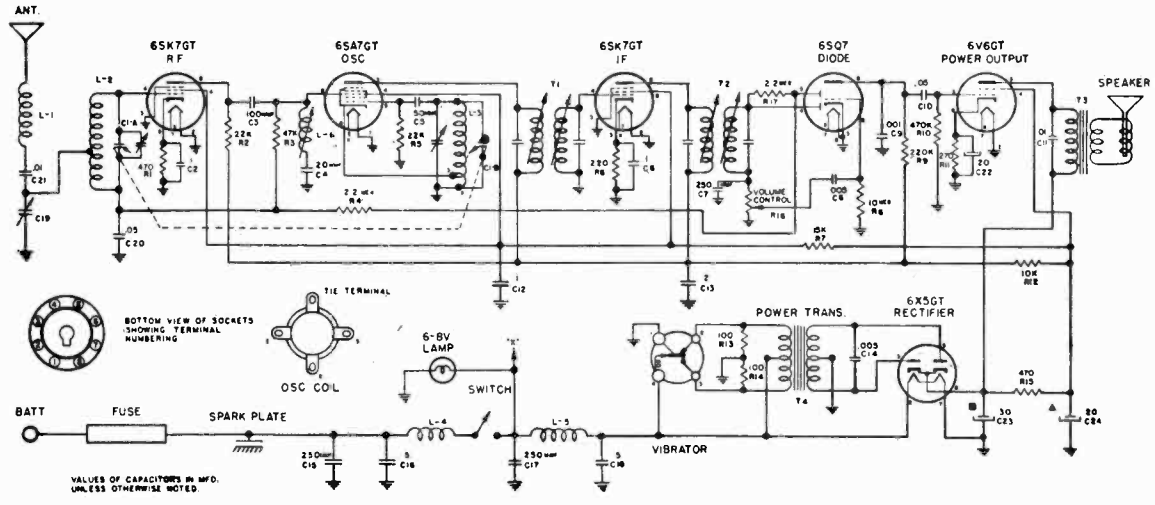


Fig. 3 Schematic Diagram

ALIGNMENT PROCEDURE

Volume control—Maximum, all adjustments.

No signal applied to antenna.

Power input—6.3 volts.

Connect dummy antenna in series with output lead of signal generator.

Connect output meter across voice coil.

Connect ground lead of signal generator to chassis.

Repeat alignment procedure as a final check.

The following equipment is necessary for proper alignment:

Signal generator that will provide the test frequencies as listed.

Non-metallic screwdriver.

Output meter.

Dummy antennas—.1 MFD., .00025 MFD.

For alignment points refer to Figures 4 ad 5.

Dial Setting	Generator Frequency	Dummy Ant	Generator Connections	Trimmer Reference	Trimmer Adjustment	Trimmer Function
Fully Open	455 KC	.1 MFD.	6SA7 Grid	T2	Maximum	Output I.F.
Fully Open	455 KC	.1 MFD.	6SA7 Grid	T1	Maximum	Input I.F.
Fully Open	455 KC	.00025 MFD.	Ant. lead	L6	Minimum	Wave trap
Fully Open	1600 KC	.00025 MFD.	Ant. lead	C1B	Maximum	Oscillator
Tune in signal from generator	1400 KC	.00025 MFD.	Ant. lead	C1A	Maximum	Antenna

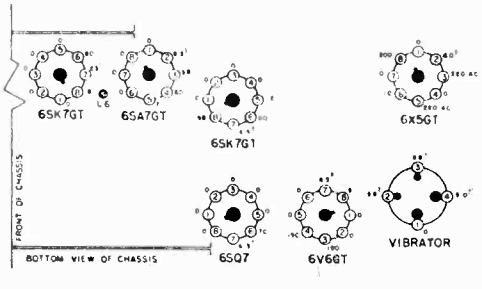


Fig. 4 Socket Voltages

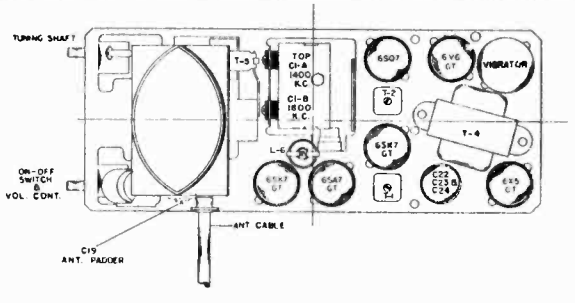


Fig. 5 Tube and Trimmer Locations

SYMBOL	PART NO.	DESCRIPTION	VALUE	TOL.	RATING
		CONDENSERS			
C1A, C1B	B19-196	Variable condenser			
C2, C6, C12	A16-187	Condenser	.1 MFD		400 volt
C3	A15-196	Ceramic condenser	100 MMFD		
C4	A16-202	Ceramic condenser	20 MMFD		
C5	A15-204	Ceramic condenser	50 MMFD		
C7, C15, C17	A15-178	Mica condenser	250 MMFD		600 volt
C8	A16-190	Condenser	.005 MFD		
C9	A16-195	Ceramic condenser	.001 MFD		600 volt
C10	A16-193	Condenser	.05 MFD		400 volt
C11, C21	A16-192	Condenser	.01 MFD		400 volt
C13	A16-188	Condenser	.2 MFD		1600 volt
C14	A16-185	Oil filled condenser	.006 MFD		100 volt
C16, C18	A16-184	Condenser	.5 MFD		
C19	A20-145	Trimmer condenser			
C20	A16-189	Condenser	.05 MFD		400 volt
C22		Electrolytic condenser	20 MFD		25 volt
C23	A18-289	Electrolytic condenser	30 MFD		350 volt
C24		Electrolytic condenser	20 MFD		350 volt
		RESISTORS			
R1	A60-722	Resistor	470 ohm	20%	1/2 watt
R13, R14	A60-752	Resistor	100 ohm	10%	1/2 watt
R2, R5	A60-744	Resistor	22K ohm	10%	1/2 watt
R3	A60-685	Resistor	47K ohm	20%	1/2 watt
R4, R17	A60-726	Resistor	2.2 megohm	20%	1/2 watt
R6	A60-753	Resistor	220 ohm	10%	1/2 watt
R7	A60-716	Resistor	15K ohm	10%	1 watt
R8	A60-726	Resistor	10 megohm	20%	1/2 watt
R9	A60-667	Resistor	220K ohm	20%	1/2 watt
R10	A60-731	Resistor	470K ohm	20%	1/2 watt
R11	A60-754	Resistor	270 ohm	10%	1 watt
R12	A60-698	Resistor	10K ohm	10%	1 watt
R15	A60-694	Resistor	470 ohm	10%	1 watt
R16	A24-177	Volume Control, w/switch	500,000 ohm		
		COILS AND TRANSFORMERS			
L1	A10-513	Antenna loading coil			
L2	B10-511	Antenna coil			
L3	A10-512	Oscillator coil			
L4	A33-229	Choke, "A" line			
L5	A33-228	Choke, vibrator hash			
L6	A10-510	I.F. trap coil			
T1	A10-508	1st I.F. transformer			
T2	A10-509	2nd I.F. transformer			
T3	B80-242	Output transformer (part of speaker)			
T4	B80-243	Power transformer			
		CABINET, DIAL, AND TUNING PARTS			
	A11-303	Bracket, dial scale			
	A11-304	Bracket, string guide			
	A72-29	Bushing, tuning shaft bearing			
	A70-130	Clip, spring, for tuning shaft			
	D40-141	Dial escutcheon			
	A58-55	Dial pointer			
	B67-522	Dial scale			
	A28-101	Gasket for speaker			
	A52-257	Knob			
	A89-10	Pilot light, type G.E. No. 422			
	A65-37	Rivet, shoulder, for string guide bracket			
	A75-68	Shaft, tuning			
	A75-67	Shaft, for dial pointer			
	A70-132	Spring, for pilot light socket			
	A70-133	Spring, string tension, pointer drive, and tuning			
		MISCELLANEOUS			
	A83-421	Clip, I.F. transformer mounting			
	A83-517	Clip, oscillator coil mounting			
	A43-10	Fuse, 15 Amp.			
	A47-112	Grommet, rubber (for mounting speaker and variable condenser)			
	B31-134	Mounting strap, rear			
	A31-139	Mounting plate, front			
	S84-192	Mounting parts kit			
	A87-38	Receptacle, antenna cable			
	B79-362	Speaker, 4" P.M. (includes output transformer)			
	S84-193	Suppression kit assembly			
	A34-105	Vibrator			
	A83-519	Wiper, grounding, for case covers			

SERVICE NOTES

Voltages taken from the different points of the circuit to the chassis are measured with volume control in maximum position, all tubes in their sockets, no signal applied, and with a volt meter having a resistance of 20,000 ohms per volt. These voltages are clearly shown on the voltage chart, (Fig. 4).

All voltages should be measured with an input voltage of 6.3 volts DC.

FINAL ADJUSTMENTS

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

To adjust the antenna trimmer condenser, carefully tune the receiver to a weak station at approximately 600 kilocycles (K.C.). Remove the snap button covering the antenna trimmer (See Figure 2) and adjust the trimmer for maximum volume. A small screw driver will be needed for this purpose.

ALIGNING INSTRUCTION

Never attempt any adjustments on this receiver unless it becomes necessary to replace a coil or transformer, or the adjustments have been tampered with in the field. Always make certain that other circuit components, such as tubes, condensers, resistors, etc., are normal before proceeding with realignment.

INSTRUCTIONS FOR REMOVING CHASSIS FROM THE CASE

The bottom cover (the one with the speaker louvers) can be removed to permit servicing of major components, such as tubes and vibrator, by removing the eight (8) screws holding it to the top cover. There are three (3) screws on each side, one (1) in the rear, and one (1) in the front.

CAUTION: Before attempting to remove the top cover, to service condensers, resistors, etc., the screw connecting the spark plate to the "A" terminal (inside case) must be removed. This is a round head screw, and is located on the rear of the case, close to the mounting stud bolt. It is recessed in a ½ inch hole in the case itself, thereby permitting contact with the spark plate.

After removing the spark plate screw, remove the two knobs by pulling forward and remove the eight (8) screws securing the cover to the chassis. Lift the chassis at the rear, at the same time moving it away from the front of the case so that the volume and tuning shafts will clear the holes in the cover.

NOTE: When reinstalling the chassis into the case, be sure the screw connecting the spark plate to the "A" terminal (inside case) is tightened very securely, otherwise the receiver will not operate properly.

ELECTRICAL SPECIFICATIONS

Power Supply.....6.3 volts DC
Current.....4.8 amp. average
Frequency Range.....540 to 1600 KC
I. F. Frequency.....455 KC
Speaker.....4" P. M.
Power Output.....1.2 watts, undistorted
2.5 watts, maximum
Sensitivity.....10 microvolts average for 1 watt output
Selectivity...20 KC broad at 1000 times signal, at 1000 KC

The tube compliment of this receiver is as follows:

1—6SK7GT—R. F. Amplifier.
1—6SA7GT—Converter.
1—6SK7GT—I.F. Amplifier.
1—6SQ7—Detector—AVC—1st audio.
1—6V6GT—Power output.
1—6X5GT—Rectifier.

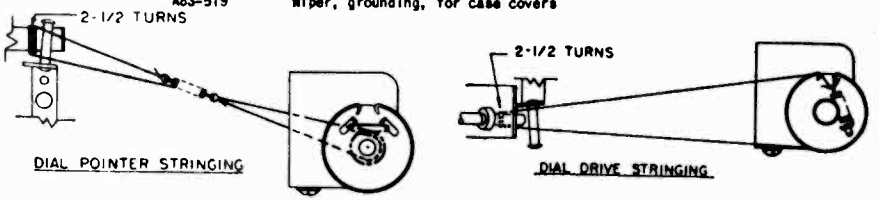
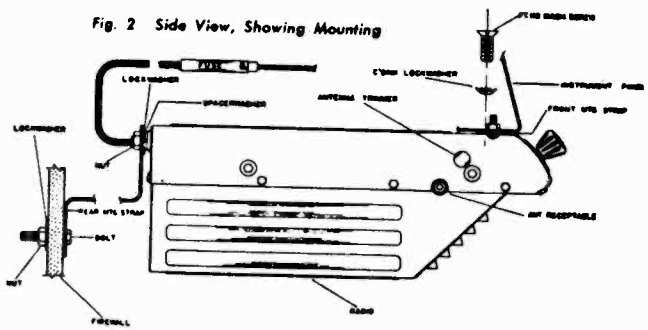
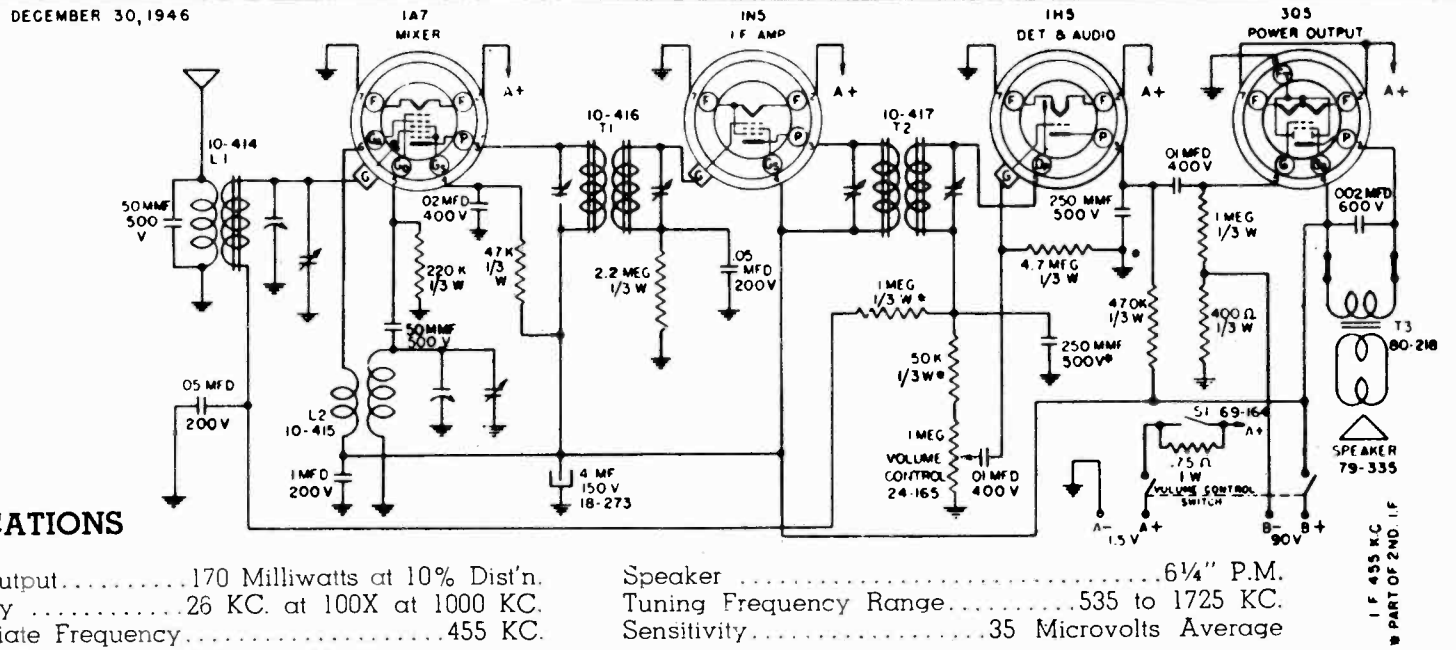


Fig. 2 Side View, Showing Mounting





SPECIFICATIONS

Power Output.....170 Milliwatts at 10% Dist'n.
Selectivity .....26 KC. at 100X at 1000 KC.
Intermediate Frequency.....455 KC.
Speaker .....6¼" P.M.
Tuning Frequency Range.....535 to 1725 KC.
Sensitivity.....35 Microvolts Average

CONTINUITY AND VOLTAGE

Tube sockets as shown on the schematic diagram have each element numbered with respect to the guide pin. Tube sockets on the chassis are also numbered in the same manner. All voltage measurements are average and were taken with a new battery or one known to be good, volume control full on, antenna and ground wires shorted together, using a volt meter with a resistance of 1000 ohms per volt. The correct voltages are shown in the voltage chart.

A complete realignment of all tuned circuits will be necessary after replacing an I.F. transformer, the antenna coil, or the oscillator coil. Never attempt realignment unless all other circuit components have been checked and found to be normal. If realignment is necessary follow the instructions under "ALIGNMENT PROCEDURE". After alignment has been completed repeat the procedure as a final check.

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. Where no voltages are shown the voltage is O or is too low to be read with this type of voltmeter.

	PIN NO.	VOLTS
1A7GT TUBE		
Plate-P—to ground	3	85
Screen-G3 & G5—to ground	4	37
Grid-G2—to ground	6	85
1N5GT TUBE		
Plate-P—to ground	3	85
Screen-G2—to ground	4	85
1H5GT TUBE		
Plate-P—to ground	3	17
3Q5GT TUBE		
Plate-P—to ground	3	83
Screen-G2—to ground	4	85

ALIGNMENT EQUIPMENT

Do not attempt to realign this chassis without the equipment listed below:

1—Signal generator, capable of giving a modulated signal from 455 KC to 1725 KC.
2—Non-metallic screwdriver.
3—Dummy antennas, .1 MFD. and .00025 MFD. condensers.
4—Output meter.

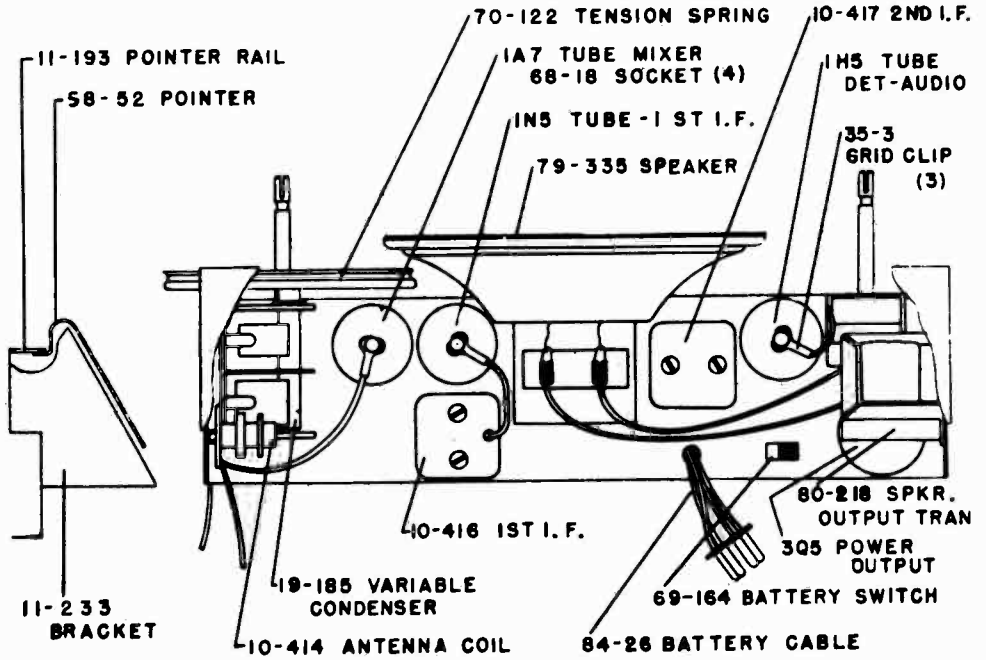
ALIGNMENT PROCEDURE

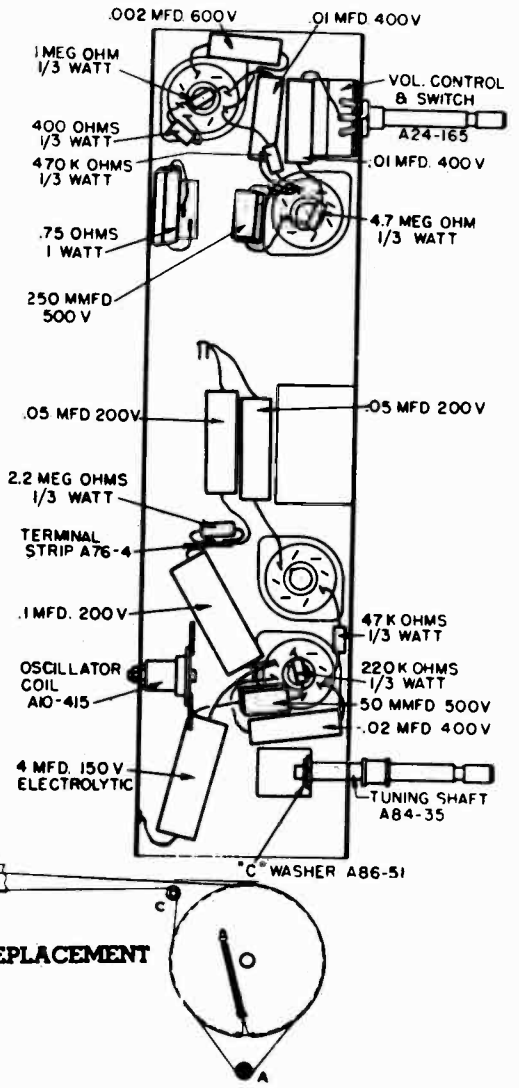
Volume control maximum all adjustments.
Connect ground lead of signal generator to chassis.
Connect dummy antenna in series with output lead of signal generator.
Connect output meter across voice coil of speaker.

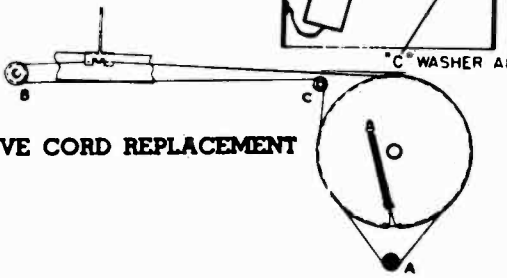
Variable Condenser Setting	Generator Frequency	Dummy Antenna Mfd.	Connection to Radio	Trimmer Adjustment	Trimmer Function
Minimum Capacity (Fully Opened)	455 K.C.	.1	Grid of 1A7GT Tube	Two Trimmers on top of T2	Output I.F.
Minimum Capacity (Fully Opened)	455 K.C.	.1	Grid of 1A7GT Tube	Two Trimmers on top of T1	Input I.F.
Minimum Capacity (Fully Opened)	1725 K.C.	.00025	Antenna Lead	C1B (on gang)	Oscillator Trimmer
Tune in Signal From Generator	1500 K.C.	.00025	Antenna Lead	C1A (on gang)	Antenna Trimmer

With an output meter connected across the voice coil of the speaker, the output meter reading for 50 millwatts is 4 volts using a signal which is modulated 400 c.p.s.

Frequency Range
535 to 1725 K.C.
I.F. Frequency 455K.C.



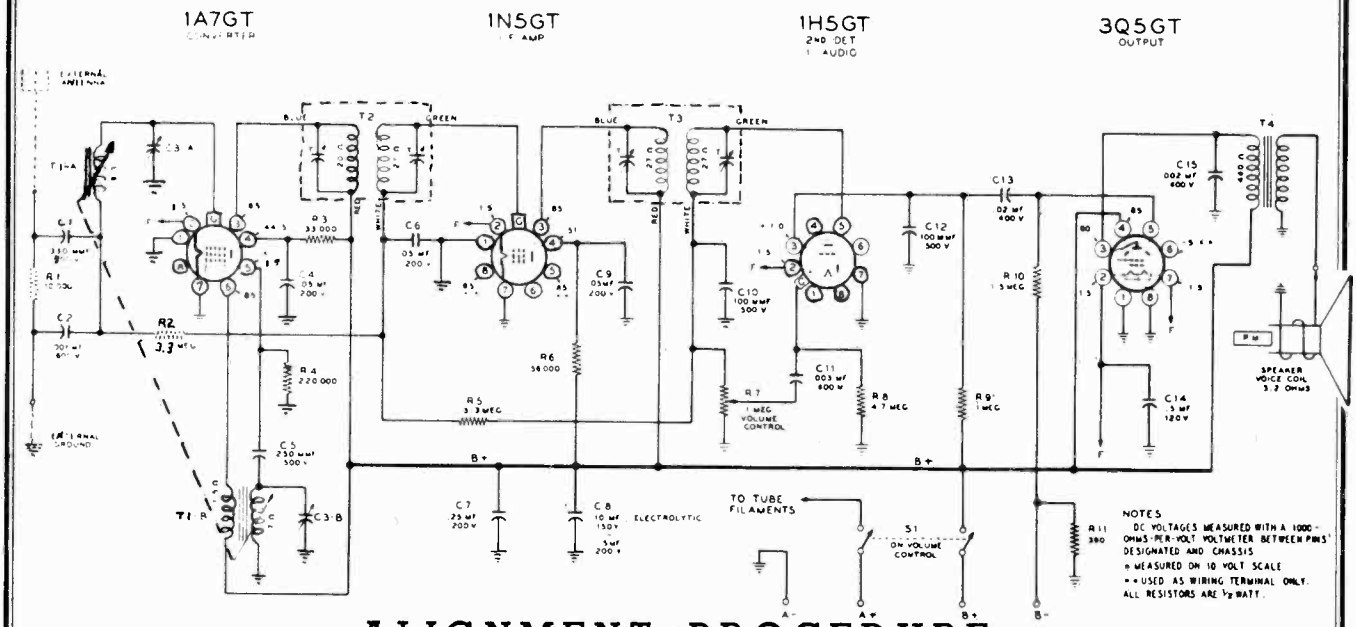




DRIVE CORD REPLACEMENT

Turn gang condenser to fully open position. Use a new drive cord and fasten one end to tension spring. Fasten the other end of the tension spring to the hook on the drive pulley. Pass the drive cord through the slot in the drive pulley rim and continue over the top of pulley counter-clockwise completely around through the string guide, around pulley B, over pulley C, around idler A counter-clockwise two times. Pass cord through slot in pulley rim, stretch the tension spring and fasten free end of cord to the spring.

GAMBLE-SKOGMO, INC. MODEL 43-6321



ALIGNMENT PROCEDURE

Output meter across 3.2-ohm output load.

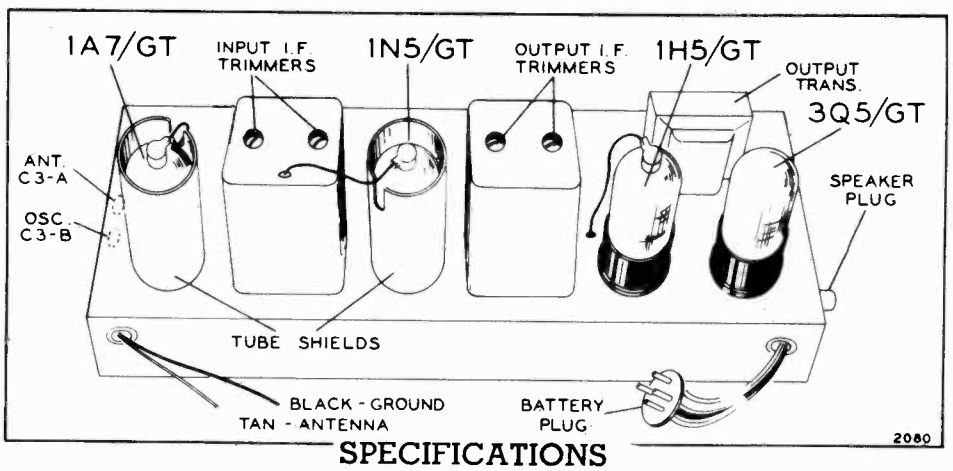
Align for maximum output. Reduce input as needed to keep output near 0.4 volts.

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. cans
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)

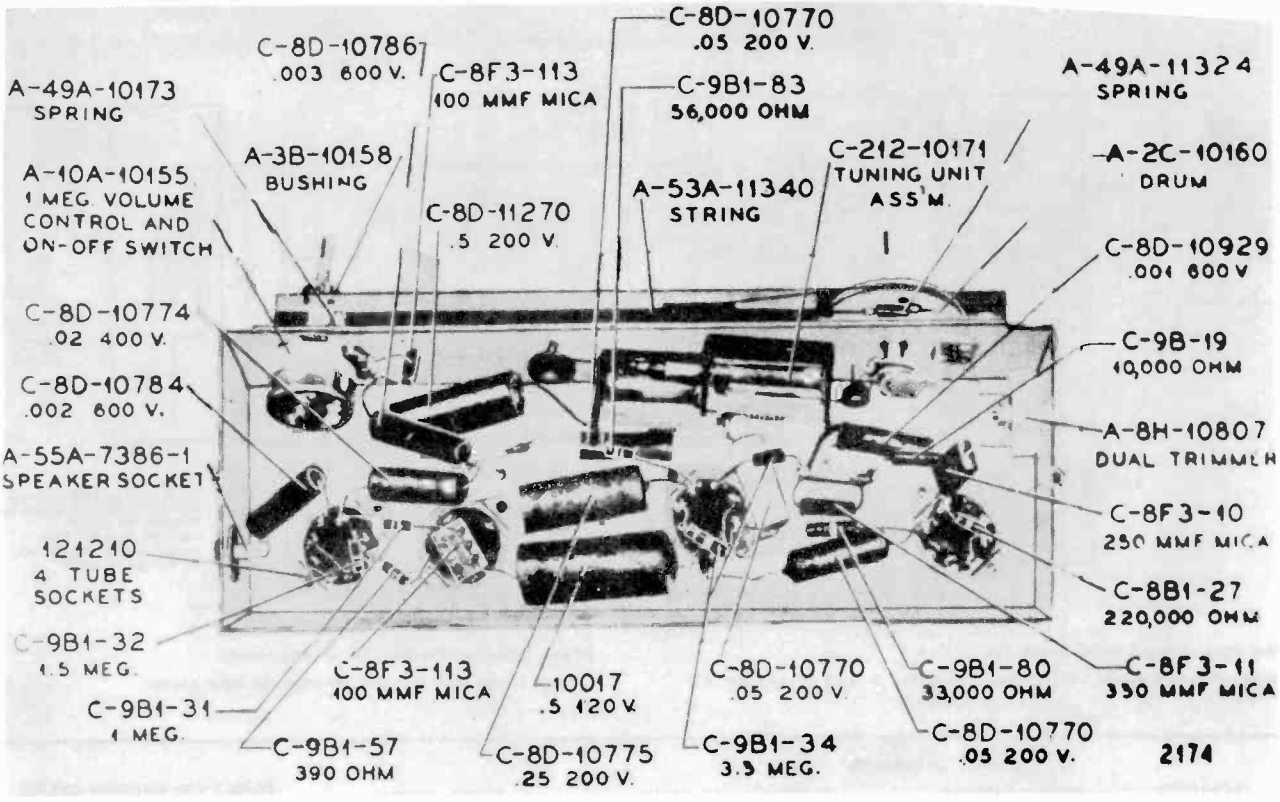
This adjustment and the previous adjustment are interlocking: therefore repeat the two adjustments alternately for best results.

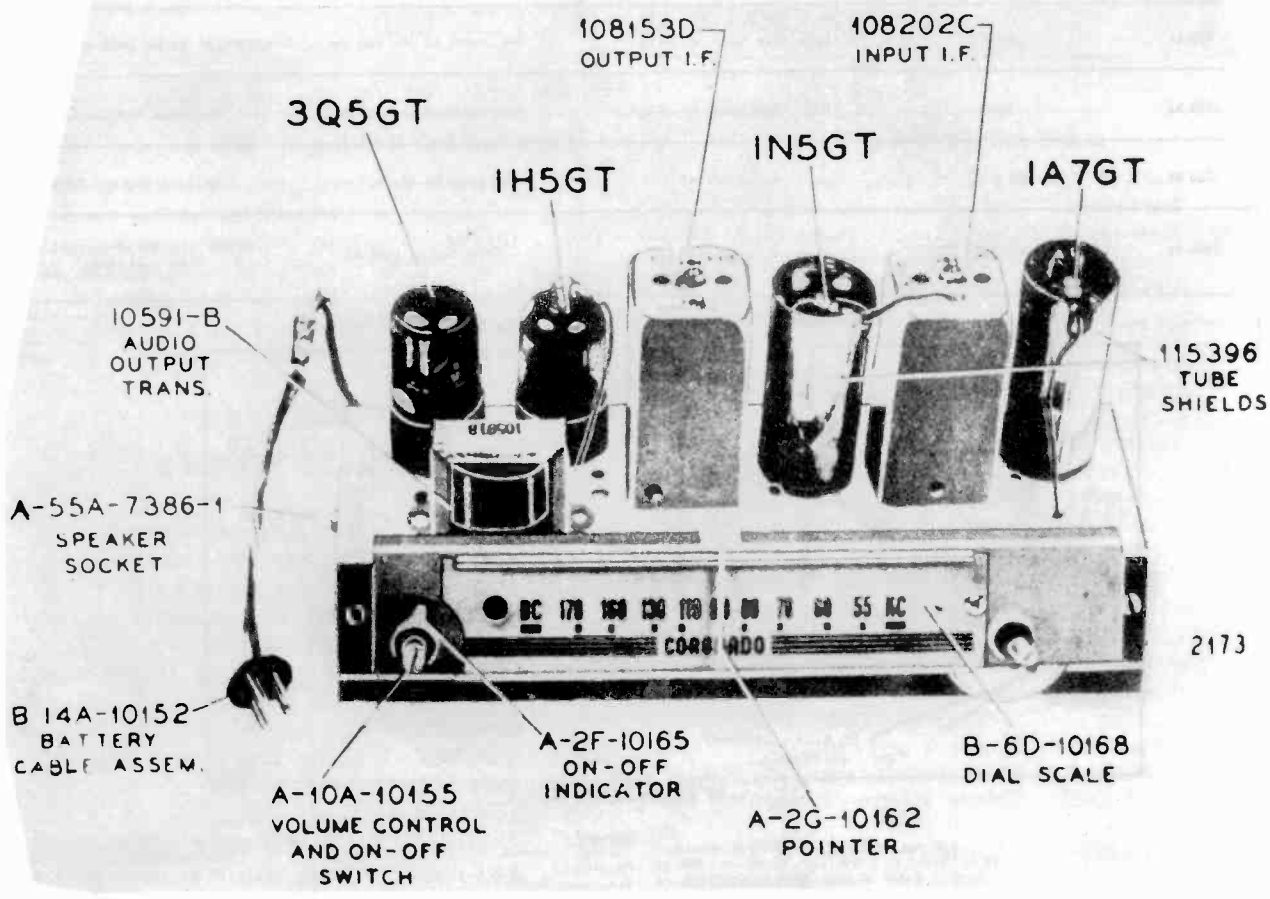


SPECIFICATIONS

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 ohms
Tuning	Two permeability-tuned circuits
Sensitivity	20 mv. avg. for 50 mw. output
Frequency Range	535 to 1,720 kc.
Power Supply	A battery 1.5 v. 250 ma., B battery 90 v. 14 ma.

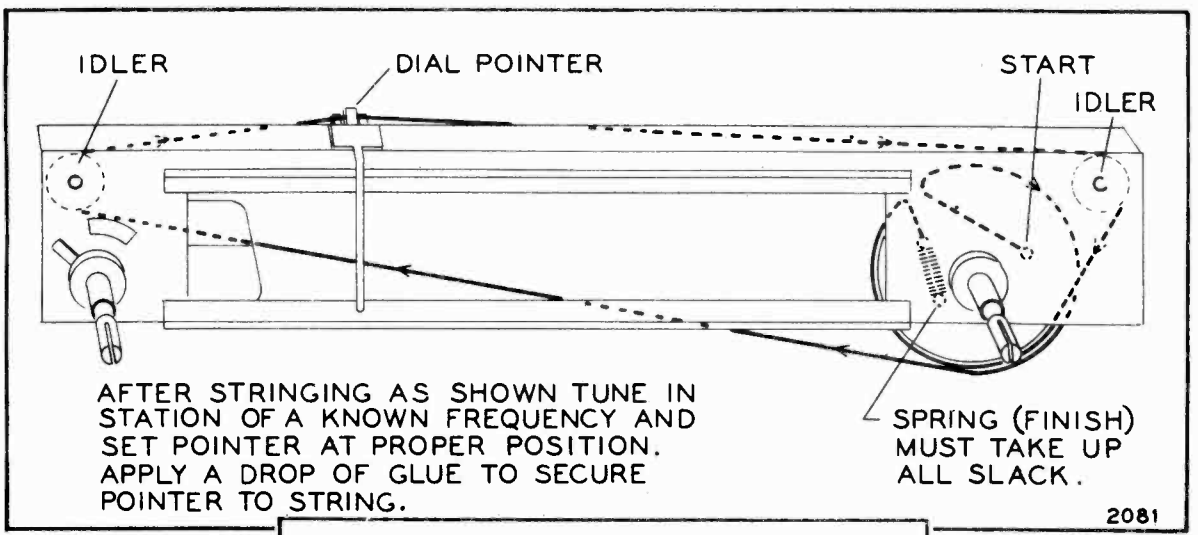

C-8D-10770
.05 200 V.
C-8D-10786
.003 600 V.
C-8F3-113
100 MMF MICA
A-49A-10173
SPRING
C-9B1-83
56,000 OHM
A-49A-11324
SPRING
A-3B-10158
BUSHING
C-212-10171
TUNING UNIT
ASS'M.
A-2C-10160
DRUM
A-10A-10155
1 MEG. VOLUME
CONTROL AND
ON-OFF SWITCH
A-53A-11340
STRING
C-8D-11270
.5 200 V.
C-8D-10929
.001 600 V.
C-8D-10774
.02 400 V.
C-9B-19
10,000 OHM
C-8D-10784
.002 600 V.
A-8H-10807
DUAL TRIMMER
A-55A-7386-1
SPEAKER SOCKET
C-8F3-10
250 MMF MICA
121210
4 TUBE
SOCKETS
C-8B1-27
220,000 OHM
C-9B1-32
1.5 MEG.
C-8F3-113
100 MMF MICA
10017
.5 120 V.
C-8D-10770
.05 200 V.
C-9B1-80
33,000 OHM
C-8F3-11
350 MMF MICA
C-9B1-31
1 MEG.
C-9B1-57
390 OHM
C-8D-10775
.25 200 V.
C-9B1-34
3.9 MEG.
C-8D-10770
.05 200 V.
2174

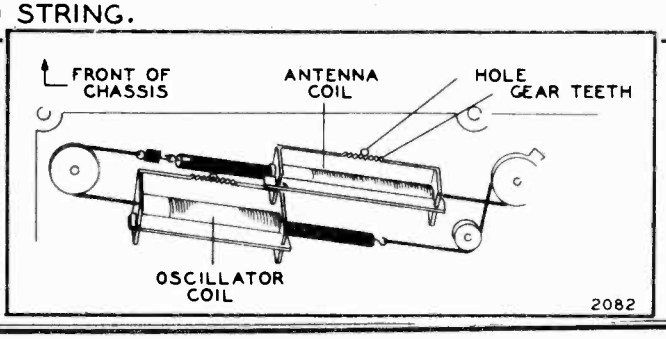

108153D
OUTPUT I.F.
108202C
INPUT I.F.
3Q5GT
1H5GT
1N5GT
1A7GT
10591-B
AUDIO
OUTPUT
TRANS.
115396
TUBE
SHIELDS
A-55A-7386-1
SPEAKER
SOCKET
2173
B 14A-10152
BATTERY
CABLE ASSEM.
A-10A-10155
VOLUME CONTROL
AND ON-OFF
SWITCH
A-2F-10165
ON-OFF
INDICATOR
A-2G-10162
POINTER
B-6D-10168
DIAL SCALE

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, including antenna and oscillator coils
T2	108202C	Input I.F. coil, complete in can (range of trimmers: pri. 60-110 mmf, sec. 40-70 mmf)
T3	108153D	Output I.F. coil, complete in can (range of trimmers: 40-70 mmf 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, 1A7GT)
	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

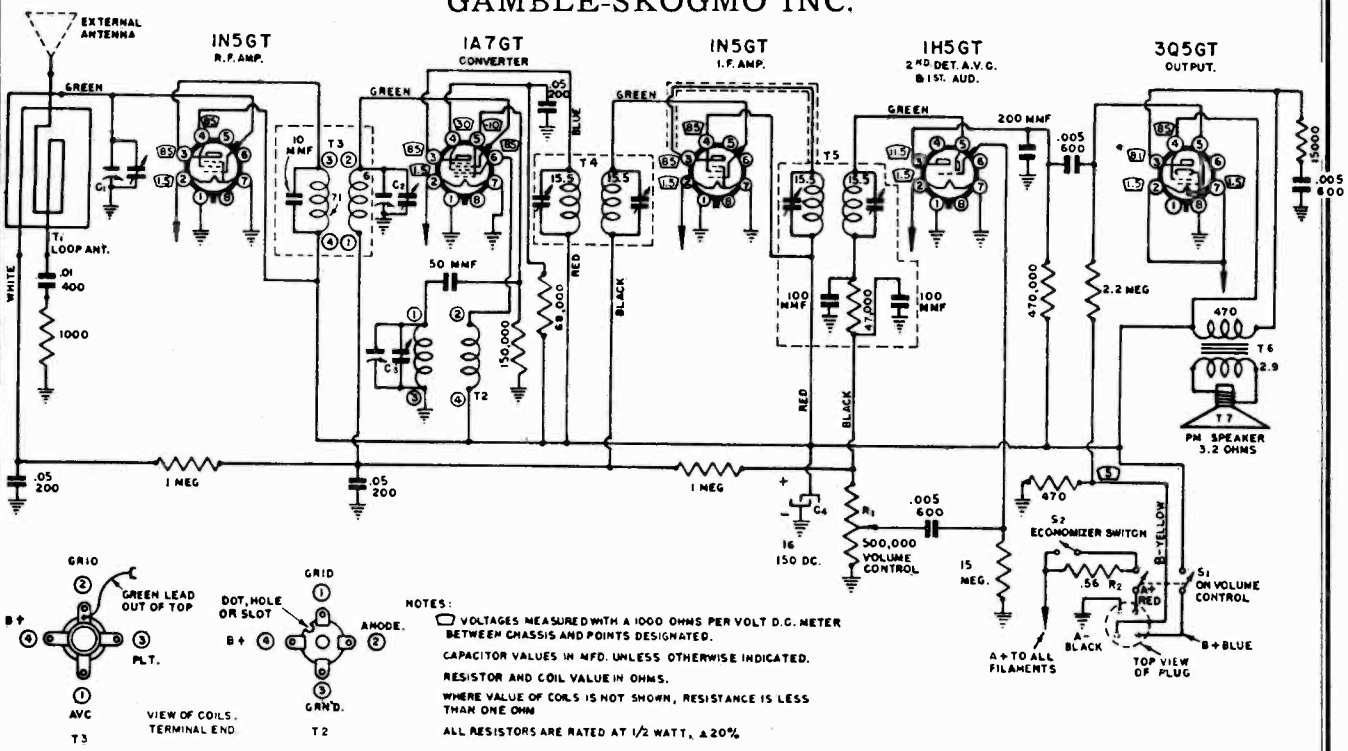
DRIVE CORD REPLACEMENT





MODEL 43-6451

GAMBLE-SKOGMO INC.



IF PEAK 455 KC

SERVICE PARTS LIST MODEL 43-6451

Order Parts by Model No. and Part No.

Part No.	Name
25296	Adaptor, for use with 2 volt storage battery.
25566	Bearing (for wood pulleys)
25561	Cabinet
25597	Coil, R. F. (T3)
25598	Coil, Oscillator (T2)
25600	Condenser, Electrolytic 16 Mfd, 150 V. (C4)
25592	Condenser—Tuning, 3 Gang, less Tuning Shaft (C1, C2, C3)
25367	Control, Volume, with On-Off Switch (R1)
25811	Cord, Dial, complete with Spring and Pointer Coupling
25696	Knob, Tuning or Volume
25609	Loop (T1)
25612	Plug, Battery Cable 4 Prong
	Pointer, Dial — See "Track-Pointer"
25336	Pulley—Wood
25616	Scale, Dial
25766	Shaft—Tuning with "spool" pulley
25620	Socket—Tube
25593	Speaker 5" P. M. Dynamic (T7) (less Transformer)
25319	Switch, Economizer (S2)
25808	Track, Pointer, complete with Brackets and Pointer
25621	Transformer I. F. Input (T4)
25622	Transformer I. F. Output (T5)
25594	Transformer—Speaker Output (T6)

Reference Numbers such as (C4) are shown on circuit diagram.

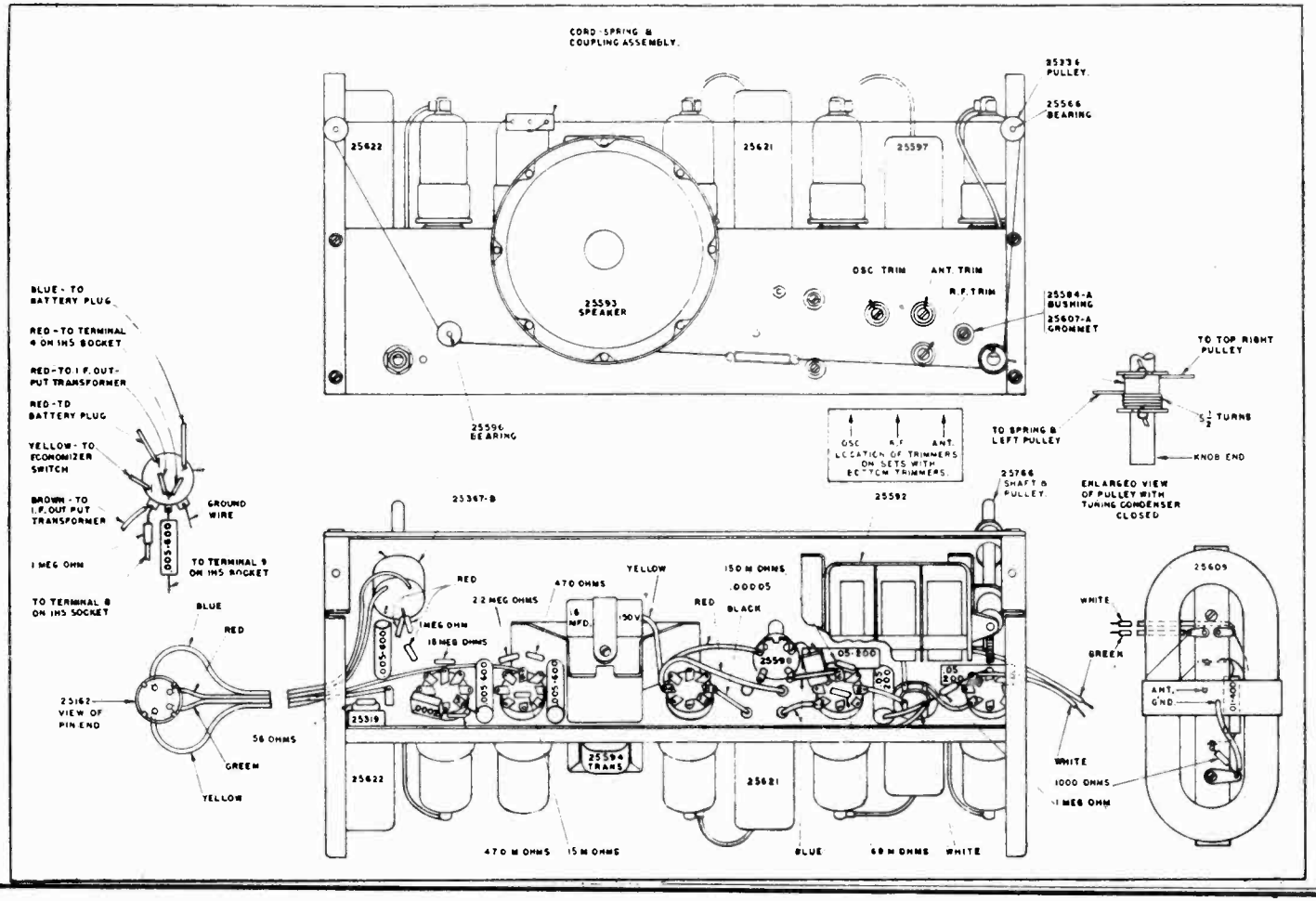
Parts not listed above, may be ordered by part number as shown in the picture and by complete description, send a sketch if possible. Order parts from your local Gamble Store.

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 test oscillator adjusted to 455 KC, connected to the grid of the 1A7GT through a .1 Mfd condenser, with the tuning condenser set at minimum capacity. To align tuning condenser, connect test oscillator to antenna wire (green) through a .0001 Mfd. condenser. Adjust oscillator trimmer condenser (located on left top) to 1620 KC with tuning condenser at minimum capacity (completely 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 bakelite pointer coupling on dial cord.

Battery Unit Voltages—Should be checked with receiver turned on—if B voltage is below 60 Volts, battery unit should be replaced.

Dial Cord Replacement—Is best accomplished by replacing complete cord assembly #25811, which is made up to correct length. In an emergency 30 lb. fish line may be used. See picture of chassis for correct installation.



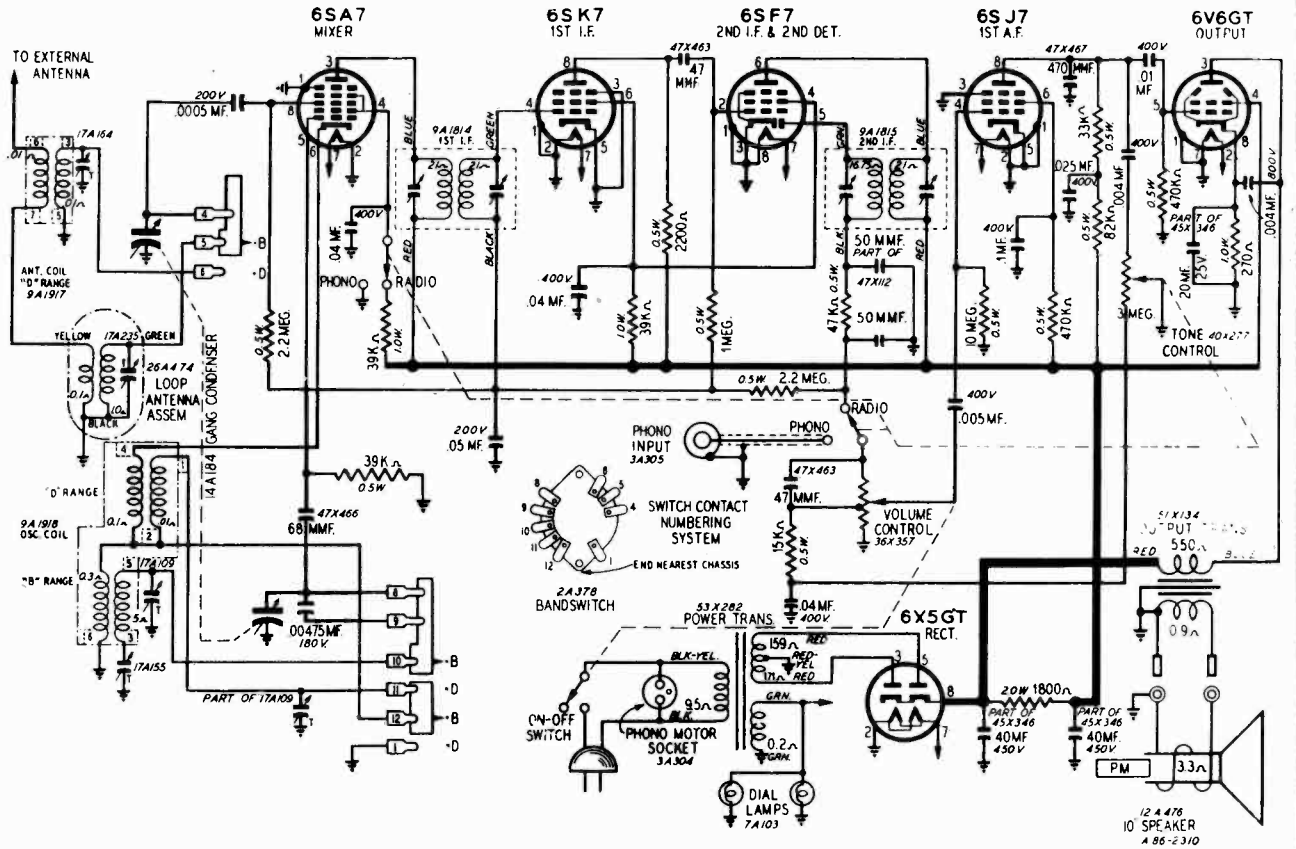
MODELS 43-7603, 43-7604

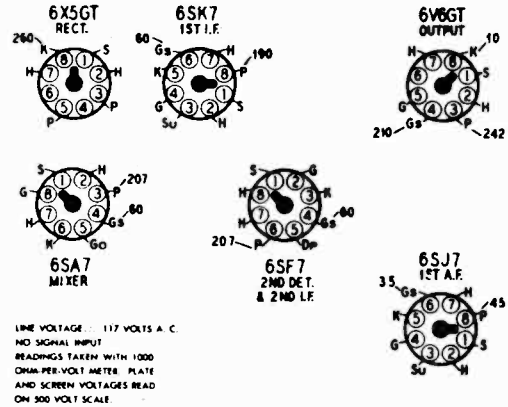
GAMBLE-SKOGMO, INC.

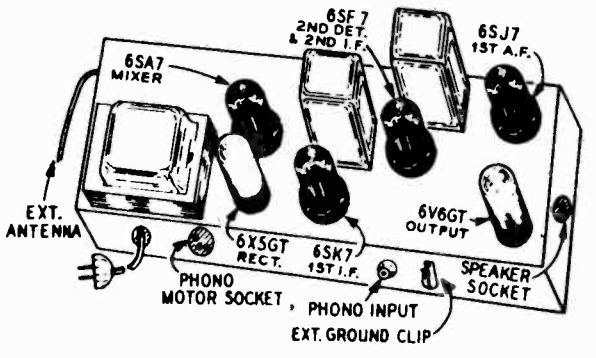
SPECIFICATIONS

6 Tube Superheterodyne, Including Rectifier Tube
Speaker.....10" 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

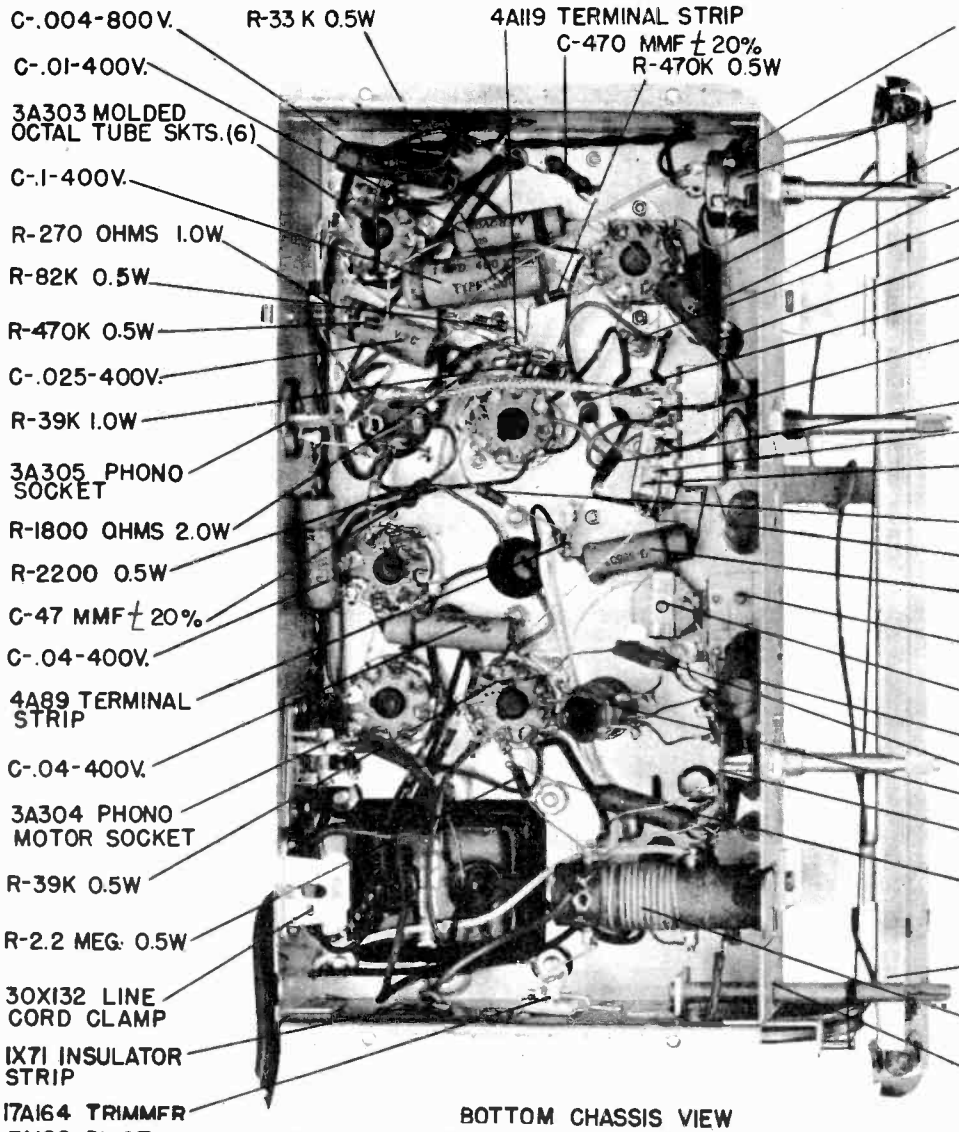
Power Supply ..... 102-125 Volts, 60 cycle
Power Consumption (at 117 Volts AC) 45 Watts (norma
65 Watts (phono)
Power Output ..... 4 Watts Maximum 2.3 Wat
10% Harmonics
Tuning Frequency Range
B Range .....540-1600 Kilocycles
D Range .....5.75 - 18.3 Megacycles
Record Changer .....Plays ten 12" or twelve 10"



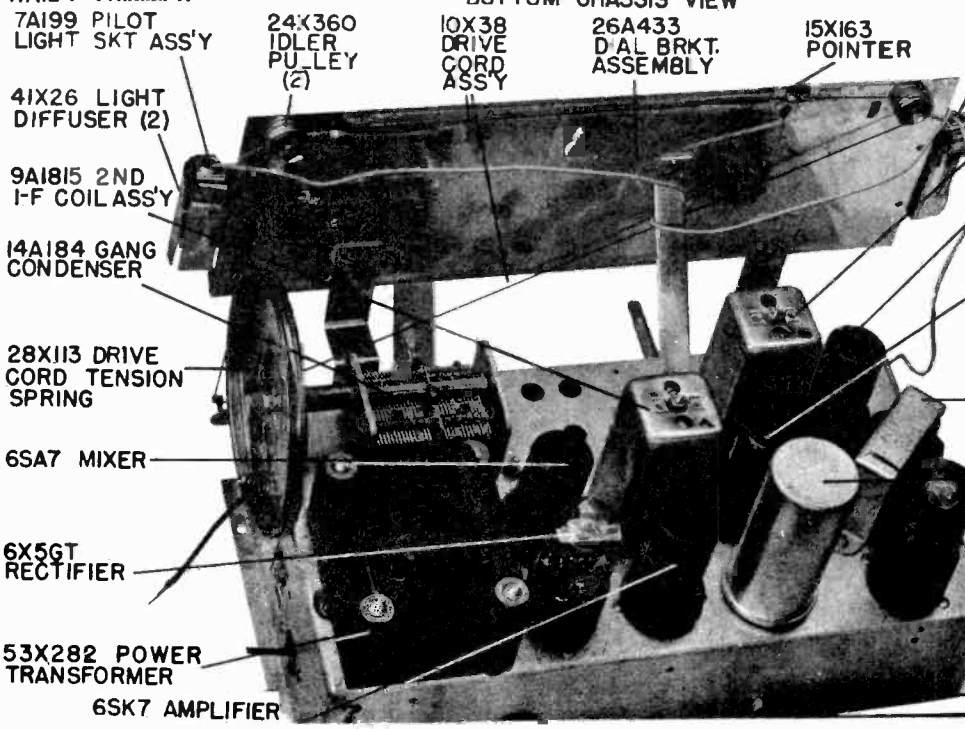




GAMBLE-SKOGMO, INC. MODELS 43-7603, 43-7604



BOTTOM CHASSIS 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:

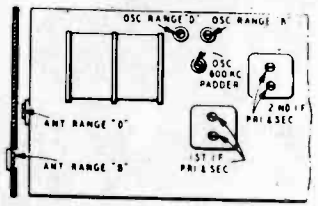
An All Wave Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.
Output Indicating Meter—Non-metallic screwdriver.
Dummy Antennas—.1 mf., 50 mmf., and 400 ohms.

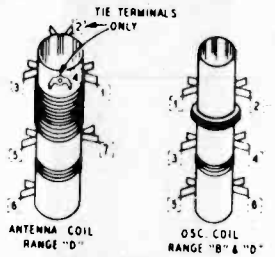
	SIGNAL GENERATOR FREQUENCY SETTING	CONNECTION AT RADIO	DUMMY ANTENNA	BAND SWITCH SETTING	CONDENSER SETTING	ADJUST TRIMMERS TO MAXIMUM
I. F.	455 Kc.	Grid of 6SA7 Pin 8	.1 mf.	B Range	Turn Rotor to Full Open	2nd I.F. (Pri.) and (Sec.) 1st I.F. (Pri.) and (Sec.)
RANGE B	1,620 Kc.	Antenna Lead	50 mmf.	B Range	Turn Rotor to Full Open	Oscillator Range B
	1,400 Kc.	Antenna Lead	50 mmf.	B Range	Tune Rotor to Max. Output Set Pointer to 1,400 Kc. (See Note A)	Antenna Range B
	600 Kc.	Antenna Lead	50 mmf.	B Range	Tune Rotor to Max. Output	Oscillator (600 Kc. Padder) Rock Rotor See Note B
	Repeat above steps at 1,620 and 600 Kc. until readjusting the oscillator. Range B Trimmer causes no further improvement of output.					
RANGE D	10.3 Mc.	Antenna Lead	400 ohm	D Range	Turn Rotor to Full Open	Oscillator Range D
	16 Mc.	Antenna Lead	400 ohm	D Range	Tune Rotor to Max. Output	Antenna Range D Rock Rotor—See Note B
LOOP RANGE B	Reassemble chassis in cabinet.					
	1,400 Kc.	Antenna Lead	50 mmf.	B Range	Tune Rotor to Max. Output	Antenna Range B

NOTE A—Set pointer at the 1,400 KC. mark on the dial scale. Attach pointer to drive cord.

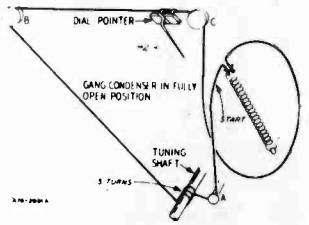
NOTE B—Turn Rotor back and forth and adjust the trimmer until the peak of greatest intensity is obtained.

