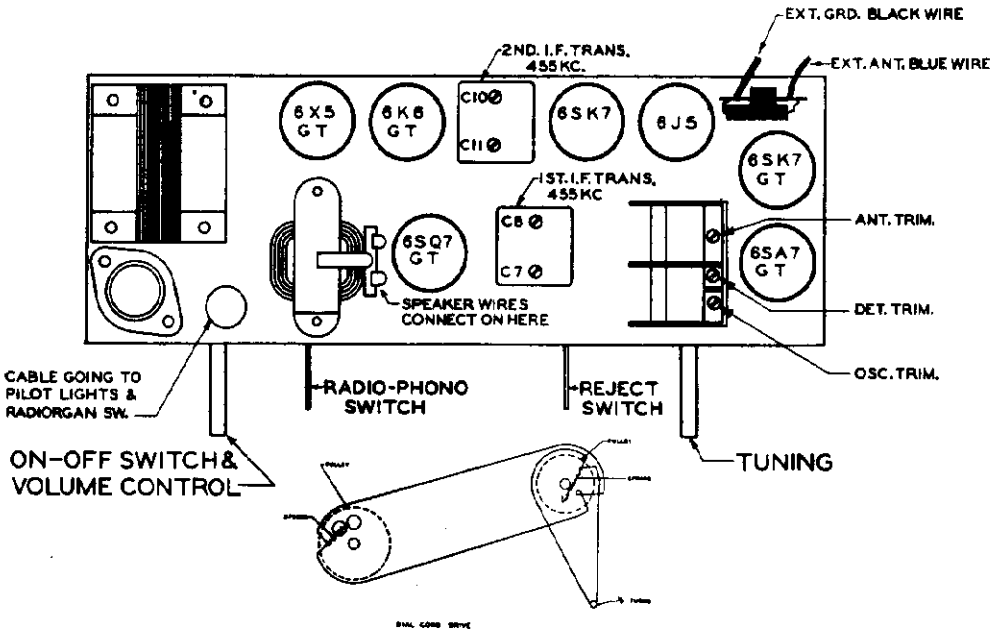
TUNING RANGE 535 — 1620K.C.

A feature of chassis 7E22 is a high gain tuned R.F. stage ahead of the conventional superheterodyne circuit.

When making repairs or adjustments on the chassis be sure to have the Phono-Radio switch in Radio position (button out).

The Radiogran tone control is of the low impedance type in which a portion of the audio voltage is taken from the speaker voice coil and fed back out of phase into the grid of the first audio. The characteristic of the feedback voltage is determined by the setting of the Radiorgan buttons. To attenuate the high notes, more highs are fed back. To attenuate the low notes, more lows are fed back. For normal reproduction, both highs and lows are fed back and results in no overall change in tone.

The 6SK7 1st IF tube is also the phono preamplifier. The output from the phono oscillator is fed to the grid of the 6SK7 through R13 and C25. The amplified output is taken from the screen grid and fed back through U1 and C14 into the volume control circuit and the grid of the 6SQ7GT 1st audio amplifier.



TUBE TRIMMER LOCATION AND DIAL CABLE DRAWING

ALIGNMENT PROCEDURE

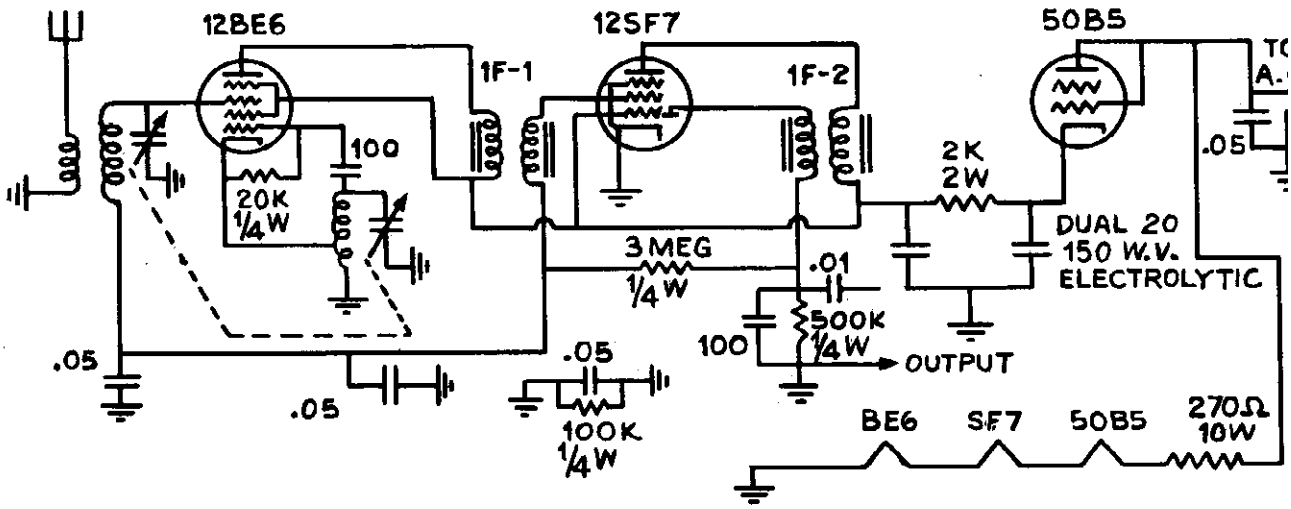
OPERATION	CONNECT OSCILLATOR TO	DUMMY ANTENNA	INPUT SIG. FREQUENCY	SET DIAL AT	TRIMMERS	PURPOSE
1	Converter Grid	.5 Mfd.	455 Kc.	600 Kc.	C-7, C-8 C-10, C-11	Align I. F.
2	One turn loop loosely coupled to the wavemagnet	--	1600 Kc.	1600 Kc.	Oscillator Trimmer	Set Oscillator to Dial Scale
3		--	1400 Kc.	1400 Kc.	Detector Trimmer	Align Det.
4		--	1400 Kc.	1400 Kc.	Antenna Trimmer	Align Ant.

PARTS LIST

PART NO.	REF. NO.	DESCRIPTION
		DIAL ASSEMBLY
26-402		Dial Scale
59-213		Dial Pointer
76-501		Tuning Control Shaft
78-699		Dial Light Socket
80-402		Dial Cord Tension Spring
80-634		Pointer Retaining Spring
93-690		Brown Felt Washer
94-371		Pointer Pulley Bushing (S11292)
100-36	PL-1	Dial Light Bulb - Mazda #44
188-32		Retaining Ring (Tuning Shaft)
188-34		Retaining Ring (Pointer Pulley)
S-11292		Pointer Pulley & Bushing Assem. (59-213)
S11356		Dial Cord & Eyelet Assem. (Short)
S14475		Pulley & Bushing Assem.
S14477		Dial Plate & Stud Assem.
S14476		Dial Cord & Eyelet Assem. (Long)
		COILS & CHOKES
95-1091	T1	1st. I. F. Transformer
95-1092	T2	2nd. I. F. Transformer
S11163	L2	Detector Coil Assembly
S12603	L5	Pre-Amp Oscillator Coil Assembly
S14195	L4	Loop Loading Coil Assembly
S14654	L3	Oscillator Coil Assembly
		CONDENSERS
22-171	C6	.05MFD . . . 600V.
22-182	C17	.00025MFD. (or 22-1666) . . . 500V.
22-186	C14	.02MFD . . . 400V.
22-243	C15	.01MFD . . . 400V.
22-365	C18	.0001MFD . . . 500V.
22-456	C21	.006MFD . . . 600V.
22-530	C5	12MMFD . . . 500V.
22-828	C8	.05MFD . . . 200V.
22-830	C25	.02MFD . . . 600V.
22-854	C12	.0005MFD . . . 600V.
22-887	C20	.001MFD . . . 600V.
22-1041	C29	.005MFD . . . 400V.
22-1256	C26	75MMFD. (or 22-1746) . . . 500V.
22-1418	C28	.1MFD . . . 200V.
22-1531	C19	.2MFD . . . 200V.
22-1720	C22,23,24	Electrolytic 40MFD.-25V.X40-40MFD. 450V
22-1755	C15	16MFD. Electrolytic . . . 300V.
22-1761	C27	50MMFD. Ceramic . . . 500V.
22-1772	C1	Three Gang Variable
105-16	U1	.0005 MFD - 400V .002 MFD - 400V .002 MFD - 400V
		RESISTORS
63-1071	R2	10K Ohm (Insulated) . . . 1W.
63-1534	R23	2700 Ohm . (Insulated) W.W . . . 4W.
63-1222	R21	470 Ohm. . (Insulated) W.W . . . 1W.
63-1571	R12	6800 Ohm . (Insulated) . . . 2W.
63-1848	R9	Volume Control & Switch
63-1758	R3	220 Ohm. . (Insulated) . . . 1/2W.
63-1778	R16	680 Ohm. . .(Insulated). . . . 1/2W.
63-1785	R18	1000 Ohm . .(Insulated). . . . 1/2W.
63-1792	R15	1500 Ohm . .(Insulated). . . . 1/2W.
63-1800	R22	2200 Ohm . .(Insulated). . . . 1/2W.
63-1813	R17	4700 Ohm . .(Insulated). . . . 1/2W.
63-1828	R4	10K Ohm. . .(Insulated). . . . 1/2W.
63-1842	R7	22K Ohm. . .(Insulated). . . . 1/2W.
63-1855	R13	47K Ohm. . .(Insulated). . . . 1/2W.
63-1884	R19	220K Ohm . .(Insulated). . . . 1/2W.
63-1898	R20	470K Ohm . .(Insulated). . . . 1/2W.
63-1908	R10	820 K Ohm. .(Insulated). . . . 1/2W.
63-1911	R14	1 Megohm . .(Insulated). . . . 1/2W.
63-1912	R1	1 Megohm. . .(Insulated). . . . 1/2W.
63-1926	R8	2.2 Megohm .(Insulated). . . . 1/2W.
63-1950	R5	8.2 Megohm .(Insulated). . . . 1/2W.
63-1961	R11	15 Megohm. .(Insulated). . . . 1/2W.
		MISCELLANEOUS
2-133		Cabinet Back
11-104		Line Cord & Plug - 7 Ft. Long
12-886		Tuning Shaft Bracket
12-1187		Dial Plate Bracket - R.H
12-1188		Dial Plate Bracket - L.H
15-82		Plug Cap & Insulator
19-169		Record Changer Mounting Clip (4 Used)
46-697		Tuning & Volume Control Knob
46-726		Phono Switch Knob
49-636	SP-1	10" P.M. Speaker
54-30		208-636 Cone & Voice Coil
54-139		#8-32X5/16" Hd. Nut-Steel-N.P. (Speaker Mtg.)
54-143		#3/8-32X9/16" Palnut Cad
54-228		Speed Nut
54-267		Speed Nut (Trim Strip Mtg.)
57-1380		#6-32X5/16" Palnut-Steel-Cad. (4 Used)
70-83		Dial Escutcheon
72-59		#6X1/2" Washer Hd. Wood Screw (12 Used) (Cabinet Back)
73-35		#2X1/2" Flat Phillips Hd. Wood Screw-Steel Brass Plate
78-709		#8-32X3/16" Hex. Hd. Slotted Set Screw-Cuppoint (2 Used)
78-750	P1	Socket-Octal Tube
78-793		Socket-Phono Cable
80-483		Socket-Octal Tube (6 Used)
80-604		Record Changer Mtg. Spring (4 Used)
83-765		Hinge Spring (2 Used)
83-1245		Armite Strip (3 Used)
83-1501		Record Changer Trim Strip
83-1521		Escutcheon Trim Strip
85-422	S2	Dial Crystal Rubber Strip
85-425	S1	Reject Switch
93-35		Phono-Radio Switch
		.032 x 144 x 3/8" Steel Washer-N.P. (3 Used)
93-125		#6 Int. Shakeproof Lockwasher #1206 (2 Used)
93-392		3/32" X 93/64" X 1" Brown Felt Washer (2 Used)
93-525		1/16" X .127 X 5/16" Fibre Washer
93-897		1/16" X 13/64" X 1" Steel Washer-Cad
94-295		Condenser Mounting Bushing
94-584		Gang Condenser Pulley Bushing
95-1093		Output Transformer
95-1094		Power Transformer
112-56		#6X1/4" Hex. Hd. Self Tapping Screw (2 Used)
112-350		#10X1-3/4" R.H. Self Tapping Screw-Type Z
112-712		Record Changer Mounting Screw (4 Used)
114-26		#8X1/4" Hex. Hd. Self Tapping Screw
114-58		#6-32-X3/8" Hex. Acorn Hd. M.S. -Steel-N.P
114-128		#10X1-1/16" Hex. Washer Hd. Self Tapping Screw (4 Used)
125-17		Rubber Grommet (5 Used)
125-26		Rubber Grommet (2 Used)
159-50		Snap Button-Black Oxidize Finish (5 Used)
192-119		Dial Crystal
196-81		Dial Crystal Dust Gasket
202-602		Instruction Book (Radio & Phono)
S-14004		Non-Intermixer Record Changer
S-14531		Record Changer Compartment Hinge Assem. (R.H.)
S-14532		Record Changer Compartment Hinge Assem. (L.H.)
S-14557		Record Changer Mtg. Frame Assem.
		RADIORGAN ESCUTCHEON PARTS
57-1381		Radiorgan Escutcheon (R.H.)
57-1382		Radiorgan Escutcheon (L.H.)
76-444		Radiorgan Knob Shaft (2 Used)
80-639		Radiogran Retaining Spring (2 Used)
112-723		#6X7/32" Rd. Phillips Hd. Self Tapping Screw
S-14255		Radiorgan Mounting Bracket Assem
S-14261		Radiorgan Strip & Contact Assem. (2 Used)
S-14273		Radiorgan Knob & Eyelet Assem.-Lo-Bass
S-14274		Radiorgan Knob & Eyelet Assem.Bass
S-14276		Radiorgan Knob & Eyelet Assem.Treble
S-14277		Radiorgan Knob & Eyelet Assem.Alto
S-14278		Radiorgan Knob & Eyelet Assem. Normal
S-14554		Radiorgan Escutcheon & Knob Assem. (R.H.)
S-14555		Radiorgan Escutcheon & Knob Assem. (L.H.)
S-14663		Radiorgan Knob & Eyelet Assem. - Voice

25M-648-CPC

ADAPTOL COMPANY MODEL C



Adaptol CT-1 Miniature Superheterodyne Data

The following data will enable you to understand your tuner, and service with a minimum of test equipment.

The circuit is a straightforward superheterodyne of high efficiency, due to the employment of modern, best quality components and tubes. The 12BE is a dual purpose oscillator and mixer. The 12SF7 is used as a high gain I.F. stage, diode detector, and A.V.C. tube. The 50B5 is used as a rectifier because it does not open as readily as a conventional rectifier under overloads, and it permits a smaller value of dropping resistor, with lower dissipation below chassis.

The following voltages should appear under normal operation, with a strong Broadcast signal tuned in ...

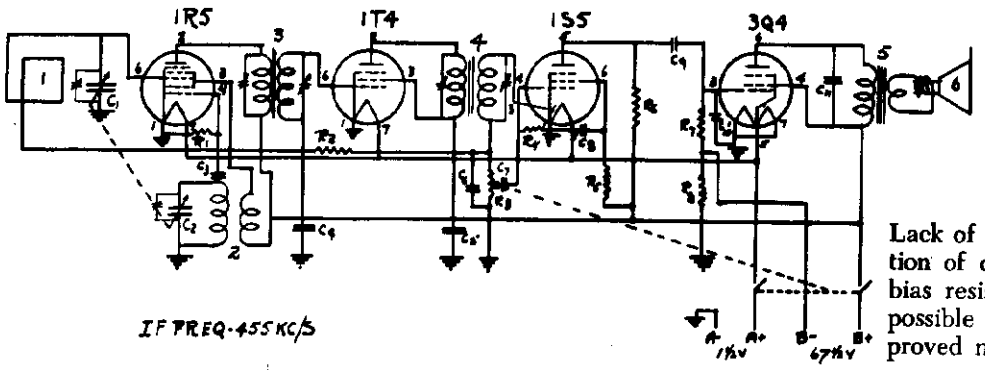
A.V.C. 3-6 volts
Plate at output of filter 100-120 volts
Total current 20-25 milliamperes
Oscillator grid bias 9-11 volts
Power consumption 20 watts 110 volts D.C. 60 cycle A.C.
All voltages measured with a VTVM with respect to B- (not chassis)

I.F. is 455 k.c. I.F.'s are permeability tuned, drift free units.

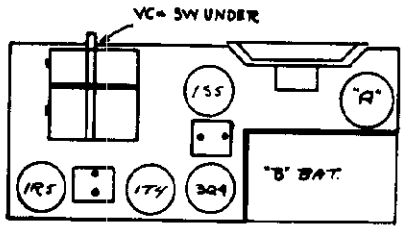
The following gain checks are approximate, depending on the equipment us line voltage, etc. Tuner set for 1000 kc.

Antenna to converter grid 4 to 5
Converter grid to IF grid 30
IF grid to diode 60
Audio Output on strong signal on five foot antenna .5 volt RMS
Selectivity 10 times down 8 kilocycles off resonance at 1000 k.c.

Note: Floating ground is used
⏚ Signifies B minus
⏚ Signifies chassis
Rotating tuning condenser to extreme counterclockwise position silences tuner for "standby", permits instant operation, thus eliminatin necessity for extra switch on amplifier.



TYPE - Four tube battery operated superheterodyne.
BATTERIES USED: "A" battery standard flashlight cell.
Eveready 950, Burgess 2R or equivalent.
"B" battery 67½ volt - Eveready 467, Burgess.
XX45 or equivalent.
TUNING RANGE: 540 to 1700 KCS.
TUBES USED: 1R5 - 1T4 - 1S5 - 3Q4
WARRANTY: This receiver carries the standard RMA guarantee.



PARTS LIST			
PART NO.	Description	PART NO.	Description
R1	100.00 ohms	C1, C2	2 gang condenser
R2	2.2 meg	C3	50 UUF mica
R3	1 meg V.C. & D.P.S.T. switch	C4, C8	.02 paper condenser
R4	8.2 meg	C5	10 MFD 90 volt
R5	3.3 meg	C6, C10	100 UUF mica
R6	1 meg	C7, C9, C11	.005 paper condenser
R7	.5 meg		
R8	510 ohm	1. loop (in case)	
ALL RESISTORS ½ WATT AND ALL CONDENSERS 400 VOLT UNLESS OTHERWISE MARKED.		2. Oscillator Coil 3. 1st I.F. 455 KCS 4. 2nd I.F. 455 KCS 5. Output Transformer 6. 3" P.M. - 1 oz. Magnet	

SERVICE DATA

Lack of sensitivity and poor tone quality may be due to any one or a combination of causes such as weak or defective tubes or speaker, open or grounded bias resistor, bypass condenser, etc. Never attempt to realign set until other possible sources of trouble have been thoroughly investigated and definitely proved not to be the cause.

NOTE: IT IS ABSOLUTELY NECESSARY THAT AN ACCURATELY CALIBRATED OSCILLATOR WITH SOME TYPE OF OUTPUT MEASURING DEVICE BE USED WHEN ALIGNING THE RECEIVER AND THAT THE PROCEDURE BE CAREFULLY FOLLOWED. OTHERWISE THE RECEIVER WILL BE INSENSITIVE AND THE DIAL CALIBRATION WILL BE INCORRECT. THE TRIMMERS WILL BE REFERRED TO BY THEIR FUNCTION AS INDICATED ON THE PARTS DIAGRAM.

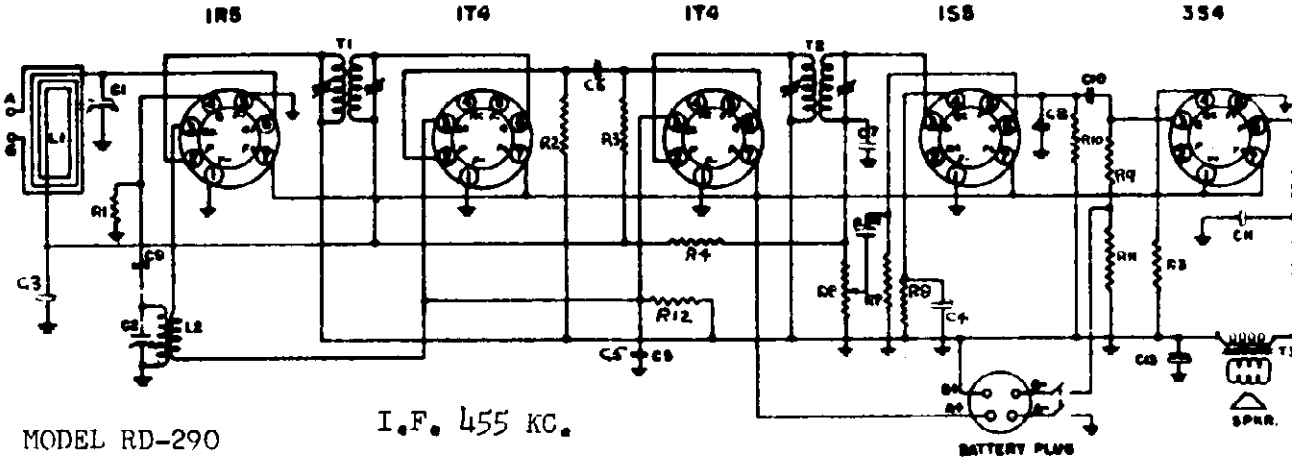
ALIGNMENT PROCEDURE

GENERAL DATA: The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 455, 1400, 1700 KCS and an output meter to be connected across the primary or secondary of the output transformer. If possible all alignments should be made with the volume control on maximum and the test oscillator output as low as possible. For more accuracy a vacuum tube voltmeter should be used.

1. Couple signal generator to loop loosely using one or two turns of wire connected to signal generator output.
2. Set signal generator of 455 KC and adjust the 4 I.F. trimmers on top of I.F. cans. An output meter may be connected across voice coil but we suggest for more accurate alignment that a vacuum tube voltmeter be connected between ground and tie lug connecting return lead of loop.
3. The oscillator trimmer should next be set so that a 1700 KC signal comes in at minimum setting of condenser. (Plates all out.)
4. The R.F. trimmer should be set at 1400 KC. It is suggested that it be adjusted with both batteries in case and chassis as near in the case as possible, and still adjust trimmer; as the chassis affects inductance of loop.

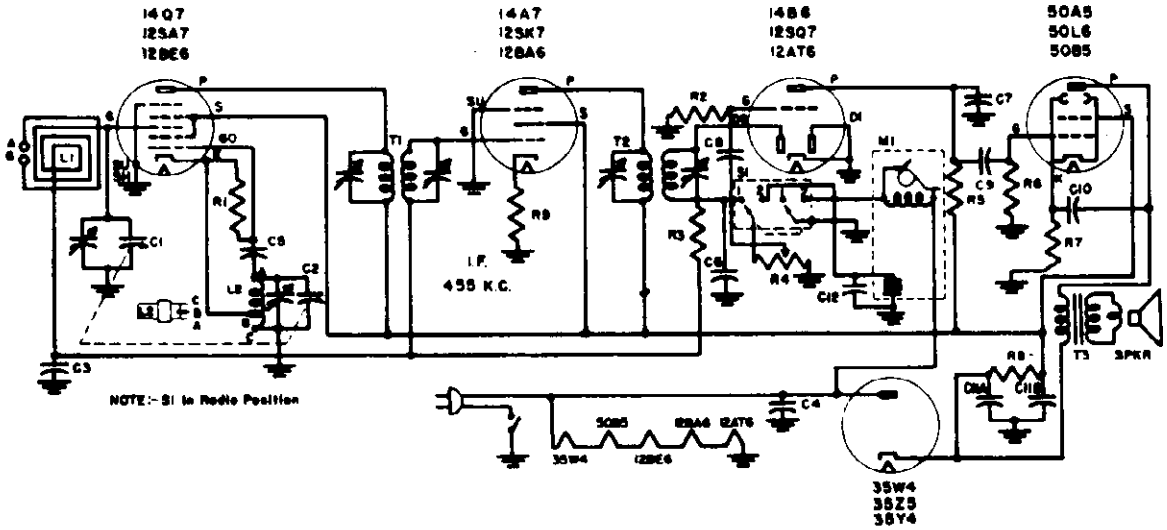
BUTLER BROTHERS

MODEL RD-29
MODEL RD-29



MODEL RD-290 I.F. 455 KC.

Circuit Symbol	Part Number	Description	Circuit Symbol	Part Number	Description
C1,C2	CV-10002-E	Condenser-Variable with pulley	R6,R9	RC-32004	Resistor-Carbon, 2 Meg ohms ½ watt
C3,C4,C5	CP-14503	Condenser-Paper, 0.05 mfd. 400 volt	R10	RC-31004	Resistor-Carbon, 1 Meg ohm ½ watt
C6,C7	CM-15251	Condenser-Mica, 250 mmfd. 500 volt	R11	RC-25003	Resistor-Carbon, 400 ohms ½ watt
C8,C9	CM-15500	Condenser-Mica, 50 mmfd. 500 volt	R12	RC-31002	Resistor-Carbon, 10,000 ohms ½ watt
C10,C11,C12	CP-14105	Condenser-Paper, 0.01 mfd. 600 volt	L1	AL-10004	Antenna-Loop
C13	CL-10003	Condenser-Electr. 12 to 20 mfd. 150 volt	L2	TRC-10001	Coil-Oscillator
R1	RC-31003	Resistor-Carbon, 100,000 ohms ½ watt	T1	TS-10000	Transformer-1st I.F.
R2,R3	RC-25001	Resistor-Carbon, 5,000 ohms ½ watt	T2	TS-10001	Transformer-2nd I.F.
R4,R5	RC-32004	Resistor-Carbon, 2 Meg ohms ½ watt	T3	TO-10002	Transformer-Output
R8	VC-20105	Control-Volume, 1 Meg ohm with d.p.s.t. switch	SPKR	SR-10002	Speaker-P.M. 5" round less output transformer
R7	RC-31505	Resistor-Carbon, 10 Meg ohms ½ watt			

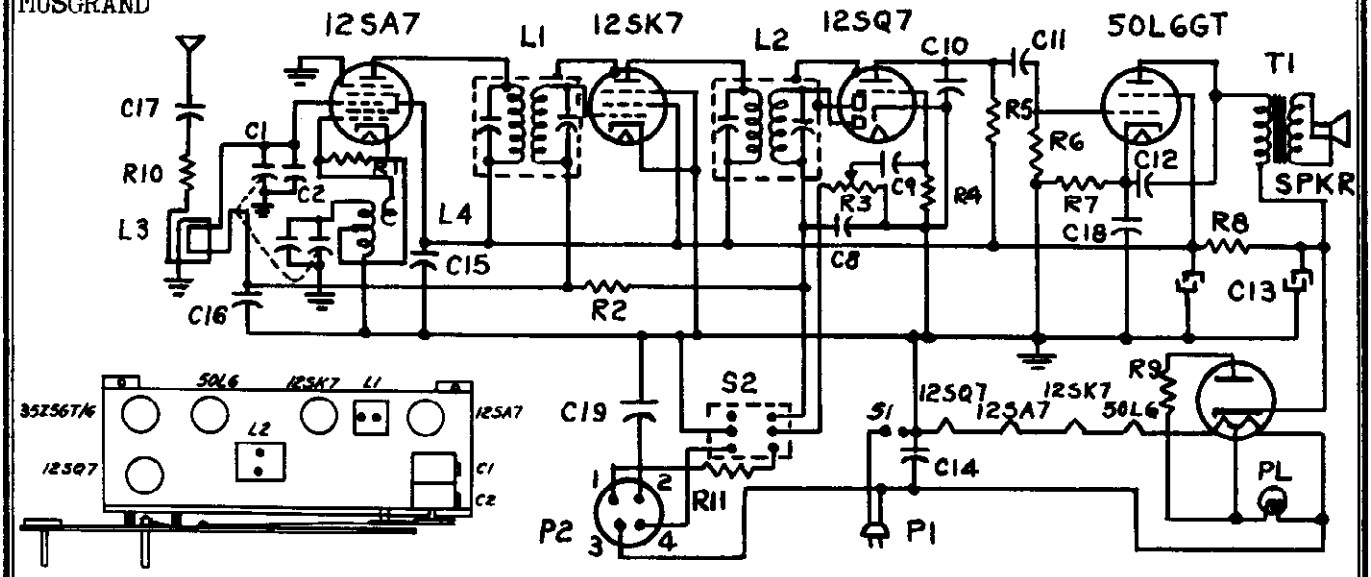


MODEL RD-291 I.F. 455 KC.

Circuit Symbol	Part Number	Description	Circuit Symbol	Part Number	Description
C1,C2	CV-10002-E	Condenser-Variable, with pulley	R6	RC-25005	Resistor-Carbon, 500,000 ohms ½ watt
C3	CP-12508	Condenser-Paper, 0.05 mfd., 200 volt	R7	RC-31500	Resistor-Carbon, 150 ohms ½ watt
C4,C10	CP-14503	Condenser-Paper, 0.05 mfd., 400 volt	R8	RC-32000	Resistor-Carbon, 200 ohms ½ watt
C5	CM-15500	Condenser-Mica, 0.00005 mfd., 500 volt	R9	RC-30680	Resistor-Carbon, 68 ohms ½ watt
C6,C7	CM-15251	Condenser-Mica, 0.00025 mfd., 500 volt	M1	PRA-10000	Changer Automatic
C8	CP-12103	Condenser-Paper, 0.01 mfd., 200 volt	L1	AL-10003	Loop-Antenna
C9	CP-14103	Condenser-Paper, 0.01 mfd., 400 volt	L2	TRC-10000-B	Coil-Oscillator
C11A,C11B	CL-10001	Condenser-Electrolytic 20/20/20 mfd., 150 volt	T1	TS-10000	Transformer-1st I.F.
R1	RC-32002	Resistor-Carbon, 20,000 ohms ½ watt	T2	TS-10001	Transformer-2nd I.F.
R2	RC-31005	Resistor-Carbon, 10 Megohms ½ watt	T3	TO-10000	Transformer-Output
R3	RC-32004	Resistor-Carbon, 2 Megohms ½ watt	SPKR	SR-10000	Speaker-P.M. 4" round less T3
R4	VC-10105	Control-Volume, with switch, 1 Megohm	S1	VS-10000	Switch-Radio Phono, a.p. three position
R5	RC-32503	Resistor-Carbon, 250,000 ohms ½ watt			

MODEL 100
MUSGRAND

ECKENROTH CO., INC.



Parts Description List

C1	Ant. Trimmer cond.	L1	1st. I F transformer
C2	Osc. Trimmer cond.	L2	2nd. I F transformer
C8	220 mfd mica capacitor	L3	Antenna loop
C9	.005 mfd paper cap.	L4	Oscillator coil
C10	220 mfd mica cap.	PL	Pilot lamp
C11	.01 mfd paper cap.	T1	Output transformer
C12	.02 mfd paper cap.	P2	Phono plug
C13	Filter 50/30 mfd 150V	R1	22,000 ohm carbon resistor
C14	.05 mfd paper cap.	R2	2.2 megohm carbon resistor
C15	.05 mfd paper cap.	R3	Volume control 0.5 megohm
C16	.05 mfd paper cap.	R4	4.7 megohm carbon resistor
C17	.01 mfd paper cap.	R5	470,000 ohm carbon resistor
C18	25 mfd 25 volt elect.	R6	470,000 ohm carbon resistor
C19	.1 mfd paper cap.	R7	150 ohm carbon resistor
Spkr	Loudspeaker	R8	1200 ohm carbon resistor
S-1	Line switch on Vol. cont.	R9	18 ohm carbon resistor
S-2	Radio-Phone switch	R10	470 ohm carbon resistor
P-1	Line plug	R11	1.8 megohm carbon resistor

SERVICE NOTES

Rating: 105-125 volts 60 cycles AC

Tuning frequency range: 540-1720 Kilocycles

Intermediate frequency: 455 KC

Loudspeaker: Alnico V Magnet Dynamic
Outside cone diameter 5-1/4 inch diameter
Voice coil impedance (400 Cycles) 3.2 Ohms

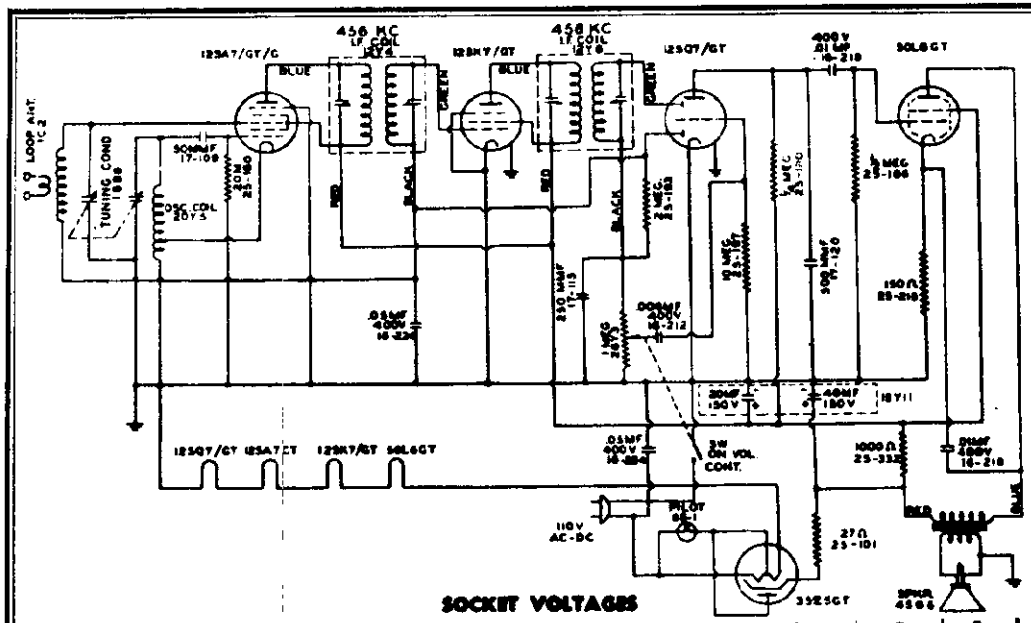
Tubes:
Converter and oscillator	12SA7
I.F. Amplifier	12SK7
Det., Audio, A.V.C.	12SQ7
Power Output	50L6GT
Rectifier	35Z5GT/G
Pilot Lamp	G.E. 47

ALIGNMENT PROCEDURE

I.F. Alignment: Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 KC. and keep the oscillator output as low as a readable meter reading will permit. Apply signal to the converter grid through a .05 mfd. capacitor and align progressively the trimmers in the second and first IF transformer cans.

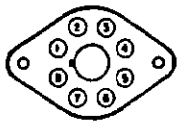
R.F. Alignemt : Apply the R.F. alignment signals through a standard I.R.E. dummy Ant. to the receiver antenna post. With the gang condenser wide open, align the oscillator trimmer on front section of gang to 1720 KC. Change the signal generator to 1500 KC., tune the receiver to the signal and peak the antenna trimmer on rear section of gang for maximum output on output meter.

Precaution: If the signal generator is AC operated, use an isolating transformer between the power supply and the radio receiver power input. The use of an isolating capacitor is not recommended, as A-C through the capacitor will introduce hum modulation and/or create the possibility of a burned out signal generator attenuator.



SOCKET VOLTAGES

TUBE	POSITION	1	2	3	4	5	6	7	8
12SA7GT	Osc. and Mixer	0	37.5 AC	99	99	-4.2	0	24.5 AC	0
12SK7GT	IF Amplifier	0	24.5 AC	0	0	0	99	12.5 AC	99
12SQ7GT	2nd Det.—1st Audio	0	0	0	0	0	16	12.5 AC	0
50L6GT	Power Output	0	85 AC	91.5	99	0	0	37.5 AC	5.9
35Z5GT	Rectifier	0	117 AC	112 AC	0	112 AC	0	85 AC	112



NOTE: All DC voltages measured with a 1000 ohm per volt meter from ON-OFF switch (—B) to socket contact indicated. All AC voltages are measured from ON-OFF switch (—B) to socket contact indicated.
All voltages are positive DC unless otherwise marked.
Volume control full on.
Line voltage 117 volts AC.

ALIGNMENT PROCEDURE

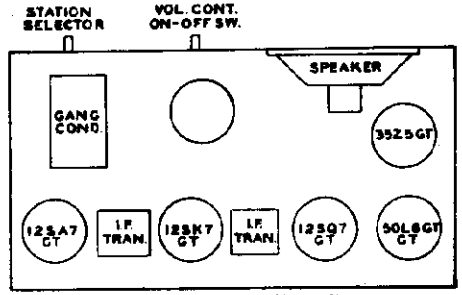
The following equipment is necessary to properly align this chassis:

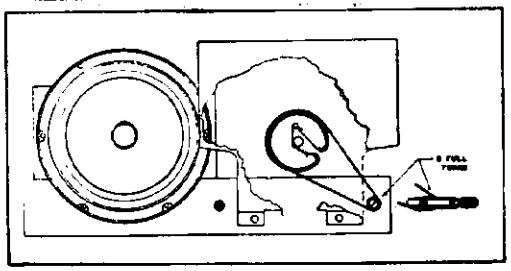
1. A signal generator which will provide an accurately calibrated signal at the frequencies listed.
2. An output meter.
3. A non-metallic screwdriver.
4. Dummy antenna: — .1 mfd., — 10 mmf.

GENERATOR	CONNECTION AT RADIO	DUMMY ANTENNA	DIAL	TO TUNE TRIMMERS	REMARKS
IF 455 kc.	12SA7GT grid	.1 mfd.	HF end	IF trimmers C D E F	Tune to max.
	12SA7GT Grid	10 mmf.	LF end	Osc. trimmer B	Set limit of

PARTS LIST

PART NO.	DESCRIPTION
1C2	Loop antenna assembly
18B6	Tuning gang condenser
12Y4	1st I.F. transformer 456KC
12Y8	2nd I.F. transformer 456KC
15Y11	Two section electrolytic cond.
26Y3	Vol. cont. & Switch 1 megohm
20Y5	Oscillator coil
45B6	5" PM dynamic speaker
66-1	Pilot lamp 6-8 volt type 47





Dial Mechanism

TUBE COMPLEMENT

1—12SA7GT Oscillator and Mixer tube
1—12SK7GT IF Amplifier tube
1—50L6GT Power Output tube
1—35Z5GT Rectifier tube
1—12SQ7GT Second Detector and First Audio tube

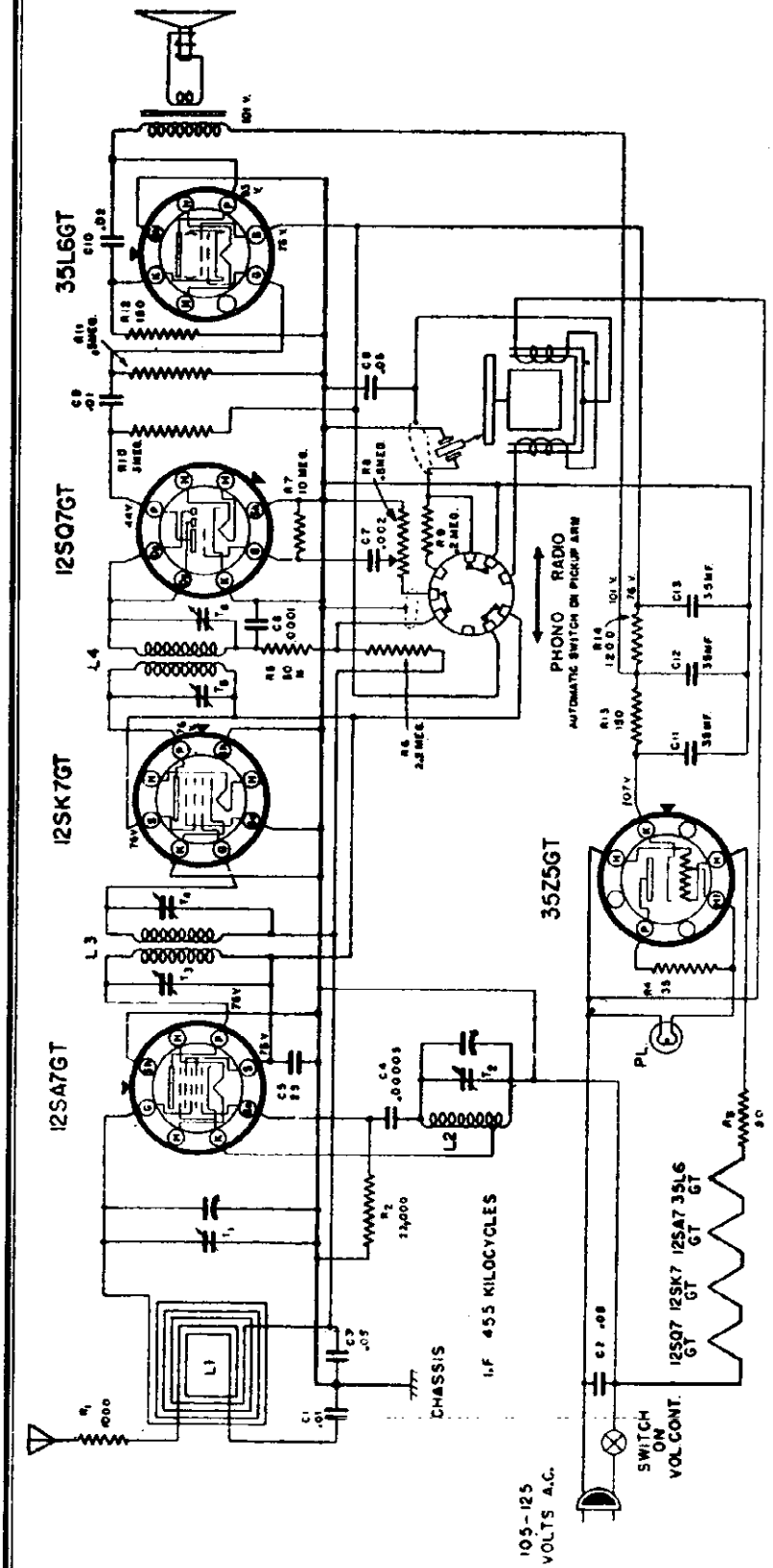
NOTE: The above glass tubes are interchangeable with their metal equivalent.

Electrical and Mechanical Specifications

Frequency Range	540-1700 kc.
Intermediate Frequency	455 kc.
Power Supply	105-125 volts AC-DC
Power Output (Undistorted)	.75 watts
Power Output (Maximum)	1.5 watts
Tuning Drive Ratio	3 to 1

MODEL 68F

INTERSTATE HOME EQUIPMENT CO.



Alignment Frequencies:

I. F. ..... 455 K.C.
R. F. ..... 1500 K.C.

I. F. Alignment

Connect an output meter across the voice coil. Rotate the volume to maximum. Set test oscillator to 455 K.C. and apply signal to lug on stator of gang condenser to which loop is connected through a .05 Mfd. capacitor. Align the second I. F. transformer trimmers, next adjust the first I. F. transformer trimmers. Keep test oscillator output as low as a readable meter reading will permit.

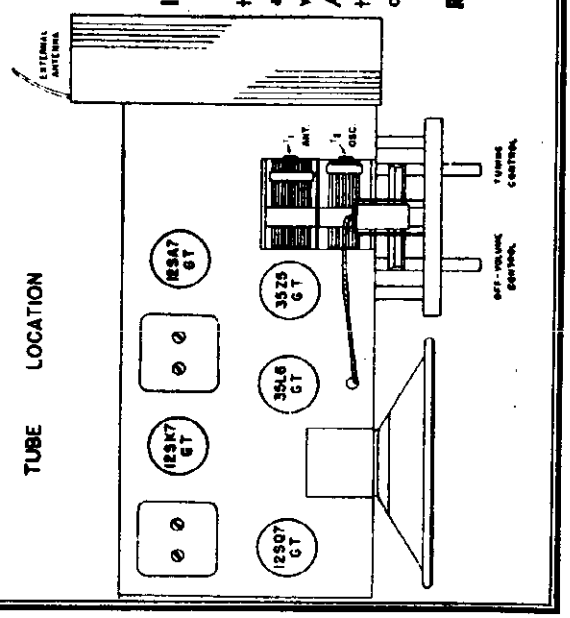
R. F. Alignment

Set the dial pointer and generator at 1500 K.C. Run wire from the output terminal of the generator, having it come near the receiver. However, no metallic connection is made between the signal generator and the receiver.

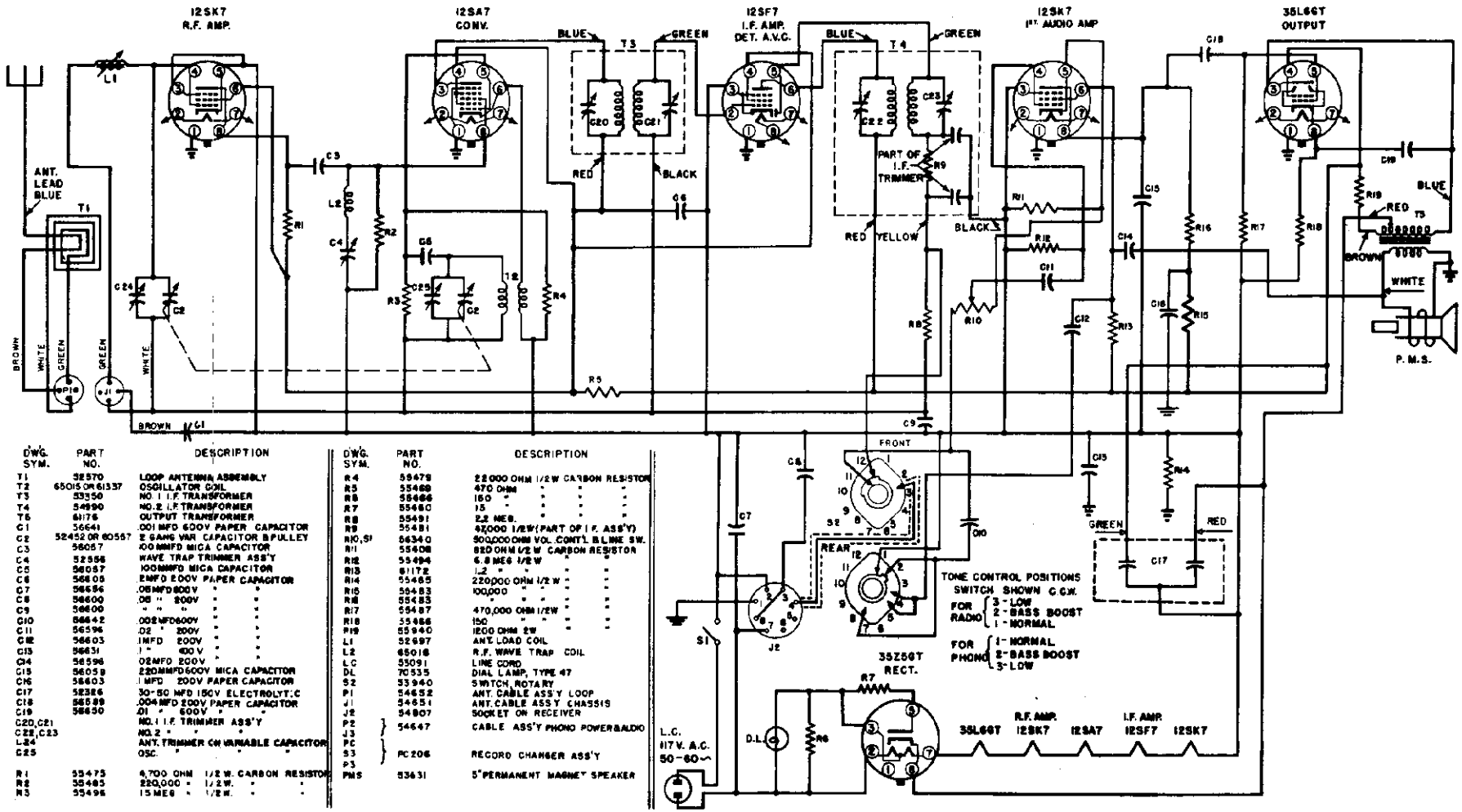
Peak the oscillator trimmer for maximum output and then the antenna trimmer.

If the variable condenser plates have become bent or damaged, it may be necessary to adjust them for tracking, at 600 K.C. The oscillator plates are adjusted first, then the antenna plates are adjusted for maximum output at 600 K.C.

This radio is a compact, table model phono-radio superheterodyne receiver using six tubes and operates from an A.C. source of power. This receiver tunes the broadcast band of frequencies, covering the range of 540-1720 kilocycles.

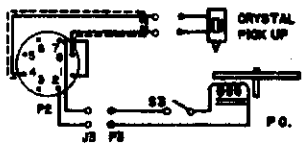


BOTTOM VIEWS OF ALL SOCKET CONNECTIONS



DWG. SYM.	PART NO.	DESCRIPTION
T1	32570	LOOP ANTENNA ASSEMBLY
T2	65015 OR 61337	OSCILLATOR COIL
T3	53350	NO. 1 I.F. TRANSFORMER
T4	54990	NO. 2 I.F. TRANSFORMER
T5	61176	OUTPUT TRANSFORMER
C1	56641	.001 MFD 600V PAPER CAPACITOR
C2	52452 OR 60567	3 GANG VAR. CAPACITOR &PULLEY
C3	56057	.00 MMFD MICA CAPACITOR
C4	52356	WAVE TRAP TRIMMER ASS'Y
C5	56057	100MMFD MICA CAPACITOR
C6	56606	2MFD 600V PAPER CAPACITOR
C7	56656	.05MFD 600V " "
C8	56600	.05 " 200V " "
C9	56600	" " " " "
C10	56642	.002MFD 600V " "
C11	56596	.02 " 200V " "
C12	56603	.1MFD 200V " "
C13	56631	.1 " 400V " "
C14	56596	.02MFD 200V " "
C15	56059	220MMFD 600V MICA CAPACITOR
C16	56603	.1 MFD 200V PAPER CAPACITOR
C17	52386	30-50 MFD 150V ELECTROLYTIC
C18	56589	.004 MFD 200V PAPER CAPACITOR
C19	56650	.01 " 600V " "
C20,C21		NO. 1 I.F. TRIMMER ASS'Y
C22,C23		NO. 2 " " " "
L24		ANT. TRIMMER OR VARIABLE CAPACITOR
C25		OSC. " " " "
R1	55475	4,700 OHM 1/2 W. CARBON RESISTOR
R2	55485	220,000 " 1/2 W. " "
R3	55496	1.5 MEG " 1/2 W. " "

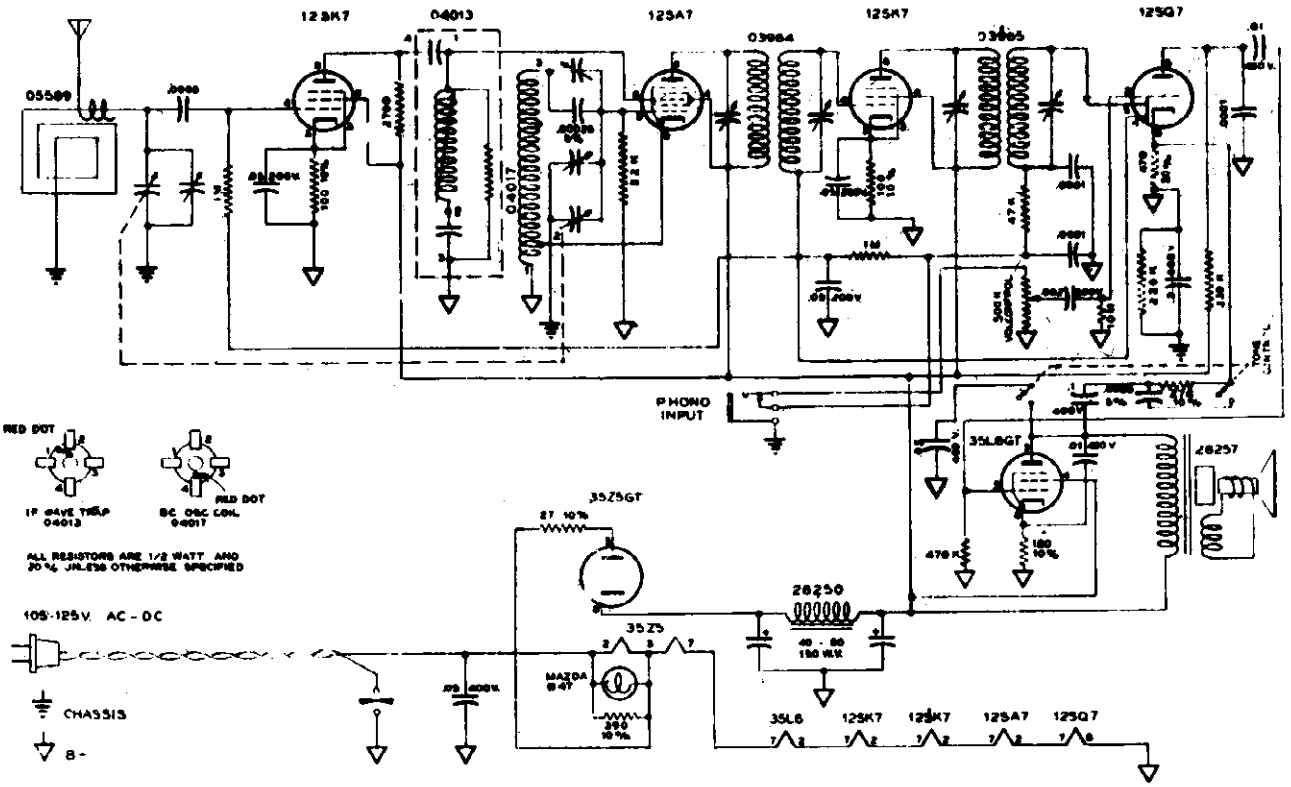
DWG. SYM.	PART NO.	DESCRIPTION
R4	55479	22,000 OHM 1/2 W CARBON RESISTOR
R5	55469	470 OHM " " " "
R6	55466	150 " " " "
R7	55460	15 " " " "
R8	55491	2.2 MEG. " " "
R9	55481	47,000 1/2 W (PART OF I.F. ASS'Y)
R10,S1	56340	500,000 OHM VOL. CONT'L. & LINE SW.
R11	55408	820 OHM 1/2 W CARBON RESISTOR
R12	55494	6.8 MEG 1/2 W " "
R13	61172	1.2 " " " "
R14	55485	220,000 OHM 1/2 W " "
R15	55483	100,000 " " " "
R16	55483	" " " " "
R17	55487	470,000 OHM 1/2 W " "
R18	55466	150 " " " "
R19	55940	1200 OHM 2 W " "
L1	52697	ANT. LOAD COIL
L2	65016	R.F. WAVE TRAP COIL
LC	55091	LINE CORD
DL	70535	DIAL LAMP, TYPE 47
S2	53940	SWITCH, ROTARY
P1	54652	ANT. CABLE ASS'Y LOOP
J1	54651	ANT. CABLE ASS'Y CHASSIS
J2	54907	SOCKET ON RECEIVER
P2	54647	CABLE ASS'Y PHONO POWER & AUDIO
J3		
P4	PC 206	RECORD CHANGER ASS'Y
P3		
PMS	53631	5" PERMANENT MAGNET SPEAKER

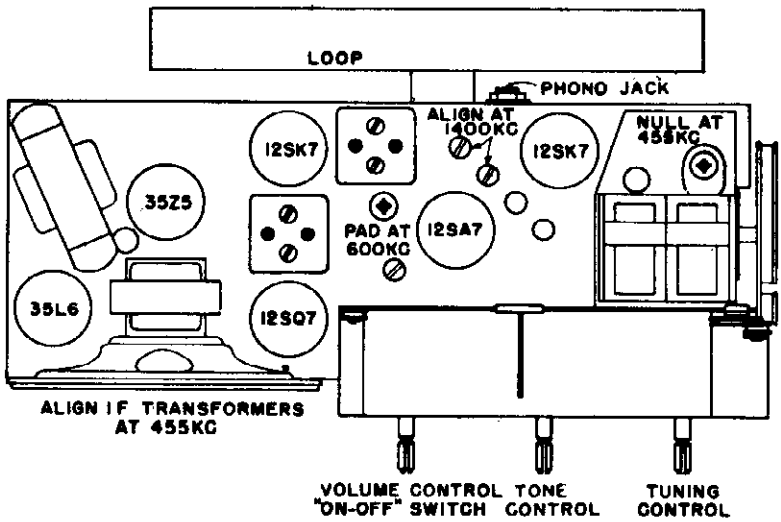


B.C. BAND 540-1730 KC.
INTERMEDIATE FREQUENCY 455 KC.
- - - - - - SHIELDED

MODEL 6K

MAGUIRE INDUSTRIES, INC.





TUBE LAYOUT

This is a 6-tube superheterodyne radio receiver, with provision for phonograph input, for operation on 105-125 volt AC or DC power supply. The tubes used are a 12SK7 as an R.F. amplifier, a 12SA7 as an oscillator-converter, a 12SK7 as an I.F. amplifier, a 12SQ7 as an AVC, detector, and 1st audio amplifier, a 35L6 as an output, and a 35Z5 as a power rectifier.

The broadcast band covers a frequency range from 535 to 1620 kilocycles. The dial is calibrated in kilocycles (KC) (less the final zero).

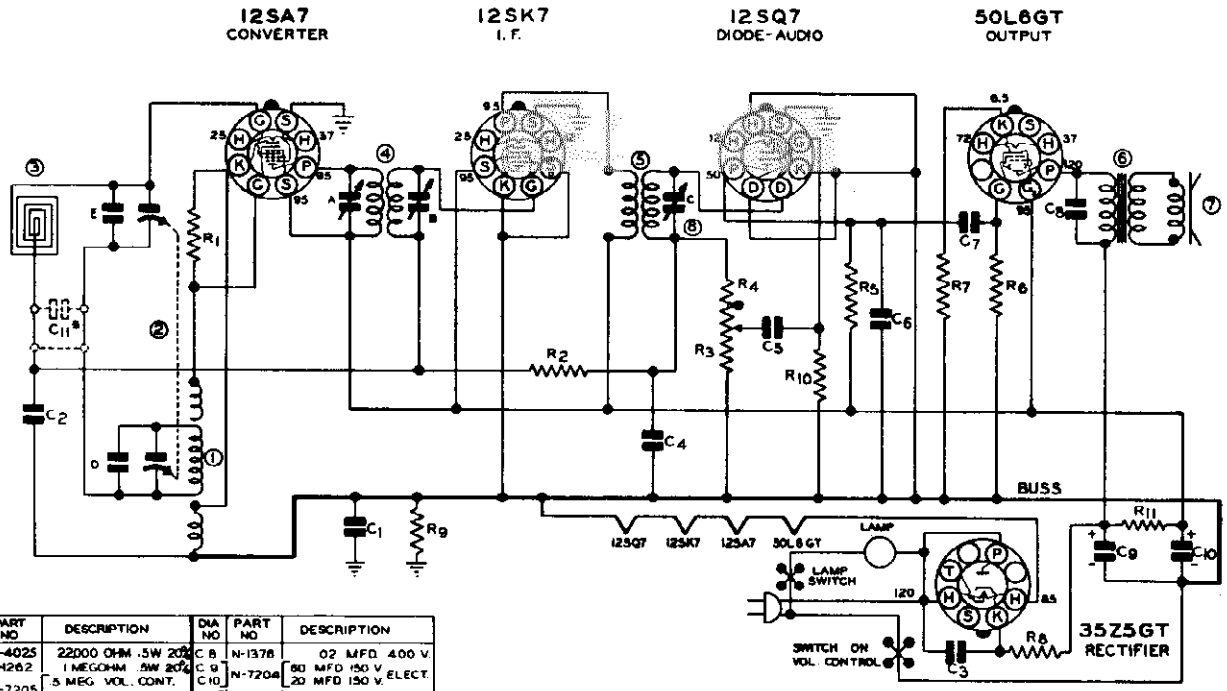
When using D.C. power supply, and after allowing sufficient time for tubes to warm up, if the receiver does not operate, remove the line cord plug from the socket and reverse. Replace the plug in the reverse position and allow tubes to warm up, at which time the receiver will operate.

When using A.C. power supply, it will be found that there will be less hum when the line cord is in the best position. Try both positions, leaving the plug in the position that produces the least hum.

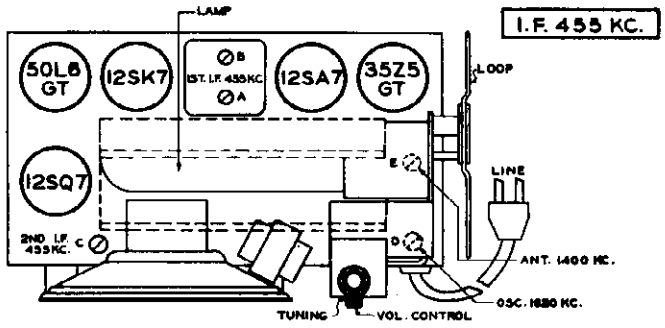
For reception of local stations no antenna is necessary, the built-in loop providing sufficient volume. If it is desired to listen to more distant stations, an antenna 50 to 100 feet long should be connected to the flexible lead protruding from the rear of the cabinet. **Do not use a ground with this receiver.**

MITCHELL MFG. CO.

MODEL LULLABY
BED-LAMP RADI



DIA NO	PART NO	DESCRIPTION	DIA NO	PART NO	DESCRIPTION
R1	N-4025	22000 OHM .5W 20%	C 8	N-1378	02 MFD 400 V.
R2	N-1262	1 MEGOHM .5W 20%	C 9	N-7204	60 MFD 150 V ELECT.
R3	N-7205	.5 MEG VOL. CONT.	C10		20 MFD 150 V.
R4		IN VOLUME CONTROL	C11*	N-1345	.05 MFD. 200 V. USED IN SOME MODELS
R5	N-4026	220,000 OHM .5W 20%			
R6	N-4027	470,000 OHM .5W 20%			
R7	N-6244 OR N-4024	220 OHM .5W 10% 220 OHM .5W 10%			
R8	N-6256	47 OHM LOW 10%			
R9	N-4026	220,000 OHM .5W 20%		N-2084	LAMP SWITCH
R10	N-4028	6.8 MEGOHM .5W 20%		N-2585	25W. T-10 110V. LAMP
R11	N-4900	1200 OHM LOW 10%			
			1	N-7139	OSCILLATOR COIL
C1	N-1345	.05 MFD 200 V.	2	N-7203	2 GANG CONDENSER
C2	N-1345	.05 MFD 200 V.	3	N-7199	ANT. LOOP COIL
C3	N-1346	.05 MFD 400 V.	4	N-4813	IST. I.F.
C4	N-6015	100 MMFD CERAMIC	5	N-4846	2ND I.F.
C5	N-4894	005 MFD 600 V.	6	N-7197 OR	SPK'R & OUTPUT XFMR.
C6	N-6135	250 MMFD CERAMIC	7	N-7198	
C7	N-1344	.01 MFD 400 V.	8	N-4985	2ND I.F. TRIMMER



This receiver is designed to operate over the standard broadcas band which extends from 535 to 1620 Kilocycles (KC) (185 to 56 Meters.)

ALIGNMENT PROCEDURE

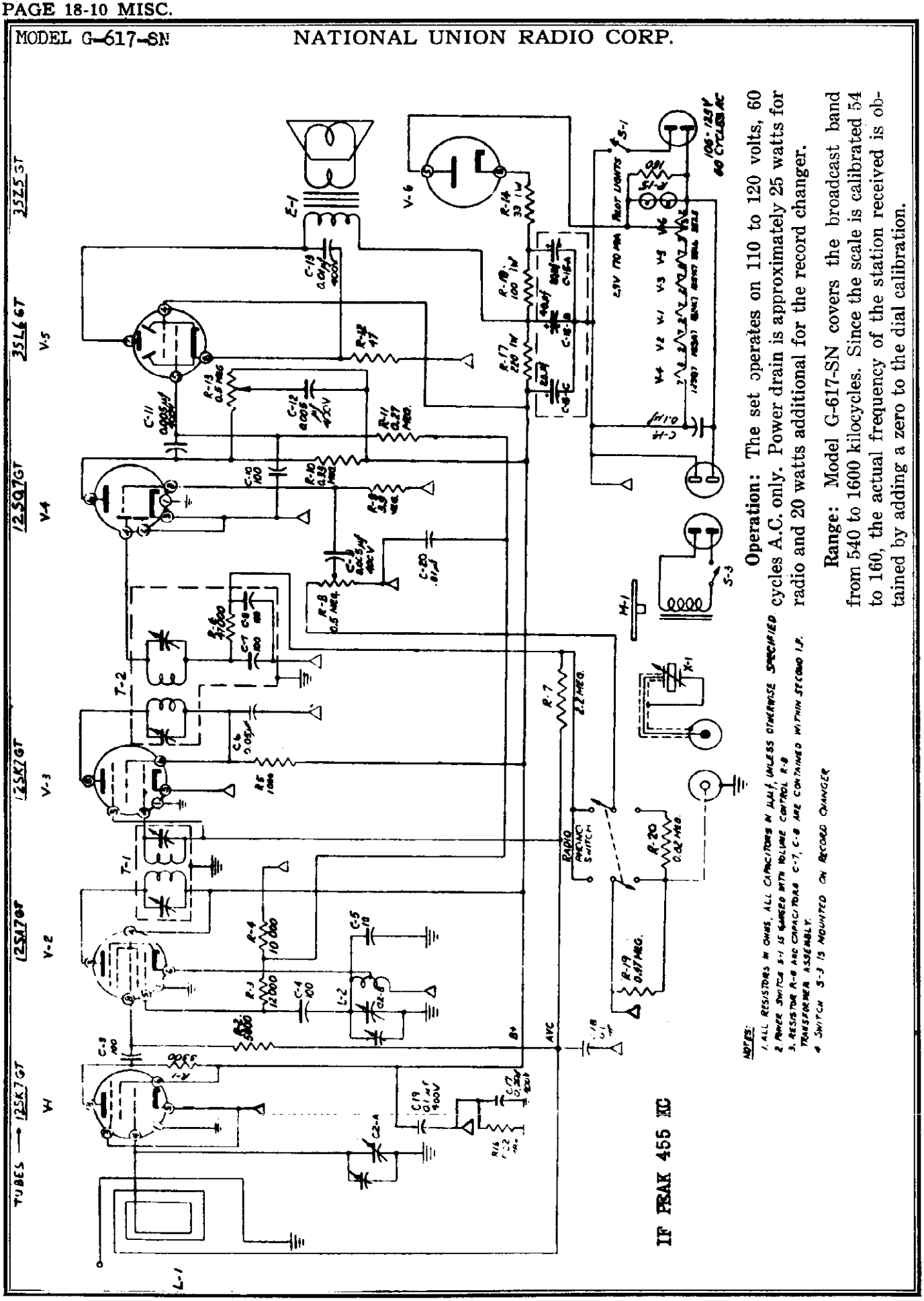
GENERAL DATA. The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 455, 600, 1400 and 1620 KC and an output meter to be connected across the primary or secondary of the output transformer. If possible, all alignments should be made with the volume control on maximum and the test oscillator output as low as possible to prevent the AVC from operating and giving false readings.

CORRECT ALIGNMENT PROCEDURE. The intermediate frequency (I.F.) stages should be aligned properly as the first step. After the I.F. transformers have been properly adjusted and peaked, the broadcast band should be adjusted.

I.F. ALIGNMENT. Remove the chassis and loop antenna from the cabinet and set them up on the bench so that they occupy exactly the same respective positions on the bench as they did in the cobinet. Care should be taken to have no iron or other metal near the loop. Do not make this set-up on a metal bench. With t gang condenser set at minimum, adjust the test oscillator to 4 KC and connect the output to the grid of the converter tube (12SA through a .05 or .1 mfd. condenser. The ground on the test oscilla should be connected to the ground buss, indicated on the circ diagram. Align all three I.F. trimmers to peak or maximum readi on the output meter.

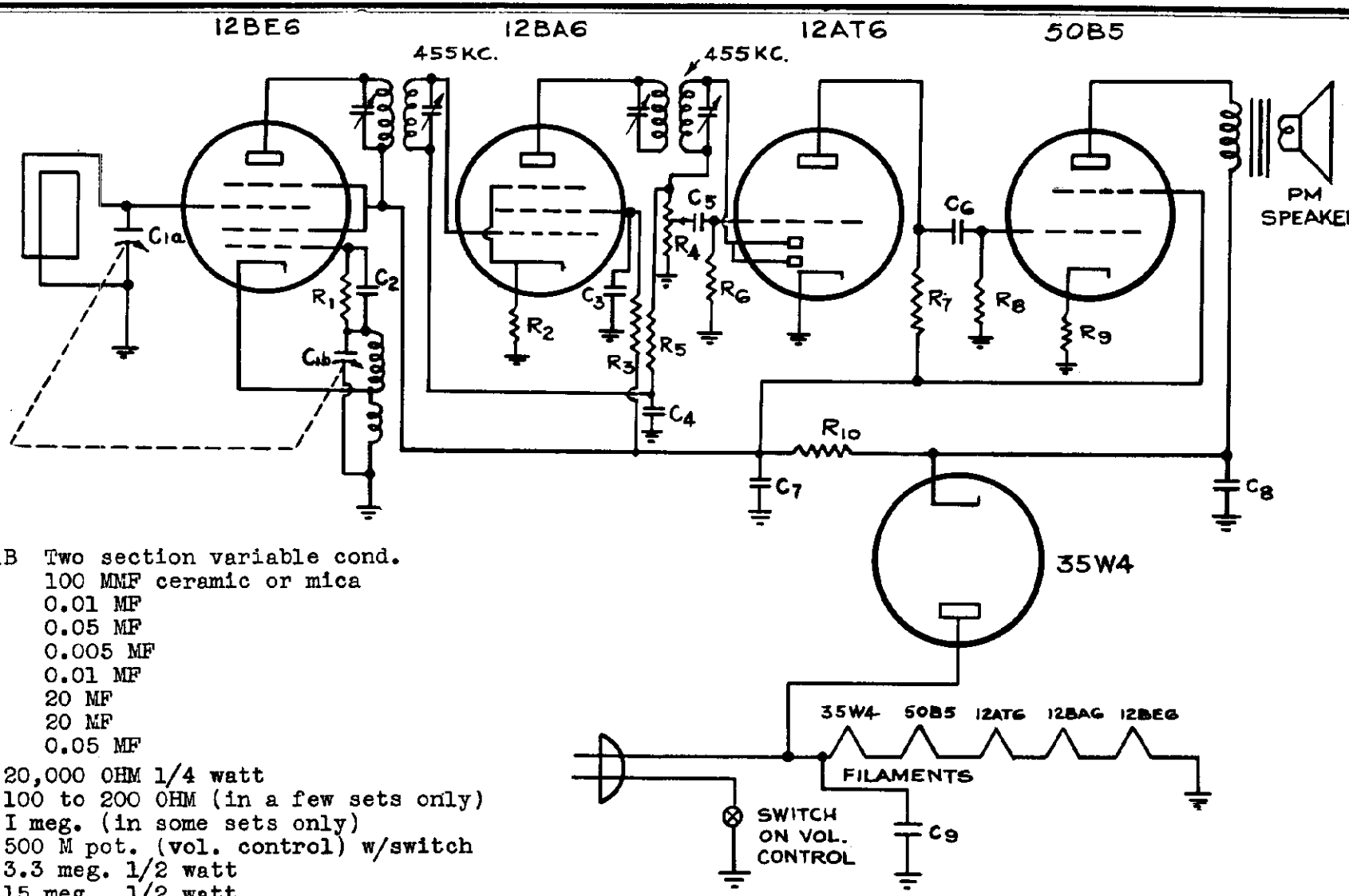
BROADCAST BAND ALIGNMENT. Connect the test oscillator to a dummy l which can be made by coiling 2 turns of hookup wire about 6" in diame Place this dummy loop about a foot from the loop on the receiver and in same plane as the receiver loop. With the gang condenser set at minim capacity, set the test oscillator at 1620 KC, and adjust the oscillator (or 1620 trimmer) on the gang condenser. Next—set the test oscillator at 1400 KC, tune in the signal on the gang condenser. Adjust the antenna trimmer (or 1 KC trimmer) for maximum signal. Next set the test oscillator at 600 KC, tune in signal on condenser to check alignment of coils.

MODEL G-617-SN NATIONAL UNION RADIO CORP.



Operation: The set operates on 110 to 120 volts, 60 cycles A.C. only. Power drain is approximately 25 watts for radio and 20 watts additional for the record changer.

Range: Model G-617-SN covers the broadcast band from 540 to 1600 kilocycles. Since the scale is calibrated 54 to 160, the actual frequency of the station received is obtained by adding a zero to the dial calibration.

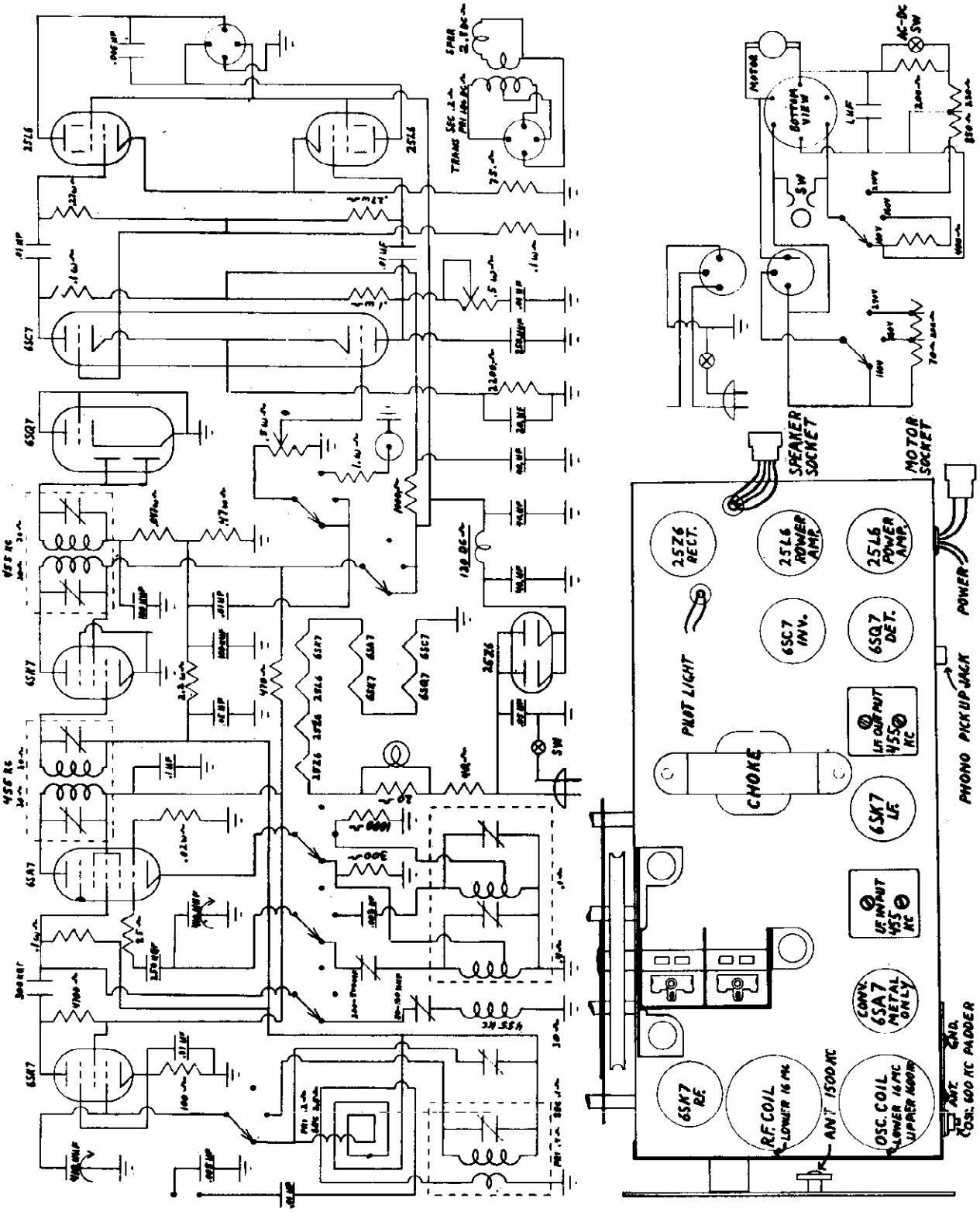


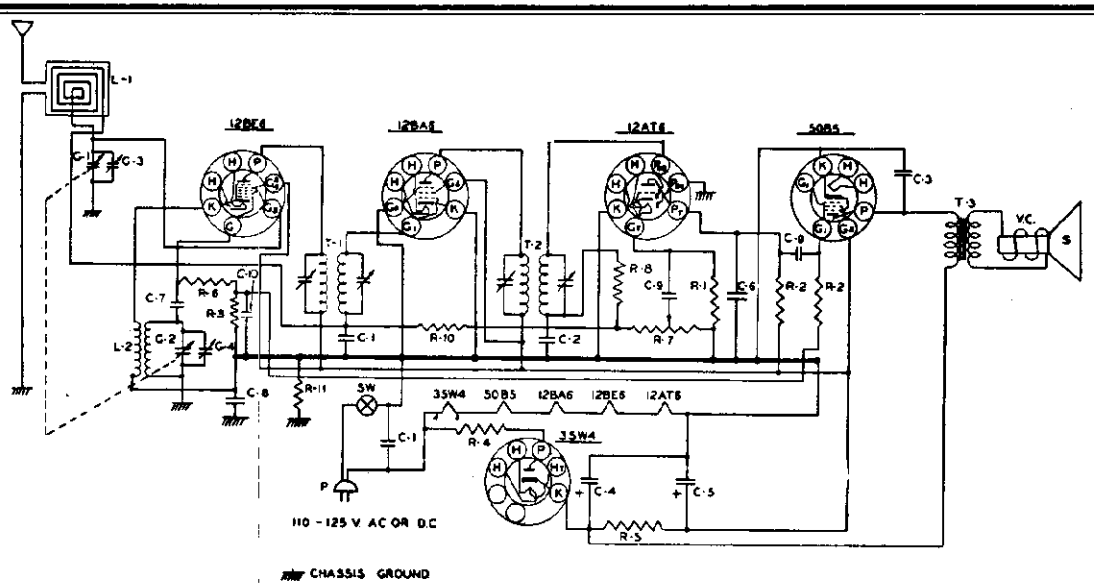
C1A, C1B Two section variable cond.
C2 100 MMF ceramic or mica
C3 0.01 MF
C4 0.05 MF
C5 0.005 MF
C6 0.01 MF
C7 20 MF
C8 20 MF
C9 0.05 MF
R1 20,000 OHM 1/4 watt
R2 100 to 200 OHM (in a few sets only)
R3 I meg. (in some sets only)
R4 500 M pot. (vol. control) w/switch
R5 3.3 meg. 1/2 watt
R6 15 meg. 1/2 watt
R7 470,000 OHM 1/2 watt - some sets have Couplate instead
R8 470,000 OHM 1/2 watt - some sets have Couplate instead
R9 150, 120, or 200 OHM 1/2 watt
R10 2000 OHM 1/2 or 1 watt

PIN-IT-UP RADIO CORP.

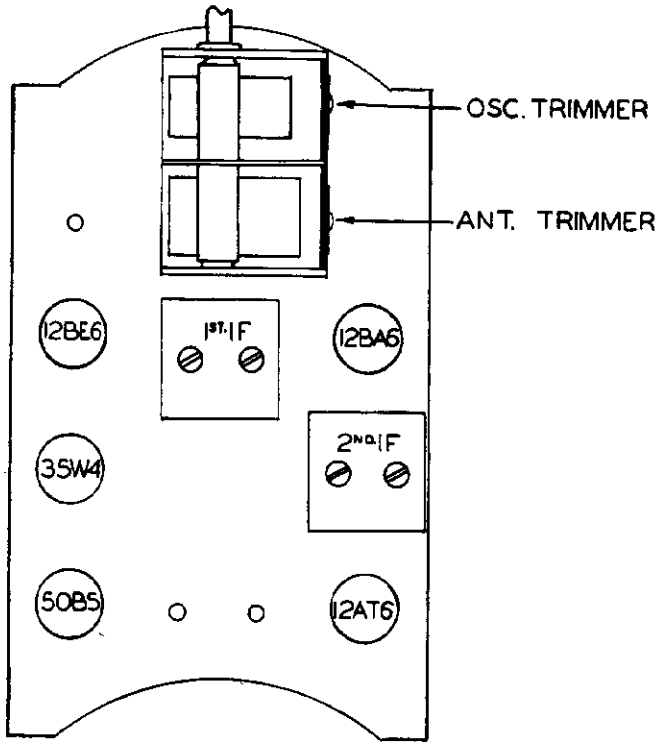
MODELS 400WA, 400WC,
U400GA, U400GC

THE PORT-O-MATIC CORP.





TUBE AND TRIMMER LOCATION



PART NO.		DESCRIPTION	PART NO.		DESCRIPTION	PART NO.		DESCRIPTION
IR-13	R-1	2.2 MEG. RESISTOR 1/2 W. 20%		G-4	OSC. TRIMMER COND.	LO-14	L-2	OSC. COIL
IR-11	R-2	470M RESISTOR 1/2 W. 20%	PC-5	C-1	.05 MFD. CONDENSER 400 V.	LI-6	T-1	INPUT TRANSFORMER
IR-10	R-3	47M RESISTOR 1/2 W. 20%	MC-2	C-2	.0001 MFD. MICA CONDENSER 20%	LI-7	T-2	OUTPUT TRANSFORMER
IR-17	R-4	33 RESISTOR 1/2 W. 20%	PC-7	C-3	.01 MFD. CONDENSER 400 V.		T-3	OUTPUT SPK. TRANFORMER
IR-25	R-5	2200 RESISTOR 1 W. 10%	EC-12	C-4	40 MFD. 150 V. ELECTROLYTIC CONDENSER	SPK-10X	VC	VOICE COIL
IR-9	R-6	22 M RESISTOR 1/2 W. 20%		C-5	20 MFD.		S	PM. SPEAKER
VC-9	R-7	1 MEG. VOLUME CONTROL	MC-5	C-6	.0005 MFD. CONDENSER 20%	IR-20	R-11	220M RESISTOR 1/2 W. 20%
GC-9	G-1	GANG CONDENSER	MC-4	C-7	.000056 MFD. MICA 20%		SW	A.C. SW. ON VOLUME CONTROL
	G-2		PC-8	C-8	.1 MFD. CONDENSER 400 V.	CO-1	P	LINE CORD
	G-3	ANT. TRIMMER COND.	LL-21	L-1	LOOP ANTENNA	TU-18	—	12BE6 - 12BA6 - 12AT6 50B5 - 35W4
IR-19	R-8	100M RESISTOR 1/2 W. 20%	IR-23	R-10	3.3 MEG. RESISTOR 1/2 W. 20%	PC-4	C-10	.25 CONDENSER 200 V.
			PC-6	C-9	.005 MFD. CONDENSER 600 V.			

ALIGNMENT PROCEDURE

The following equipment is necessary to properly align this chassis:

1. A signal generator which will provide an accurately calibrated signal at the frequencies listed.
2. An output meter.
3. A non-metalic screwdriver.
4. Dummy antenna: — .1 mfd., — 10 mmf.

GENERATOR	CONNECTION AT RADIO	DUMMY ANTENNA	DIAL	TO TUNE TRIMMERS	REMARKS
IF 455 kc.	12BE6 Grid	.1 mfd.	HF end	IF Trimmers C D E F	Tune to max.
535 kc.	12BE6 Grid	10 mmf.	LF end	Osc. Trimmer B	Set limit of band
1400 kc.	12BE6 Grid	10 mmf.	1400 kc.	Ant. Trimmer A	Tune to max.

Frequency Range.....540-1700 kc.
Intermediate Frequency.....455 kc.
Power Supply.....105-125 volts AC-DC
Loudspeaker.....4 inch Dynamic
V.C. Impedance....3.5 ohms at 400 cycles

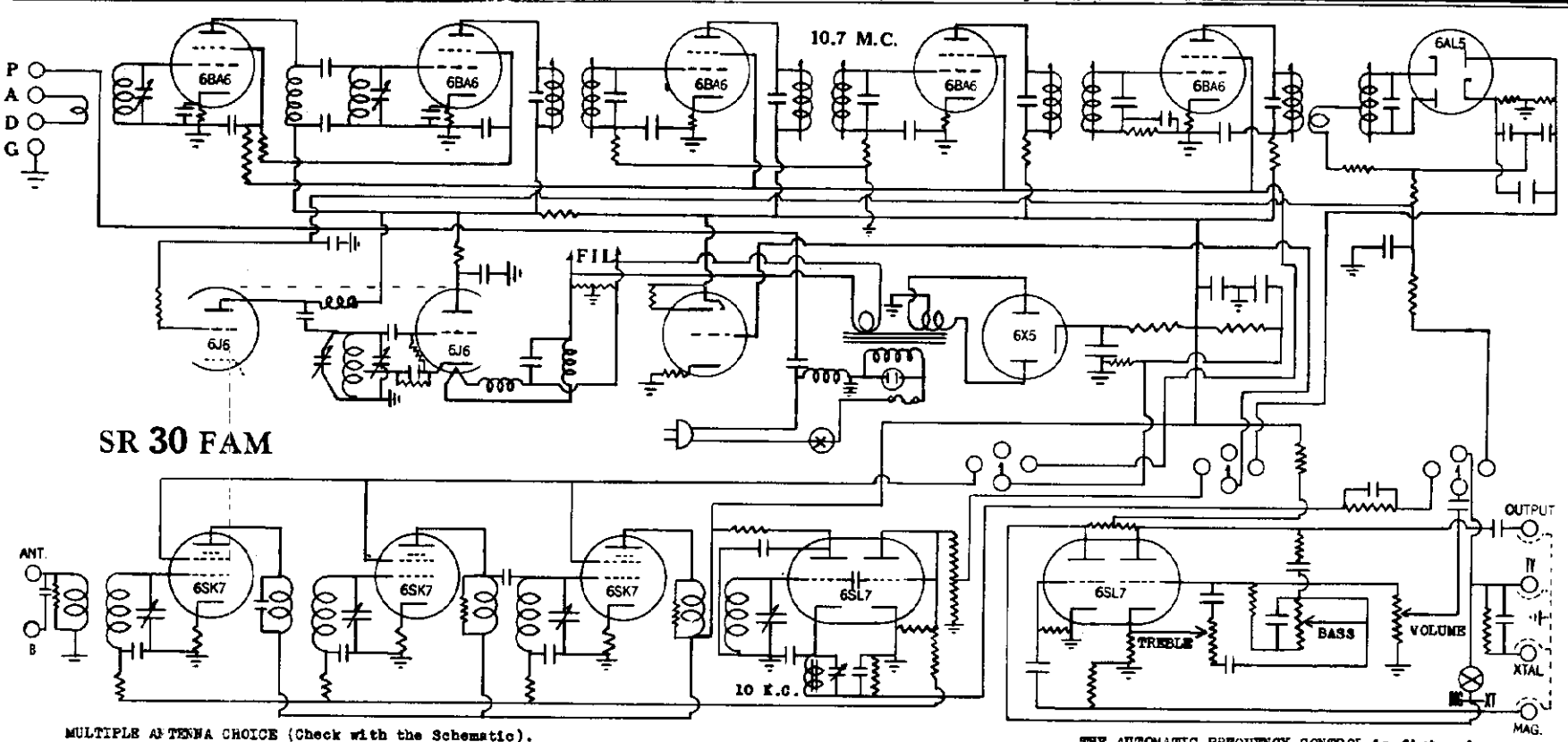
Power Output (Undistorted).....75 watts
Power Output (Maximum).....1.5 watts
Tuning Drive Ratio.....1 to 1
Rated Power Input.....32 watts

TUBE COMPLEMENT

1—12BE6 Oscillator and Mixer tube.
1—12BA6 IF Amplifer tube.
1—50B5 Power Output tube.
1—35W4 Rectifer tube.
1—12AT6 Second Detector and First Audio tube.

PARTS LIST

Part No.	Description	Part No.	Description
LL-21	Loop antenna assembly	EC-12	Two section electrolytic cond.
GC-9	Tuning gang condenser	VC-9	Vol. cont. & switch 1 megohm
LI-6	1st I.F. transformer 456 kc.	LO-14	Oscillator coil



MULTIPLE ANTENNA CHOICE (Check with the Schematic).
For best F.M. results a 100 M.C.Dipole should be installed well above surrounding obstructions. The twisted 300 ohm line from the dipole should be connected to antenna terminals "A" and "D".

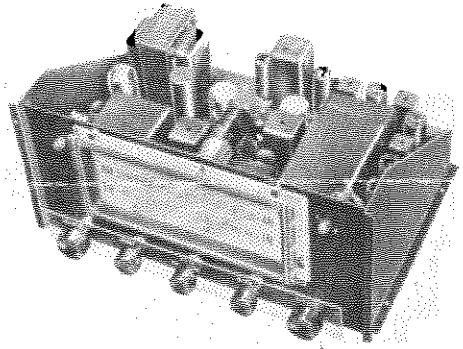
If only a single wire antenna is possible it should be connected to "A" with terminal "D" shorted to "G", which indicates "GROUND".

If suitable antenna is not available the power line may be used as a substitute antenna by connecting terminal "P" to terminal "A" and terminal "D" to "G". No other connections are necessary, just be sure that the line-cord is not skeined or coiled. Results will depend greatly on location.

THE ANTENNA FOR THE A.M. Section of SR30FAM must be connected to Ant. or Ant."B". Ant."B" inserts a 10 MMF capacitor in series with the Ant. connection and is to be used when an outside antenna is made necessary by the shielding construction of a building. Keep AM and FM leads apart.

PROVISION IS MADE FOR AURAL TELEVISION - when AM-PHONO-FM Switch is in PHONO position.

MG-XL. The switch so marked and located near the center rear of the chassis re-arranges the Phono input circuit for Variable Reluctance (magnetic) or crystal pickup.



THE AUTOMATIC FREQUENCY CONTROL is fixt and requires no adjustment.

ALL INPUTS go thru the SR "Tone Gate" tube and are therefore effected by all controls. This allows for a pre-set amplifier.

OUTPUT. The audio output jack should be connected by plug and shielded wire to the high impedence input circuit of a high quality amplifier. Choose a speaker capable of wide range reproduction.

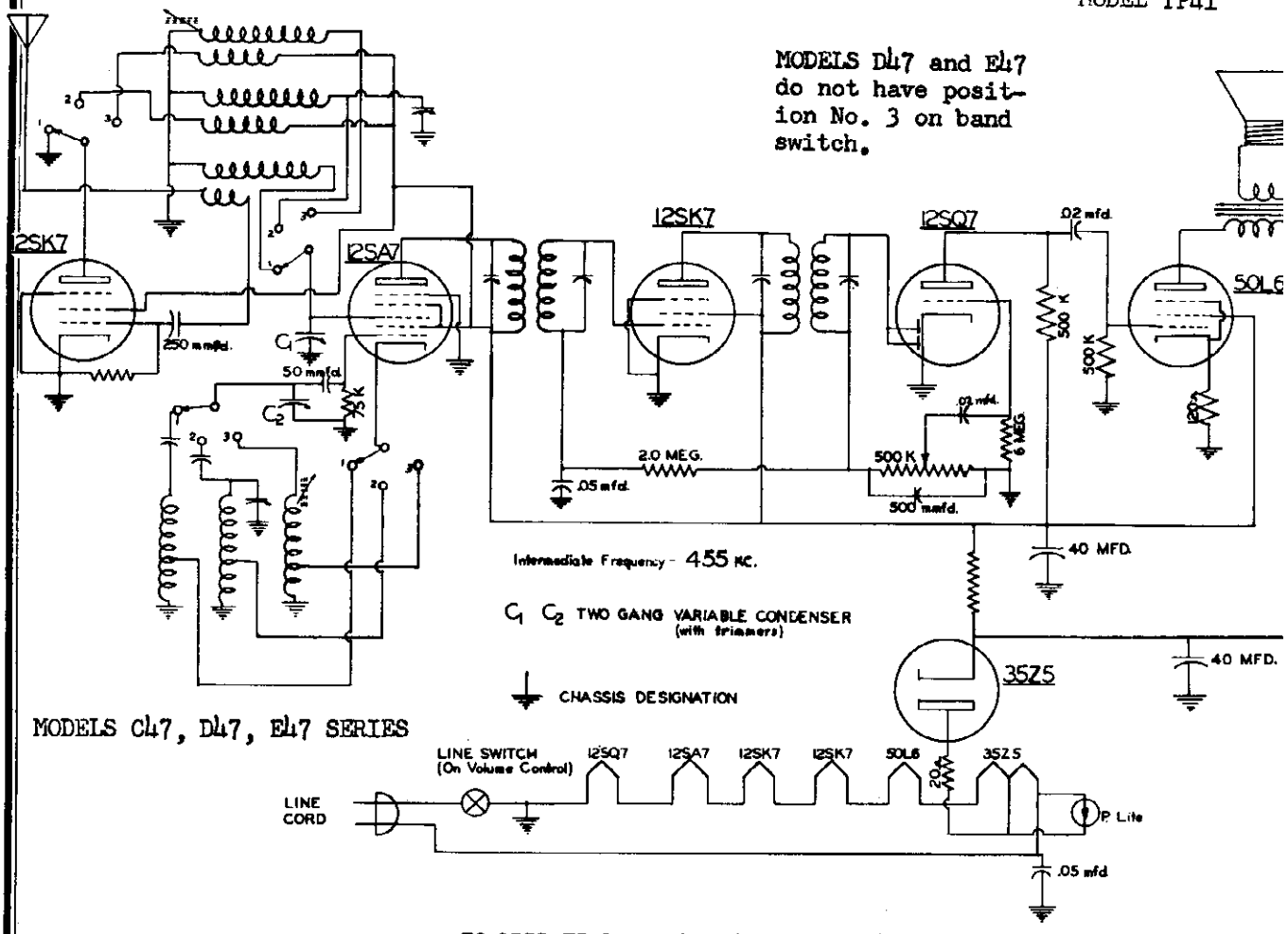
A.C.POWER. SR30FAM is completely powerized for 110-125 volts 50-60 cycles. The power switch (on the Volume Control) also controls the A.C. receptacle on the back of the chassis for convenience in amplifier installation.

No component values have been listed as each unit is clearly marked in accordance with RMA code and approximate values are obvious to the skilled technician.

TAFFET RADIO & TELEV. CO.

MODELS C47, D47
E47 SERIES
MODEL TP41

MODELS D47 and E47 do not have position No. 3 on band switch.

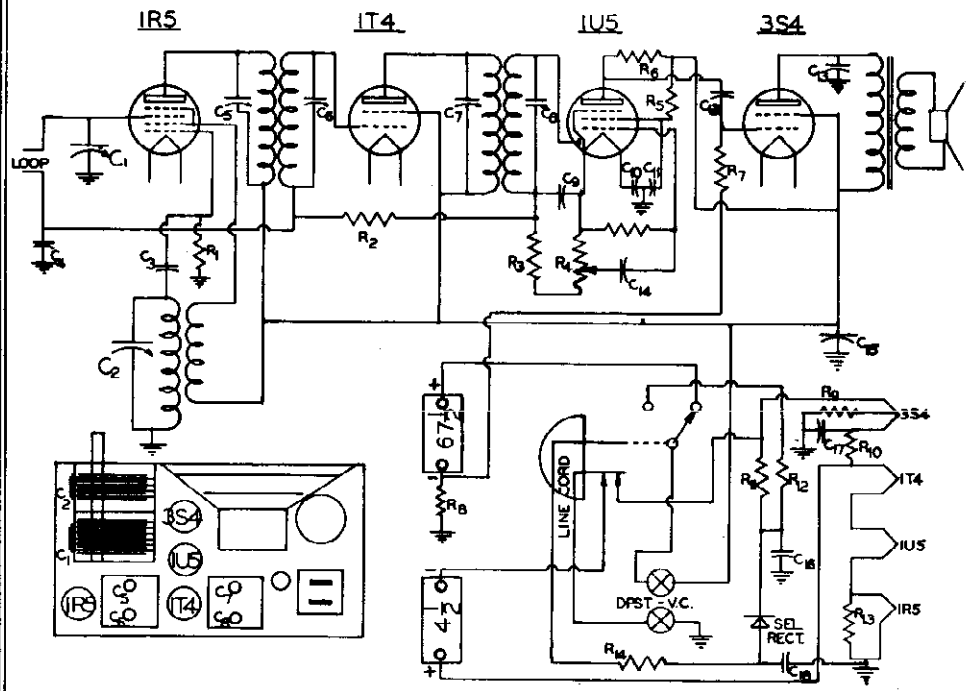


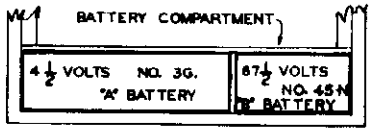
MODELS C47, D47, E47 SERIES

TO OPERATE ON LINE: (110 volts AC-DC)
PLUG LINE CORD INTO WALL RECEPTACLE
(NOTE - REVERSE PLUG FOR BEST OPERATION)

TO OPERATE ON BATTERIES:
PLUG LINE CORD INTO RECEPTACLE ON CHASSIS

MODEL TP41



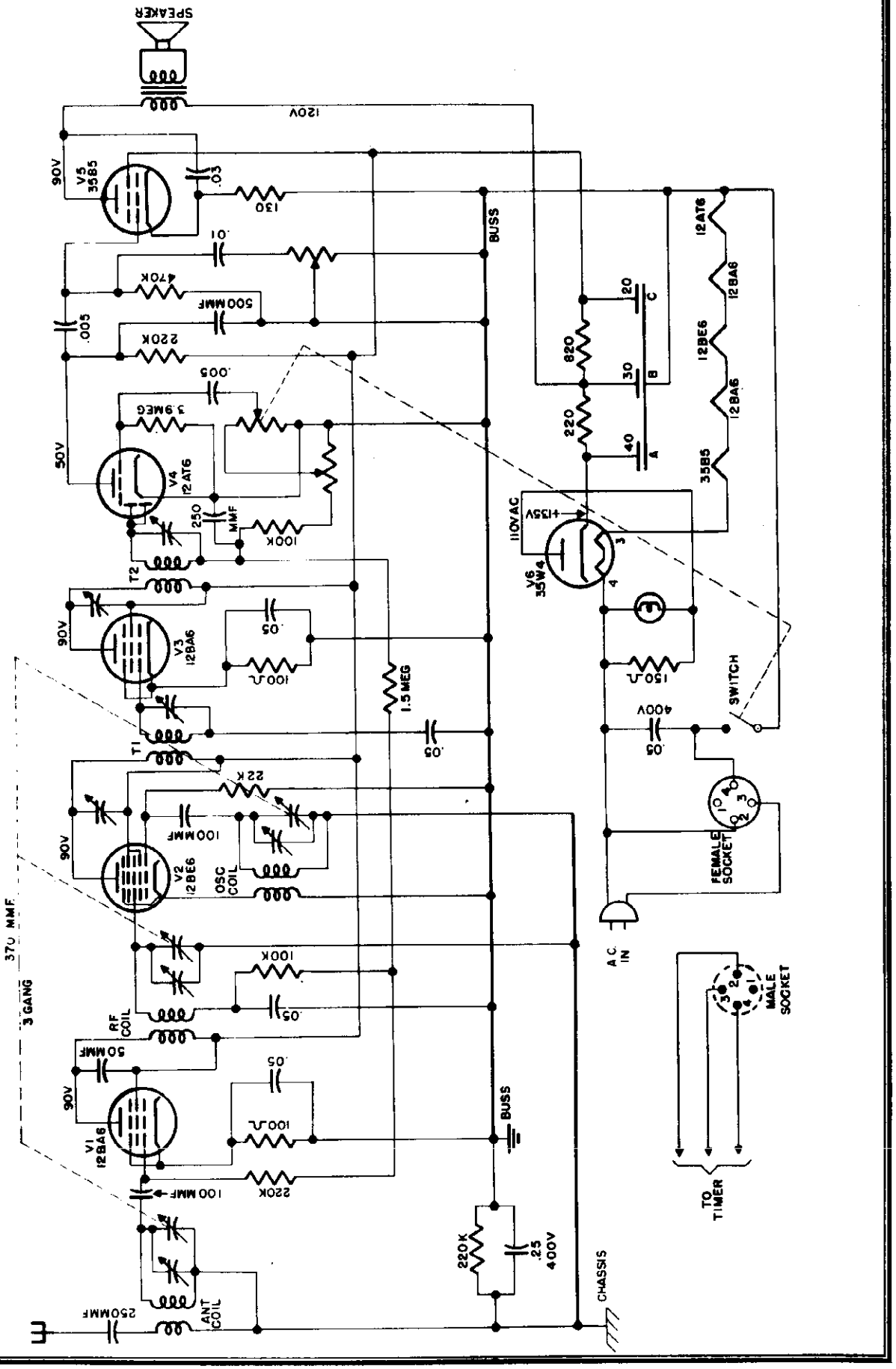


PARTS LIST

C_1 - C_2 - VARIABLE COND. with TRIMMERS	
C_3 - 50 MMFD. MICA	
C_4 - .03 MFD. - 150 v.	
C_5 - C_6 - C_7 - C_8 - I.F. TRIMMERS	
C_9 - 150 MMFD. MICA	
C_{10} C_{11} - .1 MFD. - 200 v.	
C_{12} - .01 MFD. - 200 v.	
C_{13} - .005 MFD. - 400 v.	
C_{14} - .0005 MFD. - 150 v.	
C_{15} - 30 MFD. - 150 v.	
C_{16} - 50 MFD. - 150 v.	
C_{17} - 100 MFD. - 150 v.	
C_{18} - .1 MFD. - 400 v.	
R_1 - 100,000 OHMS	
R_2 - 4.7 MEG.	
R_3 - 60,000	
R_4 - 1.0 MEG. POT. with DPST SW.	
R_5 - 4.7 MEG.	
R_6 - 1.0 MEG.	R_{10} - 35 OHM
R_7 - 2.2 MEG.	R_{11} - 2000 - 10 watt.
R_8 - R_{13} - 500	R_{12} - 3000
R_9 - 1000	R_{14} - 100 - 2 watt.

MODEL TF6

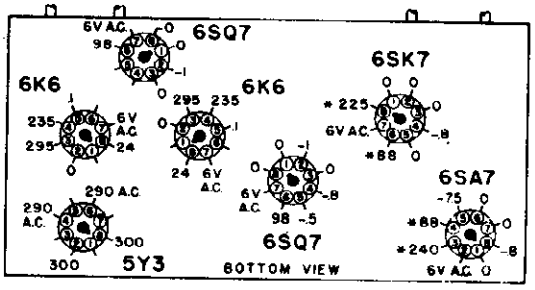
TRADIO



Admiral 7C65

The voltage data and parts list of model 7C65, chassis 7E1 were omitted from *page 17-3 of Rider's Volume XVII* and are here reproduced for inclusion in that Manual. The record changer for this receiver is the Admiral model RC170 or RC170A, the data for which will be found on *RCD.CH. page 16-1 of Rider's Volume XVI.*

VOLTAGE DATA — "Radiophone" switch in "Radio" position. Readings made between point indicated and chassis. Measured on 117-volt a-c line. Dial turned to low-frequency end, no signal. Voltages measured with a vacuum-tube voltmeter. If voltage readings are taken with "Radio-Phono" switch in "Phono" position, readings will be zero or practically zero.



Symbol	RESISTORS	Part No.
R1	22,000 Ohms, ½ Watt	60B 8-223
R2	15,000 Ohms, 2 Watt	60B 20-153
R3	47,000 Ohms, ½ Watt	60B 8-473
R4	4.7 Megohms, ½ Watt	60B 8-475
R5	270,000 Ohms, ½ Watt	60B 8-274
R6	270,000 Ohms, ½ Watt	60B 8-274
R7	1 Megohm, ½ Watt	60B 8-105
R8	220,000 Ohms, ½ Watt	60B 8-224
R9	4.7 Megohms, ½ Watt	60B 8-475
R10	270,000 Ohms, ½ Watt	60B 8-274
R11	270,000 Ohms, ½ Watt	60B 8-274
R12	680 Ohms, 2 Watt	60B 20-681
R13	2 Megohms, Tone Control	75B 1-8
R14	27,000 Ohms, ½ Watt	60B 8-273
R15	1 Megohm, Volume Control and Switch (SW2) Tapped at 500,000 Ohms	75B 2-2
R16	270,000 Ohms, ½ Watt	60B 8-274
R17	100,000 Ohms, ½ Watt	60B 8-104
R18	1,800 Ohms, 2 Watt	60B 20-182
R19	50 Ohms, 5 Watt	61A 1-6
R20	120,000 Ohms, ½ Watt	60B 8-124
R21	1,000 Ohms, ½ Watt	60B 8-102
	CONDENSERS	
C1	50 mmfd., Ceramic	65B 6-4
C2	20 mmfd., Ceramic (used only in early production)	65B 6-26
C3	.1 mfd., 400 Volts, Paper	64B 1-20
C4	.05 mfd., 400 Volts, Paper	64B 1-22
C5	100 mmfd., Ceramic	65B 6-3
C6	250 mmfd., Ceramic	65B 6-5
C7	.02 mfd., 400 Volts, Paper	64B 1-24
C8	.1 mfd., 200 Volts, Paper	64B 1-30
C9	.002 mfd., 600 Volts, Paper	64B 1-14
C10	.002 mfd., 600 Volts, Paper	64B 1-14
C11	.02 mfd., 400 Volts, Paper	64B 1-24
C12	.02 mfd., 400 Volts, Paper	64B 1-24
C13	.001 mfd., 600 Volts, Paper	64B 1-15
C14	.25 mfd., 200 Volts, Paper	64B 1-28
C15	.02 mfd., 400 Volts, Paper	64B 1-24
C16a	30 mfd., 350 Volts, Elect.	67C 6-22
C16b	30 mfd., 350 Volts, Elect.	67C 6-22
C17a	0-420 mmfd. (RF section)	
C17b	0-162 mmfd. (Osc. section) Gang and drum assembly A1550† (used in later production)	
C18	.002 mfd., 600 Volts, Paper	64B 1-14
C19	10 mmfd., Ceramic (used only in early production)	65B 6-24

Symbol	CONDENSERS	Part No.
C20a	4-70 mmfd.) Dual Trimmer	
C20b	4-70 mmfd.) (used with A1550 gang in later production	66A 1-10†
C21	500 mmfd., Ceramic	65B 6-6

† If early type tuning gang (with trimmers attached) must be replaced, use gang assembly A1550 and separate trimmer 66A1-10, and remove C2 and C19 from circuit.

	COILS AND TRANSFORMERS	
L1	Loop Antenna (11")	95A 18-2
L2	Coil, Loop Loading	69A 26-1
L3	Coil, Oscillator	69A 14
T1	Transformer, 1st IF (Slug tuned)	72B 46
T2	Transformer, 2nd IF (Slug tuned)	72B 47
	T1 & T2 were trimmer-tuned in early production.	
T3	Transformer, Power	80B 1
T4	Transformer, Output	98A 34-10
	DIAL AND TUNING DRIVE PARTS	
	"C" Washer (used with tuning shaft)	4A 4-1
	Crystal, Dial (for 7C65W & 7C65M)	24B 7
	Crystal, Dial (for 7C65B cabinet)	24B 7-1
	Cord, Dial Drive (30½")	50A 1-3
	Dial Drum and Hub Assembly	A1380
	Dial Scale Assembly	A1530
	Pointer, Dial	A1303
	Shaft, Pointer	28A 16
	Shaft, Tuning	28A 10-1
	Snap Button, Dial Crystal Fastening (used on 7C65B cabinet only)	13A 1-3-21
	Socket, Pilot Light, with leads	82A 8-3
	Spring, Dial Cable Tension	19B 1-5
	Spring, Hairpin (for pointer shaft)	19A 2-4
	Spring, on Tuning Shaft	19A 18
	Spring Washer (for pointer shaft)	4A 6-9-0
	Spring Washer (for tuning shaft)	4A 6-5-0
	MISCELLANEOUS	
SW1	Switch, Radio-Phono	77A 16-2
SW2	Switch, AC power	Part of R15
SW3	Switch and Lever, part of record changer assembly)	G400A 162
M1	Socket, Speaker	87A 6-1
M2	Speaker, includes M3 and T4	78B 29
M3	Plug, Speaker	88A 4-4

Description	MISCELLANEOUS	Part No.
Grommet, Condenser Gang Mounting		12A 1-2
Socket, Octal Tube		87A 5-1
	PHONOGRAPH PARTS	
	Note: See record changer manual for complete parts list.	
M4	Socket and Leads	89A 6-6
M5	Socket, Phono Pickup	88A 5-8
M6	Pickup Cable & Plug	A1415
M7	Cartridge & Needle, Pickup	A1372
M8	Motor	407B 3-2
M9	Plug, Motor (Male)	88A 8-1
	Centerpost	G400B 137-1
	Drive Disc (under Turntable)	G400A 179
	Eye Bolt (for Tilt-Out Spring)	1A 87-1
	Idler Wheel (407B3 Motor)	G400A 23
	Idler Wheel (407B1 Motor)	G400A 57
	Nut, Wing (for fastening record changer during shipment)	2A 5-9-2
	Strip, Sponge Rubber (1/16x¼x1")	12A 5-5
	Tilt-Out Hinge Assembly (Pickup Arm Side)	AC118-2
	Tilt-Out Hinge Assembly (Record Support Side)	AC118-1
	Tilt-Out Spring (2¼" long)	19A 15-1
	Tilt-Out Tie Bar	138 126
	Tilt-Out Tie Rod	28A 22
	CABINET PARTS	
	*Cabinet Walnut (7C65W)	35E 67-1
	Mahogany (7C65M)	35E 67-2
	Blond (7C65B)	35E 67-3
	Door Catch and Strike Plate	98A 34-9
	*Door, Radio and Phono Tilt-Out pair for 7C65W	98A 34-1
	pair for 7C65M	98A 34-2
	pair for 7C65B	98A 34-3
	Door Handle, Radio or Phono Comp. for 7C65W, 7C65M	98A 34-4
	for 7C65B	98A 34-5
	Grille Cloth	98A 34-8
	Hinge, Radio Door pair for 7C65W, 7C65M	98A 34-6
	pair for 7C65B	98A 34-7
	Knob	33A 13-3
	Washer, Felt (used under tuning knobs)	5A 4-4

* Supplied only if old part cannot be repaired. When ordering, describe condition of old part in detail.

Admiral Models 7RT41, 7RT42, 7RT43

These models are shown on *pages 16-11 and 16-2 of Rider's Volume XVI.* An error has been found in the part number of the SW2 radio-phono switch in the service information on these models. The part number of this switch should be 77A16-1 instead of 77A16-2.

Admiral Chassis 9A1

This chassis is shown on *pages 16-6 to 16-8 of Rider's Volume XVI.* It has been found that the dial windows of these chassis build up a small electrostatic charge, thus causing the plastic to attract fine dust particles. These are so fine that the dial windows appear milky or foggy.

Treating the windows with a solution called Hexco Dust-Ded reduces the amount of fine dust that collects on them. The dial window should be removed from the cabinet to apply the solution properly. Remove the knobs and the screws holding the escutcheon to the cabinet. Clean the window by wiping off the dust thoroughly on both sides with a damp (not wet) cloth or chamois skin. Apply the Hexco Dust-Ded according to the directions on the bottle.

Part No.	*Description*
98A11-2	Hexco Dust-Ded

Allied Radio 6A-127 Revised, 6B-127, 6C-127

This model is the same as Model 6A-127 appearing on *pages* 15-4 *and* 15-5 *of Rider's Volume XV,* except for the following changes. Part 36 has been changed in value from one megohm to 220,000 ohms and the bottom side of this resistor has been moved from the negative filament line (junction of parts 34 and 17 and 47) to the avc bus (junction of parts 33, 34, 14, and 35). Part 40 has been changed in value from 220,000 ohms to 100,000 ohms. Part 13 is now connected from the junction of resistor 39 and the secondary of the first i-f transformer to the positive side of the filament of the IN5GT tube instead of from the junction to the common negative as previously.

Part 28 is now connected from the negative side of the filament of the 1H5GT tube to the grid of that tube instead of from the center arm of the volume control to the common negative. The bottom side of part 19 is now connected to the junction of part 48 and the center tap of the filament of the 3Q5GT tube, and thence to the left-hand side as shown on the schematic) of capacitor 10. This part was formerly connected directly to the right-hand side of the same capacitor. The connection from the negative side of the filament of the IN5GT tube to the left-hand side of capacitor 10 has been removed. A 68-ohm resistor has been inserted in the high side of the 45-volt battery lead.

The following changes have been made in the parts list.

Illus. No.	*Part No.*	*Description*
36	27E224	Carbon, 220,000 Ohm, ½ W.
40	27E104	Carbon, 100,000 Ohm, ½ W.

Allied 6C-122

This model is the same as Model 6B-122 appearing on *pages 16-3 and 16-4 of Rider's Volume XVI.*

Automatic Tom Thumb

Please change the listing in your Rider's Volume XVII Index for Automatic page 17-8 from Models 660, 662, 666 to Model Tom Thumb.

Automatic 127

This model is the same as Model 120, appearing on *page 12-7 of Rider's Volume XII.*

Automatic 640, Series B

The schematic of this model is the same as the 640 shown on *page* 15-7 *of Rider's Volume XV* except for the change from octal type to loctal type tubes.

This model uses the 14Q7, 14A7, 14B6, 50A5, and 35Y4 in place of the 12SA7GT, 12SK7GT, 12SQ7GT, 50L6GT, and 35Z5GT tubes.

Automatic 650

This model is similar to the 650 shown on *pages 15-4 and 15-7 of Rider's Volume XV* except for the following change: The 20,000 resistor in the oscillator grid circuit of the 12SA7GT now is connected directly to ground instead of to the cathode of that tube.

Belmont 6D127

This model is the same as Model 5D128 appearing on *pages 15-4 and 15-5 of Rider's Volume XV.*

Belmont 8A510

This model is the same as the 8A59 shown on *pages 15-8 to 15-12 of Rider's Volume XV,* except for the addition of four parts.

The two miscellaneous parts of the removable tuner assembly are:

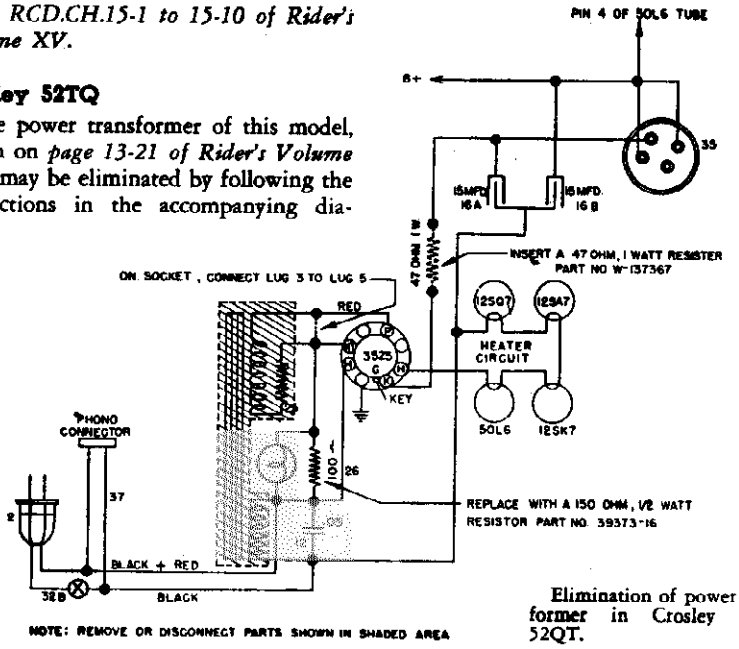
1. Part No. A-2J-7176—cam locking spring.
2. Part No. A-2J-7627-1—retainer spring.

The miscellaneous part added to the main chassis is part A-19A-11539 which is a plug on the speaker leads.

The final addition is an alternate record changer which can be used with this model. Part C-201-12545-1 is a Detrola changer model 550, which is shown on *pages RCD.CH.15-1 to 15-10 of Rider's Volume XV.*

Crosley 52TQ

The power transformer of this model, shown on *page 13-21 of Rider's Volume XIII,* may be eliminated by following the instructions in the accompanying diagram.



Elimination of power transformer in Crosley model 52QT.

Crosley 56PA, 56PB

These models appear on *pages* 15-29 to 15-31 *of Rider's Volume XV.* It has been found that the 3S4 tube used in these models has a tendency to burn out. The following change should be made to prevent this. Remove the wire that connects the plate lug 3 to the cathode lug 8 of the 117Z6 tube socket. In its place solder one end of a 47-ohm, 1-watt resistor (part number 39373-119) to the plate lug. The 1S5 Det.—AVC—1st A-F Amplifier tube has been changed to a 1U5 tube. The characteristics of the tubes are the same but the socket connections are different.

The accompanying socket voltage chart includes both changes.

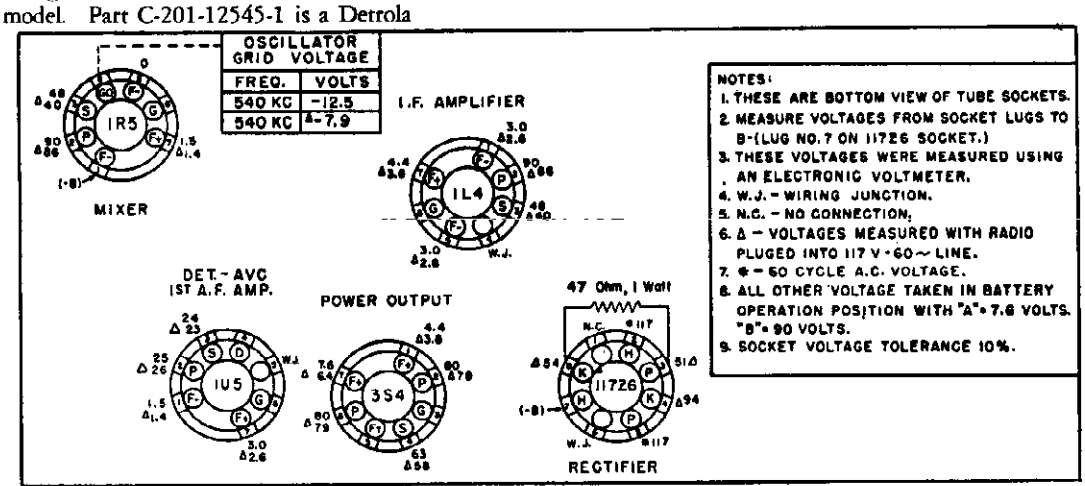
Crosley Model 66CS(0)

This model is the same as Model 66CS (s) appearing on *pages 16-16 to 16-19 of Rider's Volume XVI,* except for the cabinet and the following changes:

Item	*Part No.*	*Description*
44*	39368-10	Control, Tone
45*	39368-18	Control, Volume
	39369-1	Switch, Power
	39370-1	Shaft, Plug In
	R-139206	Cabinet
	D-137057	Record Changer
	AC-137885	Lid Support, Cabinet
	W-138330	Hinge, Cabinet Lid

* These parts replace the original equipment parts.

The record changer (Part No. D-137057) is Oak Model 6666 shown on *RCD.CH. pages 15-1 to 15-7 of Rider's Volume XV.*



Socket voltage chart for Crosley models 56PA and 56PB showing new socket connections.

DeWald 418

This model is the same as model 414 appearing on *page 11-2 of Rider's Volume XI.*

Electronic Laboratories 2811

This model, shown on *page 16-8 of Rider's Volume XVI,* uses the Webster model 56 record changer, which is shown on *page RCD.CH.15-10 of Rider's Volume XV.*

Emerson BF-169, BF-204, And BF-207

These models are the same as Model BF-191 appearing on *pages 9-1 and 9-2 of Rider's Volume IX.*

Emerson 567, Chassis 120016

This model is the same as Model 560, Chassis 120016, appearing on *pages 17-30 to 17-32 of Rider's Volume XVII.*

FM Specialties Model Fidelotuner

This model is shown on *pages 17-1 to 17-4 of Rider's Volume XVII.* Three terminals are shown in Fig. 5, page 17-4; the first labelled 3, and the third terminal (not labelled in this figure) should be labelled 4. The ground from the phonograph connection to the receiver should be made to this third terminal (terminal 4).

Farnsworth AC-55, Chassis C2-3

This model is the same as model ACL-55, Chassis C 2-3, shown on *pages 11-7 and 11-10 in Rider's Volume XI.*

Farnsworth ACL 55, ACL56, AKL58, AKL 59

These models shown on *pages 11-7 and 11-10 of Rider's Volume XI* are erroneously listed as ATL.

Farnsworth GK-140

Slippage of the dial-drive cable on the early production sets can be corrected by replacing the cable with part number 05096. This cord is softer and smaller than the one used previously.

If the push buttons bind on the front panel of the cabinet, the ganged capacitor may not be properly positioned. This may be corrected by installing a flat metal washer under each of the mounting grommets. This may be done without removing the gang from the chassis.

Oscillation or low sensitivity on f.m. may be due to poor ground connections from the gang to the r-f shelf. When aligning the f-m band, oscillation may occur with certain signal generators. Changing the value of the resistor in series between the generator and the chassis will prevent oscillation. With some generators more than 400 ohms are required, with others less.

In some preliminary sets a 200-$\mu\mu$f capacitor was placed in series with the short-wave converter-trimmer. If for any reason this trimmer requires replacement, removal of the capacitor is suggested. This capacitor is not shown on the schematic.

In some of the preliminary 14-tube sets, Belden braid was used to ground the ganged capacitor to the r-f shelf. In certain instances too much solder flowed into the braid and as a result some joints break loose or the set becomes microphonic. This braid should be replaced with soft copper strips.

General Electric A51, A56

These models are the same as model A54 shown on *pages 7-4 to 7-6 of Rider's Volume VII.*

General Electric H639AC-DC

The r-f alignment instructions of these models found on *page 11-80 of Rider's Volume XI,* should read as follows: With gang condenser plates completely meshed, set dial to the first mark at the left end of scale. Then set dial to 1500 kc. Apply a 1500-kc signal either through a standard I.R.E. dummy to the antenna terminal or through an additional loop connected to the generator output which can be magnetically coupled to the receiver Beam-a-Scope. Align C2 and C1 at 1500 kc for maximum output. Set dial to 580 kc and peak C3 on 580 kc while rocking the gang condenser. Retrim at 1500 kc.

GE YRB 60-12

This receiver is the same electrically as the YRB 60-2 appearing on *page 15-5 of Rider's Volume XV* but the cabinet is different.

GE YRB 92-2 and 81-3

These models are the same electrically as the YRB 82-1 appearing on *pages 15-53 to 15-54 of Rider's Volume XV,* but they have different cabinets.

General Electric L604

This model is the same as Model L600 appearing on *page 13-40 of Rider's Volume XIII.*

General Electric 202

This receiver is the same electrically as the model 200 as shown on *pages 15-54 to 15-56 in Rider's Volume XV,* except that it has a different cabinet.

General Electric 219, 220, 221

A few cases of hum which cannot be reduced in the normal manner from these models shown on *pages 15-28 to 15-31 of Rider's Volume XV,* may be corrected by cathode degeneration in the output tube, 35L6GT/G, cathode circuit. Remove R17 and C29-C from the circuit. This can be done by disconnecting one end of R17.

General Electric 260

This model appears on *pages 16-7 to 16-12 of Rider's Volume XVI.* It has been found that late production 1LC6 tubes, coded H7E, will oscillate at another frequency in addition to the desired frequency, causing unsatisfactory operation. To remedy this condition, the oscillator grid capacitor, C17, should be changed from 100$\mu\mu$f to 56$\mu\mu$f.

GE 254

This model is illustrated on *pages 16-to 16-5 of Rider's Volume XVI.* Th suffix letters after 254 indicate only th cabinet styling. All versions are elec trically identical.

Firestone 7402-4

This model is the same as model S7426-6 shown on *page 10-5 of Rider's Volume X.*

Firestone 7423-5

This model is the same as model S7402-5 shown on *page 13-38 of Rider's Volume XIII.*

Goodrich R655W

This model uses the Admiral record changer model RC161 or RC161A, whic are to be found on Admiral RCD. CH pages 17-1 to 17-7 of Volume XVII.

Hallicrafters S-40A

This model is the same as Model S-40 second revision, on *pages 16-67 to 16-8 of Rider's Volume XV,* except for the fol lowing changes. C18 has been changed in value from 100$\mu\mu$f to 68$\mu\mu$f. A 10-ohm re sistor (R30) has been connected betwee the center tap of oscillator coil T10 and terminal C. R30 has been removed from its previous position between C16 and the junction of C26, C6C, C7C, and switch S1F. C55 has been changed in value from 100$\mu\mu$f to 47$\mu\mu$f, and is now connected to the top of the 470-$\mu\mu$f capacitor (C54). The coil T17 is connected directly across C54, with one end going to ground. The center tap of this coil is connected to the cathode of the 6J8 tube. The 0.01-μf capacitor (C53) is connected from the plate of the 6J8 tube directly to ground.

The parts list should be changed to read as follows:

Ref. No.	*Description*	*Hallicrafter's Part No.*
C18	68$\mu\mu$f, ±10%, 500 vdcw; neg. temp. coeff. 0.0075$\mu\mu$f/$\mu\mu$f/deg.C; ceramic	CC25UK680K
C55	47$\mu\mu$f, ±20%, 500VDC, Mica	CM20A470M
T17	BFO coil; 455 kc; shielded	54B033-2

Hallicrafters SP-44 AND SX-42

These models appear on *pages* 17-1 *to* 17-5 *and* 17-6 *to* 17-16 *respectively of Rider's Volume XVII.* When the SX-42 is used with the SP-44 Panadaptor on the low-frequency band, it appears to motor boat. To correct this condition, do the following.

The connecting cable between the SP-44 and the SX-42 is shielded and the shield is connected to the SX-42 ground. Disconnect the shield from the SX-42 ground and place a 50-$\mu\mu$f capacitor between the shield and the SX-42 chassis. Be sure that the SX-42 chassis is well grounded. A shielded antenna lead, or a balanced antenna, on the SX-42 may also help.

The following modifications should be made on the SP-44 unit. A strip of bonding braid, 5/8 inch wide, may

be connected to the No. 1 grounded pin of the 6AC7 tube, going around the choke coil and connecting to the right side of the chassis. The braid should be insulated with a piece of spaghetti and should lie parallel to the front panel. Two pieces of braid ¼ inch wide, or a copper strap may also be used.

A piece of copper or steel sheet about 2½ inches wide may be screwed or soldered across the bottom so that it is attached to both edges of the chassis. This plate should be centered over the bottom of the 6AC7 tube.

Hallicrafters SX-42

This model appears on *pages 17-6 to 17-16 of Rider's Volume XVII*. It has been found that there is unsatisfactory image ratio on the 10-meter band. This can be corrected in two ways, one of which provides for the change or replacement of four parts and the other provides for no change in the oscillator coil.

The first method is as follows:

1. The band 4 oscillator coil should be removed and replaced with a new coil, part number 50-837D.
2. Resistor R24, now 56 ohms, should be removed and replaced with a 22-ohm resistor, part number RC20AE220M.
3. Remove the main tuning dial scale, part number 83C265, and replace with new scale, part number 83C325.
4. Remove antenna coil, part number 51B827-C, and replace it with antenna coil, part number 51B827-D.
5. Align the receiver in the normal manner, making certain that the image falls on the high-frequency side of the signal frequency.

The second method is as follows:

1. Remove the oscillator trimmer capacitor C-42.
2. Calibrate the main tuning dial at 28 megacycles, with slug S-33, making certain that the image falls on the high-frequency side of the fundamental.
3. Calibrate the bandspread as outlined on *page 17-15 of Rider's Volume 17*, except that slug S-33 should be used instead of trimmer C-42.

It will be noticed that in this method the calibration of the low-frequency end of the number 4 band has been neglected entirely, since this cannot be accomplished without the use of trimmer C-42. The oscillator coil would have to be replaced to allow the use of this trimmer.

International Detrola 339, 340, 340-1

These models appear on *page 12-4 of Rider's Volume XII*. The 30-ohm resistor used in these models is the resistor with 5% tolerance, part number 8158.

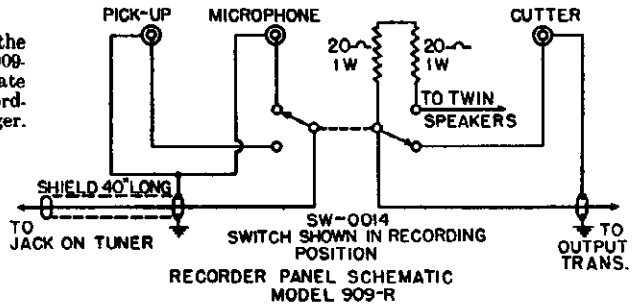
International Detrola 2744

This model is the same as Model 274 appearing on *page* 10-9 *of Rider's Volume X*.

Howard 909MR

This model is similar to Model 909M appearing on *pages 17-54 to 17-57 of Rider's Volume XVII*, except that recording units were added. The General Industries Model GI-RC130 recorder and record changer combination was used to make this change. The recorder unit was added without disturbing the wiring of the radio chassis. The wiring necessary for the addition is shown in the accompanying diagram.

The wiring in the Howard Model 909-MR to accomodate the GI-RC130 recorder and record changer.



Majestic 8FM783, Chassis 8BO7D

This model is the same as Model 8FM776, Chassis 8B07D, appearing on *pages 17-17 to 17-22 of Rider's Volume XVII*, except that "solid doors" are used instead of metal grilled frame doors. The parts list should be changed to read as follows:

Part No.	*Description*
115-48	Cabinet, console combination, mahogany or walnut (state color)

Montgomery Ward 04BR-420B

This model is the same as Model 93BR-420A appearing on *pages 11-25 and 11-26 of Rider's Volume XI*.

Montgomery Ward 14WG-635B

This model is the same as Model 14WG-624A appearing on *pages* 13-53 *and* 13-54 *of Rider's Volume XIII*.

Montgomery Ward 64WG-1050D, 74WG-1050B

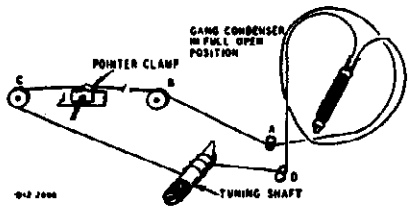
These models are similar to the 64WG-1050A shown on *pages 15-75 to 15-77 of Rider's Volume XV* with the following changes. The 0.1-μf capacitor (C-11) is connected to B— from pin 1 of the 1R5 socket instead of to chassis ground. A 1000-ohm resistor (R-13) is connected from pin 7 of the 3S4 output tube to B—.

Montgomery Ward 64WG-1804B, 74WG-1804B

These two models are similar to Model 64WG-1804A shown on *pages* 15-88 *to* 15-90 *of Rider's Volume XV*, except for the following changes.

The frequency range has been slightly contracted to 540-1600 kc. A 47-ohm dropping resistor (R-20) has been inserted between B+ and the junction of the primary winding of the first i-f transformer (T-3), the screen grids of the 12SA7 mixer, the screen-grid of the 12SK7 r-f amplifier, and resistor R-1. A 0.05-μf bypass capacitor is connected from this junction to the point marked "X" in the filament line of the schematic shown on *page* 15-88 *of Rider's Volume XV*.

The drive cord length has been increased for these models and the following drive cord replacement instructions should be observed. Turn the gang capacitor to the fully open position. Use a new drive cord 42 inches long and tie one end to the tension spring. Hook the other end of the tension spring over the tab on the drive pulley rim and continue around pulley ½ turn counterclockwise. Pass cord around stud D and wind three turns clockwise (from front of chassis) around the turning shaft. Turns must progress away from chassis. Pass cord around pulleys C and B and stud A. Pass cord under drive pulley and wind 1½ turns counterclockwise around drive pulley. Stretch tension spring and tie free end of cord to spring. Cut off any excess string. Attach the dial pointer to the cord and position as instructed on *page* 15-89 *of Rider's Volume XV*.



Winding for the new longer drive cord for Models 64WG-1804B and 74WG-1804B.

The components used in the Models 64WG-1804B and 74WG-1804B are the same as those enumerated on *page* 15-90 *of Rider's Volume XV*, except for the following.

Ref. No.	*Part No.*	*Description*
C-1	D67102	0.001μf, 400 v. tubular
C-14	B67403	0.04μf, 200 v. tubular
C-15	B67602	0.006μf, 200 v. tubular
C-19	B67253	0.025μf, 200 v. tubular
C-22	B67204	0.2μf, 200 v. tubular
C-24	17A123	1.5—12μμf, trimmer
C-28	B67503	0.05μf, 200 v. tubular
R-14	B84274	270,000Ω, 0.5 watt, carbon
R-20	B85471	470Ω, 0.5 watt, carbon
	20X329	Capacitor cushion stud in gang capacitor mounting
	28X95	Drive cord tension spring

Montgomery Ward 64WG-1807B, 74WG-1807B

These models are the same as model 64WG-1807A, shown on *pages 15-91 to 15-94 in Rider's Volume XV*, except for the following changes. A 0.2-μf bypass capacitor (C-35) has been connected between ground and the screen grid of the 6V6GT output tube, resistor R-14, resistor R-12, the red lead of the second i-f transformer (T-3), resistor R-5, resistor R-4, the red lead of the first i-f transformer (T-2), and resistor R-2. The 0.004-μf capacitor (C-31) is now connected from the plate lead of the 6V6GT output tube to the cathode of this tube. No counterpoise foil antenna is used.

Montgomery Ward 64WG-2500B, 74WG-2500B

These models are similar to the 64WG-2500A, shown on *pages 15-1 and 15-31 to 15-35 of Rider's Volume XV*, except for the following changes: The 64WG-2500B has a 10" electrodynamic speaker in place of an 8" electrodynamic speaker used in the issue A models. The part number and description of the new speaker is as follows:

Part No.	*Description*
12A399	10" Electrodynamic Speaker

Two types of speaker assemblies are used in the 74WG-2500B receiver. These are listed below and are directly interchangeable, both electrically and mechanically.

Part No.	*Description*
12A399	10" Electrodynamic Speaker
or	
12A455	10" Electrodynamic Speaker

Montgomery Ward 64WG-2700B

This model is similar to the 54WG-2500A, shown on *pages 15-1 and 15-32 to 15-35 of Rider's Volume XV*, except for the following change: This receiver has a 10" electrodynamic speaker in place of the 8" electrodynamic speaker used in the issue A models. The part number and description of the new speaker is as follows:

Part No.	*Description*
12A455	10" Electrodynamic Speaker

Montgomery Ward 74BR-1812B

This model is the same as Model 74BR-1812A appearing on *pages 16-17 through 16-21 of Rider's Volume XVI.*

Montgomery Ward 62-690

This model is the same as Model 14WG-690A appearing on *pages 15-61 and 15-62 of Rider's Volume XIII.*

Montgomery Ward 74WG-2711

This model is similar to model 74WG-2705B described in SUCCESSFUL SERVICING for September-October 1947, except for the addition of twin doors on the cabinet covering the dial panel.

Montgomery Ward 74BR-2003C

This model is the same as Model 74BR-2003B appearing on *pages 17-29 to 17-31 of Rider's Volume XVII*, except for the following changes. The 100-μμf capacitor in the external antenna lead CI has been changed to 820-μμf capacitor, C22. The 820-μμf capacitor, C2, which was connected from terminal 2 of the antenna socket to ground, has been removed. The 220,000-ohm resistor, R1, that was connected from terminal 2 of the antenna socket to the low side of capacitor C6 has been removed. A 1000-ohm resistor, R17, has been inserted between terminal 2 of the antenna socket and C22. On some sets a 100,000-ohm resistor has been added in series with the high side of the volume control. The loop has been changed and the loops of series B and series C are not interchangeable.

Ref. No.	Part No.	Description
	C-13E-15103	Loop antenna assembly
R17	C-9B1-62	1000 ohms, ½ watt

Montgomery Ward 74WG-1801C

This model is similar to 64WG-1801C shown on *pages 15-27 to 15-29 in Rider's Volume XV*, except for the following changes. The frequency range has been slightly contracted to 540 to 1600 kc. The dial cord length has been increased, and the following dial cord replacement data should be used.

Turn the gang capacitor to the fully closed position. Use a new drive cord 18 inches in length and tie one end to the tension spring. Fasten the other end of the tension spring to the hook on the drive pulley. Pass the cord through the slot in the drive-pulley rim and continue around pulley one-half turn, counterclockwise. Wind 3½ turns counterclockwise (from front of chassis) around tuning shaft. Turns should progress toward rear of chassis. See accompanying illustration.

Wind cord counterclockwise around drive pulley in back of previous ½ turn. Pass cord through the slot in the pulley rim. Stretch tension spring and tie free end of cord to the spring. Cut off any excess string.

New dial cord stringing for Montgomery Ward model 74WG-1801C.

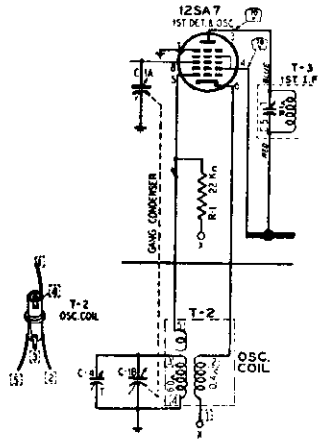
The components used in the 74WG-1801C are the same as those listed for the 64WG-1801A on *page 15-29 of Rider's Volume XV*, except as noted below.

Ref. No.	*Part No.*	*Description*
C-15	B67204	0.20 μf 200 V tubular
C-16	D67104	0.10 μf 400 V tubular
C-18	D67102	0.001 μf 400 V tubul
C-19	17A123	1.5-12 μμf trimmer
T-1	26A467	"B" band loop anten assembly
T-3	9A1775	1st i-f transformer a can assembly

Montgomery Ward 74WG-1801D

This model is similar to the 64WG 1801C shown on *pages 15-27 to 15-29 Rider's Volume XV*, except for t changes listed below. This model i corporates all the changes previous listed for the 74WG-1801C.

The grid resistor (R-1) of the 12SA det. and osc. tube has been changed 22,000 ohms. The oscillator coil h been changed and capacitance couplin to the tube is now obtained throug



First detector and oscillator circuits of th Montgomery Ward model 74WG-1801D.

the use of a "gimmick," as shown in th accompanying drawing. The component used in the 74WG-1801D are the sam as those listed for the 64WG-1801C or *page 15-29* except for the changes pre viously noted for the 74WG-1801C an those below.

Ref. No.	*Part No.*	*Description*
R-1	B84223	22,000 ohms 0.5 wat carbon
R-4	36X368	0.5 megohm volum contro and switch
R-8	B84151	150 ohms 0.5 wat carbon
T-2	9a1911	Oscillator coil assembly
	13X546	Line cord and plug as sembly
	10X45	Drive cord assembly

To replace the dial cord, use either a new 10 x 45 drive-cord assembly or a piece of cord 18 inches long. See replacement instructions under Model 74WG-1801C.

Motorola 402

This model is the same as the Motorola shown on *pages* 12-62 *and* 12-65 *of Rider's Volume XII.*

National Union Presentation

This model is the same as Model G-619 appearing on *pages 16-1 and 16-2 of Rider's Volume XV*. This company's Presentation Deluxe is the same as Model G-613 appearing on *pages 16-1 and 16-2 of Rider's Volume XVI.*

Montgomery Ward 74WG-1054A and 74WG-1054B

These models are similar to 64WG-1054A shown on *pages 15-82 to 15-84 of Rider's Volume XV*, except for the following changes. The terminals of the oscillator coil are reversed. The high side of the 2.2-ohm winding goes to the first grid of the 1R5 mixer tube and the high side of the 6.4-ohm winding goes to grids 2 and 4 of the same tube. The low side of the 2.2-ohm winding is grounded and the low side of the 6.4-ohm winding is connected to R-7. These models also incorporate the changes noted on page 6 of the May 1947 issue of SUCCESSFUL SERVICING.

It has been called to our attention that misinterpretations are possible of the statements made in the May 1947 issue about wiring changes. The wiring of the set does not change, as no components are changed; but the wiring of the *socket* of the output tube changes as indicated in the afore-mentioned issue.

In model 74WG-1054B, in addition to the changes listed above, a 2.2-megohm resistor (R24) in parallel with a 100-$\mu\mu$f capacitor (C24) is connected from the antenna to grid 3 of the 1R5 mixer tube.

Arvin 140P, Chassis RE-209

This model appears on *pages 17-1 through 17-4 of Rider's Volume XVII*. The volume control mounting has been revised to prevent the dial-indicator eccentric mounted on the volume-control shaft from binding in its bracket. The mounting bushing on the control is slotted instead of threaded, and the control is mounted with a C20227 Speed Clip, instead of a 3/8-inch nut.

The following changes have been made in the oscillator circuit to increase the sensitivity. The 0.05-μf capacitor (C5) formerly located between the bottom of the oscillator tickler coil (L3) and floating ground, has been connected from the second grid of the 1R5 converter tube (pin 3) to the junction of the top of the tickler coil to the bottom of the primary of T1. The 22,000-ohm resistor (R3) is now connected in parallel with C5 instead of from the bottom of the tickler coil to the bottom of the primary of T1. The top of the tickler coil is connected to the bottom of the primary of T1 instead of to the second grid of the 1R5 converter tube. The 1R5 plate current as well as the screen current thus passes through the tickler coil.

To prevent audio oscillation, a 0.00025-μf bypass capacitor (C10) has been added from the plate to the positive filament of the 1S5 tube. The plate load of the 1S5 tube (R9) has been changed from 330,000 to 470,000 ohms. The value of R21 has been changed from 6.8 to 15 megohms. The value of C13 has been changed from 0.05μf to 0.02μf. The 0.05-μf capacitor (C19) has been changed from the input side to the plate side of L4 to reduce hash.

Since the clinch nuts in the top of the loop shield, which hold the screw in the top of the cabinet, have at times come loose, a brass extruded nut, part number A21681, has been made available for replacing these clinch nuts when they come loose.