T-1 T-5





COIL TERMINALS

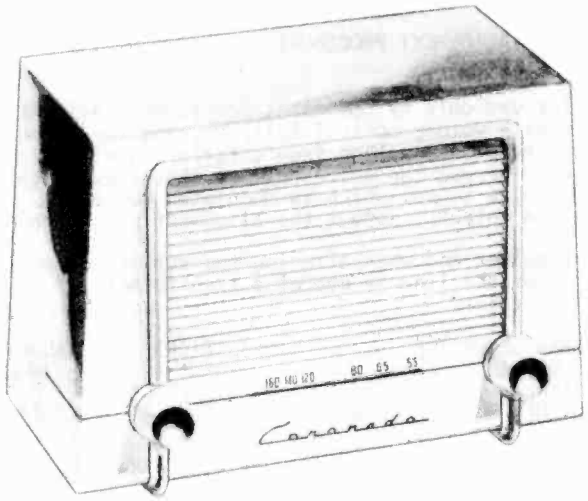


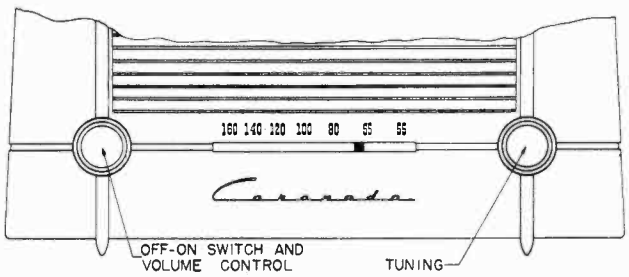
Part No.

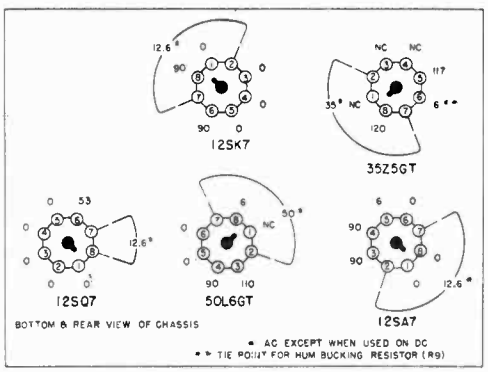
2A378	Band Change Switch
3A303	Molded Octal Tube Socket
3A304	Phono Motor Socket
3A305	Single Pin Jack
4A89	Terminal Strip
4A119	Terminal Strip
7A103	#47 Pilot Light
7A199	Pilot Light Socket Assembly
9A1814	1st I-F Coil Assembly
9A1815	2nd I-F Coil Assembly
9A1917	"D" Antenna Coil Assembly
9A1918	"B" & "D" Oscillator Coil Assembly
10A620	Knob (Tuning)
10A621	Knob (Volume)
10A622	Knob (Tone, R.P.)
10A623	Knob (SW-BC)
12A476	Speaker, 10" P.M.
14A184	Gang Condenser
17A109	Trimmer Condenser (dual) 2.5-35 mmf
17A155	Trimmer Condenser, 350-430 mmf
17A164	Trimmer Condenser, 5-50 mmf
26A442	"B" Range Loop Antenna Ass'y consisting of: 9A1821 "B" Range Loop Antenna 17A235 Trimmer Condenser #1701 Tubular Rivet 3/16"
26A443	Dial Bracket Assembly 7X42 Cardboard Spacer 58X615 Dial Background 25X1495 Dial Bracket 24X360 Idler Pulley 41X26 Light Diffuser 20X268 Rivet
26A444	Idler Bracket Assembly consisting of: 25X1488 Idler Bracket 20X1450 Rivet
1X71	Insulator Strip
2X310	Felt Washer (mtg. 28X113)
4X990	Escutcheon
28A139	Record Changer VM #800
	#1114 1/4" Lockwasher, E. T. Shakeproof (Mtg. 57X184)
	1/4-20 x 1 1/4 R.H.M.S. Steel, Cad. Pl. (Mtg. 58X184)
	#6-32 Hex Nut Cad. Pl.
	#6 Split Lockwasher (Mtg. 1X71)
6X21	Rubber Grommet
8X93	Rubber Bumpers
10X38	Drive Cord Assembly
13X328	Line Cord and Plug
15X163	Pointer
19X8	Flat Washer (Mtg. chassis to cabinet)
19X45	#1 Flat Washer (Mtg. power transformer)
19X192	"C" Washer (Mtg. drive shaft)
20X329	Condenser Cushion Stud
20X1449	6-32 x 5/16" Washer Hd. Machine Screw
20X1491	Eyelet
26X486	Drive Shaft
27X56	Bottom Plate
25X1488	Idler Bracket
28X113	Drive Cord Tension Spring
28X208	Coil Mounting Spring
28X265	Ground Plate
30X132	Line Cord Clamp
30X138	Fahnestock Clip (External Ground)
30X522	Terminal (connecting 27X56 to chassis)
30X523	Terminal (connected to 27X56)
36X357	Volume Control and Switch
40X277	Tone Control & Radio-Phono Switch
41X26	Light Diffuser
45X346	3 Section Electrolytic Condenser 40mf, 450V. - 40mf, 450V. - 20mf, 25V.
46X289	Capacitor, Tubular - .00475 mf, 180 V.
47X112	Capacitor, Dual Mica - 50-50 mmf ± 20%
47X463	Capacitor, Molder Mica - 47 mmf ± 20%
47X466	Capacitor, Molder - 68 mmf ± 10%
47X467	Capacitor, Molded Mica - mmf ± 20%
51X134	Output Transformer
53X282	Power Transformer (60 cycles)
57X184	Locking Plate
58X615	Dial Background
58X695	Dial Glass
B66501	Capacitor, Tubular - .0005 mf 200V. ± 20%
B66503	Capacitor, Tubular - .05 mf 200V. ± 25%
B84153	Resistor, Carbon - 15,000 ohms .5W
B84222	Resistor, Carbon - 2200 ohms .5W
B84333	Resistor, Carbon - 33,000 ohms .5W
B84393	Resistor, Carbon - 39,000 ohms .5W
B84824	Resistor, Carbon - 82,000 ohms .5W
B85105	Resistor, Carbon - 1 megohm .5W
B85106	Resistor, Carbon - 10 megohms .5W
B85225	Resistor, Carbon - 2.2 megohms .5W
B85473	Resistor, Carbon - 47,000 ohms .5W
B85474	Resistor, Carbon - 470,000 ohms .5W
C84271	Resistor, Carbon - 270 ohms 1.0W
C84393	Resistor, Carbon - 39,000 ohms 1.0W
D64253	Capacitor, Tubular - .025 mf 400V. ± 10%
D64403	Capacitor, Tubular - .04 mf 400V. ± 10%
D66103	Capacitor, Tubular - .01 mf 400V. ± 25%
D66402	Capacitor, Tubular - .004 mf 400V. ± 25%
D66403	Capacitor, Tubular - .04 mf 400V. ± 25%
D66502	Capacitor, Tubular - .005 mf 400V.
D67104	Capacitor, Tubular - .10 mf 400V. -10% + 30%
D84182	Resistor, Carbon - 1800 ohms 2.0W
H66402	Capacitor, Tubular - .004 mf 800V. ± 25%
	#1701 3/16" Tubular Rivet (mtg. parts)
	#1701 5/32" Tubular Rivet (mtg. parts)
	#1701 1/8" Tubular Rivet (mtg. parts)
	3/8" Palnut (Mtg. tone control, band switch, Type 9N1 and volume control)
	#8 Lockwasher E. T. } Mtg. Power Transformer
	#8 - 32 Hex Nut }
	#6 x 1/4" Slotted Hex. Hd. P.K Type "X" Screw (Mtg. idler bracket, dial bracket, and bottom plate & S-27X1)
	#2 x 3/8" French Oval Hd. Wood Screw Statuary Bronze (mtg. escutcheon)
	#6 (1106) Lockwasher, E.T. Shakeproof, Cad. Pl.
	#10 x 1/2" Slotted Hex. Hd. P-K Type "Z" Screw (mtg. chassis to cabinet)
	#10 x 3/4" Washer Hd. Wood Screw Steel (mtg. speaker)
	#16 x 5/8" Flat Hd. Blue Finished Nail (mtg. loop to cabinet)
	#10 x 5/8" Washer Hd. Wood Screw, Steel (Mtg. 57X184)

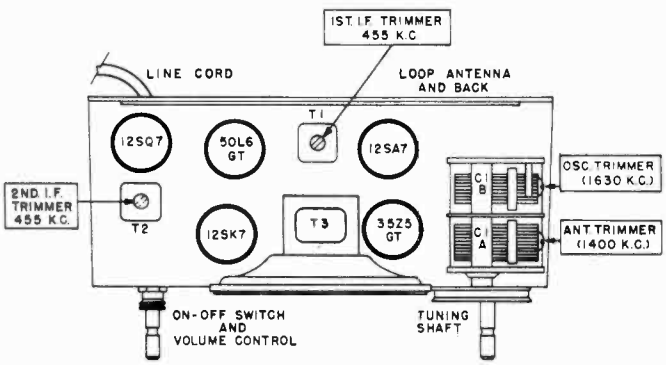
GAMBLE-SKOGMO, INC.

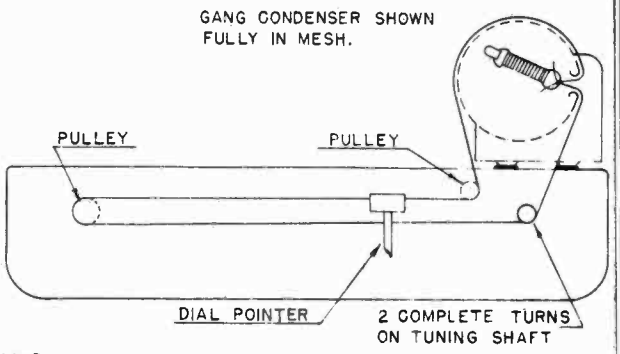
MODELS 43-8129A, 43-8130A, 43-8130B, 43-8131A, 43-8131B











SPECIFICATIONS

Power Supply	117 volts 60 cycle AC, 117 volts DC, 29 watts
Frequency Range	535 KC to 1630 KC
Intermediate Frequency	455 KC
Antenna	Built-in Loop
Tuning	Variable Capacity
Speaker	4", P.M., voice coil impedance 3.2 ohms
Power Output	0.75 watt undistorted, 1.8 watts maximum
Sensitivity	500 uv/m average for 50 milliwatts output
Selectivity	65 KC broad at 1000 times, signal at 1000 KC

Tubes used are as follows:

12SA7 Oscillator-Converter
12SQ7 AVC, Detector and Audio
12SK7 I.F. Amplifier
50L6GT Power Output
35Z5GT Power Rectifier

MODELS 43-8129A, 43-8130A, 43-8130B, 43-8131A, 43-8131B

GAMBLE-SKOGMO, INC.

ALIGNMENT PROCEDURE

The following 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 AVC action from interfering with proper alignment.

With the output meter connected across the voice coil of the speaker, the output meter reading for 50 milliwatts is 0.4 volts, using a signal which is modulated 400 c.p.s.

Adjust all trimmers for maximum output. Repeat the alignment procedure given below as a final check.

CAUTION: This is an AC/DC 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 to place a .2 MFD condenser in each test lead of the Signal Generator.

SIGNAL GENERATOR Frequency	Dummy Antenna	Connection to Radio	POSITION OF VARIABLE	ADJUST FOR MAXIMUM OUTPUT
455 KC	.1 MFD	12SA7 Grid	Fully	T1 & T2
		Stator C1A	Open	
1630 KC	.1 MFD	12SA7 Grid	Fully	C1B
		Stator C1A	Open	Oscillator
		Loosely	Tune in	
1400 KC		Coupled	Signal	C1A
		To Loop	Generator	Antenna

Connect low side of Signal Generator to common negative.

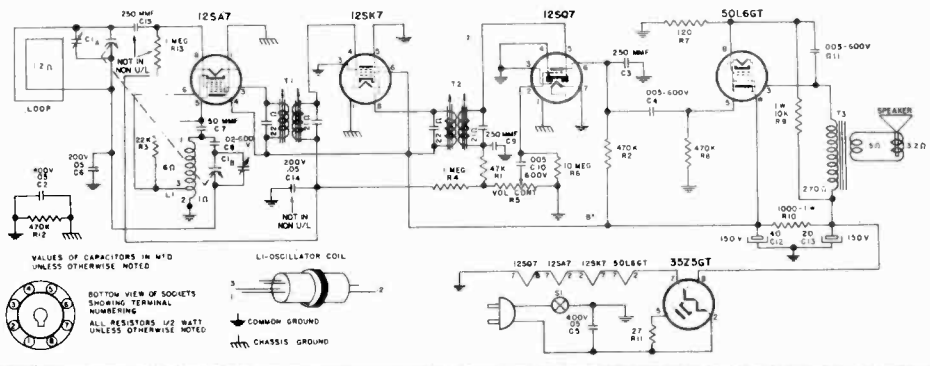
SYMBOL	PART NO.	DESCRIPTION	VALUE	TOL.	RATING
		CONDENSERS			
C1A, C1B	B19-198	Condenser, 2 gang			
C2, C5	A16-158	Condenser, paper	.05 MFD	20%	400 volts
C3, C9, C15	A15-176	Condenser, mica	250 MMF	20%	500 volts
C4, C10, C11	A16-153	Condenser, paper	.005 MFD	20%	600 volts
C6, C14	A16-152	Condenser, paper	.05 MFD	20%	200 volts
C7	A15-175	Condenser, mica	50 MMF	20%	500 volts
C8	A16-151	Condenser, paper	.02 MFD	20%	600 volts
C12	A18-280	Electrolytic	40 MFD		150 volts
C13	A18-272	Electrolytic	20 MFD		150 volts
		RESISTORS			
R1	A60-685	Resistor	47K ohm	20%	1/2 watt
R2, R8, R12	A60-662	Resistor	470K ohm	20%	1/2 watt
R3,	A60-659	Resistor	22K ohm	20%	1/2 watt
R4, R13	A60-668	Resistor	1 megohm	20%	1/2 watt
R5	A24-180	Volume control and switch	1 megohm	20%	1/2 watt
R6	A60-663	Resistor	10 megohm	20%	1/2 watt
R7	A60-702	Resistor	120 ohms	10%	1/2 watt
R9	A60-698	Resistor	10K ohm	10%	1 watt
R10	A60-732	Resistor	1000 ohms	10%	1 watt
R11	A60-690	Resistor	27 ohms	10%	1/2 watt
		COILS AND TRANSFORMERS			
T1, T2	A10-479	Input and output I.F. transformers			
L1	B10-480	Oscillator coil			

CABINET, DIAL AND TUNING PARTS

PART NO.	DESCRIPTION
A42-453	Cabinet, polystyrene, brown
D42-450	Cabinet, polystyrene, white
A42-452	Cabinet, polystyrene, black
A52-282	Knob, tenite, brown
B52-281	Knob, tenite, white
A51-105	Dial cord
A58-73	Pointer, slide type
A70-122	Spring, dial cord tension

MISCELLANEOUS

PART NO.	DESCRIPTION
A11-187	Clamp, line cord
A23-151	Line cord
A83-421	Clip, I.F. trans. mounting
B79-369	Speaker, 4", P.M. w/output trans.
C21-139	Cover, chassis bottom
SD84-275	Loop and back (for U/L models)
SD84-305	Loop and back (for non U/L models)
68-11	Tube socket



GAMBLE-SKOGMO INC.

MODEL 43-8160

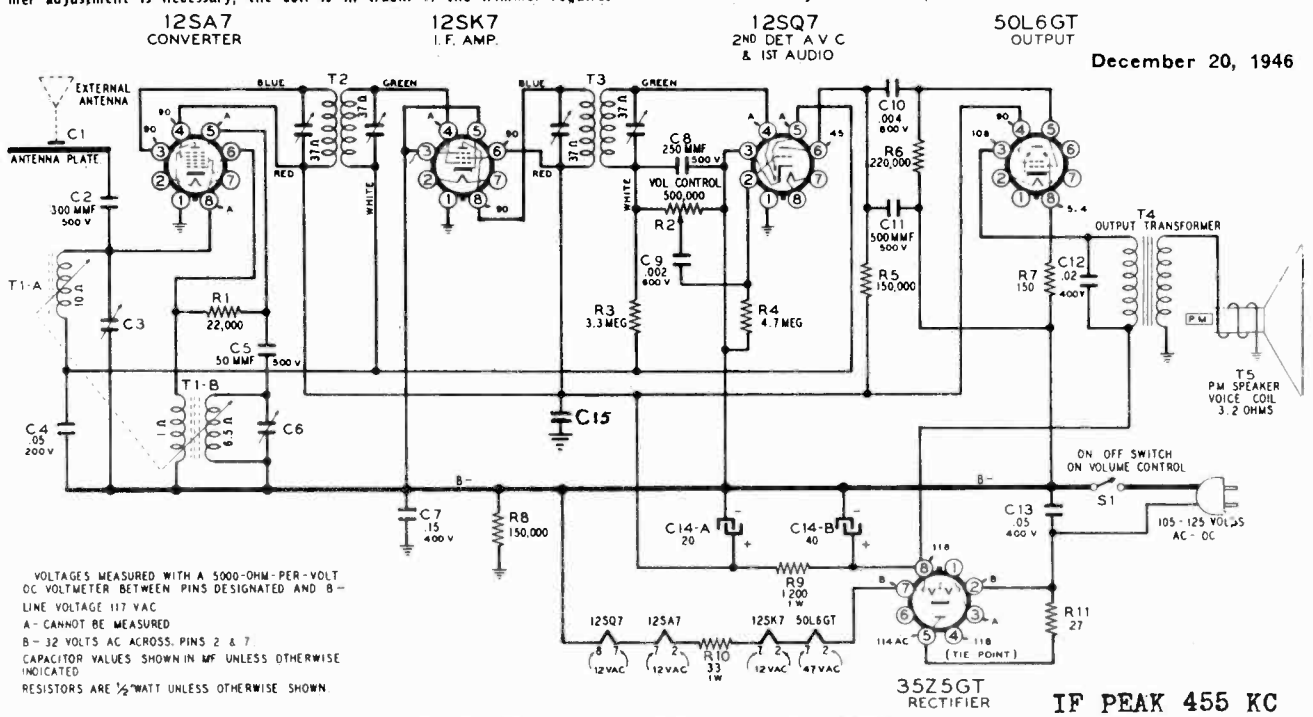
ALIGNMENT PROCEDURE

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.

FREQUENCY	SIGNAL GENERATOR COUPLING CAPACITOR	SIGNAL GENERATOR CONNECTION TO RADIO	GROUND CONNECTION	TUNER SETTING	ADJUST TRIMMERS TO MAXIMUM OUTPUT (in order shown)
455 kc	.1 mf	Metal antenna plate	12SQ7 Pin 3 (B—)	Iron cores all the way out	Trimmers on output and input I.F. cans
1720 kc	.1 mf	Metal antenna plate	12SQ7 Pin 3	Iron cores all the way out	Oscillator trimmer C6
1720 kc	200 mmf	External antenna clip	12SQ7 Pin 3	Iron cores all the way out	Antenna trimmer C3
1400 kc	200 mmf	External antenna clip	12SQ7 Pin 3	Turn dial to 1400 kc	Adjust position of antenna coil (see coil assembly view)
1720 kc	200 mmf	External antenna clip	12SQ7 Pin 3	Turn dial to 1720 kc	Antenna trimmer C3*

*After the antenna coil has been tracked at 1400 kc, it is necessary to check the antenna trimmer C3 again at 1720 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 coil at 1400 kc must be readjusted. These two adjustments should be made several times, until no trimmer adjustment is required at 1720 kc.



SCHEMATIC DIAGRAM LEGEND

C 1 Antenna plate, walnut color
C 1 Antenna plate, ivory color
C 2 300 mmf. 20% mica
C 3 Dual trimmer 74-136 mmf. (antenna)
C 4 .05 mf. 200 v. 25%
C 5 .05 mf. 400 v. 25%
C 6 95-175 mmf. (oscillator)
C 7 .15 mf. 400 v. 25%
C 8 250 mmf. 20% mica
C 9 .002 mf. 600 v. 25%
C10 .004 mf. 600 v. 25%
C11 500 mmf. 20% mica
C12 .02 mf. 400 v. 25%
C13 .05 mf. 400 v. 25%
C14-A, B Electrolytic 40 mf. x 150 v.
20 mf. x 150 v. for 60 cycles
Electrolytic 60 mf. x 150 v.
40 mf. x 150 v. for 25 cycles
C15 .01 mf. 400 v. 25%

RESISTORS

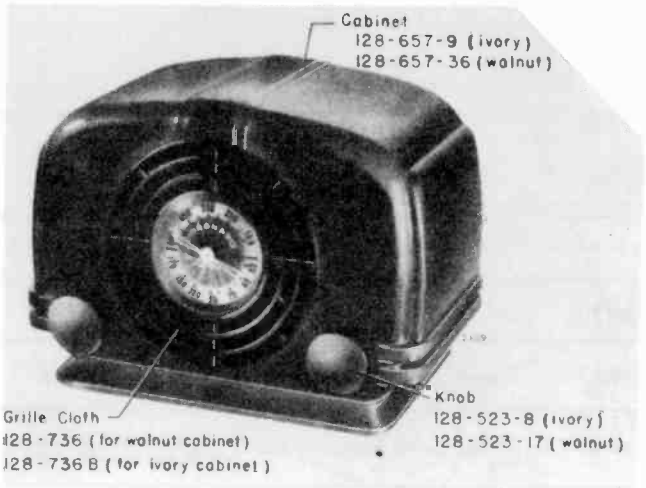
R 1 22,000 ohms ½ w. 10%
R 2 Volume control, 500,000 ohms, on-off switch
R 3 3.3 megohms ½ w. 20%
R 4 4.7 megohms ½ w. 20%
R 5 150,000 ohms ½ w. 20%
R 6 220,000 ohms ½ w. 20%
R 7 150 ohms ½ w. 10%
R 8 150,000 ohms ½ w. 20%
R 9 1,200 ohms 1 w. 10%
R10 33 ohms 1 w. 10%
R11 27 ohms ½ w. 10%

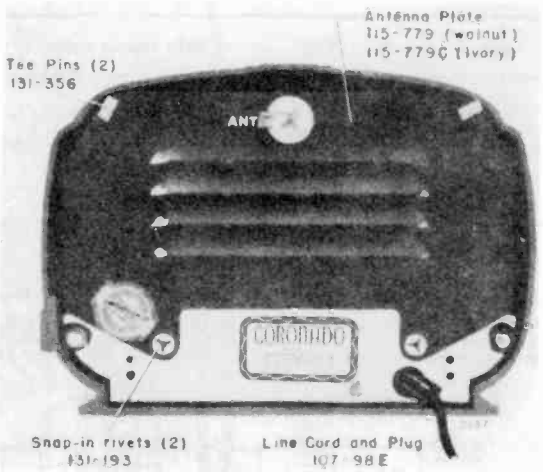
MISCELLANEOUS

T1A, B Permeability tuning unit complete, including antenna and oscillator coils
T2 Input I.F. coil complete in can. Range of trimmers: 39-73 mmf. each
T3 Output I.F. coil complete in can. Range of trimmers: 39-73 mmf. each
T4 Output transformer
T5 Speaker 4 inch P.M. voice coil impedance, 3.2 ohms

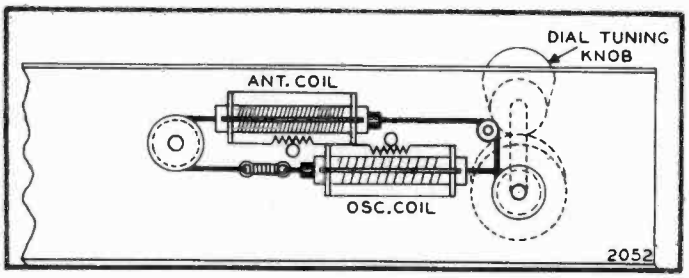
MODEL 43-8160

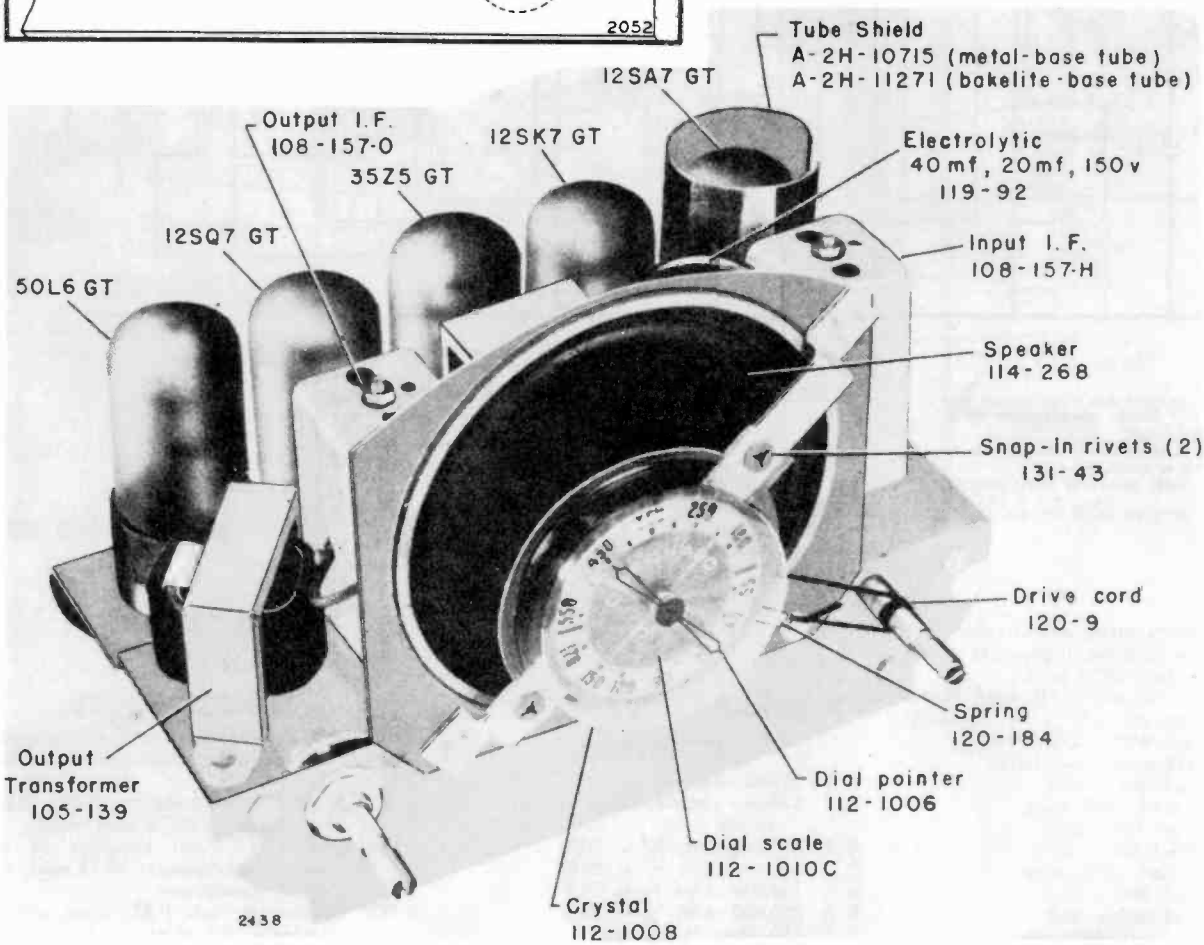
GAMBLE-SKOGMO INC.

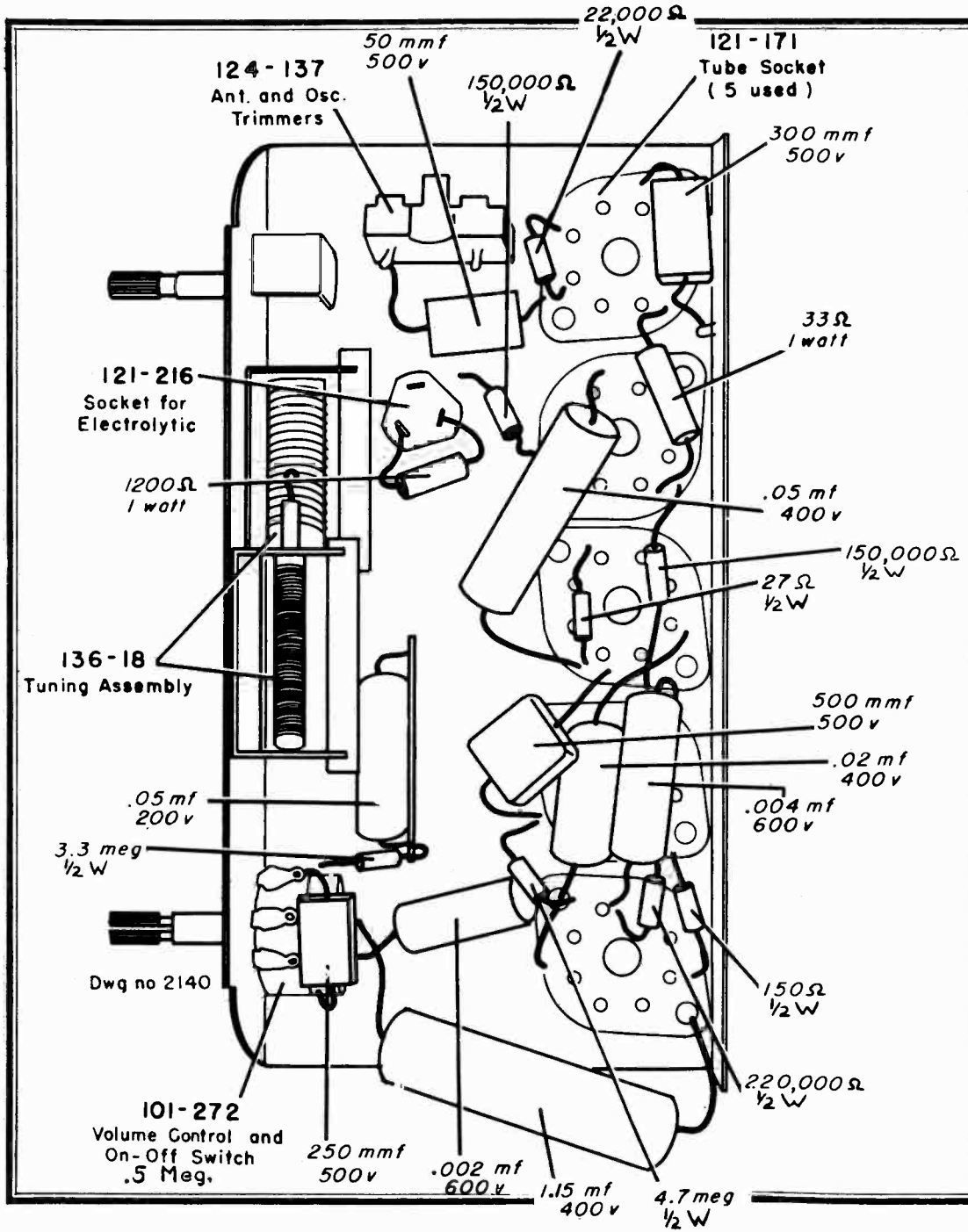




SLUG TUNER



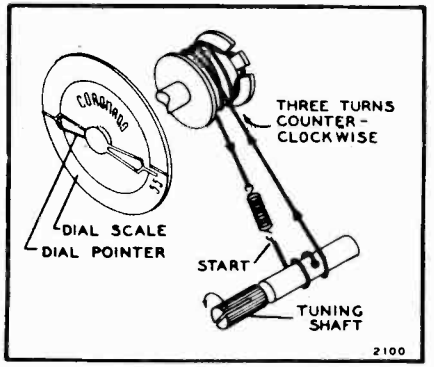




SPECIFICATIONS

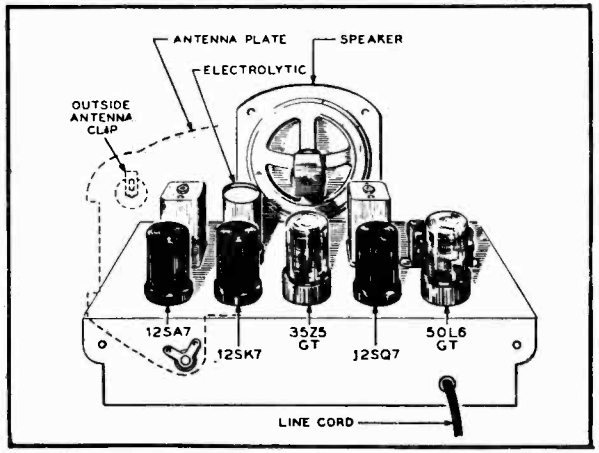
5 Tube Superheterodyne, including rectifier tube	
Power Consumption	28 w.
Power Output	0.80 w. undistorted, 1.5 w. maximum
Selectivity	71 kc. broad at 1,000 times signal at 1,000 kc.
Antenna	Self-contained plate antenna. Also provision for connection of external antenna
Intermediate Frequency	455 kc.
Speaker	4 inch P.M., voice coil impedance, 3.2 ohms
Tuning	Two permeability-tuned circuits
Sensitivity	40 mv. avg. for 50 mw. output
Frequency Range	540 to 1,720 kc.
Power Supply	105 to 125 v., A.C.-D.C., 50-60 cycle

DRIVE CORD REPLACEMENT



1. Turn tuning shaft counter-clockwise.
2. Re-string as shown.
3. Adjust pointer so that the band is covered properly when turning the tuning shaft back and forth.

CHASSIS VIEW

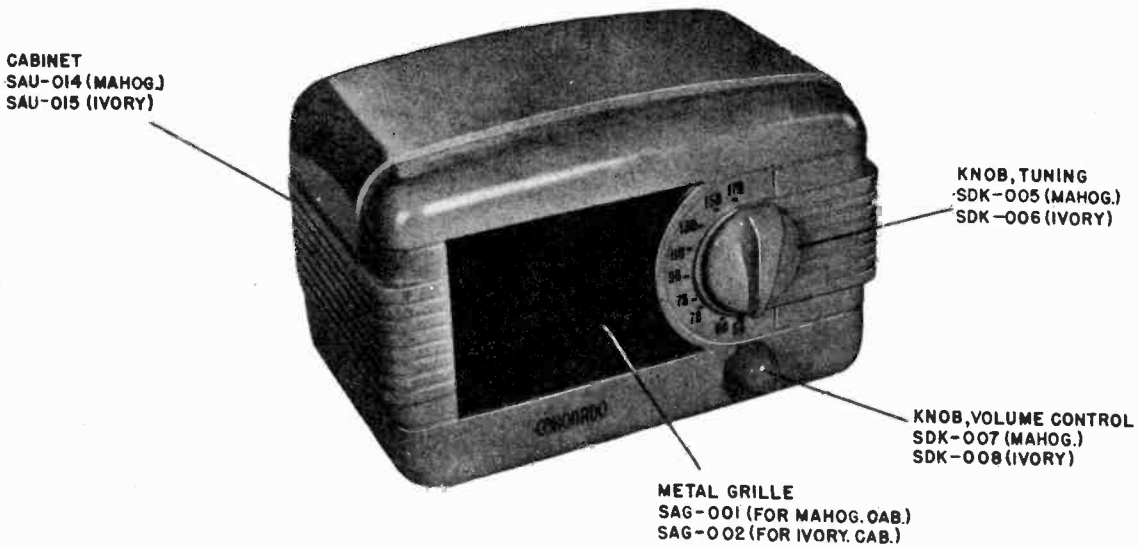


GAMBLE-SKOGMO INC.

MODEL 43-8160

MODELS 43-8177, 43-8178 43-8179

GAMBLE-SKOGMO, INC.



SPECIFICATIONS

5 tube Superheterodyne, including rectifier tube
Intermediate Frequency ---------- 455 KC
Antenna Sensitivity ----- 89 mv. average for 0.5 w output
Selectivity -- 70 KC broad at 1000 times signal at 1000 KC
Power Output ------- 0.8 w undistorted, 1.5 w minimum full power output
Frequency range ---------- 540 to 1720 KC
Tuning ---------- Direct drive—2 gang condenser
Power supply ---------- 105 to 125 Volts, AC or DC
Frequency on AC ---------- 40 to 60 cycles
Power Consumption ---------- 28 watts at 117V.
Speaker ------- 4 inch "Alnico 5" Magnet Dynamic, voice coil impedance 3.5 ohms (400 cycles)
Antenna ---------- Self contained loop antenna, also provision for external antenna

CATALOG NO.	SYMBOL	TITLE	VALUE	RATING	TOLERANCE
UCC-045	C1	Paper Capacitor	.05 mf	600WVDC	+40 - 15%
SCE-003	C2A	Electrolytic Capacitor	40 mf	150WVDC	+100 - 10%
SCE-003	C2B	Electrolytic Capacitor	40 mf	150WVDC	+100 - 10%
UCC-041	C3	Paper Capacitor	.02 mf	600WVDC	±20%
UCU-1040	C4	Mica Capacitor	330 mmf	500WVDC	±10%
UCC-040	C5	Paper Capacitor	.01 mf	400WVDC	±20%
UCC-039	C6	Paper Capacitor	.006 mf	600WVDC	+40 - 15%
UCU-1040	C7	Mica Capacitor	330 mmf	500WVDC	±10%
*	C9	Antenna Trimmer			
*	C10A	Variable Condenser ant. section			
*	C10B	Variable Condenser osc. section			
*	C11	Oscillator Trimmer			
UCC-045	C12	Paper Capacitor	.05 mf	400WVDC	±20%
UCC-039	C13	Paper Capacitor	.005 mf	600WVDC	±20%
UCC-045	C18	Paper Capacitor	.05 mf	400WVDC	±20%
URE-007	R1	Carbon Resistor	22 ohm	½ W	±20%
URF-053	R2	Carbon Resistor	1500 ohm	2 W	±20%
URD-029	R3	Carbon Resistor	150 ohm	½ W	±20%
URD-113	R4	Carbon Resistor	470,000 ohm	½ W	±20%
URD-105	R5	Carbon Resistor	220,000 ohm	½ W	±20%
URD-145	R6	Carbon Resistor	10 megohm	½ W	±20%
SRC-004	R7	Volume Control	500,000 ohm		
URD-129	R8	Carbon Resistor	2.2 megohm	½ W	±20%
URD-081	R9	Carbon Resistor	22,000 ohm	½ W	±20%
URD-041	R11	Carbon Resistor	470 ohm	½ W	±20%
*	L1	Antenna Loop			
*	L2	1st IF Transformer			
*	L3	2nd IF Transformer			
SLC-001	L4	Oscillator Coil			
*	T1	Output Transformer			
SRC-004	S1	Power Switch with R7			
*	SPKR	4" PM Speaker			
SJS-002		Socket-Octal base tube			
SMS-003		Speed Nuts—for fastening metal grille in cabinet			

ADDITIONAL PARTS FOR MODEL 43-8179

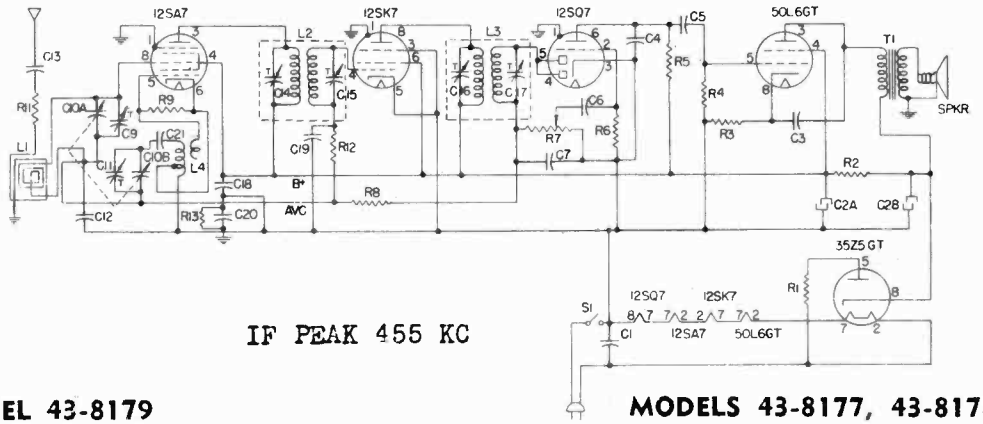
UCC-039	C19	Paper Capacitor	.005 mf	600WVDC	
UCC-048	C20	Paper Capacitor	.1 mf	400WVDC	
UCC-040	C21	Paper Capacitor	.01 mf	400WVDC	
URD-113	R12	Carbon Resistor	470,000 ohm	½ W	±20%
URD-113	R13	Carbon Resistor	470,000 ohm	½ W	±20%

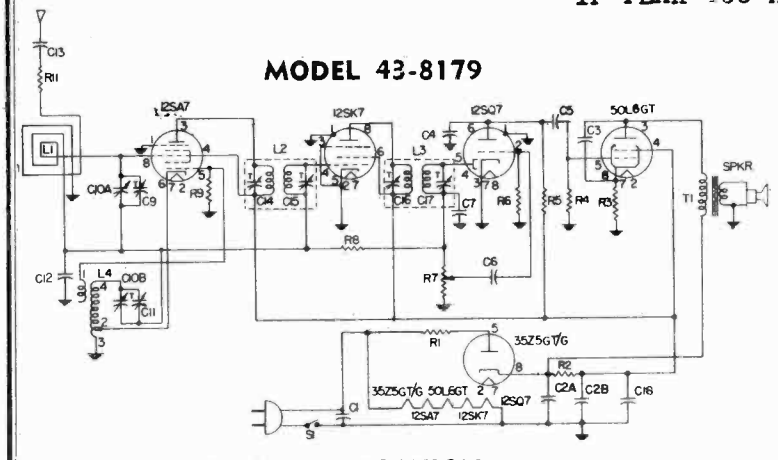
*See listings on pictures

GAMBLE-SKOGMO, INC.

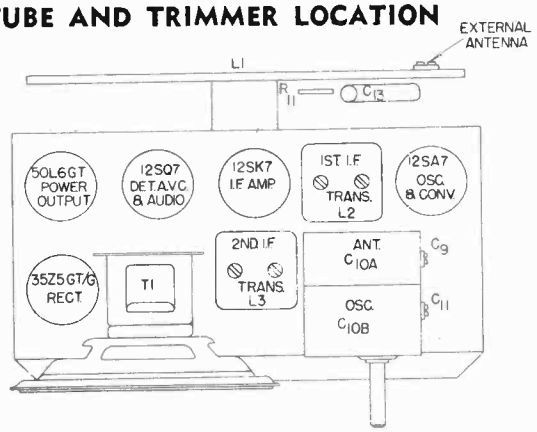
MODELS 43-8177, 43-8178
MODEL 43-8179

May 1, 1947

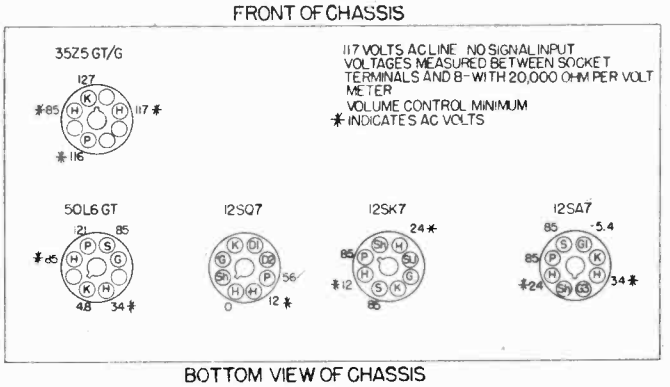




TUBE AND TRIMMER LOCATION



SOCKET VOLTAGE DIAGRAM



ALIGNMENT PROCEDURE

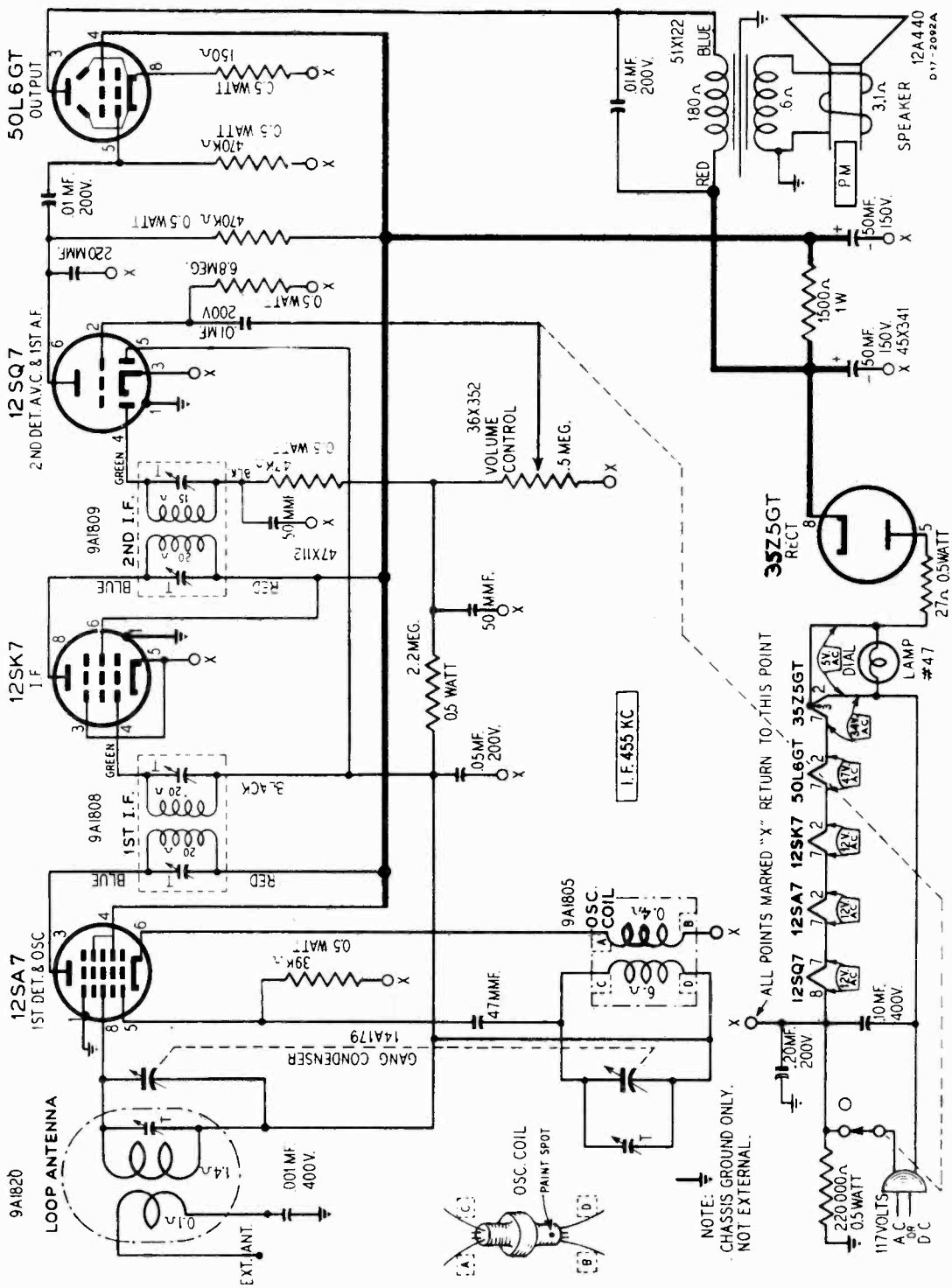
Allow unit to heat for a few minutes before starting alignment.
Volume control set to maximum.
Output meter across speaker.
Align for maximum output.
Reduce input as needed to keep output near 1.0 volt.

Note: If 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 AC through the capacitor will introduce hum and/or create the possibility of a burned out signal generator attenuator.

FREQUENCY	SIGNAL GENERATOR COUPLING CAPACITOR	SIGNAL GENERATOR CONNECTION TO RADIO	GROUND CONNECTION	TUNER SETTING	ADJUST TRIMMERS FOR MAXIMUM OUTPUT (in order shown)
455 KC	0.1 mf	Converter grid	B-	Wide open	2nd IF transformer trimmer 1st IF transformer trimmer
1725 KC	200 mmf	Receiver antenna post	B-	Wide open	Oscillator trimmer C11
1500 KC	200 mmf	Receiver antenna post	B-	Tune for maximum output	Antenna trimmer C9

MODEL 43-8213

GAMBLE-SKOGMO INC.



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 max., .9 watt (10% harmonics)

Selectivity.....55.5 KC Broad at 1000 Times Signal
Intermediate Frequency.....455 KC
Speaker.....5" PM Dynamic
Sensitivity (for .05 watt output with external antenna).....25 microvolts average

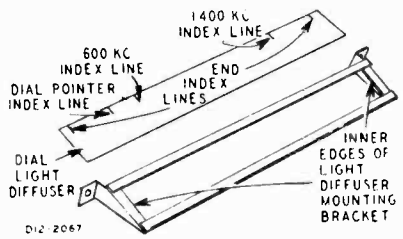
GAMBLE-SKOGMO INC.

DIAL CALIBRATION

In order to align the receiver, the dial pointer must be positioned on the dial string correctly with reference to the dial. Index lines are provided on the dial light diffuser for this purpose.

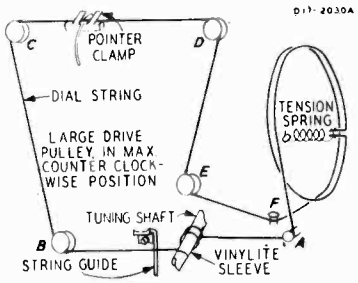
Before aligning the receiver (or when replacing the dial light diffuser) check the position of the diffuser strip, making certain that the two extreme index lines are aligned with the inner edges of the diffuser mounting bracket opening. The bracket should be crimped at one point to prevent movement of the diffuser strip. To position the dial pointer, turn the gang condenser to the fully closed position. The dial pointer should be directly over the dial pointer index line. (See illustration).

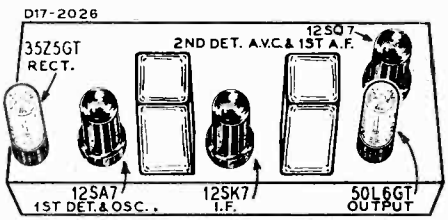
The 600 KC and 1400 KC index lines are for use when aligning the receiver.

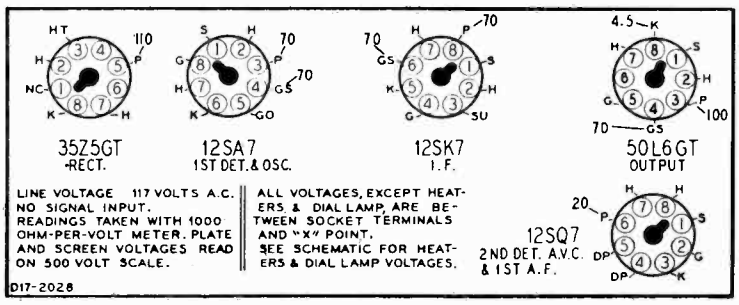


DRIVE CORD REPLACEMENT

Turn gang condenser to fully open position. Use a new drive cord 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 drive cord through the slot in the drive pulley rim and continue over top of pulley (counterclockwise) one-half turn. Pass cord around idler stud A and wind two turns clockwise around tuning shaft, turns must progress away from chassis. Pass cord in front of string guide, around pulley B, over pulleys C, D, E and around idler stud F. Wind cord counterclockwise one and one-half turns around drive pulley in back of previous one-half turn. Pass cord through slot in pulley rim, stretch the tension spring and fasten free end of cord to spring. Refer to the Replacement Parts List for the number of the drive cord assembly for use with this radio.







ALIGNMENT PROCEDURE

Check dial pointer position, see DIAL CALIBRATION paragraph.

Volume Control—Maximum All Adjustments.

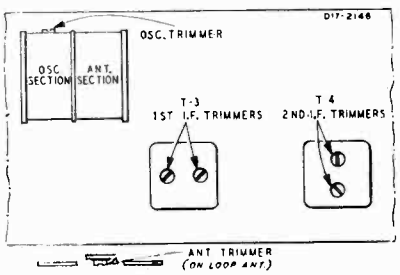
Allow Chassis and Signal Generator to "Heat Up" for several Minutes.

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—.1mf., 50 mmf.

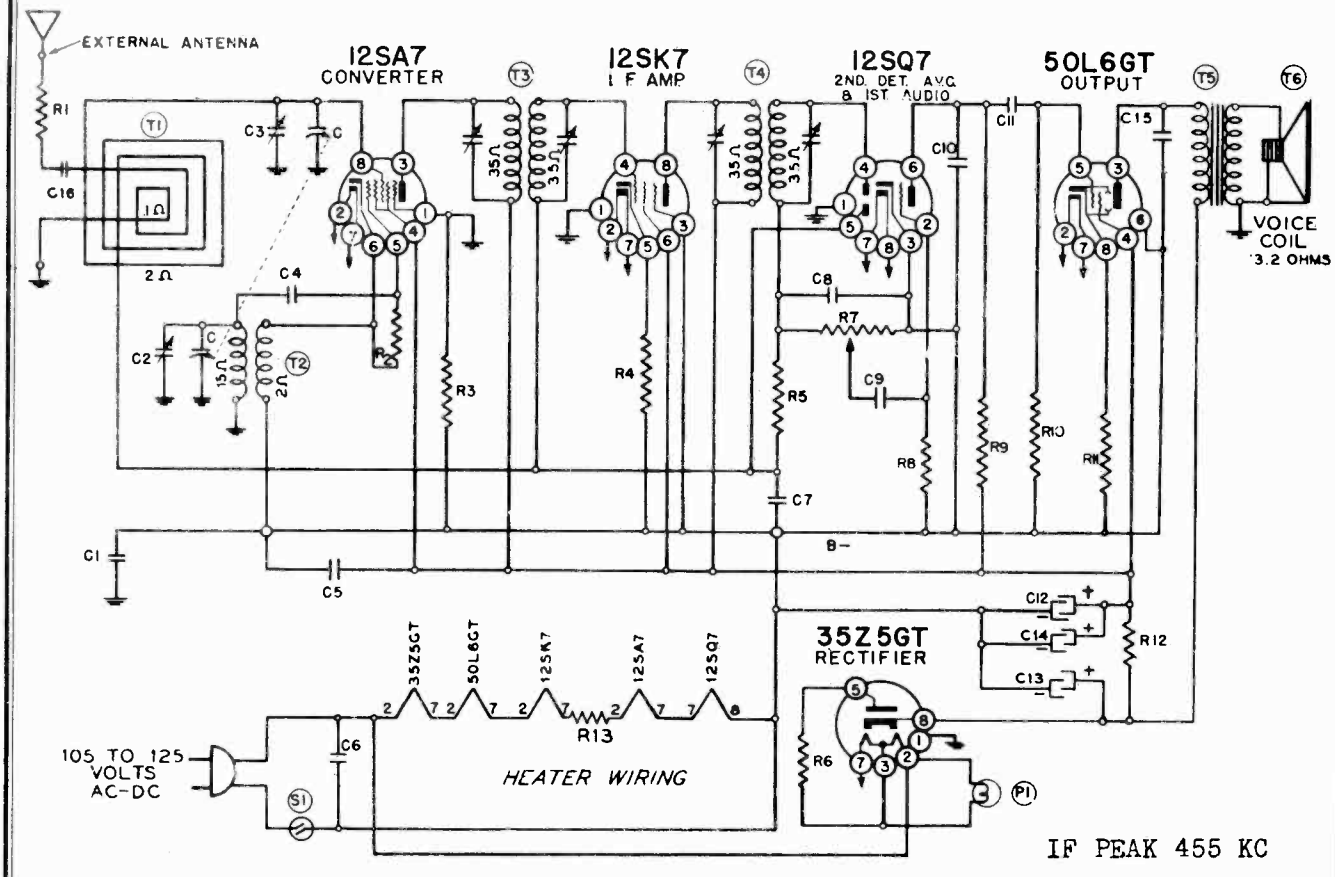


NOTE A—Use 1400 KC index line on dial light diffuser. See DIAL CALIBRATION paragraph.

SIGNAL GENERATOR			DUMMY ANTENNA	CONDENSER SETTING	ADJUST TRIMMERS TO MAXIMUM (See Trimmer Illustration)
FREQUENCY SETTING	ANTENNA CONNECTION	GROUND CONNECTION			
455 KC	Control Grid 12SK7—I. F. Prong No. 4	Point "X" 12SK7—I. F. Prong No. 3	.1 mf.	Turn Rotor to full open	2nd I. F. Trimmers
455 KC	Control Grid 12SA7—1st Det. Prong No. 8	Same As Above	.1 mf.	Turn Rotor to full open	1st I. F. Trimmers
1400 KC	Control Grid 12SA7—1st Det. Prong No. 8	Same As Above	.1 mf.	Turn Rotor to 1400 KC See Note A	Oscillator Trimmers
1400 KC	External Antenna Clip On Loop	Chassis	50 mmf.	Turn Rotor to 1400 KC See Note A	Antenna Trimmer

MODELS 43-8240, 43-8241

GAMBLE-SKOGMO, INC.



Note: Some sets of this model were built with a 2-section electrolytic condenser — a 40-mf section (C13) and a 20-mf section (C12 or C14).

CONDENSERS

C	2-gang variable
C1	.15 x 400 volts
C2	Oscillator trimmer on gang
C3	Antenna trimmer
C4	.0002 mica
C5	.05 x 200 volts
C6	.1 x 400 volts
C7	.05 x 200 volts
C8	.0001 mica
C9	.002 x 600 volts
C10	.0005 mica
C11	.004 x 600 volts
C12	Electrolytic, 20 x 150 volts
C13	Electrolytic, 40 x 150 volts
C14	Electrolytic, 20 x 150 volts
C15	.02 x 400 volts
C16	.002 x 600 volts

RESISTORS

R1	1000 ohms, 20%, ½ watt
R2	47,000 ohms, 10%, ½ watt
R3	220,000 ohms, 20%, ½ watt
R4	47 ohms, 10%, ½ watt
R5	3.3 megohms, 20%, ½ watt
R6	22 ohms, 10%, ½ watt
R7	Volume control, 1 megohm
R8	10 megohms, 20%, ½ watt
R9	470,000 ohms, 20%, ½ watt
R10	680,000 ohms, 20%, ½ watt
R11	150 ohms, 10%, ½ watt
R12	1200 ohms, 10%, 1 watt
R13	33 ohms, 20%, 1 watt

MISCELLANEOUS

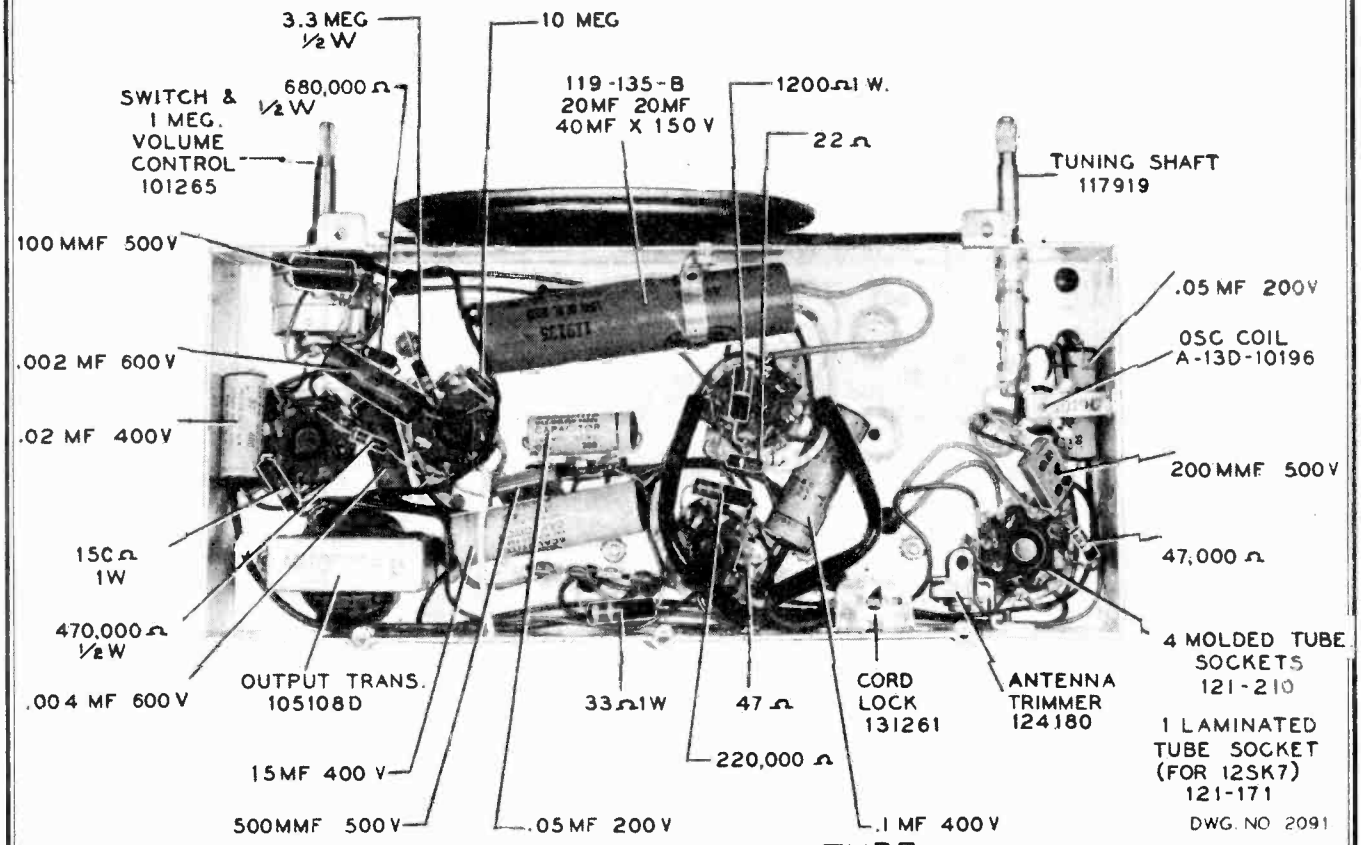
P1	Pilot light, 6-8 volts
S1	On-off switch on volume control
T1	Loop antenna assembly
T2	Oscillator coil
T3	Input I.F. coil
T4	Output I.F. coil
T5	Output transformer
T6	5-inch P.M. speaker

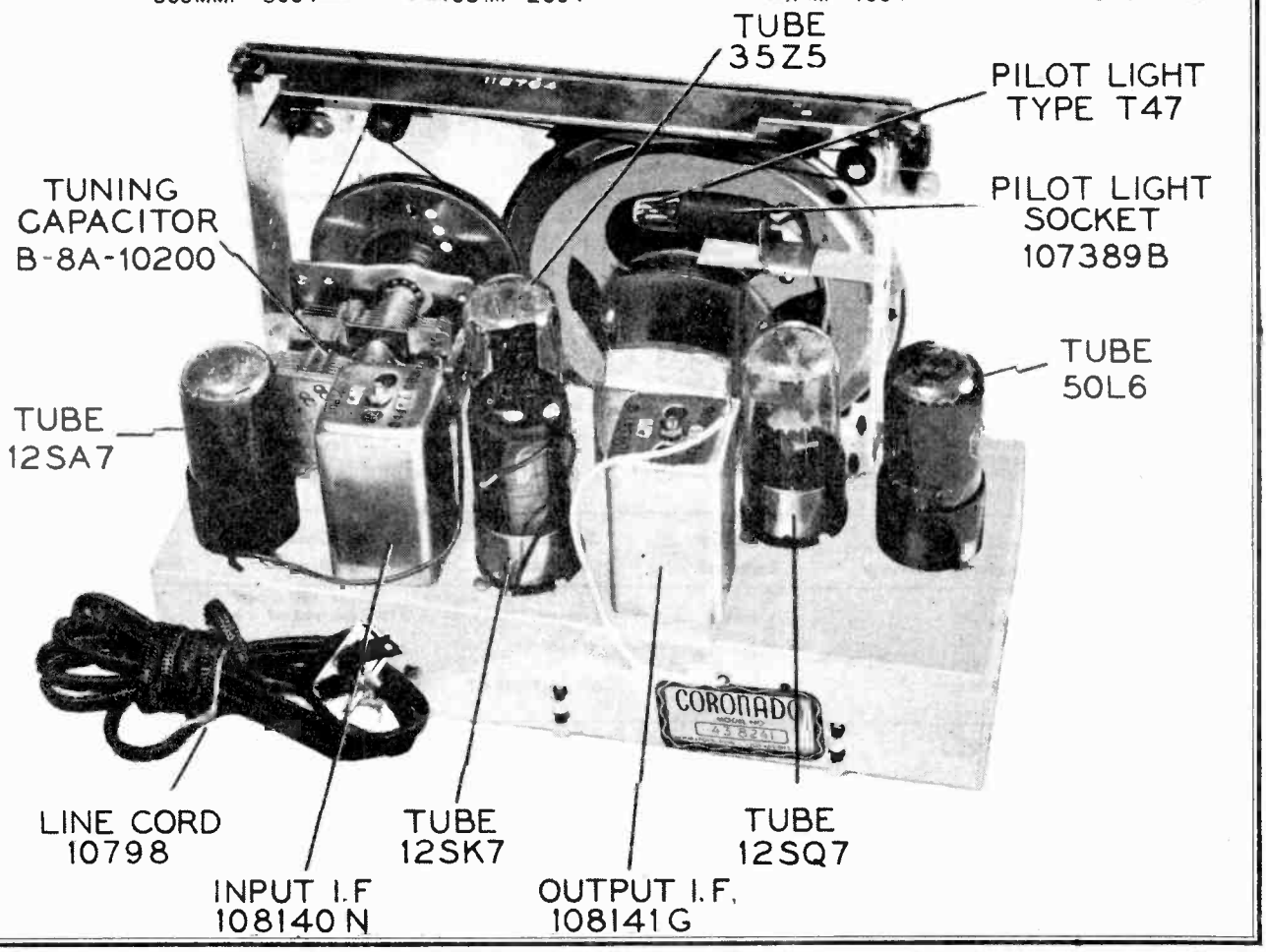
SPECIFICATIONS

6 Tube Superheterodyne, including rectifier tube	
Power Consumption	35 w.
Power Output	0.8 w. undistorted, 1.5 w. maximum
Selectivity	52 kc. broad at 1,000 times signal at 1,000 kc.
Antenna	Built-in loop, also provision for external antenna
Intermediate Frequency	455 kc.
Speaker	5 in. 0.7 oz. P.M. voice coil imp. 3.2 ohms
Tuning	Two-gang capacitor
Sensitivity	30 mv. avg. for 50 mw. output
Frequency Range	530 to 1,650 kc.
Power Supply	105-125 v. D.C., 50-60 cycle A.C., also made for 25 cycles
Output Transformer	Impedance ratio 2,500:3.2

GAMBLE-SKOGMO, INC.