In the note under the resistance chart on *page 17-4 of Rider's Volume XVII*, K was shown as equalling 100 ohms. This note should read K equals 1000 ohms. The parts numbers given in the parts list on *page 17-2* for the miniature tube sockets were A21032-1 and A21032-2. These should have been A20132-1 and A20132-2.

A slide switch, part number A21051, has been added to the parts list.

Arvin 150TC, 151TC, Chassis RE-228-1

These models are the same as Model 150TC appearing on pages *17-5 to 17-8 of Rider's Volume XVII*, except for the following changes. The 35W4 rectifier tube has been replaced with a 100-ma selenium rectifier. The 35B5 output tube has been replaced with a 50L6 output tube. A negative temperature coefficient resistor has been added in the filament line. The filter choke has been replaced by a 1200-ohm resister and a tap on the output transformer. The 0.005-μf tone capacitor has been replaced with an 0.003-μf capacitor.

DELETE

REF. NO.	PART NO.	DESCRIPTION
	A19141	Terminal Strip, Double
	B21123-1	Tube retainer Spring, long
R13	C20060-331	Resistor 330 ohm ¼ W
R14	C20070-123	Resistor 11,000 ohm ¼ W
R15	C20060-104	Resistor 0.1 Megohm ¼ W
L3	AE21107-1	Filter Choke Assembly
T3	AE21099-1	Output Transformer

ADD

REF. NO.	PART NO.	DESCRIPTION
	A19140	Terminal Strip, Single left hand
	A18254-1	Socket, tube wafer octal
SR	A20207-2	Selenium Rectifier
T3	AC21494-1	Output Transformer
NTCR	AC21489-1	N.T.C. Resistor and Can Assy.
C10	C20069-302	Capacitor 0.003 μf 600 V P.T.
R13	C20223-122	Resistor 1200 ohm, 2W. ± 10%

Arvin 544 and 544R (Noblitt-Sparks)

The following changes have been made in the circuit appearing on *pages 15-3 to 15-5 of Rider's Volume XV* to reduce low level hum and hum modulation.

1. The capacity of the electrolytic capacitor A19136 (C7) is changed from 40-20$\mu\mu$f, 150v, 20$\mu\mu$f, 25v, to 50-20$\mu\mu$f, 150C, 20$\mu\mu$f, 25c.
2. The rotor of the variable capacitor is now connected to AVC instead of to chassis. (This is the same circuit that was used in sets built previous to March 1946.)
3. C11 0.1μf, 400v, capacitor from AVC to chassis is deleted.
4. The bypass capacitor from B+ to chassis is changed from C9, 0.05μf, 400v, to C11, 0.1μf, 400v, to prevent oscillation.
5. A fiber washer part 20198 ¼ inch ID, ½ inch OD, ⅛ inch thick, is added under the pointer to prevent the pointer from touching the dial and shorting AVC to the chassis.
6. The floating ground wiring is changed; the jumper from the oscillator coil to the #3 lug on the 12SK7 socket is removed and replaced by a jumper from the ground side of the volume control to the a-c switch lug.
7. The top of the dial scale backing plate has been cut off even with the top of the dial, to allow the dial to set in a more vertical position. The part number remains the same, and the old and new plates are interchangeable.

The parts list for these models remains the same as that enumerated on *page 15-5 of Rider's Volume XV* except for the changes noted.

Part No.	*Description*
A19136	Capacitor, electrolytic 50-30$\mu\mu$f, 150v. 20$\mu\mu$f, 25v.
A20198	Washer, fiber

Noblitt-Sparks 664 and 664A

These models are the same as Model 6640, Chassis RE-206-1, appearing on *pages 17-16 to 17-18 of Rider's Volume XVII*, except that the loop assembly has been changed. The part number is AC18579-1.

Arvin 664 and 664A, Chassis RE-206-1

These models appearing on *pages 15-10 and 15-5 and 15-6 of Rider's Volume XV*, have been changed as follows to reduce the a-c hum. The 0.1-μf capacitor (C12) connected from B+ to the cathode of the 35L6 tube has been changed to 0.03μf. The resistance of R12 connected from B+ to the cathode of the 35L6 tube has been changed from 12,000 to 15,000 ohms .Making this change will reduce the a-c hum of many of the sets with the previous circuit.

The parts list should be changed as follows:

Delete:

Ref.No.	*Part No.*	*Description*
R12	C20070-123	Resistor 12,000 ohms, 1 watt
C12	C20068-104	Capacitor, 0.1μf, 400 v. p. t.

Add:

Ref.No.	*Part No.*	*Description*
R12	C20070-153	Resistor, 15,000 ohms, 1 watt
C12	C20068-303	Capacitor, 0.03μf, 400 v. p. t.

Phillips Petroleum 3-62A

This is the same as Model 3-61A, appearing on *pages 17-9 to 17-12 of Rider's Volume XVII*

Radio & Television (Brunswick) 4000, 4000½, 6000, 6000½, 6876

These models are the same as Model SF-6810 on *pages 16-1 to 16-5 of Rider's Volume XVI*.

Olympic Radio 6A-501W-U, 6A-501V-U, 6A-502-U

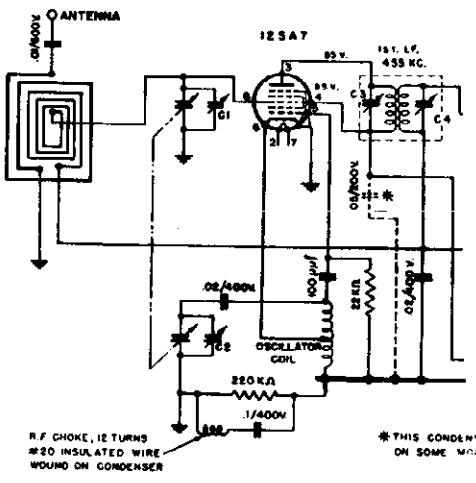
These models are the same as Model 6-501W-U on *page 15-2 of Rider's Volume XV*, except for the following changes. The tube lineup may be 12BE6, 12BA6, 12AT6, 50B5, and 35W4, instead of the lineup shown on page 15-2. The 330-$\mu\mu$f capacitor in the oscillator feed-in line has been changed to 100$\mu\mu$f. The 8200-ohm resistor connected from the top of this capacitor to B minus is now 22,000. A 220,000-ohm resistor is connected from B minus to the ground side of C2 and the trimmer capacitor across it. A 0.1-μf capacitor and an r-f choke are connected in series across the 220,000-ohm resistor. The choke consists of 12 turns of #20 insulated wire wound on the capacitor. In some models, a 0.05-μf capacitor is connected from the primary of the first i-f transformer to B minus.

A 47,000-ohm resistor has been placed inside the can of the second i-f transformer and two 100-$\mu\mu$f capacitors are connected across it. The resistor is connected between the secondary of the i-f transformer and the avc line. There is a connection from the cathode of the 12SQ7 (or 12AT6) tube to the junction of the capacitors.

The parts list has been changed as follows:

Part No.	*Description*
CA-327W	Cabinet—walnut bakelite cabinet
CA-327V	Cabinet—ivory bakelite cabinet
CL-575	Coil—oscillator coil
REB223M	Resistor—22,000 ohms, ±20%, 1/2 watt
ST-255-1	Back—cardboard back (for 6A-501U only)
TR-707	Transformer—first i-f transformer (shielded)
TR-708	Transformer—second i-f transformer with built in diode filter (shielded)

Changes in the mixer-oscillator circuit of the Olympic models 6A-501-W-U, 6A-501V-U, and 6A-502-U.



RCA QU61

The following circuit modifications have been made in RCA Model QU61, the schematic of which appears in *Rider's Volume XV on page 15-55:*

1. In some sets, a modification has been made in the "Radio-Phono Switch and Tone Control Strip," the diagram of which appears on *page 15-58.* The modified diagram appears in Fig. 1. In these sets, R9 (Stock No. 30648) has been omitted and C57, 120 $\mu\mu$f (Stock No. 39630) has been changed to 47$\mu\mu$f (Stock No. 35644). A 220,000-ohm resistor (R33, Stock No. 14583) has been added from terminal 12 of S7 to the ground terminal of R11.

2. In some sets, a modification has been made in the bias supply to the output tubes. The schematic for the unmodified diagram appears on *page 15-55 of Rider's Volume XV*, and the modified diagram is shown in Fig. 2. A 120,000-ohm resistor (R25, Stock No. 30180) has been added in series with the supply and a 0.05 μf capacitor (C56, Stock No. 70615) has been added from the output tube side of the 120,000-ohm resistor to ground.

3. Should interference from a powerful near-by station require the use of a wave trap, install RCA Stock No. 32553 trap as illustrated in Fig. 3. The complete chassis view is found on *page 15-58 of Rider's Volume XV.* Connect the coil lug to the receiver antenna connection; ground connection is made to the chassis through coil mounting foot. Adjust the capacitor mounted on top of the coil for minimum signal from the interfering station.

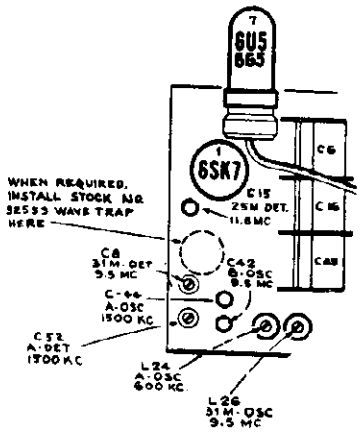


Fig. 3. In case of interference, a wave trap can be installed as shown in the RCA model QU61.

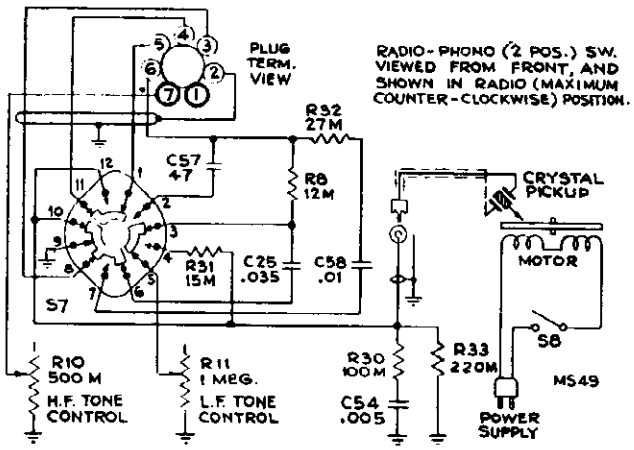
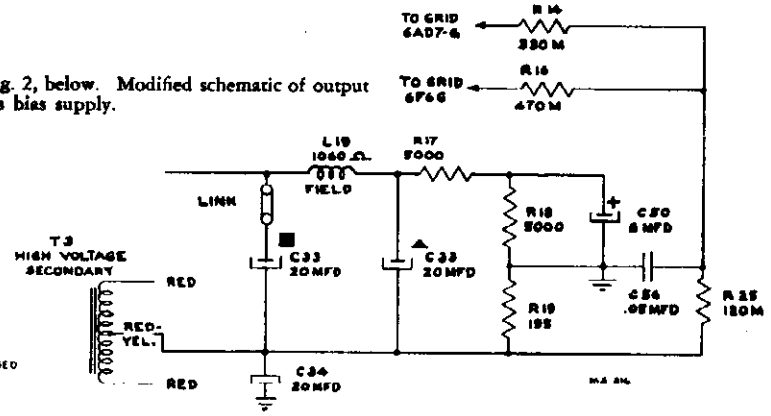


Fig. 1, above. Modified schematic of phono switch and tone control strip in RCA model QU61.

Fig. 2, below. Modified schematic of output tubes bias supply.



RCA QB55, Chassis RC-563A

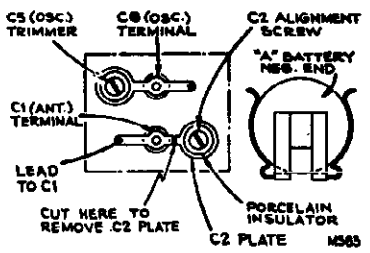
The following changes pertain to RCA QB55, chassis RC-563A appearing on *pages 15-27 to 15-28 of Rider's Volume XV*. In some chassis the 12-$\mu\mu$f section (C20) of the electrolytic capacitor has been changed to 20-$\mu\mu$f and the 20-$\mu\mu$f section (C22) has been changed to 30-$\mu\mu$f. C12 has been changed to 0.03μf and C18 to 0.003-μf.

RCA 54B Series

These receivers have been produced with loops of two types of construction: "taped," in which the coil is fastened to the loop cover with Scotch tape; and "cemented," wherein the coil is fastened to the loop cover with coil cement. Receivers using "cemented" loop have been produced with and without the antenna trimmer capacitor, C2. Receivers using the "taped" loop have only been produced with antenna trimmer C2, and they are to be aligned according to the instructions on *page* 15-22 *of Rider's Volume XV*. In the case of those receivers using the "cemented" loop which has the trimmer C2, this capacitor is removed before alignment. Trimmer C2 is removed by removing the C2 alignment screw and cutting off the C2 capacitor plate as shown in the accompanying illustration.

Removal of the trimmer necessitates changes in the alignment for sets using the "cemented" loop. Refer to the alignment instructions on *page* 15-22. Steps 1 and 2; connect the high side of the test oscillator to the connection lug of C1 located on rear of gang in series with 0.01-μf capacitor. Step 3: test oscillator tuned to 1500 kc; the gang capacitor is rocked instead of being set to 1600 kc. Step 4: omitted. Step 5: the gang capacitor is rocked instead of being set to 600 kc. All other instructions are the same with the foregoing exceptions.

If there is distortion and low volume in the RCA 54B series, check



Before aligning the RCA model 54B with a "cemented" loop, C2 is removed, as indicated.

the coupling capacitor C19 (0.002 μf) for leakage. This capacitor couples the audio signal from the 1S5 tube to the 3S4 output tube. This capacitor has only a 150-volt rating and it should be replaced with one that has a 200-volt rating.

The following is a list of changes for the parts lists for these models:

1. Delete Stock No. 70454—Capacitor-Tubular, 0.002 μf, 150 volts (C14, C19)

2. Add Stock No. 72315—Capacitor-Tubular 0.002 μf, 200 volts (C14, C19).

3. Delete Stock No. 70453—Capacitor-Tubular, 0.02 μf, 100 volts (C10, C15).

4. Add Stock No. 71928—Capacitor-Tubular, 0.02 μf, 200 volts (C10, C15).

NOTE: C15 (Stock No. 71928) should be located adjacent to the output transformer instead of under the socket subpanel, since its physical size is slightly larger than C15 (Stock No. 70453).

RCA 54B1, 54B2, 54B3

These models appear on *pages 15-22 to 15-24 of Rider's Volume XV*. The position of the green and black leads of the second i-f transformer (stamped (922246-2) have been transposed to facilitate assembly. This change affects only the wiring, not the schematic.

RCA 56X, 56X2, 56X3, Chassis RC-1011, A, B

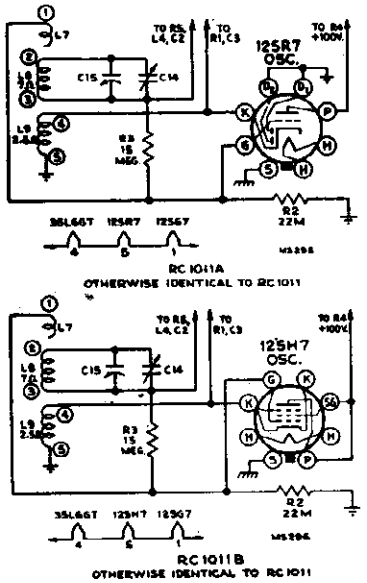
These models are the same as Model 56X on *pages 15-31 and 15-26 of Rider's Volume XV*, except for the following changes. Some sets have a 220,000-ohm resistor in shunt with the primary of the first i-f transformer. The replacement transformers may not need this resistor if the i-f amplifier seems stable.

Some sets have a 22-ohm, 1-watt resistor as a fuse in series with the electrolytic capacitor.

Some sets have a 56-$\mu\mu$f capacitor from terminal 1 of the oscillator coil to terminal 2. This is not necessary on replacement coils as they have a built-in capacity winding.

On some models the 500,000-ohm volume control is not furnished with a stop 50,000 ohms from the high end of the control. Controls having no stop can be identified by a dot of red lacquer on the left side of the control, viewing the shaft end with terminals up. In models using this completely covered with spaghetti tubing, is connected between the high end of the control and the yellow lead on the second i-f transformer.

Replacement controls equipped with a stop do not need this external 56,000-ohm resistor, so when replacing a volume control, check the resistance between the arm and the high end of the replacement control with the arm turned fully clockwise. A reading of 50,000 ohms will indicate that the control is equipped with a stop and that the 56,000-ohm resistor should be removed before installing the new control.

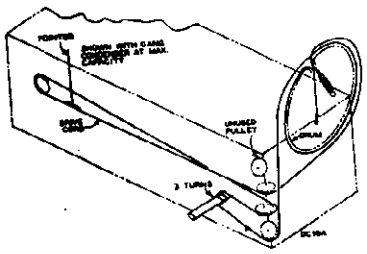


Changes in the oscillator circuit of RCA Chassis RC1011A, above, and Chassis RC1011B, below.

In chassis RC 1011A and chassis RC 1011B, the 12J5GT oscillator tube has been replaced with a 12SR7 in the former and a 12SH7 in the latter. The wiring changes in respect to these tube changes are shown in the accompanying partial schematics. Otherwise chassis RC 1011A and RC 1011B are identical to chassis RC 1011.

RCA 68R1, 68R2, 68R3, 68R4, Chassis RC-608

These models are the same as those illustrated on *pages 16-39 to 16-43 of Rider's Volume XVI*, except that the dial cord assembly has been redesigned. The revised design uses a simpler method, and the length of the dial cord has been reduced to approximately 67 inches



Revised method for dial cord stringing in RCA models 68R series.

rather than the original 80 inches. See accompanying illustration for method of restringing.

Radio Wire Television M72 and M73

These models are the same as Model M70A which appears on *pages 17-6 to 17-11 of Rider's Volume XVII*, with the following exceptions. The 22K resistor (R51) in the grid circuit of the first audio stage has been removed. The 0.02-μf capacitor (C19) which was connected from the top of R51 to one side of the tone control (R14) now is connected from the bottom of R13 to ground.

RCA 54B1, Chassis RC-589, 54B1-N, Chassis RC-589D, 54B2, Chassis RC-589A, 54B3, Chassis RC-589B, Second Production, Chassis RC-589U, RC-589UA, RC-589UB

These models are the same as Model 54B1, Chassis RC-589, appearing on *pages 15-22 through 15-24 of Rider's Volume XV*, except for the following changes. These models have been produced with loops of two types of construction: "taped"—the coil is fastened to the loop cover with scotch tape; and "cemented"—the coil is fastened to the loop cover with coil cement. The models with the "cemented" loops have been produced with and without the 2—15-$\mu\mu$f antenna trimmer capacitor C2. Receivers with the "taped" loop all have C2. The three combinations are listed below with the correct alignment procedure specified. CAUTION: A "taped" type loop should never be used as a replacement on those models which do not have antenna trimmer capacitor C2.

Loop Construction	*C2 Ant. Trimmer*	*Alignment Procedure*
Taped	With	As given on page 15-22
Cemented	With*	See following alignment table
Cemented	Without	See following alignment table

*Remove antenna trimmer capacitor C2 by removing C2 alignment screw and cut off C2 capacitor plate.

*Steps 3, 4, and 5 require a coupling loop from the signal generator to feed a signal into the receiver loop located in the lid. This loop should be approximately one turn of 6x3½ inches coupled to the signal generator through a 200-$\mu\mu$f capacitor, and loosely coupled to the receiver loop antenna at about 1¾ inches distances, so as not to disturb the receiver loop inductance. Ground test oscillator through 0.1-μf capacitor to receiver chassis.

Steps	Connect the high side of test osc. to—	Tune test-osc. to—	Turn radio dial to—	Adjust the following for max. peak output—
1	Connection lug of C1 located on rear of gang in series with .01 mf.	455 kc	Quiet point near 1,600 kc	C11, C12 2nd I-F trans.
2		455 kc	Quiet point near 1,600 kc	C9, C8 1st I-F trans.
3	*Antenna coupling loop thru 200 mmf. capacitor	1,500 kc	Rock gang	C5 (osc.)
4		600 kc	Rock gang	L2 (osc.)
5	Repeat steps 3 and 4 for final adjustments.			

The second production of these models use a type 1U5 tube in place of the type 1S5 (second detector, a-f, avc). They may be identified by the letter U in the chassis number which is stamped on the tuning capacitor or chassis. The accompanying diagrams show a partial schematic and a parts layout and wiring diagram for this tube. The replacement parts for these models are the same as those for the first production, with the exception of the following.

Stock No.	*Description*
72230	Support—tube support less tube sockets and transformers

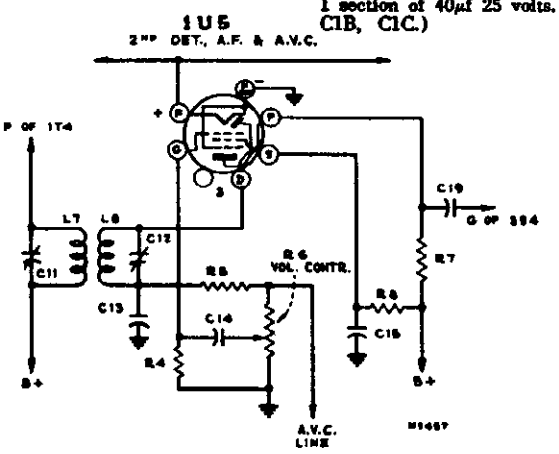
The following changes should be made in the parts list shown on *page 15-24 of Rider's Volume XV* to conform to all first production models.

Delete:

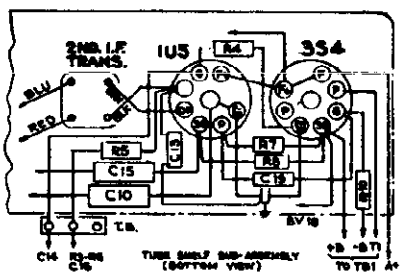
Stock No.	*Description*
60954	Capacitor—ceramic, 56$\mu\mu$f (C4)
65405	Capacitor—ceramic, 82$\mu\mu$f (C13)

Add:

Stock No.	*Description*
70448	Fastener—push fastener to hold loop (two required)
71563	Hinge—lid hinge—Model 54B3, —Red (two required)
71565	Lid—case lid complete with lid support less loop—Model 54B3—Red
71564	Loop—antenna loop complete with connectors less lid — Model 54B3—Red
71562	Plate—backing plate for mounting hinge on lid—Model 54B3—Red (two required)
71725	Screw—case cover mounting screw (one set)—Model 54B3
71567	Bottom—case bottom—Model 54B3—red
71566	Center—case center—Model 54B3—red
71568	Handle—carrying handle—Model 54B3—red
71569	Link—handle link—Model 54B3—red (two required)

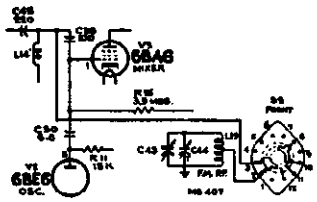


Alignment instructions for sets with cemented loop are shown in the table. The wiring changes for the type 1U5 tube used in the second production are shown on the right.



RCA 711V1, 711V2, 711V3, CHASSIS RK-117, RS-123

Models 711V1 and 711V3 are the same as Model 711V2 shown on *page 17-44 to 17-55 of Rider's Volume XVII* except for the cabinets. The following changes apply to all models. Resistor R6 is 1200 ohms instead of 680 ohms as indicated on the schematic of the RK-117 chassis. The



The revised V3 mixer circuit.

mixer (V3) input circuit of this chassis has been revised. C28 is omitted, the connections to terminals #2 and #3 of the range switch (S3 front) have been reversed, the plate circuit of the r-f amplifier (V1) is coupled to the grid circuit of the mixer (V3) through C38 instead of C28. Capacitor C1B on Chassis RS-123 has been changed from 15μf to 50μf. The following change should be made in the parts list for for this chassis. Stock number 36599 should be deleted, and number 72955 added.

Stock No.	*Description*
72955	Capacitor—Electrolytic, comprising 1 section of 30μf, 450 volts, 1 section of 50μf 400 volts, and 1 section of 40μf 25 volts. (C1A, C1B, C1C.)

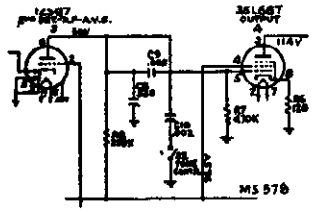
RCA 66X1, 66X2, RC-1038, 66X3, 66X4, 66X7, 66X8, 66X9, Chassis RC-1038A

These models are similar to Model 66X1, Chassis RC-1038, appearing on *pages 15-89 through 15-91 of Rider's Volume XV*. The following additions have been made to the parts list.

Stock No.	*Description*
72753	Plate—dial back plate complete with four (4) pulleys less dial for models 66X3, 66X4, 66X7, 66X8, 66X9
6134	Resistor—1200 ohms, 1 watt, (R11)
72514	Back—cabinet back for 66X7 and 66X9
72721	Back—cabinet back for 66X8
X1627	Baffle—baffle board and grill cloth for 66X7, 66X8, 66X9
Y1423	Cabinet—catalin (black) cabinet for 66X7
Y1408	Cabinet—catalin (red) cabinet for 66X8
Y1393	Cabinet—catalin (black and white) cabinet for 66X9
72822	Dial—glass dial scale for 66X3, 66X7, 66X8, 66X9
72678	Knob—control knob (black) for 66X7 and 66X9
71821	Knob—control knob (maroon) for 66X8
72295	Socket—phono

RCA 66X11, 66X12, 66X13, Chassis RC-1046C, RC-1046D, RC-1046E

These models are the same as Model 66X11, chassis RC-1046A, on *pages* 17-29 *and* 17-30 *of Rider's Volume XVII*, except for the following change. The capacitor C10 (tone-control circuit) which was connected



Capacitor C10 is here connected to the plate of the 12SQ7 a-f amplifier tube.

to the grid of the 35L6GT output tube, is now connected to the plate of the 12SQ7 a-f amplifier tube, as shown.

RCA 66X11, 66X12, 66X13, Chassis RC-1046C, RC-1046D, RC-1046E, Second Production

These models are similar to Model 66X11, chassis RC-1046A, on *pages 17-29 and 17-30 of Rider's Volume XVII*. They incorporate the changes listed in the June 1948 issue of SUCCESSFUL SERVICING, in addition to the following changes. The parts list should be amended as follows:

CHASSIS ASSEMBLIES

Change: 72896 Plate—to read
72896 Plate—dial back plate complete with drive cord pulleys for Model 66X11.

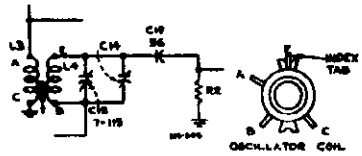
Add: 72601 Plate—dial back plate complete with drive cord pulleys for Model 66X12.

MISCELLANEOUS

Change: 73169 Back—to read
73169 Back—cabinet back for Model 66X13—walnut

Add: 73278 Back—cabinet back for Model 66X13 mahogany
71893 Decal—trade mark decal

The stock number of the dial cord should be 72953 instead of 72913. This cord is supplied in 250 foot reels. Approximately 56 inches are required for the first



Oscillator Circuit
RC-1046C, RC-1046E

Schematic otherwise identical to RC-1046-A,-B except ant. tuning cond. C12 is 10-398 mmfd., only one dial lamp used on RC-1046E.

production and approximately 49 inches for the second production.

The differences between these various chassis are as follows. Chassis RC-1046C uses oscillator coil without capacity winding, L5. Capacitor C19 is used and a tuning capacitor without C16 is used. Two dial lamps type number 1490 are used. Chassis RC-1046E is the same as RC-1046C, except that only one dial lamp, Type 47, is used. For oscillator circuit see accompanying diagram.

73172	Capacitor—ceramic, 56μμf (C19)
73163	Coil—Oscillator coil complete with adjustable core and stud (L3, L4)
73164	Capacitor—Variable tuning capacitor (C12, C13, C14, C15)

RCA 612V1, 612V3, AND 612V4

These models appear on *pages* 17-31 *to* 17-43 *of Rider's Volume XVII*. The alignment tabulation should be corrected to read as follows.

Step No. 12—Repeat steps 10 and 11 for exact calibration.

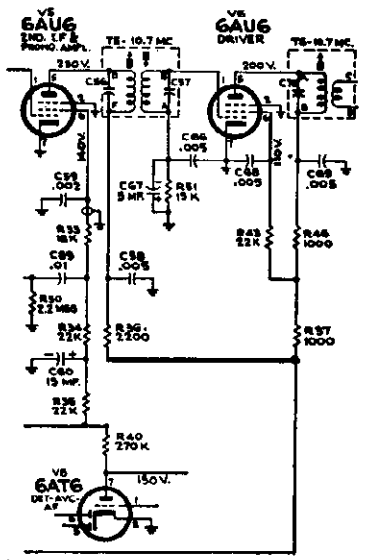
Step No. 18—Repeat steps 16 and 17 for maximum output.

On chassis RS-123, the electrolytic capacitor C1B has been changed from 15μf to 50μf.

RCA 612V1, 612V3, 612V4, Chassis RK-121

These models, appearing on *pages* 17-31 *to* 17-43 *of Rider's Volume XVII*, have been changed as follows. R36 is no longer connected to the junction of R35-R40-R22-R25. It is now connected to R37 and terminal #11 of S5. This change removes the plate voltage from V5 (6AU6) when the range switch is in the "Phono" position, and is illustrated here.

If the shielded lead of the power cable touches the speaker frame, noise will be caused. The power cable should be clamped in such a position to prevent contact with the speaker frame.



This new connection for R36 removes the plate voltage from V5 when the range switch is in the "Phono" position.

RCA Record Changer Model 960015

This model is shown on *RCD.CH. Page 15-11 of Rider's Volume XV*. If binding or freezing of turntable bearing occurs, the turntable shaft should be removed and polished with very fine emery cloth or crocus cloth. Clean off any bearing metal or foreign particles from the shaft, including the set-screw burr. Next, bevel the top edge of the top bearing slightly, with a knife or scraper. Clean the shaft and the bearing with carbon tetrachloride, removing oil and grease and being certain to clean out any chips which may have dropped into the bottom bearing. Lubricate all moving surfaces with a light coating of a very light-bodied grease.

If records do not separate properly and it is found necessary to adjust record slide actuating lever, proceed as follows:

1. Rotate separator shelf to 10" position.
2. Remove 10" landing adjustment bolt.
3. Press down on reject button and rotate turntable by hand in the normal direction until a "click" is heard (reject actuating slide latching).
4. Loosen set screws "G" and set record actuating lever ⅜ inch from bracket as indicated in Fig. 2 of service data.
5. Tighten set screws "G" and replace landing adjustment bolt.
6. Make necessary landing adjustment as described in service data.

NOTE: This method just described makes the set screw "G" more accessible and is therefore found more convenient. This method can be substituted for step No. 9 under Preliminary Adjustments.

RCA Record Changers 960001 Series

These changers are the same as Model 960001-1 on *RCD. CH. page 15-1 of Rider's Volume XV* except for the following changes:

960001-4 Uses L230270 Motor. Has additional pickup shorting switch that shorts out pickup arm when in the rest position.

960001-5 Uses pickup cable 72583 of different length.

960001-6 Same as 960001-5 except for color of knobs, arm, etc.

Regal Electronics 208

This model is the same as models 800 and 801 shown on *page* 16-1 *of Rider's Volume XVI.*

Remler Model 5100

This model appears on *Misc. page 16-9 in Rider's Volume XVI.* The external resistor connected from the suppressor grid (pin 3) to the cathode (pin 5) of the 6SK7 i-f amplifier has been changed from 100 ohms to 220 ohms. The 1-meg resistor connected from the plate (pin 3) of the 6V6GT audio amplifier to the junction of the 0.01-μf coupling capacitor and the 220,000-ohm plate load resistor of the 6SQ7 detector, has been removed. A 0.05-μf filter capacitor has been connected from each side of the a-c power line to ground.

Sears Roebuck 3351, 3451, 3551, Chassis 132.802-2C, -2D, -2E

These models are the same as Model 3351, Chassis 132.802 on *page 12-3½ of Rider's Volume XII,* except for the following changes. A pilot-light shield and snubber assembly has been added, replacing the dial-light shield which was assembled to the dial-pointer shaft bracket. The push-button caps are permanently cemented to the push buttons at the time the set is built.

Sears-Roebuck 4518, Chassis 101.393

This model is the same as model 4500, chassis 101.393 shown on *page 8-15 of Riders Volume VIII.*

Sears-Roebuck 6200A, Chassis 101.800-1; 6203, Chassis 101.800-A

These models are the same as Model 6200, chassis 101.800, shown on *pages* 15-13 *and* 15-2 *of Rider's Volume XV,* except for the following changes. A phono socket has been added to Model 6200A. An ivory cabinet, instead of a brown one, is used on Model 6203.

Part Number	Description
R61010	Cabinet, Ivory (101.800-A)
R44897	Socket, phono (101.800-1)

Sears-Roebuck 7025, Chassis 132.807-2

This model is the same as that shown on *page* 13-63 *of Rider's Volume XIII,* with the following exceptions. The electromagnetic speaker (Part No. N17258) has been replaced by a permanent magnet speaker (Part No. N16993.) The oscillator coil (Part No. 17233) has been rotated 180 degrees and the mounting lug soldered to the back of the chassis to provide a better mounting. This change does not involve any circuit changes.

Sears Roebuck 7056

This model appears on *pages 13-75 and 13-76 of Rider's Volume XIII.* The Astatic L-40A crystal cartridge should be used as a replacement cartridge for the phonograph pickup.

Sears-Roebuck 7080, Chassis 101.809; 7100, Chassis 101.811

These models, shown on *page 16-4 of Rider's Volume XVI,* use The General Instrument model 205 record changer which is shown on *page RCD.CH.15-5 of Rider's Volume XV.*

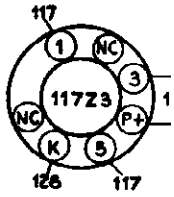
Sears Roebuck 8052, Chassis 101.808-1C, and 8053, Chassis 101.808-1D

These models are similar to Model 7054, Chassis 101.808, appearing on *pages 16-1 to 16-3 of Rider's Volume XVI,* except for the appearance of some of the parts and the addition of a variable tone control circuit. This circuit, consisting of a 0.001-μf capacitor (C23) in series with a 2-megohm variable resistor (R15), has been connected from the plate of the 7C6 tube to the B minus line. The location of these parts is shown in the accompanying illustration.

The dial stringing diagram for these models is shown in the accompanying diagram and is the same for both Models 8052 and 8053 except that part No. R62057 is part No. R62187 for Model 8053.

Sentinel Model 286P

In this model (*pages 16-14 to 16-16 Rider's Volume XVI*) all factory wiring connections were made to the 117Z3 tube socket at pin number 1. The 117Z3 tube as originally produced, had an internal connection to pins 1, 3, and 5. Therefore



When a new type 117Z3 is used in the Sentinel model 286P, pins 1, 3, and 5 must be externally connected. Voltages are here shown.

the foregoing connection was satisfactory and no jumper was provided.

The new production of 117Z3 tube provides no internal connection between the number 1 pin and the number 3 and 5 pins. Therefore, it is necessary to wire the 1, 3, and 5 socket connections together so that this receiver will operate when the original 117Z23 tube is replaced with a recent production tube.

Setchell Carlson 416

This model appears on *Misc. page* 15-19 *of Rider's Volume XV.* The i-f transformers were coated with a low melting point wax (yellow wax). If this wax runs, the trimmers will not stay adjusted. The only remedy is to replace the transformer.

Sonora RMR-219, RMR-220, RMR-245, 402A Mahogany and Prima Vera

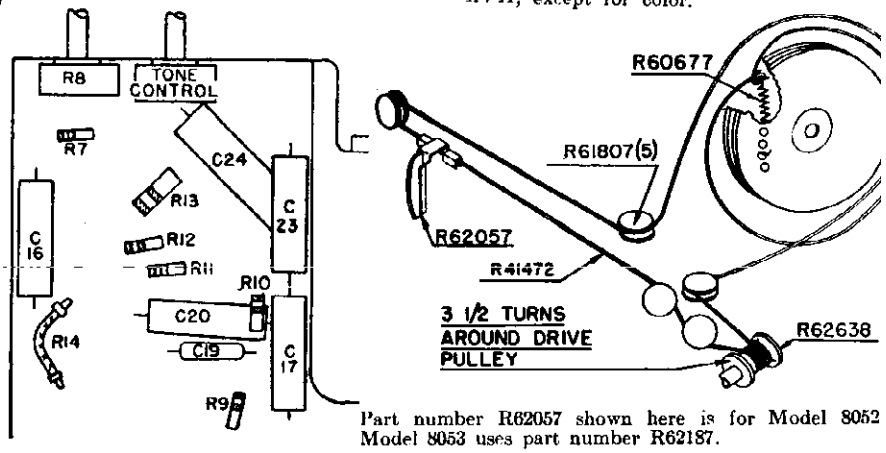
These models are the same as Model RMR appearing on *pages 17-6 to 17-8 of Rider's Volume XVII.*

Sonora KBU-168

This model is the same as Chassis KB, appearing on *page 12-6 of Rider's Volume XII.*

Stewart Warner VM-506261 Record Changer

This model is the same as Model VM-505339, appearing on *pages RCD.CH. 17-14 to RCD.CH. 17-19 of Rider's Volume XVII,* except for color.



Part number R62057 shown here is for Model 8052. Model 8053 uses part number R62187.

The variable tone control consisting of capacitor C23 and resistor R15 in Models 8052 and 8053.

Sentinel 1U286

This model is the same as Model 286PR on *pages 16-14 to 16-16 of Rider's Volume XVI*, except for the following changes.

A 0.1-μf capacitor (46) has been placed between pin number 6 of the 1R5 oscillator-modulator tube and the top side of the ganged tuning capacitor. A 470,000-ohm resistor (48) has been connected in the a.v.c. line between the top of the 0.05-μf capacitor (14) and the 4,700,000-ohm resistor (35). A 0.05-μf capacitor (47) has been connected from the junction of resistors 48 and 35 and ground. Two interlock plugs have been added in the power line. The i-f transformers (2 and 3) may either be the transformers listed in the parts list on page 16-16, or they may be part number 20E299.

The following parts should be deleted from the parts list shown on page 16-16.

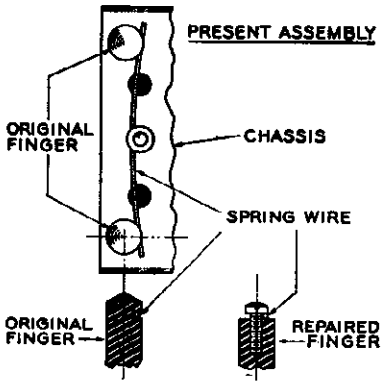
Illus. No.	Part No.	Description
8	23E2014-6	Capacitor, tubular, 0.01 μf, 150 V.
10	23E2014-6	Capacitor, tubular, 0.01 μf, 150 V.
11	23E2014-6	Capacitor, tubular, 0.01 μf, 150 V.
12	23E2014-6	Capacitor, tubular, 0.01 μf, 150 V.
13	23E2014-6	Capacitor, tubular, 0.01 μf, 150 V.
14	23E2014-8	Capacitor, tubular, 0.05 μf, 150 V.
16	23E2014-12	Capacitor, tubular, 0.002 μf, 150 V.
17	23E2014-9	Capacitor, tubular, 0.01 μf, 150 V.
46	23E2014-9	Capacitor, tubular, 0.1 μf, 150 V.
23	23E680-3	Resistor, carbon, 68 ohm, ½ W.
	20E128	"A" battery con. bracket assembly, with 4 No. 10E43 trimount studs
	20E130-1	Complete cabinet assembly, with lid and loop, handle, lid catch and pushbutton assembly and bottom assembly
	20E184	Top lid assembly with loop and hinges.
	20E185-1	Bottom assembly with locking slotted head stud
	30E25-1	Cabinet center section, less lid and bottom assemblies, with handle, speaker screen, lid catch and pushbutton
	20E136-1	Hinge and spring assembly with two No. 82E36-F10 No. 4-24 x ¼ mounting screws
	55E22-1	Handle, leather
	71E42-F10	Screw, No. 4-40 x 3/16 slot B.H.I.M.

The following parts should be added to the parts list.

Illus. No.	Part No.	Description
8	23E2004-5	Capacitor, tubular, 0.01 μf, 200 V.
10	23E2004-5	Capacitor, tubular, 0.01 μf, 200 V.
11	23E2004-5	Capacitor, tubular, 0.01 μf, 200 V.
12	23E2004-5	Capacitor, tubular, 0.01 μf, 200 V.
13	23E2004-5	Capacitor, tubular, 0.01 μf, 200 V.
14	23E2004-7	Capacitor, tubular, 0.05 μf, 200 V.
16	23E2004-2	Capacitor, tubular, 0.002 μf, 400 V.
17	23E2004-8	Capacitor, tubular, 0.01 μf, 200 V.
23	27E680-3	Resistor, carbon, 68 ohm, 1 W.
44	20E280-2	Switch, lid operated, mounted on "A" battery bracket assembly
45	20E284	Interlock, socket assembly
46	23E2014-9	Capacitor, tubular, 0.1 uf, 200 V.
47	23E2014-8	Capacitor, tubular, 0.05 μf, 200 V.
48	27E47-7	Resistor, carbon, 470,000 ohm, ¼ W.
48	20E284	Interlock, socket assembly
	20E130-3	Complete cabinet assembly with lid and loop, handle, lid catch and pushbutton assembly and bottom assembly
	20E184-3	Top lid assembly with loop and hinges
	30E25-3	Cabinet center section, less lid and bottom assemblies, but with handle, speaker screen, lid catch and pushbutton assembly.
	20E136-2	Hinge, right hinge and spring assembly with two No. 82E36-F10 No. 4-24 x ¼ mounting screws
	20E136-3	Left hinge and spring assembly with two No. 82E36-F10 No. 4-24 x ¼ mounting screws
	20E280-2	Complete "A" battery bracket assembly with lid operated switch assembly
	20E283	"A" battery contact plate assembly
	52E28	Plastic covered handle
	55E39	Handle strap, clock spring steel
	85E4-21	Screw, No. 4-40 x 3/16 Slot headless cup point for control knobs
	82E2004	Screw, for adjusting lid switch shaft

Setchell Carlson 427

This model appears on *page* 16-1 *of Rider's Volume XVI*. If the line voltage is extremely low, the 50L6 tube should be replaced with a 35L6 tube. The chassis is held in the cabinet by means of a spring wire caught in slots which are near the top of a finger built into the cabinet. If the head of this finger breaks off, repair can be made by drilling and tapping for an 8/32 machine screw. The accompanying illustration shows this method.



A machine screw can be substituted for the broken head of the finger which catches the spring wire holding chassis of Setchell Carlson 427 in cabinet.

Stewart-Warner 61TR36 (9029-B), 61TR46 (9029-H), 61TR56 (9029-J), 61TR66 (9029-K), 61TR76 (9029-L)

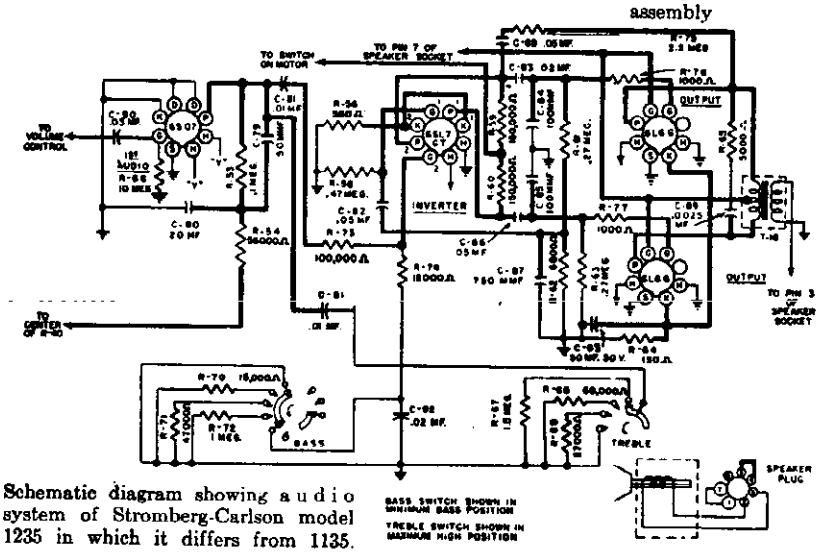
These models are the same as the 61TR36 shown on *pages 15-9 and 15-10 of Rider's Volume XV*, except for the addition of a 0.0008-μf capacitor 52 part No. 502470. This is connected at the junction of resistor 27 and the phono-pickup cable socket to ground when an L-70-Z cartridge is contained in the tone arm used with the DT-505049 changer.

Stromberg-Carlson 1235

This model is similar to Model 1135, appearing on *pages 16-8 to 16-10 and 16-16 to 16-19 of Rider's Volume XVI*, except for the following changes. The audio system has been changed and is shown in the accompanying diagram. Connections have been omitted from pins 1, 2, 3, 4, and 7 of the wire record socket. Pin 6 is grounded and the 17,000-ohm resistor, R-79, has been removed. Pin 5 is still connected to the junction of R46 and R47. A 1000-ohm resister, R-41, has been added to the top of the bleeder. There is no connection to the junction of R-41 and R-40.

The following additional parts are used on the Model 1235.

149246	R-64	150 ohm, 5 watt
28155	R-56	560 ohm, ½ watt
149247	R-41	1000 ohm, 5 watt
28158	R-76, 77	1000 ohm, ½ watt
28168	R-62	6800 ohm, ½ watt
28172	R-70	15000 ohm, ½ watt
28179	R-68	68000 ohm, ½ watt
28191	R-72	1 megohm, ½ watt
28193	R-67	1.5 megohm, ½ watt
149121	R-75	2.2 megohm, ½ watt
149125	R-66	10 megohm, ½ watt
25485	C-81	0.01 μf
29891	C-86, 88	0.05 μf
110494	C-90	0.05 μf
111012	Electrolytic	50 uf
41489		6SL7 tube
30224		Plug
161230		Output transformer
33964		Bull's eye socket assembly



Schematic diagram showing audio system of Stromberg-Carlson model 1235 in which it differs from 1135.

TELETONE 139, 140, 141, 149, 157, 163, 164, Chassis H

These models are the same as Model 135, Chassis H, appearing on *Misc. Page 16-11 of Rider's Volume XVI.*

Teletone 161, 167, 168, 171, 174, Chassis T

These models are all the same as Model 150, Chassis T, appearing on *pages 17-2 and 17-3 of Rider's Volume XVII.*

Wells-Gardner 7A41-593

This model is the same as Model 7A41-704 appearing on *pages 12-8 to 12-11 of Rider's Volume XII.*

Truetone D-696

This model is the same as Model D-727, which appears as Model 175 on *Detrola page 9-1 of Rider's Volume IX.*

Truetone D1118B

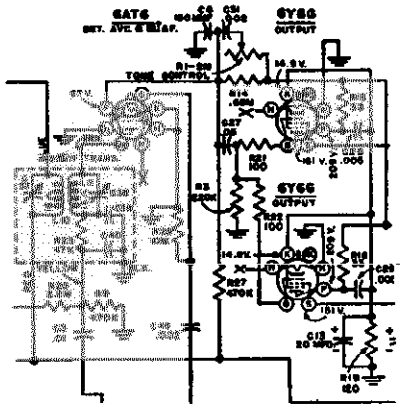
This model is similar to the D1118A model, shown on *pages 13-68 and 13-69 of Rider's Volume XIII* except for the following changes: The antenna trimmer (C2), part number 17A1116, mounted on the loop aerial assembly in the issue A model has been removed. The 1400-kc adjustment as given in the alignment procedure is omitted. The 1400-kc adjustment is made at the factory and need not be made in the field.

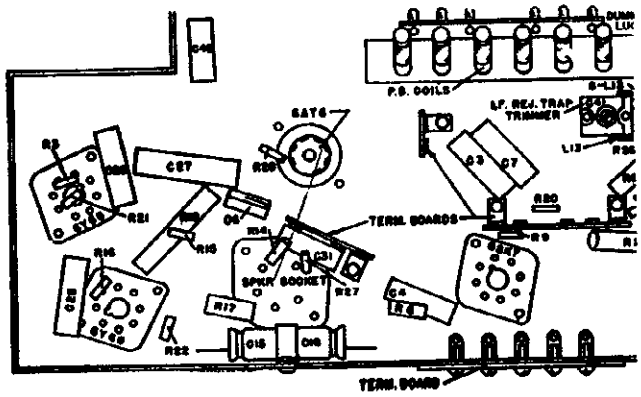
Westinghouse H-110A, H-111A, H-137A, and H-138A, Chassis V-2102-2

These models are the same as Model H-104 on *pages 15-1 to 15-4 of Rider's Volume XV*, except that the tone control circuit has been modified and a 6AT6 miniature tube replaces the 6SF7 tube used originally. The tube layout is the same, but certain components have been added, as may be seen in the accompanying diagrams.

The following parts should be added to the parts list.

Part No.	Description
RCP10W6202A	Capacitor, 0.002 μf, 600 v. (C48)
RC10AE474M	Resistor, 470K ¼ w. (R27)
RC10AE106M	Resistor, 10M ¼ w. (R28)

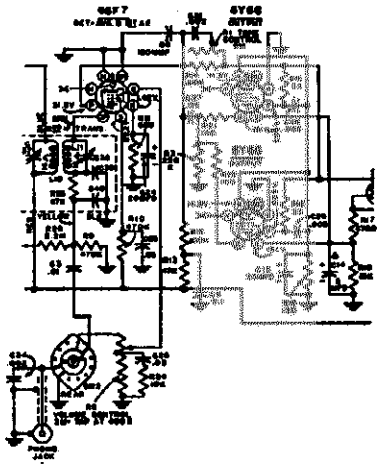




Changes in the tone control circuit, above, and in the parts layout, left, of the Westinghouse Chassis V-2102-2.

Westinghouse H-110, H-111, H-137, and H-138, Chassis V-2102-1

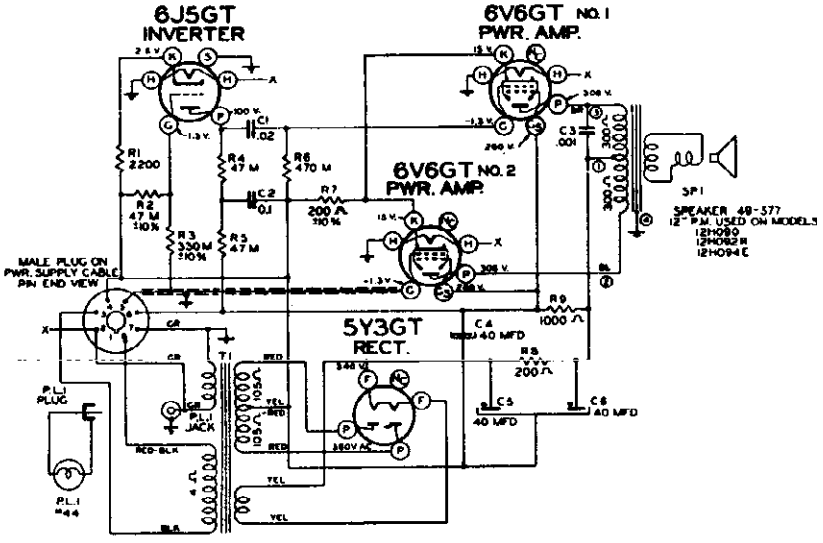
These models are the same as Model H-104 on *pages 15-1 to 15-4 of Rider's Volume XV*, except that the tone control circuit has been modified. This change is illustrated in the accompanying diagram.



The modified tone control circuit of the Westinghouse Chassis V-2102-1.

Zenith 12H090, 12H091, 12H092, 12H093, 12H094, Chassis 11C21Z

These models are similar to Mode 12H090, Chassis 11C21, on *pages 15-87 t 15-94 of Rider's Volume XV*. The diffe ence between these chassis appears in th power supply and the audio section. Cha sis 11C21 uses an electro-dynamic speake and the field of the speaker is used as choke in the power-supply filter circui Chassis 11C21Z uses a permanent magne speaker. To convert Chassis 11C21 t 11C21Z, it is necessary to replace th speaker field with a 200-ohm, 5-watt resist (R8 in the accompanying diagram). 40-μf capacitor must be connected fro the center tap of the powe transform to pin number 6 of the power-supply cab plug, as shown in the diagram. C40 ar C41 must be changed from 30μf to 40 (they appear as C5 and C6 in the 11C21 chassis). A 1000-ohm, 3-watt resistor (R must be connected between the screen gr of the first beam-power output tube ar the center tap of the output transforme The capacitor shown as C3 in the accor panying diagram is capacitor C39 in th schematic on *page 15-87, 88 of Rider Volume XV*.



The audio section and power supply of the Zenith chassis 11C21Z

IMPORTANT: Only difference between RC 180 & RC 181 is shape of pan.

OPERATING INSTRUCTIONS

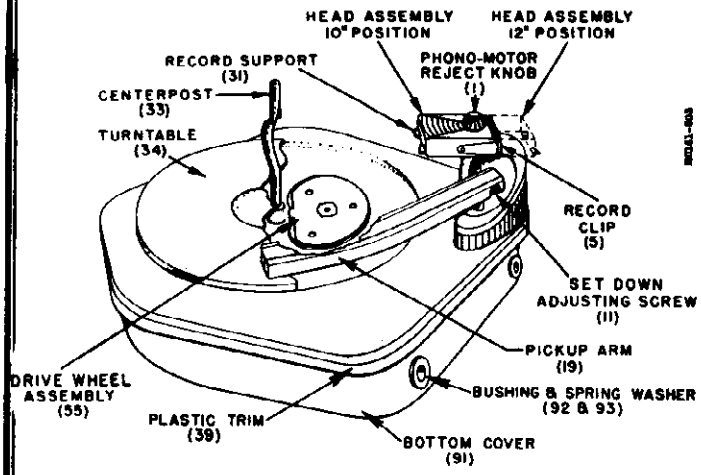


Figure 1A - Record Changer RC181, Top View.

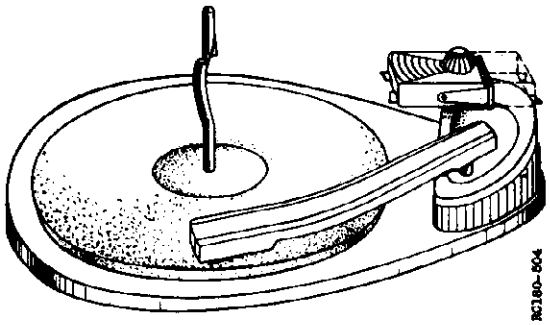


Figure 1B - Record Changer RC180, Top View Showing Pear-Shaped Pan.

1. SETTING FOR SIZE OF RECORD

The size of record for which the record changer is set to play is determined by the position of the head assembly (See Figure 1). With the embossed design toward the centerpost, the changer is set for 10-inch records. With the embossed design away from the centerpost, the changer is set for 12-inch records.

To change the setting, rotate the head assembly in either direction, until it clicks and locks in the desired position.

A slight amount of pressure may be required to begin the rotation when the head assembly is locked in an operating position.

2. STARTING THE RECORD CHANGER

To load the record changer, move the record clip (5) away from the centerpost (33) and place the records on the centerpost. The bottom record is supported by the offset in the centerpost and the record support (31).

Move the record clip so that it rests on the top record.

Turn the Phono-Motor switch knob (1) to the ON position. Then press down on this knob momentarily. The bottom record will drop to the turntable and the Record Changer will play the entire stack of records automatically.

3. REJECTING A RECORD

To reject a record at any time, press down o the Phono-Motor switch momentarily.

4. STOPPING THE RECORD CHANGER

This Record Changer cannot be turned off b means of Phono-Motor switch during its chang cycle. If the On-Off switch on the radio is used t turn off the changer, it is advisable to stop it whe the changer mechanism is out of cycle.

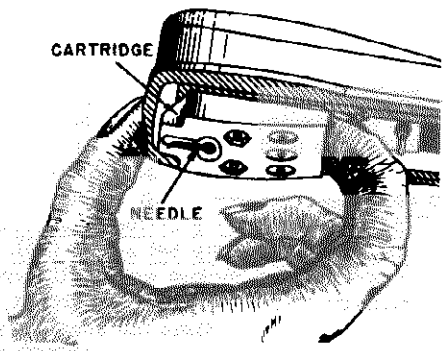


Figure 2 - Removing Cartridge by Pulling Down on Back Edge.

5. REPLACING CARTRIDGE AND NEEDLE

Before replacing, see cartridge service data i paragraph 14.

Remove the old cartridge (25) by getting you finger nails or a small screwdriver under it a shown in Figure 2 and pull down on the back edge Press new cartridge into place again, making sur to push near its back edge where its pins go into th socket.

THE CHANGE CYCLE

6. DESCRIPTION OF CHANGE CYCLE
(See Figures 1, 3 and 4)

If at all possible, we recommend that you carefully observe the operation of a changer that is in normal operating condition. It is a good idea to rotate the turntable by hand and repeat the changing cycle until you understand the function of each part. It is important to note that this changer employs the oscillating type trip, which depends upon the in and out movement of the pickup arm caused by the eccentric groove in the record. This is different than previous Admiral Changers which tripped when the pickup arm reached a given position.

The changer operates as follows: The changer mechanism is driven during its change cycle by the knurled hub of the turntable rotating the rubber-tired drive wheel (55). During normal playing, the drive wheel is held in a neutral position as illustrated in Fig. 1 & 3A, so that the indentation prevents the tire from contacting the knurled hub. The drive wheel (55) is held in this position by the trip stop wire (81A) and the cam stop stud (58A) on the control cam (58).

During the record play and as the needle enters the eccentric groove, the pickup arm is moving in toward the centerpost. The pawl (87A) is moving across the trip serrations (83). When the eccentric groove in the record causes the pickup arm to move away from the centerpost, the pawl tends to reverse its direction but its sharp point catches in one of the trip serrations (83) and moves the trip lever (81). As the eccentric groove moves the pickup arm back in toward the centerpost, and then away from the centerpost again, the pawl (87A), again locks in one of the trip serrations, moves the trip lever (81) far enough so that the trip stop wire (81A) is no longer engaged with the cam stop stud (58A). This oscillating trip action is dependent upon the adjustment of the trip set screw (85). If it is adjusted properly, the pickup arm will move away from the centerpost, toward the centerpost, and as it comes away the second time the changer will trip and start its change cycle. (See paragraph 8.) The position of the drive wheel (55) at this moment is shown in Figure 3B.

This allows the cycle spring (82) to pull the control cam clockwise (bottom view). Since the control cam (58) and the drive wheel (55) are on the same shaft, the drive wheel is turned so its rubber tire is against the knurled hub of the turntable (see Figure 3B). The turntable now rotates the drive wheel (55) which in turn rotates the control cam (58). As soon as changer has been tripped, the trip cocking spring (80) causes the trip lever (81) to return the trip stop wire (81A) to the normal playing position.

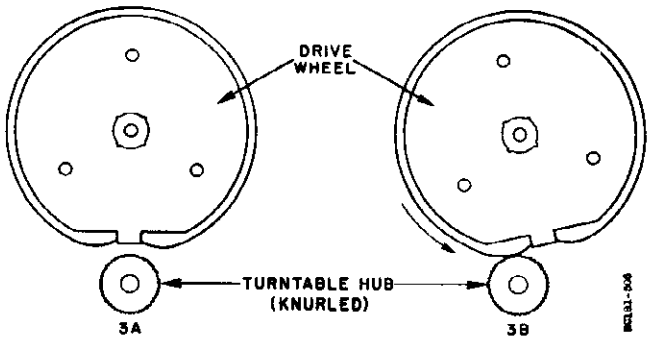


Figure 3 - Drive Wheel Positions.

Roller (72) riding on the control cam moves the pivot link (70) which in turn rotates the control plate (69). The rotation of the control plate (69) causes its inclined tab (69A) to ride against the lift rod (16) which lifts the pickup arm from the record. The arm control lever roller and stud (87B) then engages the safety arm (76). Further rotation of the control cam (58) moves the pivot link (70) causing further rotation of the control plate (69) causing the pickup arm to move to the right, clearing the record. This much has taken place in approximately one-third of the total rotation of the control cam.

As the control cam rotates further, its push-off stud (58B) engages with the end of the slot in the pushoff link assembly (62), moving it. This movement is transmitted through the push-off arm (62A) and as a result, the push-off shaft (8) is rotated. This rotates the push-off cam (8A) which in turn slides the push-off plate (30) forward and drops the next record to be played. (Note that the record stack rests on the record support shelf (31) and not on the push-off plate as on the RC170 and RC170A. The small slide at the top end of the centerpost holds back all records other than the bottom one when the push-off plate (30) moves forward.

As the control cam continues its rotation, the pivot link (70) moves back following the cam, since the roller (72) is kept in contact with the cam by the control plate spring (71). This moves the control plate (69) back, the arm control lever (87) moves the pickup arm to the set-down point for the record to be played. The pickup arm is held above the record because the lift rod (16) is still resting at the top of the inclined tab (69A) on the control plate (69). The set-down point is governed by the set-down adjusting screw (11). (See figure 1 & 5.) The shoulder on the set-down arm (88A) holds the pickup arm at the set-down point until it is pushed back by the

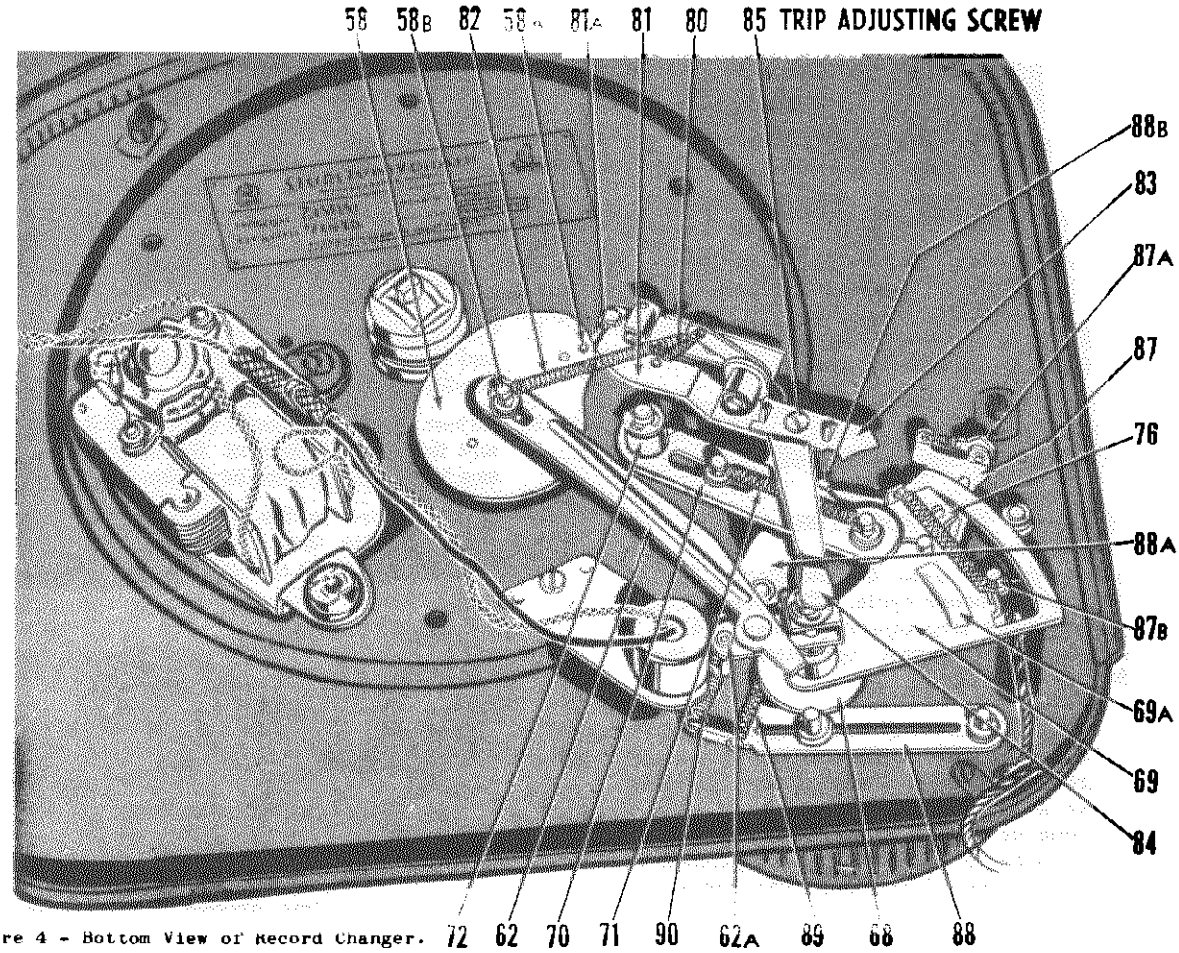


Figure 4 - Bottom View of Record Changer.

THE CHANGE CYCLE - Continued

edge of the control plate engaging the set-down arm stud (88B). The arm is then free and starts moving down toward the record starting groove.

When the record changer is set to play 10-inch records, the set-down arm (88A) through the tension of the set-down spring (89) moves the arm in to-the centerpost until the arm return roller and stud (87C) reaches the shoulder of the set-down arm (88A). The pickup arm is held in this position until the control plate (69) engages the set-down arm stud (88B), pushing the set-down arm back, releasing or freeing the pickup arm.

When the changer is set for 12-inch records the size change eccentric (68) moves the set-down and size change assembly (88) so that the arm return roller and stud (87C) does not travel as great a distance along the set-down arm (88A) before it reaches the shoulder. Therefore the pickup arm cannot move in toward the centerpost as far as for 10-inch records, during change cycle.

When the On-Off reject knob (1) is pressed down, the push-off cam and shaft (8) moves the reject link (84) down. This movement causes the trip lever (81) to move which prevents the trip stop wire (81A) from engaging the push-off pin (58A). The change cycle then proceeds in the manner described above.

ADJUSTMENTS

7. ADJUSTMENT OF SET-DOWN POINT

Adjustment of the set-down point, for either 10-inch or 12-inch records, is made by adjustment of the set-down adjusting screw (11), see Figures 1 & 5. Turning this screw in moves the set-down point of the pickup arm farther away from the centerpost and turning the screw out moves it closer to the centerpost. The proper set-down point for 10-inch records is between 4-5/8" and 4-11/16" from the needle to the near side of the centerpost. The proper set-down point for 12-inch records is between 5-5/8" and 5-11/16" from the needle to the near side of the centerpost.

To make the set-down point adjustment, proceed as follows:

1. Set the record changer for 10-inch records.
2. Press down on the Phono-Motor switch knob (1) momentarily and rotate the turntable by hand through the change cycle until the pick-up arm moves down toward the turntable.

ADJUSTMENTS - Continued

3. Check the distance between the needle and centerpost.
4. Adjust set-down screw (11) and repeat steps 2 and 3 until the proper distance between needle and centerpost is obtained.
5. Set Record Changer for 12-inch records, rotate the turntable by hand through the change cycle and check the 12-inch set-down point. This should be very close to being correct without further adjustment.
6. If any fine adjustment for 12-inch records is necessary, make the adjustment and repeat steps 5 and 6 for the 10-inch position.

8. ADJUSTMENT OF TRIP ADJUSTING SCREW

This Record Changer uses the oscillating trip principle to begin the change cycle. Therefore it is very important that the trip adjusting screw (85) is properly adjusted for correct operation of the changer. (See Figure 4 and 6.)

The trip adjusting screw (85) is properly adjusted when the changer trips into change cycle after the eccentric groove in the record has caused the arm to move away from the centerpost once or twice, that is, one or two backswings of the arm, before it trips into cycle. Some eccentric grooves cause greater movement of the arm than others.

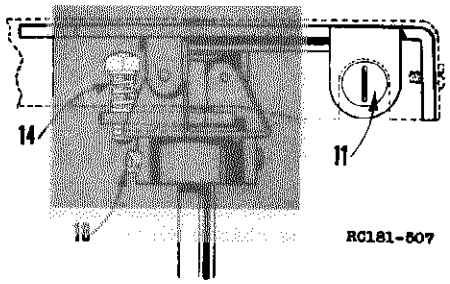


Figure 5 - Arm Detail Showing Adjustments.

Consequently the changer might trip with only one backswing on some records and with two backswings on others.

The ideal adjustment of screw (85) for best operation, is when the smooth side of the trip serrations (83) and the point of the pawl (87A) are horizontally even, as shown in Figure 6.

When adjusting the trip adjusting screw (85) proceed as follows:

1. Connect changer motor to power source and turn Phono-Motor switch on and off as needed to check adjustments.
2. Adjust screw (85) until the point of the pawl and the smooth side of the trip serrations are horizontally even or at the same level.
3. Place record on the turntable and check to make certain that the changer trips into change cycle with one or two backswings.

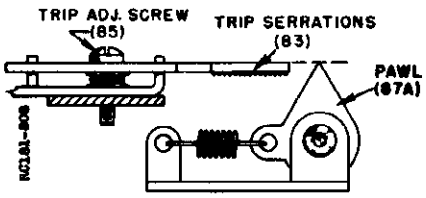


Figure 6 - Positioning Pawl Trip Serrations.

NOTE: The eccentric groove of a record should be used when checking the trip adjustment. Do not lift the pickup arm and move it, in toward the centerpost and out, by hand.

If the trip adjusting screw is turned out too far it will take more than two backswings of the arm to trip into cycle. If the screw is almost all the way out the changer will not trip.

If the screw is too far in, there will be excessive drag and wear on the trip serrations, pawl point and the record eccentric groove. Consequently this adjustment should be made carefully.

SERVICE AND REPAIR

9. ADJUSTING THE PICKUP ARM HEIGHT (See Figure 5.)

Before adjusting the pickup arm height, make sure that the cartridge (25) is all the way in its holder (23), and that the needle projects 1/16" from the cartridge (see paragraph 14).

This changer is designed so that if the pickup arm rests 1/4" above the changer pan, the arm will automatically lift high enough, during change cycle, to clear the top record of a stack twelve 10-inch records or ten 12-inch records on the turntable, and will not lift enough to touch the bottom record of a stack to be played.

With the Record Changer out of cycle and the pickup arm clear of the turntable, adjust screw (14) so that the needle is approximately 1/4" above the top of the changer pan. Turning the screw in lowers the arm and turning it out raises the arm.

After this adjustment has been made, the changer should be run through the change cycle to make certain that the pickup arm does not touch bottom of record stack. If, for some reason, the arm lifts too high, a compromise adjustment should be made. That is, turn screw in and lower arm slightly. If the pickup arm is held slightly above the record by riding on the edge of the base housing (28), the Allen set screw (18) should be loosened and the pi-

SERVICE AND REPAIR - Continued

vot spring and hub assembly (17) moved up on the shaft just enough so that the arm will rest 1/4" above the top of the pan. Generally there should be no clearnace between the pivot spring and hub (17) and retaining ring (26).

10. REMOVING THE PLASTIC BASE HOUSING (28) (See Figures 4 and 8)

Should it be necessary to remove the plastic base housing, proceed as follows:

1. Remove retaining rings (73 and 74).
2. Release one end of the index spring (90).
3. Lift the entire head assembly up from the top of the changer.
4. Loosen Allen set screw (18) and lift complete pickup arm assembly off.
5. Remove retaining ring (26) and spring washer (27).
6. Remove three screws (29) holding base.
7. Lift off the plastic base housing (28).
8. When reassembly has been completed, the pickup arm height should be carefully checked and adjusted, if necessary, by means of the lift adjusting screw (14).

11. REMOVING TURNTABLE AND BEARING ASSEMBLY

To remove the turntable it is only necessary to grasp the table by its edges and lift up. Before replacing the turntable, make sure that the recessed part of the drive wheel (55) is towards the centerpost. If necessary, turn drive wheel counter clockwise about a turn so it locks in this position. The pickup arm should be positioned away from the turntable. In replacing the turntable, force is not needed to seat it. Make sure, however, that the idler wheel of the motor has been pushed in towards the centerpost and that the wheel is making contact with the inner side of the turntable flange. In some cases it may be found that the two cork washers, after considerable use, are compressed so the turntable will rub. To build the stack up, an extra cork washer should be used. This third cork washer may be placed at the top or bottom of the stack.

The washers (35) and thrust bearing assembly (36) are removed by sliding them off of the centerpost. In replacing, have them in the order shown in Figure 8.

12. REMOVING BOTTOM COVER (91)

To remove the bottom cover (91) from the record changer, remove the two rear screws (44) through the bottom. Then press on the front edge of the bottom cover; this frees the changer from the slotted mounting brackets at the front of the bottom cover. To replace bottom cover, reverse above operations.

The changer must float on the springs (43) to prevent microphonic feedback, thus these springs must be re-installed properly. The wider end fits around and hugs the extrusion in the mounting brackets in the bottom cover. The narrow end of the spring fits over the threaded bushing on the changer pan (45). In some changers it has been necessary to add spacer washers beneath the narrow portion of the spring (43) to assure "free floating" of the changer.

13. MOUNTING 407B1 MOTOR TO CHANGER

The model 407B1 motor may be used with this record changer but it is necessary that a fibre or felt washer be used as a spacer between the motor mounting grommet and the changer pan. The No. 401A106 shakeproof motor fastener can be used to then mount the motor.

14. CARTRIDGE (See Figure 7)

The new Admiral pick-up cartridge uses an entirely new principle since it is not a crystal, magnetic, or capacitive device. The pick-up element is made of special rubber which is a high resistance electrical conductor (R-1 & R-2). The resistance varies as the length of the rubber is changed. A Monel metal needle, osmium tipped, is clamped to the center of the resistive rubber as shown at B. As the needle moves back and forth in the record groove, it alternately lengthens the rubber on one side and shortens the rubber on the other side.

A DC voltage is applied at A. The voltage drop from B to C varies as the resistance changes due to the "back and forth" movement of the needle. The varying voltage drop is in reality an alternating voltage of audio frequency. This voltage is applied through the coupling condenser (Cc) to the grid (G) of the audio amplifier tube.

Trouble Shooting: If you suspect the cartridge or needle and have a replacement cartridge available, the quickest test is to try the other cartridge. This is very simple since the Admiral cartridge plugs in. Remove the old cartridge as described on page 1 and plug in the replacement cartridge. If replacing cartridge does not correct the trouble or if no replacement is available, proceed as follows:

1. Make sure radio operates satisfactorily on radio stations.
2. Turn switch to Phono and turn volume control up high. Touch the needle with finger... If a loud hum is heard, circuit from B to G is not open or shorted. If hum is not heard, check circuit from B to G.
3. If hum is heard, check voltage across outer terminals on bottom of cartridge. Generally it should measure from 80 to 100 volts DC. See circuit diagram for individual chassis. If voltage is correct, cartridge should be replaced.
4. If voltage is not correct, check circuit for fault. In case of distortion, check coupling condensers.
5. If the needle is bent, it can be straightened by bending it down so that it projects 1/16" from cartridge. If should then be pressed back several times with a flat object.

SERVICE AND REPAIR - Continued

Do not attempt to repair cartridge or remove the cap on the cartridge assembly as this will void the warranty.

15. LUBRICATION

Under normal operating conditions, the motor should never require oiling. The rest of the changer, however, should be lubricated with grease whenever it comes into the shop for repairs or adjustment. All pivot and friction points should be greased adequately but not excessively. A good grade automobile chassis grease may be used for this purpose.

The push-off shaft (8), powdered iron roller (72), oilite bearings, used in the turntable hub and base housing, may be lubricated with SAE No. 20 motor oil.

Care should be taken to prevent any of the lubricant from coming into contact with the drive or idler wheel tires. Also be careful, when using oil, that an excess does not seep into the felt of the turntable.

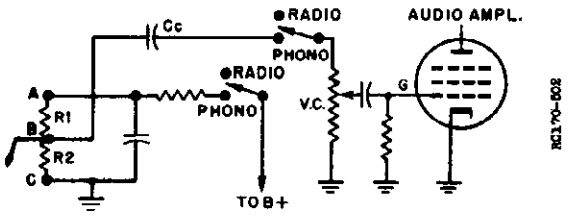
16. REPLACEMENT PARTS

In some cases replacement parts from the factory may be a different type than those being replaced. These parts will be of a later production but may be used as replacement parts. In cases where rivets or adapting parts are needed, they will be included with the replacement part.

17. CAUTIONS!

1. See that the rubber tires on both the drive wheel and the idler wheel are kept clean and free from oil, grease, dirt or any foreign material. Carbona or carbon tetrachloride may be used for cleaning these parts.
2. The drive wheel assembly (55) appears to be almost identical with that used on the RC170 and RC170A. These parts are not interchangeable.
3. When replacing the rubber tire (54) do not bend the tab on the drive wheel over too far as this may result in the tire catching or rubbing on the drive wheel pressure spring (57).
4. If the On-Off reject knob (1) cannot be pulled off with the fingers, pry very carefully.
5. When removing or replacing the pawl spring (86) care should be taken not to stretch it.
6. When removing or replacing the pickup arm (19), always loosen the Allen set screw (18) and lift off the complete assembly. The pivot spring, hub and pin assembly (17) can be removed from the pivot plate assembly (13) and replaced much more readily with the complete pickup arm assembly off of the changer.
7. Washers (75) and (63) have the same dimensions except that (75) is thicker. Do not replace washers (63) with (75) or vice versa.

ADMIRAL CARTRIDGE
BASIC CIRCUIT



SEE SCHEMATIC FOR EXACT CONNECTIONS ON INDIVIDUAL MODELS

Figure 7 - Basic Circuit for Admiral Cartridge.

8. When replacing the switch mounting bracket (65) or the trip bracket (79) be sure to locate the half punches in the holes in the pan before tightening their mounting screws (66).
9. When replacing the on-off switch assembly (67) care should be used in bending the tab fasteners so that the switch is mounted firmly to the bracket.
10. The powdered iron roller (72) is similar to the roller used on the RC170 and RC170A except that the ends are chamfered. The new roller (chamfered) can be used on both the RC170 and RC180 models. The old style roller should not be used on the RC180 or RC181.

18. RECORD CHANGER TROUBLE SHOOTING

1. Records Do Not Drop To Turntable Or More Than One Record Drops.
   (a) Check the distance between the inside edge of the centerpost (33) and the edge of the record support (31). This distance should be 4-61/64" ± 1/32", in the 10-inch position. This dimension is very critical.

   If distance does not meet specifications, bend the centerpost slightly toward or away from the head assembly as needed.

2. Changer Repeatedly Trips Into Change Cycle.
   (a) Check for broken or loose trip cocking spring (80), or
   (b) Check for broken or missing reject spring (2), or
   (c) Check for bent reject link (84).

3. Changer Will Not Trip.
   (a) Check for broken or loose cycle spring (82), or
   (b) Check On-Off switch cover (67). If cover is not assembled to switch properly, it may bind push-off link and arm (62) preventing cycle spring (82) from pulling the main cam (58) around.

4. Changer Will Not Reject.
   (a) Check for bent reject link (84).

5. Cannot Get Proper Set Down.
   (a) Check for broken or loose set-down spring (89), or
   (b) Check for broken or loose set-down adjusting spring (11).

RC 180 & RC 181 PARTS LIST (TOP)

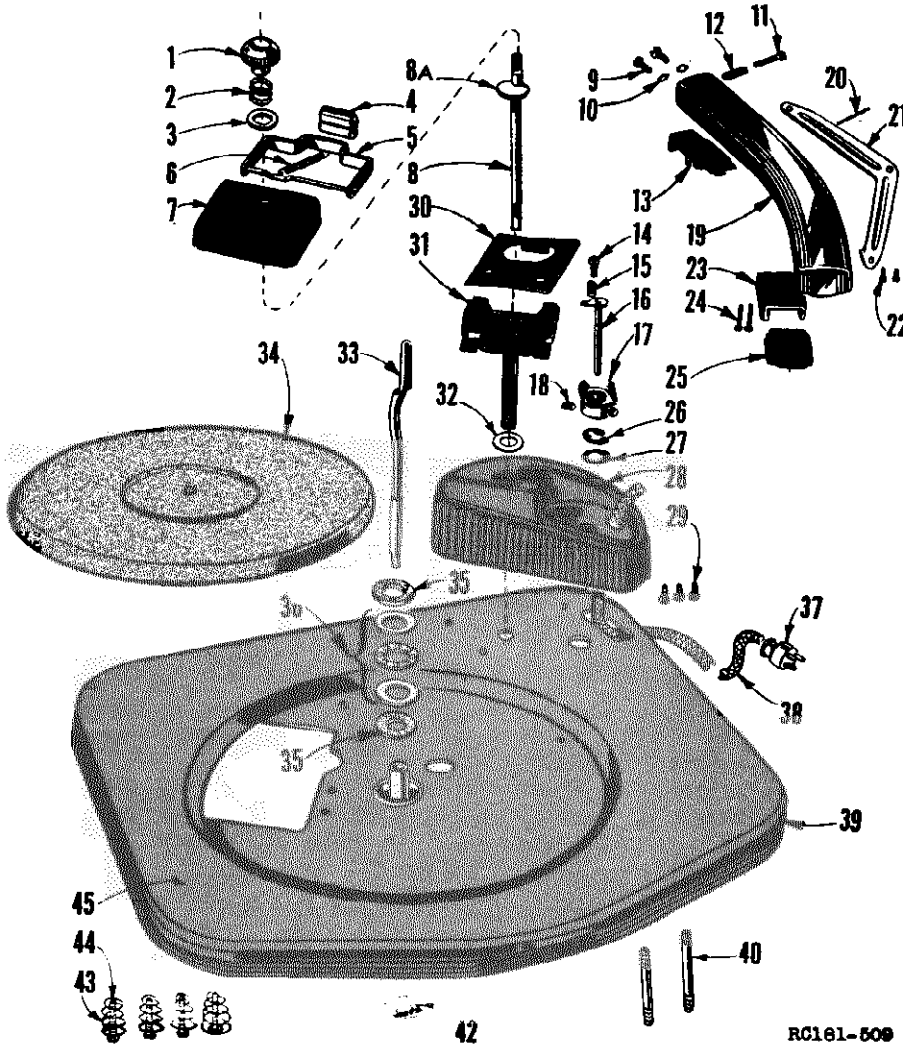


Figure 8 - Top View of Record Changer, Exploded.

Ref. No.	Part No.	Description
1	†403A27	Reject Off-On Knob
2	405A97	Reject Spring
3	481-166-47	Washer .390 X 5/8 X 1/16
4	406A18	Rubber Bumper for Record Clip
5	G400A253	Record Clip
6	405A94	Record Clip Spring
7	G400A258	Head Cover
8	G400A248	Push-Off Cam & Shaft
9	45-250-C2-47	Screw, 4-40 X 1/4"
10	381-23-21	#4 Lockwasher
11	45-500-C2-47	Set-down Adjusting Screw, 4-40 X 1/2 BH MS
12	405A95	Set-down Adjusting Spring
13	G400A240	Pickup Arm Pivot & Mtg. Plate
14	402A141	Lift Adjusting Screw
15	405A81	Lift Adjusting Lock Spring
16	G400A239	Lift Plate & Rod
17	G400A242	Pivot Spring, Hub & Pin
18	1A43-14	Allen Set Screw 8-32 X 3/16
19	†403B29	Pickup Arm, Plastic
20	414A26	Pickup Arm Wire Clip
21	401A234	Pickup Arm Stiffener
22	402A139	#2 Type 25 Plastiscrew 1/4" long, 3 required
23	G400A198	Cartridge Holder (socket with contacts)
24	402A129	Screw, Shakeproof #2 Type 25 Thread Cutting Plastic
25	A1372	Cartridge and Needle
26	401A229	Retaining Ring
27	405A27	Support Spring Washer
28	403C28	Base Housing
29	402A115	Screw, Base Housing Mtg.
30	401A165	Push-Off Plate
31	G400A249	Support Tube & Shelf
32	481-166-47	Washer, .390 X 5/8 X 1/16
33	G400B137-1	Centerpost Ass'y. (includes 405A62 Speed Nut)
34	G400B167	Turntable
35	412A1	Cork Washer (2 required)
36	415A11	Thrust Bearing
37	98A19	Plug (3 contact)
	88A8-5	Plug (4 contact)
38		See radio service manual for proper cable & part no.
39	403A24	Plastic Trim
40	1A80-5	Mounting Screws
42	405A62	Speed Nut
43	19A10-3	Conical Mounting Spring
44	G400A197	Mtg. Screw & Washer Assy. 4 required
45	G400D257	Changer Pan (RC 181)
	G400D263	Changer Pan (RC 180)

†Before replacing parts marked †, see appropriate caution in paragraph 17.

MODELS RC180, RC181 ADMIRAL CORPORATION

RC 180 & RC 181 PARTS LIST (BOTTOM)

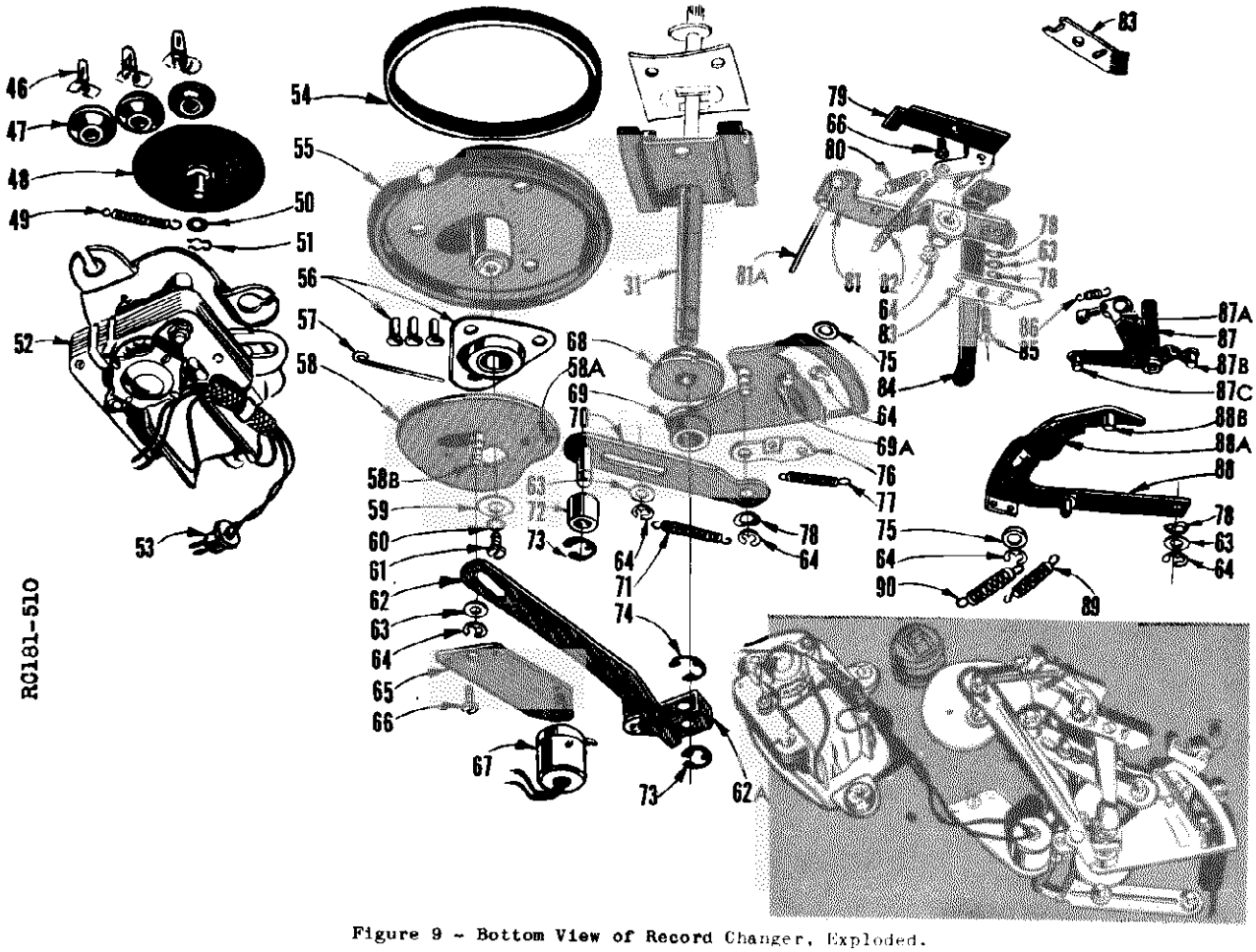


Figure 9 - Bottom View of Record Changer, Exploded.

Ref. No.	Part No.	Description
46	401A106	Shakeproof Motor Fastener
47	G400A196	Rubber Mounting Grommet and 401A106 fastener (for 40783-2 and 40784-2 motor)
	G400A203	Rubber Mounting Grommet, spacer, and fastener (for 40781 Motor)
48	G400A23	Idler Wheel Ass'y. (40783, 40784 Motor)
	G400A57	Idler Wheel Assembly (for 40781 Motor)
49	405A14	Spring, Idler Wheel (40783, 40784 Motor)
	405A67	Spring, Idler Wheel (for 40781 Motor)
50	412A3-2	Hard Fibre Washer under Hairpin Clip
51	405A15	Hairpin Clip for Idler Wheel
52	*40783-2	Motor with Idler Wheel and fasteners; 105-125V 60 Cycle
	*40784-2	Motor with Idler Wheel and fasteners; 105-125V 50 Cycle
	401A48	Drive Pulley (Part of 52. For Motors 40783, 40784. In addition, Motor 40784 includes a coil spring part no. 405A32
	405A32	50 Cycle Conversion Spring (Used to convert 40783 Motor)
53	88A8-1	Motor Plug (Male)
54	406A13	†Drive Wheel Tire Only
55	G400A252	†Drive Wheel (Includes Tire)
56	404A18-1	Drive Wheel Support (Includes Rivets)
57	414A23	Drive Wheel Pressure Spring
58	G400A227	Control Cam
58A		Cam Stop Stud (Part of 58)
58B		Push-Off Stud (Part of 58)
59	401A145	Control Cam Washer
60	381-26-47	#8 I. T. Lockwasher
61	85-376-C2-39	Control Cam Screw 8-32 X 3/8 BH MS
62	G400A219	Push-Off Arm & Link
62A		Push-Off Arm (Part of 62)
63	†481-68-2	Washer
64	401A177	Retaining Ring
65	†401A223	Switch Bracket
66	1A53-10-47	Switch and Trip Bracket Mounting Screws
67	†408A1	On-Off Switch & Cover
68	404A17	Size Change Eccentric
69	G400A226	Control Plate, Hub & Stud
69A		Inclined Tab (Part of 69)
70	G400A224	Pivot Link & Stud
71	405A91	Control Plate Spring
72	†415A9	Powdered Iron Roller
73	401A229	Retaining Ring
74	401A230	Retaining Ring
75	†401A173	Washer
76	401A202	Safety Arm
77	405A90	Safety Spring
78	405A22	Spring Washer
79	†G400A228	Trip Bracket & Stud
80	405A88	Trip Cocking Spring
81	G400A230	Trip Lever Complete
81A		Trip Stop Wire (Part of 81)
82	405A87	Cycle Spring
83	401A224	Trip Serrations
84	401A222	Reject Link
85	65-500-C2	Screw, Trip Adjusting 6-32 X 1/2 BH MS
86	†405A89	Pawl Spring
87	G400A233	Arm Control Lever, Studs & Pawl
87A		Pawl (Part of 87)
87B		Arm Control Lever Roller (Part of 87)
87C		Arm Return Roller (Part of 87)
88	G400A222	Set Down & Size Change Assembly
89	405A93	Set Down Spring
90	405A92	Index Spring
91	G400D260	Bottom Cover (Consoles only)
92	27A24	Bushings in Bottom Cover (Consoles only)
93	405A99	Spring Washer for bushing (Consoles only)

†Before replacing, see appropriate caution in paragraph 17.
*40783-2 and 40784-2 are the same as 40783 and 40784 respectively except that three 401A106 fasteners are included. Also note that some 40781 motors were used in production.

RC180 & RC181 PRODUCTION CHANGES

A few minor changes have been made in the late production of RC180 & RC181 Record Changers. These changes are included in the RC182 Two Speed Record Changer.

The most important change is the addition of an adjustable reject link (84) which assures more positive rejecting action. See Figure12. This new reject link consists of reject arm support (84A) spotwelded to trip lever (81), reject arm (84B), adjusting screw (84C), spring washers (84D), and flat washer (84E). The new and old links are interchangeable.

The record clip (5) and the head cover (7) are now made of plastic. The set-down adjusting screw (11) was 1/2" long; it is now 3/4" long.

Part numbers for these parts are listed below:

Ref. No.	Part No.	Description
5	403A 32	Record Clip (Plastic)
7	403A 31	Head Cover (Plastic)
11	45-750-C2-47	Screw, Set-down Adjusting 4-40x3/4 BH MS
84	G400A 266	Reject Link & Trip Lever Assembly
84A	G400A 230-1	Reject Arm Support & Trip Lever
84B	401A 237	Reject Arm
84C	65-375-C2-39	Screw (6-32x3/8 BH MS)
84D	405A 98	Spring Washer
84E	481 68-2	Flat Washer

FAULTY REJECT AND TRIP ACTION

Before making reject or trip adjustments on the RC180, RC181 or RC182 Record Changers, it is very important to see that the reject spring (2) is holding the push-off shaft (8) up as far as it will go. If it is not, erratic reject and trip action may result. Possible causes of the spring not holding the push-off shaft up are: the knob (1) may be loose; the spring (2) broken, missing or placed incorrectly; or push-off shaft binding.

When servicing an RC180, RC181 or the new RC182 Two Speed Record Changer which repeatedly rejects records, will not trip or trips erractically, proceed as follows:

Old Type Reject Link #401A222
(See Fig. 4 in RC180 & RC181 Service Manual.)

1. Make certain that the On-Off Reject knob (1) is tight and down as far as it will go on the push-off shaft (8).
2. Check to be sure that the reject spring (2) pulling the push-off shaft (8) up as far as will go. The reject spring (2) should rest washer (3) and should not slip between it a the push-off shaft (8).
3. Bend the end of the reject link (84) enough that when it is resting on the end of the pus off shaft (8) it causes the top of the trip st wire (81A) to be level with the top of t main cam stop stud (58A). See Figure11.
4. Adjust the trip adjusting screw (85) until t point of the pawl (87A) is even with t smooth side of the trip serrations (83) outlined in paragraph 8 of the RC180 & RC1 service manual.
5. It may be necessary to repeat steps 3 and making slight re-adjustments until the chan er will reject and trip properly.
6. If the changer will not trip properly aft carefully making the above adjustments, r place the reject link with the new type.

New Type Reject Link #G400A266
(See Fig12)

1. Repeat steps 1 & 2 as outlined above.
2. Adjust the reject link adjusting screw (84 until there is approximately 1/32 of an in space between the round end of the reje arm (84B) and the rivot on the push-off ar and link assembly (62). If there is no spa between these two parts, it will be possib for the changer to begin its change cyc when the On-Off Reject knob is turned to t "OFF" position.
3. Adjust the trip adjusting screw (85) until t point of the pawl (87A) is even with t smooth side of the trip serrations (83) outlined in paragraph 8 of the RC180 & RC1 service manual.
4. If the top of the trip stop wire (81A) is level with the top of the main cam stop st (58A) as shown in Figure11, bend the wi enough to make it even with the top of t stud.
5. If necessary, repeat steps 3, 4 and 5 until t changer rejects and trips properly.

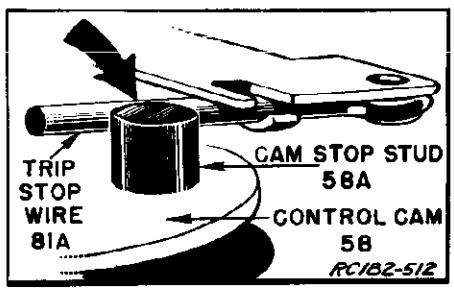
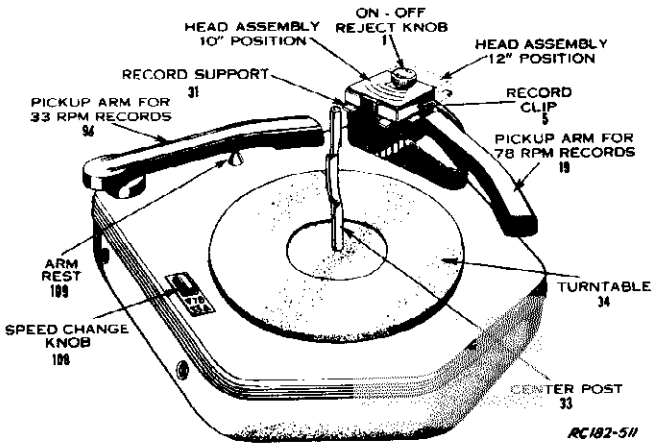


Figure11 - Positioning Trip Stop Wire.

The RC182 Two Speed Record Changer is a modification of the RC181 in order to adapt it for manually playing the new 33-1/3 RPM records in addition to either automatically or manually playing the standard 78 RPM records.

The major differences are the addition of a second pickup arm, a new two speed motor, a speed change switch and knob, and a few related miscellaneous parts. Figures12,13 &14 and the parts list on the back page indicate the parts which have been added to modify the RC181 for playing the 33-1/3 RPM records.



RC182 Two Speed Record Changer.

OPERATION

The pickup arm on the right side of the RC182 Record Changer is for automatically or manually playing the standard 78 RPM records. The operation of this part of the changer is described in detail in the RC180 and RC181 Record Changer Service Manual.

The second pickup arm, at the rear of the changer is for manually playing the new 33-1/3 RPM records.

In order to play this new type record, merely move the speed change switch to the "33" position, place the 33-1/3 RPM record on the turntable, turn the changer on by means of the "ON-OFF REJECT" knob and place the pickup arm for 33-1/3 RPM record, on the record. When moving the speed change switch to either position make certain that it "clicks" or "snaps" into the desired position.

When the record has finished playing, the changer will automatically shut off. If the pickup arm is lifted from the record and moved toward its arm rest, the changer will automatically turn on unless the "ON-OFF REJECT" knob has been turned to the "OFF" position.

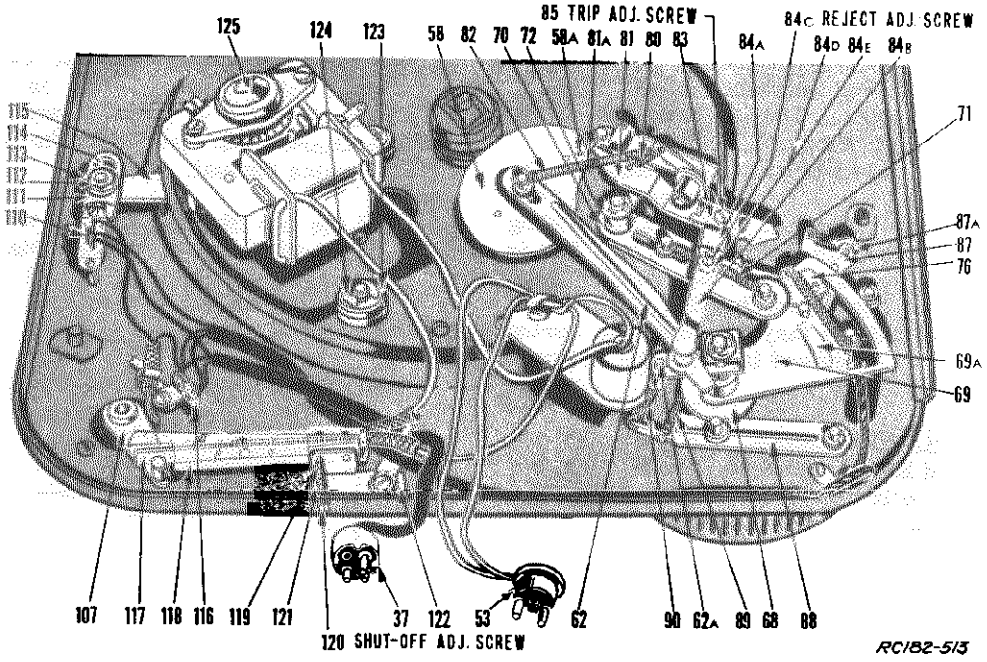


Figure12 - Bottom View of RC182.

NEEDLE FOR 33 RPM PICKUP ARM

The needle (95) used in the 33-1/3 RPM pickup arm is an osmium tipped needle especially designed for playing 33 RPM records. The point of the needle has a radius which is only 1/3 of the radius of a standard needle. To prevent possible damage to "microgroove" records, be abolutely certain when replacing a needle that the correct needle is used.

TWO SPEED MOTOR (125)

The turntable speed of the RC182 Two Speed Record Changer is changed mechanically. When the speed change knob (108) is moved to the "33" position, the speed change arm (115) moves. This causes the 33 RPM drive shaft to pivot and ride against the idler wheel (126). Simultaneously, the 33 RPM pickup arm (94) is switched into the circuit, and the 78 RPM pickup arm (19) out of the circuit, by means of switch (110). When the speed change knob is moved to the 78 RPM position, the speed change arm causes the 33 RPM drive shaft to pivot away from the idler wheel (126).

When the speed change switch knob (108) is moved, make certain that it "clicks" or "snaps" into position. If it is not moved far enough, the speed of rotation will change but the correct pickup arm will not have been switched into the circuit.

Note that the 33 RPM drive shaft is driven by the 78 RPM drive shaft by means of a rubber belt (130). This belt should be clean and free from oil. If the belt is greasy or stretched, it might possibly slip which would cause the turntable speed to vary resulting in unsatisfactory operation.

AUTOMATIC SHUT-OFF ADJUSTMENT

When the changer is playing 33 RPM records, it should shut-off when the needle is approximately 2-1/4 inches from the near side of the centerpost.

If the changer motor shuts off before or after the arm reaches this point, merely turn the shut-off adjusting screw (120) in or out until the roller on the arm stop and shaft assembly (107) opens the contacts of the leaf switch (117) when the needle is 2-1/4 inches from the near side of the centerpost.

If this adjustment is insufficient to obtain prop shut-off, reposition the arm stop and shaft assem (107) as follows:

1. Loosen Allen set-screw (104). With the pic up arm (94) resting on the arm rest (10 move the arm stop and shaft assembly (1 until it touches the rear flange or lip of changer pan.
2. Tighten the Allen set-screw (104). Adj screw (120) for proper shut-off.

SERVICE HINTS

1. The dimensions of the two speed motor are su that an extra cork washer (131) has been added u der the turntable hub to keep the turntable from ru bing against the idler wheel drive shafts. This co washer (approximately 3/64" thick) should not omitted.

2. The rubber mounting grommets (123) are t same as those used for mounting the RC180 a RC181 motor, except that they are put on so the co portion of the grommet is against the changer pa The grommets are mounted in the opposite directi in the RC180 and RC181.

3. The largest of the four holes in the switch li (111) is slightly off-center. When replacing or r installing this part, be sure the narrow side toward the nearest edge of the changer pan or bas

Installing this part with the narrow side towa the center of the changer pan will cause the spe change knob (108) to bind making it extremely di cult to switch from one speed to another.

4. Fibre washers (113) and (114) have the same mensions except for thickness. The thin was (113) should be placed between the spacer nut (1 and the switch link (111). The thicker washer (1 goes between link (111) and the speed change a (115).

MODEL RC182

ADMIRAL CORPORATION

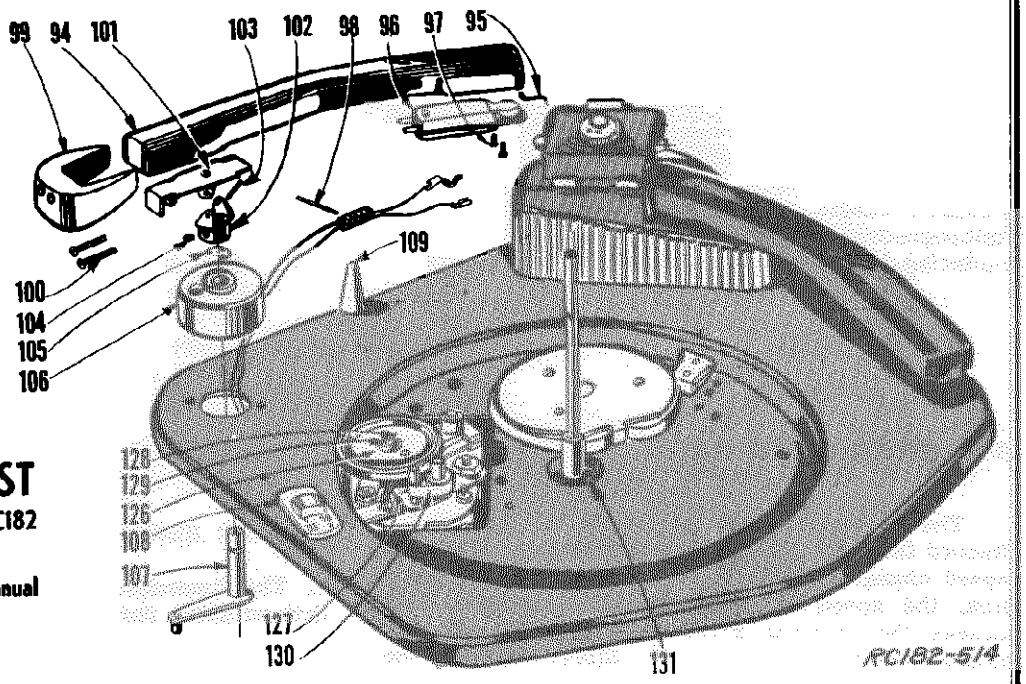


Figure13 - Top View of RC182.

RC182 PARTS LIST

Use this list when ordering RC182 parts.

See RC180 & RC181 Service Manual for any part NOT listed here.

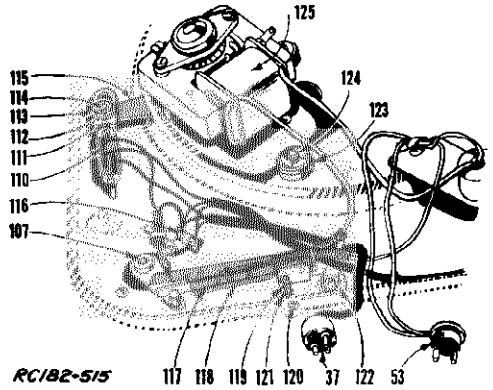


Figure14 - Bottom View of RC182 — 33 RPM Section.

Ref.No.	Part No.	Description
5	403A 32	Record Clip (Plastic)
7	403A 31	Head Cover (Plastic)
11	45-750-C2-47	Screw, Set-down Adjusting 4-40x3/4 BH MS
84	G400A 266	Reject Link & Trip Lever Assembly
84A	G400A 230-1	Reject Arm Support & Trip Lever
84B	401A 237	Reject Arm
84C	65-375-C2-39	Screw (6-32x3/8 BH MS)
84D	405A 98	Spring Washer
84E	481 68-2	Flat Washer
94	403B 29-3	Pickup Arm
95	98A 15-2	Needle
96	409A 10	Cartridge
97	402A 139	#2 Type 25 Plastiscrew (2 req.)
98	414A 26	Wire Clip
99	404A 21-1	Pickup Arm Counterweight
100	40-562-C2-47	Screw 4-40x9/16 RH MS (2 req.)
101	G400A 278	Pivot and Mounting Plate
102	G400A 271	Pivot Spring and Hub
103	414A 29	Pivot Shaft
104	1A 43-14	#8 Allen Set Screw
105	401A 235	Retaining Ring
106	G400A 173	Pickup Arm Base
107	G400A 270	Arm Shaft and Stop Assembly
108	403A 33	Knob (speed change)
109	402A 151	Pickup Arm Rest
110	778 1-1	Switch (speed change)
111	401A 241	Switch Link
112	402A 152	Spacer Nut
113	412A 28	Fibre Washer
114	412A 23	Fibre Washer
115	401A 242	Speed Change Arm
116	108 1-6	Terminal Board
117	408A 2	Leaf Switch (Automatic shut-off)
118	412A 29	Switch Cover
119	401A 244	Leaf Switch Bracket
120	45-1125-C2-47	Screw, Shut-off Adjusting
121	405A 106	Lock Spring
122	402A 165	Spacer
123	408A 4	Rubber Mounting Grommet (3 req.)
124	401A 229	Retaining Ring
125	407B 15	Motor, Two Speed
126	G400A 279	Idler Wheel Assembly
127	405A 107	Idler Wheel Spring
128	405A 15	Hairpin Clip
129	412A 30	Washer (under hairpin clip)
130	406A 20	Drive Belt
131	412A 9	Cork Washer

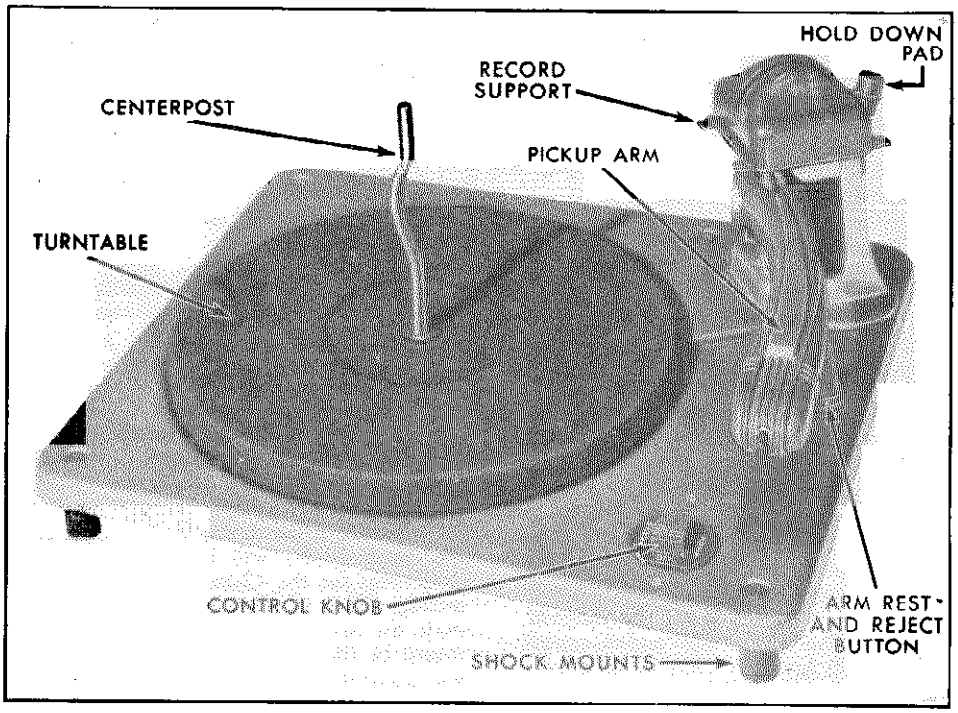


FIGURE 1. RECORD PLAYER, TOP VIEW

1. SETTING FOR SIZE OF RECORD

The size of record for which the record changer is set to play is indicated by the number (on the top of the cover assembly) nearest the turntable.

To change the setting, grasp the record support and cover assembly and rotate it a half turn until it snaps into place with the correct record size toward the turntable. **In changing the setting from 10-inch to 12-inch, rotate the assembly counterclockwise only; in changing from the 12-inch to the 10-inch setting, rotate the assembly clockwise only.**

2. STARTING FOR AUTOMATIC PLAY

Load the record changer with a maximum of ten twelve-inch or twelve ten-inch records, and set the hold down pad so that it rests on the top record. Move the control knob to the auto-on position which will set your record changer for automatic play and start the turntable rotating.

Press down on the reject button which is located on top of the arm rest or push down on the pickup arm momentarily if it is setting on the arm rest. The entire stack of record will be played automatically.

3. MANUAL PLAY

Set record support and cover assembly for size record you intend to play and place record on turntable. Move control knob setting to manual-on position and press down on reject button or push down on pickup arm momentarily if it is setting on the arm rest. If you desire to play the record for the second time in succession press down on reject button and the record will be played again. After record has been played manually grasp pickup arm and place on arm rest and remove record.

Reject button may be used during manual play only when playing standard ten or twelve inch records otherwise it must be done manually.

4. REJECTING A RECORD

To reject a record at any time and start playing the next one, merely press down on the reject button. This may be done while playing manually also.

5. UNLOADING RECORDS

To remove the records it is advisable to have the changer mechanism out of cycle. However, it is possible to unload the changer while it is in cycle so long as the pickup arm is clear of the records.

Move the control knob to the off position before lifting pickup arm to arm rest and remove records.

When removing records, hold them lightly and lift straight up.

CAUTIONS

1. **Do not place your unit on a radiator or other source of heat. The pickup may be damaged by heat.**
2. **Never use force to stop the motor or turntable.**
3. **Do not leave records on the supports as they are liable to warp. To protect your records, keep them in a record file, album or cabinet when not in use.**
4. **Records which have become warped or damaged will slide on one another when playing, resulting in unsatis factory operation.**
5. **Never leave the pickup arm with the needle resting on record or the turntable.**
6. **Do not let the pickup arm drop off of the arm rest.**
7. **When setting for size of records, be careful not to breal the hold down pad.**

THE CHANGE CYCLE

6. DESCRIPTION OF CHANGE CYCLE. (See Figures 2, 5, and 6.)

While a record is playing and as the pickup arm moves toward the center of the record, the arm control pin (28A) on the arm control assembly (28) moves along the portion of the arm control track (33B) as indicated at "P", figure 2. As the record reaches the pickup or trip point, the pin reaches point "T" on the track. As it moves into the recessed position in which it is shown in the illustration, it permits the trip spring (32) to pull the arm control plate (33) forward towards the centerpost (37). As the arm control plate is drawn forward, the stop tab (33A) on the arm control plate (33) is withdrawn from behind the reject catch (51) on the eccentric cam (53). The cam, which no longer is held in place by the stop tab (33A), is pulled over by the eccentric cam spring (54) until the rubber tire makes contact with the knurled roller (46) on the turntable shaft (38A). This knurled roller, which rotates with the turntable shaft, rotates the eccentric cam. In turn, this forces the riser plate assembly (34) back along its guide rods (42A) away from the centerpost (37). As soon as the riser plate begins to move, the push-off cam and shaft assembly (36) rides along the inclined track (34C) of the riser plate (34). This action causes the push-off cam and shaft assembly (36) to be drawn downward; as a result the pickup arm lift (21) presses down on the arm lift bearing pin (15), causing the pickup arm to be raised clear of the record. Then the riser plate tab (34B) contacts and moves the arm control assembly (28) which, since it is coupled to the pickup arm support assembly (23) carries the pickup arm away from the centerpost and clear of the edge of the turntable. As the riser plate (34) continues to travel further along the guide rods (42A), the riser plate motion bracket (34A) contacts and rotates the push-off cam and shaft assembly (36); as a result, the push-off arm (5), which is coupled to the push-off cam and shaft assembly (36) causes the push plate (7B) to drop a record to the turntable.

During the second half of the change cycle, the pressure of the push plate spring starts to return the push plate (7B) and push-off arm (5) back to their normal position. At the same time, the motion of the eccentric cam (53) and the guide rod recoil spring (35) propel the riser plate (34) toward the centerpost. The arm control assembly (28), and hence the pickup arm, are drawn back by the tension in the set-down spring (27). After the arm reaches this point directly above the set-down point, the riser plate (34) has moved far enough back towards the centerpost (37) to allow the push-off cam and shaft assembly (36) to ride down the inclined track (34C) of the riser plate (34). This lowers the pickup arm onto the record. As the eccentric cam (53) aided by the eccentric cam spring (54) completes its revolution, the rubber tire of the cam moves away from the knurled roller (46) on the turntable shaft and the reject catch (51) to rest against the stop tab (33A) of the arm control plate (33). The change cycle is completed.

7. DESCRIPTION OF DETERMINATION OF 10-INCH AND 12-INCH SET-DOWN POINTS.

During the early part of the change cycle, the arm control plate (33) has traveled (in a direction away from the centerpost) until the size change stop (33C) reaches the cam (36B) of the push-off cam and shaft assembly. The distance traveled by the arm control plate (33) will depend on the size of the record being played; the distance is less for a 12-inch setting than for a 10-inch setting. (This is true because the push-off cam [36B] presents its short radius to the size stop [33C] for the 10-inch setting and presents its long radius to the size change stop for a 12-inch setting.) This variation in distance traveled means that the arm control track (33B) will be in a position closer to the centerpost for the 12-inch setting than for the 10-inch setting. This in turn means that during the change cycle the arm control pin (28A) whose path is determined by the motion of the arm control assembly (28) will leave its recessed position, and will ride along the "S" portion of the arm control track for the 12-inch setting and along the "L" portion for the 10-inch setting. (See Figure 2.)

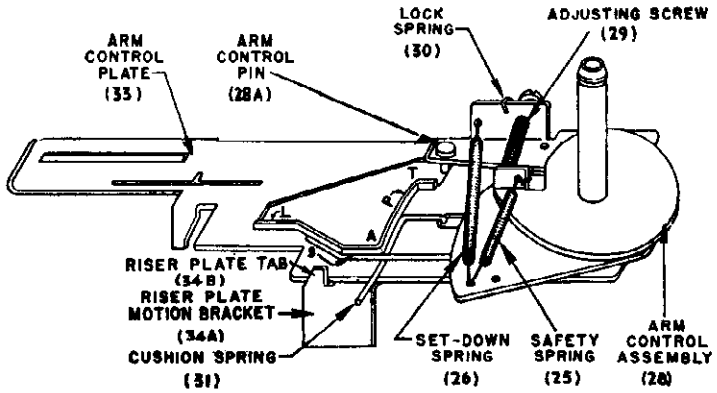


FIGURE 2

As the pickup arm moves back towards the record during the second half of the change cycle, it will be stopped when the bracket (28C) reaches the adjusting screw (29). How far the arm returns before being stopped depends on whether the arm control pin (28A) has been riding in the "S" or "L" portion of the arm control track. If the pin has been riding in the "S" or 12-inch portion of the track, the arm will be stopped at a point directly above the 12-inch set-down point; if the pin has been riding in the "L" or 10-inch portion, the arm will be stopped at a point directly above the 10-inch set-down point.

8. REJECTING A RECORD. (See Figures 3 and 6.)

The reject button (59A) is located on the top of the arm rest (59). The parts used to provide push button rejection are shown in Figures 3 and 6.

Figure 3 shows the changer going thru cycle, that is, in the process of rejecting a record. When the changer is out of cycle the reject catch (51) engages both the stop tab on the arm control plate and the reject arm (44A). If the changer is allowed to finish playing the record, the stop tab on the arm control plate is withdrawn from behind the reject catch (51); the eccentric cam (53) is then pulled against the knurled roller (46) and the change cycle begins. However, when the reject button (59A) is pressed the reject trigger wire (64) pulls the reject arm (44A) from behind the reject catch (51); the eccentric cam (53) is then pulled against the knurled roller (46) and the change cycle begins.

9. MANUAL PLAY.

The control knob (60) is located on top of the motorboard (72). The parts used to provide manual play are shown in figures 5 and 6.

To play manually, move the control knob (60) to the left. This will shift switch mounting to the left and cause manual control bracket (44B) to be engaged, so that size change stop (33C) is prevented from coming forward and completing change cycle.

The reject button may still be used as explained in Paragraph 8 even though the control knob is set for manual play.

ADJUSTMENTS

CAUTIONS

1. **See that the drive pulley and the rubber tire on the motor (61) and the rubber tire on the eccentric cam (53) are kept clean and free from oil, grease, dirt, or any foreign material. Carbona or carbon tetrachloride may be used for cleaning these parts.**

2. **If replacement of any parts requires the removal of the lift adjusting collar (10), pickup arm support assembly (23), or the push-off arm (5), be sure to re-position or replace these parts as directed in paragraphs 11, 12, and 14 respectively.**

TOOLS REQUIRED

#6 Bristol Set Screw Wrench
#6 Allen Set Screw Wrench
#8 Bristol Set Screw Wrench
#8 Allen Set Screw Wrench
Lift Out Tool (2 Required)

} Can be obtained as Kit.

10. REMOVING CHANGER FROM CABINET FOR ADJUSTMENT.

When it is necessary to remove changer from cabinet for adjustment this can easily be done with the aid of the lift out tool furnished as specified above. *Wires must be disconnected first.*

The changer is mounted on four rubber shock mounts (73), their location can be quickly identified by the location of the four phillips head screws (76) on the motorboard (72). Hold lift out tools by long handle, one in each hand and pry up under bulb of rubber mount, two at a time. Pry up on two that are located on the same side of motorboard. When one side is free of cabinet, wedge something under motorboard so the free mounts do not fall back into the hole. Use the same procedure on the other two mounts and the changer is free of cabinet.

To install changer back in cabinet line up rubber mounts with holes in cabinet and push down on motorboard. The changer is automatically locked in cabinet, connect wires and changer is ready for operation.

11. SET-DOWN POINTS AND PICKUP OR TRIP POINT.

(If the pickup arm support assembly [23] has been removed or if its set screws are loose, it must be repositioned as described in paragraph 13 before adjusting the set-down points and pickup or trip point.)

This changer is designed so that the 10-inch set-down point, the 12-inch set-down point, and the pickup or trip point are simultaneously adjusted in a single operation. It is recommended that you make the adjustment at either of the set-down points. This adjustment is made by means of the adjusting screw (29) shown in Fig. 3. Turning this screw counter-clockwise will cause the arm to set down closer to the centerpost; turning it clockwise will cause the arm to set down further

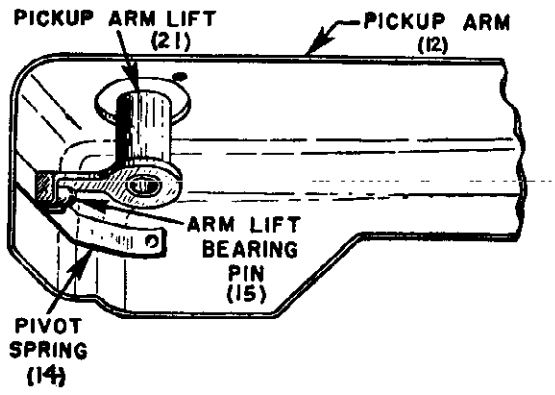


FIGURE 4

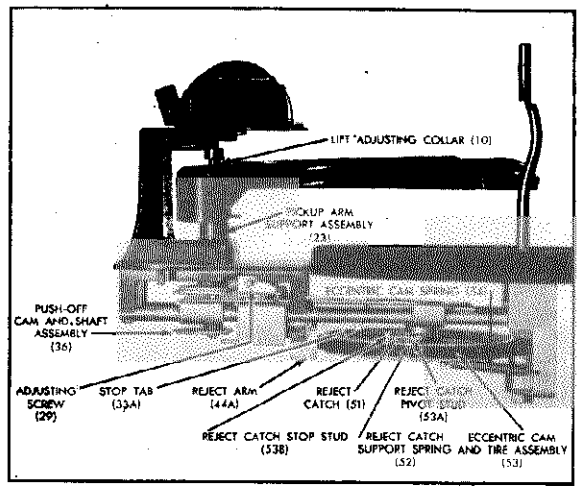


FIGURE 3

away from the centerpost. One turn on the screw will move the arm about ¼ inch.

If the adjusting screw (29) will not change the seting sufficiently, the pickup arm support assembly (23) may be out of position (see paragraph 13)

The set-down point when using a straight-shank needle will differ slightly than when using an offset shank needle.

If you do not know which type of needle is to be used by the customer, we suggest the following settings when tested with a straight needle: measuring from the side of the centerpost, 4⅝" for the 10-inch set-down point, 5⅝" for the 12-inch set-down point, and 1-19/32" for the pickup or trip point.

If you know which type of needle will be used by the customer, and test with that type of needle, the following settings are recommended:

Measuring from the side of the centerpost, 4-21/32" for the 10-inch set-down point, 5-21/32" for the 12-inch set-down point, and 1⅝" for the pickup or trip point.

When using an offset-shank needle, slight variations in set-down point can often be corrected by loosening the needle screw and rotating the needle slightly.

12. PICKUP ARM HEIGHT.

When properly adjusted, the pickup arm height should be such that, without a needle and with a single record on the turntable, the arm should be about 1/32" above the record. The arm height depends on the location of the lift adjusting collar (10). As the collar is moved down, the arm is raised, and vice versa. When necessary, the pickup arm height may be adjusted by re-positioning the lift adjusting collar (10) as follows·

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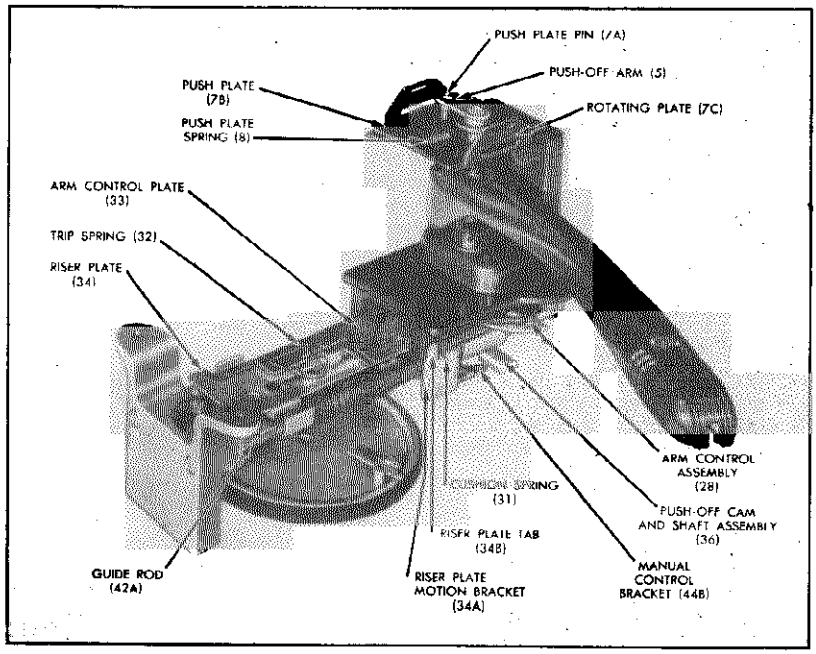

FIGURE 5

(a) The changer should be out of cycle.

(b) Lift the pickup arm and check to see that the pickup arm lift (21) is positioned properly over arm lift bearing pin (15). (See Fig. 4.)

(c) Remove needle and place pickup arm on turntable close to its edge.

(d) Loosen set screw in lift adjusting collar (10).

(e) Remove slack by pushing up on push-off cam and shaft assembly (36). Do not compress the arm lift shaft spring (36C).

(f) Using a #6-32 Bristol wrench, place it in the set screw and slide the lift adjusting collar (10) down until it is snug against the pickup arm lift (21).

(g) Tighten set screw in the lift adjusting collar.

(h) Check height.

13. RE-POSITIONING PICKUP ARM SUPPORT ASSEMBLY (23).

To assure proper set-down adjustment, this must be done carefully as follows if set screws are loose or if pickup arm support assembly (23) has been removed.

(a) Turn adjusting screw (29) (see paragraph 11) clockwise 2 full turns.

(b) Place a 12" record on the turntable.

(c) With the changer out of cycle, manually move the arm control assembly (28) outwards as far as it moves freely. In this position, the arm control pin (28A) will be located as indicated at "A" in Figure 2.

(d) Place pickup arm so that needle rests in first playing groove on the 12" record.

(e) Tighten the two set screws in pickup arm support assembly (23).

(f) Make the final set-down adjustment as described in paragraph 11.

14. REMOVING COVER (3) FROM HEAD ASSEMBLY (7).

(a) To remove cover (3) from head, squeeze cover at ends and lift up enough for cover to come free of rotating plate (7C).

(b) Remove hairpin spring from hold down plate (4) and slide hold down plate (4) out of rotating plate (7C).

15. RE-POSITIONING PUSH OFF ARM (5).

This must be carefully done if set screws are loose or push off arm (5) has been removed.

(a) Rotate the record support to the 10-inch position. Remove push off arm (5).

(b) Line up push off cam (36C) with push off arm (5) so they are parallel. If the push off is still faulty set push off cam (36C) slightly back of push off arm (5), this will give a little less push off on 10-inch side and little more on 12-inch side. Reverse this procedure for more push off on 10-inch side.

(c) Put push off arm (5) in position leaving push off arm about 1/32" above top of arm lift shaft.

(d) Tighten set screws in push off arm.

16. CHANGER REPEATEDLY GOES THROUGH CHANGE CYCLE WITHOUT PLAYING RECORD.

(a) Mounting screw on eccentric cam (53) may be loose. Tighten.

(b) Cushion spring (31) has slipped out of position and is on wrong side of riser plate tab (34B). Re-position spring. (See Figure 5.)

(c) In normal operation, the trip spring (32) holds the arm control plate (33) against the riser plate (34). If the trip spring is faulty, it permits the arm control plate to rise too high above the riser plate. This causes the reject catch (51) to pass underneath the stop tab (33A). To correct, bend the legs of the trip spring closer together. If necessary replace trip spring.

(d) Eccentric cam (53) is bent so that reject catch (51) passes underneath stop tab (33A) on the arm control plate (33). To correct, straighten cam by putting changer out of cycle and pressing upward on cam near reject catch.

17. NEEDLE SLIDES ACROSS PORTION OF RECORD AFTER SET-DOWN ON 12-INCH RECORD.

Cushion spring (31) has slipped out of position and is on wrong side of riser plate tab (34B). Re-position spring. (See Figure 5.)

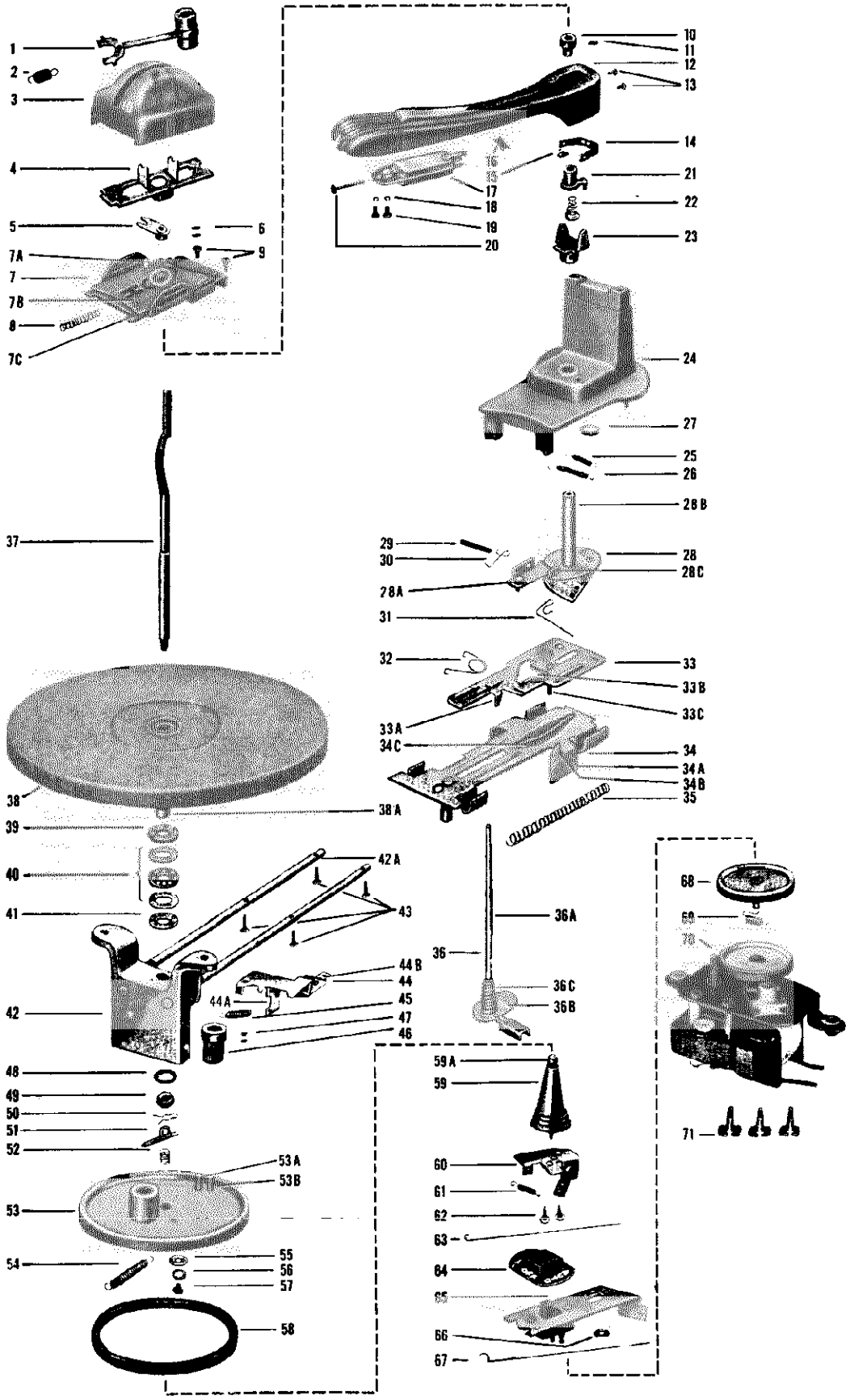
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FIGURE 6

MODEL C-250

CRESCENT INDUSTRIES, INC.

See Exploded View, Figure 6, for Identification of Parts.

Ref. No.	Part No.	Description
1	2C3-A1	Hold Down Pad
2	405-A4	Hold Down Spring
3	2C3-B2	Cover
4	2C1-A14	Hold Down Plate
5	G400-A66	Push Off Arm Assembly
6	1A44-37	Set Screw (Bristol Head #6-32x1/8")
7	C250-A3	Head Assembly
7A		Push Plate Pin (Part of 7)
7B		Push Plate (Part of 7)
7C		Rotating Plate (Part of 7)
8	405-A33	Push Plate Spring
9	6C-312	Screw (#6x5/16" Phillips Flat Hd. Type Z)
10	402-A57	Lift Adjusting Collar
11	1A44-38	Set Screw (Bristol Head #6-32x3/16")
12	C250-A8	Pickup Arm, Pivot Spring and Arm Lift Bearing Pin Assembly. (Does not include 16-20 incl.)
13		Rivet (pickup arm pivot spring) — Supplied as a group. Order Part No. C250-A9
14		Pivot Spring (pickup arm) — Supplied as a group. Order Part No. C250-A9
15		Arm Lift Bearing Pin — Supplied as a group. Order Part No. C250-A9
16	405-A13	Spring Clip (pickup arm)
17	409-A1	Pickup Cartridges — Interchangeable
	409-A2	Pickup Cartridges — Interchangeable
	409-A3	Pickup Cartridges — Interchangeable
18	3A2-3-21	Lockwasher, #4 Split — Doz.
19	42-250	Screw (Fil. H.M.S. #4-40x1/4"; Mtg. Cartridge
20	402-A43	Needle Screw for Cartridges
21	G400-A86	Pickup Arm Lift Assembly
22	405-A46	Brake Spring
23	G400-A73	Pickup Arm Support Assembly
24	2C4-C1	Base Casting
25	405-A41	Safety Spring
26	405-A49	Set Down Spring
27	405-A27	Spring Washer
28	C250-A10	Arm Control Assembly
28A		Arm Control Pin (Part of 28)
28B		Arm Support Tube (Part of 28)
28C		Bracket (Part of 28)
29	402-A60	Adjusting Screw
30	2C5-A2	Lock Spring (Set Down Adjustment)
31	405-A45	Cushion Spring
32	405-A43	Trip Spring
33	C250-A11	Arm Control Plate
33A		Stop Tab (Part of 33)
33B		Track (Part of 33)
33C		Size Change Stop (Part of 33)
34	C250-A12	Riser Plate Assembly
34A		Riser Plate Motion Bracket (Part of 34)
34B		Riser Plate Tab (Part of 34)
34C		Inclined Track (Part of 34)
35	405-A9	Recoil Spring
36	G400-A98	Push off cam and shaft Assembly (Includes retaining ring, safety collar, and spring.)
36A		Arm lift shaft (Part of 36)
36B		Push off cam (Part of 36)
36C		Arm Lift shaft spring (Part of 36)
37	G400-B21	Centerpost
38	C250-B13	Turntable
38A		Turntable shaft (Part of 38)
39	412-A1	Cork Washer
40	415-A2	Thrust Bearing Assembly (Replace as a unit)
41	412-A9	Cork Washer
42	C250-B14	Turntable mounting and guide rod Assembly
42A		Guide Rods (Part of 42)
43	6C-625	Screw (#6x5/8 Fil. Hd. Type Z)
44	C250-A6	Reject Manual Control Assembly
44A		Reject Arm (Part of 44)
44B		Manual Control bracket (Part of 44)
45	405-A25	Reject Arm Spring
46	2C2-A1	Knurled roller, turntable shaft
47	1A44-13	Set Screw (Bristol Head #8-32x1/8")
48	3B1-29	Lockwasher, 1/4" I.D. — Doz.
49	402-A41	Hex nut (1/4"-20; used on centerpost)
50	405-A15	Hairpin Spring
51	2C1-A8	Reject Catch
52	405-A50	Reject Catch support spring — Doz.
53	G400-A117	Eccentric cam and tire assembly
53A		Reject Catch pivot stud (Part of 53)
53B		Reject Catch Stop stud (Part of 53)
54	405-A47	Eccentric Spring
55	4B1-57-47	Flat Washer (eccentric cam)
56	3B1-26-47	Lockwasher #8 I.T. — Doz.
57	84-250	Screw (B.H.M.S. #8-32x1/4" for mtg. cam) — Doz.
58	406-A1	Rubber Tire (Eccentric cam)
59	C250-A15	Arm Rest Assembly
59A		Reject Button (Part of 59)
60	C250-A16	Reject lever Assembly
61	405-A25	Reject lever spring
62	1A20-14-21	Screw (#6x3/8" Drive Screw; used for reject lever mounting)
63	414-A13	Reject trigger wire
64	2C3-B3	Control Knob
65	C250-A5	Switch Mounting Assembly
66	405-A22	Spring Washer
67	2C14-A2	Manual Control wire
68	G400-A57	Idler wheel assembly (Used with motor 407-B1 only.)
	G400-A59	Idler wheel assembly (Used with motor 407-B10 only.)
	C250-A17	Idler wheel assembly (Used with motor 407-B9 only.)
69	405-A35	Spring, idler wheel (Used with motor 407-B1 only.)
	405-A36	Spring, idler wheel (Used with motor 407-B10 only.)
	2C5-A6	Spring, idler wheel (Used with motor 407-B9 only.)
70	407-B1	Motor, complete with idler wheel; 105-125 Volts. 60 cycle (Motor 407-B9, 407-B10 are interchangeable with 407-B1.)
	407-B6	Motor, complete with idler wheel; 105-125 Volts. 50 cycle (Motors 407-B7, 2C7-B1 are interchangeable with 407-B6.)
	2C7-B2	Motor, complete with idler wheel; 220 Volt. 60 cycle (Motors 2C7-B4, 2C7-B6 are interchangeable with 2C7-B2.)
	2C7-B3	Motor, complete with idler wheel; 220 Volt. 50 cycle (Motors 2C7-B5, 2C7-B7 are interchangeable with 2C7-B3.)
71	2C5-A3	Motor snap fasteners, motor mounting

The following parts are not identified in exploded view, figure ???

72	C250-B2	Motorboard Assembly (Does not include 73, 74, 75, 76)
73	2C6-A3	Rubber shock mount
74	2C2-A5	Motorboard mounting stud
75	4B1-72	Flat Washer, #10 I.D.
76	100-500	Screw (Phillips countersunk flat head)
77	9B1-15	Solder lug
78	10B1-18	Terminal Board
79	2C5-A5	Faston Washer, fastening base to motorboard

SPECIFICATIONS

Power Consumption at 117 volts ..... 18 watts

Voltage Rating ..... 105 to 125 volts at 60 cycles

Speed at 117 volts ..... 78 r.p.m.

Starting Torque at 117 volts ..... 27.5 in. oz.

Weight less records ..... 7.5 pounds

Type of Pickup
- P-72 ..... Variable Reluctance
- P-73 ..... Crystal

Type of Needle
- P-72 and P-73 ..... Permanent Osmium Point

Maximum Record Capacity
- 12 inch ..... 10 records
- 10 inch ..... 12 records
- 10 and 12 inch intermixed ..... 10 records

DESCRIPTION AND OPERATION OF THE CHANGER

RECORD LOADING

The record spindle shelf is to be loaded to a maximum of 12 ten inch, 10 twelve inch, or to the red line on the spindle with both sizes, intermixed. The stabilizer arms must be moved into the recess of the spindle to prevent interference in loading the records.

The tone arm set-down is always in 10" position unless a 12" record has just been dropped from the spindle shelf. In dropping to the turntable, the 12" record strikes the intercepter lever #58698, contacting the tone arm swing lever #58698, imparting movement to the tone arm lift lever #58694 and causing the tone arm to be set down to 12" position.

RECORD CHANGING

After the changer is loaded with records, the control button is pressed to start the record change cycle. Rotation of the main cam will actuate the compression lever causing the compression rod to depress the inner-spindle assembly. The four-prong spring support (spindle shelf) has receded into the outer spindle and the rubber sleeve on the spindle, being compressed, has expanded, and therefore holds all but the bottom record which descends to the turntable. Then the tone arm return lever moves the tone arm into position to be lowered to the record by following the cam track. The tone arm moves across the record until the selection is finished and the trip mechanism functions. Finally, the tone arm is lifted and carried over the record until clear of the record stack and the next record is released, completing one change cycle. In this manner all the records in the stack are played.

AUTOMATIC STOP

The weight of the records on the spindle allows the record lift lever to follow the contour of the main cam. When the last selection is played, a spring lifts the record lift lever into position to move the automatic stop pawl inward. The main cam carries the stop pawl into engagement with the switch lever, thus stopping the changer.