MODELS 43-8240, 43-8241



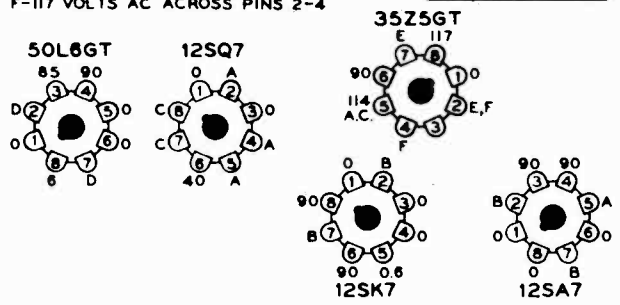


MODELS 43-8240, 43-8241

GAMBLE-SKOGMO, INC.

A-CANNOT BE MEASURED WITH VOLTMETER
B-12 VOLTS A C ACROSS PINS 2-7
C-12 VOLTS A C ACROSS PINS 7-8
D-48 VOLTS A C ACROSS PINS 2-7
E-27.5 VOLTS AC ACROSS PINS 2-7
F-117 VOLTS AC ACROSS PINS 2-4

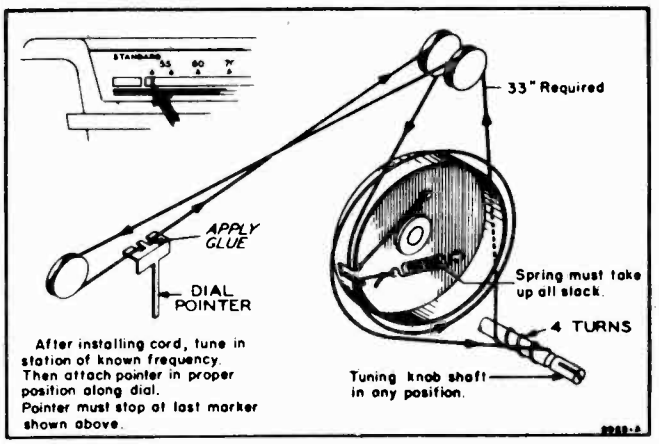
ALL VOLTAGES MEASURED BETWEEN SOCKET PIN & B- WITH A 1000 OHMS PER VOLT VOLTMETER. 117 VOLT LINE.



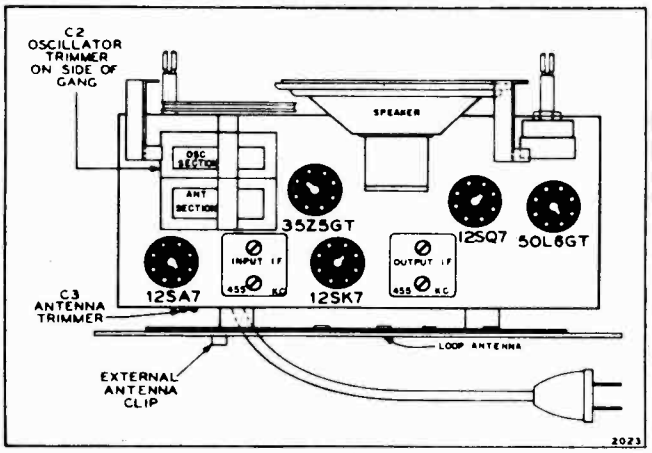
BOTTOM VIEW OF CHASSIS

2024

DRIVE CORD REPLACEMENT



CHASSIS VIEW



2023

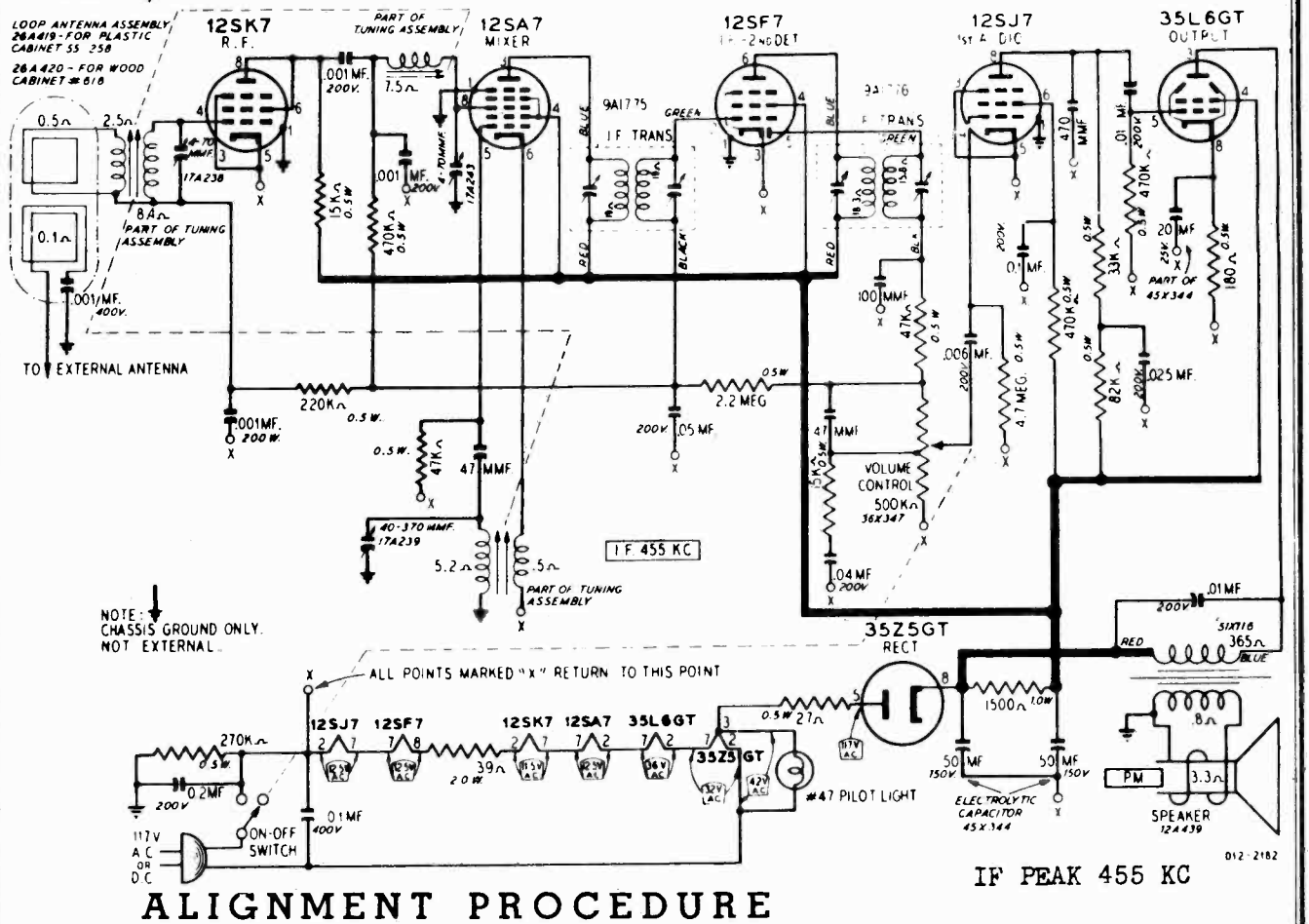
ALIGNMENT PROCEDURE

- No aligning adjustments should be attempted until all other possible causes of trouble have been checked.
- The loop antenna should be connected to the radio and in its proper position during all adjustments.
- Turn volume control to maximum (extreme clock-wise) for all adjustments.
- Connect ground post of signal generator to B— of radio through a .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
I.F.	455 Kc.	.1 mfd.	Grid of 12SK7	Rotor full open (plates out of mesh)	2 trimmers on top of output I.F. (see chassis view)
	455 Kc.	.1 mfd.	Grid of 12SA7	Rotor full open (plates out of mesh)	2 trimmers on top of input I.F. (see chassis view)
Broadcast	1650 Kc.	.1 mfd.	Grid of 12SA7	Rotor full open (plates out of mesh)	Oscillator trimmer C2 on gang (see chassis view)
	1400 Kc.	None	See note below	Set dial at 1400 Kc.	Antenna trimmer C3 (see chassis view)

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

DECEMBER 30, 1946



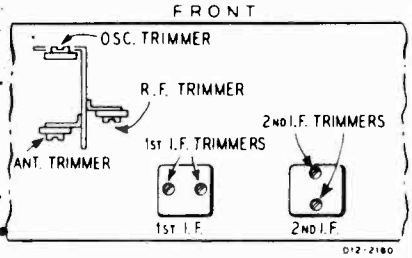
IF PEAK 455 KC

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.
Dummy Antennas—.1 mf., 50 mmf.

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.

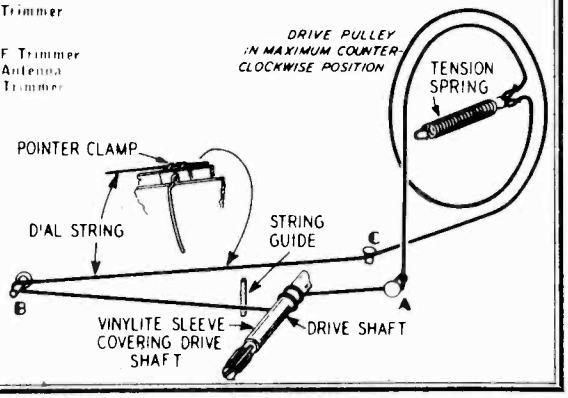
SIGNAL GENERATOR Frequency Setting	Antenna Connection	Ground Connection	Coupling Capacitor	Dial Setting	Adjust Trimmers to Maximum (See Trimmer Illustration)
455 KC	Control Grid 12SF7 - I.F. (Prong No. 2)	Point "X" 12SK7 - R.F. (Prong No. 3)	.1 mf.	1600 KC	2nd I.F. Trimmers
455 KC	Control Grid 12SA7 - 1st Det. (Prong No. 8)	Point "X" 12SK7 - R.F. (Prong No. 3)	.1 mf.	1600 KC	1st I.F. Trimmers
1400 KC	External Antenna Clip on Loop	Point "X" 12SK7 - R.F. (Prong No. 3)	50 mmf.	1400 KC Index Line See Note A	Oscillator Trimmer
1400 KC	External Antenna Clip on Loop	Chassis	50 mmf.	1400 KC Index Line See Note A	R.F. Trimmer Antenna Trimmer



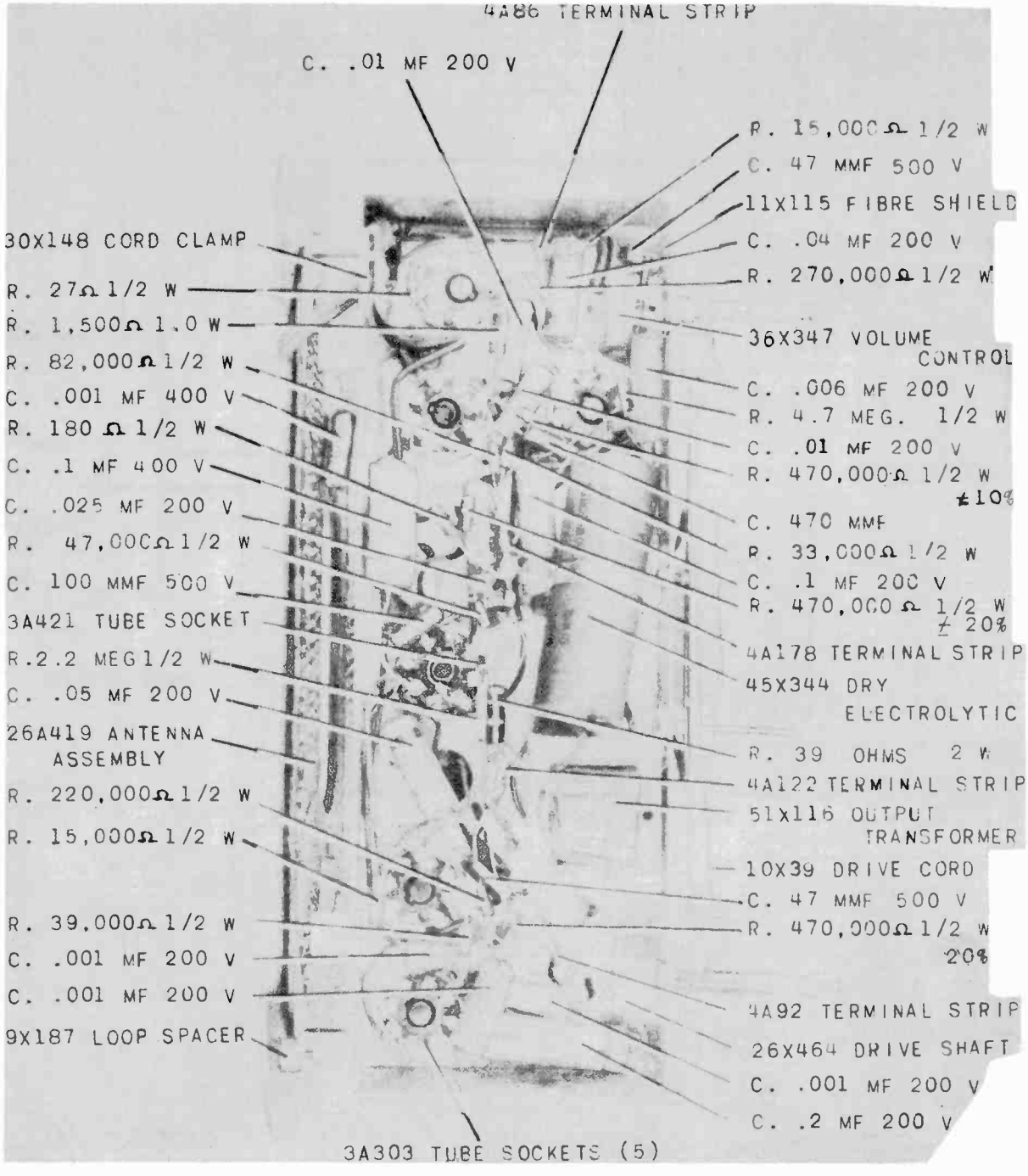
DRIVE CORD REPLACEMENT

Turn the large drive pulley to the maximum counter-clockwise position. Use a new drive cord and fasten one end to the tension spring. Hook the other end of the tension spring over the tab on the drive pulley. Pass the cord through the slot on the drive pulley rim and continue around pulley ½ turn counter-clockwise. Pass cord around stud A and wind two turns clockwise (from front of chassis) around the tuning shaft. Turns must progress away from chassis. Pass cord around studs B and C, then under drive pulley and wind 1½ turns counter-clockwise around drive pulley. Stretch tension spring and fasten free end of cord to spring.

Attach the dial pointer to the cord and position as instructed in paragraph DIAL CALIBRATION.

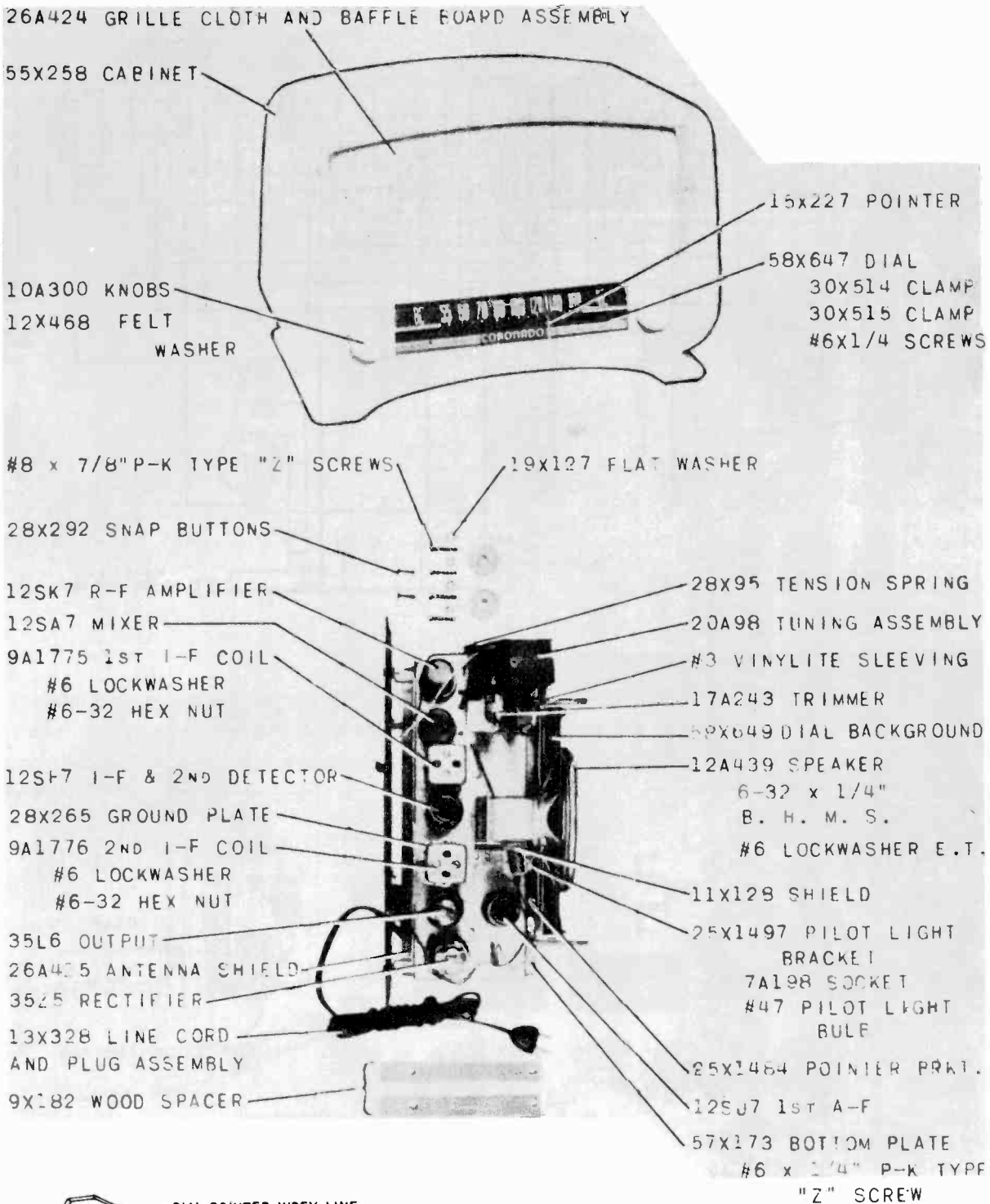


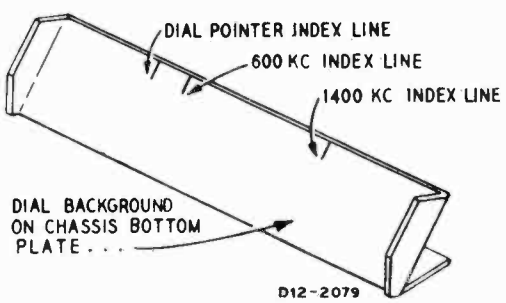
MODEL 43-8312 GAMBLE-SKOGMO, INC.



SPECIFICATIONS

6 Tube Superheterodyne, including Rectifier Tube.
Speaker.....5-inch PM Dynamic
Intermediate Frequency.....455 KC
Selectivity.....50 KC Broad at 1,000 Times Signal
Sensitivity (for .05 watt output with external antenna).....15 microvolts average
Power Consumption.....35 watts (at 117 volts AC)
Power Output..1.5 watt maximum, .9 watt (10% harmonics)





DIAL CALIBRATION

In order to align the receiver, the dial pointer must be positioned on the dial string correctly with reference to the dial. Index lines are provided on the dial background attached to the chassis bottom plate for this purpose.

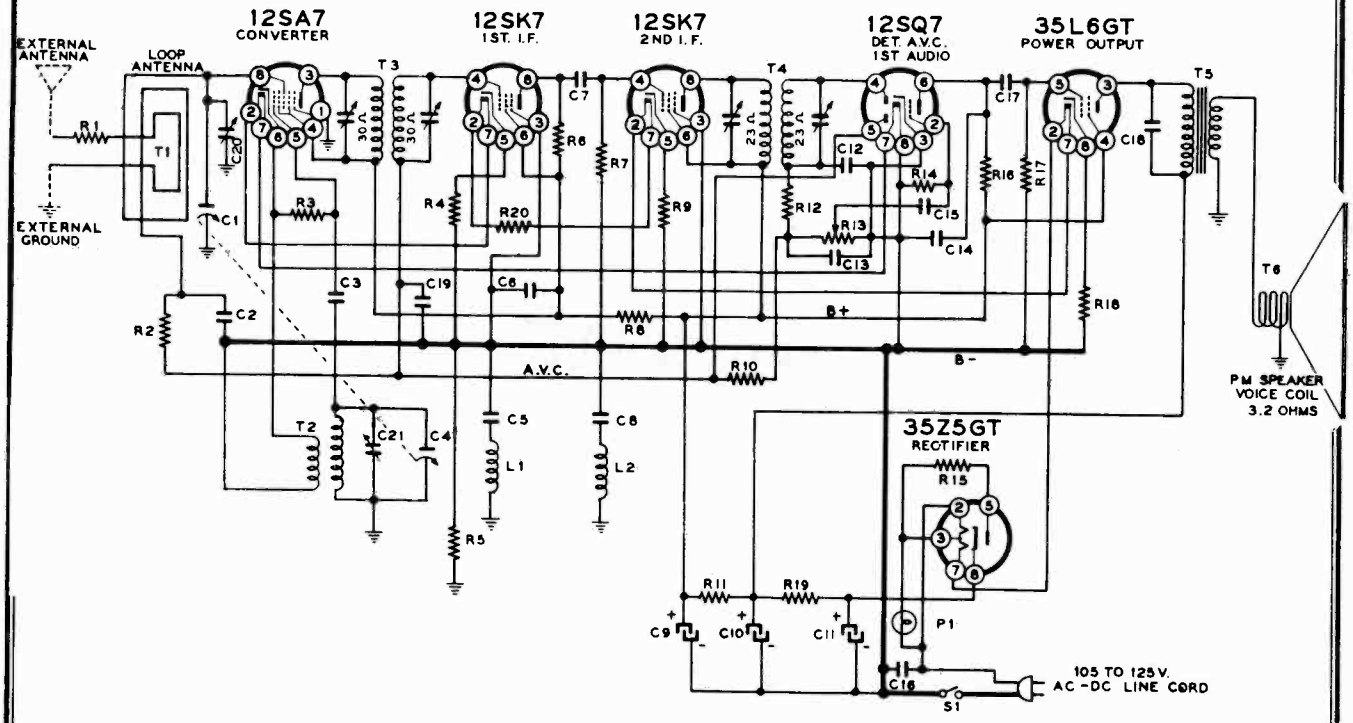
To position the dial pointer, adjust the radio to the "stop" position at the low frequency end of the dial. The dial pointer should be directly over the dial pointer index line. (See Illustration.) If not, move the pointer on the drive cord until it is directly over the index line. The 1,400 KC index lines are for use when aligning the receiver.

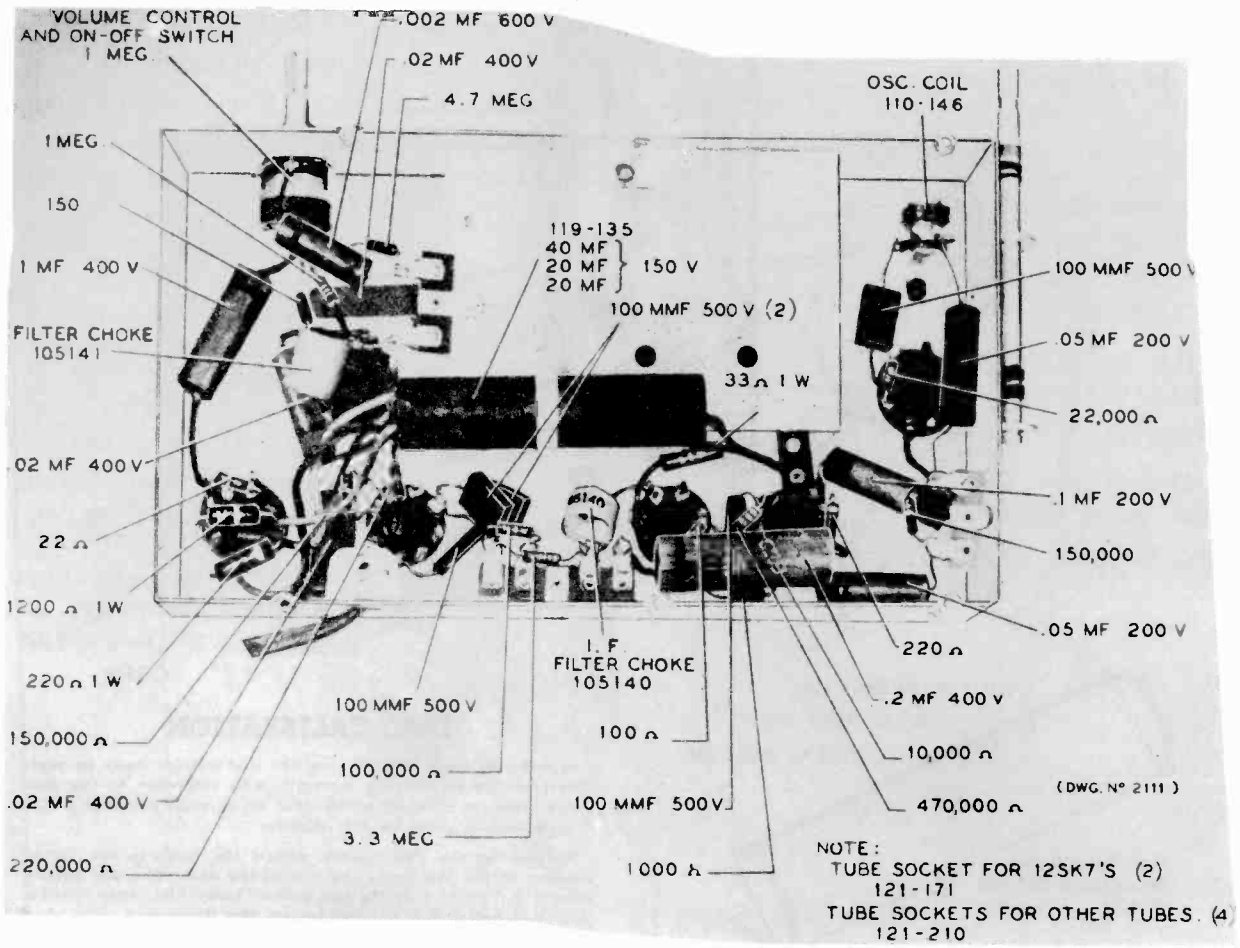
MODELS 43-8351, 43-8352

GAMBLE-SKOGMO, INC.

DECEMBER 18, 1946

IF PEAK 455 KC





GAMBLE-SKOGMO, INC

MODELS 43-835
43-8352

SPECIFICATIONS

6 Tube Superheterodyne, including rectifier tube	
Power Consumption	35 w.
Power Output	0.74 w. undistorted, 0.9 w. maximum
Selectivity	51 kc. broad at 1,000 times signal at 1,000 kc.
Antenna	Built-in loop, also provision for external antenna and ground
Intermediate Frequency	455 kc.
Speaker	4x6 in. 1 oz. P.M. voice coil imp. 3.2 ohms
Tuning	Two-gang capacitor, 6 pushbutton
Sensitivity	18 mv. avg. for 50 mw. output
Frequency Range	535 to 1,720 kc.
Power Supply	105-125 v. D.C., 50-60 cycle A.C., also made for 25 cycles
Output Transformer	Impedance ratio 3,500:3.2

CONDENSERS

C1	Antenna section of gang
C2	.05 x 200 volts, 25%
C3	.0001 mica, 20%
C4	Oscillator section of gang
C5	.2 x 400 volts, +30%, −10%
C6	.1 x 200 volts, 25%
C7	.0001, mica, 20%
C8	.02 x 400 volts, 25%
C9	Electrolytic, 20 x 150 volts
C10	Electrolytic, 20 x 150 volts
C11	Electrolytic, 40 x 150 volts NOTE: C9, C10, and C11 are in one unit.
C12	.0001, mica, 20%
C13	.0001, mica, 20%
C14	.0001, mica, 20%
C15	.002 x 600 volts, 25%
C16	.1 x 400 volts, +50%, −10%
C17	.02 x 400 volts, 25%
C18	.02 x 400 volts, 25%
C19	.05 x 200 volts, 25%
C20	Antenna trimmer
C21	Oscillator trimmer

RESISTORS

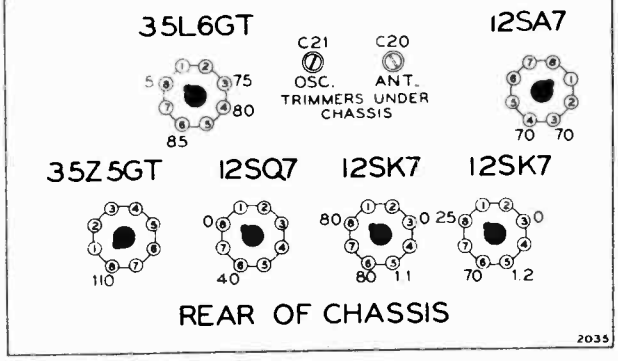
R1	1000 ohms, 20%, ½ watt
R2	150,000 ohms, 20%, ½ watt
R3	22,000 ohms, 20%, ½ watt
R4	100 ohms, 10%, ½ watt
R5	150,000 ohms, 20%, ½ watt
R6	10,000 ohms, 10%, ½ watt
R7	470,000 ohms, 20%, ½ watt
R8	1900 ohms, 10%, ½ watt
R9	220 ohms, 10%, ½ watt
R10	3.3 megohms, 20%, ½ watt
R11	1200 ohms, 10%, 1 watt
R12	100,000 ohms, 20%, ½ watt
R13	1 megohm, vol. cont. & switch
R14	4.7 megohms, 20%, ½ watt
R15	22 ohms, 10%, ½ watt
R16	220,000 ohms, 20%, ½ watt
R17	1 megohm, 20%, ½ watt
R18	150 ohms, 10%, ½ watt
R19	220 ohms, 10%, 1 watt
R20	33 ohms, 10%, 1 watt

MISCELLANEOUS

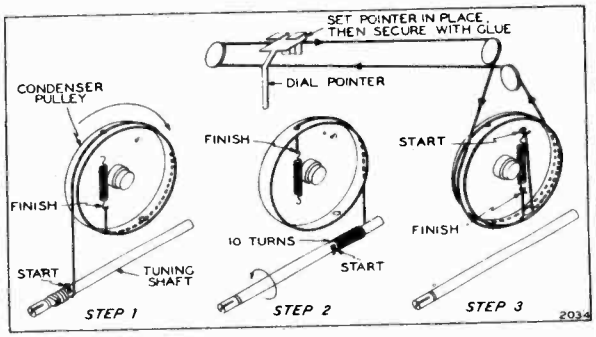
L1	I.F. filter choke
L2	Filter choke
P1	Pilot light, 6-8 volts, type T-47
T1	Loop antenna
T2	Oscillator coil
T3	Input I.F. coil
T4	Output I.F. coil
T5	Output transformer
T6	4" x 6" oval P.M. speaker

BOTTOM VIEW OF CHASSIS

MEASUREMENTS TAKEN WITH A HIGH RESISTANCE VOLTMETER FROM "B—" TO DESIGNATED POINTS.

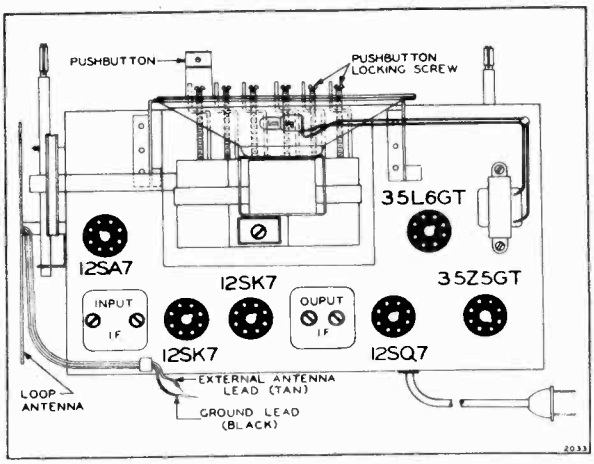


DRIVE CORD REPLACEMENT



1. Steps 1 and 2 are for tuning shaft, step 3 for dial pointer.
2. Direction and number of turns must be as illustrated.
3. In step 1, first turn condenser pulley to extreme clockwise position (viewing it as shown).
4. In step 3, after installing string, tune to known station and set dial pointer at proper position along dial before glueing.

CHASSIS VIEW

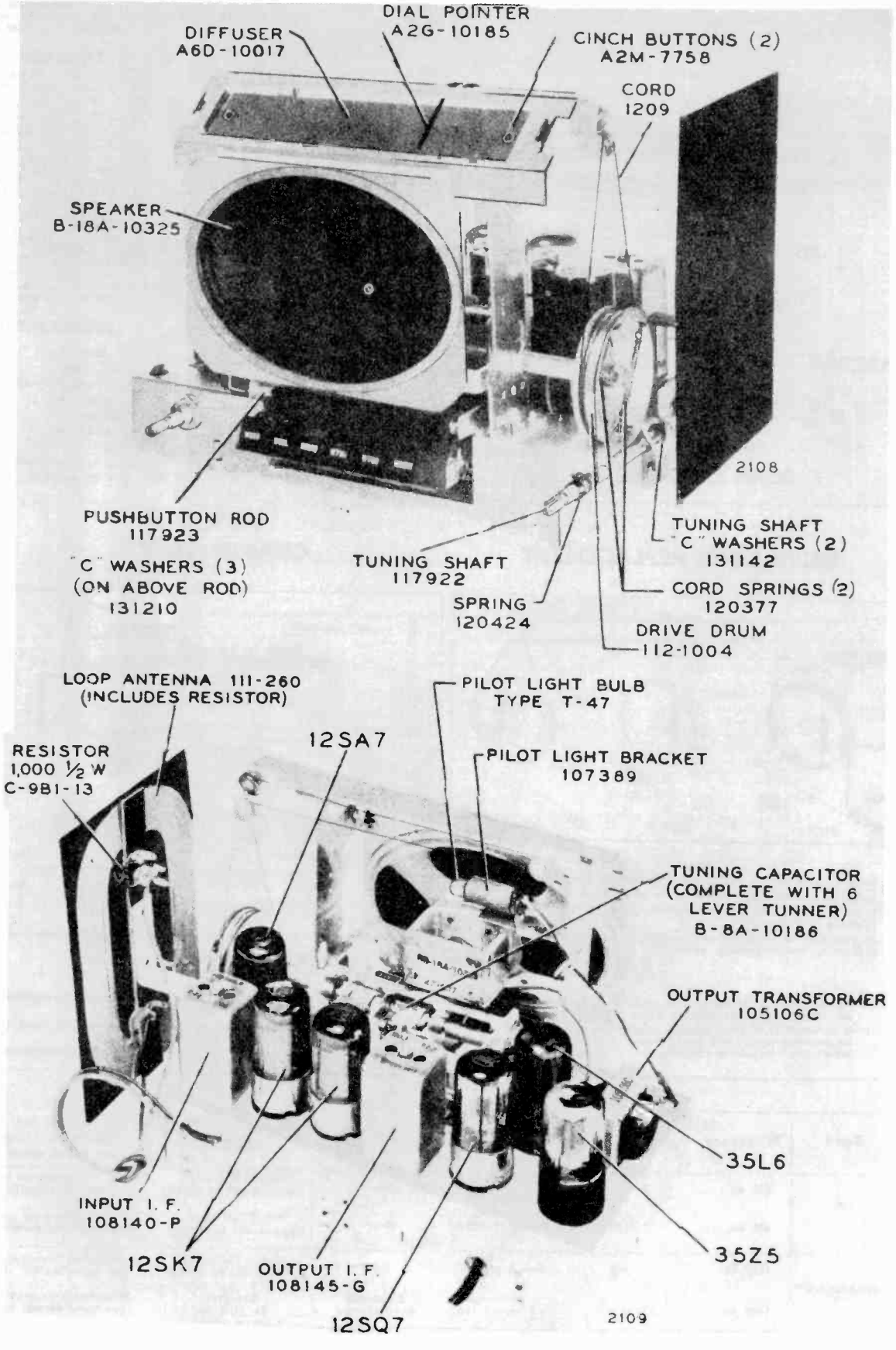


ALIGNMENT PROCEDURE

- No alignment adjustments should be attempted until all other causes of trouble have been checked.
- 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.
- Align for maximum output. Reduce input as needed to keep output near 0.4 volts.
- Connect output meter across 3.2-ohm output load (resistor may be substituted for voice coil).
- Turn volume control to maximum for all adjustments.

		Signal Generator				
Band	Frequency	Dummy Antenna	Connection to Radio	Ground Connection	Tuning Capacitor Setting	Adjust for Maximum Output (in order shown)
I.F.	455 kc	.1 mf	Pin 4 of 12SK7 2nd I.F.	B—*	Rotor full open (plates out of mesh)	Two trimmers on top of output I.F. transformer
	455 kc	.1 mf	Pin 8 of 12SA7	B—*	Rotor full open (plates out of mesh)	Two trimmers on top of input I.F. transformer
BROADCAST	1720 kc	.1 mf	Pin 8 of 12SA7	B—*	Rotor full open (plates out of mesh)	Oscillator trimmer C21 (see tube socket view)
	1400 kc	200 mmf	External antenna lead	External ground lead	Set dial at 1400 kc	Antenna trimmer C20 (see tube socket view)

*Insert a .1 mf capacitor between ground post of signal generator and B— of set.


DIAL POINTER
A2G-10185
DIFFUSER
A6D-10017
CINCH BUTTONS (2)
A2M-7758
CORD
1209
SPEAKER
B-18A-10325
2108
PUSHBUTTON ROD
117923
"C" WASHERS (3)
(ON ABOVE ROD)
131210
TUNING SHAFT
117922
SPRING
120424
TUNING SHAFT
"C" WASHERS (2)
131142
CORD SPRINGS (2)
120377
DRIVE DRUM
112-1004
LOOP ANTENNA 111-260
(INCLUDES RESISTOR)
PILOT LIGHT BULB
TYPE T-47
RESISTOR
1,000 ½ W
C-9B1-13
12SA7
PILOT LIGHT BRACKET
107389
TUNING CAPACITOR
(COMPLETE WITH 6
LEVER TUNNER)
B-8A-10186
OUTPUT TRANSFORMER
105106C
35L6
INPUT I. F.
108140-P
12SK7
OUTPUT I. F.
108145-G
35Z5
12SQ7
2109

MODEL 43-8437

GAMBLE-SKOGMO INC.

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—I.R.E.

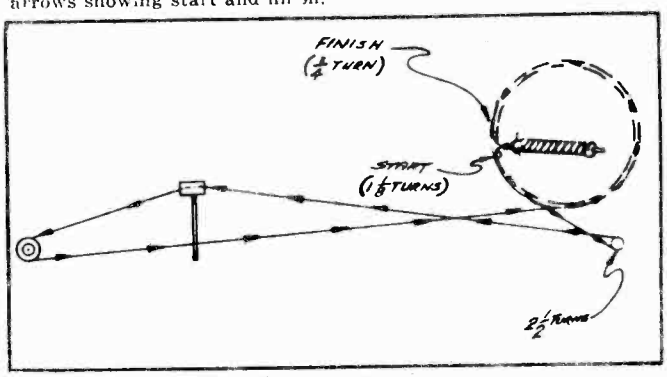
	SIGNAL GENERATOR FREQUENCY SETTING	CONNECTION AT RADIO	DUMMY ANTENNA	CONDENSER SETTING	ADJUST TRIMMERS
I.F. (See Note A)	455 kc	Apply signal to the converter grid 12SA7 through a .05MFD Condenser	I.R.E. Dummy Antenna	Turn rotor to full open	2nd I.F. (Pri.) & (Sec.) 1st I.F. (Pri.) & (Sec.) Adjust for maximum output
R.F. Alignment	1720 kc	Antenna Lead	I.R.E. Dummy Antenna	Turn rotor to full open	C17B Antenna Trimmer
	1500 kc	Antenna Lead	I.R.E. Dummy Antenna	Set Pointer to 1500 kc (See Note B)	Tune C17A for maximum output

NOTE A—Connect an output meter across the voice coil.

NOTE B—Set pointer at the 1500KC mark on the dial scale. Attach pointer to drive cord.

DRIVE CORD REPLACEMENT

The drive cord can be replaced by carefully following the drawing showing cord replacement. Care should be taken to follow arrows showing start and finish.



FRONT OF CHASSIS

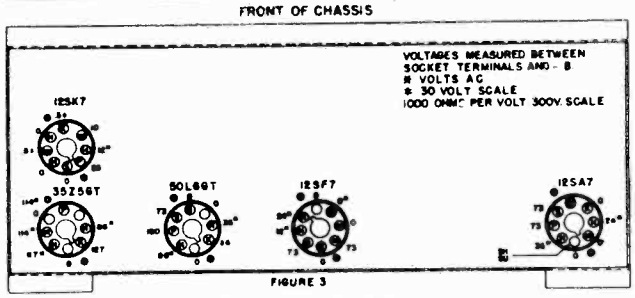
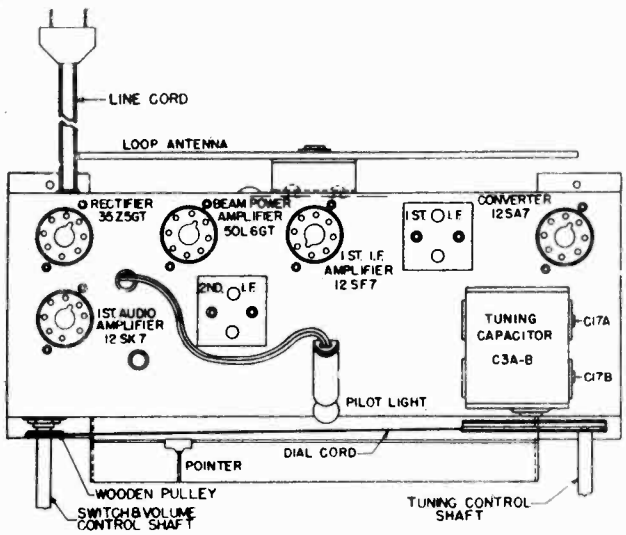


FIGURE 3

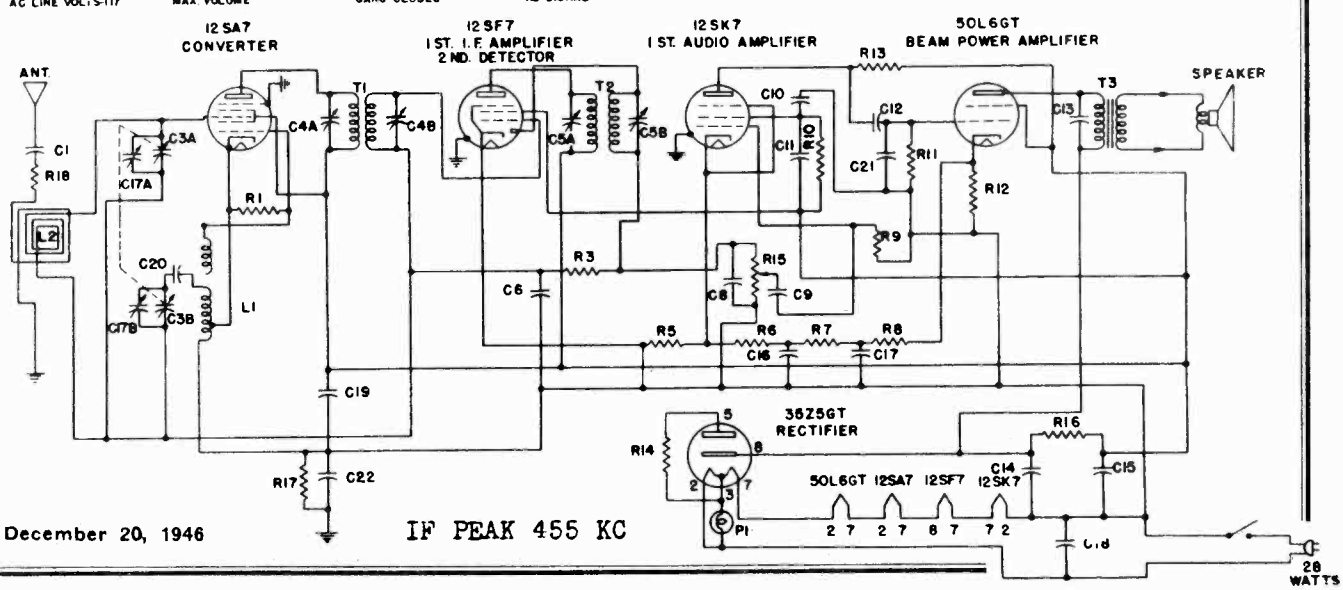
BOTTOM VIEW OF CHASSIS

SPECIFICATIONS

5 Tube Superheterodyne, including rectifier tube
Power Consumption ..... 28 w. (at 117 v. A.C.)
Power Output ..... 1.5 w. maximum 1 w., 10% harmonics
Selectivity ..... 65 kc. broad at 1,000 times signal
Intermediate Frequency ..... 455 kc.
Speaker ..... 5¼ inch P.M. dynamic
Tuning Frequency Range ..... 540 to 1,700 kc.
Sensitivity ..... 85 mv. avg. (for 0.5 w. output with external antenna)



AC LINE VOLTS-117 MAX. VOLUME GANG CLOSED NO SIGNAL



December 20, 1946

IF PEAK 455 KC

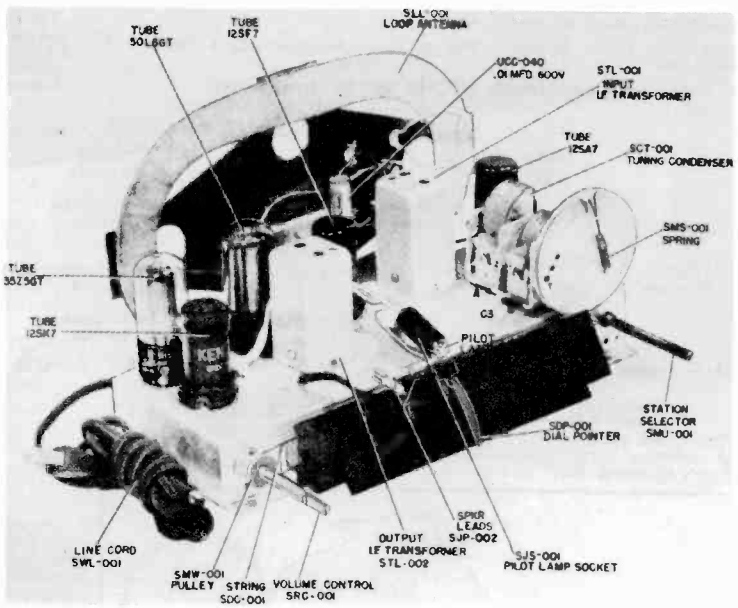
MODEL 43-8437 GAMBLE-SKOGMO INC.

RESISTORS

R 1 220,000 ohm carbon, ½ watt
R 3 2.2 megohm carbon resistor, ½ watt
R 5 680 ohm carbon resistor, ½ watt
R 6 4,700 ohm carbon resistor, ½ watt
R 7 4,700 ohm carbon resistor, ½ watt
R 8 4,700 ohm carbon resistor, ½ watt
R 9 10 megohm carbon resistor, ½ watt
R10 470,000 ohm carbon resistor, ½ watt
R11 470,000 ohm carbon resistor, ½ watt
R12 150 ohm carbon resistor, ½ watt
R13 100,000 ohm carbon resistor, ½ watt
R14 18 ohm carbon resistor, 1 watt
R15 500,000 ohm carbon resistor, ½ watt
R16 2,700 ohm carbon resistor, 2 watt
R17 470,000 ohm carbon resistor, ½ watt
R18 470 ohm carbon resistor, ½ watt

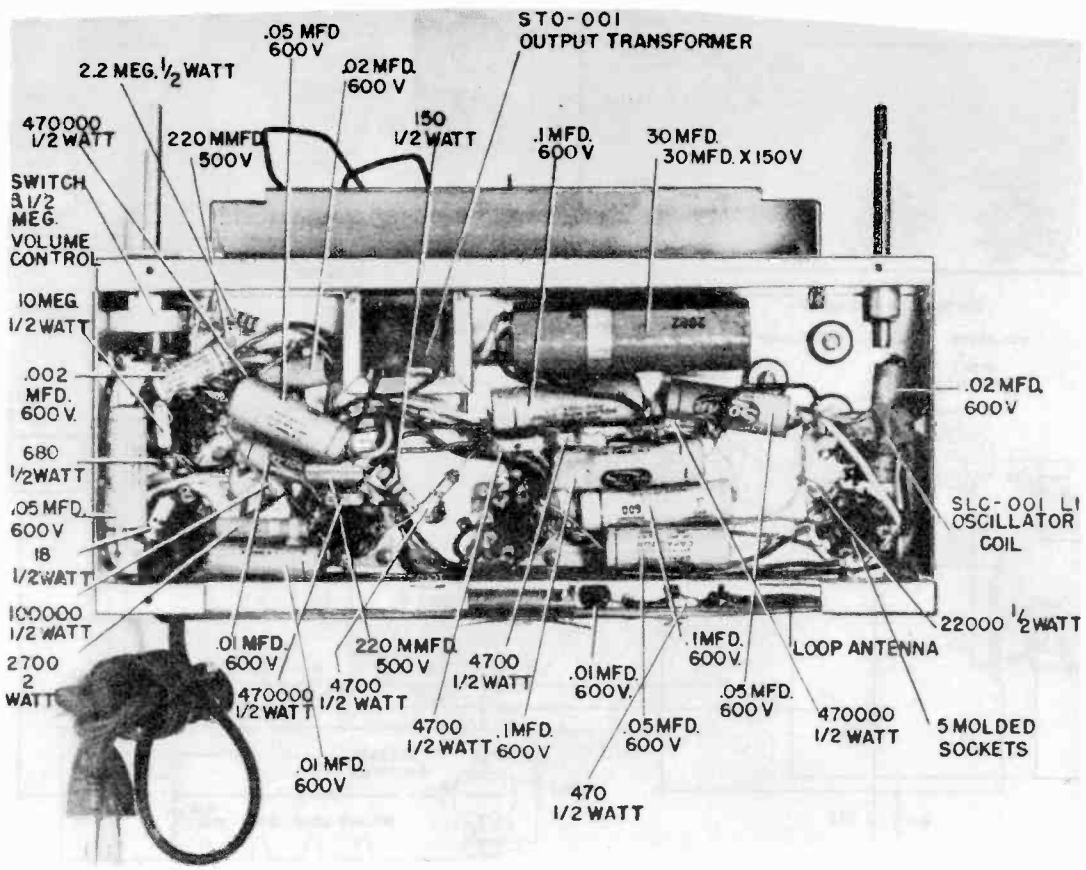
CONDENSERS

C 1 .01 mfd. paper capacitor
C 2 47 mmfd. mica capacitor
C 3A Antenna section
C 3B Oscillator section
C 6 .05 mfd. paper capacitor
C 8 22 mmfd. mica capacitor
C 9 .002 mfd. paper capacitor
C10 .05 mfd. paper capacitor
C11 .02 mfd. paper capacitor
C12 .01 mfd. paper capacitor
C13 .01 mfd. paper capacitor
C14 30 mfd. 150 v. electrolytic capacitor
C15 30 mfd. 150 v. electrolytic capacitor
C16 .1 mfd. paper capacitor
C17A Antenna trimmer
C17B Oscillator trimmer
C18 .05 mfd. paper capacitor
C19 .05 mfd. paper capacitor
C20 .02 mfd. paper capacitor
C21 22 mmfd. mica capacitor
C22 .1 mfd. paper capacitor



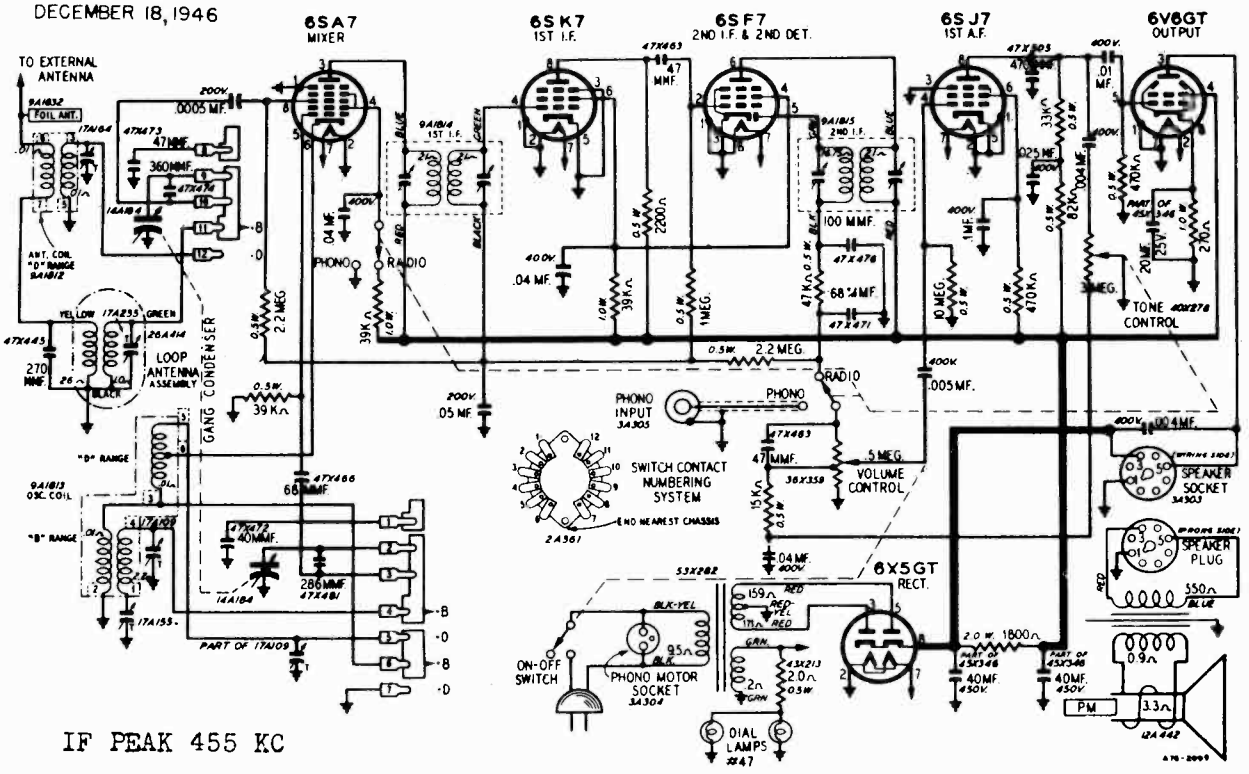
MISCELLANEOUS

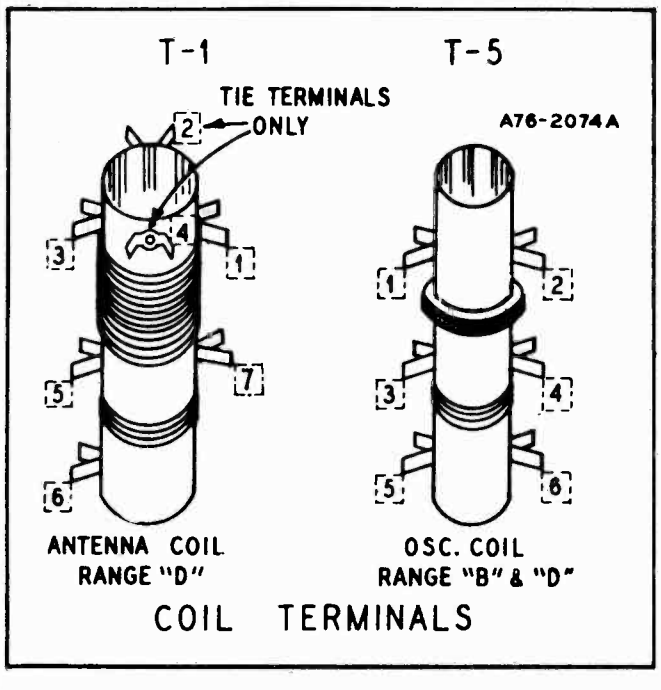
L1 Oscillator coil
L2 Antenna loop
T1 1st I.F. transformer
T2 2nd I.F. transformer
T3 Output transformer
P1 Pilot light—Mazda No. 51

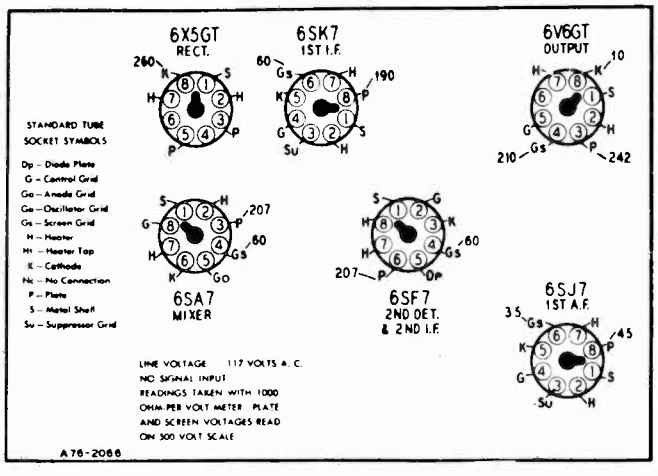


GAMBLE-SKOGMO INC.

MODEL 43-8576







CIRCUIT DESCRIPTION

The circuit and tube complement of the receiver are as follows: 1—6SA7 1st Detector and Oscillator, 1—6SK7 1st I-F Amplifier, 1—6SF7 2nd I-F Amplifier and 2nd Detector, 1—6SJ7 1st Audio Amplifier, 1—6V6GT Power Output, 1—6X5GT Rectifier. Two No. 47 dial lamps are used for dial illumination.

A jack is provided at the rear of the chassis for record player or other special service connections. This jack is switched in or out of the audio circuit with a switch controlled by the tone control knob that also shorts out the r-f signal when it is turned to the phono position.

SPECIFICATIONS

6 Tube Superheterodyne, Including Rectifier Tube

Speaker ..... 6" PM Dynamic

Intermediate Frequency ..... 455 Kc.

Selectivity ..... 40 Kc. Broad at 1,000 Times Signal

Sensitivity (For 0.5 Watt Output, with External Antenna)

B Range ..... 9 Microvolts Av.