SPRING MOUNTING

The changer is solidly mounted on a panel which is floated upon spring mountings. These spring mountings eliminate rumble or feedback and insulate the changer from any cabinet vibration occasioned by the sound waves emanating from the speaker. This vibration, if transmitted through the tone arm to the pickup, would be amplified in the audio system of the radio and passed into the speaker again. The spring mountings also cushion the changer from sudden jars or shocks.

To remove the changer from the cabinet, remove four acorn nuts located on the corners of the mounting panel and lift panel out of cabinet. In some cases it is necessary to remove the cabinet drawer before removing the mounting panel.

On the underside of changer loosen screw next to spindle (paragraph B, section 7), and turn lock so that turntable may be removed from changer. Remove three screws and lift changer out of mounting panel.

CYCLE OF OPERATION

STUDYING THE CYCLE

The record change cycle consists of the sequence of motions required to move the pickup into position on a record, play the record, remove the pickup and place a record into position. Since movements of various parts are being performed simultaneously, it is impossible to follow all of the actions at one time. A suggested method is to select one certain cycle of operation. For example the raising of the tone arm, moving it over the record and the replacement on the record may be studied while running the changer slowly by hand. After the motions associated with the tone arm are understood, another portion of the changer may be observed.

TRIP ASSEMBLY

Motion of the tone arm is transmitted through the tone arm crank to the tone arm lever and pin assembly #15194 which is secured to the tone arm support tube with lever #58695. When the needle enters the trip grooves of a record, the increased velocity of movement impels the tone arm lever against the starting reset lever #58853. The start-

ing reset lever then engages the starting pawl on the turntable hub.

THE CHANGE CYCLE

The turntable is driven through an idler pulley by the electric motor, the turntable being free on the spindle. A gear on the turntable hub meshes with the main cam gear. Several teeth are left off the main cam to stop it in playing position. After a selection has been played, the trip mechanism moves the starting reset lever, which is part of the main cam assembly #13672, forward at the right speed and correct distance to permit it to mesh properly with the starting pawl on the turntable hub. As the main cam rotates, the tone arm lift lever #58694 lifts the tone arm upward and the tone arm return lever moves the tone arm over the record. The compression lever #57240 will actuate the compression rod #55424, which will in turn depress the inner-spindle assembly #11379. During this cycle the rubber sleeve #62152 has expanded and is holding all but the bottom record. At the same time the spindle shelf recedes into the outer spindle #55334, dropping the bottom record to the turntable. By following the cam track the tone arm return lever moves the tone arm into position to lower the pickup needle to the starting groove in the record. The main cam is now in playing position, disengaged from the turntable hub gear. One change cycle has been completed.

PICTORIAL REPRESENTATION

The following series of photographs, with a corresponding brief explanation of each phase, are inserted to illustrate the movements of pertinent parts of the changer during a change of record cycle.

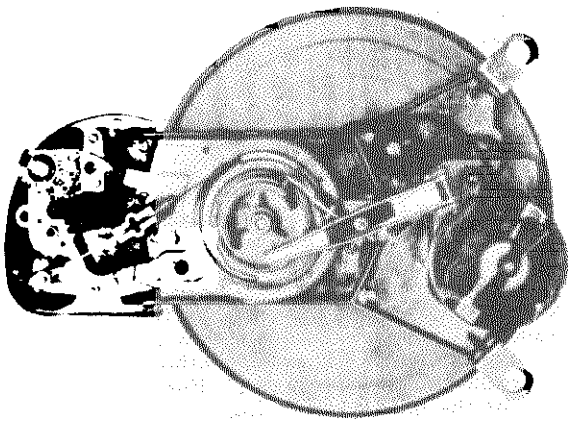


FIGURE A

The main cam is driven through the gear on the turntable hub. When a change cycle is completed, the main cam disengages from the turntable gear because several teeth are left off the main cam gear. The tone arm is in position on the record and free to follow the playing groove. This phase of cycle is called the playing position.

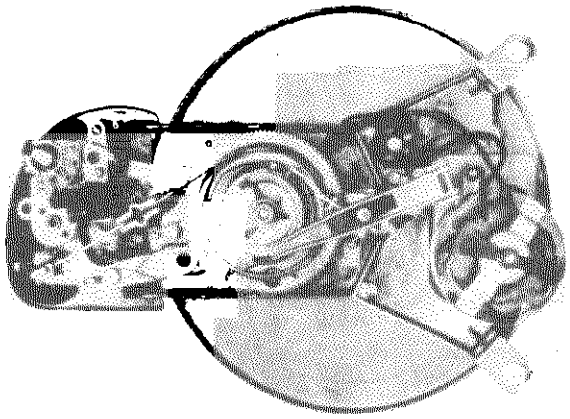


FIGURE B

The change cycle has just begun. The tone arm lift lever has raised the tone arm from the record and the tone arm return lever has started to move the tone arm away from the turntable. The compression lever assembly has started to pull the compression rod, thus beginning to recede the spindle shelf into the outer spindle and expanding the rubber sleeve on the spindle.

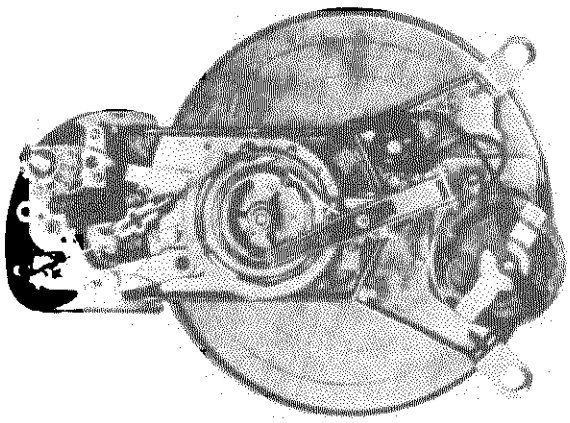


FIGURE C

The tone arm has moved outward, clear of the turntable, and the spindle shelf has fully receded into the outer spindle, dropping the bottom record to the turntable. The rest of the record stack is held by the expanded rubber sleeve. The spindle shelf has started to return to its former position.

CHANGER LUBRICATION

The record changer should be lubricated and cleaned periodically or when a major part or assembly is replaced. Dirt, old oil, or grease may be removed with carbon tetrachloride or other similar cleaning fluid.

Use only a good grade of electric motor oil.

Care should be exercised to prevent an excess of oil being used on any part and that no oil gets on the velocity trip assembly, motor pulley, idler pulley or turntable rim. There is a self-lubricating type bearing in the turntable with an oil reservoir which may be filled through the four holes in the turntable hub.

Once a year a thin coat of light grease of the vaseline type may be applied to all surfaces of the main cam that contact lift levers and record lift lever roller. Also grease all working parts on the main cam and oil other moving parts (see figures D & E) except those that rely upon friction, i.e., contact surfaces being dry.

PRECAUTIONS

With mechanical devices, much information pertinent to lubrication can be obtained by observation. Obviously, it will be seen that certain parts of rotating or sliding machinery must be lubricated,

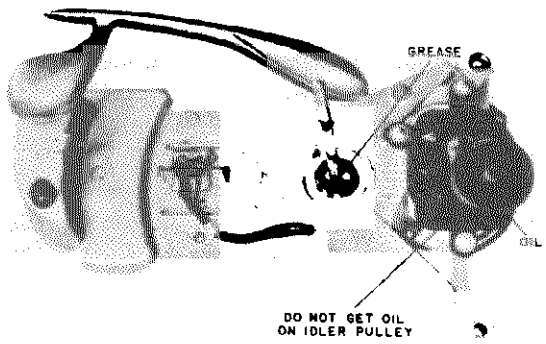


FIGURE D

but that other parts depend upon contact surfaces being dry and free from foreign substances, such as grease, so that proper friction exists. Where lubrication is indicated, it should be applied judiciously, avoiding any excess lubricant that may be transferred or thrown to some part designed for dry operation.

Inspect parts not requiring lubrication to make certain they are clean. Always be sure to use the type of oil or grease recommended for lubricating specified items.

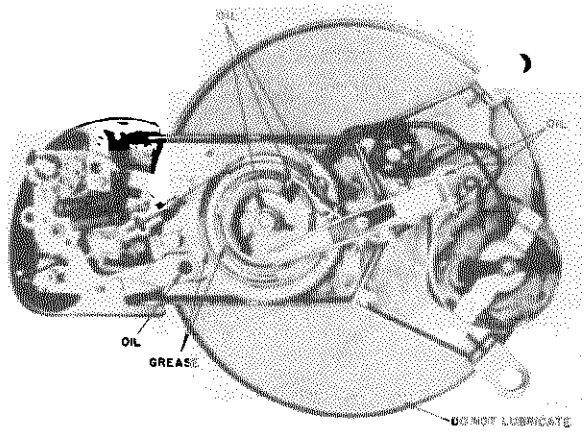


FIGURE E

PARTS IDENTIFICATION

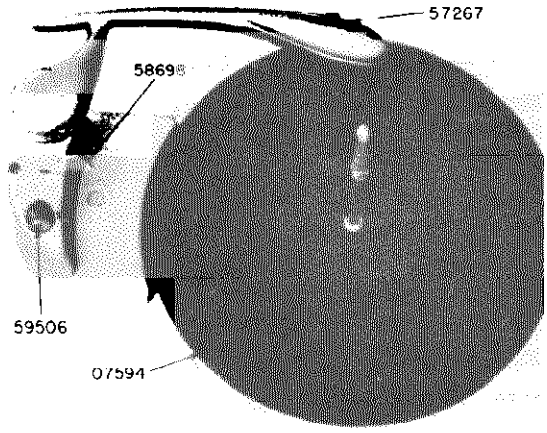


FIGURE 1—Top View

FIGURE 1

Part No.	*Description*
07594	— Turntable Assy.
55343	— Reject Plunger.
57259	— Tone Clarifier Knob.
57267	— Tone Arm.
58698	— Tone Arm Interceptor Lever.
59506	— Reject Button.

MODELS P-72, P-73 FARNSWORTH TELEV. & RADIO CORP.

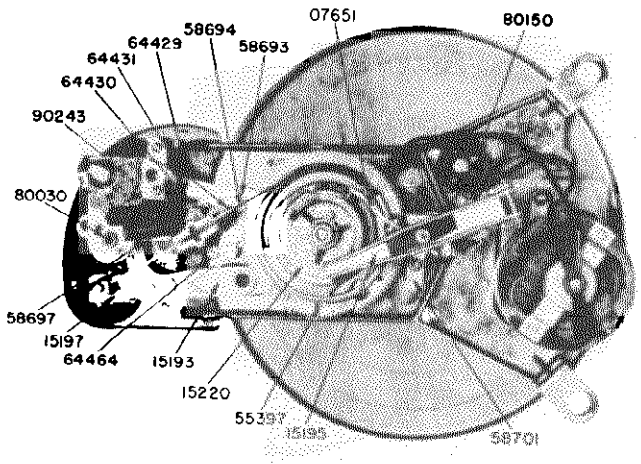


FIGURE 3—Bottom View

FIGURE 3

Part No.	*Description*
07651	— Record Lift Lever Assy.
15193	— Tone Arm Swing Lever Assy.
15195	— Compression Lever Assy.
15197	— Tone Arm Crank and Pin Assy.
15220	— Main Cam.
55397	— Trip Adjustment Screw.
58693	— Switch and Reject Lever.
58694	— Tone Arm Lift Lever.
58697	— Tone Arm Adjusting Lever.
58701	— Turntable Hold-Down.
64429	— Reset Spring.
64430	— Reject Spring.
64431	— Lift Lever Spring.
64464	— Switch Release Spring.
80030	— Phono Output Jack.
80150	— 4 Prong Motor Plug (Male).
90243	— Tone Switch.

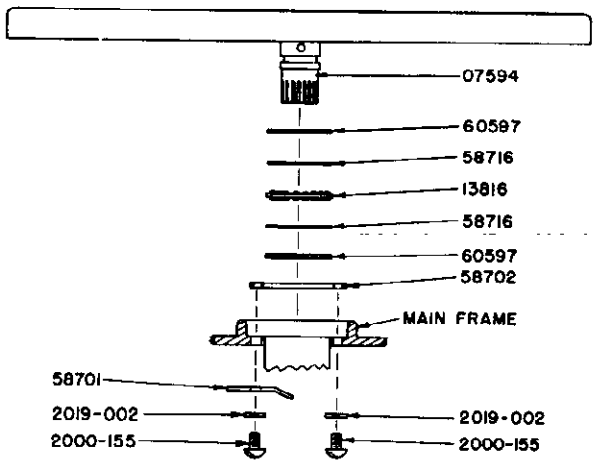


FIGURE 4—Turntable and Bearing Assembly

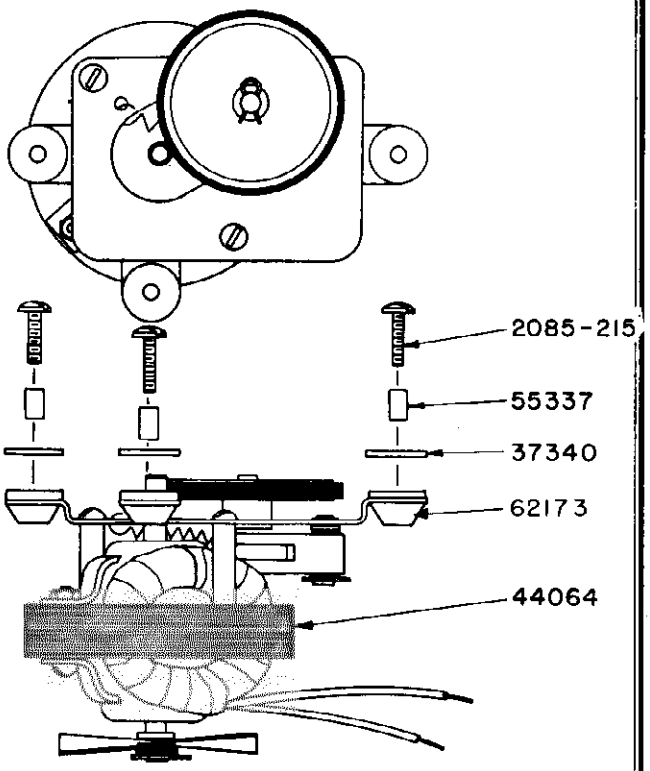


FIGURE 5—Phono Motor Assembly

FIGURE 5

Part No.	*Description*
37340	— Brass Washer.
44064	— Phono Motor.
55337	— Motor Mtg. Spacer.
62173	— Rubber Motor Mtg. Grommet.
2085-215	— Motor Mtg. Bolt (#6-32 x 5/8").
11437	— Phono Motor Assy. Complete.
13819	— Idler Pulley.
15237	— Idler Brkt. and stud assy.
37421	— "E" washer (to mount idler pulley, idler pulley brkt., and ventilator fan).
54308	— Fibre thrust washer (to mount idler pulley and idler pulley brkt.)
54309	— Fibre thrust washer (to mount ventilator fan).
64471	— Spring for idler pulley.
80150	— 4 prong motor A. C. plug (male).
92335	— Felt washer (for ventilator fan).
62190	— Alternate rubber motor mounting.

FIGURE 4

Part No.	*Description*
07594	— Turntable Assy.
13816	— Ball Bearing and Retainer.
58701	— Turntable Hold Down.
58702	— Bearing Support Washer.
58716	— Bearing Race Washer.
60597	— Cork Washer for Turntable Bearing.

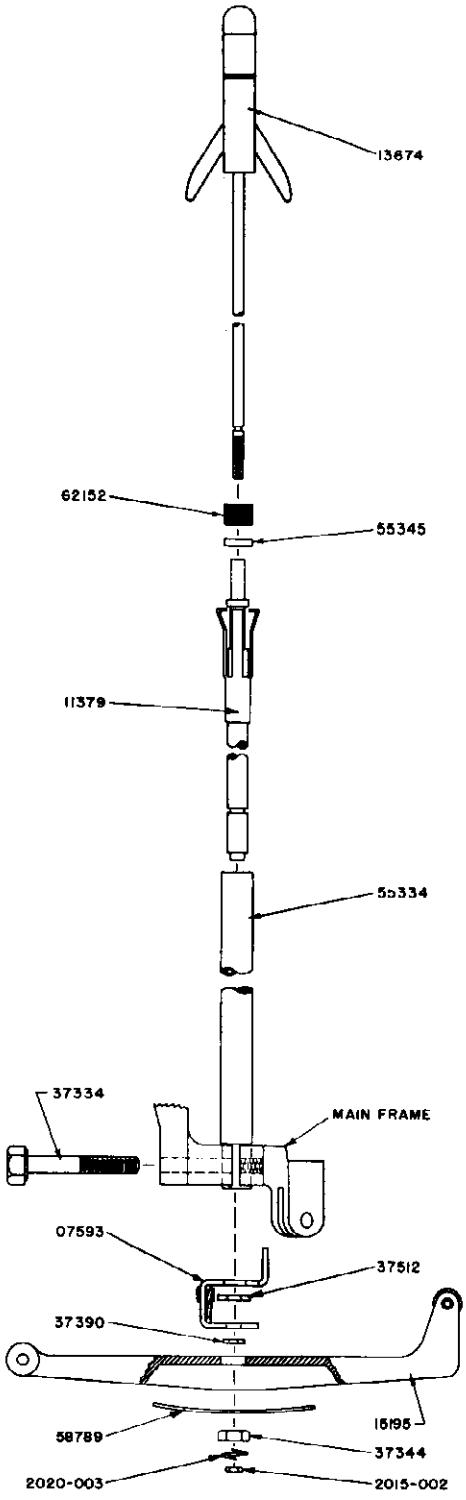


FIGURE 6—Spindle Assembly

FIGURE 6

Part No.	*Description*
07593	— Record Lift Lever Bracket Assy.
11379	— Inner Spindle Assy.
13674	— Upper Spindle Assy.
15195	— Compression Lever Assy.
37334	— H. H. Bolt (#10-32 x 7/8").
37344	— Special Hex Nut (#3-48).
37390	— "E" Washer (small) for Record S dle.
37512	— "E" Washer (large) for Record S dle.
55334	— Outer Spindle.
55345	— Sleeve Support Washer.
58789	— Compression Spring.
62152	— Rubber Sleeve for Record Spindl
2015-002	— Hex Nut (#3-48).
2020-003	— Split Lockwasher (#3)

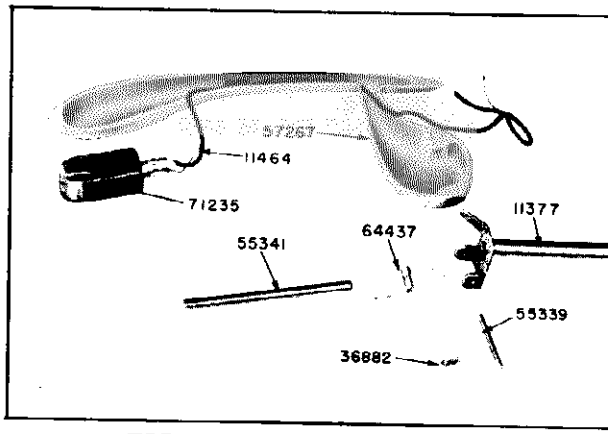


FIGURE 7—Tone Arm Assembly

FIGURE 7

Part No.	*Description*
11464	— Pickup Lead Assy.
36882	— H.P. Cotter.
55339	— Hinge Pin.
55341	— Tone Arm Lift Rod.
57267	— Tone Arm.
64437	— Tone Arm Spring.
71235	— Magnetic Pickup (P-72).
71243	— Crystal Pickup (P-73).

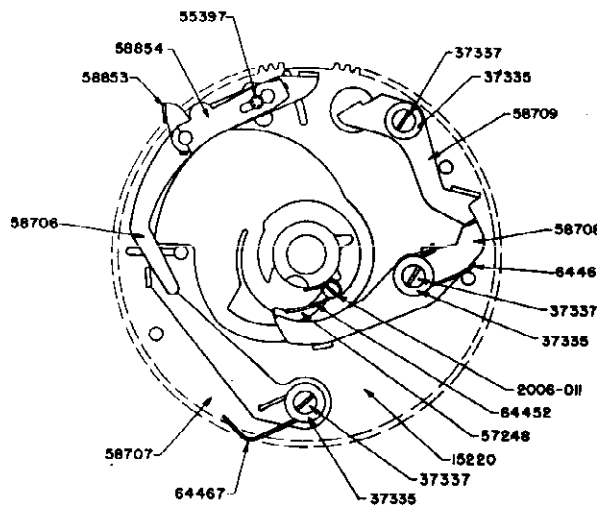


FIGURE 8—Main Cam Assembly

FIGURE 8

Part No.	*Description*
15220	— Main Cam and Pin Assy.
37335	— Washer (#4 x 3/8" o.d).
37337	— Mtg. Screw for Levers (H.M.S #4-36 x 1/4").
55397	— Trip Adjustment Screw.
57248	— Main Cam Switch.
58706	— Starting Lever.
58707	— Reject Lever.
58708	— Tone Arm Hold Out Lever.
58709	— Hold Out Locking Lever.
58853	— Starting Reset Lever.
58854	— Starting Lever Spring.
64452	— Cam Switch Spring.
64466	— Spring for Hold Out Lever.
64467	— Trip Spring.
2006-011	— #2-56 x 7/16" Fil. M.M.S.

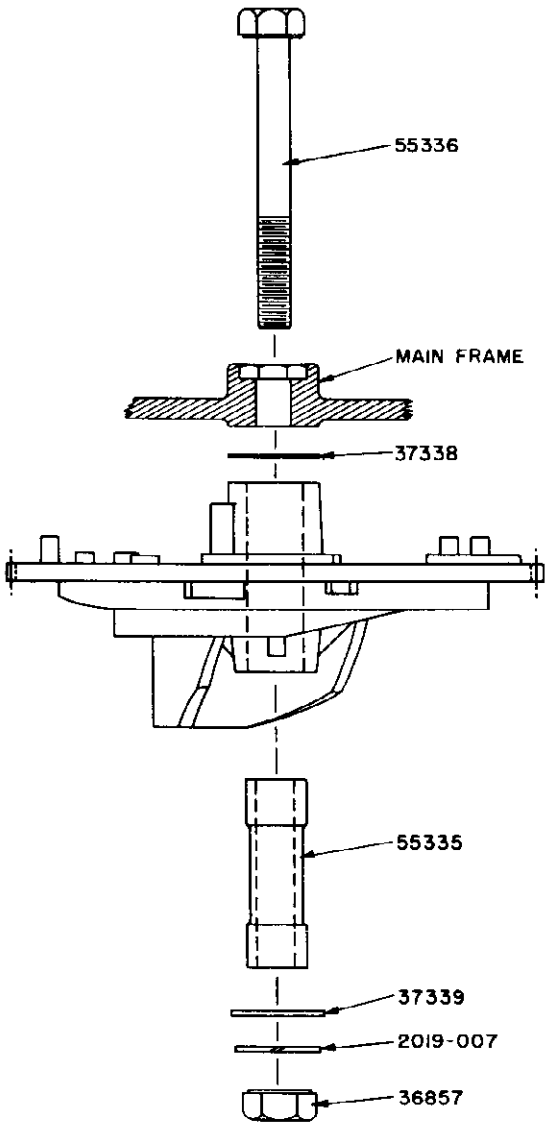
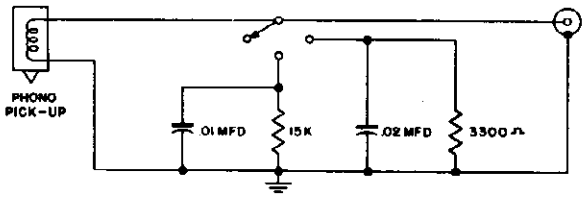


FIGURE 10—Cam Mounting Assembly



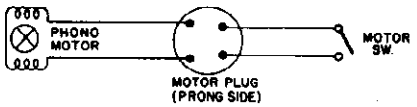


FIGURE 9—Circuit Diagrams

FIGURE 10

Part No.	*Description*
36857	— 1/4-28 Hex. Nut (To Mount Main Cam)
37338	— Shim Washer.
37339	— Flat Washer (1/4" i.d. x 5/8" o.d. x 1/16" thick).
55335	— Cam Spacer (Inside Main Cam Hub).
55336	— Mtg. Bolt for Main Cam.
2019-007	— 1/4" S.P. Int. Lockwasher.

Inspect parts not requiring lubrication to make certain they are clean. Always be sure to use the type of oil or grease recommended for lubricating specified items.

PARTS REPLACEMENT

A. REASSEMBLING PARTS

When repairs are being made, a careful check should be made of all moving parts in order to make sure that no binding occurs. Check all moving parts for binding before springs are connected.

All levers which operate on shoulder studs should be assembled with the burred side of the retaining washer away from the lever to prevent the washer from binding on the lever.

B. TO REMOVE AND REPLACE TURNTABLE

Remove the changer from the cabinet, and from the bottom side of the main frame (near the spindle) loosen the screw which holds the turntable down, so that it is clear of the pinion gear. The turntable may then be raised from the top side of the changer. Care must be taken not to damage the cork washers next to the bearing.

When replacing the turntable, see that the cork washer 60597, then the bearing race 58716, bearing retainer 13816, and another bearing race and cork washer are installed in this sequence (see Figure 1). Align these parts with the center spindle. When pushing the turntable over the spring assembly, push firmly but cautiously, avoiding too much pressure which may damage the springs. When the turntable is in place, move hold-down into groove in turntable hub and tighten screw.

C. TO REMOVE IDLER PULLEY

After the turntable has been removed, the idler pulley can be removed by slipping off the small hairpin cotter on the end of the idler pulley shaft.

When replacing the pulley a single drop of oil should be used on the pulley shaft.

CAUTION:

Do not allow oil to get on either the idler pulley or the turntable rim.

D. TO REMOVE AND REPLACE SPINDLE ASSEMBLY

Remove nuts from bottom of compression rod. Lift compression lever 57240 out of position. Remove E washers and record lift bracket 58700. Pull spindle assembly out from top side. Do not attempt to repair assemblies but replace with new parts. To reassemble, push assembly inside of outer spindle from the top. Put record lift bracket in place and install E washers. Swing compression lever into position and install flat spring 58789, nuts 37344 and 2015-002 and No. 3 lockwasher. Tighten nuts on compression lever until rubber sleeve on spindle reaches .330" to .337" diameter when fully compressed. Use Glyptal to secure lock nuts.

E. TO REMOVE AND INSTALL MAIN CAM ASSEMBLY (Fig. 1)

Remove turntable (paragraph B). Remove nuts from bottom of spindle and turn compression lever back to clear cam. Disconnect spring from tone arm lift lever 58694. Remove nut 36857 from under side of cam and withdraw bolt 55336 from top side of changer. Slide cam out carefully so as not to bend any levers on baseplate side. Adjust screw 55397 so that tension on starting reset lever 58853 is 6 to 8 grams. Use Glyptal on bottom side of screw. To reinstall the cam replace cam shim 37338, slide bolt through from top side of changer and slide cam into place being sure that spacing shim 37338 is not lost. Cam should have insert spacer 55335. Use flat washer 37339, lockwasher 2019-007 and hex nut 36857. Reinstall tone arm lift lever 58694 and attach spring 64431. Swing compression lever into place and install flat spring, two nuts and lockwasher. Secure these nuts with Glyptal after spindle assembly has been adjusted. Reassemble turntable (paragraph B.)

F. TO REMOVE AND INSTALL TONE SWITCH & BRACKET ASS'Y 13825

Disconnect pickup lead wires from socket 80030. Remove two screws which hold bracket to baseplate. Lift bracket from assembly.

To reinstall, insert tone switch coupling 64464 between rejects plunger 55420 and switch 90243. Replace screws 2000-157 and lock washers 2019-004. Resolder pickup wires to socket; the black wire should be connected to the center terminal.

G. TO REMOVE AND REPLACE TONE KNOB & PLUNGER ASSEMBLY 09353

Remove Tone Switch and bracket assembly 13825 (paragraph F). Lift plunger assembly out from top side. Unscrew reject knob 59486 while holding shaft 55420 rigid. Remove spring 64474 and knob 57262 by lifting over top of shaft. To reassemb place knob 57262 on shaft. Drop spring into kn and screw reject knob onto shaft. Push assemb in from top side of changer so that pointer is markings on baseplate. Reinstall tone switch a bracket assembly (paragraph F).

H. SHIPPING CHANGER

The changer is solidly mounted on a mounti board. The mounting board is mounted upon fr floating springs.

When shipping the changer, a hold-down b should always be used on each side of the chang mounting board to hold the changer securely the cabinet. A cardboard spacer ⅛" thick shou be placed adjacent to the shipping bolts betwe the mounting board and the cabinet. The tone a may be held securely to the outer edge of the tu table by arranging a cardboard strip to fit over t spindle and hold the tone arm down.

I. INSERTING PHONO PLUG

The phono input plug must be inserted into t phono socket as far as possible to avoid "grid hur If hum presists, check ground connection of sock

OPERATIONAL ADJUSTMENTS

J. TONE ARM HEIGHT ADJUSTMENT

Load a 10" record on the spindle and turn turntable by hand through cycle until the tone a is at its highest point. From bottom side of chan er, loosen hex nut 2015-007 and adjust screw 37 to tone arm height desired. Tighten locknut lift lever.

To remove lift lever 58694, release spring 54 and withdraw lever from slot. To reinstall, ins pin 55325 in lift lever. Insert lift lever in slot a connect spring.

K. NEEDLE LANDING ADJUSTMENT

Place a 10" record on spindle and press reje button. Changer should continue in cycle un coming into playing position. Observe wheth or not the needle lands in starting groove (abo 3 32" from outside edge of record). If needle lan too close to outer edge of record, turn top tone ar adjusting screw 55328 with coin in direction i dicated on baseplate. If needle landing was t far from outer edge of record, turn adjusting scre in opposite direction. Hold top of spindle down ar press reject button to check needle landing.

12" needle landing will usually not require a justment. If required, it should be made only aft 10" adjustment has been corrected. For errat needle landing, check the wire leads to see th they do not bind or interfer with the tone arm.

L. VELOCITY TRIP ADJUSTMENT

Break the seal on the adjustment screw 553 which is located in hole in bottom of cam ne spindle. Turn to the left to tighten until the ton arm will trip on the record. To check adjustme lever 58706 on cam should contact both lugs c turntable hub when tone arm is in last playin grooves of record before tripping. Seal scre thread with Glyptal to prevent screw from comin out of adjustment.

M. RECORD FEED

1. DOES NOT DROP RECORDS
   a. See that stabilizer arms are not down under the record stack.
   b. Check vertical clearance in spindle. Should be approx. 1/64".
   c. Check the records to see that the label is not extended into the center hole.

2. DROPS MORE THAN ONE RECORD
   a. Check center hole of record for being chipped or oversized. (This changer will not chip or break records).
   b. If 12" record hangs on interceptor lever 58698, check slot in changer head for burrs. This lever should move freely with a slight drag on the side of the slot.

3. CHANGER DOES NOT START
   a. If changer does not start immediately, press reject button a second time.
   b. Check if phono plug and line cord are in their respective sockets.
   c. If further trouble, turn turntable several revolutions to be sure that changer was not shut off during cycle. Press reject button to start.

4. CHANGER SHUT-OFF

Changer should shut off after last record is played. Spindle should have approx. 3/32" vertical motion when no records are on spindle. One 10" record should be sufficient weight to depress spindle so that changer will not shut off. If changer does not shut off or if it shuts off before last record is played, see that spindle is not sticking. It should have a free vertical motion. Also check stop pawl for binding.

N. REPRODUCTION

1. No response.
   a. Audio system. Check with radio reception.
   b. Pickup leads shorted.
   c. Pickup cartridge dead. Try new cartridge.
2. Distorted tone.
   a. Worn needle.
   b. "WOWS" or variance in speed.
      (1) Oil on idler pulley and turntable rim.
   c. Warped records.
   d. Defective pickup cartridge.
      1. Use of badly chipped records or records with breaks.
      2. Dropping tone arm on record.
3. Thumping noise.
   a. Groove in idler pulley worn by motor drive pulley. Result of idler pulley being held stationary with motor running.
      1. Sand idler pulley smooth or replace pulley.
4. "Grid Hum".
   a. Insert phono input plug into phono socket as far as possible.
   b. Check electrical ground connection of phono socket.
5. Mechanical Hum.
   Check alignment of turntable motor armature.

CHECKING THE CHANGER

Check the needle landing with full stack of records, intermixed. This is done by loading the spindle shelf with 10 records, both 10" and 12" and pressing the control button to reject a record and put the changer into operation. The stabilizer arms must be moved into the recess in the spindle to prevent interference in loading the records. Allow the first record to play through and trip, observing the needle landing on several 10" and 12" records, then trip records up to and including nine. Allow the ninth record to play through and feed number ten automatically, observe needle landing, automatic trip and automatic shut-off.

Check electrical operation by turning radio program switch to phono position and playing a record. The tone clarifier should be checked in each position by listening to reproduction. As a rule, old worn records should be played while the switch is in the No. 1 position. Position 2 is for normal records, while No. 3 gives wide-range reproduction from the new high-fidelity recordings.

PARTS LIST

Part No.	Description
07593	Record Lift Lever Bracket Assy.
07594	Turntable Assembly
07651	Record Lift Lever Assy.
09370	Mtg. Spring Assy.
11377	Tone Arm Support Tube & Brkt. Assy.
11379	Inner Spindle Assy.
11437	Phono Motor Assy.
11464	Pickup Lead Assy. For P-72, P-73
13674	Upper Spindle Assy.
13816	Ball Bearing & Retainer (for turntable)
13819	Idler Pulley
13825	Tone Switch & Brkt. Assy. Complete
15193	Tone Arm Swing Lever Assy.
15194	Tone Arm Lever & Pin Assy.
15195	Compression Lever Assy.
15196	Automatic Stop Switch Assy.
15197	Tone Arm Crank & Pin Assy.
15220	Main Cam (casting only)
15237	Idler Brkt. and Stud Assy. (on Phono motor)
25112	.01 mfd. 200 volt Condenser
25276	.02 mfd. 200 volt condenser
36857	1/4-28 Hex nut (to mount main cam)
36882	H. P. Cotter
37066	Acorn Palnut
37155	Spade lug (for tone arm lift lever spring)
37332	#6 Special flat washer (to mount reject lever assy.)
37333	"E" Washer (for tone arm adjusting stud)
37334	#10-32 x 7/8" H. H. bolt (to mount outer spindle)
37335	#4 x 3/8" o.d. washer (for mounting levers on main cam)
37337	#4-36 x 1/4" Bdg. H.M.S. (Mtg. screws for levers on main cam—reject, tone arm hold out)
37338	Shim Washer (to mount main cam)
37339	Flat Washer 1/4" i.d. x 5/8" o.d. x 1/16 thick (to mount main cam)
37340	Brass Washer (to mount motor)
37341	#8-32 x 7/8" hex head bolt (for tone arm crank assy.)
37343	#3 x 5/16" o.d. flat washer (on bottom of record spindle)
37344	#3-48 special hex nut (spindle height adj. nut)
37390	"E" washer (small) for record spindle
37421	"E" Washer (to mount idler pulley, idler pulley brkt. and ventilator fan)
37511	#10-32 x 5/8" H.H.M.S. (on tone arm lift lever)
37512	"E" washer (large) for record spindle
37646	Mounting bolt (for mtg. changer to mtg. board) (two required)
54308	Thrust Washer for idler pulley and idler pulley Brkt.
54309	Thrust Washer for motor ventilator fan
55325	Lift Lever Pin
55328	Tone arm set down adjustment stud
55329	Pin for tone arm interceptor lever
55332	Pin for compression lever
55333	Pin for record lift lever
55334	Outer spindle
55335	Cam spacer (inside main cam hub)
55336	Mounting Bolt for Main Cam
55337	Motor Mtg. Spacer
55339	Tone Arm Hinge Pin
55341	Tone Arm Lift Rod
55345	Sleeve support washer for record spindle
55395	Hinge pin for reject link
55396	Mounting pin for starting lever
55397	Trip adjustment screw
55416	Mounting bolt (one required to mount changer to mounting board)

Part No.	Description
55420	Manual reject plunger rod
57248	Main cam switch
57262	Tone Clarifier Knob (Chrome) for P-
04128	Tone arm for P-72, P-73 (Less Picku
58692	Interceptor reset lever
58693	Switch & reject lever
58694	Tone arm lift lever
58697	Tone arm adjustment lever
58698	Tone arm interceptor lever
58701	Turntable hold down Brkt.
58702	Bearing support washer (under tur table bearing)
58706	Starting lever
58707	Reject lever (on main cam)
58708	Tone arm hold out lever
58709	Hold out locking lever
58716	Bearing race washer (for turntable)
58789	Compression spring
58851	Tone switch bracket
58852	Manual reject link
58853	Starting reset lever
58854	Starting lever spring
58971	Ventilator fan for phono motor
59486	Reject Button For P-72
09367	Reject Button & Plunger ass'y. for P-
60597	Cork washer for turntable bearing (f turntable)
62152	Rubber sleeve for record spindle
62173	Rubber motor mtg. grommets
64429	Reset spring
64430	Reject Spring
64431	Lift lever spring
64433	Spring for tone arm adjustment
64434	Spring for tone arm interceptor lever.
64437	Tone arm counterbalance spring
64452	Cam switch spring
64464	Switch release spring
64465	Tone switch coupling link
64466	Spring for tone arm hold out lever
64467	Trip spring
64471	Spring for idler pulley
64474	Spring for reject button
64476	Lead-in spring
71235	Magnetic Pickup for P-72
71243	Crystal Pickup for P-73
77240	3300 ohm 1/2 watt resistor
77246	15K ohm 1/2 watt resistor
80030	Phono output jack
80150	4 prong motor plug (male)
80327	2 prong molded pickup socket
90243	Tone selector switch
92256	Felt Washer for turntable bearing
92335	Felt washer for motor ventilator fan
2003-155	#6-32 x 1/4" F.H.M.S. (to mount ton arm adjusting lever)
2006-011	#2-56 x 7/16" Fil. H.M.S. (to moun cam switch)
2015-001	#2-56 Std. Hex nut (to mount cam switch)
2015-002	#3-48 Std. Hex nut (lock nut for spindl height adj.)
2015-007	#10-32 Std. hex nut
2017-004	#8 i.d. x 3/8" o.d. flat washer (for ton arm crank assy.)
2019-007	1/4" S.P. Int. lockwasher (to mount mai cam)
2085-205	#6-32 x 1/4" Truss H.M.S. (for mtg reject lever)
2085-215	Motor mtg. bolt #6-32 x 5/8"

CYCLE OF OPERATION

Records should be examined before placing them on the shelves. Badly warped records, badly chipped records, or records with breaks, should not be used. The record shelves are set for the size record to be played (either 10" or 12") by turning either shelf to the position indicated on the decal, then the correct number of records should be placed on the record shelves. (Twelve 10" or ten 12"). The tone arm should be on its rest.

Move the control switch which starts the phonograph and move the reject button sidewise. The changer will go into cycle, lifting the tone arm off the rest and swinging it under the stack. The tone arm should swing clear of the record stack, a record should drop to the hooks, pause, then gently settle to the turntable. The tone arm should swing back and be lowered to the starting groove on the record. When the record is played the above cycle is repeated until all the records have been played.

The turntable is screwed onto the spindle and gear assembly and both are driven through the idler pulley by the motor.

When the reject button is moved, the reject lever pushes the starting lever into position to engage the pawl on the spindle gear. This moves the main cam assembly forward at the right speed and the correct distance to cause the gears to mesh properly. Then the main cam goes through a complete revolution. When the cycle is completed the main cam gear disengages from the spindle gear because several teeth are left off it. This is called the playing position.

First the Tone Arm is lifted off the record through the Tone-Arm Lift Lever (07215). As soon as it is elevated both the Record Plungers move toward the Spindle to center the record for the drop to the Turntable; if no record is on the shelves the Automatic Switch is turned off, however the cycling switch makes the changer complete the cycle. As this happens the Tone Arm Return Lever (09123) moves the Tone Arm from under the record stack. The Rear Record Plunger moves forward at the same rate of speed as the eccentric portion of the Spindle and the Front Plunger moves. This pushes the record off the Rear Shelf where the Rear Record Plunger catches it. Both Front and Rear Plungers move backwards at the same rate as the Spindle does, pushing the record off the Front Shelf and dropping it to the Front Hooks, the record pauses here until the Hooks move to center the record in respect to the Spindle. Then both Hooks snap back out of the way, allowing the record to settle gently to the turntable. Next the Tone Arm swings into the proper position and is lowered to the record. A wire feed-in spring acts against the Tone Arm Crank to feed the Tone Arm into the music grooves in case there is no feed-in groove on the record.

To accomplish the record feed there are three sections of the Main Cam, together with the Centering Lever and Rocker Arm Assembly, involved. The first section of the Main Cam is a "Boss" illustrated at the end of the Tone Arm Lift Lever in Fig. A. The Second section is the Trip Roller Assembly on top of the Main Cam. The third section is the "slot" in the Tone Arm Lift portion of the cam adjacent to the Trip Roller Assembly.

The action is as follows: As the Main Cam rotates, the "Boss" strikes the Centering Lever and Rocker as shown in Fig. B, this moves the Record Plungers toward the Spindle. Because this pressure is applied through a spring, variations in record diameter are of little consequence. After the Boss passes the Centering Lever, the Trip Roller strikes the Rear Rocker the first time moving the Rear Record Plunger forward and the Front Record Plunger is also moved forward, Fig. C. As the Main Cam moves on, the Record Plungers go to a central position then both move backward, Fig. D, then resume the central position, this is while the record rests on the Hooks. Then the Centering Lever drops into the "slot" in the Main Cam, Fig. E, the Front and Rear Hooks are suddenly withdrawn from the record and it drops to the Turntable.

The trip action of the P-62 is positive and is set to trip automatically when the needle reaches a predetermined distance (1⅞") from the spindle.

The following five illustrations show the cycle of operation of a P-62 Capehart Changer.

Figure A. When the cycle is complete the Main Cam disengages from the Spindle Gear because several teeth are left off the Main Cam Gear. This position is called the playing position.

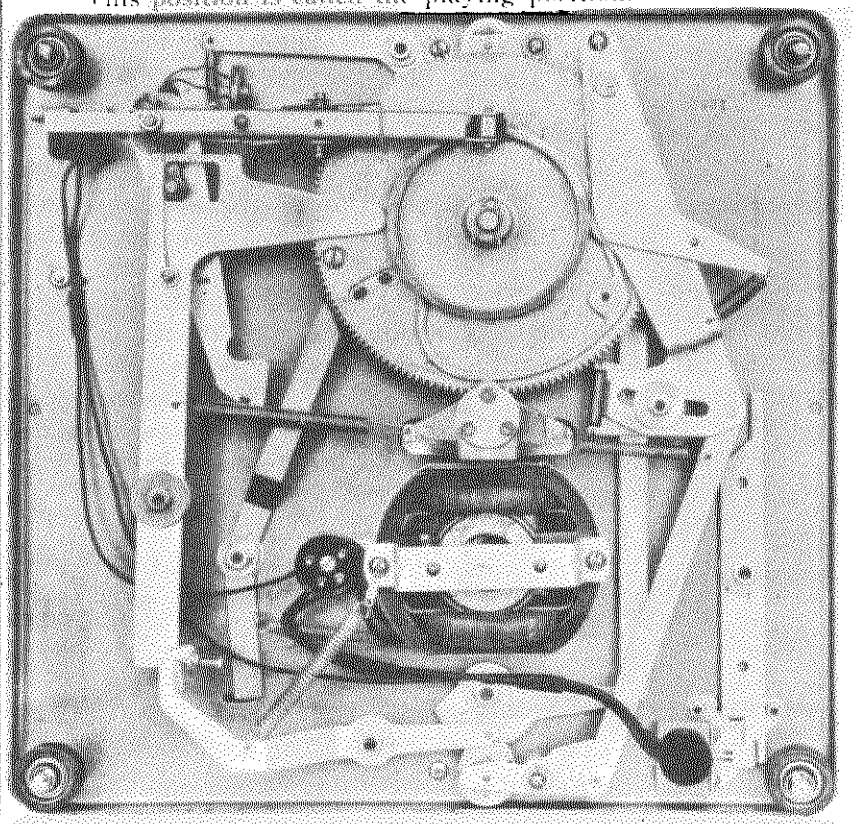


FIGURE A

FRONT

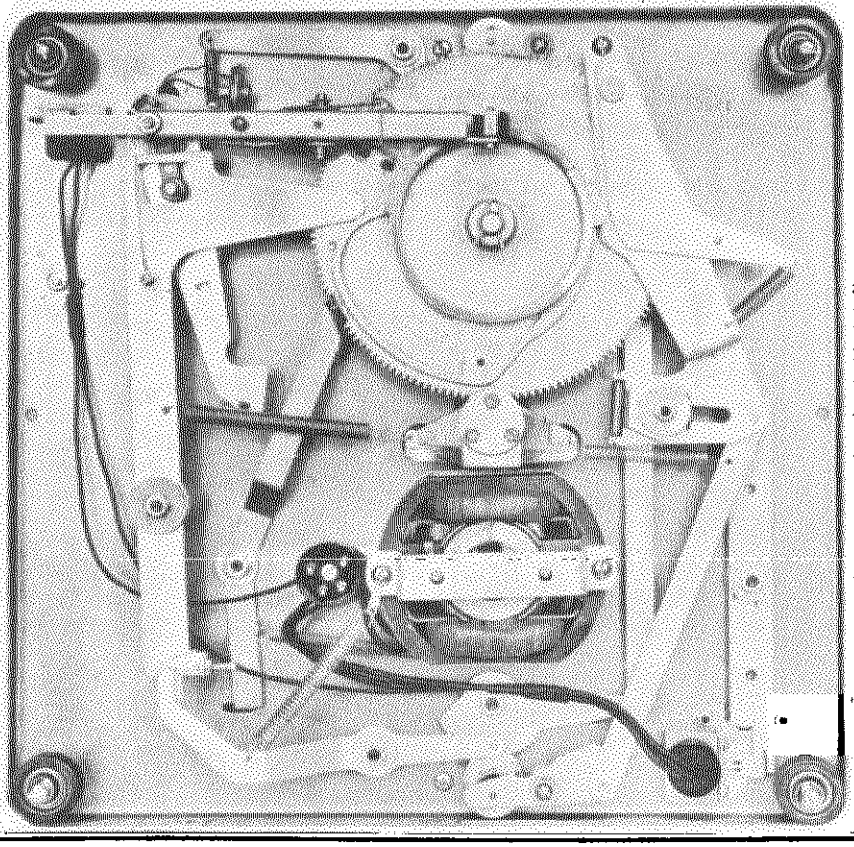
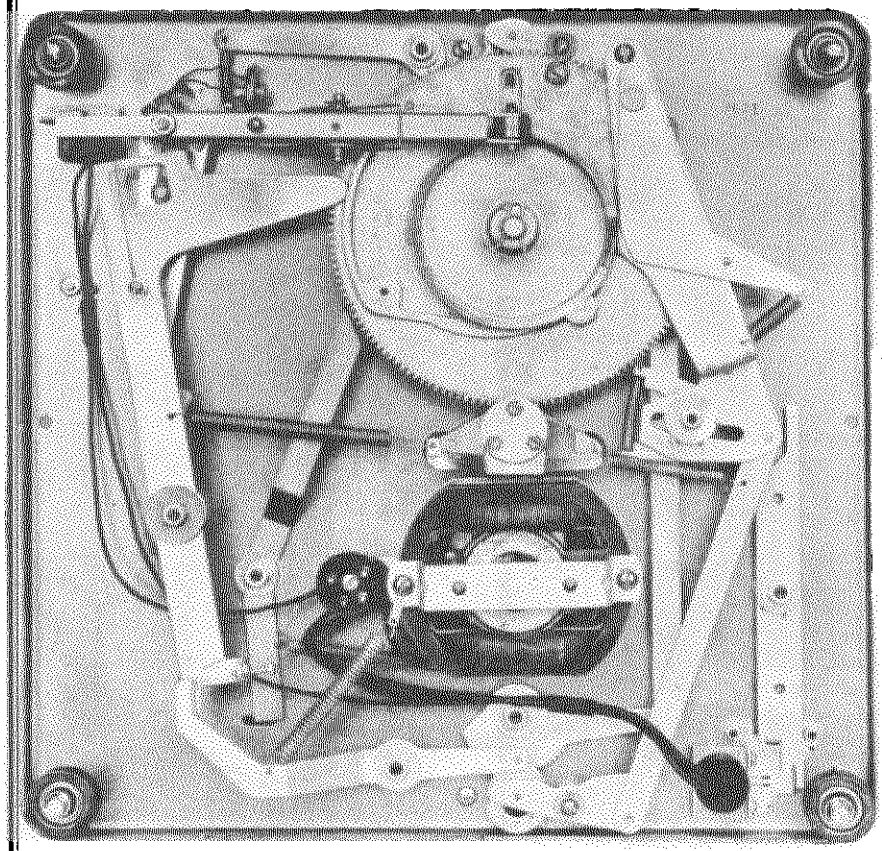


FIGURE B

In figure B the Main Cam advanced so the "Boss" on Main Cam has moved the Cer ing Lever Return Arm away f the cam, which because of the turn Spring causes the Cente Arm through the Rocker Levers Plunger Shafts to move the Re Plungers toward the Spindle. to the motion being transmi through the Return Spring, diffe diameter records are handled ec ly well. The equalizer spring in exactly centering the recor regard to the Spindle. Note, in illustration the Tone Arm Sv Lever is part way up the Shoulder.

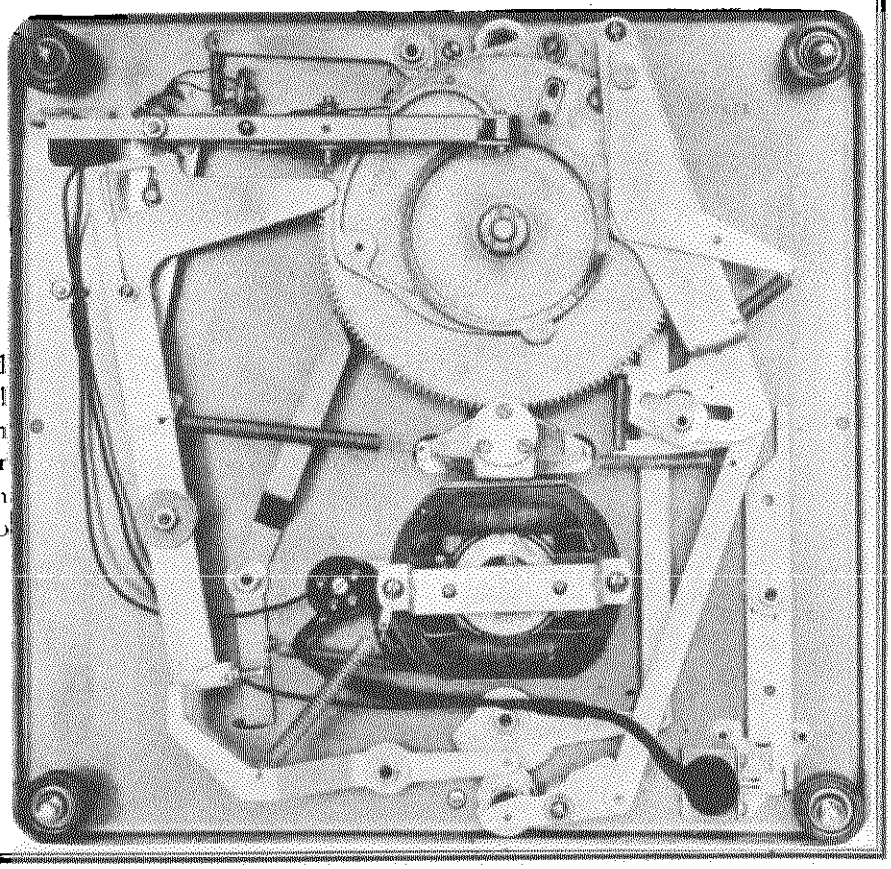
MODEL P-62 FARNSWORTH TELEV. & RADIO CORP.



In Fig. C the Trip Roller (part of Main Cam Assembly) has advanced to move the rear plunger rocker away from the spindle, at the same time moving the front plunger rocker toward the spindle. Due to the Plunger Shafts, which transmit the motion of the Rockers to the Record Plungers, the Record Plungers move in the opposite direction from the Rockers, i.e. Front Record Plunger moves away from the Spindle. This causes the record to be pushed off the Rear Shelf and drop to the Rear Hooks.

FIGURE C

FRONT



Between C & D the Record Plungers go through the central position and assume the position shown in Fig. D where the Rear Record Plunger moves away from the Spindle causing the record to drop to the Front Hooks.

FIGURE D

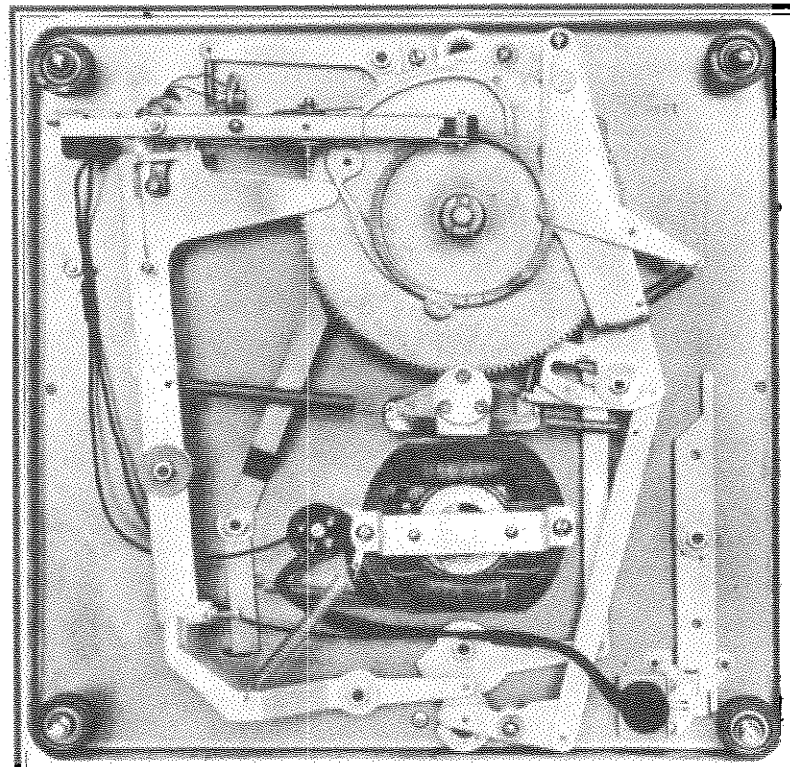
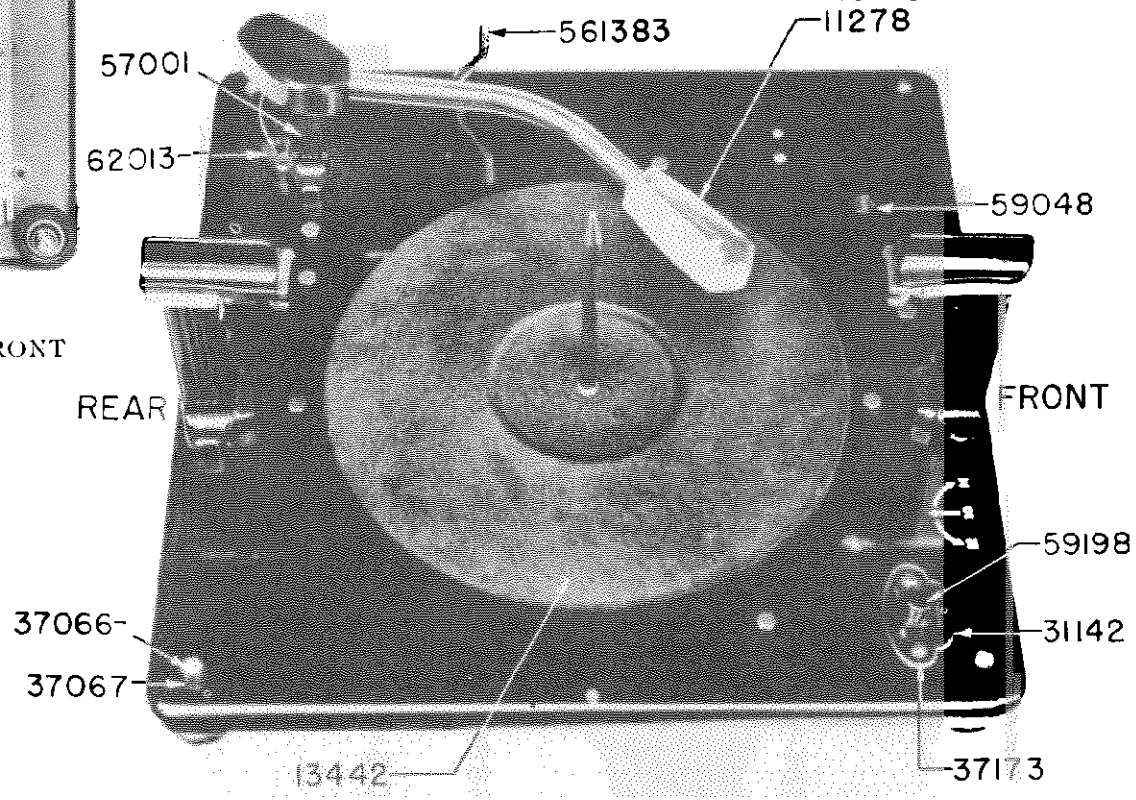


FIGURE E

In Fig. E the Centering Lever Return Arm has dropped into the "Slot" in the Main Cam, moving both Plungers Rockers toward the Spindle, causing the Front and Rear Hooks to snap back, permitting the record to settle flat on the turntable. In this illustration the Tone Arm Swing Lever is returning to the normal position.

TOP VIEW P-62 RECORD CHANGER

11278	Pickup head assembly
13442	Turntable assembly
31142	Escutcheon for automatic on-off switch
37066	Acorn Palnut, record changer mounting
37067	Flat washer, record changer mounting
37173	#6—32 x 3/8" Phil. O.H.M.S. for automatic on-off switch
561383	Tone arm rest
57001	Tone arm support housing
59048	Reject knob
59198	Knob for automatic on-off switch
62013	Rubber bushing for tone arm support post



MODEL P-62 FARNSWORTH TELEV. & RADIO CORP.

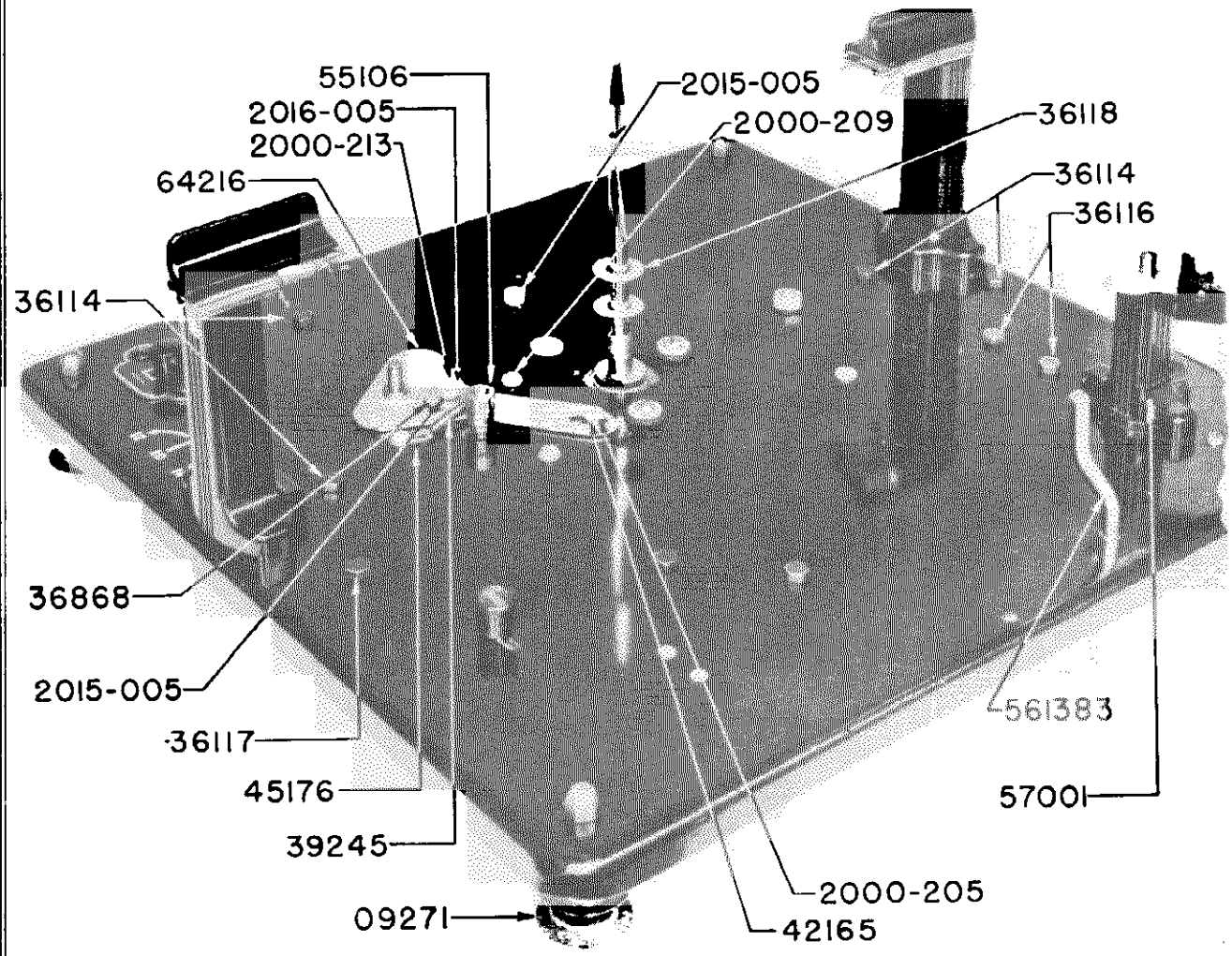


FIGURE 2
TOP VIEW WITH TURNTABLE REMOVED

09271	Record changer m't'g spring assembly
36114	#10—32 x 21/32" H.H. bolt
36116	#10– 32 x ¼" H.H. bolt
36117	#10—32 x 1" H.H. bolt
36118	Spacer Washer
39245	Spring for idler pulley bracket
45176	Spring clip
55106	Motor pulley (60 cycle)
561383	Tone arm rest
57001	Tone arm support housing
64216	Mounting bracket for idler pulley
	2000-209 #8—32 x ⅜" R.H.M.S.
	36868 Brass washer
	42165 Spacer
2000-205	#8—32 x ¼" R.H.M.S.
2000-213	#8—32 x ½" R.H.M.S.
2015-005	#8—32 x 11/32" Hex nut
2016-005	#8—32 x ¼" Hex nut

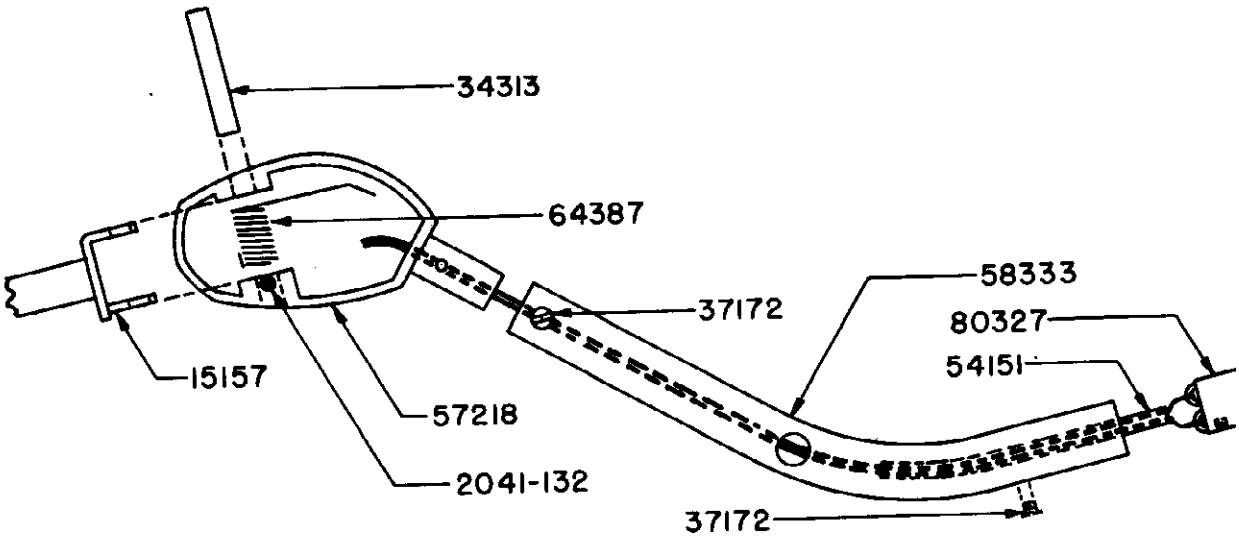


FIGURE 3—TONE ARM ASSEMBLY

15157	Tone arm support tube and bracket assembly
34313	Hinge pin
37172	#4—36 x ⅛" Spec. flat head M.S. (Chrome)
54151	Insulating sleeve
57218	Tone arm end
58333	Tone arm tube (Chrome)
64387	Counterbalance spring
80327	2 Pin socket
2041-132	Set screw for hinge pin

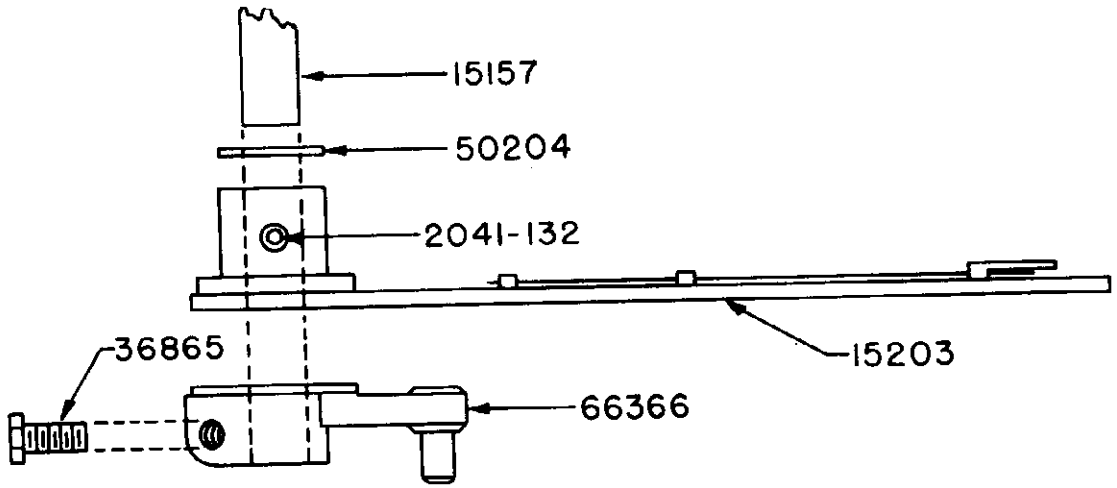


FIGURE 4—TRIP LEVER ASSEMBLY

15157	Tone arm support bracket and tube assembly
15203	Trip lever, collar and spring assembly
36865	#10—24" x ½" H.H.M.S.
50204	Cork washer, ¾" O.D.
66366	Tone arm crank assembly
2041-132	#6—32 x 3/16" set screw

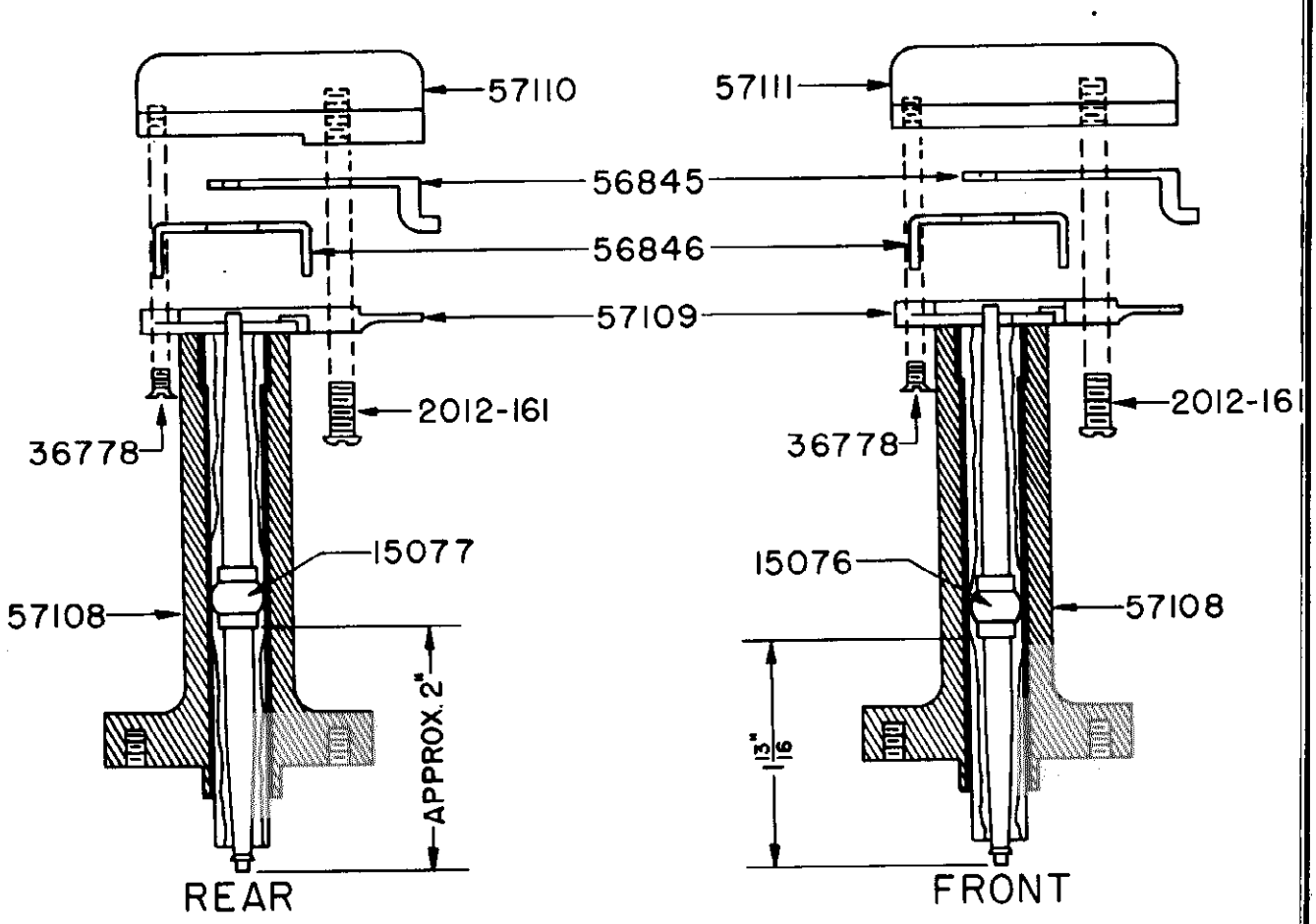


FIGURE 5

RECORD SUPPORT POST AND COVER ASSEMBLY

15076	Front plunger shaft assembly
15077	Rear plunger shaft assembly
36778	#4—36 x 3/8" F.H.M.S.
56845	Plunger 10"
56846	Plunger 12"
57108	Record support post
57109	Record support shelf & tube assembly
57110	Shelf cover (rear)
57111	Shelf cover (front)
2012-161	#6—32 x 7/16" Bdg. H.M.S.

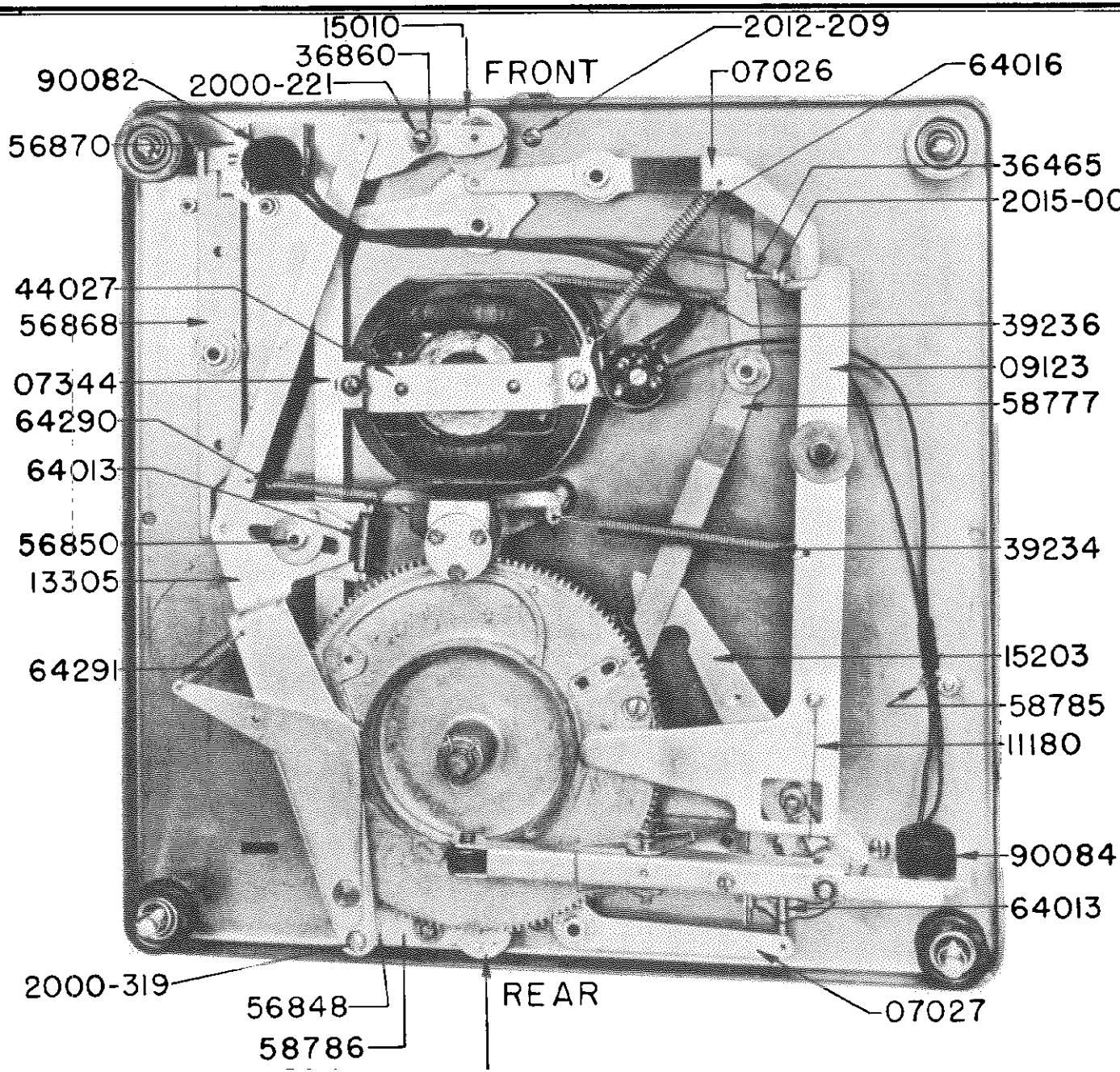

15010
36860
90082
2000-221
FRONT
2012-209
07026
64016
56870
36465
2015-004
44027
56868
39236
07344
09123
64290
58777
64013
56850
39234
13305
64291
15203
58785
11180
90084
64013
2000-319
56848
58786
REAR
07027

FIGURE 6

FIGURE 6 — PARTS LIST

07026 Front locking lever assembly
- 36117 #10—32 x 1" Spec. H.H. bolt
- 36845 #10 flat washer ¾" O.D.
- 56112 Mounting spacer
- 2015-007 #10—32 Std. Hex nut
- 2019-006 #10 S.P. Int. lockwasher

07027 Rear locking lever assembly
- 36114 #10—32 x 21/32" Spec. H.H. bolt
- 36878 #10 flat washer ⅝" O.D.
- 56122 Mounting Spacer
- 2015-007 #10—32 Std. hex nut
- 2019-006 #10 S.P. Int. lockwasher

07344 Connecting link assembly
- 36114 #10-32 x 21/32" Spec. H.H. bolt
- 36873 Spring wave washer
- 36874 Flat washer ¾" O.D. x 17/64" I.D. x .050"
- 36878 #10 flat washer, ⅝" O.D.
- 56263 Gear sector spacer
- 2015-007 #10—32 Std. hex nut
- 2019-006 #10 S.P. Int. lockwasher

09123 Tone arm return lever assembly and feed-in spring assembly
- 36112 #10 Flat washer 1" O.D.
- 36115 #10—32 x 1½" Spec. H.H. bolt
- 56103 Mounting spacer
- 2015-007 #10—32 Std. hex nut
- 2019-006 #10 S.P. Int. lockwasher

11180 Feed-in spring assembly
- 2000-155 #6—32 x ¼" R.H.M.S.
- 2017-003 #6 Std. flat washer
- 2019-004 #6 S.P. Int. lockwasher

13305 Centering lever and rocker assembly
- 36860 #8 Flat washer
- 56848 Spacer
- 2000-221 #8—32 x 1" R.H.M.S.
- 2019-005 #8 Int. lockwasher

15010 Front gear and cam assembly

15011 Rear gear and cam assembly

15203 Trip lever, collar and spring assembly

36465 #6—32 x ⅝" Spec. R.H.M.S.

39234 Spring for tone arm return lever

39236 Spring, reject lever

44027 Motor

56848 Spacer

56850 Centering lever guide stud
- 56849 Washer for guide stud
- 2015-005 #8—32 Hex nut 11/16 A.F.
- 2019-005 #8 S.P. Int. lockwasher

56868 Switch shifting lever (on-off switch)
- 36114 #10—32 x 21/32" Spec. H.H. bolt
- 36867 #10 Flat washer ⅝" O.D.
- 36873 Spring wave washer
- 36874 Flat washer ¾" O.D. x 17/64 I.D. x .050"
- 56263 Mounting spacer
- 2015-007 #10—32 Std. hex nut
- 2019-006 #10 S.P. Int. lockwasher

56870 Switch mounting bracket
- 37173 #6—32 x ⅜" Phil. oven H.M.S.
- 2016-004 #6—32 Std. hex nut ¼ A.F.
- 2019-004 #6 S.P. Int. lockwasher

58785 Trip finger stop

58777 Reject lever
- 36136 #10 Flat washer ¾" O.D.
- 36231 #10—32 x ½" Spec. H.H. bolt
- 56865 Spacer
- 2015-007 #10—32 Std. hex nut

58786 Plunger rocker

64013 Spring

64016 Spring, front locking lever

64290 Spring

64291 Spring

90082 Automatic on-off switch
- 60205 Switch cover
- 2000-153 #6—32 x 3/16" R.H.M.S.
- 2019-004 #6 S.P. Int. lockwasher

90084 Cycling switch
- 36624 #6—32 x ½" Phil. Bdg. H.M.S.
- 56881 Mounting spacers
- 561144 Switch cover

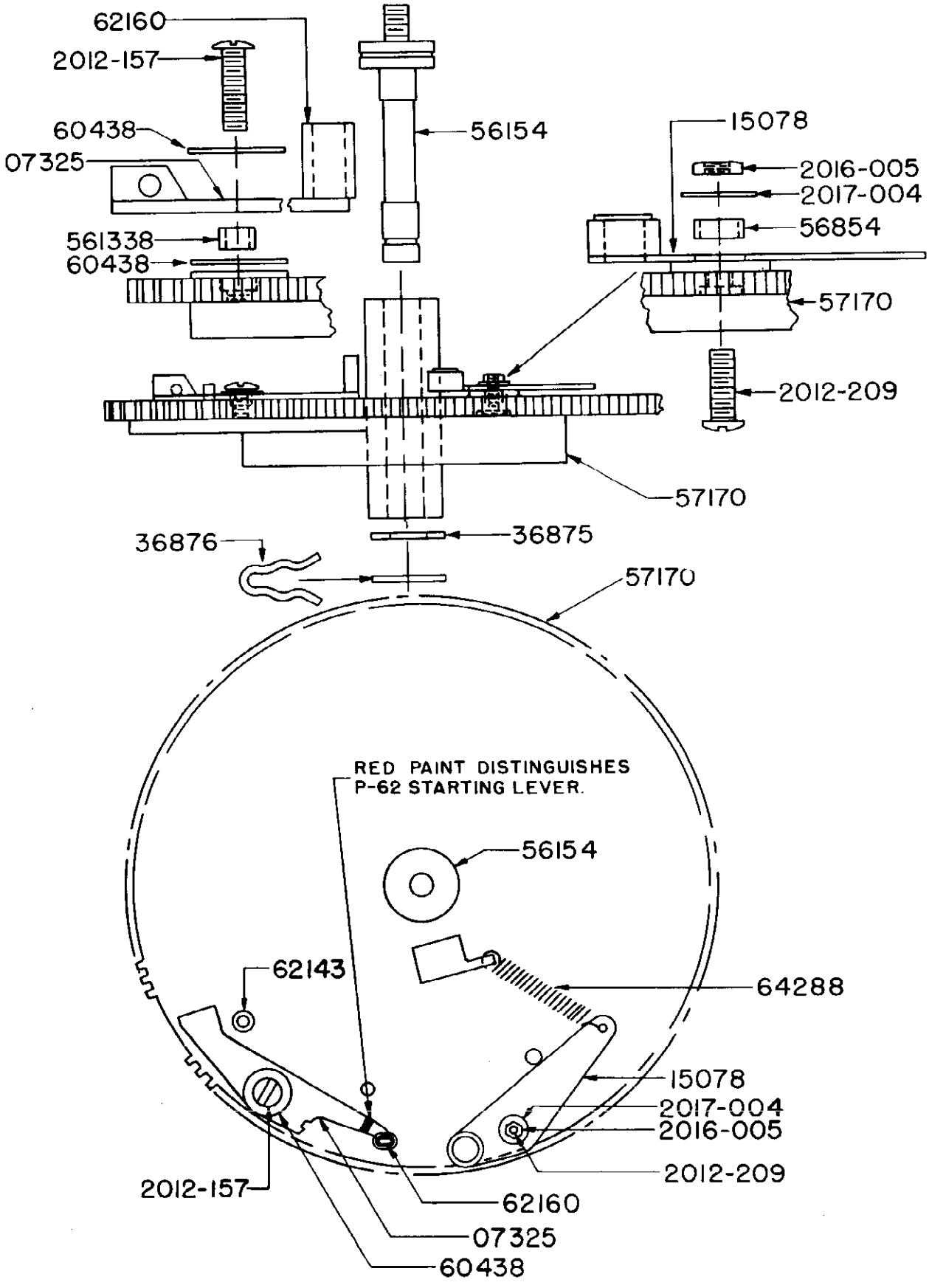
2000-221 #8—32 x 1" R.H.M.S.

2000-319 #10—32 x ⅞" R.H.M.S.

2012-209 #8—32 x ⅜" Bdg. H.M.S.

2015-004 #6—32 Hex nut 5/16" A.F.

FARNSWORTH TELEV. & RADIO CORP. MODEL P-



RE 7 — MAIN CAM ASSEMBLY

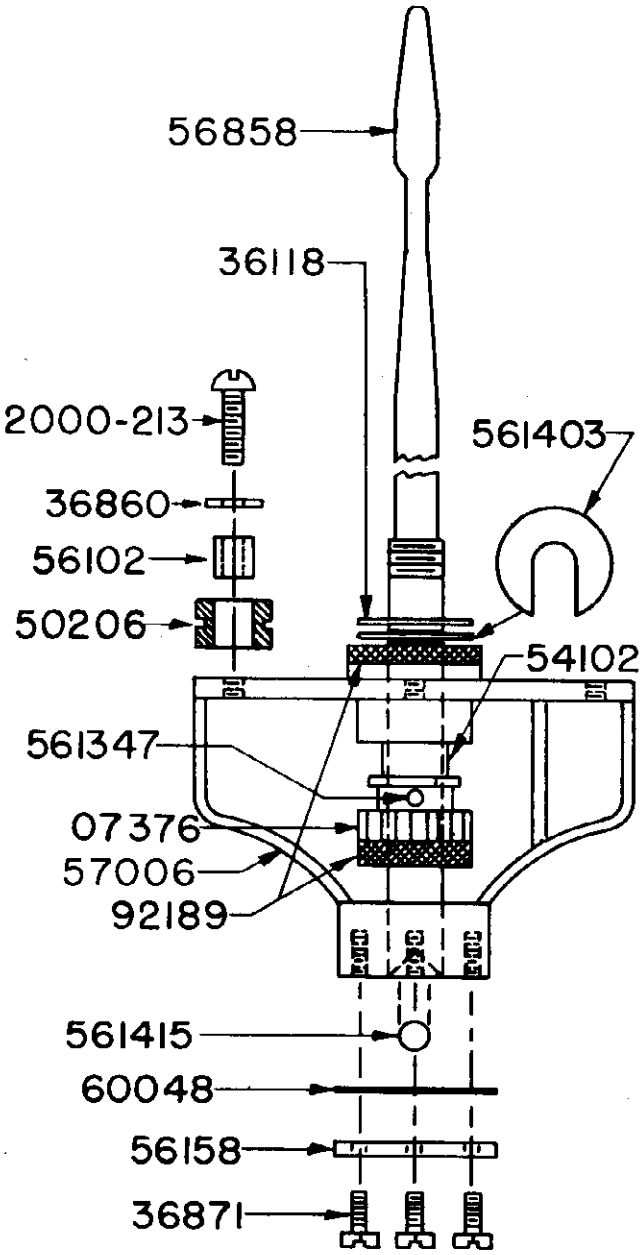


FIGURE 8

SPINDLE AND BRACKET ASSEMBLY

FIGURE 8

SPINDLE AND BRACKET ASSEMBLY

PARTS LIST

07376	Gear and starting pawl assembly
36118	Flat spacer washer
36860	Flat washer
36871	#6—32 x ¼" H.H.M.S.
50206	Rubber grommet
54102	Fibre spacer
56102	Spacer
56158	Thrust plate, spindle bracket
56858	Spindle
561347	Pin
561403	"C" washer, turntable stop
561415	3/16" diameter ball
57006	Support bracket for spindle
60048	Gasket, spindle bracket
92189	Felt washer
2000-213	#8—32 x ½" R.H.M.S.

MAIN CAM ASSEMBLY PARTS LIST — FIGURE 7

.07325	Starting lever assembly
15078	Trip roller assembly, main cam
36875	Flat washer, main cam stud
36876	Hair pin cotter, main cam stud
56154	Mounting stud, main cam
56854	Spacer, trip roller mounting
561338	Spacer, starting lever mounting
57170	Main cam, casting, only
60438	Paper washer for starting lever
62143	Rubber sleeve
62160	Sleeve for starting lever
64288	Spring for trip roller bracket
2012-157	#6—32 x 5/16" Bdg. H.M.S.
2012-209	#8—32 x ⅜" Bdg. H.M.S.
2016-005	#8—32 x ¼" Hex nut
2017-004	Washer, main cam

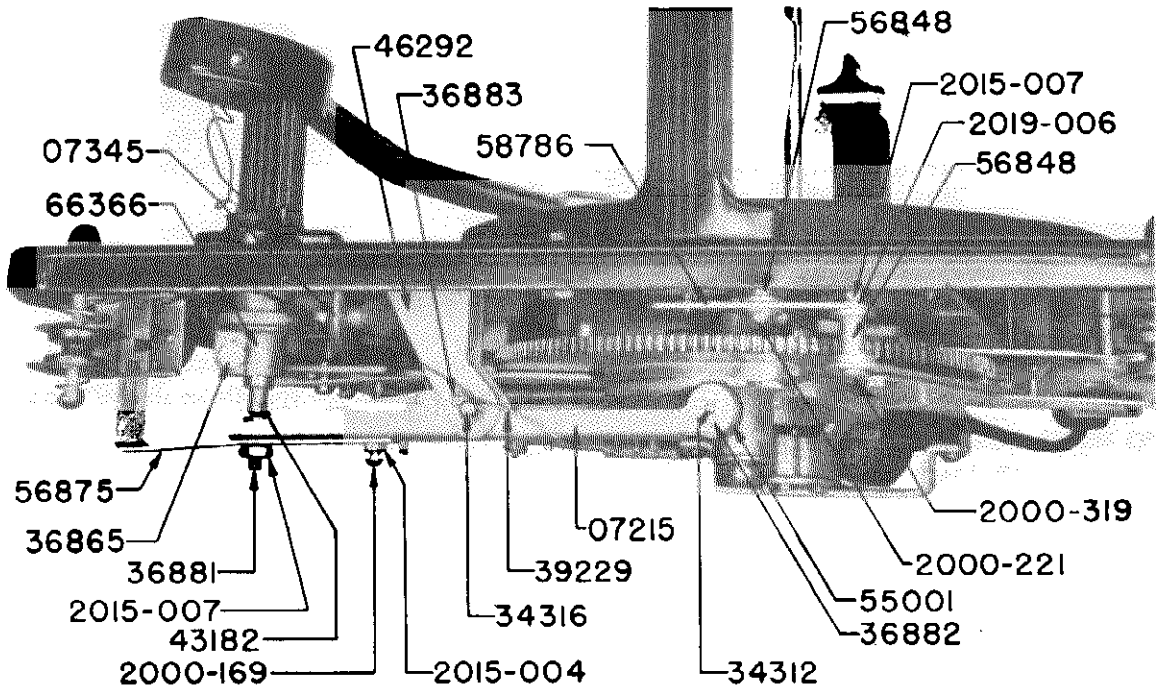


FIGURE 9 — TONE ARM LIFT LEVER ASSEMBLY

07215 Tone arm lift lever and brake spring assembly
07345 Pickup socket and bracket assembly
2012-207 #8—32 x 5/16" Bdg. H.M.S.
56251 Wire clip
34312 Pin for tone arm lift lever roller
34316 Pin for tone arm lift lever pivot
36865 #10—24 x ½" HHMS for tone arm crank
36881 #10—32 x ½" HHMS
36882 Hairpin cotter for lift lever roller
36883 Hairpin cotter for tone arm lift lever pivot pin
39229 Spring for tone arm lift lever
43182 Tone arm lift rod
46292 Mounting bracket for tone arm lift leve
55001 Tone arm lift lever roller
56848 Rocker lever spacer
56875 Operating finger for cycling switch
58786 Plunger rocker
66366 Tone arm crank
2000-169 #6—32 x ⅞" RHMS
2000-221 #8—32 x 1" RHMS
2000-319 #10—32 x ⅞" RHMS
2015-004 #6—32 hex nut
2015-007 #10—32 Std. hex nut
2019-006 #10 Sp. Int. lockwasher

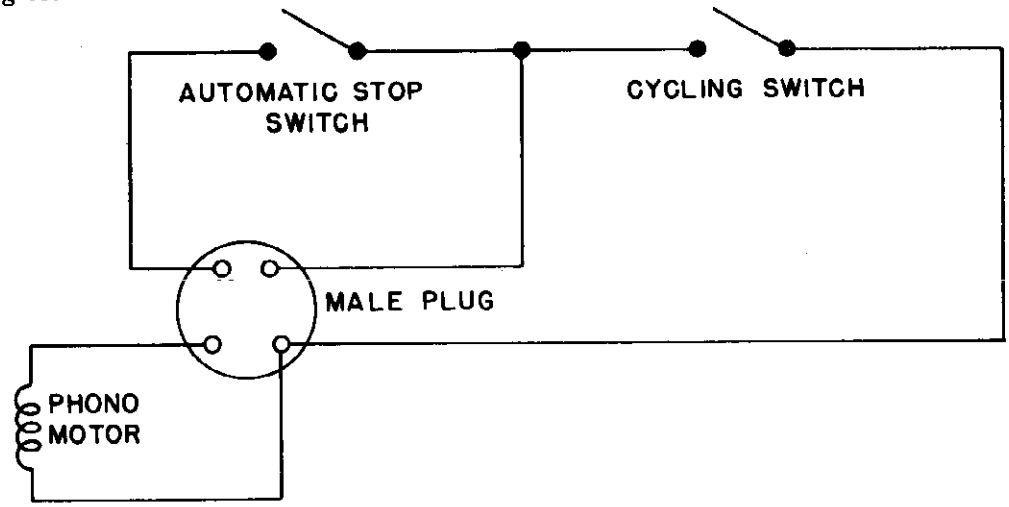


FIGURE 10 — CIRCUIT DIAGRAM

MODEL P-62 FARNSWORTH TELEV. & RADIO CORP.

SERVICE SUGGESTIONS

1. TO REMOVE TURNTABLE 13442

The Spindle Gear may be wedged, by a screwdriver between it and the Main Cam, to prevent its turning while the Turntable is unscrewed from the Spindle. When removing the Turntable make certain none of the Spacer Washers are lost. These Washers often adhere to the Turntable because of an oil film from the Felt Washer. When replacing Turntable make sure it is properly tightened. NEVER USE GAS PLIERS TO HOLD SPINDLE.

2. TO REPLACE OR ADJUST IDLER PULLEY 13441

First remove Turntable. The Idler Pulley is used to transfer power from the Motor Pulley 55106 to the Turntable. If the Idler Spring tension is incorrect the Turntable speed may be too high or too low, it should fall between 76.59 R.P.M. and 80.00 R.P.M. This tension is adjusted by loosening the Motor Mounting Screw holding the Spring Holder 45176 and turning the Spring Holder until the required tension is secured.

If it is necessary to replace the Idler Pulley remove the Hair Pin Cotter 36869 and the Thrust Washer 50209. After removing the Idler Pulley also remove the Thrust Washer used underneath the pulley. If the Idler Pulley is replaced both Thrust Washers should be also.

When replacing the Pulley a single drop of oil should be used on the Pulley Stud.

CAUTION—Do not allow oil to get on either the Idler Pulley or the Turntable Rim.

3. ALIGNMENT OF RECORD SUPPORT SHELVES

The center line of the record shelves should form a straight line, in 10″ position, which passes through the center of the spindle. The shelves should be exactly 9 and 41/64 inches apart, plus or minus .005″, and should be equidistant from the spindle. In the event it becomes necessary to change the spacing of the record shelves it is recommended that shims be used to adjust them. In some cases if oversized or undersized records are used it may be necessary to change the spacing of the shelves.

4. ALIGNMENT OF RECORD SPINDLE

To prevent feedback the Spindle, Gear and Bracket Assembly is rubber mounted and can shift in transit. To reposition the spindle loosen all three mounting screws, position the spindle and tighten all three mounting screws equally; so as not to force the spindle out of place which may happen if one screw is tightened first.

5. SHELF LOCKING LEVER ADJUSTMENTS

The Front Record Shelf 57111 should be lined up with the record spindle in the 10″ position. The Shelf Locking Cam 15010 is lined up with the center line of the Gear Sector Assembly and adjusted until the Locking Lever is properly seated in the Shelf Locking Cam. The Record Shelf should not be permitted to slip when adjusting these parts.

When aligning the Rear Shelf Locking Cam the Locking Lever Hex Head Mounting Screw may be loosened to permit the necessary adjustment to properly align the Shelf Locking Cam and Shelf Locking Lever.

6. RECORD DROP

If a record fails to drop due to the record plunger not coming out far enough, remove the plunger shaft assembly (No. 15076 or 15077) and check to see if it is bent. If neither of these are bent and both front and rear plungers do not have sufficient travel loosen screw 2012-209 (Fig. 7 Page 12) and move screw out toward rim of main cam. Make sure that the plunger shafts are not reversed as they are not interchangeable. If the front plunger, only, lacks sufficient travel loosen screw 2000-221 (Fig. 9 Page 14) to a sliding tension and lightly bump stud 56848 out slightly toward edge of changer baseplate. Retighten screw to maintain adjustment. If the rear plunger, only, lacks sufficient travel loosen the corresponding mounting screw on the rear of the changer and bump the stud lightly toward the edge of the changer baseplate. Retighten screw to maintain adjustment.

7. NEEDLE LANDING AND TRIP SETTING.

Needle landing must be set correctly for 10″ record before any attempt is made to set the trip lever. Loosen the Allen set screw in the trip lever collar and loosen the set screw in the tone arm crank. Insert a .008″ spacer between the tone arm

SERVICE SUGGESTIONS---Continued

support bracket and the top of the tone arm support post. Set the automatic on-off switch in manual position, set the record support shelves in 10" position and run the changer by hand through cycle until playing position is reached. Press down on the tone arm support tube and up on the tone arm crank. Set the needle in approximately 3/32" from the outside of a 10" record. Press the tone arm crank pin firmly against the outer edge of the cut-out in the tone arm return lever. This will depress the feed-in spring slightly. Tighten the tone arm crank set screw. Move the tone arm in until the needle is 1⅞" from the center of the spindle. Set the trip lever so that it is touching the end of the starting lever and starting to move the lever in to engage the pawl on the spindle. Tighten the Allen set screw in the trip lever collar.

8. TONE ARM HEIGHT ADJUSTMENT (See Fig. 9)

With records on the shelves, the top of the pickup arm at the highest point in its return should be 3/16" below the bottom of the lowest record on the shelves. When so adjusted the needle will not slide across the top of a stack of twelve ten inch records during the change cycle. To set this correctly, remove the power plug from the changer at that part of the cycle where the tone arm has reached maximum lift and just before it starts to swing out. In this position loosen locknut No. 2015-007 and adjust machine screw No. 36881 for correct tone arm height. Tighten locknut securely after correct adjustment is made.

9. STARTING LEVER.

If there is a tendency for the spindle to "jump" when the cycle starts due to the main cam and spindle gear not meshing properly, it is probably due to the end of the starting lever being bent.

10. MOTOR SPEED

Due to commercial tolerance it is impossib to secure motors which will run at exactly 78.2 R.P.M. Our limits are from 76.59 R.P.M. to 80.(R.P.M.

In the event it becomes necessary to get exa speed on one of these changers choose a mot pulley that gives a slightly higher speed than r quired. Using a fine file reduce the diameter the motor pulley a little at a time until the require speed is secured.

11. THE FOLLOWING SIMPLE OILING II STRUCTIONS WILL RESULT IN *MINIMUM OF SERVICE CALLS—*

Every six months or once each year, two three drops of oil should be put on the two fe washers in the Spindle Gear Bracket. One wash is located at the bottom of the Spindle Gear, tl other is at the top of the bracket and is accessib by removing the Turntable. Two or three dro of oil on the felts in the Motor. One drop of on the Pin for the roller of the Tone Arm Li Lever. A very light application of White Vaseli on the teeth of the Main Cam, also some on tl face of this Cam where the Tone Arm Swing Lev rides. A single drop of oil on the 10" and 1 plungers. Care should be exercised to prevent excess of oil being used on any part.

No further lubrication on the tone arm bearir will be necessary unless a replacement is mad In this case a thin film of vaseline may be used.

Care should be taken to see that no oil gets the motor pulley, idler pulley or rim of the tur table.

Use only a good grade of machine oil with viscosity of SAE 10.

MODEL P-62 FARNSWORTH TELEV. & RADIO CORP.

PARTS LIST FOR P-62 RECORD CHANGER

Part No.	DESCRIPTION
56154	Mounting Stud for Main Cam
56158	Thrust Plate
56251	Wire Clip
56263	Mounting Spacer
56845	Plunger 10"
56846	Plunger 12"
56848	Rocker Lever Spacer
56849	Centering Lever Washer
56850	Centering Lever Guide Stud
56854	Spacer,Trip Roller Mtg.
56858	Turntable Spindle
56865	Spacer, Reject Lever Mtg.
56868	Switch Shifting Lever for Automatic On-off Switch
56870	Switch Mtg. Bracket for Automatic On-off Switch
56875	Operating Finger for Cycling Switch
56881	Spacer, Cycling Switch Mtg.
561144	Cover for Cycling Switch
561338	Spacer for Starting Lever Mtg.
561347	Pin for Spindle Gear
561383	Tone Arm Rest
561403	"C" Washer, Turntable Stop
5614153	16 Dia. Ball
57001	Tone Arm Support Housing
57006	Spindle Support Brkt.
57108	Record Support Post
57109	Record Support Shelf & Tube Assy.
57110	Plastic Cover for Rear Record Shelf
57111	Plastic Cover for Front Record Shelf
57170	Main Cam, Casting Only
57218	Tone Arm End Housing
58333	Tone Arm Tube Only (Chrome)
58777	Reject Lever
58785	Trip Finger Stop
58786	Plunger Rocker
59048	Reject Knob
59198	Auto. On-off Switch Knob
60048	Gasket for Spindle Brkt.
60205	Switch Cover for Automatic On-off Switch
60438	Paper Washer, Starting Lever Mtg.
62013	Rubber Bushing for Tone Arm Support Post
62143	Starting Lever Stop Bumper
62147	Starting Lever Sleeve
62160	Bumper for Starting Lever
64013	Spring
64016	Spring, Front Locking Lever
64216	Idler Bracket & Stud Assy.
64288	Spring, Trip Roller
64290	Spring
64291	Spring
64387	Spring, Tone Arm Counterbalance
66366	Tone Arm Crank Assy.
80327	2 pr. Molded Socket, in Tone Arm Tube
90082	Automatic On-Off Switch
90084	Switch, Cycling
92189	Felt Washer
2000-153	#6—32 x 3/16 R H M S
2000-155	#6—32 x ¼ R H M S
2000-169	#6—32 x ⅜ R H M S
2000-205	#8—32 x ¼ R H M S
2000-209	#8—32 x ⅜ R H M S
2000-213	#8—32 x ½ R H M S
2000-221	#8—32 x 1 R H M S
2000-319	#10—32 x ⅜ R H M S
2012-155	#6—32 x ¼ Bdg. H M S
2012-157	#6—32 x 5/16 Bdg. H M S
2012-161	#6—32 x 7/16" Bdg. H M S
2012-207	#8—32 x 5/16" Bdg. H M S
2012-209	#8—32 x ⅜ Bdg. H M S
2015-004	#6—32 Hex Nut 5/16 AF
2015-005	#8—32 Hex Nut 11/32 AF
2015-007	#10—32 Std. Hex Nut
2016-004	#6—32 Std. Hex Nut ¼ AF
2016-005	#8—32 Hex Nut ¼ AF
2017-003	#6 Std. Flat Washer
2017-004	Washer
2019-004	#6 SP Int. Lockwasher
2019-005	#8 SP Int. Lockwasher
2019-006	#10 SP Int. Lockwasher
2041-132	#6—32 x 3/16 Allen Cup Point Set Screw

PARTS LIST FOR P-62 RECORD CHANGER

Part No	DESCRIPTION
07026	Front Locking Lever Assy.
07027	Rear Locking Lever Assy.
07215	Lever & Brake Spring Assy.
07325	Starting Lever Assy.
07344	Connecting Link Assy.
07345	P. U. Socket & Bracket Assy.
07376	Spindle Gear
09123	Tone Arm Return Lever & Feed-In Spring Assy.
09271	Record Changer Mtg. Spring Assy. (4 required)
11180	Feed-In Spring Assy., Tone Arm Return Lever
11278	Pickup Head Assy.
13305	Centering Lever & Rocker Assy.
13441	Idler Pulley
13442	Turntable
15010	Front Gear & Cam Assy.
15011	Rear Gear & Cam Assy.
15076	Front Plunger Shaft Assy.
15077	Rear Plunger Shaft Assy.
15078	Trip Roller Assy., Main Cam
15157	Tone Arm Support Brkt. & Tube Assy.
15203	Trip Lever, Collar & Spring Assy.
31142	Stop Switch Escutcheon
34312	Pin for Tone Arm Lift Lever Roller
34313	Hinge Pin
34316	Pin for Tone Arm Lift Lever Brkt
36112	#10 Flat Washer
36114	#10—32 x 21/32 H H Bolt
36115	#10—32 x 1½ Spec. H H Bolt, Tone Arm Return Lever Mtg
36116	#10—32 x ¼ Spec. H H Bolt, Tone Arm Lift Lever Mtg.
36117	#10—32 x 1" Spec. H H Bolt
36118	Turntable Washer
36129	¼—28 Std. Hex Nut
36136	#10 Flat Washer
36231	#10—32 x ½ Spec. H H Bolt, Reject Lever Mtg.
36465	#6—32 x ⅝ Spec. R H M S
36624	#6—32 x ½ Phil Bdg. H M S
36690	#10 Flat Washer, ½" O. D. x .042"
36778	#4—36 x ⅜ F H M S, Record shelf cover mtg.
36845	#10 Flat Washer
36860	#8 Flat Washer
36865	#10—24 x ½ H H M S
36867	#10 Flat Washer
36868	Brass Washer
36869	H P Cotter
36871	#6—32 x ¼ H H M S
36873	Spring Wave Washer
36874	Flat Washer
36875	Washer, Main Cam Mtg. Stud
36876	H P Cotter, Main Cam Mtg. Stud
36878	#10 Flat Washer
36881	#10—32 x ½ H H M S
36882	H P Cotter for Lift Lever Roller Pin
36883	H P Cotter for Tone Arm Lift Lever Brkt
37066	Acorn Palnut, Record Changer Mtg.
37067	Flat Washer, Record Changer Mtg.
37172	#4—36 x ⅛ Spec. Flat H M S, Chrome
37173	#6—32 x ⅜ Phil Oven H M S, On-off switch escutcheon mtg
39229	Spring, Tone Arm Lift Lever
39234	Spring, Tone Arm Return Lever
39236	Spring, Reject Lever
39245	Spring for Idler Pulley
42165	Spacer
43182	Tone Arm Lift Rod
44027	Motor
45176	Tension Spring Holder
46292	Mounting Bracket for Tone Arm Lift Lever
50204	Cork Washer (small) ¾" O. D.
50206	Rubber Mtg. Grommet
50209	Thrust Washer for Idler Pulley
54102	Fibre Spacer for Turntable Spindle
54151	Pick-Up Wire Insulating Sleeve
55001	Roller for Tone Arm Lift Lever
55051	Motor Pulley (50 Cycle)
55106	Motor Pulley (60 cycle)
56102	Spacer, Spindle Mtg. Brkt.
56103	Spacer, Tone Arm Return Lever Mtg.
56112	Spacer, Front Locking Lever
56122	Spacer, Rear Locking Lever

RECORD STANDARDS

Major record manufacturers have adopted standards intended to govern the physical characteristics of records produced. Such standards are of course necessary in order that records may properly operate automatic changers.

Below is outlined certain manufacturing standards.

Some records, however, are yet being issued which do not conform to established standards. Some years ago, the knife-edge was unknown—yet today, many cases of faulty operation are traceable to various forms of knife-edge records.

The old masters are yet being used for pressings, resulting in lack of feeding or trip grooves.

Other factors to be considered when tracing malfunction of the record changer are thickness of the record, warpage and chipped edges.

DIMENSIONAL STANDARDS 10" & 12" RECORDS

RECORD SIZES (A)	WEIGHT	OUTSIDE DIA. (B)	THICKNESS (C)	CENTER HOLE (D)	ECCENTRICITY OF HOLE (E)	OUTER EDGE (F)	LEAD SPIRAL (G)	DIA. FIRST GROOVE AT RECORDING PITCH (H)	MIN. INSIDE DIA. RECORDING (I)	ECCENTRIC GROOVE D. (J)	ECCENTRICITY OF ECCENTRIC GROOVE (K)	GUARD CIRCLE (L)
12"	11½ to 12 oz.	11 7/8 ± 1/16	.090 +.010 −.020	.286 +.001 −.001	.005 MAX.	"V" CONTOUR	FROM OUT EDGE	11 1/2 +.020 −.020	4	5 3/8	1/8	3 5/8
10"	7 to 7½ oz.	9 7/8 ± 1/16	.075 +.020 −.005	"	"	"	"	9 1/2 +.020 −.020	4	3 3/8	1/8	3 1/16

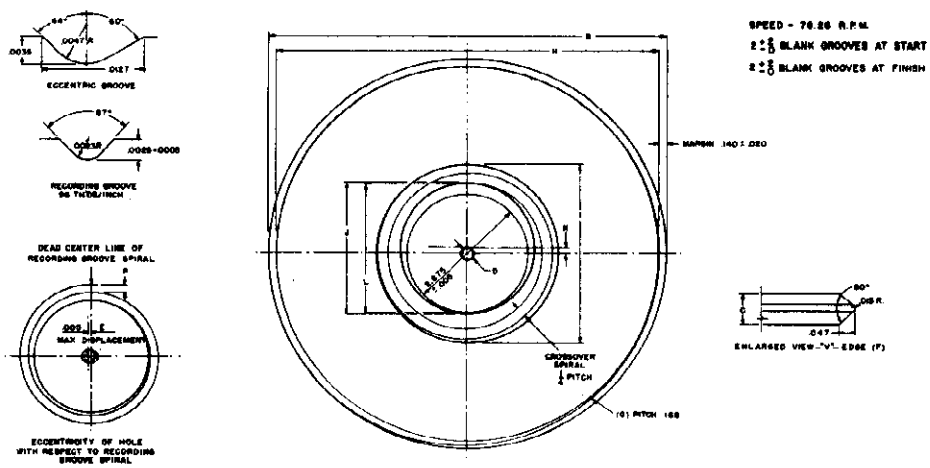


Figure 1

INSTRUCTIONS FOR INSTALLING IMPROVED LOWER RECORD SUPPORT ASSEMBLY WITH DOUBLE SEPARATOR KNIFE

1. Remove the pin from below the base plate on the separator hook assembly. (Part No. 09218.)
2. Screw on adjusting nut. (Part No. 37347.)
3. Replace the pin in the separator hook assembly.
4. Adjust the separator hook post (Part No. 561178), so that the lever arm will have a 1/32" clearance over the cam. (Part No. 57135.)
5. Secure separator hook post with locking nut.
6. Remove the four screws from the lower record support assembly. (Part No. 09189.)
7. Remove the reversing arm lock, lock screw, lock spring, and lock spring anchor stud and install them in the new lower record support assembly.
8. Remove the record reverse guide arm assembly (Part No. 67340) and install it on the new lower record support assembly.
9. Install the new lower record support assembly in the machine and adjust the record ejector arm to clear the bottom of a 10" record by 1/32".
10. Adjust the separator hook assembly to fit the slot in the record ejector arm.
11. Replace the upper record support with the new support (Part No. 57256). Use the same screws in doing this. No adjustment is required with this change.
12. Refer to: Reshaping the Interceptor Reset Lever, Page 15.

MODEL 41-E, CAPEHART

FARNSWORTH TELEV. & RADIO CORP.

Herein is presented a complete listing of the various checks which may be applied to the 41E changer in determining the cause of malfunction. It is recommended that the serviceman follow the listing in detail prior to customer delivery. Having followed the procedure several times and having so gained familiarity with the various checks, he may then employ this section simply as a guide.

Reference is made to section X whose indexing follows that of this section.

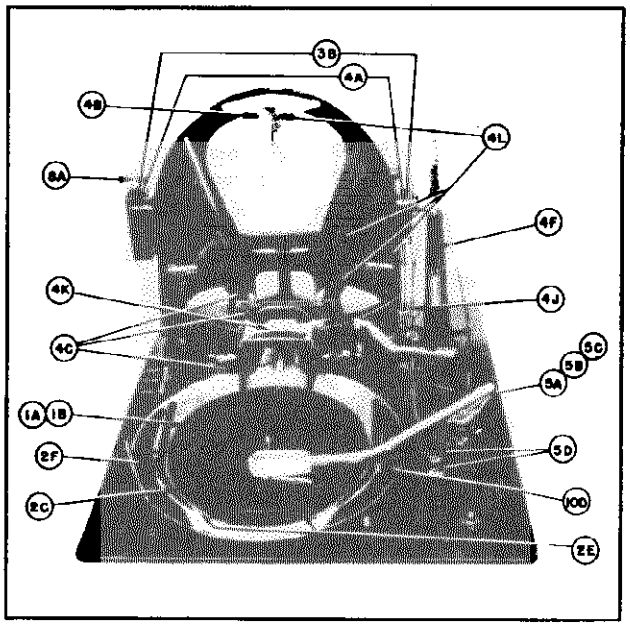


Figure 2A

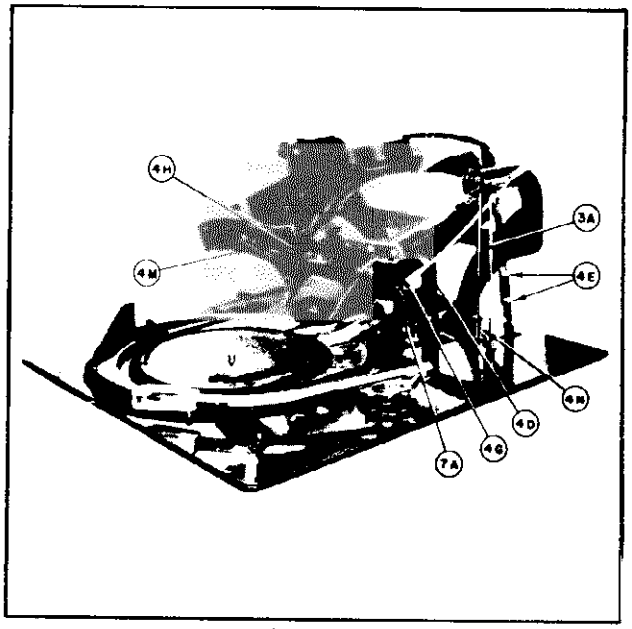


Figure 2B

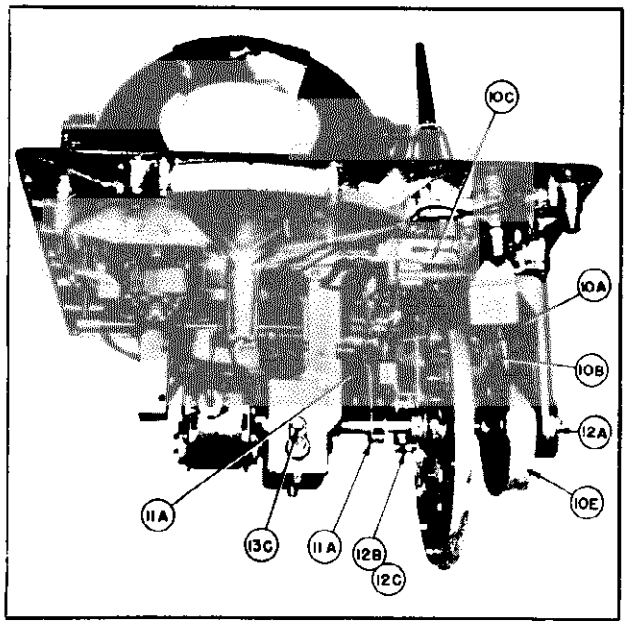


Figure 2C

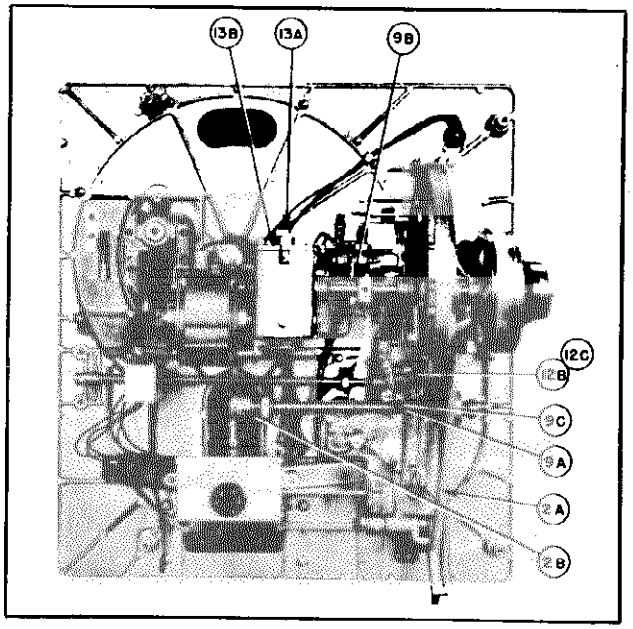


Figure 2D

TURNTABLE

1. A. Check height of turntable.
   B. Check to see that the turntable cover is of the later type with the felt extending 3/8" beyond the plastic. Also check to see that 1/8" felts have been installed on the baseplate under the bosses of the record tray.

RECORD TRAY CHECKS

2. A. Check the position of #561264 record tray slide arm spring.
   B. Check for binding between record tray gears.
   C. Check centering of record tray with turntable.
   D. Check the second pause position of the record tray.
   E. Check 10" rubber bumpers #62101.
   F. Check 10" record guard for smooth operation and roughness.

3. A. Check the distance from the center of #561297 magazine pivot pin, which is mounted in the buckhorn section of the #57138 magazine support, to the milled section of the baseplate, on which is mounted #561178 record separator hook post.
   B. Check distance between buckhorn pivot arms.

MAGAZINE CHECKS

4. A. Check distance between magazine pivot arms.
   B. Check position of the upper record support Part No. 57162 on changers incorporating the single-action separator knife, and part No. 09349 on those using the double separator knife.
   C. Check centering of record magazine in relation to #05084 record bumper guide and felt assembly and record tray.
   D. Check adjustment of #2000-269 magazine stop adjustment screw.
   E. Check adjustment of magazine linkage.
   F. Check #07340 record reverse guide assembly,
      a. centering in magazine
      b. parallel to 12" record
      c. trueness and width of fork section.
   G. Check the adjustment of #15115 record separator stop adjustment.
   H. Check the action of #15124 record separator and hub assembly.
   J. Check the relation between the end of #15124 record separator and hub assembly and #55016 record separator hook.
   K. Check the #561177 record support bracket.
   L. Check lubrication and surfaces.
   M. Check lower record support felts for loose ends and proper shape.
   N. Check record separator hook post #561178.

TONE ARM

5. A. Check tone arm height.
   B. Check the distance of travel of the tone arm in toward the turntable spindle on a 12" record.
   C. Check pickup.
   D. Check 10" and 12" adjustments.

TRIP SLIDE ASSEMBLY

6. A. Check trip slide and arm assembly.
      a. height above baseplate at rubber roller end,
      b. slide action
      c. working freely in pressed sleeve bearing in baseplate
      d. tension setting of #561213 friction trip lever screw
      e. setting of stop.

RECORD BUMPER GUIDE

7. A. Check #05084 record bumper guide and felt assembly.
      a. position
      b. curvature of ends.

8. A. Check play control.

BELOW CHASSIS—Reverse Arm Mechanism

9. A. Check position of #561238 reverse segment adjustment cam.
   B. Check adjustment of reverse arm linkage.
   C. Check adjustment of #09197 reverse arm unlocking lever assembly.

TONE ARM MECHANISM

10. A. Check horizontal and vertical position of #09198 tone arm crank assembly, also relation to #07313 tone arm swing lever assembly.
   B. Check position of #561375 tone arm brake spring collar.
   C. Check action of #13408 tone arm stop bracket assembly.
   D. Check for roughness, at the point of interception with a 12" record, of #13408 tone arm stop bracket assembly.
   E. Check position of #57142 tone arm cam.
      a. horizontally on main cam shaft.
      b. clockwise and anti-clockwise on main cam shaft for timing with main cam.
   F. Check tone arm trip pin.

MERCURY SWITCH OPERATION

11. A. Check the position of #561221 main cam shaft mercury switch reset lever,
      a. timing with main cam
      b. point of interception with #561222 mercury switch dog. Check the clearance between #09176 trip slide assembly and #561222 mercury switch dog.

MAIN CAM SHAFT ASSEMBLY

12. A. Check for horizontal play in the main cam shaft with the record magazine tilted up.
   B. With the selector lever in the one side position and while the changer is going through change cycle, check clearance between #561204 magazine slide arm selector pin and the #57154 gravity operated main cam switch rest pin (rest pin is part of the #57135 main cam casting) with the play taken up in the #07341 magazine slide arm rivet assembly toward the main cam. With the selector lever in the one side position and while the changer is going through change cycle, check for definite interception of #561204 magazine slide arm selector pin and #57155 spring loaded main cam switch with the play taken up in the #07341 magazine slide arm rivet assembly away from the main cam.
   C. Check cam switches #57154 and #57155.
   D. Check lubrication on the cam tracks.
   F. Check for screw in cam. (See page 15.)

GEAR REDUCTION BOX

13. A. Check adjustment of #561246 gear box end thrust screw.
   B. Check cover alignment.
   C. See that bottle of oil s placed in the gearbox.

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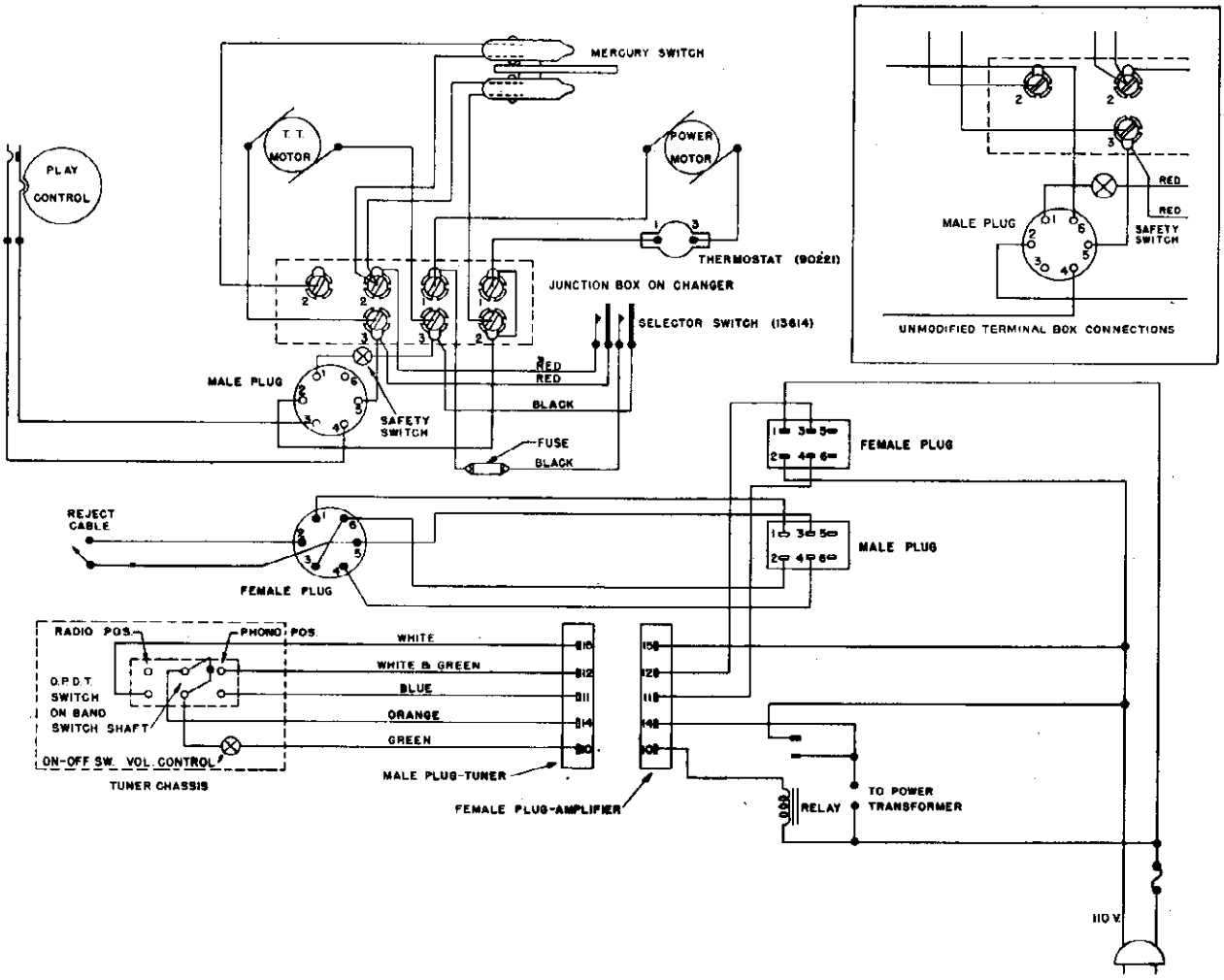

Figure 3

In the Electrical System of the 41E Changer we have:

1. Two (2) mercury switches mounted on one bracket and actuated by the mechanical trip. One operates the Cycle Motor. The other is used to keep the changer in operation to complete the cycle, should the instrument be turned off during a change cycle. These may be used to shut off current, when working under baseplate, by raising bulbs.

2. There is a manually operated switch on top of the base that opens the circuit of both motors (T. T. and C. M.) so that the changer may be stopped during any part of the cycle.

3. There is a switch that opens the circuit of the cycle motor when the shift lever is placed in the manual position.

4. Also built as part of the changer is a play control which shuts the whole instrument off after it has completed the desired number of selections. The play control is mechanically operated by the action of the magazine.

WIRING MODIFICATIONS

Wiring modifications have been two in number. (1) No fuse was incorporated in the early changers. (2) Junction box wiring was originally as here shown, which we shall term the "unmodified" changer. Identification is by a colored dot painted on the bearing cover plate of the main cam support bracket as follows:

Red dot or no dot—unmodified changer.
Brown dot—modified changer.

This modification was occasioned by the introduction of N4 instruments using the 41E changer.

At the same time, connecting cables (terminating in the 6-prong socket) of instruments other than the N4-series were changed by the addition of a jumper between terminals #3 and #6. Such a cable change permits the use of a modified changer in any instrument. Only the modified changer may be used in the N4 instrument.

The thermostat (safety) switch is mounted on the cycling motor.

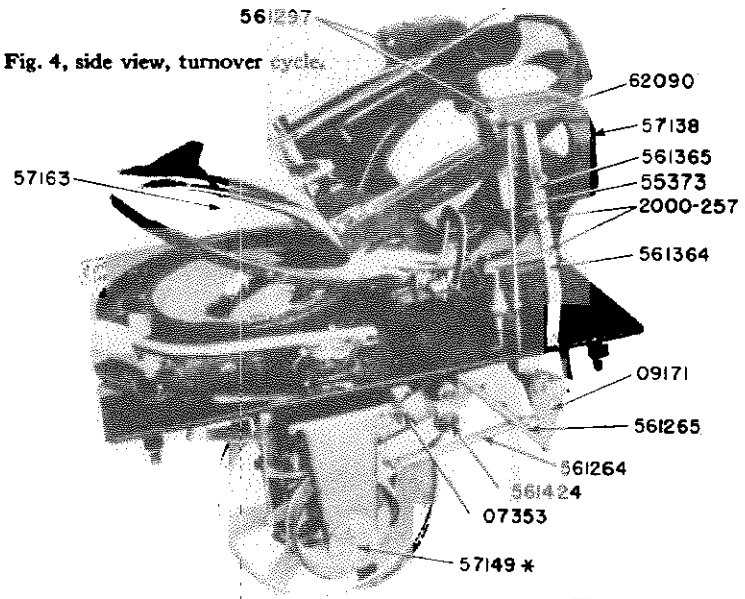

Fig. 4, side view, turnover cycle.

Figure 4

Part No.	Description
07353	Pickup Socket and Bracket Assembly
09171	Magazine Slide Arm Lever Assembly
55373	Magazine Support (Right) Tie Rod
57138	Magazine Support
57149	Bearing Support Cover Plate, Main Cam Shaft
57163	10-inch Guard, Record Tray
62090	Rubber, Reverse Arm Rest Pin
561264	Spring, Record Tray Slide Arm
561265	Spring, Magazine Slide Arm Lever
561297	Magazine Pivot Pin
561364	Magazine Link, Lower
561365	Magazine Link, Upper
561424	Eccentric Shoulder Screw, Record Tray Slide Arm
2000-257	#10—24x5/16" R.H.M.S.

*Designates expanded drawing.

Figure 5

Part No.	Description
05074	Play Control Knob & Dial Assembly
05084	Record Bumper Guide & Felt Assembly
07340	Record Reverse Guide Assembly
11278	Pickup Head Assembly
13419	Record Reverse Arm & Fork Assembly
13424	Turntable Assembly
15133	Tone Arm Support Housing & Lower Bearing Assembly
36855	#10-24x1/4" Allen Set Screw
39130	Reverse Guide Spring
57137	Record Magazine Casting
57140	Lower Record Support Casting
57145	Tone Arm Support Bracket (chrome)
57162	Upper Record Support (chrome)
58317	Tone Arm Tube (chrome)
59169	Capehart Name Plate (plastic)
59171	Selector Lever Escutcheon
62101	Record Tray Bumper (front) 4 required
62102	Record Tray Bumper (rear) 2 required
90182	Toggle Switch S.P.S.T.
92194	Record Tray Felt, large, 2 required
92195	Record Tray Felt, small, 2 required
92196	Magazine Felt, 2 required
92219	Magazine Felt, 2 required
561177	Record Support Bracket (chrome)
561179	Tray Hinge Pin
561180	Reversing Arm Lock
561194	Adjusting Screws, 10" and 12" set down
561233	Magazine Roller

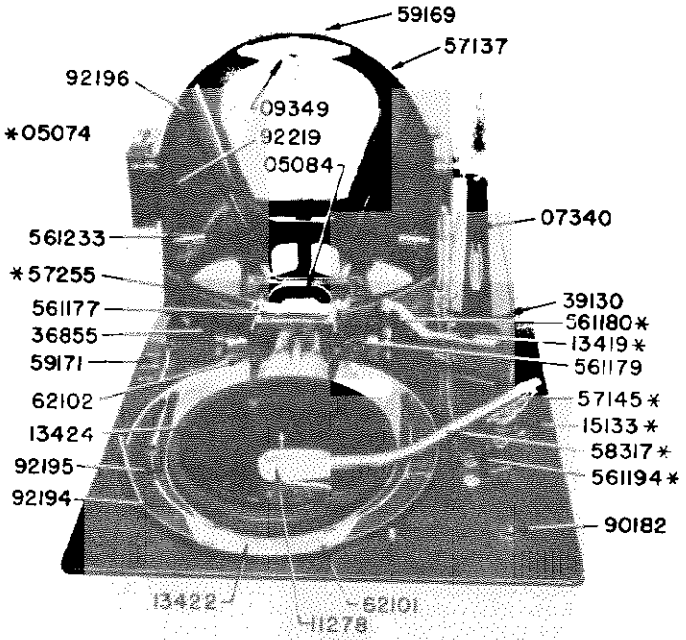

Fig. 5, top view, playing position.

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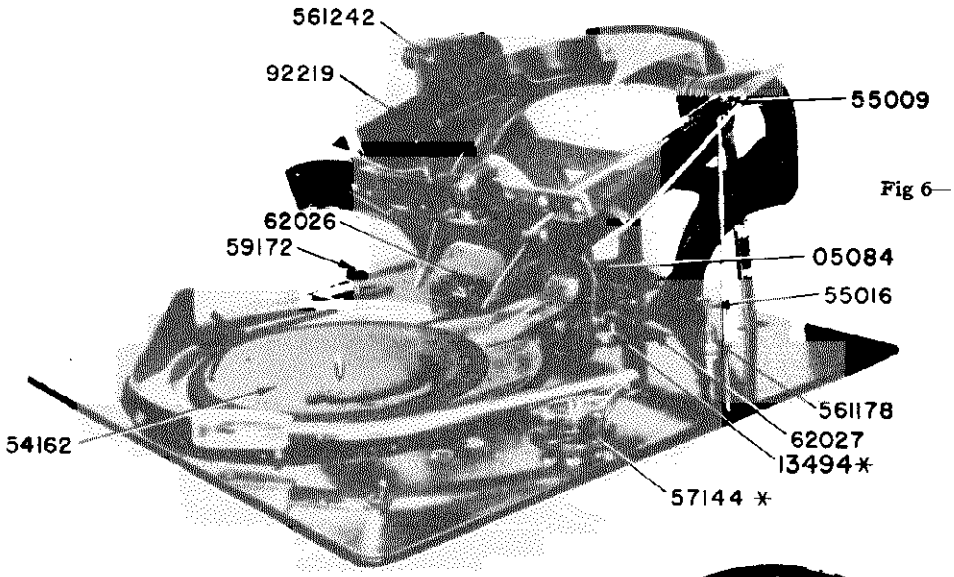

Fig 6—Side view—one side cycle.

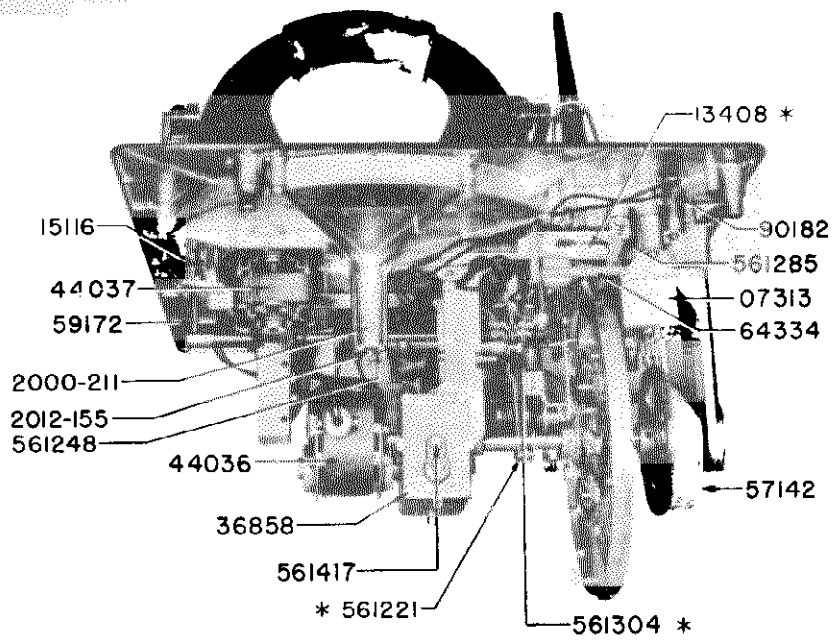

Fig. 8—Bottom view—showing gear reduction box.

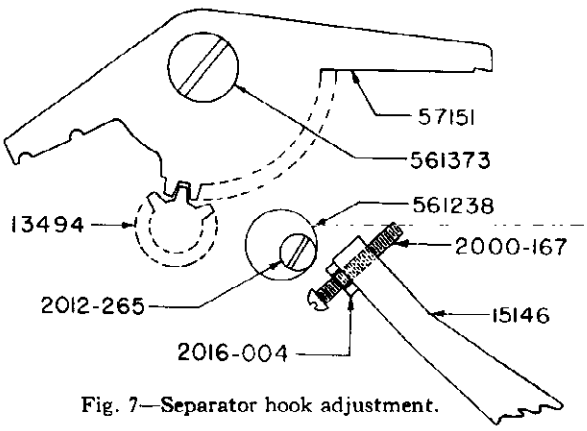

Fig. 7—Separator hook adjustment.

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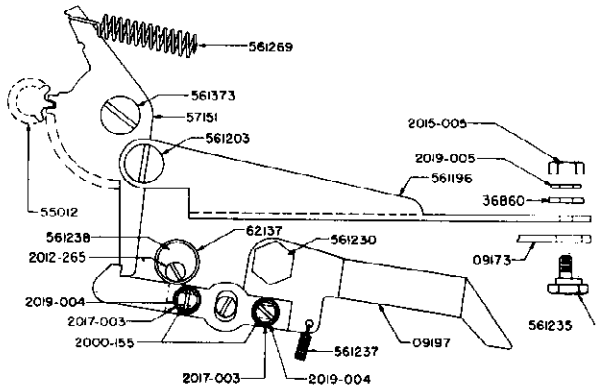

Fig. 10 Reverse arm linkage adjustment.

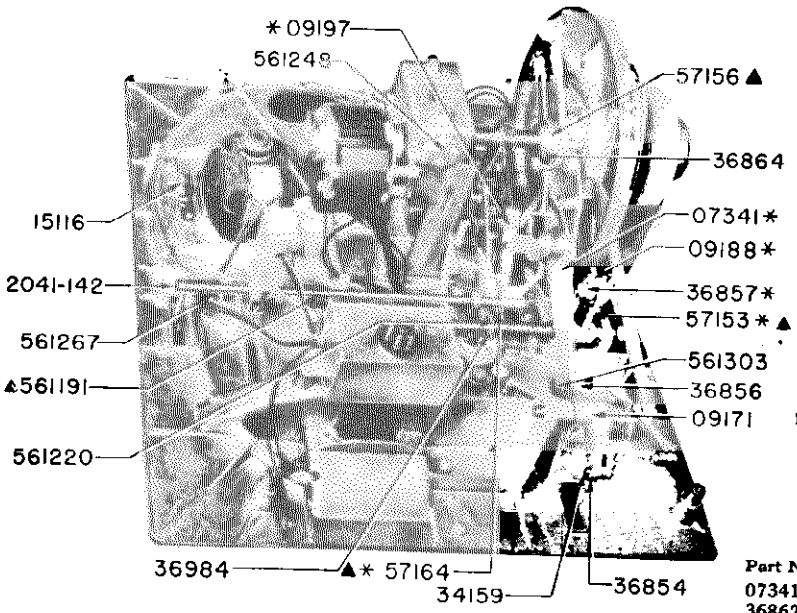

Fig. 9 Bottom view showing magazine slide arm.

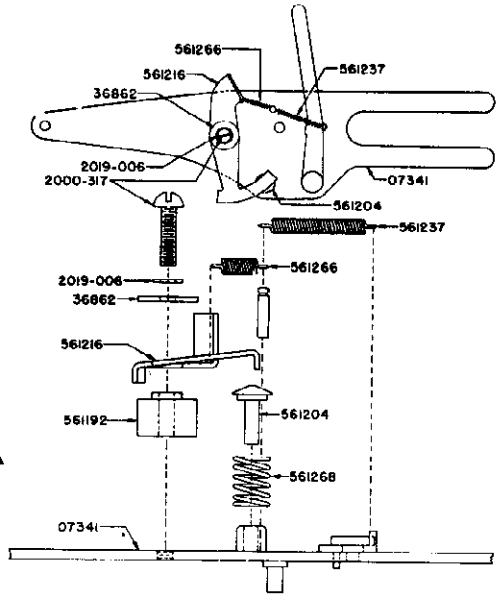

Fig. 11 Magazine slide arm assembly.

FIGURE 9

Part No.	Description
07341	Magazine Slide Arm, Rivet Assembly only
09171	Magazine Slide Arm Lever Assembly
09188	Slide Arm Assembly, Record Tray (not sold as an assembly)
	36857 ¼"x28 Hex Nut
	561234 Slide Pin
	561273 Slide Arm
	2019-007 ¼" S.P. Int. Lockwasher
09197	Reverse Arm Unlocking Assembly
15116	Guard Roller and Bracket Assembly (10-inch)
34159	Arm Lever Pin, Magazine Slide
36854	Cotter Pin
36856	⅜"x24 Std. Hex Nut, Magazine
36857	¼-28 Hex Nut ¼" thick, Record Tray Slide Arm
36864	#0x13/16" Taper Pin
36984	Driv-Lok Pin 3/32"x¾"
57153	Drive Arm, Record Tray Shaft
▼57156	Collar, Magazine Slide Arm
▼57164	Selector Lever Stop
▼561191	Selector Shaft
561220	Spring Stop Washer, Tray Shaft
561248	Thrust Plate, Reduction Gear Box
561267	Spring, Selector Shaft
561303	Shoulder Screw, Magazine Slide Arm
2041-142	#8 - 32x3/16" Allen Set Screw

FIGURE 11

Part No.	Description
07341	Magazine Slide Arm Rivet Assembly
36862	Flat Washer, 196" I.D.x¾" O.D.x1/6" Th.
561192	Magazine Slide Arm Spacer
561204	Magazine Slide Arm Selector Pin
561216	Magazine Slide Arm Selector Lever
561237	Magazine Slide Arm Unlocking Lever Spring
561266	Magazine Slide Arm Selector Lever Spring
561268	Magazine Slide Arm Selector Pin Spring
2000-317	#10—32x¾" R.H.M.S.
2019-006	#10 S.P. Int. Lockwasher

FIGURE 10

Part No.	Description
09173	Reverse Arm Lever and Hub Assembly
09197	Reverse Arm Unlocking Lever Assembly
36860	#8 Flat Washer ½" O.D. x 1/32" Th.
55012	Reverse Pinion
57151	Record Reverse Pinion Segment
62137	Locking Lever Silencer
561196	Reverse Arm Link
561203	Reverse Arm Link Screw
561230	Shoulder Screw, Reverse Unlocking Lever
561235	Reverse Lever Eccentric Screw
561237	Unlocking Lever Spring, Magazine Slide Arm
561238	Reverse Segment Stop Adjustment Cam
561269	Reverse Segment Arm Lever Spring
561373	Reverse Segment Shoulder Screw
2000-155	#6—32x¼" R.H.M.S.
2012-265	#10—24x⅝" Bdg. H.M.S.
2015-005	#8—32 Hex Nut 11/32" A.F.
2016-004	#6—32 Hex Nut ¼" A.F.
2019-004	#6 S.P. Int. Lockwasher
2019-005	#8 S.P. Int. Lockwasher

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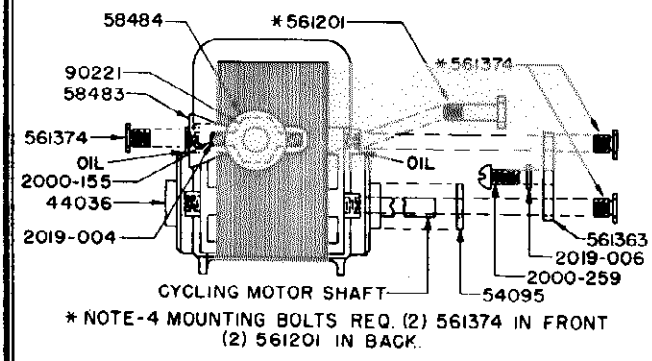


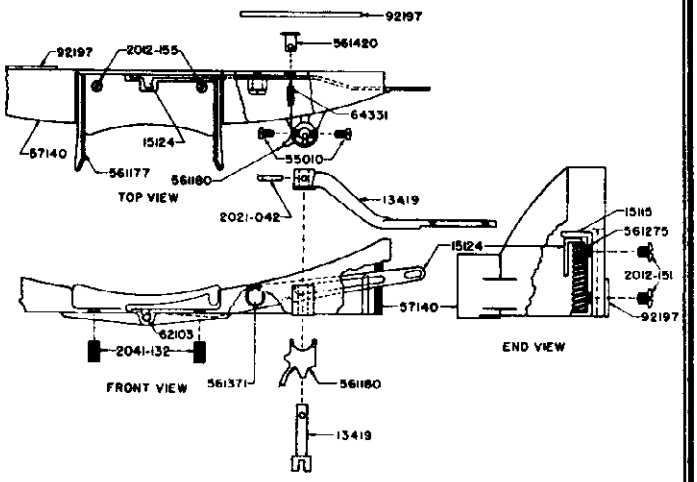


Fig. 14 Lower record support assembly (single separator knife).

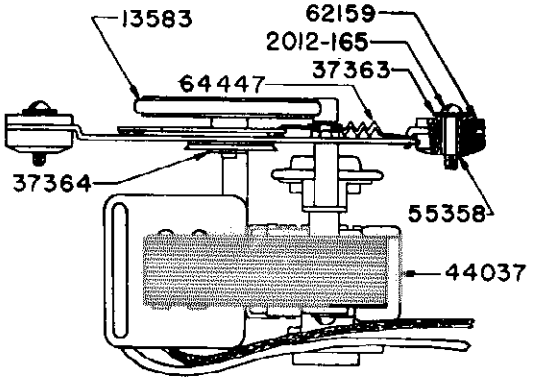


Fig. 12 (Top) cycling motor.
Fig. 13 (Bottom) Turntable motor.

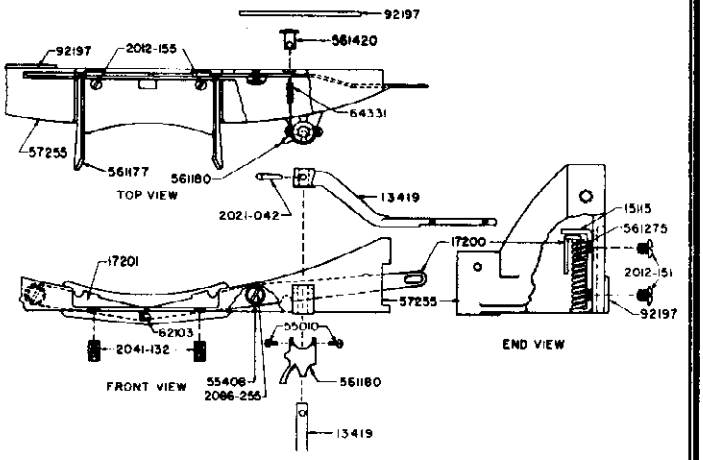


Fig. 15 Lower record support assembly (double separator knife).

FIGURE 12

Part No.	Description
44036	Cycling motor
54095	Motor to gear box gasket
58483	Thermostat bracket
58484	Thermostat Cover
90221	Thermostat
561201	Motor Mounting Bolt (long)
561363	Motor Mounting Bracket
561374	Motor Mounting Bolt (short)
2000-155	#6—32x1/4" R.H.M.S.
2000-259	#10—24x3/8" R.H.M.S.
2019-004	#6 S.P. Int. Lockwasher
2019-006	#10 S.P. Int. Lockwasher

FIGURE 13

Part No.	Description
13583	Idler Pulley
37363	Flat Washer (brass)
37364	Hairpin Cotter
55358	Sleeve Spacer
60533	Fibre thrust washer (upper)
60534	Fibre thrust washer (lower)
62159	Rubber motor mounting grommet (turntable motor)
64447	Spring
2012-165	#6—32x5/8" Bdg. H.M.S.

FIGURE 14

Part No.	Description
13419	Reverse Arm & Fork Assembly
15115	Record Separator Stop Assembly
15124	Record Separator and Hub Assembly
55010	Reversing Arm Lock Screw
57140	Lower Record Support Casting
62103	Reverse Arm Bumper
64331	Reverse Arm Lock Spring
92197	Lower Record Support Felt
561177	Record Support Bracket
561180	Reversing Arm Lock
561275	Record Separator Spring
561371	Separator Knife Shoulder Screw
561420	Reverse Arm Lock Spring Anchor Stud
2012-151	#6—32x1/8" Bdg. H.M.S.
2012-155	#6—32x1/4" Bdg. H.M.S.
2021-042	#00x1/2" Taper Pin
2041-132	#6—32x3/16" Allen Cup Pt. Set Screw

FIGURE 15

Part No.	Description
17200	Record Ejector Assembly, R.H.
17201	Record Ejector Assembly, L.H.
55408	Record Ejector Bearing
2086-255	#8-32x1/4" Truss H.M.S. Brass

(All other parts same as for the single separator knife.)

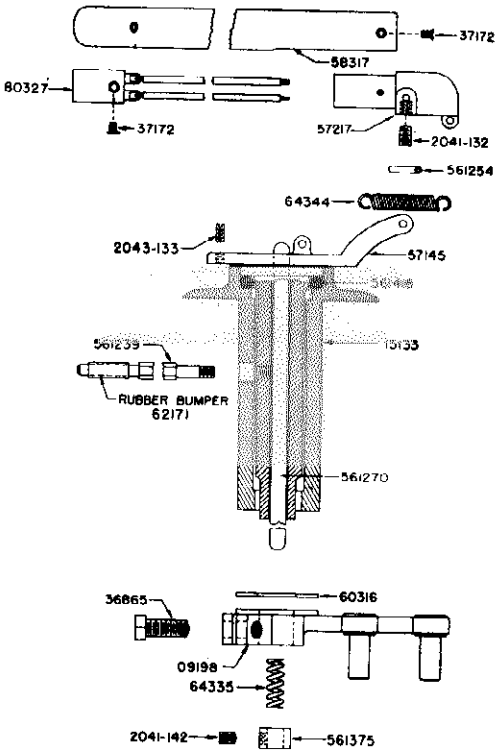


Fig. 16 Tone arm assembly and tone arm support housing assembly.

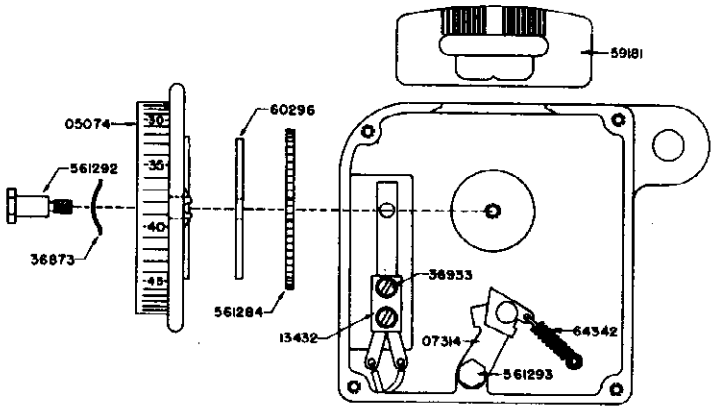
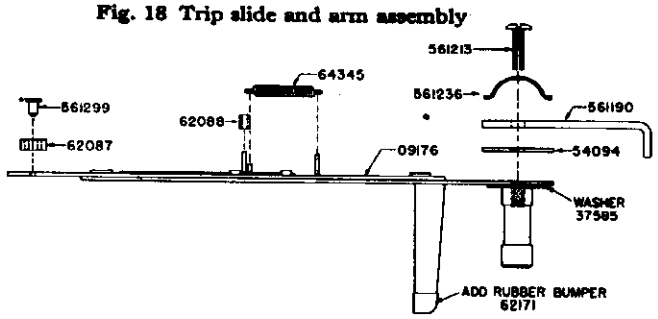


Fig. 17 Play Control Assembly.

Fig. 18 Trip slide and arm assembly



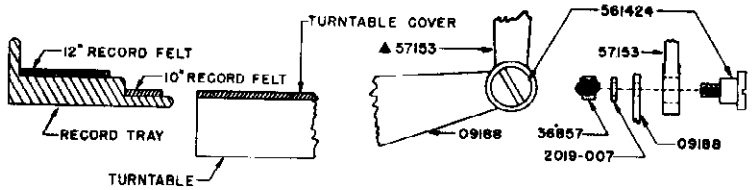


Fig. 19

FIGURE 16

Part No.	Description
09198	Tone Arm Crank Assembly
15133	Tone Arm Support Housing & Lower Bearing Assembly
36875	#10—24x1/2" H.H.M.S.
37172	#4—36x1/8" Flat H.M.S.
57145	Tone Arm Support Bracket (chrome)
57217	Tone Arm End (chrome)
58317	Tone Arm Tube only (chrome)
60316	Tone Arm Brake Facing Cork Washer
64335	Tone Arm Brake Spring
64344	Tone Arm Counter Balance Spring
80327	Two Prong Molded Socket (tone arm)
561239	Tone Arm Trip Pin
561254	Tone Arm Hinge Pin
561270	Tone Arm Lift Rod
561375	Tone Arm Brake Spring Collar
561416	5/32" Diam. Ball, Tone Arm Support (17 required)
2041-132	#6—32x3/16" Allen Cup Pt. Set Screw
2041-142	#8—32x3/16" Allen Cup Pt. Set Screw
2043-133	#6—32x1/4" Slotted Cup Pt. Set Screw

FIGURE 19

Part No.	Description
57172	Separator Hook Arm
561238	Reverse Segment Adjustment Cam
561373	Reverse Segment Shoulder Screw
2000-167	#6—32x3/4" R.H.M.S.
2012-265	#10x5/8" Bdg. H.M.S.
2016-004	#6—32 Hex Nut 1/4" A. F. x 3/32 Th.
2015-005	#8—32 Hex Nut 11/32" A.F.
2016-004	#6—32 Hex Nut 1/4" A.F.
2019-004	#6 S.P. Int. Lockwasher
2019-005	#8 S.P. Int. Lockwasher

FIGURE 17

Part No.	Description
05074	Play Control Knob and Dial Assembly
07314	Play Control Pawl Assembly
13432	Play Control Switch Assembly
36873	Spring Wave Washer
36236	#6-32x1/4" Phillips O.H.M.S. Play Control Cov Mtg.
36933	#5- 40x1/2" R.H.M.S.
59181	Play Control Escutcheon
60296	Cork Washer
64342	Pawl Spring
561283	Play Control Cover Plate
561284	Play Control Ratchet
561292	Play Control Stud
561293	Pawl Screw

FIGURE 18

Part No.	Description
09176	Trip Slide Assembly
54094	Friction Trip Cork Washer
62087	Trip Roller
62088	Rubber Stop
64345	Trip Slide Spring
561190	Automatic Stop Trip Lever
561213	Friction Trip Lever Screw
561236	Friction Trip Spring Wave Washer
561299	Trip Stud

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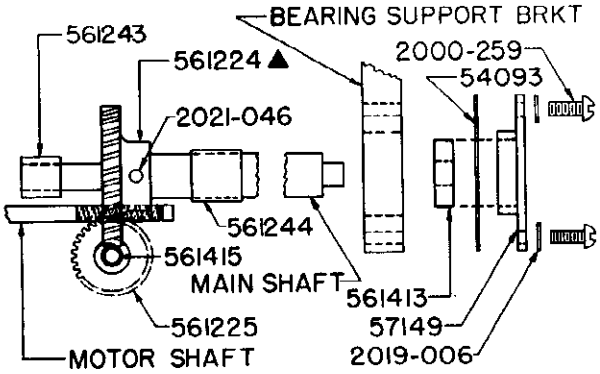


Fig. 20. Reduction gear box train.

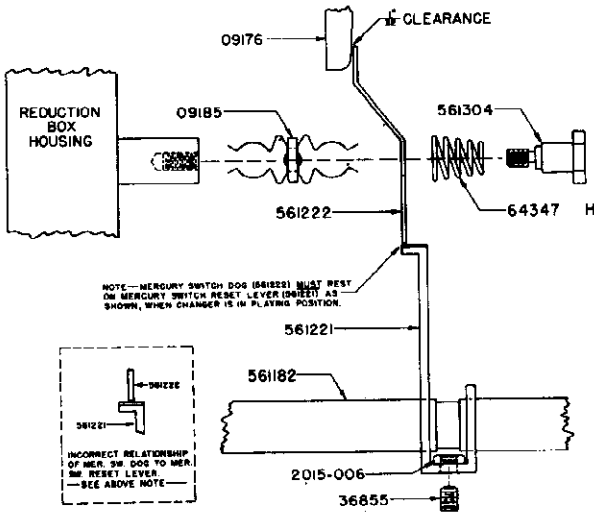


Fig. 21. Mercury switch adjustment screws and related parts.

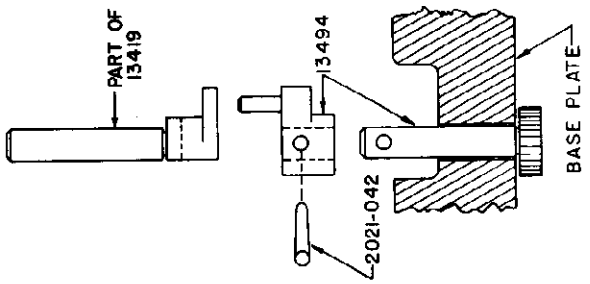


Fig. 22. Reverse pinion and crank assembly.

FIGURE 21

Part No.	Description
09185	Mercury Switch Mtg. Bracket Assembly
36855	#10—24x1/4" Allen Cup Pt. Set Screw
64347	Mercury Switch Dog Spring
561182	Main Cam Shaft
561221	Mercury Switch Reset Lever, Main Cam Shaft
561222	Mercury Switch Dog
561304	Shoulder Screw, Mercury Switch Mtg.
2015-006	#10—24 Std. Hex Nut

FIGURE 23

Part No.	Description
57164	Selector Lever Stop
561196	Reverse Arm Link
561215	Selector Lever Lock
2000-155	#6—32x1/4" R.H.M.S.
2019-004	#6 S.P. Int. Lockwasher

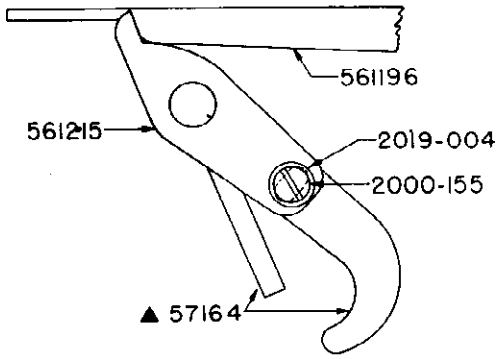
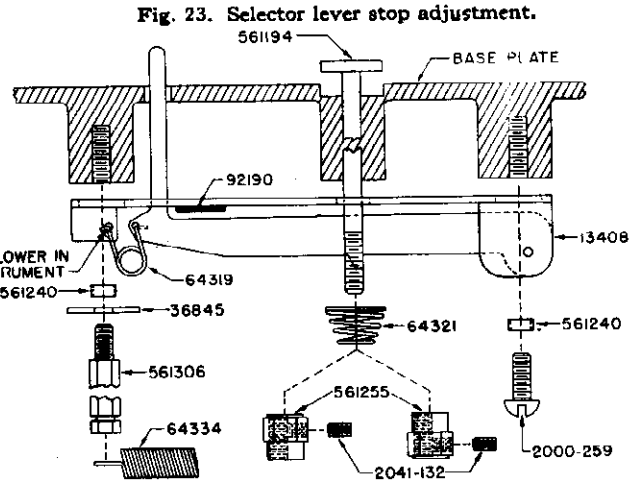


Fig. 23. Selector lever stop adjustment.



NOTE PART NOS. 561194, 64321, AND 561255.
TWO OF EACH ARE REQUIRED, ONE FOR 10" TONE ARM ADJ. & ONE FOR 12" TONE ARM ADJ.
ECCENTRIC SHOULDER ON 561255 SHOWN DOWN FOR 10" ADJ. AND UP FOR 12" ADJ.

Fig. 24. Tone arm stop bracket assembly and tone arm adjusting screw.

FIGURE 20

Part No.	Description
54093	Bearing Support Shim, Main Cam Shaft
57149	Bearing Support Cover Plate, Main Cam Shaft
561224	Main Shaft Gear, Second Reduction
561225	Second Reduction Gear & Shaft
561242	Sleeve Bearing (used on each end of 561225 Gear and Shaft Assembly)
561243	Sleeve Bearing, Small, Main Shaft
561244	Sleeve Bearing, Large, Main Shaft
561413	Main Shaft Ball Bearing and Race
561415	3/16" dia. Thrust Ball Bearing; Gear Box and T. T. Spindle
2000-259	#10—24x3/8" R.H.M.S.
2019-006	#10—S.P. Int. Lockwasher
2021-046	#00—1" Taper Pin

FIGURE 22

Part No.	Description
13494	Reverse Pinion and Crank Assembly
2021-042	#00 x 1/2" Taper Pin
13419	Record Reverse Fork and Arm Assembly

FIGURE 24

Part No.	Description
13408	Tone Arm Stop Brkt. Assembly
36845	#10 Flat Washer 3/4" O.D.
64319	Interceptor Spring
64321	Tone Arm Adjusting Spring
64334	Tone Arm Swing Lever Spring
92190	Tone Arm Stop Felt Bumper
561194	Tone Arm Adjusting Screw
561240	Spacer, Tone Arm Stop Bracket
561255	Tone Arm Adjusting Nut
561306	Spring Stud. Tone Arm Stop Bracket
2000-259	#10—24x3/8" R.H.M.S.
2041-132	#6—32x3/16" Allen Cup Pt. Set Screw

FARNSWORTH TELEV. & RADIO CORP. MODEL 41-
CAPEHART

INSTRUCTIONS FOR INSTALLING MAGAZINE SUPPORT TIE RODS

PARTS NEEDED

Right Hand Tie Rod	Left Hand Tie Rod
1 Tie Rod (Part #55373 7 15/16" long threaded at both ends	1 Tie Rod (Part #55423) 5 1/16" long threaded at both ends
2 Flat Metal Washers	2 Flat Metal Washers
1 Lock Washer	2 Lock Washers
3 Hex Nuts	4 Hex Nuts

Run one (1) nut to the full extent of the threads on each end of the rods.

1. Remove magazine link assembly (consisting of parts #561364 and #561365.)

2. Remove the four screws (under base plate) holding the magazine support (#57138), tip the magazine upward and lift magazine support backward with a folding motion, resting the support on a box or other object of proper height to prevent strain on the play control wires.

3. Drill hole in base plate 3/4" from center of separator hook boss, which will be 3 1/2" from rear of base plate and 3 27/32" from right side of base plate (as viewed in cabinet) using 13/64" drill (see drawing).

4. Drill hole in magazine support 7/16" deep with No. 25 drill, 9/16" from the center of magazine pivot pin set screw and 1/4" from edge. NOTE: DO NOT use same drill as used on base plate!

5. Tap hole in magazine support, using #10-24 bottom tap. Use care in tapping to prevent breakage of the top. Remove shavings from hole.

6. Drill hole in baseplate 3/8" from left edge and 2 3/4" from rear of base plate, using 13/64" drill (see drawing).

7. Remove play control cover plate and drill hole in the bottom of play control box 2 3/4" from rear and 5/8" from outside of box.

8. Screw short threaded end of tie rod (#55373) into magazine support as far as it will go. See that the flat washer is under the nut. Lock the nut using an end wrench.

9. Fasten the bent end of the tie rod (#55423 to the play control box (as shown) with the lock washer on inside of box. Replace control box cover plate.

10. Raise magazine support into position, inserting the rods into the holes drilled in the base plate. Replace the magazine support mounting screws.

11. Replace magazine link assembly, lower end first. The upper shoulder screw (#55009) (Fig 6.) can usually be replaced by moving magazine slightly. Otherwise, the link screws #2000-25 must be loosened.

12. Place nuts on ends of the rods protruding through the base plate and draw up the right hand nut until the distance from the top of the milled section around the hook post to the center of the magazine pivot pin is 7 9/16". Draw up the left hand nut an equal amount. Tighten the nuts above the base plate to lock the adjustment, and recheck the distance.

13. Adjust tension of the magazine. (See part 4, pages 17-18). Check the record separator hook (#55016) to see that it does not touch end of record separator (#15124).

The installation of these tie rods is intended to retain the permanency of magazine support adjustment during transit of instruments from factory to dealer. Some dealers feel that this is a desirable modification to add to early production 41-E Record Changers, when instruments are given a thorough test before delivery to a customer. It is for this reason that the foregoing instructions are herein included.

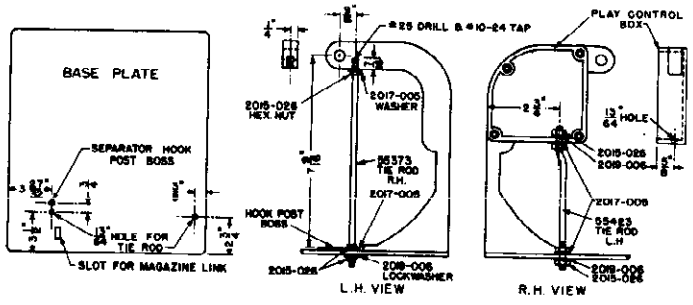


Fig. 26

MODEL 41-E, CAPEHART

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OPERATING POSITIONS

On the baseplate is located the selection-arm for the three functions; manual, one side and both sides.

Manual

In this position, the instrument operates without the changer mechanism functioning—only the turntable revolves. A switch is provided at the right-front portion of the baseplate whereby the turntable may be stopped while manually changing records.

One Side

When the selector lever is in the ONE SIDE position, each record in the record magazine is played on one side only, in sequence. The records are turned over when returned to the magazine. Therefore, the second side is played on the second playing.

Both Sides

Each record is played on both sides when in this position, whereby continuity is had when selections are continuous from one side to another. In addition, the uninterrupted-playing capacity of the changer is doubled over that of conventional record changers.

LOADING MAGAZINE

To load the record magazine, place one record in the magazine with its lower edge resting on the record support bracket and push it back snugly against the shoulder of the lower record support with the top of the record in front of and resting against the lower part of the upper record support. Then the rest of the records may be placed in the magazine either singly or in groups, assuming that all records are on the record support bracket.

To load an album set of records, select the first record, place it on the record support bracket with the "A" side toward the turntable. Move the selector lever to the ONE SIDE position and press the reject button. As soon as the first record moves to the turntable, move the selector lever to the proper position for the type of album set. Check the play control and if at or near zero, reset.

TO PLAY RECORDS

After the records have been placed in the magazine, turn the program switch on the radio to "Phono" position and the "Off-On" switch on the right side of the changer to "On" position.

The changer will not start if the play control is set at "Off."

PLAY CONTROL

The play control is located at the front of the magazine. This Capehart development allows any number, up to fifty, recorded selections to be played, after which the instrument stops automatically. The play control is set by turning the knob beside the dial until the desired number of selections to be played appears opposite the pointer. If for any reason, it is desirable to have the play control inoperative, the dial may be turned beyond the number 50 until the word "OUT" is seen.

NOTE: When the play control dial is at "OFF" the record changer cannot be started.

NEEDLE LANDING

Ten-inch setting—Allow the changer to deliver a 10" record to the turntable and the tone arm to move over the record. Stop the changer with the "OFF-ON" switch and lift the tone arm so that a coin may be inserted in the slot in the tone arm indexing screw marked 10. If the tone arm is moved away from the turntable spindle, a definite stop will be noticed. Beyond this point a spring tension will tend to return the arm to the correct landing on the record. The arm should be against this "stop" while turning the 10" indexing screw. Start the changer and reject the record. Check the needle landing on the next record. If incorrect, repeat the adjustment.

Twelve-inch setting—The same procedure is followed as explained for the 10" setting except that it is necessary to use 12" records and the adjusting screw marked 12.

REJECT BUTTON

A "reject button" is located on the panel of the tuner compartment. By pushing this button, any record which is being played may be rejected. The button should be depressed for one or two seconds.

HOW IT OPERATES

"THREE CHANGERS IN ONE"

The best approach to a knowledge of the 41E changer is to accept it on the basis that it is really "Three Changers in One." A study of each of the three fundamentals will enable a quick analysis of trouble.

The first operation, (Manual), is accomplished by placing the Selector Lever in the "Manual" position, thus opening the Mercury Trip Switch circuit so the changer mechanism does not trip at the end of a record.

The second operation, (Play one side).

1. Pickup Arm is elevated.
2. Pickup Arm swings clear of Record Tray.
3. Record Tray lifts to deliver record to Magazine.
4. As record in Record Tray touches Record Support Bracket, another record is discharged from the Magazine.
5. After record is expelled from the Magazine, the Record Tray returns part way and pauses.
6. Magazine tilts, and waits to deliver record to Record Tray, which starts down again.
7. Record Tray again pauses to allow record to settle over Spindle.
8. Magazine returns to normal position as does Record Tray.
9. Pickup Arm swings in and needle is lowered to record.

The third operation, (Play both sides).

1. Pickup Arm is elevated and swings clear of the Record Tray.
2. The Record Reverse Arm and Guide swing around in front of the Magazine.
3. The Record Tray places the record against the Reversing Arm and starts back to normal position, pausing midway.

4. The Magazine tilts to slide the reversed record onto the Record Tray, pauses in its return until the record touches the front of the Tray, and then returns to normal position.
5. The record settles over the Spindle.
6. The Tray returns to normal position.
7. Pickup Arm swings against either 10" or 12" indexing screw depending on size of record.
8. Needle is lowered on record.

ONE SIDE CYCLE

The selector lever is moved to the one side position. The change cycle is started by the tone arm moving in to the trip groove of a record. In this position the trip slide assembly is moved in toward the turntable spindle. The Trip Bracket on the turntable strikes the hook on the trip slide assembly. This motion is transmitted to the mercury trip switch mounting bracket pushing it off the reset lever on the main cam shaft. The mercury switch drops, thus energizing the cycling motor. The Pickup Arm is elevated and swung clear of the Record Tray, which lifts the record off the Turntable and delivers it to the Magazine. Just before the tray with the record reaches the point where the record touches the sloping face of the Record Support Bracket, a record is rejected from the Magazine by the Record Separator. When the changer is in cycle, the Main Cam revolves; on its periphery is a raised portion that lifts the Record Separator Hook Arm, drawing the Record Separator Hook down, thereby raising the Record Separator and three records. One record is lifted to the shoulder of the Lower Record Support Assembly, and the Hook which is part of the Record Separator, and located on the center line of the Lower Record Support Assembly, engages the two bottom records of the stack and lifts them slightly. This assists in the discharge of the record from the Magazine by forcing the second and third record back against the first record, thereby helping to push it off the separator knife into the record well. The record drops to the Rubber Bumpers in the well while the Record Tray is delivering a record to the Magazine. The tray starts downward and its curved tail-piece lifts the record as the Magazine starts to tilt. The Record Tray pauses midway on its downward trip until the Magazine moves to the highest horizontal point, thus allowing the record to slide out; the Magazine then remains stationary until the record slides against the front of the Record Tray which resumes its downward movement, only pausing to allow the Magazine to lower the center hole of the record over the Spindle. The Record Tray returns to normal position as does the Magazine, the Pickup Arm swings in and is lowered, and the mercury trip switch is raised by the reset lever on the main cam shaft striking the mercury mounting bracket.

On One Side position the reverse arm linkage is locked to prevent the reverse guide from moving around in front of the magazine. Also a pin (561204 Fig. 11) on the magazine slide arm assembly is pushed into position to engage a shoulder on switch (part No. 57155) on the main cam. This throws the switch and keeps the magazine slide arm pin in the outer track.

BOTH SIDES CYCLE

The selector lever is moved to the "Both Sides" position. The cycle is started as outline under "One Side Cycle."

After the Pickup is elevated, the Record Re verse Arm and Guide Assembly swings around i front of the Magazine. When it gets to the re versing position and the Tone Arm is clear of th Record Tray, the Tray raises. As the Tray raises the record slides back against the Rear Rubbe Bumpers, and the Tray compresses the spring arr of the Record Reversing Guide. The record touche the slanting face of the Support Bracket while th Tray continues up, and the record slides up thes faces to the top surface of the Support Bracket When the Record Tray starts to return, the sprin tension of the Record Guides pushes the botton edge of the record off the support bracket and a the record Tray pauses midway to the normal o playing position, the Magazine tilts, causing th record to slide down the Record Guide. The Maga zine reaches its furthest excursion and returns par way, where it pauses, and the Record Tray con tinues downward to nearly the normal position About the time the record touches the front of the Tray, the Magazine returns to the normal position after the record has dropped over the Spindle. The Record Tray then returns to normal, and the Pick up Arm is returned as in the one side cycle.

If one carefully watches the Magazine in the Both Sides Position, it will be noted the travel of the Magazine is shorter in the "Turnover" cycle than in the change cycle. It will also be observed that there are two tracks on the side of the main cam facing the gear reduction box. The pin on the Magazine Slide Arm follows the outer track when the magazine is tilted to its highest position to discharge a record. It follows the inner track when turning a record over. The passage of the pin through one track automatically throws the switch (part No. 57155) into the opposite position so that on the next cycle the pin follows the other track thus permitting alternate discharge of a record from the magazine and then turning the record over.

In the turnover operation the gravity operated switch (part No. 57154,) strikes a lever on the Magazine Slide Arm assembly. This unlocks the reverse arm linkage permitting the reverse arm crank and roller to follow the outer edge of the main cam and thus moves the reverse arm and guide around against the front of the magazine to turn the record over. The crank and roller continue to follow the main cam until it reaches the highest point on the cam which returns the reverse arm and guide back to normal playing position. It is locked in this position until the next turnover cycle. Caution! Do not attempt to move the guide around by hand.

The segment gear which meshes with the pinion gear on the reverse crank and pin assembly has an arm which also engages a part of the record separator hook moving it off the main cam and preventing a record being discharged from the magazine during the turn-over cycle.

Due to the impossibility of covering the action of each part in the changer in the brief description above, it is essential that every service man spend considerable time observing the action of each part of the changer under each of the conditions outlined above.

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CAPEHART

FARNSWORTH TELEV. & RADIO CORP.

The numbering system employed in this section coincides with and refers to that of the check-list of section V. These are adjustments which may be applied to the changer in the correction of malfunction, adjustments to be effected in the event that the check list routine reveals some discrepancy. These adjustments are also referred to in the "complaint" section.

It must here be pointed out that some adjustments are interdependent with others. Therefore, after making an adjustment, if not sure that some other adjustment beforehand proper has not been disturbed, the check list should be referred to in checking other pertinent points.

TURNTABLE—Part 1

A. The top surface of the turntable should be level with the milled surface of the baseplate on which is mounted # 15133 tone arm support housing and lower bearing assembly (Note: check with a straight edge ruler long enough to extend over the complete turntable and to the milled surface). The allowable tolerance is 1/64" high or low. If this check shows the turntable to be high or low beyond this allowable tolerance, it can easily be corrected by pressing the spindle in the desired direction in the turntable. The spindle is a pressed fit in the turntable.

NOTE: To remove turntable, remove set-screw in turntable well.

RECORD TRAY—Part 2

A. Due to the use of light records, it has been found necessary to relocate the position of # 561264 record tray slide arm spring. On the first run of 41E changers, this spring was hooked to the upper pin of # 09171 magazine slide arm lever assembly. It should be mounted in a hole drilled in # 09171 magazine slide arm lever assembly through the F (the F prefixes the casting part number.) Too much tension may hang up Record Tray just before play position.

B. If the tray gears bind, the pause position of the record tray will vary with different weight records. An easy way to check for binding gears is to run the changer through change cycle stopping at the second pause position of the record tray (without records) and press lightly on the tray, if then the tray is found to assume a lower position, the gears are likely to be binding. To correct a binding condition of the tray gears, remove # 561424 eccentric shoulder screw and work tray up and down by hand with .012 shim stock between the gears. Tray gears should be aligned so that when the tray is in max. upward position, the first tooth of the tray gear will mesh in between the 2nd and 3rd teeth of the drive gear.

C. After the gears are properly meshed, the record tray should be adjusted sidewise until the turntable is uniformly spaced within the tray at the time when the record tray is raised until the front edges of the 10" felts are level with the turntable cover. After the tray has been properly positioned sidewise, tighten the two Allen set screws (36855 Fig. 5) holding the tray pivot pins, then check to see that no side play exists.

D. With the record selector lever (59172 Fig. 6) in the "One-side" position, run the record changer through a cycle. It will be noted that before the tray has come to rest in its playing position it has paused twice. So to adjust the elevation of the tray it is necessary to stop the changer in the portion of the cycle where the tray has reached the second point where it pauses. In this position the front points of the 10" felts in the record tray should be level with the turntable cover. (A straight edge should be used). If the level is not the same, loosen the nut (36857) on the back of the eccentric screw (561424. See Fig. 4.) Adjust this screw until the felts are the same height, then while holding the screw to prevent its turning, tighten the nut. A slight pressure approximately equivalent to the weight of a 10" record should be applied downward on the tray so as to duplicate normal operating conditions when this adjustment is made.

E. If bumpers are too high, the 12" records will catch on them when sliding on the tray. If too high, trim off as required.

F. Check 10" Record Guard # 57163 to see that there are no burrs and that it is not binding on the tray as where it enters the base plate. Guard roller and bracket assembly # 15116 should be adjusted so that 10" guard is not too high and rubs against 12" records. See that all polished and chrome surfaces are clean and polished.

BUCKHORN—Part 3

A. This distance should be 7 9/16". If the changer does not incorporate a buckhorn brace, this should be installed before making further adjustments. See page 21 for instructions.

B. This distance should be 13 7/16" between the inner surfaces of the buckhorn pivot arms. If this distance is found to be incorrect it can be adjusted by striking the buckhorn with a rubber hammer. Move in the desired direction by striking side of pivot arms.

MAGAZINE—Part 4

A. This distance is 13¼" (outside dimensions of pivot arms).

B. The # 57162 upper record support should be back as far as possible yet so adjusted to allow a straight (not warped) record to rest against both sides. If the upper record support is more forward, a 10" record that is followed by a 12" record may fail to be discharged from the magazine. Note new upper record support, page 20.

C. Stop the changer just as the record magazine lower forks are even with # 05084 record bumper guide and felt assembly. If not evenly spaced, shift the # 561297 magazine pivot pins allowing no side play in the magazine.

D. The record magazine should always return snugly against the magazine stop screw (2000-269). If it does not, it is necessary to place selector lever on one-side position and run the changer through its cycle until the magazine attains the maximum height position as shown in Fig. 6. Stop the cycle

by use of the on-off switch. Loosen the two adjusting screws on the magazine actuating link to a sliding tension. Press downward on the lower part of the magazine thus lengthening the magazine link assembly. Now resume the cycle, and when the magazine touches the magazine stop screw, the magazine will adjust itself, after which the adjusting screws on the link assembly should be tightened securely. Avoid too much tension to prevent distortion of #57138 magazine support. Too much tension may cause failure of changer to start change cycle.

E. Just as the changer is starting a reverse cycle and the #07340 record reverse guide assembly has just swung around in front of the magazine, stop the changer and check to see that the reverse arm fork (#55015) projects approximately 1/16" beyond reverse arm crank pin (#15144) with the magazine held firmly against #2000-269 magazine stop screw. If not, correct by adjusting stop screw.

F. (a) After the #07340 record reverse guide assembly has swung around in front of the magazine, stop the changer and see that it is equally spaced between the ends of #56177 record support bracket. If not, loosen the two screws mounted up through #57143 record reverse arm and shift in the desired direction.

(b) If the guide is parallel with the 12" record, it should return and rest against the rubber bumper on the magazine support assembly, in such a position as shown in Fig. 5. If the eccentric cam (561235 Fig. 7) is properly adjusted, the guide will rest against the rubber bumper; however, if the record reverse guide does not properly return, loosen the nut holding the eccentric cam and rotate the cam slightly until the correct position is secured. CAUTION! Do not attempt to move the record reverse arm and guide assembly in front of the magazine by hand.

(c) The upper fork section should be parallel with the magazine so as to avoid pushing one side of a 12" record over the outer 10" rubber bumpers on the tray before the other. If this is not the case unclip the fork from #39130 reverse guide spring and form in the desired direction. Also if the ends of this upper fork are too close together, it will be noted that the tray has a tendency to raise the reverse guide assembly. To correct this unclip from the #39130 reverse guide spring and bend the ends of the fork out.

G. With the magazine tilted up set the separator knife stop so as to allow at least 1/64" and not more than 1/32" between the record separator and a "V" edge 10" record. (With a 10" record in the magazine, the upper edge of the record separator should be flush with the top of the lower support.) To adjust the position of the record separator, move the record separator stop to the position desired by loosening the two screws (2012-151) holding this stop. This stop (15115) is shown clearly in the end view portion of Fig. 14, and is located at the rear of the right bottom side of the magazine. When the magazine has returned to playing position the record separator hook should then be readjusted. Make sure that screws #2012-151 are not too long. These should be 6-32 x 1 16" binder head screws.

H. The end of the record separator that comes in contact with the records, should be as snug against the magazine as possible without binding. To accomplish this, it may be necessary to remove the record separator and bend the end toward the hook so that it will be perfectly free at that end and then bend it 3/8" from the hub toward the knife end and reinstall it. It now may be binding some against the magazine but with a thin screw-driver it can be bent back a little at a time to arrive at its proper position. It may be found helpful to slightly bend the tip end away from or toward the magazine casting for the use of some of the present records on the market. Check to see that the knife operates freely.

J. Adjust the #55016 record separator hook so that the #15124 record separator and hub assembly will not be disturbed as the magazine comes back to its normal position. Hook should not touch end of knife. If a complete turn of the hook gives more adjustment than is desired, some adjustment may be gained by bending the end of the record separator.

K. The top surface of the outer ends of #561177 record support bracket should be slightly higher than the rear rubber bumpers on the record tray with the tray in the vertical position. Two Allen screws are provided in the magazine directly under the record support to make this adjustment if needed. If the outer ends of the record support bracket should be slightly lower than the rubber bumpers on the tray, records will be pulled back off of the record support bracket as the tray starts to lower itself. Adjust screws #2041-132 so that the lower record support #561177 lifts the record off the rear record tray bumpers #62102.

L. See that rollers on the magazine are operating freely and that all polished and chrome surfaces that contact the record are kept clean and polished.

M. The position of these felts (#92197) is shown in Fig. 14. Check to see that they are securely cemented to the magazine and that the inner ends are cut off at a 45 degree angle so as not to restrict the dropping of records.

N. This post should be adjusted for improved operation of the single-action separator by raising until the roller on separator lever 561212 clears the periphery of the main cam by 1/32", lock into position by a lock nut. (To add this lock nut, 1. remove pin from below baseplate on separator hook assembly 09218, 2. screw on adjusting nut 37347 (size), 3. replace pin in separator hook assembly, 4. adjust separator hook post 561178 so that lever arm will have 1/32" clearance on cam 57135, 5. secure separator hook post with locking nut.)

TONE ARM Part 5

A. Check tone arm height. Pick up needle should barely clear turntable cover when the tone arm swings over without record on turntable. Adjustment is made with slotted head screw #2043-133. After setting is correctly made, one or two drops of shellac placed on top of screw will prevent loss of setting from vibration. Alcohol may be used to free screw.

B. The tone arm should come in far enough on a 12" record for the stylus to freely come in past the label on the record. If this condition does not exist, it is possible that the tone crank assembly #09198 is being restricted by the tone arm swing lever assembly #07313 being bent down at the point of interception or there is not enough clearance in

the cut out portion of the tone arm swing lever assembly. This can be easily corrected by removing the tone arm swing lever assembly and filing 1/32" in the cut out portion of the tone arm swing lever where the tone arm crank rides against. CAUTION! Be sure to file evenly across this 5/8" portion of the tone arm swing lever assembly.

C. See that the pickup is parallel to the record.

D. 10" adjustment: For 10" adjustment allow the changer to deliver a 10" record to the turntable and the tone arm move over the record. Stop the changer by use of the On-Off switch after the changer has completed its cycle. Lift the tone arm to give access to the indexing screw marked 10. As the tone arm is moved away from the spindle a definite "stop-point" will be noticed. Beyond this point, a spring tension will tend to return the tone arm to the correct landing on the record. The tone arm should be against the "stop point." while turning the 10" indexing screw. The needle landing should be 3/32" in from the edge of both 10" and 12" records. Allow the changer to complete one more cycle and note the tone arm set down. If incorrect the above adjustment should be repeated. If 10" record adjustment is not sufficient, see part 11a.

12" adjustment: For 12" adjustment the same procedure as above should be followed except a 12" record should be used and the indexing screw marked 12 is adjusted. When used with a 12" record the tone arm stop bracket (13408 Fig. 24) is pushed down by the record and allows the 12" indexing screw to control the needle landing. Note: Tone arm action will be erratic if bracket # 57145 is bent. Make sure that tone arm trays pin # 561239 does not screw into support too far and bind the tone arm lift rod. Check for burrs in bearing assembly.

TRIP SLIDE ASSEMBLY—Part 6

On instruments using the piano wire spring on trips, remove and discard the piano wire spring from trip slide assembly # 09176. Carefully reinstall the various parts, except for piano wire spring, being sure to maintain their original relationship. Be sure that the trip stud on the tone arm support tube assembly is carefully inserted inside of the "U" shaped trip lever # 561190.

The stop is to be set so that it will only be intercepted by the lower portion of the trip slide assembly and set so as to make it impossible for the trip clip, mounted on the underside of the turntable, to ever catch on the end of the trip slide assembly (this would stall the turntable). This can easily be checked by replacing the turntable and turning by hand while holding the trip slide assembly in toward the spindle and noting the amount of travel of the upper portion of the trip slide assembly, if this is three fourths of the possible travel, the stop is set correctly.

A. Should be at least 1/8" above the baseplate, also check to see that it will definitely be intercepted by the trip clip, mounted on the under side of the turntable. If it is too high, the turntable trip clip mounting screws will strike # 561299 trip stud causing a clicking noise. As not to disturb the slide action, all bending should be at the end opposite the rubber roller. The action should be positive with no possibility of sticking. Use no lubricant. This should work free enough as not to require more than 1½ grams pressure to move it at the rubber roller end. If this is not the case polish with crocus cloth the surfaces causing the friction (the stud on the trip slide assembly and the pressed sleeve bearing in the baseplate. In polishing the pressed sleeve bearing in the baseplate, better results may be gained by using a circular motion, that is by wrapping the crocus cloth around a pencil. Set this screw as to gain a tension of from 5 to 7 grams at the rubber roller end. Whenever trip is re-adjusted, screw No. 561213, Fig. 18, page 13, should be removed. When replacing screw in order to "HOLD" its adjustment, use a slight amount of cement or shellac on the threads. After proper adjustment, has been effected, let stand five or ten minutes until cement sets.

RECORD BUMPER GUIDE—Part 7

A. The record bumper guide # 05084 (or "U" bracket) and felt assembly should be mounted as far toward the magazine side of the changer as possible and yet not restricting the record tray from dropping into its rest position. The bottom ends should be curved as far as possible toward the turntable and yet still allowing a 12" record (to check, use as thick a record as is normally ever used on the changer) to drop freely into the record well onto the sponge rubber bumpers.

PLAY CONTROL—Part 8

A. Make sure that the spring on the magazine is so adjusted that the play control will move positively as the magazine comes to its rest position. Check to see that the # 59181 play control escutcheon is not restricting the movement of the play control knob and dial assembly.

NOTE: When replacing play control knob and dial assembly, place the dial in off position so that the contact points are left open, in that manner there is no strain or pressure on the dial, which will allow shoulder screw to be replaced without binding cork washer or rachet gear.

REVERSE ARM MECHANISM—Part 9

A. With the Record Selector in the Both Sides position, run the changer through a cycle until the point is reached where the Record Reverse Guide swings in front of the Magazine. In this position the Crank Pin should touch the side of the Record Reverse Fork that is toward the magazine without binding.

B. Stop the changer just before it has completed a reverse cycle, that is just as the roller on # 09172 reverse arm crank assembly is on the highest point on the outer periphery of the main cam and check to see that the pin on assembly 15144 reverse pinion crank and pin is centered or free in the slot of record reverse fork part # 55015. If not free, adjust # 561235 eccentric adjusting screw. See Fig. 10. Caution, with the use of an eccentric screw, two maximums and two minimums may be reached with the full 360 degree turn of the screw. Use the 180 degree swing most favorable to keep the # 561196 reverse arm link away from the baseplate rib which it works near to.

C. Now allowing the changer to complete the reverse cycle and the roller has just dropped off the highest point of the main cam, check to see that the hook on #09197 reverse arm unlocking assembly is just holding the roller off of the main cam. This can be checked, either of two ways, first by unlocking and locking it by hand to see that the pressure is on the hook or by checking to see that the roller can be turned by hand. If this adjustment is incorrect, loosen #2000-155 set screws and adjust center eccentric screw, after correct adjustment tighten set screws. See Fig. 10. It may be necessary to loosen screw 2012-263 and turn eccentric spacer 561238 slghtly to insure more positive action of hook. In making this adjustment, make sure that the point of reverse arm unlocking lever #09197 does not catch on the main cam track walls—should clear by 1/16". Be sure the screw 2000-167 in Fig. 7 is screwed half way in and locked with the nut. This prevents the Separator Hook from ejecting a record from the magazine during the Reverse Cycle, and allowing the record to be caught under the returning magazine, due to its inability to reach the turntable while another record is being reversed. If not, adjust eccentric cam #561238 Fig. 7 until pin is properly set.

TONE ARM MECHANISM—Part 10

A. To determine the proper position of the tone arm crank assembly, it is necessary to set the 12" record adjusting screw #561194 in the center of its eccentric swing and then set the tone arm crank so that the tone arm pickup stylus will set down properly on the edge of a 12" record. If the allen set screw #2041-132 in the 12" tone arm-adjusting nut #561255 is facing either side of the changer (or nearly so) and the tone arm to setting down correctly on 12" records it can safely be assumed that the tone arm crank assembly is horizontally set correctly. For vertical setting, see that there is at least .008" play up and down of the tone arm support bracket #57145. Also check to see that the tone arm crank assembly is far enough down in the tone arm swing lever assembly #07313. It may be necessary to use more than one cork washer above the tone arm crank assembly or a thicker washer.

B. With the changer in the playing position the tone arm brake spring collar should be just against the spring. If the collar is too far up against the spring, the movement of the tone arm will be restricted. If the collar is not up against the spring, the tone arm lift rod #561270 may not smoothly follow the cam track and a little chatter is heard.

C. The action of the tone arm stop bracket assembly should be free enough to be readily actuated by a very light record. Failure to be perfectly free may be found to be that the torsion spring is bent too much at the end or ends. It is very important that the intercepter reset lever #561285 is so formed as to raise the intercepter lever to the highest point, not just past center and depending on the torsion spring to raise it the rest of the way.

D. If the point of interception with a 12" record is found to be rough or with a burr be sure to properly grind off and polish.

E. a. By stopping the changer just as the to arm has swung out to its extreme limit, check see that the pin on the tone arm swing lever a sembly #07313 is not binding on the tone arm ca To correct a binding condition move the tone ar cam further in toward the main cam.

b. The tone arm cam should be so timed wi the main cam so as to just allow the tone arm swing out before the tray rises. Setting the to arm cam at this point minimizes the possibili of the tone arm starting to raise as the chang stops in the playing position.

MERCURY SWITCH OPERATION—Part

A. a. The #561221 main cam mercury swit reset lever should be so adjusted on the main ca shaft as to allow the changer to stop the chan cycle as the highest point on the outer periphe of the main cam has passed the roller on #091 reverse arm crank assembly approximately 3/ Examine for burrs on top edge of part No. 56122

b. The mercury switch dog should be inte cepted by the main cam shaft mercury switch res lever on its outer edge (the edge opposite the bend

NOTE: Wire to mercury switches must be fr (not stiff) and long enough for freedom of motio

MAIN CAM SHAFT ASSEMBLY—Part 12

A. About .020" horizontal play is permissib in the main cam shaft, if greater loosen the fo mounting screws of the outer main cam sha mounting bracket and place shims between moun ing bracket and base plate at the outer edge an tighten screws.

B. It will be noted that shortly before th changer completes a change cycle (one side pos tion), the selector pin passes very close to the re pin on the main cam and should these pins b intercepted by one another, the changer will eith jerk at this point or possibly stall. It is possibl that the #561216 magazine slide arm selecto lever is so formed that it is pushing the selecto pin further in than is actually necessary to defi itely retrack the #57155 spring loaded main ca switch. More clearance may be gained by eithe slightly reforming the magazine slide arm selecto lever or filing a little off the end of the rest pin o the main cam or both.

C. Should operate freely and have a minimun of side play.

D. Use petroleum jelly such as Vaseline.

GEAR REDUCTION BOX—Part 13

A. Check for end play in Second Reductio gear shift. Adjustment made with changer in play ing position. Loosen lock nut 36861, turn screw 561246 up snug and back out approximately 1/ turn until shaft does not bind. Tighten lock nut Trip changer and run through one cycle. If cyclin motor will not start, adjustment is too tight. I gear chatters, adjustment is too loose.

B. If cover is not aligned properly, it will caus binding of gears.

C. Should use two ounces of special Capeha gearbox oil.

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MAINTENANCE OF THE CHANGER

SECTION VIII

References are to section X, that showing adjustments to the changer.

1. RECORD BREAKAGE
   - A. See page 16.
   - B. All polished surfaces on magazine and tray should be cleaned
   - C. Improper loading
2. CHANGER NOISE
   - A. Motor noise. Misalignment of motor or gear
   - B. A "groaning" noise may be heard as magazine is tilting if the thrust bearing adjustment on the gear reduction box is too loose.
   - C. The record bumper guide may be adjusted improperly, allowing 12" records, especially, to strike the lower bent portion of the bumper guide and be deflected against the back of the record magazine, instead of dropping on the rubber bumpers in the baseplate. This occurs as the record is separated and dropped from the record stack. If an early correction is not made the felt may be worn off the bumper guide, causing extra noise.
   - B. Rubber bumpers in record tray may be worn, permitting records to strike tray instead of bumper.
3. NEEDLE DRAGS ON TURNTABLE COVER
   Check tone arm height, adj. sec. 5A. See adj. sec. 5A
4. POOR TONE
   - A. Wow may be due to worn spot on idler pulley
   - B. Check pickup and tubes
5. IMPROPER NEEDLE LANDING
   - A. Check tone arm adjustments, adj. sec. 5D.
6. DOES NOT TRIP PROPERLY
   - A. See Adj. sec. 6A
   - B. Stud on baseplate under turntable may be holding trip lever out too far to contact trip pin on the turntable.
   - C. Cycling motor or changer stalls or jams.
7. TRIP CLICK
   - A. See fig. 18
   - B. See Adj. sec. 6A
8. REVERSE ARM MOTION SLUGGISH
   - A. Adj. sec. 4D, E, F, J, 9A, B, C
   - B. Pickup arm binding
   - C. Adj. sec. 10A, B, E
9. RECORD NOT CENTERING ON SPINDLE
   - A. Adj. sec. 3A, B, 4A, 1A, 2A, B, C, D, E
   - B. 12" records jamming in magazine
   - C. Adj. sec. 7A
10. TWO RECORDS COMING OUT AT ONE TIME
    - A. See adj. sec. 4H
    - B. Be sure that record chips are not lodged behind knife
11. MAGAZINE JUMPS (JERKS) AT FULL RETURN
    - A. Adj. sec. 4E, F
12. RECORD TRAY STICKING
    - A. Adj. sec. 2A, B
13. CHATTERING GEARS, GEARBOX
    - A. Adj. sec. 13A
    - B. Check lubrication
14. CHISEL EDGE RECORD HANGS UP behind record support bracket projections in turnover cycle
    - A. See 4L, adj. sec.
15. RECORDS FAIL TO MOVE INTO WELL
    - A. Magazine rollers should be free and oiled
    - B. See adj. sec. 4B, G, H, J, M, N
    - C. Insufficient records. Six to sixteen provide best operation
    - D. Warped records and/or chips on edges.
16. 12" RECORDS MARKED NEAR EDGE IN PLAYING GROOVE
    - A. See adj. sec. 1A, B, 2F, 10C, D
17. 12" RECORD HANGING UP IN MAGAZINE, usually occurring when followed by number of 10" records
    - A. See adj. sec. 4D, 7A
    - B. See that the wires in the record tray are properly imbedded
18. 12" RECORDS CATCH ON 10" RUBBER BUMPERS
    - A. See adj. sec. 2E
19. RECORD COMES OUT ON TURNOVER CYCLE
    - A. Make sure stop screw #2000-167 on separator hook arm #57172 does not hang on cam #561238
20. MOTOR STALLS
    - A. Check whether actually stalled when energized or if not energized by holding piece of iron against frame to detect magnetic field

    IF NOT ENERGIZED
    - A. Check switch operated by record selector lever (cycling motor)
    - B. Play control in out position or defective points (both motors)
    - C. On-Off switch (both motors)
    - D. Thermostat (cycling motors)
    - E. Fuse in terminal box. (Cycling notes)
    - F. If reject button is pressed and released before main drive shaft rotates sufficiently to drop mercury switch. (Cycling motor). Instruct operator to hold reject button down for a few seconds rather than only for an instant.
    - G. Unmodified changer with N4 instrument

    IF ENERGIZED
    - A. Defective motor
    - B. Check thrust on motor drive shaft (cycling motor)
    - C. Check alignment of motor and gearbox cover (cycling motor)
    - D. Mercury switch binding (cycling motor)
    - E. Check changer for jams (cycling motor)
    - F. Defective mercury switches (cycling motor)

RESHAPING THE INTERCEPTOR—RESET LEVER

As an aid in record-separation by action of the separator knife, the two steps outlined below are given. These lead to an extra "Kick" by the separator knife which has been found to be advantageous in separating records which do not conform to manufacturers' standards.

First, disassemble the interceptor reset lever and bend a larger radius of curvature on the end as sketched:

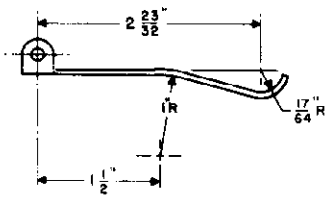

Fig. 25

This larger curvature is to assure that the end of the interceptor reset lever which contacts the main cam will pass over the machine bolt next added.

Second, drill the main cam with a #45 drill at the point giving GREATEST ELEVATION of the separator lever.

Tap with a 4-36 tap and install a 4-36, 1/8" binder head machine screw. This is the same screw which is used in the tray assembly, No. 36278. This operation must be done with due care, that the hole be drilled without damage to the cam and that the tap be not broken off in the hole. Since we are dealing with aluminum, it is recommended that a thread finer than #36 be not used. Remove burrs from the main cam outside periphery.

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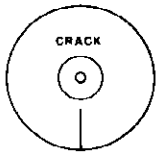
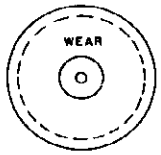
PROBABLE CAUSE OF RECORD INJURY

Figures shown here of record injuries are exaggerated merely to illustrate damage which might occur to records due to improper changer adjustments. For example records with small nicks or wear might have to be scrutinized closely observe the damage. If they are prevalent t changer should be adjusted to eliminate furth record damage.

LARGE NICK
Magazine too far forward. Record support pins bent.



CRACK
Magazine too far forward. Magazine overloaded (more than 16 records).



WEAR
Interceptor lever too tight or burr on top of lever. Install felt-edge turntable cover. Check record tray adjustment.

SMALL NICK
Made in turnover position. Check shoulder on reco support bracket. These should not be too steep. File a use crocus cloth or replace with later type of bracket.

SMALL BREAK
Record failing to drop in well. Dropping late or sticki on slide rolls of magazine. Improper knife height adjustme

LARGE BREAK
Complete breakout caused by failure of record to sl from magazine to tray. See items 2 and 4 of section VI.

The following tools are necessary to complete adjustment of the 41E changer.

Part No.	Description
37149	1/4" Allen wrench
88086	#8 Allen wrench
88326	#6 Allen wrench
88327	#10 Allen wrench
88065	8-32 Bristol wrench
37159	6-32 Bristol wrench

3/8" Spintite wrench
11/32" Spintite wrench
5/16" Spintite wrench
1/4" Spintite wrench
9/16 flat end wrench
7/16" flat end wrench
4" or 6" Crescent adjustable end wrench
Heavy screwdriver
Medium screwdriver
Medium Phillips screwdriver

REPLACING GEARS, COLLARS AND SHAFTS

SECTION IX

The expense and inconvenience of stocking complete taper pinned assemblies has been eliminated by adopting standard automotive practice. This method of supplying shafts drilled, or gears or collars drilled through one side, allow the individual parts to be reamed to an accurate taper for the pin. Parts finished with pilot hole drilled are designated with ▼.

To replace a gear or collar, center the pilot hole with the small diameter of the present taper pin hole in the shaft and drill through to the other side of the gear or collar, using size drill specified in the table below. Then, using the specified size taper reamer, the hole is reamed through the shaft and gear or collar. Be sure the large diameter of taper in the gear or collar will align with the large diameter of taper in the present hole in the shaft when the parts are in correct position. The pin may now be inserted.

To replace a shaft, the gear or collar is installed in correct position on the shaft and the specified size reamer run through gear or collar and shaft pilot hole. Insert taper pin.

Drill and Taper Reamer Size

Description	Drill	Tap Rear
Record Tray Shaft Assembly		
Shaft 561231		#
Collar 55014	#29	#
Drive Arm 57153	#29	#
Gear Driver 57152	#29	#
Main Shaft Assembly		
Main Cam Shaft 561182		For G #
Main Cam Shaft 561182		For Co or Ca #
Gear, 2nd Reduction 561224	#28	#
Slide Arm Collar 57156	#28	#
Main Cam 57135	#28	#
Selector Shaft Assembly		
Shaft 561191		#
Hub 561272		#
Selector Lever Stop 57164	#31	#

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LUBRICATING THE CHANGER

The 41-E changer is shipped with a one-ounce bottle of oil. THIS OIL MUST BE PLACED IN THE GEARBOX PRIOR TO OPERATION. A medicine dropper is convenient for this operation.

Materials needed: Light oil SAE 10; lubriplate; carbon tetrachloride; cleaning cloth; wrench, to fit gear reduction box cover screws; screw driver.

Approximately twice a year a few drops of oil should be applied in the oil holes at each end of the cycling motor. The turntable motor armature should be raised vertically by hand and a few drops of oil applied to the lower bearing. The turntable should be removed and oil applied to the upper turntable drive bearing being careful not to get any oil on the rubber tired idler pulley or the inner rim of the turntable. The idler pulley should be removed and a drop or two of oil placed on its bearing. If the changer is out of the cabinet the hair pin cotter and lower thrust washer can be removed and the idler pulley taken out. If the changer is in the cabinet it will be easier to remove the three motor mounting screws and lift up the motor thus exposing the hair pin cotter and washer. Apply a few drops of oil to the felt washer above the center turntable spindle bearing.

The main cam tracks and slide arms should then be thoroughly cleaned using a cloth saturated with carbon tetrachloride. The cam tracks and slide arms should then be covered with a light coat of lubriplate.

The oil in the gear reduction box should not need replenishing for an indefinite period of time. However, if in doubt the cover can be removed allowing the oil to drain and after replacing the cover one ounce may be added either by removing the pipe plug in the cover or removing the neoprene plug in the side opposite the cycling motor. A medicine dropper is convenient for placing oil in the gearbox.

CONVERSION TO 50 CYCLE OPERATION CAPEHART 41-E RECORD CHANGER

The Capehart instrument normally operates from power mains supplying 105-125 volts at 60 cycles. Operation from 50 cycle mains, without conversion, would result in

(1) slow turntable speed

(2) turntable-drive motor would overheat and might become damaged.

Conversion for 50 cycle operation may be made in the following steps:

1. Obtain from the Capehart Service Department at Fort Wayne, Indiana, a kit for making the conversion consisting of (a) Special 50 watt resistor with mounting assembly (b) Turntable motorshaft spring bushing (c) "50 cycle" tag to be attached to the cabinet, indicating the conversion. This kit is part No. 41135

2. Remove the set-screw in the turntable well and remove turntable. Should the ball bearing upon which the shaft revolves come out, it must be replaced before replacing turntable

3. Place the bushing spring over the turntable motor shaft.

4. Replace turntable and tighten set screw in turntable well.

5. Mount the resistor assembly as shown on the accompanying sketch.

6. Remove jumper between terminals 1 and 2 on the terminal strip.

7. Move the turntable wire from #3 to #1.

8. Move thermostat wire from #1 to #2.

9. Connect the resistor between terminals 1 and 3.

10. Attach the "50 cycle" tag to the inside of the cabinet in a prominent place.

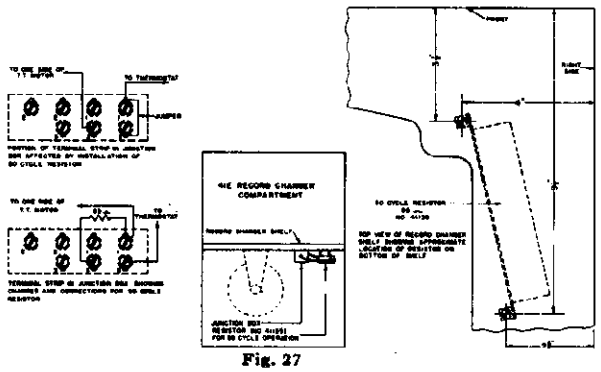

Fig. 27

PARTS

Part No.	Description
05074	Play control knob and dial assembly
05084	Record bumper guide and felt assembly
07313	Tone arm swing lever assembly
07314	Play control pawl assembly
07340	Record reverse guide assembly
07341	Magazine slide arm rivet assembly
07353	P. U. socket and bracket assembly
09171	Magazine slide arm lever assembly
09176	Trip slide assembly
09180	Switch lever assembly
09182	Reverse arm lever, crank and pin assembly.
09185	Mtg. bracket assembly, mercury switch
09197	Reverse arm unlocking lever assembly
09198	Tone arm crank assembly
11278	Pickup head assembly
13408	Tone arm stop bracket assembly
13419	Reverse arm and fork assembly
13422	Record tray assembly
13424	Turntable assembly
13432	Play control switch assembly
13583	Idler pulley
13614	Switch and bracket assembly, manual
13494	Reverse pinion and crank assembly
13710	Cement for turntable cover
15115	Record separator stop assembly

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Part No.	Description
57137	Record magazine (casting only)
57138	Magazine support (casting only)
57140	Lower record support (casting only)
57142	Tone arm cam
57144	Tone arm support housing
57145	Tone arm support bracket, chrome
57149	Bearing support cover plate, main cam shaft
57150	Cover plate
57151	Reverse pinion segment
57152	Gear, record tray driver▼
57153	Drive arm (record tray shaft)▼
57154	Main cam switch (gravity operated)
57155	Main cam switch (spring loaded)
57156	Magazine slide arm collar (specify right or left)▼
57162	Upper record support, chrome
57163	10" guard, record tray
57164	Selector lever stop▼
57167	Main shaft bearing bracket
57217	Tone arm end, chrome
58317	Tone arm tube only, chrome
58483	Thermostat bracket
58484	Thermostat cover
59169	Capehart name plate, plastic
59170	Plastic reverse guide plate
59171	Selector lever escutcheon
59172	Selector knob and lever
59181	Escutcheon, play control
60296	Cork washer for play control
60309	Gear box plug (Neoprene)
60316	Cork washer, tone arm brake facing
60533	Fibre thrust washer, upper
60534	Fibre thrust washer, lower
62026	Record well bumper, L. H.
62027	Record well bumper, R. H.
62085	Stop rubber, mercury switch
62087	Trip roller
62088	Rubber stop, trip slide
62089	Stop rubber, main cam switch
62090	Rubber, reverse guide rest pin
62092	Mounting rubbers
62093	Mounting rubbers for record changer
62101	Record tray bumper, front (4 required)
62102	Record tray bumper, rear (2 required)
62103	Reverse arm bumper
62137	Locking lever silencer
62159	Rubber motor mounting grommet (turntable motor)
62171	Rubber for tone arm rest
64319	Interceptor hair pin spring
64321	Spring, tone arm set down adjustment
64331	Spring, reverse arm lock
64333	Play control spring (magazine)
64334	Spring, tone arm swing lever
64335	Spring, tone arm brake
64342	Pawl spring, play control
64344	Spring, tone arm counterbalance
64345	Spring, trip slide
64347	Spring, mercury switch dog
64348	Spring, record tray shaft
64349	Separator hook spring

Part No.	Description
64447	Spring
64455	Feed in spring for tone arm
80263	6 pr. plug, male
80327	2-prong molded socket (tone arm)
80454	Fuse block
90147	Mercury switch (single)
90182	Toggle switch, S. P.S.T.
90221	Thermostat
92181	Tray shaft felt washer
92182	Guard, felt
92190	Felt bumper, tone arm stop
92191	Record reverse guide felt
92194	Record tray felt, large (2 required)
92195	Record tray felt, small (2 required)
92196	Magazine felt (2 required)
92197	Lower record support felt (2 required)
92219	Magazine side felt (2 required)
92237	Felt washer (under turntable)
92290	Felt record tray bumper
2000-100	#4—40 x 1/8" R.H.M.S.
2000-155	#6—32 x 1/4" R.H.M.S.
2000-167	#6—32 x 3/4" R.H.M.S.
2000-211	#8—32 x 7/16" R.H.M.S.
2000-257	#10—24 x 5/16" R.H.M.S.
2000-259	#10—24 x 3/8" R.H.M.S.
2000-269	#10—24 x 7/8" R.H.M.S.
2000-276	#10—24 x 1 3/8" R.H.M.S., tone arm swing lever mtg.
2000-317	#10—32 x 3/4" R.H.M.S.
2000-363	1/4 x 20 x 1/2" R.H.M.S., magazine support mtg.
2012-151	#6—32 x 1/8" Bdg. H.M.S.
2012-155	#6—32 x 1/4" Bdg. H.M.S.
2012-165	#6—32 x 5/8" Bdg. H.M.S.
2012-209	#8—32 x 3/8" Bdg. H.M.S., (lower record support, magazine assembly)
2012-255	#10—24 x 1/4" Bdg. H.M.S.
2012-263	#10—24 x 1/2" Bdg. H.M.S.
2012-265	#10—24 x 5/8" Bdg. H.M.S.
2015-003	4/40 std. hex nut
2015-005	#8—32 hex nut
2015-006	#10—24 hex nut
2015-026	#10—24 hex nut (stainless)
2016-004	#6—32 x 1/4" hex nut
2017-005	Flat washer
2019-003	#4 S. P. int. lockwasher
2019-004	#6 S. P. int. lockwasher
2019-005	#8 S. P. int. lockwasher
2019-006	#10—S. P. int. lockwasher
2019-007	1/4" S. P. int. lockwasher
2019-046	#10—S. P. ext. lockwasher
2021-042	#00 x 1/2" taper pin
2021-044	#00 x 3/4" taper pin
2021-046	#00 x 1" taper pin
2021-054	#0 x 3/4" taper pin
2021-056	#0 x 1" taper pin
2021-143	#00 x 5/8" taper pin
2041-132	#6—32 x 3/16" Allen set screw
2041-142	#8—32 x 3/16" Allen set screw
2043-133	#6—32 x 1/4" slotted head set screw
2090-052	Rivet 1/8" x 9/32" (chrome)

ELECTRICAL-MECHANICAL SPECIFICATIONS

Power Consumption at 117 Volts
- Turntable Motor ..... 17 Watts
- Cycling Motor ..... 91 Watts

Voltage Rating ..... 105 to 125 Watts at 60 Cycles*

Turntable Speed at 117 Volts ..... 78 r.p.m.

Maximum Record Capacity
- 10 Inch Records ..... 16 Records
- 12 Inch Records ..... 16 Records
- 10 Inch & 12 Inch Intermixed ..... 16 Reco

(Records Can Be Played on Both Sides or One Side Only)

Type of Pickup ..... Capehart True Tim

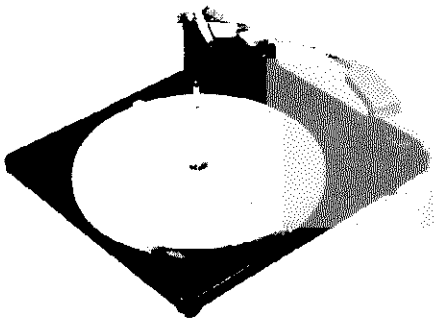
Type of Needle ..... Permanent "Precious Metal" Po

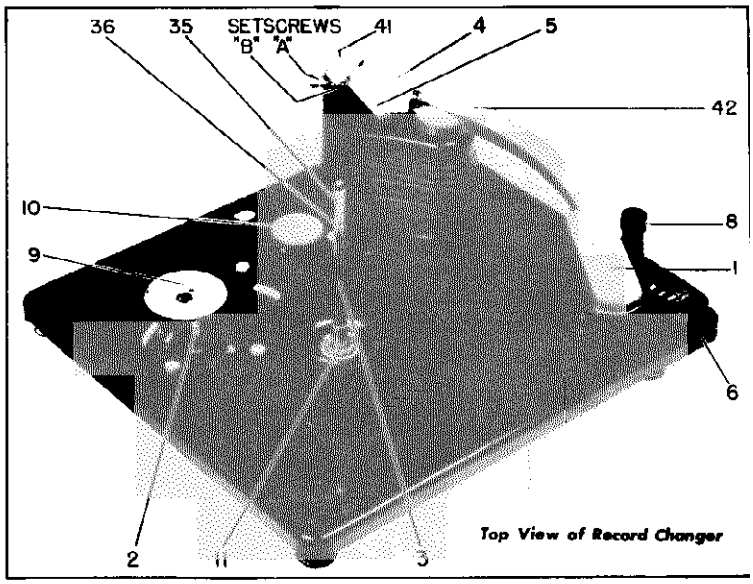
*50 Cycle Operation with Modification.

MODEL 41-E, CAPEHART

FARNSWORTH TELEV. & RADIO CORP.

Part No.	Description
15116	Guard roller and bracket assembly (10")
15124	Record separator and hub assembly
15133	Tone arm support housing and lower bearing assembly
15146	Separator hook arm assembly
34159	Arm lever pin magazine slide
36236	#6—32 x 1/2" Phillips O.H.M.S., St., St. Br., Play control
36278	#4—36 x 3/16" Bd. H.M.S. steel, stat. br., record tray
36279	#4—36 x 1/8" Bdg. H.M.S. steel
36835	Driv-Lok pin, type 1/8" x 3/4"
36845	#10 flat washer 3/4" O. D.
36852	5/32 x 5/8" Driv-Lok pin, type "F," gear box
36853	1/4-20 x 1/4" Allen cup pt. set screw, st., park., tone arm cam
36854	Cotter pin, 1/16" x 1/2"
36855	#10—24 x 1/4" Allen set screw
36856	3/8-24 hex nut, magazine slide arm
36857	1/4-28 hex nut, tray slide arm assembly
36858	#10-24 x 3/8" Hex H.M.S. steel, cad., gear box cover
36859	#10 flat washer 3/8" o.d. steel, chrome, magazine link assembly
36860	#8 flat washer, 1/2" o.d.
36861	7/16-20 hex nut, gear box thrust lock
36862	Flat washer, magazine slide arm
36864	#0 x 1 3/16" taper pin main cam collar
36865	#10-24 x 1/2" H.H.M.S., tone arm crank
36873	Spring wave washer, play control knob and dial assembly
36880	Rivet 1/8" x 1/8" steel, chrome, record reverse guide arm assembly
36882	Hairpin cotter
36911	#0 x 3/16" drive screw, main cam switch arm
36933	#5-40 x 1/2" R.H.M.S., play control switch mtg.
36984	Driv-Lok pin type "E" 3/32" dia. x 3/4" lg., tray shaft
37172	#4-36 x 1/8" flat hd. M.S. brass, brt. nic., tone arm
37180	#6 x 1/4" R.H.S.T.S., P.K. type "A" cad., junction box cover
37250	#4 x 1/4" R.H.M.S. self-tap. screw, P.K. type "2" cad., manual switch cover
37363	Flat washer (brass)
37364	Hairpin cotter (Hubbard #115)
39130	Reverse guide spring
44036	Cycling motor
44037	Turntable motor
48013	3 amp., 250 v. fuse
54093	Bearing support shim, main cam shaft
54094	Cork washer, friction trip
54095	Motor to gear box gasket
54096	Gasket, thrust cover plate
54097	Cover plate gasket, large, reduction gear box
54162	Turntable cover assembly
54274	Fuse cover
55009	Shoulder screw, magazine link
55010	Screw, Reversing arm lock
55014	Record tray shaft collar▼
55016	Record separator hook
55231	Sleeve bearing, second reduction shaft
55358	Sleeve spacer
55373	Buckhorn brace
55375	Tone arm rest
561177	Record support bracket, chrome
561178	Separator hook post
561179	Tray hinge pin
561180	Reversing arm lock
561182	Main cam shaft▼
561189	Turntable trip bracket
561190	Auto. stop trip lever
561191	Selector shaft▼
561192	Spacer, magazine slide arm
561194	Adjusting screw, 10" and 12" set down
561196	Reverse arm link
561198	Locking lever hook
561201	Cycling motor mtg. bolt, long
561203	Shoulder screw, reverse arm link
561204	Selector pin, magazine slide arm
561212	Separator lever
561213	Friction trip lever screw
561215	Selector lever lock
561216	Magazine slide arm selector lever
561220	Spring stop washer, record tray shaft
561221	Mercury switch reset lever, main cam shaft
561222	Mercury switch dog
561224	Main shaft gear, second reduction▼
561225	Second reduction gear and shaft
561230	Shoulder screw, reverse unlocking lever
561231	Record tray shaft▼
561232	Magazine roller bracket
561233	Magazine roller
561234	Record tray slide pin
561235	Eccentric shoulder screw, reverse lever
561236	Spring wave washer, friction trip
561237	Spring, magazine slide arm unlocking lever
561238	Adjustment cam, reverse segment stop
561239	Tone arm trip pin
561240	Spacer, tone arm stop bracket
561241	Spacer, tone arm swing lever
561242	Sleeve bearing, record tray, magazine pivot, and second reduction shaft (cover plate)
561243	Sleeve bearing, small, main shaft
561244	Sleeve bearing, large, main shaft
561246	End thrust screw, gear box
561248	End thrust plate, turntable shaft housing and reduction gear box
561254	Tone arm hinge pin
561255	Tone arm set down adjustment nut
561256	Shoulder screw, main cam
561257	Shoulder screw, main cam
561263	Hair pin spring, main cam switch arm
561264	Spring, record tray slide arm
561265	Spring, magazine slide arm lever
561266	Spring, magazine slide arm selector lever
561267	Spring, selector shaft
561268	Spring, magazine slide arm selector pin
561269	Spring, reverse segment arm lever
561270	Tone arm lift rod
561272	Manual switch lever and hub (on selector shaft)
561273	Record tray slide arm
561274	Locking plate, selector lever
561275	Spring, record separator
561283	Play control cover plate
561284	Play control ratchet
561285	Interceptor reset lever, tone arm set down
561286	Interceptor reset lever bracket, tone arm set down
561292	Play control stud
561293	Play control pawl screw
561297	Magazine pivot pin
561298	Record tray shoulder screw, 10" guard
561299	Trip stud
561301	Magazine slide roller
561302	Tray slide roller
561303	Magazine slide arm shoulder screw
561304	Shoulder screw, mercury switch mount
561306	Spring stud, tone arm stop bracket
561307	Reset lever hinge pin, tone arm stop
561363	Mounting bracket, cycling motor
561364	Magazine link, lower
561365	Magazine link, upper
561369	Reverse guide rest pin sleeve
561370	Reverse guide rest pin
561371	Shoulder screw, separator knife
561372	Tray shaft bearing, main frame
561373	Shoulder screw, reverse segment
561374	Cycling motor mounting bolt, short
561375	Collar, tone arm brake spring
561376	Main frame turntable spindle bearing (2 required)
561413	Main shaft ball bearing and race
561414	Trip spring clip
561415	3/16" dia. thrust ball bearing, gear box and turntable spindle
561416	5/32" dia. ball bearing, tone arm support housing (17 required)
561417	Pipe plug (reduction box)
561418	1/4" dia. ball bearing, reduction box main shaft
561420	Anchor stud, reverse arm lock spring
561424	Eccentric shoulder screw
57135	Main cam (casting only)▼





Top View of Record Changer

GENERAL

This record changer is designed to operate from a power source of 105-125 volts a-c, 60 cps. It will automatically play twelve 10-inch records or ten 12-inch records at a single loading. The turntable speed is 78 rpm.

MANUAL OPERATION

1. Turn record support (4) so that its long curved surface faces the spindle.
2. Turn the hold-down finger (5) so that it slants across the corner of the record changer.
3. Twist the top of the spindle (35) so that it aligns into a smooth spindle with the lower part (3) of this assembly.
4. Place the record on the turntable and push the switch button (6) to ON position, then gently lower the pickup on the first groove of the record.
5. When the record is through playing, depress switch as indicated for reject and allow tone arm to reset on record, then gently lift tone arm (42) and place on rest position and push switch to OFF position.

AUTOMATIC OPERATION

1. Twist the top of the spindle (35) so that the top part is "off-center" and a little step appears.
2. For 10-inch records, turn the record support (4) so that its short side is towards the spindle. For 12-inch records the long, curved side should face the spindle. Keep the hold-down finger (5) turned slantwise across the corner.
3. Place the records to be played on the spindle (35). They will rest on the record support (4) and the step (36) of the spindle. Swing the hold-down finger so that it rests on the top record.
4. Start operation by moving the switch button to ON position, then push down on this button. The records will play through and then will repeat the last record until the operation is stopped. If you wish to reject a record before it has finished playing, push down on the switch plate button.
5. To stop the phonograph before or after all records are played, remove any records remaining on the record support. Depress switch button and allow tone arm to reset on record, then gently lift tone arm and return it to its rest post.
6. Push switch plate button (6) to OFF position.

OPERATION PRECAUTIONS

1. Use only unwarped records for automatic operation. For warped, odd size or home recorded records, play as for manual operation.
2. Never use force to start or stop the motor or any part of the record changing mechanism.
3. Do not store the records on the record post or on the turntable as they may warp, especially if the temperature is high.
4. Do not allow oil or grease to come in contact with the drive wheels or any other rubber part.

LUBRICATION

Use light grease (Lubriplate or equivalent) on the following:

1. Worm gear and main cam gear.
2. All cams.
3. Spindle bearing.

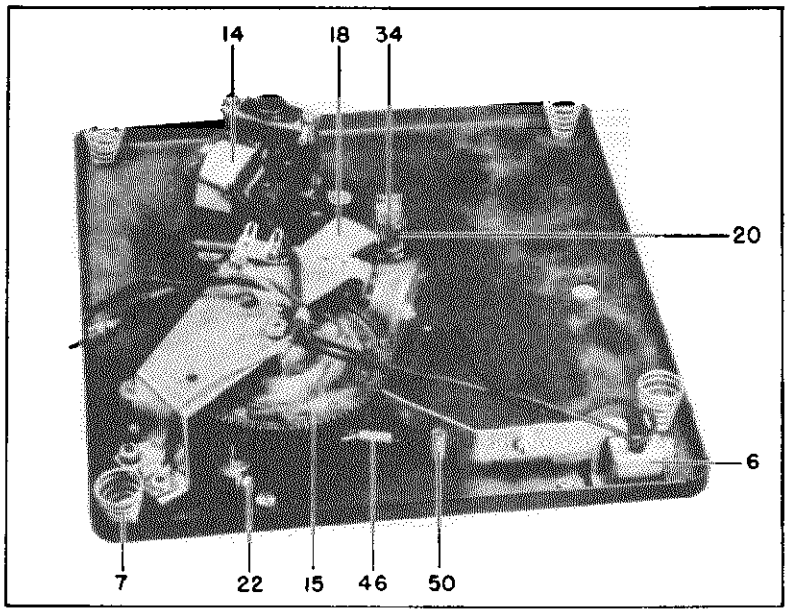
Use light machine oil on the following:

1. All shafts before insertion in bearing (replacement).

Keep oil or grease away from drive pulleys or other rubber parts.

RECORD CHANGER REPLACEMENT PARTS LIST

CAT. NO	REFERENCE	DESCRIPTION
RBH-001	14	MOTOR—Phono motor 105-125 v., 60 cycles (complete)
RHW-001		WASHER—"C" washer 9/32"
RHW-002		WASHER—"C" washer 5/16"
RMB-002	11	BEARING—Turntable ring bearing
RMF-002	5	FINGER Record stabilizer finger
RMM-012		FAN—Fan assembly (external fan motor)
RMM-014	31	BAR—Manual trip bar
RMO-001	6	SWITCH—Power switch
RMP-002	24	PIN—Tone arm lift pin
RMR-001	19	ROLLER—Feed cam roller
RMS-011	7	SPRING—Shock mounting spring
RMS-012	45	SPRING—Stop lever spring
RMS-013	46	SPRING—Trip lever spring
RMS-014	58	SPRING Pull-in spring
RMS-022	53	SPRING—Record feed spring
RMS-023	62	SPRING—Carrier lever spring
RMS-026	42	SPRING—Counterbalance spring
RMS-027	41	SPRING—Stabilizer finger spring
RMS-028	50	SPRING—Trip bar spring
RMS-045		SPRING—Motor idler wheel spring (external fan motor)
RMS-046		SPRING—Motor idler wheel spring (internal fan motor)
RMS-047		SPRING—Motor drive pinion spring (internal fan motor)
RMS-053		SPRING—Selector rod spring (assembled at end of 40)
RMT-002		TURNTABLE Turntable used with internal fan motor
RMT-006		TURNTABLE—Turntable used with external fan motor
RMW-019	9	WHEEL—Idler wheel (external fan motor)
RMW-020	9	WHEEL—Idler wheel (internal fan motor)
RMX-002	16	DRIVE—Flexible drive shaft
RMX-023	3	SPINDLE—Turntable spindle assembly
RMX-024	36	ECCENTRIC—Spindle eccentric assembly
RMX-025	35	CAP Spindle cap assembly
RMX-026		ASSEMBLY—Thrust bearing assembly
RMX-027	20	PINION—Pinion gear assembly
RMX-031	17	GEAR—Worm gear assembly
RMX-032	10	WHEEL—Drive wheel assembly
RMX-035		ASSEMBLY—Feed sector assembly (cam gear end of feed arm)
RMX-043	15	CAM—Cam gear assembly
RMX-048		ROD—Stabilizer finger rod assembly
RMX-050	16, 17	DRIVE Drive assembly (with vibration damper)
RMX-051	40	ROD—Selector rod assembly
RMX-053	25	LEVER—Stop lever assembly
RMX-054	21	LEVER—Sweep lever assembly
RMX-057	12	LEVER—Carrier-trip lever assembly
RPX-010		PICKUP—Magnetic pickup
RPX-016	1	TONE ARM—Tone arm assembly (less pickup)



Bottom View

PICKUP

A special General Electric magnetic pickup is used in this changer which will give superior results from the standpoint of high fidelity, low surface noise, and negligible record wear. This pickup is not replaceable with a crystal pickup as the ratio of output voltage levels of the two types is at least 70 to 1, the pickup supplied having an extremely low output.

The pickup is supplied with a semipermanent-type stylus. Dust and foreign matter should be removed from the stylus assembly at regular intervals with a soft brush. Make sure the stylus arm is centered between the stops. This clearance should be 9 to 11 mils on each side.

CYCLE OF OPERATION

INITIATING THE CHANGE CYCLE—Pushing the *control button* (6) forward turns the power ON and starts the turntable rotating. Automatic cycling may be started by depressing the button (6). This movement pivots the *trip bar* (31), causing engagement with the *carrier lever* and its attached *drive wheel* (10). This *drive wheel* (10) contacts the rim of the turntable and rotates with it. This motion is transmitted through the *flexible coupling* (16) to the *worm drive* (17), which in turn drives the *main cam* (15).

CYCLING—A single revolution of the *main cam* (15) results in a complete automatic cycling of the changer. This includes selection of a record from the stack, lifting the *tone arm* (1) from its rest position and setting the needle in the first groove of the record. Near the completion of the revolution, the automatic *trip cam* (13) which has the *block* (65) on the *trip lever* (12) riding on its outer surface, drops into a depression on the *trip cam* (13) which causes the *carrier lever* to return to its original position so that the *drive wheel* (10) will disengage with the turntable rim.

RECORD FEED—The outer surface of the *main cam* (15) controls the record selection. Motion of the *feed cam roller* (19) about the cam groove causes the *feed sector lever* (18) which is engaged with the *record feed pinion* (20), to turn the *eccentric* (35) to the proper position for a record selection and to then return, allowing the record to drop over the *spindle* (3).

PICK-UP ARM MOVEMENT—The inner surface of the *main cam* (15) controls the *pick-up arm* movement. The tone arm is lifted by the motion of the *lift pin* (24) as it contacts the outer vertical edge of the cam as the latter rotates. The direction of swing of the tone arm is controlled by the engagement of the *main cam* (15) with the *sweep lever pinion* (29). The *sweep lever* (21) connects directly to the *tone arm* (1) by means of a *clamp* (22) around the pick-up arm *pivot sleeve* (23). A boss projecting from the upper side of the *main cam* (15) displaces the *stop lever* (25) at the end of the change cycle, thus permitting the tone arm to proceed across the record.

POSITIVE TRIP ACTION—As the tone arm runs in the inner groove of the record after the playing of that record, the *sweep lever* (21) hits the *positive trip screw* (28) mounted on the *trip lever* (12). This action re-engages the *drive wheel* (10) with the rim of the turntable and starts a new cycle.

10-INCH OR 12-INCH OPERATION—Setting the *record support shelf* (4) to the 10-inch or 12-inch position lowers the selector rod (40) a definite amount. The raising and lowering of this rod determines whether the *stop lever* (25) positions against the *rod* (40) or the *cap* at the top of the rod. This regulation of the distance that the *sweep lever* (21) will travel determines whether the tone arm which is attached to the *sweep lever* (21) will lower on the first groove of a 10-inch or 12-inch record.

SERVICE ADJUSTMENTS

The turntable is driven by means of a friction *idler wheel* (9). The driving power is transferred from the motor *bushing* (2) to the *drive wheel* (9) and then to the rim of the turntable. It is important, therefore, that the *motor bushing* (2) and the *idler wheel* (9) be kept clean of grease, oil, dirt, or any foreign matter. Any quick drying solvent like naphtha is satisfactory for cleaning these parts.

A. *Tone Arm Drop-point*

The point at which the stylus of the tone arm drops on the record is adjusted by loosening slightly the *sweep lever clamp* (22) and repositioning the *tone arm* (1) with respect to the *sweep lever* (21) sufficiently so that the proper landing point is obtained. The stylus should land approximately ⅛-inch in from the edge of the record when properly adjusted. When the landing adjustment has been made for 10-inch records, the landing will be correct for the 12-inch records.

B. *Position of Record Support (4)*

The angle through which the record support rotates when changing from its 10-inch to its 12-inch position, and the position of its edge with respect to the records it supports when in either of its two positions may be adjusted by means of the two positioning screws "A" and "B," see Figure 1. Screw "A" adjusts the 12-inch position; screw "B" adjusts the 10-inch position.

The position of the record support for either 10-inch or 12-inch records is correct when the support is symmetrical with respect to the records being supported (so that the record will drop from both corners of the support simultaneously).

C. *Positive Trip*

The time at which the changer starts to cycle is adjustable by turning the positive trip screw (28). Turn the screw clockwise to delay tripping or cycling of the mechanism and counterclockwise to trip earlier in the playing cycle. The

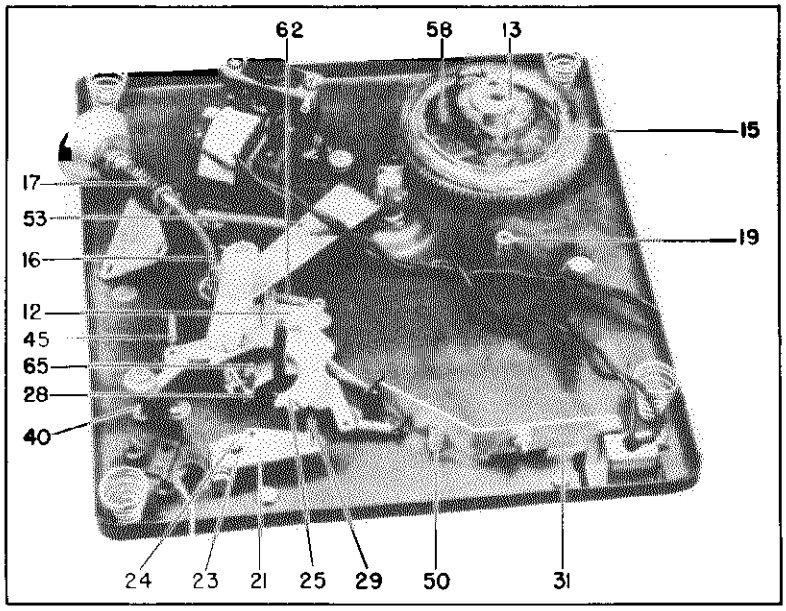


Fig. 3. Bottom View (Cam Removed)

screw should be adjusted so that the changer trips when the needle is 3 1/8 inches in from the edge of a 10-inch record. This adjustment is rather critical and should be made accurately.

D. Alignment of Eccentric (36)

The alignment of the eccentric (36) is accomplished by loosening the clamping screw on the *feed pinion* (20), shifting the position of the eccentric so that it is aligned with the spindle (3) and retightening the clamping screw.

The position of the eccentric is correct if it is aligned with the spindle when the mechanism is not in a change cycle.

E. Alignment of Spindle Cap (35)

The alignment of the spindle cap (35) is accomplished by loosening the two setscrews holding the *cap index cam* (34) in place, rotating the *cap index cam* until the *spindle cap* (35) is aligned with the spindle (3). Tighten the two setscrews.

TROUBLE SHOOTING CHART

SYMPTOMS	REMEDIES OR CAUSES
RECORD SELECTION	
1. Records drop unevenly from record support.	1. (a) Check adjustment B.
2. Records do not slip on or off the spindle smoothly.	2. (a) Check adjustment D. (b) Check adjustment E.
3. Records fail to drop.	3. (a) Check adjustment D. (b) Check adjustment B.
4. Records drop more than one at a time.	4. (a) Check adjustment E. (b) Check center hole in records—probably too large.
5. Records fail to stay on spindle cap when loading.	5. (a) Check adjustment E.
TONE ARM MOVEMENT	
1. Needle lands incorrectly.	1. (a) Check adjustment A.
2. Needle fails to feed in after landing.	2. (a) Check *pull-in spring* (58)—probably too weak.
3. Needle lands properly on record but slides in on record.	3. (a) Check for broken stylus in pickup. (b) Pull-in spring (58) too strong.
TRIPPING-CYCLING	
1. Changer fails to trip.	1. (a) Check adjustment C.
2. Changer trips too soon.	2. (a) Check adjustment C. (b) Check record—may be eccentric.
3. Changer trips continuously.	3. (a) *Trip lever spring* (46) too weak. (b) *Trip block* (65) on trip lever turned out of line or catching edge worn. (c) Disengaging *cam* (13) worn. (d) *Carrier lever spring* (62) too strong.
4. Changer trips but fails to change—turntable continues to turn.	4. (a) *Carrier lever spring* (62) too weak. (b) Grease on drive wheel or turntable rim.
MOTOR	
1. Changer is sluggish or motor overheats.	1. (a) Check lubrication—oil old or gummy. (b) Incorrect line voltage. (c) Defective motor winding. (d) Check binding of worm on main cam.
2. Motor rumble heard in record reproduction.	2. (a) Shipping bolts not removed from motor board.

Record Changer B-27-RC: for Motorola 1946 Home Set Models 55F11, 65F11 & 12, 65F21, 75F31 and 85F21 (dark brown paint finish).

Record Changer B-28-RC & phono oscillator chassis HS-18: for Motorola 1946 Wireless Record Players, Models WR6, WR7 & WR8. (Same as B-27-RC except for the power switch and addition of phono oscillator chassis HS-18).

Record Changer B-29-RC: for Motorola 1946 Home Set Models 95F31 & 95F31B (same as B-27-RC except light brown paint finish).

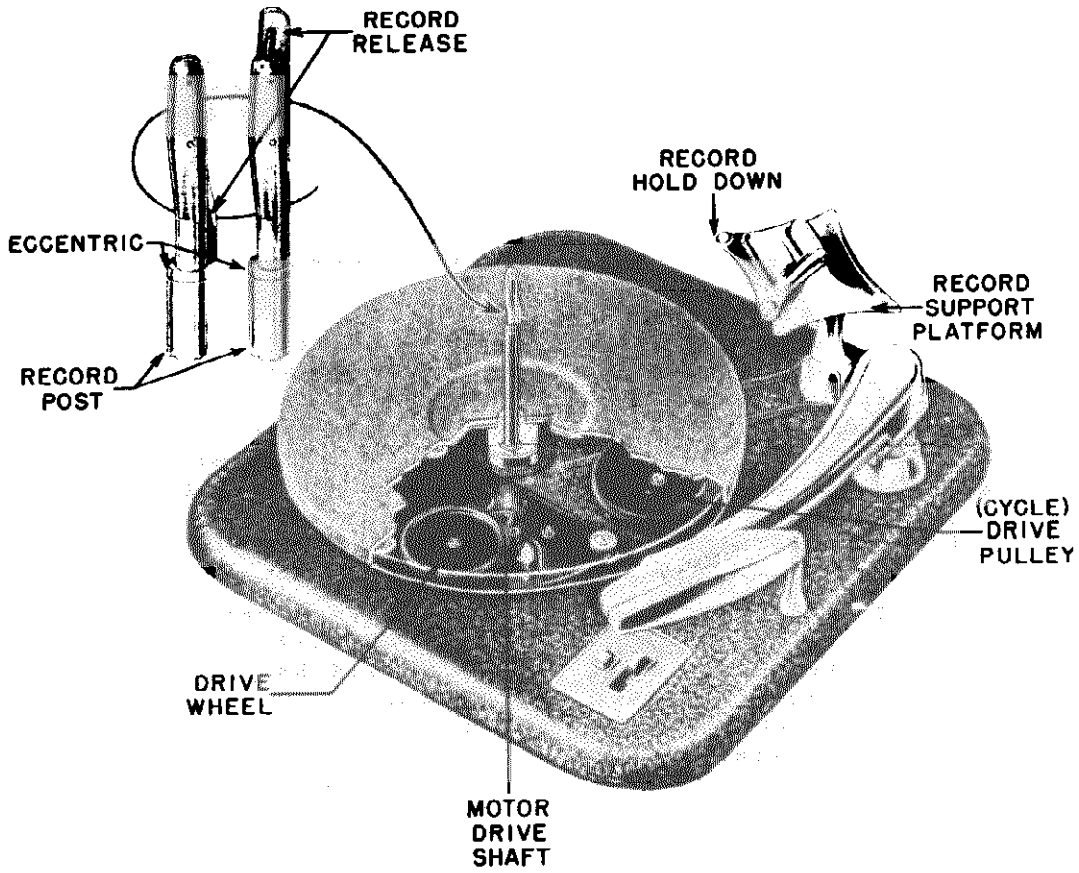


FIGURE 1 TOP VIEW OF RECORD CHANGER

Record Changers B-27-RC and B-28-RC are the revised and improved versions of Record Changers B-24-RC and B-25-RC, respectively. Fundamentally, the changer is the same, that is, it operates on the same general principle but numerous revisions in manufacturing methods, types of material, finishes, etc., have been made.

The revised record changers can be distinguished from the original changers by the new model number which is stamped on the bottom of each revised record changer base. From the top, the B-27-RC, B-28-RC and B-29-RC Record Changers can be easily identified by the large adjustment nut at the base of the record support platform.

For your guidance, we are listing the revisions that were incorporated in the changers. These may be found on page Record changers B-24-RC and B-25-RC may be revised to include some or all of the revisions by following the detailed information given on page

MODELS B-27-RC, B-28-RC, B-29-RC, B-31-RC — MOTOROLA INC. — MODELS B-32-RC, B-33-RC

IMPORTANT POINTS TO REMEMBER WHEN SERVICING RECORD CHANGERS

WARNING: Do not lift record changer by record post or record support platform! Always lift the changer by its base only.

IMPORTANT: Final adjustments on record changer are to be made with the changer horizontal and supported on springs by its 4 corners. AVOID DISTORTING THE BASE WHEN MAKING FINAL ADJUSTMENTS. Placing a mirror below the changer would permit the service man to make observations and adjustments without getting into awkward positions.

CHECK THE RECORD FIRST

Before attempting to service or adjust the record changer, check the records first to make sure they are not causing the trouble. This instrument will handle most of the 10 or 12 inch records available on the market, but it is not guaranteed to handle all of them. Records must be in good mechanical condition and should not be chipped, particularly around the center hole. Do not try to play automatically, records that are too thick, too thin, or that are oversized or undersized, in regard to the diameter of record or centerhole. Do not mix 10 and 12 inch records on the changer.

Warped records can slip on the turntable and introduce "WOWS". Such records may be flattened by placing between two pieces of flat plate glass and then heating in the sun or oven. Do not overheat. Allow record to cool for several hours before removing glass.

Old records made before the days of automatic record changers may not change automatically, due to the difference in thickness, or to lack of the proper eccentric groove at the finish. Most of the old records, however, may be played one at a time.

RECORD CHANGER OPERATION

SUMMARY OF OPERATION INSTRUCTIONS

As many as 10 ten-inch or 8 twelve-inch records may be loaded and played automatically on this record changer at one time.

Set the record support for the size records to be used and place records on spindle. Records will be supported above turntable by the small ledge formed by the off-set in the spindle and the record support platform. Steady the stack with the record hold-down plate.

The left hand button will start the motor. Momentarily, push the right hand button to the reject position to start the cycle. Last record will be repeated until the machine is stopped. Lift up the pick-up arm only while it is resting on the record.

To play records manually, push right hand button to MANUAL position and load records one at a time. When loading, hold the record at a slight angle so that the edge is under the lip of the record support. The record support should be turned to the 12" position to allow more room for loading and unloading records.

The wireless record players have a 3 position power switch (Record Changer B-28-RC); the switch is marked "OFF-TUBES ON - MOTOR ON" In the center (TUBES ON) position the tubes are on but the turntable does not revolve; this position is used when changing records. In the "MOTOR ON" position, the tubes are on and the turntable revolves. To turn player completely off, it is necessary to push the switch to the "OFF" position.

The wireless record players are set to 1560 KC at the factory. It is necessary to tune your radio to this frequency before record can be heard.

If the radio is a push-button type, it is desirable to set one button for the wireless record player.

TO CHANGE FREQUENCY

NOTE: The 1560 KC position was selected as a good average setting for most localities. If by chance you receive a strong radio station at that frequency, you should retune the record player to some other frequency that is reasonably free from interference. The oscillator can be adjusted to any frequency between 1250 KC and 1750 KC.

Proceed as follows:

1. Turn your radio dial to some other frequency between 1250 KC and 1750 KC where there is no radio station interference.

2. While the record player is operating, carefully adjust the tuning screw until you can hear the recorded music through your radio. The tuning adjustment may be reached by removing a plug button on top of the unit. Its exact location is shown in Figure 2. To lower frequency, turn screw clockwise; turn screw counterclockwise to increase frequency.

When the tubes are renewed or if music is distorted, reset the oscillator adjustment under the chassis, as follows:

1. Let the instrument overhang the edge of a table or console so the control is accessible from below. See Figure 2 for location.

2. Turn the oscillator control full counterclockwise.

3. Start the record player and tune in the record on the radio.

4. Push left hand switch to center position; turntable will stop revolving.

5. Turn the control full clockwise - carrier should disappear.

6. Very slowly turn the control back in a counterclockwise direction until a "plop" is heard in the radio speaker.

7. The control should remain in the position where the "plop" appears.

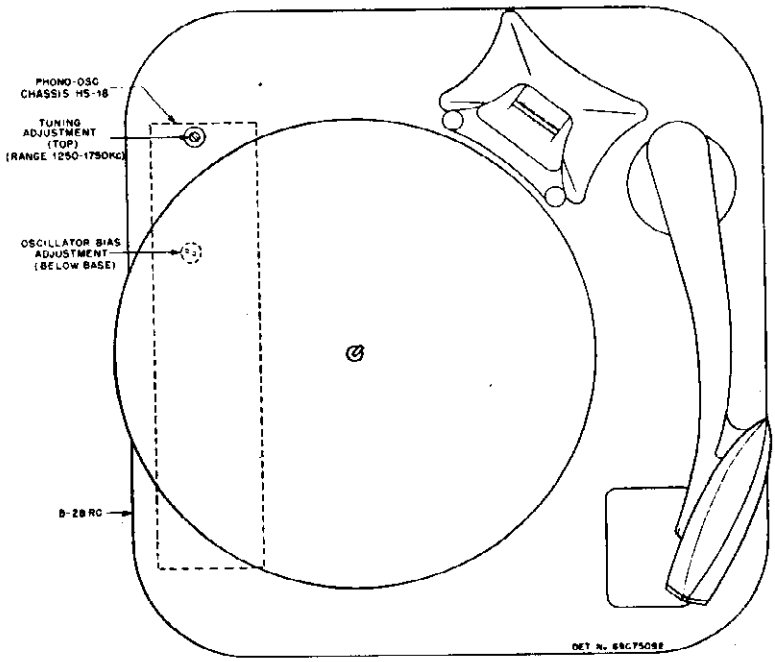


FIGURE 2. OSCILLATOR ADJUSTMENTS ON WIRELESS RECORD PLAYERS

MODELS B-27-RC, B-28-RC, B-29-RC, B-31-RC, B-32-RC, B-33-RC

MOTOROLA INC.

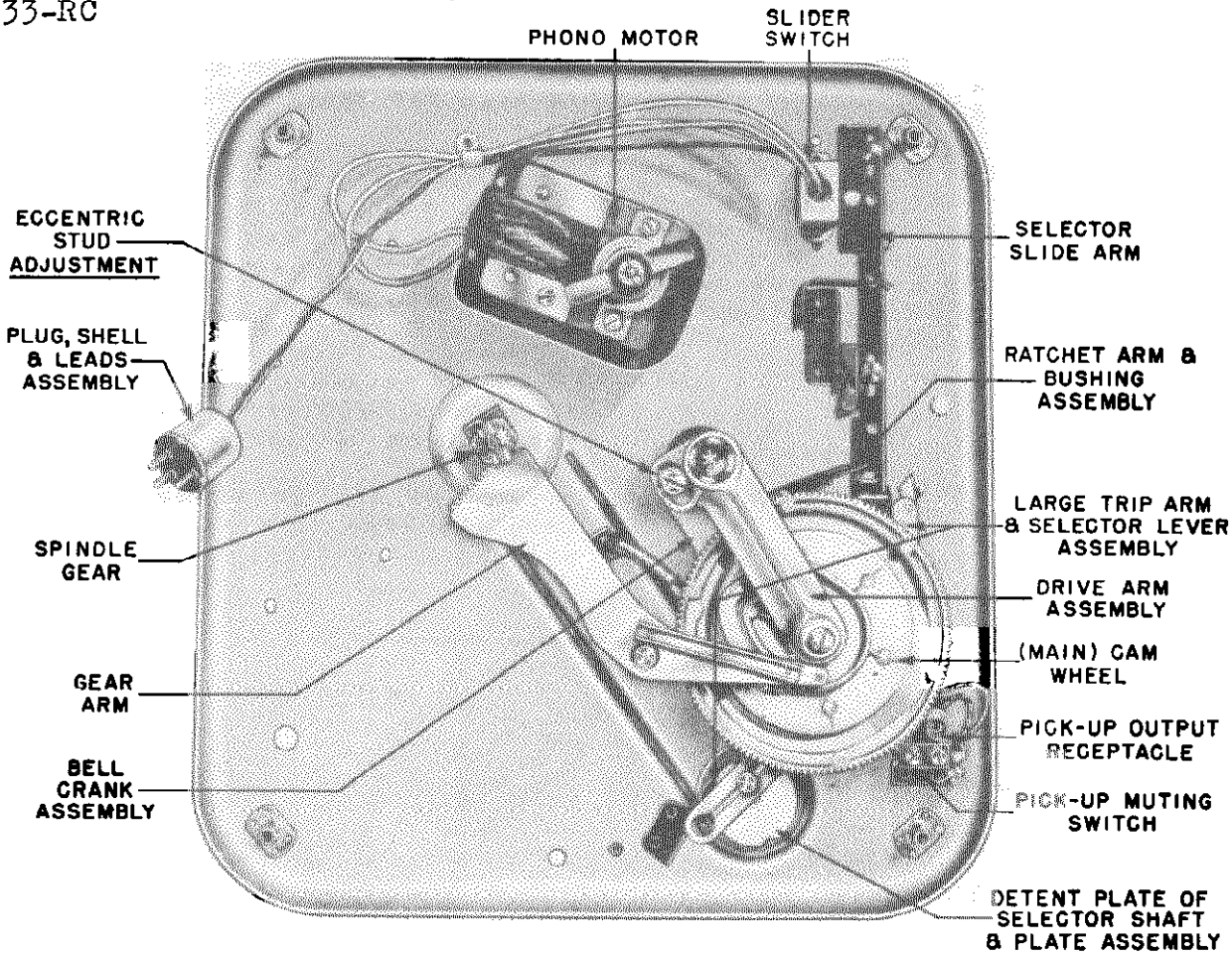


FIGURE 3. BOTTOM VIEW OF RECORD CHANGER

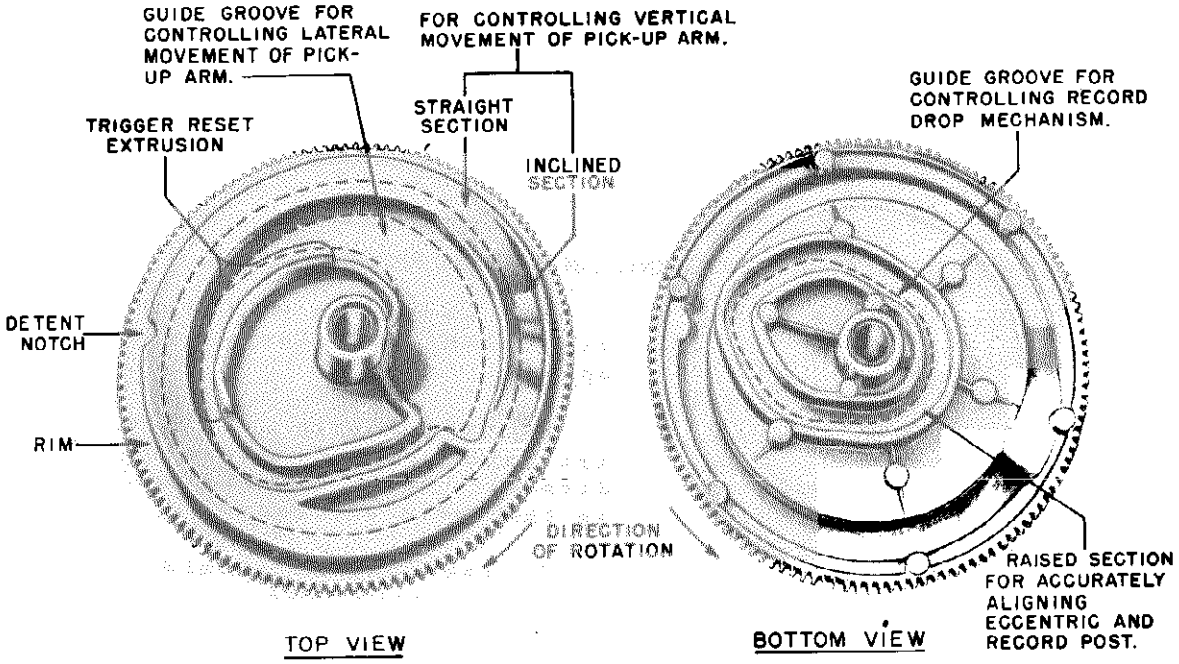


FIGURE 4. MAIN CAM WHEEL

MOTOROLA INC. MODELS B-27-RC, B-28-RC, B-29-RC, B-31-RC, B-32-RC, B-33-RC

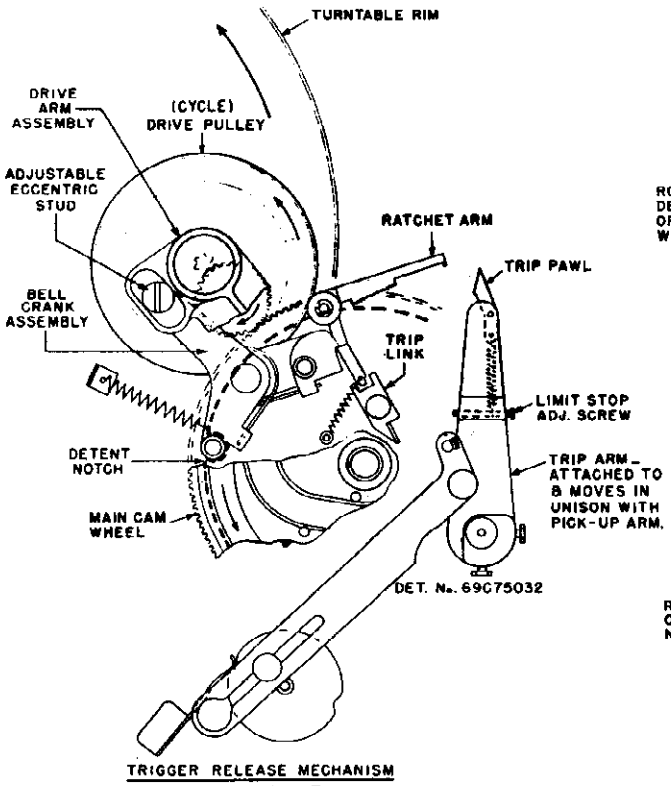
THEORY OF OPERATION

By referring to the various photographs and figures which will be found in the service manual, you can readily follow through the changing cycle from the continuity given hereafter:

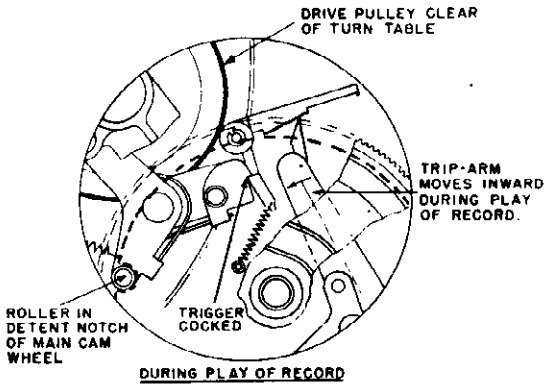
The turntable is rim driven. Power is transmitted to it from the motor shaft by means of a rubber tired drive wheel. The record spindle does not revolve; it is fixed to the record changer base.

The heart of the record changer is the main cam wheel. On it are cast all the cams, extrusions etc., required to perform all the operations during the changing cycle. See Figure 4.

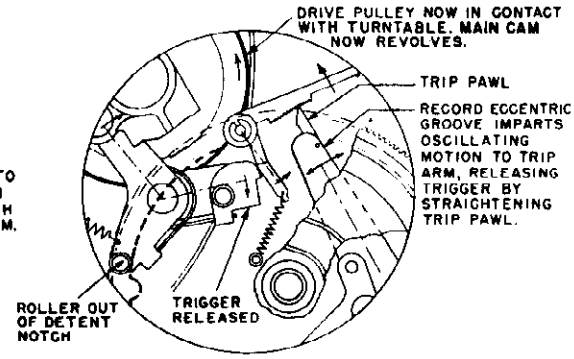
The only mechanism that operates during the playing of a record is the motor and turntable. The changing mechanism is entirely disengaged until the change cycle starts.



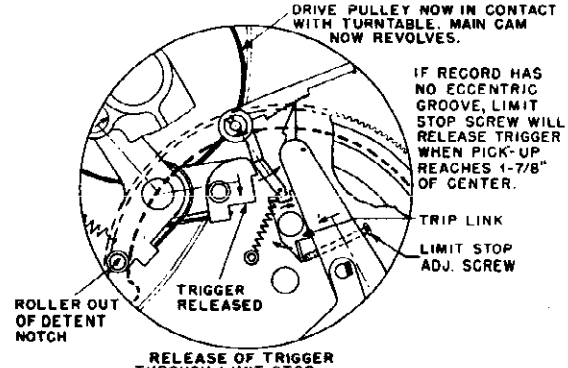
TRIGGER RELEASE MECHANISM
FIGURE 5



DURING PLAY OF RECORD
FIGURE 5A



RELEASE OF TRIGGER THROUGH PAWL & RATCHET ARM
FIGURE 5B



RELEASE OF TRIGGER THROUGH LIMIT STOP
FIGURE 5C

FIGURE 5. RELEASE OF TRIGGER AND START OF CYCLE (BOTTOM VIEW)

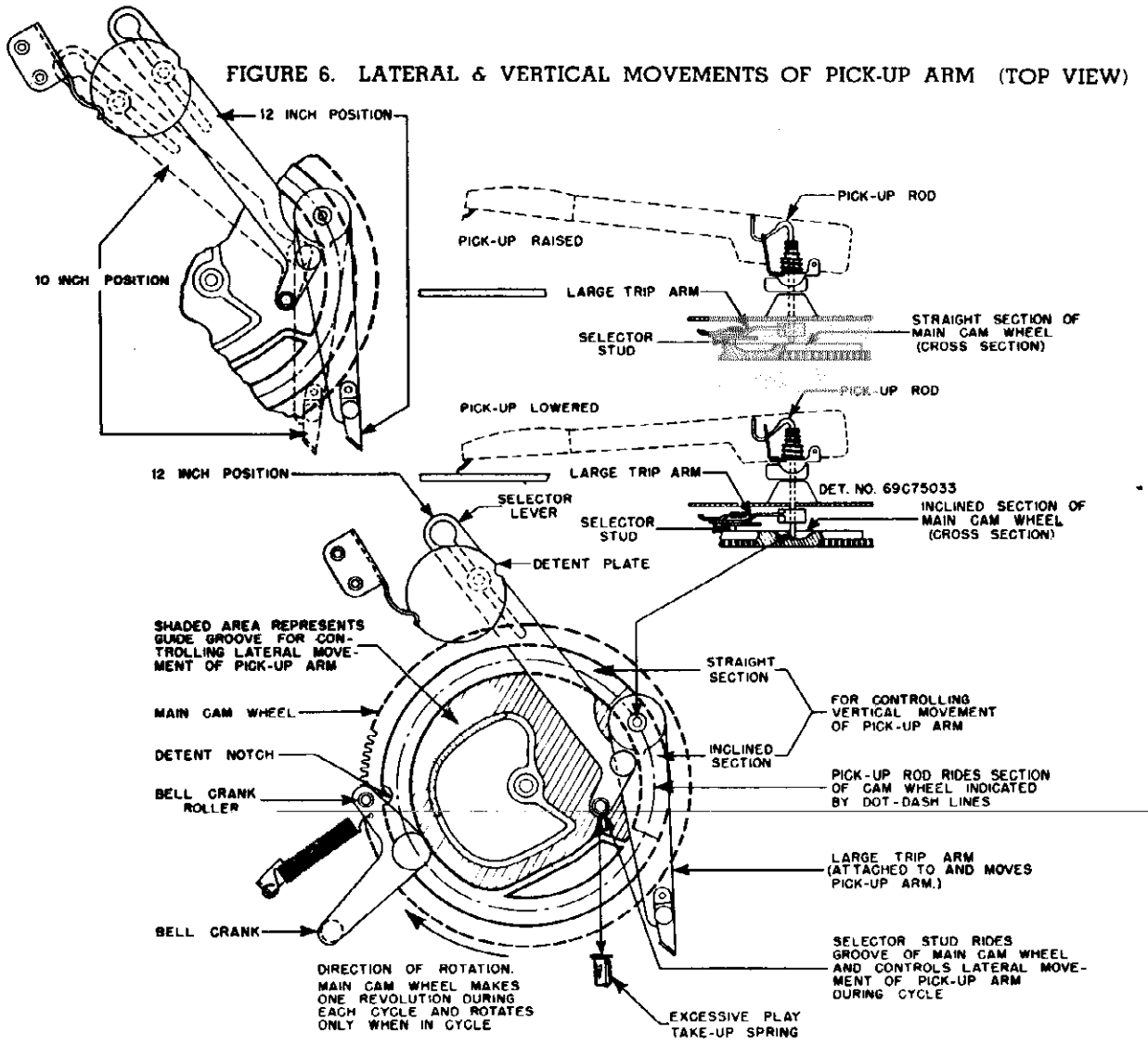
In explaining the theory of operation, let us begin from the point where the record changer is just finishing a record.

The needle in the pick-up finishes the record and enters the eccentric groove. This imparts an oscillating motion to the pick-up arm, which in turn, causes the trip pawl to release the trigger through its action against the ratchet arm. See Figures 5A & B. If the record does not have an eccentric groove, the limit stop will trip the trigger when the pick-up needle reaches a point 1-7/8" of the spindle center. See Figure 5C.

Tripping the trigger, releases the bell crank assembly, allowing its tension spring to push the cycle drive pulley up against the inside rim of the revolving turntable, starting the changing cycle. See Figures 5B & C. With the same motion of the bell crank, its roller leaves the detent notch in the rim of the main cam wheel and the main cam wheel revolves. The roller now rides on the rim of the main cam wheel and in this manner, holds the cycle drive pulley firmly against the turntable.

As the main cam wheel revolves, the pick-up rod rides out of the inclined section, raising the pick-up clear of the record. See Figure 6. After the pick-up arm is elevated, continued rotation of the main cam wheel swings the pick-up arm outward, clear off the record. The lateral movement

FIGURE 6. LATERAL & VERTICAL MOVEMENTS OF PICK-UP ARM (TOP VIEW)



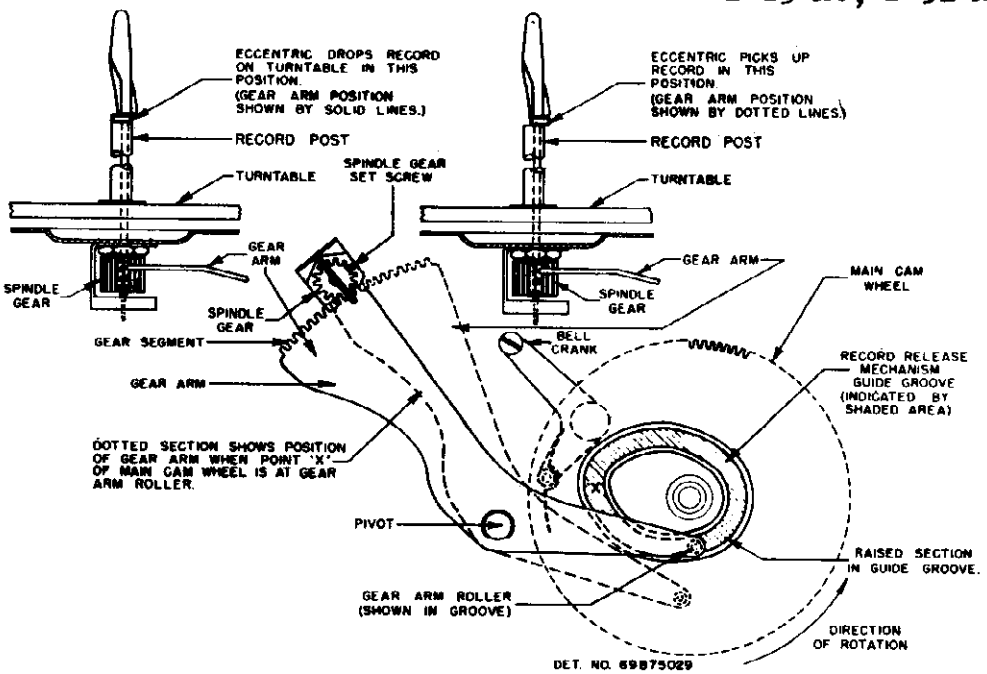


FIGURE 7. RECORD DROP MECHANISM (BOTTOM VIEW)

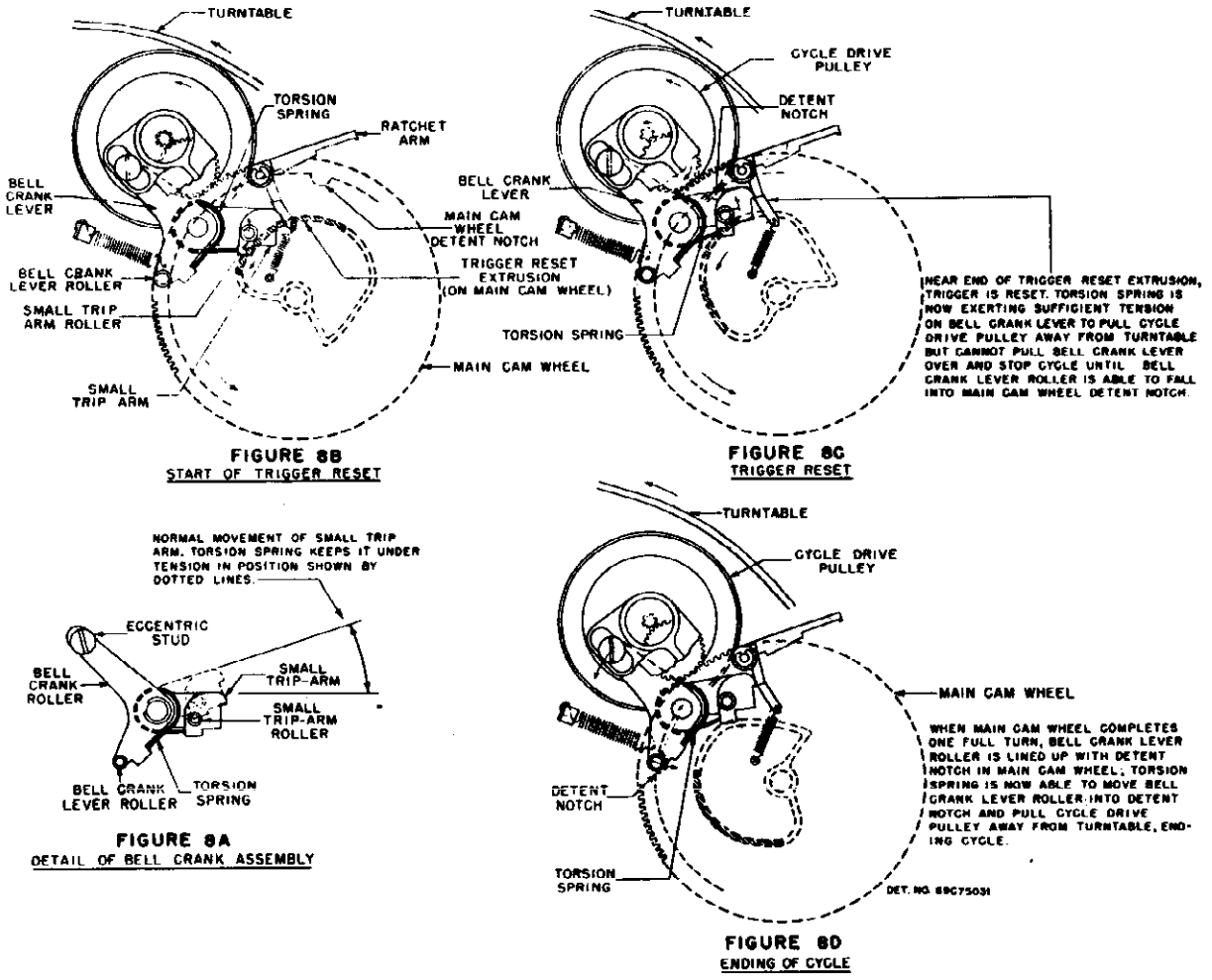


FIGURE 8. TRIGGER RESET AND CYCLE STOPPING MECHANISM (BOTTOM VIEW)

of the pick-up arm is controlled by the selector stud which rides in a specially shaped groove in the main cam wheel See Figure 6.

At the same time the pick-up arm was being lifted and swung clear, the record release cam was rotated through 180° by the gear segment arm to pick up a record and then back to its normal position in line with the record on the turntable. The movement of the segment gear is controlled by the specially shaped groove on the bottom of the main cam wheel. See Figure 7.

Continued rotation of the main cam wheel swings the pick-up arm (by the action of the selector stud riding in the top groove of the main cam wheel) back over the first groove in the record and the arm is gently lowered on to the record when the inclined section of the main cam wheel reaches the pick-up rod. See Figure 6.

As the main cam wheel approaches the full 360 degree point of its rotation the reset extrusion pushes against the trigger reset stud of the small trip arm, causing the trigger to be "cocked" ready for the next cycle, and in the same motion applies spring tension through the torsion spring to the bell crank lever so that when the main cam wheel detent notch reaches the bell crank lever roller, the roller falls into it, pulling the cycle drive pulley away from the turntable, causing the main cam wheel to stop, thus ending the cycle. See Figure 8.

A shorting switch, operated by the straight and inclined sections of the main cam wheel, shorts the pick-up cartridge whenever the record changer is in cycle. This keeps all unwanted noises from reaching the speaker.

Turning the record support post to accommodate the size record being used, automatically sets the mechanism so the pick-up needle will come down in the middle of the blank area between the outer edge and the first groove of the record. Turning the record post, positions the large trip arm so that the attached pick-up arm will swing out farther for 12 inch records and closer in for 10 inch records. See Figure 6.

The right hand button controls a three position mechanical switch. Through it it is possible to start the changing cycle at any time regardless of whether or not the record has been completely played. By this means a record can be rejected. This lever can also be pushed into the manual position at any time without damage to the mechanism. Figure 9 shows the mechanics behind the switch.

A self-centering cam device built into the base of the pick-up arm prevents damage to the mechanism, should the arm be accidentally touched while the instrument is in a changing cycle. Should you accidentally move it out of adjustment, the self-centering device will automatically return the arm to the proper position.

PHONOGRAPH NEEDLE

The changer is equipped with a permanent point (sapphire or precious metal) long-life needle that is good for several thousand plays, unless damaged by dropping or mishandling. For best results use Motorola phonograph needles; they have been especially designed for use in these changers.

To replace phonograph needle, it is only necessary to loosen the small set screw that holds the needle in place. The set-screw is accessible through a small hole in the front of the pick-up arm; use a small screwdriver to avoid damaging the crystal cartridge or pick-up arm.

MODELS B-32-RC, B-33-RC MOTOROLA INC. MODELS B-27-RC, B-28-RC B-29-RC, B-31-RC

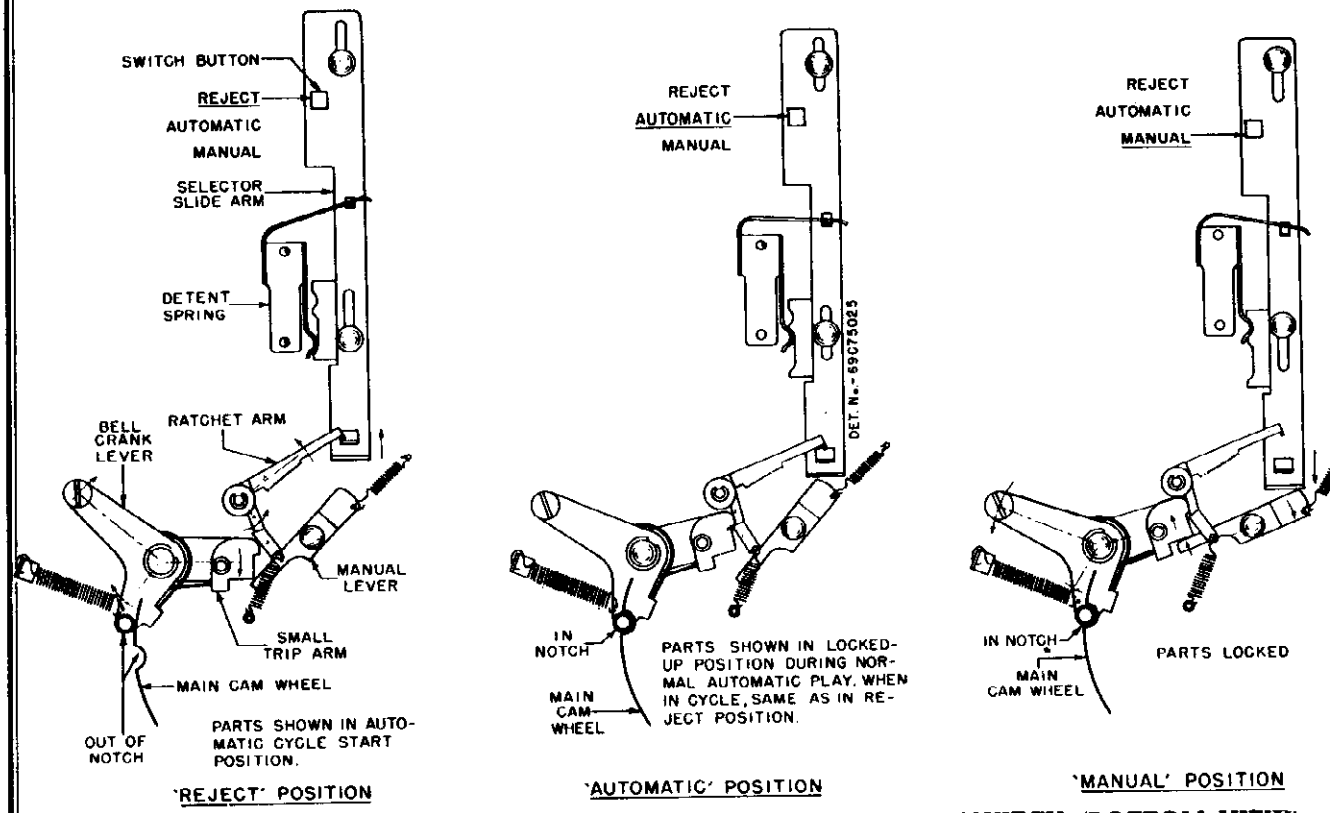


FIGURE 9. MECHANICS BEHIND REJECT-AUTOMATIC-MANUAL SWITCH (BOTTOM VIEW)

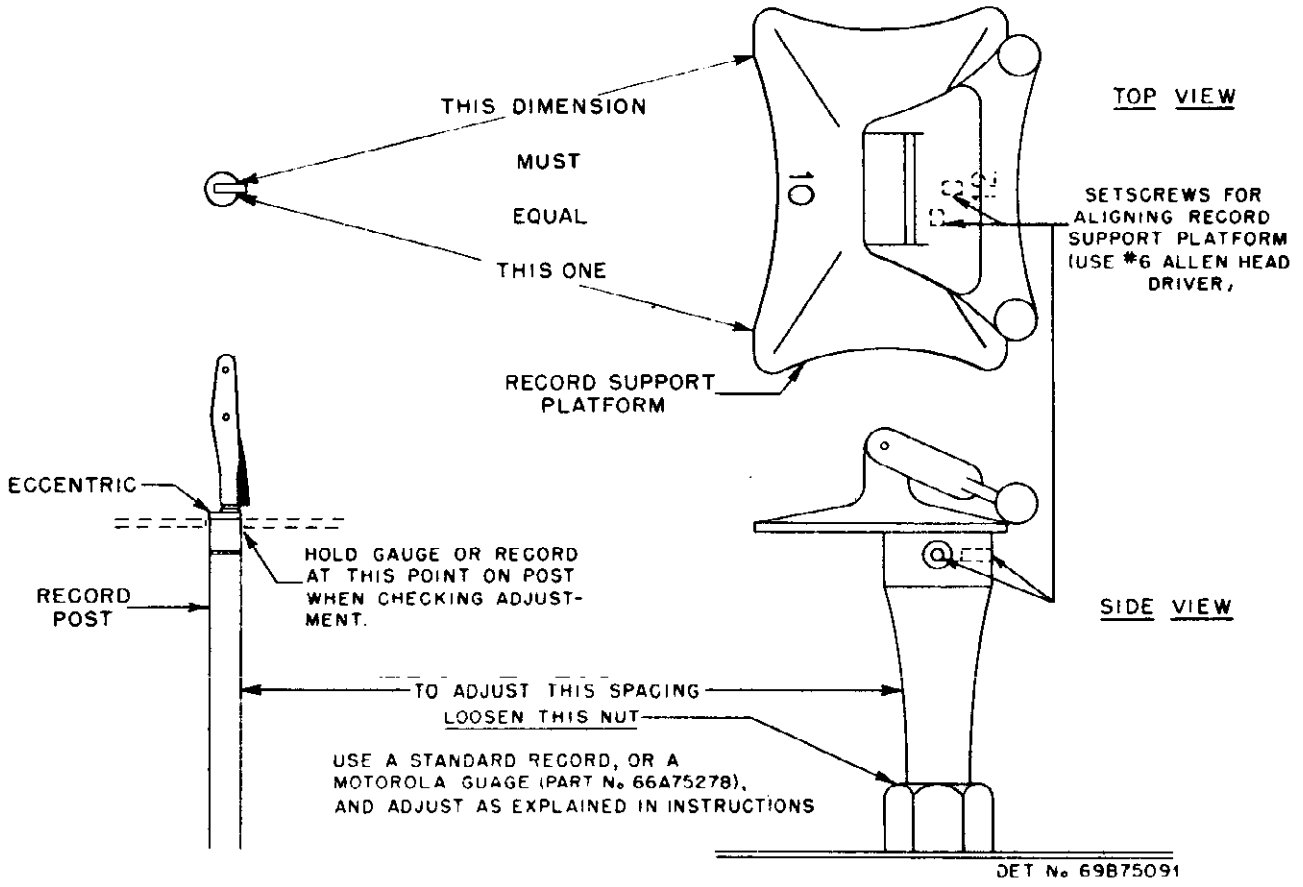


FIGURE 10. RECORD SUPPORT PLATFORM ADJUSTMENT DETAIL

MODELS B-27-RC, B-28-RC, B-29-RC, B-31-RC MOTOROLA INC. MODELS B-32-RC, B-33-RC

ROUTINE CHECKS AND ADJUSTMENTS

LINING UP THE RECORD SUPPORT PLATFORM

It is important that all points on the "lip" of the record support platform be equi-distant from the center point of the spindle. This will assure that all points of the record will leave the platform at the same time. If the record support is too far out of alignment, the record would actually hang on the point nearest the spindle and fail to drop properly. See Figure 10. The record support platform must also be spaced properly from the record post.

TO CHECK ADJUSTMENT OF RECORD SUPPORT PLATFORM

1. Turn the record support platform to the ten-inch position, making sure it is turned so that the selector lever falls into the detent notch.

2. Slip a ten-inch record over the record post and cycle the changer once to allow the record to drop on the turntable, then stop the changer.

3. Lift the record so it is in line with the top of record post (not eccentric) as shown in Figure 10. The record should clear the lip of the record support platform equally at all points and the gap between the record and record support platform should be just large enough to let the record clear the platform.

NOTE: The 10" record used should have a diameter of 9-7/8" ± 1/64.

TO ADJUST RECORD SUPPORT PLATFORM

1. If one point of the record support platform is nearer the record than the other, the position of the platform may be adjusted after loosening the two allen head set screws located directly under the record support platform. Use a #6 allen head driver (Motorola part number 66X10704).

2. The spacing between the record post and the record support platform can be varied by loosening the large hex nut at the base of the record support base (see Figure 10) and moving the platform, as required. The spacing should be such that the record, when held as shown in Figure 10, will just clear the platform.

NOTE: A "standard gauge" (Motorola part number 66A75278) can be used in place of a record when adjusting the platform.

3. TEST: After tightening the set screws, test the adjustment by running a ten-inch record through a complete cycle and check the point where the needle falls. If the needle misses the record by one inch, the record support platform is 180 degrees out of line with the detent plate and should be turned one-half turn without turning the detent plate.

ADJUSTMENT OF RECORD DROP MECHANISM

For minimum wear around the center hold of records and proper automatic dropping of records, it is important that the record release eccentric and record post line up perfectly at the end of each change cycle.

TO CHECK ADJUSTMENT OF RECORD DROP MECHANISM

1. Cycle the record changer once, by pulling the reject button.

2. At the end of the cycle, stop changer and carefully observe the position of the eccentric with respect to the record post. It should line up perfectly with the record post.

3. If at the end of a cycle the eccentric does not line up perfectly with the record post, re-adjust as described below.

TO ADJUST THE RECORD DROP MECHANISM

1. Pull the reject button and slowly revolve the turntable by hand until the gear arm roller is resting on the raised section of the record guide groove. See

Figure 7 for its location. The raised section of the groove is very small and resembles what is often taken for flash on castings. It serves to narrow down the guide groove at this point and in this manner insures closer alignment of eccentric and record post.

2. Loosen the slab head set screw in the spindle gear. The eccentric will now turn freely. See Figure 7.

3. Turn the eccentric so it is in perfect alignment with the record post.

4. Tighten slab head set screw in spindle gear. WARNING: Do not use excessive pressure when tightening slab head set screw. Excessive pressure may dent the eccentric tube and cause binding.

PICK-UP ARM LATERAL ADJUSTMENT

The lateral adjustment positions the pick-up arm so the needle will come down on the record at a point midway between the edge and the first groove of the record.

TO CHECK LATERAL ADJUSTMENT OF PICK-UP ARM

1. Turn the record support to the twelve-inch position.

2. Place a standard twelve-inch record on the turntable.

3. Start the changer and allow it to go through its cycle.

4. Note the point at which the needle contacts record. It should contact the record in the middle of the area between the first groove and the edge of the record.

5. If the needle doesn't come down at the proper point, adjust as described below.

TO MAKE LATERAL ADJUSTMENT OF PICK-UP ARM

1. Place a full stack (eight) of twelve-inch records on the turntable.

2. IMPORTANT: It is imperative to make the lateral adjustment while the selector stud is still riding in the groove of the main

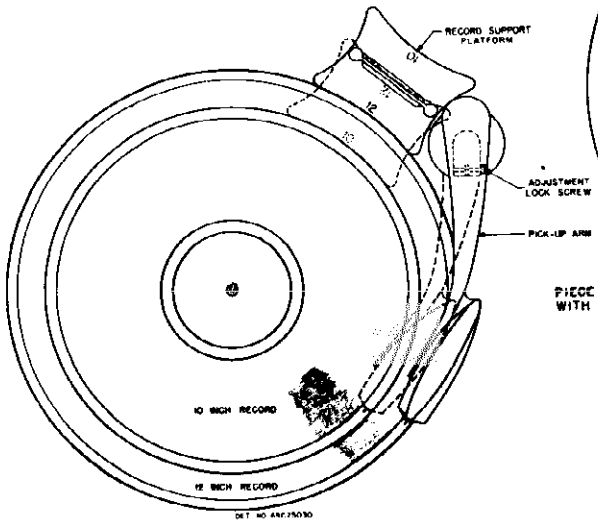


FIGURE 11. PICK-UP ARM LATERAL ADJUSTMENT DETAIL

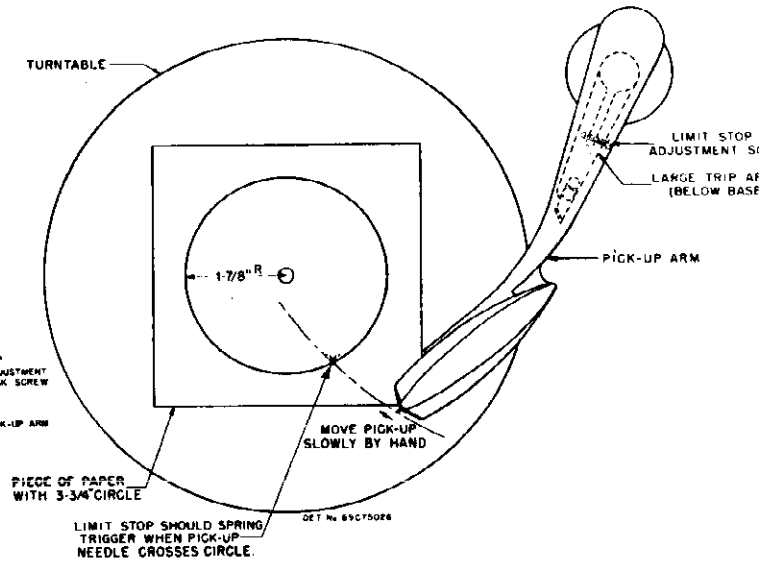


FIGURE 12. LIMIT STOP ADJUSTMENT DETAIL

cam wheel. See Figure 6. If the record player is stopped just before the needle contacts the top record of a full stack of records, the selector stud will still be in the main cam wheel groove and the pick-up arm will not be free to move annoyingly about while the lateral adjustment is being made. This is the reason for using a full stack of records on the turntable. If any pick-up arm side play is noted at this point, it should be eliminated by slightly spreading the play take-up spring on the selector stud. See Figure 6. Excessive play between the selector stud and main cam wheel groove will prevent needle from coming down at exactly the same spot on the record each time.

3. With a screw driver, loosen the adjustment lockscrew (see Figure 11) and then move the pick-up arm until phono needle is positioned correctly over the middle of the area between the edge and the first groove in the record.

NOTE: The lateral adjustment screw was omitted from B-27-RC and B-28-RC record changers after the first production run. It is suggested that the service man remove the lateral adjustment screws from changers he services; this will simplify adjustment.

4. After adjustment, tighten the adjustment lockscrew.

5. Check the adjustment by putting the changer through its cycle.

6. If further adjustment is required, repeat above steps 1 through 5.

7. Remove the twelve inch records and place a ten inch record on the turntable.

8. Turn the record support to the ten-inch position and cycle the changer. The needle should come down into the area between the first groove and the edge of the ten-inch record. If necessary, make minor compromise adjustments so needle will come down properly on both ten and twelve-inch records.

ADJUSTMENT OF THE LIMIT STOP

The limit stop mechanism permits the record changer to operate even though the record may not have an eccentric groove or if the eccentric groove is too close to the center hole.

Before checking or making adjustment on the limit stop, make sure the lateral adjustment is O.K.