D Range ..... 20 Microvolts Av.

Power Consumption (at 117 Volts AC) 40 Watts (normal)

Power Output .....

4 Watts Maximum 2.3 Watts, 10% Harmonics

Tuning Frequency Range

B Range ..... 540-1600 Kilocycles

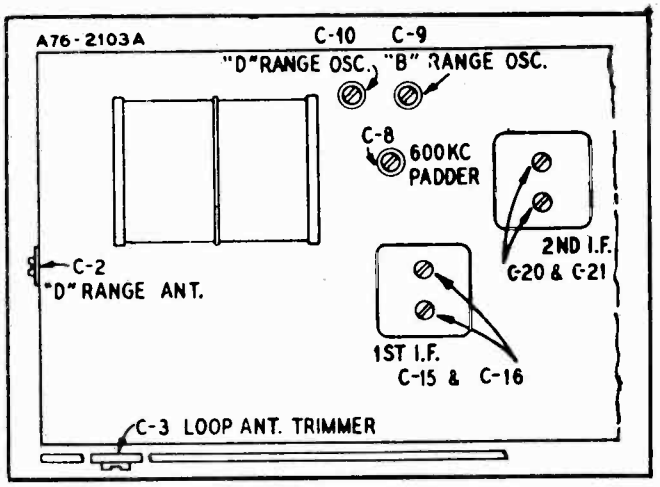
D Range ..... 9-15.5 Megacycles

MODEL 43-8576

GAMBLE-SKOGMO INC.

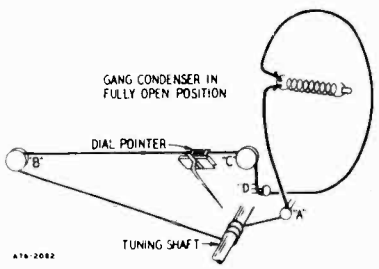
REMOVAL OF CHASSIS FROM CABINET

After the cabinet back has been taken off, it is necessary to disconnect the white lead from the foil antenna mounted in the top of the cabinet and to loosen the screw and remove the black lead fastened to the lower left rear corner of the chassis. The chassis may then be pulled from the cabinet.



DRIVE CORD REPLACEMENT

When installing a new drive cord, turn the large drive pulley until the gang condenser plates are fully unmeshed. Hook one end of the new drive cord to the tension spring and hook the tension spring to the tab on the large drive pulley. Pass the cord through the slot in the drive pulley rim and continue one-fourth turn counterclockwise around the drive pulley. Then pass the cord around idler stud A (see illustration) and wind three turns clockwise around the tuning shaft with the turns progressing away from the chassis. Pass the cord over pulleys B and C and around idler stud D. Wrap the cord one-half turn counterclockwise around the large drive pulley and hook the end of the drive cord to the tension spring. It may be necessary to unhook the tension spring from the drive pulley in order to attach the cord, after which it should be again hooked to the drive pulley and the tuning shaft turned a few turns in order to take up the slack in the drive cord.



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 Screw-driver.
Dummy Antennas—.1 mf., 100 mmf., and 400 ohms.

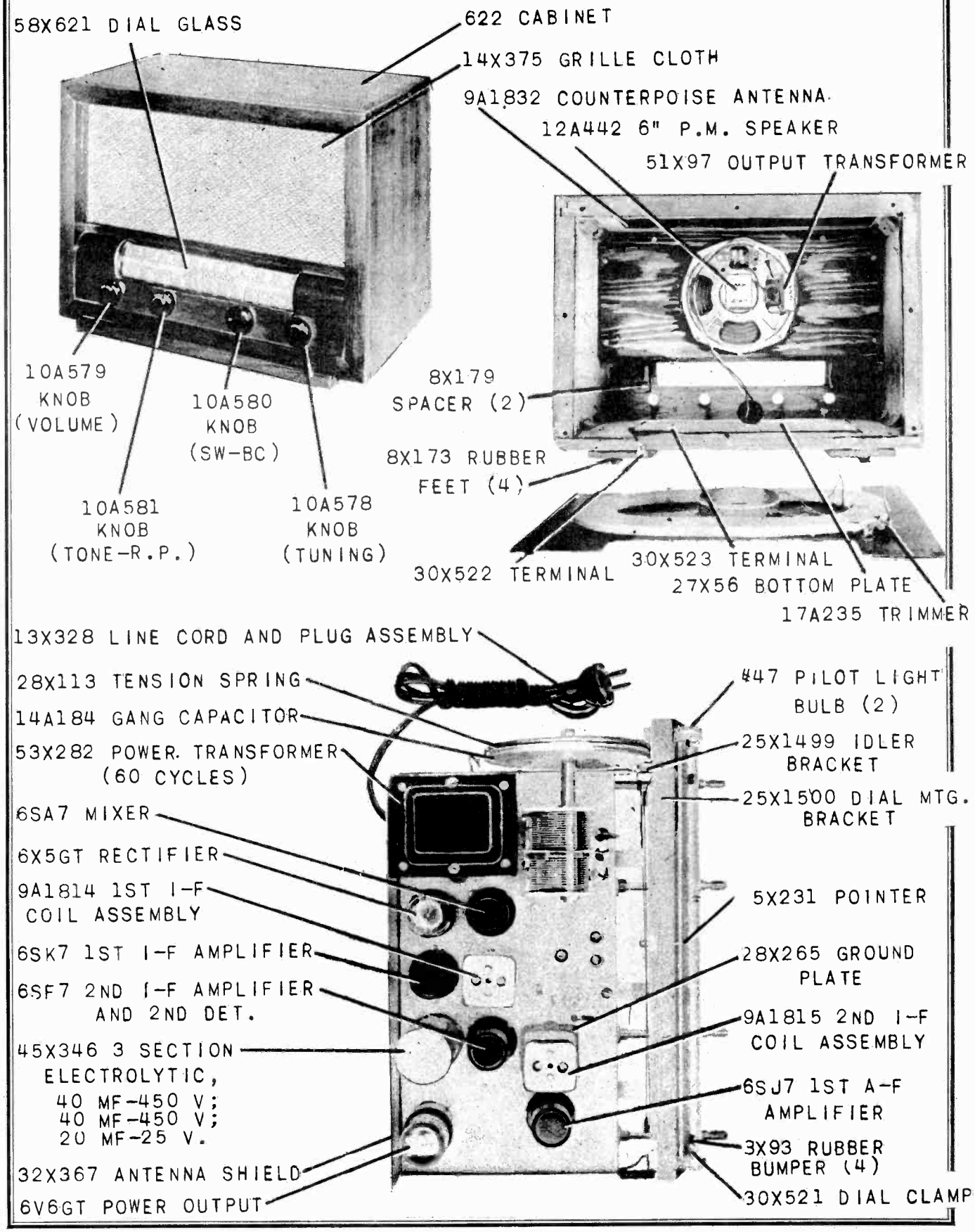
	SIGNAL GENERATOR FREQUENCY SETTING	CONNECTION AT RADIO	DUMMY ANTENNA	BAND SWITCH SETTING	CONDENSER SETTING	ADJUST TRIMMERS TO MAXIMUM
I.F.	455 Kc.	Grid of 6SA7 Pin 8	.1 mf.	B Range	Turn Rotor to Full Open	2nd I.F. (C20) & (C21) 1st I.F. (C15) & (C16)
RANGE B	1,620 Kc.	Antenna Lead	100 mmf.	B Range	Turn Rotor to Full Open	Oscillator Range B (C9)
	1,400 Kc.	Antenna Lead	100 mmf.	B Range	Tune Rotor to Max. Output Set Pointer to 1,400 Kc. (See Note A)	Ant. Range B (C3)
	600 Kc.	Antenna Lead	100 mmf.	B Range	Tune Rotor to Max. Output	Oscillator (C8) Rock Rotor See Note B
	Repeat above steps at 1,620 and 600 Kc. until readjusting the oscillator Range B Trimmer (C9) causes no further improvement of output.					
RANGE D	15,600 Kc.	Antenna Lead	400 ohm	D Range	Turn Rotor to Full Open	Oscillator Range D (C10)
	14,000 Kc.	Antenna Lead	400 ohm	D Range	Tune Rotor to Max. Output	Ant. Range D (C2)
LOOP RANGE B	Reassemble chassis in cabinet.					Rock Rotor—See Note B
	1,400 Kc.	Antenna Lead	100 mmf.	B Range	Tune Rotor to Max. Output	Ant. Range B (C3)

NOTE A—Set pointer at the 1,400 Kc. mark on the dial scale. Attach pointer to drive cord.

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

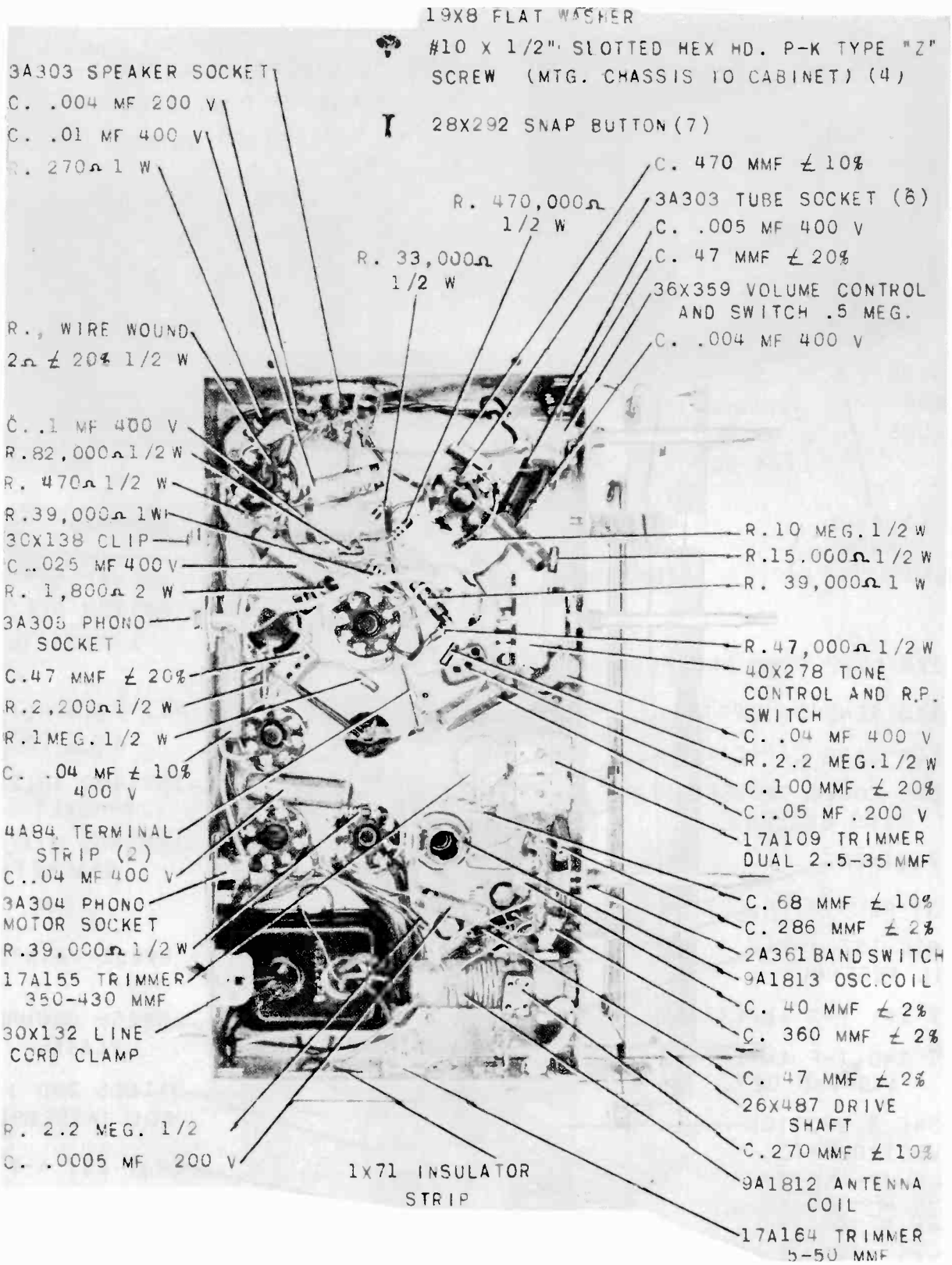
MODEL 43-8576

GAMBLE-SKOGMO INC.

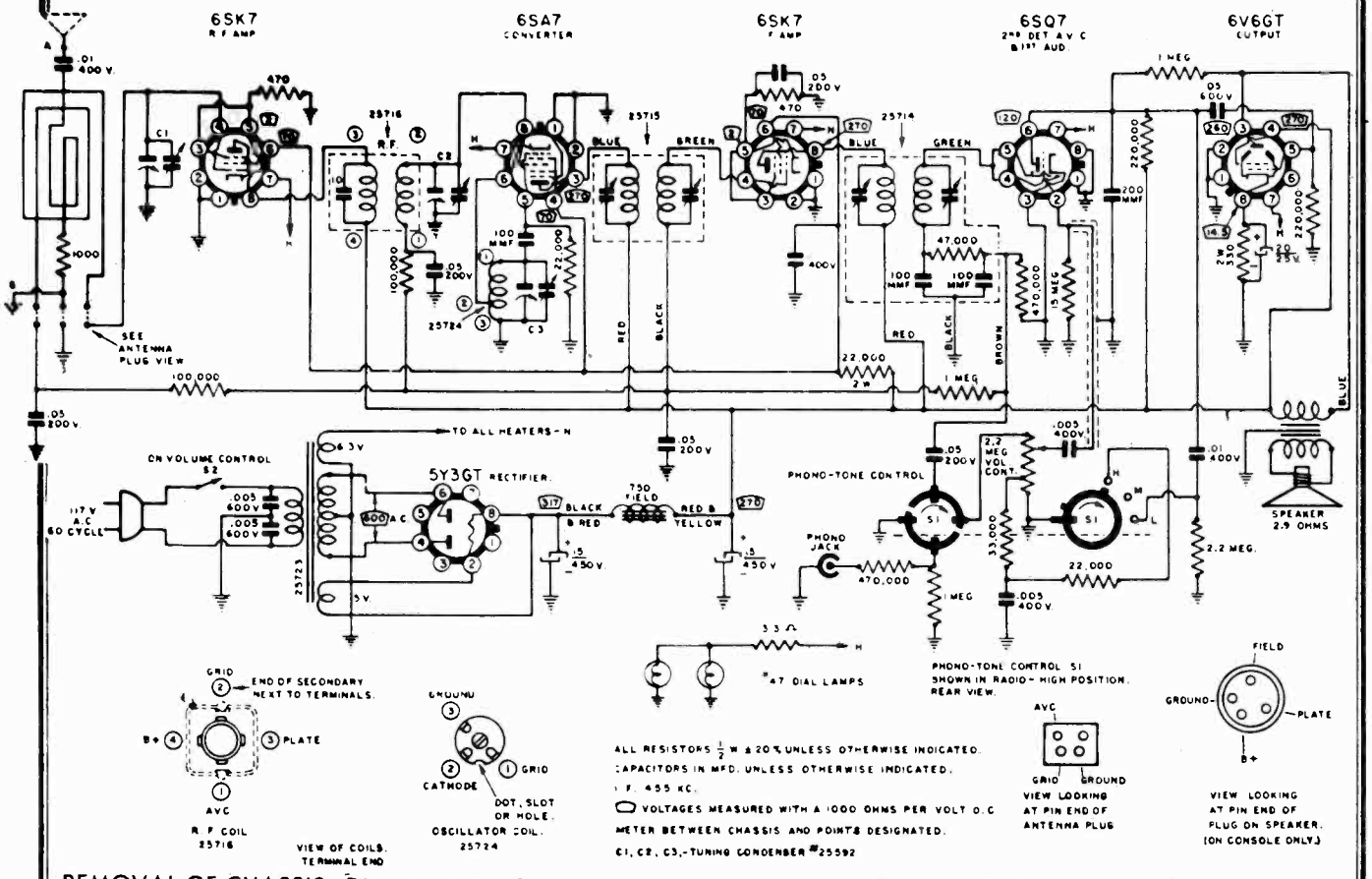


MODEL 43-8576

GAMBLE-SKOGMO INC.



GAMBLE-SKOGMO INC.



REMOVAL OF CHASSIS—Disconnect set from wall plug. Remove knobs by pulling straight out. Remove loop plug on back of chassis. Remove two screws under cabinet, chassis may be withdrawn from rear.

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 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.

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.

DESCRIPTION

This radio is an AC operated superheterodyne set. It is designed for use on the usual home lighting service of 110 - 120 volts 50 - 60 cycles.

The set contains a built-in loop antenna (aerial) and will receive stations on the standard broadcast band, 535 - 1620 kilocycles.

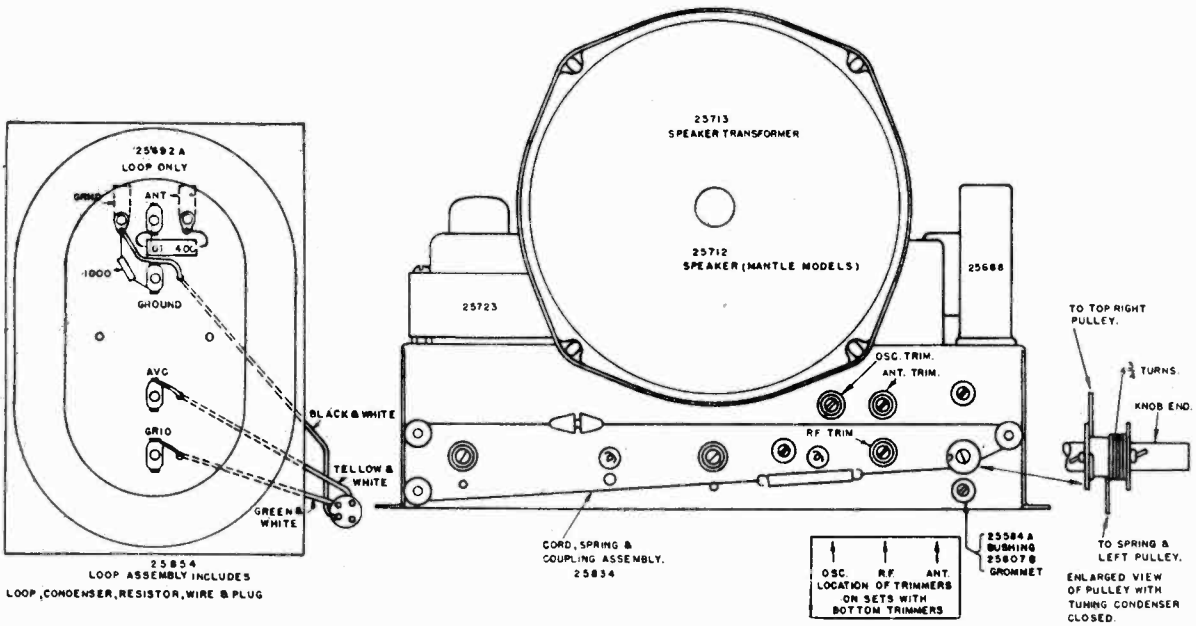
This radio combines many desirable features such as: Oversize eight inch Electro-dynamic speaker for excellent tone; Bass "boost" to give "rich" reproduction at normal volume; Three gang tuning condenser for better selectivity; High efficiency circuit for minimum cost of operation and maintenance.

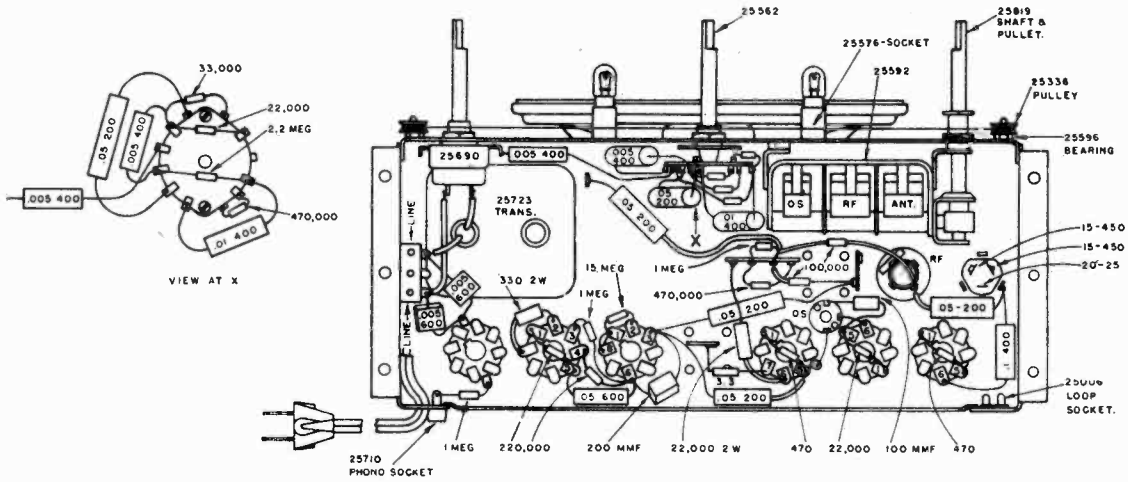
INSTALLATION

TUBES—All the tubes are properly mounted in their sockets when the set is shipped. There is a possibility, however, that the tubes have worked loose during shipment. Press each tube firmly into its socket.

POWER—Be sure that your home is supplied with current that is within the voltage and frequency ratings given above.

GAMBLE-SKOGMO INC.





SERVICE PARTS LIST

MODEL 43-8685

When ordering parts always mention complete factory model number, series and issue.

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
25660	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)
25751	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.

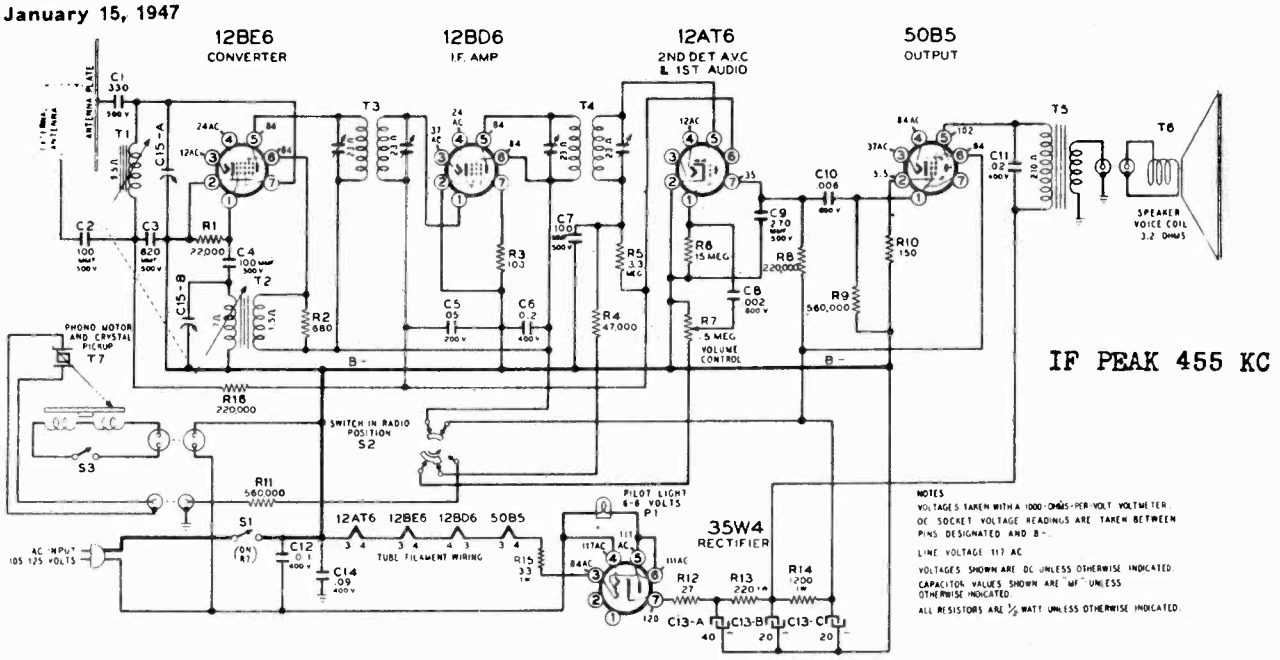
In ordering any part not listed give complete description and a sketch, if possible.

Order parts from your local Gamble Store.

GAMBLE-SKOGMO, INC.

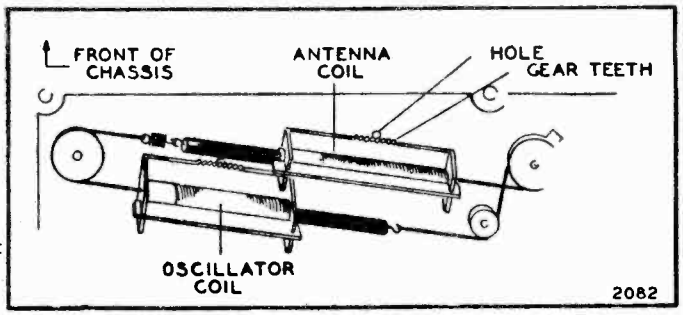
MODEL 43-9201

January 15, 1947



Ref. No.	Part No.	Description
		CAPACITORS
C13-A, C13-B, C13-C	A-8C-10077	Electrolytic, 40x20x20, 150 volts
C15-A, C15-B	A-8E-10723	Trimmer condenser, dual, antenna and oscillator
C14	C-8D-11251	.09 mf x 400 volts 10% tubular
C6	C-8D-10942	.2 mf x 400 volts 10% tubular
C5	C-8D-10770	.05 mf x 200 volts 20% tubular
C10	C-8D-10785	.006 mf x 600 volts 20% tubular
C8	C-8D-10789	.002 mf x 600 volts 20% tubular
C11	C-8D-10774	.02 mf x 400 volts 20% tubular
C12	C-8D-10760	.1 mf x 400 volts 10% tubular
C1	C-8F3-119	330 mmf x 500 volts 10% mica
C3	C-8F3-247	820 mmf x 500 volts 5% mica
C9	C-8F3-118	270 mmf x 500 volts 10% mica
C2,C4 C7	C-8F3-113	100 mmf x 500 volts 10% mica
		RESISTORS
R7 S1	A-10A-10720	Volume control (500M ohms) and switch
R15	C-9B2-44	33 ohms, 1 watt, 10%
R8	C-9B1-90	220k ohms, ½ watt, 10%
R13	C-9B2-54	220 ohms, 1 watt, 10%
R14	C-9B2-63	1200 ohms, 1 watt, 10%
R12	C-9B1-43	27 ohms, ½ watt, 10%
R4	C-9B1-82	47k ohms, ½ watt, 10%
R3	C-9B1-50	100 ohms, ½ watt, 10%
R5	C-9B1-34	3.3 megohms, ½ watt, 20%
R9	C-9B1-95	560k ohms, ½ watt, 10%
R11 R10	C-9B1-52	150 ohms, ½ watt, 10%
R6	C-9B1-302	15 megohms, ½ watt, 10%
R2	C-9B1-60	680 ohms, ½ watt, 10%
R1	C-9B1-78	22k ohms, ½ watt, 10%
		COILS AND TRANSFORMERS
T1 T2	C-211-10171	Tuner unit, permeability tuned, Ant and Osc. coils
T3	B-13A-10728	Input I.F. transformer
T4	B-13B-10729	Output I.F. transformer
T5	B-12C-10074-1	Output speaker transformer

Ref. No.	Part No.	Description
		DIAL AND TUNING PARTS
	A-6D-10163	Dial scale
	C-5C-10009-48	Escutcheon for dial
	A-5B-10170-1	Knobs for radio
	B-200-10980	Dial and bracket assembly
	A-55A-10093	Pilot light and bracket
P1	A-46A-10793	Pilot light bulb, 6-8 volt type
		MISCELLANEOUS
T6	B-18A-11089	4x6 oval P.M. speaker
	A-15C-10717	Tube socket
	A-2H-10718	Shield base
	A-2H-10974	Tube shield
	B-15B-10076	Mounting base for electrolytic
S2	A-20A-10722	Radio-phono switch
	A-19B-10727	Phono motor socket
	A-55A-7386-1	Phono input socket
	A-19B-11044	Speaker socket
	A-23A-10344	Line cord lock
	B-14M-11085	A.C. line cord and plug
	A-2E-12192	Needle cup
	B-2E-11038	Antenna plate
	A-5B-11239-1	Knob for radio-phono switch
	A-3A-12263	Extension shaft for radio-phono switch
	A-2M-11074	Spring clamp for shaft
	A-2C-10972	Indicator plate

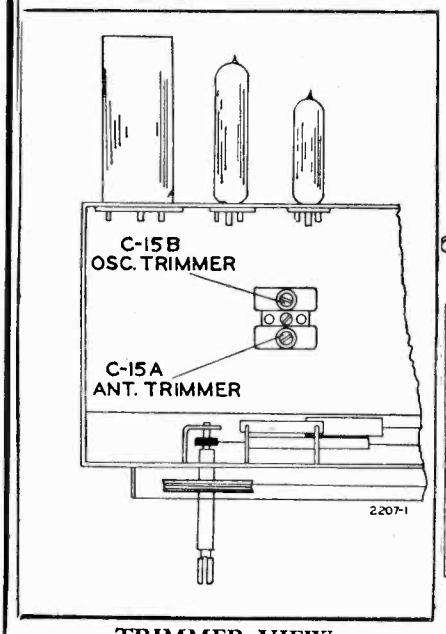


View of Coil Assembly

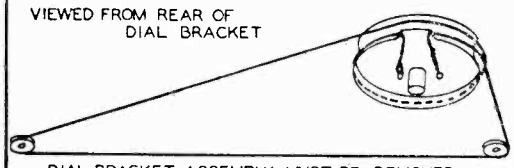
The antenna coil assembly is movable left to right. When making the adjustment as required in the alignment procedure, move the coil assembly very slowly, either by hand or by pivoting one edge of a screwdriver blade in the hole and engaging the blade in the gear teeth of the coil form.

MODEL 43-9201

GAMBLE-SKOGMO, INC.

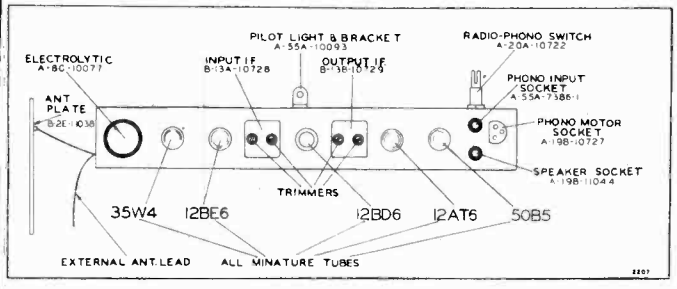


DRIVE CORD REPLACEMENT



DIAL BRACKET ASSEMBLY MUST BE REMOVED TO REPLACE DIAL STRING.

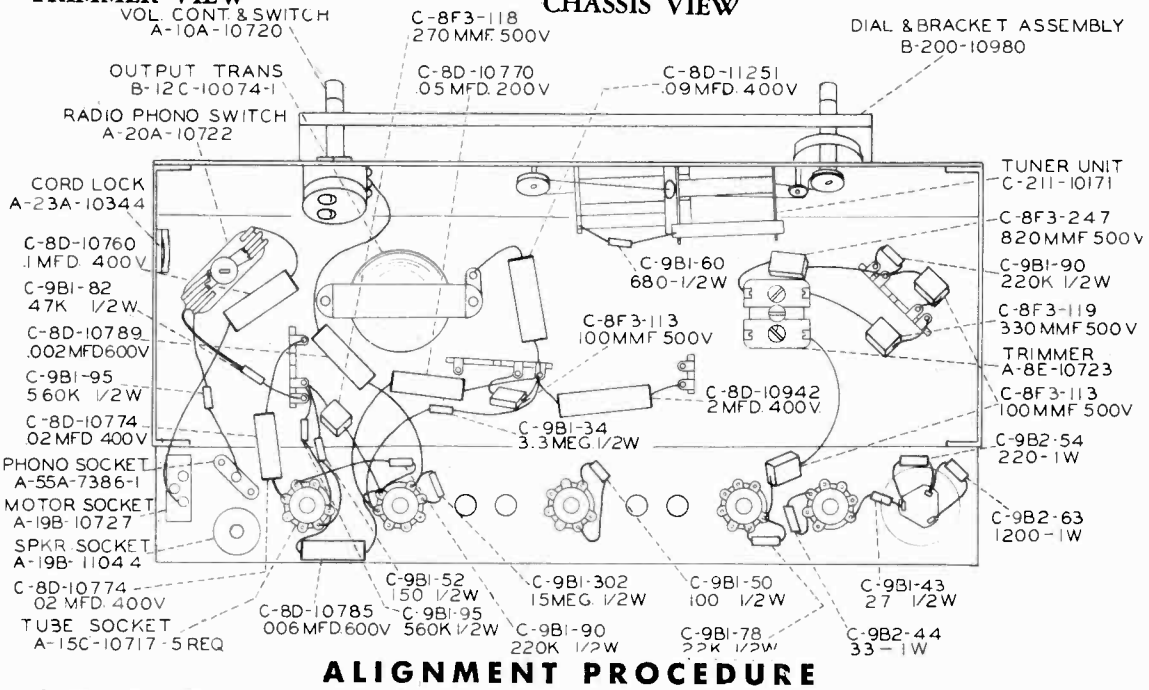
DIAL LIGHT—If the dial lamp burns out the set should not be operated until a new lamp has been installed. Failure to heed this caution may result in a burned-out 35W4 tube. Use only a type T-47 lamp for replacement.



43-9201

TRIMMER VIEW

CHASSIS VIEW

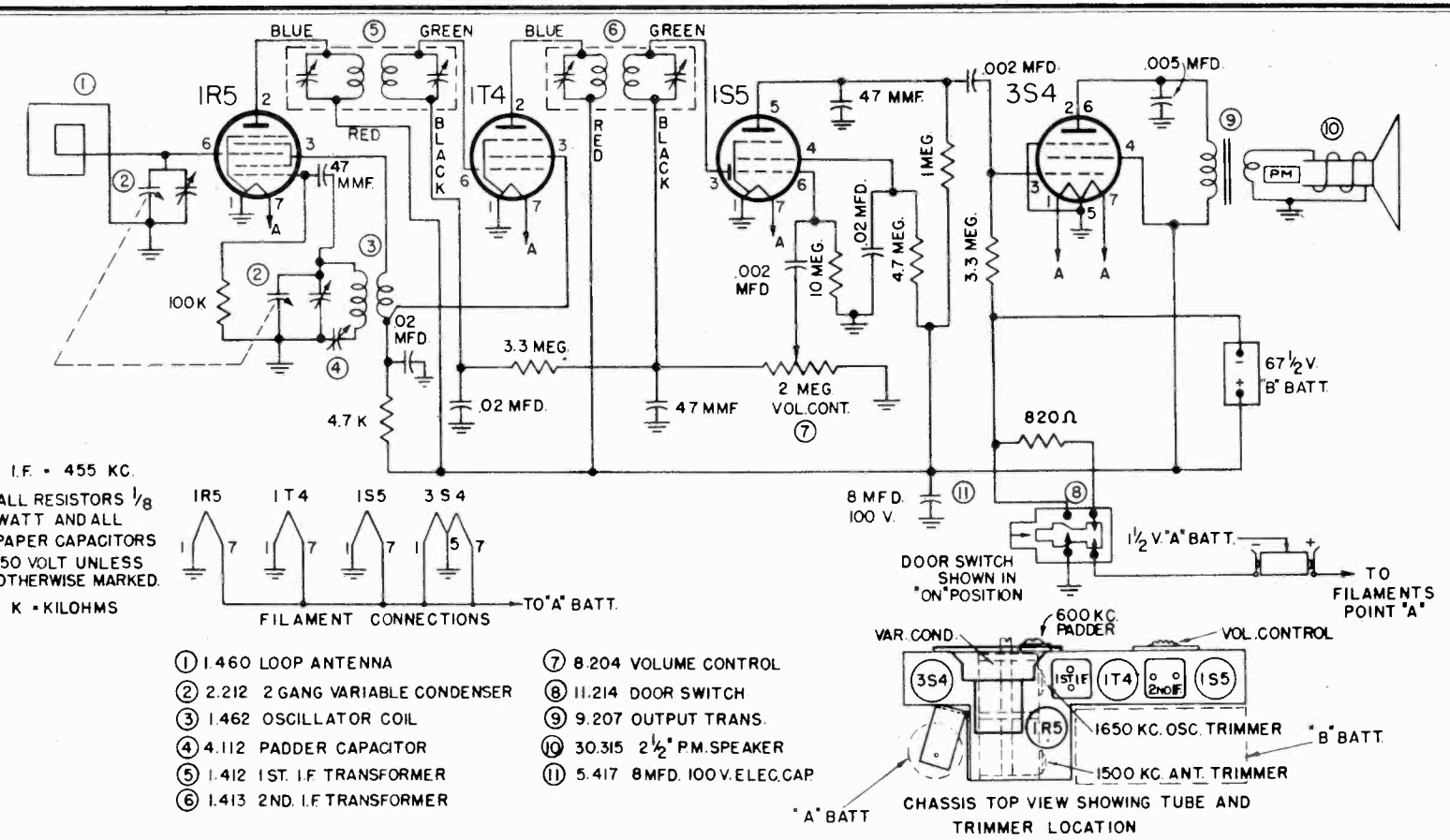


ALIGNMENT PROCEDURE

- 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 B− of radio.

SIGNAL GENERATOR			*TUNER SETTING*	*ADJUST FOR MAXIMUM OUTPUT (in order shown)*
Frequency	*Dummy Antenna*	*Connection to Radio*		
455 kc	.1 mf	Grid (pin 7) of 12BE6	Iron cores all the way out	Trimmers on output and input I.F. cans
1720 kc	.1 mf	Grid (pin 7) of 12BE6	Iron cores all the way out	Oscillator trimmer C-15B
1720 kc	200 mmf	Antenna lead	Iron cores all the way out	Antenna trimmer C-15A
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



① 1.460 LOOP ANTENNA
② 2.212 2 GANG VARIABLE CONDENSER
③ 1.462 OSCILLATOR COIL
④ 4.112 PADDER CAPACITOR
⑤ 1.412 1ST. I.F. TRANSFORMER
⑥ 1.413 2ND. I.F. TRANSFORMER
⑦ 8.204 VOLUME CONTROL
⑧ 11.214 DOOR SWITCH
⑨ 9.207 OUTPUT TRANS.
⑩ 30.315 2½" P.M. SPEAKER
⑪ 5.417 8 MFD. 100 V. ELEC. CAP.

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 455 KC and connect to the stator lug (rear section) of variable capacitor. Extend the loop leads and solder to original points. 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).

(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 the variable capacitor set at minimum capacity, 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 until this frequency is heard. Adjust the antenna trimmer on the variable capacitor (rear section) for maximum output.

(6) Set the signal generator to 600 KC and turn the tuning control until this frequency is heard. Adjust the oscillator padder located adjacent to the front of the variable capacitor for maximum response while "rocking" the variable capacitor. Recheck the 1500 KC high frequency adjustment until no further improvement can be made.

(7) Install the chassis into the cabinet and re-adjust the antenna trimmer at 1500 KC.

BATTERY VOLTAGE: This personal receiver is designed for operation from a self contained 1½ volt "A" battery and a 67½ volt "B" battery.

BATTERY REQUIREMENTS: The following batteries are required:

QUANTITY	TYPE	MANUFACTURER
1	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.

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.

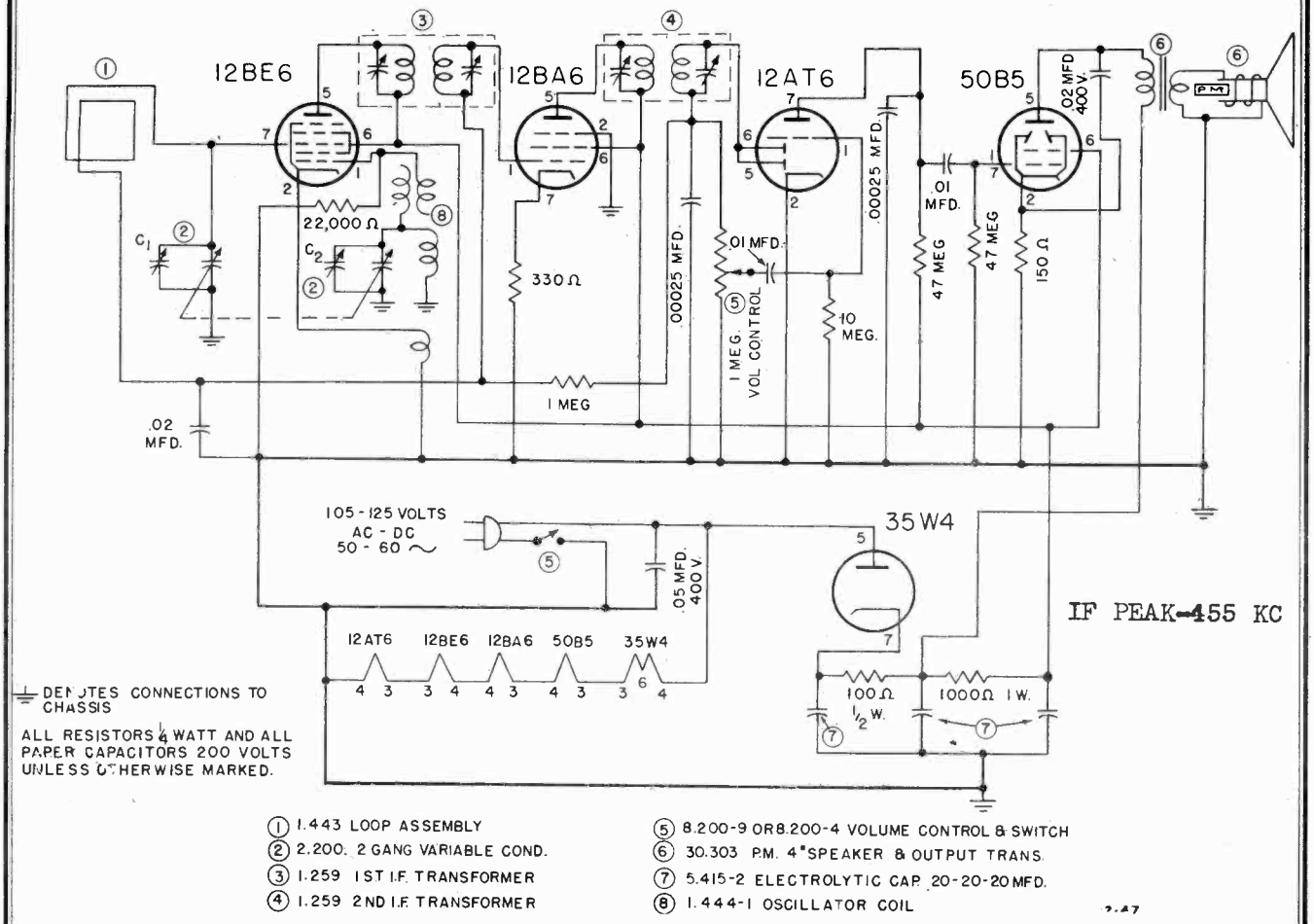
TUBES: The tubes used and their functions are as follows:

1R5 Converter	1S5 Detector, AVC and Audio Amp.
1T4 I.F. Amplifier	3S4 Power Amplifier

For the placement of these tubes, see the diagram showing tube layout.

MODEL 5A1
The Ensign

GAROD RADIO CORP.

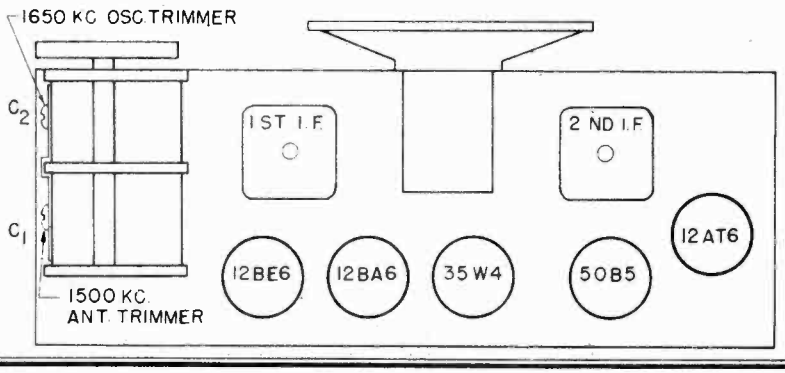


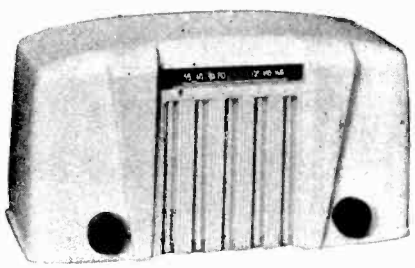
① 1.443 LOOP ASSEMBLY
② 2.200. 2 GANG VARIABLE COND.
③ 1.259 1ST I.F. TRANSFORMER
④ 1.259 2ND I.F. TRANSFORMER
⑤ 8.200-9 OR 8.200-4 VOLUME CONTROL & SWITCH
⑥ 30.303 P.M. 4"SPEAKER & OUTPUT TRANS.
⑦ 5.415-2 ELECTROLYTIC CAP. 20-20-20 MFD.
⑧ 1.444-1 OSCILLATOR COIL

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.

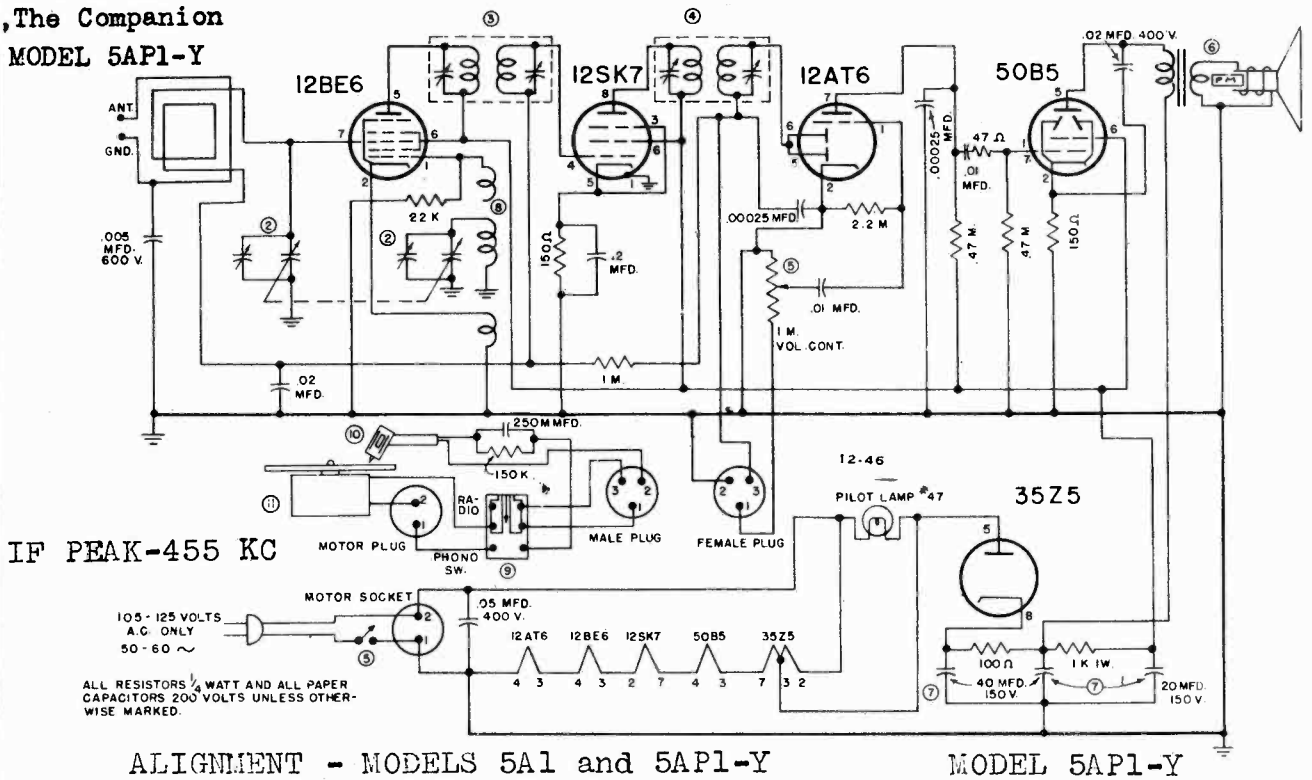
TUNING RANGE: Broadcast: 540 to 1650 Kilocycles (180 to 555 meters).





The Ensign
MODEL 5A1
,The Companion
MODEL 5AP1-Y

GARROD RADIO CORP.



IF PEAK-455 KC

ALIGNMENT - MODELS 5A1 and 5AP1-Y

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

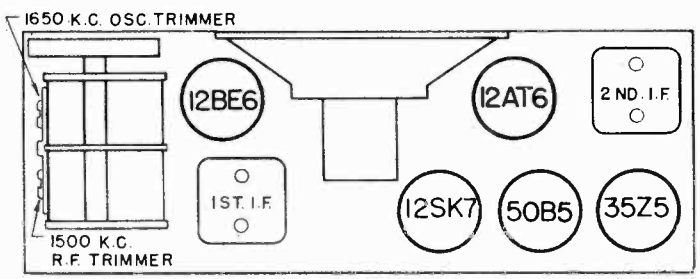
(1) Set the Signal Generator to 455 KC and connect to the stator lug on the rear section of the Variable Capacitor. Connect the Signal Generator Ground lead to the chassis. Connect a suitable output meter across the Speaker Voice Coil Connections. Turn the Volume Control to the maximum position. Turn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

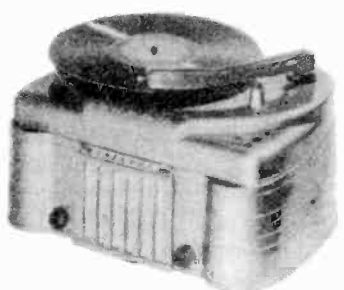
(4) With the Variable Capacitor set at the extreme clockwise position, tune in the 1650 KC signal by means of the Oscillator Trimmer on the Variable Capacitor (front section).

(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 5AP1-Y

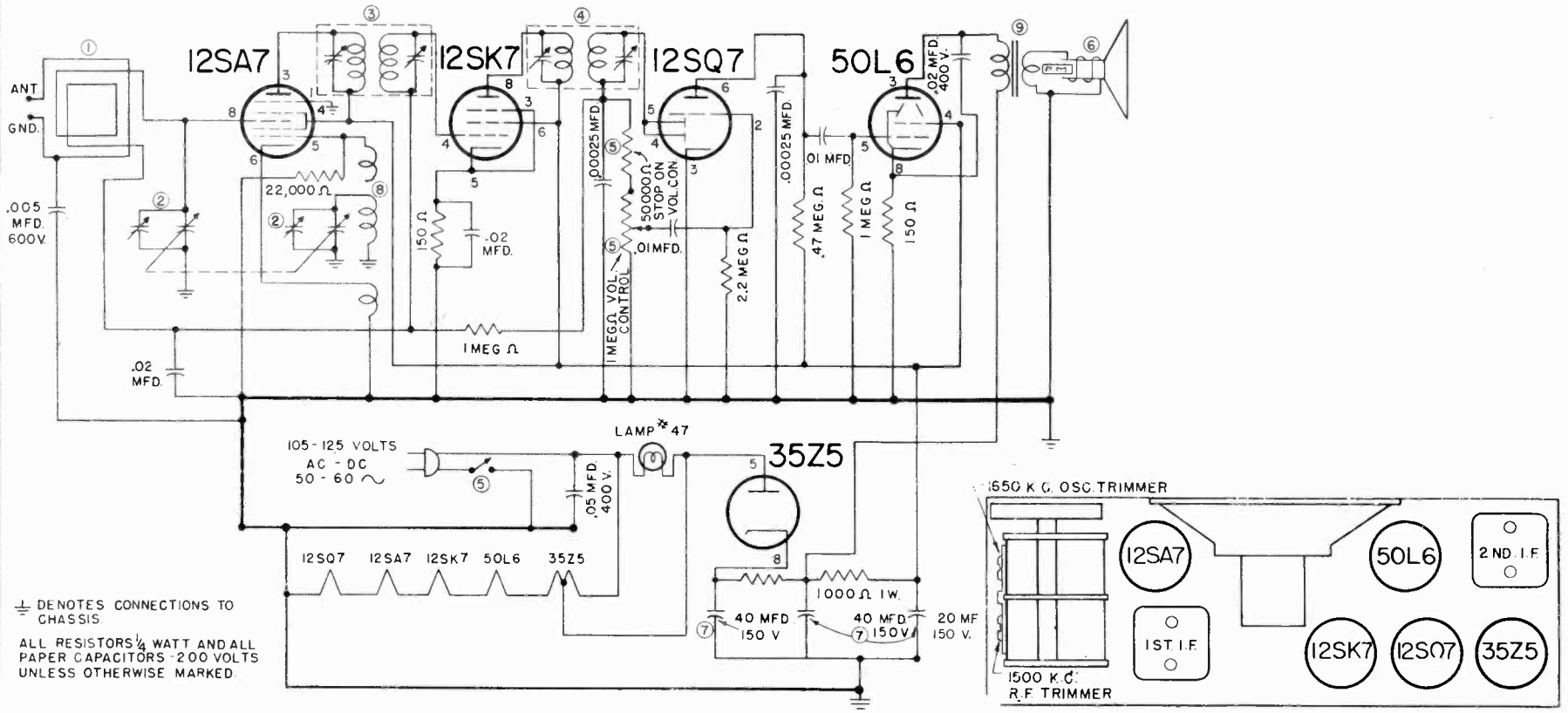
① 1.410 LOOP ASSEMBLY
② 2.200 2 GANG VARIABLE CONDENSER
③ 1.259 1ST. I.F. TRANSFORMER
④ 1.259 2ND. I.F. TRANSFORMER
⑤ 8.201-2 VOL. CONTROL & SWITCH
⑥ 30.301 P.M. 4" SPEAKER & OUTPUT TRANS.
⑦ 5.400-8 ELECTROLYTIC CAP. 40-40-20 MFD.
⑧ 1.402-2 OSCILLATOR COIL
⑨ 11.207 D.P.D.T. SWITCH
⑩ 36.104 PHONO PICKUP
⑪ 36.108 PHONO MOTOR & TURNTABLE



LINE VOLTAGE: 105-125 Volts, 60 Cycles, Alternating Current (AC) only.

POWER CONSUMPTION: 45 Watts.

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



① 1.403 LOOP ASSEMBLY
② 2.163 2GANG VARIABLE COND.
③ 1.259 1 ST. I.F. TRANSFORMER
④ 1.409 2 ND. I.F. TRANSFORMER
⑤ 8.200-1 VOLUME CONTROL & SWITCH
⑥ 30,300 P.M. 5" SPEAKER
⑦ 5.400-8 ELECTROLYTIC CAP. 40-40-20 MFD
⑧ 1.402 OSCILLATOR COIL
⑨ 9.200 OUTPUT TRANSFORMER

I.F. = 455 K.C.

TRIMMER AND TUBE LOCATION DIAGRAM

POWER CONSUMPTION: 30 Watts.

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

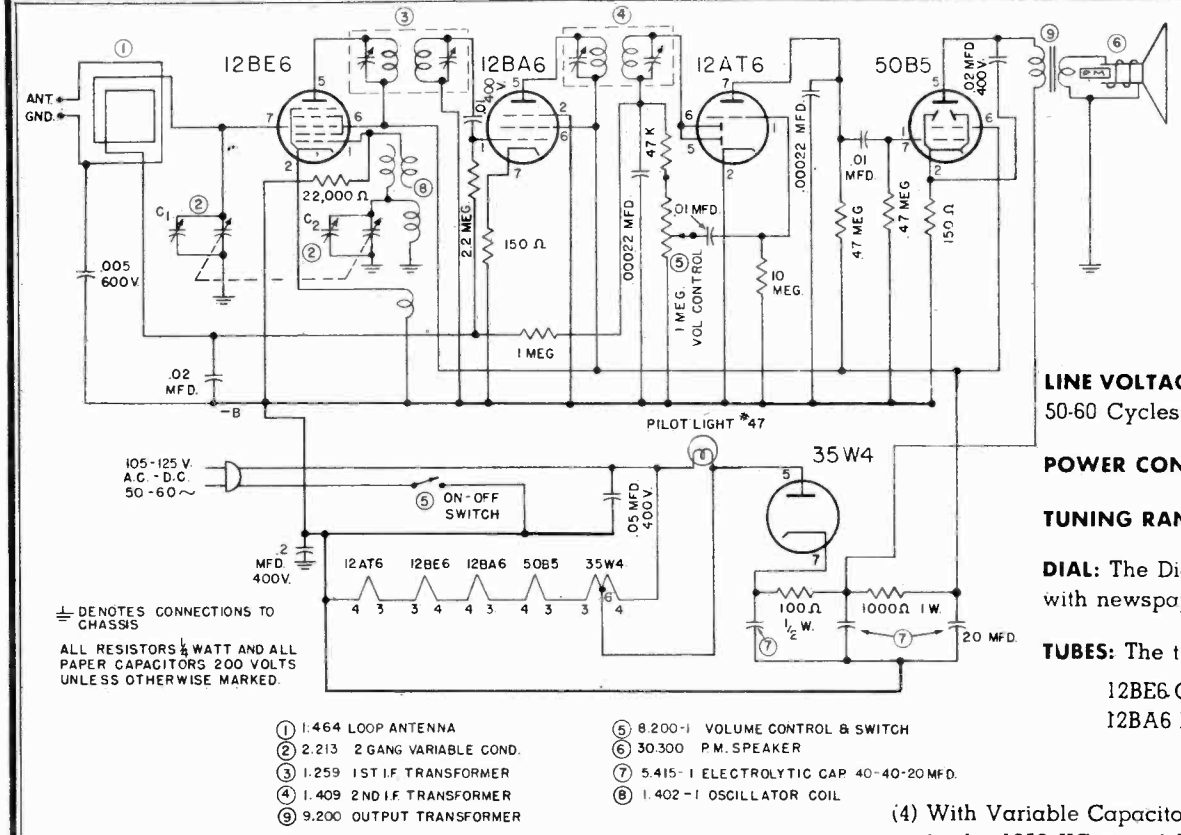
(1) Set the Signal Generator to 455 KC and connect to the stator lug on the rear section of the Variable Capacitor. Connect the Signal Generator Ground lead to the chassis. Connect a suitable output meter across the Speaker Voice Coil Connections. Turn the Volume Control to the maximum position. Turn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

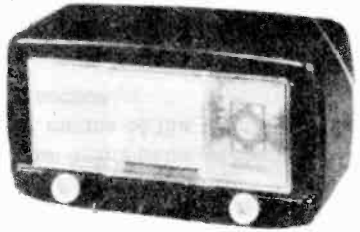
(3) Loosely couple the Signal Generator lead to the Loop and set to 1650 KC.

(4) With 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.



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
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
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

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

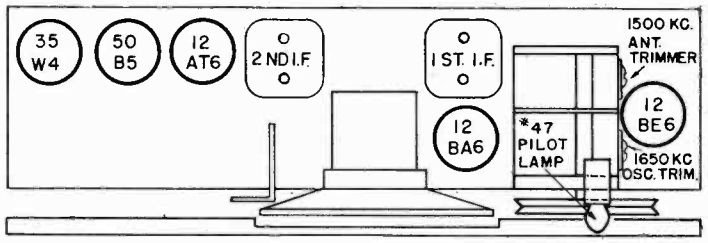
(1) Set the Signal Generator to 455 KC and connect to the stator lug on the rear section of the Variable Capacitor. Connect the Signal Generator Ground lead to the chassis. Connect a suitable output meter across the Speaker Voice Coil Connections. Turn the Volume Control to the maximum position. Turn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

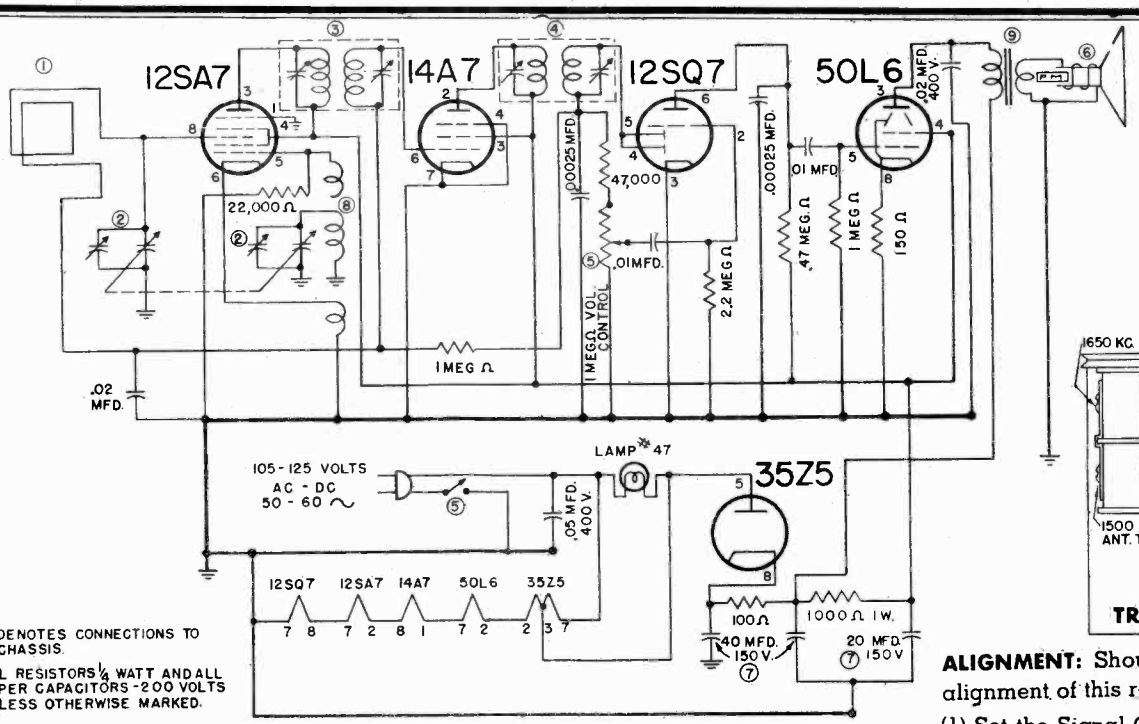
(3) Loosely couple the Signal Generator lead to the Loop and set to 1650 KC.