TO CHECK LIMIT STOP ADJUSTMENT

1. Scribe a 3-3/4" diameter circle on a piece of stiff paper. Cut out a 1/4" hole at the center of the circle and slip the paper over the record post of the record player. See Figure 12.

2. Set up the record changer for twelve-inch records.

3. Turn on the record player, momentarily push the button to the reject position and allow the changer to complete one cycle. Stop the changer; the pick-up arm should now move freely.

4. Grasp the pick-up arm and slowly move it towards the record post. As the pick-up needle crosses the scribed circle line the trigger should be heard to "click over".

5. Should the trigger mechanism be actuated before or after crossing the scribed line, readjust as described below.

TO ADJUST THE LIMIT STOP

1. Move the pick-up arm to its resting post.

2. Reset the trigger mechanism by moving the button momentarily to the MANUAL position and then back to AUTOMATIC (center position).

3. With a screwdriver, adjust the limit stop adjustment screw.

which is located on the trip arm. See Figure 12. Turn the screw clockwise if the trigger is tripped after the needle crosses the scribed line, and counter-clockwise if it trips too soon.

4. Check adjustment by moving the arm manually across the scribed line.

5. If the adjustment is still not correct, repeat above steps 1, 2, 3, 4 and 5 until it is correct.

VERTICAL ADJUSTMENT OF PICK-UP ARM

This adjustment assures that:

1. The pick-up arm rests properly on the first record.

2. The pick-up arm will clear a full stack of records (10 ten-inch or 8 twelve-inch) on the turntable, during the changing cycle.

3. There will be sufficient clearance between the top of the pick-up arm and a record in position on the record support, during the changing cycle.

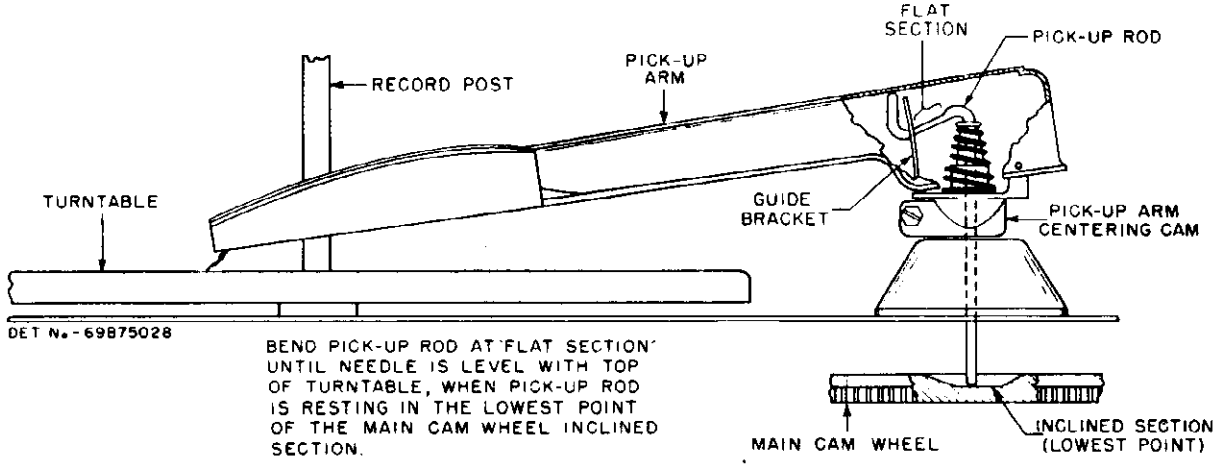


FIGURE 13. PICK-UP ARM VERTICAL ADJUSTMENT DETAIL

4. There will be sufficient clearance between the pick-up arm and the pick-up resting post during the changing cycle.

TO CHECK VERTICAL ADJUSTMENT OF PICK-UP ARM

1. Turn the record support to the twelve-inch record position and cycle the record changer. As soon as the changing cycle is complete, turn off the changer by means of the left hand button. The pick-up arm should now be resting alongside the turntable. Correct adjustment is indicated if the pick-up needle is exactly level with the top of the turntable.

2. Fully load the record changer with records. Use 10 ten-inch or 8 twelve-inch records of standard manufacture only. Start the changer and drop one record on the turntable. The pick-up should come down and rest normally in the playing position on the record.

3. Push the left hand button to the REJECT position momentarily and release. Now as the pick-up is lifted off the record, carefully note that there is clearance between the top of the pick-up arm and the bottom record on the record support.

4. Drop the full load of records (10 ten-inch or 8 twelve-inch) on the turntable. As the record changer is cycled, note the clearance between the pick-up needle and the top record.

ADJUSTMENT OF VERTICAL TRAVEL OF PICK-UP ARM

The pick-up rod (Figure 13) controls the vertical movement of the pick-up arm.

1. After the changer has completed its cycle and pick-up arm is resting in playing position, stop the changer by pushing the left hand switch to OFF. The pick-up rod will now be resting on the bottom of the inclined

section of the main cam wheel and the pick-up arm will be at its lowest point of vertical travel.

2. Lift the pick-up arm straight up, exposing the pick-up rod. With long nose pliers, bend the pick-up rod (along its straight portion) in the required direction till the pick-up needle point is level with the top of the turntable. See Figure 13.

3. Recheck as shown under TO CHECK VERTICAL ADJUSTMENT OF PICK-UP ARM. In some cases minor compromise adjustment will be required.

ECCENTRIC STUD ADJUSTMENT INSTRUCTIONS

This adjustment is one of the most important for dependable cycling of the record changer. It must be followed closely as too tight an adjustment will cause slow cycling and undue motor wear or the changer may keep cycling continuously; a loose adjustment may prevent changer from cycling at all. See Figure 3 for location of eccentric stud adjustment.

CHECK AND ADJUSTMENT OF ECCENTRIC STUD

1. Set changer in cycle and stop turntable when pick-up arm comes back to within one inch of right of turntable (almost the set down position).

2. Loosen eccentric stud completely so cycle drive pulley (see Figure 1) moves completely free of the turntable.

3. Rotate turntable by hand (counterclockwise) 90° (1/4 turn) and back (clockwise). Pick-up arm should not move.

4. With a screwdriver, turn eccentric stud until pick-up arm begins to move when rotating turntable by hand clockwise. Do not hold screwdriver on eccentric stud while checking adjustment.

5. When pick-up arm moves down with the clockwise rotation of turntable without slipping, but not up with counterclockwise rotation, the critical position of the adjustment has been reached.

6. Then tighten the eccentric just far enough to pick up the pick-up arm when rotating the turntable counterclockwise and the setting is complete.

7. To check for too tight adjustment, complete cycle of changer with motor operating. Complete change cycle should not take more than 7 seconds; if it takes longer, eccentric stud should be readjusted.

SERVICE INFORMATION

REPLACEMENT OF ECCENTRIC & TUBE ASSEMBLY (104) OR SPINDLE & RELEASE ASSEMBLY (113)

These two assemblies, reference numbers (104) and (113) are supplied only in factory matched sets for replacement purposes. For positive record changing performance, always replace assemblies (104) and (113) with a factory matched set. Do not replace one assembly without replacing the other at the same time. Lubricate parts before installing, use Lubriplate #105 grease.

TO REMOVE TURNTABLE

Refer to Figure 15 for location of parts.

1. Remove two screws (59) and spindle clamp (13).

2. Remove the spindle and release assembly (113).

3. The turntable can now be lifted off the record post (108). Make sure the eccentric (104) is in line with record post (108) otherwise it may be damaged when removing turntable.

CRYSTAL CARTRIDGE CONNECTION NOTE

Observe that one of the pins on the crystal pick-up cartridge is grounded through a copper strip to the cartridge case. It is important that the connecting lead shield be connected to this pin.

MECHANISM IS SLOW IN STARTING OR MOTOR HEATS UP

1. Check lubrication.

2. Dirt in bearings. Wash dirt out with carbon tetrachloride or similar solvent and relubricate. Use a #10 motor oil in the phono motor and turntable bearings and Lubriplate #105 grease on all other bearings and moving parts.

3. Check line voltage and frequency.

4. Motor damaged. If found damaged, remove motor and return it to factory for repair or replacement.

5. Room temperature abnormally low.

6. Eccentric stud adjustment set at maximum throw causing cycle drive wheel to drag on turntable rim. Correct by setting eccentric stud per instructions under ECCENTRIC STUD ADJUSTMENT.

7. Loose sleeve on motor drive shaft. Replace motor.

8. Slew motor. Replace motor.

9. Defective turntable bearing. Replace.

10. Grease on rubber rim idler wheel and/or inner rim of turntable. Clean off with carbon tetrachloride.

MOTOR FAILS TO RUN

1. Check to see that ON-OFF switch is OK and that power is being supplied to motor.

2. Trouble in motor winding. If easily seen, repair; otherwise, replace.

3. Damaged or frozen bearings. Replace motor.

4. Gummed oil or foreign material between armature and pole-piece. Clean out.

SQUEAKS OR OTHER NOISES DURING PLAYING OF RECORDS

1. Check lubrication (if squeaks are heard, they will usually be found to come from the records - not from mechanism).

2. Compare the squeak with and without a load of records. If squeak disappears when records are removed, then noise is obviously from records. Correct by rubbing a little wax on the turntable record post.

CHANGER IS NOISY WHEN IN CYCLE

1. Check lubrication.

2. See if any part has become loose or bent and is rubbing against a moving part.

3. Check center post eccentric shaft (104) lubrication.

"WOW" IN RECORD REPRODUCTION

1. Record is warped or otherwise defective, or the instrument is not being operated at normal room temperature (70°F). See CHECK THE RECORD FIRST

2. May be caused by slippage due to grease on idler wheel or inside rim of turntable.

PICK-UP ARM TRIPS OUT OF OSCILLATING GROOVES

1. Record changer not level.

2. Rough surface on catch surface of small trip arm (116). Repolish.

3. Ratchet arm (50) bent too close to trip pawl. Replace.

4. Pick-up arm main shaft binding in bearing.

(a) Ream out the hole.

(b) Sometimes the trip arm (117) may be too close to the base, causing a bind. To remedy, loosen its two setscrews (65) and space lightly.

5. Selector lever (117) may be bent out of shape and binding against detent plate (109). Straighten.

6. Selector lever (117) slot or retaining rivet on detent plate (109) may be undersize or oversize, respectively, effectively causing a binding feeling on the pick-up arm. Correct by spreading slot in selector lever (117).

7. Record may have oscillating groove covered with paper nameplate. Remove paper from oscillating groove.

8. Needle may be chipped. Replace.

CHANGER KEEPS CYCLING

1. Eccentric stud adjustment sets too tight. Correct per instructions found under ECCENTRIC STUD ADJUSTMENT.

2. Catch surface of small trip arm (116) or ratchet arm (50) worn to improper angle causing slipping apart of mating surfaces. Correct by replacing parts.

3. Bell crank torsion spring (83) may be too weak. Replace.

4. Ratchet arm (50) improperly formed. Replace.

CHANGER WILL NOT CYCLE

1. Weak pawl spring (82) causing non-mating of pawl on ratchet arm (50) teeth. Replace spring.

2. Pawl frozen on trip arm (117). Check for cause; if other than due to dirt or grease, replace entire trip arm and selector lever assembly (117).

3. Binding drive arm (17) or main cam wheel (9) on shaft (75). Replace parts or remove burrs.

4. Eccentric adjustment stud set at minimum throw. Cycling drive wheel (49) is not against inner rim of turntable. Correct by setting up as shown under ECCENTRIC STUD ADJUSTMENT.

5. Weak bell crank arm spring (79). Bend bracket to tighten spring or replace spring (79).

6. Bell crank arm (103) binding on shaft (84).

NEEDLE SETS DOWN ON RECORD WITH A WHIP MOTION

1. Pick-up arm centering cam (40) not seating properly during cycle caused by pick-up arm rod (57) pushing against its guide bracket. Correct by bending guide bracket forward to relieve pressure. See Figure 13.

RECORD WILL NOT DROP WHILE CYCLING

1. The record release in the spindle assembly (113) may not be protruding out enough from the spindle assembly. It should stick out as far as the eccentric does when the eccentric is picking up a record. If it doesn't and trouble persists, replace spindle assembly (113).

2. Eccentric (104) out of line with record post. Correct as shown in ADJUSTMENT OF RECORD DROP MECHANISM.

3. Set screw (111) loose on spindle gear (22). Tighten after readjusting.

REVISIONS INCORPORATED IN RECORD CHANGERS

NOTE: Changers that have been revised as indicated below, are known as B-27-RC and B-28-RC; without these revisions, the changers are known as B-24-RC and B-25-RC. A model number is stamped on the bottom of the B-27-RC and B-28-RC record changer bases; this will serve to easily identify these units. From the top, the B-27-RC and B-28-RC record changers can easily be identified by the large adjustment nut at the base of the record support platform.

Record changers B-24-RC and B-25-RC may be revised to include some or all of the revisions by following the detailed information given below Reasons for changes are given in the "remarks" column

OLD REF. NO.	OLD PART NO.	NEW REF. NO.	NEW PART NO.	DESCRIPTION	REMARKS
None	None	102	43A76396	Bearing, Oilite: ring type	Slips over record post and replaces the original ball bearings (2). Before installing a new Oilite bearing, pre-soak it in a good 20W motor oil for at least 1/2 hour.
3	1B71785	103	1B76783	Bell Crank Assembly: includes bell crank lever with eccentric stud and roller (4), torsion spring (83) and small trip arm (116)	Material in small trip arm (116) changed from aluminum to stainless steel to reduce wear. When installing this new part, place a small quantity of very light grease on the trigger catch surface. Directly interchangeable with old part.
18	47A72662	104	1B76770	Eccentric & Tube assembly	Re-designed to work with new spindle and release assembly (113). Cannot be interchanged with original part. Sold only in matched set with Spindle & Release Assembly (113). Lubricate lightly with Lubriplate #105 grease before installing.
21	1X71798	105	1X76781	Gear Arm Assembly: with re-inforcing channel	Reinforcing channel added to stiffen arm and reduce possibility of gear arm bending should record jam during change cycle. Revised part is directly inter-

OLD REF. NO.	OLD PART NO.	NEW REF. NO.	NEW PART NO.	DESCRIPTION	REMARKS
23	45A27549	23	45A27549-D	Lever, manual	Re-designed to prevent possibility of manual lever wedging itself between base and small trip arm (116). Directly interchangeable with old part.
None	None	106	2A76397	Nut, adjustment: acorn shaped	Used with redesigned record support post (115).
39	47D71605	39	47D71605-G	Pick-up arm (only): less all other parts	Hole drilled in arm to make needle replacement setscrew accessible from outside. This makes it unnecessary to remove crystal cartridge when replacing needle.
44	1X71797	107	1X76774	Platform & Clamp Assembly	The corners of the new record support platform have been cut off to reduce area that record hangs on. New platform is directly interchangeable with old one.
50	1X75569	50	1X75569-B	Ratchet Arm & Bushing Assembly	Notches added on revised part to give a better trigger mesh. Directly interchangeable with old part.
52	47A71702	108	47B76762	Record Post & Bearing Assembly	Redesigned to be used with new ring type Oilite bearing (102). When this part is used, the turntable retaining washer (96) and the ball bearings (2) are eliminated. Use with the new Oilite bearing (102) to directly replace old record post and bearing assembly (52).
74	1X71788	109	1X76778	Selector Shaft & Plate Assembly	Part differs from old assembly by use of new type of shoulder rivet. New rivet (part No. 5A76489) spaces selector lever from detent plate, thus eliminating rubbing or catching of selector lever (117) on selector spring (80). New selector shaft and plate assembly

					is not interchangeable with original one. A new trip arm and selector lever assembly (117) must be used with this revised selector shaft and plate assembly.
62	3S2672	110	3S9700	Setscrew, steel: 6-32 x 3/16, Allen head, cup-point machine screw; cadmium plated	Record support mounting screw was cone point type. Now it is changed to cup point (same as (63)) to permit easier adjustment of record support platform.
64	3S7119	111	3S7109	Setscrew, steel: 6-32 x 5/16 slabhead, cup point machine screw, cadmium plated	Length was 1/4". Increased for better wrench grip.
77	41A72568	112	42A76484	Spring, clip (cycle pulley retainer)	Re-designed to have greater holding power and facilitate removal and installation. Directly interchangeable with old part.
76	1B71709	113	1B76766	Spindle, & Release Assembly	Redesigned to provide greater ledge for records. Cannot be directly interchanged with old part (76). Must be used with the new eccentric and tube assembly (104). Sold only in matched set with Eccentric & Tube Assembly (104). Lubricate lightly with Lubriplate #105 grease before installing.
82	41A27491	114	41A76681	Spring, tension	Tension increased (approximately doubled) to give positive cycling action. Directly replaces old tension spring (82).
86	46B71653	115	46B76775	Support Post	Part redesigned by threading lower portion for adjustment nut (106). Replaces original support post, but adjustment nut (106) must also be used with it. Lockwasher (27) must also be replaced with flat washer (120). The redesigned support post and addition of adjustment nut permits adjustment of

OLD REF. NO.	OLD PART NO.	NEW REF. NO.	NEW PART NO.	DESCRIPTION	REMARKS
					and record post by simply loosening adjustment nut (106) from top of changer (no dismantling of changer required).
90	1X71787	116	1X76780	Trip Arm Assembly (small)	Material changed from aluminum to stainless steel to reduce wear. When installing this new part, place a small quantity of a very light grease on the trigger catch surface. Directly interchangeable with old part (90). Bell Crank Assembly now changes from (3) to (103).
91	1X71789	117	1X76779	Trip Arm & Selector Lever Assembly (large): consists of large trip arm assembly and selector lever and stud assembly, assembled together; pawl spring (82) and screws (65) & (58) not included.	Differs from old assembly by bend in selector lever (45A71632-B). Bend gives more clearance between selector lever and selector spring (80), eliminating rubbing. Use this new trip arm and selector lever assembly with the new selector shaft and plate assembly (109). Old and new assemblies are not directly interchangeable.
None	None	118	4K76609	Washer, brass: 9/16 x .316 x .010 thick	Washer added between drive arm assembly (17) and washer (98) to reduce main cam wheel play.
None	None	119	4A21491	Washer, brass: 9/16 x .316 x .020 thick	Washer added between record changer base and main cam wheel to reduce play. Washer is the same type as used in position (101).
None	None	120	4S1758	Washer, brass: 13/16 x .515 x .040 thick; bright nickel finish	Replaces lockwasher (27).
None	None	121	4S7569	Washer, steel: 5/16 x .145 x .027 thick; cadmium plated	Washer is inserted in slot of die cast pick-up shaft cam assembly (40) to eliminate possibility of cracking die casting when tightening lateral adjustment lockscrew. The lateral adjustment lockscrew (68) is passed through the washer.

MOTOROLA INC. MODELS B-27-RC, B-28-RC, B-29-RC, B-31-RC, B-32-R B-33-RC

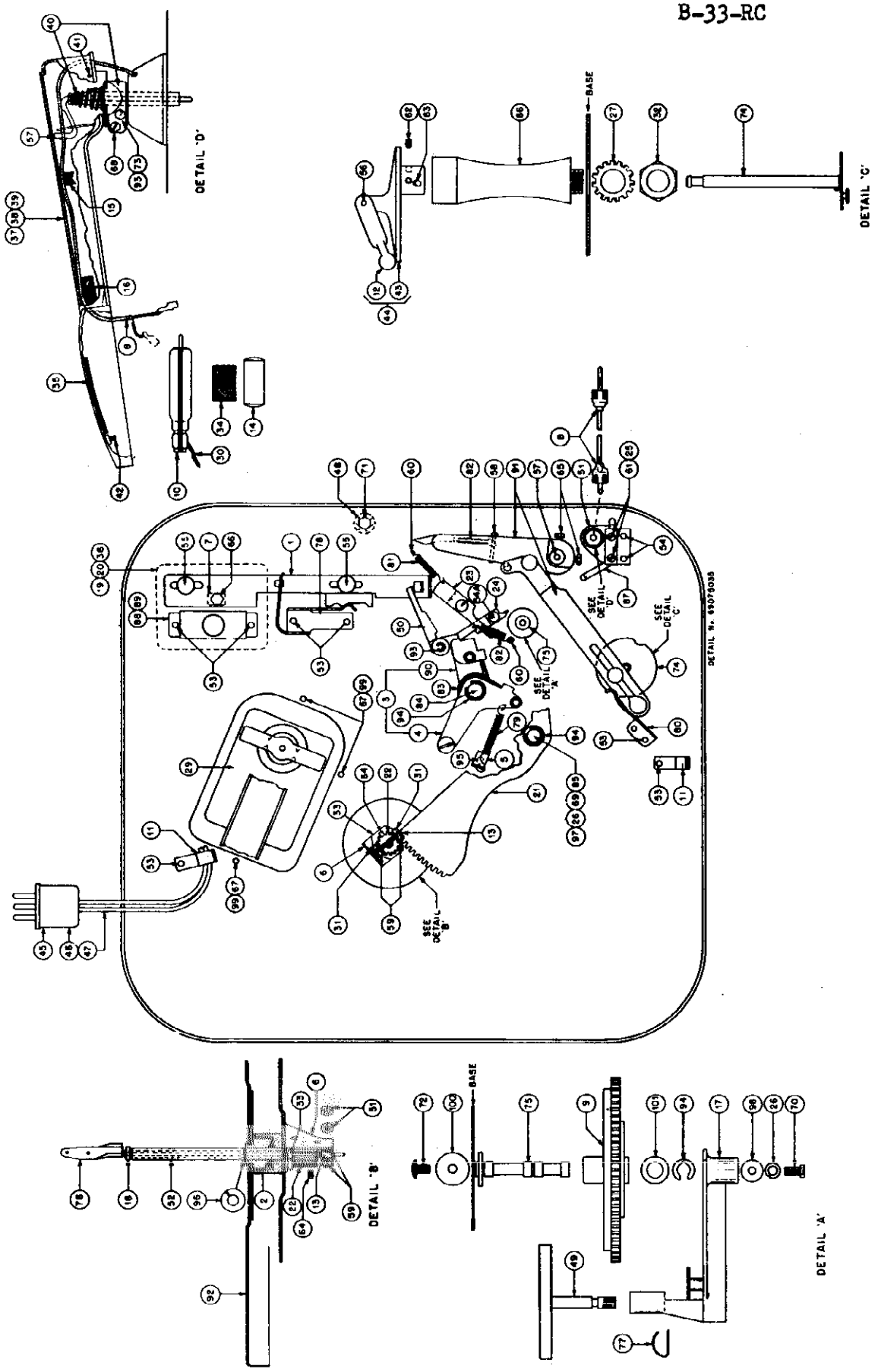


FIGURE 14. RECORD CHANGER PARTS LOCATION DETAIL

MODELS B-27-RC, B-28-RC, B-29-RC, B-31-RC

MOTOROLA INC.

MODELS B-32-RC, B-33-RC

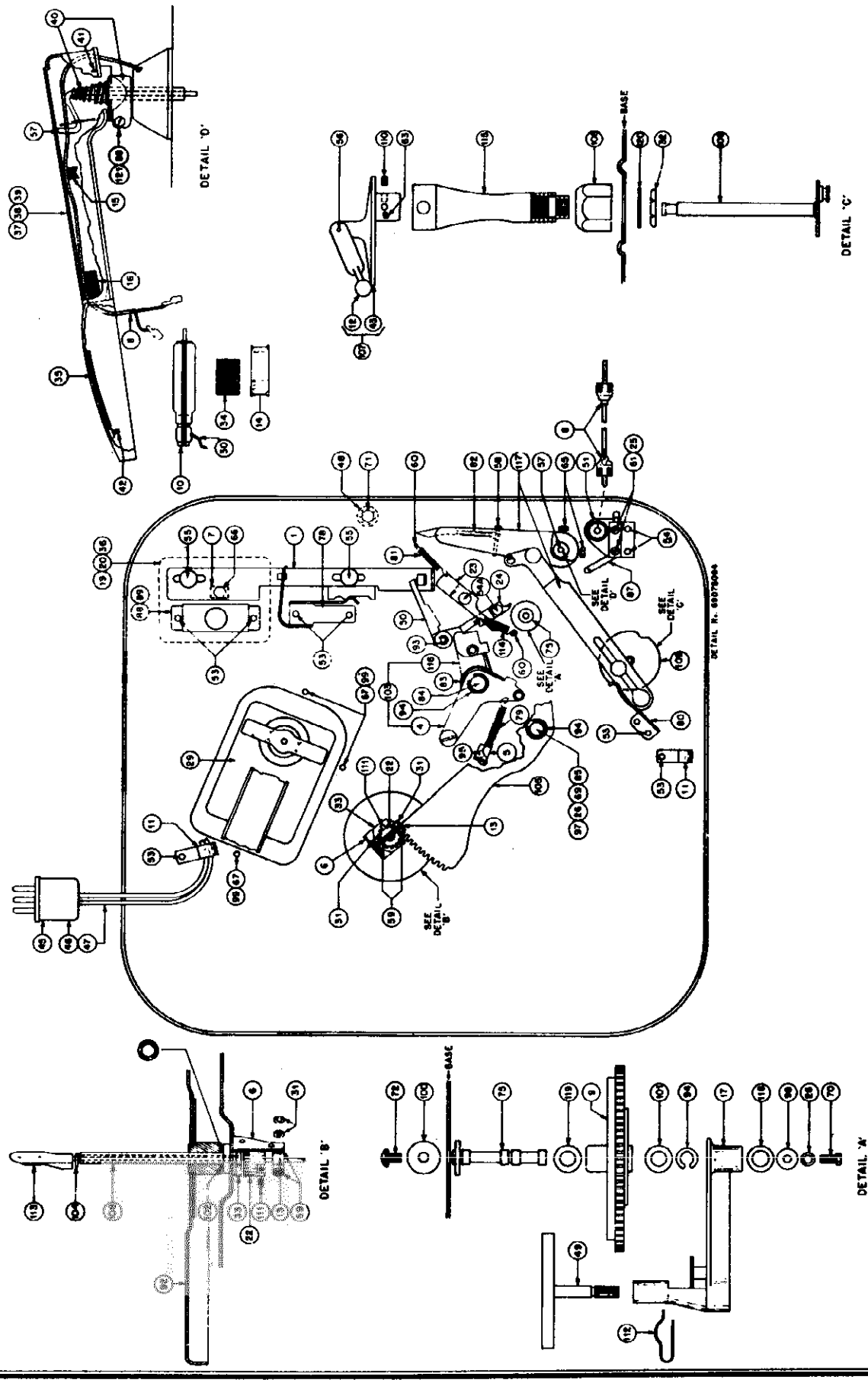


FIGURE 15. RECORD CHANGER PARTS LOCATION DETAIL

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
1	45B27543	Arm, selector slide
2	43X4554	Bearing, ball: .062 diameter (16 used in turntable bearing) B-24-RC & B-25-RC only. No longer used; replace with Oilite bearing (102)
3	1B71785	Bell Crank Assembly - B-24-RC & B-25-RC only. Replace with (103)
4	1X71786	Bell Crank Lever Assembly: consists of bell crank lever with eccentric stud and roller
5	7A72463	Bracket, mounting (anchors bell crank spring)
6	7A71686	Bracket, spindle
7	38A27564	Button, switch
8	1X72672	Cable & Pin Terminal Assembly (pick-up connecting lead)
9	1B71679	Cam Wheel & Bearing Assembly: die cast cam wheel with pressed in Oilite bearing
10	59A71618 or 59A74887	Cartridge, crystal
11	42K13135	Clamp, cable: 1/2"; cadmium plated (cable support)
12	42B71643	Clamp, record
13	42A71690	Clamp, spindle
14	42A75809	Clip, cartridge retainer: spring steel
15	42A72314	Clip, retainer: steel, 7/8 long (holds pick-up lead inside pick-up arm)
16	35A72628	Cushion, pick-up arm: sponge rubber, 19/64 x 3/8 x 1/2 long
17	1X71794	Drive arm assembly: die cast; includes brass idler gear
18	47A72662	Eccentric & Tube Assembly - Replace with matched (113) & (104)
19	13A27714	Escutcheon, switch (B-24 & 27-RC only)
	13K77077	Escutcheon, switch (B-29-RC only)
20	13A27526	Escutcheon, switch (B-25 & 28-RC only)
21	1X71798	Gear Arm Assembly: includes roller and bushing - B-24-RC & B-25-RC only. Replace with (105)
22	44B71634	Gear, spindle
23	45A27549	Lever, manual
24	45A74582	Link, trip
25	4S7695	Lockwasher, steel: #5 internal: cadmium plated (muting switch mounting)
26	4S7671	Lockwasher, steel: #8 split; cadmium plated (gear arm stud mounting - drive arm mounting)
27	4S8441	Lockwasher, steel: 1/2" external; cadmium plated. B-24-RC &
28	11M8605	Lubricant: Metal Lubriplate #105 (general lubricant)
29	59C71678 or 59C75524	Motor, Phono: complete: 117V, 60 cycles
30	47X72643 or	Needle, phonograph: sapphire tipped
	47X74920	Needle, phonograph: precious metal tipped
31	2S7019	Nut, steel: 4-40 x 1/4 hex; cadmium plated (spindle clamp mounting)
32	2K17206	Nut, steel: 1/2-28 x 5/8 hex; cadmium plated (record support mounting)
33	2A72311	Nut, special (record post mounting)
34	35A74665 or	Pad, cartridge (small): sponge rubber: 1/2 x 3/4 x 1/16 thick
	35K74908	Pad, cartridge (small): sponge rubber: 1/2 x 3/4 x 1/8 thick (cushion between cartridge retainer clip and cartridge. 1/16 pad used with Shure cartridge; 1/8" pad is used with Webster cartridge)
35	35A74664	Pad, cartridge (large): sponge rubber; 3/4 x 1-1/2 x 1/8 thick (pad between pick-up arm and pick-up cartridge)
36	32A27776	Pad, escutcheon: paper

REF. NO.	PART NO.	DESCRIPTION
37	1X76313	Pick-up Arm Assembly (less needle) complete with crystal cartridge, cable, shaft, pick-up elevating rod, guide bracket and cam assembly. (B-24, 25, 27 & 28 RC Only)
	1X77202	Pick-up Arm Assembly (less needle) same as above except for B-29-RC only)
38	1X71792	Pick-up Arm, Shaft & Arm Cam Assembly: complete but less crystal cartridge, lead and cartridge retaining parts. (B-24, 25, 27 & 28-RC only)
	1X77062	Pick-up Arm, Shaft & Arm Cam Assembly: same as above except for B-29-RC only
39	45D71605	Pick-up Arm (only): less cartridge and all other parts (B-24, 25, 27 & 28-RC only)
	49K77074	Pick-up Arm (only): less cartridge and all other parts (B-29-RC only)
40	1X72338	Pick-up Shaft & Cam Assembly
41	47A71685	Pin,pick-up arm: steel (hinges pick-up arm to shaft & cam assembly)
42	47A74656	Pin, cartridge locating: rubber; 7/64 diameter 5/16 long
43	64B71647	Plate, record support (B-24, 25, 27 & 28 RC only)
	64K77075	Plate, record support (B-29-RC only)
44	1X71797	Platform & Clamp Assembly: B-24-RC & B-25-RC only; no longer used; replace with (107)
45	28A27573	Plug: 3 pin
46	1X72351	Plug, Shell & Leads Assembly: 3 pin plug with two leads. (B-24, 27 & 29-RC only)
47	1X72498	Plug, Shell & Leads Assembly: 3 pin plug with three leads. (B-25 & 28-RC only)
48	46A27563	Post, pick-up resting; tenite
49	1X71795	Pulley & Shaft Assembly
50	1X75569	Ratchet Arm & Bushing Assembly
51	1X75267	Receptacle, Bracket & Switch Assembly (pick-up output receptacle & muting switch on bracket)
52	47A71702	Record Post and Bearing Assembly: antique copper finish; powdered iron bearing - B-24-RC & B-25-RC only. No longer used. Replace with (108) and use Oilite bearing (102) in place of the original ball bearings (2). Discard turntable retaining washer (96).
53	587716	Rivet, steel: .122 x 5/32; antique copper finish
54	587718	Rivet, steel: .122 x 3/16; antique copper finish
54A	5K21337	Rivet, shoulder (trip link & manual lever mounting)
55	5K72597	Rivet, shoulder (selector slide arm mounting)
56	47K76777	Rod, record clamp; steel, .062 diameter x 1-3/8 long; copper plated
57	47A71633	Rod, pick-up (pick-up arm elevating rod)
58	382697	Screw, steel: #2 x 5/8 PKZ slotted round head; cadmium plated (limit stop adjustment)
59	382286	Screw, steel: lockscrew, 4-40 x 3/16 locking type hex head machine screw: cadmium plated (spindle clamp)
60	382669	Screw, steel: #4 x 5/16 PKZ Phillips binder head: antique copper finish (spring anchoring studs)
61	381443	Screw, steel: 6-40 x 5/16 slotted binder head machine screw, nickel plated (muting switch mounting)
62	382672	Setscrew, steel: 6-32 x 3/16 Allen head, cone point: cadmium plated - B-24-RC & B-25-RC only. No longer used. Replace with cup point setscrew (110)
63	389700	Setscrew, steel: 6-32 x 3/16 Allen head, cup point machine screw: cadmium plated (record support mounting)
64	387119	Setscrew, steel: 6-32 x 1/4 slab head machine screw; cadmium plated; B-24-RC & B-25-RC only. Use longer screw (111) for replacement

REF. NO.	PART NO.	DESCRIPTION
65	3S7152	Screw, steel: 6-32 x 1/4 slotted hex head machine screw, cadmium plated (large trip arm mounting setscrews)
66	3S7506	Screw, steel: #6 x 1/4 PKZ plain hex head; cadmium plated (switch button mounting)
67	3S7342	Screw, steel: 6-32 x 5/8 slotted binder head machine screw; cadmium plated (motor mounting)
68	3S2288	Screw, steel: 6-32 x 3/4 slotted hex head machine screw; cadmium plated (pick-up arm lateral adjustment lockscrew)
69	3S2291	Screw, steel: 6-32 x 5/16 slotted hex head machine screw; antique copper finish (gear arm stud mounting)
70	3S7374	Screw, steel: 8-32 x 5/16 slotted hex head machine screw; cadmium plated (drive arm mounting)
71	3S2676	Screw, steel: #8 x 5/8 plain locking hex head; cadmium plated (pick-up resting post mounting)
72	3S2287	Screw, steel: 12-24 x 1/4 slotted binder head machine screw; antique copper finish (cam shaft mounting)
73	3A71612	Screw, adjustment: special; cadmium plated (pick-up arm lateral adjustment) - Remove & discard, no longer required
74	1X71788	Selector Shaft & Plate Assembly - B-24-RC & B-25-RC only
75	47A21298	Shaft, cam (for main cam wheel)
76	1B71709	Spindle Assembly - B-24-RC & B-25-RC only. Replace with matched (113) & (104)
77	41A72566	Spring, clip (cycle pulley retainer) - B-24-RC & B-25-RC only. Use improved clip (112) when replacing
78	41B71660	Spring, detent (for selector slide arm)
79	41A72337	Spring, drive arm tension
80	41A71635	Spring, selector (for 10-12 inch selector detent plate)
81	41A27775	Spring, tension (manual lever)
82	41A27491	Spring, tension (ratchet arm & pawl springs)
83	41A71676	Spring, torsion (used in bell crank assembly)
84	46A71620	Stud, bell crank lever
85	46A71631	Stud, shoulder (gear arm mounting stud)
86	46B71653	Support Post: B-24-RC & B-25-RC only. NOTE: If top adjustment type of record support is desired, replace parts (86) and (27) with (115) (106) and (120).
88	40A27846	Switch, slider: 2 position; with shell (B-24, 27 & 29-RC only)
89	40A27545	Switch, slider: 3 position; with shell (B-25 & 28-RC only)
90	1X71787	Trip Arm Assembly (small): small trip arm with roller. Use improved type (116) when replacing.
91	1X71789	Trip Arm and Selector Lever Assembly (large): consists of large trip arm assembly and selector lever and stud assembly, assembled together, less pawl spring (82) and screws (66) & (58). (B-24-RC & B-25-RC only)
92	59C71664	Turntable, phono
93	4K24125	Washer, "C" Spring (holds pick-up arm lateral adjustment screw in position and ratchet arm retainer) - Remove & discard; no longer required.
94	4A21941	Washer, "C" spring (bell crank retainer, main cam retainer & gear arm retainer)
95	4A19199	Washer, spring (used between mounting bracket that holds the bell crank spring and chassis base.)
96	4A74846	Washer, spring steel: special (turntable retainer) B-24-RC & B-25-RC only.
97	4S7623	Washer, steel: 3/8 x 11/64 x .033

REF. NO.	PART NO.	DESCRIPTION
98	4S7597	Washer, steel: 7/16 x .171 x .038 thick; cadmium plated (drive arm retainer)
99	4S1765	Washer, steel: 1/2 x .147 x 1/64 thick; cadmium plated (motor mounting)
100	4S7643	Washer, steel: 11/16 x 15/64 x .021 thick; antique copper finish (on cam wheel shaft mounting screw)
111	3S7109	Setscrew, steel: 6-32 x 5/16 slab-head machine screw; cadmium plated
112	42A76484	Spring, clip (cycle pulley retainer)
113	1B76766	Spindle & Release Assembly: furnished only in matched set with Eccentric & Tube Assembly (104)
114	41A76681	Spring, tension
115	46B76775	Support Post (B-27 & 28-RC only)
	46K77076	Support Post (B-29-RC only)
116	1X76780	Trip Arm Assembly (small)
117	1X76779	Trip Arm & Selector Lever Assembly (large): consists of large trip arm assembly and selector lever and stud assembly, assembled together; pawl spring (82) and screws (65) & (58) not included
118	4K76609	Washer, brass: 9/16 x .315 x .010 thick
119	4A21491	Washer, brass: 9/16 x .315 x .020 thick
120	4S1758	Washer, brass: 13/16 x .515 x .040 thick; bright nickel finish
121	4S7569	Washer, steel: 5/16 x .145 x .027 thick; cadmium plated
101	4A21491	Washer, brass: 9/16 x .315 x .020 thick (main cam wheel thrust washer)
102	43A76396	Bearing, Oilite: ring type (should be pre-soaked in grade 20W motor oil for at least 1/2 hour before installation)
103	1B76783	Bell Crank Assembly: includes bell crank lever with eccentric stud and roller (4), torsion spring (83) and small trip arm (116).
104	1B76770	Eccentric & Tube Assembly: furnished only in matched set with Spindle & Release Assembly (113)
105	1X76781	Gear Arm Assembly: with re-inforcing channel
106	2A76397	Nut, adjustment: acorn shaped
107	1X76774	Plate & Clamp Assembly (B-24, 25, 27 & 28-RC only)
	1X77083	Plate & Clamp Assembly (B-29-RC only)
108	47B76762	Record Post & Bearing Assembly
109	1X76778	Selector Shaft & Plate Assembly
110	3S9700	Setscrew, steel: 6-32 x 3/16; Allen head, cup-point machine screw; cadmium plated

PHONO OSCILLATOR CHASSIS HS-18

C-1	21R6535	Capacitor, fixed: mica; 25 mmf. 500V
C-2	21R6641	Capacitor, fixed: mica; 100 mmf. 20% 500 V
C-3	20A14502	Capacitor, trimmer: 16-160 mmf; with mounting bracket
C-4	21R6535	Capacitor, fixed: mica; 25 mmf. 500V
C-5	21R6638	Capacitor, fixed: mica; 1000 mmf. 500V
C-6	23A20867	Capacitor, electrolytic: 10-10-10 mf 150V; with mounting strap
C-7	8S9816	Capacitor, fixed: paper; .05 mf 400V
C-8	8S9816	Capacitor, fixed: paper; .05 mf. 400V
L-1	24A20892	Coil, oscillator
R-1	6R6056	Resistor, fixed: carbon; 47,000 1/2W Ins.
R-2	18A20869 or 18A71773	Resistor, variable: 10,000; screwdriver adj. type
R-3	6R2122	Resistor, fixed: carbon; 4.7 meg 1/2W Ins.
R-4	6R6101	Resistor, fixed: carbon, 4700 1/4W N.I.
T-1	25A17449	Transformer, Power
	42A22318	Clip, line cord: formed wire (holds line cord against chassis)
	30K31258	Cord, line & plug: 3 conductor; rubber covered

WR6, WR7 & WR8 MECHANICAL PARTS

PART NO.	DESCRIPTION
32K31259	Lock, line cord: fibre (holds line cord to chassis)
29R5207	Lug, soldering: #6; hot tinned
2S7051	Nut, steel: 3/8 -32 x 9/16 hex palnut; cadmium plated (bias control mounting)
9A22182	Receptacle, plug: 1 prong
9A27674	Receptacle, plug: 3 prong
5S7707	Rivet, steel: .122 x 5/32; nickel plated (tube socket and bias control mounting bracket)
5S7701	Rivet, steel: .122 x 3/16; nickel plated (osc. coil and trimmer mounting)
5S7703	Rivet, steel: .122 x 7/32; nickel plated (Power transformer and receptacle mounting)
5S7708	Rivet, steel: .122 x 9/32; nickel plated (line cord lock mounting)
3S7454	Screw, steel: #8 x 1/4 PKZ plain hex head; cadmium plated (cover mounting)
3S7456	Screw, steel: #8 x 1/4 PK A slotted acorn head; antique copper finish, mounts HS-18 to B-25-RC or B-28-RC
9A6738	Socket, tube; octal; saddle type
4S7578	Washer, brass: 5/16 x .130 x .025 thick (power transformer mounting)
4S1719	Washer, steel: 3/8 x .140 x .030 thick; cadmium plated (line
38A10544	Button, plug: for 1/4" hole; copper oxide finish
42X22210	Button, plug: fits 3/8" hole; copper oxide finish
16D71242	Cabinet, wireless record player: metal (WR6)
16E71007	Cabinet, wireless record player: wood (WR7)
1X75247	Cabinet, wireless record player: fibre; (WR8), includes 4 cover mounting brackets
32K70058	Cover, bottom (WR6)
32K70059	Cover, bottom (WR7)
32C72668	Cover, bottom (WR8)
37K15841	Foot, rubber: 3/4 diameter (WR7)
3S7163	Screw, steel: 8-32 x 1/4 slotted hex head machine screw: cadmium plated (bottom cover mounting - WR8)
3S7345	Screw, steel: 10-32 x 1/2 slotted round head machine screw; cadmium plated (Record changer mounting - WR6)
3S7329	Screw, steel: 10-32 x 2-1/4 slotted hex head machine screw; cadmium plated (record changer mounting - WR7)
3S7325	Screw, steel: 10-32 x 2-3/4 slotted hex head machine screw; copper plated (Record changer mounting - WR6)
41A21807	Spring, cushion (bottom) (WR7)
1X72458	Phono Pick-up Lead Assembly: 15" long
3S7439	Screw, steel: #4 x 1/2 slotted acorn head wood screw; antique copper finish (bottom cover mounting - WR6 and WR7)
3S7437	Screw, steel: #5 x 3/8 round head wood screw; antique copper finish (anchor strip mounting - WR6 and WR7)
3S1319	Screw, steel: #6 x 1/2" slotted oval head wood screw; antique copper finish (lid support mounting WR7)
3S1321	Screw, steel: #6 x 3/8 slotted round head wood screw; statuary bronze finish (lid support mounting WR7)
32A30684	Strip, anchor (WR6 and WR7)
55B71779	Support, lid (WR7)
4S8206	Washer, steel: 3/8 x .171 x .027 thick; cadmium plated (bottom cover mounting - WR8)
4S7582	Washer, steel: 1/2 x .195 x .033 thick; cadmium plated (Record changer mounting - WR6)
4S7565	Washer, steel: 1/2 x .218 x .048 thick; cadmium plated (Record changer mounting - WR7)
4S7563	Washer, steel: 5/8 x .203 x .033 thick; cadmium plated (record

MODELS WR6, WR7, WR8
CHASSIS HS-18

MOTOROLA INC.

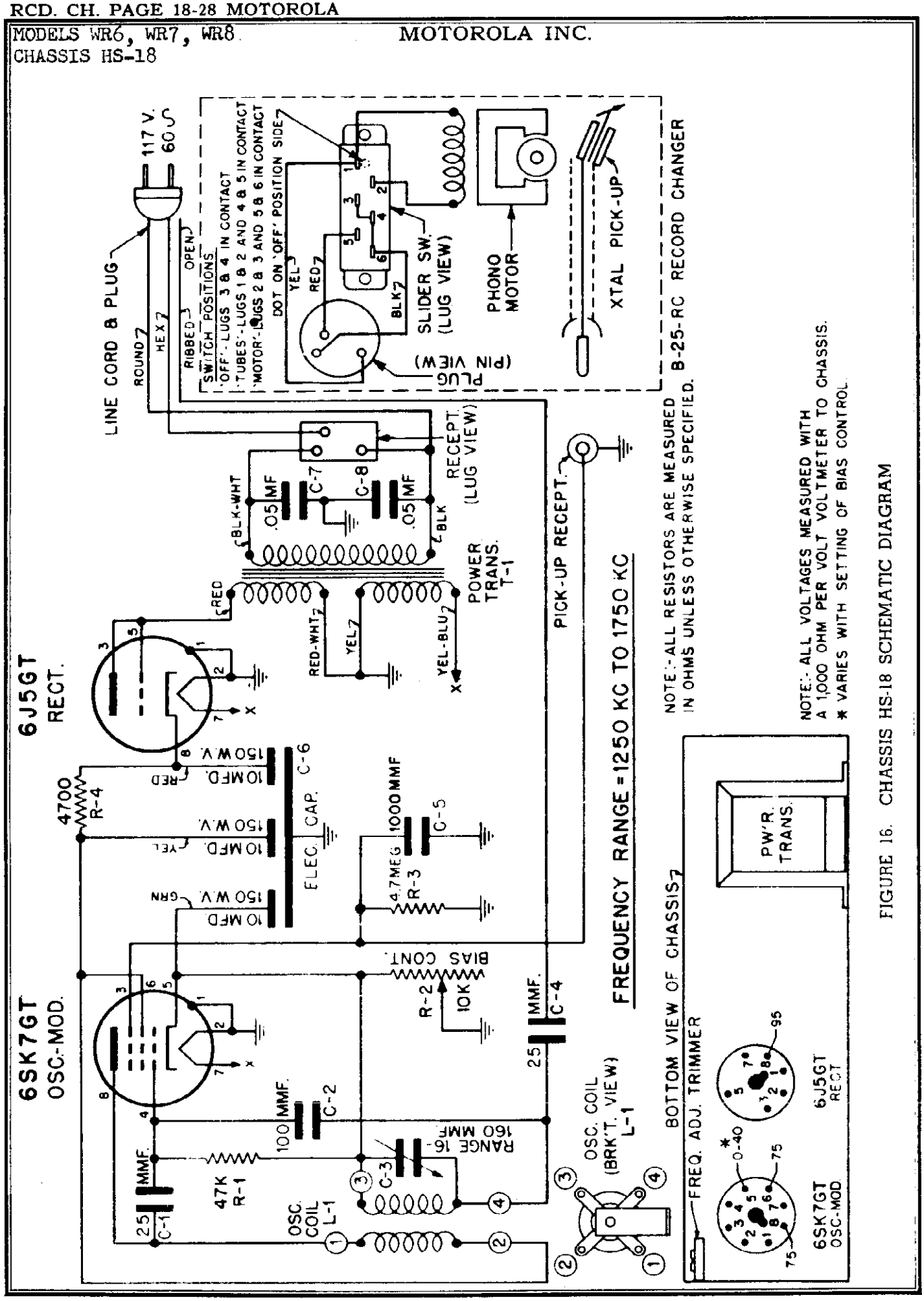


FIGURE 16. CHASSIS HS-18 SCHEMATIC DIAGRAM

These models are mechanically identical, the only difference being in the tone arm. This difference can be seen in figures 1 and 2. The tone arm on the D-10 employs a crystal pickup, while the tone arm on the D-10A is equipped with a dynamic pickup.

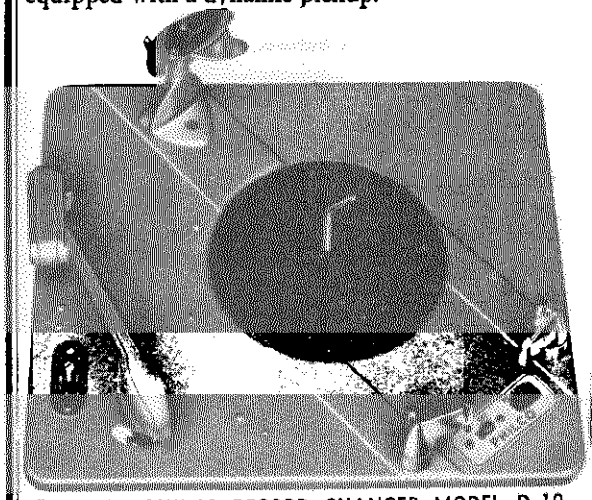


Figure 1. PHILCO RECORD CHANGER MODEL D-10

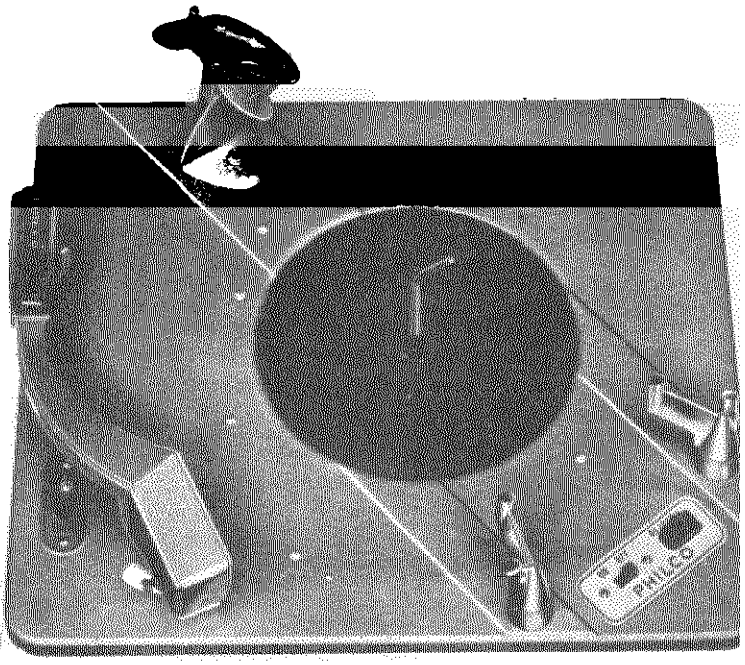


Figure 2. PHILCO RECORD CHANGER MODEL D-10A

PREPARATION FOR USE

OPERATING CHECKS—The following is a logical series of checks to be performed before the instrument is delivered to the owner. Should any of these checks reveal faulty operation, the correct adjustment will be found in the SERVICING section of this manual.

1. Without using a record, place the tone arm on its rest, set both record support levers and the record-separator post to their 12″ positions, as shown in figure 3. Set the manual-automatic lever to AUT. Turn the motor ON and operate the REJECT control; the changer should go through its cycle. Watch the tone arm swing out; it should clear the arm rest. At the completion of the cycle, the point of the needle should clear the changer base plate by $\frac{3}{32}$″.

2. Place a good 12″ record over the spindle and onto the record support levers and separator post. Operate the REJECT control and observe the action of the separator. The record should drop smoothly and evenly onto the turntable. The pickup should lower (index) so that the needle strikes the record approximately ⅛″ in from the outside edge.

3. Allow the record to play through and, when the needle enters the eccentric finishing groove, observe the tripping action; it is normal for the tone arm to ride the eccentric groove for three or four revolutions of the turntable.

4. Load the changer to capacity by placing nine more 12″ records on the supports. Reject each record with the REJECT control. The separator should select each record individually and each should drop smoothly. The tone arm, in its elevated position, should not strike the bottom of the remaining stack of records. After the full stack of records has dropped onto the turntable, the tone arm should lift high enough to clear the top record by ⅛″.

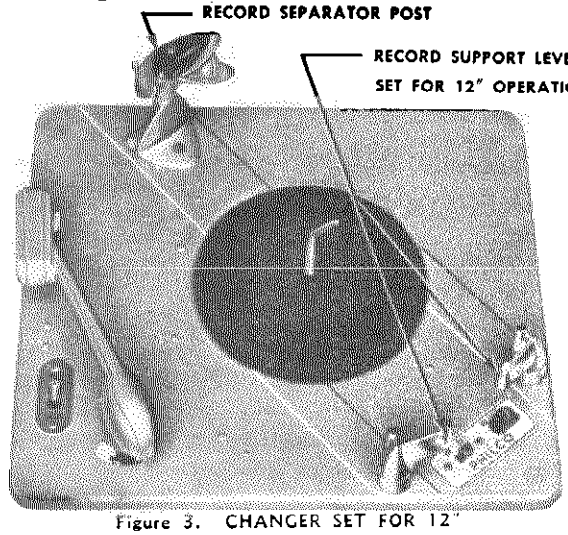


Figure 3. CHANGER SET FOR 12″ AUTOMATIC OPERATION

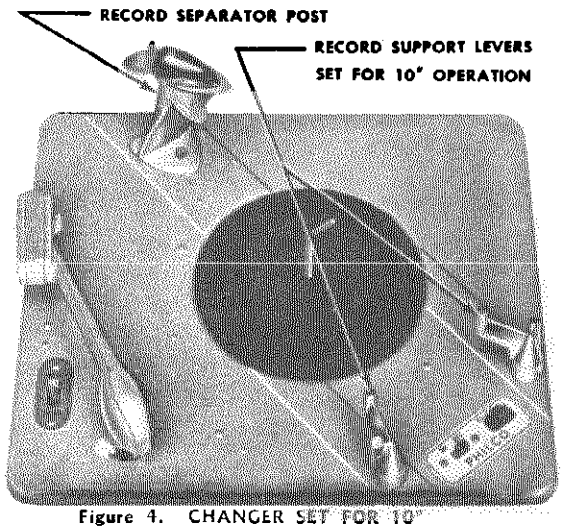


Figure 4. CHANGER SET FOR 10″ AUTOMATIC OPERATION

5. Place the manual-automatic lever at MAN; place the tone arm on its rest; shut off the motor and unload the changer.

6. Set the record support levers and record separator post in the 10″ position, as shown in figure 4. Place a good 10″ record over the spindle and onto the support levers and separator post. Set the manual-automatic lever to AUT, turn on the motor and operate the REJECT control. The record should drop smoothly and the tone arm should lower so that the needle strikes the record approximately ⅛″ in from the outside edge.

7. Allow the record to play through and observe the tripping action. Again, it should be smooth and positive.

8. Load the changer to capacity with eleven more 10″ records. Reject each record with the REJECT control, making certain that each record drops smoothly and individually. When the full stack has dropped onto the turntable, place the manual-automatic lever at MAN and play one record through to determine that the automatic mechanism is disengaged.

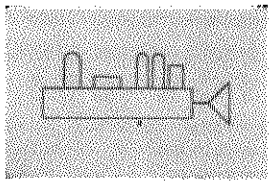
9. Turn the changer off as before, and unload.

PHILCO RADIO-PHONOGRAPH TROUBLE-SHOOTING PROCEDURE

The following tests are given for quickly localizing trouble in a Philco radio-phonograph. Be sure to make each test, in the order given, *before* removing the record changer from the cabinet.

If the trouble is found to be in the audio amplifier, refer to the radio service manual for the particular model under test. If the trouble is in some part of the record changer, refer to the SERVICING section of this record-changer manual.

1. AUDIO-AMPLIFIER TEST



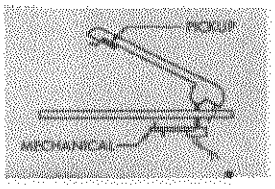
The audio amplifier is common to both the radio and phonograph sections of the combination. With a station tuned in, check the audio amplifier by noting the tonal quality and volume of the speaker output.

On models using the D-10A record changer, also check the phonograph pre-amplifier stage by applying a weak audio signal to the grid of the first audio tube of the radio; the signal should be just strong enough to be barely audible through the speaker. Then apply the same signal to the grid of the phonograph pre-amplifier tube. If the pre-amplifier stage is normal, an appreciable increase in volume will be noticed. An output meter connected across the output of the audio amplifier would normally indicate a gain of approximately five times.

If trouble is found in the audio amplifier, refer to the service manual for the particular model under test.

2. TONE-ARM TESTS

a. Pickup Test



Play a familiar record on the radio-phonograph, and listen to the reproduction. If the audio amplifier was found to be normal in the first test, distortion or low volume indicates trouble in the pickup or in the connecting leads to the radio chassis. Try a new needle if the output is distorted.

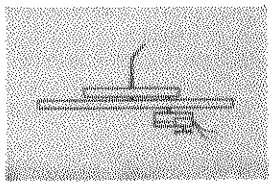
NOTE: It is advisable that a familiar record be carried as a regular part of the serviceman's test equipment.

b. Indexing and Tripping Test

Set the record separator post to the 12″ position and place a good 12″ record on the turntable. Set the manual-automatic lever to AUT, turn on the motor, and operate the REJECT control. Observe the action of the tone arm. It should rise and travel over to the record, with the needle making contact approximately ⅛″ in from its outside edge. After the record has played through, tripping of the mechanism should occur during three or four revolutions of the turntable.

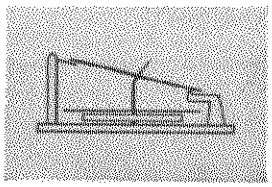
Set the record separator post to the 10″ position and, using a 10″ record, repeat the procedure.

3. TURNTABLE AND MOTOR TEST



Set the manual-automatic lever to MAN. Load the turntable with ten 12″ records and place the tone arm on the top record. Place a stroboscope disc, such as Philco Part No. 45-2900, on the record, and illuminate the disc with a lamp (preferably a neon bulb) operated on 60-cycle a.c. The dots in the row calibrated for 78 r.p.m. should appear to remain stationary, or drift slowly but smoothly forward or backward. Erratic motion of the dots indicates trouble in the drive mechanism.

4. RECORD-SEPARATOR TEST



Set the record separator post and the support levers to the 12″ position and load the changer with ten 12″ records. Set the manual-automatic lever to AUT, turn on the motor, and operate the REJECT control. Observe the action of the separator and the motion of the record as it drops. Repeat the operation of the REJECT control to drop each record in turn. The records should be released smoothly, one at a time.

Set the record separator post and the support levers to the 10″ position and, using twelve 10″ records, repeat the procedure.

If the records do not drop properly, an adjustment of the separator post or an alignment of the spindle may be necessary.

SERVICING

DESCRIPTION OF OPERATING CYCLE—Power for the motor is supplied from the power line through the ON-OFF switch. The turntable is rim-driven by a rubber-tired idler wheel between the motor shaft and turntable rim. A small gear, cast as part of the turntable at its hub, drives a larger composition gear to furnish power to the main cam of the changer mechanism through a pinion gear. The pinion gear is engaged with the main cam gear through action of the trip mechanism. The changer is so designed that the tone arm and record separator post mechanisms operate by levers in contact with the various surfaces of the main cam. The trip mechanism is operated by a pawl and ratchet assembly and starts the change cycle when the needle travels the eccentric finishing groove of the record. The trip mechanism is locked in a disengaged position when the manual-automatic lever is in MAN position.

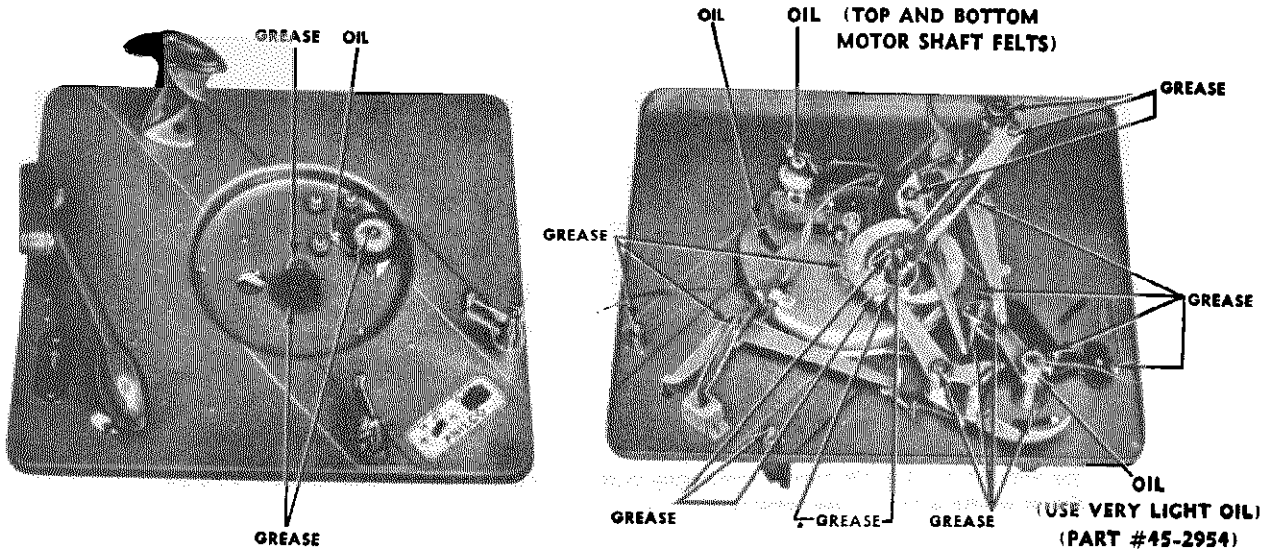


Figure 5. CHANGER LUBRICATION POINTS

CLEANING AND LUBRICATION — Cleaning and lubrication of the record changer should be done periodically or when a major part or assembly is replaced. Carbon tetrachloride or other similar cleaning fluid may be used to remove dirt, old oil or grease. All lubrication points are shown in figure 5.

PARTS NOT TO BE LUBRICATED— The following parts should not be lubricated at any time:

Separator
Trip pawl and ratchet (serrated surface)
Sliding segment on top of main cam.

PARTS TO BE GREASED—Using a light grease of the vaseline type, such as Philco Part No. 60130, lubricate the following parts:

All studs with moving parts attached.
Elevating lever where it contacts tone-arm lift rod.
Locating and tone-arm levers where they contact stud on trip arm.
Detent spring on manual lever.
Idler-wheel bearing stud.
Manual lever where it contacts trip-pawl stud in manual position.
Separator lever (both ends).
Main cam gear and pinion gear.
All shafts (except tone-arm shaft).
Record-separator-post shaft.
Record supports (under posts).
Turntable hub and composition drive gear.
Turntable bearing and ball bearings under turntable.

PARTS TO BE OILED—Using a good grade of light machine oil, lubricate the following parts:

Idler-wheel lever assembly.

CAUTION: Do not get oil on rubber tire, if so, remove immediately with carbon tetrachloride.

Motor-shaft felt oil retainers (top and bottom).
Tone-arm shaft (use very light oil such as Philco Part No. 45-2954).

Some parts and assemblies may have to be removed for proper lubrication. The correct procedure for the removal and re-installation of these parts and assemblies will be found in the REPLACEMENT OF PARTS AND ASSEMBLIES section of this manual.

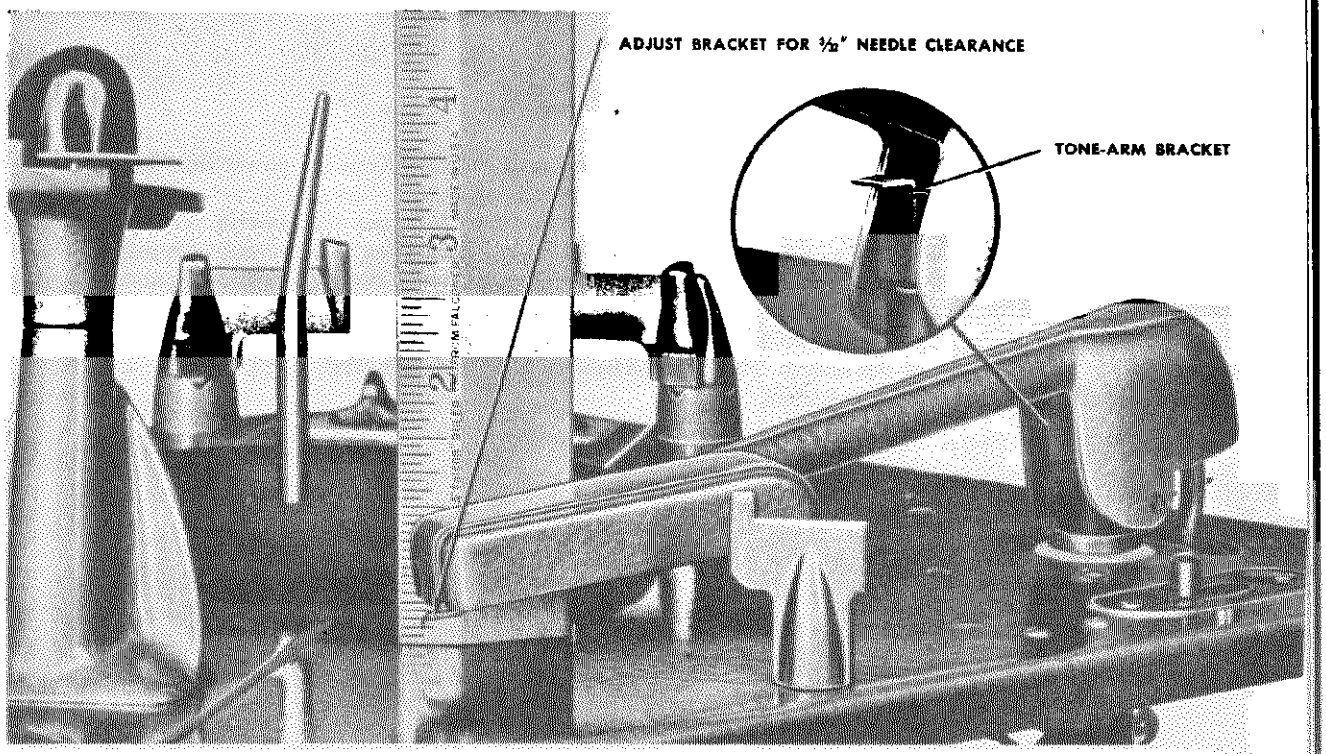


Figure 6. TONE-ARM BASE-PLATE CLEARANCE

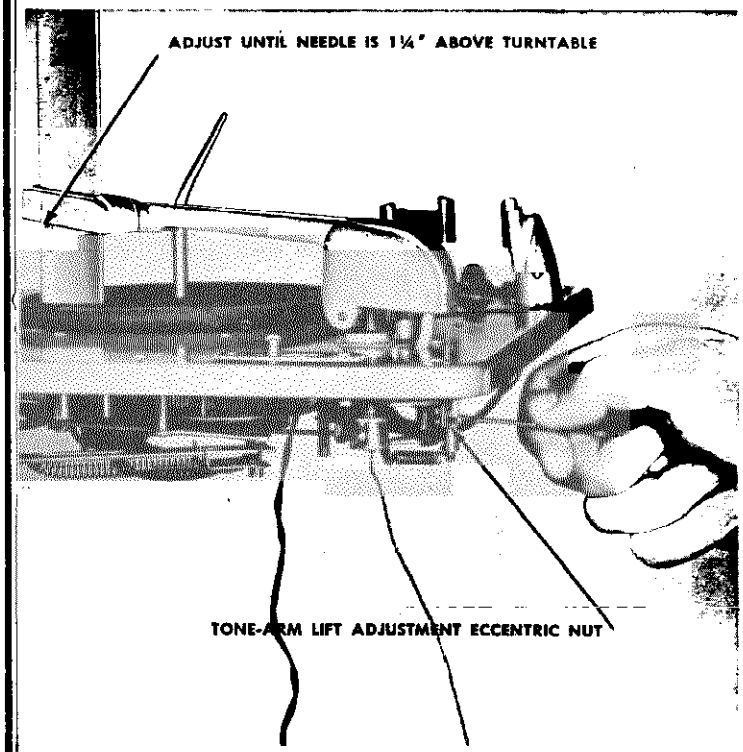


Figure 7. TONE-ARM LIFT ADJUSTMENT

TONE-ARM BASE-PLATE CLEARANCE — Without a record on the turntable and the changer out of cycle (playing position), the needle point should clear the changer base plate by $\frac{3}{32}$". To adjust, shape the tone-arm bracket, when necessary, as shown in figure 6.

TONE-ARM LIFT ADJUSTMENT—Without using a record, place the changer in automatic position; do not turn the motor on. Bring the tone arm into the center to actuate the trip. Manually revolve the turntable 1¼ turns. At this point, the needle should be 1¼" above the turntable. Adjustment is made by turning the eccentric nut on the tone-arm elevating assembly, figure 7, until the proper height is obtained.

12" INDEXING ADJUSTMENT

NOTE: As the 12" indexing adjustment affects the 10" indexing, any changes made in the 12" adjustment must be followed by an adjustment for 10" indexing. The 12" adjustment must be made first.

With the changer set for 12" operation, place a good 12" record on the changer and cycle the changer. Shut off the motor and stop the turntable when the needle is approximately ¼" above the record. Loosen the two setscrews (one has a flat end, the other a cone-pointed end) on the trip-lever assembly attached to the tone-arm vertical shaft. See figure 8. Holding the tone-arm lever lightly against the stop, move the tone arm until the needle point is approximately ⅛"

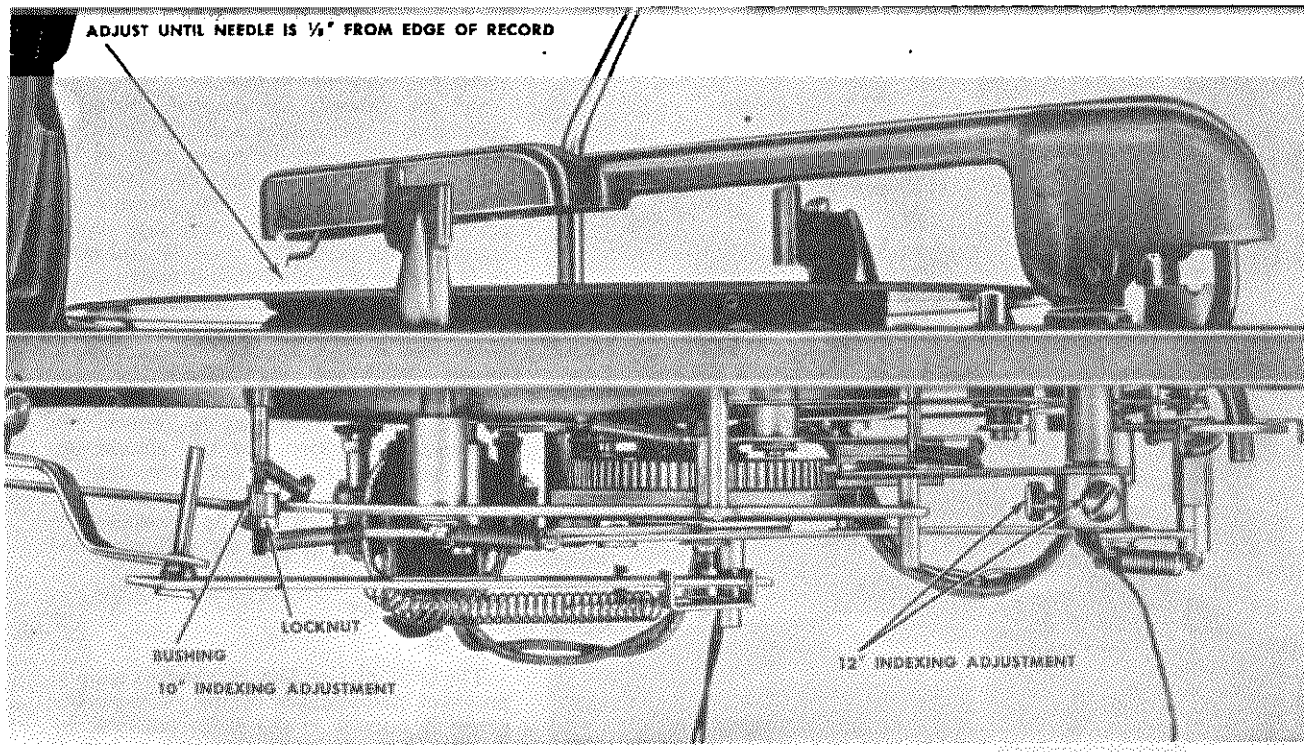


Figure 8. 12" AND 10" INDEXING ADJUSTMENTS

in from the outer edge of the record. Using a shim to provide .003" to .005" end play of the tone-arm post, first tighten the flat-end setscrew. Cycle the changer a few times to make sure the adjustment is correct; then tighten the cone-pointed setscrew.

10" INDEXING ADJUSTMENT—With the changer set for the 10" operation, place a good 10" record on the changer and cycle the changer. Shut off the motor and stop the turntable when the needle is approximately ¼" above the record. Referring to figure 8, loosen the locknut and turn the eccentric bushing directly above until the needle is approximately ⅛" in from the outside edge of the record. Tighten locknut. Cycle changer a few times to make certain the adjustment is correct.

TONE-ARM NEEDLE PRESSURE AND VERTICAL FRICTION

With a 2 oz. postal-type scale, similar to Philco Part No. 45-2958, hooked under the front edge of the tone arm, as shown in figure 9, lift the arm while noting the reading; lower the arm, again noting the reading. The difference in these two readings represents the vertical friction; this friction should not exceed 3/16 ounce. The reading midway between the two readings taken is the needle pressure. The crystal tone arm should have a needle pressure between 1 and 1¼ ounces. The needle pressure of the dynamic tone arm should be between ¾ and 1 ounce. If the tone arm pivot screw is too tight, excessive friction will result. Loosen lockscrew, adjust the pivot screw, and retighten the lockscrew. If the pivot screw is too loose, trip failure on some records is likely.

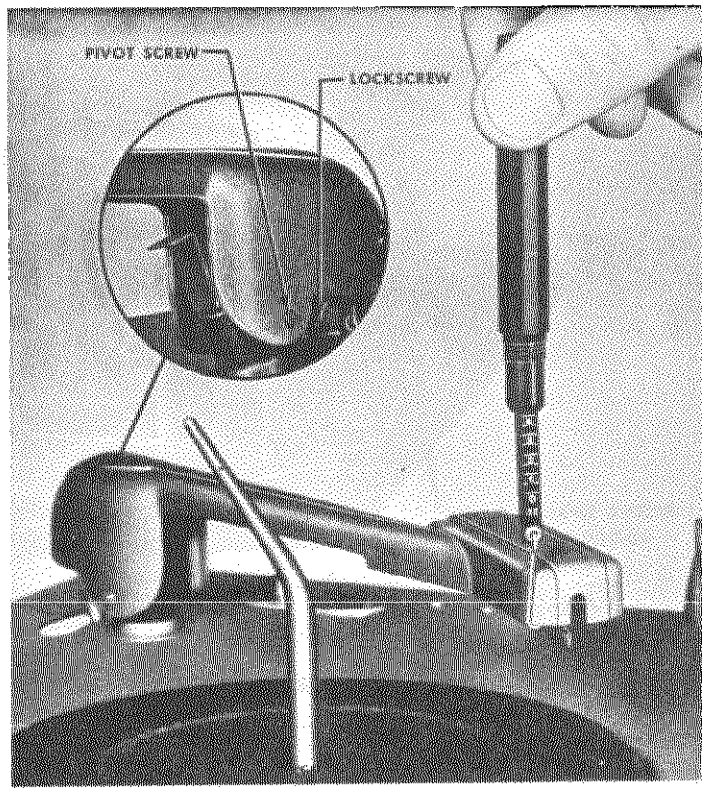


Figure 9. CHECKING TONE-ARM NEEDLE PRESSURE AND VERTICAL FRICTION

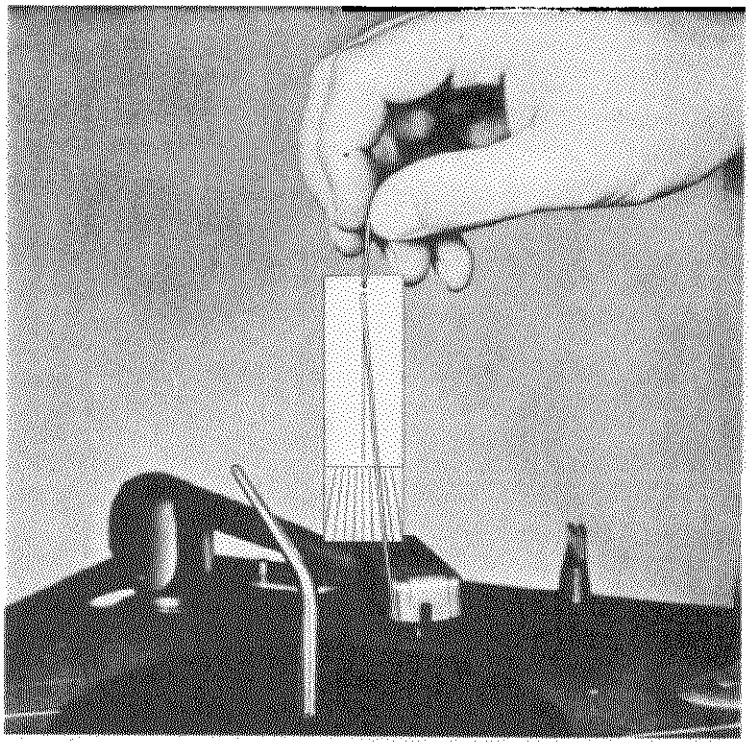


Figure 10. CHECKING TONE-ARM HORIZONTAL FRICTION

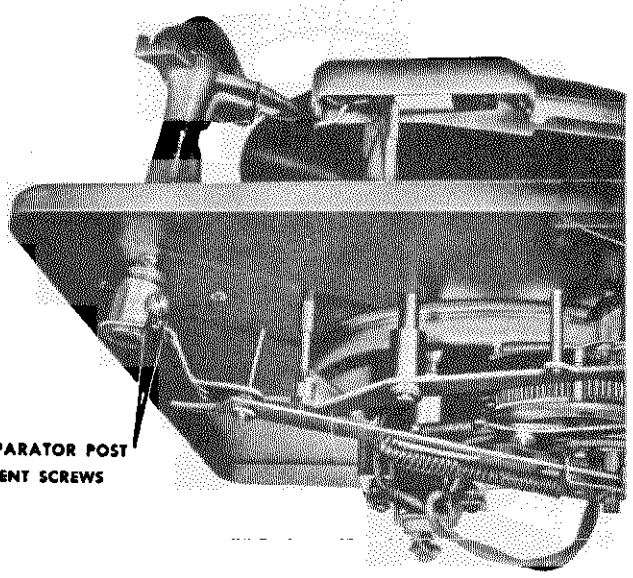


Figure 11. RECORD-SEPARATOR-POST ADJUSTMENT

TONE-ARM HORIZONTAL FRICTION AND TRIP SENSITIVITY

Set the changer for manual operation, and hook a pendulum scale, Philco Part No. 45-2953, under the front edge of the tone arm, as shown in figure 10. Move the tone arm with scale slowly toward the spindle, and back to the outer edge of the record. The pendulum scale is calibrated in $\frac{1}{16}$-ounce divisions, with 0 center. The average of both readings should not exceed $\frac{1}{8}$ ounce. Unlatch the trip; over the same range the average should not exceed $\frac{1}{16}$ ounce. With the trip latched, the horizontal reading in the direction toward the spindle should not exceed $\frac{5}{16}$ ounce. In the reverse direction, the trip should unlatch with a reading not exceeding $\frac{1}{2}$ ounce. If these specifications are met, many records which may be considered to have defective trip grooves will play and trip satisfactorily.

PICKUP TEST

D-10

The D-10 pickup may be checked simply, provided performance of the radio-phonograph is normal in the radio position, by playing a familiar record and listening to the tone quality and volume. If there is no reproduction, check for a short or open circuit in the shielded-wire pickup lead before replacing the pickup unit.

D-10A

The D-10A pickup may also be checked by the same listening test described for the D-10 pickup, provided radio performance is good and the pre-amplifier checks normal. If there is no reproduction, or if the reproduction is weak or distorted, check for a short or open circuit in the connecting leads and phono input transformer before replacing the pickup unit. The primary of the transformer should measure .1 ohm, and the secondary 7000 ohms.

D-10 or D-10A

If reproduction with either the D-10 or D-10A pickup is weak, but the leads and transformer check normal, replace the pickup unit as directed under REPLACEMENT OF PARTS AND ASSEMBLIES. If the reproduction is distorted, try a new needle before replacing the pickup unit.

RECORD-SEPARATOR-POST ADJUSTMENT

There are wide variations in records with respect to outside diameter, size of center hole, and thickness; we urge, therefore, that the record separator post adjustment never be made to any record, unless it has been carefully chosen to meet industry centerline specifications, as follows: For the

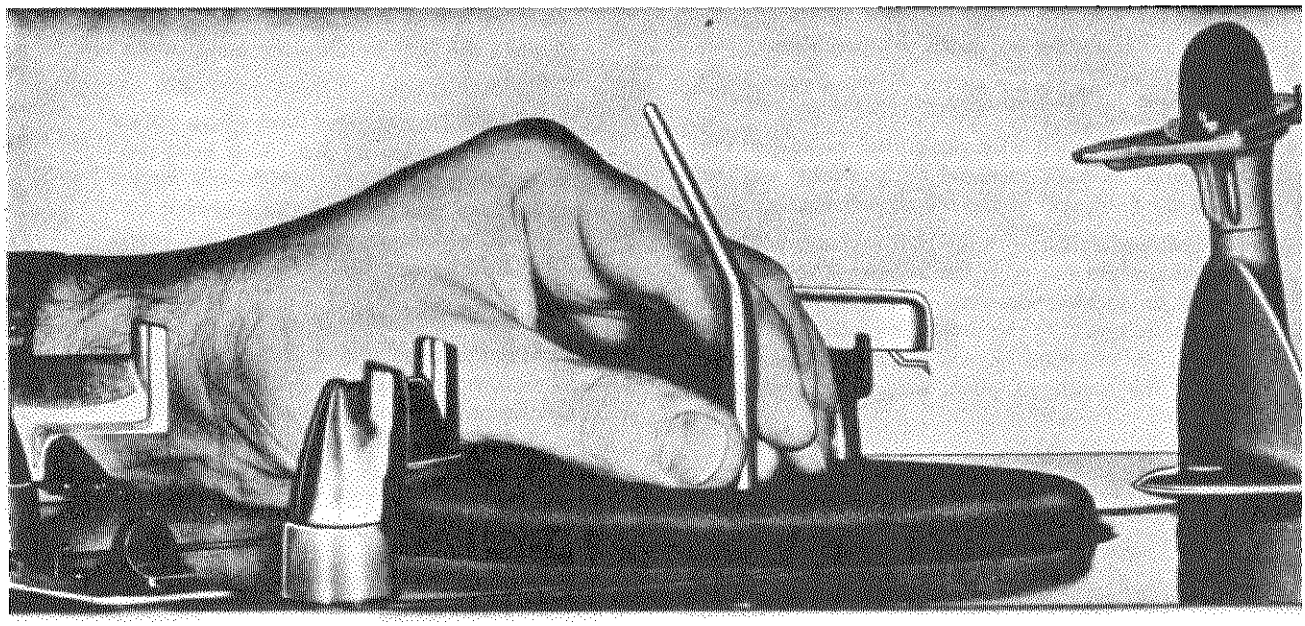
10" record—outside diameter, 9⅞"; center hole, .286"; thickness, .080"; for the 12" record—outside diameter, 11⅞"; center hole, .286"; thickness, .090". However, with an average record, observations can be made that should indicate a normal adjustment. With a 10" record placed on the separator post and both record supports, and with the record held on the separator post as far as the spindle will permit, the separator blade should not touch the record; the outer edge of the record should rest approximately in the center of the record supports. When held away from the separator base, the distance from the edge of the record to the separator tip should not exceed ⅛". With a 12" record placed on the separator post and both record supports, and with the record held on the separator post as far as the spindle will permit, the separator blade should not touch the record; the outer edge of the record should rest approximately in the center of the record supports. When held away from the separator base, the distance from the edge of the record to the separator tip should not exceed $\frac{1}{16}$". These conditions can be met precisely by adjusting the height of the spindle as shown in figure 12. However, the spindle should not be adjusted too low, as binding of the turntable will reduce speed. If the spindle is adjusted too high, the ball bearings may be allowed to escape, and the cleats on the spindle will damage the bottom record.

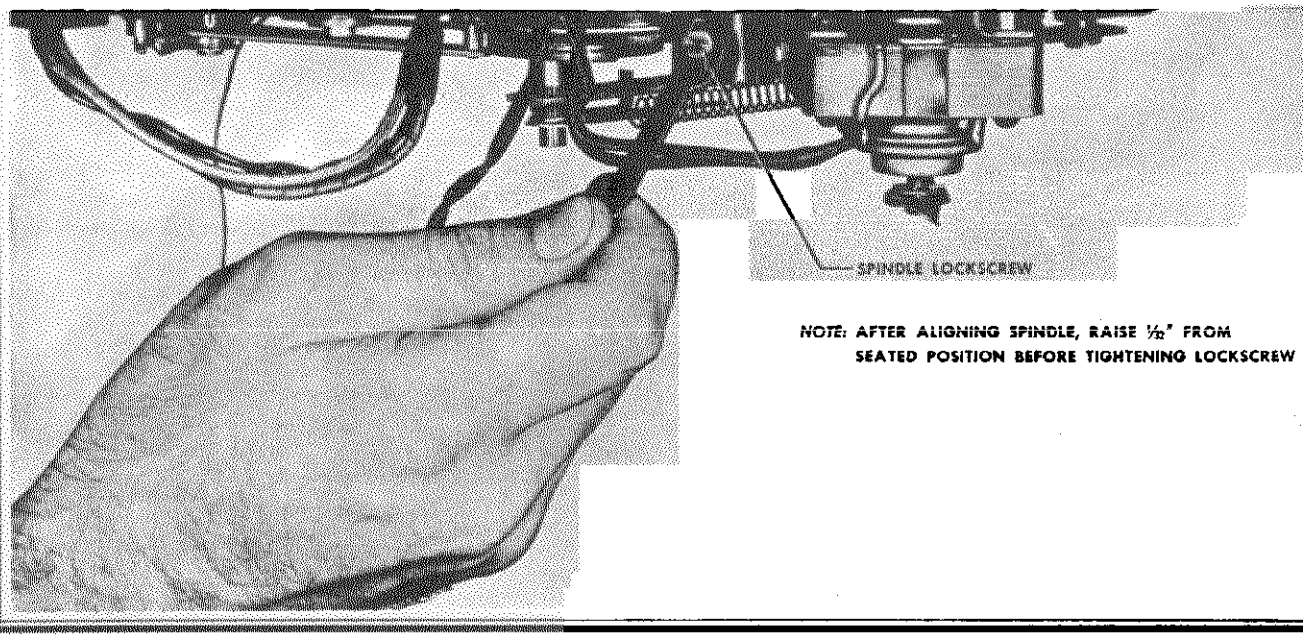
RECORD-SEPARATOR HEIGHT ADJUSTMENT

The changer is adjusted so that the separator blade engages a 10" record at a height of .060" ± .002", and a 12" record at a height of .070" ± .002".

SPINDLE ALIGNMENT—Loosen the hex-head setscrew in collar at bottom of spindle. Align spindle, with its top away from record separator post, so that tip of spindle points midway between the two record support levers.

Figure 12. SPINDLE ALIGNMENT





NOTE: AFTER ALIGNING SPINDLE, RAISE 1/32" FROM SEATED POSITION BEFORE TIGHTENING LOCKSCREW

REPLACEMENT OF PARTS AND ASSEMBLIES

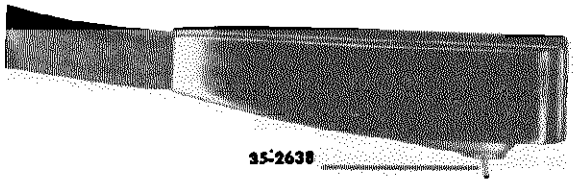


Figure 13. NEEDLE POSITION IN D-10A PICKUP

Whenever a part or assembly is found to be defective, or it becomes necessary to remove parts for lubrication, the following procedures are recommended. The part should be replaced by reversing the order of removal and adjusted according to the directions given in the SERVICING section of this manual. Be certain that the changer is out of cycle (playing position) before removing any parts or assemblies.

1. NEEDLE

a. The needle used with the crystal pickup in the D-10 changer may be replaced by loosening the setscrew at the front end of the crystal cartridge.

b. The needle used with the D-10A changer should be pulled straight out with the fingers. There are no setscrews or locking devices. When replacing the needle, make sure that the needle is placed so that its bend is in the direction of record rotation. See figure 13. Push the needle in place, using finger pressure only.

2. CRYSTAL

a. Remove tone arm, by loosening lockscrew and pivot screw. See figure 14. It is not necessary to unsolder the shielded cable, as there is generally enough slack to allow the arm to be turned over.

b. Remove the two screws and lockwashers which hold crystal to arm. See figure 15.

c. Lift out crystal cartridge and remove two jacks from end, as shown in figure 15.

3. DYNAMIC HEAD

a. Remove tone arm, by loosening lockscrew and pivot screw. See figure 14. It is not necessary to unsolder the shielded cable at the radio, as there is usually enough slack to allow the arm to be turned over.

b. Unsolder the wires from the head at points shown in figure 16.

c. Remove the bolt holding the head to the arm, and lift off head.

CAUTION: Do not place head where it may pick up iron filings or dirt. This head contains a powerful magnet which will attract and hold any small particles of magnetic material, and a delicate mechanism which will be damaged by any foreign material.

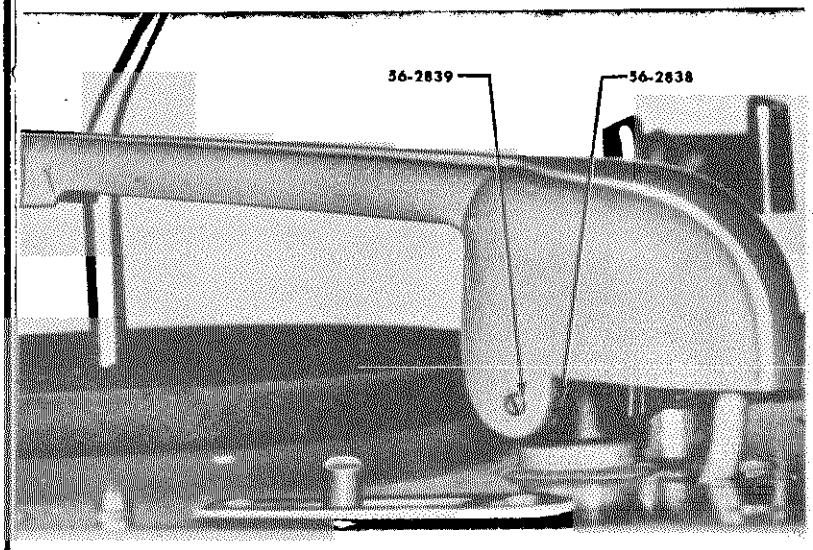
4. TONE-ARM ASSEMBLY

a. Unsolder end of the shielded cable which is soldered directly to a terminal panel in table model sets, and to a plug in floor models.

b. Loosen lockscrew and pivot screw. See figure 14.

c. Lift out tone arm.

Figure 14. TONE-ARM LOCKSCREW AND PIVOT SCREW



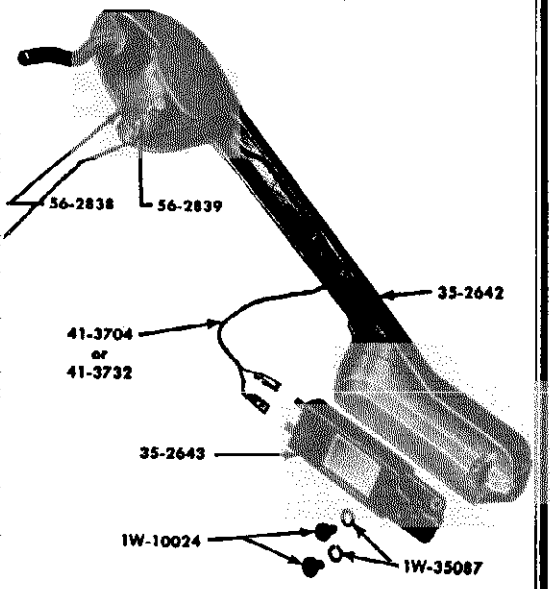


Figure 15. CRYSTAL CARTRIDGE REMOVED

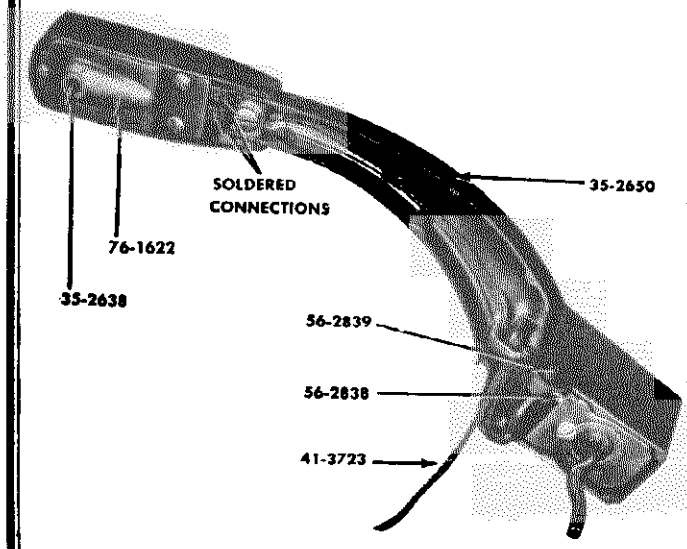


Figure 16 D-10A PICKUP, BOTTOM VIEW

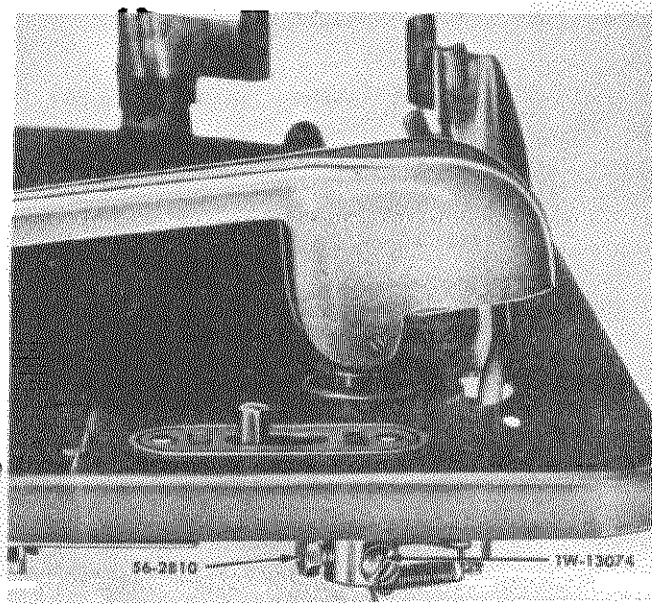


Figure 17. TONE-ARM-POST SETSCREWS

5. TONE-ARM AND POST ASSEMBLY

a. Unsolder the end of the shielded cable which is soldered to a terminal panel in table model sets, and to a plug in floor models.

b.. Loosen the cadmium-plated and bronze setscrews, figure 17, which hold the trip-lever assembly to the tone-arm post and remove trip-lever assembly.

c. Dress setscrew burrs from tone-arm-post shaft with a fine file to prevent damage to tone-arm bearing bushing. If these are thoroughly removed, the post will pass through the bearing freely.

d. Lift out tone-arm and post assembly, being careful not to lose the single ball bearing on top of bushing. The proper sequence of parts is shown in figure 18.

6. TURNTABLE

CAUTION: Be careful not to lose the eleven ball bearings and two thrust washers under the turntable gear. To prevent loss of the bearings when removing the turntable and spindle, place hand on container under spindle opening to catch any ball bearings that may fall out. These parts are shown in their proper relationship in figure 19.

a. Loosen setscrew 56-2810 in turntable-bearing bushing 56-2814, figure 20, and lift out spindle.

b. Lift off turntable.

Figure 18. TONE-ARM REMOVAL

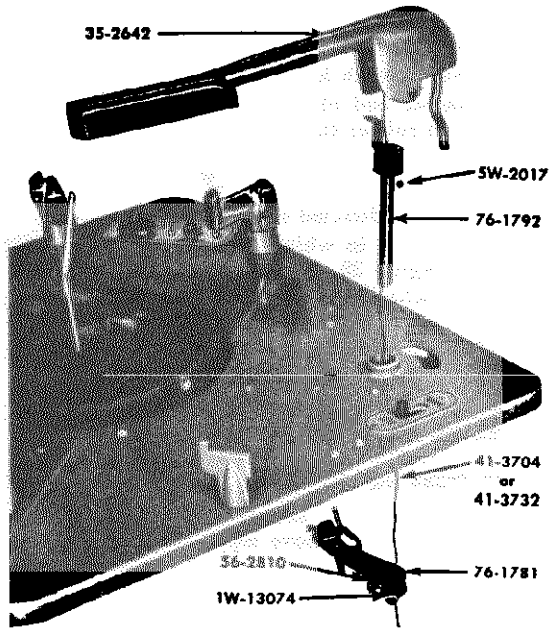
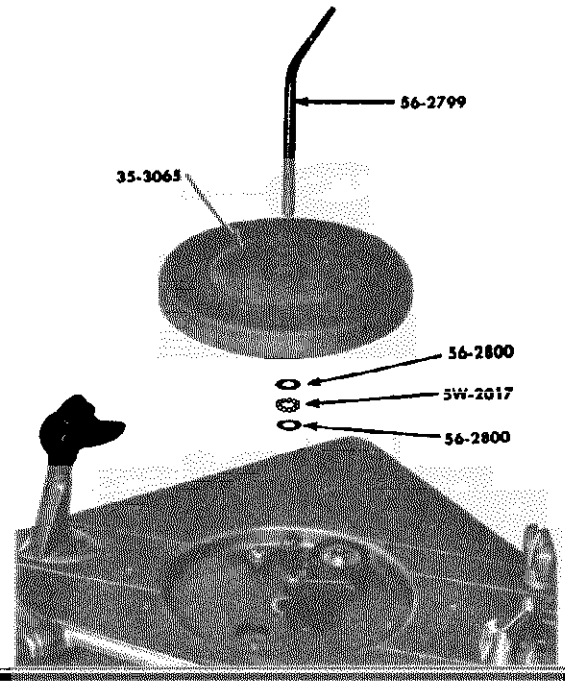


Figure 19. TURNTABLE REMOVAL



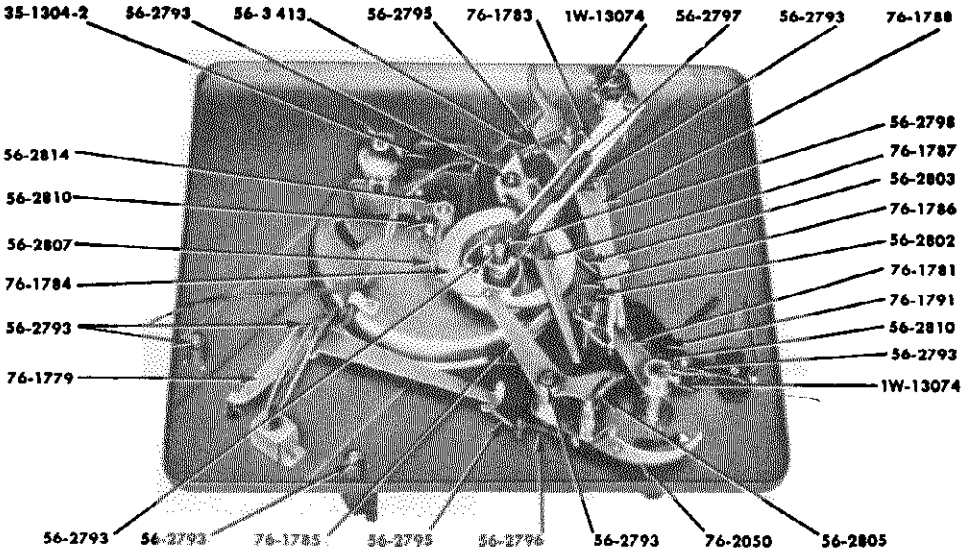


Figure 20. BOTTOM VIEW OF CHANGER

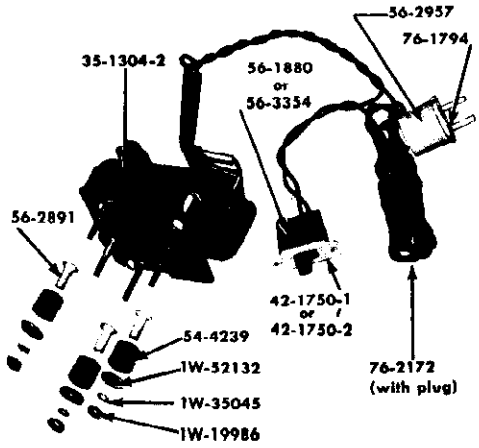


Figure 21. MOTOR REMOVAL

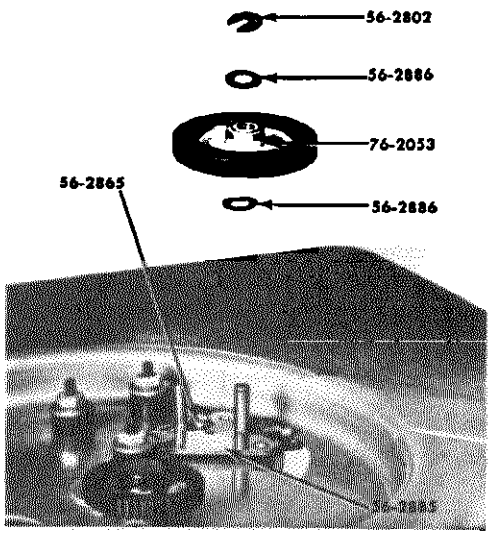


Figure 22. IDLER-WHEEL REMOVAL

c. Use grease on ball bearings, as directed in the CLEANING AND LUBRICATION paragraph of this manual, when replacing bearings. This will hold bearings in place for reassembly and will provide proper lubrication.

d. After replacing turntable, adjust height of spindle, as directed in the SERVICING section of this manual.

7. MOTOR

a. Remove turntable, as directed in paragraph 6.

b. Remove two screws from ON-OFF switch, and remove switch from base plate.

c. Loosen sheet-metal screw from clamp which holds wires against base plate, and lift wires from under clamp.

d. Remove three nuts from motor mounting bolts. Be sure there are three lockwashers, three flat washers, three rubber grommets, and three spacers, as shown in figure 21.

e. Lift out motor.

8. IDLER WHEEL

a. Remove turntable, as directed in paragraph 6.

b. Remove "C" washer with long-nose pliers.

c. Remove flat washer and idler wheel. See figure 22. Do not get grease or oil on rubber tire.

9. CAM-GEAR DRIVE-GEAR ASSEMBLY

a. Remove turntable, as directed in paragraph 6.

b. Drive out tapered pin in white metal pinion gear 56-2807 under base plate. See figure 20.

c. Remove lower (white metal) and upper (composition) gears.

10. SEPARATOR

a. Remove Phillips-head screw from plastic handle.

b. Remove plastic handle and separator. See figure 23.

11. SEPARATOR-POST ASSEMBLY

a. Loosen cadmium-plated and bronze setscrews in separator-lever assembly, figure 24, and remove separator lever from separator post.

b. Lift out post. See figure 23.

12. SEPARATOR-LEVER ASSEMBLY

a. Loosen cadmium-plated and bronze setscrews at separator-post end, figure 24.

b. Remove "C" washer and flat washer at cam-gear end and lift off lever.

13. TONE-ARM ACTUATING-LEVER ASSEMBLY

a. Remove separator-lever assembly at cam-gear end.

b. Remove tension spring 56-3413 from stud at short end of tone-arm actuating-lever assembly 76-1787. See figure 20.

c. Remove "C" washer and flat washer, and lift off lever.

14. TONE-ARM LOCATING-LEVER ASSEMBLY

a. Remove separator-lever assembly at cam-gear end.

b. Remove tension spring 56-3413 from tone-arm actuating lever 76-1787. See figure 20.

c. Remove tension spring 56-2795 from tone-arm locating lever 76-1788. See figure 20.

d. Remove "C" washer and flat washer and lift off lever.

15. TONE-ARM ELEVATING-LEVER ASSEMBLY

a. Remove lower tension spring 56-3414 from lower tone-arm elevating lever 76-1785. See figure 20.

b. Remove upper tension spring 56-2796 from upper tone-arm elevating lever 76-2050. See figure 20.

c. Remove "C" washer and flat washer and lift out both levers.

16. CAM-GEAR ASSEMBLY

a. Remove separator-lever assembly at cam-gear end.

b. Remove lower tension spring from tone-arm elevating levers and move lower tone-arm elevating lever away from cam gear.

c. Remove tension spring from stud at short end of tone-arm lever.

d. Remove "C" washer and flat washer from stud holding cam gear.

e. Lift tone-arm lever over stud on trip-lever assembly and hold away from cam gear with one hand while removing cam gear with the other hand, as shown in figure 25.

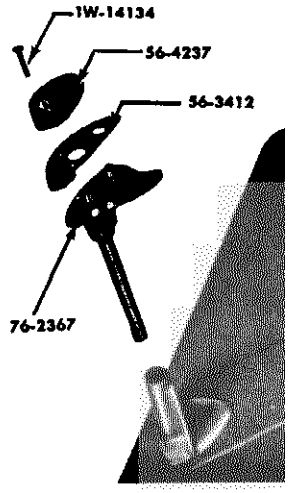


Figure 23. SEPARATOR-POST-ASSEMBLY REMOVAL

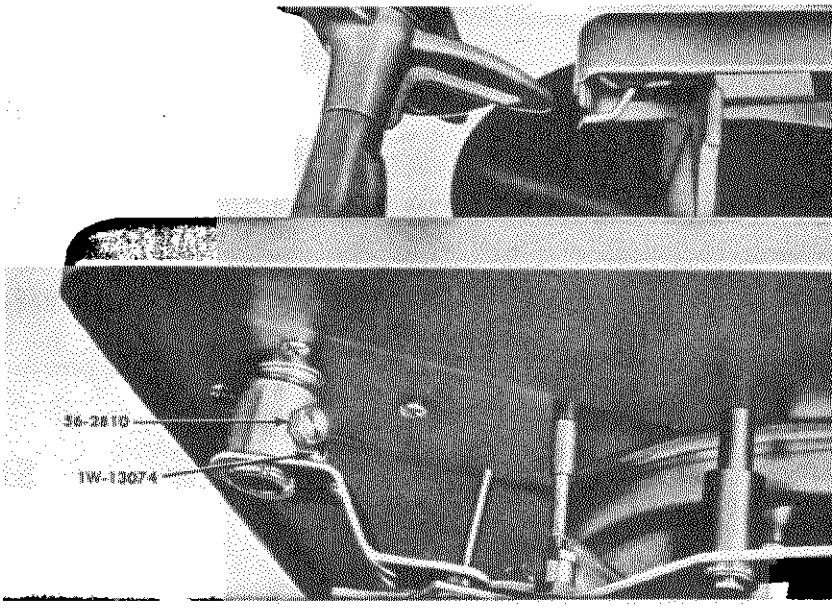
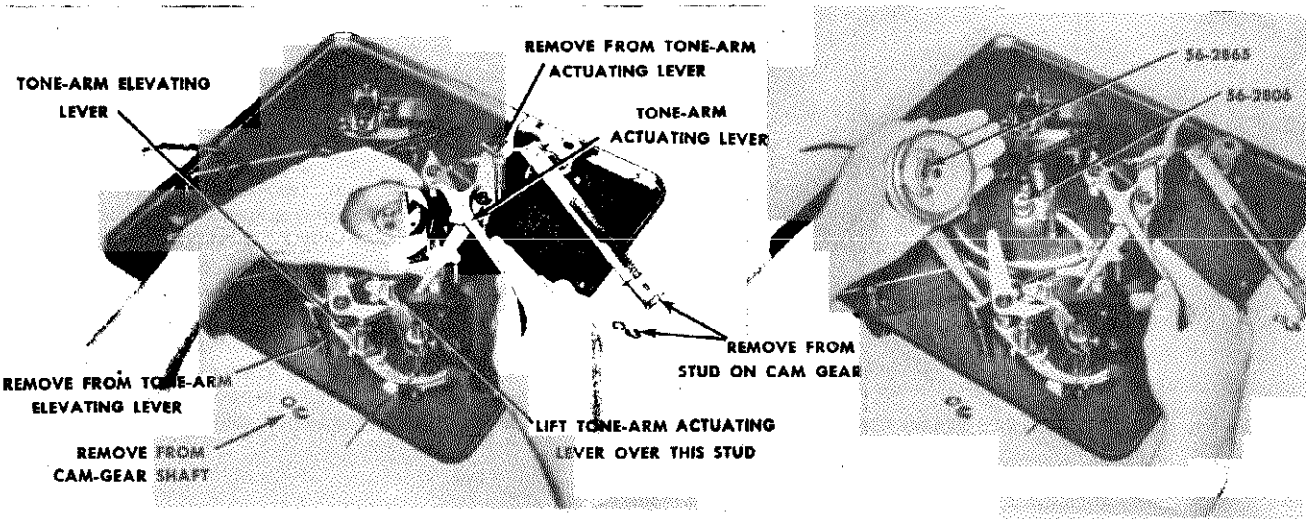


Figure 24. SEPARATOR-LEVER SETSCREWS

Figure 25. CAM-GEAR REMOVAL



REPLACEMENT PARTS LIST MODELS D-10 and D-10A

SERVICE PART NO.	DESCRIPTION
27-6209	Socket, cable plug (D-10A)
35-1304-2	Motor (can be used on either model)
35-2638	Needle (D-10A)
35-2641	Tone-arm assembly (D-10)
35-2642	Tone arm (D-10)
35-2643	Cartridge, pickup (D-10)
35-2644	Needle (D-10)
35-2648	Tone-arm assembly (D-10A)
35-2650	Tone arm (D-10A)
35-3065	Turntable
35-5078	Plate, base
41-3704	Cable, shielded, tone-arm (D-10)
41-3723	Cable, shielded, tone-arm (D-10A)
41-3732	Cable, shielded, tone-arm (double conductor used on a-c and d-c sets)
42-1750-1	Switch, ON-OFF (Stackpole)
54-4235	Bumper (record)
54-4236	Knob (REJECT control)
54-4237	Cap, separator
54-4239	Grommet, rubber (motor mounting)
56-1880	Cover (Stackpole switch)
56-2027	Plug (shielded cable D-10)
56-2448	Cover, socket (D-10A)
56-2792	Spring, compression (record-support lever)
56-2793	Washer, "C"
56-2794	Nameplate (ON-OFF—REJECT)
56-2795	Spring, tension (reject lever and locating lever)
56-2796	Spring, tension (upper elevating lever)
56-2797	Spring, compression (separator lever)
56-2798	Slide, separator-lever
56-2799	Spindle, turntable
56-2800	Washer, bearing (turntable bearings)
56-2801	Washer (ratchet lever)
56-2802	Washer, "C" (ratchet lever and drive wheel)
56-2803	Spring, tension (ratchet lever)
56-2805	Spring, tension (lower elevating lever)
56-2806	Pin, pinion (pinion gear)
56-2807	Gear, pinion
56-2809	Nameplate (AUT-MAN)

SERVICE PART NO.	DESCRIPTION (Continued)
56-2810	Setscrew (hex head)
56-2823	Spring, detent (manual lever)
56-2838	Screw, pivot-locking (tone arm)
56-2839	Screw, pivot-point (tone arm)
56-2851	Spring (trip pawl)
56-2865	Spring, tension (idler wheel and segment ge
56-2891	Bushing (motor mounting)
56-2957	Cover (a-c plug)
56-3023	Bushing, eccentric (10" indexing)
56-3074	Spring (feed-in lever)
56-3412	Separator
56-3413	Spring, tension (tone-arm actuating lever)
56-3414	Spring, tension (tone-arm elevating lever)
76-1622	Unit, pickup (D10-A)
76-1775	Lever, support (right-hand)
76-1776	Lever, support (left-hand)
76-1777	Knob (REJECT)
76-1779	Reject-lever assembly
76-1781	Trip-lever assembly
76-1782	Separator assembly
76-1783	Separator-lever assembly
76-1784	Cam assembly
76-1785	Tone-arm elevating-lever assembly (lower)
76-1786	Ratchet-lever assembly
76-1787	Tone-arm actuating-lever assembly
76-1788	Tone-arm locating-lever assembly
76-1789	Gear assembly
76-1791	Manual-lever assembly
76-1792	Tone-arm shaft assembly
76-1794	Plug (a-c)
76-2050	Tone-arm elevating-lever assembly (upper)
76-2053	Wheel, idler
76-2172	Cable, a-c (with plug)
1W-14134	Screw, Phillips-head (separator cap)
5W-2017	Bearing, ball (turntable and tone-arm)
318-4316	Stud and lever assembly (idler wheel)

OPERATING CHECKS

The following is a logical series of checks to be performed before the instrument is delivered to the owner. Should any of these checks reveal faulty operation, the correct adjustment will be found in the SERVICING section of this manual.

1. Place the spindle into the turntable and turn the spindle so that the offset is toward the record shelf. The spindle should drop all the way into its slot.

2. Place the tone arm on its rest post, turn the record shelf fully counterclockwise to the 10" position and lift the record hold-down over and toward the corner of the changer, as shown in figure 2.

3. Place a good 10" record over the spindle and onto the record shelf. Bring the hold-down over onto the record.

4. Turn the master control switch to REJ (reject) and release; it will spring back to AUT (automatic). The changer should go through its cycle. Observe the action of the push-off mechanism; the record should drop smoothly onto the turntable. The pickup jewel should lower onto the record approximately ⅛" in from the edge.

5. Allow the record to play through and, when the jewel travels the eccentric finishing groove, observe the tripping action; it should be smooth and positive.

6. Load the changer to capacity by placing eleven more 10" records over the spindle and onto the record shelf. See figure 3. Reject each record with the master control switch and observe the changer action. The tone arm, in its elevated position, should not strike the bottom of the remaining stack of records. After the full stack of records has dropped onto the turntable, the tone arm should lift high enough to clear the top record by approximately ⅛".

NOTE

Should any record fail to drop onto the turntable, carefully examine the record before making any adjustments to the changer. An unusually thick record may not drop.

7. Turn the changer master control switch to OFF, place the tone arm on its rest post, and pull the spindle straight up and out; unload the records, and replace the spindle.

8. Turn the record shelf fully clockwise to the 12" position, as shown in figure 4.

9. Place a good 12" record over the spindle and onto the record shelf. Bring the hold-down over onto the record. Repeat steps 4, 5, and 6, using nine additional 12" records in step 6.

10. Place the master control switch at MAN (manual) and play one record through to determine that the tripping mechanism is electrically disconnected.

11. Unload the changer as outlined in step 7.

12. With the master control switch OFF, the idler wheel should automatically disengage from the turntable rim. Check by spinning the turntable manually; it should revolve freely.

NOTE

Should the tone arm be held during a change cycle, the safety device will permit the changer to cycle without damage to any parts or adjustments.

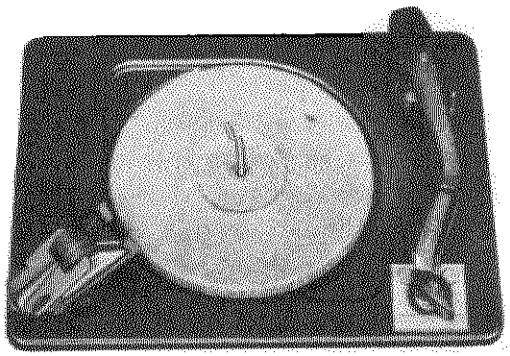


Figure 2—CHANGER, RECORD SHELF IN 10" POSITION.

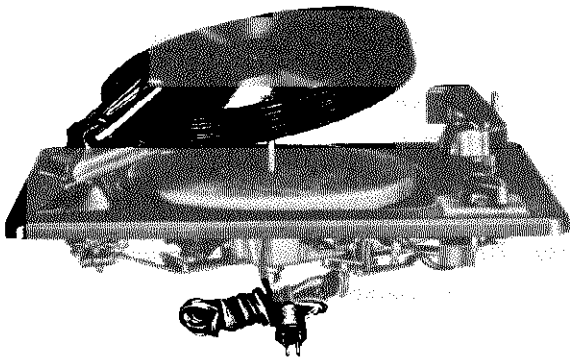


Figure 3—CHANGER, LOADED WITH TWELVE 10" RECORDS.

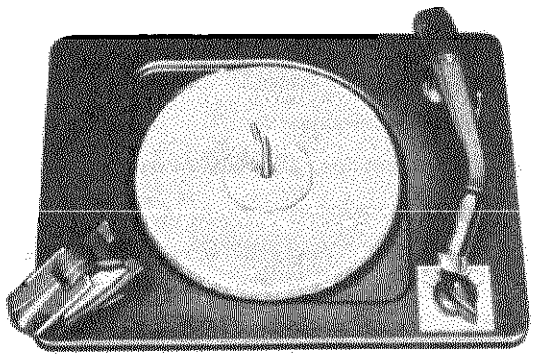


Figure 4—CHANGER, RECORD SHELF IN 12" POSITION.

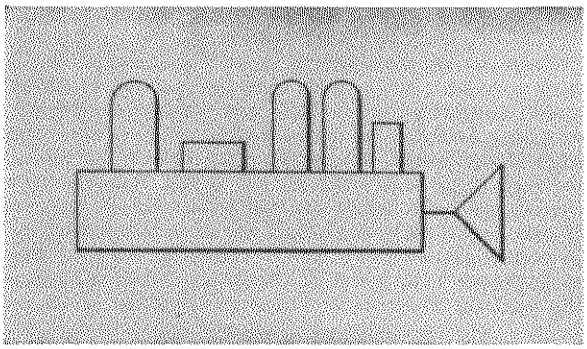
TROUBLE-SHOOTING PROCEDURE

The following tests are given for quickly localizing trouble in a Philco radio-phonograph. Be sure to make each test, in the order given, *before* removing either the radio chassis or the record changer from the cabinet.

If the trouble is found to be in the audio amplifier, or pre-amplifier, refer to the radio service manual for the particular model under test. If the trouble is in some part of the record changer, or in the separately-mounted phono input transformer, refer to the SERVICING section of this record changer manual.

1. AUDIO-AMPLIFIER TESTS

The audio amplifier, with the exception of the pre-amplifier and separately-mounted phono input transformer, is common to both the radio and phonograph



sections of the combination. With a station tuned in, observe whether the speaker output is normal by listening to its tonal quality and volume, with the volume control set to the tap. To locate the tap, set the tuning control for background noise between stations, or slightly out of tune with a station; then slowly turn the volume control from its minimum volume position until a sharp increase in high-frequency response is noted. The tap is at this point. The volume should be approximately the same in radio and phonograph operation.

a. Pre-Amplifier

Check the pre-amplifier as follows:

Remove the cable plug connection between the phono input transformer and radio chassis. Adjust the volume control for normal radio volume (tap on volume control). With the radio-phonograph set for phonograph operation, touch a test prod to the receptacle contact on the radio chassis; a loud audible response should be heard from the speaker.

If no response is heard, there is trouble in the pre-amplifier circuit; test the pre-amplifier tube before removing the radio chassis from the cabinet. An audible response merely indicates that the circuit is not completely inoperative, and does not conclusively indicate that the gain is normal.

b. Phono Input Transformer

Check the input transformer as directed on page of this manual.

2. TONE-ARM TESTS

a. Pickup

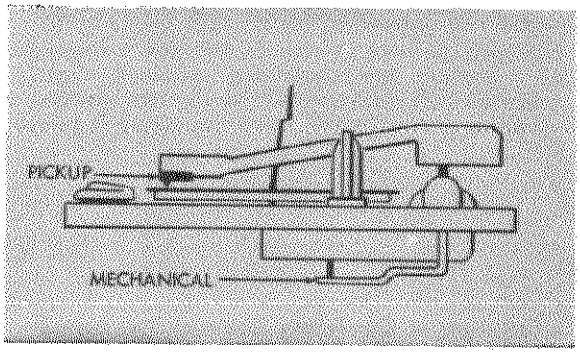
Play a familiar record on the radio-phonograph, and listen to the reproduction.

NOTE

It is advisable that a familiar record be included as a regular part of the serviceman's test equipment.

If the output is distorted, try a new needle. Distortion or low volume may indicate trouble in the pickup, phono input transformer, connecting leads, or pre-amplifier.

Further tests on the pickup are given on page of this manual. If the pickup is found to be faulty, it will be necessary to remove the record changer from the cabinet.



b. Set-Down

Set the record shelf to the 10" position, and place the tone arm on its rest post. Place a good 10" record on

the turntable, then turn the master control switch to REJ, and release. Observe the action of the tone arm; it should rise and travel over to the record, the needle coming down approximately ⅛" in from the outside edge of the record. If the tone arm does not set down correctly, the necessary adjustment may be made, as directed on page of this manual, without removing the record changer from the cabinet.

c. Lift

Set the record shelf for 10" operation and place a full stack of twelve 10" records on the changer. Start the changer by turning the master control switch to REJ and releasing. During the change cycle, the tone arm, in its elevated position, should not strike the bottom of the remaining stack of records.

Continue to reject each record until the full stack is on the turntable. Make sure that the tone arm clears the top record by ⅛" when the arm swings away from the spindle.

If either of these clearances is not correct, the lift adjustment may be made, as described on page of this manual, without removing the record changer from the cabinet.

d. Tripping

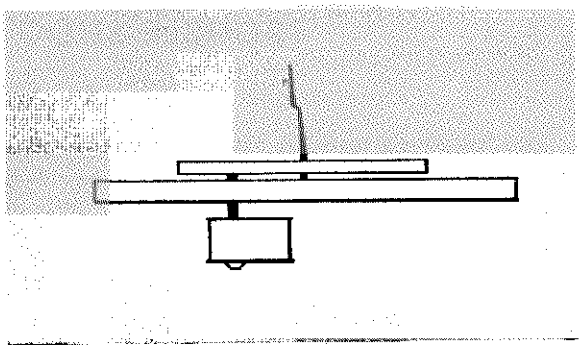
Play a record through, with the master control switch in AUT position. As the needle travels the eccentric finishing groove, tripping of the mechanism should be prompt and positive. The adjustments required are given on page of this manual.

3. TURNTABLE and MOTOR TEST

Load the turntable with ten 12" records. Place a stroboscope disc, such as Philco Part No. 45-2900, on the top record. Illuminate the disc with an electric light, preferably a neon bulb. The circle of dots on the disc indicating the turntable speed will normally appear to remain stationary, or will drift slowly in one direction or the other. The speed of the turntable should be 78 +3 −1.4 r.p.m. Erratic movement of the dots indicates unstable turntable speed.

If a stroboscope disc is not available, a small piece of paper may be inserted under the edge of a record to serve as an indicator, and the revolutions may then be counted and timed.

Remove the stack of records, and play a single record, preferably one containing sustained, high-frequency tones. Listen critically to the reproduction to determine if any "wow" (tone variation) is present.

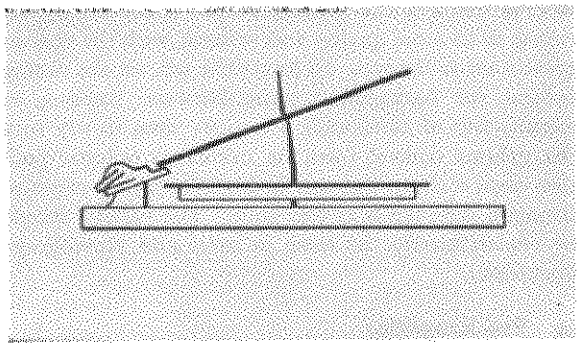


Wows are caused by unstable turntable speed. See page of this manual.

Unsatisfactory operation in the above tests indicates trouble in the motor, idler-wheel assembly, or turntable bearings.

4. RECORD-SHELF TEST

Turn the record shelf to the 10" position. Place a stack of twelve 10" records over the spindle. Turn the master control switch to REJ, and observe the record-dropping action. The record should fall smoothly; the edge of the record should leave the lips of the record shelf *after* the center has started to fall. Run through the change cycle, using the complete stack of records. If one record fails to change, examine the record for defects. Unsatisfactory record changing may be due to improper adjustment of the record shelf, including the push-off slider cam. These adjustments, given on page of this manual, require removal of the record changer from the cabinet.

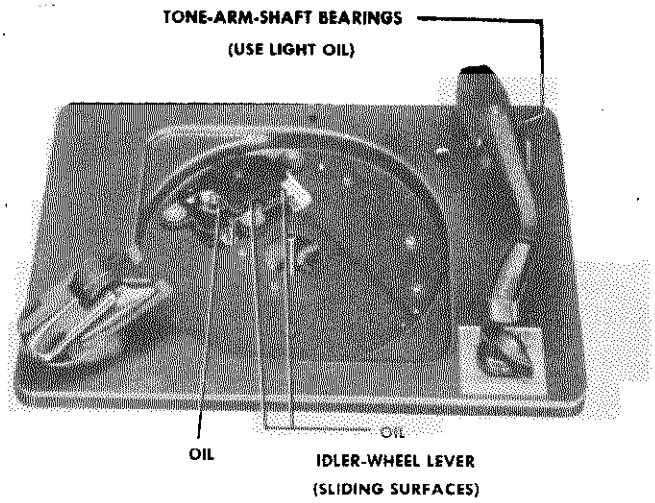


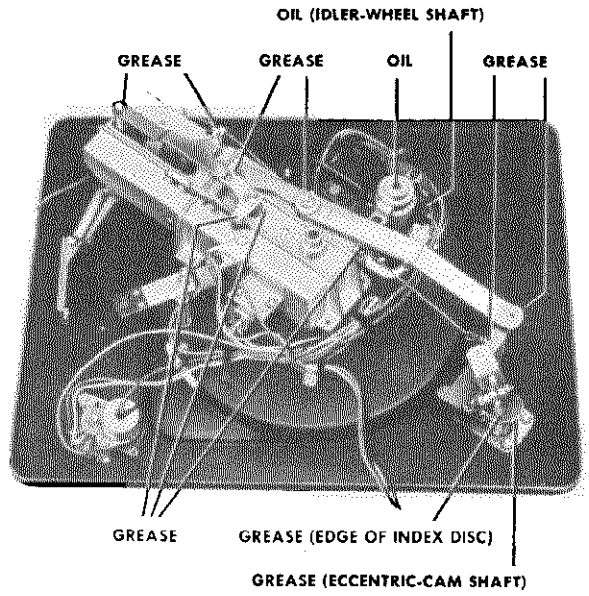
SERVICING

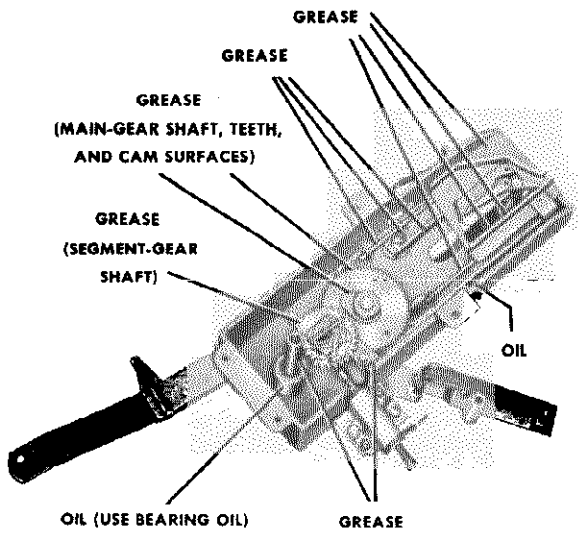
Description of Operating Cycle

Power for the motor is supplied from the power line through a master control switch having OFF, MAN, AUT, and REJ positions. The turntable is rim-driven by a rubber-tired idler wheel between the motor and turntable rim.

The changer mechanism is driven, by the turntable gear, through an intermediate gear having a retractable







segment; when retracted, this segment is held by a latch, thus mechanically disconnecting the turntable from the remainder of the changer mechanism while a record is playing. When the needle travels the eccentric finishing groove of the record, the change cycle is started, electrically, by a trip pawl riding a trip switch. This switch energizes a solenoid, driving its plunger against the intermediate-gear latch, and releasing the movable segment. The segment meshes with the turntable-hub gear, causing the changer mechanism to be driven through a cycle. At the completion of the cycle, the gear segment is retracted by a cam lever and is again held by the latch.

During the change cycle, the tone arm is operated by a lift-rod and a sliding, main-cam assembly, while the next record is dropped by the operation of a push-off slider in the record-shelf assembly.

Record rejection is also started electrically by the control switch, which, in REJ position, shorts across the trip-switch circuit, energizing the solenoid.

Cleaning and Lubrication

After long periods of use, or when a major part or assembly is replaced, the record changer should be cleaned and lubricated. Carbon tetrachloride or other similar cleaning fluid may be used to remove dirt, old oil, or grease. Some parts and assemblies may have to be removed for proper lubrication. The correct procedure for the removal and reinstallation of these parts and assemblies will be found in the REPLACEMENT OF PARTS AND ASSEMBLIES section of this manual. Apply lubricants sparingly, using only enough to do the job. All lubrication points are shown in figure 5.

Parts Not to be Lubricated

The following parts should not be lubricated at any time:

Segment, latch, or gear teeth, of segment gear.
Turntable-hub gear teeth.
Trip pawl.
Solenoid plunger.
Guide arm and tracking pawl (part of main-cam assembly).

Parts to be Greased

Using a light grease of the vaseline type, such as Philco Part No. 60130, lubricate the following parts:

All studs with moving parts attached.
Index disc and lever.
Turntable shaft (apply grease around sleeve, then put turntable on).
Main-cam and slider-cam slide rods (4).
Positioning-cam slots.
All shafts (except tone-arm shaft).
Main-cam gear teeth and cam surfaces.
Push-off-slider eccentric cam and shaft.
Tone-arm pivots.
Lift-arm bushing.

Figure 5—CHANGER, SHOWING ALL LUBRICATION POINTS.

Parts to be Oiled

Using very light oil, Philco Part No. 45-2954, lubricate the following parts:
Motor bearings.
Idler-wheel bearing and idler-wheel lever assembly.
Turntable-shaft ball bearings.
Tone-arm-shaft bearings.

CAUTION

Do not get oil on rubber tire, motor pinion, or inside rim of turntable; if so, remove immediately with carbon tetrachloride.

ADJUSTMENTS AND TESTS

All adjustments to this changer made on the service bench require the use of a radio chassis designed for the changer; all adjustments except those made to the pickup may be made by the use of a suitable auxiliary power supply, to furnish operating voltage for the electric trip mechanism. Details of the auxiliary supply will be found on page 11 of this manual.

Tone-Arm Lift Adjustment

Set the record shelf for 10" operation. With the master control switch OFF, manually trip the changer by lightly pushing the solenoid plunger into the coil. Swing the tone arm in near the spindle. Revolve the turntable one turn by hand. Place a 10" record onto the record shelf and spindle. Position the tone arm so that the needle point is approximately 1½" from the center of the spindle. In this position, the tone arm is at maximum height and should clear the bottom of the record by 1/16" to ⅛", and the needle point should clear the turntable by approximately 1¼". Adjust for correct clearance by turning the adjustment screw through a hole at the top and rear of the tone arm, as shown in figure 6. Turning the screw clockwise raises the arm; counterclockwise lowers it. Then determine whether the tone arm lowers sufficiently to play the first record by revolving the turntable through the complete cycle. The tone arm should lower until the needle point is below the top surface of the turntable.

Figure 6—ADJUSTING TONE-ARM LIFT.

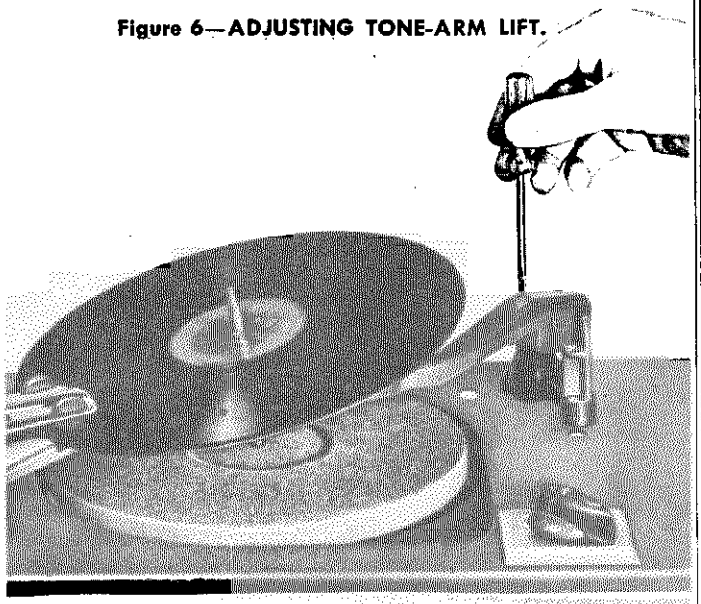
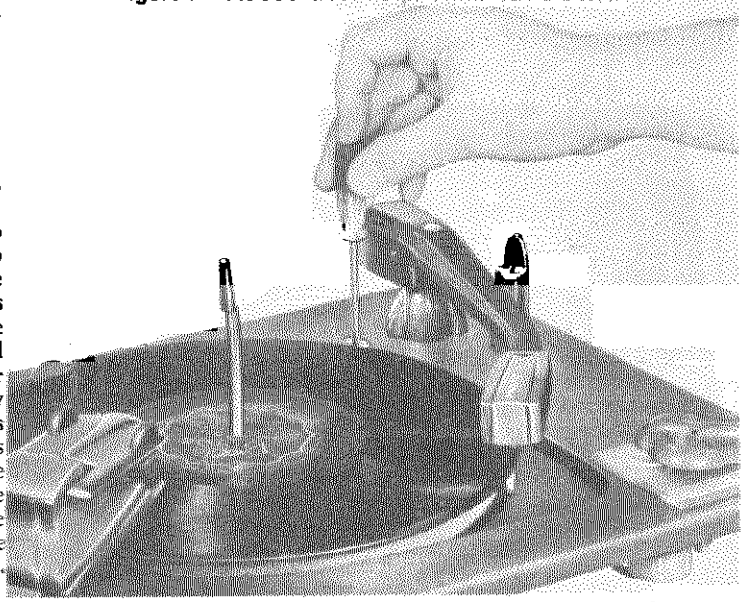


Figure 7—ADJUSTING TONE-ARM SET-DOWN.



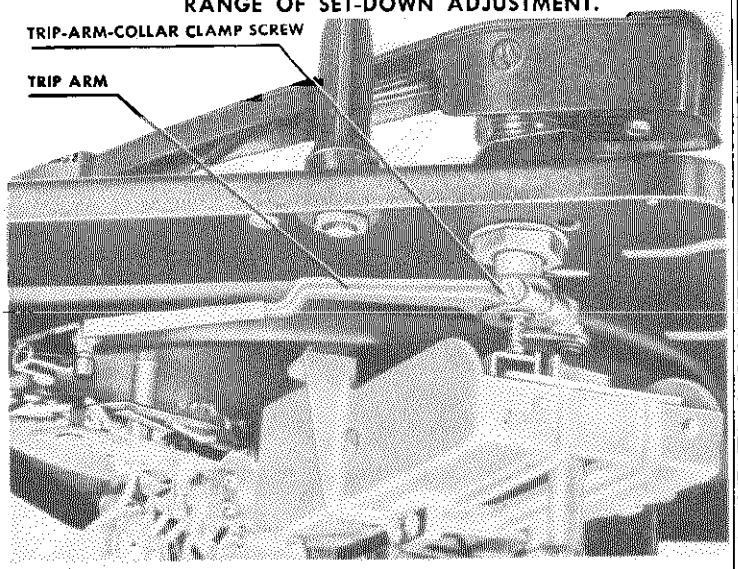
Tone-Arm Set-Down Adjustment

Set the changer for 10" operation. Place a 10" record in position and start a change cycle. Shut off the changer and stop the turntable when the jewel lowers to approximately ¼" above the record. An eccentric screw, reached through a slot in the changer base plate near the tone-arm mounting, provides the adjustment. See figure 7. Adjust so that the jewel will lower onto the record ⅛" in from the edge.

In the event that the range of the eccentric screw does not provide the correct adjustment, proceed as follows:

Turn the eccentric screw to the mid-position of its range. Loosen the clamp screw on the trip-arm collar attached to the tone-arm shaft. See figure 8. Hold the

Figure 8—TRIP-ARM CLAMP, FOR EXTENDING RANGE OF SET-DOWN ADJUSTMENT.



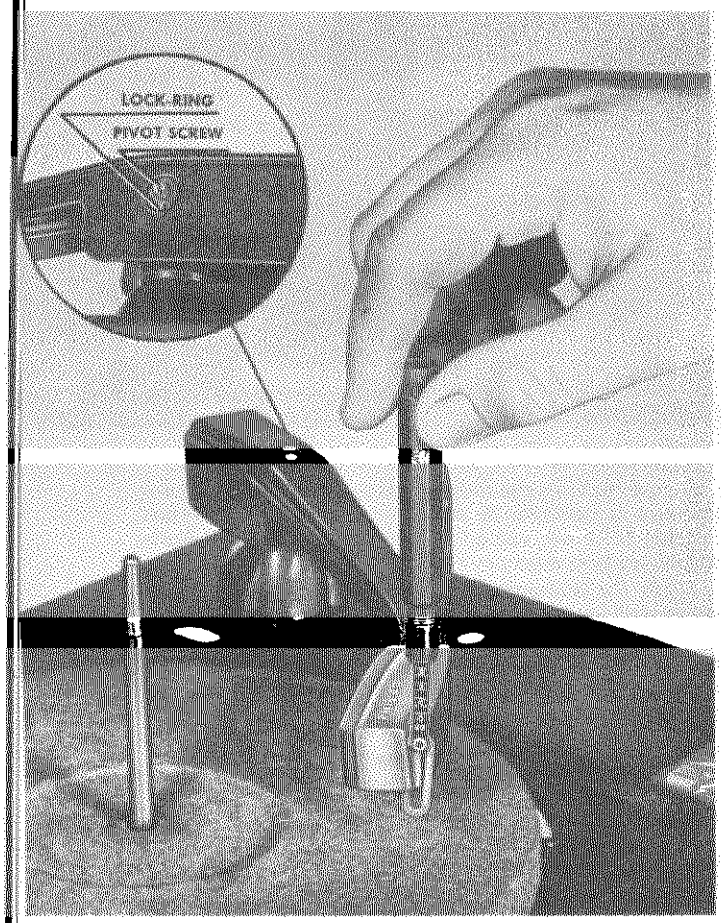


Figure 9—MEASURING TONE-ARM VERTICAL FRICTION.

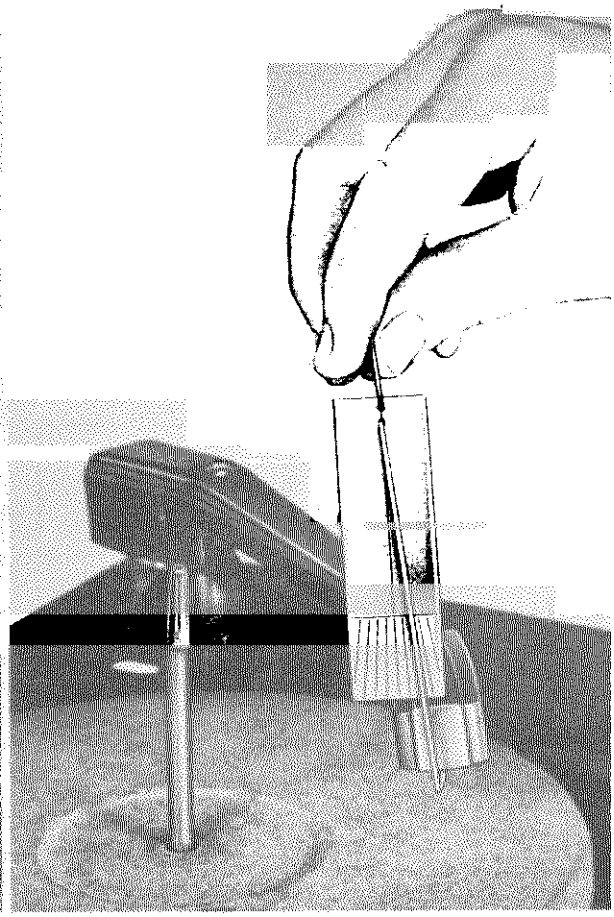


Figure 10—MEASURING TONE-ARM HORIZONTAL FRICTION.

trip arm firmly and move the tone arm to the approximate desired position and tighten the collar.

NOTE

A .003″ to .005″ vertical play in the tone-arm shaft must be maintained when making this adjustment.

If necessary, a vernier set-down adjustment may now be made with the eccentric screw, as previously described.

The 10″ adjustment should be correct for 12″ records. However, the tone-arm rest is adjusted so that the tone arm cannot set down off a 12″ record.

Tone-Arm Needle Pressure and Vertical Friction

With a 2-oz., postal-type scale, similar to Philco Part No. 45-2958, hooked under the front edge of the tone arm, as shown in figure 9, lift up the arm with the scale, noting the reading. Lower the arm, again noting the reading; the difference in these two readings represents vertical friction and should not exceed ⅛ oz.

The reading midway between the two readings taken is the needle pressure. The needle pressure of the dynamic tone arm should be between ¾ and 1 ounce. If the tone arm pivot screw is too tight, excessive friction will result. Loosen the locknut, adjust the pivot screw, and retighten the locknut. If the pivot screw is too loose, erratic set-down of the tone arm and trip failure on some records is likely.

Tone-Arm Horizontal Friction and Trip Sensitivity

With the changer out of cycle and the master control switch OFF, hook a pendulum scale, similar to Philco Part No. 45-2953, under the front edge of the tone arm, as shown in figure 10. Move the tone arm with scale slowly toward the spindle, and back to the outer edge of the record. The pendulum scale is calibrated in 1/16-ounce divisions, with 0 center. The average of both readings should not exceed 1/16 ounce.

With the trip pawl riding at 45° on the top member of the trip switch, the needle should be in the operating range for tripping, i.e., 1½″ to 3″ from the center of the spindle. The trip contact should make with a reading of from ¼ to ⅜ ounce. If these specifications are met, many records which may be considered to have defective trip grooves will play and trip satisfactorily.

Excessive friction may be caused by lack of vertical play in the tone-arm shaft or a defective shaft bearing. Correct assembly of shaft and bearing is given under REPLACEMENT OF PARTS AND ASSEMBLIES.

Tone-Arm Lead-In Test

Using a record which has no lead-in groove, see that the tone arm leads into the first record-playing groove. If it does not lead in properly, check to make

sure that the changer is level in the cabinet. If necessary, level the changer by adjusting the T-nuts and locknuts, as required.

Pickup and Phono Input Transformer Test

To test the pickup and phono input transformer, attach the pickup plug to the phono input transformer, Philco Part No. 32-8256, and attach the lead from the transformer to a radio chassis, designed for use with the dynamic pickup, and known to be in normal operating condition. If such a receiver is not available,

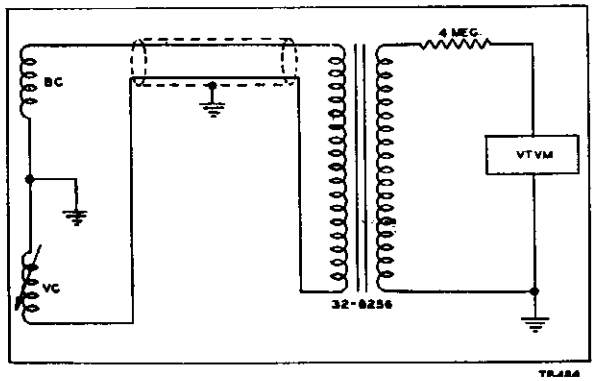


Figure 11—TESTING DYNAMIC PICKUP.

a comparable audio amplifier may be used. Play a record of good quality and listen to the reproduction.

If no reproduction is heard:

Check for a short or open in the shielded-wire pickup lead.

Check the pickup voice coil; this coil should have a resistance of approximately 3 to 4 ohms.

Check the primary and secondary of the transformer; normal resistance of the primary is approximately .1 ohm; secondary, 7000 ohms.

If output is distorted:

Try a new needle.

For a complete check of the dynamic pickup, a standard audio-tone record, or equivalent, and a vacuum-tube voltmeter with a range of 1 or 1½ volts, and with an input impedance of 1 megohm or more, are required. An oscilloscope may be used in the place of the vacuum-tube voltmeter, if desired.

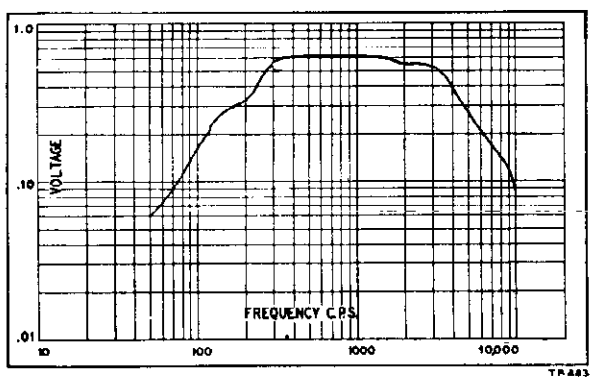


Figure 12—FREQUENCY-RESPONSE CURVE OF DYNAMIC PICKUP.

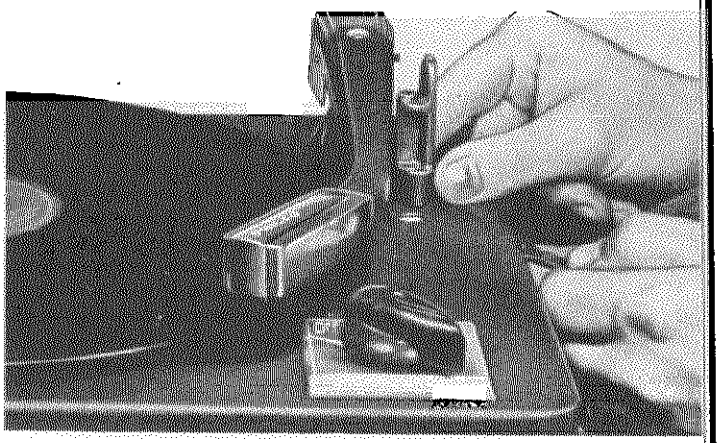


Figure 13—ADJUSTING TONE-ARM REST POST.

Before making the check, make sure that the needle pressure is between ¾ and 1 ounce, that the vertical friction does not exceed ⅛ ounce, and that the horizontal friction does not exceed $\frac{1}{16}$ ounce.

With the vacuum-tube voltmeter (or oscilloscope) connected as shown in figure 11, the output voltage, when playing 1000 cycles on the audio-tone record, should be at least .6 volt. A complete frequency-response curve should closely approximate that of figure 12.

Tone-Arm Rest-Post Placement

The tone-arm rest is adjusted so that the tone arm cannot set down off a 12" record. See figure 13.

Tripping Adjustments

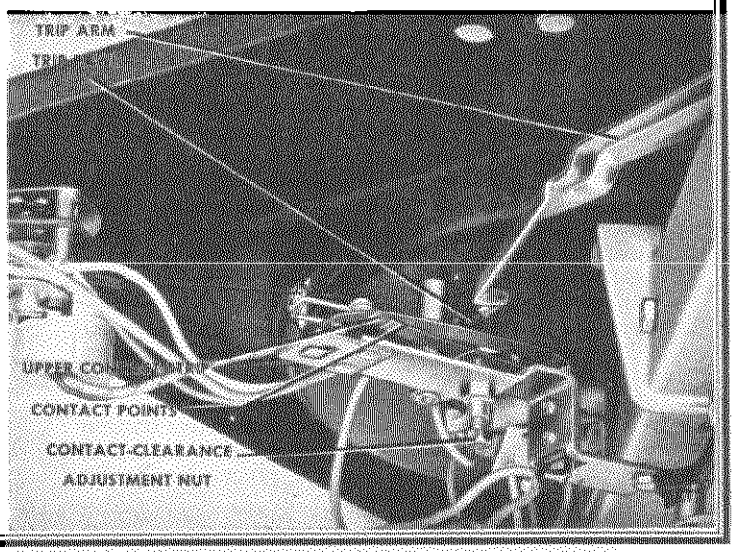
Before making any adjustments to the trip-switch assembly, make the following observations:

Be sure the two trip-switch-assembly mounting screws are tight. One point of mounting is on the changer-mechanism housing and the other screw is under the turntable.

Examine the upper contact strip and make sure it is reasonably flat along the center portion. The strip should have sufficient tension to hold the lip, located on the outer end, against the slotted insulated piece, with a pressure of from ⅛ to ¼ oz.

With the master control switch OFF, swing the tone

Figure 14—TRIP-CONTACT ASSEMBLY, SHOWING CORRECT ANGLE OF TRIP PAWL.



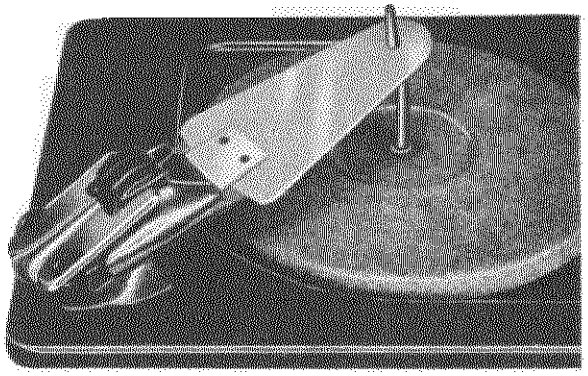


Figure 15—RECORD SHELF, SHOWING SPECIAL RECORD-SHELF GAUGE IN CORRECT POSITION.

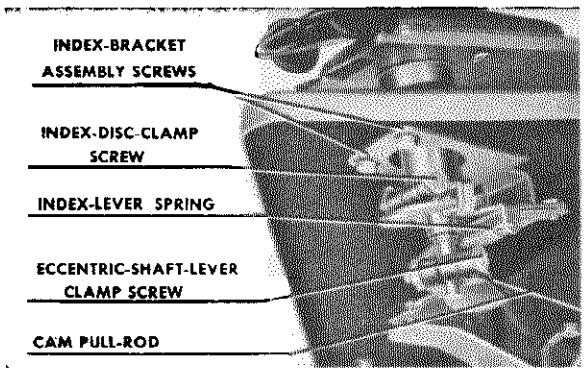


Figure 16—INDEX-BRACKET, INDEX-DISC, AND ECCENTRIC-SHAFT-LEVER ASSEMBLIES.

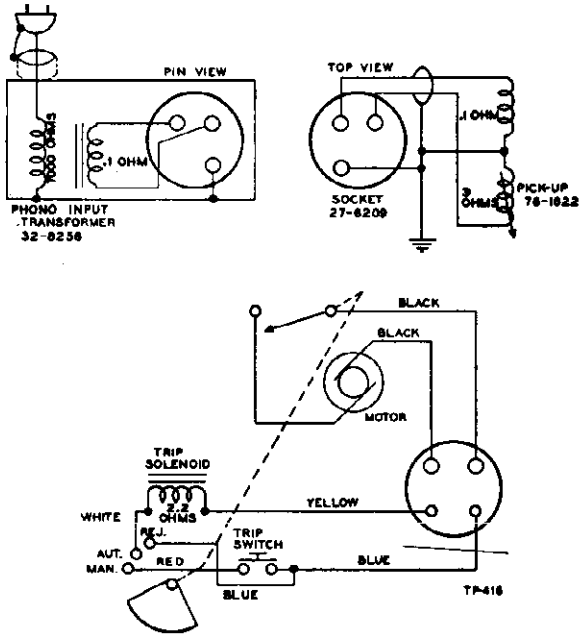


Figure 17—WIRING DIAGRAM OF CHANGER.

arm in so that the rubber-tipped trip pawl is approximately in the center of the flat portion of the upper contact strip. In this position, the trip pawl should be at an angle of approximately 45° with respect to the strip, as shown in figure 14. If necessary, shape the trip arm slightly up or down to give the correct angle.

The clearance between the contact points should be adjusted for a gap of $\frac{1}{32}$", by means of the adjusting nut on the lower strip. See figure 14. The tripping action can be checked by watching the trip pawl and the contacts while the jewel needle is travelling the eccentric finishing groove of a record.

The trip should operate by a slight backward movement of the tone arm (not less than $\frac{1}{16}$") while the arm is between 1½" and 3" from the center of the spindle. Check the action at several points within this range.

NOTE

The top surface of the upper contact strip is coated with a substance for positive action.

Record-Shelf Adjustments

To set the record shelf correctly, place the shelf in its 10" position. Place a special record-shelf gauge, Philco Part No. 45-1470, over the spindle and onto the record shelf, as shown in figure 15.

Loosen the two hex-head screws which hold the index-bracket assembly to the changer base plate. See figure 16. Also loosen the hex-head clamp screw on the index disc. Disconnect one end of the index-lever spring. Move the record-shelf assembly away from the spindle, allowing the center raised portion of the gauge to fit between the record shelf lips, and the wide part of the gauge to drop level with the shelf lips, as shown in figure 15. Push the entire assembly lightly against the edge of the gauge. Before tightening the index-bracket-assembly screws, turn this assembly so that the cam pull-rod is just taut without tensing the spring. Hold the assembly in this position and tighten the two index-bracket screws. Re-connect the index-lever spring; then tighten the clamp screw on the index disc. When the above adjustments have been made, both lips of the record shelf should be touching the edge of the gauge.

Record Push-Off Adjustment

With the changer out of cycle, set the record shelf to the 10" position. Loosen the hex-head clamp screw holding the eccentric-shaft lever to the push-off cam shaft. See figure 16. Rotate the push-off cam shaft *clockwise* until the end of the push-off slider nearest the turntable emerges from the slot in the record shelf and retracts to a point where the center portion of the slider end is just flush with the edges of the slot. Tighten the clamp.

Uneven Turntable Speed (Wows)

Uneven turntable speed (wows) may be caused by the following:

Dirt under and around turntable or idler-wheel assembly. Remove the turntable and clean out the dirt.

Flat or worn spots on rubber tire of idler wheel or defective turntable shaft and bearing assembly. Replace

defective parts as directed under **REPLACEMENT OF PARTS AND ASSEMBLIES.**

Lack of lubrication on turntable-bearing assembly or idler-wheel assembly. Follow directions under the *Cleaning and Lubrication* paragraph in this section of the manual.

Hole in record too large or too small. Try other records.

AUXILIARY POWER SUPPLY

A power adapter for the Model M-4 Philco Automatic Record Changer, providing proper voltages for the motor and solenoid through the connector on the changer, can be quickly assembled.

A small power transformer with one 6.3-volt filament winding, such as Philco Part No. 32-8190, will be satisfactory. The filament winding should have a rating of at least 2 amperes. The voltage for the motor is obtained by a direct connection to the power-transformer primary. The solenoid is energized by the 6.3-volt winding. The use of a socket, Philco Part No. 27-6182, will facilitate the connection of the auxiliary power supply to the changer.

The power supply may be assembled on any suitable chassis; the wiring diagram is shown in figure 18.

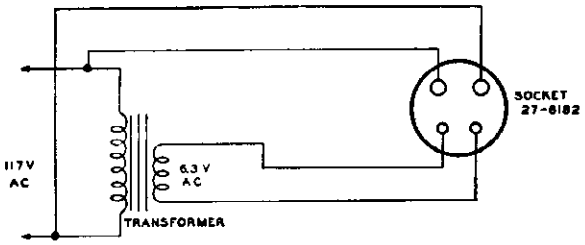


Figure 18—WIRING DIAGRAM OF AUXILIARY POWER SUPPLY.

SPECIAL TOOLS

Most of the adjustments and repairs to the Philco M-4 Changer may be made with the tools usually found in the serviceman's tool kit, and the two scales and special gauge illustrated in figure 19.

The pendulum scale, Philco Part No. 45-2953, may be used to measure the horizontal friction, or drag, of the tone arm.

The 2-oz. scale, Philco Part No. 45-2958, may be used to measure the vertical friction and needle pressure of the tone arm, and all spring tensions not in excess of 2 ounces.

The special record-shelf gauge, Philco Part No. 45-1470, must be used to make the record-shelf adjustments accurately.

A stroboscope disc, Philco Part No. 45-2900, will aid in detecting faulty turntable speed.

After the changer has been removed from the cabinet for repairs, a stand similar to the one shown in figure 20 may be used. This stand is constructed from easily obtainable parts, listed in the figure, and is a convenient addition to any repair shop which expects to service record changers.

If it is not convenient to construct a stand to support the changer, changer support posts, Philco Part No. 45-2894 (4 required), may be purchased.

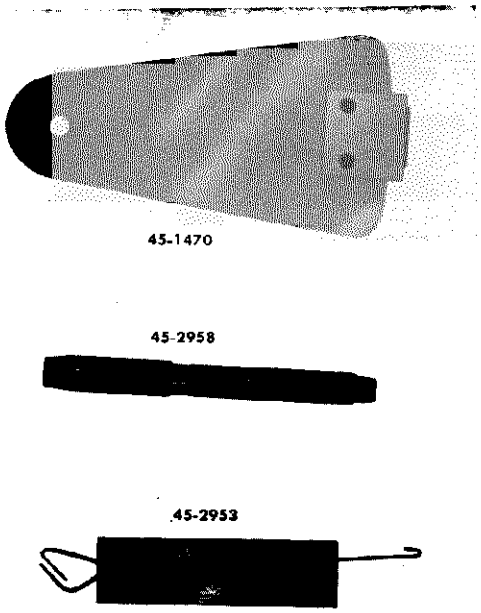


Figure 19—SCALES AND SPECIAL GAUGE.

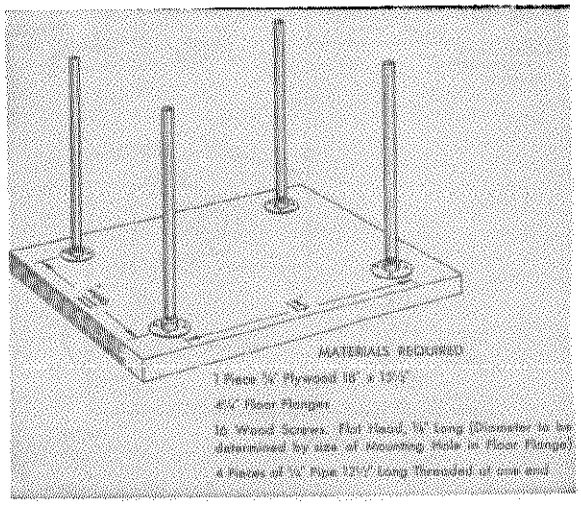


Figure 20—DETAILS OF SUPPORTING STAND FOR CHANGER.

REPLACEMENT OF PARTS AND ASSEMBLIES

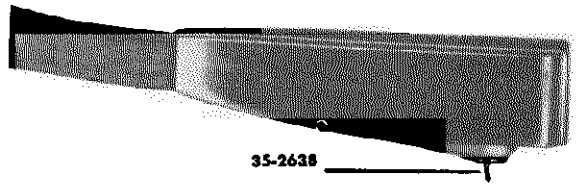


Figure 21—PICKUP HEAD, SHOWING CORRECT PLACEMENT OF NEEDLE.

Whenever a part or assembly is found to be defective, by test or visual inspection, or when it becomes necessary to remove parts for lubrication, the following procedures are recommended.

Parts should be replaced by reversing the order of removal, and adjusted and lubricated according to the directions given in the SERVICING section of this manual. A part should be replaced only when a defect is evident or when all adjustments fail to produce proper operation.

1. Needle (Part No. 35-2638)

The needle should be pulled straight out with the fingers. There are no setscrews or locking devices. When replacing the needle, make sure that it is placed so that its bend is in the direction of record rotation. See figure 21. Push the needle in place, using finger pressure only.

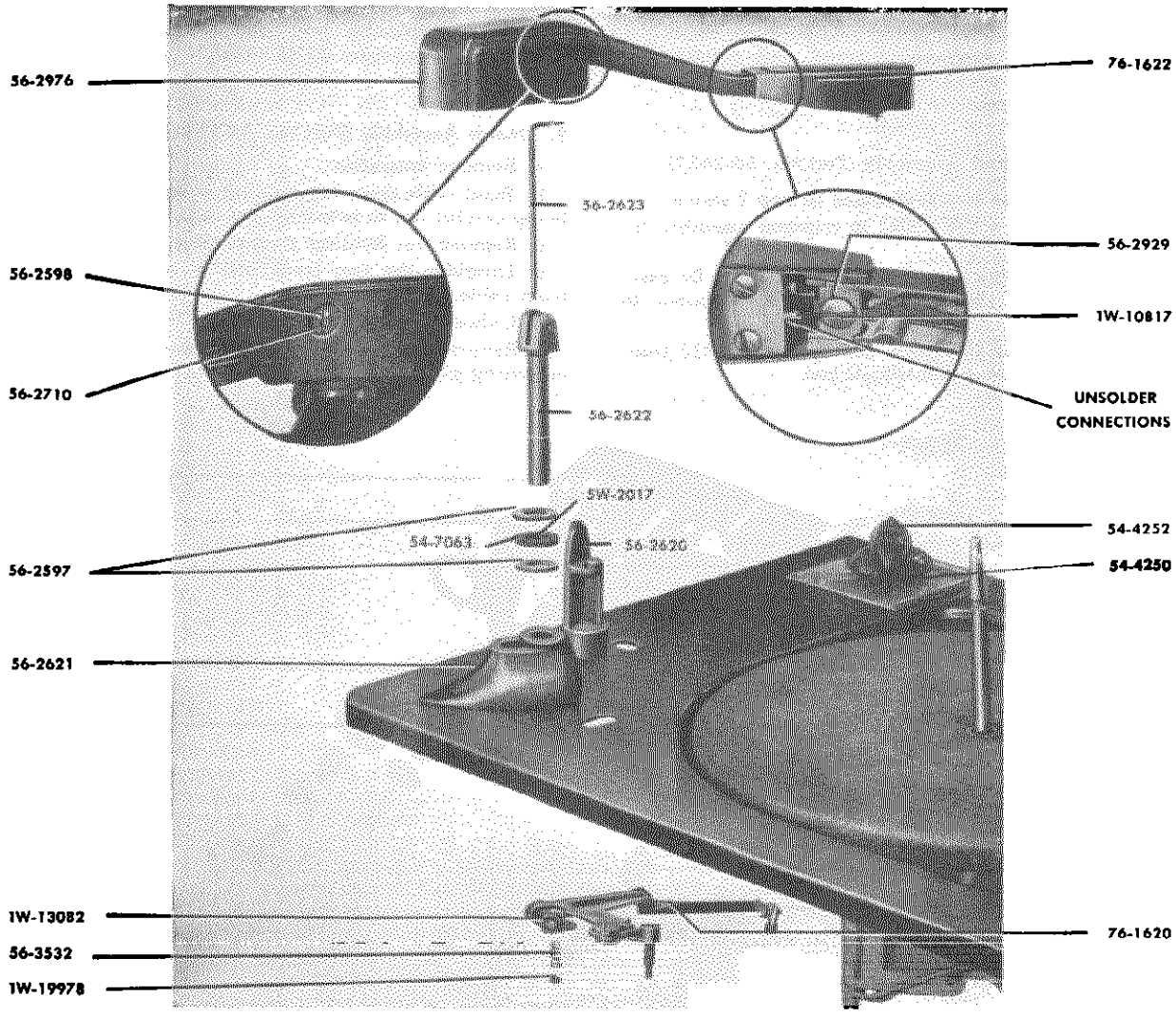


Figure 22—TONE-ARM-SHAFT AND TRIP-ARM ASSEMBLIES, EXPLODED VIEW.

9. Idler Wheel (Part No. 76-2379)

a. Remove spindle and turntable.

b. Remove retaining spring and flat washer from idler-wheel shaft (underside of changer).

c. Lift out idler wheel.

10. Master Control Switch (Part No. 42-1734)

a. Unsolder five leads from switch.

b. Lift off knob 54-4252, figure 22.

c. Remove ⅜" nut under knob.

d. Unhook pull-cord spring 56-2617, figure 24.

11. Record Hold-Down (Part No. 56-2653)

a. Remove record-shelf cap cover 56-2915, by turning counterclockwise about ⅛ turn and lifting out. See figure 25.

b. Lift out retaining spring 56-2656.

c. Unhook hold-down spring 56-2654 and lift off hold-down.

12. Eccentric-Shaft-Lever Assembly (Part No. 76-1618)

a. Remove cross-link spring 56-2627 and cross-link 56-2626, figure 24.

b. Loosen screw 1W-13082 and remove assembly, figure 25.

c. When replacing assembly, make record push-off adjustment as directed under ADJUSTMENTS AND TESTS.

13. Index-Disc Assembly (Part No. 76-1904) and Index-Bracket Assembly (Part No. 76-1615)

a. Remove eccentric-shaft-lever assembly as directed in step 12 above.

b. Unhook one end of pull-rod spring 56-3591, figure 24.

c. Loosen screw 1W-13083 holding index-disc assembly.

d. Remove two screws, 1W-32694, holding index-bracket assembly and remove both assemblies.

e. When replacing these assemblies, make all record-shelf adjustments, including record push-off adjustment, as directed under ADJUSTMENTS AND TESTS.

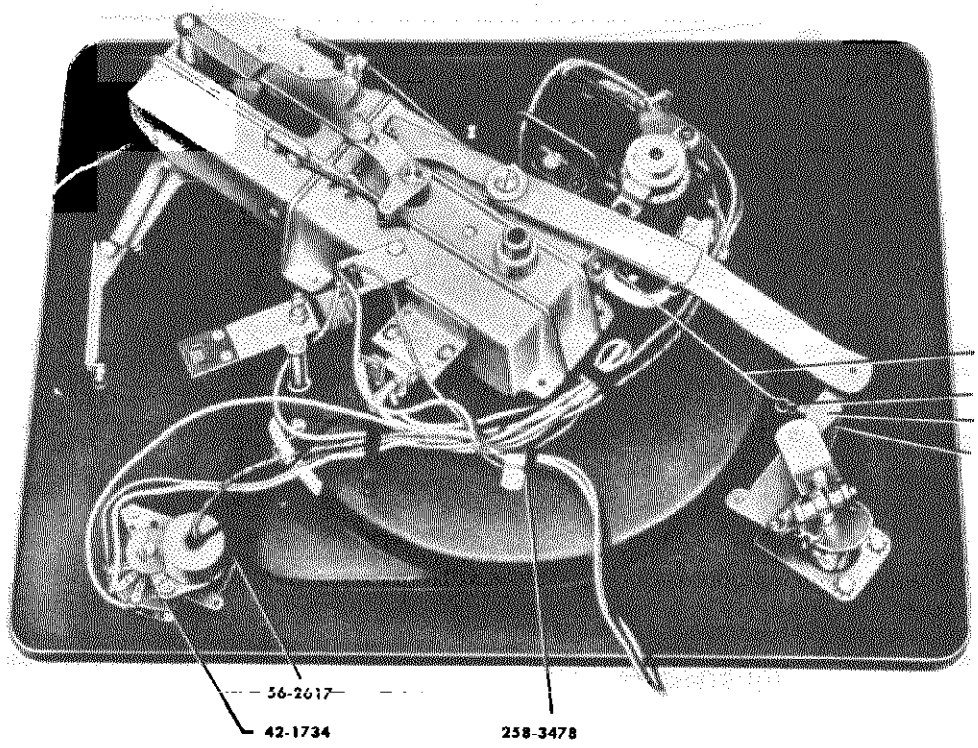


Figure 24—CHANGER, UNDERSIDE VIEW.

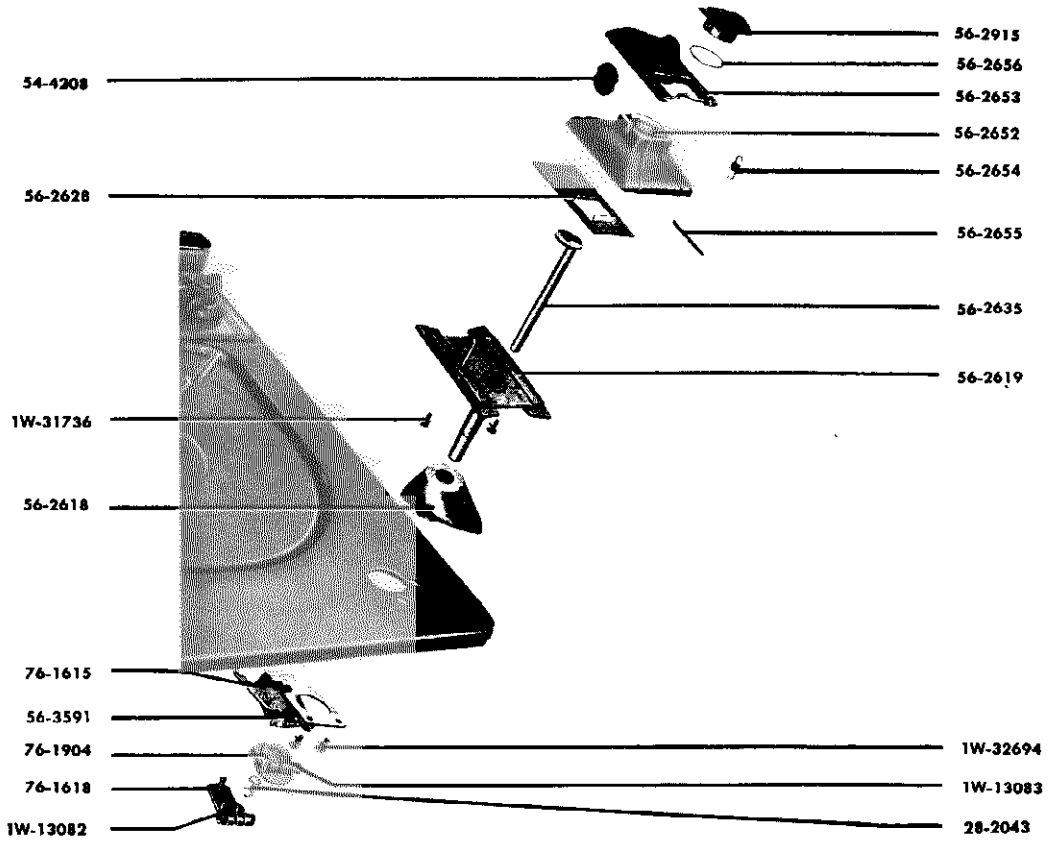


Figure 25—RECORD SHELF AND ASSOCIATED ASSEMBLIES, EXPLODED VIEW.

14. Record-Shelf Stanchion (Part No. 56-2618)

a. Remove index-disc assembly and index-bracket assembly as directed in step 13 above.

b. Lift out record-shelf and cap assembly and lift out stanchion.

c. When replacing this assembly, make all record-shelf adjustments, including record push-off adjustment, as directed under ADJUSTMENTS AND TESTS.

15. Record-Shelf-Cap Assembly (Part No. 56-2652)

a. Remove index-disc assembly and index-bracket assembly as directed in step 13 above.

b. Lift out record-shelf and cap assembly.

c. Remove two screws, 1W-31736, figure 25, from underside of record shelf and lift out record-shelf-cap assembly.

d. When replacing this assembly, make all record-shelf adjustments, including record push-off adjustment, as directed under ADJUSTMENTS AND TESTS.

16. Push-Off Slider (Part No. 56-2628)

a. Remove record-shelf-cap assembly as directed in step 15 above.

b. Lift out push-off slider.

c. When replacing this assembly, make all record-shelf adjustments, including record push-off adjustment, as directed under ADJUSTMENTS AND TESTS.

17. Push-Off-Cam Assembly (Part No. 56-2635)

a. Remove record-shelf-cap assembly as directed in step 15 above.

b. Remove locking ring 28-2043, figure 25.

c. Lift out push-off-cam assembly.

d. When replacing this assembly, make all record-shelf adjustments, including record push-off adjustment, as directed under ADJUSTMENTS AND TESTS.

18. Record Shelf (Part No. 56-2619)

a. Remove push-off-cam assembly as directed in step 17 above.

b. Lift out record shelf.

c. When replacing this assembly, make all record-shelf adjustments, including record push-off adjustment, as directed under ADJUSTMENTS AND TESTS.

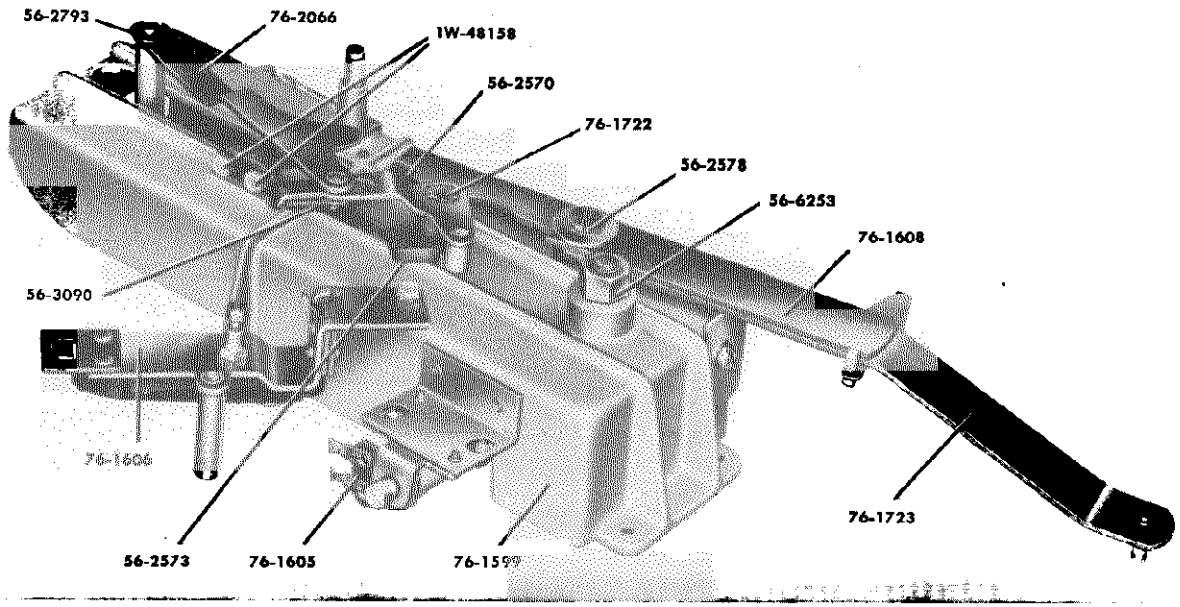


Figure 26—CHANGER MECHANISM ASSEMBLY, UNDERSIDE VIEW.

19. Trip-Contact Assembly (Part No. 76-1606)

a. Remove spindle and turntable.

b. Unsolder the red and blue wires.

c. Remove hex-head screw holding trip-contact assembly to changer-mechanism housing, figure 26.

d. Remove slotted screw holding trip-contact assembly to base plate and lift off assembly.

e. When replacing, adjust contact clearance as directed under ADJUSTMENTS AND TESTS.

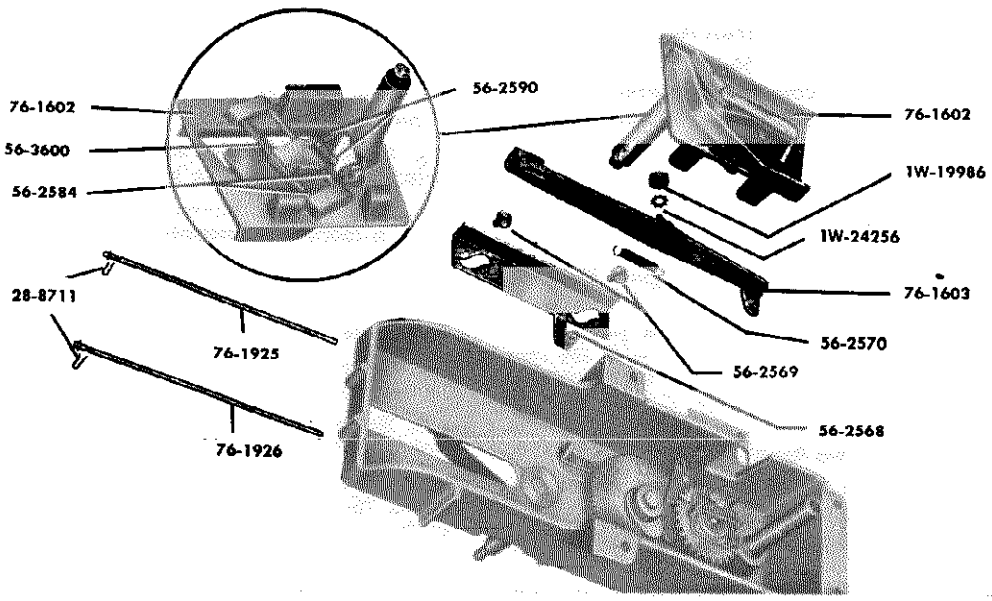
20. Push-Link Assembly (Part No. 76-2066)

a. Remove "C" washers 56-2793 from main-cam and main gear-shaft assemblies, figure 26.

b. Remove spring 56-3090 from main gear-shaft assembly.

c. Lift out link.

Figure 27—CHANGER MECHANISM ASSEMBLY, SHOWING DISASSEMBLY OF MAIN CAM, LIFT ARM, AND POSITIONING CAM.



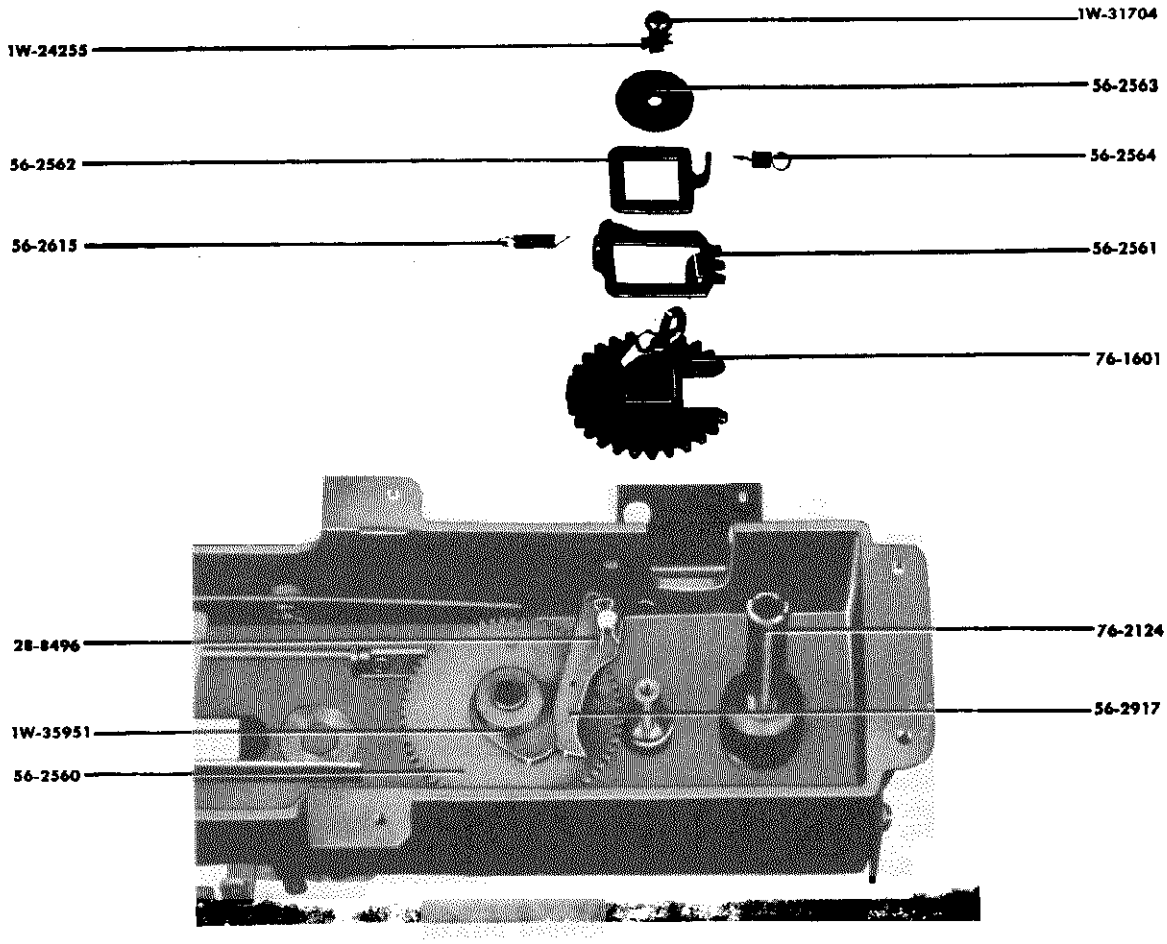


Figure 28—CHANGER MECHANISM, DISASSEMBLY OF INTERMEDIATE GEAR.

21. Push-Off-Lever Assembly (Part No. 76-1608)

a. Remove cross-link spring 56-2627, and cross-link 56-2626, figure 24, from eccentric-shaft lever.

b. Remove spring 56-2570 from mechanism frame, figure 26.

c. Remove bearing screw 56-2578 and lift off assembly.

22. Stop-Spring (Part No. 56-2573)

a. Remove two screws, 1W-48158, figure 26, from mechanism frame and lift off spring.

b. When replacing this spring, adjust position of intermediate gear; the gear should stop with the cut-out section centered, with respect to the turntable shaft.

23. Changer-Mechanism Assembly (Part No. 76-1599)

a. Remove cross-link spring 56-2627, figure 24.

b. Remove cross-link 56-2626.

c. Remove spring 56-3591 and pull-rod 56-2657, figure 24.

d. Remove spindle and turntable.

e. Remove cable clamp 258-3478.

f. Bend dress lugs to remove wires; be careful not to break lugs.

g. Remove one screw (under turntable) holding trip-switch assembly to main base plate.

h. Remove four screws (under turntable) holding changer-mechanism assembly to main base plate.

i. Lift out assembly.

24. Main-Cam Assembly (Part No. 76-1602)

a. Remove changer-mechanism assembly as directed in step 23 above.

b. Remove "C" washer 56-2793 which holds push-link 76-2066 to main-cam stud. See figure 26.

c. Lift out two retaining springs, 28-8711, from slide shafts 76-1925 and 76-1926, figure 27, and pull out shafts.

d. Lift out main-cam assembly.

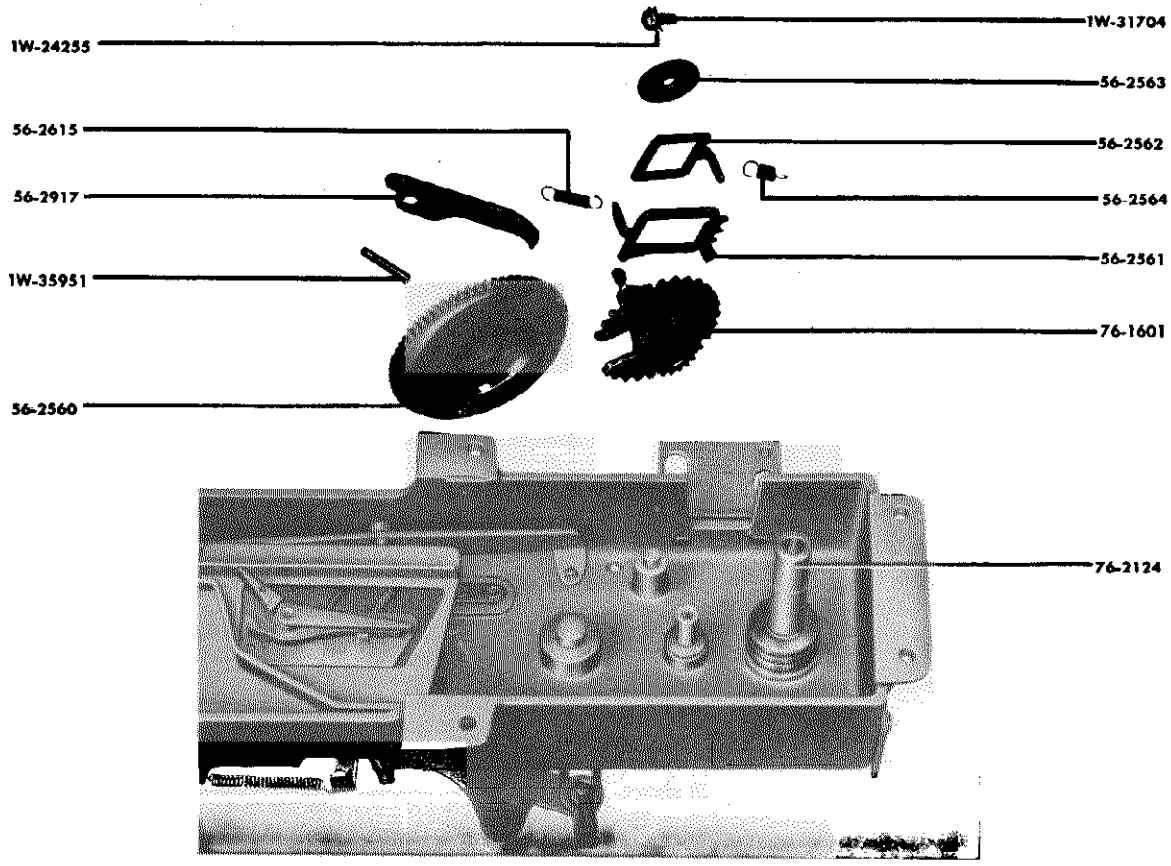


Figure 29—PARTS OF MAIN-GEAR AND INTERMEDIATE-GEAR ASSEMBLIES, UNDERSIDE VIEW.

25. Positioning Cam (Part No. 56-2568)

a. Remove changer-mechanism assembly as directed in step 23 above.

b. Remove main-cam assembly as directed in step 24 above.

c. Remove pull-rod 56-2657, figure 24, and spring 56-2570, figure 26.

d. Remove two shouldered screws, 56-2569, figure 27, and lift out cam.

26. Lift-Arm Assembly (Part No. 76-1603)

a. Remove changer-mechanism assembly as directed in step 23 above.

b. Remove nut 1W-19986 and lockwasher 1W-24256. See figure 27.

c. Lift out assembly.

d. When replacing this assembly, be sure to place ball-end on cam surface under main gear.

27. Intermediate-Gear Assembly (Part No. 76-1601)

a. Remove changer-mechanism assembly as directed in step 23 above.

b. Remove two springs, 56-2564 and 56-2615, from latch and segment gear. See figure 28.

c. Remove screw 1W-31704, lockwasher 1W-24255, and retaining washer 56-2563.

d. Lift out spring lug 56-2562 and gear segment 56-2561.

e. Lift out intermediate-gear assembly. Figure 29 shows the underside of the parts in the assembly.

28. Main Gear (Part No. 56-2560)

a. Remove changer-mechanism assembly as directed in step 23 above.

b. Remove intermediate-gear assembly as directed in step 27 above.

c. Remove main-cam assembly as directed in step 24 above.

d. Remove two screws, 1W-47664, figure 30, holding solenoid assembly 76-1605 to mechanism, and remove solenoid.

e. Remove hex-head screw holding trip-contact assembly 76-1606 to changer-mechanism housing and remove trip-contact assembly.

f. Remove retaining spring 28-8496, figure 28, and remove cam lever 56-2917.

g. Drive out tapered pin 1W-35951 in main gear and lift out main gear. Figure 29 shows the underside of the main gear.

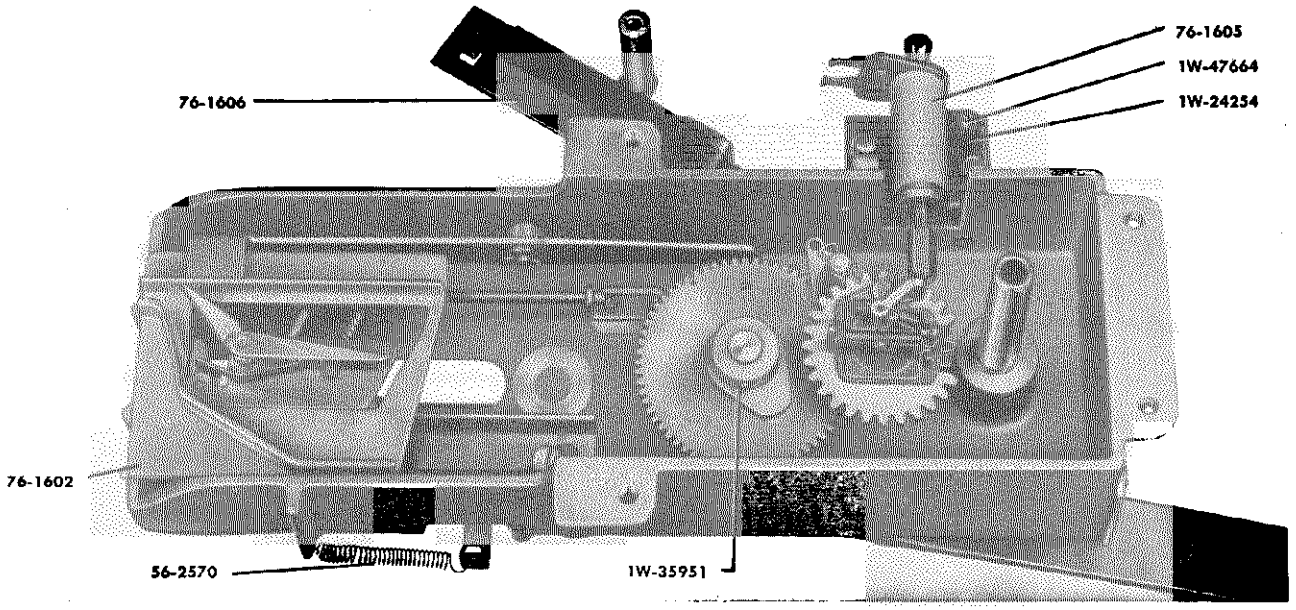


Figure 30—CHANGER MECHANISM ASSEMBLY, TOP VIEW.

29. Main-Gear-Shaft Assembly (Part No. 76-1722)

a. Remove changer-mechanism assembly as directed in step 23 above.

b. Remove push-link assembly as directed in step 20 above.

c. Remove main gear as directed in step 28 above.

d. Lift out main-gear-shaft assembly, figure 26.

30. Turntable-Shaft Assembly (Part No. 76-2124)

a. Remove changer-mechanism assembly as directed in step 23 above.

b. Loosen nut 56-6253, figure 26, a few turns and tap with a wooden mallet. Continue this process until shaft is free.

31. Turntable Bearings (Part No. 5W-2017)

a. Remove changer-mechanism assembly as directed in step 23 above.

b. Remove turntable-shaft assembly as directed in step 30 above.

c. Remove spring ring 56-2599, steel washer 56-2596, neoprene washer 54-4220, ball race 56-2597, ball retainer 54-7063, ball race 56-2597, neoprene washer 54-4220, and steel washer 56-2596, in order, as shown in figure 31.

32. Solenoid Assembly (Part No. 76-1605)

a. Remove changer-mechanism assembly as directed in step 23 above.

b. Unsolder the two wires from the lugs of the solenoid.

c. Remove the two screws, 1W-47664, and lockwasher, 1W-24254, figure 30.

d. When replacing this assembly, align the solenoid plunger so that its center strikes the latch and trips the segment gear, but does not over-push so as to bind the gear segment. The correct position is shown in figure 30.

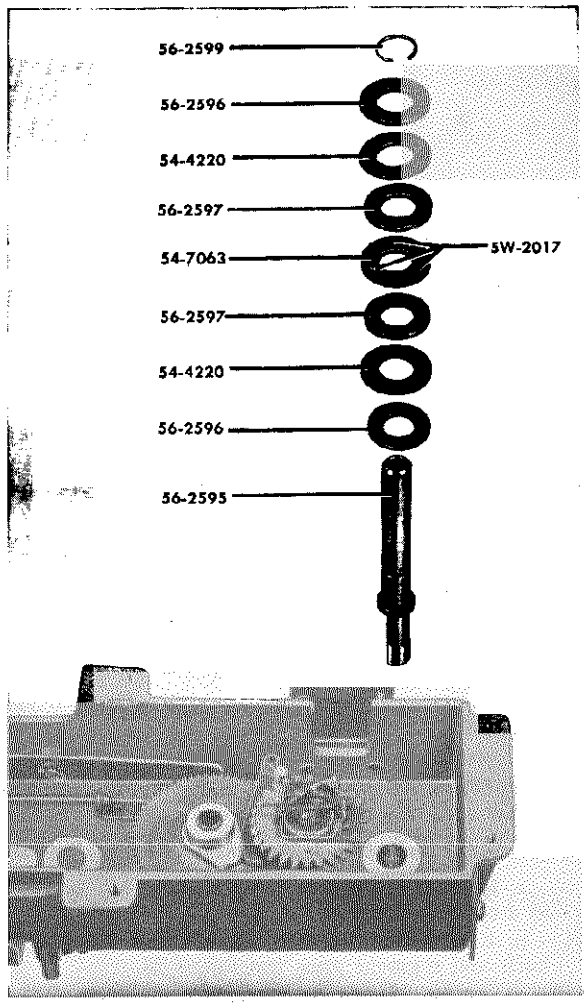
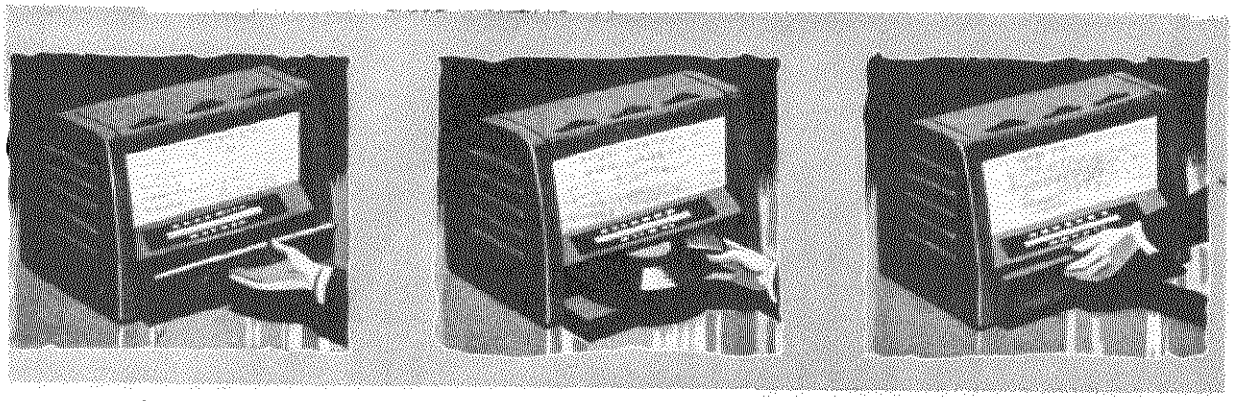


Figure 31—DISASSEMBLY OF TURNTABLE SHAFT AND BEARINGS.

REPLACEMENT PARTS LIST

SERVICE PART NO.	DESCRIPTION
27-6209	Socket (Pickup Cable)
28-2043	Ring, Locking (Push-Off-Cam Shaft)
28-8496	Spring, Retaining (Lift Arm—Cam Lever)
28-8711	Spring, Retaining (Main-Cam Slide Shaft)
32-8256	Transformer (Phono Input)
35-1298	Motor
35-2638	Needle
35-2639	Turntable
41-3685	Cable Assembly (A-C)
41-3723	Cable (Tone Arm)
42-1734	Switch, Master Control
54-4142	Plug, Four-Prong (A-C)
54-4181	Bumper, Rubber (Trip Pawl)
54-4208	Bumper, Rubber (Record Hold-Down)
54-4220	Washer, Cushion (Turntable Shaft)
54-4250	Plate (Master Control Switch)
54-4252	Knob (Master Control Switch)
54-4254	Grommet (Motor Mounting)
54-7063	Retainer, Ball (Turntable Shaft—Tone-Arm Shaft)
54-7124	Cord, Pull
56-2071	Shell, Plug (A-C)
56-2448	Cover, Plug (Pickup Cable)
56-2560	Main Gear
56-2561	Gear Segment
56-2562	Lug, Spring (Segment-Gear Assembly)
56-2563	Washer, Retaining (Segment-Gear Assembly)
56-2564	Spring (Segment-Gear Assembly)
56-2568	Cam, Positioning
56-2569	Stud (Positioning Cam)
56-2570	Spring (Positioning Cam—Push-Off Lever)
56-2573	Spring, Stop (Push-Off Arm)
56-2578	Screw, Push-Off Lever
56-2584	Slider Cam Rod, Cam Assembly
56-2590	Spring (Slider Cam—Guide Arm)
56-2595	Shaft Assembly, Turntable
56-2596	Washer (Turntable Shaft)
56-2597	Race, Ball (Turntable Shaft—Tone-Arm Shaft)
56-2598	Screw, Tone-Arm Bearing
56-2599	Ring, Spring (Turntable Shaft)
56-2615	Spring, Segment (Segment-Gear Assembly)
56-2617	Spring (Pull-Cord)
56-2618	Stanchion, Record-Shelf
56-2619	Record Shelf
56-2620	Rest Post
56-2621	Bushing, Tone-Arm-Shaft
56-2622	Shaft, Tone-Arm
56-2623	Rod, Lift (Tone Arm)
56-2626	Cross Link
56-2627	Spring, Cross-Link
56-2628	Slider, Push-Off
56-2635	Shaft, Push-Off-Cam
56-2652	Cap, Record-Shelf
56-2653	Hold-down, Record
56-2654	Spring (Record Hold-Down)
56-2655	Pin, Spring (Record Hold-Down)
56-2656	Spring, Retaining (Record-Shelf Cap)
56-2657	Pull-Rod, Cam
56-2710	Locknut (Tone-Arm Pivot)
56-2713	Counterweight (Tone Arm)
56-2714	Spring (Push-Off-Lever Extension)
56-2793	"C" Washer (Push-Link)
56-2915	Cap Cover (Record Shelf)
56-2917	Cam Lever
56-2919	Spindle (Turntable)
56-2920	Push-Off-Lever Guide
56-2929	Clamp Plate (Pickup Head)
56-2976	Tone Arm
56-2996	Bearing Pin (Tone Arm)
56-2997	Brass Spacer (Motor Mounting)
56-3090	Spring (Push-Off Arm)
56-3091	Roller (Push-Link)
56-3092	Stud, Roller (Push-Link)
56-3532	Spring (Lift-Rod)
56-3591	Spring (Pull-Rod—Bell-Crank)
56-3600	Spring (Slider-Cam Rod)
56-6243	Nut, Tone-Arm Swivel-Bushing
56-6253	Nut, Turntable-Shaft Mounting
76-1599	Changer-Mechanism Assembly
76-1600	Base Assembly (Changer Mechanism)
76-1601	Intermediate-Gear Assembly
76-1602	Main-Cam Assembly
76-1603	Lift-Arm Assembly
76-1604	Turntable-Shaft Assembly
76-1605	Solenoid Assembly
76-1606	Trip-Contact Assembly
76-1608	Push-Off-Lever Assembly
76-1614	Plate and Lug Assembly
76-1615	Index-Bracket Assembly
76-1617	Push-Off-Cam Assembly
76-1618	Eccentric-Shaft-Lever Assembly
76-1620	Trip-Arm Assembly
76-1622	Pickup-Head Assembly
76-1722	Shaft Assembly
76-1723	Push-Off Lever Extension Assembly
76-1725	Tone-Arm Assembly
76-1904	Index-Disc Assembly
76-1925	Slide-Shaft Assembly (Short)
76-1926	Slide-Shaft Assembly (Long)
76-2066	Push-Link
76-2379	Idler Wheel Assembly
1W-10639	Screw, Motor Mounting, No. 6-32
1W-10817	Screw
1W-10941	Screw
1W-13082	Screw, No. 10-32
1W-13083	Screw, No. 10-32
1W-14318	Screw, Lift-Adjust
1W-19978	Nut (Lift-Rod)
1W-19986	Nut, No. 6-32
1W-24254	Washer
1W-24255	Lockwasher, No. 5
1W-24256	Lockwasher, No. 6
1W-24257	Lockwasher, No. 8
1W-24264	Lockwasher, ⅜"
1W-24520	Lockwasher, ⅜" (Rest Post)
1W-24524	Lockwasher, ⅛"
1W-31704	Screw, No. 5-40
1W-31736	Screw, No. 6-32
1W-32694	Screw
1W-35951	Pin
1W-36672	Rivet
1W-36675	Rivet
1W-44709	Nut, ⅛"-32
1W-47664	Screw
1W-48158	Screw, No. 6-32
1W-48188	Screw
1W-52100	Washer, Compression
1W-56913	Nut, Speed
5W-2017	Ball Bearing
W-1775	Locknut, Spring



Open Door *Insert Record* *Close Door*

Figure 1

GENERAL DESCRIPTION

The PHILCO M-7 AUTOMATIC RECORD PLAYER automatically plays single 10-inch or 12-inch records. See Figure 1. The player is loaded by simply opening the door in the front and pushing the record through the slot. As the door is closed, the tone arm is placed on the record, and the drive mechanism is started; after the record is played, the drive mechanism is turned off automatically. The door may be opened at any time a record is being played, without harming any part of the mechanism; the opening of the door shuts off the power and places the tone arm in its starting position.

The tone arm is equipped with a crystal pickup unit using a special, alloy needle having a precious-metal point; this needle plays several thousand records before replacement is necessary.

REMOVAL OF PACKING SUPPORTS

Special packing is used for the tone arm, which is supported by a corrugated cardboard strip, and is lashed to the tone-arm index pin. The turntable is held in place by a cord. Remove the packing carefully.

PRELIMINARY INSPECTION

Connect Set to Power Source

After removing the packing from the tone arm, see that the needle is held tightly by its set screw. Close the door, and see that the tone arm swings freely, without undue friction, over the playing range; also, see that it moves easily upward and downward. Turn the RADIO-OFF-PHONO switch knob of the radio receiver to the PHONO position.

Phono Test—Ten-Inch Record

Open the door of the record player and insert a 10-inch record through the slot, pushing the record in until it stops. While observing the player, close the door; the needle should readily enter the lead-in groove of the record, the *spindle* should rise upward through the hole in the record, and the turntable drive mechanism should start.

Adjust the receiver volume control for moderate volume, and turn the tone control to the treble position. Listen for general quality of reproduction. After the record is played, the turntable should stop automatically. When the door is opened, the tone arm should lift and swing over against the *tone-arm index pin.*

Check the turntable speed while a record is being played; the speed should be approximately 78 r.p.m. Open the door when a record is partially played; the tone arm should lift and swing aside, and the turntable should stop.

Phono Test—Twelve-Inch Record

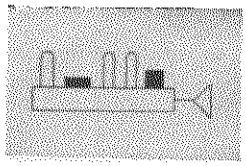
Insert a 12-inch record, pushing inward until the record stops; as the record is pushed home, the tone arm should swing aside (needle remaining over lead-in groove), and the 10-inch hinged section of the *rear index bracket* should lift to clear the edge of the record. When the door is closed, the two rubber-covered *guide rollers* should move away from the edges of the record at least 1/16 inch. When the door is opened, the tone arm should swing aside, and the *guide rollers* should come into contact with the sides of the record; when the record is removed, the hinged section of the *rear index bracket* should fall into its 10-inch position.

SERVICING

TEST PROCEDURES

The following tests are given for quickly localizing trouble in a Philco radio-phonograph. Be sure to make each test, in the order given, *before* removing the record player from the cabinet.

If the trouble is found to be in the audio amplifier, refer to the radio service manual for the particular model under test. If the trouble is in some part of the record player, refer to pages of this manual.

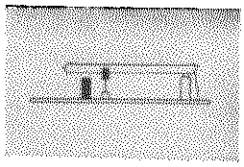


1. AUDIO-AMPLIFIER TEST

The audio amplifier is common to both the radio and phonograph sections of the combination. With a station tuned in, check the audio amplifier by noting the tonal quality and volume of the speaker output.

If the trouble is found to be in the audio amplifier, refer to the radio service manual for the particular model under test.

2. TONE-ARM TESTS



a. Pickup Test

Play a familiar record on the radio-phonograph, and listen to the reproduction. If the audio amplifier was found to be normal in the first test, distortion or low volume indicates trouble in the pickup or in the connecting leads to the radio chassis. Try a new needle if the output is distorted. If the pickup is found to be faulty, replace the unit, following the procedure given on page of this manual.

Note: It is advisable to carry a familiar record with you as a regular part of your test equipment.

b. Indexing and Tripping Test

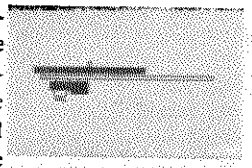
Open the door of the record player. While observing the record player, insert a 10-inch record, and close the door. As the door is closed, the tone arm should set down with the needle in the lead-in groove of the record. After the record has played through, tripping of the mechanism should occur during three to five revolutions with the needle riding in the eccentric groove.

Open the door; the tone arm should lift and swing across to the index pin.

Insert a 12-inch record and repeat the above test.

If the indexing or tripping is incorrect, refer to ADJUSTMENTS in this manual.

3. TURNTABLE-AND-MOTOR TEST



In table-model combinations, it is necessary to raise the top of the cabinet, as directed on page 11. Open the door of the record player, and insert a 12-inch record. Place a stroboscope disc, such as Philco Part No. 45-2900, on the record, and illuminate the disc with a lamp (preferably a neon bulb) operated on 60-cycle a.c. Close the door to start the turntable. The dots in the row calibrated for 78 r.p.m. should appear to remain stationary, or drift slowly but smoothly forward or backward. Erratic motion of the dots indicates trouble in the drive mechanism.

If the speed of the turntable is unstable, refer to POSSIBLE CAUSES OF "WOWS" on page of this manual.

QUALITY OF RECORDS

When diagnosing trouble, or when adjusting or servicing this record player, it should be borne in mind that records, in general, are non-uniform in a number of respects. The characteristics encountered, not only in new records from different manufacturers, but in different records of the same make, include:

Lack of (or incomplete) lead-in groove

Lack of (or incomplete) eccentric groove

Variations in position of eccentric groove

Small hole

Poor recording

In addition to the above, used records may also be found to have cracks, warpage, or high surface noise.

To properly service the PHILCO M-7 AUTOMATIC RECORD PLAYER, the operation of the mechanism should be well understood; therefore, the following explanation is given, preliminary to the actual servicing information.

HOW THE M-7 OPERATES

The operation of the record player is controlled by a *slide-lever assembly,* and an *index-lever assembly.* The *slide-lever assembly,* under the *motor board* (main base plate) is coupled to the door by a *connector-bar,* and is moved forward or backward by the opening or closing of the door.

The indexing (adaptation to 10-inch or 12-inch records) is accomplished by the action of the *index-lever assembly,* which is controlled by the diameter of the record pushed into the slot.

WHEN THE DOOR IS OPENED, as shown in Figure 2, the following operations are performed:

1. The tone arm is moved, by a *pull-cord,* to the starting position; in this position, the pickup and needle are raised, to clear an incoming record.
2. The *record spindle* is retracted.
3. If a record is playing, the motor is turned *off.*

Figure 3 shows the bottom view of the record player (for clarity of reproduction, the wood frame and door are removed). All parts are in their closed-door positions. The *slide-lever assembly* is forward. Note that the tone-arm pull-cord is taut, the record-spindle *connector block* is lowered, and the *mercury switch-case assembly* is tilted to the *off* position.

WHEN A 10-INCH RECORD IS PUSHED INTO THE SLOT, it is guided into place, with the hole approximately centered on the turntable, without altering the positions of the *index-lever assembly* or *rear-inaex bracket.* Figure 4 shows the 10-inch record in position.

WHEN A 12-INCH RECORD IS PUSHED INTO THE SLOT, the *guide rollers* are moved outward, operating the *index-lever assembly* and changing the *rear index bracket* to its 12-inch position. The *tone-arm index pin,* being mounted on the right-hand *index lever,* moves outward, allowing the needle to assume the starting position required by the larger record.

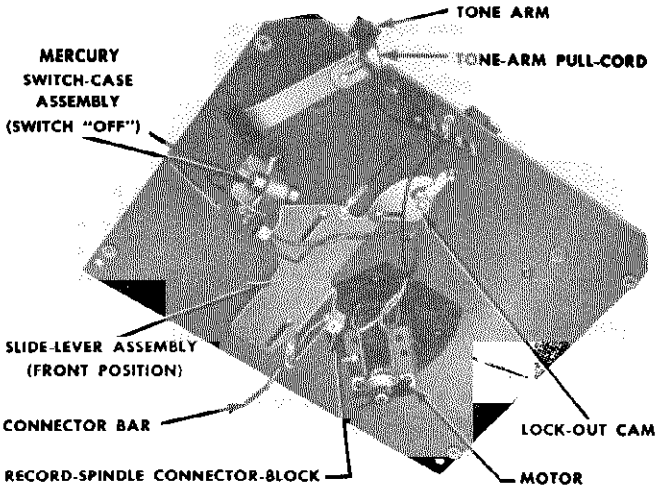


Figure 3—BOTTOM VIEW, COMPONENTS IN OPEN-DOOR POSITIONS, WITHOUT RECORD.

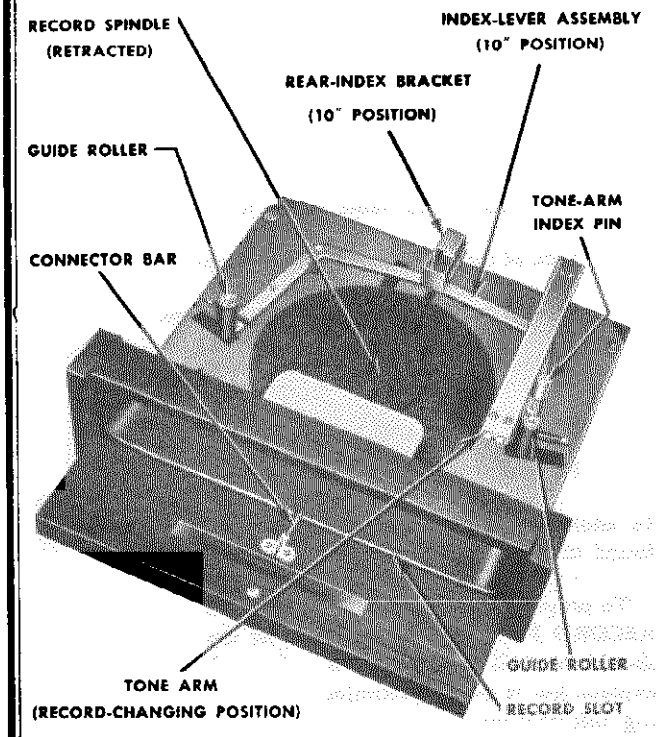


Figure 2—TOP VIEW, DOOR OPEN, WITHOUT RECORD.

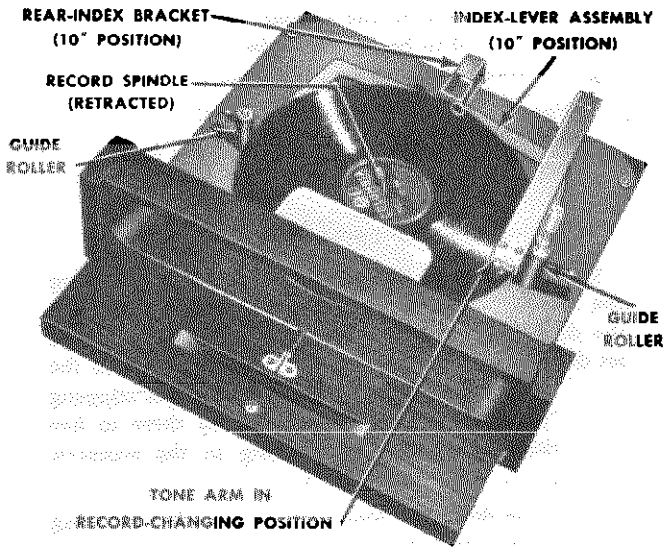


Figure 4—TOP VIEW, DOOR OPEN, WITH 10" RECORD.

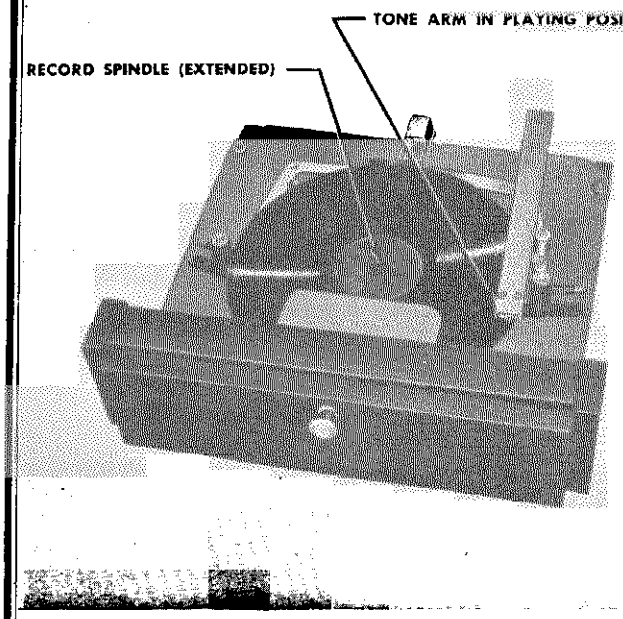


Figure 5—TOP VIEW, DOOR CLOSED, WITH 10″ RECORD.

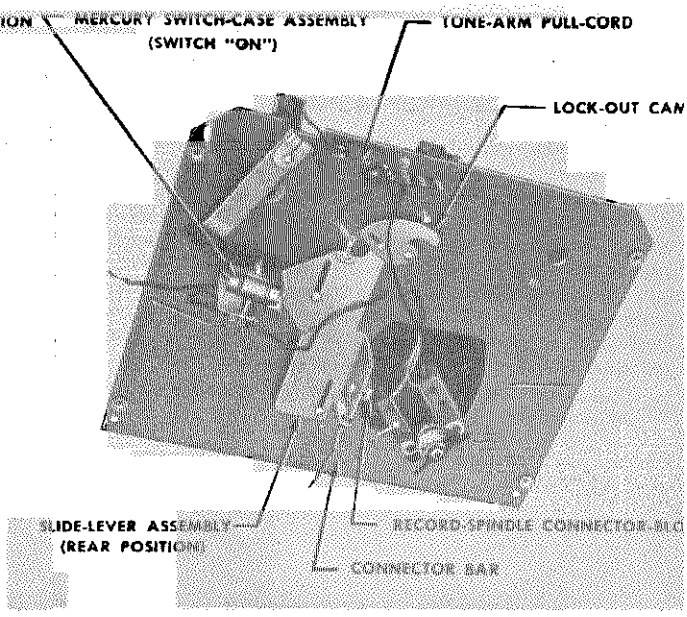


Figure 6—BOTTOM VIEW, COMPONENTS IN CLOSED-DOOR POSITIONS, WITH 10″ RECORD.

WHEN THE DOOR IS CLOSED, WITH A 10-INCH RECORD IN PLACE, the following operations are performed:

1. The *record spindle* is extended through the hole in the record, positioning the record accurately for the tone-arm set down.
2. The needle is lowered to the lead-in groove.
3. The motor is turned *on*.

Figure 5 shows the 10-inch record in place, with the door closed. Note the position of the *record spindle* and the tone arm.

Figure 6 shows the bottom view under the same conditions. Note the positions of the *slide-lever assembly*, the record-spindle *connector-block*, and the *mercury switch-case assembly*. It will be seen that the *tone-arm pull-cord* is slack.

WHEN THE DOOR IS CLOSED, WITH A 12-INCH RECORD IN PLACE, the operations mentioned above are performed, and, in addition, the *stud* of the *index-lever assembly* is engaged by the *lock-out cam;* this causes the two *guide rollers* to be moved away from the edges of the record, permitting the record to turn freely. Figure 7 shows a top view of the record player with a 12-inch record in place. Figure 8 shows the bottom view, with all parts in their closed-door position. Note the positions of the *index-lever stud* and the *lock-out cam*.

When the needle rides into the eccentric portion of the groove, at the finish of the record, the motor is turned *off*. The motor is controlled by the *mercury trip switch;* the power is turned *on* or *off* by closing or opening the door, or turned *off*, at the finish of the record, by the tone-arm trip mechanism.

Figure 7—TOP VIEW, DOOR CLOSED, WITH 12′ RECORD.

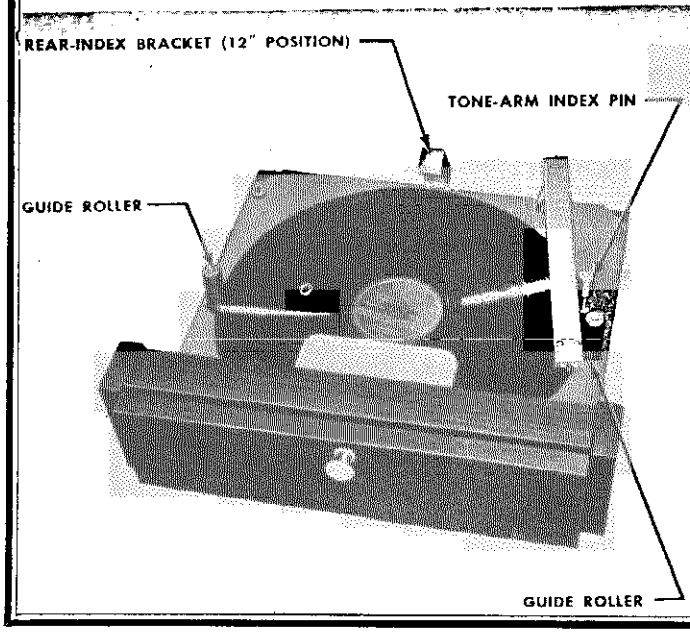
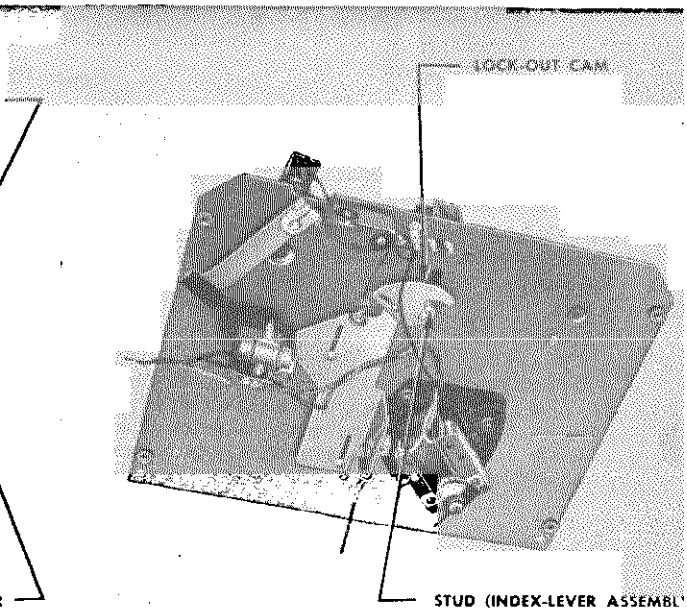


Figure 8—BOTTOM VIEW, COMPONENTS IN CLOSED-DOOR POSITIONS, WITH 12′ RECORD.



SLIDE-LEVER ASSEMBLY

Most of the operations of the record player are controlled by the *slide-lever assembly* (Figure 9), which is actuated by the opening or closing of the door. The door is coupled to a *connector-bar*, the other end of which is attached to the *slide-lever assembly*, located under the motor board (main base plate). The *slide-lever assembly* moves forward or backward as the door is opened or closed. The operations performed by the *slide-lever assembly*, besides positioning the tone arm, are accomplished by its three elements.

1. The trip-switch reset spring turns the trip switch *off* or *on*.

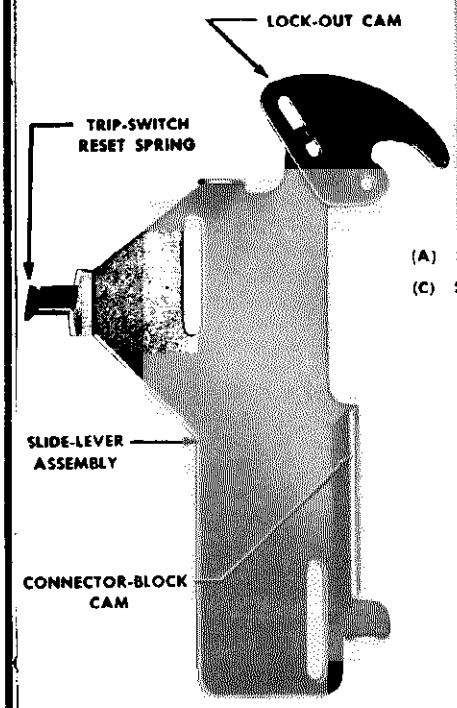


Figure 9—SLIDE-LEVER ASSEMBLY.

2. An ear having a diagonal slot (connector-block cam) retracts or extends the *record spindle*.
3. The *lock-out cam*, at the rear, moves the two *guide rollers* away from the edges of a 12-inch record, allowing the record to turn freely.

TRIP-SWITCH ASSEMBLY

The power to the drive motor is controlled by the *mercury trip switch*, shown in Figure 10A; the *mercury switch-case assembly*, which is mounted in a rocking clamp assembly, is provided with an adjustable *trip lever* at one end of the supporting shaft, and a lever and *trip pawl* at the other end. The switch contacts are closed when the case is tilted so that the mercury settles in the end nearest the *slide lever;* in the *on* position, this end is slightly lower than the opposite end, as shown in Figure 10A. The switch is turned *off* or *on*, when the door is opened or closed, by the *trip-switch reset spring* on the *slide-lever assembly;* this spring engages the tip of the adjustable *trip lever*. The switch is turned *off*, when the needle rides into the eccentric groove of the record, by the *trip pawl;* this pawl is actuated by a reverse motion of the *tone-arm trip lever*.

Figures 10A, 10B, 10C, and 10D show the positions of the *tone-arm trip lever, trip pawl,* and *mercury switch-case assembly* for a sequence of record-playing and tripping actions.

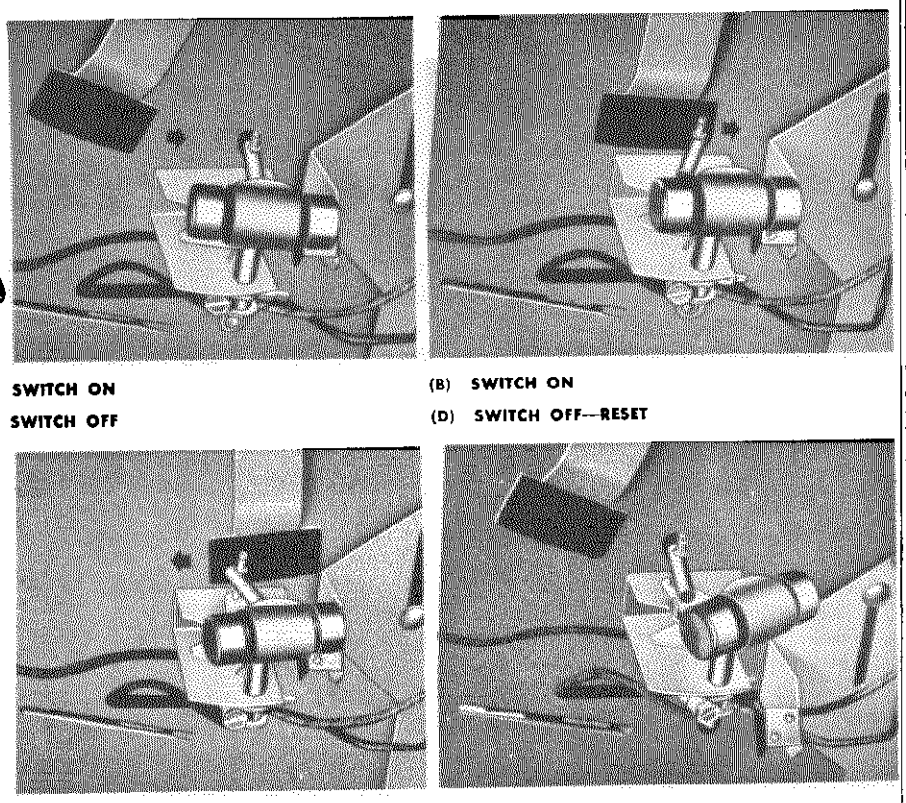


Figure 10—MERCURY TRIP-SWITCH AND TONE-ARM TRIP-MECHANISM OPERATION.

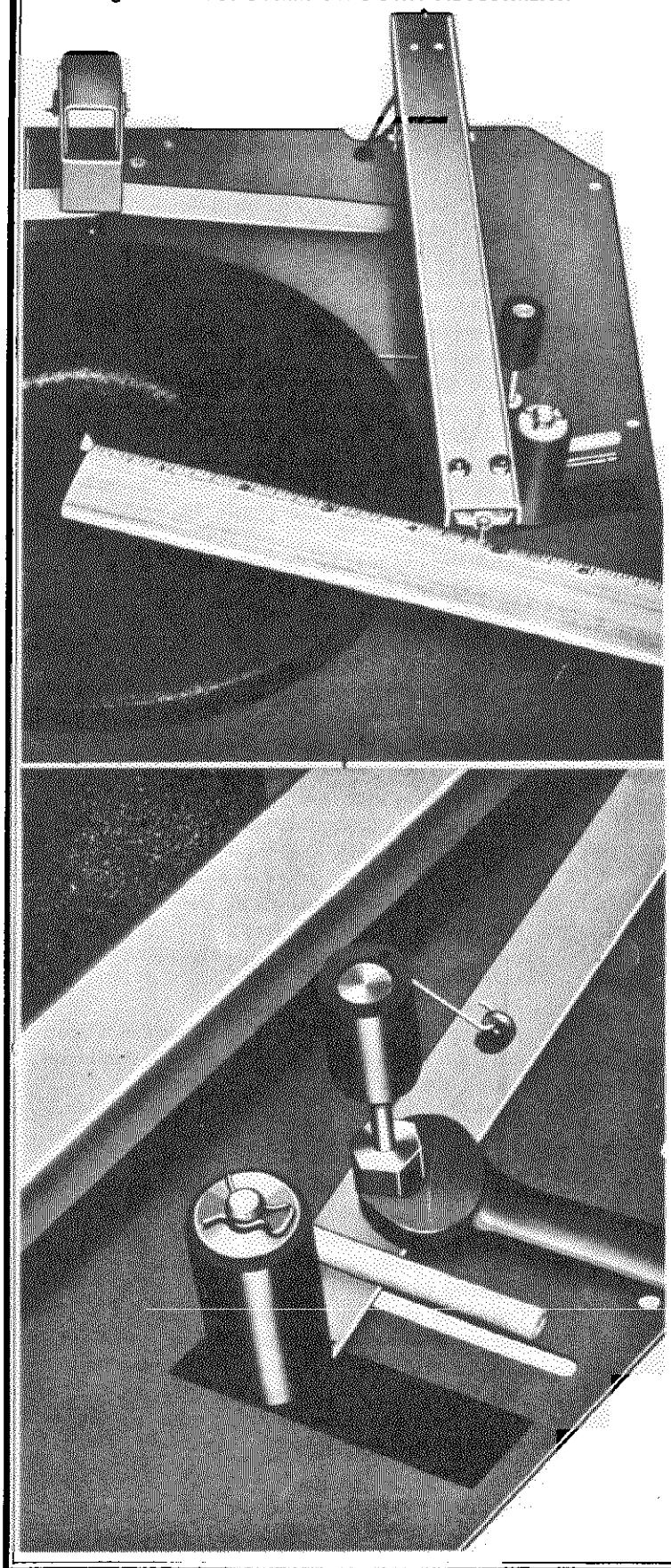
Figure 10A shows the switch in *on* position, and the *tone-arm trip-lever* position soon after the record has started to play.

Figure 10B shows the *trip pawl* starting to ride the *tone-arm trip lever* as the record is partially played.

Figure 10C shows the *trip pawl* after the trip action is completed; the switch is turned *off*.

Figure 10D shows the position of the *mercury switch-case assembly*, after the door is opened; the switch has been *reset*, by the *trip-switch reset spring*, to the position from which it may again be turned *on*, by the same spring, when the door is closed.

Figure 11—TONE-ARM SET-DOWN ADJUSTMENT.



ADJUSTMENTS

Each of the adjustments described below, un otherwise stated, is independent of other adjustme and may be performed separately as required. I advisable, however, to check all adjustments w servicing the record player.

TONE-ARM SET-DOWN

This adjustment should be made without a rec because of the wide variation in individual reco the adjustment is made by measurement, *to insure best average set-down position.*

1. See that the door of the record player is closed.
2. Lift the tone arm until the needle is slightly hig than the turntable.
3. Hold the tone arm lightly against the tone-arm dex pin.
4. Using a 3/8" open-end wrench on the hex shoul of the eccentric-mounted tone-arm index pin, t the pin until the distance between the point of needle and the *side* of the *spindle* nearest the nee is $4\frac{11}{16}$". See Figure 11.

INDEX-LEVER ASSEMBLY

This adjustment establishes the minimum clearа between the guide rollers and the edges of a 10-i record. The position of the index-lever assembly ca ing these rollers is determined by the adjustable inc lever cam shown in Figure 12.

1. Place a 10-inch record on the turntable, and cl the door.
2. Using a socket wrench, loosen the nut (beneath motor board) holding the adjusting cam.
3. Turn the cam until the clearance between the gu rollers and the edges of the record is $\frac{1}{16}$". Hold the cam firmly, tighten the nut.
4. Try a variety of 10-inch records on the turnta If the guide-roller tires contact any of these records with the door closed, repeat the adjustment.
5. After this adjustment is satisfactory, make the tone-arm set-down adjustment, since this is disturbed by changing the index-lever cam.

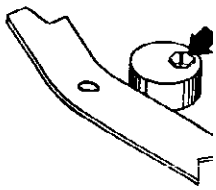


Figure 12 INDEX-LEVER ADJUSTMENT.

Figure 13—TONE-ARM TRIP-LEVER ADJUSTMENT.

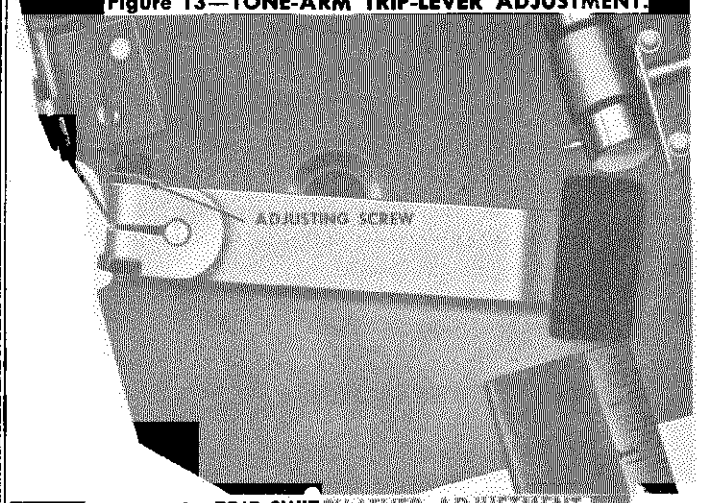
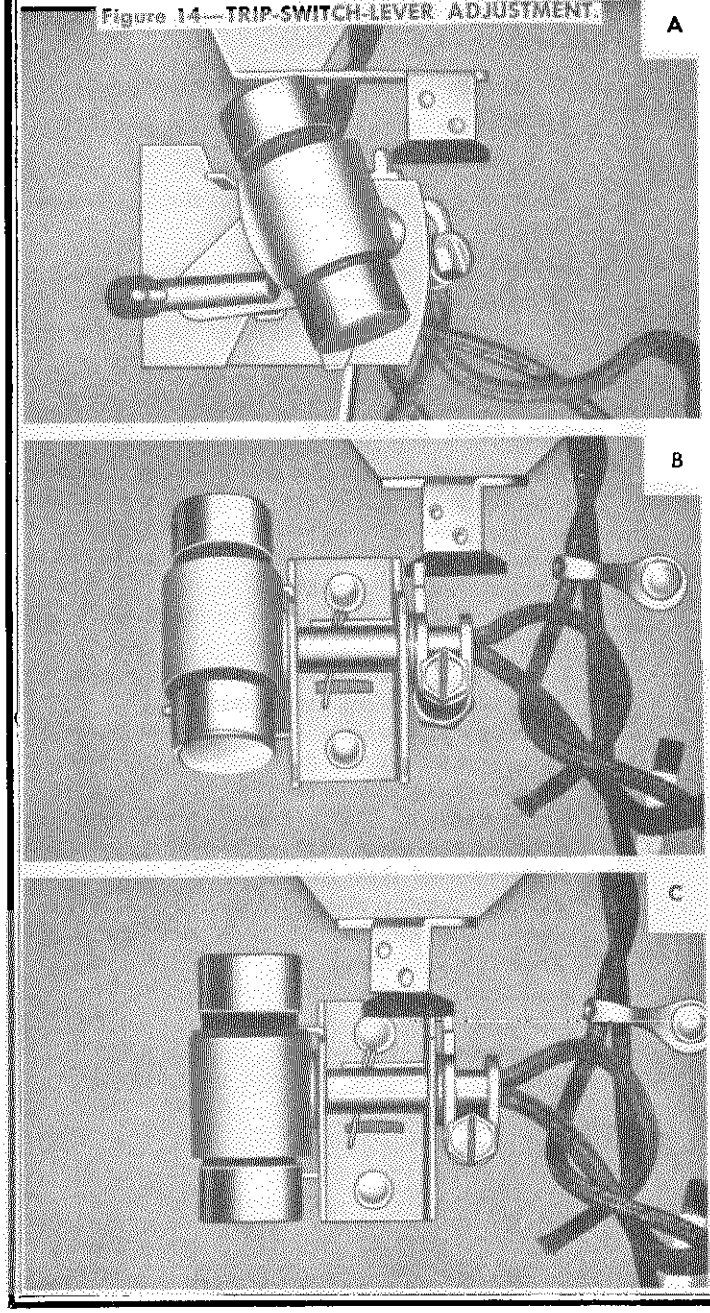


Figure 14—TRIP-SWITCH-LEVER ADJUSTMENT.



TONE-ARM TRIP LEVER

This adjustment is made to obtain the proper relationship between the trip lever and the tone arm, thus allowing the tone arm, when starting to oscillate in the eccentric groove, to turn off the drive-motor power. There should be an angular difference of approximately 15° between the tone arm and its trip lever. The adjustment, when made according to the following procedure, insures proper operation of the trip mechanism with the wide eccentric-groove variations encountered in different records.

1. See that the door of the record player is closed. No record is required.
2. Loosen the screw in the trip-lever clamp on the lower end of the tone-arm spindle. See Figure 13.
3. Hold the tone arm against the tone-arm index pin.
4. Swing the trip lever until the outside corner of the adhesive-coated portion is ¾" to ⅞" from the edge of the motor board. See Figure 13. Tighten the clamp screw.
5. Check the end play of the tone-arm spindle; there should be just enough play (.003" to .005") to allow the tone arm to swing freely throughout its range. The adhesive-coated end of the trip lever should be close to the motor board, and should swing throughout its range without scraping.
6. When this adjustment is properly made, the trip mechanism should operate through a range between 1½" and 3" from the center of the record spindle.

TRIP-SWITCH LEVER

This adjustment establishes the proper relationship between the trip-switch lever and the trip switch, so that the switch is turned *off* or *on* by opening or closing the door, and is turned *off* by the tone-arm trip mechanism after a record is played.

1. Loosen the screw in the trip-switch-lever clamp. See Figure 14A.
2. Open the door of the record player.
3. Tilt the switch to the position shown in Figure 14A; the lever carrying the trip pawl should be against the stop.
4. Turn the trip-switch lever until its tip is contacted, when the door is closed, by the under surface of the switch-reset spring at a point close to the upper tip of the spring, as shown in Figure 14B. When the door is reopened, the lever tip should be contacted by the upper surface of the switch-reset spring at a point close to the lower tip of the spring, as shown in Figure 14C.
5. Open and close the door several times, observing the upper and lower points where the trip lever contacts the spring; readjust the lever until its tip makes contact at equal distances from the tips of the spring as the spring is moved forward and backward. Tighten the screw.

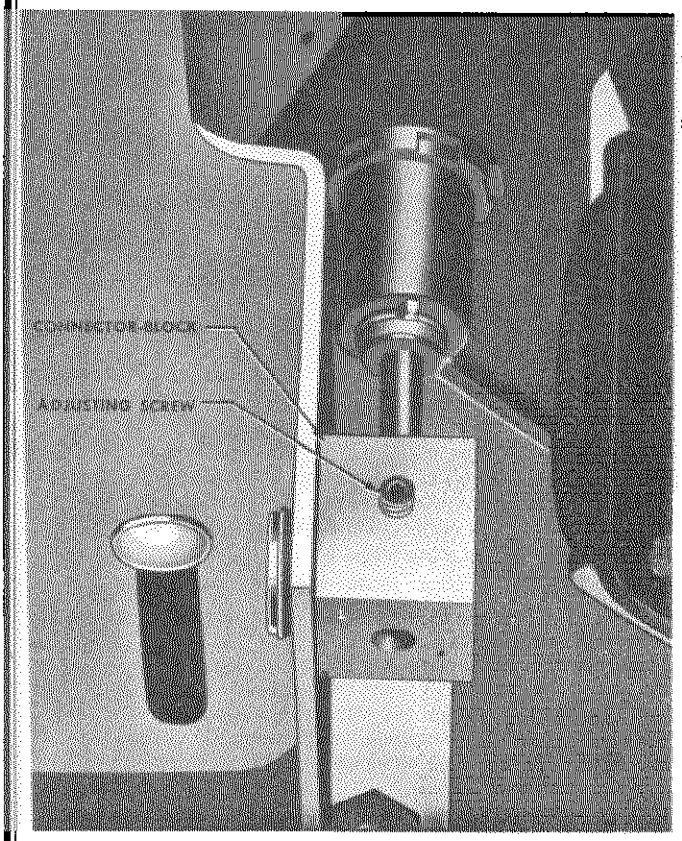
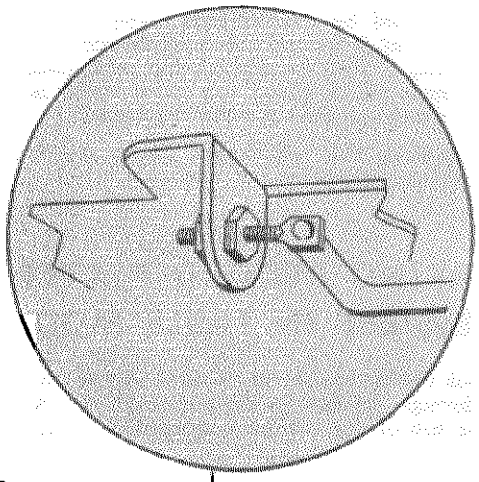


Figure 15—SPINDLE-HEIGHT ADJUSTMENT.

SPINDLE HEIGHT

The height of the record spindle, when extended, should be such that the spindle properly engages the record hole without delay, when the door is closed. The adjustment is made as follows:

1. Open the door of the record player. No record should be used.
2. Using a No. 4 Allen wrench, release the set screw in the spindle connector block. See Figure 15.



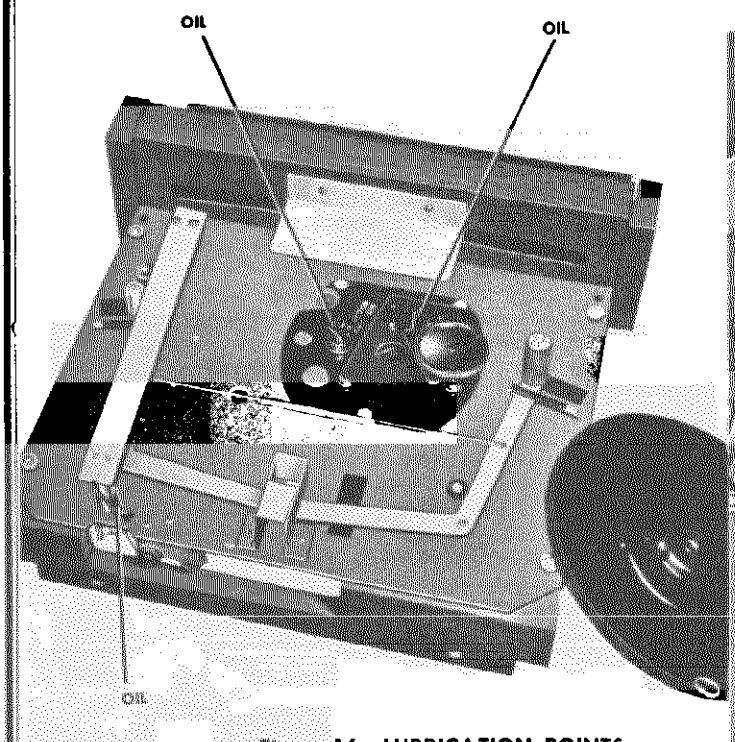


Figure 16—LUBRICATION POINTS UNDER TURNTABLE.

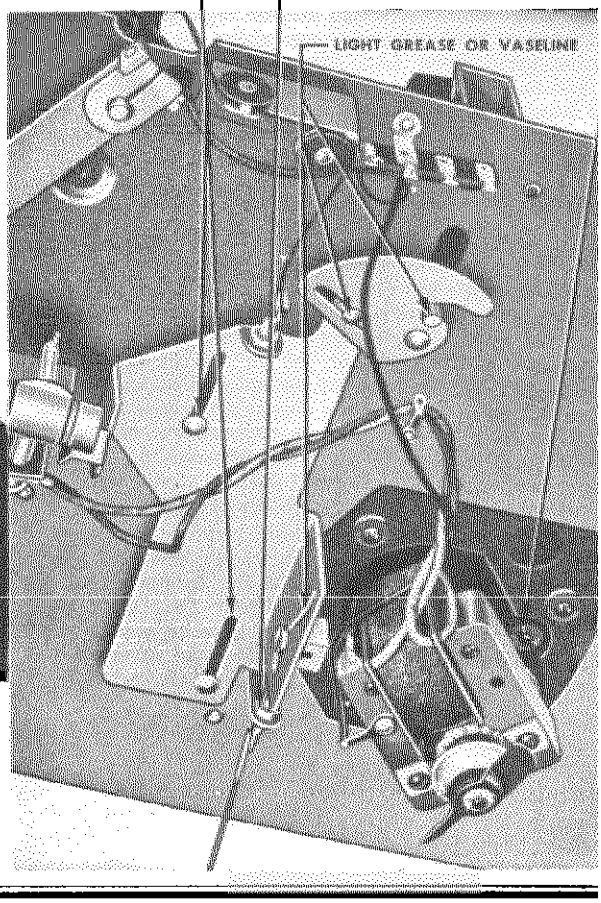


Figure 17—LUBRICATION POINTS UNDER MOTOR BOARD.

3. Adjust the spindle height until the point on the upper end of the spindle is flush with the spindle bushing. Tighten the set screw.

CONNECTOR BAR

This adjustment establishes the correct position of the slide-lever assembly, with respect to the door.

1. Open the door to its limit (do not force).
2. Loosen the two nuts on the threaded stud of the connector bar. See detail, Figure 17.
3. Hold down the door, and separate the two nuts, so that the slide-lever assembly may be pulled forward until stopped by the shoulder rivets in the two straight slots. With the slide-lever assembly held in this forward position, tighten the nuts. Avoid an adjustment which places too much strain on the ear to which the threaded stud is fastened.

After making this adjustment, check the record-spindle height, readjusting if necessary.

MAKING RECORD PLAYER ACCESSIBLE IN TABLE MODELS

Unhook the latch; this can be done by inserting one finger through the hole in the bottom of the cabinet. Push the top of the cabinet backward, then upward.

LUBRICATION

It is recommended that the PHILCO M-7 AUTOMATIC RECORD PLAYER be lubricated about once a year. Remove the turntable, by lifting upward.

CAUTION

Do not get any oil or grease on the idler-wheel tire, drive-motor pinion, or turntable.

The points to be lubricated are indicated in Figures 16 and 17. Apply a few drops of *oil*, such as Philco Part No. 60319, to the following points:

1. Edges of slot under idler-wheel plate (the slot in which the guide pin rides).
2. Record-spindle and bushing.
3. Tone-arm spindle.
4. Idler-wheel bearing, shown in Figure 17.

Clean off old grease with carbon tetrachloride, and apply *light grease* or *vaseline*, such as Philco Part No. 60130, to the following points, also shown in Figure 17.

1. Two straight slots of slide-lever.
2. Diagonal slot carrying record-spindle connector block.
3. Slot of lock-out cam.

After completing the lubrication, close the door of the record player and wipe oil from the extended portion of record spindle. Replace the turntable. Dip a pipe cleaner in carbon tetrachloride, and carefully clean the pin on which the trip pawl swings; do not apply any lubrication to this pin.

REPLACEMENT OF PARTS

Parts or assemblies which may be replaced for worn, damaged, or broken parts or assemblies are listed in the Replacement Parts List. Many of the parts are attached to the motor board by rivets; movable sections are attached by shoulder rivets. When replacing a part or assembly, drill out the ends of the rivets, and knock them out with a nail set or center punch.

NEEDLE

TO REPLACE THE PICKUP NEEDLE IN TABLE MODELS, first remove the top of the cabinet according to the directions given on this page. Then pull the phonograph-compartment door fully open to tilt the tone arm upward. Hold the end of the tone arm and loosen the needle screw on the end of the arm with a small screwdriver. Remove the old needle, and insert the new one *as far into the needle hole as it will go, with the flat side of the shank facing toward the needle screw.* Hold the end of the tone arm with the needle in the proper position, and tighten the needle screw.

TO REPLACE THE PICKUP NEEDLE IN FLOOR MODELS, first pull the phonograph-compartment door about halfway open, and carefully move the tone arm around toward the back of the cabinet until a slight resistance to movement is felt. Then close the door to permit free movement of the tone arm to the end of its backward swing. Hold the end of the tone arm in the left hand, as shown in Figure 18, and loosen the needle screw on the end of the arm with a small screwdriver. Remove the old needle, and insert the new one *as far into the needle hole as it will go, with the flat side of the shank facing toward the needle screw.* Hold the end of the tone arm, with the needle in the proper position, and tighten the needle screw. Again pull the phonograph-compartment door about halfway open, and move the tone arm around toward the front of the cabinet until resistance to movement is felt. Then close the door to permit free movement of the tone arm to its original position.

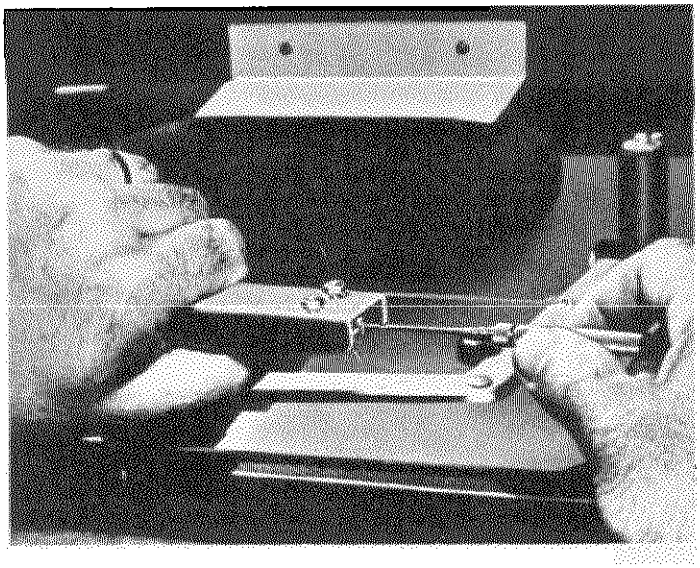


Figure 18—REPLACING NEEDLE.

CRYSTAL-PICKUP UNIT

To replace the pickup unit, first remove the two hex nuts and lockwashers from the tone arm; then withdraw the unit from under the tone arm sufficiently to permit unsoldering the connections.

CAUTION

Excessive heat will damage the crystal in the pickup unit. When unsoldering or soldering connections to this unit, use a well-tinned soldering iron. *Do not apply more heat than is absolutely necessary.*

After removing the connections, the new unit may be connected, and mounted in the tone arm.

MERCURY SWITCH-CASE ASSEMBLY

When replacing the mercury switch-case assembly, this unit must be positioned properly in its clamp, so that, when the switch case is tilted to the *on* position, the mercury covers the contacts. After running the switch leads through the hollow shaft, turn the switch case until the hole through which the leads enter is facing directly upward (toward motor board).

SLIDE-LEVER ASSEMBLY

When any part of the slide-lever assembly becomes worn or damaged, it is recommended that the entire assembly be replaced.

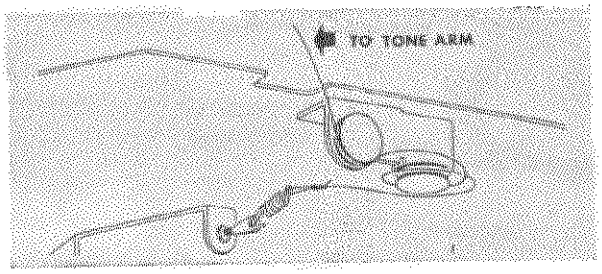


Figure 19—PULL-CORD INSTALLATION DETAILS.

PULL-CORD AND SPRING ASSEMBLY

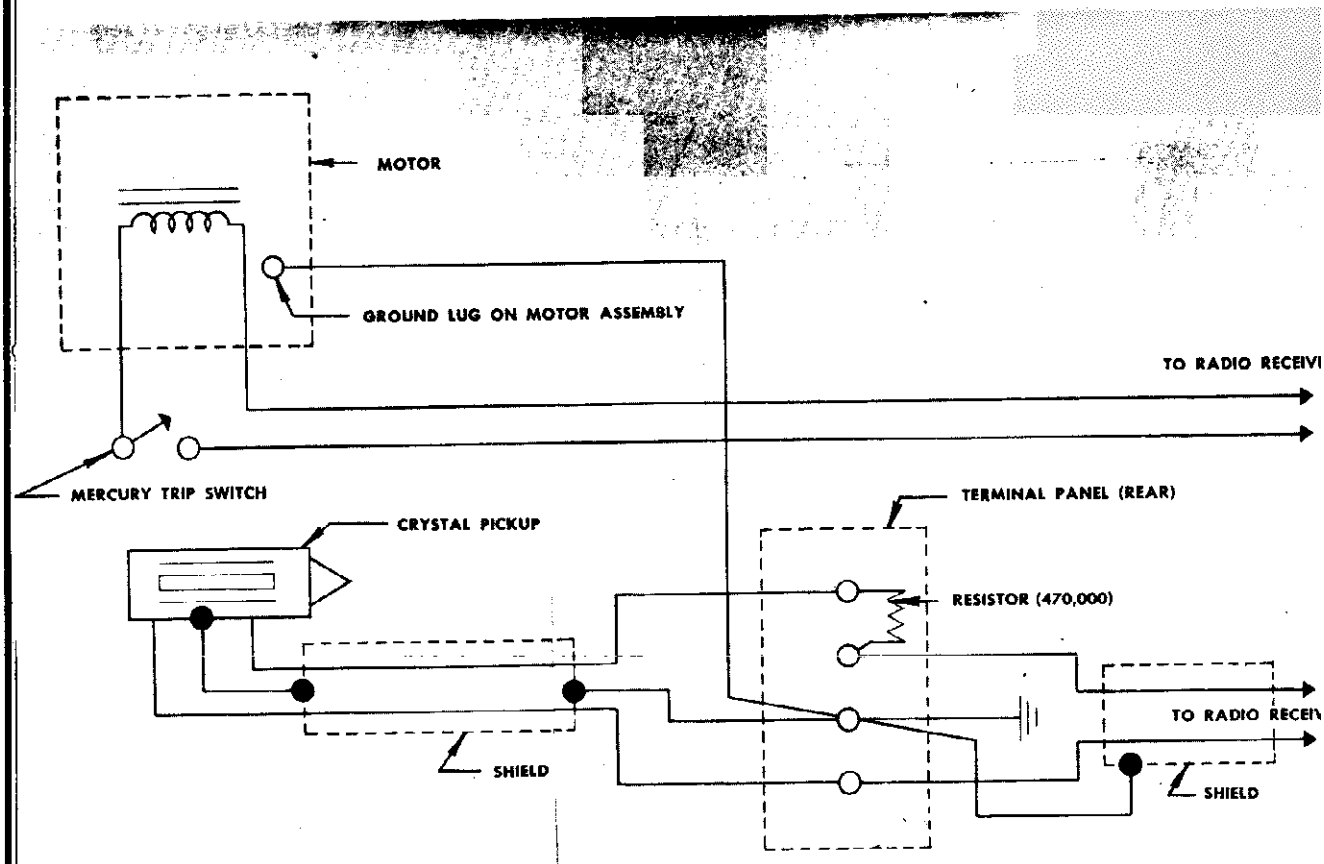
The pull-cord and spring assembly may be replaced by referring to the sketch, Figure 19.

POSSIBLE CAUSES OF "WOWS"

The presence of "wows" (pitch variations) is usually caused by a change in the speed of the turntable during each revolution. If this condition develops, it may be due to one of the following causes:

1. Defective record.
2. Idler-wheel tire unevenly worn.
3. Oil (or other foreign matter) on idler-wheel tire.
4. Binding of idler-wheel shaft.
5. Binding between record spindle and turntable bushing.
6. Guide roller tire touching edge of record.

Figure 20—WIRING DIAGRAM OF M-7 RECORD PLAYER.



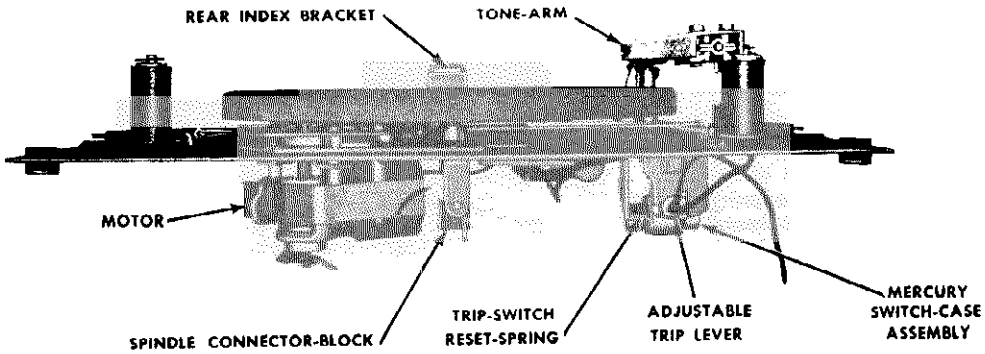


Figure 21
FRONT EYE-LEVEL VIEW.

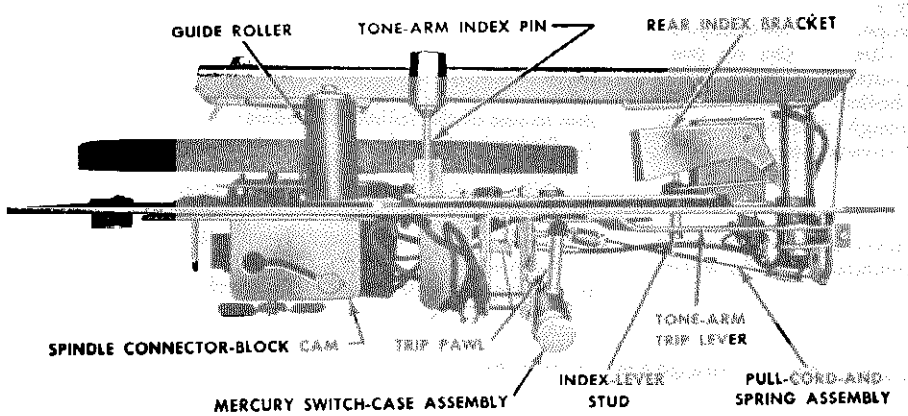


Figure 22
RIGHT EYE-LEVEL VIEW.

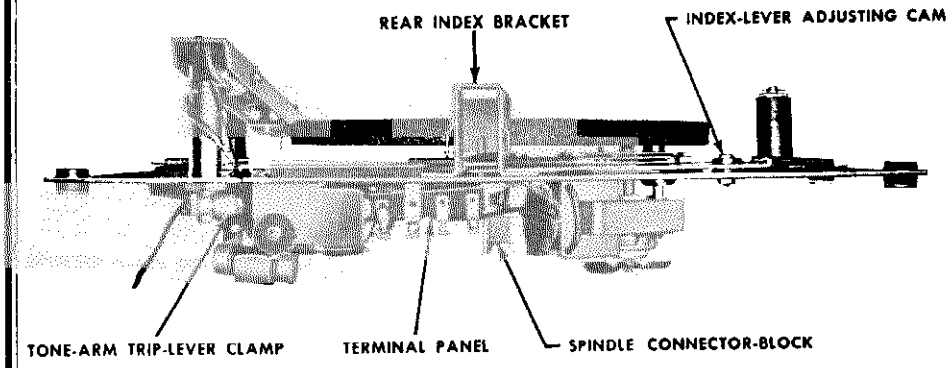


Figure 23
REAR EYE-LEVEL VIEW.

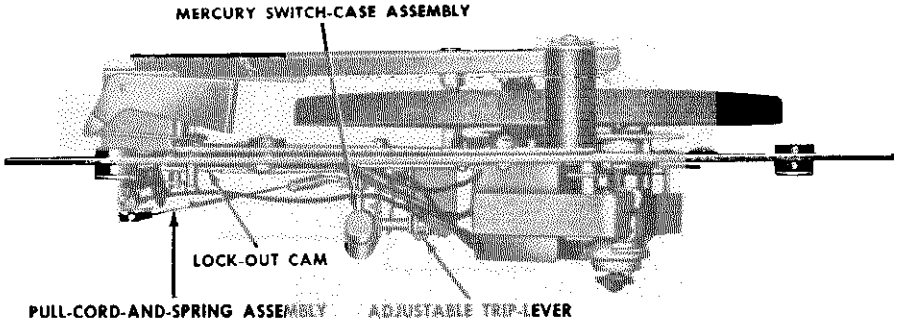


Figure 24
LEFT EYE-LEVEL VIEW.

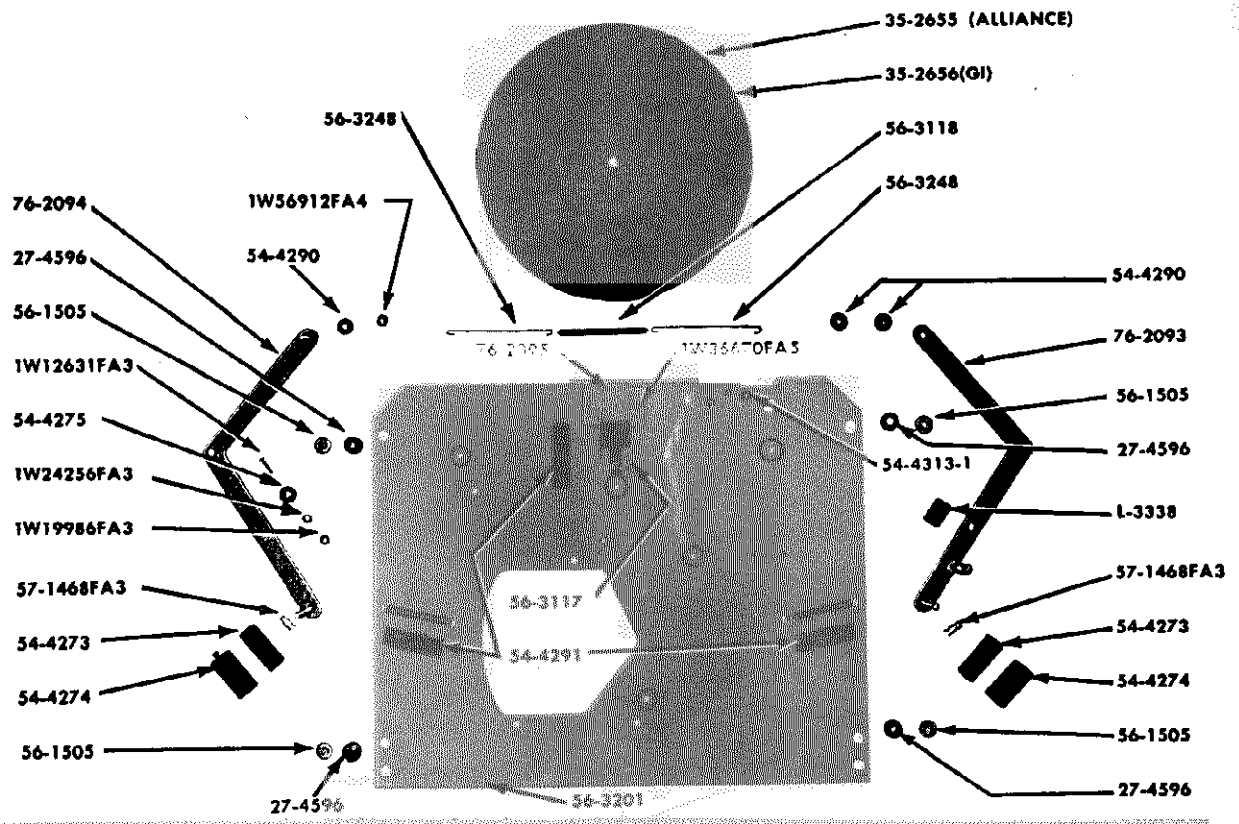
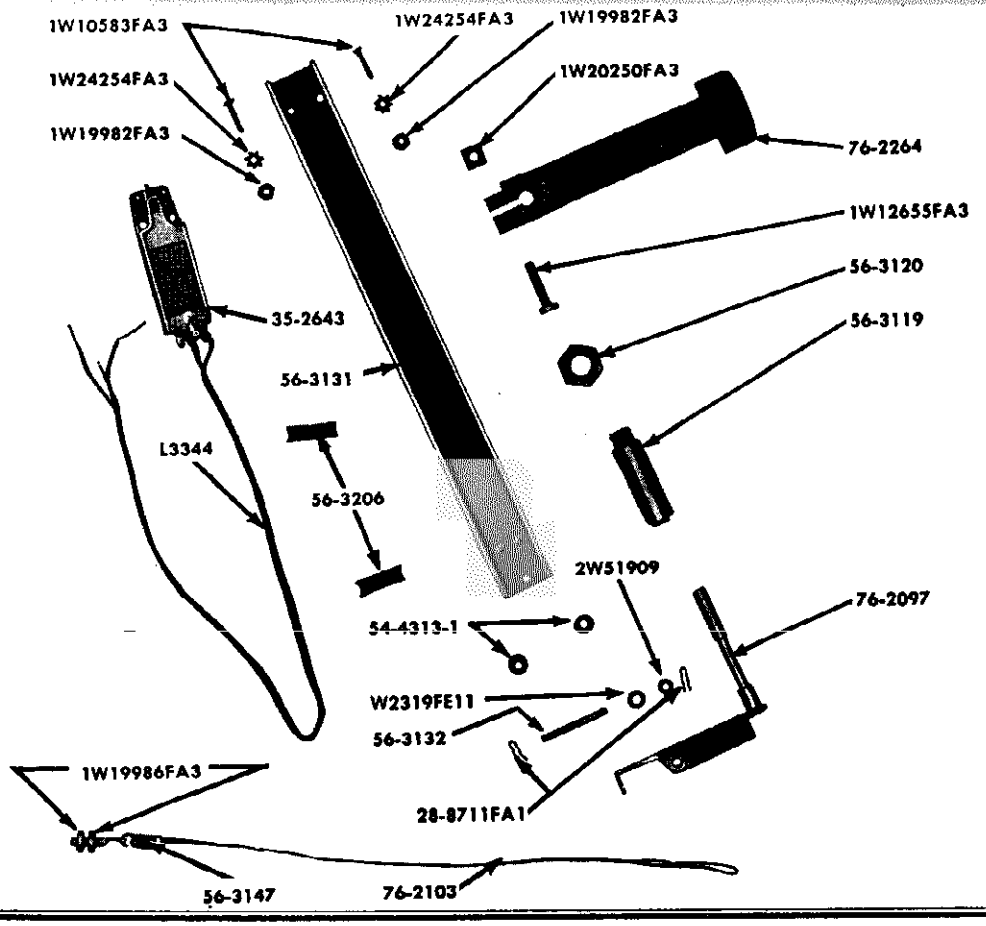


Figure 25—TOP VIEW OF MOTOR-BOARD AND PARTS.

Figure 26—TONE-ARM AND TRIP-LEVER ASSEMBLIES.



MODEL M-7 PHILCO CORP.

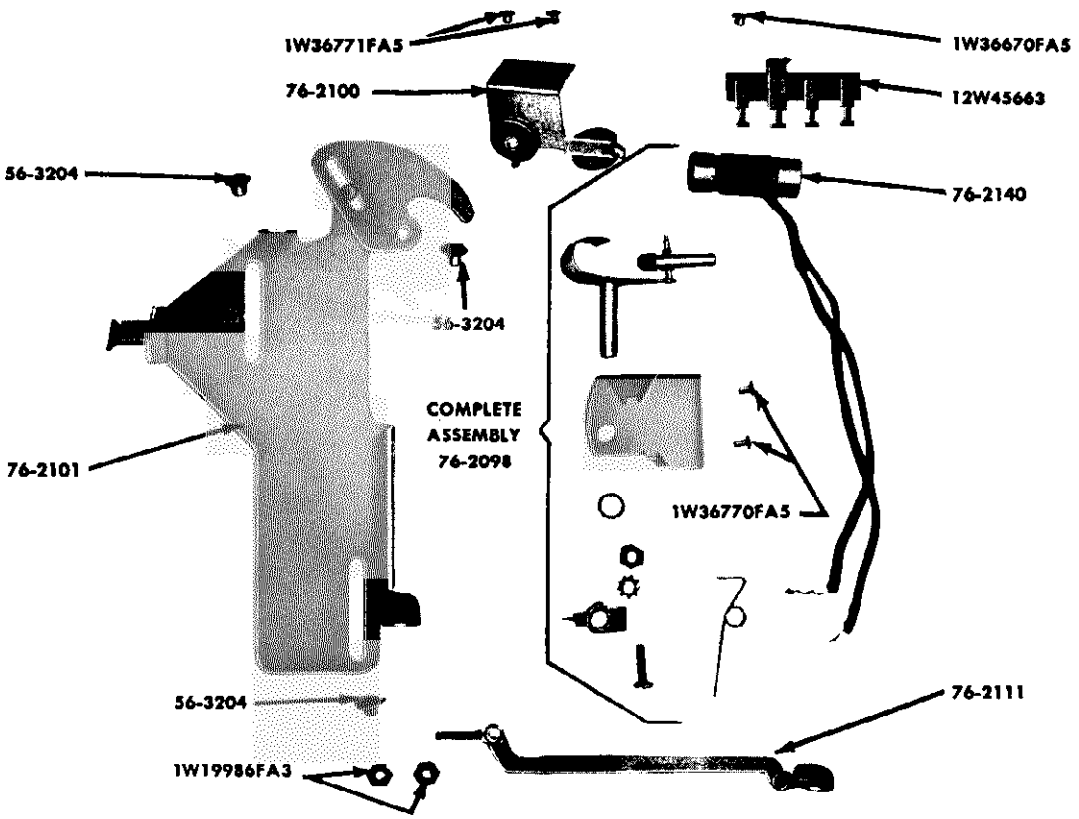
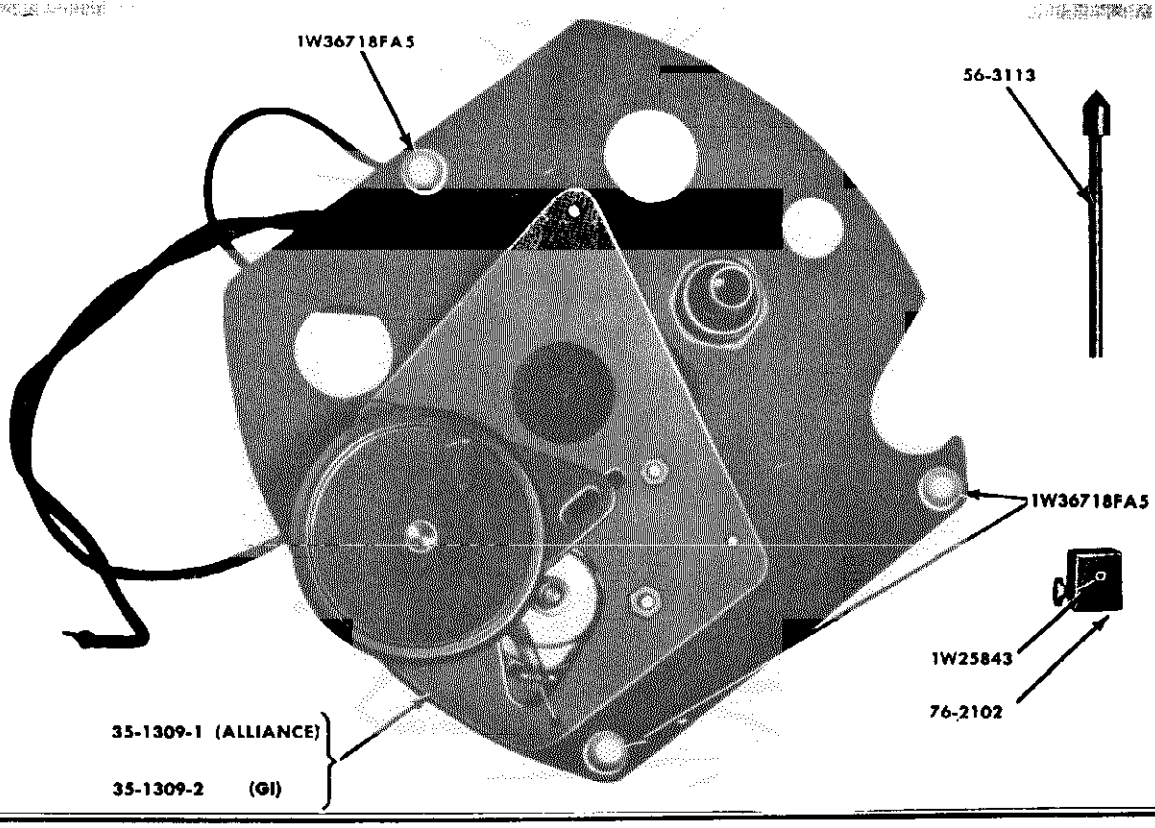


Figure 27—ASSEMBLIES-SLIDE LEVER, TRIP SWITCH, CONNECTOR-BAR, TERMINAL PANEL, BRACKET AND PULLEY.

Figure 28—MOTOR, RECORD SPINDLE, AND CONNECTOR-BLOCK.



REPLACEMENT PARTS LIST

PART No.	PART NAME
27-4596	Grommet
28-8711FA1	Hair Pin
35-1309-1	Motor (Alliance)
35-1309-2	Motor (GI)
35-2643	Crystal Pickup
35-2655	Turntable (Alliance)
35-2656	Turntable (GI)
45-2996	Needle (Philco Hi-Quality, Card of 12)
54-4273	Index Roller
54-4274	Index Tire
54-4275	Cam
54-4290	Rubber Washer
54-4291	Felt Pad
54-4313-1	Rubber Grommet
56-1505	Spacer
56-3113	Spindle
56-3117	Wire Clip
56-3118	Index Spring
56-3119	Spindle Bearing
56-3120	Spindle-Bearing Nut
56-3123	Record Hold-down (on Cabinet)
56-3131	Tone Arm
56-3132	Bearing
56-3135	Bracket (Trip Switch)
56-3147	Spring
56-3201	Motor Board
56-3204	Shoulder Rivet (Slide Lever and Index Lever)
56-3206	Cable Retainer
56-3248	Extension (Index Spring)
57-1468FA3	Hair Pin
66-4473340	Resistor 470,000 ohms—½ watt
76-2093	Index-Lever Assembly (R.H.)
76-2094	Index-Lever Assembly (L.H.)
76-2095	Rear-Index Bracket Assembly
76-2096	Tone-Arm Assembly
76-2097	Spindle and Bearing-Bracket Assembly
76-2098	Switch and Clamp Assembly
76-2100	Bracket and Pulley Assembly
76-2101	Slide-Lever Assembly
76-2102	Connector-Block Assembly
76-2103	Cord and Spring Assembly
76-2111	Connector Bar and Clip Assembly
76-2140	Mercury Switch-Case Assembly
76-2264	Trip-Lever Assembly
76-2374	Idler Wheel, with Tire (Alliance Motor)
76-2375	Idler Wheel, with Tire (GI Motor)
1W10583FA3	Screw No. 4-40 x ½"
1W12496FA3	Screw No. 6-32
1W12631FA3	Screw No. 6-32 x ½"
1W12655FA3	Screw No. 8-32
1W19982FA3	Nut No. 4-40 hex
1W19986FA3	Nut No. 6-32
1W20250FA3	Nut No. 8-32 Square
1W24254FA3	Lockwasher No. 4
1W24256FA3	Lockwasher No. 6
1W24520FA1	Lockwasher
1W251181FA9	Wood Screw No. 4 x ⅜"
1W25368FA3	Wood Screw No. 8 x ⅜"
1W25843FA3	Screw (Allen) No. 4
1W36670FA5	Rivet
1W36671FA5	Rivet
1W36716FA5	Rivet
1W56912FA4	Speed Nut
2W51909	Flat Washer
12W45663	Terminal Panel
L-3338	Tubing
L-3344	Shielded Cable
W-2319FE11	Spring Washer

RADIO CORP. OF AMERICA

MODELS RP-177, RP-177A
RP-177B

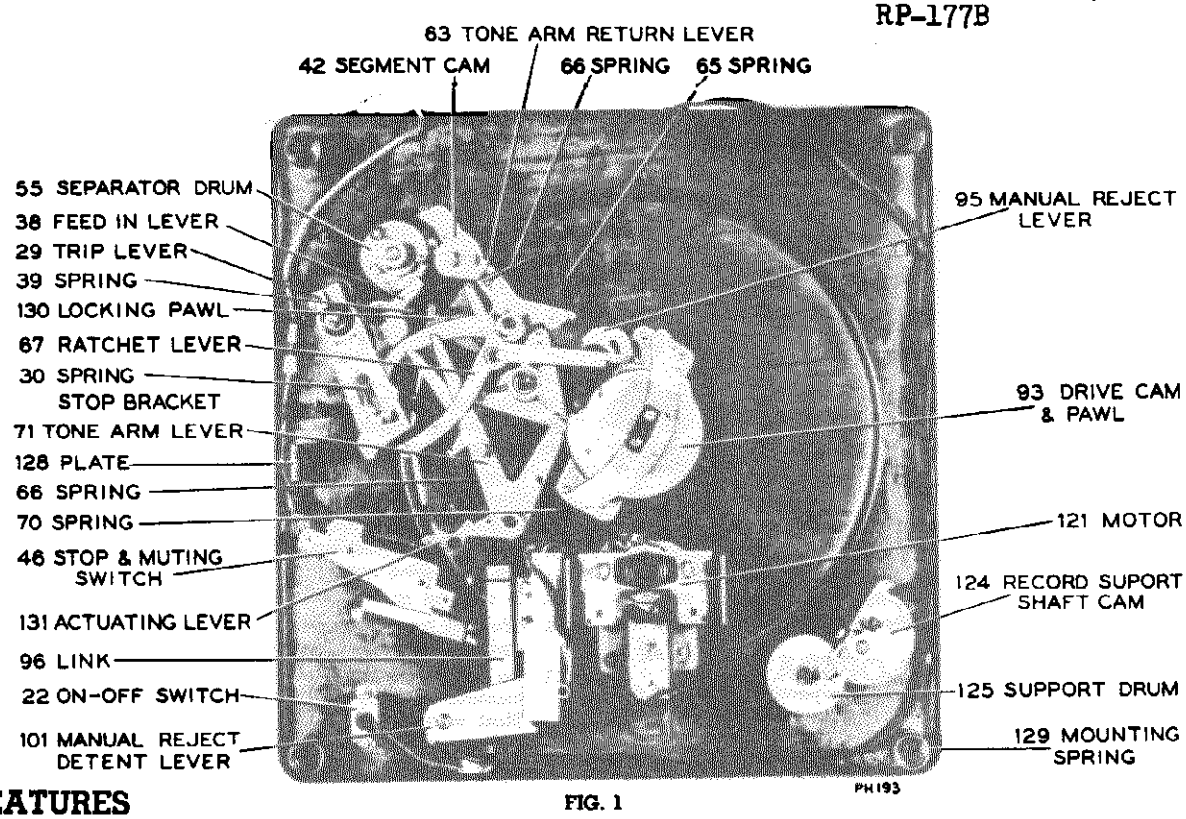


FIG. 1

FEATURES

1. This record changer is a two-support, drop type, non-intermixing mechanism designed to play automatically a series of twelve ten-inch or ten twelve-inch records of the standard 78 RPM type.
2. The mechanism uses a lightweight, low-noise, crystal pickup cartridge, equipped with a long-life sapphire point.
3. The tone arm is automatically returned to rest position and the power removed from the drive motor, after the mechanism has finished playing the last selection of the stack.
4. The changer is equipped with an eccentric tripping device which insures tripping on all standard records.
5. A pickup muting switch is incorporated, which shorts out the pickup while the changer is in cycle. This prevents mechanical noise of moving parts from being amplified.
6. The record support and separator are mechanically linked, requiring only one operation for changing of record size.
7. Moving parts are few in number while playing records. This insures quiet reproduction, free from rumble and wow.
8. The mechanism is provided with a safety clutch which prevents damage to the mechanism in case of a jam due to a defective record.

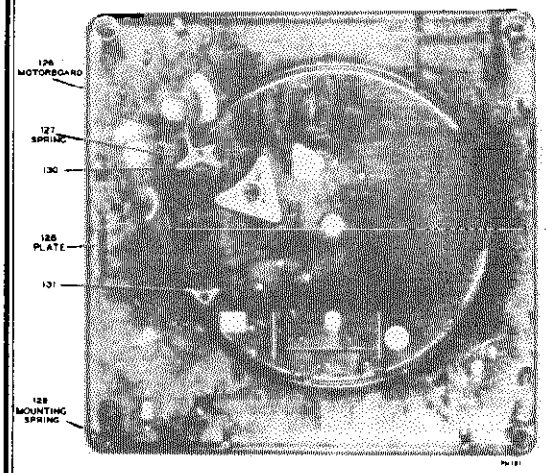


FIG. 3

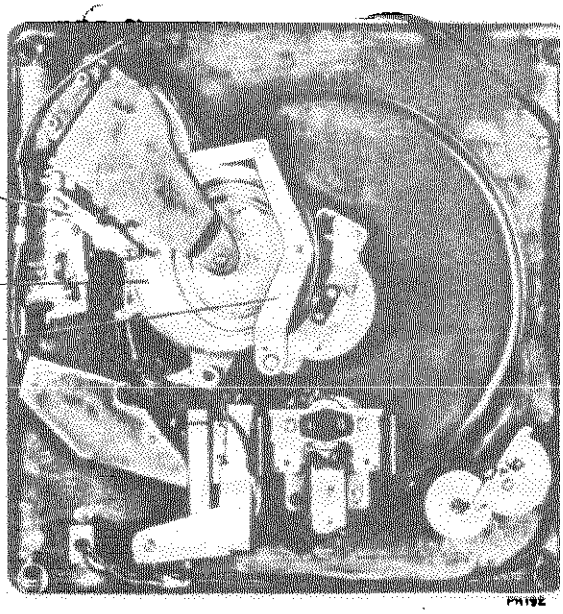


FIG. 2

MODELS RP-177, RP-177A, RP-177B — RADIO CORP. OF AMERICA

MANUAL OPERATION

1. Make certain the mechanism is out of cycle with the pickup on the rest.
2. Push "Start-Reject" knob to manual position.
3. Place record on turntable and push the power switch to the "on" position.
4. Lift and place pickup on record.
5. When the selection has finished playing, the pickup will continue to ride in the eccentric groove until the pickup is lifted from the record or the power is removed from the drive motor.

LUBRICATION

A light machine oil (SAE #10) should be used to oil the bearings of the drive motor.

On all bearing surfaces, excepting the motor bearings, Houghton STA-PUT No. 320, or equivalent, should be used. On all other surfaces, STA-PUT No. 512, or equivalent, is recommended. STA-PUT can be purchased from E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia, Pa.

(Do not oil or grease record separator shaft.)

It is important that the drive motor spindle and the rubber tire on the friction disc as well as that on the idler wheel be kept clean and free from oil or grease, dirt, or any foreign material at all times. Carbon tetrachloride or naphtha is satisfactory for cleaning these parts.

AUTOMATIC OPERATION

The pickup "rest" consists of a post incorporating a button and shaft connecting a switch beneath the motor board. This switch, which controls the power to the drive motor, is actuated by the weight of the pickup and tone arm while going in and out of rest position.

1. Turn the record support on the left-hand side of the changer, to position it for 10- or 12-inch records.
2. Load the records on the supports with the desired selections upward, the last record to be played on top. (Make certain the separator shelf is pushed down when stack is placed on the supports.)
3. Push the "On-Off" knob to the "on" position.
4. Push "Manual-Reject" handle to reject position and release. The mechanism will automatically play in sequence, one side of each record stacked on the supports. After completing the selection on the last record the tone arm will return to rest position and the power will be removed from drive motor.
5. To reject a record being played, push the control handle to "Reject" and release.
6. Lift and turn separator shelf to facilitate the removal of records.
   (Note: For automatic operation, each record is required to have the standard eccentric groove.)

Cautions

Before servicing the automatic changer, inspect the assembly to see that all gears, cams, springs, levers, etc., are correctly assembled and in good working order.

1. Never use force to start or stop the motor or any part of the record changing mechanism.
2. Warped or damaged records may cause the mechanism to jam. When jamming occurs, the safety clutch slips, causing a clicking sound.
3. A cracked or chipped record may damage the sapphire.
4. Warped records may slide on one another while playing and result in unsatisfactory reproduction.
5. Do not leave the records on the record posts or on the turntable as they may warp, particularly in warm climates. Most warped records may be flattened by placing them on a flat surface with a heavy flat article placed on top of them for a few days.
6. If, for any reason, the mechanism stalls, turn off the "On-Off" switch and remove the records from the posts. Start the turntable by turning the switch on and allow the tone arm to complete its cycle.
7. Do not tighten copper-plated, cone-pointed screws until final adjustment has been made.

FUNCTION OF PRINCIPAL PARTS

Trip Lever 29
When the pickup is riding in the eccentric groove, the trip pawl located on the trip lever engages the ratchet lever, starting the cycle.

Ratchet Lever 67
Portion of lever acts as a ratchet and the other portion acts as a stop or catch to hold the drive clutch from engaging.

Ratchet Wheel 90 (Fig. 4)
Acts as part of the safety clutch, which is engaged with the cam pawl during cycle.

Drive Cam, Gear and Pawl 93
Transfers motion from turntable through clutch to main gear.

Turntable Spindle Support 82 (Fig. 4)
Forms a bearing for turntable spindle.

Main Cam 80 (Fig. 4)
Has a series of tracks controlling cycling action.

Record Separator Lever, Link, Crank 85 (Fig. 4)
Transfers motion from the main cam through the stud, lever and link to the separator post during change cycle.

Feed-in Lever Locking Pawl or Latch 130
Provides a means of locking feed-in lever until the pickup has landed on the record, then unlatching and allowing feed-in lever to gently push the pickup into starting groove. (Used only on early RP-177)

Manual-Reject Control Knob and Lever Assembly 102-101-96-95
In "manual" position, it contacts the stud on clutch portion of drive cam thereby preventing the clutch from engaging and starting cycle.
In "automatic" position, it permits operation of the ratchet lever safety clutch and stop switch.
In "start reject" position, it momentarily closes control switch which is shunted across stop switch. It also moves the ratchet lever away from drive cam pawl, permitting the clutch to engage and start cycle.