(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

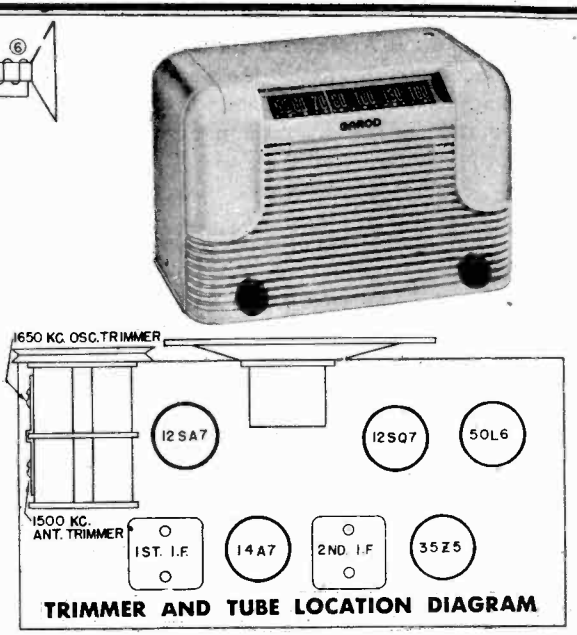


⏚ DENOTES CONNECTIONS TO CHASSIS.

ALL RESISTORS 1/4 WATT AND ALL PAPER CAPACITORS - 200 VOLTS UNLESS OTHERWISE MARKED.

I-F - 455 K.C.

① 1.469 LOOP ASSEMBLY
② 2.163 2GANG VARIABLE COND.
③ 1-259 1ST. I.F. TRANSFORMER
④ 1.409 2ND. I.F. TRANSFORMER
⑤ 8.201-3 VOLUME CONTROL & SWITCH
⑥ 30,318 P.M. 5" SPEAKER
⑦ 5,400-8 ELECTROLYTIC CAP. 40-40-20MFD
⑧ 1.402-1 OSCILLATOR COIL
⑨ 9.219 OUTPUT TRANSFORMER



TRIMMER AND TUBE LOCATION 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: 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:

12SA7 Converter — 12SQ7 Detector, Avc and Audio Amp.
14A7 I.F. Amplifier — 50L6 Beam Power Amplifier
35Z5 Rectifier

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

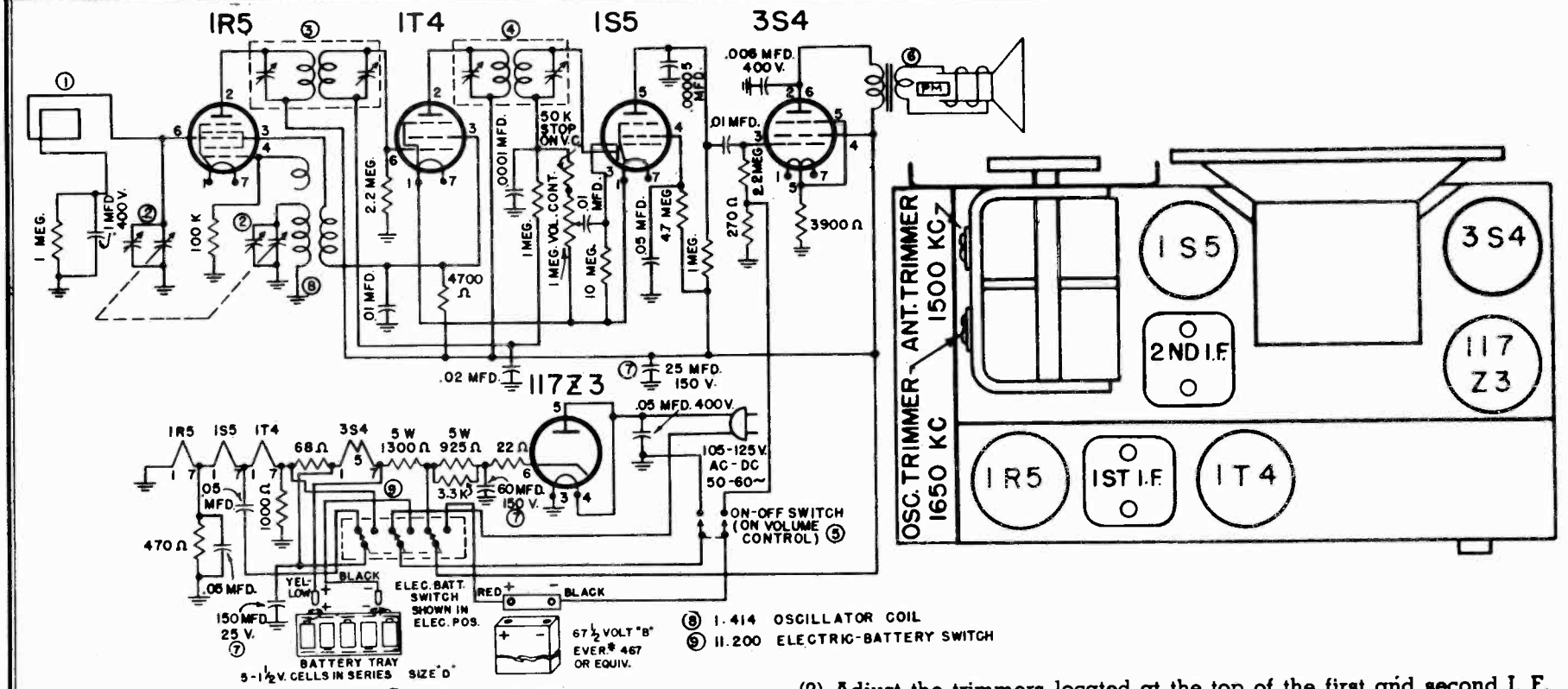
(1) Set the Signal Generator to 455 KC and connect to the stator lug on the rear section of the Variable Capacitor. Connect the Signal Generator Ground lead to the chassis. Connect a suitable output meter across the Speaker Voice Coil Connections. Turn the Volume Control to the maximum position. Turn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

(2) Adjust the trimmers located at the top of the first and second I. F. Transformers or the iron cores located at the top and bottom of each I. F. 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.



ALL RESISTORS ¼ WATT AND ALL PAPER CAPACITORS 200 VOLTS UNLESS OTHERWISE MARKED.

K = KILOHMS

I. F. = 455 K C.

-4-46

① 1.405 LOOP ANTENNA
② 2.203 2 GANG VARIABLE CONDENSER
③ 1.412 1ST I. F. TRANSFORMER
④ 1.413 2ND I. F. TRANSFORMER
⑤ 8.200-2 VOLUME CONTROL & SWITCH
⑥ 30302 3½" P.M. SPEAKER
⑦ 5.400-3 ELECTROLYTIC CAP. 60-25-150 MFD.
⑧ 1.414 OSCILLATOR COIL
⑨ 11.200 ELECTRIC-BATTERY SWITCH

ALIGNMENT (Electric Operation) 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 455 KC and connect to the stator lug (front section) of the Variable Capacitor. Extend Loop leads and connect to Loop contacts inside top of cabinet. 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 counter-clockwise position (minimum capacity).

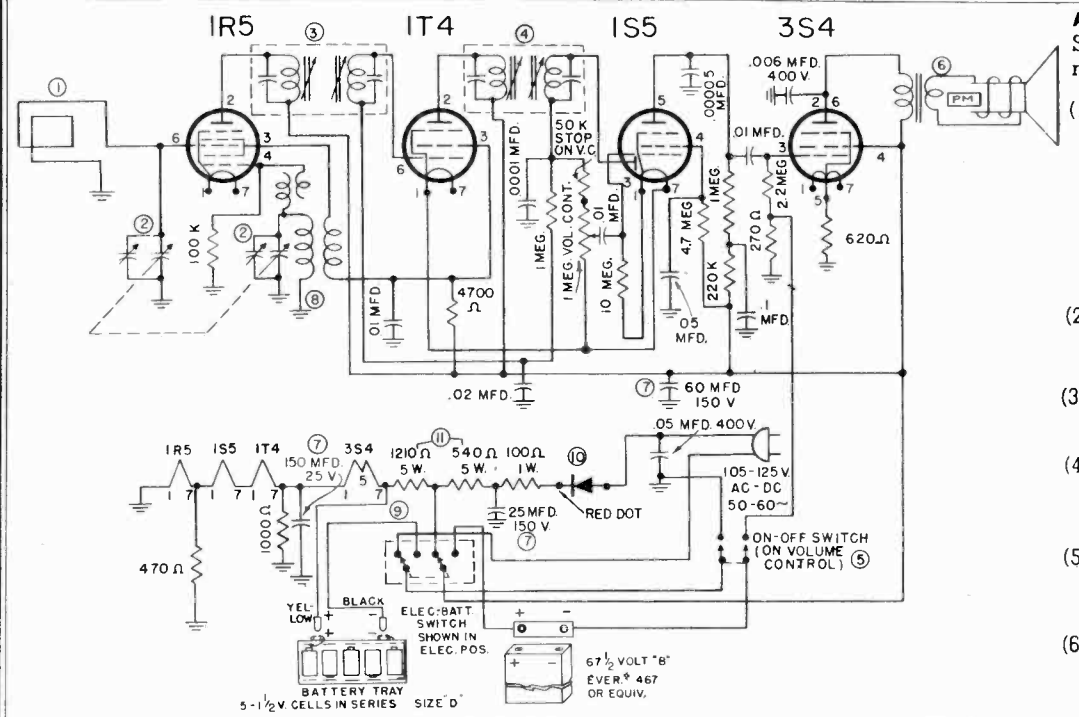
(2) Adjust the trimmers located at the top of the first and second I. F. Transformers for maximum output as indicated on the output meter.

(3) Loosely couple the Signal Generator lead to the Loop (open position) and set to 1650 KC.

(4) With the Variable Capacitor set at the extreme counter-clockwise position (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 so that this frequency is indicated on the dial. Adjust the Antenna Trimmer on the Variable Capacitor (front section) for maximum output.

(6) Install the chassis into the cabinet and check the dial calibration. If further adjustment is required, remove the two plug buttons on the side of the cabinet adjacent to the Variable Capacitor and adjust the Oscillator Trimmer as required for correct dial calibration. Readjust the Antenna Trimmer for maximum output and replace plug buttons.



ALL RESISTORS ¼ WATT AND ALL PAPER CAPACITORS 200 VOLTS UNLESS OTHERWISE MARKED.

K = KILOHMS

I.F. = 455 K.C.

9-47

① 1.437 LOOP ANTENNA
② 2.210 2GANG VARIABLE CONDENSER
③ 1.445 1ST I.F. TRANSFORMER
④ 1.445 2ND I.F. TRANSFORMER

⑪ 6.208-1 METAL CLAD RESISTOR

⑤ 8.200-2 VOLUME CONTROL & SWITCH
⑥ 30.312 5" P.M. SPEAKER & OUTPUT TRANS.
⑦ 5.415-3 ELECTROLYTIC CAP. 60-25-150 MFD.
⑧ 1.414 OSCILLATOR COIL
⑨ 11.210 ELECTRIC-BATTERY SWITCH
⑩ 36.111 5 PL. SELENIUM RECTIFIER

BATTERY OR LINE VOLTAGE: This receiver is designed for operation on 105-125 volts, 50-60 cycles either Alternating or Direct Current (AC-DC) and also from self contained batteries.

POWER CONSUMPTION: 20 Watts on Electric Operation.

BATTERY REQUIREMENTS: The following batteries are required for battery operation:

QUANTITY	TYPE	MANUFACTURER
5	1½ volt "A"	Eveready #950, Burgess #2 or equivalent.
1	67½ volt "B"	Eveready #467, Burgess #XX45 or equivalent.

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.

ALIGNMENT: (Electric Operation) 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 455 KC and connect to the stator lug (rear section of variable capacitor. Extend the loop leads and connect grid lead to the terminal connecting the wire from the Ant. Section of the variable capacitor. Connect the other lead to the chassis. 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 counter clockwise position (minimum capacity).

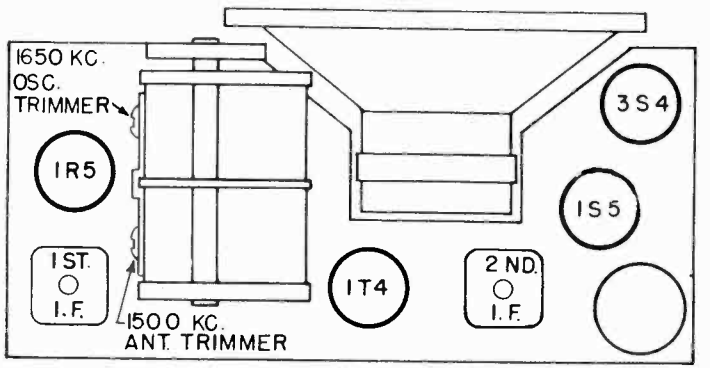
(2) Adjust the iron cores located at the top and bottom of the first and second I. F. transformers for maximum output as indicated on the output meter.

(3) Loosely couple the Signal Generator lead to the Loop (open position) and set to 1650 KC.

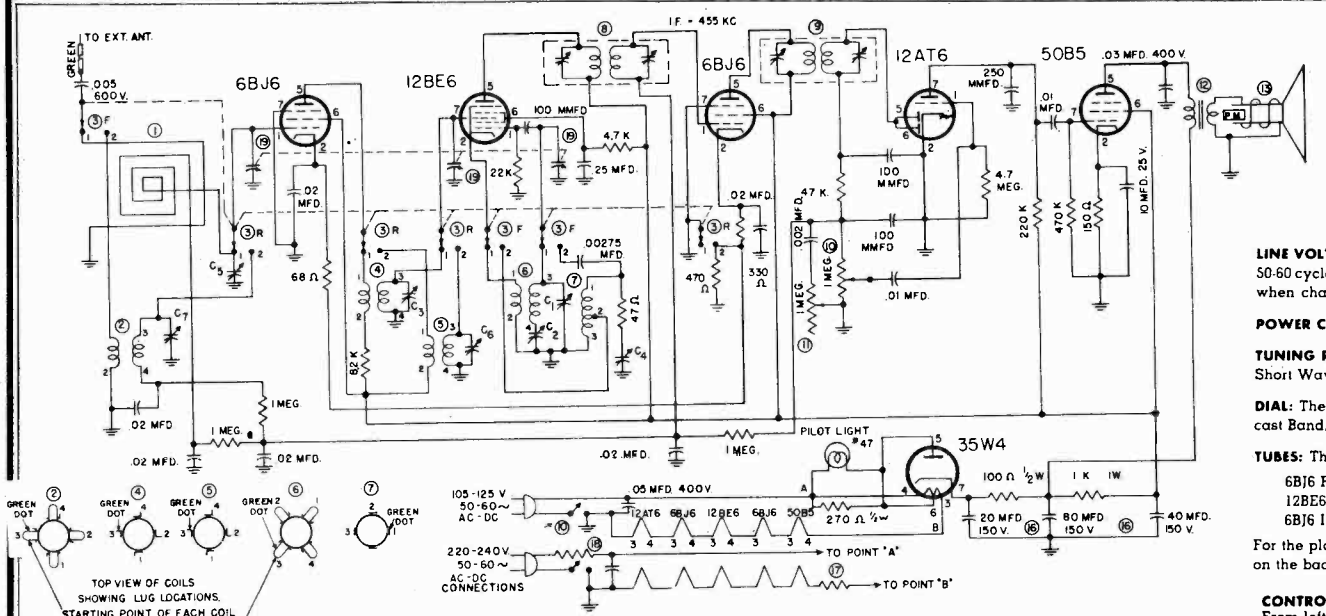
(4) With the variable capacitor set at the extreme counter clockwise position (minimum capacity), tune in the 1650 KC signal by means of the oscillator trimmer on the variable capacitor (front section).

(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.

(6) Install the chassis into cabinet and check the dial calibration. If further adjustment is required, remove the two plug buttons on the side of the cabinet adjacent to the variable capacitor and adjust the oscillator trimmer as required. Adjust the antenna trimmer for maximum output and replace plug buttons.



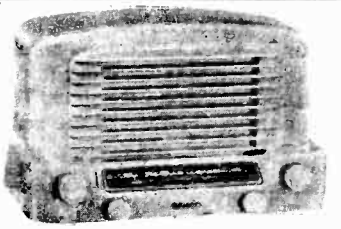
TRIMMER AND TUBE LOCATION DIAGRAM



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 8.200-4 VOLUME CONTROL & SWITCH
⑪ 8.203-1 TONE CONTROL
⑫ 9.200 OUTPUT TRANSFORMER
⑬ 30.311 5" 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 6.206 160 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

⏚ DENOTES CONNECTIONS TO CHASSIS.
ALL RESISTORS ½ WATT AND ALL PAPER CAPACITORS 200 V. UNLESS OTHERWISE SPECIFIED.

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.

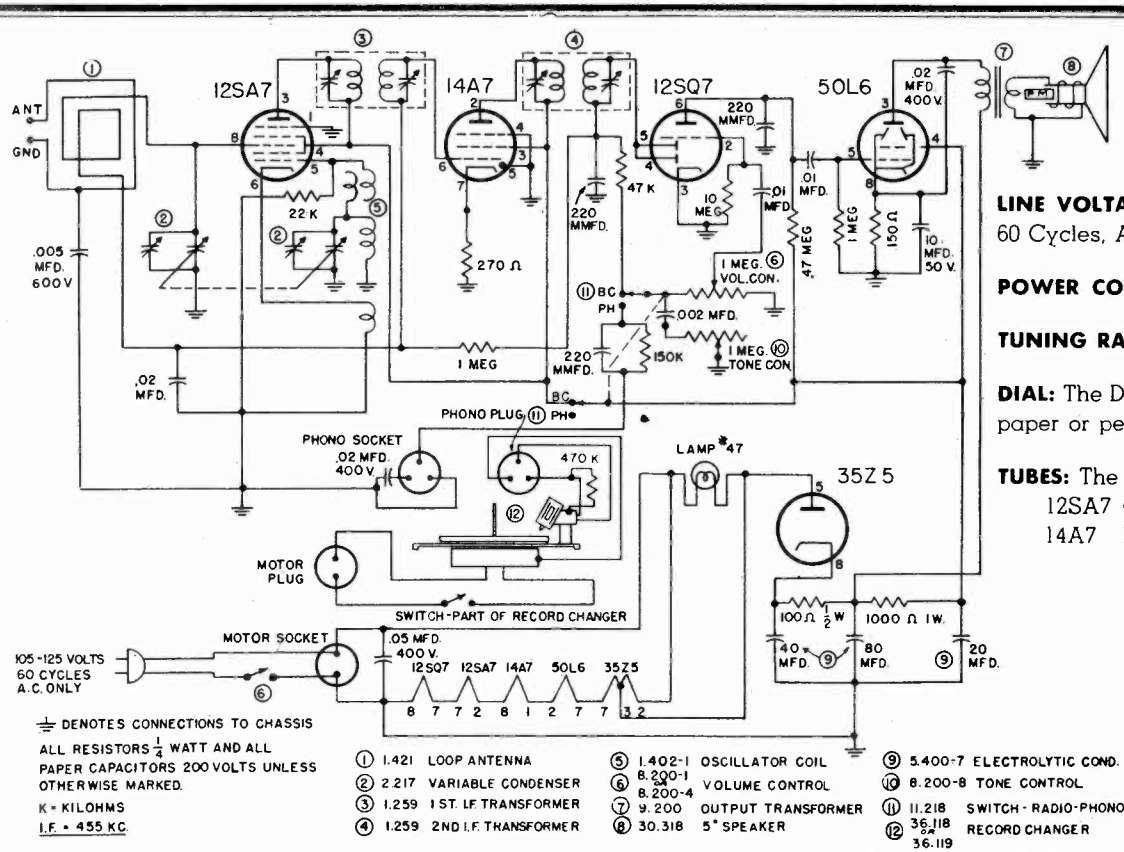
(4) Set the signal generator to 600 KC and turn the Tuning Control so that this frequency is indicated on the dial. Adjust the broadcast oscillator padder capacitor (C2) for maximum response while "rocking" the variable capacitor. Repeat the last three steps until no further improvement can be made.

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.



LINE VOLTAGE: This unit is designed for operation on 105-125 Volts, 60 Cycles, Alternating Current (AC) only.

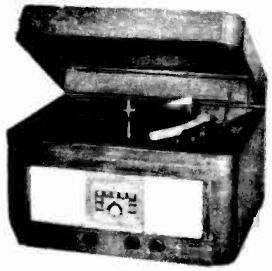
POWER CONSUMPTION: 45 Watts.

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:

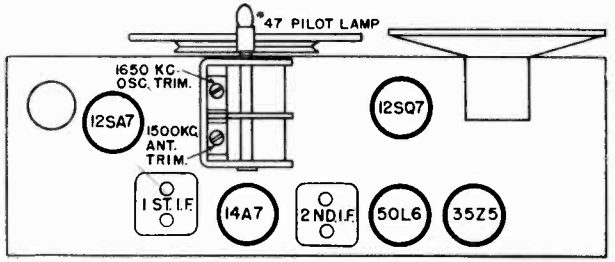
(1) Set the Signal Generator to 455 KC and connect to the stator lug on the rear section of the Variable Capacitor. Connect the Signal Generator Ground lead to the chassis. Connect a suitable output meter across the Speaker Voice Coil connections. Turn the Volume Control to the maximum position. Turn 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).

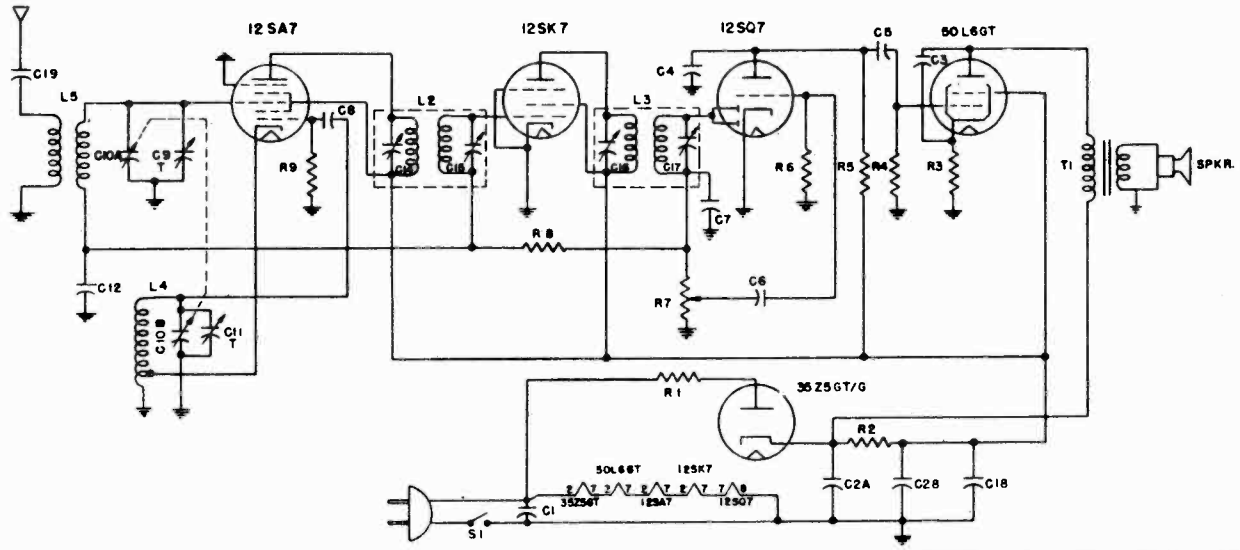
(5) Set the Signal Generator to 1500 KC and turn the Tuning Control so that this frequency is indicated on the dial. Adjust the Antenna Trimmer on the Variable Capacitor (rear section) for maximum output. No other adjustments are necessary.

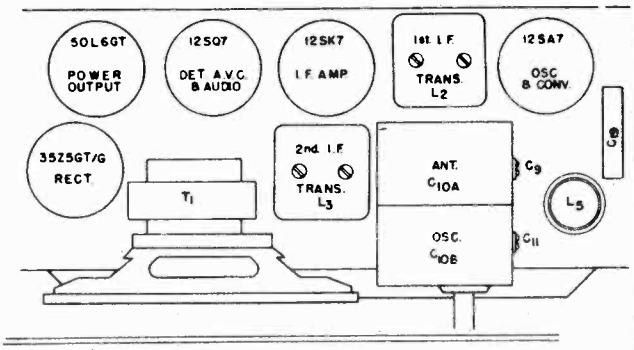


TRIMMER AND TUBE LOCATION DIAGRAM

GENERAL ELECTRIC CO.

MODELS YRB60-1, YRB60-2, YRB60-12





Tuning Frequency Range: ..... 540–1725 kc

Intermediate Frequency: ..... 455 kc

LOUDSPEAKER "ALNICO V" MAGNET DYNAMIC

Outside Cone Diameter ..... 4 in.
Voice Coil Impedance (400 cycles) ..... 3.5 ohm

ALIGNMENT PROCEDURE

ALIGNMENT FREQUENCIES

I.F. ..... 455 kc
R.F. ..... 1725 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.

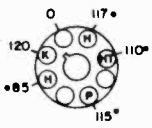
R.F. ALIGNMENT

Apply the R.F. alignment signals through a standard I.R.E. dummy antenna to the receiver antenna post. 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.

35Z5GT/G



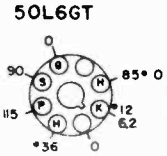
VOLTAGES MEASURED BETWEEN SOCKET TERMINALS AND CHASSIS

● INDICATES A.C. VOLTS
A.C. LINE 117 VOLTS
NO SIGNAL INPUT

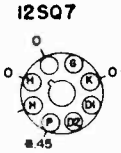
ALL VOLTAGES MEASURED WITH 1000 OHM/VOLT METER

* MEASURED ON 300 V. SCALE

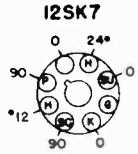
50L6GT



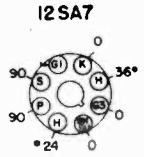
12SQ7



12SK7



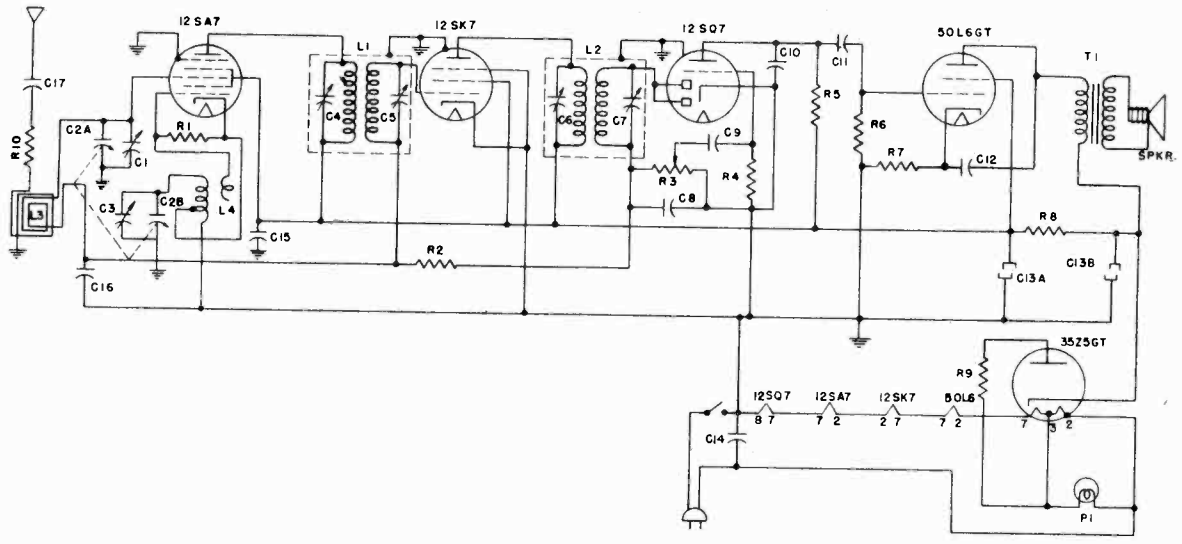
12SA7



Cat. No.	Symbol	Description
UNIVERSAL G-E REPLACEMENT PARTS		
UCC-039	C6, C19	Capacitor—.005 mfd paper
UCC-040	C5, C13	Capacitor—.01 mfd paper
UCC-041	C3	Capacitor—.02 mfd paper
UCC 045	C1, C12, C18	Capacitor—.05 mfd paper
UCU-1020	C8	Capacitor—47 mmfd mica
UCU-1040	C4, C7	Capacitor—330 mmfd mica
URD-029	R3	Resistor—150 ohm ½ watt carbon
URD-041	R11	Resistor—470 ohm ½ watt carbon
URD-081	R9	Resistor—22,000 ohm ½ watt carbon
URD-105	R5	Resistor—220,000 ohm ½ watt carbon
URD-113	R4	Resistor—470,000 ohm ½ watt carbon
URD-129	R8	Resistor—2.2 megohm ½ watt carbon
URD-145	R6	Resistor—10 megohm ½ watt carbon
URE-007	R1	Resistor—18 ohm 1 watt carbon
URF-053	R3	Resistor—1500 ohm 2 watt carbon
SPECIALIZED G-E REPLACEMENT PARTS		
SAB-009		Back cover for cabinet
SAU-011		Cabinet, Model YRB 60-1
SAU-012		Cabinet, Model YRB 60-2
SCE-003	C2A, C2B	Capacitor—electrolytic filter, 40-40 mfd 150 volts
SCT-003	C10A, C10B	Capacitor—tuning
SDK-005		Knob—tuning, Model YRB 60-1
SDK-006		Knob—tuning, Model YRB 60-2
SDK-007		Knob—volume control, Model YRB 60-1
SDK-008		Knob—volume control, Model YRB 60-2
SDX-002		Grille and dial, Model YRB 60-1
SDX-003		Grille and dial, Model YRB 60-2
SJS-002		Socket, octal tube
SLA-001		Antenna coil
SLC-002		Oscillator coil
SMC-003		Fasteners, speed clip for fastening grille
SMF-003		Fasteners, for fastening cabinet back cover
SOP-001		Speaker, 4 in. PM dynamic
SRC-004		Volume control, 0.5 megohm, with power switch
STL-003		Transformer, 1st I.F.
STL-004		Transformer, 2nd I.F.
SWL-001		Power cord

MODELS YRB67-1, YRB67-2, YRB82-1

GENERAL ELECTRIC CO.



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 I.R.E. dummy antenna to the receiver antenna post. With the gang condenser wide open, align the oscillator trimmer (C17B) to 1720 KC. Change the generator signal to 1500 KC, tune the receiver to the signal and peak the antenna trimmer (C17A) 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.

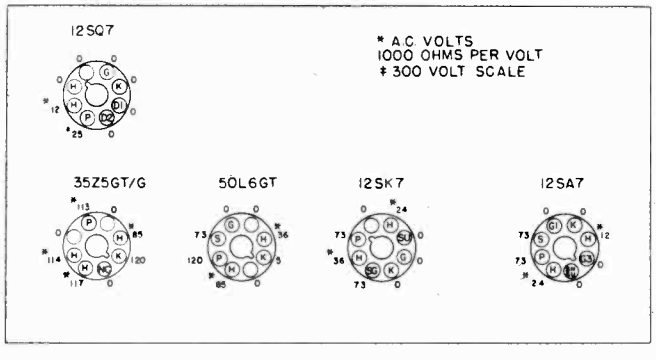


Fig. 2. Socket Voltage Diagram

OVERALL DIMENSIONS—YRB 82-1

	YRB 82-1	YRB 67-1, 2
Height	8⅛″	8½″
Width	12½″	13″
Depth	7″	6⅞″

Rating: 105-125 volts DC
105-125 volts 40-60 cycles AC
28 watts at 117 volts

Tuning Frequency Range: 540-1720 KC

Intermediate Frequency: 455 KC

LOUDSPEAKER "ALNICO V" MAGNET DYNAMIC

Outside Cone Diameter	5¼″
Voice Coil Impedance (400 cyc)	3.2 ohms

TUBES

Converter and Oscillator	12SA7
I.F. Amplifier	12SK7
Det. Audio, AVC	12SQ7
Power Output	50L6GT
Rectifier	35Z5GT
Pilot Lamp	GE 51

GENERAL INFORMATION

Models YRB 67-1 and 67-2 are 5 tube (including rectifier) superheterodyne receivers in distinctively styled wood cabinets; Model YRB 82-1 is a rich brown plastic cabinet. These receivers incorporate built-in antenna, automatic volume control, oversize permanent magnet speaker and beam power output.

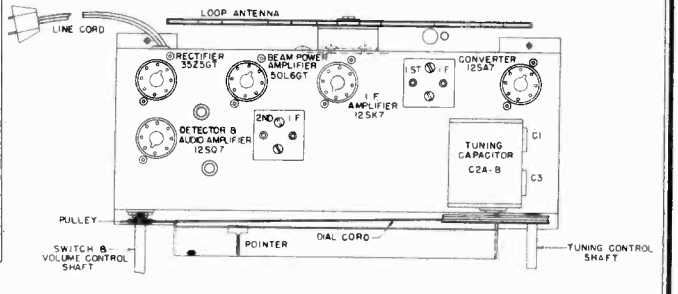


Fig. 1. Tube and Trimmer Location

GENERAL ELECTRIC CO.

MODELS YRB67-1, YRB67-2, YRB82-1
MODELS 200, 203, 205

PARTS DESCRIPTION LIST

MODELS YRB 82-1, YRB 67-1, YRB 67-2

Symbol	Description	Symbol	Description	Symbol	Description
C1	Ant. trimmer condenser	C14	.05 mfd paper capacitor	R2	2.2 megohm carbon resistor
C2A	Tuning condenser, ant. section	C15	.05 mfd paper capacitor	R3	Volume control .5 megohm
C2B	Tuning condenser, osc. section	C16	.05 mfd paper capacitor	R4	4.7 megohm carbon resistor
C3	Osc. trimmer condenser	C17	.01 mfd paper capacitor	R5	470,000 ohm carbon resistor
C8	220 mmfd mica capacitor	L1	1st I.F. transformer	R6	470,000 ohm carbon resistor
C9	.005 mfd paper capacitor	L2	2nd I.F. transformer	R7	150 ohm carbon resistor
C10	220 mmfd mica capacitor	L3	Loop assembly	R8	2700 ohm carbon resistor
C11	.01 mfd paper capacitor	L4	Oscillator coil	R9	18 ohm carbon resistor
C12	.02 mfd paper capacitor	P1	Pilot lamp	R10	470 ohm carbon resistor
C13A	30 mfd electrolytic capacitor	T1	Output transformer		
C13B	30 mfd electrolytic capacitor	R1	22,000 ohm carbon resistor		

REPLACEMENT PARTS LIST

MODELS YRB 82-1, YRB 67-1, YRB 67-2

Stock No.	Description
	SPECIALIZED G-E REPLACEMENT PARTS
SAB 004	Back cover, Models YRB 67-1 and 67-2
SAB 006	Back cover, Model YRB 82-1
SAU 001	Cabinet, Model YRB 82-1
SAV 003	Cabinet, Model YRB 67-1
SAV 015	Cabinet, Model YRB 67-2
SCE 002	Capacitor, filter electrolytic, 30-30 mfd 150 volt, C13A, C13B
SCT 002	Capacitor, tuning, C2A, C2B
SDC 001	Cord, dial drive cord
SDK 002	Knob, Models YRB 67-1 and 67-2
SDK 010	Knob, Model YRB 82-1
SDP 001	Pointer, dial scale
SDS 004	Dial scale, Models YRB 67-1 and 67-2
SDS 006	Dial scale, Model YRB 82-1
SHC 001	Hair pin cotter for dial drive
SJP 002	Connector, female to speaker
SJS 001	Pilot lamp socket
SJS 003	Socket, octal tube
SLC 001	Coil, oscillator
SLL 001	Loop, antenna
SMF 002	Snap button
SMF 003	Fastener, back cover to cabinet
SMS 001	Spring, dial drive drum
SMU 001	Shaft, dial drive
SMW 001	Pulley, dial drive
SRC 003	Volume control, 0.5 megohm with power switch

Stock No.	Description
	SPECIALIZED G-E REPLACEMENT PARTS (Cont.)
STL 001	Transformer, 1st I.F.
STL 002	Transformer, 2nd I.F.
STO 001	Transformer, output
SWL 001	Power cord
	UNIVERSAL G-E REPLACEMENT PARTS
UCC 039	Capacitor, .005 mfd paper, C9
UCC 040	Capacitor, .01 mfd paper, C17
UCC 041	Capacitor, .02 mfd paper, C12
UCC 045	Capacitor, .05 mfd paper, C14, C15, C16
UCU 1036	Capacitor, 220 mmfd mica, C8, C10
UDL 013	Pilot lamp, Mazda 51
UOP 526	Speaker, 5¼ inch PM dynamic
URD 007	Resistor, 18 ohm ½ watt carbon, R9
URD 029	Resistor, 150 ohm ½ watt carbon, R7
URD 041	Resistor, 470 ohm ½ watt carbon, R10
URD 081	Resistor, 22,000 ohm ½ watt carbon, R1
URD 113	Resistor, 470,000 ohm ½ watt carbon, R5, R6
URD 129	Resistor, 2.2 megohm ½ watt carbon, R2
URD 137	Resistor, 4.7 megohm ½ watt carbon, R4
URE 059	Resistor, 2700 ohm 1 watt carbon, R8

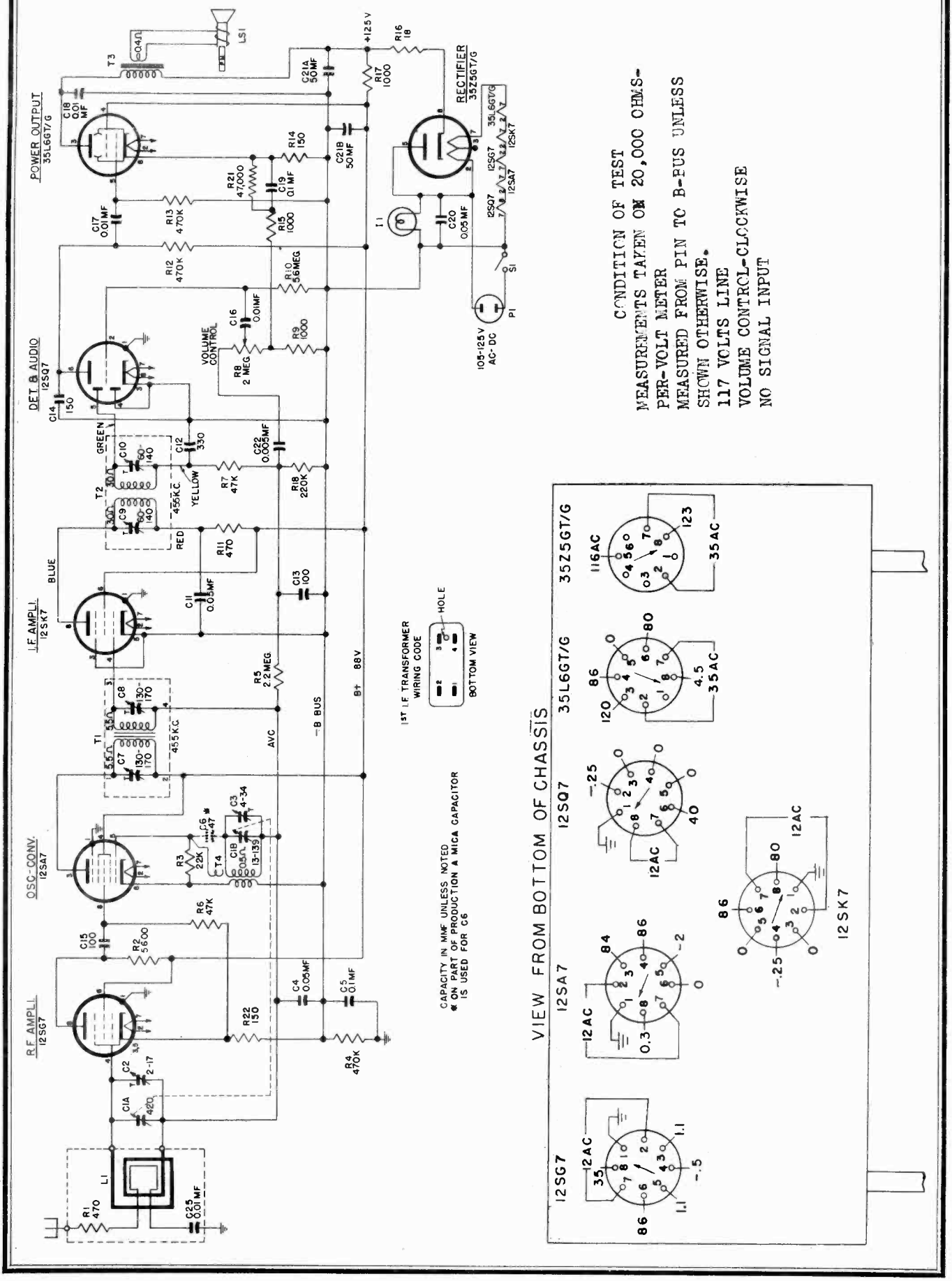
REPLACEMENT PARTS LIST—MODELS 200, 203, & 205

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-006		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

MODELS 200, 203, 205

GENERAL ELECTRIC CO.



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

SPECIFICATIONS

CABINET:

	200	203	205
Model			
Material	Plastic	Wood	Wood
Color	Brown	Mahogany	Maple
Height	7 1/2 in.	8 1/4 in.	8 1/4 in.
Width	12 in.	13 in.	13 in.
Depth	7 1/2 in.	7 15/16 in.	7 15/16 in.

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	5 1/4 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, 1 1/2 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 1 1/4 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.

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 1/2-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.

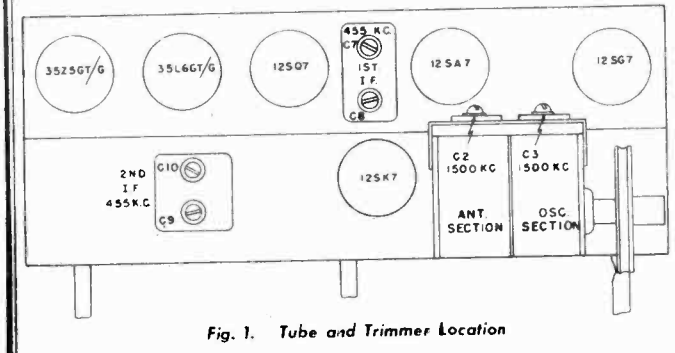


Fig. 1. Tube and Trimmer Location

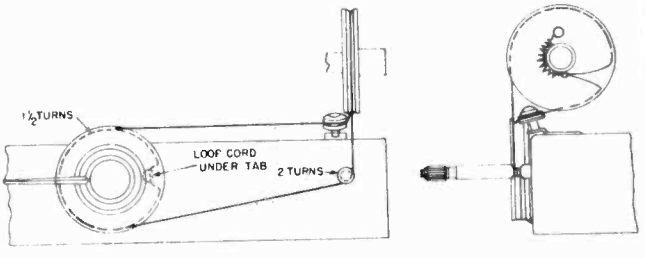
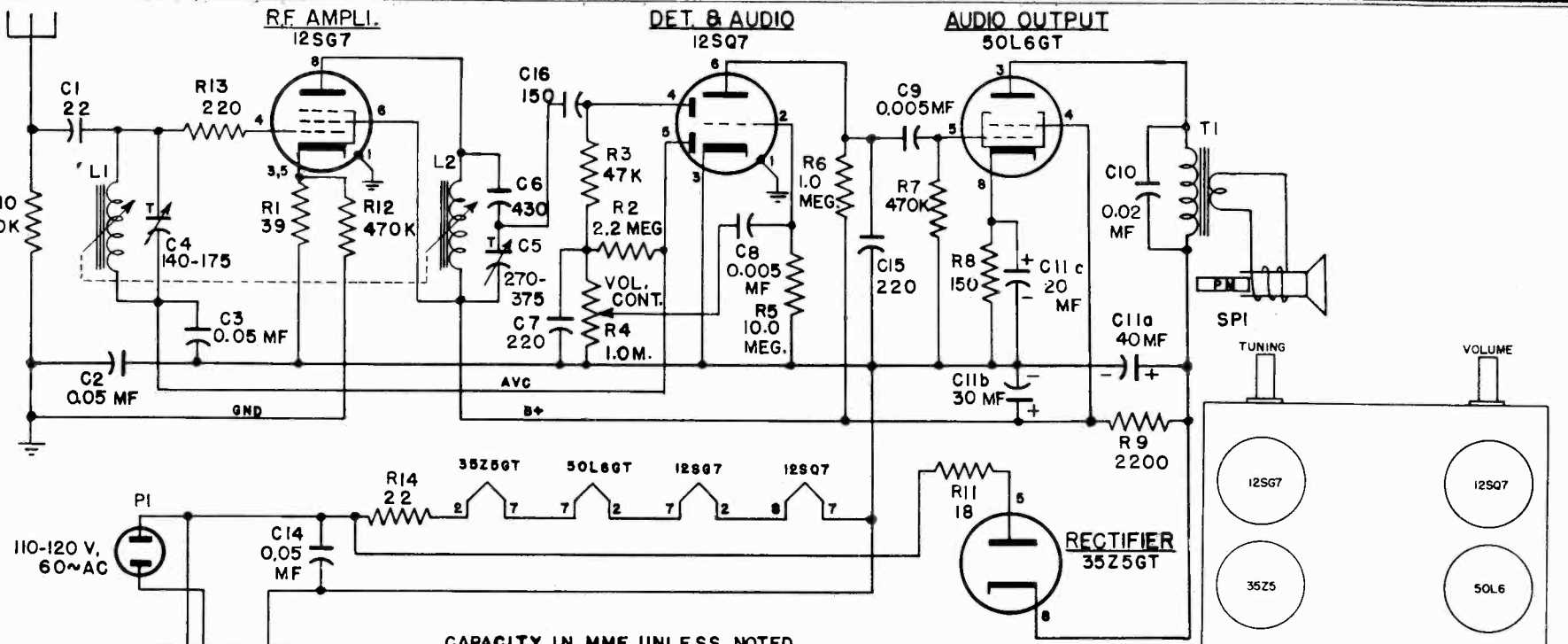
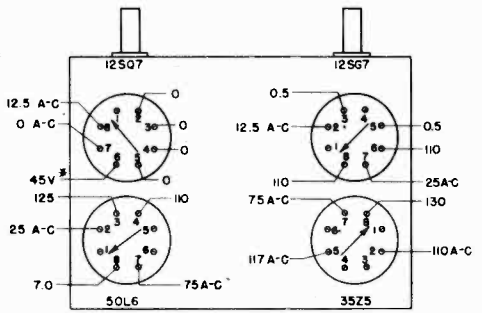


Fig. 2. Dial Stringing Diagram



CAPACITY IN MMF UNLESS NOTED



*Measured with 20,000 ohm/volt meter

Fig. 4. Socket Voltages (Bottom View)

RADIO CIRCUIT ALIGNMENT

EQUIPMENT REQUIRED

1. Test oscillator with audio tone modulation.
2. A-C output meter, 1½ volts full scale.
3. 100 mmf. mica capacitor.
4. Insulated screwdriver.

PROCEDURE

1. Connect test oscillator through 100 mmf. to antenna lead; connect output meter across the loudspeaker voice coil leads.
2. Turn dial pointer as far clockwise as it will go.
3. Set test oscillator to 1620 kc with tone modulation. Keeping the radio volume control set for maximum and attenuating test oscillator so that the output meter reading never exceeds 1¼ volts, trim antenna (C4) and RF (C5) trimmers for maximum output.
4. Set test oscillator to 580 kc with tone modulation. While rocking tuning control in vicinity of this dial calibration, adjust tracking adjustment platform up or down to give maximum output meter reading.
5. Recheck 1620 calibration adjustment. If RF (C5) trimmer has to be changed appreciably for maximum output, recheck step 4.

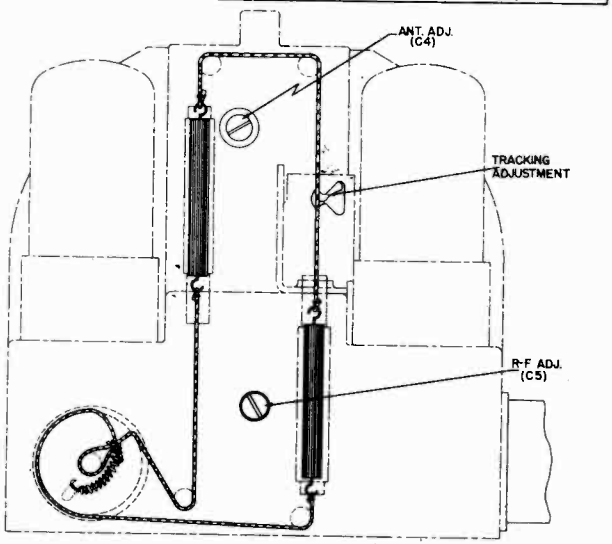


Fig. 1. Drive Stringing and Trimmer Location

CLOCK SERVICE

Figure 6 shows clock parts referred to in the following paragraphs and the parts list.

CLOCK MOVEMENT DISASSEMBLY

1. Remove clock movement from case. When removing knobs, note that the Alarm-set knob is a left-hand thread, while Alarm-Radio is a pull-off knob.
2. Remove Bezel Window, Hands and Dial Face.
3. Remove two field screws (A) and break two soldered joints on Field. The Field and Rotor assembly (R) can now be removed. The Rotor is held by friction only to the Field.
4. Remove Switch Assembly (B) by removing two screws from base plate.
5. Remove Switch Shaft Assembly (C) and spacer.
6. Remove Alarm-set Shaft Assembly (D) and spacer.
7. Remove the three front plate assembly screws that are located under the Dial Face and then remove Front Plate.
8. Remove Alarm Gear Sleeve Assembly (E), Hour Gear Sleeve Assembly (F), Minute Gear Sleeve Assembly (G), and Sweep Second Gear Shaft Assembly (H).
9. Remove Alarm Cam Gear Assembly (I) and Spring Washer (J).
10. Remove Alarm-set Gear (K).
11. Remove Time-set Gear and Shaft Assembly (L).
12. Remove Switch Cam Lever (M).

CLOCK MOVEMENT REASSEMBLY

Reassemble in the reverse order of disassembly, observing the following precautions:

1. The spring washer (J) should curve upward when placed on the Alarm Cam Gear (I).
2. The Switch Cam Lever (M) fork must straddle the base plate post as shown in the illustration.
3. After reassembly of front plate, check the Sweep Second Gear (H) through hole in base plate to make sure it is free to turn.
4. Proceed with ALARM AND SWITCH ADJUSTMENTS as described below before installing hands.

ALARM AND SWITCH ADJUSTMENTS

1. Turn Alarm-Radio shaft to ALARM position.
2. Slowly rotate Time Set shaft clockwise until the contacts of the Switch Assembly (B) close.
3. Replace Dial Face, Alarm Dial, the Minute, Hour and Second Hands. Set all Hands and Dial so that they indicate 12 o'clock. Make sure all Hands and Alarm Dial are tight on their respective shafts.
4. With Alarm Set knob pulled out, continue to rotate Time Set shaft clockwise and note that the vibrator arm (N) drops against field core approximately 7-10 minutes later.
5. Set alarm at some other selected position and make sure mechanism actuates within limits (±1 minute).
6. Check alarm tone of vibrator. This can be adjusted by either bending vibrator arm nearer or farther away from field core. Bend arm near anchor point.

CLEANING AND LUBRICATION

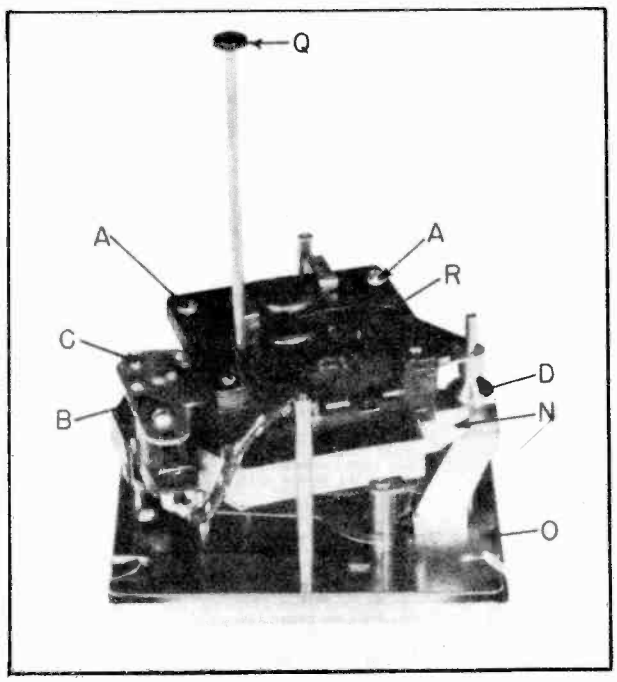
To clean, completely disassemble and clean all moving parts in carbon tetrachloride or some similar cleaner.

The inside of the sleeves and shaft surfaces may be cleaned of oxidized oil by rubbing with a fine grade of steel wool dampened in carbon tetrachloride.

Do not use too much oil and apply by means of a small wire (drop oiler). Too much oil collects dust and later oxidizes. Use only recommended clock oil, such as Nyes Celebrated Oil which may be purchased from Wm. F. Nye Co., Inc., New Bedford, or equivalent.

CLOCK TROUBLES

1. Clock will not operate—Defective field coil, defective rotor, binding of parts.
2. Clock loses time—Binding parts, too little friction on minute hand sleeve assembly, defective rotor. Clock time set shaft bent and rubs against hole in back cover. Radio pushed against wall so that knob (Q) rubs will cause loss of time.
3. Noisy Clock—Rotor defective, alarm armature improperly adjusted, loose parts, or binding of moving parts.



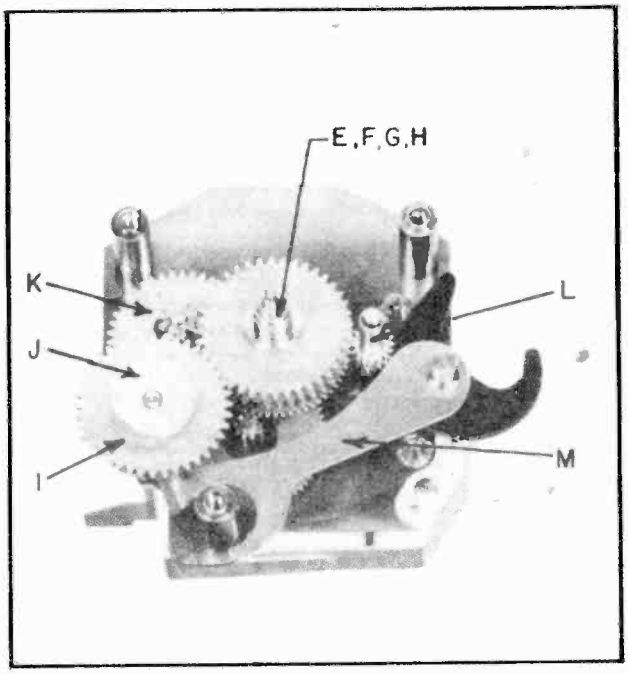


Fig. 6. Clock Part Identification

ELECTRICAL RATING (INPUT):

Voltage	105–125 volts, a-c
Frequency	60 cycles
Wattage	30 watts

TUNING FREQUENCY (RADIO):

Broadcast Band	540–1600 kc

POWER OUTPUT (117 VOLTS LINE):

Undistorted	1.5 watts
Maximum	2.2 watts

LOUDSPEAKER:

Type	Alnico P.M.
Outside Cone Diameter	4 inch
Voice Coil Impedance (400 Cycles)	3.5 ohms

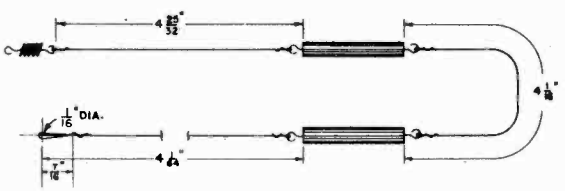


Fig. 2. Drive Cord Assembly

DRIVE CORD REPLACEMENT

When replacing the drive cord, it is essential that the measurements shown in Figure 2 be maintained very accurately, otherwise alignment and dial calibration difficulties will be experienced. Use a 3/32-inch diameter nylon jacketed cord, Part No. RDC-015, for replacement.

RADIO 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 are taken with low signal input.

(1) R-F Stage Gains.

Antenna lead to 12SG7 grid	8 at 1000 kc
12SG7 grid to 12SQ7 diode plate	50 at 1000 kc

(2) Audio Gain.

0.06 volts at 400 cycles across volume control (R4) with control set at maximum will give approximately ½-watt output across speaker voice coil.

(3) Socket Pin Voltages.

Figure 4 shows voltages from all points to B−. Voltage readings much lower than those specified may help localize defective components or tubes.

RADIO REPLACEMENT PARTS LIST—MODEL 50

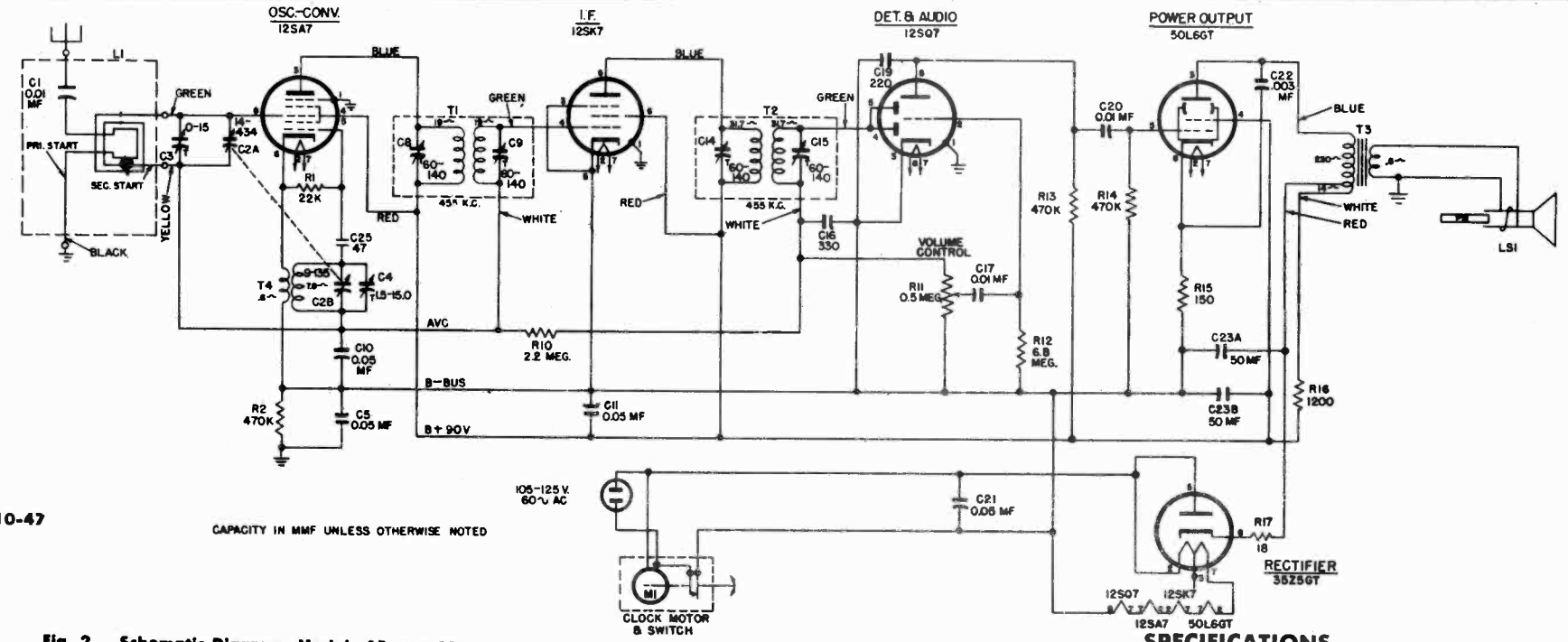
CAT. NO.	SYMBOL	DESCRIPTION
UNIVERSAL G-E RADIO REPLACEMENT PARTS		
UCC-039	C8	CAPACITOR—0.005 mfd., 600 v., paper
UCC-045	C2, 3	CAPACITOR—0.05 mfd., 600 v., paper
UCG-543	C6	CAPACITOR—430 mmf., silver mica
UCU-512	C1	CAPACITOR—22 mmf., mica
UCU-532	C16	CAPACITOR—150 mmf., mica
UCU-536	C7, 15	CAPACITOR—220 mmf., mica
UIC-001		CEMENT—Speaker cement
UOP-405	SP1	LOUDSPEAKER—4-inch PM speaker
UOX-009		CONE—Speaker replacement cone
URD-015	R1	RESISTOR—39 ohms, ½ w., carbon
URD-029	R8	RESISTOR—150 ohms, ½ w., carbon
URD-033	R13	RESISTOR—220 ohms, ½ w., carbon
URD-089	R3	RESISTOR—47,000 ohms, ½ w., carbon
URD-097	R10	RESISTOR—100,000 ohms, ½ w., carbon
URD-113	R7, 12	RESISTOR—470,000 ohms, ½ w., carbon
URD-121	R6	RESISTOR—1.0 megohm, ½ w., carbon
URD-129	R2	RESISTOR—2.2 megohms, ½ w., carbon
URD-145	R5	RESISTOR—10.0 megohms, ½ w., carbon
URE-057	R9	RESISTOR—2,200 ohms, 1 w., carbon
SPECIALIZED G-E REPLACEMENT PARTS		
RAB-016		COVER Cabinet back cover

CAT. NO.	SYMBOL	DESCRIPTION
SPECIALIZED G-E REPLACEMENT PARTS		
RAU-009		CABINET—Plastic cabinet
RCC-039	C9	CAPACITOR—0.005 mfd., 600 v., paper
RCC-041	C10	CAPACITOR—0.02 mfd., 600 v., paper
RCC-045	C14	CAPACITOR—0.05 mfd., 600 v., paper
RCE-031	C11A, B, C	CAPACITOR—40 mfd., 150 v.; 30 mfd., 150 v.; 20 mfd., 25 v.; electrolytic
RCY-007	C4	TRIMMER—140-175 mmf., antenna trimmer
RCY-008	C5	TRIMMER—270-375 mmf., r-f trimmer
RDC-015		CORD—Tuning drive cord (bulk)
RDK-028		KNOB—Volume or tuning knob
REI-004		CORE—Powdered iron tuning core
RHJ-001		ASSEMBLY—Tuning shaft assembly and spacer
RIT-005		COVER—Electrolytic cardboard cover (inner and outer)
RJS-003		SOCKET—Tube socket
RLA-005	L1, 2	COIL—Antenna or R-F coil
RMB-003		BUSHING—Drive shaft bushing
RMS-034		SPRING—Drive cord tension spring
RMX-006		PULLEY—Drive pulley
RRW-003	R14	RESISTOR—22 ohms, 1 w., wirewound
RRW-008	R11	RESISTOR—18 ohms, 1 w., glassohm W.W.
RWL-009		CORD—Power cord
RZC-001		CLOCK—Clock assembly

CLOCK REPLACEMENT PARTS LIST—MODEL 50

CAT. NO.	SYMBOL	DESCRIPTION
MISCELLANEOUS		
XC34X110	O	Frontplate Assembly
XC11X8	D	Alarm Set Shaft Assembly
XC10X115	L	Time Set Gear and Shaft Assembly
XC40X73	C	Switch Shaft Assembly
XC53X83		Inner Bezel 2 7/8 in. Square—Lacquer
XC58X15		Crystal—2 7/8 in. Square
XC60X707		Dial
XC32X129		Hands—Gold
XC55X3		Alarm Dial
XC3X49	Q	Time Set Shaft Knob—Bronze
XC4X5		Alarm Set Knob—Ivory
XC40X74		Switch Knob—Ivory
XC31X26		Sweep Second Hand—Gold
CLOCK MOVEMENT		
XC40X260		Spacer—Switch Shaft
XC44X38		Rotor Unit—60 Cycle
XC45X69	R	Field Coil Assembly—60 Cycle

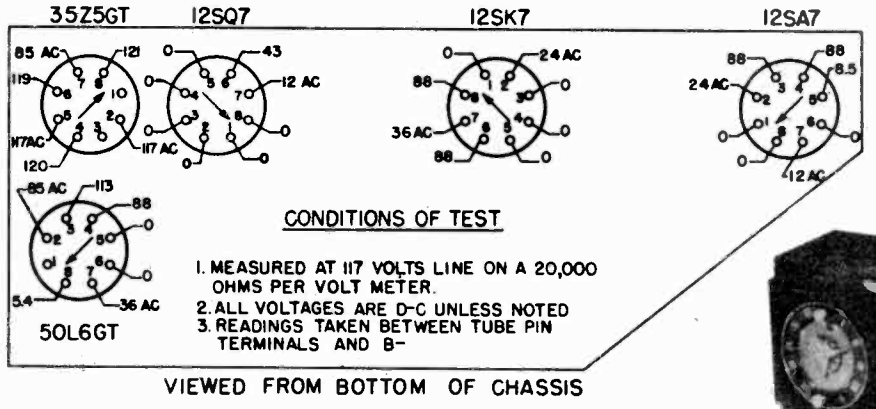
CAT. NO.	SYMBOL	DESCRIPTION
CLOCK MOVEMENT		
XC64X1-2-3		Frontplate Screw
XC40X202		Spreader Post
XC40X252	J	Cam Gear Spring Washer
XC1X1	A	Field Screws, No. 4-40 x 1 1/8 in. R.H.
XC1X2		No. 1204 Lockwasher
XC1X6		Screw No. 4-40 x 3/8 in. R.H.
XC1X43		Hex Nut
XC40X261		Time Set Shaft Spacer
XC40X262		Time Set Shaft Spacer (at front plate)
XC35X39		Baseplate Assembly
XC14X15	G	Minute Gear Sleeve Assembly
XC13X11	F	Hour Gear Sleeve Assembly
XC15X3	E	Alarm Gear Sleeve Assembly
XC40X77	K	Alarm Set Gear Assembly
XC17X8	I	Alarm Gear Shaft Assembly
XC40X78	M	Switch Cam Lever Assembly
XC16X14	H	Sweep Second Gear Shaft Assembly
XC40X13		Rivet—Vibrator
XC40X263		Alarm Shut-off Spacer
XC40X76	B	Switch Assembly
XC40X79		Upper Contact Spring Assembly
XC40X80		Lower Contact Spring and Tip Assembly



10-47

CAPACITY IN MMF UNLESS OTHERWISE NOTED

Fig. 2. Schematic Diagram, Models 60 and 62



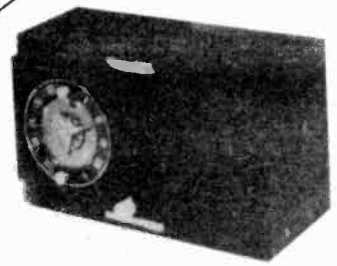


Fig. 3. Socket Voltages

SPECIFICATIONS

CABINET:

	60	62
Model		
Color	Mahogany	Ivory
Height	$6\frac{3}{16}$ in.	$6\frac{3}{16}$ in.
Width	$10\frac{1}{2}$ in.	$10\frac{1}{2}$ in.
Depth	$5\frac{3}{8}$ in.	$5\frac{3}{8}$ in.

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	1.2
Maximum	2.0

LOUDSPEAKER:

Type	Alnico PM
Outside Cone Diameter	4-inch
Voice Coil Impedance (400 cycles)	3.5 ohms

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.

RADIO 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. 0.05 mf. paper capacitor.
4. 200 mmf. mica capacitor.
5. Insulated screwdriver.

PROCEDURE—GENERAL:

1. With the tuning scale control wheel turned so that the gang condenser plates are fully meshed, the index should read approximately $\frac{1}{16}$-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 meter across the loudspeaker voice coil terminals.
4. Keep radio volume control at maximum and attenuate the test oscillator signal output so that the output meter 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.

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 mf. cap.	455 kc	1600 kc	2nd i-f trans. trimmers, C14 and C15
2	12SA7 grid (8) in series with 0.05 mf. cap.	455 kc	1600 kc	1st i-f trans. trimmers, C8 and C9
3	Antenna Post in series with 200 mmf. cap.	1500 kc	1500 kc	C4 (oscillator)
4	Antenna Post in series with 200 mmf. 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 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 @ 1000 kc
12SA7 Grid to 12SK7 Grid ..... 50 @ 455 kc
12SK7 Grid to 12SQ7 Diode Plate ..... 70 @ 455 kc

(2) Audio Gain.
0.15 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 8.5 volts at 1000 kc.

(4) Socket Pin Voltages.
Figure 3 shows voltages from all tube pins to B— unless otherwise specified. Voltage readings much higher or lower than those specified may help localize defective components or tubes.

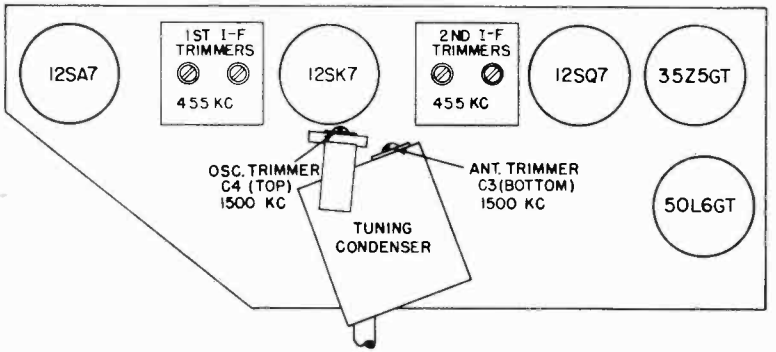
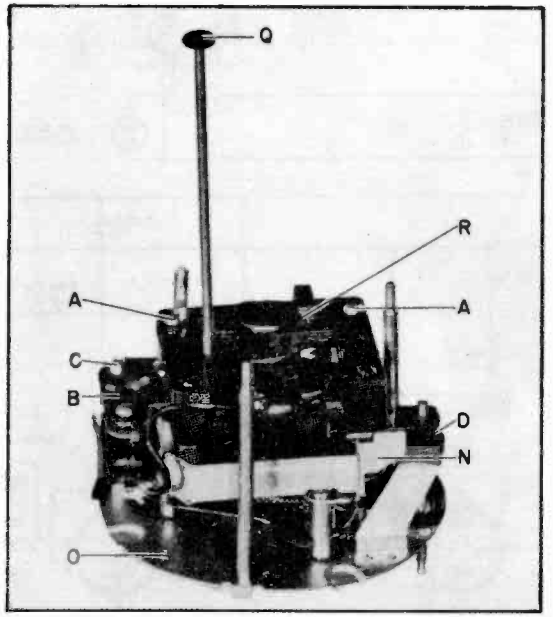


Fig. 1. Tube and Trimmer Location



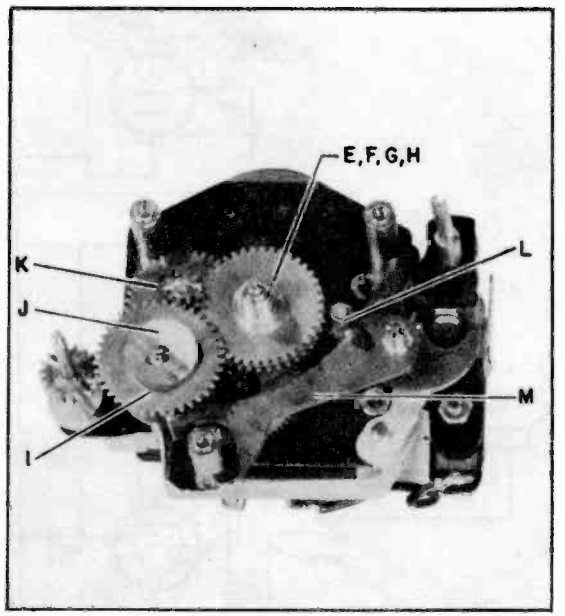


Fig. 4. Clock Part Identification

CLOCK SERVICE

Figure 4 shows clock parts referred to in the following paragraphs and the parts list.

CLOCK MOVEMENT DISASSEMBLY

1. Remove clock movement from case. When removing knobs, note that the Alarm-Set knob is a left-hand thread, while Alarm-Radio is a pull-off knob.
2. Remove Bezel, Hands and Dial Face.
3. Remove the motor assembly by removing two screws (A) and break two soldered joints on Field. The Field and Rotor Assembly (R) can now be removed. The Rotor is held by friction only to the Field.
4. Remove Switch Assembly (B) by removing two screws from base plate.
5. Remove Switch Shaft Assembly (C) and spacer.
6. Remove Alarm-Set Shaft Assembly (D) and spacer.
7. Remove the three front plate assembly screws that are located under the Dial Face and then remove Front Plate.
8. Remove Alarm Gear Sleeve Assembly (E), Hour Gear Sleeve Assembly (F), Minute Gear Sleeve Assembly (G), and Sweep Second Gear Shaft Assembly (H).
9. Remove Alarm Cam Gear Assembly (I) and Spring Washer (J).
10. Remove Alarm-Set Gear (K).
11. Remove Time-Set Gear and Shaft Assembly (L).
12. Remove Switch Cam Lever (M).

CLOCK MOVEMENT REASSEMBLY

Reassemble in the reverse order of disassembly, observing the following precautions:

1. The spring washer (J) should curve away from the gear when placed on the Alarm Cam Gear Assembly (I).
2. The Switch Cam Lever (M) fork must straddle the base plate post as shown in the illustration.
3. After reassembly of front plate, check the Sweep Second Gear (H) through the hole in the base plate to make sure it is free to turn.
4. Proceed with Alarm and Switch Adjustments as described below before installing hands

ALARM AND SWITCH ADJUSTMENTS

1. Turn Alarm-Radio shaft to ALARM position.
2. Slowly rotate Time Set shaft clockwise until the contacts of the Switch Assembly (B) close.
3. Replace Dial Face, Alarm Dial, the Minute, Hour and Second Hands. Set all Hands and Dial so that they indicate 12 o'clock. Make sure all Hands and Alarm Dial are tight on their respective shafts.
4. With Alarm Set knob pulled out, continue to rotate Time Set shaft clockwise and note that the vibrator arm (N) drops against field core approximately 7–10 minutes later.
5. Set alarm at some other selected position and make sure mechanism actuates within limits (±1 minute).
6. Check alarm tone of vibrator. This can be adjusted by either bending vibrator arm nearer or farther away from field core. Bend arm near anchor point.

CLEANING AND LUBRICATION

To clean, completely disassemble and clean all moving parts in carbon tetrachloride or some similar cleaner.

The inside of the sleeves and shaft surfaces may be cleaned of oxidized oil by rubbing with a fine grade of steel wool dampened in carbon tetrachloride.

Do not use too much oil and apply by means of a small wire (drop oiler). Too much oil collects dust and later oxidizes. Use only recommended clock oil, such as Nyc's Celebrated Oil which may be purchased from Wm. F. Nye Co., Inc., New Bedford, or equivalent.

CLOCK TROUBLES

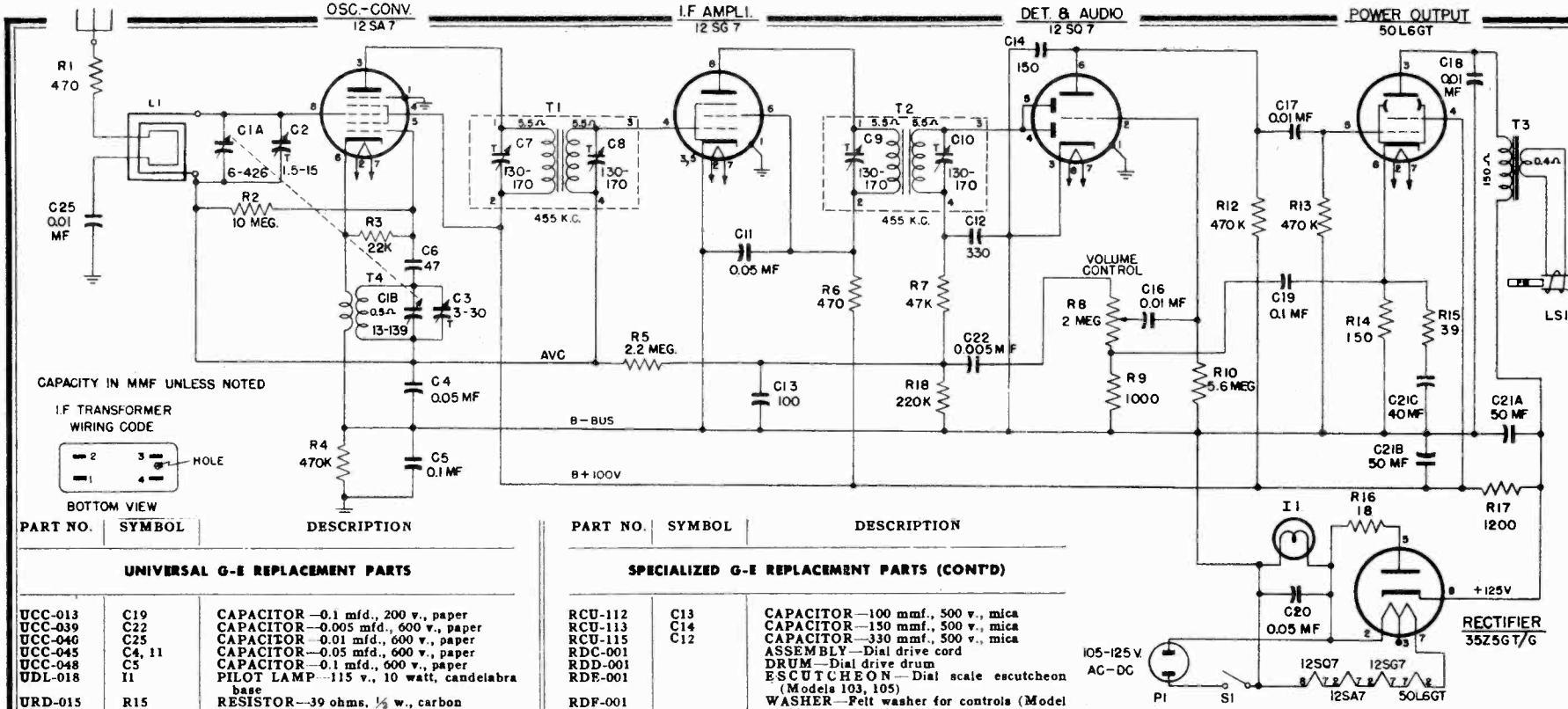
1. Clock will not operate—Defective field coil, defective rotor, binding of parts.
2. Clock loses time—Binding parts, too little friction on minute hand sleeve assembly, defective rotor. Clock time set shaft bent and rubs against hole in clock bracket.
3. Noisy Clock—Rotor defective, alarm armature improperly adjusted, loose parts, or binding of moving parts.

RADIO REPLACEMENT PARTS LIST

Cat. No.	Symbol	Description
UNIVERSAL G-E REPLACEMENT PARTS		
UCC-623	C22	CAPACITOR—.003 mf., 600 v., paper
UCC-630	C1, 17, 20	CAPACITOR—.01 mf., 600 v., paper
UCC-635	C5, 10, 11, 21	CAPACITOR—.05 mf., 600 v.
UCU-036	C19	CAPACITOR—220 mmf., mica
UCU-040	C16	CAPACITOR—330 mmf., mica
UCW-020	C25	CAPACITOR—47 mmf., 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
SPECIALIZED G-E REPLACEMENT PARTS		
RAB-054	L1	BACK—Cabinet back cover (includes loop antenna)
RAU-020		CABINET—Mahogany plastic cabinet (Model 60)
RAU-021		CABINET—Ivory plastic cabinet (Model 62)
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-028		KNOB—Volume control knob (Models 60 or 62)
RDK-094		KNOB—Tuning dial wheel (Models 60 or 62)
RDS-047		SCALE—Dial scale (Model 60)
RDS-050		SCALE—Dial scale (Model 62)
RJS-003		SOCKET—Octal tube socket (Type 12SA7)
RJS-006		SOCKET—Octal tube socket
RLC-051	T4	COIL—Oscillator coil
RRC-054	R11	POTENTIOMETER—0.5 megohm, volume control
RRW-008	R17	RESISTOR—18 ohms, 1 watt, wirewound
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 (Model 60)
RWL-014		CORD—Power cord, white (Model 62)
RZC-005	M1	CLOCK—60 cycle, 105-125 v., clock assembly
RZC-006	M1	CLOCK—50 cycle, 105-125 v., clock assembly

CLOCK REPLACEMENT PARTS LIST

Cat. No.	Symbol	Description
MISCELLANEOUS		
XC3X49	Q	TIME SET SHAFT KNOB—Bronze
XC4X5		ALARM SET KNOB—Ivory
XC10X131	L	TIME SET GEAR AND SHAFT ASSEMBLY
XC11X11	D	ALARM SET SHAFT ASSEMBLY
XC31X26		SWEEP SECOND HAND
XC32X167		HOUR AND MINUTE HANDS
XC34X139	O	FRONTPLATE ASSEMBLY
XC53X100		INNER BEZEL—2 9/16 in., round, maroon
XC54X29		OUTER BEZEL—Brass
XC55X11		ALARM DIAL
XC58X16		CRYSTAL—2 9/16 in., round
XC59X234		NUMERAL COLOR RING—Bronze
XC59X699	C	SWITCH SHAFT ASSEMBLY
XC59X716		SWITCH KNOB—Ivory
XC60X712		DIAL FACE—(On frontplate)
CLOCK MOVEMENT		
XC1X1	A	SCREW—Holds Field, No. 4-40X1 3/8 in. R.H.
XC1X2		No. 1204 LOCKWASHER
XC1X6		SCREW No. 4-40 x 5/8 in. R.H.
XC1X43		HEX NUT
XC13X11	F	HOUR GEAR SLEEVE ASSEMBLY
XC14X15	G	MINUTE GEAR SLEEVE ASSEMBLY
XC15X3	E	ALARM GEAR SLEEVE ASSEMBLY
XC16X14	H	SWEEP SECOND GEAR SHAFT ASSEMBLY
XC17X8	I	ALARM GEAR SHAFT ASSEMBLY
XC35X39		BASEPLATE ASSEMBLY
XC40X13		RIVET—Vibrator
XC40X76		SWITCH ASSEMBLY—Consists of: Contact Block, Contact Block, Contact Spring Insulator
XC40X77	K	ALARM SET GEAR ASSEMBLY
XC40X78	M	SWITCH CAM LEVER ASSEMBLY
XC40X79		UPPER CONTACT SPRING ASSEMBLY
XC40X80		LOWER CONTACT SPRING AND TNP ASSEMBLY
XC40X202		SPREADER POST
XC40X252	J	CAM GEAR SPRING WASHER
XC40X260		SPACER—Switch shaft
XC40X261		TIME SET SHAFT SPACER
XC40X262		TIME SET SHAFT SPACER
XC40X263		ALARM SHUT-OFF SPACER
XC44X38		ROTOR UNIT—60 cycles
XC45X69	R	FIELD COIL ASSEMBLY—60 cycle
XC64X1-2-3		FRONTPLATE SCREW



SPECIFICATIONS

CABINET:

	100	101	103	105
Model				
Material	Plastic	Plastic	Wood	Wood
Color	Brown	Ivory	Mahogany	Maple
Height	7 ½"	7 ½"	8 ¼"	8 ¼"
Width	12"	12"	13"	13"
Depth	7 ½"	7 ½"	7 15/16"	7 15/16"

ELECTRICAL RATING (INPUT)

Voltage ..... 105-125 volts a-c or d-c
Frequency on a-c ..... 25 to 60 cycles
Wattage ..... 40 watts

OPERATING FREQUENCIES

Broadcast Band ..... 540-1600 kilocycles
I-F Amplifier ..... 455 kilocycles

POWER OUTPUT (117 VOLTS LINE)

Undistorted ..... 1.25 watts
Maximum ..... 2.0 watts

LOUDSPEAKER

Type ..... Alnico P.M.
Outside Cone Diameter ..... 5 ¼ in.
Voice Coil Impedance (400 cycles) ..... 3.5 ohms

UNIVERSAL G-E REPLACEMENT PARTS

PART NO.	SYMBOL	DESCRIPTION
UCC-013	C19	CAPACITOR—0.1 mfd., 200 v., paper
UCC-039	C22	CAPACITOR—0.005 mfd., 600 v., paper
UCC-040	C25	CAPACITOR—0.01 mfd., 600 v., paper
UCC-045	C4, 11	CAPACITOR—0.05 mfd., 600 v., paper
UCC-048	C5	CAPACITOR—0.1 mfd., 600 v., paper
UDL-018	I1	PILOT LAMP—115 v., 10 watt, candelabra base
URD-015	R15	RESISTOR—39 ohms, ½ w., carbon
URD-029	R14	RESISTOR—150 ohms, ½ w., carbon
URD-041	R6	RESISTOR—470 ohms, ½ w., carbon
URD-049	R9	RESISTOR—1,000 ohms, ½ w., carbon
URD-081	R3	RESISTOR—22,000 ohms, ½ w., carbon
URD-089	R7	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 megohms, ½ w., carbon
URD-139	R10	RESISTOR—5.6 megohms, ½ w., carbon
URD-145	R2	RESISTOR—10 megohms, ½ w., carbon
URE-007	R16	RESISTOR—18 ohms, 1 w., carbon
URF-051	R17	RESISTOR—1200 ohms, 2 w., carbon

SPECIALIZED G-E REPLACEMENT PARTS

RAB-001		BACK—Cabinet Back Cover (Models 103, 105)
RAB-002		BACK—Cabinet Back Cover, white (Model 101)
RAB-003		BACK—Cabinet Back Cover, brown (Model 100)
RAD-001		BRACKET—Antenna Bracket, right rear
RAD-002		BRACKET—Antenna Bracket, left rear
RAU-002		CABINET—Brown Plastic, with grille assembly (Model 100)
RAU-003		CABINET—Ivory Plastic, with grille assembly (Model 101)
RAX-001		ASSEMBLY—Idler pulley assembly
RCC-040	C16, 17, 18	CAPACITOR—0.01 mfd., 600 v., paper
RCC-045	C20	CAPACITOR—0.05 mfd., 600 v., paper
RCE-001	C21A, 21B, 21C	CAPACITOR—50 mf., 150 v., 50 mf., 150 v., 40 mf., 25 v., dry electrolytic
RCT-001	C1A, C1B C2, C3	CAPACITOR—Tuning capacitor assembly
RCU-110	C6	CAPACITOR—47 mmf., 500 v., mica
RCU-112	C13	CAPACITOR—100 mmf., 500 v., mica
RCU-113	C14	CAPACITOR—150 mmf., 500 v., mica
RCU-115	C12	CAPACITOR—330 mmf., 500 v., mica
RDC-001		ASSEMBLY—Dial drive cord
RDD-001		DRUM—Dial drive drum
RDE-001		ESCUTCHEON—Dial scale escutcheon (Models 103, 105)
RDF-001		WASHER—Felt washer for controls (Model 101)
RDF-003		WASHER—Felt washer for controls (Models 100, 103, 105)
RDK-001		KNOB—Control knob (Model 101)
RDK-004		KNOB—Control knob (Models 103, 105)
RDK-006		KNOB—Control knob (Model 100)
RDP-002		POINTER—Dial scale pointer
RDS-001		SCALE—Dial scale (Models 100, 101)
RDS-002		SCALE—Dial scale (Models 103, 105)
RDX-001		ASSEMBLY—Dial scale back plate assembly
RHG-001		GROMMET—Tuning capacitor mounting grommet
RHM-001		RING—Pointer shaft retainer ring
RHM-002		CLIP—Speaker mounting clip
RHM-004		CLIP—Dial scale mounting clip (Models 100, 101)
RHM-005		CLIP—Dial scale mounting clip (Models 103, 105)
RHU-001		SPACER—Scale back plate spacer
RHU-002		SPACER—Tuning capacitor mounting spacer
RLC-001	T4	COIL—Oscillator coil assembly
RLL-001	L1	BEAM-A-SCOPE—Loop antenna assembly
RMM-001		SHIELD—Tube shield
RMS-001		SPRING—Drive cord tension spring
RMU-001		SHAFT—Tuning control shaft
ROP-005	LS1	LOUDSPEAKER—5¼-inch permanent magnet
RRC-002	R8, S1	VOLUME CONTROL—2.0 megohm potentiometer (includes power switch)
RTL-001	T1	TRANSFORMER—1st i-f transformer
RTL-002	T2	TRANSFORMER—2nd i-f transformer
RTO-001	T3	TRANSFORMER—Output transformer
RTS-001		SOCKET—Pilot lamp socket
RTS-003		SOCKET—Octal base tube socket
RTS-004		SOCKET—Electrolytic capacitor mounting socket
RWL-001	P1	CORD—Power cord and plug

TUBE COMPLEMENT

Oscillator-Converter	Type 12SA7
I. F. Amplifier	Type 12SG7
Detector-Audio	Type 12SQ7
Power Output	Type 50L6GT
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, 1 ½ 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 counter-clockwise 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 drum on cord until 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 1 ¼ 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, the rf and osc. trimmers are then available through the hole in the Beam-a-scope assembly when the back cover is removed.

5. Connect the capacitor as listed in column 2, between the output "High Side" of test oscillator and the point of input specified.

ALIGNMENT CHART

Step	Connect test oscillator to	Test osc. setting	Pointer setting on radio	Adjustment for maximum output
1	12SG7 grid in series with 0.05 mf. cap.	455 kc	1,500 kc	2nd I-F Trans. Trimmers
2	12SA7 grid in series with 0.05 mf. cap.	455 kc	1,500 kc	1st and 2nd I-F Trans. Trimmers
3	Ant. Post in series with 50 mmf.	1,500 kc	1,500 kc	C3 (Osc.)
4	Ant. Post in series with 50 mmf.	1,500 kc	1,500 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%. Readings taken with low signal input so that AVC is not effective.

(1) R-F Stage Gains.

Antenna post to 12SA7 grid	4 @ 1000 kc
12SA7 grid to 12SG7 grid	30 @ 455 kc
12SG7 grid to 12SQ7 diode plate	150 @ 455 kc

(2) Audio Gain.
0.06 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

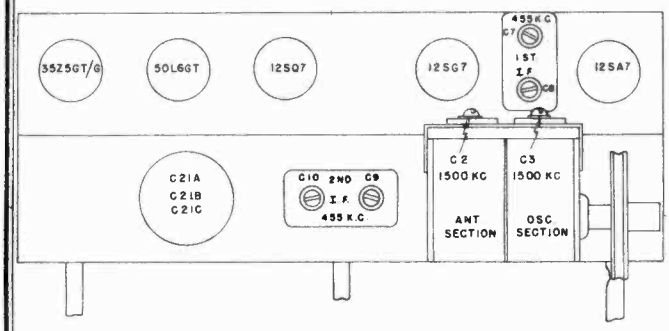


Fig. 1. Tube and Trimmer Location

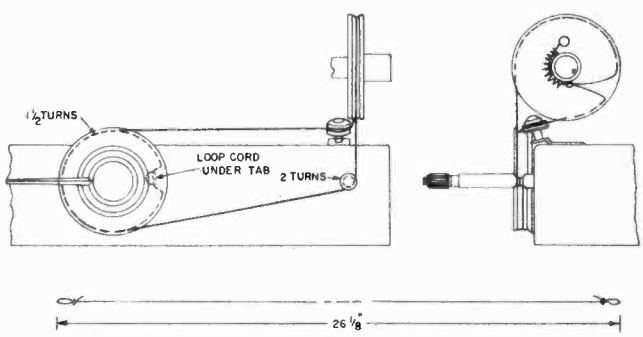


Fig. 2. Dial Stringing Diagram

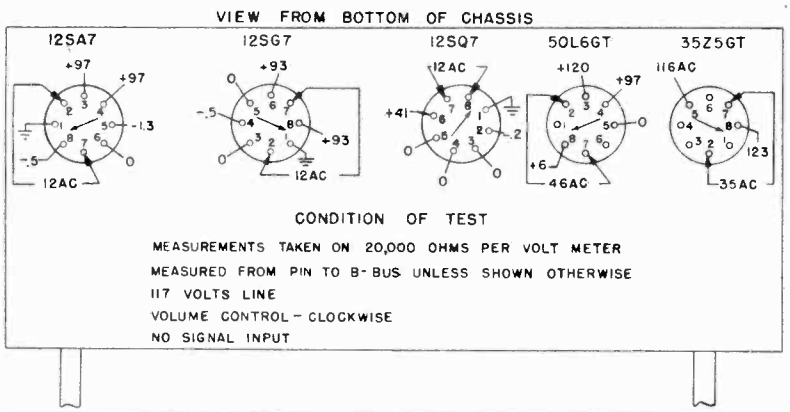


Fig. 4. Socket Voltages

PRODUCTION CHANGES WERE MADE ON ALL MODELS 100,101,103,AND 105, HAVING SERIAL NUMBERS 5000 AND OVER. THE SERVICING DATA ON THE PRECEDING PAGES APPLY TO THE REVISED MODELS WITH THE FOLLOWING EXCEPTIONS:

(ELECTRICAL CIRCUIT ALIGNMENT)—Under the paragraph *PROCEDURE—GENERAL* the third sentence should read "If it doesn't, remove chassis and slip pointer on shaft until the pointer is under reference mark when chassis is bolted in place."

For receivers equipped with the Beam-A-Scope which forms a part of the back cover(Part Nos.RLL-009 and RLL-010), paragraph 4 should be changed to read, "Chassis must be removed from cabinet during i-f alignment. For r-f alignment,bolt chassis in cabinet securely; r-f and oscillator trimmers are then available through the hole in the back cover assembly".

(SCHEMATIC DIAGRAM)—A corrected schematic is printed below. Changes were made as follows:

(1) C18 connects between the output plate and screen instead of between plate and ground.

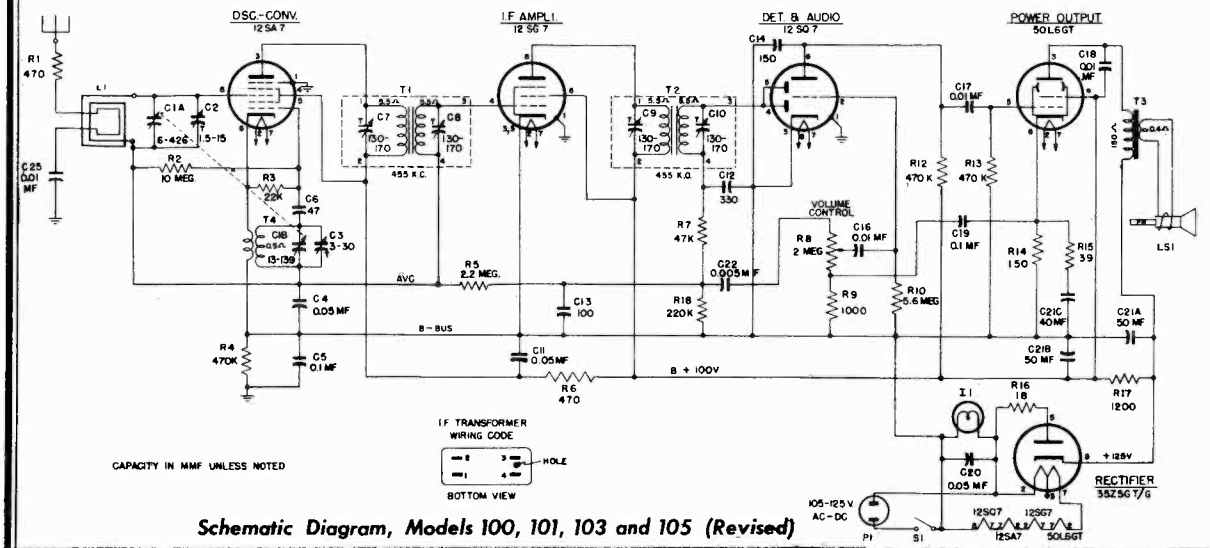
(2) The plate and screen filter (C11, R6) is moved from the IF amplifier circuit to the converter plate and screen circuit.

(3) The filament connections (Pins 2 and 7) to the 12SA7 converter tube are interchanged.

(4) The 10-megohm resistor,R2, is removed.

(Fig.4, Socket Voltages) At 12SA7 socket, pins 3 and 4 should be changed to read +92. At 12SG7 socket,pins 6 and 8 should be changed to read +97 volts.

(REPLACEMENT PARTS LIST)—Part Number UCC-013, Symbol C19, becomes Part Number RCC-013. Stock numbers RTS-001, RTS-003, and RTS-004 should be changed to read: RJS-001, RJS-003, and RJS-004, respectively.



Schematic Diagram, Models 100, 101, 103 and 105 (Revised)

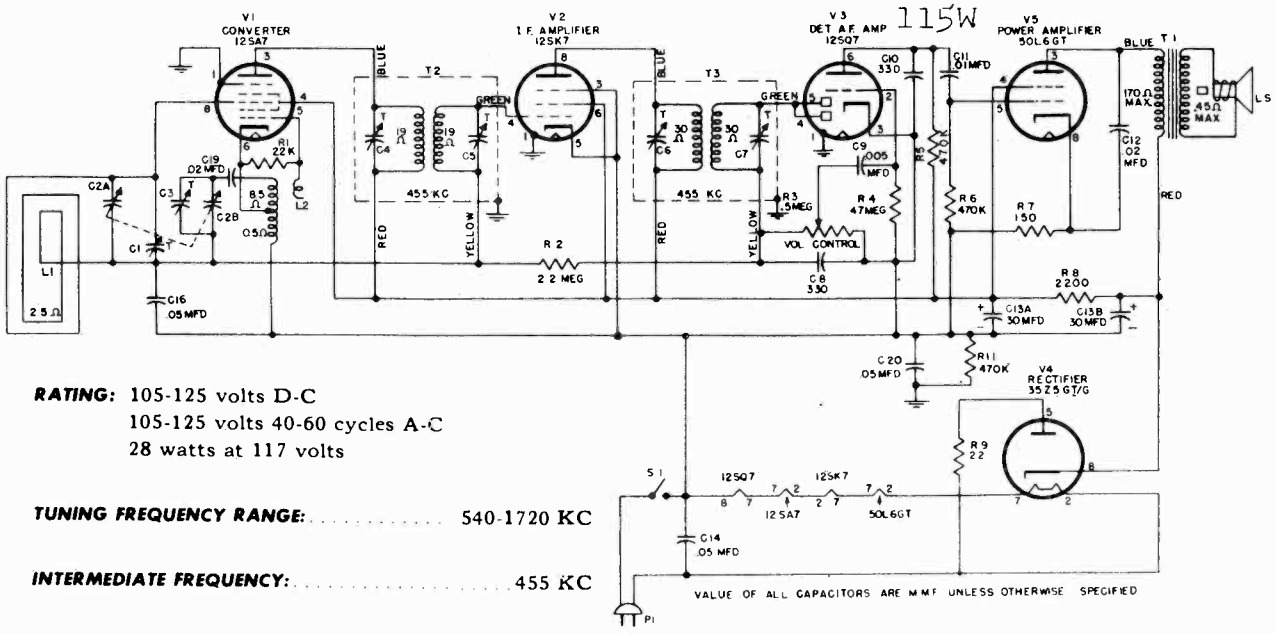
(Parts List). Part No.RCE-001 changed to RCE-027. Delete Part Nos.RDF-001,RDF-003,RDX-001,and RMM-001. Part No.RWL-001 changed to RWL-004.Add Part No.RIT-006, Electrolytic cardboard cover.Add Part No.RLL-009,Beam-A-Scope loop ant. and back cover assembly,Models 103,105. Add Part No.RLL-010,Beam-A-Scope loop ant. and back cover assembly,Models 100, 101.Change Part No.ROP-005 to read Part No.UOP-525.

Beam-A-Scope Change. Two different type loop antenna assemblies were used uri Beam-A-Scope Change.--Two different type loop antenna assemblies were used during production. Part No.RLL-001 is secured to the chassis by two metal brackets and needs a separate cabinet back cover. The other type Beam-A-Scope is identified as it is a part of the back cover assembly. This new assembly is stocked as Part No. RLL-009 for Models 103 and 105,and as Part No.RLL-010 for Models 100 and 101.

The Beam-A-Scopes are electrically interchangeable. The loop(RLL-009,RLL-010), which is a part of the back cover can be used without alteration to replace Part No.RLL-001. Part No. RLL-001 may replace Part No.RLL-009 or RLL-010,provided that brackets (Part No.RAD-001 and RAD-002) are added to the chassis to mount the new loop. When connecting the Beam-A-Scopes into the circuit, the inner turn of Part Nos.RLL-009 and RLL-010 must be connected to the converter grid(pin 8);while on Part No.RLL-001 loop, the turn nearest the back cover connects to the converter grid (pin 8).

REMOVAL OF PILOT LIGHT: In some cases, the glyptal cement used between the pilot light base and socket prevents removal of the light. Repeated applications of acetone or nail-polish remover between the lamp and socket will soften cement sufficiently to permit removal.

GENERAL ELECTRIC CO. MODELS 102, 102W, 107, 107W, 114, 114W, 115, 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

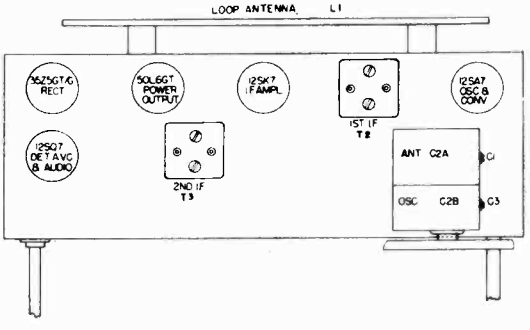
Apply the R-F alignment signals through a standard IRE dummy antenna to the primary on the loop. With the gang condenser wide open, align the oscillator trimmer (C3) to 1720 KC. Change the generator signal to 1500 KC, tune the receiver to the signal and peak the antenna trimmer (C1) for maximum output.

PRECAUTION

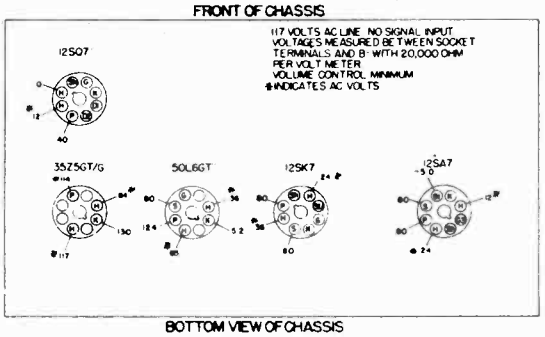
If the signal generator is A-C operated, use an isolating transformer between the power supply and the radio receiver power input. The use of an isolating capacitor is not recommended, as A-C through the capacitor will introduce hum modulation and/or create the possibility of a burned-out signal generator 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

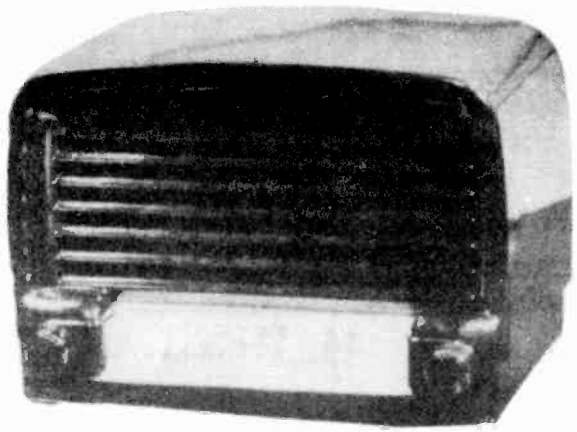
GENERAL INFORMATION

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.

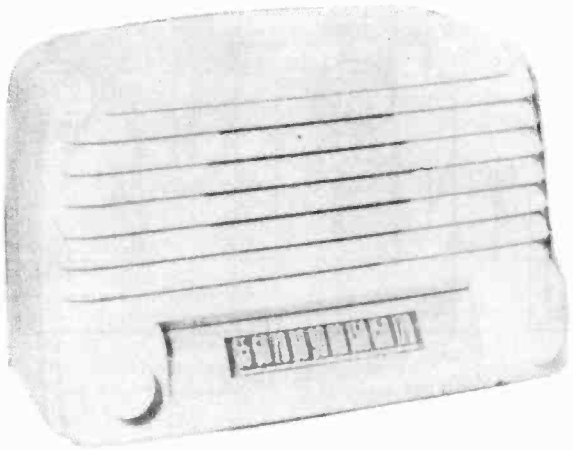
TUBES

Converter and Oscillator	12SA7
I.F. Amplifier	12SK7
Det. Audio, AVC	12SQ7
Power Output	50L6GT
Rectifier	35Z5GT

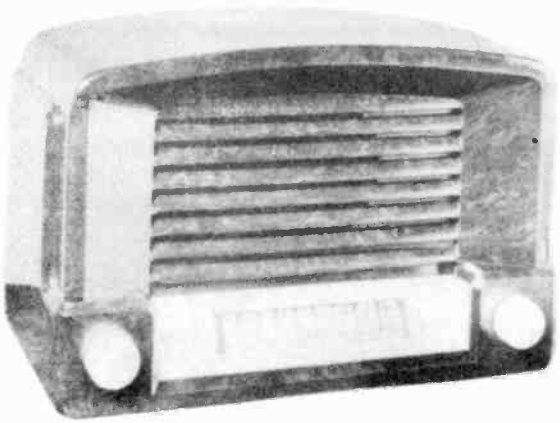
MODELS 102, 102W, 107, 107W, 114, 114W, 115, 115W GENERAL ELECTRIC CO.



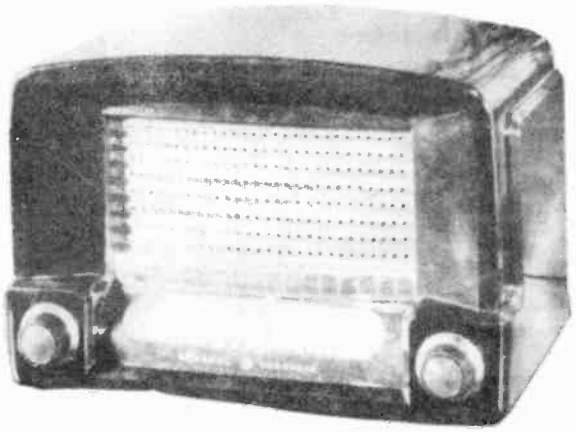
MODEL 102



MODEL 107W



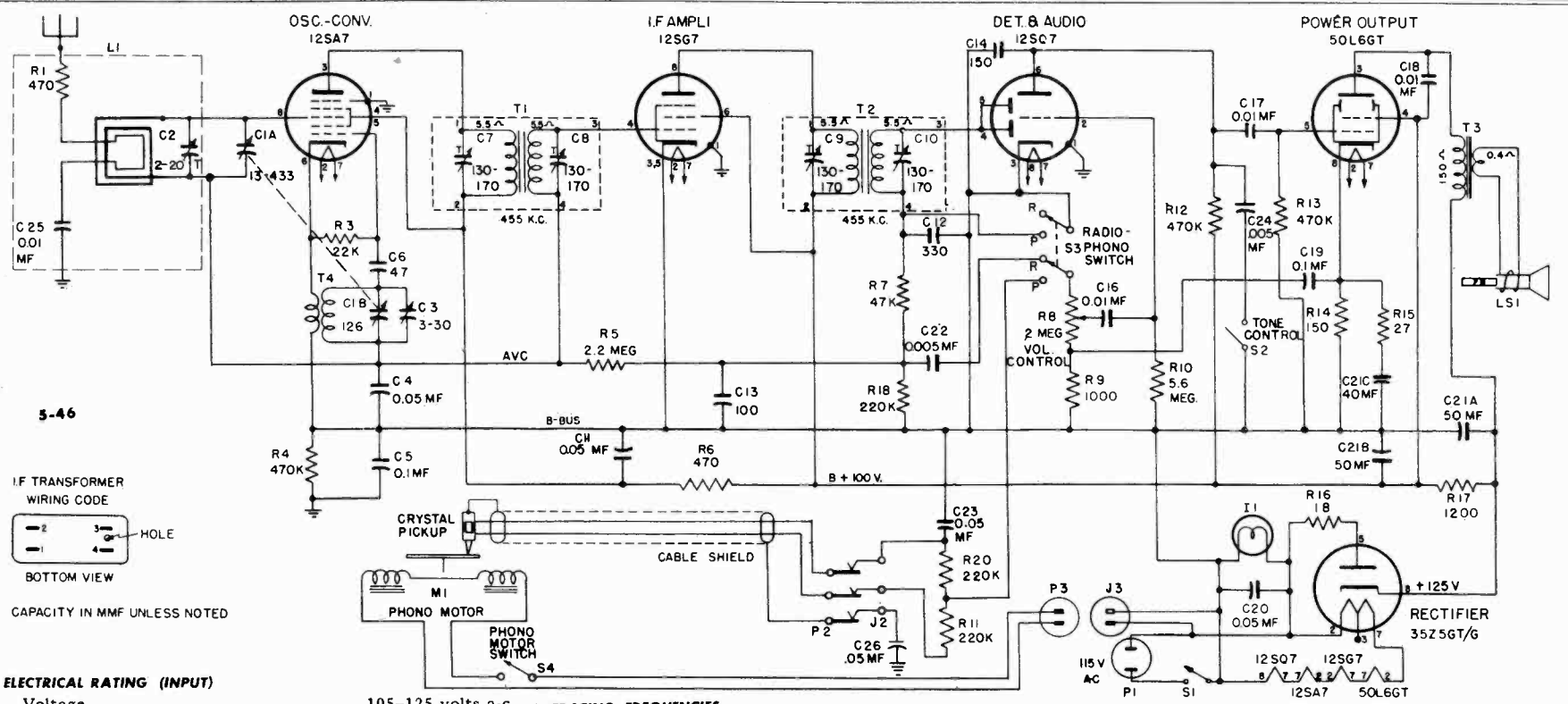
MODEL 114



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



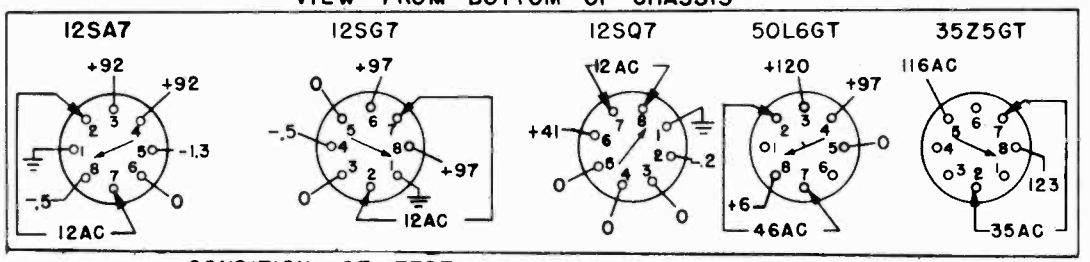
ELECTRICAL RATING (INPUT)

Voltage	105–125 volts a-c
Frequency	60 cycles
Wattage (Including Phonograph)	55 watts

OPERATING FREQUENCIES

Broadcast Band	540–1600 kilocycles
I-F Amplifier	455 kilocycles

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

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 12SA7 grid	4 @ 1000 kc
12SA7 grid to 12SG7 grid	30 @ 455 kc
12SG7 grid to 12SQ7 diode plate	150 @ 455 kc

(2) Audio Gain.

0.06 volts 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.

Fig. 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.

PART NO.	SYMBOL	DESCRIPTION
UNIVERSAL G-E REPLACEMENT PARTS		
UCC-039	C22	CAPACITOR—0.005 mfd., 600 v., paper
UCC-040	C25	CAPACITOR—0.01 mfd., 600 v., paper
UCC-045	C4, 11, 23, 26	CAPACITOR—0.05 mfd., 600 v., paper
UCC-048	C5	CAPACITOR—0.1 mfd., 600 v., paper
UDL-018	I1	PILOT LAMP—115 v., 10 watt, candelabra base
UIC-001		CEMENT—Thermoplastic Cement
UOP-625	LS1	LOUDSPEAKER—6½" PM Speaker
URD-011	R15	RESISTOR—27 ohms, ½ w., carbon
URD-029	R14	RESISTOR—150 ohms, ½ w., carbon
URD-041	R1, 6	RESISTOR—470 ohms, ½ w., carbon
URD-049	R9	RESISTOR—1000 ohms, ½ w., carbon
URD-081	R3	RESISTOR—22,000 ohms, ½ w., carbon
URD-089	R7	RESISTOR—47,000 ohms, ½ w., carbon
URD-105	R18, 11, 20	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 megohms, ½ w., carbon
URD-139	R10	RESISTOR—5.6 megohms, ½ w., carbon
URE-007	R16	RESISTOR—18 ohms, 1 w., carbon
URF-051	R17	RESISTOR—1200 ohms, 2 w., carbon
SPECIALIZED G-E REPLACEMENT PARTS		
RAA-002		ARM—Switch Arm
RAA-003		ARM—Tone Control Switch Arm
RAD-003		BRACKET—Top Bracket Support for Back Plate
RAD-004		BRACKET—Bottom Bracket Support for Back Plate
RAX-002		ASSEMBLY—Idler Pulley Assembly
RAX-003		BRACKET ASSEMBLY—Dial Drum Support
RBH-001	M1	ASSEMBLY—Phono-motor Assembly
RBK-004		ARMATURE—Motor Armature
RBX-001		ASSEMBLY—Phono-motor, Drive Wheel, and Mounting Plate Assembly
RCC-013	C19	CAPACITOR—0.1 mfd., 200 v., paper
RCC-039	C24	CAPACITOR—0.005 mfd., 600 v., paper
RCC-040	C16, 17, 18	CAPACITOR—.01 mfd., 600 v., paper
RCC-045	C20	CAPACITOR—.05 mfd., 600 v., paper
RCE-001	C21A, 21B, 21C	CAPACITOR—50 mfd., 150 v., 50 mfd., 150 v., 40 mfd., 25 v., dry electrolytic
RCT-002	C1A, 1B, 3	CAPACITOR—Tuning Capacitor
RCU-110	C6	CAPACITOR—47 mmf., 500 v., mica
RCU-112	C13	CAPACITOR—100 mmf., 500 v., mica
RCU-113	C14	CAPACITOR—150 mmf., 500 v., mica
RCU-115	C12	CAPACITOR—330 mmf., 500 v., mica
RCY-005	C2	CAPACITOR—2-20 mmf. trimmer
RDC-002		CORD—Dial Drive Cord and Spring
RDD-002		DRUM—Dial Drive Drum
RDE-002		ESCUTCHEON—Dial Scale Escutcheon

PART NO.	SYMBOL	DESCRIPTION
SPECIALIZED G-E REPLACEMENT PARTS (CONT'D)		
RDF-002		WASHER—Felt Washer for Control Knob
RDK-002		KNOB—Radio-phono Knob
RDK-003		KNOB—Volume Control Knob
RDK-005		KNOB—Tone Switch Wafer Knob
RDK-006		KNOB—Tuning Knob
RDP-001		POINTER—Dial Scale Pointer
RDS-003		SCALE—Dial Scale
RDX-025		ASSEMBLY—Back Plate Weld Assembly
RHC-003		PIN—Hairpin Cotter (Fan)
RHC-004		PIN—Hairpin Cotter (Spindle)
RHG-001		GROMMET—Tuning Capacitor Mounting Grommet
RHM-001		RING—Pointer Shaft Retaining Ring
RHM-006		CLIP—Speed Clip (Motor Board)
RHQ-001		TIRE—Rubber Tire (Phono-motor Idler)
RHU-001		SPACER—Scale Back Plate Spacer
RHU-002		SPACER—Tuning Capacitor Mounting Spacer
RIT-001		COVER—Electrolytic Capacitor Cover
RJP-003	P3	PLUG—Phono Power Plug
RJS-002		SOCKET—Pilot Light Socket
RJS-003		SOCKET—Octal Tube Socket
RJS-004		SOCKET—Electrolytic Capacitor Mounting Socket
RJS-049	J3	SOCKET—Phono Power Socket
RJX-005	P2	PLUG AND SOCKET—Phono Plug and Socket
RLC-018	T4	COIL—Oscillator Coil Assembly
RLL-002	L1	BEAM-A-SCOPE—Loop Antenna Assembly
RMM-008		SHIELD—Pilot Lamp Shield
RMS-006		SPRING—Idler Wheel Spring
RMT-001		TURNTABLE—9-inch diameter Turntable
RMU-002		SHAFT—Tuning Shaft
RMU-007		SPINDLE—Turntable Spindle
RMW-005		WHEEL—Phono Idler Wheel (with Rubber Gasket)
ROP-006	LS1	LOUDSPEAKER—6½-inch Permanent Magnet
RPC-014		PICK UP—Crystal Cartridge Pick-up
RPX-012		ARM—Tone Arm Assembly with Pick-up
RRC-001	R8, S1	VOLUME CONTROL—2.0 megohm Potentiometer (includes power switch)
RSS-001	S4	SWITCH—Phono Motor Switch
RSX-001		ASSEMBLY—Phono-motor Switch Assembly
RSX-002		ASSEMBLY—Phono-switch Arm Assembly
RSW-001	S3	SWITCH—Phono radio Switch
RSW-002	S2	SWITCH—Tone Control Switch
RTL-001	T1	TRANSFORMER—1st I-f Transformer
RTL-002	T2	TRANSFORMER—2nd I-f Transformer
RTO-001	T3	TRANSFORMER—Output Transformer
RWL-004		CORD—Power Cord and Plug

Part No. RJX-005 should be changed to read RJX-007. Delete Part No. ROP-006. Add Part No. UOX-001, CONE-Replacement speaker cone.

POWER OUTPUT

Undistorted	1.25 watts
Maximum	2.0 watts

LOUDSPEAKER

Type	Alnico P.M.
Outside Cone Diameter	6½ in.
Voice Coil Impedance (400 cycles)	3.5 ohms

PHONOGRAPH MECHANISM

Type	Manual
Pick-up	Crystal
Needle	Permanent Type
Turntable Speed	78 rpm

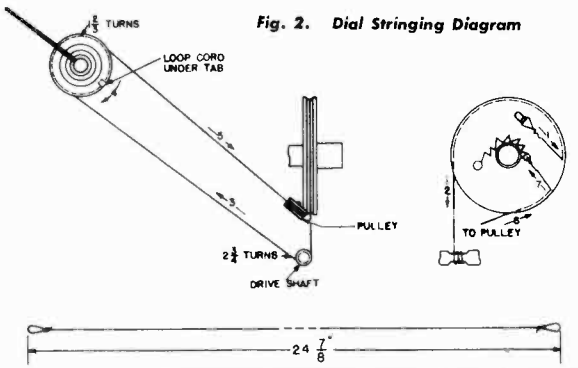


Fig. 2. Dial Stringing Diagram

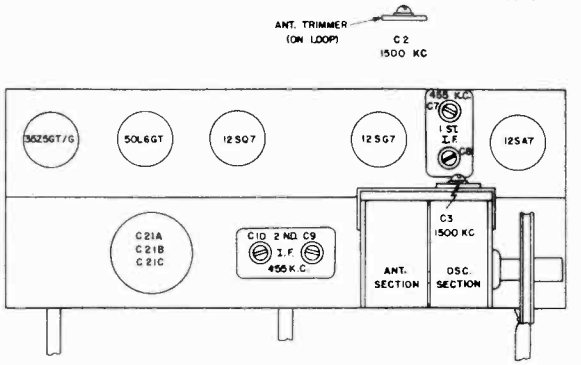


Fig. 1. Tube and Trimmer Location

ELECTRICAL CIRCUIT ALIGNMENT

EQUIPMENT REQUIRED

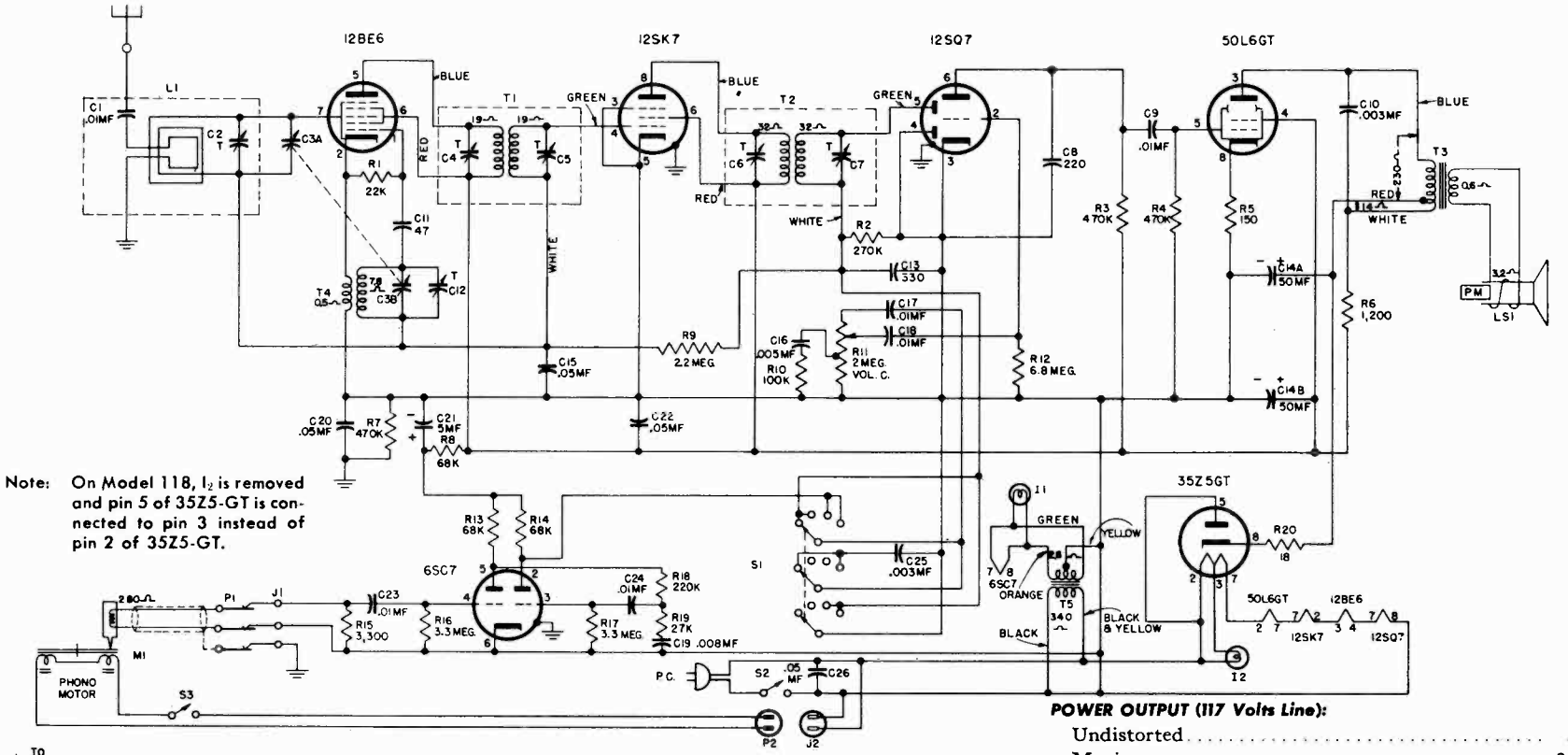
1. Test oscillator with audio tone modulation
2. A-c output meter, 1½ volts, full scale
3. 0.05 mf paper capacitor
4. 50 mmf mica capacitor
5. Insulated screwdriver

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 drum until pointer is under reference mark when chassis is bolted in place.

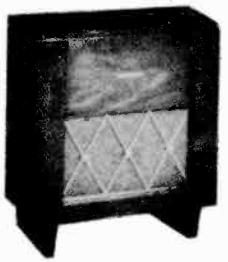
2. For i-f and r-f alignments, the output meter is connected across the loudspeaker voice coil terminals.
3. Keep radio volume control at maximum and attenuate test oscillator signal output so that the output meter reading never exceeds 1¼ volts.
4. The chassis must be removed from the cabinet during i-f alignment. For r-f alignment, bolt the chassis in the cabinet securely. The r-f trimmer is then available through the hole in the Beam-a-Scope assembly (back cover). The Osc. Trimmer can be reached when the back cover is tilted back.
5. Connect the capacitor as listed in column 2 between the output "High Side" of test oscillator and the point of input specified.

ALIGNMENT CHART

Step	Connect test oscillator to	Test osc. setting	Pointer setting on radio	Adjustment for maximum output
1	12SG7 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)



Note: On Model 118, I_2 is removed and pin 5 of 35Z5-GT is connected to pin 3 instead of pin 2 of 35Z5-GT.



119M and 119W

OPERATING FREQUENCIES: **Dial cord stringing**

Broadcast Band	540-1600 kc
I-F Amplifier	455 kc

ELECTRICAL (INPUT):

	A5	A6
Voltage (A-C only)	105-125	105-125
Frequency	50 cps	60 cps
Wattage (on Radio)	35	35
Wattage (on Phono)	70	55

POWER OUTPUT (117 Volts Line):

Undistorted	.95 watts
Maximum	2.2 watts

LOUDSPEAKER:

Model	118	119
Type	Alnico PM	Alnico PM
Outside Cone Diameter	5.25 inches	12 inches
Voice Coil Impedance at 400 cps	3.2 ohms	3.2 ohms

PHONOGRAPH PICK-UP:

Type	Variable Reluctance
D-C Resistance	280 ohms

TUBE COMPLEMENT:

Converter-Oscillator	Type 12BE6
I-F Amplifier	Type 12SK7
Detector and Audio Amplifier	Type 12SQ7
Output	Type 50L6
Phono Preamplifier	Type 6SC7
Rectifier	Type 35Z5
Pilot Lamps	Mazda No. 47

MODELS 118, 119M, 119W

GENERAL ELECTRIC CO.