Muting Switch Actuating Lever 131
Opens pickup muting switch during the playing cycle.

Tone Arm Lever 71
Directs horizontal motion of tone arm. It also incorporates an additional retard lever which stabilizes tone arm while the mechanism is in cycle.

Tone Arm Return Lever 63
Moves the tone arm inward and provides positioning for landing.

Feed-in Lever 38
A small lever under spring tension providing a small amount of force inward on tone arm, after the pickup has landed on record. (Used only on early RP-177)

Tone Arm Elevating Lever 77
Directs vertical motion of tone arm.

Tone Arm Elevating Rod 9 (Fig. 4)
Transfers motion from elevating lever to tone arm.

Record Support Shaft, Cam 124
Functions as a lock for record support belt drum.

Record Support and Separator Drums and Belt Assembly 55-56-125
Forms a mechanical linkage between record support and record separator.

Record Support
Provides a support for the record stack and a handle for record size change.

Record Separator Post and Blade
Functions to support the records and, together with the selector blade, to separate the lowest record of the stack and allow it to drop to the turntable during the change cycle.

Shut-off or Segment Cam 42
Forms a stop for tone arm return lever thereby preventing it from pushing the tone arm in for landing.

Retainer Spring and Plate 128
A small piece of phosphor-bronze functioning as a partial lock which stabilizes the tone arm when in the outermost position.

Stop Bracket (part of Motor Board)
A small piece of spring steel used as a stop, which determines the outermost position of tone arm. (Adjustable.)

Cycle of Operation

The changer can be conveniently rotated through the change cycle by pushing the reject handle and revolving the turntable by hand. Eight turntable revolutions are required for one change cycle. Block up the motor, so it is disengaged fro the drive disc, to permit easier manual rotation of the tur table.

	Function	Explanation
Operator	Turn Record Support to 10" or 12" Position as Desired	1. Separator post positions itself by means of belt drive.
	Place Records on Posts	1. Separator shaft is pushed down against its spring and carries segment-cam out of path of inde finger.
	Push Start Knob	1. Switch connected to start knob momentarily applies power to drive motor until tone arm raised from stop button. 2. Manual-reject lever pushes ratchet lever. 3. Ratchet lever is pushed out of step on main gear shaft and releases drive cam pawl. 4. Drive cam pawl engages cam sprocket and it revolves, carrying drive gear with it.
Automatic Cycle	Tone Arm Rises	1. Main cam and gear revolves with drive gear. 2. Stud on tone arm lever rides in top track on main cam and directs movement of the lever. 3. Tone arm elevating lever rides up on ridge on main cam and pushes tone arm up by mean of elevating rod.
	Tone Arm Moves Out	1. Tone arm lever pushes on trip lever stud. (Feed-in on early RP-177 only) 2. Trip lever moves out. 3. Stud on trip lever, on its outermost swing, pushes feed-in lever into locking pawl (130) (fig. 1) 4. Tone arm return lever is carried along by trip lever stud, and by stud on main cam top trac
	Record Knife Separates Bottom Record from Stack After Gauging Thickness of Record	1. Stud on separator lever follows main cam bottom track and directs the motion of the lever. 2. Through the separator link and crank, the separator lever turns the separator shaft. 3. Knife turns with shaft and strikes edge of bottom record. 4. Separator shaft continues to revolve and teeth on inner circumference of knife ride up c shelf teeth until knife is carried high enough against the action of the coil spring to mov in over top of record.
	Record Drops to Turntable	1. Separator shaft continues to turn until knife supports stack of records and shelf moves ou from under bottom record.
	Tone Arm Moves In	1. Separator shaft reverses rotation. 2. Tone arm lever moves away from trip lever stud. 3. While tone arm lever moves away from stud on trip lever, the retard lever, hinged on ton arm lever, stabilizes tone arm for accurate landing. 4. Tone arm return lever pushes on trip lever stud. 5. Trip lever moves in.
	Tone Arm Lowers Sapphire on to Record	1. Index finger on tone arm return lever moves against separator shaft to insure proper landin position. 2. Tone arm elevating lever rides down on main cam ridge thus lowering the elevating rod an the tone arm. 3. Separator shaft returns knife to original position and allows stack of records to rest on shel
	Sapphire Moves In to Record Groove Record Begins to Play	1. Ratchet lever rides into eccentric step on main gear shaft and blocks drive cam pawl. 2. Pawl is disengaged from drive cam sprocket. (Feed-in on early RP-177 only) 3. Drive gear and main gear stop. 4. Tone arm lever moves into cam to maintain disengagement. 5. As tone arm lever moves to its innermost position, it contacts feed-in latch, unlatching feed-i lever. This allows it to gently push pickup into the first groove of the record.
	Last Record Drops and the Last Selection Is Finished Playing	1. As the mechanism goes into cycle the separator shaft raises, allowing segment cam to engag index finger and prevent tone arm return lever from pushing tone arm in for landing. 2. Tone arm is lowered into rest position. 3. Power is removed from drive motor by the weight of the tone arm resting on stop button whic opens the stop switch.

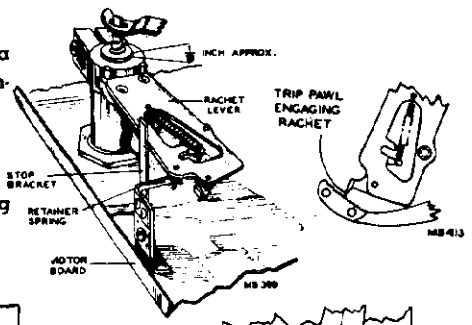
Preliminary Adjustments for Assembling Mechanism

It should be understood that the preliminary adjustments are only approximate and intended to aid in the process of assembling a mechanism in which the major parts have been removed. The final and exact adjustments can be made when the mechanism is completely assembled.

Mounting the Tone Arm:

The assembled tone arm should be mounted with the ratchet lever clamp approximately 1/16" from the end of the pivot arm bushing and against the stop bracket when the tone arm is on the rest as shown in the sketch.

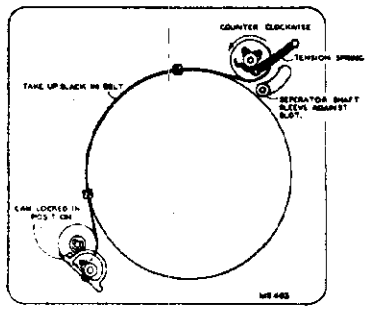
(**Note:** The 1/16" is only a starting point, the important factor is to have the trip pawl engage the ratchet properly.)

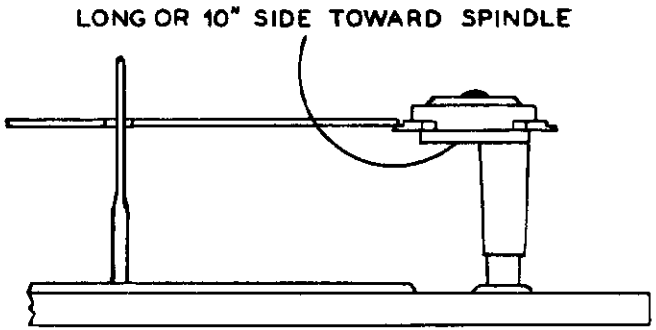


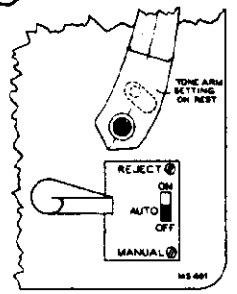
Positioning Record Support Shaft:

Assemble the record support post with the ten inch side (long side) pointing towards the spindle. Adjust the cam so it is locked in position as shown in the sketch.

Take up all the slack in the belt by turning the separation shaft counter clockwise (viewed from underside) aiding the action of the tension spring when the separator shaft sleeve is against the side of the slot in the motor board nearest the turntable as shown in the sketch.



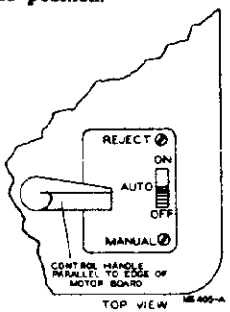


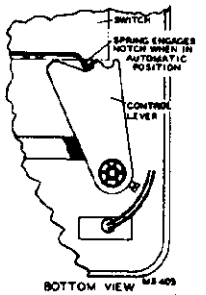


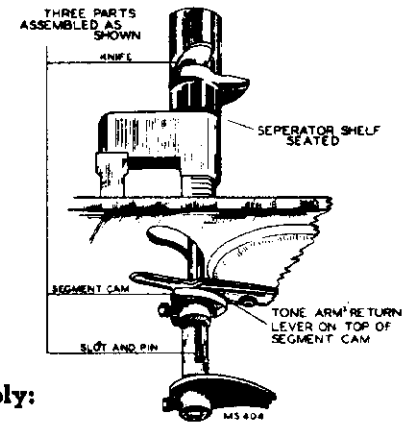
Manual-Reject Lever Mounting:

Place the control handle parallel to the front side of the motor board and pointing towards the "on-off" switch.

Adjust the control lever so the notch engages the spring of the switch as shown in the sketch when the control handle is in the automatic position.







Mounting the Separator Knife and "Shut-off" Cam Assembly:

Turn the record support post to the ten inch position and assemble the separator knife, "Shut-off" cam, and separator shaft pin and bushing assembly approximately in line as shown in sketch. Allow the end of the tone arm return lever to ride on the upper side (towards the motor board) of the "shut-off" cam as shown in sketch.

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MODELS RP-177, RP-177
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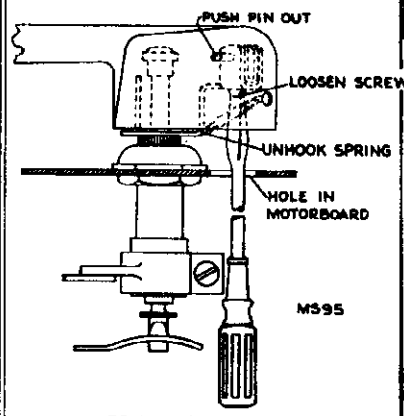
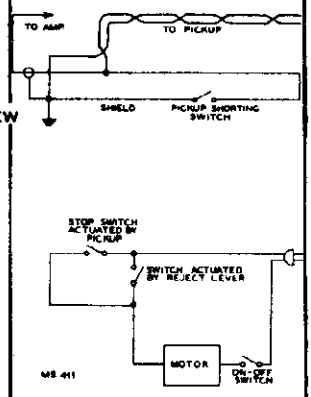
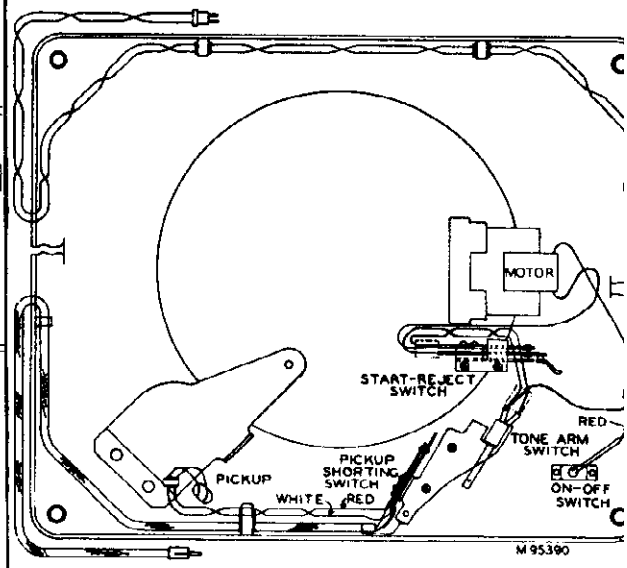
1. Unhook spring
2. Loosen screw
3. Push pin out

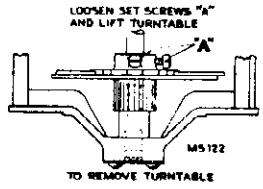


REMOVING TONE ARM

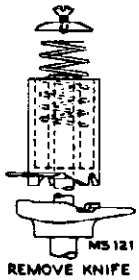


Electrical Connections

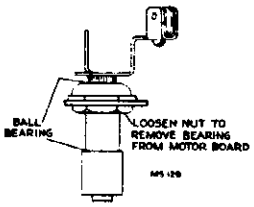




To remove turntable loosen set screws "A" and lift the turntable.



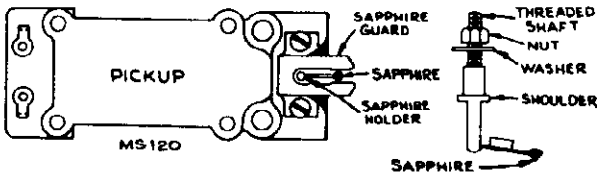
To remove separator knife, loosen top screw and entire assembly can be dismantled as shown.



Do not remove ball bearings from tone arm bearing unless absolutely necessary. If cleaning is necessary immerse entire bearing in cleaning solution such as carbon tetrachloride.

To Remove Tone Arm Bearing:

Replacement of Sapphire:



Caution: Never bend the sapphire support wire.

Extreme care should be used when loosening the sapphire mounting nut so that the twisting motion does not break the crystal.

Remove the two screws holding the sapphire guard in place and remove guard. Remove the small nut and washer on the threaded shaft of the sapphire holder and push the shaft through the hole in the viscoloid until the sapphire holder assembly comes free.

Insert threaded shaft of replacement sapphire holder through viscoloid and replace the washer and nut. Make sure the sapphire is in the correct position. Take hold at the lower end of the shaft with a pair of pliers while tightening the nut, being very careful so as not to strip the threads or break the crystal. Replace the sapphire guard, positioning it by means of the oversize screw slots. Make certain that the sapphire and its supporting wire are centered in the guard. Tighten the guard screws. Before using, check to see that the sapphire projects far enough (approx. .020) beyond the guard so that the guard will not strike the record. If necessary, bend the guard a little.

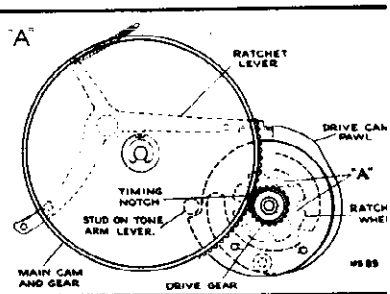
Note: Pickup force should be approximately 1 to 1¼ oz.

Reference Chart for
Automatic Record Changer Adjustments

Mechanism jams. General irregularity of operation.

(Mechanism Timing)

With the ratchet lever and the pawl on the drive shaft cam in playing position as shown, remove the bottom support bracket, link and lever assembly. Remove the "C" washer on the main cam shaft and slip the cam down far enough that it can be rotated with respect to the drive gear. Then rotate it until the timing notch is positioned as shown. Put the main gear back in mesh with the drive gear, replace the "C" washer, place the elevating lever on the cam ridge. Make certain the separator link and lever assembly is in its correct position and replace the bottom support bracket.



MODELS RP-177, RP-177A, RP-177B — RADIO CORP. OF AMERICA

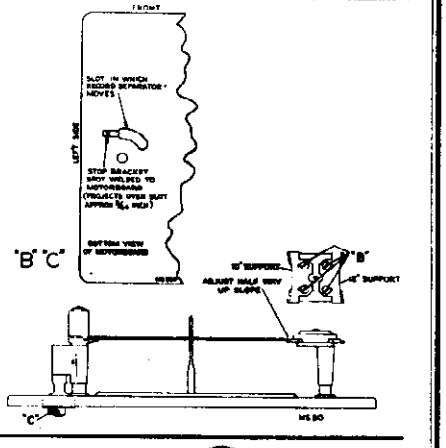
Records strike separator post or fail to stay on record shelf.

(Spacing Between Record Posts)

Turn the record support post to the ten-inch position. Loosen set screws "C," hold the separator post against the end of its slot in the motorboard and turn the belt drum to take up any slack in the belt. Tighten the zinc-plated, blunt-nosed screw and check to see that a ten-inch record fits the posts as shown. Then tighten the copper-plated, cone-pointed screw. Loosen set screws "B" and adjust support shelf so both 10- and 12-inch records set half-way up the slope when support post is turned to their respective positions.

Note:—
A small piece of metal (stop bracket) has been welded to the motor board to improve the separation and dropping of the twelve-inch records.

Bending the metal limits the outward movement of the record separator post, and in so doing makes it possible to equalize the distances between the spindle and the record support and separator posts.

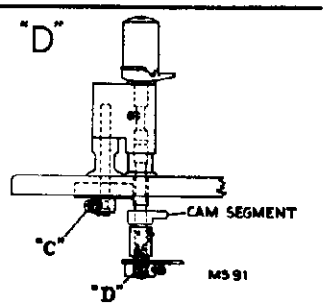


Records do not drop at proper time.

(Record Shelf Timing)

With the record supports turned to ten-inch position, place a ten-inch record on the supports. Loosen the set screws "D" and turn the record separator shaft until the edge of the record-separating knife is 3/32 inch away from the edge of the record. The teeth on the inner circumference of the knife should be resting in the bottom of their slots at the time the adjustment is made. Tighten the zinc-plated blunt-nosed screw first, run through cycle several times as a check, then tighten the cone pointed screw.

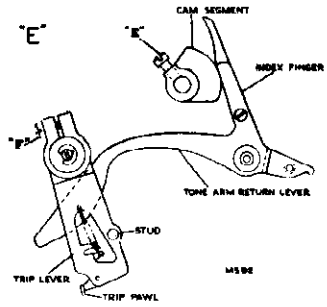
Note: It may be found necessary to deviate slightly from 3/32 inch dimension if twelve-inch records do not drop properly.



Tone arm continues to repeat playing of top record or jams when part way in on record.

(Segment-cam height or radial position)

With record changer in the ten-inch position and the records removed from the posts, loosen the set screw "E." Set the record separator segment-cam so that the index finger of the tone arm return lever rides on the middle of the segment-cam, as shown. Rotate the segment-cam until it is in such a position that the index finger will not ride off either end. Check to see that the index finger rides in over top of the cam when the record shelf is depressed by the weight of one record. Tighten the set screw.



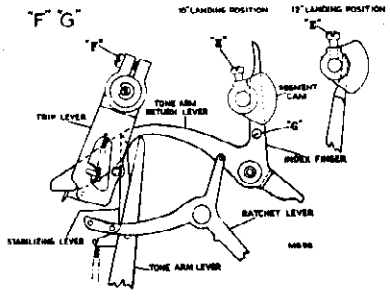
Sapphire does not land at correct point on 10-inch record.

(Tone Arm Position With Respect To Trip Lever)

Correct dimension from outside edge of spindle to sapphire $4\frac{11}{16}$ inches.

With the record changer in the ten-inch position, place a ten-inch record on the turntable and rotate the changer through cycle by hand, until the sapphire is just ready to land. Make certain that the index finger of the pickup arm return lever is against the record separator shaft and that the tone arm trip lever stud is held firmly against the return lever. Loosen the set screw "F" and move the pickup arm to the correct landing position. Maintain correct alignment between ratchet lever and trip pawl, when tightening set screw "F." (Note—Make certain trip lever stud does not come in contact with motorboard while making this adjustment.)

Place a twelve-inch record on the turntable and rotate the changer through cycle until the sapphire is just ready to land. Loosen screw "G" and adjust end of tone arm return lever so it is against separator shaft when pickup is in correct landing position.



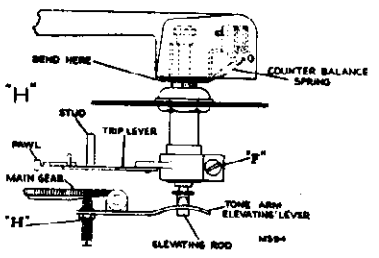
Top of tone arm strikes stack of records or sapphire fails to clear the records on the turntable.

(Tone Arm Height While In Cycle)

Rotate the changer through cycle until the tone arm has risen to its maximum height above the turntable but has not begun to move out. At this point adjust the screw "H" until the distance between the turntable and the sapphire is one and three-sixteenths inches. Tighten the locknut.

(Tone Arm Height While Out of Cycle)

Bend end of tone arm support bracket or pivot arm so the pickup end of tone arm clears the motorboard by 3/32 inch.



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MODELS RP-177, RP-177A
RP-177B

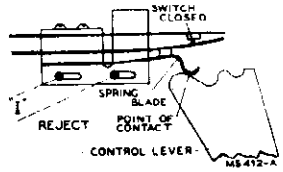
Turntable fails to rotate when the control handle is pushed to "Manual" or "Start-Reject" position.

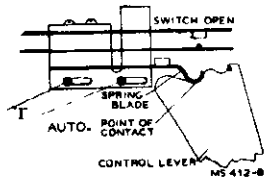
(Control lever and switch position)

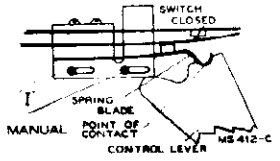
Remove the switch cover.

Loosen the two mounting screws "I" and position the switch so as to conform with the following three conditions.

1. When the control handle is in the "Start-Reject" position, the spring blade should ride up the side of the deep notch in the control lever causing the switch contacts to close. (The control handle should return to "Automatic" position automatically.)
2. When the control handle is in the "Automatic" position the spring blade should engage the deep notch in the control lever and in doing so allow the switch contacts to open.
3. When the control handle is in the "Manual" position, the spring blade should engage the shallow notch in the control lever causing the switch contacts to close and at the same time have "Manual Reject" lever move ratchet lever far enough so as to have free movement of trip lever, thereby preventing engagement between trip pawl and ratchet.





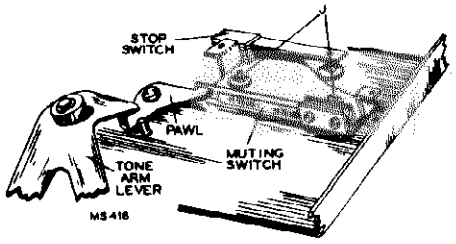


No output.

Noise during cycle.

(Position of pickup shorting switch)

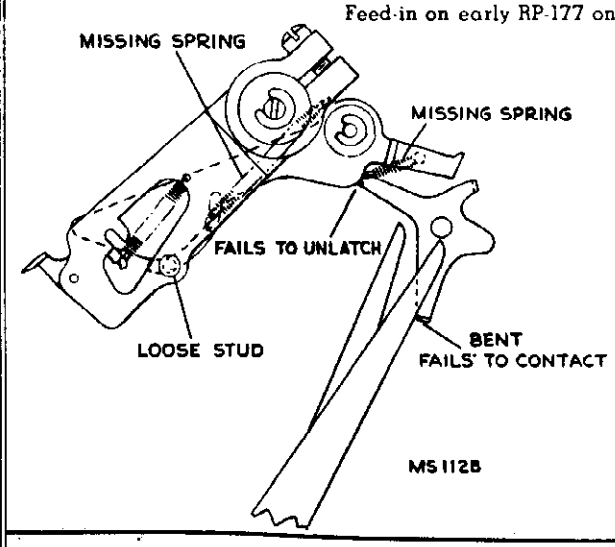
Remove the cover from the switch assembly. Loosen the two mounting screws "J" and position the switch assembly so the shorting switch pawl causes the switch to close during cycle and open while playing records.



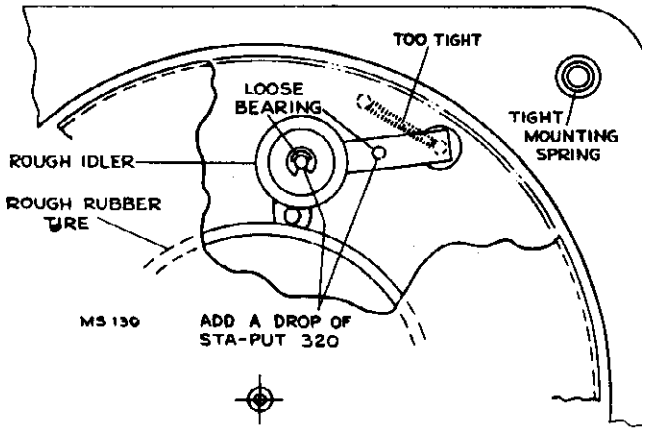
SERVICE HINTS

Incorrect Feed-in:

Feed-in on early RP-177 only.

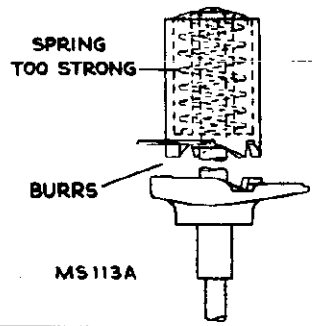


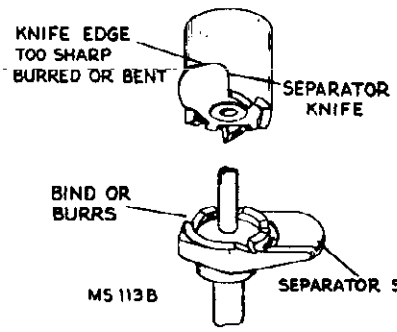
Rumble: **RP-177A and RP-177B use rim drive**

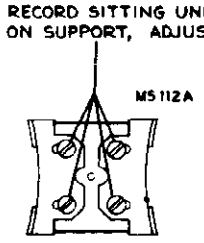


Records Jam or Stack Unsteady:

Record too thick, too thin, warped, or has rough edge.







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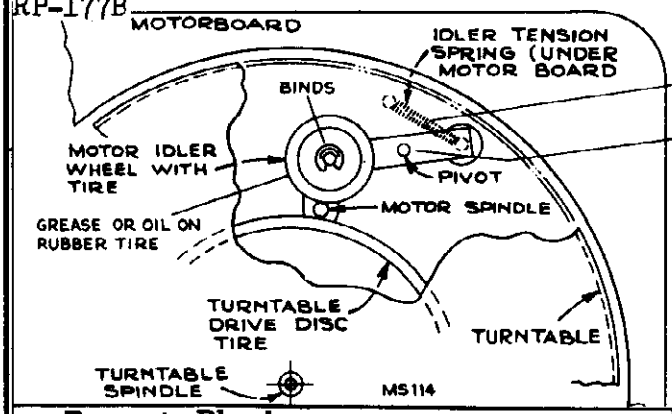
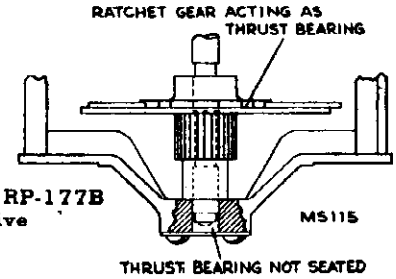


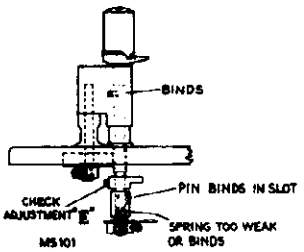
Slow Speed:

Turntable spindle binds on bottom or top bearing.

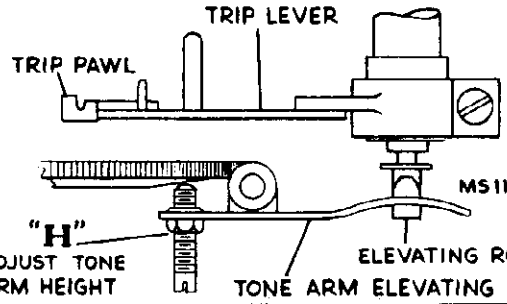


RP-177A and RP-177B use rim drive

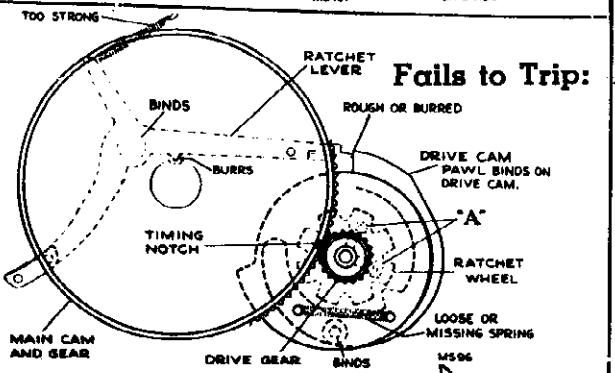
Repeats Playing of Last Record:

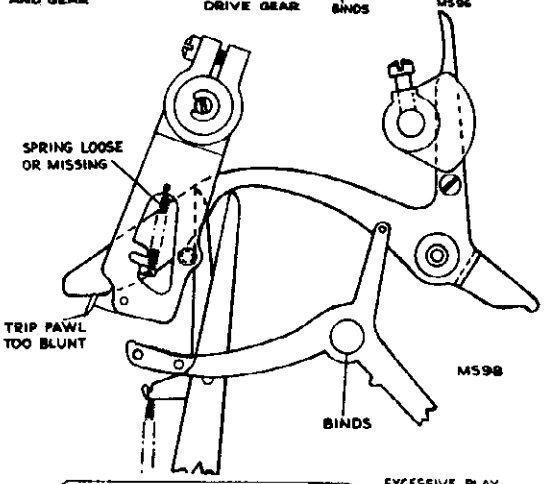


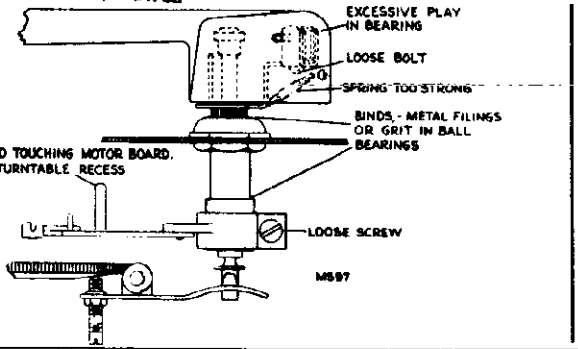
Tone Arm Touches Record on Separator Shelf:



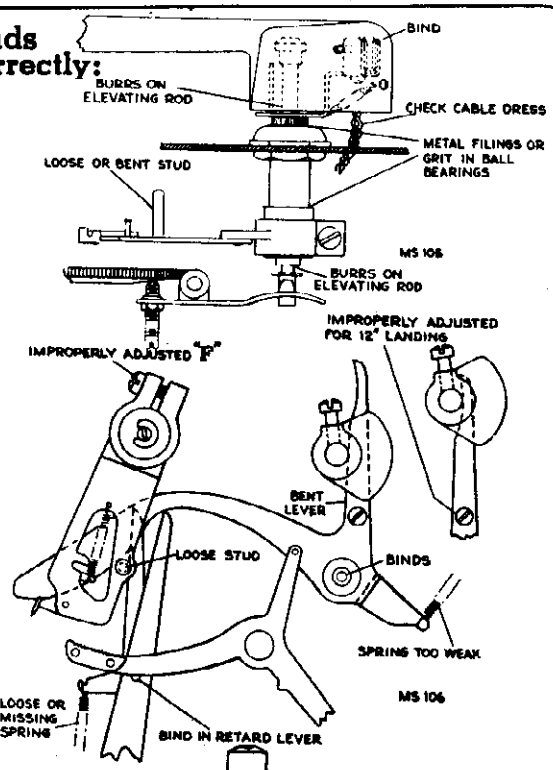
Fails to Trip:

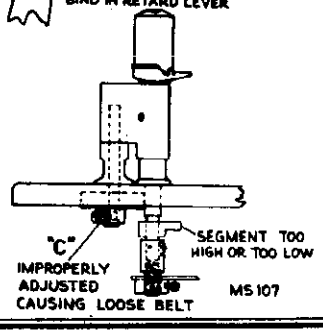






Lands Incorrectly:

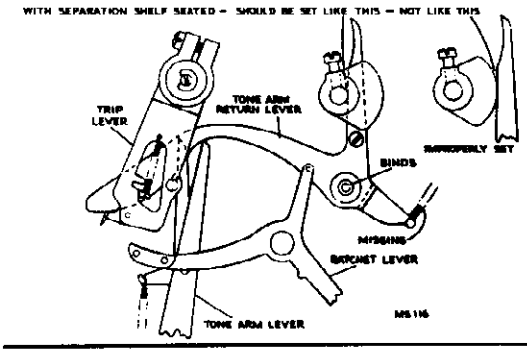


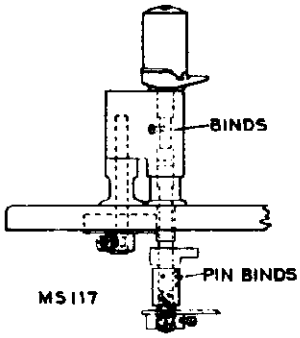


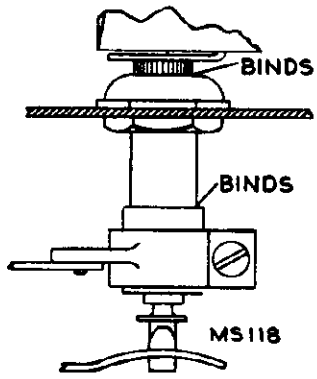
RADIO CORP. OF AMERICA

MODELS RP-177, RP-177
RP-177B

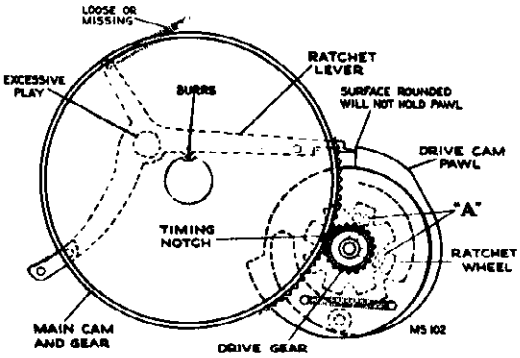
Tone Arm Continues to Come Down in Rest Position:

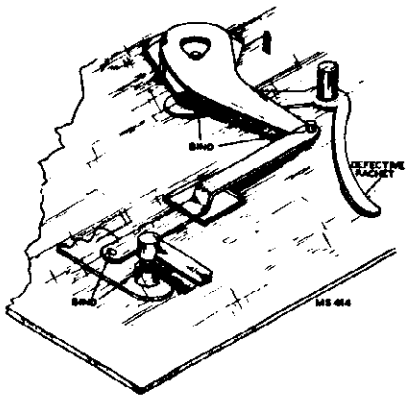


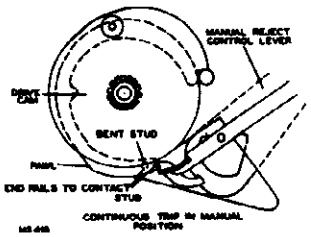




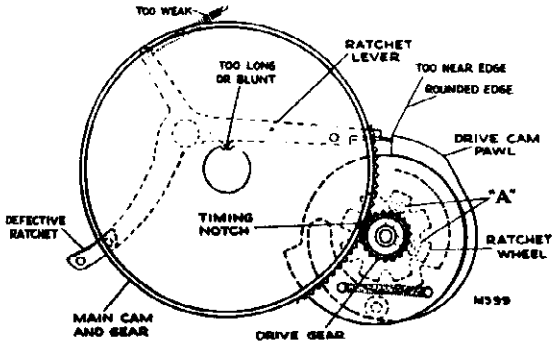
Trips Continuously:

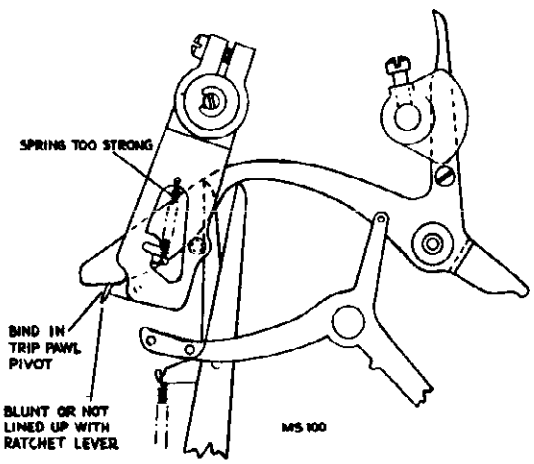




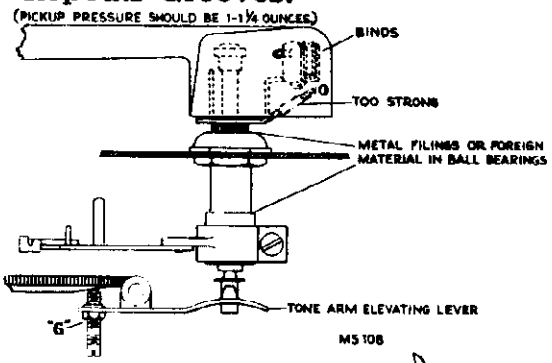


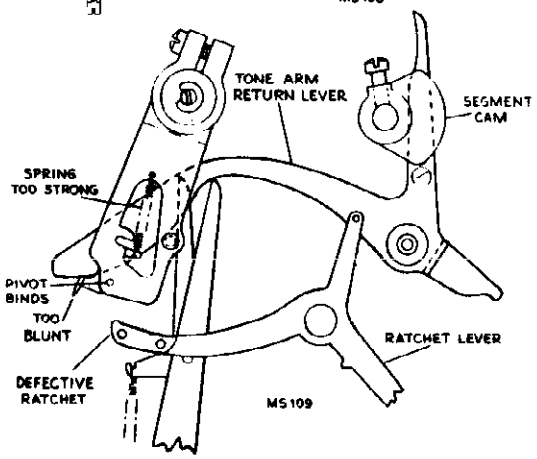
Trips Early:





Repeats Grooves:

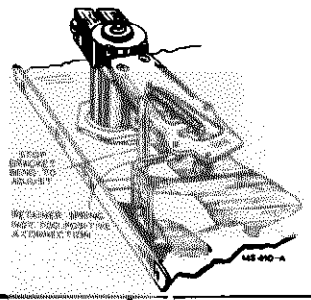




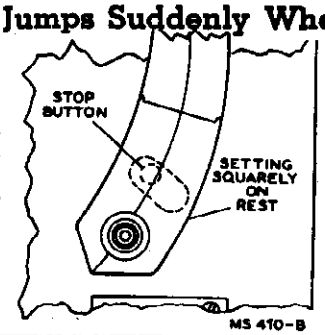
MODELS RP-177, RP-177A, RP-177B

RADIO CORP. OF AMERICA

Tone Arm Lands Incorrectly on Rest, Drifts Off of Rest, or Jumps Suddenly When Moving in for Landing:



1. Bend bracket for tone arm limit stop.
2. Bend retainer spring which contacts stud on trip lever, so tone arm is stabilized while on rest or in the outermost position. Do not make too positive contact or motion of tone arm will start with a sudden jump.



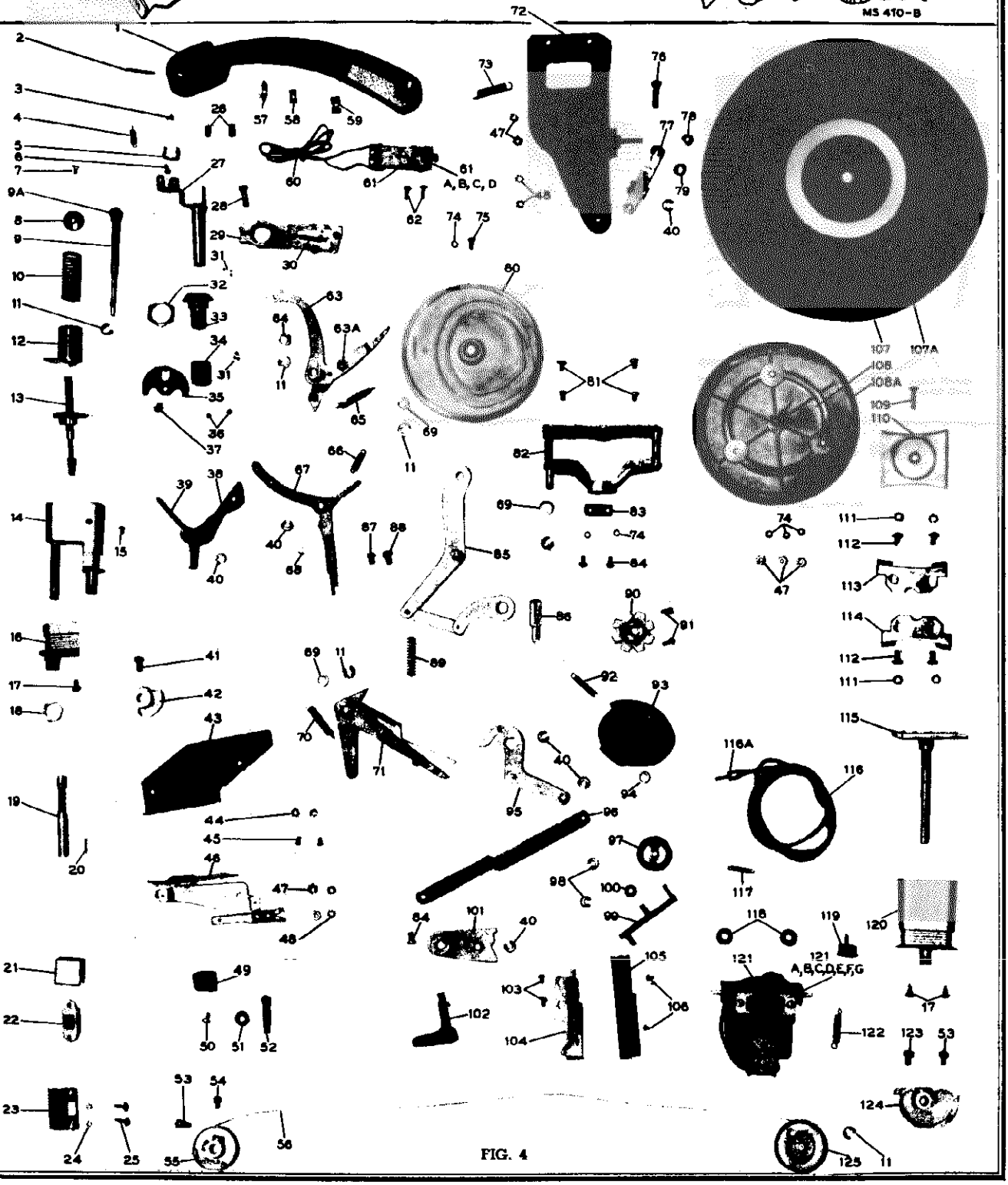


FIG. 4

CHANGES—DIFFERENCES

Pivot Arm Spring:

On early RP-177 the pivot arm spring (Ref. No. 4) was anchored to a stud (Ref. No. 3) in the rear of the tone arm. On RP-177A and late RP-177 a curved spring (Stock No. 73198) clips into the rear of the tone arm to which the pivot arm spring is anchored.

Feed-in Adjustment:

On early RP-177 a feed-in provision was used to cause the sapphire to enter the starting groove of the record after the tone arm had landed. This feature was found to be unnecessary and is not used on RP-177A or late RP-177, however, the feed-in adjusting disc may be found on late RP-177.

Stock No.	Ref. No.		Stock No.	Ref. No.	
72655	35	Disc	71548	127	Spring
70873	38	Lever	—	130	Lever
71550	39	Spring			

Used only on early RP-177, also screws and washers to mount above iten

The major differences between the two models is in the method of drivi the turntable. This requires different turntables, motors, motor boarc motor mountings and idler wheels. In RP-177 the motor drives a rubb tired disc which is attached to the turntable and spindle, in RP-177A t motor drives an idler wheel which engages with the inside rim of the tu table. In RP-177 the record separator swivel (14), record separator supp (16) and record support base (120) are gold finish whereas in RP-17 they are finished the same color as the motor board.

Record supports (113 & 114) are metal in RP-177 and molded plastic RP-177A.

The on-off switch (22) ratchet lever spring (66) and tone arm lever spri (71A) have been changed slightly.

RP-177B is identical to RP-177A except the crystal pickup

RP 177

Motor drives rubber tired disc which is attached to turntable. Record separator swivel and record separator support are gold finish.

Early production has feed-in adjustment.

RP 177A

Motor drives idler wheel which engages with inside rim of turntable.

Record separator swivel and record separator support are finished the same color as the motor board.

Does not have feed-in adjustment.

RP-177B

Same as RP-177A except pickup.

Eccentric groove diameter	3⅜" nominal
Eccentricity	.125" ± .008"
(causes tone arm swing of	.250" ± .016")

The Replacement Parts Listed Below Bear the Same Reference Number as the Corresponding Parts used on RP-177. Refer to RP-1 Parts List for All Other Parts which are Identical. Refer to "CHANGES—DIFFERENCES"

REPLACEMENT PARTS

STOCK No.	Ref. No.	DESCRIPTION
		RP 177A
73198		Spring—Curved spring for anchoring pivot arm coil spring.
*73311	14	Swivel—Record separator swivel and shaft.
32875	22	Switch—"On-Off" switch.
72372	66	Spring—Ratchet lever spring (.170" O.D. x 11 32"—80 Turns).
73053	67	Lever—Ratchet lever.
71550	71A	Spring—Tone arm lever spring (.106" O.D. x 1⅜"—82 turns).
*73306	91	Screw—#8-32 x 5/16" fillister head set screw for ratchet wheel.
71181		Spring—Hairpin spring to fasten drive idler wheel.
71179	97	Wheel—Drive idler wheel.
*73307	107	Turntable—Turntable and spindle assembly complete with rubber mat.
*73313	107A	Mat—Rubber mat for turntable.
*73317	111	Washer—⅛" O.D. x .195" I.D. flat washer for mounting record supports.
*73314	113	Support—Record support for 12" records.
*73315	114	Support—Record support for 10" records.
*73316	115	Shelf—Record support shelf and shaft.
*73309	118	Grommet—Rubber grommet to mount motor (3 required).
*73318	120	Base—Record support base.
*73308	121	Motor—117 volt, 60 cycle motor complete with idler wheel.
†	121G	Spring—60 to 50 cycle conversion spring.
71180	122	Spring idler wheel tension spring.
*73305	123	Screw—#10-32 x ⅜" fillister head set screw for record support shaft cam—cone point (2 required).
*73312	126	Motor board—Motor board complete with pickup rest, welded, staked or riveted parts less operating parts.
*73310		Fastener—Snap fastener for mounting motor (3 required).
		RP-177B
		Same as RP-177A except
70339	61	Crystal—Crystal cartridge complete
70915	61c	Sapphire—Sapphire and holder assembly

* This is the first time this Stock No. has appeared in Service Data.
† These parts are not stocked.

MODELS RP-177, RP-177A, RP-177B

RADIO CORP. OF AMERICA

RP-177 REPLACEMENT PARTS

Stock No.	Ref. No.	DESCRIPTION
72397	1	Arm—Pickup arm shell only less crystal, cable and pivot arm
70905	2	Pin—Pivot pin
39674	3	Stud—Pivot arm spring stud
71099	4	Spring—Pivot arm spring (.187" O.D. x 3/4"—24 turns)
71098	5	Clamp—"U" clamp to lock pivot arm in position
71097	6	Screw—#4-40 x 1/4" long self tapping screw to lock pivot clamps
72414	7	Screw—#6-32 x 1/4" oval head screw for record separator cap
72415	8	Cap—Record separator cap
70909	9	Rod—Pusher rod including rubber cushion
38607	9A	Cushion—Rubber cushion for pusher rod
70895	10	Spring—Record separator spring—upper (.622" O.D. x 1-11/16"—13½ turns)
2917	11	Washer—"C" washer for lift rod, drum and belt, tone arm return lever, link, tone arm lever and main cam
*72416	12	Knife—Record separator knife
*72413	13	Shelf—Record separator shelf and shaft
*72399	14	Swivel—Record separator swivel and shaft
*72400	15	Screw—Record separator swivel and shaft screw
*72589	16	Support—Record separator support
†	17	Screw—#10 x 3/8" self tapping screw
70890	18	Nut—9/16-32 hex nut for record separator support
71280	19	Shaft—Record separator bottom shaft
71103	20	Pin—Drive pin for record separator shaft end bushing
71106	21	Cover—Metal cover for "On-Off" switch
72407	22	Switch—"On-Off" switch
72591	23	Escutcheon—Index escutcheon
†.....	24	Nut—Hex nut #4-40
72588	25	Screw—#4-40 x 5/16" binder head screw for "On-Off" switch
†.....	26	Insulation—Two small pieces of spaghetti
70906	27	Arm—Pivot arm and shaft
72402	28	Screw—#10-32 x 5/8" fillister head screw for trip lever
70858	29	Lever—Trip lever less spring
71543	30	Spring—Trip lever spring (.135" O.D. x 21/32" —58 turns)
3658	31	Ball—Steel ball (3/32" dia.)
70886	32	Nut—3/4-32" hex nut for pickup arm pivot bearing
72585	33	Bushing—Pivot arm bushing (upper)
70911	34	Bushing—Pivot arm bushing (lower)
72655	35	Disc—Feed-in adjusting disc
5042	36	Screw—#8-32 x 1/8" set screw for lower pivot arm bushing
72408	37	Screw—#8-32 x 1/4" binder head screw for feed-in adjusting disc
70873	38	Lever—Feed-in lever
71550	39	Spring—Feed-in adjusting disc spring (.160" O.D. x 1 3/8"—82 turns)
20165	40	Washer—"C" washer for ratchet lever, manual operating lever, manual detent lever and feed-in lever and tone arm lift lever
32869	41	Screw—#10-32 x 5/16" fillister head screw for tone arm control lever
70848	42	Cam—Shut-off or segment cam, fastens on record separator shaft
70855	43	Cover—Stop switch cover
†.....	44	Washer—Lockwasher #4
†.....	45	Screw—Round head screw #4-40 x 3/16" long
70876	46	Switch—Stop and muting switch, mounted on bracket
†.....	47	Nut—Hex nut #6-32
†.....	48	Washer—Lockwasher #6
72820	49	Rest—Pickup arm rest
.....	50	Screw—Self tapping screw #10-3/8" long
32943	51	Nut—Pickup stop switch button speed nut
71102	52	Button—Pickup stop switch button
32869	53	Screw—#10-32 x 5/16" fillister head screw for record separator drum flat end
72562	54	Screw—#10-32 x 5/16" fillister head set screw for record separator drum —cone point
70898	55	Drum—Record separator drum
70900	56	Belt—Record separator to support belt
71279	57	Nut—Speed nut to hold cable, rear of pivot arm
71095	58	Nut—Speed nut to hold cable, rear of arm
38458	59	Nut—Speed nut to hold cable, front of arm
72584	60	Cable—Pickup cable, twisted pair
72551	61	Crystal—Crystal cartridge complete
38452	61A	Guard—Needle guard
70341	61B	Nut—Mounting washer and nut for sapphire
72345	61C	Sapphire—Sapphire and holder assembly
37763	61D	Screw—#2-56 x 1/8" screw for needle guard
70912	62	Screw—#4-40 x 3/8" binder head screw to mount crystal (2 required)
70847	63	Lever—Tone arm return lever
72401	63A	Screw—Tone arm return lever screw
70884	64	Washer—Bearing washer for tone arm return lever
71726	65	Spring—Tone arm return lever spring (.218" O.D. x 1 1/2"—48 1/2 turns)
71549	66	Spring— ratchet lever spring (.180" O.D. x 7/8" —54½ turns)
73053	67	Lever—Ratchet lever
†.....	68	Washer—Steel washer O.D. ½" I.D., .193", T .020"
70877	69	Washer—.280" I.D. x 7/16" flat washer for link, tone arm lever and main cam
71547	70	Spring—Tone arm lever tension spring (.218" O.D. x 1½"—48½ turns)
70858	71	Lever—Tone arm lever less spring
71549	71A	Spring—Tone arm lever spring (.180" O.D. x 7/8" —54½ turns)
72420	72	Brace—Bottom support for tone arm lift lever and main cam
71544	73	Spring—Drum and belt tension spring (.255" O.D. x 1¾"—27½ turns)
†.....	74	Washer—#6 lockwasher
†.....	75	Screw—#6-32 x 5/16"
39691	76	Screw—#10-32 x 7/8" fillister head screw for adjusting tone arm lift lever
38631	77	Lever—Tone arm elevating lever
71104	78	Nut—#10-32 hex locknut for tone arm lift lever adjusting screw
†.....	79	Washer—Washer, O.D. 7/16", I.D. 3/16", T 1/32"
70864	80	Cam—Main cam
*72409	81	Screw—#8-32 x 1/4" binder head screw for turntable spindle support
70891	82	Support—Turntable spindle support bearing
70880	83	Plate—Spring thrust plate for turntable
70883	84	Screw—#6-32 x 5/16" round head screw for turntable spring plate
70852	85	Link—Record separator shaft link and lever
70849	86	Bushing—Record separator shaft and bushing
71100	87	Screw—#10-32 x 5/16" round head screw for link
31118	88	Screw—#10-32 x 5/16" fillister head screw for link or for automatic—manual—reject detent lever
70850	89	Spring—Record separator shaft bottom spring (.290" O.D. x 1.35"—14¾ turns)
38624	90	Ratchet—Ratchet wheel (drive cam sprocket) for turntable drive
38626	91	Screw—#8-32 x 1/4" fillister head set screw for ratchet wheel
70854	92	Spring—Drive shaft cam and pawl spring (.195" O.D. x 1-3/16"—42 turns)
70853	93	Cam—Drive shaft cam and pawl
70879	94	Washer—Washer for cam and pawl
72403	95	Lever — Automatic — manual — reject operating lever
72406	96	Link—Link for automatic—reject—manual operating and detent levers
36274	97	Wheel—Idler wheel
33728	98	Washer—"C" washer for idler wheel and arm
70863	99	Arm—Motor idler arm—less wheel
39996	100	Washer—Fibre washer for idler wheel
72404	101	Lever—Automatic—manual—reject detent lever
72586	102	Lever—Reject lever (handle)
†.....	103	Screw—Hex. head 6-32 x 1/4" self-tapping screw
72410	104	Switch—Manual shorting switch
72411	105	Cover—Manual shorting switch cover
†.....	106	Screw—#4-40 x 1/8" round head machine screw
72421	107	Turntable—Turntable including rubber mat less drive disc and tire
70866	107A	Mat—Rubber mat only for turntable
73054	108	Spindle—Turntable spindle drive less tire
37873	108A	Tire—Rubber drive tire
72587	109	Screw—#10-32 x 3/4" oval head screw for record support cap
72423	110	Cap—Record support cap
†.....	111	Washer—Approx. 7/16" O.D., 3/16" I.D., .030 T
70881	112	Screw—#10-32 x 3/8" binder head screw for record supports
72418	113	Support—Record support for 12" records
72417	114	Support—Record support for 10" records
72419	115	Shelf—Record support shelf and shaft
72708	116	Cable—Shielded output cable complete with pin plug
31048	116A	Plug—Pin plug for shielded output cable
71546	117	Spring—Idler arm tension spring (.187" O.D. x 7/8"—31 turns)
34388	118	Grommet—Rubber grommet to mount motor (2 required)
30870	119	Plug—2-prong male plug for power cable
72590	120	Base—Record support base
38612	121	Motor—105-125 volts, 60 cycle
39749	121G	Spring—60 to 50 cycle conversion spring
71545	122	Spring—Motor tension spring (.192" O.D. x 1½" —58 turns)
39772	123	Screw—#10-32 x 5/16" fillister head set screw for record support shaft cam—cone point
70845	124	Cam—Record support shaft cam
70899	125	Drum—Record support drum
72398	126	Motorboard—Motorboard sub-assembly complete with all welded, staked and riveted parts—less operating parts
71548	127	Spring—Feed-in control spring (.160" O.D. x 11/16"—52 turns)
72412	128	Plate—Anti-drift spring and plate for tone arm (retainer spring)
38873	129	Spring—Conical spring to mount record changer (4 required)
†.....	130	Lever—Feed-in lever locking pawl or latch. Part of motorboard
†.....	131	Lever—Muting switch actuating lever. Part of motorboard.

† These parts are not stocked.

* This is the first time this Stock No. has appeared in Service Data.

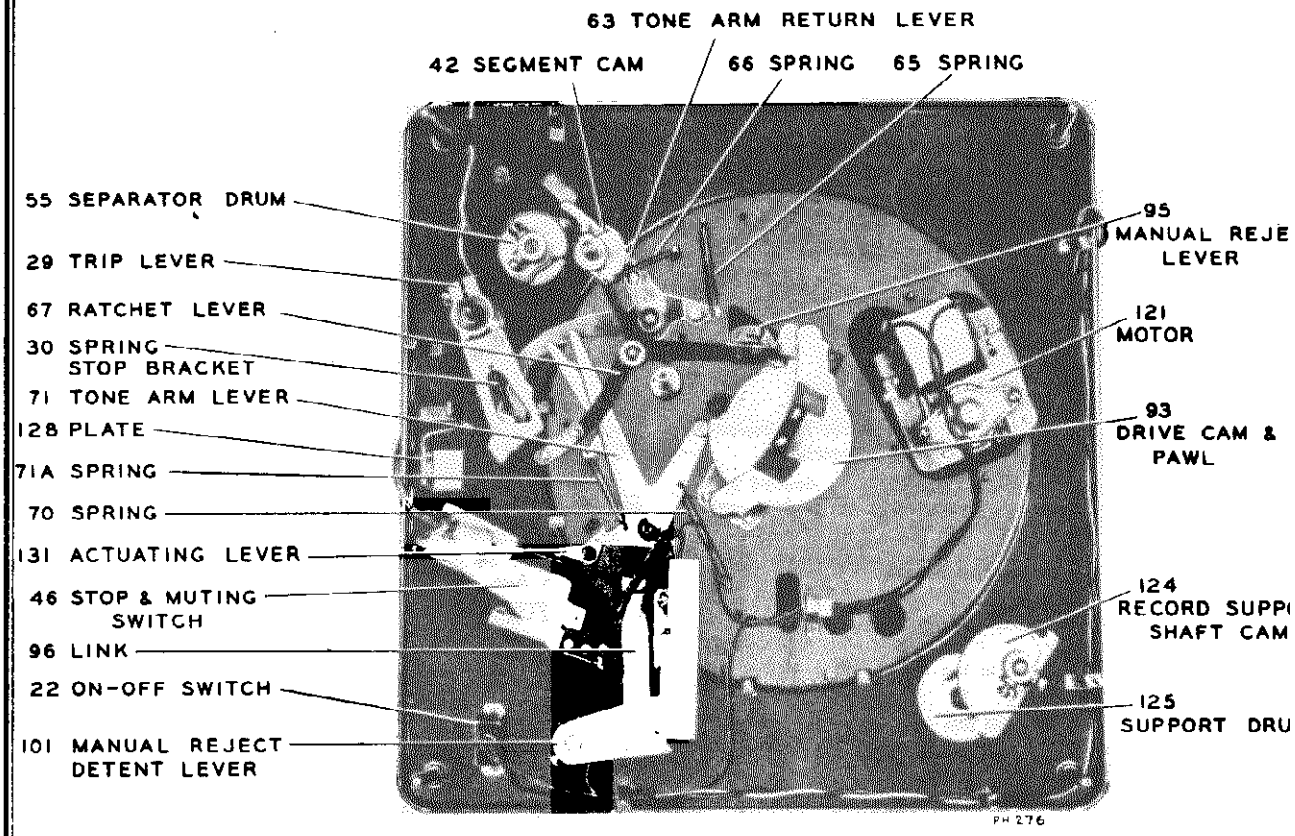
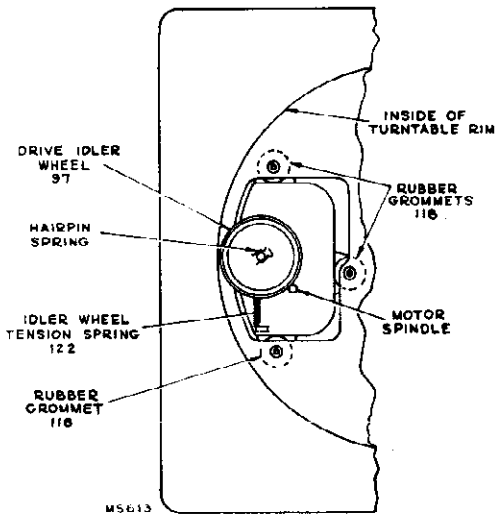


FIG. 5
Bottom view RP-177A, RP-177B



Turntable drive RP-177A, RP-177B

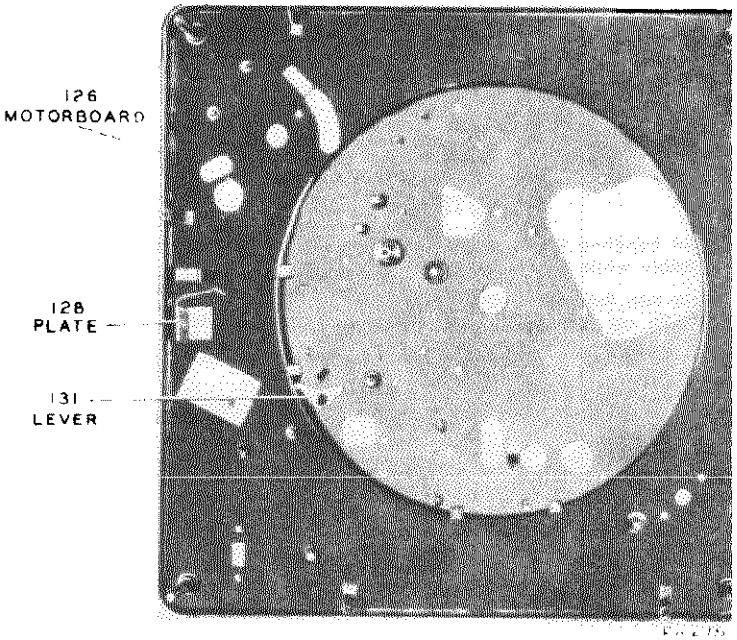


FIG. 6
Bottom view RP-177A, RP-177B (motorboard only)

MODEL RP-178 RADIO CORP. OF AMERICA

FEATURES

1. This mechanism is designed to play automatically a series of twelve 10-inch or ten 12-inch standard records of the 78 r.p.m. type.
2. It will play manually records up to 12 inches in diameter.
3. Tripping system is of "eccentric" type, insuring reliable automatic operation on all records made to RMA proposed standards.
4. It is a simple operation of sliding the record support to change from 10- to 12-inch records or vice versa.
5. Cycling mechanism is disconnected completely while records are being played. This reduces the load on the drive motor, thereby reducing the tendency for "wow" or rumble.
6. Low noise sapphire point pickup cartridge.

AUTOMATIC OPERATION

1. With the power switch in the off position slide the record support shelf as required for 10- or 12-inch records.
2. Place the records to be played in a stack with desired selections upward and in proper sequence with the last record on top. Load them on the changer by placing them over the center post and resting on the record support shelf. Place record stabilizing clamp on top of the record stack.
3. Turn power switch on and press the reject button. The changer will play automatically one side of each record in the stack.
   The tone arm can be moved to the rest position any time the mechanism is not in cycle.
4. Turn the power switch off, lift the stabilizing clamp and remove the stack from the turntable by placing fingers of both hands directly opposite and under the stack. Then lift straight up "don't tilt" or squeeze stack.

MANUAL OPERATION

1. Slide the record support shelf in towards the center post for 10-inch or away from the center post for 12-inch position.
2. Place the record to be played on the turntable and turn the power switch on.
3. Place the pickup on the start of the record.

   Note: The mechanism should be allowed to complete cycle before attempting to move tone arm to the rest position.
4. Turn power switch off manually.
5. Remove the record by raising straight up without tilting.

CAUTIONS

1. Avoid handling the tone arm or sliding the record support assembly while mechanism is in cycle.
2. Never turn the power switch off, leaving the mechanism in cycle for an extended period of time.
3. Do not allow the records to remain on supports when not in use.
4. Do not allow oil or grease to come in contact with any rubber parts.
5. Do not install instrument near source of heat. Excessive heat may damage the pickup cartridge.

LUBRICATION

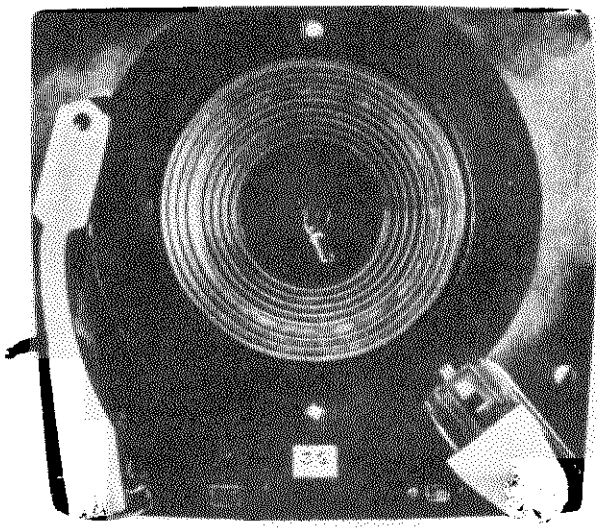
Motor

Motor is lubricated at factory to provide normal operation for a long period of time.

If it becomes necessary to lubricate, use SAE #10 motor oil to saturate the felt wicks on the motor bearings.

Main Bearing

Use STA-PUT #512 or SAE #30 motor oil.



Slides and Levers

Use STA-PUT #512.

STA-PUT can be purchased from E. F. Houghton & Co., 303 W. Lehigh Ave., Phila., Pa.

FUNCTION OF PRINCIPAL PARTS

Trip Lever—67

When the sapphire is riding the eccentric groove, the trip pawl engages the ratchet lever, starting cycle.

Ratchet Lever—63

Portion of the lever acts as a ratchet and the other portion incorporates a catch for the stud on the cycling cam carriage. The engagement of this stud prevents the mechanism from going into cycle.

Center Post—32

The center post performs the function of supporting and aids in the separation of the records.

Tone Arm Return Lever and Latch—53B

The tone-arm return lever, together with the latch, locks and stabilizes the tone arm in its outermost position. It also gives the necessary inward motion to the tone arm.

Cycling Cam Carriage—50A

This carriage provides a movable support for the cycling cam.

Tone Arm Director Lever—71

The roller on one end of this lever follows a channel in the cycling cam and thereby pulls on the cable directing the vertical and outward motion of the tone arm.

Locating Lever—12

The sloped portion of the lever forms a stop for the stud on the tone arm return lever thereby determining the landing position of the pickup.

Record Push Cam Gear Assembly—5, 7

Provides a means of coupling the push cam to the rack lever.

Record Support—1A, B, C, D

Provides a support for the edge of the records and a mounting for the record push cam.

Rack Lever—10

One end of the lever follows the eccentric elevated portion of the cycling cam causing the lever to move in and out from the center of the mechanism. The teeth on the rack lever engage the teeth in the record push cam gear producing a rotary motion necessary to push the record off the step in the center post.

Record Push Cam—4

The oval shaped cam located in the record support, rotates during change cycle. This cam engages and pushes the record from the step in the center post.

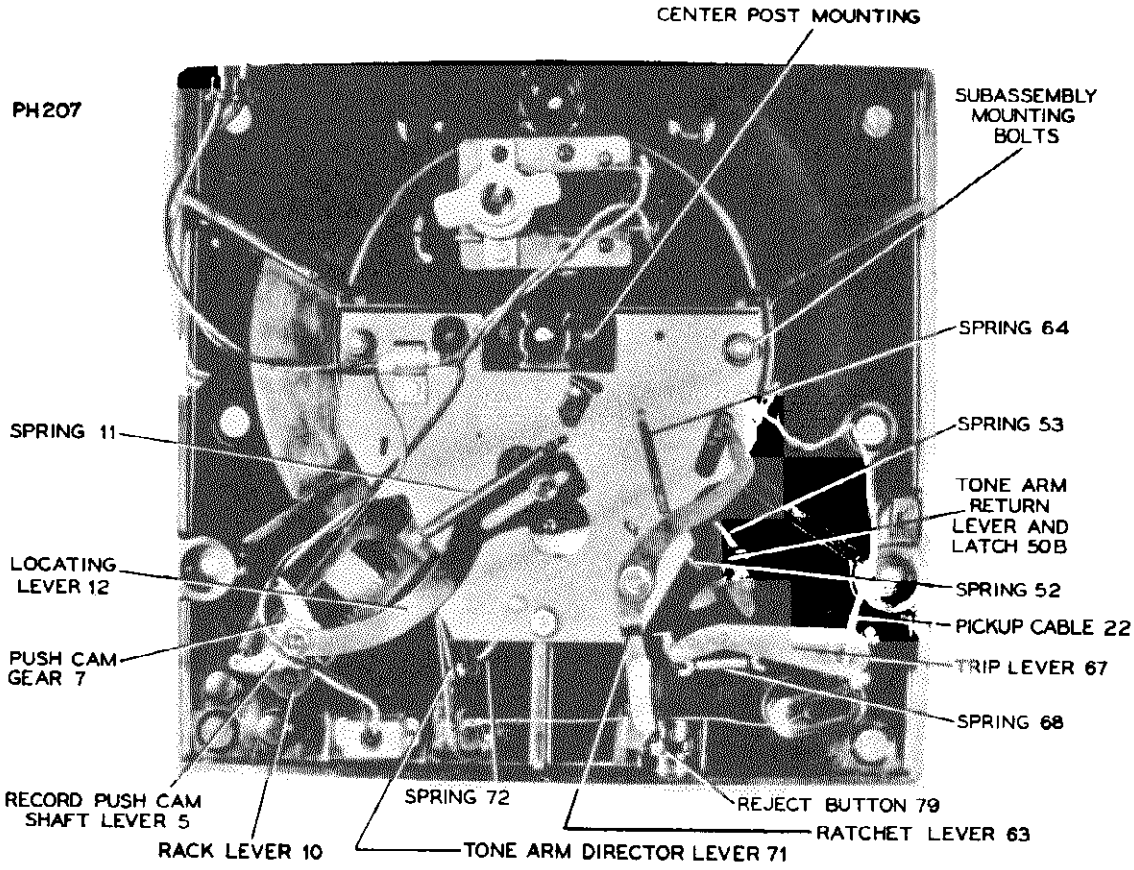


Figure 1

ADJUSTMENTS

Tone arm (out of cycle) height adjustment

1. Rotate the turntable until the change cycle is completed.
2. Move the tone arm to a position off the edge of the record and allow it to rest freely in air.
3. Bend portion of the tone arm bracket so that the sapphire is 3/16 inches above the flat surface of the motorboard. (Figure 3.)

Tone arm height adjustment while in change cycle

1. Press the reject button and rotate the turntable by hand until the pickup has raised, to the maximum height in the change cycle.
2. Turn the adjustment screw "A" until the sapphire is 1⅛ inches above the turntable.
   This adjustment will permit the pickup to land and play one record placed on the turntable. At the same time it prevents the tone arm from touching the record resting on the centerpost while the mechanism is going through cycle.
   (If this height cannot be reached by the adjustment screw, take up on the cotter pin.) (Figures 4 and 5.)

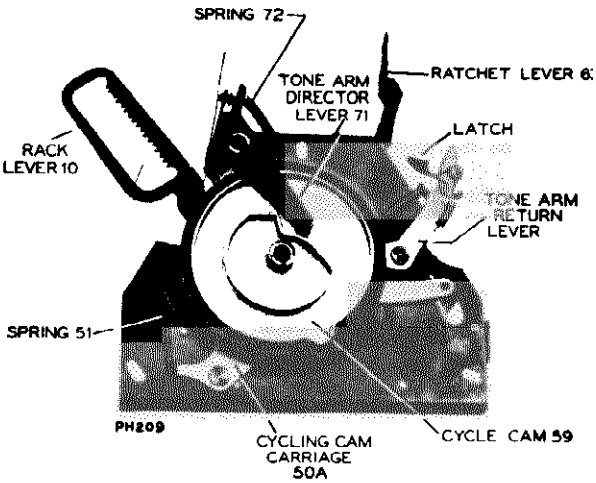


Figure 2

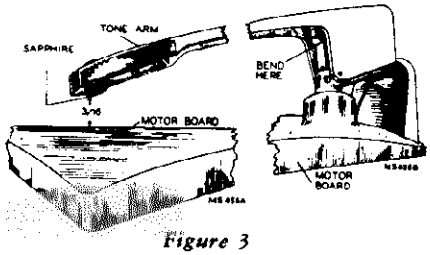


Figure 3

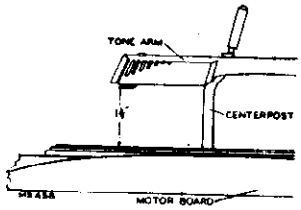


Figure 4

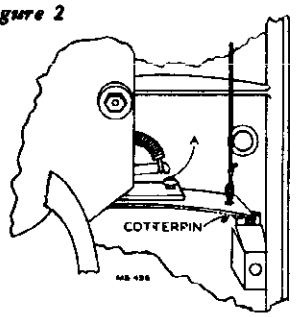


Figure 5

Pickup landing adjustment

1. Slide the record support as required for playing 10-inch records.
2. Place a ten-inch record on the turntable and rotate the turntable by hand until the sapphire is just ready to land.
   Loosen set screws "B" (Figure 6).
3. Hold the trip lever to keep it from moving while the pickup is moved to the start of the record.
4. Tighten the black screw "B" and allow the mechanism to run through cycle automatically. If landing is correct, tighten copper plated screw "B." (Figure 6.)
   (Note) No separate 12-inch landing adjustment is necessary.

Record push cam and gear assembly adjustment

1. Have the mechanism out of cycle.
2. With the push cam in place and the record support in the 10-inch position, assemble and engage the teeth of the push cam gear with the rack lever so the eye in the lever is approximately in line with the centerpost as shown in drawing. (Figure 7.)
3. Set the push cam parallel to the front edge of the record support, make certain the thin edge of the cam is on the left side, viewed from the front or centerpost side of the support. (Figure 8.)

Removing the turntable

1. Loosen the two screws mounting the centerpost. (Figure 10.)
2. The centerpost, turntable and thrust bearing can now be easily lifted out.

Replacing the turntable

1. Slip the turntable over the lower end of the centerpost until it comes against the stop or ears. (Figure 9.)
2. Place the thrust bearing and washers on the bottom end of the centerpost and place the centerpost and turntable in position as shown. (Figure 9.)
3. Turn the spindle so the step in the centerpost is away from the record support. (Figure 11.)
4. Tighten the two mounting screws. (Figure 10.)

Turntable centering

If for any reason the sub-assembly had been removed from the motorboard it is necessary to re-center the turntable.

1. Loosen the three sub-assembly mounting bolts. (Figure 12.)
2. Place the turntable in place with the center post extending down through the mounting as shown. (It is not necessary to have the thrust bearing in place for this operation.) (Figure 9.)
3. Center the turntable in respect to the recess in the motorboard by shifting the position of the sub-assembly slightly. (Figure 11.)
4. Tighten the nut on the end of the square head mounting bolt. (Figure 12.)
5. Remove the turntable and tighten the other two mounting bolts. (Figure 12.)

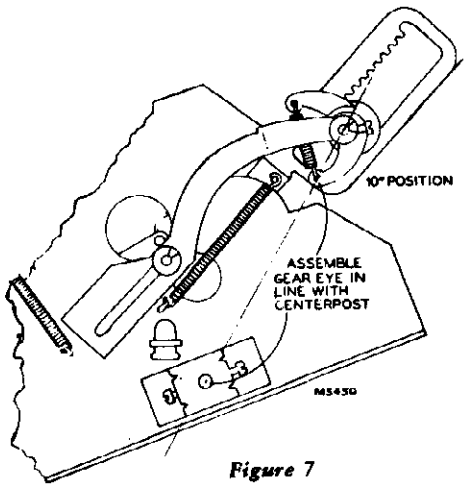


Figure 7

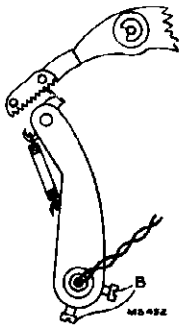


Figure 6

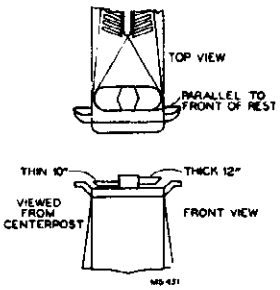


Figure 8

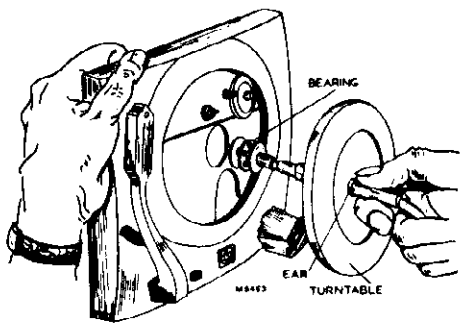


Figure 9

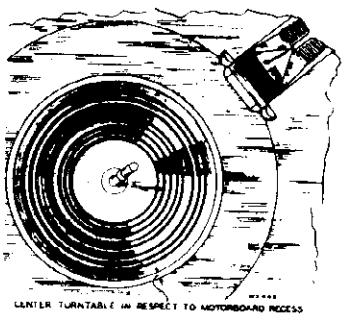


Figure 11

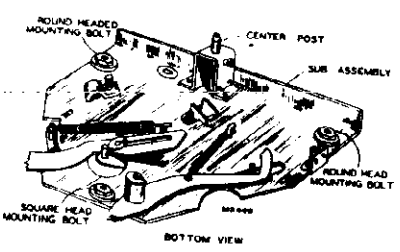


Figure 12

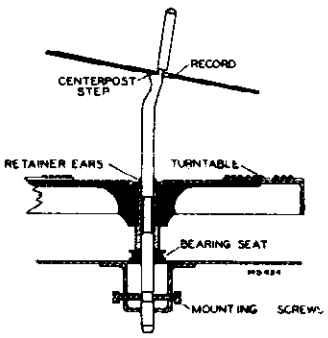
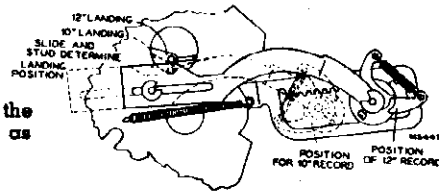


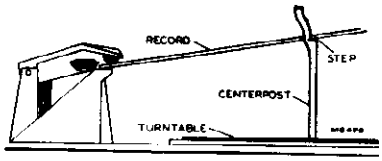
Figure 10

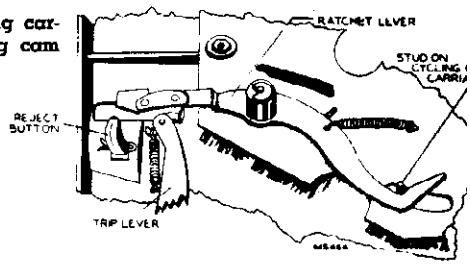
CYCLE OF OPERATION

Operator

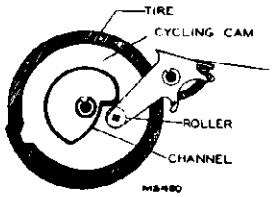
Function	Explanation
Lift and slide the record support to 10 or 12 inch position as desired	1. Record support locks in position and at the same time the record push cam and gear rotates and assumes a position as required for 10- or 12-inch records.
Place the stack of records over the center post	1. The lower record of the stack is sitting on the step in the centerpost, and the edge is resting on the record support.
Push reject button	1. The end of the reject button extending through the motorboard contacts and moves ratchet lever. 2. Ratchet lever unlatches stud which is mounted on cycling carriage. This allows the tension spring to pull the cycling cam against the rotating knurled roller and start cycle.

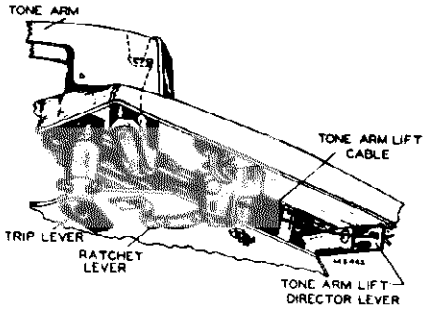




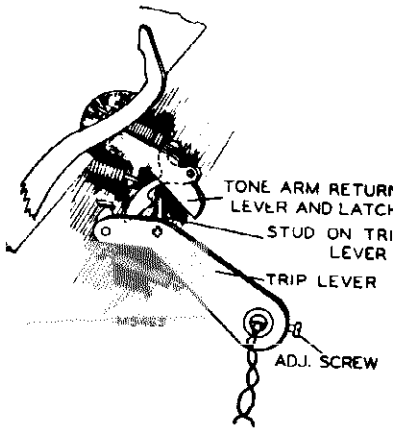


Automatic Cycle





Function	Explanation
Tone arm rises and moves out	1. As the cycling cam rotates the small roller on the tone arm director lever follows the channel in the cam and in so doing pulls on the cable connected to the tone arm. 2. The hole in the motorboard provides a guide for the tone arm cable. It is so placed as to allow the cable to pull at an angle slightly off 90 degrees thus giving the necessary rising and outward motion of the tone arm. 3. The trip lever which is rigidly connected to the tone arm through the tone arm pivot shaft is moved out with the tone arm. 4. The tone arm return lever has moved out slightly ahead of the trip lever. The tone arm return lever together with the small latch assumes such a position so as to engage the stud on the trip lever and stabilize the tone arm in its outermost position.



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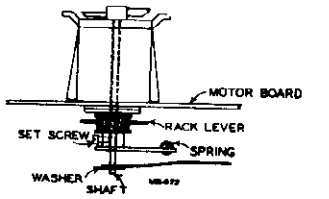
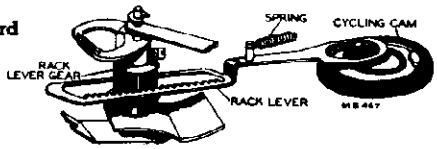
RADIO CORP. OF AMERICA

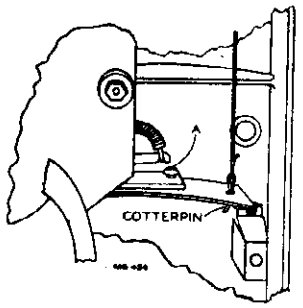
CYCLE OF OPERATION

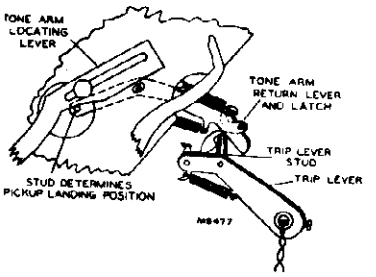
Function	Explanation
The record push cam together with the "step" in the centerpost separates the lower record of the stack allowing it to drop to the turntable	1. While the cycling cam is continuing to rotate, the rack lever is being pushed outward by the small eccentric elevated cam, with which it is engaged. 2. The teeth in the rack lever being engaged with record push cam gear, converts the sliding action of the rack lever into a rotary motion. 3. The rotary motion of the record push cam pushes the record off the step in the centerpost.



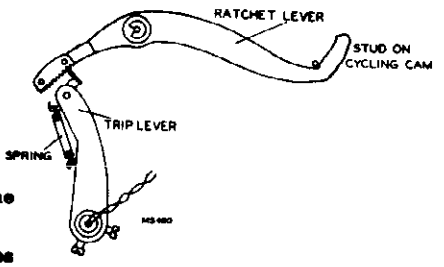


Tone arm moves in and lands on record	1. As the cycling cam is returning to normal position, the tone arm director lever is gradually allowing a slack in the tone arm cable. 2. While the tone arm director lever is gradually allowing slack in cable, the tone arm return lever is tending to retain the tension on the cable by returning the tone arm to the landing position. 3. The distance the tone arm return lever travels, while moving the pickup in for landing, is determined by the contact between the tone arm locating lever and the stud on the tone arm return lever. 4. After the tone arm return lever has moved the tone arm to the landing position the tone arm director lever continues to move and allow enough slack in the cable so the pickup can sit down on the start of the record.





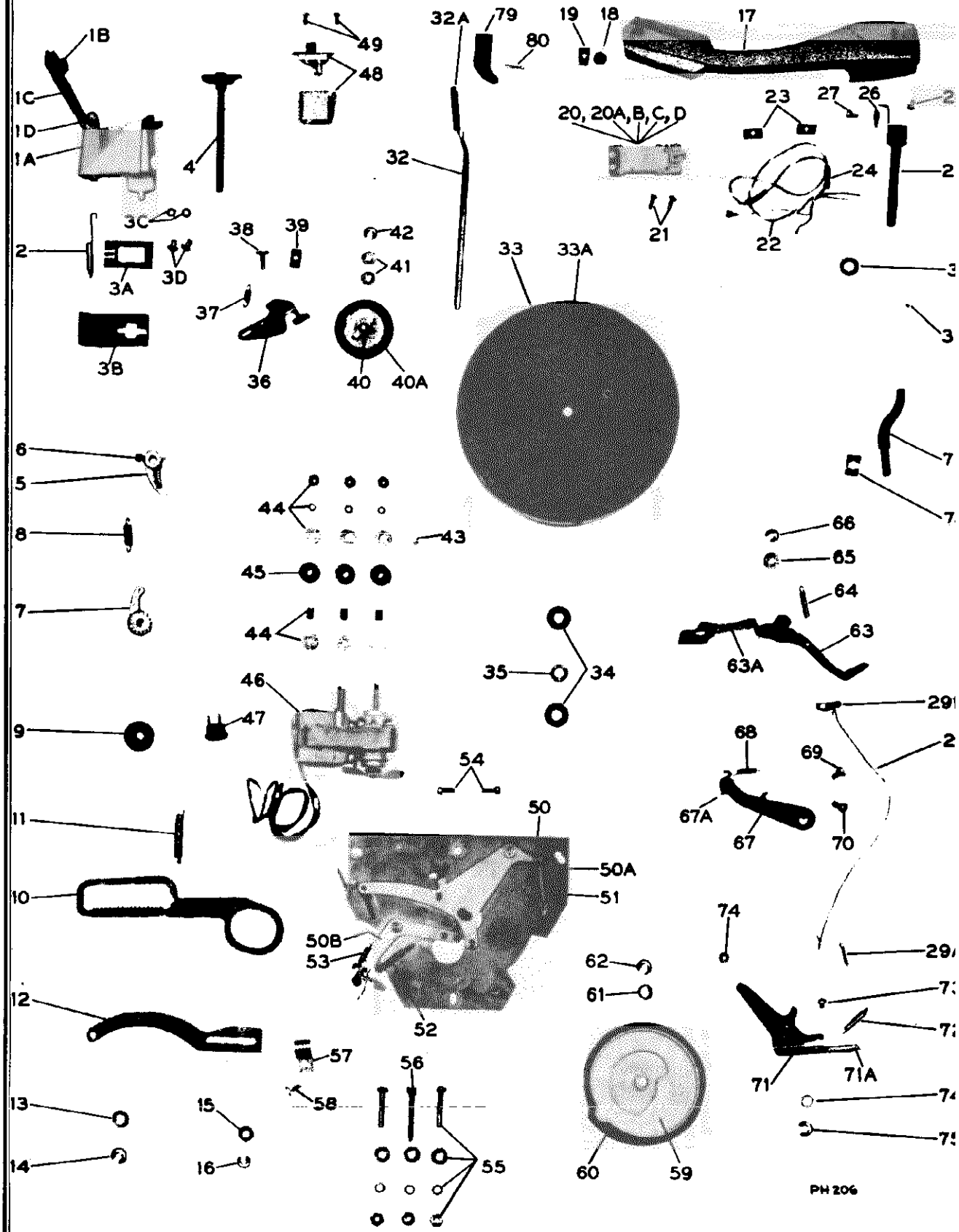
Sapphire moves into record groove. Record begins to play	1. As the sapphire moves into the playing groove, the cycling cam becomes disengaged from the rotating knurled roller as the roller falls into the step in the cam. 2. The change cycle is completed as the stud on the cycling cam carriage becomes engaged with the ratchet lever. This engagement prevents the cycling cam from contacting the knurled roller, starting a new cycle.



The record plays	1. After the playing of the record, the pickup moves into the eccentric groove. 2. The movement of the pickup in the eccentric groove causes the trip pawl to engage the ratchet lever starting a new cycle. (The mechanism plays one side of each record in the stack then repeats the playing of the last record until the pickup is manually placed on the rest or the power removed from the mechanism.)

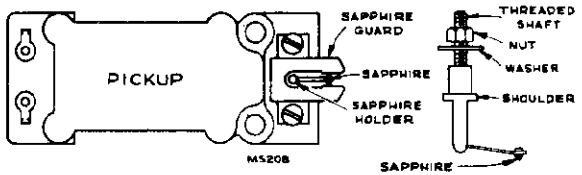
RADIO CORP. OF AMERICA

MODEL RP-1



Photograph of Parts

REPLACEMENT OF SAPPHIRE



Caution: Never bend the sapphire support wire.

Extreme care should be used when loosening the sapphire mounting nut so that the twisting motion does not break the crystal.

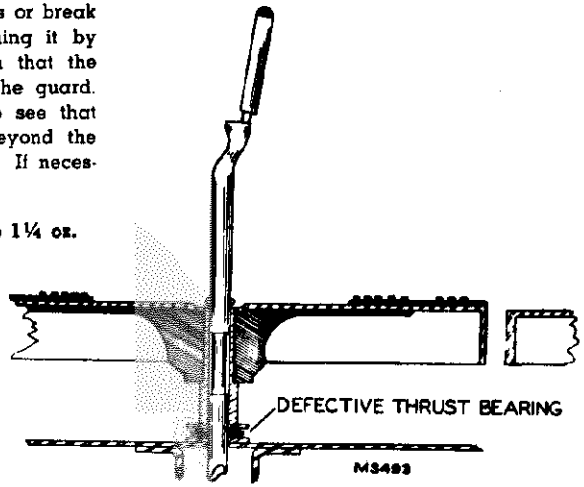
Remove the two screws holding the sapphire guard in place and remove guard. Remove the small nut and washer on the threaded shaft of the sapphire holder and gently push the shaft through the hole in the armature shaft until the sapphire holder assembly comes free.

Do not use force as the crystal may be broken.

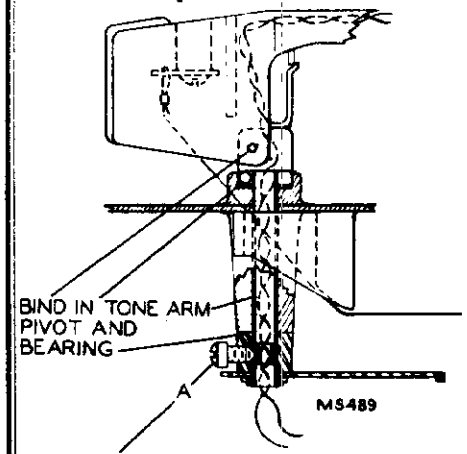
Insert threaded shaft of replacement sapphire holder through armature shaft and replace the washer and nut. Make sure that the sapphire is in the correct position. Take hold at the lower end of the shaft with a pair of pliers while tightening the nut, being very careful so as not to strip the threads or break the crystal.. Replace the sapphire guard, positioning it by means of the oversize screw slots. Make certain that the sapphire and its supporting wire are centered in the guard. Tighten the guard screws. Before using, check to see that the sapphire projects far enough (approx. .020) beyond the guard so that the guard will not strike the record. If necessary, bend the guard a little.

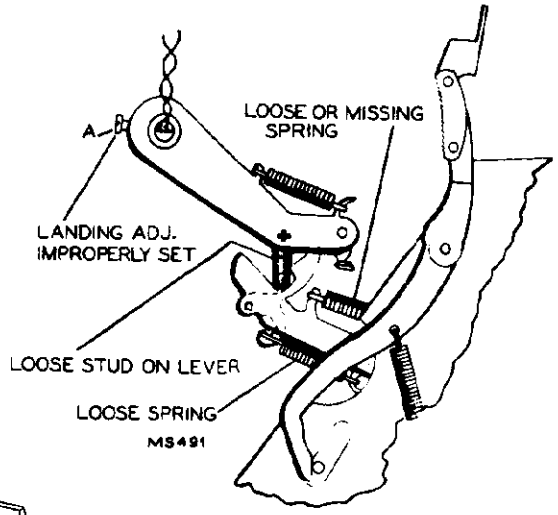
Note: Pickup pressure should be approximately 1 to 1¼ oz.

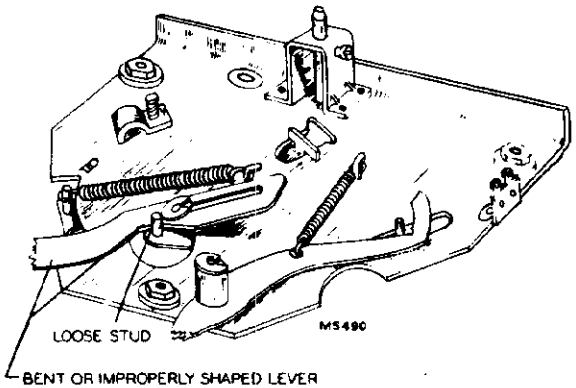
Rumble

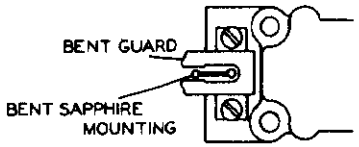


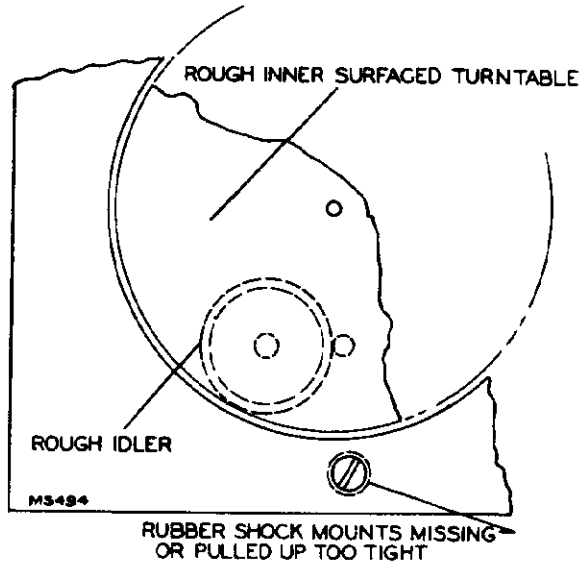
Improper Pickup Landing



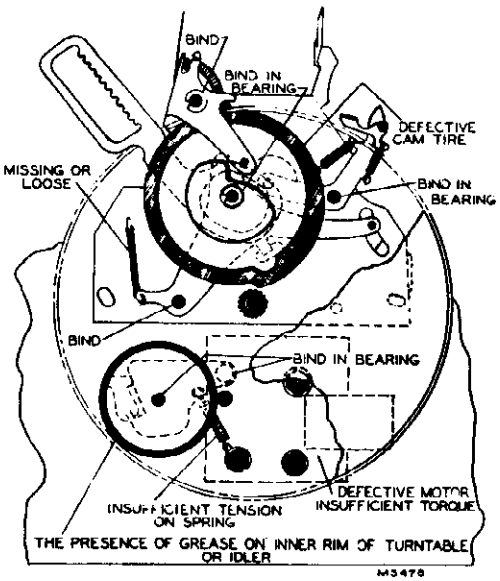


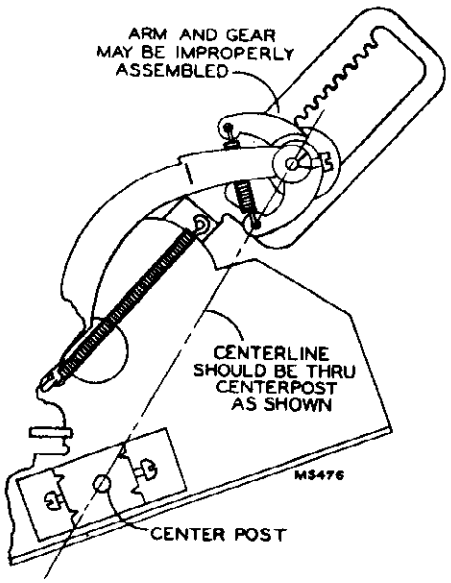




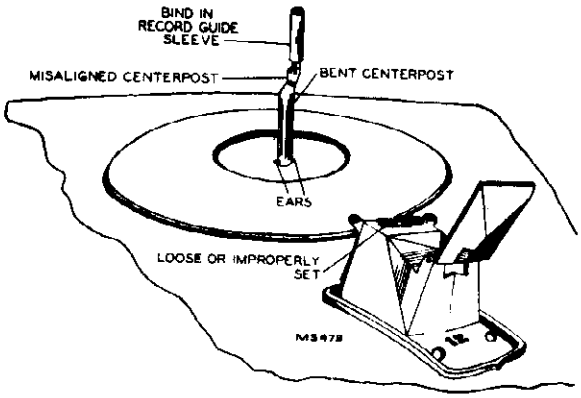


Changer Will Not Complete Cycle

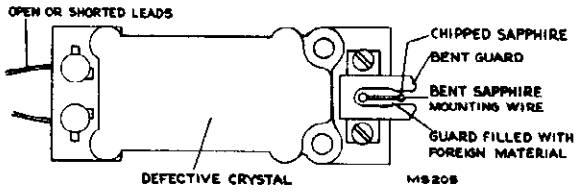




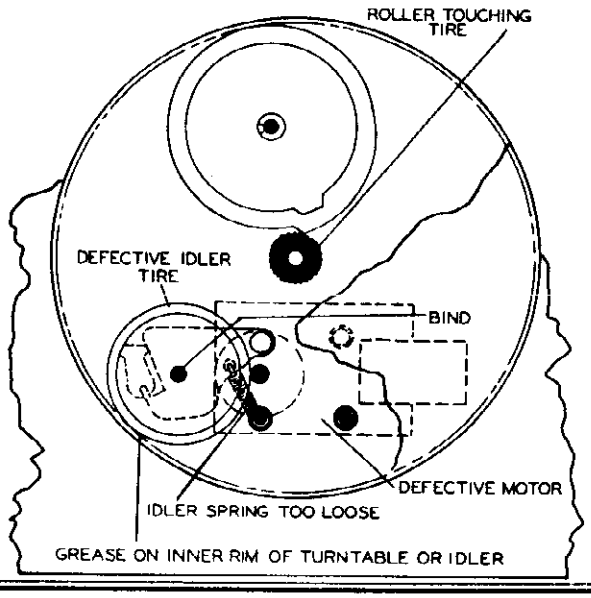
Records Do Not Separate or Drop Properly

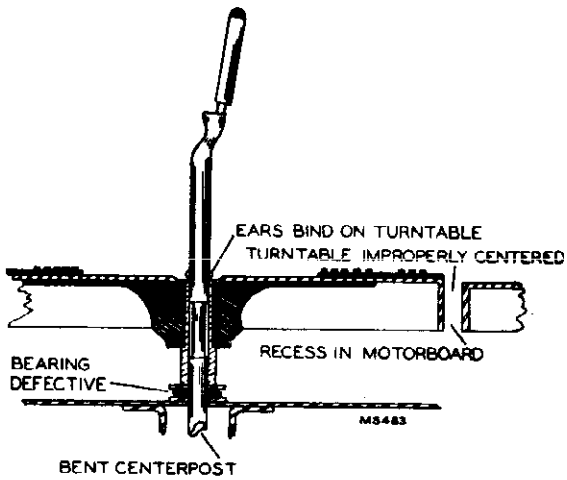


Distorted Output



"Wow" or Slow Turntable Speed





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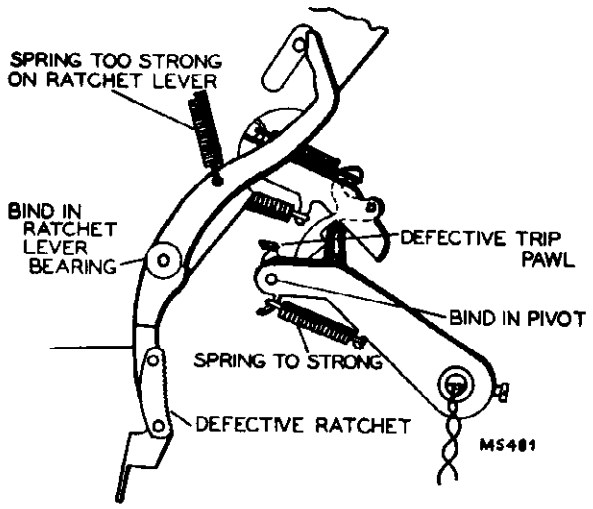
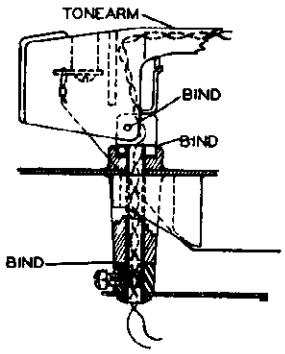
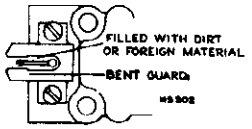
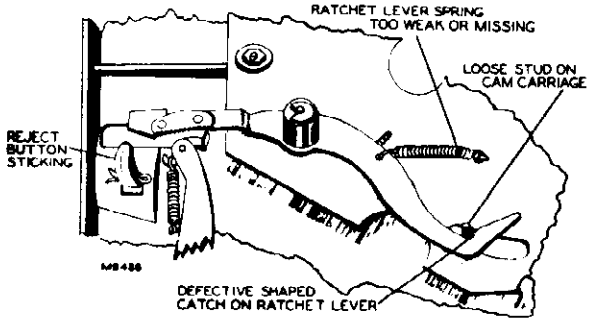
Pickup Repeats Grooves



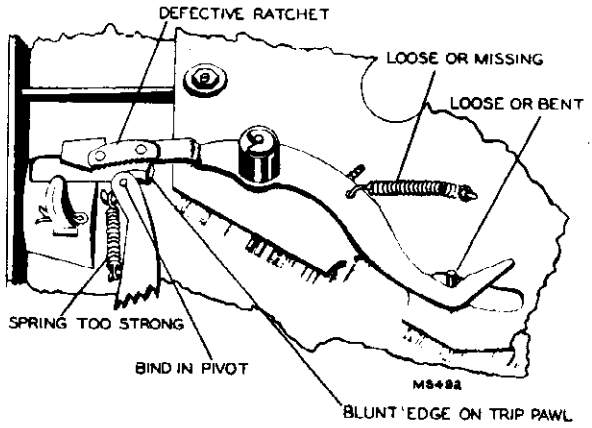




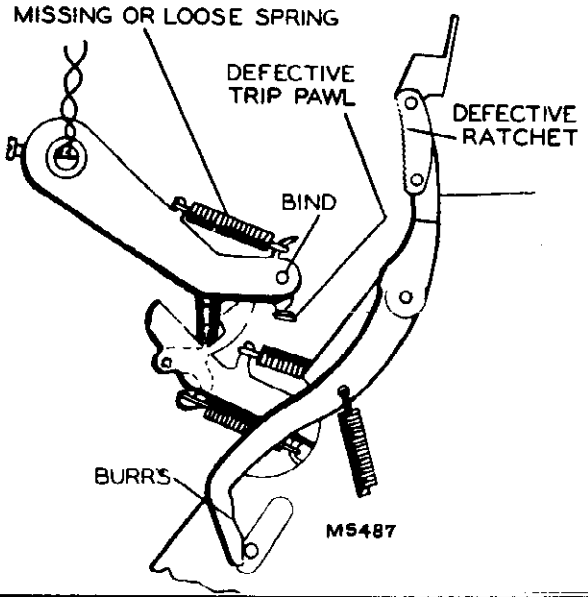
Continuous Tripping

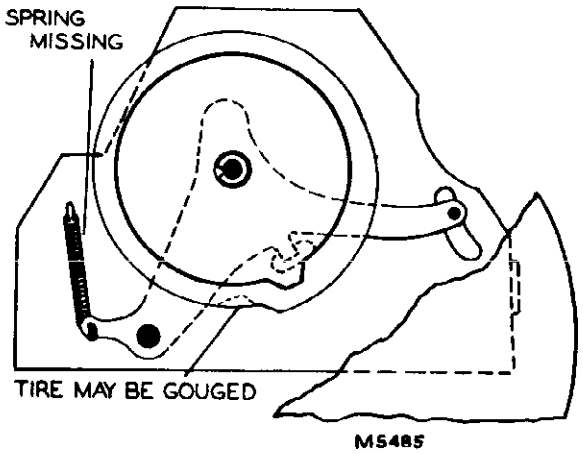


Premature Tripping



Failure To Trip or Go Into Cycle



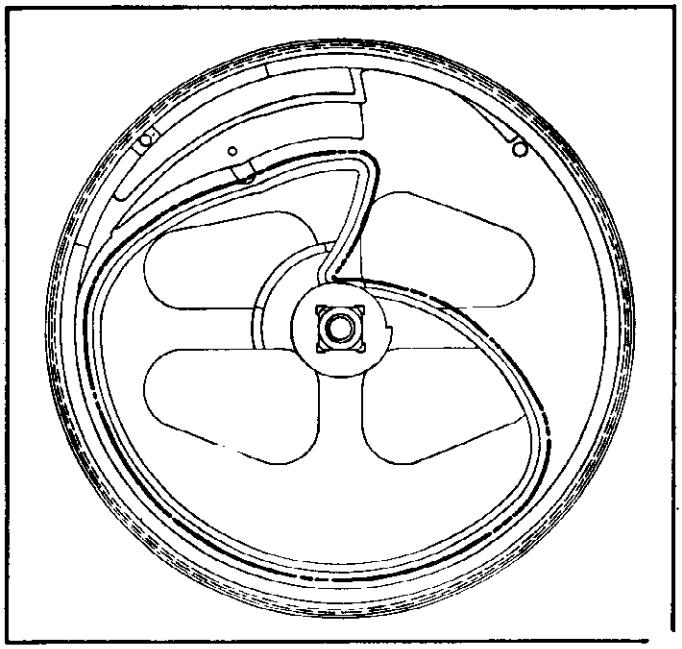


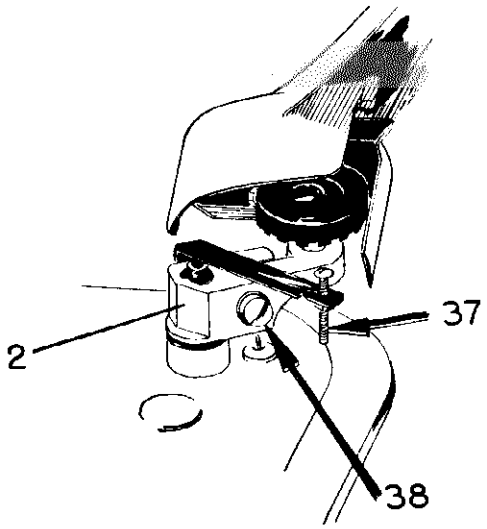
REPLACEMENT PARTS

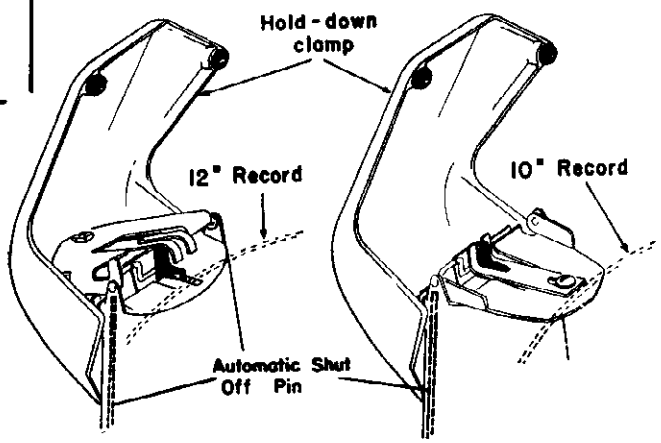
REF. No.	STOCK No.	DESCRIPTION
		OPERATING ASSEMBLIES
1A 1B 1C 1D	*72390	Record Support Assembly 1A, complete with rubber cushion 1B, top clamp 1C, and pins 1D
2	*72357	Spring—Record support and clamp spring (.200" O.D. x 1-31/32"—37¼ turns)
3A 3B 3C 3D	*72391	Plate—Clamp 3A, plates 3B (1 set) for record support assembly including lockwashers 3C and screws 3D
4	*72356	Cam—Record separator cam and shaft
5	*72360	Lever—Record push cam shaft lever, upper
6	*72353	Screw—#8-32 x 5/16" filister head screw for Item #5
7	*72361	Lever—Record push cam shaft lever, lower (gear and lever, assembly)
8	*72362	Spring—Record push cam shaft levers connecting spring (.242" O.D. x 1"—19½ turns)
9	*72354	Washer—Flat washer (29/32" O.D. x .22.)" I.D.) between rack lever and record separator cam
10	*72371	Lever—Rack lever
11	*72370	Spring—Rack lever spring (.233" O.D. x 1-11/16"—53 turns)
12	*72352	Lever—Tone arm locating lever
13	70877	Washer—Brass washer (7/16" O.D. x .280" I.D.) to mount locating lever to record separator cam shaft
14	35969	Washer—"C" washer to fasten locating lever to record separator cam shaft
15	*72351	Washer—Brass washer (7/16" O.D. x .195" I.D.) to mount locating lever to sub-base stud
16	33726	Washer—"C" washer to fasten locating lever to sub-base stud
17	*72338	Arm—Pickup arm shell only
18	*72344	Jewel—Pickup arm decorative jewel
19	38458	Nut—Speed nut to hold jewel
20	72551	Crystal—Crystal cartridge complete (including sapphire and guard)
20A	72345	Sapphire—Sapphire and holder assembly
20B	70341	Nut—Mounting washer and nut for sapphire
20C	38452	Guard—Needle guard
20D	37763	Screw—#2-56 x ⅛" screw for needle guard
21	70912	Screw—#4-40 x ⅜" binder head screw to mount crystal in arm (2 required)
22†	.....	Cable—Pickup cable (twisted pair)
23	38458	Nut—Speed nut to hold pickup cable
24†	.....	Sleeving—Sleeving to protect pickup cable
25	*72339	Shaft—Pickup arm shaft
26	*72341	Pivot—Pivot pin 26B, and screw 26A for pickup arm shaft
27	*72342	Screw—#4-40 x 3/16" filister head machine screw for locking pivot screw
28	*72340	Screw—#8-32 x ¼" round head machine screw to hold lift cable tie plate
29	*72343	Cable—Pickup arm lift cable complete (including tie plate and cotter pin)
29A	*72386	Pin—Cotter pin to fasten lift cable
29B	.....	Plate—Tie plate nut stocked separately, lift cable (Part of 29)
30	10941	Ball—Steel ball (⅛" dia.) for pickup arm shaft
31	*72348	Washer—Thrust washer (.580" O.D. x .300" I.D.) for pickup arm shaft
32	*72346	Spindle—Turntable spindle or center post
32A	.....	Guide—Record guide (Part of 32)
33	*72355	Turntable—Turntable complete with knurled bushing and rubber mat
33A	*72564	Mat—Rubber mat only for turntable
33B	.....	Roller—Knurled roller (Part of 33)
34	*72350	Washer—Thrust washer (.750" O.D. x .285" I.D.) for turntable spindle (2 required)
35	*72349	Bearing—Thrust bearing
36	*72395	Arm—Idler wheel arm and mounting lever
37	*72393	Spring—Idler spring (.195" O.D. x 11/16"—17 turns)
38	*72388	Stud—Mounting stud for idler wheel arm
39	38458	Nut—Speed nut to hold idler wheel arm stud
40	*72396	Wheel—Idler wheel including tire
40A	.....	Tire—Rubber tire for idler wheel (not sold separately)
41	39996	Washer—Fibre dampening washer for idler wheel (2 required)
42	33726	Washer—"C" washer to fasten idler wheel
43†	.....	Lug—To hold spring 37 (not stocked)
44	*72387	Mounting—Motor mounting hardware consisting of 6 (six) washers, 3 (three) spacers, 3 (three) lockwashers and 3 (three) nuts
45	*72384	Grommet—Rubber grommet for mounting motor (3 required)
46	72394	Motor—117 volt, 60 cycle motor
47	30870	Plug—2 prong male plug for motor
48	32875	Switch—"On-Off" switch with cover
49	*72389	Screw—Mounting screws for power switch (2 required)
50	*73071	Base—Sub-base assembly complete with cam mounting plate and tone arm return lever and latch less springs
50A	.....	Plate—Cam mounting carriage (Part of 50)
50B	.....	Lever—Tone arm return lever and latch (Part of 50)
51	*72367	Spring—Cam mounting plate spring (.195" O.D. x 1.167"—38¼ turns)
52	*72375	Spring—Return lever spring (.195" O.D. x ⅞"—26 turns)
53	*72374	Spring—Return lever latch spring (.165" O.D. x 9/16"—28 turns)
54	*72363	Screw—#8-32 x 7/16" filister head screw to fasten center post (2 required)
55	*72347	Hardware—One set of mounting hardware to mount sub-base consisting of 2 screws, 3 washers, 3 lockwashers and 3 nuts
56	*72364	Screw—#10-32 x 1½" square head screw to mount sub-base
57†	.....	Clamp
58†	.....	Screw
59	*72368	Cam—Main cam (including rubber tire)
60	*72369	Tire—Rubber tire only for main cam
61	70877	Washer—Brass washer (7/16" O.D. x .280" I.D.) to mount main cam
62	35969	Washer—"C" washer to fasten main cam
63	*72377	Lever—Ratchet lever, complete with ratchet teeth
63A	.....	Ratchet—Ratchet teeth (Part of 63)
64	*72372	Spring—Ratchet lever spring (.170" O.D. x 1-1/32"—80 turns)
65	*72351	Washer—Brass washer (7/16" O.D. x .195" I.D.) to mount ratchet lever
66	33726	Washer—"C" washer to fasten ratchet lever
67	*72358	Lever—Trip lever with trip pawl less spring
67A	.....	Pawl—Trip pawl (Part of 67)
68	*72359	Spring—Trip lever spring (.165" O.D. x ⅞"—62 turns)
69	32869	Screw—#10-32 x 5/16" filister head machine screw for trip lever
70	39772	Screw—#10-32 x 5/16" filister head set screw for trip lever
71	*72378	Lever—Tone arm lift director lever
71A	.....	Spring—Spring leaf (Part of 71)
72	*72376	Spring—Pickup lift cable lever spring (.195" O.D. x 1-3/32"—40¼ turns)
73	*72379	Screw—#8-32 x 3/16" round head adjusting screw for lift lever
74	*72380	Roller—Cable lever roller
75	*72381	Washer—Flat washer (½" O.D. x .290" I.D.) to mount lift lever
76	35969	Washer—"C" washer to fasten lift lever
77	*72383	Rest—Tone arm rest
78	33225	Nut—Speed nut for mounting tone arm rest
79	*72385	Lever—Reject lever
80	*72386	Pin—Cotter pin to fasten reject lever
	*72382	Motor board—Plastic motor board only, less all operating parts

* This is the first time this Stock No. has appeared in Service Data.

† These parts are not stocked.







C-10 AND C-10M

Ref. No.	Part No.	Description
3	21372	Ball Retainer Assembly
4	21016	Center Post Assembly
9	21010	Changer Drive Assembly
10	12757	Idler Wheel Assembly
11	21360	Ball Retainer Assembly
12	20126	Release Arm Spring
13	20508	Release Arm Assembly
15	12354	Positive Tripping Lever
17	21260	Tone Arm Lift Post Assembly
18	21257	Detent Lever Assembly
21	21107	Tripping Lever Assembly
22	21287	Spring
23	21113	Spring
24	21391	Connecting Lever
25	16026	"C" Washer
27	16064	"C" Washer
28	21003	Control Knob Arm Assembly
29	21377	AC Switch
31	20509	Stop Lever Assembly
35	21075	Rubber Bumpers
36	21393	Spring
39	21388	Connecting Rod
41	21386	Trunnion Support
41	21387	Hinge
41	21390	Pin
42	20127	Spring, Push off Lever
19	21256	Tone Arm Guide Assembly
—	21254	Selector Bar Assembly (Under 13)
—	12761	Spring—(Under 13)
—	20570	Spring, (Fastened to Switch Post)
—	16027	"C" Washer, (Holds No. 9)
—	22067	Grommet—for motor mounting
—	21327	Spring (on top side of selector bar Assembly)
—	21253	Cam Assembly
—	21394	Automatic Shut off Pin
34	22043	Motor Assembly Only
—	21309	Selector Block—Part of 21253
—	21324	Slide spring, for 21309
37	16151	Height Adjusting screw 5-40x⅝
38	16106	Clamp screw, 10-32x⅝
		Crystal Cartridge: Order by number on Defective Unit.

C-10 ONLY

Ref. No.	Part No.	Description
26	21396	Tripping Arm Assembly
45	21252	Push-off Assembly with Base
8	21070	Record Clamp Assembly
2	21259	Tone Arm Carrier Assembly
1	20578	Tone Arm only, (less crystal)
7	21258-C	Turntable Assembly, Brown (Flocked)
40	21395	Automatic Stop Lever Assembly
5	16107	Plug Button
6	20571	Control Knob
33	20572	Idler Pulley Holder

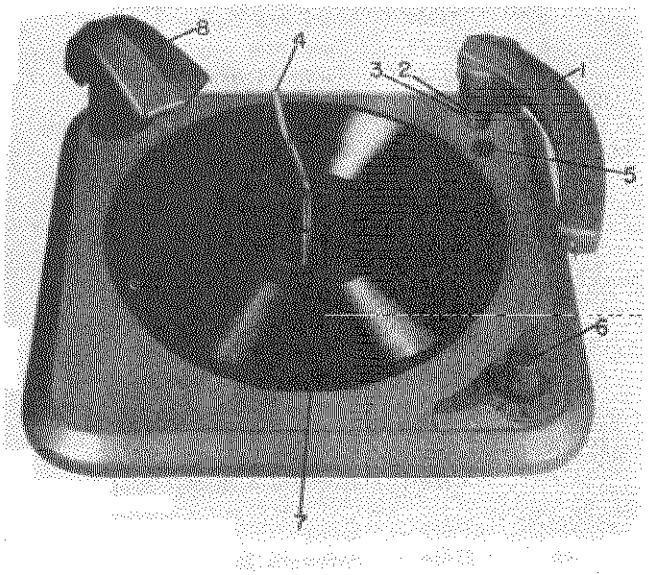
C-10M ONLY

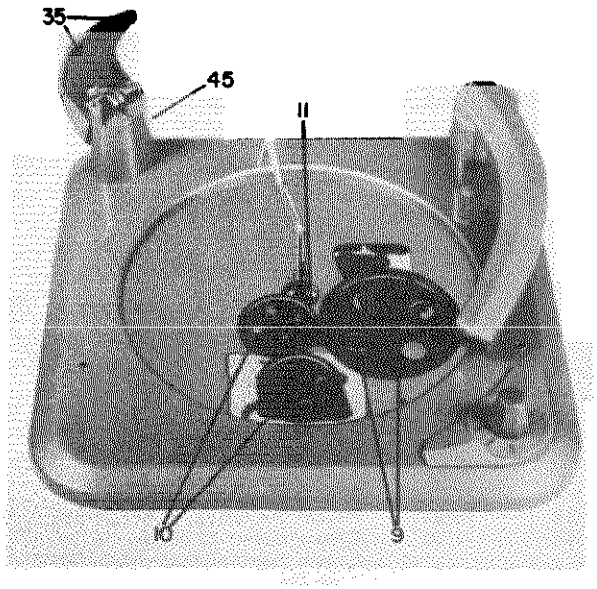
26	21411	Tripping Arm Assembly
8	21252-A	Push-off Assembly with Base
8	21070-A	Record Clamp Assembly
2	21259-A	Tone Arm Carrier Assembly
6	20571-A	Control Knob
5	16107-A	Plug Button
1	20578-A	Tone Arm only, (less crystal.)
7	21258-E	Turntable Assembly, Grey (Flocked)
44	21417	Spring
40	21414	Automatic Stop Lever Assembly

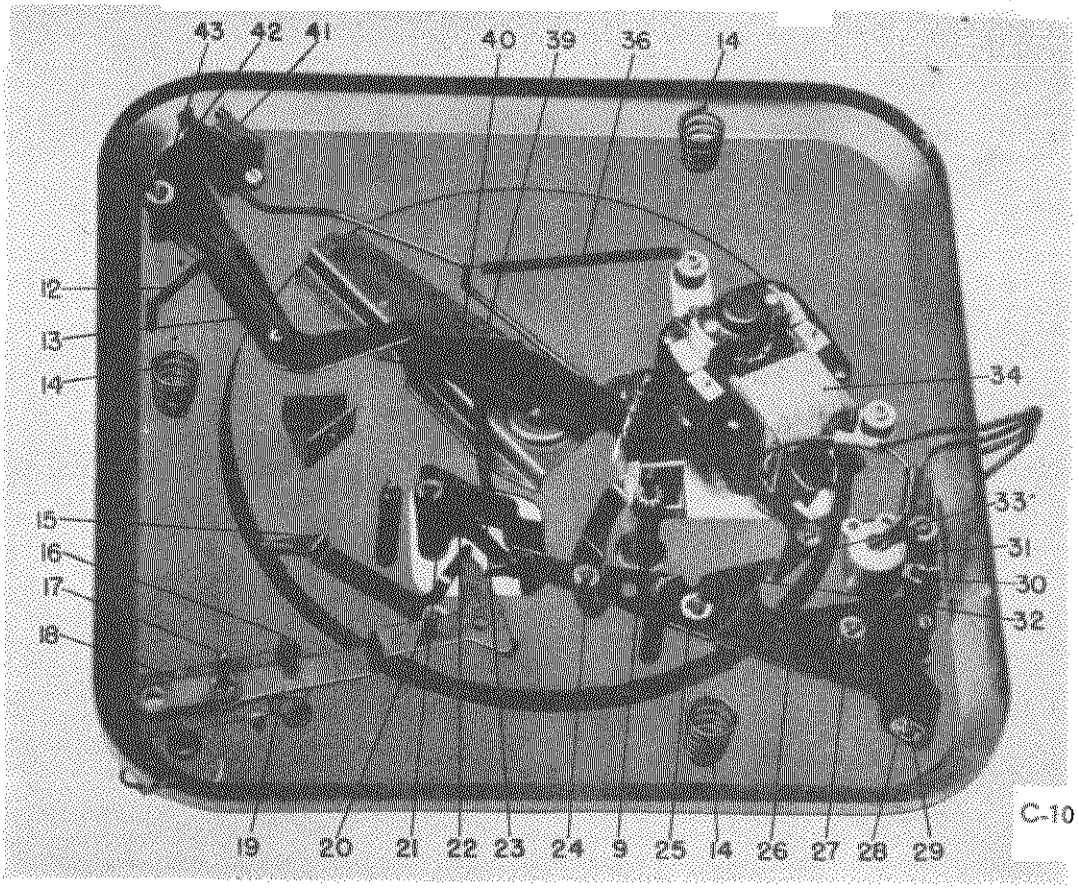
MODELS C-10, C-10M — RUSSELL ELECTRIC CO.

SERVICE AND ADJUSTMENT NOTES

1.	TONE ARM, ACTION NOT FREE	(a) Bent detent lever assembly (18). (b) Pin 20 must follow course of heavy dotted line in view of bottom of gear. (See fig. 4.). Pin must not be on other side of ridge. (c) Tone arm lead too tight.
2.	TONE ARM, FAILURE TO SET DOWN PROPERLY.	(a) After completing cycle adjust lift pin screw (37) for correct height of tone arm. Bottom of tone arm should be even with top of turntable. (b) Bent tone arm lift lever. (This lever holds screw 37).
3.	TONE ARM DROPS TOO FAR IN OR MISSES RECORD.	(a) Minor adjustment—Thru hole (5) in base plate near pickup arm post. Turn screw very slightly to right or left. (b) Major adjustment—Loosen lock screw 38 and slip tone arm bracket to compensate.
4.	CLICKING NOISE.	(a) Missing ball retainer assembly (11).
5.	FAILURE TO TRIP.	(a) Adjust screw on detent lever assembly (18). (b) Bent or loose positive tripping lever (15), or tripping lever assembly (21). (c) Defective or missing springs (22) or (23).
6.	CYCLES TOO SOON OR CONTINUOUSLY.	(a) Weak spring (22).
7.	RECORD JAMS BETWEEN SHELF AND SPINDLE.	(a) Bent spindle (4).
8.	RECORD FAILS TO DROP FROM SHELF.	(a) Check spring (42).
9.	STALLS WHEN REJECTING RECORD.	(a) Adjust idler wheel on changer drive assembly to make better contact with drum.
10.	TURNTABLE SPEED SLOW OR IRREGULAR.	(a) Same as No. 9 above.
11.	JERKY ACTION DURING CYCLE.	(a) Same as No. 9.
12.	NO AUTOMATIC SHUT-OFF, OR FAILS TO PLAY LAST RECORD.	Broken spring No. 36. Bent rod No. 39 sticking automatic shut-off pin or hinge (41).
13.	ADJUSTMENT (For C-10 Only)	If changer jams after last record is played, bend lever No. (33) about 10/1000 of an inch in direction of switch.



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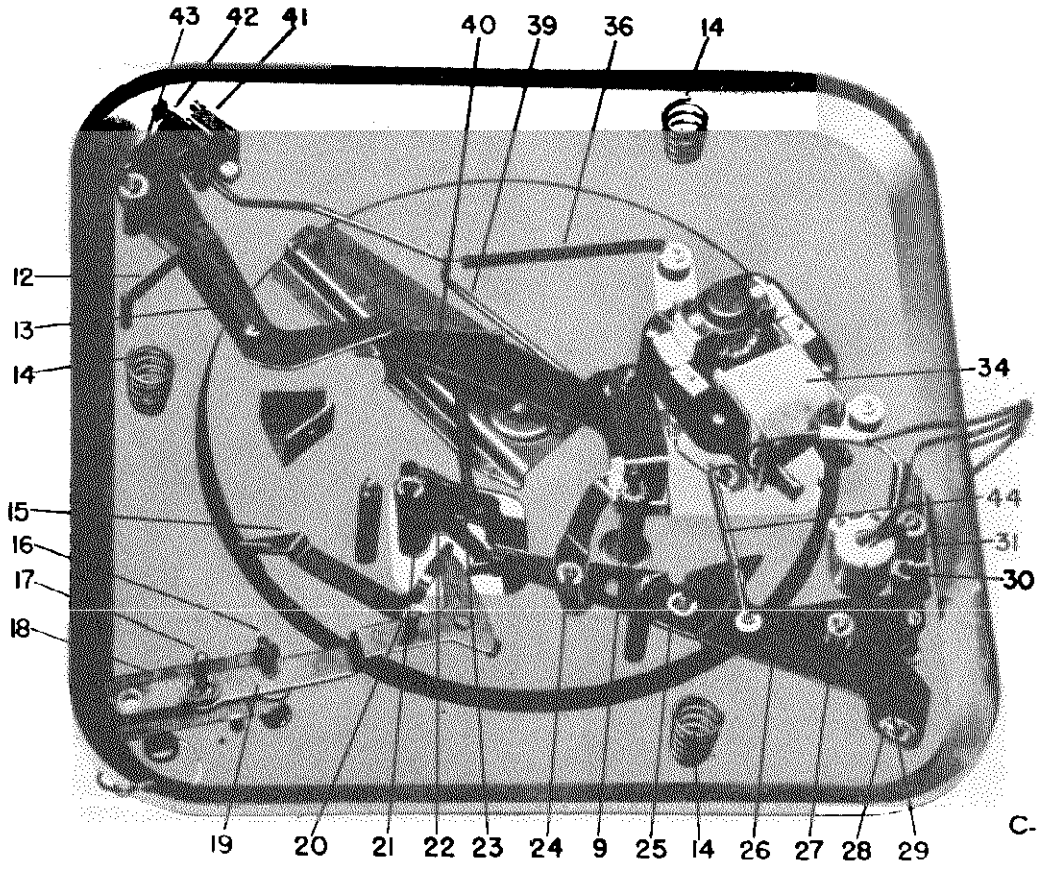
C-10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C-10M

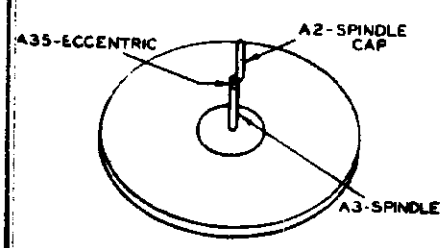


FIG. 1

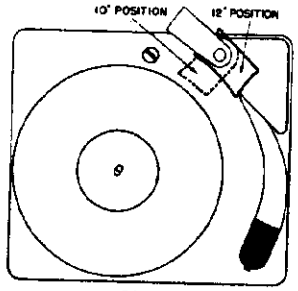
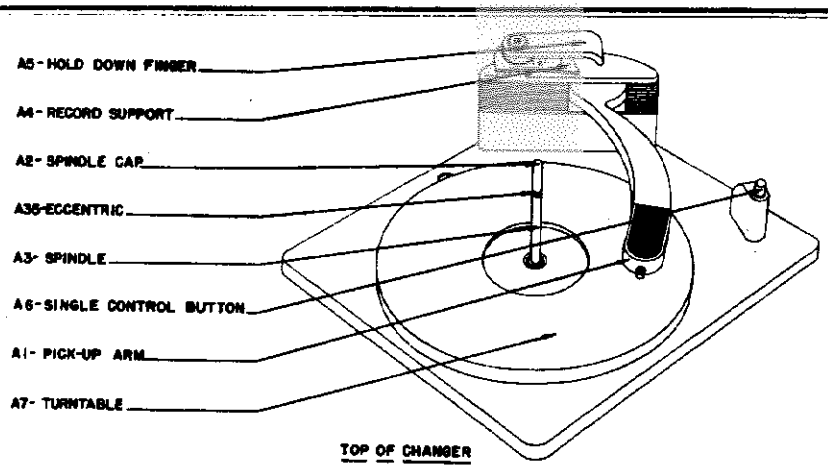
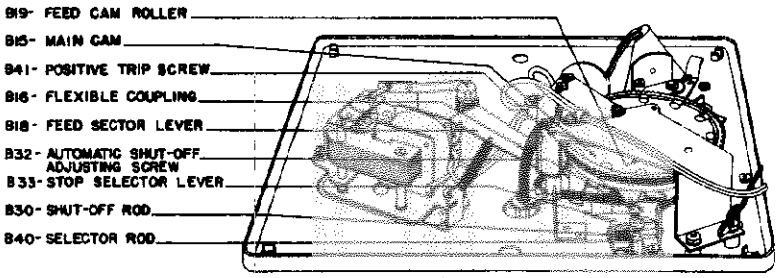
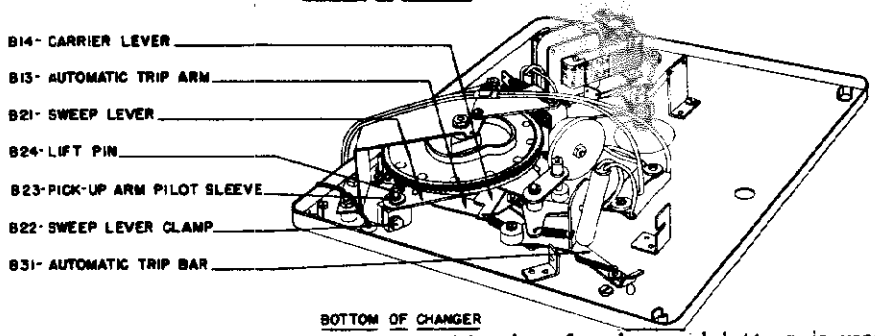


FIG. 2



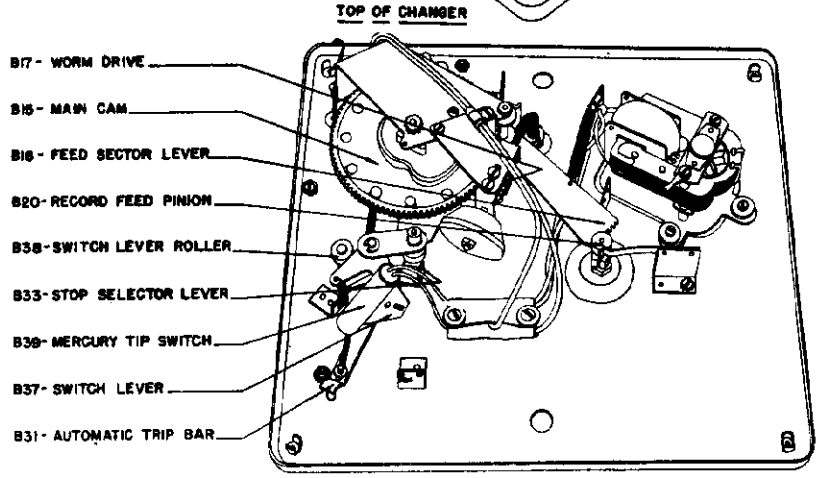


BOTTOM OF CHANGER



BOTTOM OF CHANGER

TOP OF CHANGER



BOTTOM OF CHANGER

A combination of numbers and letters is used in the illustrations and in the descriptions to facilitate locating parts in the illustrations. Parts with the prefix letter 'A' will be found in the illustration of the top of the record changer. Parts with the prefix letter 'B' will be found in the illustration of the bottom of the changer.

DESCRIPTION OF OPERATION

The Model 204 Record Changer is designed to automatically change a series of records of standard commercial dimensions, with a minimum of record wear, and to manually play any standard record up to twelve inches in diameter. The unit features Automatic Shut-off and Single Button Control.

AUTOMATIC OPERATION

Loading:

(1) Turn the Spindle Cap (A-2) until it is as completely out of line with the Spindle (A-3) as possible. (See Figure 1.)

(2) If ten-inch records are to be played, rotate Record Support (A-4) to extreme left, and for twelve-inch record operation, rotate Record Support (A-4) to extreme right, as indicated

(3) Place stack of records over Spindle Cap (A-2) and on Record Support (A-4).
NOTE: Maximum load is 12 ten-inch records or 10 twelve-inch records.
(4) Swing Hold-down Finger (A-5) so that it rests on top record.

Starting:

To start operation, press Pick-up Arm (A-1) down, thus depressing Single Control Button (A-6).

Automatic Shut-off:

After playing the last record, the Pick-up Arm (A-1) will return to rest position on the Control Button and the motor power will be automatically shut off.

Reject Records:

In order to reject a record, depress the Single Control Button (A-6)

Manual Stopping:

To discontinue operation before the Automatic Shut-off goes into effect, remove any records remaining on Record Support (A-4) and depress Single Control Button (A-6).

Unloading:

(1) Rotate Spindle Cap (A-2) until it is aligned with Spindle (A-3).
(2) Turn Hold-down Finger (A-5) aside.
(3) Lift records, tilting slightly to clear Record Support (A-4).

MANUAL OPERATION

Starting:

(1) Make sure Spindle Cap (A-2) is aligned with Spindle (A-3).
(2) Place record over Spindle (A-3) and on to turntable (A-7).
(3) Place Pick-up Arm (A-1) on outer edge of record. This will start motor.

CAUTION

(1) DO NOT bend or strain the Spindle Cap (A-2) when loading or unloading records.
(2) DO NOT force the Pick-up Arm (A-1) while in cycle.
(3) DO NOT overload the changer. The maximum load is either 12 ten-inch records or 10 twelve-inch records.
(4) DO NOT leave records on Record Support (A-4) when turning off set, or warpage of the records will result.

DESCRIPTION OF CHANGE CYCLE

The Model 204 Record Changer is an automatic cam type changer, featuring Single Button Control Automatic Shut-off and Eccentric Spindle Record Selection.

Operation

(1) Single Button Control:

Initial depression of the Single Button Control (A-6) causes a lateral motion of the Automatic Trip Bar (B-31) which in turn tilts the Mercury Tip Switch (B-39) to the CONTACT or ON position thus supplying power to the motor. The motion of the Automatic Trip Bar (B-31) causes the Carrier Lever (B-14) and its attached Drive Wheel (A-10) to come in contact with the rim of the Turntable. The consequent revolving motion of the Drive Wheel (A-10) is transmitted to the Main Cam (B-15) through a Flexible Coupling (B-16) and Worm Drive (B-17) assembly.

(2) Cycling:

A single revolution of the Main Cam (B-15) results in complete automatic cycling of the changer. This includes selection of record from stack, lifting Pick-up Arm (A-1) from rest position and setting needle on edge of record. Upon completion of the revolution, the Automatic Trip Cam (B-13) engages with the block on the Trip Lever and pulls the Carrier Lever (B-14) back to its original position so that the Drive Wheel (A-10) is no longer engaged with turntable rim.

(3) Record Feed:

The lower side of the Main Cam (B-15) controls record selection. Motion of the Feed Cam Roller (B-19) about the cam results in a backward and forward movement of the Feed Sector Lever (B-18) thus engaging the Record Feed Pinion (B-20). This in turn causes the Eccentric (A-35) to first rotate to proper position for record selection and to then return, allowing record to drop over Spindle (A-3).

(4) Pick-up Arm Movement:

The upper side of the Main Cam (B-15) controls Pick-up Arm (A-1) movement. Lift is effected by motion of the Lift Pin (B-24) along the upper horizontal face of the cam as it rotates. Direction is controlled by engagement of the Main Cam (B-15) with the Sweep Lever Pinion (B-29). The Sweep Lever (B-21) is attached to the Pick-up Arm (A-1) by means of a Clamp (B-22) around Pick-up Arm Pivot Sleeve (B-23). A boss projecting from the upper side of the Main Cam (B-15) displaces the Stop Lever (B-25) at the end of the change cycle, thus permitting the Pick-up Arm to proceed across the record.

(5) Positive Trip Action:

As the Pick-up Arm approaches the Spindle (A-3), the Sweep Lever (B-21) hits the Positive Trip Screw mounted on the Carrier-Trip Lever Assembly (B-14). This action reengages the drive wheel with the turntable rim and starts a new cycle.

(6) Pawl Trip Action:

Any reversal of the direction of the Sweep Lever (B-21) travel before positive trip action takes place causes the Sweep Lever (B-21) to push forward a Pawl mounted on the opposite side of the Trip Lever from the Positive Screw. This movement also has the effect of reengaging the Drive Wheel (A-10) to start a new cycle.

(7) Ten or Twelve-Inch Operation:

Adjusting the Record Support (A-4) to the ten-inch or twelve-inch position lowers the Selector Rod (B-40) a definite degree. The length of the extension of this rod determines the position of the Stop Selector Lever (B-33) which in turn controls the Stop Lever (B-25). The latter is the means of regulating the distance the Sweep Lever (B-21) and its attached Pick-up Arm (A-1) travel before the Pick-up Arm (A-1) is lowered to the edge of the record.

(8) Automatic Shut-off:

Release of the Record Hold-down Finger (A-5) lowers the Shut-off Rod (B-30) and forces the Stop Selector Lever (B-33) completely clear of the Stop Lever (B-25). The latter is then able to move into a position which completely blocks any forward motion of the Sweep Lever (B-21). Consequently, the Sweep Lever (B-21) cannot perform its usual function of actuating the Switch Lever (B-37). Thus, the Switch Lever Roller (B-38) remains in the path of the Stop Lever (B-25). On completion of the cycle, the Stop Lever (B-25), in returning to rest position, hits the Switch Lever Roller (B-38) and tilts the Mercury Tip Switch (B-39) to the OPEN or OFF position.

Lubrication:

No lubrication should be necessary. However, in case of squeaks or stiffness of operation, a drop of any good light machine oil on the bearings, motor, and at other pivot points should be applied. A light application of grease to the worm also might help.

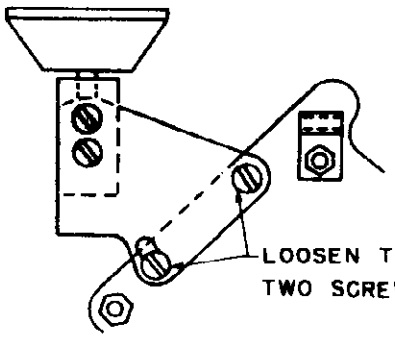


FIG. 1

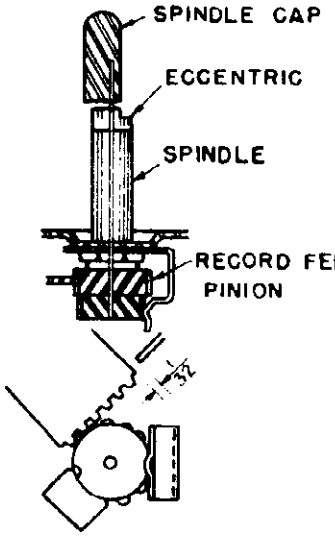


FIG. 2

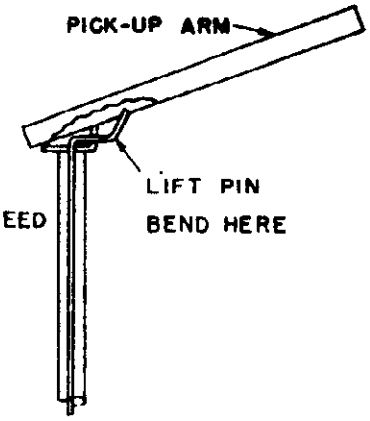


FIG. 3

SERVICE ADJUSTMENT TIPS

IF CHANGER TRIPS BEFORE COMPLETION OF THE RECORD:

Turn the Positive Trip Screw (B41) clockwise.

IF CHANGER FAILS TO TRIP AFTER COMPLETION OF THE RECORD:

Turn the Positive Trip Screw (B41) counter-clockwise.

IF THE DROP POINT OF THE PICK-UP ARM IS NOT AT PROPER POINT ON THE RECORD:

Loosen the screw on the Sweep Lever Clamp (B22) slightly and reposition the Pick-Up Arm (A1) with respect to Sweep Lever.

IF THE TURNTABLE SPEED IS LOW:

Make sure the Drive Wheel does not strike the rim of the turntable. If necessary, readjust eccentric bushing on the Drive Wheel. (NOTE: This adjustment should be exceedingly slight as a large movement may cause continous trip.)

Check for grease or oil on the Idler Wheel of the Motor and inside of turntable. Wipe with carbon techrachloride.

Check for sticky Idler Wheel plate on the Motor. Free with a screw-driver.

IF THE CHANGER STALLS IN CYCLE:

Remove any grease on the Drive Wheel or inside of turntable with carbon tetrachloride.

Check the mesh of the Worm Drive (B17) and Main Cam (B15) for proper clearance. Loosen screws on main bracket and tighten. (See Figure 1).

Check for binding in the Spindle Assembly (See Figure 2). Disassemble Index Collar and record Feed Pinion (B20), remove Spindle Cap (A2), Eccentric (A35) and Eccentric Rod.

Check for freeness and remove binds.

The following cautions should be observed in reassembling the Spindle Assembly:

(a) Reassemble with a maximum end play of .005" between Eccentric (A35) and Spindle Cap (A2).

(b) The Eccentric (A35) should be in line with the Spindle (A3) when the changer has completed its cycle.

(c) The Feed Sector Lever (B18) should mesh with the Record Feed Pinion (B20) as shown in Figure 2.

(d) Align Spindle Cap (A2) with Spindle (A3) in detent position.

IF THE RECORDS FAIL TO DROP:

Check the meshing of the Feed Sector Lever (B18) with the Record Feed Pinion (B20). Reset as shown in Figure 2.

IF THE FIRST RECORD DOES NOT PLAY:

Readjust the end of the Lift Pin (B24) so that the needle will play the first record (See Figure 3).

(NOTE: Do not bend Lift Pin (B24) too much as this will prevent playing of top record on full stack.)

Make certain that the pick-up lead does not hit the top of the Lift Pin (B24) or hinge.

IF THE AUTOMATIC SHUT-OFF FAILS TO OPERATE:

Make certain that the Automatic Shut-Off Adjusting Screw (B32) mounted on the Stop Selector Lever (B33) makes contact with the Shut-Off Adjusting Rod (B30) when the Stabilizer Finger (A5) is released. Adjust as required. Check leads on Mercury Switch (B39) for interference with the Switch Lever motion. Check Mercury Switch (B39) continuity.

IF A GRINDING NOISE OCCURS DURING THE CYCLING OPERATION:

The Worm and Main Cam Assemble are misaligned. Loosen the two small screws indicated on Figure 1; adjust the worm for closer approximation with the cam; tighten screws; lubricate worm and cam teeth.

CAUTION: It is essential to leave some play between the two parts or a definite bind will develop.

Always check through 360° movement of the cam by hand operation of the turntable before turning on the motor after an adjustment.)

IF A HIGH FREQUENCY BUZZ OCCURS DURING RECORD PLAY:

A slight burr or dust particular may be impeding the motion of the motor armature. With the motor turned on, move the armature up and down several times by hand. This will usually wear off any obstruction.

IF AUDIBLE NOISE INCREASES DURING RECORD PLAY:

The shipping bolt is secured too tightly to permit the necessary compliance between the mounting board and the record changer. Loosen the bolt slightly.

IF A METALLIC CLICKING IS HEARD DURING CYCLING:

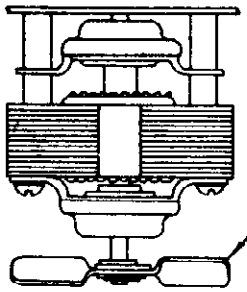
There is excess horizontal end play in the Drive Spring Assembly. Loosen the two screws indicated in Figure 1, adjust the drive assembly for approximately .010 " horizontal end play, tighten the screws and lubricate worm and cam teeth.

CAUTION: It is essential to leave at least .010 "end play or a bind will result. Always check through 360° rotation of the cam by hand operation of the turntable before turning on the motor after an adjustment.

IF A CONTINOUS BUZZING OCCURS: (EXTERNAL FAN-TYPE MOTOR ONLY)

The motor fan may be slightly bent and the pitch disturbed. Bend the fan slightly in either direction until the noise disappears.

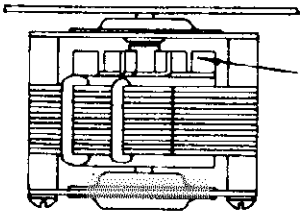
HOW TO IDENTIFY THE RECORD CHANGER MOTORS FOR CONVERSION TO 50 CYCLE OPERATION:



ALLIANCE

FAN-TWO BLADE TYPE-
ON BOTTOM OF ROTOR

USE PKG. #57311



GENERAL INDUSTRIES

FAN-BLACK OXIDIZED-
ON TOP OF ROTOR

USE PKG. #57312

ALSO MADE WITH FAN AT TOP AND BOTTOM OF ROTOR.

1. Remove the radio from the carton.

2. The record changer drawer CANNOT be opened until the shipping screws holding the record changer drawer are removed at the rear of the radio.

3. Pull the record changer drawer out as far as it will go.

4. Go to the left side of the radio and examine the motor from the underside of the record changer drawer. It may be necessary to remove a cardboard cover before the motor can be seen.

5. Compare the motor with the two illustrations above and determine the motor used. The main distinguishing points of each motor are given at the right of each illustration.

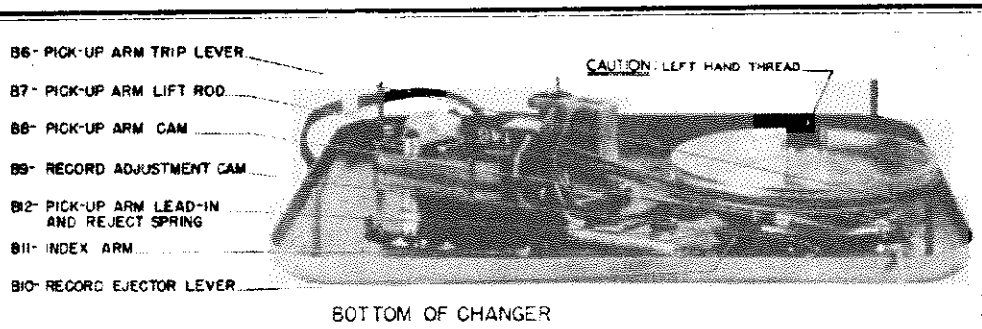
6. When the correct motor has been determined, the correct conversion spring will be found in the package identified by the part number given at the right of the motor illustration.

7. Instructions for installing the spring will be found in the envelope containing the spring.

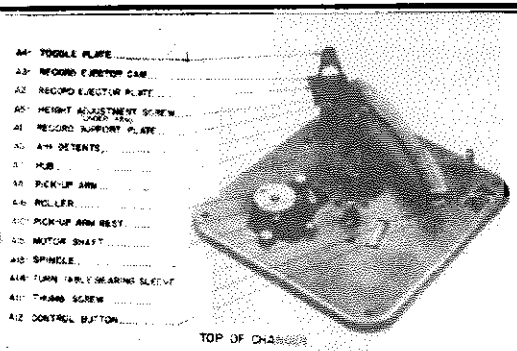
8. Before repacking the radio, secure the record changer by replacing the shipping screws at the rear of the record changer drawer.

PART NUMBER	DESCRIPTION
R59743	Arm - Pick-up - Painted
R49521	Ball Bearing Assy.
R52911	Ball - Steel
R52963	Bushing - Drive Shaft
R59737	Bushing - Record Support
R52958	Bushing - Retainer Drive
R59731	Button - Finger
R52941	Cam Assy.
R59752	Carrier & Trip Lever Assy.
R52895	Drive Shaft Assy.
R52896	Drive Spring Assy.
R52933	Eccentric Assy.
R52929	Feed Sector Assy.
R59740	Finger - Record Stab.
R59750	Grommet - Pick-up Lead
R59741	Housing - Manual Control
R52931	Indexing Collar Assy.
R59751	Indexing Spring Assy.
R59763	Lever - Starting
R59739	Lockwasher
R59772	Lockwasher
R52950	Lockwasher - Alignment Bracket
R52961	Lockwasher - Cam Lever Stud
R52960	Lockwasher - Cam Stud
R52902	Lockwasher - Drive Spring
R52894	Lockwasher - Motor
R52959	Lockwasher - Spindle
R59742	Manual Control Pin Assy.
R59785	Mercury Switch Assy. - New Style
R59744	Motor
R59745	Mounting - Vibration
R52897	Nut - Alignment Bracket
R52962	Nut - Cam Stud
R52954	Nut - Carrier Lever Stud
R52927	Nut - Spindle
R59746	Pick-up Arm Hinge Assy.
R59747	Pin - Hinge
R59749	Pin - Lift
R52926	Pinion Assy.
R59730	Record Support Housing Assy.
R52936	Retainer - Pick-up Lead
R59732	Rod - Auto. Shut-off
R52930	Roller - Feed Cam

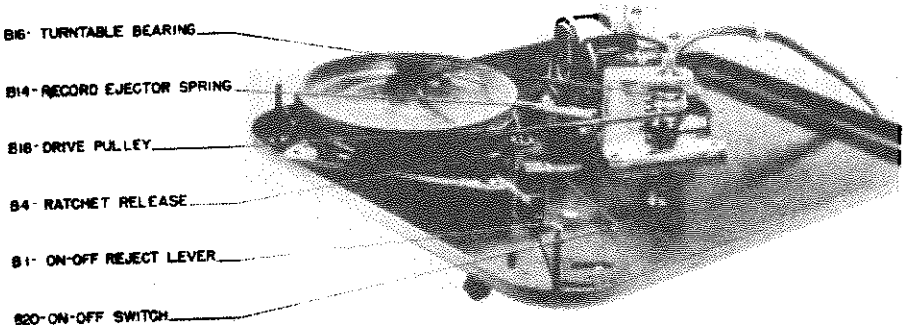
PART NUMBER	DESCRIPTION
R59733	Screw
R59776	Screw
R52910	Screw - Cartridge Att.
R59771	Screw - Drive Mech.
R52921	Screw - Record Support Stop
R59774	Screw - Self Tapping
R59775	Screw - Self Tapping
R52899	Screw - Set
R52943	Spacer - Feed Sector
R52892	Spindle Assy.
R52934	Spindle Cap Assy.
R52947	Spring - Carrier Lever
R59748	Spring - Counterbalance
R59766	Spring - Control Button
R59736	Spring - Finger
R52948	Spring - Mounting
R59764	Spring - Pull-In
R52945	Spring - Record Feed
R59765	Spring - Stop Lever
R59768	Spring - Switch Actuating
R59769	Spring - Switch Bracket Return
R59767	Spring - Trip Bar
R59760	Spacer - Motor
R59757	Stop Lever Assy.
R59759	Stop Selector Lever & Bracket Assy.
R59754	Stop Selector Rod Assy.
R52956	Stud - Carrier Lever Pivot
R59761	Support - Record
R59758	Sweep Lever Assy.
R59786	Switch Bracket Assy. - New Style
R59753	Switch Lever Assy.
R59755	Trip Bar Assy.
R59729	Turntable
R52900	Washer
R59734	Washer
R59738	Washer
R52955	Washer "C"
R59735	Washer "C"
R59777	Washer "C"
R59770	Washer - Spring
R59773	Washer - Starting Lever
R52898	Worm Assy.
R52826	Crystal Cartridge (Astatic L-70)



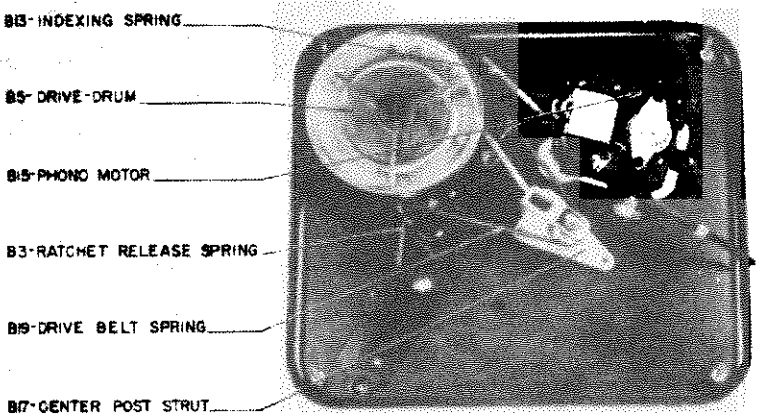
BOTTOM OF CHANGER



TOP OF CHANGER



BOTTOM OF CHANGER



BOTTOM OF CHANGER

PART NUMBER	DESCRIPTION
R52860	#4-40 Screw Hex Head Slotted (Pick-up Arm Hub)
R52848	C Balance Spring (Pick-up Arm)
R52849	Leadin and Reject Spring (Pick-up Arm)
R52850	Pick-up Arm Rest Assembly
R52851	Felt Washer (Turntable Bearing)
R52852	Spindle Assembly
R52853	On-Off Switch
R52854	Flat Washer (Turntable Bearing)
R52855	C Clip (Power Cord)
R52856	Screw-Th. Cutting #8-32x5-16 Spec. Hex Head
R52857	Screw-Th. Cutting #6-32x5-8 Hex Head & Washer (Motor Mount)
R52858	Pulley Bearing
R52859	Shoulder Rivet (On-Off Reject Lever)
R52861	Dog Ratchet Release Spring
R52862	Pick-up Arm Lift assembled to Pick-up Arm Shaft
R52863	Pick-up Arm Hub Final Assembly
R52864	Drive Drum (Machined)
R52824	Tone Arm only
R52865	Plastic Insert (Crystal Cartridge)
R52866	Screw - #4-40 Fillister Head (Crystal Cartridge)
R52823	Turntable Assembly Spun
R52867	Hair Pin Clip (Release Bracket Stud)
R52868	Speed Nut Fastener (Center Post Strut)
R52869	Slotted Headless Set Screw (Drive Pulley)
R52870	Record Ejector Cam
R52871	Cam Cover Washer (Ejector)
R52872	Washer (Release Bracket Stud)
R52873	Ball Bearing Thrust (Pulley)
R52874	Toggle Plate Bumper
R52875	Indexing Spring
R52876	Toggle Plate Spring
R52877	Record Ejector Spring
R52878	Spring Friction Pad (Cam Assembly)
R52879	Cam Stud (Left Hand Thread)
R52880	Pick-up Arm Cam with Spring
R52881	Acorn Nut (Ejector Cam)
R52882	Motor Mtg. Bushing
R52826	Pick-up Crystal - Astatic L-70
R52822	Belt-Drive
R52883	Clip-Spring (Center Post Strut)
R52760	Motor-60 cycle
R52988	Toggle Plate & Bumper Assy.

A combination of numbers and letters is used in the illustration and in the description to facilitate locating parts in the illustrations. Parts with the prefix letter 'A' will be found in the illustration of the top of the record changer. Parts with the prefix letter 'B' will be found in the illustration of the bottom of the changer.

DESCRIPTION OF OPERATION

The Model 206 Record Changer is designed to automatically change a series of records of standard commercial dimenions, with a minimum of record wear, and to manually play any standard record up to twelve inches in diameter.

AUTOMATIC OPERATION

Loading:

(1) On the Pick-up Arm Hub (A-7) are two detents marked A and H. Hold the Hub, move the Pick-up Arm (A-8) sidewise and engage the groove marked A for Automatic Operation.
(2) Adjust the Record Support (A-1) for 10 inch or 12 inch records by rotating it one-half revolution in either direction. The wide shelf is for 10 inch records, the narrower for 12 inch records.
(3) Flip the Toggle Plate (A-4), which hinges between the 10 inch and 12 inch positions on the Record Support (A-1) toward the back.
(4) Place the stack of records on the Spindle (A-13) allowing them to rest on the Record Support.
(5) Flip the Record Hold-Down Finger over on to the top of the records. This must be done to provide the necessary tension to allow the records to drop correctly.

Starting:

Push the Record Changer Control Button (A-12) to the 'ON' position. If the changing action does not start at once, push the Control Button to the 'Reject' position and release.

Reject Records:

Merely press the Control Button to the 'Reject' position and release.

Shut Off:

(1) With the Pick-up Arm (A-8) resting on a record, move the Control Button (A-12) to the 'OFF' position.
(2) Lift the Pick-up Arm and place it on its rest.

Unloading:

Flip the Toggle Plate (A-4) toward the back, away from the Spindle (A-13). The records can then be lifted from the turntable.

MANUAL OPERATION

Starting:

(1) Move the Pick-up Arm (A-8) sidewise into the detent marked H.
(2) Rotate the Record Support (A-1) to the 12 inch position.
(3) Flip the Toggle Plate (A-4) toward the back.
(4) Place the selected record over the Spindle (A-13) and down on the turntable.
(5) Move the Control Button (A-12) to the 'ON' position.
(6) Let the Pick-up Arm raise and lower. The Pick-up Arm can then be placed by hand on the starting edge of any size record.

CAUTION

(1) DO NOT force the Pick-up Arm while in cycle.
(2) DO NOT overload changer. The maximum load is either 12 ten-inch records or 10 twelve inch records.
(3) DO NOT leave records on Record Support (A-1) when turning set off, or warpage of the records will result.

DESCRIPTION OF CHANGE CYCLE

The Model 206 Record Changer is an automatic ejection lever type changer, featuring a Single On-Off Rejection Control Lever.

Operation:

(1) Single Control Lever:

Initial movement of the Control Button (A-12) to the 'ON' position turns on the Motor Power Switch (B-20) and simultaneously flips the Ratchet Release (B-4). This allows the Pick-up Arm Cam Dog (B-8) to engage the Drive Drum (B-5) bosses causing the Pick-up Arm (B-8) to rotate.

(2) Cycling:

A single revolution of the Pick-up Arm Cam (B-8) results in complete automatic cycling of the changer. This includes selection of record from stack, lifting Pick-up Arm (A-8) home position and setting stylus on lead-in groove of record. Upon completion of one revolution, the Cam Dog hits against the Ratchet Release (B-4) and is lifted to its original position, free of the Drive Drum (B-5).

(3) Record Feed:

The outer edge of the Pick-up Arm Cam (B-8) moves the Record Ejector Lever (B-10) in a horizontal direction causing the Record Ejector Plate (A-2) to move towards the spindle and return, pushing the next record off the shelf and on to the turntable.

(4) Pick-up Arm Movement:

The upper side of the Pick-up Arm Cam (B-8) controls Pick-up Arm (A-8) movement. Lift is effected by motion of the Lift Rod (B-7) along the upper edge of the cam as the latter rotates. Direction is controlled by engagement of the Pick-up Arm Cam (B-8) with the Pick-up Arm Cam Follower Stud, which guides the Pick-up Arm Trip Lever (B-6). The Pick-up Arm Trip Lever (B-6) is staked to the Hub (A-7) which controls horizontal movement of the Pick-up Arm (A-8).

At completion of cycling the Pick-up Arm Cam (B-8) comes to rest in such a position that the Pick-up Arm Cam Follower Stud has a large area for free movement permitting the Pick-up Arm (A-8) to proceed across the record.

(5) Trip Action:

As the Pick-up Arm (A-8) approaches the spindle, the eccentric groove of the record causes an oscillating action of the Pick-up Arm Trip Lever (B-6) against the Ratchet Release (B-4). This in turn releases the Pick-up Arm Cam Dog (B-8) and cycling begins.

(6) Reversal Trip Action:

Any reverse of direction of the Pick-up Arm (A-8) travel before the eccentric groove of the record is reached causes the Pick-up Arm Trip Lever (B-6) to operate the Ratchet Release (B-4) and cycling commences.

(7) Ten or Twelve Inch Operation:

Adjusting the Record Support Plate (A-1) to the ten inch or twelve inch position rotates the Record Adjustment Cam (B-9) which in turn re-sets the Pick-up Arm Cam Follower Stud, and consequently the dropping point of the Pick-up Arm (A-8).

(8) Reject Lever:

Movement of the Reject Button (A-12) during play flips the Ratchet Release (B-4) and cycling commences immediately. Thus, a record can be rejected during play.

Adjustments:

(1) A-H; Automatic and Home Recordings:

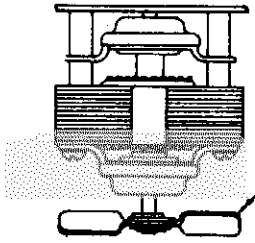
On the Pick-up Arm Hub (A-7) are two Detents (A-6). By holding Hub (A-7) and moving Pick-up Arm (A-8) sidewise, either position can be selected. Position 'A' gives us completely automatic operation with the cycling commencing as the stylus approaches within 1-7/8" of the spindle (A-13). Position 'H' moves the Pick-up Arm (A-8) inward in reference to the Pick-up Arm Trip Lever (B-6) thereby permitting the stylus to traverse nearer the spindle without tripping the cycling mechanism. This permits playing of smaller than standard recordings.

(2) Pick-up Arm Height:

If the stylus does not ride on the record or if it is not raised high enough to clear the top record of a stack this adjustment must be made. Raise Pick-up Arm (A-8) and after releasing the lock nut on the Height Adjustment Screw (A-5), rotate the screw clockwise to lower the Pick-up Arm (A-8), and counterclockwise to raise it. Be certain that locknut is then locked securely.

Lubrication:

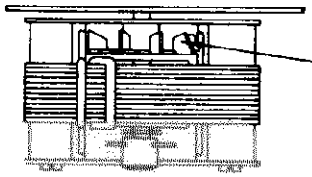
No lubrication should be necessary. However, in case of squeaks or stiffness of operation, a drop of any good light machine oil on the bearings, motor, and at other pivot points should be applied. A light application of grease to the cam also might help.



ALLIANCE

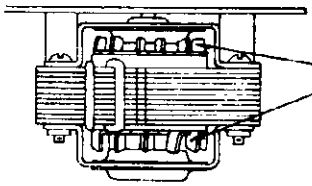
FAN-TWO BLADE TYPE-
ON BOTTOM OF ROTOR

USE PKG. #57311



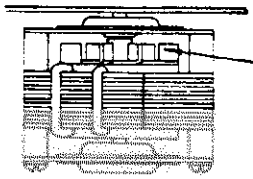
GENERAL INDUSTRIES

FAN-BLACK OXIDIZED-
ON TOP OF ROTOR
USE PKG. #57312
ALSO MADE WITH FAN AT TOP AND BOTTOM OF ROTOR.



RUSSELL MOTORS

FAN-BRASS-ON TOP AND
BOTTOM OF ROTOR.
USE PKG. #57309



SAMPSEL

FAN-CADMIUM PLATED-
ON TOP OF ROTOR.
USE PKG. #57310

HOW TO IDENTIFY THE RECORD CHANGER MOTORS FOR CONVERSION TO 50 CYCLE OPERATION.

1. Remove the radio from the carton.
2. The record changer drawer CANNOT be opened until the shipping screws holding the record changer drawer are removed at the rear of the radio.
3. Pull the record changer drawer out as far as it will go.
4. Go to the left side of the radio and examine the motor from the underside of the record changer drawer.
5. Looking at the motor from this direction will give you the same view as shown in the illustration in at the left.
6. Compare the motor with the four illustrations above and determine the motor used. The main distinguishing points of each motor are given at the right of each illustration.
7. When the correct motor has been determined, the correct conversion spring will be found in the package identified by the part number given at the right of the motor illustration.
8. Instructions for installing the spring will be found in the envelope containing the spring.
9. Before repacking the radio, secure the record changer by replacing the shipping screws at the rear of the record changer drawer.

OPERATING INSTRUCTIONS

SETTING FOR SIZE OF RECORDS: Setting of Record Support Arm (see Fig. 1) determines size of record that may be placed on the changer and may be accomplished in the following manner.

To set for 10" records grasp the Record Support Arm as shown in Fig. 1. Lift the edge closest to the Center Post and slide the entire top of the arm forward toward the center of the changer as far as it will go, (a slight pressure may be required to move it all the way). Lower Record Support Arm and it should **lock** into a level position.

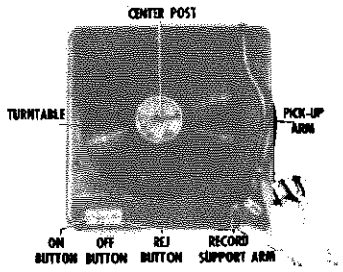


Fig. 1

To set for 12" records grasp the Record Support Arm as shown in Fig. 1. Lift the edge closest to the Center Post and slide the entire top of the arm away from the center of the changer as far as it will go. Lower Record Support Arm and it should **lock** into a level position.

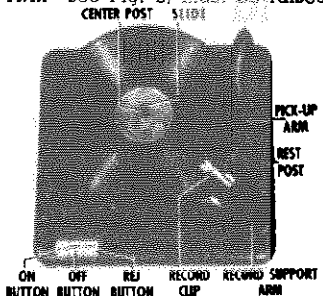
NOTE: Always be sure Record Support Arm is properly **locked** in, otherwise improper operation will result.

PICK-UP ARM AND NEEDLE: The new Stewart-Warner "Strobo-Sonic" Pick-up Arm has been designed to faithfully reproduce your records with a minimum of "surface scratch" and "needle talk." It incorporates a special "retractable" type needle which protects the needle, cartridge and record if arm is accidentally dropped or undue pressure is applied to Pick-up Arm.

Check to see that pick-up cartridge has a "floating" action. If it is ever found in a "retracted" position merely slide the cartridge until it is centrally located and it should regain its "floating" action.

A special long-life needle (good for many thousands of playings) is included with this changer. Care should be exercised to see that the point is always protruding slightly beyond the metal guard at bottom of the cartridge. Should the needle become damaged or worn, it may be removed by releasing the small set screw visible and accessible at the front of the cartridge. These needles can be purchased from your dealer by requesting Stewart-Warner Part 505717. Always insert needle in the cartridge so that flattened surface on the shaft faces the set screw. Single play steel needles or cactus needles must not be used when records are changed automatically.

PLACING RECORDS ON THE CHANGER: The Record Clip (located on the head of the Record Support Arm—see Fig. 2) must be raised until it is straight up before attempting to load records on the changer. Also check to be sure the Slide Center Post is all the way down.



Place records on the Center Post so that center of record rests on the off-set in the Center Post and outer rim of record rests on step of properly positioned Record Support Arm. Then lower the Record Clip so that it rests on the top record.

The changer is capable of handling fourteen 10 inch records or twelve 12 inch records of the 78 revolutions-per-minute type. **Do not attempt to mix 10 and 12 inch records;** the records must be all one size for each loading and may consist of fewer than listed above.

STARTING THE CHANGER: Turn on the radio before attempting to start the changer and be sure that controls on radio panel are properly set for phonograph operation.

To start the changer, press down on the "ON" button. This will turn motor on and Turntable will start rotating. Then, depress the **"REJ"** button momentarily to start the changing mechanism. All records which are loaded on the changer will then be played in sequence.

CONTROLLING THE VOLUME: Use the volume control on the radio control panel to adjust the volume of the phonograph.

In event a radio station is heard when listening to the phonograph, you can eliminate this interference by turning the Tuning Control knob to a different position (select a position which is between stations).

CONTROLLING THE TONE: The tone control on radio control panel is used to select most pleasing tone.

REJECTING A RECORD: If you wish to stop playing a record and start playing the next one, merely depress the **"REJ"** button momentarily and the changer will drop the next record.

STOPPING AND UNLOADING: It is not advisable to stop the changer when it is in the process of changing a record. Wait until the Pick-up Arm lands on the record and then press down on the **"OFF"** button. The motor will then be automatically turned off and the Turntable will stop rotating. Lift the Pick-up Arm and place it on the Rest Post.

Record Clip must be raised to straight up position before removing the entire stack of records from the Turntable. Then place the fingers of both hands under opposite edges of the bottom record. Do not apply pressure to the top record with your thumbs. Lift the stack of records straight up following the contours of the Center Post.

PLAYING RECORDS MANUALLY: Standard records or home recorded records may be played individually if desired. Set the Record Support Arm in the 12" position as described in a previous section. This arrangement provides the space necessary to lower the record over the Center Post and down onto the Turntable.

After the record has been placed on the Turntable, depress the **"ON"** Button. This starts the Turntable rotating and the Pick-up Arm may then be placed on the record. When the record is finished, the mechanism will automatically start playing it over again unless the "OFF" button is depressed so as to stop the changer.

PLAYING REVERSE RECORDINGS: This record changer may be used to play records which are recorded from the center outward toward the rim. Merely proceed as described in preceding section entitled "Playing Records Manually" with the exception that the Pick-up Arm

CAUTIONS: Observe the following precautions in order to insure proper operation.

1. Never use force to stop or start the changer.
2. Never change position of Record Support Arm while changer is in cycle.
3. Always grasp Pick-up Arm at sides, never under the cartridge, as that may force cartridge to remain in the "retracted" position. Should this happen, merely slide cartridge until it is centrally located and it should regain its floating action.
4. Never leave the Pick-up Arm and needle resting on a record when radio is turned off.
5. Be sure Record Support Arm is properly locked in a level position otherwise improper operation results.
6. Be sure that Slide in Center Post is all the way down.
7. Do not leave records on the supports for an extended period of time as they may warp.
8. Exercise care not to bend the Center Post.

DESCRIPTION OF CYCLE

In order to observe the operation of the changer mechanism, it will be necessary to remove the Turntable. This may be accomplished by taking out the three small Screws located on top of the Turntable near the Center Post. Changer may now be put thru its cycle by first depressing the "REJ" Button and then manually rotating the bushing to which the Turntable was formerly attached.

FUNCTION	EXPLANATION
STARTING (Fig. 3) Depressing "ON" Button (1).	1. Turns Power Switch (5) on. 2. Motor (6) operates Idler Wheel (7) to rotate Turntable. 3. Turntable rotates Clutch and Turntable Shaft (8).
CYCLING Depressing "REJ" Button (3).	1. Actuates Reject Link (10). 2. Moves Reject Arm (11). 3. Disengages Reject Lever (13) from Clutch Arm (15), allowing arm to contact rotating Clutch and Turntable Shaft (8) which starts the entire mechanism thru its change cycle.
Function of Pinion Gear (17).	1. Rotates Main Drive Gear (18). 2. Top Drive Roller (19) actuates Main Slide (20).
DISPLACEMENT OF A RECORD (Fig. 4) Record Selection.	1. Main Slide (20) moves toward right rear corner of changer. 2. Ejector Roller (22) engages a notch in Ejector Arm (23) and moves this arm plus Ejector Link (24) as well as attached Ejector Lever (26). 3. Ejector Lever (26) engages with a slotted hole in Channel (27) and moves attached Record Support Arm (29) away from Center Post (32). This movement allows bottom record of a stack to drop from the second step on Record Support Arm (29) to the first step.
Record Ejection.	1. Main Slide (20) now reverses its direction and proceeds toward left front corner. 2. Attached Ejector Roller (22) moves Ejector Arm (23) plus Ejector Link (24) and Ejector Lever (26). 3. Ejector Lever (26), which engages a slotted hole in Record Support Channel (27), moves attached Record Support Arm (29) toward the Center Post (32). This movement pushes bottom record until it clears the off-set in the Center Post (32) and drops down to the Turntable.
MOVEMENT OF PICK UP ARM (Fig. 5) Raising Pick-up Arm (43).	1. When Main Slide (20) moves toward right rear corner, Lift Roller (39) engages and pushes Lift Lever (40) down. 2. Lift Lever (40) actuates Lift Rod (41) which in turn causes Pick-up Arm (43) to rise. 3. Height of Pick-up Arm may be changed by shifting the Height Adjustment Screw (44).
Lateral motion of Pick-up Arm (43) toward Center Post (32).	1. When Main Slide (20) reverses its dircetion and moves toward left front corner of changer, Return Slide (48) pulls on Stud (49) which is a part of the Link Assembly (50). Since the Link Assembly is attached to Follower Arm and Pick-up Shaft (51), it controls the approach of the Pick-up Arm (43) to the record. 2. Set down point of Pick-up Arm may be changed by shifting the Horizontal Adjustment Screw (54).

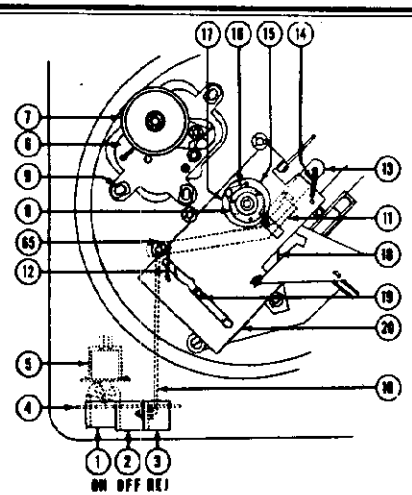


Fig. 3

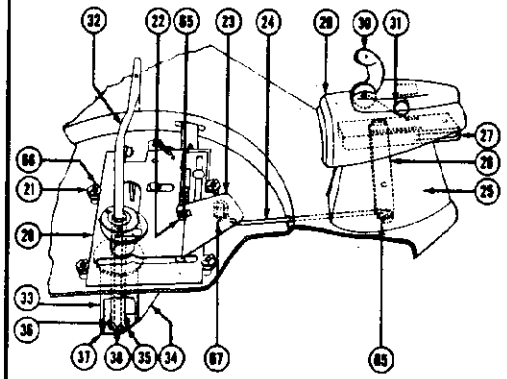


Fig. 4

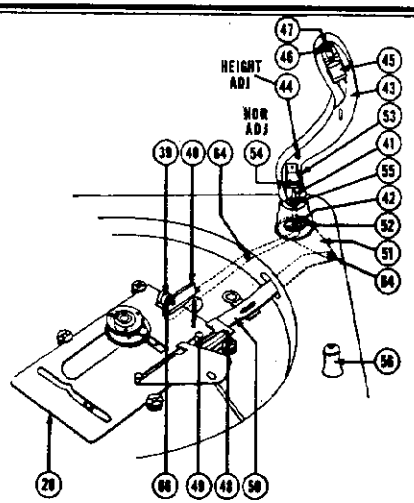


Fig. 5

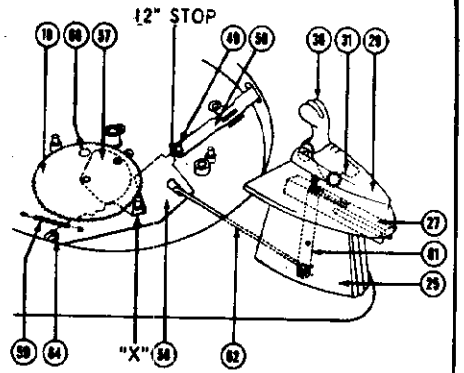


Fig. 6

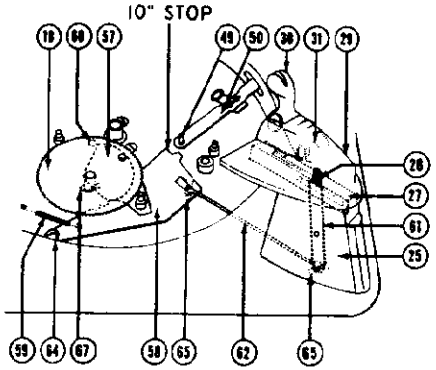


Fig. 7

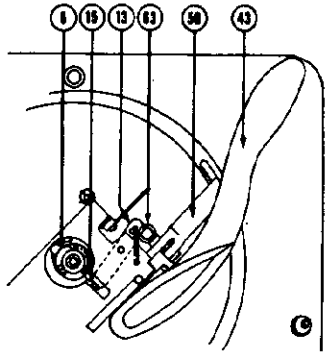


Fig. 8

Lowering Pick-up Arm (43) to the record.

1. When Main Slide (20) has almost reached its front left position, Lift Roller (39) disengages Lift Lever (40).
2. This releases the upward pressure on Lift Rod (41) and allows Pick-up Arm (43) to set down on the record.

SETTING FOR DESIRED RECORD SIZE
Record Support Arm (29) set to 12" position.
(Fig. 6)

1. When changer starts to cycle, Cam (57) under Main Drive Gear (18) actuates the Index Plate (58).
2. Index Plate (58) moves toward center of changer until it contacts lower right roller stud (see point "X" in Fig. 6).
3. Projection on end of Index Plate (58), designated as the "12 STOP," is now directly in the path of Stud (49) on Link Assembly (50).
4. As Pick-up Arm approaches record it moves Link Assembly (50) and attached Stud (49) until the stud comes in contact with the "12" STOP" (see Fig. 6)—this determines the correct set-down point of Pick-up Arm for 12" records.
5. After Pick-up Arm is lowered to the record, then Bottom Drive Roller (60) under Main Drive Gear (18) displaces the Index Plate (58) so that "12" STOP" projection disengages Stud (49) and permits Pick-up

Record Support Arm (29) set to 10" position. (Fig. 7)	1. When Record Support Arm (29) is shifted to this position it moves Channel (27) which actuates Index Lever (61). That allows Index Link (62) to control the 10" setting of Index Plate (58). 2. When the changer starts to cycle, Index Plate (58) moves toward center of changer until it is stopped by Index Link (62). 3. Notch at end of Index Plate (58), designated as the "10" STOP," is now in the path of Stud (49) on Link Assembly (50). 4. As Pick-up Arm approaches record it moves Link Assembly (50) and attached Stud (49) until the stud comes in Contact with the "10" STOP" (see Fig. 7)—this determines the correct set-down point of Pick-up Arm for 10" records. 5. After Pick-up Arm is lowered to the record, then Bottom Drive Roller (60) under Main Drive Gear (18) displaces the Index Plate (58) so that the "10" STOP" disengages Stud (49) and permits Pick-up Arm to proceed across the record.
CHANGING A RECORD (Fig. 8) Pick-up Arm (43) approaches end of record.	1. Trip Roller (63) on Link Assembly (50) approaches and moves Reject Lever (13) so that this lever releases Clutch Arm (15). 2. As Clutch Arm (15) is released, it engages the rotating Clutch and Turntable Shaft (8) which starts the entire mechanism thru its change cycle.
REJECTING A RECORD Depressing "REJ" Button (3).	1. This starts the change cycle as described above under "CYCLING" and permits the next record to be played.
STOPPING Depressing "OFF" Button (2).	1. Turns Switch (5) to off position and Motor (6) stops.

PARTS LIST

DIAG. NO.	PART NO.	DESCRIPTION
1	505947	"ON" Button
2	505948	"OFF" Button
3	505949	"REJ" Button
4	505950	Push Button Shaft
5	505758	Switch—"ON-OFF"
6	505758	Motor 115V; 60 cyc.
	505750	Motor 115V; 50 cyc.
7	505951	Idler Wheel
8	505952	Clutch and Turntable Shaft
9	505953	Clip—Motor Mounting
10	505954	Reject Link
11	505955	Reject Arm
12	505956	Reject Arm Spring
13	———	Reject Lever (part of item 20)
14	505957	Reject Lever Spring
15	———	Clutch Arm (part of item 17)
16	505958	Clutch Arm Spring
17	505959	Pinion Gear (includes Clutch Arm and Clutch Arm Spring)
18	505960	Main Drive Gear
19	505961	Top Drive Roller
20	505962	Main Slide (includes Reject Lever, Ejector Roller, Reject Lever Spring, Lift Roller, and Return Return Slide)
21	505963	Main Slide Roller
22	505964	Ejector Roller
23	505965	Ejector Arm
24	505966	Ejector Link
25	505967	Record Post Assembly (includes Eject Lever, Index Lever, Channel and Channel Spring)
26	———	Ejector Lever (part of item 25)
27	———	Channel (part of item 25)
28	505968	Channel Spring
29	505969	Record Support Arm (includes Record Clip and Record Clip Spring)
30	———	Record Clip (part of item 29)
31	———	Record Clip Spring (part of item 29)
32	505970	Center Post
33	505971	Turntable Main Bearing
34	505972	Main Bearing Bracket

DIAG. NO.	PART NO.	DESCRIPTION
35	505973	Ball Bearing Retainer
36	505974	1/8" Ball Bearings
37	505975	Center Post Support Plate
38	505976	Screw—#4-40 x 3/16"
39	505977	Lift Roller
40	505978	Lift Lever
41	505979	Lift Rod
42	505980	Lift Rod Spring
43	505981	Pick-up Arm (less Cartridge)
44	———	Height Adjustment Screw (part of item 43)
45	505100	Crystal Cartridge (includes needle)
46	505717	Needle
47	505716	Set Screw for Needle
48	———	Return Slide (part of item 20)
49	———	Stud (part of item 50)
50	505982	Link Assembly (includes Trip Roller)
51	505983	Follower Arm and Pick-up Shaft
52	505984	Index Spring
53	505985	Pick-up Hinge Assembly
54	———	Horizontal Adjustment Screw (part of item 53)
55	505986	Set Screw
56	505987	Rest Post
57	———	Cam (part of item 18)
58	505988	Index Plate
59	505989	Index Plate Spring
60	505990	Bottom Drive Roller
61	———	Index Lever (part of item 25)
62	505991	Index Link
63	———	Trip Roller (part of item 50)
64	505992	Shoulder Bushings
65	505993	1/8" Spring Clip
66	505994	3/16" Spring Clip
67	505995	1/4" Spring Clip
	505996	Turntable
	505976	Screw—#4-40 x 3/16" for Turntable
	500968	Plug for Phono. Pick-up Cable
	501031	Plug for Phono. Motor Cable
	505997	Rubber Bushing for Mtg. Record Changer
	505998	Screw for Mtg. Record Changer
	505999	Spring for Mtg. Record Changer

TROUBLE SHOOTING CHART

SYMPTOM	CAUSE	REMEDY
Turntable fails to start after depressing "ON" Button (1).	1. No Power.	Check to determine if there is power at the wall outlet by disconnecting radio power cord and connecting a lamp to same outlet.
	2. Idler Wheel (7) not engaging Turntable.	Check to see that pivot lever under Idler Wheel (7) is free. Also be sure that spring which pulls Idler Wheel (7) toward Turntable is hooked to motor frame and has sufficient tension.
	3. Defective Switch (5).	Check continuity across switch contacts. Replace switch if necessary.
	4. Defective Motor.	Check and replace if necessary.
	5. Binding in changer mechanism.	For analysis of fault see symptom entitled "Changer Stops While Changing a Record."
Changer refuses to cycle after depressing "REJ" Button (3).	1. Reject Link (10) unhooked.	Reconnect as shown in Fig. 3.
	2. Bent Reject Arm (11).	Reject Arm (11) must be flush with record changer base plate. Bent-up end of Reject Arm (11) should contact a projection on Reject Lever (13) when the Reject Button is depressed. Straighten Reject Arm so that it operates freely and properly engages Reject Lever.
	3. Clutch Arm (15) not engaging Clutch and Turntable Shaft (8) when released by Reject Lever (13).	Check for broken, loose or missing Clutch Arm Spring (16). Replace or rehook this spring as shown in Fig. 3. Also note whether Clutch and Turntable Shaft (8) is seated so that Clutch Arm (15) engages clutch teeth. Hold Clutch Arm (15) away from Center Post and allow Clutch and Turntable Shaft (8) to drop all the way down. Then tighten Center Post Screw (38) located at bottom of changer. Center Post (32) should have at least .050" end play when this screw is tight.
Changer stops while changing a record.	1. Grease on Idler Wheel (7) or Turntable rim.	Clean with carbon tetrachloride.
	2. Idler Wheel (7) not engaging Turntable properly.	Check to see that pivot lever under Idler Wheel (7) moves freely. Also be sure that spring which pulls Idler Wheel (7) toward Turntable is properly engaged and has sufficient tension.
	3. Binding in changer mechansim.	Remove the three screws located on top of the Turntable near the Center Post (32) so that Turntable may be lifted off. Then depress "REJ" Button (3) and rotate Clutch and Turntable Shaft (8) **clockwise** by hand. Check all parts for binding action. Be sure Main Slide Rollers (21) are free.
	4. Binding between shoulder on Center Post (32) and top surface of Turntable Shaft (8).	There should be at least .005" end play in Center Post (32). Pinion Gear (17) and Clutch and Turntable Shaft (8) should be pushed down as far as possible and be sure that they are not binding against surrounding parts.
	5. Low line voltage.	Line voltage should not be less than 100 volts.
	6. Operating temperature too low.	If the changer has been stored in a cold room, the Turntable speed may be slower than normal.
	7. Weak Motor (6).	If, after checking the above six items, the changer continues to stall, it may be assumed that the Motor (6) has low torque and should be replaced.
Changer cycles continuously.	1. Reject Lever Spring (14) unhooked, broken or miss-	Rehook or replace Reject Lever Spring (14) in correct position as shown in Fig. 3.

	2. Binding of reject mechanism so that Reject Lever (13) fails to engage and hold Clutch Arm (15).	Remove any binding between the following parts: "REJ" Button (3), Reject Link (10), Reject Arm (11) and Reject Lever (13). Check for burrs on contacting surfaces at bent-up portion of Reject Arm (11) and bent-down projection of Reject Lever (13).
	3. Pinion Gear (17) improperly set in respect to Main Drive Gear (18).	To obtain correct setting of these gears, refer to section entitled "Timing Adjustment of Pinion Gear" on Page 8.
Record fails to drop off of Support Arm at correct time during the change cycle.	1. Record Support Arm (29) improperly "locked" in 10" or 12" position.	Be sure Record Support Arm (29) is properly set as outlined in the section entitled "Setting For Size of Records" on Page 1. Care should be exercised that Record Support Arm (29) **"locks" in a level position.**
	2. Record size not standard.	A standard 10" record has a diameter of 9-7/8" ± 1/32" and a standard 12" record has a diameter of 11-7/8" ± 1/32".
	3. Ejector mechanism bent or loose.	Check for bent, loose or unhooked Ejector Link (24). Ejector Arm (23) should, at all times, contact Ejector Roller (22) on Main Slide (20); see Fig. 4 for location of these parts.
	4. The distance from Center Post (32) to Record Support Arm (29) is incorrect.	Using a **new** and **standard** record as a gauge, place it so that it rests on the off-set of the Center Post (32) and edge is at the **top step** of Record Support Arm (29). There should be a clearance of 1/32" between edge of record and back of this step. If that clearance is insufficient, loosen the three screws holding the Record Post Assembly (25) at base of changer and move the entire Record Post Assembly away from the Center Post. Be sure that Record Support Arm (29) is so placed that the curvature of the step matches the curve of the record—both corners of the Arm must be equidistant from the edge of the record. Recheck to see that clearance has been maintained after screws are retightened.
Multiple dropping of records OR Records drop at wrong time and land on Pick-up Arm.	1. Hole in record too large.	Records with badly worn center hole should be discarded.
	2. Slide in top of Center Post (32) has failed to return to its lowest position.	Clean out any foreign matter that might prevent free movement of slide at top of Center Post.
	3. The distance from Center Post (32) to Record Support Arm (29) is incorrect.	Using a **new** and **standard** record as a gauge place it so that record rests on off-set in the Center Post and edge rests on **top step** of Record Support Arm. There should be a clearance of 1/32" between edge of record and back of top step. If this clearance is insufficient loosen the three screws holding the Record Post Assembly (25) at base of the changer and move the entire Record Post Assembly toward the Center Post. Be sure that Record Support Arm is so placed that the curvature of the step matches the curve of the record—both corners of the arm must be equidistant from the edge of the record. Recheck to see that clearance has been maintained after screws are retightened.
Pick-up Arm (43) fails to move during change cycle.	1. Lift Lever (40) bent so that it fails to engage Lift Rod (41).	Straighten tip of Lift Lever (40) so that it contacts and actuates the Lift Rod (41) during the change cycle. (See Fig. 9).
	2. Binding between Pick-up Arm Hinge Assembly (53) and hub.	There should be from .005" to .010" end play between Pick-up Arm Hinge Assembly (53) and the hub on base plate. Loosen Set Screw (55) and adjust for proper clearance. If necessary, readjust set-down point by means of Horizontal Adjustment Screw (54).
	3. Return Slide (48) is too loose.	Return Slide (48) must have enough tension to pull Link Assembly (50) to the proper stop position. If it is too loose it will be necessary to replace the entire Main Slide (20). For a description of the function of these parts see section entitled "Lateral Motion of Pick-up Arm toward Center Post" on Page 2.
	4. Stud (49) binding against Ejector Arm (23).	There should be about 1/32" clearance between top of Stud (49) and bottom of Ejector Arm (23) when the Stud passes under the arm. Bend Ejector Arm (23) to provide this clearance.

Pick-up Arm and Needle fail to contact first record.	1. Height of Pick-up Arm (43) is incorrectly set.	With changer mechanism in normal playing position, turn Height Adjustment Screw (44) **counter-clockwise** (see Fig. 5) until Pick-up Arm lands properly on first record.
	2. Leads to Crystal Cartridge are tightly drawn causing binding of Pick-up Arm.	Be sure electrical leads to Crystal Cartridge (45) have sufficient slack to allow Pick-up Arm (43) to move freely.
Top of Pick-up Arm (43) striking Record Support Arm (29) or stack of records while changer is cycling.	1. Height of Pick-up Arm (43) is incorrectly set.	When Pick-up Arm is elevated to the highest point during the change cycle, turn Height Adjustment Screw (44) **counter-clockwise** (see Fig. 5) until Pick-up Arm clears Record Support Arm (29).
Needle strikes edge of record as Pick-up Arm approaches set-down point OR Arm strikes Rest Post during change cycle.	1. Height of Pick-up Arm is incorrectly set.	With Pick-up Arm in the position where it is approaching a full stack of 12 ten inch records, turn Height Adjustment Screw (44) **clockwise** (see Fig. 5) until Needle clears edge of top record.
Pick-up Arm (43) sets down at wrong starting point on record.	1. Crystal Cartridge (45) off center in its mounting bracket.	Slide Cartridge (45) until it is centrally located in the supporting bracket at front of Pick-up Arm (43).
	2. Incorrect adjustment of set-down point.	With the changer turned off, depress the "REJ" Button (3) and rotate Turntable by hand until needle approaches its set-down point. Then, insert a screwdriver in the hole at rear of Pick-up Arm (43) and turn Horizontal Adjustment Screw (54) clockwise to move arm away from Center Post or counter-clockwise to move arm towards Center Post (see Fig. 5 for location of this adjusting screw). Should it be found that Pick-up Arm (43) cannot be moved sufficiently by the foregoing adjustment, it will be necessary to loosen Set Screw (55) and reposition the Pick-up Arm Hinge Assembly (53) on Pick-up Shaft (51). Fine adjustment can then be made by turning Horizontal Adjustment Screw (54) until Pick-up Arm has reached the desired point. CAUTION: When tightening Set Screw (55) be sure that there is from .005" to .010" end play between Pick-up Arm Hinge Assembly (53) and hub on base plate.
	3. Index Plate Spring (59) broken, loose or missing.	Rehook or replace Index Plate Spring (59).
Pick-up Arm (43) sets down in the 10" position when playing 12" records.	1. Record Support Arm (29) improperly "locked" in the 12" position.	Be sure Record Support Arm (29) is properly set for 12" operation as outlined in the section entitled "Setting for Size of Records" on Page 1. Care should be exercised that Record Support Arm (29) **"locks" into a level position.**
	2. Bent Index Link (62).	Straighten Index Link (62) so that Index Plate (58) is in the position shown in Fig. 6 with notch in plate **at point "X"** resting against stud of slide roller.
Pick-up Arm (43) sets down in 12" position when playing 10" records.	1. Record Support Arm (29) improperly "locked" in 10" position.	Be sure Record Support Arm (29) is properly set for 10" operation as outlined in the section entitled "Setting for Size of Records" on Page 1. Care should be exercised that Record Support Arm (29) is pushed towards the Center Post as far as it will go and **"locks" into a level position.**
	2. Index Link (62) is too long.	Bend Index Link (62) so that Index Plate (58) is in the position indicated by the title "10" Stop" in Fig. 7. CAUTION: Care should be exercised not to bend Index Link too much as it might cause Pick-up Arm to set

Pick-up Arm does not set down at same position consistently.	1. Plates at base of Pick-up Shaft (51) fail to return to position where notches coincide.	Remove any burrs on edge of plates at bottom of Pick-up Shaft (51) so that Index Spring (52) will return these plates to the position where the notches in each coincide as shown in Fig. 9.
	2. Index Spring (52) broken, improperly hooked or missing.	Rehook or replace as shown in Fig. 9.
	3. Binding between Pick-up Arm Hinge Assembly (53) and hub.	There should be from .005" to .010" end play between Pick-up Arm Hinge Assembly (53) and the hub on the base plate. Loosen Set Screw (55) and adjust for proper clearance. If necessary, readjust set-down point by means of Horizontal Adjusting Screw (54).
	4. Excess play in Pick-up Arm Link Assembly (50).	There should be no appreciable play between Link Assembly (50) and Follower Arm (51) at point of attachment If necessary, replace Shoulder Bushing (64).
Improper "tracking" of needle with record—needle slips out of grooves and skips portions of record.	1. Foreign matter in record grooves.	Clean record with record brush or soft camel hair brush.
	2. Badly worn record.	Examine record for scratches that may have destroyed continuity of grooves.
	3. Needle (46) may not be properly protruding from metal guard at bottom of Crystal Cartridge (45).	Bend Needle (46) downward until the tip protrudes 1/32" beyond metal guard at base of cartridge.
	4. Badly worn needle (46).	Examine needle for worn tip and replace if necessary. To remove the old Needle (46) release the small set screw visible and accessible at front of the cartridge. When installing a new needle, always insert it in the cartridge so that flattened surface on its shaft faces the set screw.
	5. Crystal Cartridge (45) locked in a retracted position.	Shift position of Crystal Cartrige (45) until it is centrally located in its mounting bracket. This will allow the cartridge to regain its "floating" action.
	6. Stud (49) binding against Ejector Arm (23).	There should be about 1/32" clearance between top of Stud (49) and bottom of Ejector Arm (23) when the stud passes under the arm. Bend Ejector Arm (23) to provide this clearance.
	7. Binding between Pick-up Arm Hinge Assembly (53) and hub.	There should be from .005" to .010" end play between Pick-up Arm Hinge Assembly (53) and the hub on base plate. Loosen Set Screw .005" end play when this screw is tight.
Changer cycles before record is finished playing.	1. Trip (63) engages Reject Lever (13) too early.	When the Needle is 1 3/4" away from the edge of Center Post (32), Trip (63) should start to engage Reject Lever (13) thus releasing Clutch Arm (15) which permits changer to cycle. See Fig. 8 for relative position of parts. If trip point occurs too early, loosen the two screws holding trip (63) and move it in a direction away from the Center Post. Then, retighten screws.

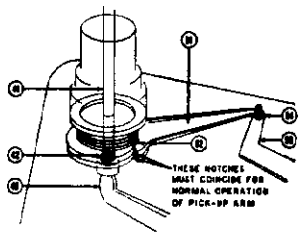


Fig. 9

STEWART-WARNER CORP. MODEL A-5056

Changer fails to cycle after playing a record.	1. Trip (63) does not properly engage Reject Lever (13) when Pick-up Arm reaches end of record.	When the Needle is 1 3/4" away from the edge of Center Post (Trip (63) should start to engage Reject Lever (13) thus releasing Clu Arm (15) which permits changer to cycle. See Fig. 8 for relative posit of parts. If trip fails to engage Reject Lever, loosen the two screws ho ing Trip (63) and move it toward the Center Post. Then, retighten scre
	2. Clutch Arm (15) not engaging Clutch and Turntable Shaft (8) when released by Reject Lever (13).	Check for broken, loose or missing Clutch Arm Spring (16). Replace rehook as shown in Fig. 3. Also note whether Clutch and Turntc Shaft (8) is seated so that Clutch Arm (15) engages clutch teeth. H Clutch Arm (15) away from Center Post and allow Clutch and Turntc Shaft (8) to drop all the way down. Then tighten Center Post Screw located at the bottom of changer. Center Post should have at le .005" end play when this screw is tight.
Slow Turntable speed.	1. Grease on Idler Wheel (7) or Turntable rim causing slipping.	Clean surfaces with carbon tetrachloride.
	2. Idler Wheel (7) not properly engaging Turntable.	Check to see that pivot lever under Idler Wheel (7) is free. Also be s that spring which pulls Idler Wheel (7) toward Turntable is hooked motor frame and has sufficient tension.
	3. Binding at Clutch and Turntable Shaft (8).	Remove Turntable and check for binding of shaft. Also check cleara between shaft and shoulder of Center Post. There should be at le .005" end play between Center Post Shoulder and Turntable Shaft. sure that Pinion Gear (17) and Clutch and Turntable Shaft (8) are pus down as far as possible.
	4. Line voltage is too low.	Line Voltage should not be less than 100 volts.
	5. Operating temperature too low.	If the changer has been stored in a cold room, the Turntable sp may be slower than normal.
	6. Faulty Motor.	If, after checking the above five items, Turntable speed is still too sl then it may be assumed that the Motor is at fault and should be repla
Rumble or "wow".	1. Changer not floating freely on its mounting springs.	Be sure the three hold-down screws used for mounting the chan have been loosened sufficiently to allow the entire unit to float fre
	2. Improper motor mounting.	Be sure that Motor (6) is mounted on rubber bushings.
	3. Worn tire on Idler Wheel (7).	Examine Idler Wheel for flat spots on tire and replace entire whee required.
Noisy Operation.	1. Clicking noise resulting from incorrect timing of Pinion Gear (17).	To obtain correct setting of Pinion Gear, refer to section entitled "Tim Adjustment of Pinion Gear" on Page 8.
	2. Lack of lubricant.	See "Lubrication" on Page 8.
	3. Binding at some point in changer mechanism.	Remove Turntable and depress "REJ" Button (3). Then, rotate Clutch Turntable Shaft (8) **clockwise.** Observe action of mechanism to loc components that are causing binding and attendant noise.

PROCEDURES FOR REMOVAL AND REPLACEMENT OF MAJOR PART

NAME OF ITEM	METHOD OF REMOVING OR REPLACING
Crystal Cartridge (45).	To remove this part, hold Pick-up Arm in a vertical position and grasp Crystal Cartridge (45) near the fr Then push the cartridge down toward rear of Pick-up Arm (43) and, at the same time, pull it away f the arm. Do not attempt to unsolder lead connections—merely slip the "quick disconnect" electrical nectors off of prongs at rear. To replace a cartridge, insert it in the arm so that flat spring hooks over lip of mounting bracket. T pull it outward slightly and at the same time pull forward until the two ears on the bracket fit into "V" groove in the body of cartridge. Be sure cartridge is centrally located and has a "floating acti Also be sure that needle protrudes 1/32" beyond metal guard.
Needle (46).	To remove the Needle, loosen small Set Screw (47) visible and accessible at front of cartridge. A Needle may be installed by inserting it so that flattened side of shaft faces the set screw.
Pick-up Arm (43).	To remove the Pick-up Arm, disconnect leads from crystal cartridge as described above. Then use a scr driver to disengage flexible ends of hinge at the pivot point. Replacement of the Arm is accomplished re-engaging the hinge at the same point.
Follower Arm and Pick-up Shaft (51).	To remove this part, take out screw that holds Lift Lever (51) to bracket at base of changer. Lift Rod will then drop out—be careful not to lose Lift Rod Spring (42). Remove screw that holds Link Assembly to Follower Arm and loosen Set Screw (55). Entire Follower Arm assembly may then be withdrawn bottom of changer. To replace the arm, apply the reverse procedure.
Record Support Arm (29	This part is held in place by two screws located in Record Support Channel (27) which is located immedic below the Record Support Arm (29). To reach these screws, move arm forward or backward as requ
Drive Mechanism.	To disassemble mechanism, proceed as follows: 1. Remove Turntable by taking out three screws located near the Center Post (32). 2. Take-out Screw (38) located at base of changer and Center Post may then be withdrawn. 3. Lift out Clutch and Turntable Shaft (8); also remove Pinion Gear (17). 4. Disconnect Ejector Link (24) from Ejector Lever (26) by taking off Spring Clip (65). Then, swing Ej Lever (26) to one side. 5. Remove hairpin type Spring Clip (66) on each stud of the Main Slide Rollers (21). Main Slide can now be taken out of the mechanism. 6. All remaining parts are easily accessible.

MODEL A-505650 STEWART-WARNER CORP.

NAME OF ITEM	METHOD OF REMOVING OR REPLACING
Drive Mechanism.	The Drive mechanism may be reassembled by reversing the above procedure and exercising the following precautions: 1. Before replacing Main Slide (20), be sure that Top Drive Roller (19) and Bottom Drive Roller (60) are in position. Also see that Stud (49) is in front of upward projection on base plate and fits into slot in Main Slide (20). 2. Be sure Return Slide (48) is in the position shown in Fig. 5 so that "L" shaped section does not contact Stud (49). 3. When replacing Pinion Gear (17), hold end of Reject Lever (13) away from Center so that gear can drop all the way down. Correct placement of Pinion Gear (17) is very important and is described in Steps 1 and 2 of the next section entitled "Timing Adjustment of Pinion Gear". When replacing Clutch and Turntable Shaft, hold Clutch Arm (15) away from center until shaft is properly seated. 4. After Center Post has been installed and Screw (38) at base is tightened, check for .005" clearance between shoulder on Center Post and top of Clutch and Turntable Shaft (8).
Timing Adjustment of Pinion Gear.	Proper operation of the changer mechanism requires the establishment of a definite timing relation between Pinion Gear (17), Main Drive Gear (18), Clutch Arm (15) and Reject Lever (13). To position these parts for correct timing, proceed as follows: 1. Rotate Main Drive Gear (18) until Top Drive Roller (19) is **centrally** located in cross slot of Main Slide (20); see position in Fig. 3. In this position the roller is equidistant from either end of the slot. 2. Mesh Pinion Gear (17) with Main Drive Gear (18) so that "Brass Rivet" on Clutch Arm (15) is directly opposite Reject Lever (13) as shown in Fig. 10. 3. After installing Clutch and Turntable Shaft (8) rotate it **counter-clockwise.** Clutch Arm (15) will be partially displaced. At the point of maximum displacement, tip of Clutch Arm (15) should be in line with **front edge** of Reject Lever (13) as shown in Fig. 11. a. If Reject Lever (13) engages Clutch Arm (15), as shown in Fig. 10, when Clutch Arm is at point of maximum displacement then Pinion Gear (17) must be re-meshed one tooth clockwise. b. If Reject Lever (13) is in the position shown in Fig. 12, when Clutch Arm is at point of maximum displacement, then Pinion Gear (17) must be re-meshed one tooth counter-clockwise. c. If necessary, fine adjustment of Reject Lever and Clutch Arm position may be accomplished by making a slight bend in tip of lever until it is flush with tip surface of Clutch Arm as shown in Fig. 11. 4. After Pinion Gear (17) is correctly meshed, rotate Clutch and Turntable Shaft **clockwise** so that the mechanism goes thru its change cycle. As cycle is completed, Reject Lever (13) should engage Clutch Arm (15) as shown in Fig. 10. Clutch and Turntable Shaft (8) will then be fully disengaged and rotates independent of the changer mechanism.
Turntable Main Bearing (33)	Turntable Main Bearing (33) is held in position by three screws which are located on top surface of base plate and will be accessible only upon removal of the entire changer mechanism. After taking out these screws then remove Center Post Support Plate (37) and exercise care to avoid loss of the six Ball Bearings (36). When replacing the Turntable Main Bearing (33) be sure to check for correct spacing between Center Post (32) and Record Support Arm (29).

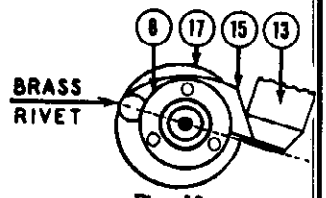
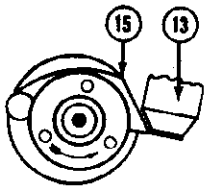


Fig. 10



Clutch Arm (15) and Reject Lever (13) shown in correct timing position.
Fig. 11

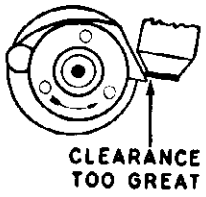


Fig. 12

LUBRICATION

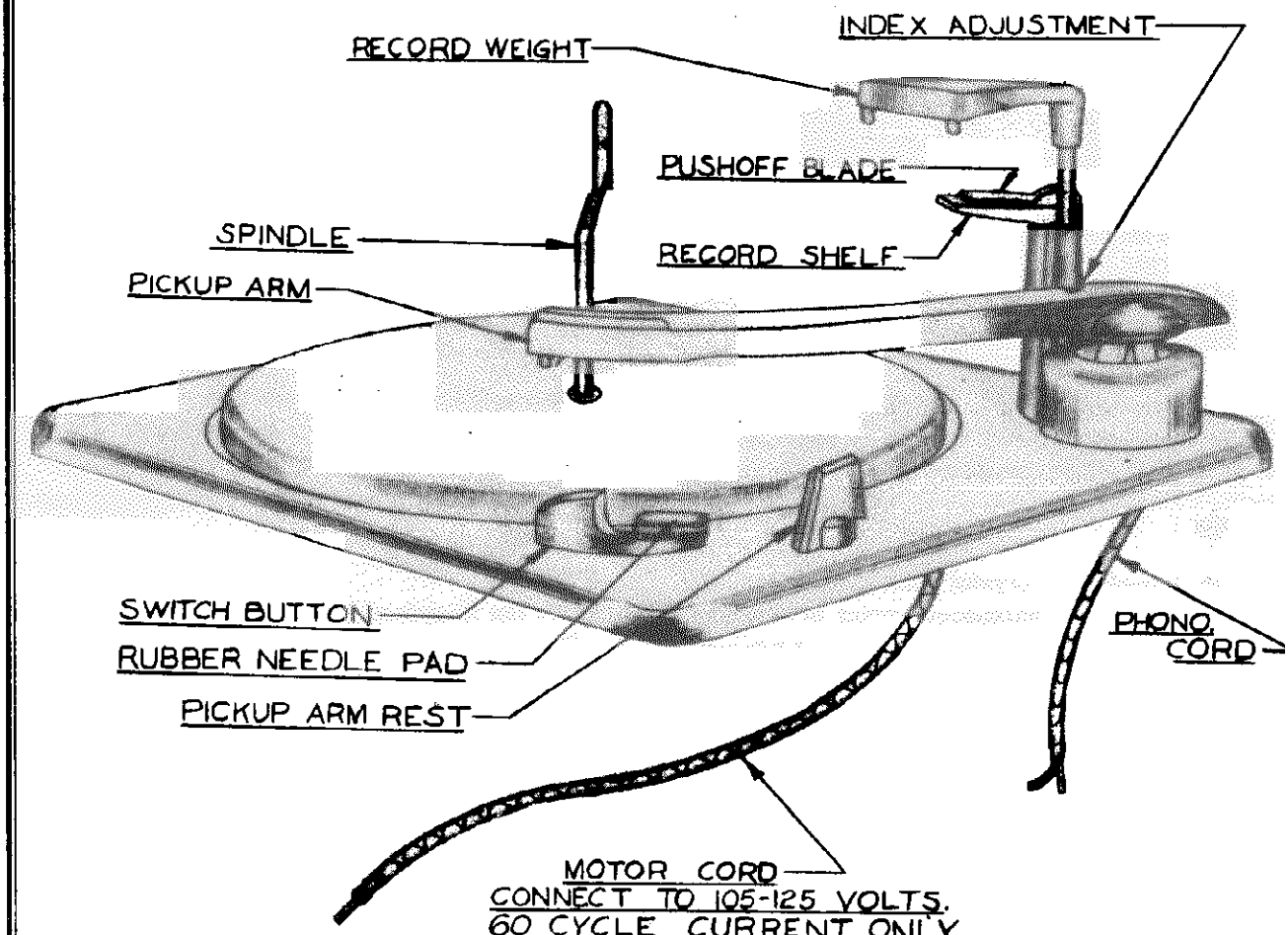
The record changer leaves the factory completely oiled and lubricated. Under normal conditions this should be adequate for the life of the product. When operated under extreme conditions of dust or heat, lubrication should be performed as required and in accordance with the following recommendations.

Use fine oil on Main Slide Rollers and other bearing surfaces with the exception of the bearing for Clutch and Turntable Shaft (8) and upper part of Turntable Main Bearing (33) which have "Oilite" bearings and require no lubricant.

Use light cup grease to lubricate Ball Bearings (36) and Ball Bearing Retainer (35) at base of Turntable Main Bearing (33).

DO NOT ATTEMPT TO OIL THE MOTOR UNDER ANY CIRCUMSTANCES.

WEBSTER CHICAGO CORP. MODEL 1



The Webster-Chicago Model 148 is a single post, spring-cushioned spindle, automatic record changer.

Model 148 features the exclusive Webster-Chicago Velocity Trip mechanism. The pickup arm is not actuated by "lead-in" springs and there is a minimum of lateral pressure. The arm travels freely in either direction. This lack of lateral pressure or inertia add immeasurably to the life of records and is considered to be as important as extra light vertical pressure, which in some instances would result in poor tracking at extremely low or high frequencies.

When set for automatic operation, Model 148 will continue to repeat a single record placed on the turntable (or the last record of a stack) until the Control Knob is returned to the STOP position.

OPERATION

MOTOR

Connect the motor cord to a source of 105-115 volt 60 cycle current only. If it is desired to operate the changer on 50 cycle current, a special motor pulley (Part No. 17X412-11) must be used in place of the one supplied with the changer in order to drive the turntable at the required speed of 78 R.P.M.

Do not under any circumstances connect the motor to a source of direct current or alternating current of any other frequencies.

PICKUP

The high impedance crystal cartridge supplied may be of the fixed permanent point or removable needle type. If it is the latter, use a needle which is not more than $^{11}/_{16}$ inches long for most satisfactory results.

Some desirable qualities of a good needle are faithful reproduction, low surface scratch or hiss, long wearing qualities, minimum record wear and rugged construction.

The Webster-Chicago Nylon Needles are particularly adaptable for use with your Webster-Chicago "148". Do not use single play or cactus needles for automatic operation. Such needles require frequent replacement or sharpening and are not designed to play a full stack of records.

OPERATION — AUTOMATIC

1. Turn the Record Shelf forward or back for ten or twelve inch records.
2. With the record ballast weight lifted and turned forward out of position, place up to ten 12" records or twelve 10" records on the spindle so that the bottom record rests on the step of the spindle and on the Record Shelf.
3. Turn the record ballast weight and lower it until it rests on the top record.
4. Move the control knob from the STOP position (nearest the pickup arm rest) to the START-REJECT position (farthest from the pickup arm rest) and release. The control will then drop back into the automatic playing position and mechanism will continue to operate automatically until the control is moved to the STOP position.
5. To reject any record while playing in the automatic position, move the control knob momentarily to the START-REJECT position and release.

NOTE: The mechanism may be turned off at any time or during any portion of the change cycle by moving the control knob to the STOP position.

The pickup arm may be moved horizontally at any time without damage to the mechanism. However, the pickup arm cannot be returned to the pickup arm rest until the change cycle has been completed.

After the last record has been played, the entire stack may be removed from the turntable at one time. The simplest procedure is as follows:

a. Place the pickup arm on the pickup arm rest.
b. Lift and turn the record ballast weight out of position.
c. Place the fingers of both hands under opposite edges of the bottom record.
d. Do not apply pressure to the top record. (Keep your thumbs free.)
e. Lift the stack of records straight up following the contours of the spindle. This permits the stack of records to follow the curve of the spindle without binding and greatly facilitates the removal of the stack.

OPERATION — MANUAL

1. Turn the Record Shelf to the TWELVE inch position (this is not essential but permits more clearance in loading and unloading records.)
2. Place a record on the turntable.
3. Move the control knob from the STOP position to the AUTOMATIC position, then toward the spindle to the MANUAL position, as indicated by the arrow on the control knob.

   No harm will result if the knob is accidentally moved to the START-REJECT position. If a twelve inch record is on the turntable, the arm will automatically index to the edge of the record. If a ten inch record is on the turntable, the needle will be set down gently on the rubber pad and the arm may be moved to the edge of the record.
4. Place the needle gently on the edge of the record. Particular care should be exercised if your pickup has a sapphire point needle. Although the sapphire is very hard and long wearing, it is extremely brittle and may be fractured or chipped if dropped on the record.
5. To stop the mechanism at any time, move the control knob to the STOP position.

SERVICE INFORMATION

All units are accurately adjusted, lubricated and tested at the factory. However, service repairs and adjustments sometimes become necessary. This bulleti... should be studied carefully before making any adjustments or replacing parts.

Service parts are available from your Webster-Chicago distributor. All parts must be ordered by piece part number and also record changer model and production number, stamped on the under side of the main plate.

The functions and most probable misadjustments of the main assemblies are as follows (reference numbers refer to the exploded views on pages 14 and 16):

THE AUTOMATIC TRIP FAILS TO FUNCTION

The Main Cam Assembly (32) and Actuating Gear (31) are the heart of the record changer. The Main Cam Assembly drives the mechanism associated with the action of the Pickup Arm (7) and the Record Selector assemblies. It, in turn, is driven by the gear train (28, 29, 30) and the Turntable which is rim driven by the phonograph motor.

The Main Cam Assembly and Actuating Gear is put in motion or "tripped" by means of the "automatic" trip or by the manually operated "reject" trip. When the movement of the Pickup Arm toward the spindle is greater than ⅛" in ½ revolution of the turntable, the Automatic Trip Arm (35) trips the Velocity Trip and Roller Assembly (33). This releases the Actuating Pawl on the Main Cam Assembly (32), allowing it to engage th Main Cam Actuating Gear (31) and driving through the change cycle. The pressure from th Automatic Trip Arm required to actuate the tri mechanism is negligible.

The Automatic Trip Arm follows the movement c the Pickup Arm through a weighted friction clutc (34). This clutch must be kept free of oil an grease. If the clutch does not cause the Automati Trip Arm to trip the mechanism, clean the clutc parts with carbon tetrachloride. This clutch shoul operate the trip mechanism without placing un due drag on the movement of the pickup arm.

Also check for:

1. Velocity Trip and Roller Assembly (32) bind ing.
2. Slight burr on end of the Actuating Pawl o on the underside of the hook end of the Veloc ity Trip and Roller Assembly.
3. Actuating Pawl stuck (part of Main Cam As sembly (32) engaged by the hook end of th Velocity Trip and Roller Assembly (33).
4. Automatic Trip Arm (35) bent and not hittin the Velocity Trip and Roller Assembly (33).
5. Automatic Trip Arm (35) fails to touch th Velocity Trip and Roller Assembly.
6. Velocity Trip and Roller Assembly (33) rub bing on the underside of the Main Cam Actu ating Gear (31).
7. No velocity lead-in groove or eccentric groov in the center of record.

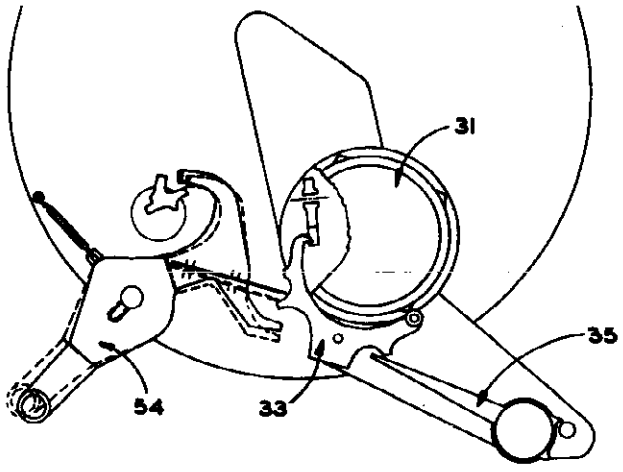
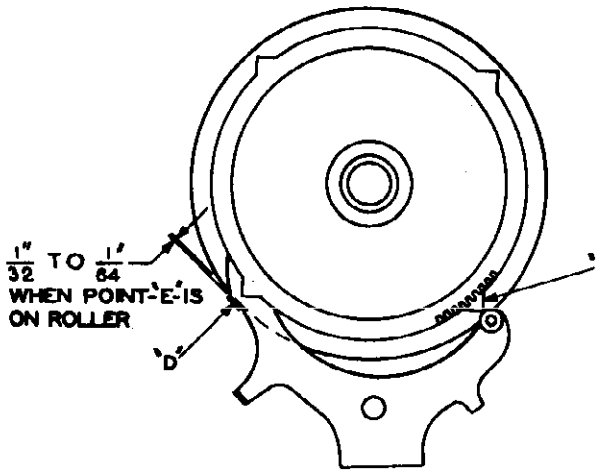


Fig. 1



ADJUST IF NECESSARY BY BENDING AT POINT "D".

Fig. 2

8. Foreign matter in record groove.
9. Badly worn record.
10. Badly bent or worn needle.

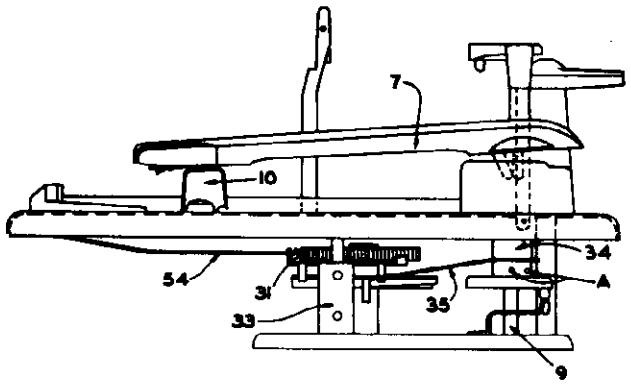


Fig. 3

IF THE "REJECT" TRIP FAILS TO FUNCTION

When the control knob is moved to the extreme START-REJECT position, the hair spring of the Reject Trip Lever Arm (54) actuates the Velocity Trip and Arm Assembly, putting the change mechanism in cycle. See Fig. 1.

Check for:

1. "Reject" trip hair spring of Lever 54 bent or broken.
2. Velocity Trip and Roller Assembly (33) binding.
3. Actuating Pawl stuck (part of Main Cam Assembly 32).

IF THE MECHANISM CONTINUES TO CYCLE

At the completion of the change cycle, the Actuating Pawl is disengaged from the Main Cam Assembly Actuating Gear by the hook end of the Velocity Trip and Roller Assembly, which has been returned to its normal position by the reset points on the Main Cam Drive Gear, Fig. 2.

If the clearance between the lip on the Velocity Trip Lever and the edge of the Main Cam is too small, it will prevent the hooked end of the Velocity Trip Lever from engaging the trigger. Adjust the clearance between the lip ("D" of Fig. 2) on the Velocity Trip Lever and the Main Cam to be within $\frac{1}{32}$" and $\frac{1}{64}$" when the roller is contacting the point of one of the reset points on the Actuating Gear.

Also check for:

1. Velocity Trip and Roller Assembly (33) rubbing on Main Cam Actuating Gear (31).
2. Manual Trip Lever (54) binding.
3. "Disengage Roller" broken on Velocity Trip and Roller Assembly (33).

PICKUP ARM LIFT TOO HIGH OR TOO LOW

The vertical movement of the pickup arm is controlled by the angle of the pickup arm raising lever (37 and Fig. 4). The needle should approach the top record of a full stack of 10" records on the turntable with approximately $\frac{1}{16}$" clearance.

To adjust:

1. Put a full stack of 10" records ON THE TURNTABLE.
2. Trip the "Start-Reject" control and rotate the turntable clockwise until the needle clears the top record of the stack by about $\frac{1}{16}$"
3. Be sure the notch in the pickup arm raising disc engages the pickup arm raising lever.
4. If the needle does not clear the top record or if it raises too high, adjust by bending the pickup arm raising lever (37) at points X and Y as indicated in Fig. 4.

CAUTION: All adjusting bends should be made slowly, using slight but firm, easy pressure.

Be sure the set screws in the Pickup Arm Raising Disc (36) are not loose and are properly positioned in the alignment holes as explained in the paragraph on Needle Setdown Indexing.

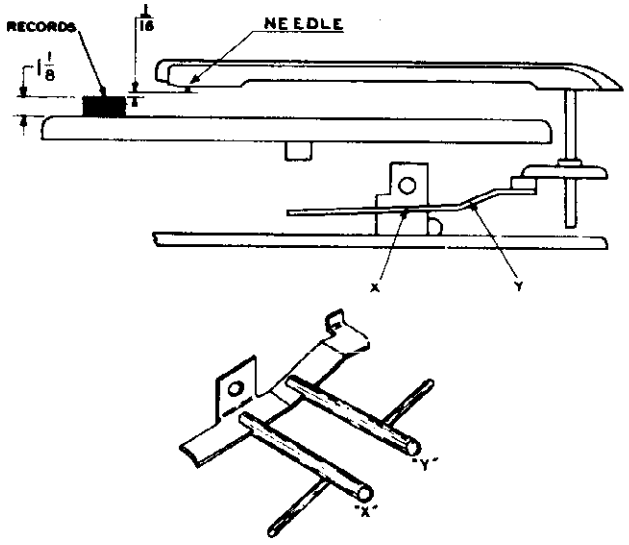


Fig. 4

NEEDLE SET DOWN INDEXING INCORRECT

The horizontal movement of the pickup arm (7) is controlled by the eccentric excursion of the Pickup Arm Raising Lever (37) moving the Pickup Arm Raising Disc (36) when actuated by the Main Cam Assembly (32). The eccentric screw (part of 8). accessible through the top of the pickup arm (7), should take care of any normal position adjustment. Turn this screw clockwise to index the needle in toward the spindle and counter-clockwise to index the needle out away from the spindle.

Should further adjustment be necessary, proceed as follows:

1. Set the eccentric screw, just mentioned, to a middle position.
2. Set the Record Shelf (4) to the 10" position.
3. Operate the mechanism by revolving the turntable manually until the needle drops to within 1/8" of a ten inch record on the turntable.
4. Be sure the notch in the Pickup Arm Raising Disc (36) engages the Pickup Arm Raising Lever (37).
5. The No. 8 Bristol set screws "A" of the Pickup Arm Raising Disc (36, Fig. 3) have pointed ends which fit into off center holes in the Pickup Arm Pivot (9). Alternately loosen one screw and tighten the other until the needle rests above the record lead-in groove at the desired point. Be sure that both set screws are tight when this adjustment is completed.
6. Complete the change cycle of the mechanism and place the pickup arm on the Pickup Arm Rest (10). The tongue of the Pickup Arm Raising Disc (36) should now rest against the post which supports the sub plate assembly. If the pickup arm does not rest in the proper position on the pickup arm rest, bend the tongue closer to or away from this post until the pickup arm is correctly positioned.

   REMEMBER: Always slight but firm, easy bends!
7. Turn the Record Shelf to 12" and check the needle drop on a twelve inch record. Make any additional adjustments with the eccentric screw mentioned previously.

PICKUP ARM DROPS OFF REST

The upturned end of the Pickup Arm Pivot Shaft Bracket (Fig. 3) prevents the Pickup Arm from falling off the Pickup Arm Rest. There should be 1/64" clearance between the tongue of the Pickup Arm Raising Disc (36) and the bottom of the groove formed by the Bracket and the Base Plate Post. Bend the Bracket end up or down to secure proper positioning of the Disc tongue and the Pivot bracket. Be careful to bend the end only or the Bracket will bind on the Pickup Arm Pivot Shaft. The Bracket should not be too high or the Disc tongue will rub on it when the needle approaches the edge of a 12" record, causing "glide in" on the first few grooves of the record.

ERRATIC INDEXING

Indexing in either the 10" or the 12" position is controlled through the presence or absence of pressure from the Compression Spring (45), on the Pickup Arm Raising Lever bracket, forcing the stud to travel the inside edge or the outside edge of the groove in the bottom of the Main Cam. The compression on this spring is changed as the Record Shelf is changed from the 10" to the 12" position. Improper adjustment of the spring tension will result in erratic indexing.

In the 12" position, the spring should be just free. In the 10" position the compression of the spring holds the stud of the Pickup Arm Raising Lever against the outside edge of the groove. If the compression tension needs adjustment:

1. Turn the Record Shelf (4) to the 12" position.
2. Trip the Reject control and rotate the Turntable clockwise until the push off Blade reaches its farthest forward position. At this point the cam follower will be at the highest point on the Main Cam ("A" of Fig. 5).
3. Loosen the lock bolts of (41) and (42).
4. Be sure that the Record Shelf is held in the extreme 12" position while adjusting the Record Shelf and Push-off Blade fingers.
5. At the same time, push the Push-off Blade forward as far as possible and push the Push-off Blade and Record Shelf Assembly downward tight against the Housing (6).
6. Position the Record Shelf finger and the Toggle Assembly (41) so the 12" finger of the Push-off

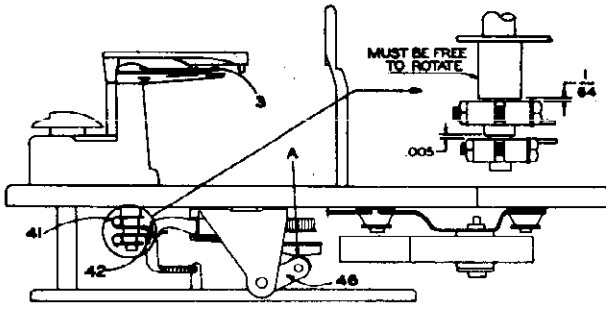


Fig. 5

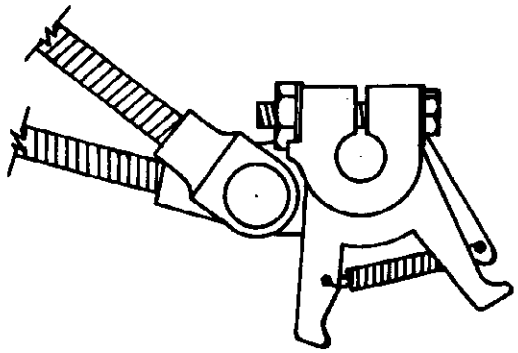


Fig. 6

Blade finger (42) looks like Fig. 6. A visual spacing of approximately 1/64 between the rounded edge of the toggle assembly and the Push-off Blade finger when viewed directly from the bottom of the record changer is required. See Fig. 6. Since these two parts lie on different planes, this adjustment must be made by observation only.

7. While holding the Push-off Blade and Record Shelf Assembly tight against the Housing (6), push the Index Toggle Assembly (41) against the spacer (40) and tighten the lock bolt.
8. Tighten the Push-off Blade bracket lock bolt, leaving approximately 1/64" clearance between the shoulder of the Record Shelf shaft and the Push-off Blade finger bracket (42).

RECORD FAILS TO DROP

The record must leave the spindle step just prior to or at least by the time it leaves the record shelf. If the spindle is too far from the record shelf, the record will hang up on the spindle step and fail to drop.

To adjust:

Press down on the edge of the turntable nearest the Record Shelf to secure proper spacing. DO NOT bend the spindle itself. Also be sure a standard record is used when making this adjustment. A standard 10" record has a diameter of 9 7/8" ± 1/32". A standard 12" record measures 11 7/8" ± 1/32" in diameter.

If the changer still fails to drop records, put the mechanism in cycle and watch the movement of the Push-off Blade. If it fails to protrude beyond the edge of the Record Shelf when at its greatest forward position, adjust the Push-off Blade finger position:

1. Turn the Record Shelf (4) to the 12" position.
2. Trip the Reject control and rotate the Turntable until the Push-off Cam Follower reaches the highest point on the Main Cam ("A" of Fig. 6).
3. Loosen the Push-off Blade finger (42) clamp bolt.
4. Push the Push-off Blade forward as far as possible and hold the Push-off Blade and Record Shelf assembly downward tight against the housing (6).
5. Tighten the Push-off Blade finger clamp bolt (42), leaving 1/64" vertical clearance between the shoulder of the Record Shelf shaft and the Push-off Blade finger (42).

CHANGE CYCLE STARTS BEFORE END OF RECORD

If the Trip Assembly chatters while the changer is running or if the changer cycles before the entire record is played, there is probably insufficient clearance between the hook end of the Velocity Trip and Roller Assembly and the actuating gear. This clearance should be adjusted to be within 1/32" to 1/64" by bending the lever at point "C" as shown in Fig. 7.

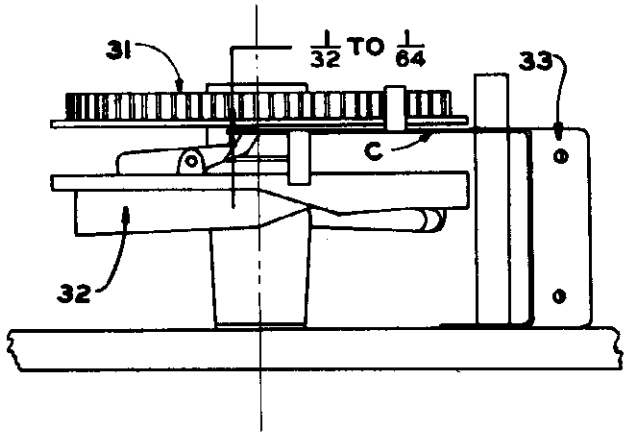


Fig. 7

REPLACEMENT OF PARTS

TO REPLACE PICKUP CARTRIDGE

A Pickup cartridge can be most easily replaced by first removing the Pickup Arm.

1. Hold the Pickup Arm firmly with left hand.
2. Remove the spring from between the pins of the hinge bracket.

3. Using a tool such as a screwdriver, press in on one of the blue steel Pickup Arm hinge brackets while lifting up on the arm. This will release the Pickup Arm Hinge pin.
4. Repeat on the other pickup arm bracket.
5. The Pickup Arm, when released from the hinge brackets, may then be turned over and laid on the turntable for easy access to the cartridge.

TO REPLACE THE PICKUP ARM

The Pickup Arm may be replaced in its bracket as follows:

1. Hook the roller on the rear of the hinge assembly under the Pickup Arm lift stop, inside the Housing (6).
2. Using a pair of long nose pliers, place the pickup arm hinge brackets, one at a time, over the pins in the Pickup Arm Pivot Shaft (9) bracket.

The retaining spring need not be replaced unless the unit is to be re-shipped.

In performing this operation, be sure that the pickup cord lies outside of the hinge and does not become wedged in the bracket.

TO REMOVE THE SUB-PLATE ASSEMBLY

In the event that it becomes necessary to replace any of the major parts in the sub-plate assembly, the entire assembly should first be removed from the Main Plate.

1. Remove the spindle which is held in by a cotter pin under the sub plate.
2. Remove the Turntable.
3. Remove the Pickup Arm.
4. Remove the three No. 8 32 x ½" screws holding the sub-plate posts to the Main Plate.
5. Carefully detach the Sub-Plate assembly from the Main Plate.

TO REPLACE THE SUB-PLATE ASSEMBLY

Reverse the above procedure making certain that all parts fall into their proper positions.

Particularly note the Selector Lever and Selector Lever Compression Spring to see that they are in position with the lever through the slot in the Pickup Arm Raising Lever Bracket.

LUBRICATION

Model 148 Record Changers leave the factory completely oiled and lubricated. Under normal conditions this should be sufficient for approximately one year or 1,000 hours of operation. When operated under extreme conditions of dust or heat, this operation should be performed more frequently as required.

NOTE: AVOID EXCESSIVE LUBRICATION.

Do not permit any oil or grease to get on the rubber Idler Drive Wheel or the Motor Sleeve, on Turntable Drive rim or on the Automatic Trip Arm clutch. Any oil or grease on these points should be removed using Carbon Tetrachloride.

The Recommended lubricants and points of lubrication are as follows:

A — No. 10 OIL (Apply With Small Oil Can Or Medicine Dropper)

1. Motor Bearings. Saturate top and bottom felts.
2. Pickup Arm Shaft. Drop one drop each to bottom bearing point, bracket hole through Main Base Plate.
3. Ball Bearing Assembly.
4. Idler Wheel Felt.

B — LUBRIPLATE (Apply With Small Brush)

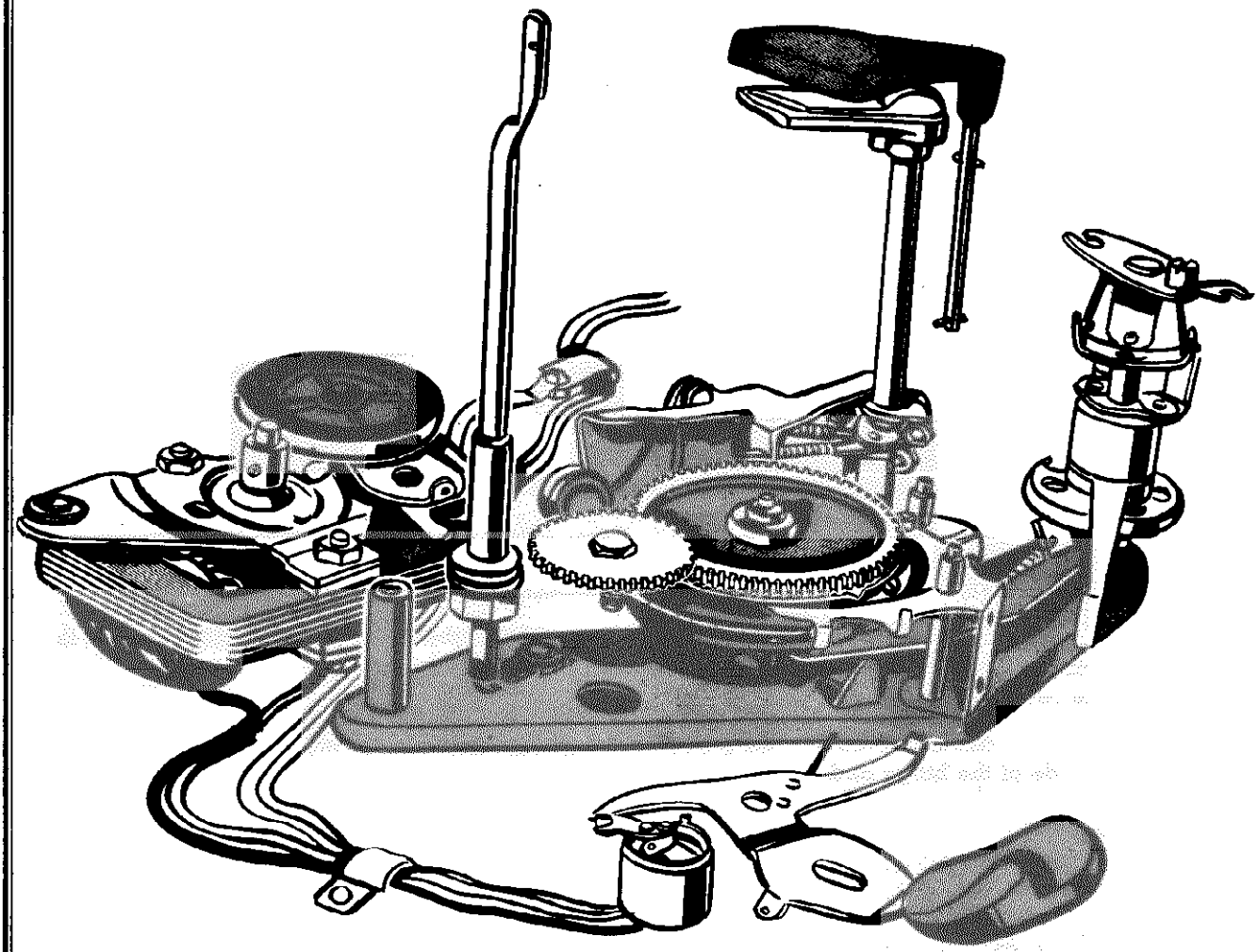
1. Idler Wheel Link.
2. Turntable Shaft Stud.
3. Pickup Arm Hinge Pins.
4. Knife edge of Pickup Arm Raising Lever.
5. Main Cam Bearing. (It is necessary to remove the sub-plate assembly to Lubriplate this bearing.)

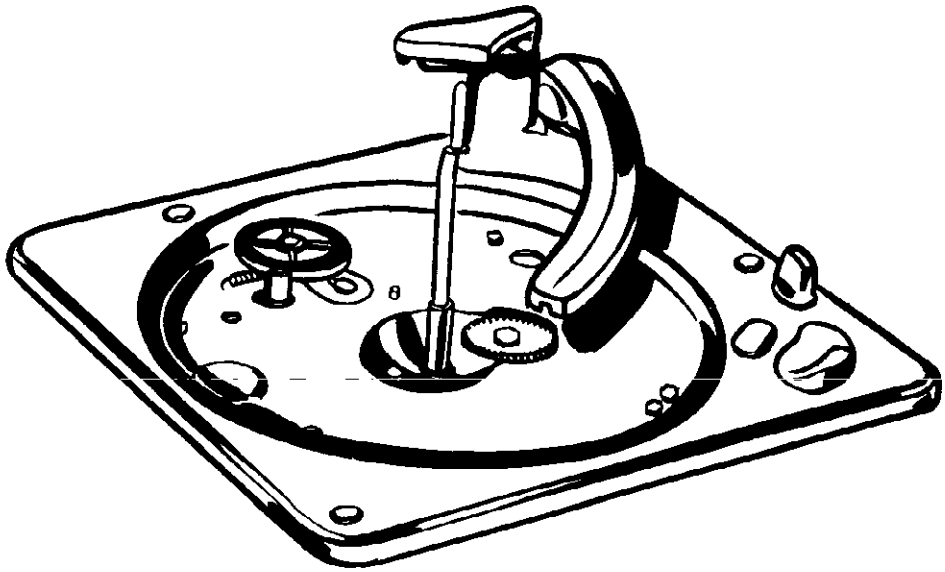
C — STA-PUT (Apply With Small Brush)

1. Teeth of Main Cam Actuating Gear.
2. Track of Main Cam Gear.
3. Teeth of Large and Small idler gears.
4. Raising lever Bracket bearing surfaces.

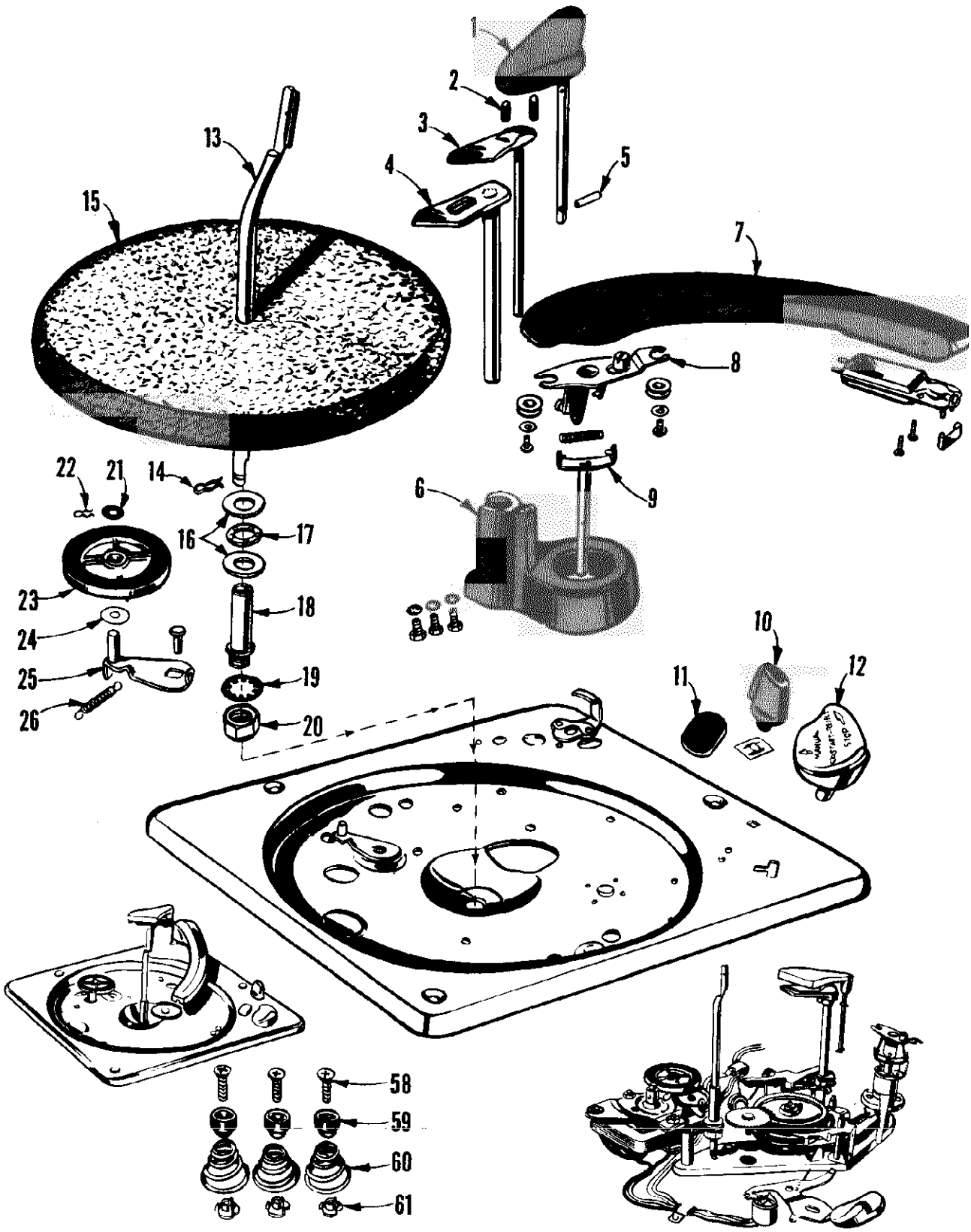
MODEL 148

WEBSTER CHICAGO CORP.





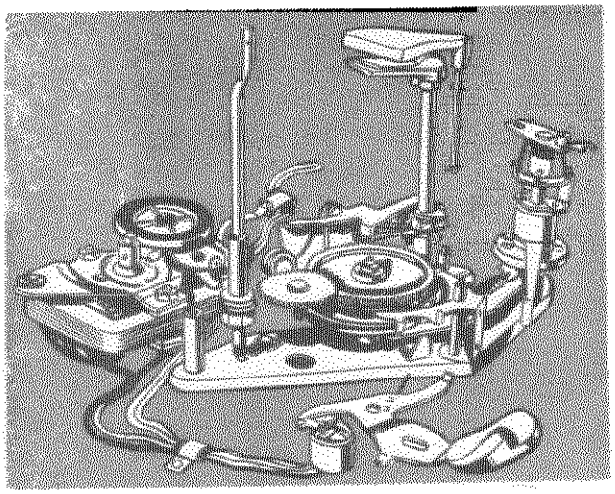
Cut Away View

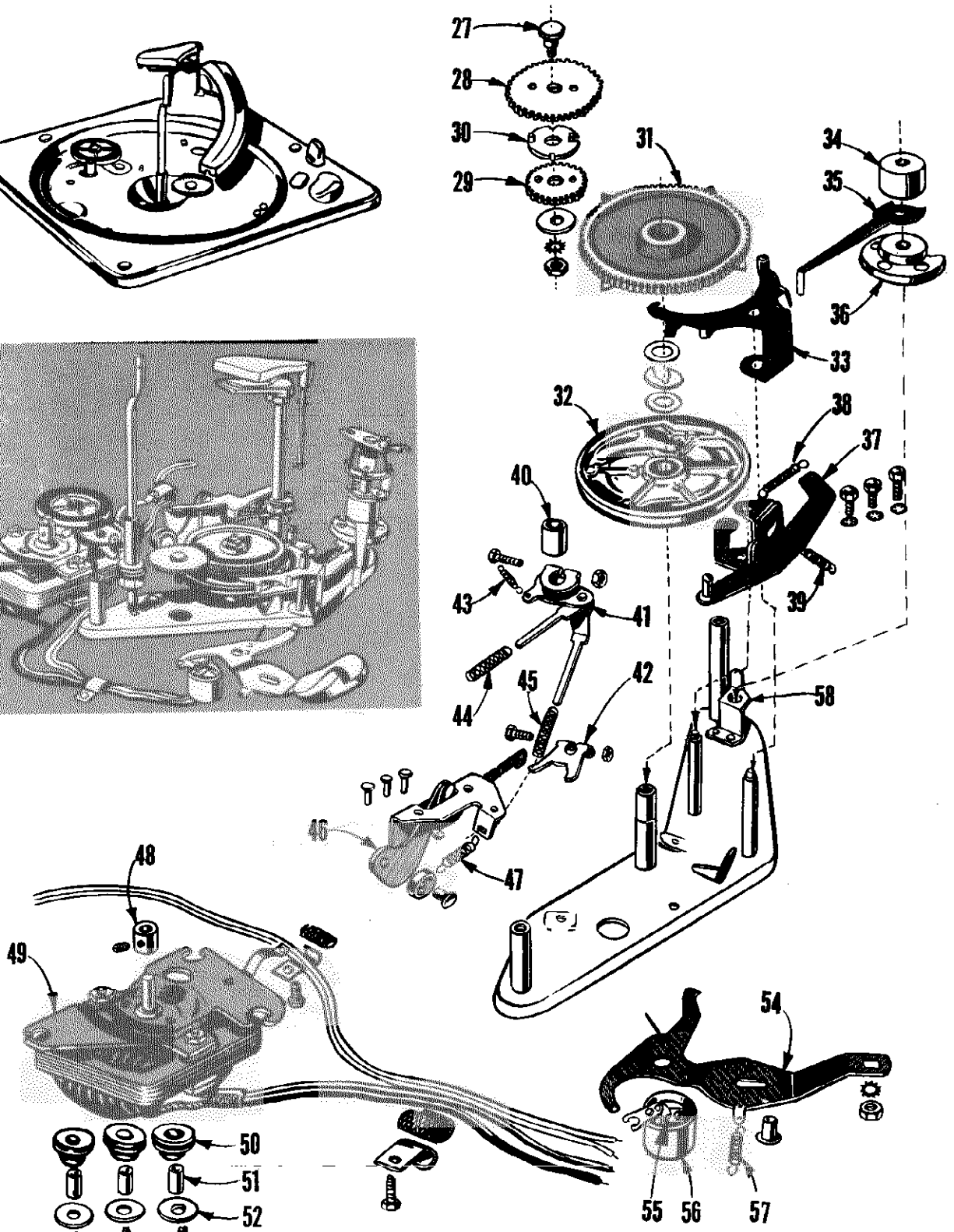


Exploded View — Above Main Plate

MODEL 148

WEBSTER CHICAGO CORP.





Exploded View — Below Main Plate

REPLACEMENT PARTS LIST

Illustration No.	Part No.	Part Name and Description
1	11X288	Record Weight Assembly
2	24P013	Record Weight Cushion
3	42X183	Push Off Blade
4	42X184	Record Shelf
5	27P157	Record Weight Groove Pin
6	42P182	Housing
7	49X021	Pickup Arm Less Cartridge and Hardware
8	21X258	Pickup Arm Hinge Assembly
		Speed Nut
10	49P090	Pickup Arm Rest including
11	24P004	Needle Pad
12	49X089	Control Knob
13	11X283	Spindle including Pawl
14	50P204	Spindle Retaining Clip
15	11X138-C	Turntable
16	25P269	Turntable Bearing Washer
17	11X058	Turntable Bearing
18	41P414	Turntable Stud
19	25P333	Lock Washer
20	26P687	Turntable Stud Nut
21	25P030	Felt Washer
22	50P125	Idler Retaining Clip
23	11X003	Idler Drive Wheel
24	25P046	Idler Fibre Washer
25	11X068	Idler Line Assembly
26	46P112	Idler Tension Spring

Illustration No.	Part No.	Part Name and Description
27	41P333	Shoulder Screw
28	47P024	Large Idler Gear
29	47P023	Small Idler Gear
30	45P342	Idler Gear Coupler
31	11X032	Main Cam Actuating Gear
32	11X033	Main Cam
33	11X047	Velocity Trip and Roller Assembly
34	41P576	Clutch Weight
35	46P568	Automatic Trip Arm
36	11X227	Pickup Arm Raising Disc
37	11X046	Pickup Arm Raising Lever and Bracket with Springs
38	46P044	Raising Lever Tension Spring
39	46P139	Raising Lever Tension Spring
41	11X287	Index Compression Lever and Toggle Assembly
42	11X312	Push-off Blade Finger
43	46P044	Tension Spring
44	46P151	Compression Spring
45	46P152	Compression Spring
46	11X284	Cam Lever and Bracket Assembly
47	46P158	Tension Spring
48	17X412-12	Sleeve — 60 Cycle
48	17X412-11	Sleeve — 50 Cycle
49	15X090-1	Motor Assembly — 117 Volt, 60 Cycle
50	25P363	Rubber Shock Mounts
51	41P592	Motor Mount Sleeve
52	25P367	Motor Mount Spacer
53	26P312	Motor Mount Screw
54	11X291	Trip Lever and Wire Assembly
55	32X045	A. C. Switch
56	32X039	Switch Cover
57	46P117	Tension Spring
58		Pickup Arm Pivot Bracket

ZENITH RADIO CORP.

MODELS S-14004
S-14007

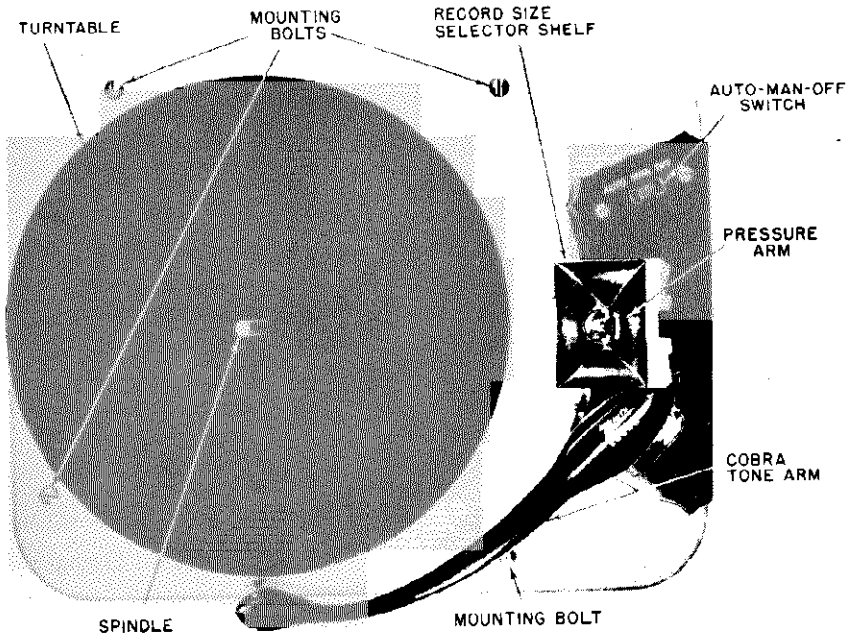


Fig. 1. S14004 and S14007 Record Changers.

GENERAL

The Models S14004 and S14007 record changers are used in Zenith Models 7R887 and 6R880 respectively. These changers are designed to play 12 ten inch or 10 twelve inch records automatically. Odd size and warped records must be played manually. Mechanically the changers are alike. There are slight electrical differences. Model S14004 receives the solenoid energizing voltage from the receiver proper while the S14007 supplies its own energizing voltage from a separate winding on the motor. When servicing these changers, check the schematic diagrams as to the electrical differences. The mechanical operation and adjustments of both changers are identical. To load for automatic operation, set the record size selector shelf to either ten or twelve, depending on th size of the records to be played. Lift the pressure arm ar place a stack of records over the spindle. Lower the pre sure arm until it rests on the record stack. Set the AUT MAN-OFF switch to AUTO and press the record chan button on the receiver panel. The record changer will pl the complete selection of records, and will repeat the la record until turned off. For manual operation set th AUTO-MAN-OFF switch to MAN, place a record on th turntable and set the needle on the starting groove of th record. To turn the changer off, set the AUTO-MAN-O switch to OFF, and place the tone arm in the rest positio

DESCRIPTION OF CYCLING

The motor driven idler wheel rim drives the turntable. Closing the contacts of the trip switch or the record change switch allows current to flow through the solenoid. The magnetic field of the energized solenoid attracts the trip pawl lever which releases the gear pawl tooth and allows it to engage the rotating turntable gear. This action starts the clutch gear to turn. A stud on the clutch gear engages the tone arm lift lever which engages the tone arm stud and raises the tone arm. The tone arm lift lever also applies the tone arm brake which prevents coasting and erratic landing of the needle. The clutch gear moves the tone arm actuating lever and laterally swings the tone arm off the turntable. During the lateral swing of the tone arm, the record ejector link and arm assembly operates the record push plate and when the tone arm moves to its maximum outward position, the record push plate ejects the record and allows it to drop on the turntable. The clutch gear then moves the tone arm actuating lever which swings the tone arm over the starting groove of the record. The tone arm swings 1 inch nearer the spindle with 10 inch records than it does with 12 inch. This difference in inward swing is controlled by the discriminator lever assembly. When the record size selector shelf is turned to the 10 or 12 inch position, its shaft moves the discriminator cam and sets the discriminator lever assembly for the correct inward swing of the tone arm. After the tone arm swings over the starti groove of the record, the tone arm lift lever lowers it a releases the brake. As the clutch gear completes the rev lution, the gear pawl tooth bracket hits the trip pawl a the action removes the gear pawl tooth from the path the turntable gear, causing the clutch gear to stop a complete the cycle.

The velocity trip depends on the ratio of oscillations the trip switch contact to the rate of movement of the to arm. As the record is played, the tone arm lever mov slowly inward. The oscillating lever comes in contact wi the ratchet on the tone arm lever and then moves out befo the ratchet can drag the oscillating lever and close the t switch contacts. When the record is completed and t needle enters the oscillating groove, the inward speed the tone arm increases. This makes it impossible for t oscillating lever to move out of the ratchet in time and as result is dragged inward, closing the trip switch contacts an starting the next cycle.

The S14004 and S14007 record changers use th famous Cobra pickup. Previously published service manua Z800 and Z801 explain in detail the theory and operatio of the Cobra pickup. If these manuals are not availabl they may be obtained from your Zenith distributor.

MODELS S-14004, S-14007

ZENITH RADIO CORP.

RECORD CHANGER MOUNTING CLIPS

Clamp on pivot clips are used to mount the record changer in the cabinet. The changer is released by applying an upward pressure to the slotted ends of the clips (see Fig. 3) until the clips pivot to a vertical position. When the changer is installed, the clips are pivoted back to the horizontal or holding position.

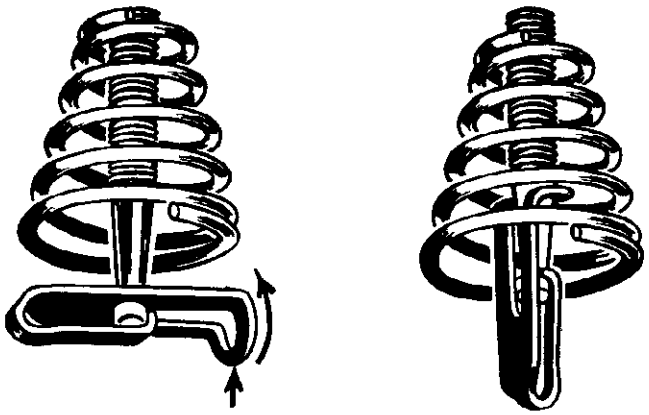


Fig. 3. Record Changer Mounting Clip.

LUBRICATION

Sta-Put grease No. 512 (light grease of the vaseline type) is used for lubrication throughout. Fig. 5 indicates the various lubrication points. Do not apply grease to the top surface or teeth of the clutch gear.

ADJUSTMENTS

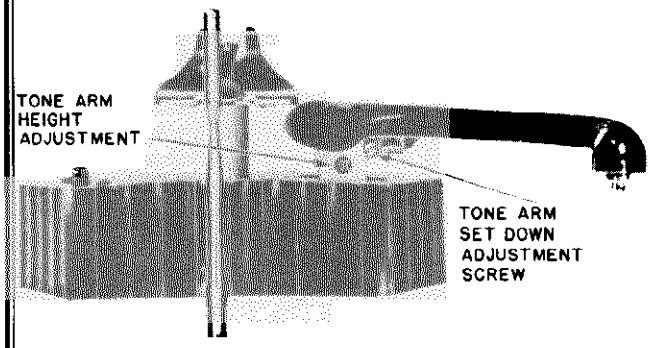


Fig. 2. Tone Arm Set Down and Height Adjustment.

TONE ARM SET DOWN ADJUSTMENT

The landing position of the needle on the record is determined by the setting of the tone arm set down adjustment screw (see Fig. 2). Clockwise rotation of the screw moves the tone arm in, while counter-clockwise rotation moves it out.

TONE ARM HEIGHT ADJUSTMENT

The tone arm height adjustment determines the vertical rise of the tone arm. If the tone arm does not rise sufficiently, the record changer will not play a full load of 12 ten inch records. If, on the other hand, the tone arm is raised too high, it may hit the records on the record shelf. Set the adjustment screw so that the needle clears 12 unwarped ten inch records on the turntable. The tone arm housing must not hit the underside of the records on the record shelf when the changer is cycled after adjustment.

TRIP SWITCH ADJUSTMENT

The tone arm lever must be moved so that its ratchet does not engage the oscillating switch lever. With a pair of long nose pliers simultaneously bend the stationary contact and guide spring until the spacing between the trip switch contacts is 1/16 inch to 3/32 inch. The contact spring must always rest against the heavier guide spring after adjustment.

ZENITH RADIO CORP. MODELS S-14004 S-14007

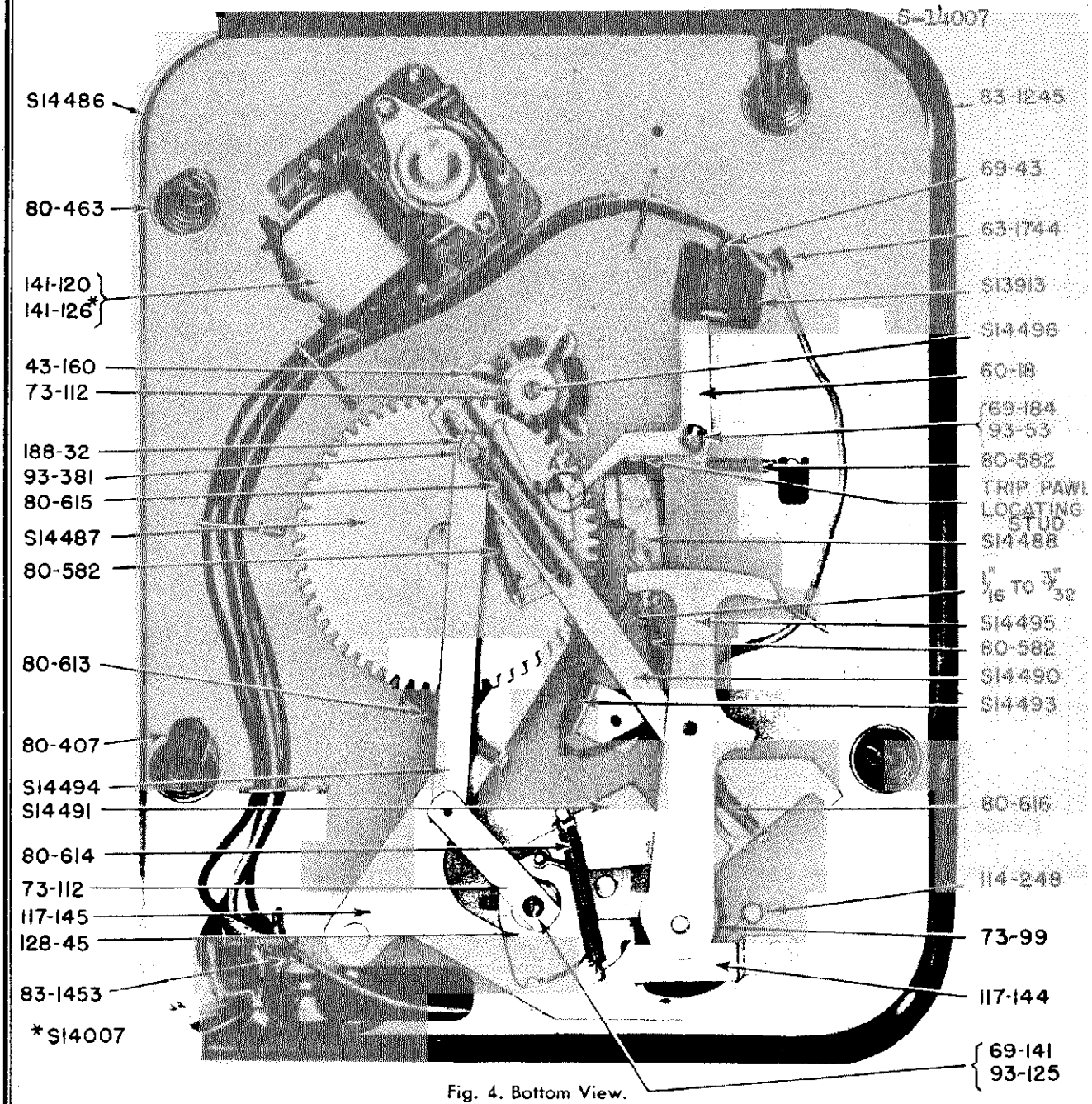


Fig. 4. Bottom View.

SLAB HEAD SET SCREWS

For maximum rigidity, the spindle, discriminator cam and tone arm lever are locked in position with slab head screws. A slab head set screw wrench is available as Zenith part No. 68-8.

REMOVING THE TONE ARM ASSEMBLY

The complete tone arm assembly can be removed by loosening the two slab head holding screws and pulling the unit out. When the tone arm assembly is installed, the cone points of the slab head screws must enter the indentations previously made. A new assembly does not have these indentations, and must be assembled as follows:

1. See that the changer mechanism is out of cycle.
2. Turn the tone arm set down adjustment screw (see Fig. 2) as far as it will go in the clockwise direction.
3. Insert the tone arm support shaft through its mountin hole.
4. Place a 12 inch record on the turntable and hold th Cobra tone arm housing against the edge of th record. Move the tone arm lever (Part No. S14495) t its maximum outward position. These two positior must be maintained during the next operation.
5. See that the tone arm lever bushing has approximatel .005 inch play and tighten the slab head screws.
6. Adjust the tone arm set down adjustment screw (se Fig. 2) for proper landing of the needle.

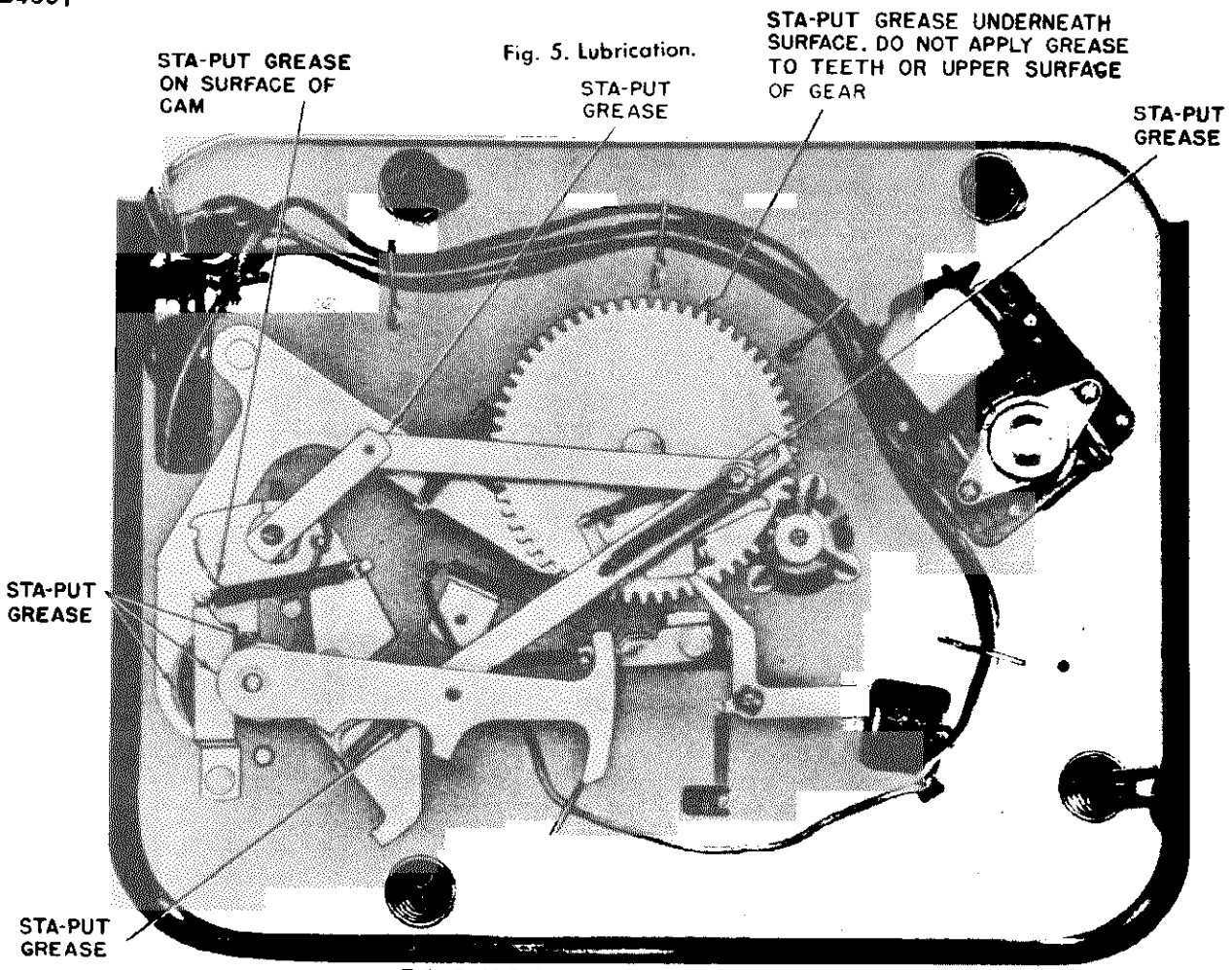
REMOVING THE RECORD SHELF

The record shelf is removed by unscrewing the slab hea screw at the bottom of its shaft and the machine screw whic holds the record ejector link. When the unit is assemblec see that the changer is out of cycle and turn the slotte shaft until the record push off plate is retracted into i housing before attaching the record ejector link.

MODELS S-14004, S-14007

ZENITH RADIO CORP.

Fig. 5. Lubrication.



TROUBLE SHOOTING

SQUEAKS OR NOISES DURING PLAYING OF RECORDS.

a. Friction between the records on the turntable and the spindle will occasionally cause squeaks. A thin coat of wax applied to the spindle will remedy this condition.

b. Check lubrication.

RECORD IS NOT HEARD ALTHOUGH CHANGER OPERATES.

a. See that the Phono Radio switch is on Phono.
b. Check receiver audio by listening to radio.
c. Check the phono oscillator tube.
d. Check Needle Cartridge.
e. Check Tone Arm Housing for broken leads.

PRESSING RECORD CHANGE BUTTON ON RECEIVER PANEL DOES NOT START RECORD CHANGE CYCLE.

a. See that the AUTO-MAN-OFF switch is set to AUTO.
b. Check Record Change Switch.
c. Check electrical continuity of solenoid circuit.
d. Check the solenoid energizing voltage.

RUMBLE AND MICROPHONICS DURING REPRODUCTION.

a. Changer not "floated" properly. Remove packing strip. Loosen mounting bolts.

b. Motor retaining rings rubbing on the idler wheel.

c. Motor leads pulled too tight preventing motor from "floating" freely.

d. Noisy phono oscillator tube.

e. Impression on Idler Wheel.

NEEDLE FAILS TO CLEAR MAXIMUM LOAD OF RECORDS ON THE TURNTABLE.

a. Check Tone Arm height adjustment.

TONE ARM SETS DOWN TOO FAR IN OR OUT ON RECORD.

a. Check Tone Arm set down adjustment.

TONE ARM SET-DOWN POSITION VARIES.

a. Check Tone Arm Brake and Spring.
b. Tone Arm pivots loosely.

CHANGER CONTINUES TO CYCLE.

a. Check the trip switch adjustment.
b. Check Record Change switch.
c. Trip Pawl sticks.

CHANGER WILL NOT CYCLE UPON COMPLETION OF RECORD.

a. See that the AUTO-MAN-OFF switch is set to AUTO.

b. Be certain that the record has an eccentric center groove.

c. Check the Trip Switch.
d. Check the solenoid energizing voltage.

SOLENOID FAILS TO TRIP MECHANISM

a. Check the pawl lever positioning stud. The tip of the pawl must be in approximately the same position in relation to the gear pawl tooth lever as indicated at "A" in Fig. 4. If the position is not the same as indicated, the positioning stud can be bent slightly.

b. Tension on the trip pawl actuating spring too high.

MECHANISM JAMS

a. Burr or sharp point on the gear pawl tooth. Smooth out with a small file.

ZENITH RADIO CORP. MODELS S-14004 S-14007

NUMERICAL PARTS LIST

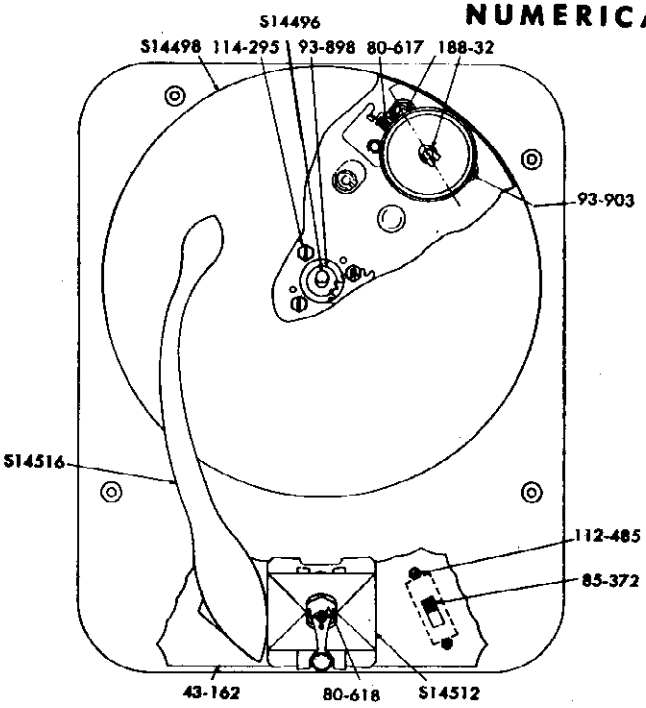


Fig. 6. Parts Identification, Top View.

12-1444	Socket Mounting Bracket
12-1477	Tone Arm Mounting Bracket (Upper)
56-144	Socket Retaining Pin
78-561	Cartridge Socket
80-605	Socket Tension Spring
80-609	Landing Adjusting Spring
83-1121	Felt Strip (Bumper)
93-899	Steel Washer—N.P.
112-619	No. 2-32 x 5/16 in. R.H. Self Tapping Screw—Steel—Cad. Pl.
17-81	Cable Clamp (S14004)
17-88	Cable Clamp (S14007)
23-22	A.C. Wire Connector
24-458	Switch Cover (S14007)
43-160	Turntable Gear Housing
43-162	Record Ejector Housing
56-239	Groove Pin Type No. 4 (3/32 in. D X 3/8 in. lg.) (S14004)
56-240	Groove Pin Type No. 2 (1/16 in. D X 1/4 in. lg.) (S14004)
58-166	6 Prong Plug (S14004)
60-18	Trip Pawl
61-125	Idler Wheel
63-1744	Resistor
69-43	No. 8-32 x 3/8 in. R.H.M.S.—Steel N.P.
69-141	No. 5-40 x 1/4 in. R.H.M.S.—Steel N.P.
69-184	No. 8-32 x 1/4 in. R.H.M.S.—Steel—Cad.
69-262	No. 8-32 x 1/2 in. Phillips R.H.M.S.—Steel
73-99	No. 8-32 x 1/4 in. Slab Hd. Set Screw—Cone-point (2 used)
73-112	No. 8-32 x 1/2 in. Slab Hd. Set Screw—Cup-point (2 used)
80-582	Pawl Spring (3 used)
80-610	Switch Contact Spring
80-613	Lift Pin Lever Spring
80-614	Brake Spring
80-615	Tone Arm Link Spring (Long)
80-616	Tone Arm Link Spring (Short)
80-617	Idler Wheel Spring
80-618	Pressure Arm Spring
80-619	Tone Arm Swivel Spring
80-645	Tone Arm Height Adjusting Spring
85-372	Three Position Slide Switch
93-53	1/64 x 1 1/64 in. x 3/8 in. Steel Washer—N.P.
93-125	No. 6 Int. Lockwasher
93-381	1/32 in. x 7/32 in. x 3/8 in. Steel Washer—Cad.
93-678	Idler Wheel Stud Fishpaper Washer—Small
93-781	No. 8 Split Lockwasher—Steel N.P.
93-876	Fibre Washer
93-898	Steel Washer
93-900	Fibre Washer (3 used)
93-903	Steel Washer—Copper Flash (3 used)
93-927	Idler Wheel Stud Washer—Large
93-928	Idler Wheel Stud Washer—Small
93-929	Idler Wheel Stud Fishpaper Washer—Large
93-930	Idler Wheel Stud Felt Washer
94-620	Stop Bushing
97-298	Trip Pawl Stud
97-301	Clutch Gear Retaining Stud
112-485	No. 4-40 x 1/4 in. B.H.M.S.—Steel—Black Zinc Plate (2 used)
114-248	No. 6-20 x 5/32 in. Hex. Hd. Slotted S.T. Screw—Steel—Cad. (4 used)
114-295	No. 8-32 x 5/16 in. Hex. Hd. Slotted S.T. Screw—Steel—Cad. (4 used)
117-144	Brake Lever
117-145	Tone Arm Lift Lever
125-61	Rubber Grommet (3 used)
125-65	Pressure Arm Grommet
128-45	Discriminator Cam
141-120	A.C. Phono Motor—110 V. 60 cycle (S14004
141-126	A.C. Phono Motor—110 V. 60 Cycle (S14007
148-83	Tone Arm Housing only
S11473	Cobra Cartridge and Needle Assembly
S14516	Cobra Tone Arm Assembly—complete
S14673	Hinge Plate Socket and Stop Assembly
S14674	Hinge Plate Assembly—complete
S14675	Shielded Wire Cable
148-96	Record Ejector Arm
148-97	Record Pressure Arm
149-60	Magnet Core
188-32	Retaining Ring (5 used)
199-85	Tone Arm Sleeve
S13913	Magnet Coil Assembly (Solenoid)
S14487	Clutch Gear Assembly
S14488	Oscillating Lever and Gear Assembly
S14490	Tone Arm Actuating Lever Assembly
S14491	Discriminator Lever Assembly
S14493	Trip Switch Assembly
S14494	Record Ejector Link and Arm Assembly
S14495	Tone Arm Lever Assembly
S14496	Record Spindle Assembly
S14498	Turntable Assembly (Flock Finish)
S14499	Ejector Cam Shaft Assembly
S14510	Record Support Plate and Post Assembly
S14512	Pressure Arm and Mounting Assembly
S14513	Tone Arm Shaft Assembly
S14514	Tone Arm Bracket and Lift Pin Assembly
S14515	Cable and Plug Assembly (S14004)
S14682	Idler Wheel Stud and Washer Assembly
S14691	Cable and Plug Assembly (S14007)

MODELS S-14004, S-14007

ZENITH RADIO CORP.

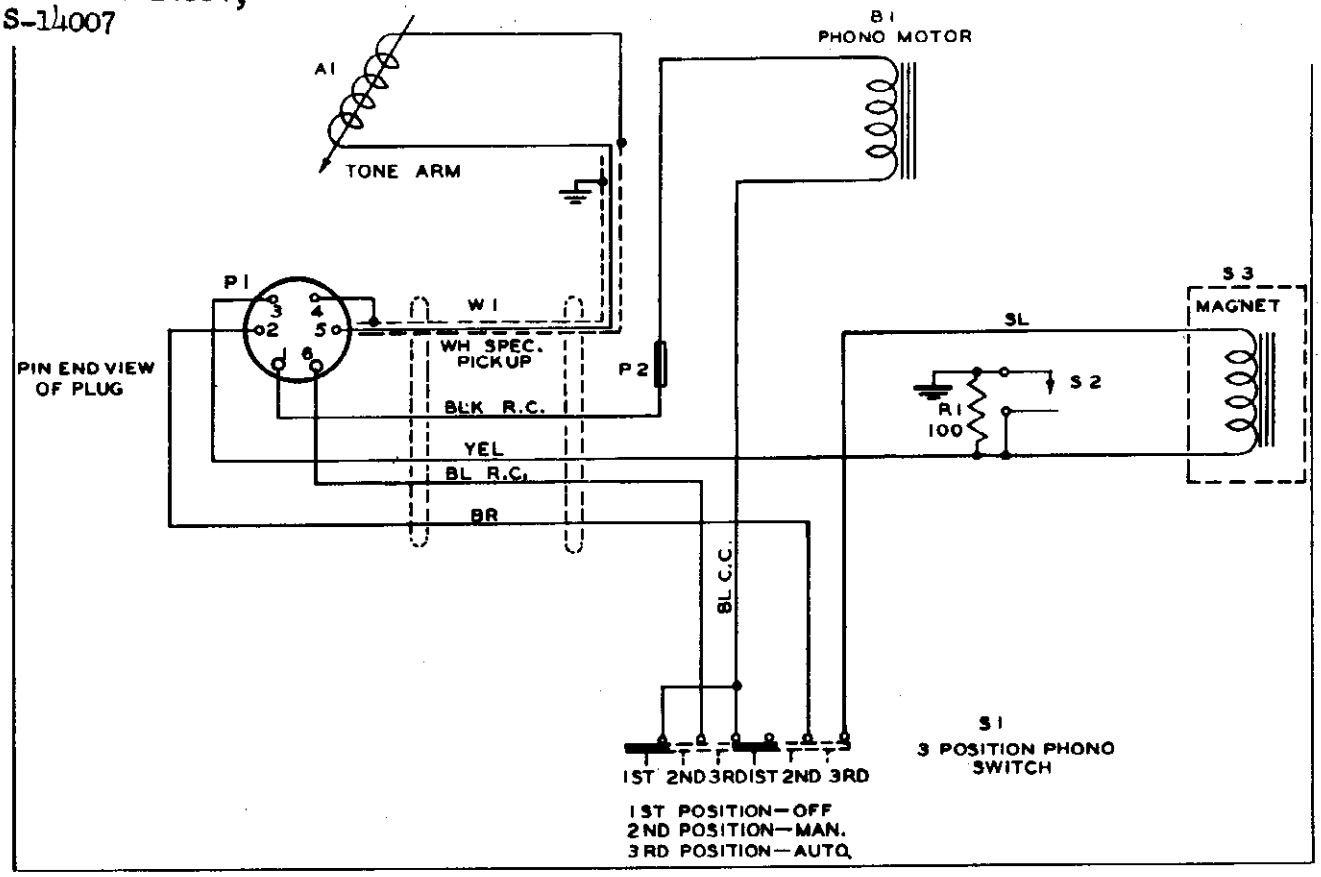


Fig. 7. Schematic Diagram S14004 Record Changer.

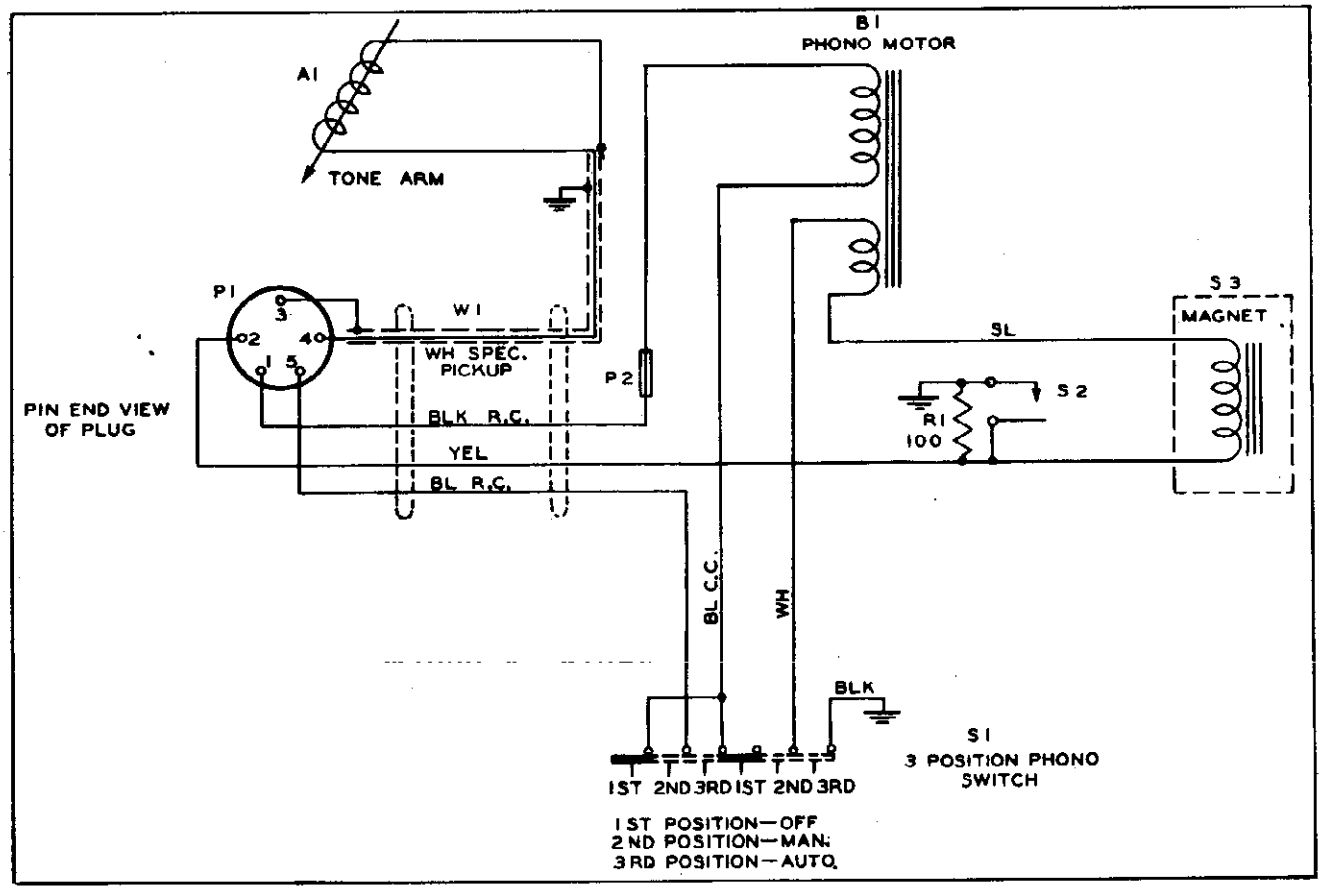


Fig. 8. Schematic Diagram S14007 Record Changer.