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 per cent. Readings should be taken with the AVC shorted to B minus.

1. R-F STAGE GAINS.

Antenna to 12BE6 Grid..... 3.5 at 1000 kc
12BE6 Grid to 12SK7 Grid..... 50. at 455 kc

2. AUDIO GAIN.

The power output across the speaker voice coil should be approximately ½ watt with .95 volts at 400 cps applied between the high side of the volume control (R11) and ground.

3. OSCILLATOR GRID BIAS.

The d-c voltage developed across the oscillator grid leak resistor (R1) averages 4.5 volts at 1000 kc.

4. SOCKET PIN VOLTAGES.

Figure 4 shows typical tube pin voltages. All readings should be made from the pins to B minus unless otherwise indicated.

ELECTRICAL CIRCUIT ALIGNMENT

EQUIPMENT REQUIRED:

1. Test oscillator with audio tone modulation.
2. A-C output meter, 1½ volts full scale.
3. Insulated screwdriver.

ALIGNMENT PROCEDURE:

The Alignment Procedure is given in table form. All i-f alignments may be made with the chassis removed from the cabinet. However, the r-f alignments should be made with the chassis and loop mounted in the cabinet, as the relative position of the loop antenna with respect to the chassis materially affects the alignment.

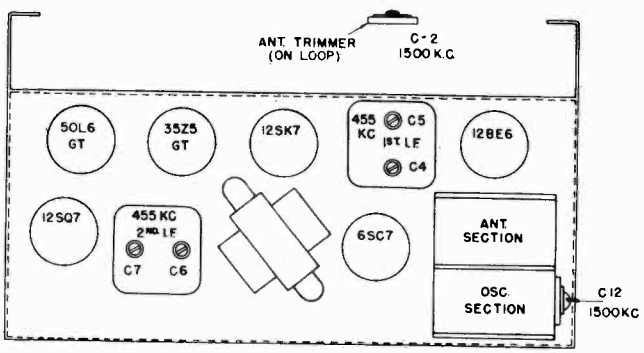
The oscillator trimmer is accessible by tilting the chassis slightly in the cabinet. The antenna trimmer is on the loop and is accessible from the rear of the cabinet. The locations of these trimmers are shown in Figure 3.

The output meter should be connected across the loudspeaker voice coil terminals. The low side of the test oscillator should be connected to B minus; the high side should be connected as indicated in the Alignment Chart. During the entire alignment procedure, the radio volume control should be in its maximum position. The test oscillator output signal should be attenuated so that the output meter reading never exceeds 1¼ volts.

ALIGNMENT CHART

Step	Connect Test-Oscillator To:	Test Oscillator Setting	Dial Setting	Adjust Trimmers For Max. Output
1	12SK7 grid (Pin 4) in series with .05 mf.	455 kc	—	C6 and C7
2	12BE6 grid (Pin 7) in series with .05 mf.	455 kc	—	C4 and C5 Readjust C6 and C7
3	Blue wire on loop in series with 200 mmf. and 470 ohms.	1500 kc	1500 kc	C12 (Osc.); C2 (Ant.)*

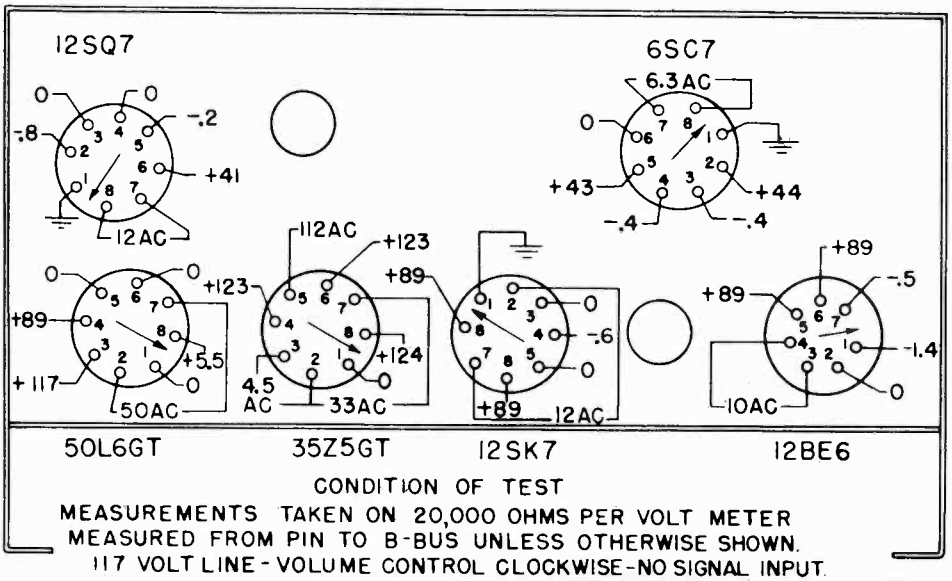
* Rock gang condenser when making alignment.



Tube and Trimmer Location

Socket Voltage Diagram

BOTTOM VIEW OF CHASSIS



REPLACEMENT PARTS LIST—MODELS 118, 119W AND 119M

Cat. No.	Symbol	Description
		UNIVERSAL REPLACEMENT PARTS
UCC-008	C23	CAPACITOR—.01 mf., 200 v., paper
UCC-025	C17	CAPACITOR—.01 mf., 400 v., paper
UCC-028	C15, C20, C22	CAPACITOR—.05 mf., 400 v., paper
UCC-040	C1, C24	CAPACITOR—.01 mf., 600 v., paper
UCC-045	C26	CAPACITOR—.05 mf., 600 v., paper, Model 119
UCC-623	C25	CAPACITOR—.003 mf., 400 v., paper
UCU-020	C11	CAPACITOR—47 mmf., mica
UCU-036	C8	CAPACITOR—220 mmf., mica
UCU-040	C13	CAPACITOR—330 mmf., mica
UOP-557		SPEAKER—Model 118. Same as S525D-7
UOP-1247		SPEAKER—Model 119. Same as S1200D7
UOX-005		SPEAKER REPAIR KIT—For Model 119
UOX-008		SPEAKER REPAIR KIT—For Model 118
URD-029	R5	RESISTOR—150 ohms, ½ w., carbon
URD-061	R15	RESISTOR—3300 ohms, ½ w., carbon
URD-081	R1	RESISTOR—22,000 ohms, ½ w., carbon
URD-083	R19	RESISTOR—27,000 ohms, ½ w., carbon
URD-093	R8, R13, R14	RESISTOR—68,000 ohms, ½ w., carbon
URD-097	R10	RESISTOR—100,000 ohms, ½ w., carbon
URD-105	R18	RESISTOR—220,000 ohms, ½ w., carbon
URD-107	R2	RESISTOR—270,000 ohms, ½ w., carbon
URD-113	R3, R4, R7	RESISTOR—470,000 ohms, ½ w., carbon
URD-129	R9	RESISTOR—2.2 meg., ½ w., carbon
URD-133	R16, R17	RESISTOR—3.3 meg., ½ w., carbon
URF-051	R6	RESISTOR—1200 ohms, 2 w., carbon
		SPECIALIZED REPLACEMENT PARTS
RAC-050		LID—For Model 119 walnut
RAC-051		LID—For Model 119 mahogany
RAL-001		BEZEL—For pilot light
RAM-002		BASE—2 for Model 119 walnut
RAM-003		BASE—2 for Model 119 mahogany
RAV-044		CABINET—Walnut Model 119W
RAV-045		CABINET—Mahogany Model 119M
RAY-054		CABINET—Model 118
RCC-040	C9	CAPACITOR—.01 mf., 600 v., paper
RCC-074	C10	CAPACITOR—.003 mf., 600 v., paper
RCC-082	C18	CAPACITOR—.01 mf., 200 v., paper
RCC-084	C19	CAPACITOR—.008 mf., 400 v., paper
RCC-085	C16	CAPACITOR—.005 mf., 200 v., paper
RCE-050	C14A, C14B	CAPACITOR—50-50 mfd., electrolytic, 150 v.
RCE-056	C21	CAPACITOR—5 mf., 150 v., electrolytic
RCN-014	C26	CAPACITOR—Phenolic capacitor for Model 118
RCT-026	C3A, C3B	CAPACITOR—Tuning capacitor
RCY-005	C2	CAPACITOR—Trimmer for Model 118
RCY-034	C2	CAPACITOR—Trimmer for Model 119
RDC-032		CORD—Dial cord (10 yds. min.)
RDK-036		KNOB—Plain
RDK-039		KNOB—With arrow
RDS-055		SCALE—Dial scale
RDX-033		POINTER—Dial scale pointer assembly
RHC-008		CLIP—For mounting filter capacitor
RHG-015		GROMMET—Rubber grommet for mounting tuning capacitor
RHJ-005		SPACER—For mounting tuning capacitor
RHM-001		RING—Tuner shaft retaining ring
RHM-014		STUD—For dial idler pulley
RHM-016		CLIP—Oscillator coil clip
RHM-037		CLIP—For mounting dial scale
RHR-003		STUD—For mounting scale
RHS-004		SPACER—Between loop and cabinet
RJP-003	P3	PLUG—Phono power plug
RJS-003		SOCKET—Octal tube socket
RJS-027		SOCKET—For dial light
RJS-031		SOCKET—Tube socket for 6SC7
RJS-033		SOCKET—Bezel pilot light socket
RJS-049	J2, J3	SOCKET—Phono power
RJS-092		SOCKET—Miniature for 12BE6
RJS-097	J1	SOCKET—Phono pickup
RLC-001	T4	COIL—Oscillator coil
RLL-026	L1	LOOP ASSEMBLY—Model 119
RLL-028	L1	LOOP ASSEMBLY—Model 118
RMM-034		HOOD—Hood for dial light
RMM-054		SUPPORT—Lid support
RMS-118		SPRING—Dial cord tension spring
RMU-036		SHAFT—Tuning shaft
RMW-037		PULLEY—Dial cord idler pulley
RRC-060	R11	VOLUME CONTROL—2 meg.
RRW-005	R21	RESISTOR—70 ohms, wirewound, for 50-cycle operation of phono motor
RRW-008	R20	RESISTOR—18 ohms, 1 w., wirewound
RSW-043	S1	SWITCH—Radio phono switch
RTF-001	T5	TRANSFORMER—Filament transformer for 6SC7
RTL-050	T1	TRANSFORMER—1st I-F transformer
RTL-051	T2	TRANSFORMER—2nd I-F transformer
RTO-038	T3	TRANSFORMER—Output transformer
RWL-009		CORD—Power cord

MODEL 150—REPLACEMENT PARTS LIST

Cat. No.	Symbol	Description
		UNIVERSAL REPLACEMENT PARTS
UCC-623	C13	CAPACITOR—.003 mf., 600 v., paper
UCC-625	C12*	CAPACITOR—.005 mf., 600 v., paper
UCC-631	C7	CAPACITOR—.02 mf., 600 v.
UCC-633	C14	CAPACITOR—.03 mf., 600 v., paper
UCC-635	C3, 8, 9	CAPACITOR—.05 mf., 600 v., paper
UCE-067	C10	CAPACITOR—100 mf., 6 v., electrolytic
UOP-488	LS1	LOUDSPEAKER 4-in. permanent magnet
URD-009	R1	RESISTOR—22 ohms, ½ w., carbon
URD-041	R6	RESISTOR—470 ohms, ½ w., carbon
URD-053	R4, 5	RESISTOR—1500 ohms, ½ w., carbon
URD-067	R11	RESISTOR—5600 ohms, ½ w., carbon
URD-073	R10	RESISTOR—10,000 ohms, ½ w., carbon
URD-085	R8	RESISTOR—33,000 ohms, ½ w., carbon
URD-097	R9	RESISTOR—100,000 ohms, ½ w., carbon
URD-113	R7, 15	RESISTOR—470,000 ohms, ½ w., carbon
URD-129	R12, 16, 18	RESISTOR—2.2 meg., ½ w., carbon
URD-133	R14, 19	RESISTOR—3.3 meg., ½ w., carbon
URD-137	R17	RESISTOR—4.7 megs, ½ w., carbon
URE-059	R2	RESISTOR—2700 ohms, 1 w., carbon
		SPECIALIZED REPLACEMENT PARTS
RAB-076		CABINET BACK—Plastic cabinet back (maroon)
RAB-080		CABINET BACK—Plastic (mahogany and gray)
RAS-001		STRAP—Battery strap
RAU-038		CABINET—Plastic cabinet (maroon)
RAU-041		CABINET—Plastic cabinet (mahogany)
RAU-042		CABINET—Plastic cabinet (gray)
RCE-069	C2A, B, C	CAPACITOR—200 mf., 25 v., electrolytic; 50-50 mfd., 150 v., electrolytic
RCT-032	C1	CAPACITOR—Tuning capacitor
RCW-177	C21	CAPACITOR—330 mmf., ceramic
RCW-1073	C6	CAPACITOR—47 mmf., ceramic
RCW-1074	C5	CAPACITOR—100 mmf., ceramic
RCW-3013	C11A,B,C,D	CAPACITOR—.002-220-220-.005, ceramic
RDC-032		DIAL CORD—Roll of 25 yards
RDK-136		KNOB—Maroon knob
RDK-148		KNOB—Mahogany knob
RDP-040		POINTER—Dial pointer
RDS-072		SCALE—Dial scale
RER-001	SR	SELENIUM RECTIFIER
RHB-004		BUTTON—Monogram button
RHC-015		CLIP—Clip for oscillator coil
RHC-016		HAIRPIN COTTER
RHG-018		GROMMET—Grommet for tuning condenser
RHI-005		HINGE—Hinge for back
RHJ-005		SPACER—For tuning condenser
RHM-052		CLIP—For loop antenna
RHM-053		BOSS CAP FOR HANDLE
RHR-005		RIVET—Tubular rivet for door hinge
RHS-010		SHIELD—Tube shield
RHX-013		HANDLE—Handle assembly
RJP-025		PLUG—Battery plug
RJS-024		MOUNTING PLATE—For electrolytic capacitor
RJS-068		
RJS-100		SOCKET—Tube socket
RLC-068	L2	COIL—Oscillator coil
RLL-029	L1	LOOP—Loop antenna
RMS-039		CLIP—"C" clip
RMS-118		SPRING—Dial spring
RMS-154		SPRING CATCH
RMW-009		PULLEY—Idler pulley
RRC-083	R13, S1, AB	VOLUME CONTROL—Volume control and switch
RRW-027	R3	RESISTOR—2300 ohms, 10 w.
RSW-058	S2A, B	SWITCH—Power switch
RTL-052	T1	TRANSFORMER—1st I-F transformer
RTL-079	T2	TRANSFORMER—2nd I-F transformer
RTO-050	T3	TRANSFORMER—Output transformer
RWL-005		CORD—Power cord
SJS-068		CONNECTING PIN FOR LOOP ANTENNA

*Some receivers have UCC-635 instead.

GENERAL INFORMATION

The Model 150 portable radio is a five-tube superheterodyne broadcast receiver with a range of 540 to 1600 kc. The power source may be either 105 to 125 volts, 50 to 60 cycles, or direct current when a power outlet is available. The receiver will also operate from its battery source, thus making it independent of external electric power providing excellent operation in any location where external power is not available.

BATTERY—AC or DC Operation.

The left knob turns on the battery provided that the power plug is well inserted into the socket in the chassis.

For AC or DC supply (105-125 volts, 50 to 60 cycle operation) the same knob switches on the power when the power plug is pulled out of its socket in the chassis and inserted into the house outlet.

ELECTRICAL CIRCUIT ALIGNMENT

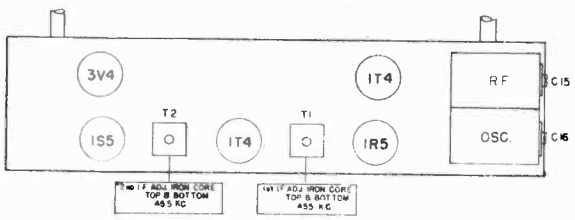
R-F ..... 1500 KC
I-F ..... 455 KC

EQUIPMENT REQUIRED

1. Test Oscillator with Tone Modulation.
2. AC Output Meter.
3. .05 mf. Paper Capacitor.
4. Insulated Screwdriver.

PROCEDURE—GENERAL

The Alignment Chart gives the alignment procedure with correct sequence of trimmer adjustments. The chassis must be removed from the cabinet during i-f alignment.



Tube and Trimmer Location

The test oscillator output signal should be attenuated so that the output meter reading never exceeds ½ volt. Connect the capacitor listed in column 2 of the Alignment Chart between the "high side" of the test oscillator and the point of input specified.

The output meter should be connected across the voice coil terminals on the speaker. The "low side" of the test oscillator output should be connected to the chassis ground; the "high side" of the 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. For alignment of the 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 output terminals, and 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 any one set of adjustments.

ALIGNMENT CHART

Step	Test-Osc. Connected to:	Test-Osc. Setting	Pointer Setting	Adjust for Max. Output
1	1T4 I-F grid in series with .05 mfd.	455 KC	550 KC	Iron cores of I-F Transformer T2.
2	1R5 converter grid in series with .05 mfd.	455 KC	550 KC	Iron cores of I-F Transformer T1.
3	Repeat Steps 1 and 2.			
4	Inductively coupled	1500 KC	1500 KC	C15* C16

* Chassis in cabinet and cabinet back (with loop) closed; remove plug button to adjust C15.

STAGE GAIN AND VOLTAGE CHECKS

Stage gain by vacuum tube voltmeter or similar measuring device may be used to check circuit performances and isolate trouble. The gain values listed may have tolerances of 20 per cent. Readings should be taken with low signal input so that the AVC is not effective.

(1) R-F STAGE GAINS

1T4 R-F Grid (Pin 6) to 1R5 Grid (Pin 6) . . 2.5 @ 1000 KC
1R5 Grid (Pin 6) to 1T4 Grid (Pin 6) . . . . . 30 @ 1000 KC
1T4 Grid (Pin 6) to 1S5 Diode Plate (Pin 3) . . 50 @ 455 KC

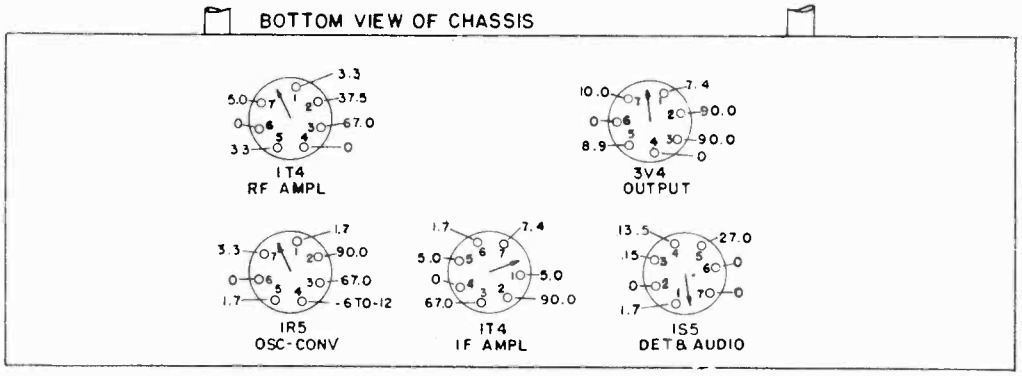
(2) AUDIO GAIN

.020 volt at 400 cycles across volume control (R13) with control set at maximum will give approximately .05 watts output across speaker voice coil.

(3) DC voltage developed across oscillator grid resistor (R9) averages −8 volts at 1000 kc with respect to B minus.

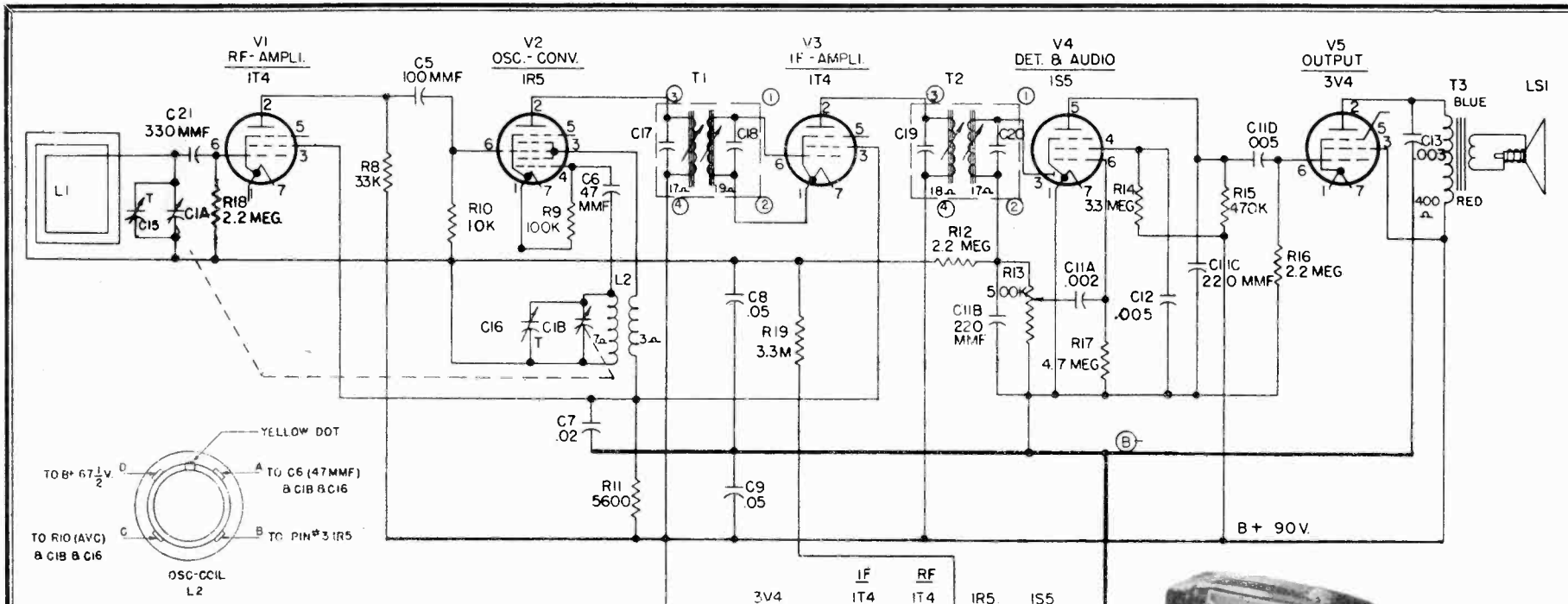
(4) SOCKET PIN VOLTAGES

Figure 3 shows voltages from all tube pins to B−. Voltage readings much lower than those specified may help localize defective components or tubes.

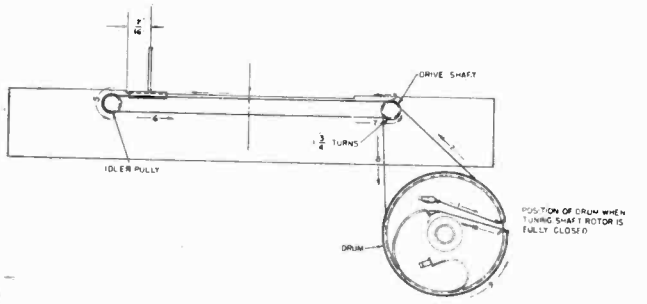


DC VOLTAGES TO GROUND UNLESS OTHERWISE SPECIFIED
ALL RATINGS ARE A.C OPERATION MEASURED WITH REFERENCE TO B-
RATINGS FOR BATTERY ARE SIMILAR TO AC RATINGS
VOLTAGE IS MEASURED WITH 20,000 OHMS PER VOLT METER

Socket Voltages



ALL CAPACITIES ARE IN MFD. UNLESS OTHERWISE INDICATED



Dial Stringing Diagram

OPERATING FREQUENCIES:

Standard Wave Band	540-1600 KC
I-F Amplifier	455 KC

POWER OUTPUT:

Undistorted	180 milliwatts
Maximum	250 milliwatts

LOUDSPEAKER:

Type	Alnico PM
Outside Cone Diameter	4 inches
Voice Coil Impedance (400 cycles)	3.2 ohms

TUBE COMPLEMENT:

R-F Amplifier	Type 1T4
Oscillator-Converter	Type 1R5
I-F Amplifier	Type 1T4
Detector—1st Audio	Type 1S5
Audio Output	Type 3V4

POWER SUPPLY:

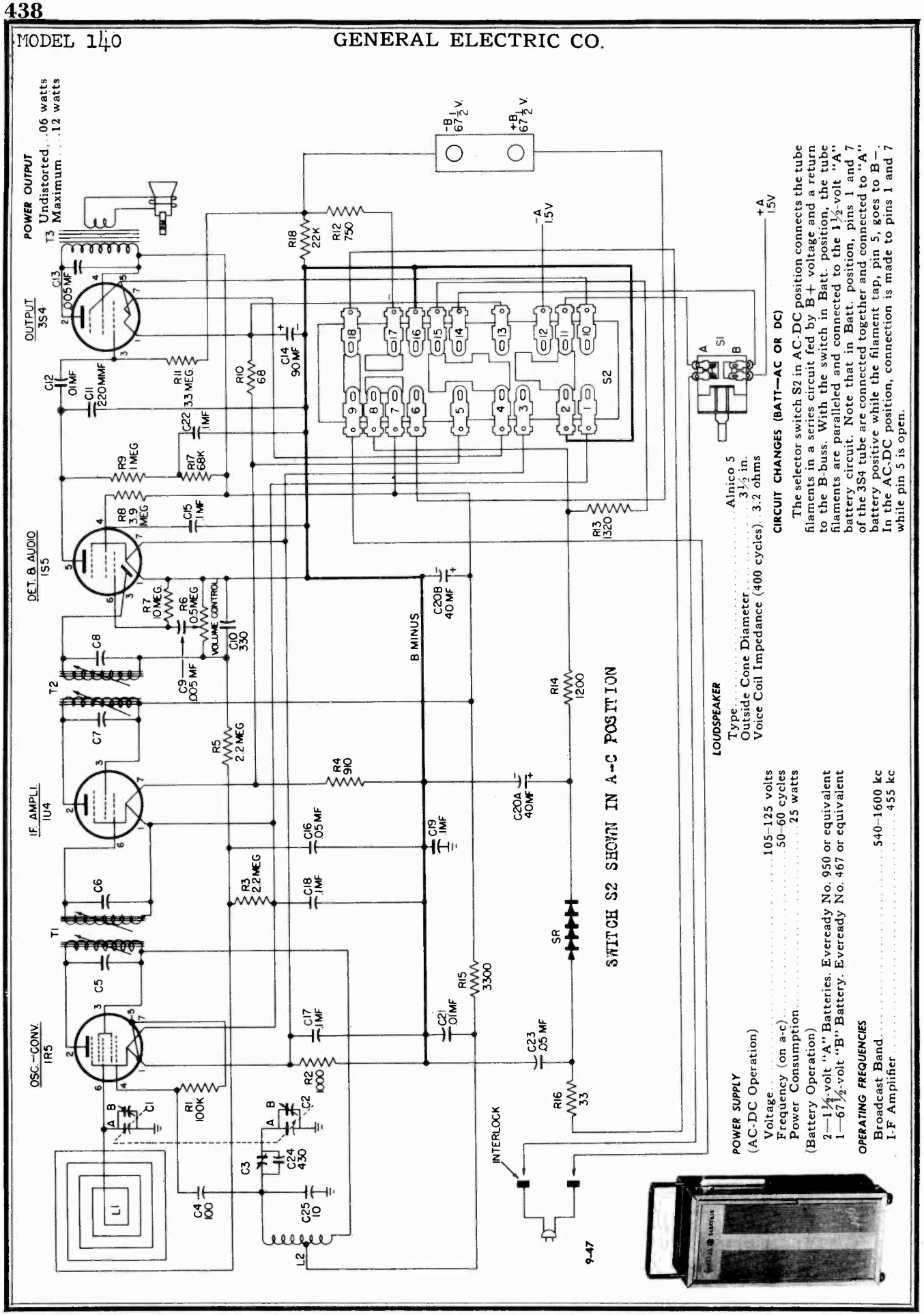
(AC-DC Operation)

Voltage	105-125 volts
Frequency	50-60 cycles
Power Consumption	25 watts

(Battery Operation)

Battery . . . Battery Pack Eveready No. 753 or equivalent

MODEL 140 GENERAL ELECTRIC CO.



CABINET INTERLOCK

Primarily as a safety device, so that contact with live wires and short circuits be avoided, the interlock provides a means by which the AC-DC power cord circuit is broken when the receiver chassis is taken out from the cabinet for battery replacement or receiver servicing.

The interlock receptacle is mounted in the top of and on the right side of the cabinet, while the interlock plug is mounted in the top of the receiver chassis so that its pins align with the receptacle.

BATTERY—AC OR DC SELECTOR SWITCH

A selector switch S2 located on the front of the panel near the bottom selects operation from the internal battery source, in the position marked "Batt." The other position of the selector switch marked AC-DC prepares the receiver for operation from the external power outlet for which a power cord and plug is provided.

DOOR SWITCH

The door switch S1-A, -B functions as the on-off switch in the receiver. S1-A, -B operates so that when the cabinet door is closed the "A" battery positive lead circuit is broken by contacts S1-B, and one side of the AC-DC power cord circuit is broken by contacts S1-A.

ELECTRICAL CIRCUIT ALIGNMENT

ALIGNMENT FREQUENCIES

R-F ..... 1620, 1500 and 580 kc
I-F ..... 455 kc

EQUIPMENT REQUIRED

1. Test oscillator with tone modulation.
2. A-c output meter.
3. .05 mfd. paper capacitor.
4. Insulated screwdriver.
5. Insulated screwdriver blade with flexible coupling.

ALIGNMENT PROCEDURE

1. The alignment procedure is given in table form. The major part of alignment will be made with the chassis removed from the cabinet. The location of i-f and r-f adjustments is shown in Figure 2. There are two adjustments for each i-f transformer, one in the top, the other in the bottom. To adjust the bottom slugs, it will be necessary to use an insulated screwdriver blade with some form of flexible coupling.

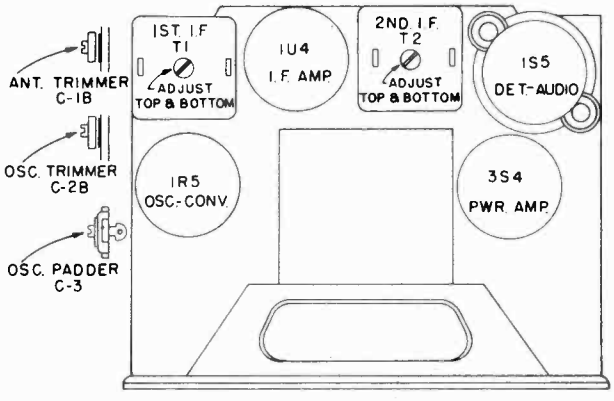
2. The output meter should be connected across the voice coil terminals on the speaker. The low side of the test oscillator output should be connected to the chassis ground; the high side of the oscillator output should be connected as indicated in the Alignment Chart. During the entire alignment procedure, the volume control should be at its maximum (clockwise) position. The test oscillator should be attenuated so that the output meter reading doesn't exceed ½ volt.

3. For alignment of the oscillator trimmer, oscillator padder and converter trimmer the input signal should be inductively coupled to the radio loop antenna, L1, by connecting a four-turn, six-inch diameter loop of bell wire across the signal generator output 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.

4. In step 6 of the Alignment Chart, "Rocking-in" of the oscillator's padder consists of turning the dial back-and-forth through signal for maximum while peaking the oscillator padder.

5. Since the cabinet has a definite effect upon the alignment because of its shielding of r-f components, it will be necessary to "touch-up" the converter trimmer after the major alignment is completed and the chassis assembled back into the cabinet. It is obvious that the adjustment must be made while the chassis is exposed and the output readings taken with the chassis and cabinet assembled.

Rather than adjust the trimmer at random, it would be helpful to learn whether more or less capacity is necessary. This can be done by wanding the radio antenna loop for an indicated gain. "Wanding" is the procedure where more or less gain will be indicated by an increase or decrease in output when a shorted one-turn loop is coupled to the radio antenna loop. If a gain is indicated the trimmer capacity must be decreased. In a similar manner, a field of powdered iron cores may be coupled to the loop. In this case a gain would indicate that capacity must be increased. When no gain is apparent with either the shorted turn wand or the iron field wand, the adjustment of the trimmer is peaked.



ANT. TRIMMER C1B AND OSC. TRIMMER C-2B LOCATED ON FRAME OF GANGED TUNING CAPACITOR C1A & C2A, OSCILLATOR PADDER NEAR TUNING CAPACITOR

Fig. 2. Tube and Trimmer Location

ALIGNMENT CHART

Step	Connect Test Oscillator to	Test Oscillator Setting	Radio Dial Setting	Adjust for Maximum Output
	I-F ALIGNMENT			
1	1U4 i-f grid (pin 6) in series with .05 mfd.	455 kc	550 kc	2nd i-f transformer (T2) cores
2	Conv. trimmer lug C1-B in series with .05 mfd.	455 kc	550 kc	1st i-f transformer (T1) cores
3	Repeat steps 1 and 2			
	R-F ALIGNMENT			
4	Inductively coupled	1620 kc	Max. freq. cond. open	Oscillator trimmer, C2-B.
5	Inductively coupled	1500 kc	1500 kc	Converter trimmer, C1-B.
6	Inductively coupled	580 kc	For max.	Rock-in oscillator padder, C3 (see General Procedure, 4).
7	Inductively coupled	1500 kc	1500 kc	Converter trimmer, C1-B.

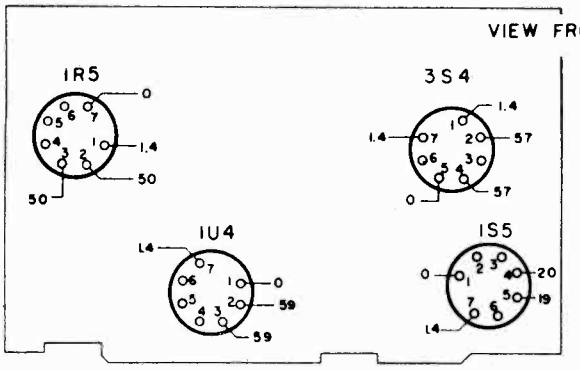


Fig. 3. Socket Voltage Diagram

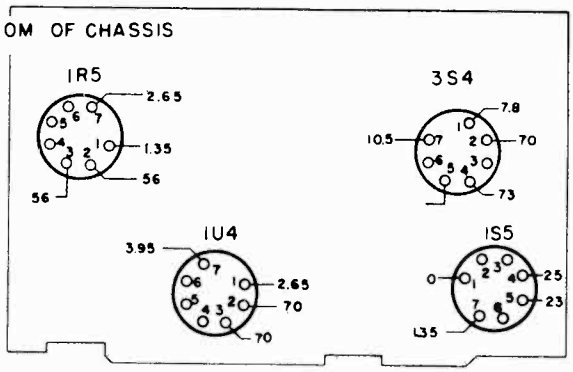


Fig. 4. Socket Voltage Diagram

STAGE GAIN AND VOLTAGE CHECKS

Stage gain by vacuum tube voltmeter or similar measuring devices may be used to check circuit performances and isolate trouble. The gain values listed may have tolerances of 20 per cent. Readings should be taken with low signal input so that AVC is not effective.

(1) R-F STAGE GAINS.

1R5 conv. grid to 1U4 i-f grid ..... 28 at 1000 kc
1U4 i-f grid for .05 w. output ..... 3600 uv at 455 kc

(2) AUDIO GAIN.

.040 volt at 400 cycles across volume control (R6) with control set at maximum will give approximately .05 watt output across speaker voice coil.

(3) D-c voltage developed across oscillator grid resistor R1 averages 16.2 volts at 1000 kc.

(4) SOCKET PIN VOLTAGES.

Figures 3 and 4 show voltages from all tube pins to B−. Voltage readings much lower than those specified may help localize defective components or tubes.

Cat. No.	Symbol	Description
UNIVERSAL REPLACEMENT PARTS		
UCC-028	C23	CAPACITOR—.05 mf., 400 v., paper
UCC-048	C19	CAPACITOR—.1 mf., 600 v., paper
UCG-543	C24	CAPACITOR—430 mmf., silver mica
UCU-528	C4	CAPACITOR—100 mmf., mica
UCU-536	C11	CAPACITOR—220 mmf., mica
UCU-540	C10	CAPACITOR—330 mmf., mica
URD-1146	R10	RESISTOR—68 ohms, ½ w., carbon
SPECIALIZED REPLACEMENT PARTS		
RAC-046		COVER—(Plastic) for cabinet door
RAD-027		DOOR—For cabinet (with loop connecting strips only)
RAD-028		DOOR—Door access to power cord, (less hinge)
RAT-007		CABINET ASSEMBLY—Complete with handle assembly, handle retainers, interlock receptacle, and trim
RAX-016		DOOR ASSEMBLY—With loop L1
RAX-017		DOOR ASSEMBLY—Door access to power cord, with hinge and tab
RCC-075	C12, 21	CAPACITOR—.01 mf., 400 v., paper
RCC-076	C9, 13	CAPACITOR—.005 mf., paper
RCC-077	C15, 17, 18	CAPACITOR—.1 mf., paper
RCC-078	C16	CAPACITOR—.05 mf., paper
RCE-051	C20A, B	CAPACITOR—40 mf., electrolytic
RCE-052	C14	CAPACITOR—90 mf., electrolytic
RCT-023	C1, 2	CAPACITOR—Tuning capacitor
RCW-020	C25	CAPACITOR—10 mmf., ceramic
RCY-030	C3	CAPACITOR—Oscillator padder
RDE-026		ESCUTCHEON
RDK-098		KNOB ASSEMBLY—Door knob and lock spring
RDK-099		KNOB ASSEMBLY—Knob with spring for volume or tuning control
REC-001		CONNECTOR—Contact strip for "B" battery
REX-004		RECTIFIER ASSEMBLY
RHC-008		CLIP—For mounting C20A, B, 40 mf. dual electrolytic capacitor
RHC-013		COTTER PIN—(Hair pin type) inserted in tube socket shield
RHF-002		FELT FOOT—On bottom of receiver
RHG-014		GROMMET—Fibre grommet for power cord
RHH-007		RETAINER—Plastic handle retainer (right)
RHH-008		RETAINER—Plastic handle retainer (left)
RHI-002		HINGE—Cabinet door top hinge
RHI-003		HINGE—Cabinet door bottom hinge
RHI-004		HINGE—For door to cord access
RHS-010		SHIELD—Tube shield for 1S5 tube
RHY-006		HANDLE ASSEMBLY—With retainers and cover
RII-002		BARRIER—Fibre strip insulator between switch S2 and chassis
RII-003		SHIELD—Fibre strip insulator between switch S2 and escutcheon
RII-004		STRIP—Insulating strip (insulates right side of chassis from cabinet)
RII-005		STRIP—Insulating strip (insulates left side of chassis from cabinet)
RII-007		BARRIER—Fibre insulating barrier insulating rectifier from chassis
RJJ-006		RECEPTACLE ASSEMBLY—Female interlock mounted on cabinet
RJP-017		PLUG ASSEMBLY—Male interlock plug, fits into female interlock receptacle
RJS-090		SOCKET—Tube socket for 1R5, 1U4 and 3S4
RJS-091		SOCKET—Tube socket for 1S5 (rubber mounted)
RLC-054	L2	COIL—Oscillator
RLL-024	L1	LOOP—Antenna loop only
RMC-018		BATTERY CUP ASSEMBLY—"A" battery negative connector
RMX-103		BRACKET ASSEMBLY—(With shield barrier) for mounting volume control and tuning capacitor
RMX-104		BATTERY CONNECTOR ASSEMBLY—Consists of one copper and two fibre strips ("A" positive)
ROP-012		LOUDSPEAKER
RRC-055	R6	RESISTOR—.5 meg., volume control
RRH-061	R15	RESISTOR—3300 ohms, ⅓ w., carbon
RRH-081	R18	RESISTOR—22,000 ohms, ½ w., carbon
RRH-093	R17	RESISTOR—68,000 ohms, ⅓ w., carbon
RRH-097	R1	RESISTOR—100,000 ohms, ½ w., carbon
RRH-121	R9	RESISTOR—1 meg., ½ w., carbon
RRH-129	R3, 5	RESISTOR—2.2 meg., ⅓ w., carbon
RRH-133	R11	RESISTOR—3.3 meg., ⅓ w., carbon
RRH-135	R8	RESISTOR—3.9 meg., ⅓ w., carbon
RRH-145	R7	RESISTOR—10 meg., ½ w., carbon
RRH-1046	R12	RESISTOR—750 ohms, ⅓ w., carbon
RRH-1048	R4	RESISTOR—910 ohms, ½ w., carbon
RRH-1049	R2	RESISTOR—1000 ohms, ½ w., carbon
RRM-001	R16	RESISTOR—33 ohms, 3 w., carbon
RRW-019	R14	RESISTOR—1200 ohms, w.w.
RRW-020	R13	RESISTOR—1320 ohms, w.w.
RSW-034	S2	SWITCH—AC-DC battery switch
RSW-035	S1A, B	SWITCH—Power switch
RTL-052	T1, 3	TRANSFORMER—I-F transformer
RTO-034	T3	TRANSFORMER—Output transformer
RWL-015		CORD—Power cord

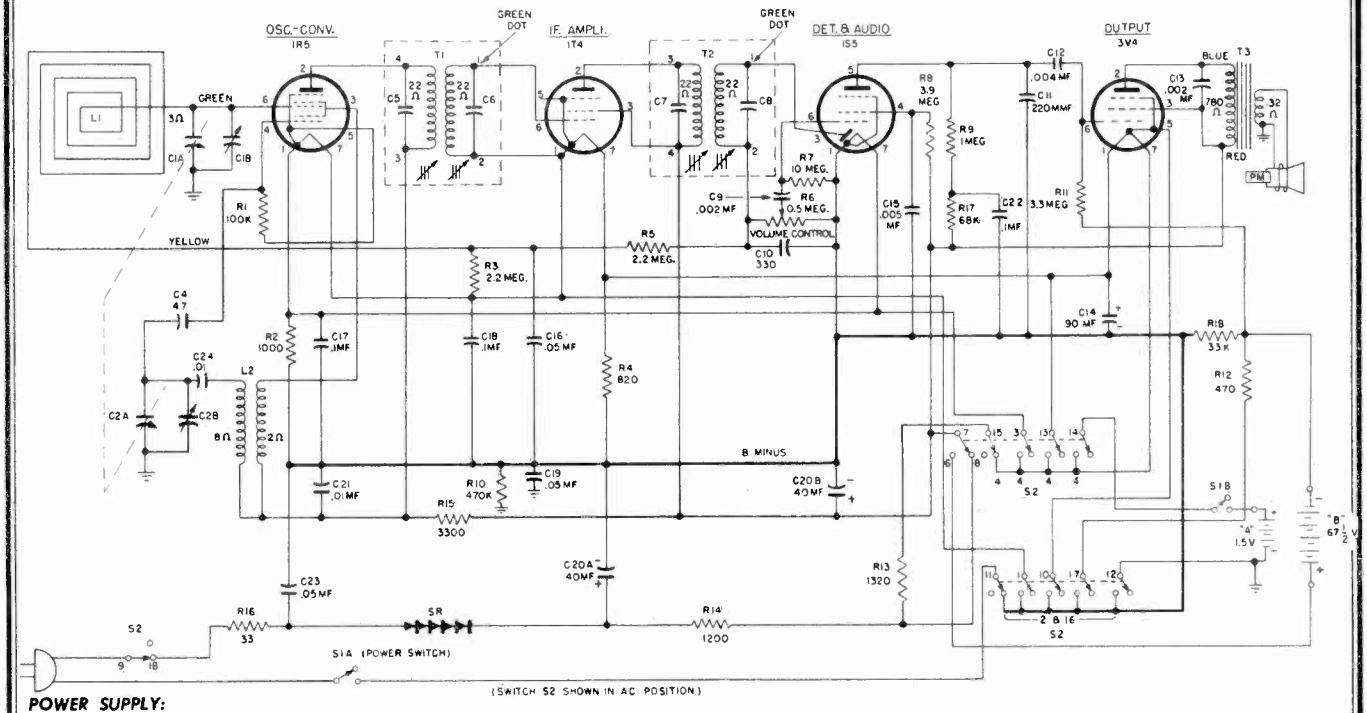


Fig. 3. Schematic Diagram. Model 145

POWER SUPPLY:

(AC-DC Operation)

Voltage	105–120 volts
Frequency on A-C	50- 60 cycles
Power Consumption	10 watts

(Battery Operation)

2— 1½ volt "A" Batteries, Eveready No. 950 or equivalent.

1—67½ volt "B" Battery, Eveready No. 467 or equivalent.

OPERATING FREQUENCIES:

Broadcast Band	540–1600 KC
I-F Amplifier	455 KC

POWER OUTPUT:

Undistorted	.06 watts
Maximum	.12 watts

LOUDSPEAKER:

Type	Alnico 5 permanent magnet
Size	4 inches
Voice Coil Impedance at 400 Cycles	3.2 ohms

TUBE COMPLEMENT:

Oscillator-Converter	1R5
I-F Amplifier	1T4
Detector Audio Amplifier	1S5
Power Output	3V4

ELECTRICAL CIRCUIT ALIGNMENT

EQUIPMENT REQUIRED:

1. Test Oscillator with Tone Modulation.
2. A-C Output Meter.
3. .05 mfd. Capacitor.
4. Insulated Screwdriver.

PROCEDURE:

1. The alignment procedure is given in table form. All i-f adjustments may be made with the chassis removed from the cabinet. The locations of the i-f and r-f adjustments are shown in Figure 1.

2. The output meter should be connected across the voice coil terminals of the speaker. The low side of the test oscillator should be connected to B minus. The high side of the test oscillator should be connected as indicated in the alignment chart.

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.*

3. During the entire alignment procedure the volume control should be rotated fully clockwise in its maximum position. The test oscillator should be attenuated so that the output meter doesn't exceed .4 volt.

4. For alignment of the oscillator and r-f trimmer, 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 output terminals, and locate the loop about one foot from the radio loop for alignment. To prevent possible errors in peak readings, the position of the loop with respect to the radio loop should not be changed during any one set of adjustments. The chassis should be installed in the cabinet when the r-f adjustment (step 4) is made.

ALIGNMENT CHART

Step	Connect Test Oscillator To:	Test Oscillator Setting	Dial Setting	Adjust for Maximum Output
1	1T4 grid (Pin 6) in series with .05 mfd. cap.	455 KC	550 KC	2nd i-f transformer (T2) primary and secondary cores.
2	1R5 grid (Pin 6) in series with .05 mfd. cap.	455 KC	550 KC	1st i-f transformer (T1) primary and secondary cores.
3	Inductively coupled (see Note 4)	1620 KC	Gang condenser completely open.	C2B for maximum.
4	Inductively coupled (see Note 4)	1500 KC	For max. signal. Set dial pointer at 1500 KC mark on dial scale.	C1B for maximum.

STAGE GAINS AND VOLTAGE CHECKS

Stage gain by vacuum tube voltmeter or similar device may be used to check circuit performance and to isolate trouble. The gain values listed may have tolerances of 20 per cent. Readings should be taken with low signal input so that AVC is not effective.

1. R-F STAGE GAINS.

1R5 Grid (Pin 6) to 1T4 Grid (Pin 6)	27 at 1000 KC
1R5 Grid (Pin 6) to 1T4 Grid (Pin 6)	33 at 455 KC
1T4 Grid (Pin 6) to 1S5 Diode Plate (Pin 3)	60 at 455 KC

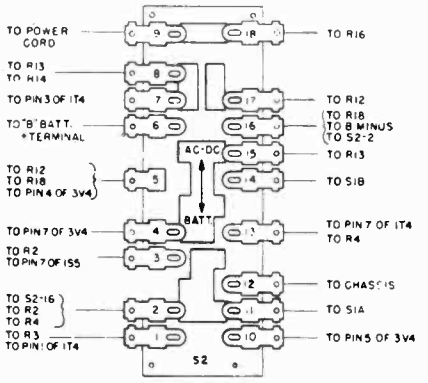
2. AUDIO GAIN.

.05 volt at 400 cycles across the volume control (R6) with volume control set fully clockwise will give approximately .05 watt output or .4 volts across the speaker voice coil.

3. D-c voltage developed across oscillator grid resistor R1 averages 18 volts at 1000 kc.

4. SOCKET PIN VOLTAGES.

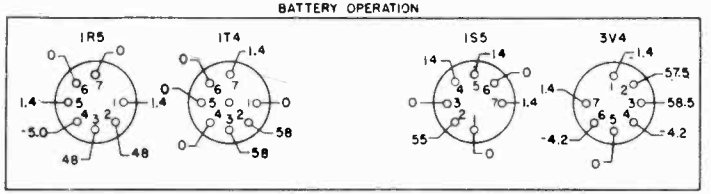
Figure 4 shows voltages from all tube pins to B—. Voltage readings much lower than those specified may help localize defective components or tubes.



S2 IN AC-DC POSITION

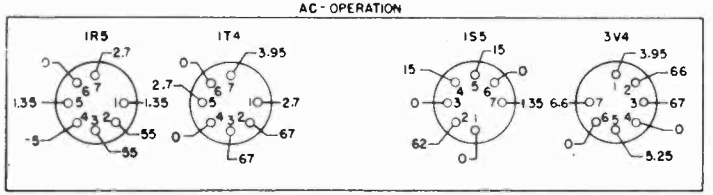
Fig. 2. Switch Connections

BATTERY OPERATION



CONDITIONS OF TEST: RECEIVER POWERED BY BATTERY SUPPLY MEASURED WITH 20,000 OHMS/VOLT PER METER: ALL VOLTAGES TAKEN FROM B- TO SOCKET PIN.

BOTTOM VIEW OF CHASSIS
AC-OPERATION



CONDITIONS OF TEST: RECEIVER POWERED BY AC LINE 117 VOLTS MEASURED WITH 20,000 OHM/VOLT METER. ALL VOLTAGES TAKEN FROM B- TO SOCKET PIN

VOLTAGE ON INPUT SECTION OF ELECTROLYTIC 135 VOLTS

Fig. 4. Socket Voltage Diagram

MODEL 145—REPLACEMENT PARTS LIST

Cat. No.	Symbol	Description
UNIVERSAL REPLACEMENT PARTS		
UCC-028	C23	CAPACITOR .05 mfd., 400 v.
UCU-020	C4	CAPACITOR .47 mmf. ±20%, mica
UOP-489		SPEAKER
URD-041	R12	RESISTOR 470 ohms, ½ w., carbon
URD-047	R4	RESISTOR 820 ohms, ½ w., carbon
URD-049	R2	RESISTOR 1000 ohms, ½ w., carbon
URD-061	R15	RESISTOR 3300 ohms, ½ w., carbon
URD-081	R18	RESISTOR 33,000 ohms, ½ w., carbon
URD-093	R17	RESISTOR—68,000 ohms, ½ w., carbon
URD-097	R1	RESISTOR—100,000 ohms, ½ w., carbon
URD-113	R10	RESISTOR—470,000 ohms, ½ w., carbon
URD-121	R9	RESISTOR 1 meg., ½ w., carbon
URD-129	R3, 5	RESISTOR—2.2 meg., ½ w., carbon
URD-133	R11	RESISTOR—3.3 meg., ½ w., carbon
URD-135	R6	RESISTOR—3.9 meg., ½ w., carbon
URD-145	R7	RESISTOR—10.0 meg., ½ w., carbon
SPECIALIZED REPLACEMENT PARTS		
RAB-082		CABINET BACK COVER
RAC-055		CABINET FRONT COVER ASSEMBLY—Includes two hinges (RHI-007) and four screws (RHS-023)
RAC-056		CABINET BODY ASSEMBLY—Includes back cover hinges (RHI-008) and four screws (RHS-023)
RAC-057		LOOP COVER
RCC-075	C21	CAPACITOR—.01 mfd., 400 v., paper
RCC-077	C17, 18, 22	CAPACITOR—.1 mfd., 400 v., paper
RCC-078	C16, 19	CAPACITOR—.05 mfd., 400 v., paper
RCE-051	C20A, B	CAPACITOR—40-40 mfd., 150 v., electrolytic
RCE-052	C14	CAPACITOR—90 mfd., 10 v., electrolytic
RCT-035	C1A, B, 2A, B	CAPACITOR—Tuning
RCW-3018	C13	CAPACITOR—.002 mfd., ceramic
RCW-3015	C9, 10, 11, 12, 15	CAPACITOR—Ceramic
RDC-032		CORD—Dial drive cord, 25 yd.
RDE-034		ESCUTCHEON
RDE-035		ESCUTCHEON—Brass for fastening handle to the cabinet

Cat. No.	Symbol	Description
SPECIALIZED REPLACEMENT PARTS (Cont.)		
RDK-149		KNOB and Clip
RDP-044		POINTER—Dial pointer assembly
RDS-080		SCALE—Dial scale
REC-001		CONNECTOR—For "B" battery
REC-004		CONTACT—For "A" battery
REX-005	SR	RECTIFIER—Selenium
RHI-007		HINGE—Front cover hinge
RHI-008		HINGE—Back cover hinge
RHJ-009		SPACER—For switch S2 (four req.)
RHM-055		SPEED NUT—"A"
RHR-002		RIVET—.121 dia. x ¼" long
RHR-006		RIVET—.121" dia. x ⅜" long for mounting RDE-035
RHS-015		SCREW—Self-tapping screw for mounting loop assembly door
RHS-022		SCREW—Self-tapping for mounting the brass latch plate
RHS-023		SCREW—Self-tapping for mounting hinges
RHY-008		HANDLE
RII-019		INSULATOR—For "A" battery contact
RII-020		BARRIER—Shield around "A" battery
RJB-100		SOCKET—For 1R5, 1S5, and 3V4 tube
RJB-125		SOCKET—For 1T4 tube
RLC-080	L2	COIL—Oscillator coil
RLL-037	L1	LOOP
RMC-028		KNOB—Catch knob
RMC-029		LATCH PLATE—On front cover, fastened by screws RHS-022
RMC-031		CATCH—Front cover catch
RMC-032		CATCH COVER—Front cover, fastened with screws RHS-022
RMC-033		LATCH PLATE—On back cover, fastened with screws RHS-022
RMC-036		LATCH—Back cover latch
RMC-037		NAMEPLATE AND CATCH
RMM-085		CLIP—For "A" battery
RMS-130		BARRIER
RMW-042		SPRING—Dial cord tension spring
RRC-094	R6, S1	PULLEY—¼-in. pulley for dial cord
RRW-030	R16	VOLUME CONTROL AND SWITCH
RRW-031	R13	RESISTOR—33 ohms, 3 w., w.w.
RRW-032	R14	RESISTOR—1320 ohms, w.w.
RSW-061	S2	RESISTOR—1200 ohms, w.w.
RTL-052	T1, T2	SWITCH—AC-DC Batt. switch
RTO-057	T3	TRANSFORMER—1st and 2nd I-F transformer
RWL-009		TRANSFORMER—Output
		CORD—Power cord

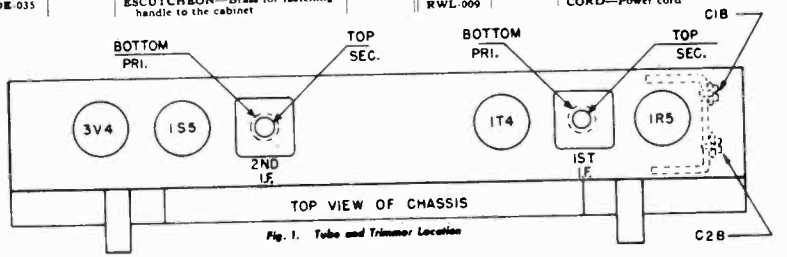


Fig. 1. Tube and Trimmer Location

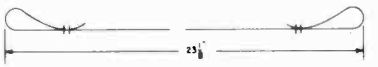
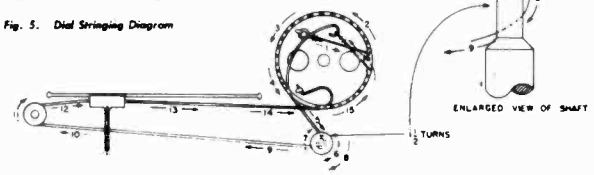


Fig. 5. Dial Stringing Diagram



SPECIFICATIONS

CABINET:	***Plastic***
Height	10 1/8 in.
Length	12 13/16 in.
Width	5 3/4 in.
Weight	17 pounds

ELECTRICAL RATING:

Charging from A-C Line:

Voltage	105–125 volts
Frequency	50/60 cps
Wattage	10 watts

Operating from Internal Battery.

Voltage	2.1 volts
Current	1.7 amp
Wattage	3.6 watts
Hours of Operation without Charging Battery	Approx. 12–15 hours

BATTERY REQUIREMENT:

Willard 2.0 volt No. 25–2 rechargeable battery or equivalent

OPERATING FREQUENCIES:

Broadcast Band	540–1600 KC
I-F Amplifier	455 KC
Power Output (at 2.1 Battery Voltage)	
Undistorted	170 milliwatts
Maximum	210 milliwatts

LOUDSPEAKER:

Type	Alnico PM
Outside Cone Diameter	5 1/4 in.
Voice Coil Impedance (400 CPS)	3.2 ohms

TUBE COMPLEMENT:

R.F Amplifier	Type 1U4
Oscillator-Converter	Type 1R5
I-F Amplifier	Type 1U4
Detector—1st Audio	Type 1S5
Audio Output	Type 3V4

GENERAL INFORMATION

The Model 160 Portable Radio is a five-tube superheterodyne broadcast receiver which operates from a built-in rechargeable battery or from 105–125 volts, 50 or 60 cps with a battery in place.

The following paragraphs describe special tests for checking the power supply and the battery of the receiver, and explain some of the special constructional features which will be encountered while servicing the receiver.

1. POWER SUPPLY

All power necessary for the operation of the receiver is supplied by the 2-volt rechargeable battery mounted within the radio. Power to the 1.4 volt tube filaments is supplied by the battery through suitable voltage dropping resistors. The high voltage for the screens and plates of the tubes is furnished by a synchronous vibrator used in conjunction with a step-up power transformer and its associated filter circuit. The synchronous vibrator operates directly from the battery.

The receiver power is obtained from the battery at all times in the manner just described, whether the power cord is connected to a power source or not. When the power cord is connected to a receptacle supplying from 105 to 125 volts, 50 or 60 cps, a-c and the power selector is in either the CHARGE or ON position, the power supplied from the line will be used to charge the battery. The CHARGE position on the three-position power selector switch allows the battery to be charged from the house current when the receiver is not operating. The ON position of the switch permits the radio to be operated with the battery floating on the charger. Under this condition the battery filters the charger's output, maintains the voltage at its proper value and acquires a slow charge, if the voltage is adequate.

The battery charging unit consists of a step-down transformer which converts the line voltage of 117 volts to approximately 5.8 volts center-tapped, and a full wave copper-oxide rectifier which supplies the battery with the d-c charging current.

A charging cable is available which provides an easy means of charging the radio battery from an automobile or a 6-volt storage battery. The cable plug is inserted over the pins provided, see Figure 3, and the plug and socket on the other end of the cable are connected to a 6-volt supply. Complete installation instructions are provided with each cable.

2. CHARGER CHARACTERISTICS

Testing the Operation of the Rectifier Unit—A 1/4 ampere fuse is used in series with the primary of the charger transformer. If the battery does not show any signs of becoming charged after a reasonable length of time, check the fuse. If it is necessary to replace the fuse, use a 1/4-ampere (G.E. No. 2548 or REF-001) fuse.

If one or more of the copper-oxide discs of the rectifier unit are defective, the charger will not operate properly. To test the rectifier unit operation, remove the battery from the unit and reconnect it in series with a d-c ammeter capable of reading at least two amperes. Plug the power cord into a 105–125 volts, 50 or 60 cps, a-c supply, and turn the power selector switch to the CHARGE position. With the a-c line voltage at 117 volts, the average charging current should read about 1.8 amperes at 2.1 volts battery voltage. Care must be exercised in making this test as the charging circuit is of extremely low resistance. Very heavy leads must be used, and the use of an ammeter having only 0.05 ohms resistance will introduce considerable error. If the line voltage is greater than 117 volts, or the battery voltage is lower than 2.1 volts, the charging current will be greater. If the current is much less than 1.8 amperes at the rated line voltage of 117 volts, one or more of the copper-oxide discs may be defective.

Testing the Individual Rectifier Disc—Two rectifier assemblies are used in the receiver, each assembly consisting of two rectifier discs held together by an eyelet. A cross section of a rectifier as-

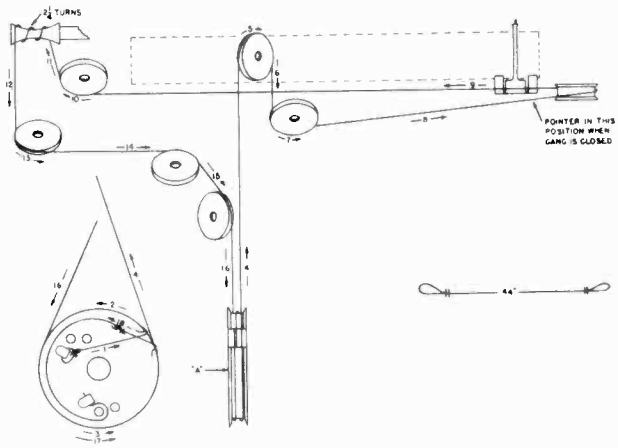


Fig. 1. Dial Stringing Diagram

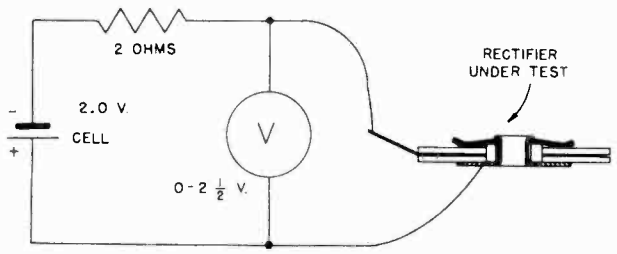


Fig. 2. Rectifier Test Circuit

sembly is shown in Figure 2. The center plate of the assembly is positive and is provided with a soldering tab. A copper-oxide rectifier disc is located on each side of the center plate. The rectifier disc conducts when the proper polarity potential is applied to the copper-oxide surface. The copper oxide is a dark coating which has been plated with nickel to afford a good surface contact to the copper oxide. If either or both of the rectifier discs in an assembly become defective, the entire assembly should be replaced.

To check the rectifier assembly, the following tests are recommended. In the conducting direction, the rectifier assembly should pass 0.5 ampere or more when ½ volt is impressed across it. If a d-c ammeter is not available for measuring currents as high as 0.65 ampere, the circuit shown in Figure 2 can be used for this check. The 2.0-ohm resistor should be fairly accurate. The voltage across the rectifier assembly should read 0.7 volt or less; if this voltage exceeds 0.7 volt, the assembly is defective and should be replaced.

The reverse current flow is as important as the above test and is made as follows: Reverse the battery polarity in the test circuit described for current check, disconnect the voltmeter, and place a milliammeter that will read 10 ma. in series with a lead to one of the battery terminals. A suitable meter fuse should be used in series with the milliammeter to prevent damage to the meter in case the assembly under test is shorted. The reversed current should not exceed 10 ma. If this current is considerably above this value, the rectifier assembly should be discarded.

If a milliammeter is not available, a rough check may be made by measuring the resistance of the assembly in the non-conducting direction on the low resistance range of an ohmmeter. The resistance should measure at least 300 ohms.

3. REPLACEMENT OF VIBRATORS

After many hours of service, the reception might become very noisy or fail due to a faulty vibrator. The type used in this receiver is REU-001.

In order to gain access to the vibrator, proceed as follows:

1. Pull out the pins on the handle of the cabinet (Figure 3).
2. Unscrew the five hex screws which hold the chassis in cabinet (one screw at the bottom of cabinet).
3. Slide the chassis out of the cabinet, being careful not to strain the loop leads.
4. Unscrew the three screws at the bottom and one on the top of the power unit.
5. Lift up the outer shield and then replacement of the vibrator is as easy as changing a normal radio tube.

BATTERY INFORMATION

The receiver uses a 2-volt Willard Radio Battery No. 25-2 or equivalent. It has a 25 ampere-hour capacity and should be cared for in the same manner as any storage battery.

CHARGE INDICATORS

The degree of charge of the battery can be determined by raising the back cover of the radio and referring to the charge ball indicators visible through the hole in the metal battery case.

If the battery is fully charged, two indicator balls will be visible at the surface of the liquid in the battery. When the battery discharges, these ball indicators will sink and disappear in the following order:

1. Green indicator sinks when approximately 20 per cent of battery capacity has been discharged.
2. The red ball sinks when battery is 80 per cent discharged. On charge, the balls rise or float in the reverse order and the charge may be stopped when both balls appear in the opening.

TO CHARGE BATTERY

The battery is charged by merely plugging the receiver power cord in the rated ac power outlet and turning the selector switch to CHARGE. Frequent check should be taken of the charge indicator and when both indicator balls are visible, the battery is adequately charged. Charging the battery after both indicator balls are visible will not harm the battery except it will evaporate the water faster. A completely discharged battery will be restored, usually within 20 to 30 hours.

When operating the receiver from the a-c house current, the battery floats or is being charged at a slow rate. Thus if you wish to operate the receiver even with a fully discharged battery, plug in the power cord in the ac receptacle and turn the power selector switch to the ON position. Prolonged operation in this manner usually will cause the battery potential to stabilize at some voltage determined by the line voltage and the characteristics of the charging circuit components. The degree of charge obtainable with this method of operation likewise is dependent on the line voltage and the characteristics of the charging circuit components.

BATTERY OPERATING INSTRUCTIONS.

1. Add distilled or tap water in the filler cap at sufficiently frequent intervals to keep liquid level at indicator mark as viewed through opening in battery case. Do not overfill as this impairs the nonspill feature. Distilled water is to be preferred, as it does not contain any chemical compound which can contaminate the battery.

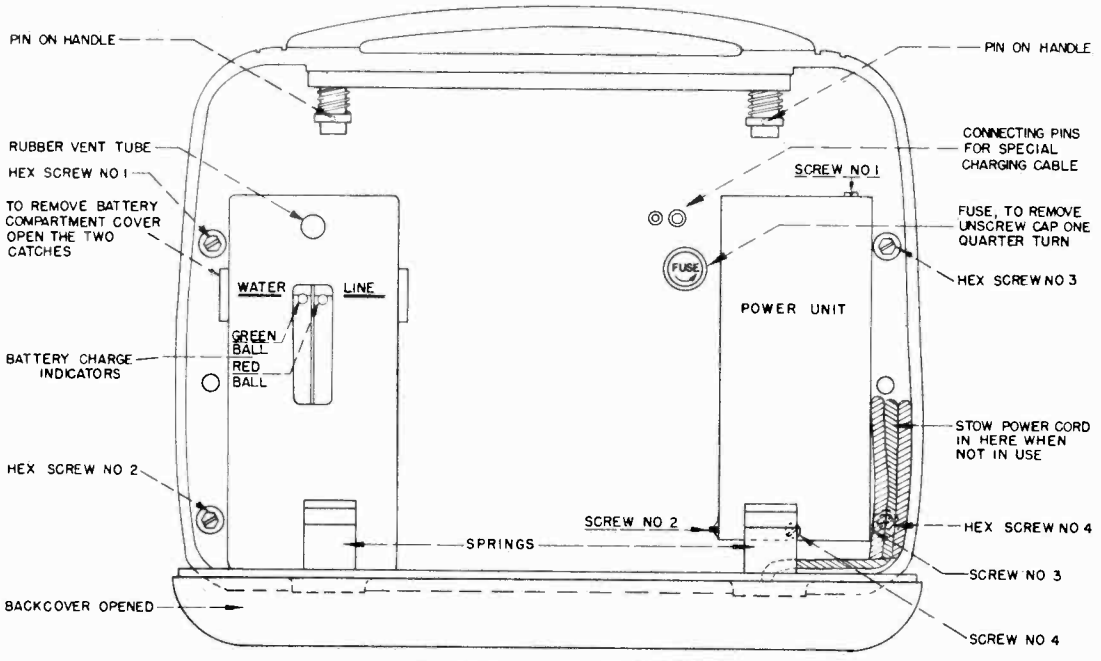


Fig. 3. Rear Compartment Assembly

2. A fully charged battery will operate the radio in the ON position without being connected to an a-c outlet for about 12 to 15 hours before recharging is required. Whenever possible, it is best not to allow the battery to become discharged to the extent that both indicators disappear. However, if both indicators have sunk, the battery should be recharged immediately or within 24 hours.

3. A battery will continually discharge at a slow rate even when not in use. For this reason, monthly checks should be made of the charge condition and the battery placed on charge when necessary. This will prevent damage to the battery, such as freezing during cold weather.

BATTERY INSTALLATION

The following instructions should be carefully followed in installing a battery, or replacing an old one:

1. Remove battery from packing carton.
2. If needed, add water to bring liquid level to indicator mark on battery container. Do not overfill.
3. Raise back cover on radio, remove battery case cover. The latter is removed by lifting two catches.
4. Unplug old battery if present, and replace with new battery.
5. Place battery on charge, if necessary, as described in a previous paragraph, until both indicators are showing in the opening in the case cover.

ELECTRICAL CIRCUIT ALIGNMENT

EQUIPMENT REQUIRED

1. Signal generator with audio tone modulation.
2. A-C output meter, 1 or ½ volts full scale, 1000 ohms/volt.
3. Insulated screwdriver.
4. .05 mf. capacitor.
5. Antenna loop.
6. Shorted one turn loop (for "wanding").
7. Powdered iron cores.

ALIGNMENT PROCEDURE

1. *General*—The alignment procedure is given in table form for convenience. Reference is made to Figure 5 for the trimmer locations. The low side of the signal generator should be connected to the chassis of the receiver for i-f alignment; the high side should be connected as indicated in the Alignment Chart. A meter or some other suitable indicating device must be connected to the output of the receiver.

When aligning the receiver, the volume control on the receiver should be turned to its maximum position. The output signal of the signal generator should be kept as low as possible at all times, the reading of a meter connected across the voice coil leads of the receiver should be kept below ½ volt by changing the signal generator output. If the signal level is too high, the AVC becomes effective and alignment errors might result.

The following paragraphs give greater details regarding the connections of the output meter and the signal generator to the receiver during alignment.

2. *Connecting the Output Meter*—In aligning the receiver some means for indicating differences in the output voltage will be required. A rectifier type a-c meter of 1 or 1½ volts full scale deflection is connected across the speaker voice coil terminals. For alignment of the i-f amplifier, the chassis and the back cover have to be removed from the cabinet (see paragraph 3 of General Information).

In order to be able to tune the i-f amplifier with ease, it is advisable to unsolder the two leads connecting the loop antenna, and solder them together avoiding any undesirable shorting to ground. Now remove the four self-tapping screws holding the speaker mounting plate and slide it out to gain access to the inside of the chassis. Due to the fact that the rectifier discs are mounted on this mounting plate, it is necessary to ground this plate temporarily to the chassis by means of a metal strip or wire to avoid excessive hum.

For the r-f alignment, the chassis can be left in the cabinet and the output meter connected between the auxiliary green voice coil lead provided and chassis.

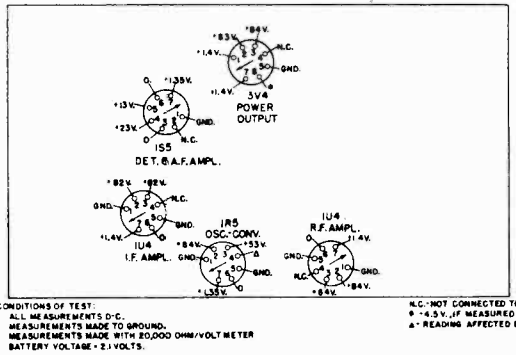
3. *Connecting the Signal Generator*—After aligning the i-f transformer T3, the output of the signal generator should be coupled through a 0.05 mf. capacitor to the grid of the 1R5 oscillator-converter tube. This may be accomplished easily by connecting the capacitor to the stator of C2-B, the middle section of the tuning gang, as this stator is connected directly to the converter grid. The low side of the signal generator output should be connected to the chassis ground to complete the circuit.

For aligning the oscillator and r-f coils, the r-f signal should be inductively coupled by connecting a three- or four-turn, 6-inch diameter loop of bell wire across the signal generator output terminals and then locating the loop about one foot from the radio cover. To prevent possible error in peak readings, the position of the loop with respect to the receiver should not be changed during any one set of adjustments. The adjustment of the iron cores must be made with the cover opened, and during the reading of the output meter the loop must be in normal position (the cover of the receiver must be closed).

For the oscillator adjustment, it is advisable to use the method of "wanding" the radio loop antenna. "Wanding" is the procedure where more or less gain will be indicated by an increase or decrease in output meter readings when a shorted one-turn loop (approximately 10 in. by 5 in.) is coupled to the radio antenna loop. If a gain is indicated, we have to increase the inductance by screwing in the iron core of the oscillator coil T6. In a similar manner, a field of powdered iron cores may be coupled to the loop. In this case a gain would indicate that the oscillator inductance must be decreased. When no gain is apparent with either the shorted turn wand or the iron field wand, the adjustment of the oscillator iron core is peaked.

After the alignment of the oscillator, the r-f transformer T1 should be aligned as follows:

1. The signal is fed over the loop coupled to the radio antenna loop with cover closed. Note the output meter reading.
2. Open the back cover and turn the tuning slug of T1 approximately ½ turn clockwise.
3. Close the back cover and note the new output meter reading. If it has increased, continue to turn the core in the same direction; if it has decreased, reverse the direction. Repeat this procedure until a definite maximum reading is obtained.



CONDITIONS OF TEST:
ALL MEASUREMENTS D-C.
MEASUREMENTS MADE TO GROUND.
MEASUREMENTS MADE WITH 20,000 OHM/VOLT METER
BATTERY VOLTAGE = 2.1 VOLTS.

N.C.=NOT CONNECTED TO TUBE.
0 = 4.5 V., IF MEASURED WITH V.T.V.M.
Δ = READING AFFECTED BY INSTRUMENTS.

Fig. 4. Socket Voltage Diagram

ALIGNMENT CHART

Step	Test-Oscillator Connected to:	Test-Oscillator Setting	Pointer Setting	Adjust for Maximum Output
1	1U4 (i-f amplifier) grid (Pin 6) in series with 0.5 mf capacitor.	455 KC	1600 KC (gang condenser open)	Iron cores of i-f transformer T3
2	1R5 converter grid (Pin 6) in series with .05 mf capacitor.	455 KC	1600 KC (gang condenser open)	Iron cores of i-f transformer T2
3	1R5 converter grid (Pin 6) in series with .05 mf capacitor.	455 KC	1600 KC (gang condenser open)	Repeak T3 and T2
4	Inductively coupled to loop antenna.	580 KC	580 KC	Iron core of T6*
5	Inductively coupled to loop antenna.	580 KC	580 KC	Iron core of T1**
6	Inductively coupled to loop antenna.	1500 KC	1500 KC	C3B, C2B, and C1B***
7	Repeat Steps 4, 5, and 6 until both peaks reach maximum.			

*Use "Wanding" method described in text.
**See text for details.
***Chassis in cabinet and cabinet back (with loop) closed; remove plug buttons to adjust trimmers.

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 tolerance of 20%.

1. R-F STAGE GAINS.
   R-F Amplifier Grid (1U4 Pin 6) to Oscillator-Converter Grid (1R5 Pin 6) ..... 13 at 1000 KC
   Oscillator-Converter Grid (1R5 Pin 6) to I-F Amplifier Grid (1U4, Pin 6) ..... 26 at 1000 KC
   Oscillator-Converter Grid (1R5, Pin 6) to I-F Amplifier Grid (1U4, Pin 6) ..... 31 at 455 KC
2. AUDIO GAIN
   The power output across the speaker voice coil should be approximately 50 milliwatts with a 400 cps signal of .03 volt applied across the volume control.
3. OSCILLATOR GRID BIAS
   The d-c voltage developed across the oscillator grid leak (Resistor R2) averages 13 volts at 1000 KC.
4. SOCKET PIN VOLTAGE
   Fig. 4 shows typical tube pin voltages. All readings should be made from the pins to ground unless otherwise indicated.
5. HUM LEVEL
   Across the primary of the output transformer T4 measured in series with 1 mf paper capacitor in series with the meter ..... 3 volts
   (With the line cord plugged in; with battery operation alone, the voltage thus measured will be negligible.)

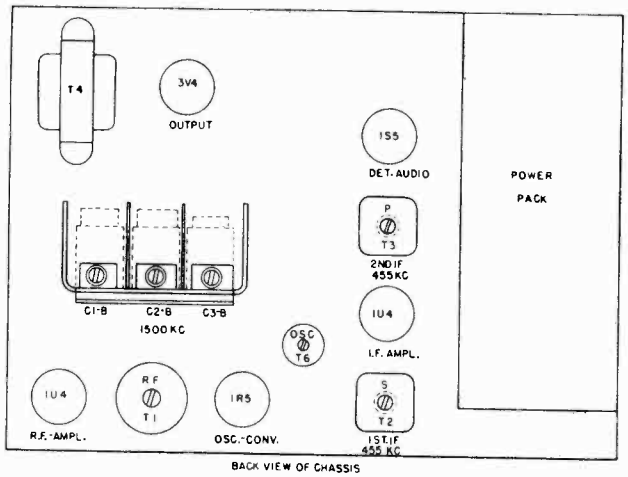


Fig. 5. Tube and Trimmer Location

MODEL 160—REPLACEMENT PARTS LIST

CAT. NO.	SYMBOL	DESCRIPTION
UNIVERSAL REPLACEMENT PARTS		
UCC-625	C9, 17	CAPACITOR—.005 mf., 400 v., paper
UCC-630	C6, 12, 13	CAPACITOR—.01 mf., 600 v., paper
UCC-631	C11, 16	CAPACITOR—.02 mf., 400 v., paper
UCC-635	C4, 15, 23	CAPACITOR—.05 mf., 400 v., paper
UCU-028	C7, 8, 10	CAPACITOR—100 mmf., mica
UOP-611		SPEAKER—PM speaker
URD-049	R16	RESISTOR—1000 ohms, ½ w., carbon
URD-057	R15	RESISTOR—2200 ohms, ½ w., carbon
URD-073	R13, 14	RESISTOR—10,000 ohms, ½ w., carbon
URD-077	R2	RESISTOR—15,000 ohms, ½ w., carbon
URD-097	R1	RESISTOR—100,000 ohms, ½ w., carbon
URD-121	R9, 12	RESISTOR—1 meg., ½ w., carbon
URD-129	R6	RESISTOR—2.2 meg., ½ w., carbon
URD-133	R10	RESISTOR—3.3 meg., ½ w., carbon
URD-137	R8	RESISTOR—4.7 meg., ½ w., carbon
URE-059	R11	RESISTOR—2,700 ohms, ½ w., carbon
SPECIALIZED REPLACEMENT PARTS		
RAC-053		COVER—Battery box cover
RAD-033		DOOR—Cabinet door
RAG-017		GRILLE—Loudspeaker grille
RAU-040		CABINET—Maroon
RBC-001	B2	CELL—Bias cell
RCC-068	C20, 21	CAPACITOR—.05 mf., 120 v., paper
RCC-090	C22	CAPACITOR—.003 mf., 1500 v., paper
RCE-007	C14A, B, C	CAPACITOR—Electrolytic
RCT-034		CAPACITOR—Tuning capacitor
RCW-1060	C19	CAPACITOR—10 mmf., ceramic
RCW-1075	C5	CAPACITOR—4 mmf., ceramic
RDC-032		DRIVE CORD—25 yards
RDK-142		KNOB—Tuning knob
RDK-143		KNOB—Knob volume and switch
RDP-041		ASSEMBLY—Slider and pointer assembly
RDS-075		SCALE—Dial scale
REF-001	F1	FUSE—¼ ampere
REV-001	V1	VIBRATOR—Vibrator unit
REX-001		RECTIFIER—Disc rectifier
RHC-013		HAIRPIN COTTER
RHE-006		EYELET—For handle
RHG-018		GROMMET—Rubber grommet
RHG-019		GROMMET—For battery box
RHI-006		HINGE—Door hinge
RHQ-002		VENT TUBE—For battery
RHS-010		TUBE SHIELD—For 1S5 tube
RHS-018		SHIELD—Spiral shield
RHY-007		HANDLE—Cabinet handle
RJP-014		PLUG—Battery plug
RJP-026		PLUG BUTTON
RJS-091		SOCKET—Tube socket shock mounting
RJS-105		SOCKET—Tube socket
RJS-121		SOCKET—Vibrator socket
RJW-002		HOLDER—Fuse holder
RLB-028	T1	TRANSFORMER—R-F transformer
RLC-078	T6	TRANSFORMER—Oscillator transformer
RLF-014	L3	CHOKE—B + filter choke
RLF-015	L4	CHOKE—A + filter choke
RLI-026	L2	CHOKE—Hash filter choke
RLL-032	L1	LOOP—Antenna loop
RMA-006		ARM—Switch arm
RMC-022		CATCH—Catch for cabinet door
RMC-023		CATCH—Battery box catch
RMC-025		CLAMP—Clamp for bias cell
RML-019		LINK—Link for lever
RML-020		LEVER—Lever for switch control shaft
RML-021		LEVER—Lever for volume control
RMM-082		RUBBER CUSHION—For battery box cover
RMP-017		PIN—Handle retaining pin
RMS-120		SPRING—Drive cord spring
RMS-156		SPRING—For handle
RMU-044		SHAFT—Shaft for switch
RMU-045		SHAFT—Tuning shaft
RMW-027		PULLEY
RMW-077		WINDLASS
RRC-092	R7	VOLUME CONTROL—.5 meg.
RRW-018	R3, 4, 5	RESISTOR—7.5 ohms, wirewound
RSW-060	S1	SWITCH—Power switch
RTL-052	T2	TRANSFORMER—1st I-F transformer
RTL-054	T3	TRANSFORMER—2nd I-F transformer
RTO-003	T5	TRANSFORMER—Charging transformer
RTO-055	T4	TRANSFORMER—Output transformer
RTV-003	T7	TRANSFORMER—Vibrator transformer
RWL-009		POWER CORD

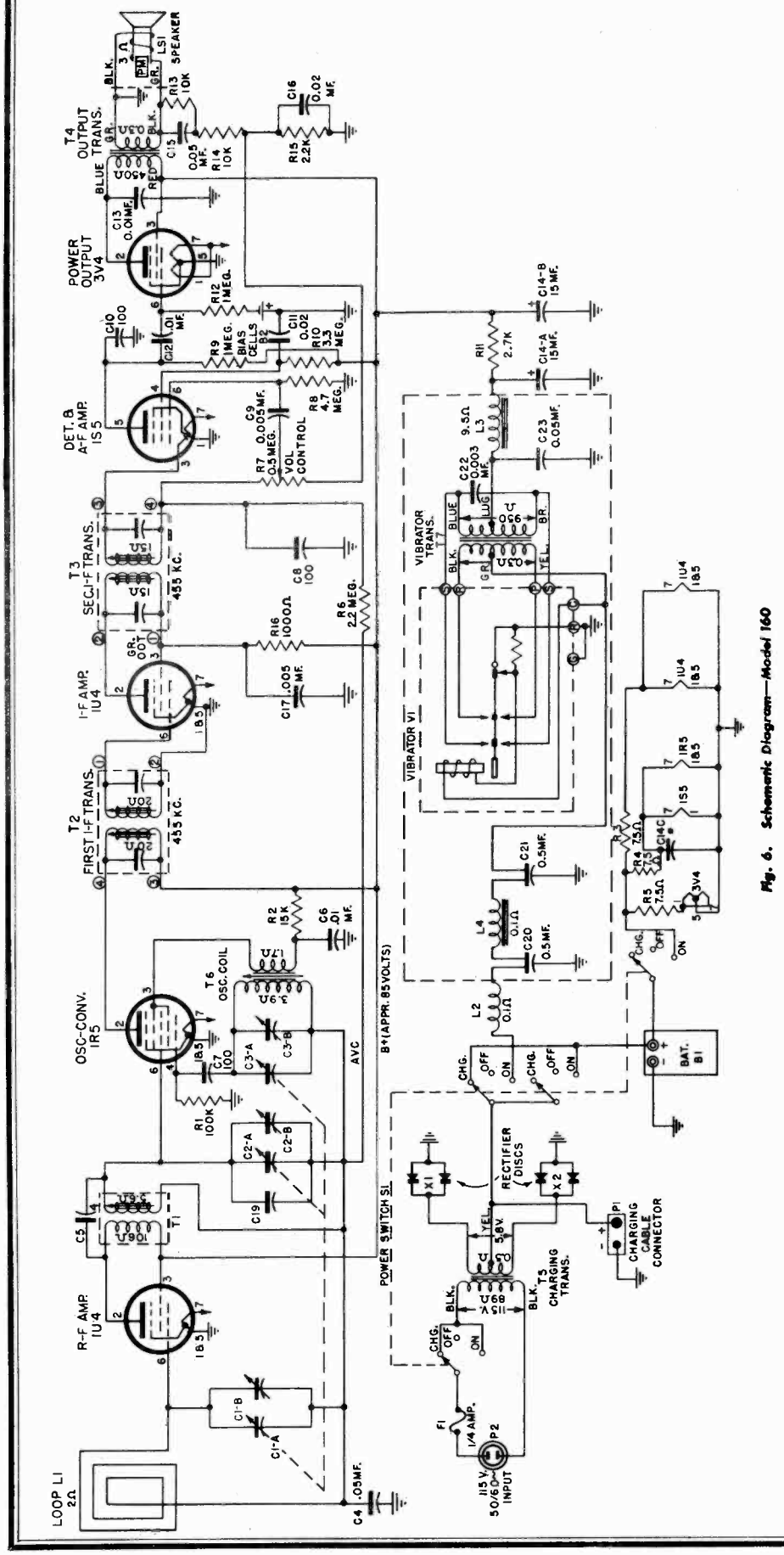


Fig. 6. Schematic Diagram—Model 160

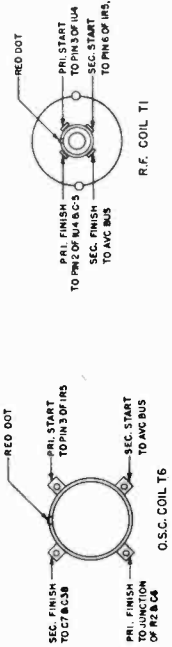


Fig. 7. Coil and Switch Terminal Identification

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:

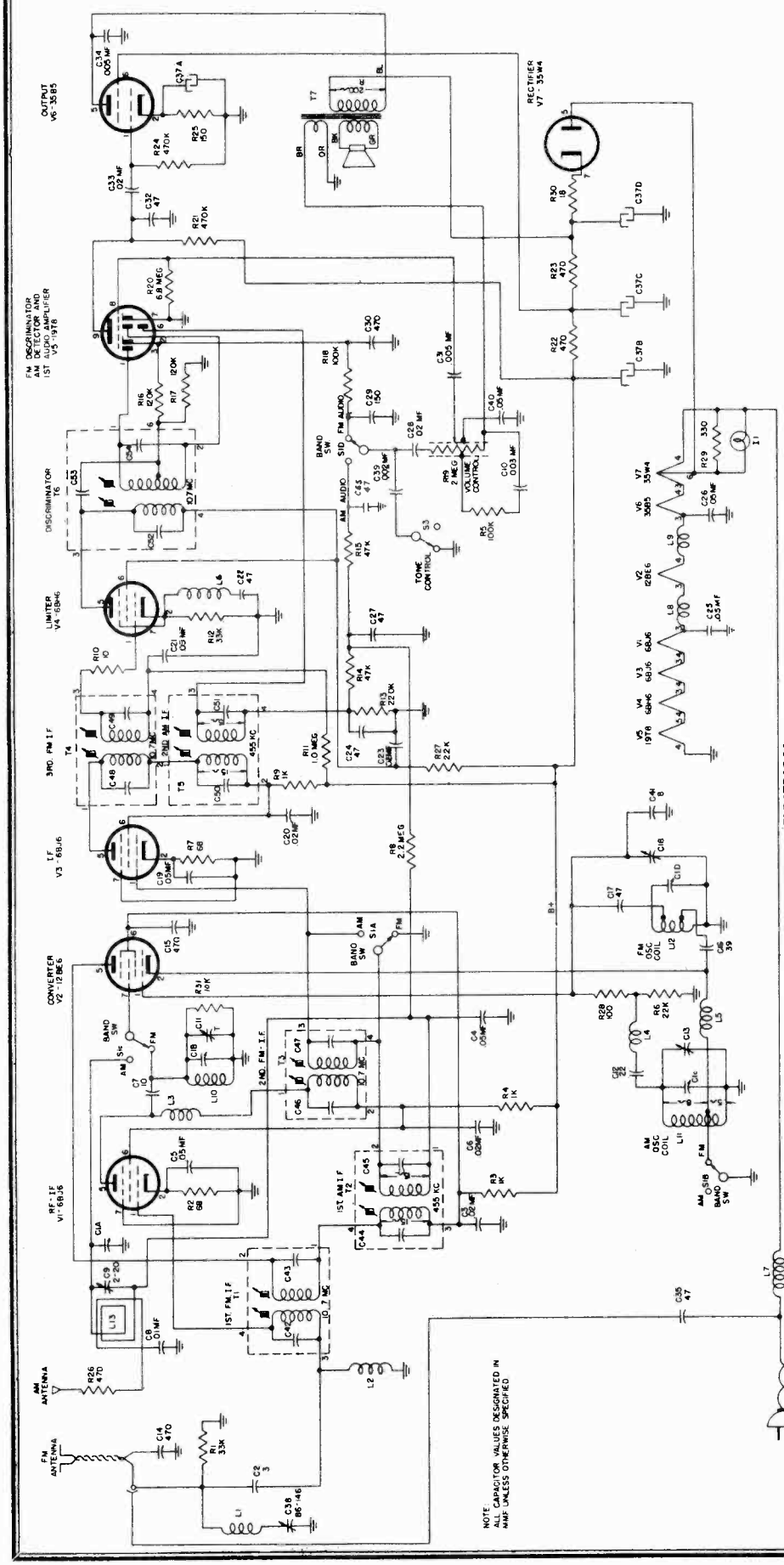
1. Connect vertical plates of scope to the limiter cathode (pin 2 or 7 of V4) through 200,000-ohm resistor and ground. Connect an 8 to 10 mfd. pyranol capacitor between junction of C21 and R11 and ground.
2. Connect vertical plates of scope to junction of R18 and C29 (FM audio).
3. Connect vertical plates 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.

GENERAL ELECTRIC CO.

MODELS 210, 211, 212



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)

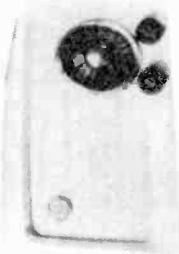
Undistorted ..... 1.1 watts
Maximum ..... 1.8 watts

LOUDSPEAKER:

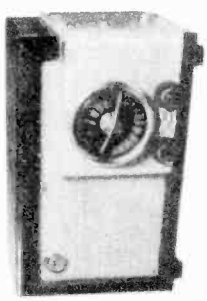
Type ..... "Alnico" permanent magnet
Outside Diameter of Cone ..... 5¼ inches
Voice Coil Impedance at 400 Cycles ..... 3.2 ohms

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.



212—Wood

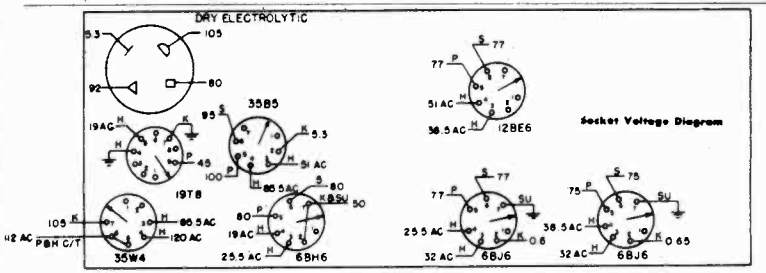


211—Ivory

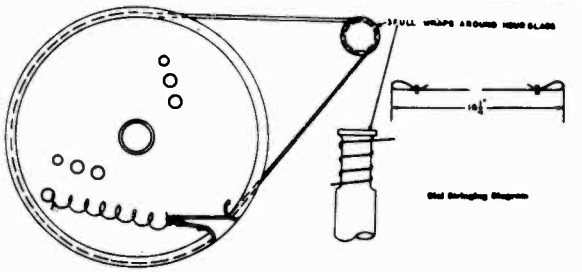
210—Mahogany

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



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

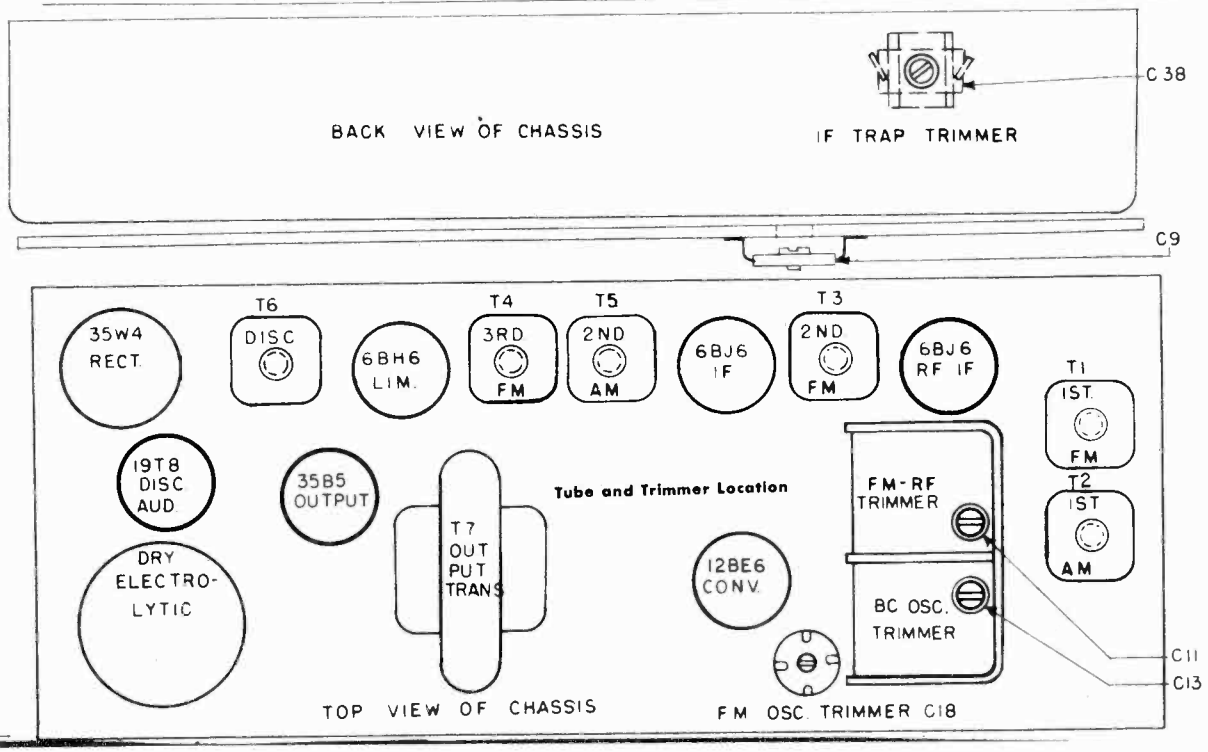


GENERAL ELECTRIC CO.

MODELS 210, 211, 212

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



MODELS 219,220,221

GENERAL ELECTRIC CO.

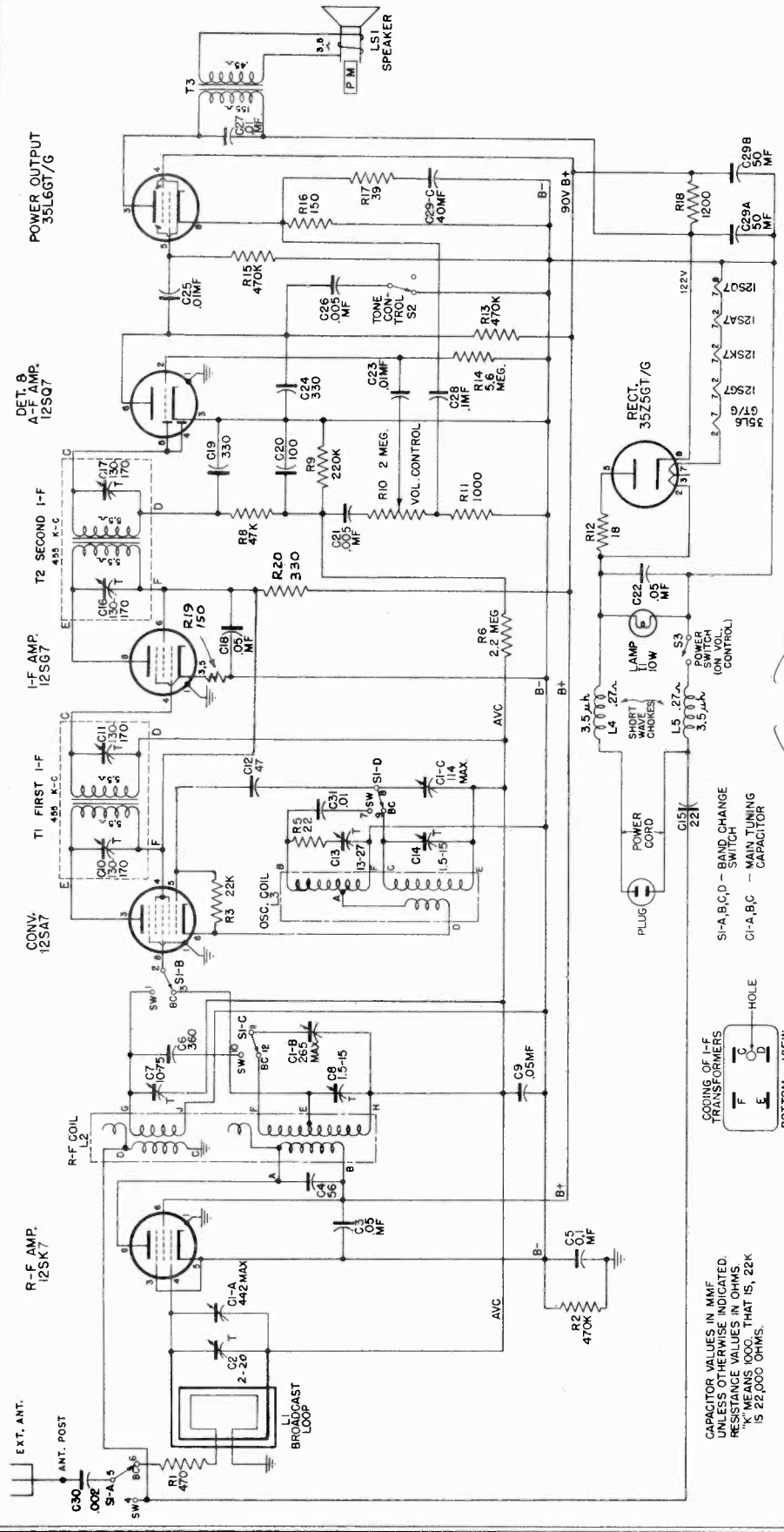


Fig. 7. Identification of Terminals on Band Change Switch S1

Fig. 5. Identification of Terminals on R-F Coil L2

Fig. 6. Identification of Terminals on Oscillator Coil L3

ELECTRICAL RATING (INPUT).

Voltage	105–125 volts, a-c or d-c
Frequency (a-c)	25–60 cps
Wattage	45 watts

ELECTRICAL POWER OUTPUT (120 LINE VOLTS).

Undistorted	1.25 watts
Maximum	2 watts

LOUDSPEAKER.

Type	"Alnico" permanent magnet
Outside cone diameter	5¼"
Voice Coil Impedance (400 cycles)	3.5 ohms

TUNING BAND.

Standard Broadcast	540 KC–1600 KC
Shortwave	6 MC–10 MC

INTERMEDIATE FREQUENCY ..... 455 KC

A few cases of hum which cannot be reduced in the normal manner from these models 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.

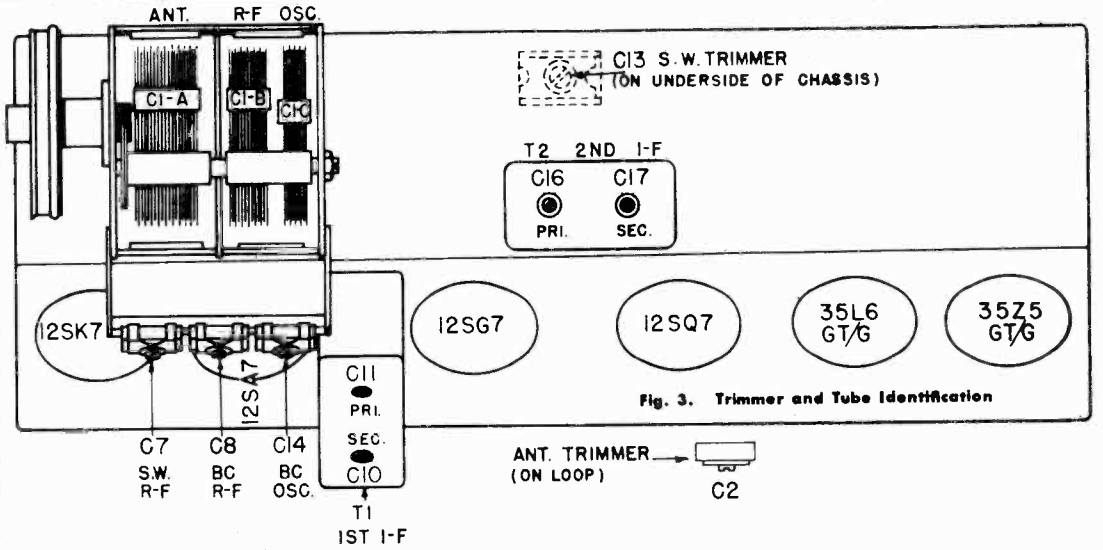


Fig. 3. Trimmer and Tube Identification

ALIGNMENT

Equipment Needed.

Signal Generator, modulated 30% with 400 cycles.
One—60 mmf. capacitor
One—.05 mf. capacitor
One—400-ohm resistor
One—output meter
One—insulated screw driver.

General.

For a complete alignment, the i-f should be aligned before the r-f.

The i-f sections may be aligned with the chassis removed from the cabinet, but for the final r-f alignment the chassis should be in place, in the cabinet.

Fig. 3 identifies and locates all trimmers.

Be sure the radio has been "on" for at least 10 minutes before making any alignment adjustments.

In order to be sure of frequency stability in the signal generator, follow the manufacturer's recommended procedure for use.

When making connections to the signal generator, avoid any ground connections to the radio unless an isolation transformer is used in the power line.

I-F Alignment.

1. Remove chassis from cabinet.
2. Connect output meter across the speaker voice coil.
3. Set volume control for maximum.
4. Connect output terminal of signal generator through a .05 mf. capacitor to pin 4 of the 12SG7 (i-f amplifier) tube.
5. Set signal generator frequency to 455 kc.
6. Set dial pointer on radio to approximately 1500 kc.
7. Peak second i-f trimmers, C16 and C17, for maximum output.
8. It is important to keep the output reading under 1¼ volts by reducing the input or gain control so as to avoid spurious results due to a.v.c. action.
9. Disconnect signal generator from 12SG7 and connect (through .05 mf. capacitor) to pin eight of the 12SA7 converter.
10. Keeping output below 1¼ volts as before, peak the first i-f trimmers, C10 and C11, for maximum output.
11. Check second and first i-f trimmer adjustments.

Broadcast R-F Alignment.

When making the following alignment, the Beam-a-Scope (loop antenna) must be mounted to the chassis, and the chassis must be installed in the cabinet. All trimmer adjusting screws are available through the hole in the loop antenna frame.

1. Connect the output of the signal generator through a 60 mmf. capacitor, to the radio antenna post.
2. Set the signal generator and dial pointer to 1500 kc.
3. Adjust C14, C8, and C2 for maximum output. If two peaks are obtained when adjusting C14, the correct point is the one with the trimmer plates the furthest apart.

Shortwave R-F Alignment.

1. Set Band Change switch to SW position.
2. Set dial pointer and signal generator to 9.5 mc.
3. Remove chassis carefully, so as not to disturb the setting of the dial pointer.
4. Connect the output of the signal generator through a .05 mf. capacitor to pin eight of the 12SA7 converter tube.
5. Adjust C13 (under the chassis) for maximum output. Two points of maximum output may be obtained. The correct point is the one with the trimmer plates closest together.
6. Remove the signal generator connection, and connect its output through a 400-ohm resistor to the radio antenna post. Peak C7 for maximum output while rocking-in the main tuning condenser.
7. Replace the chassis in the cabinet, and check the setting of C7.

ANTENNA.

Broadcast Reception—Built in "Beam-a-Scope" loop antenna.

Shortwave Reception—Power cord used as antenna. An external antenna is recommended for improvement of long-distance reception.

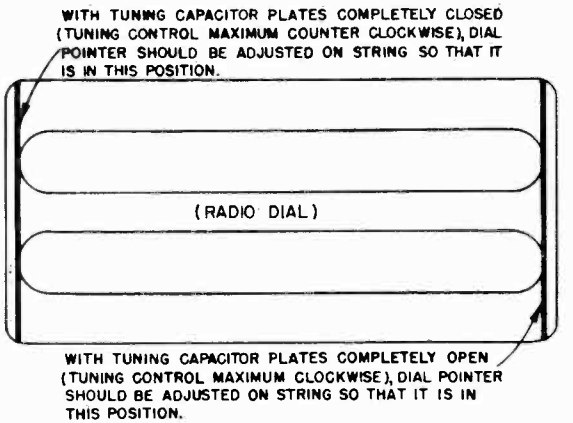


Fig. 1. Alignment of Dial Pointer on String

Alignment of Dial Pointer and String.

The extreme left and right positions of the dial pointer should be in accordance with Fig. 1. This adjustment should be checked before proceeding with the r-f alignment.

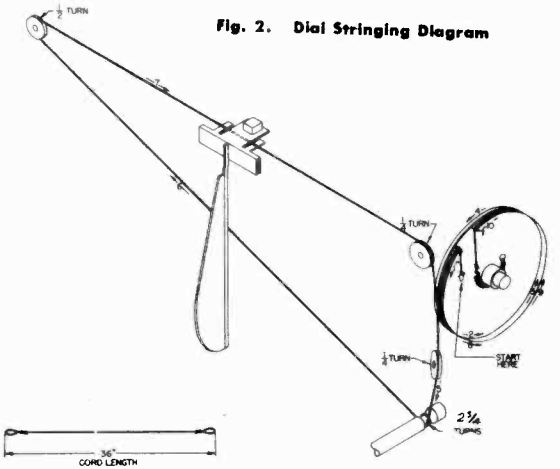


Fig. 2. Dial Stringing Diagram

STAGE GAINS AND VOLTAGE CHECKS

The following information will be useful to servicemen equipped with vacuum tube voltmeters or similar voltage measuring instruments. The stage gain values listed may have a tolerance of 20%.

Stage Gains.

(1) Antenna terminal* to pin 4 of 12SK7 . . . 4 @ 1000 kc
(2) Pin 4 of 12SK7† to pin 8 of 12SA7 . . . . . 10 @ 1000 kc
(3) Pin 8 of 12SA7† to pin 4 of 12SG7 . . . . . 35 @ 455 kc
(4) Pin 4 of 12SG7† to pins 4 or 5 of 12SQ7 . . . . . 100 @ 455 kc

* Connect to signal generator output through a 60 mmf. capacitor.
† Connect to signal generator output through a .05 mf. capacitor.

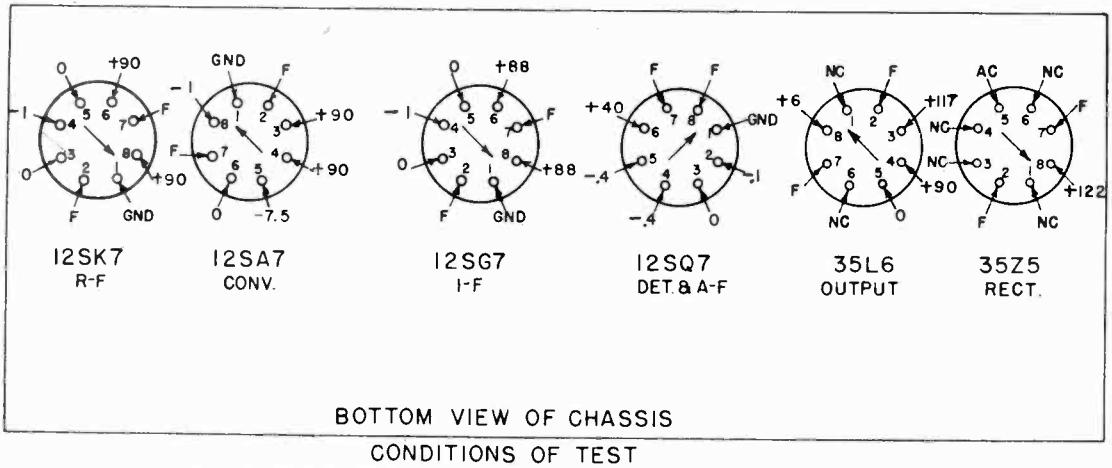
In all measurements, the readings should be kept as low as possible by reducing the signal generator gain control so as to avoid a.v.c. action.

Audio Gain.

0.06 volt at 400 cycles across the volume control (R10), with the control set at maximum, will give approximately 0.5 watt output (1.32 volts) across the speaker voice coil.

Oscillator Grid Voltage.

The d-c voltage developed across the grid leak R3 (22,000 ohms) averages 7.7 volts at 1000 kc. This should be measured with a vacuum tube voltmeter. (The grid current, measured with an ammeter in series with pin 6 of the 12SA7 tube, should be in the order of 350 microamps.)



BOTTOM VIEW OF CHASSIS

CONDITIONS OF TEST

ALL MEASUREMENTS D-C
MEASUREMENTS MADE TO B- BUS
MEASUREMENTS MADE WITH 20,000 OHM/VOLT METER

LINE VOLTAGE 117 VOLTS
VOL. CONTROL MAX. CLOCKWISE
NC - NOT CONNECTED
F - FILAMENT

PART NO.	SYMBOL	DESCRIPTION
UNIVERSAL G-E REPLACEMENT PARTS		
UCC-036	C30	Capacitor—.002 mf, 600 V., paper
UCC-039	C21	Capacitor—.005 mf, 600 V., paper
UCC-040	C23, C25, C27, C31	Capacitor—.01 mf, 600 V., paper
UCC-045	C3, C9, C18, C22	Capacitor—.05 mf, 600 V., paper
UDL-018	11	Lamp—110 125 V., 10 W.
URD-009	R5	Resistor—22 ohm, ½ watt, carbon
URD-015	R17	Resistor—39 ohm, ½ watt, carbon
URD-029	R16, R19	Resistor—150 ohm, ½ watt, carbon
URD-041	R1, R7	Resistor—470 ohm, ½ watt, carbon
URD-049	R11	Resistor—1000 ohm, ½ watt, carbon
URD-081	R3	Resistor—22,000 ohm, ½ watt, carbon
URD-089	R8	Resistor—47,000 ohm, ½ watt, carbon
URD-105	R9	Resistor—220,000 ohm, ½ watt, carbon
URD-113	R2, R13, R15	Resistor—470,000 ohm, ½ watt, carbon
URD-129	R6	Resistor—2.2 meg., ½ watt, carbon
URD-139	R14	Resistor—5.6 meg., ½ watt, carbon
URE-007	R12	Resistor—18 ohm, 1 watt, carbon
URF-051	R18	Resistor—1200 ohm, 2 watt, carbon
SPECIALIZED G-E REPLACEMENT PARTS		
RAA-003	—	Switch arm, with set screw, for Band Change and Tone Control switches—switch half
RAA-004	—	Switch arm, with set screw, for Band Change and Tone Control switches—flipper half
RAB-005	—	Cabinet back, for Model 220
RAB-006	—	Cabinet back, for Model 221
RAB-007	—	Cabinet back, for Model 219
RAD-006	—	Antenna bracket, left side
RAD-007	—	Antenna bracket, right side
RAD-008	—	Baffle bracket—models 219, 220
RAE-001	—	Baffle shield
RAG-001	—	Grille—models 219, 220
RAU-004	—	Cabinet—model 219
RAU-005	—	Cabinet—model 220
RAV-002	—	Cabinet—model 221
RCC-004	C26	Capacitor—.005 mf, 600 V., paper
RCC-040	C23, C25, C27	Capacitor—.01 mf, 600 V., paper
RCC-045	C22	Capacitor—.05 mf, 600 V., paper
RCC-046	C5, C28	Capacitor—0.1 mf, 600 V., paper
RCE-001	C29-A, -B, -C	Capacitor—50-50-40 mf, 150-150-25 V., electrolytic
RCT-004	C1, C7, C8, C14	Capacitor—main tuning capacitor assembly

PART NO.	SYMBOL	DESCRIPTION
SPECIALIZED G-E REPLACEMENT PARTS (Cont'd)		
RCU-053	C4	Capacitor—56 mmf, mica
RCU-108	C15	Capacitor—22 mmf, mica
RCU-110	C12	Capacitor—47 mmf, mica
RCU-112	C20	Capacitor—100 mmf, mica
RCU-115	C19, C24	Capacitor—330 mmf, mica
RCU-164	C6	Capacitor—360 mmf, mica
RCY-002	C2	Capacitor—trimmer—1.5-15 mmf
RCY-003	C13	Capacitor—trimmer—13-27 mmf
RDE-004	—	Escutcheon—model 221
RDF-002	—	Felt washer, smaller, under round knobs—models 220, 221
RDF-004	—	Felt washer, larger, under flipper knobs—models 220, 221
RDK-003	—	Knob, round—model 220
RDK-005	—	Knob, flipper—model 220
RDK-008	—	Knob, round—model 219
RDK-009	—	Knob, round—model 221
RDK-010	—	Knob, flipper—model 221
RDK-011	—	Knob, flipper—model 219
RDP-004	—	Pointer assembly
RDS-005	—	Dial scale assembly
RDX-005	—	Dial parts—back plate and bracket assembly
RDX-006	—	Shaft, hair pin cotter, and drive shaft bracket
RDX-007	—	Cord—for dial pointer
RHG-001	—	Grommet—cushion used for mounting tuning capacitor
RHU-002	—	Spacer—for RHG-001
RHX-001	—	Chassis mounting bolt and washer
RIT-001	—	Cover for electrolytic capacitor
RJS-003	—	Tube socket—octal
RJS-004	—	Socket for electrolytic capacitor
RJS-010	—	Socket—dial light
RLB-001	L2	Coil—RF
RLC-003	L3	Coil—oscillator
RLI-001	L4, L5	Coil—power cord choke
RLL-003	L1	Loop Assembly
RMS-001	—	Spring—on dial string drum
ROP-005	LS1	Speaker—5¼ in. PM
RRC-004	R10	Volume Control—2 meg.
RSW-004	S2	Switch—Tone Control
RSW-005	S1	Switch—Band Change
RTL-001	T1	I-F Transformer assembly
RTL-002	T2	I-F Transformer assembly
RTO-003	T3	Transformer—output
RWL-003	—	Power cord

URD-037 R20 RESISTOR--330 ohms 1/2 w., carbon

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.

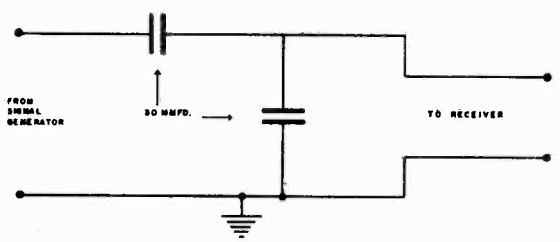
ALIGNMENT CHART, TABLE I

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.

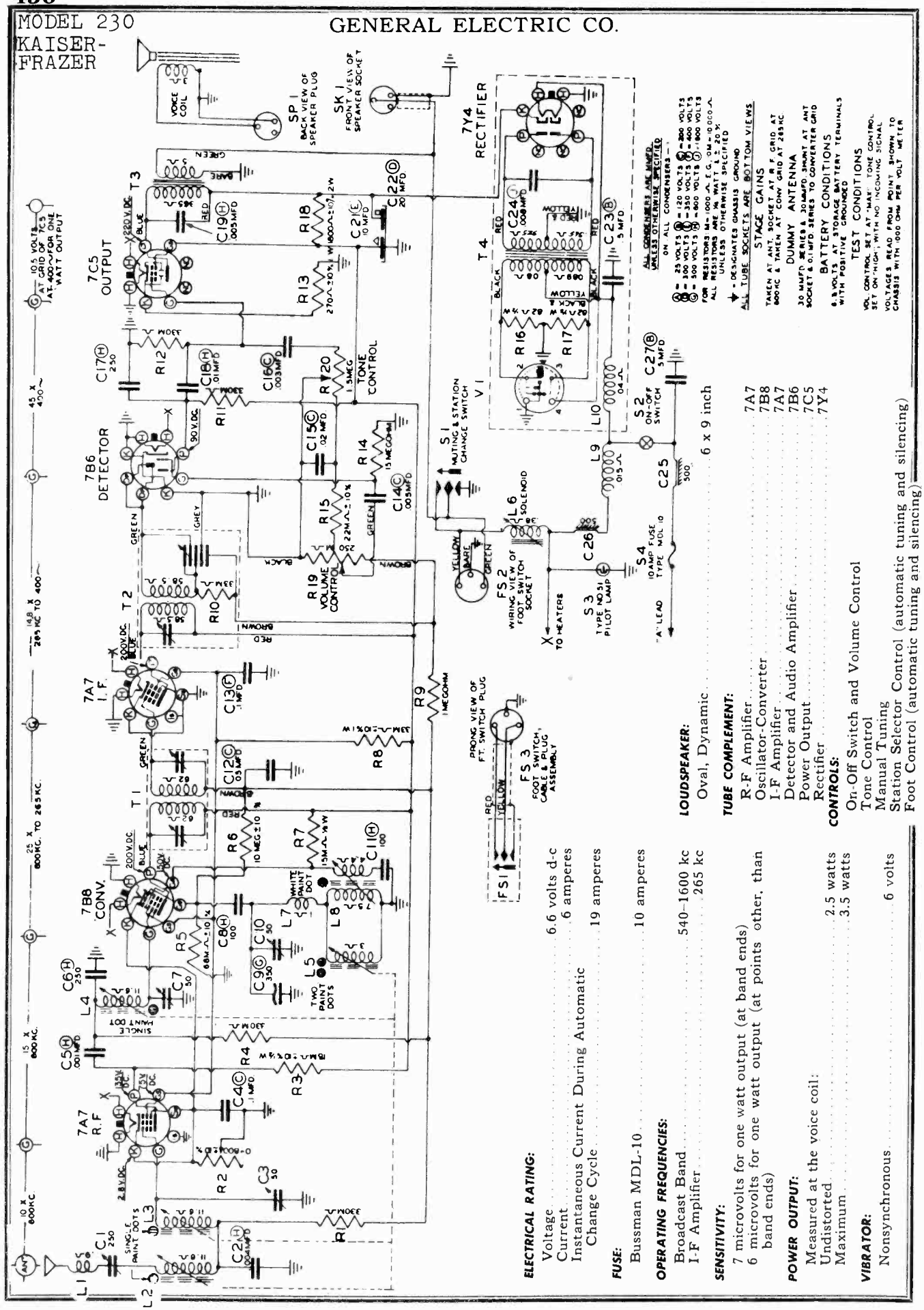
PERMEABILITY TUNING UNIT

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.



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)

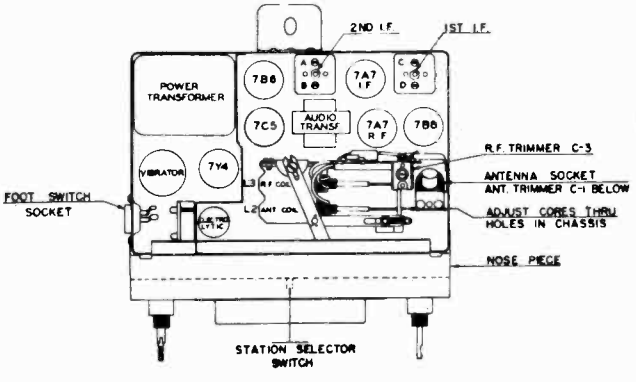
GENERAL ELECTRIC CO.

MODEL 230
KAISER-FRAZER

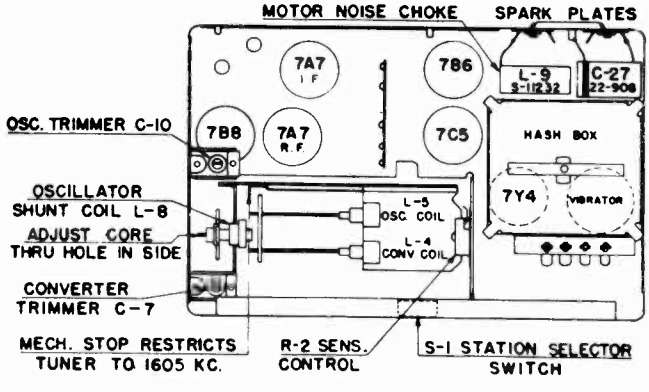
Cat. No.	Symbol	Description
DIAL AND TUNING MECHANISM ASSEMBLY		
RDB-012		BUTTON—Station selector button (Kaiser)
RDE-025		ESCUTCHEON—Dial scale escutcheon
RDM-002		FLAG—Indicator flag and window assembly (Frazer)
RDM-003		FLAG—Indicator flag and window assembly (Kaiser)
RDP-030		POINTER—Dial pointer 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—0.1 mfd., 200 v., paper
UCC-016	C23, 27	CAPACITOR—0.5 mfd., 120 v., paper
UCC-030	C13	CAPACITOR—0.1 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

MODEL 233
KAISER-FRAZER

GENERAL ELECTRIC CO.

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

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

Cat. No.	Symbol	Description
SPECIALIZED REPLACEMENT PARTS (Cont'd)		
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.

GENERAL ELECTRIC CO. MODEL 233
KAISER-FRAZER

SPECIFICATIONS

CABINET:

Material	Steel
Height	5¼ inches
Depth	13 1/16 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 dial lights are also controlled by the Instrument Panel Control. To illuminate radio dial scale at night, the control, which also controls the brilliance of the dial lights and auto instrument panel lights to various degrees, must be advanced as desired.

MANUAL TUNING

Manual tuning is accomplished by rotating the Tuning Control knob, which drives the tuning mechanism and dial pointer through a reduction drive to the desired station frequency as indicated by the pointer on the dial scale. The dial is marked in numbers to which a zero must be added to correspond to the frequency numbers of the stations, as listed in radio program schedules. Accurate tuning of the station is necessary for optimum quality of reproduction.

PUSHBUTTON TUNING

Instantaneous tuning of any one of the six preselected stations may be accomplished by fully depressing the pushbutton for the desired station. After depressing the pushbutton, the radio will become tuned to the selected station and the pushbutton will return to its normal position upon release.

TONE CONTROL

The Tone Control knob is located directly behind the Volume Control knob. Rotating the control to the right or left will change the tone of receiver reproduction. Turning the control to the right will emphasize the treble tones, while turning it to the left will emphasize the bass tones. The treble position is useful in overcoming wind noise, etc., when driving; while the bass position brings out the full mellow tones of musical programs. With the tone control set midway, the full tonal range is obtained.

PUSHBUTTON TUNING ADJUSTMENTS

There are six pushbutton positions which are available for setting up six desired stations for instantaneous tuning. Proceed to adjust as follows:

1. Release the retaining spring beneath the bottom surface of the pearl-colored pushbutton cover by pushing it to the left with the finger tip. The cover is now free and may be removed from its shaft, exposing the knurled adjustment screw.

2. With the fingers, loosen the long screw, by a few turns of its knurled head, in the counterclockwise direction.

3. Tune in the desired station for pushbutton tuning by operating the Manual Tuning Control knob. Accurate tuning of the station is necessary for optimum quality of reproduction.

4. Depress the exposed pushbutton plunger screw fully and then release and immediately tighten screw in a clockwise direction.

5. Replace the pearl-colored pushbutton cover with the spring on the under surface of the cover, by merely slipping it over the exposed pushbutton mechanism until the spring cover lock automatically snaps in place.

The five steps above complete the procedure for adjustment of one pushbutton-controlled preselected station. Repeat the procedure for each of the remaining pushbutton positions or any one pushbutton position which may be changed to a new station setting when so desired. Any pushbutton may be set up or operated on any station without regard to frequency or sequence.

RADIO INSTALLATION

Reference is made to the Installation Details shown in Figures 1 and 2. The necessary mounting hardware for radio installation and, also, the radio control knobs and interference elimination components are found packaged in a cardboard box inside the radio shipping carton. The step-by-step procedure for installation is given as follows:

1. Install the antenna. Complete instructions are packed with each antenna kit. Dress the antenna lead-in cable up and over the auto instrument panel wires to the center of the instrument panel.

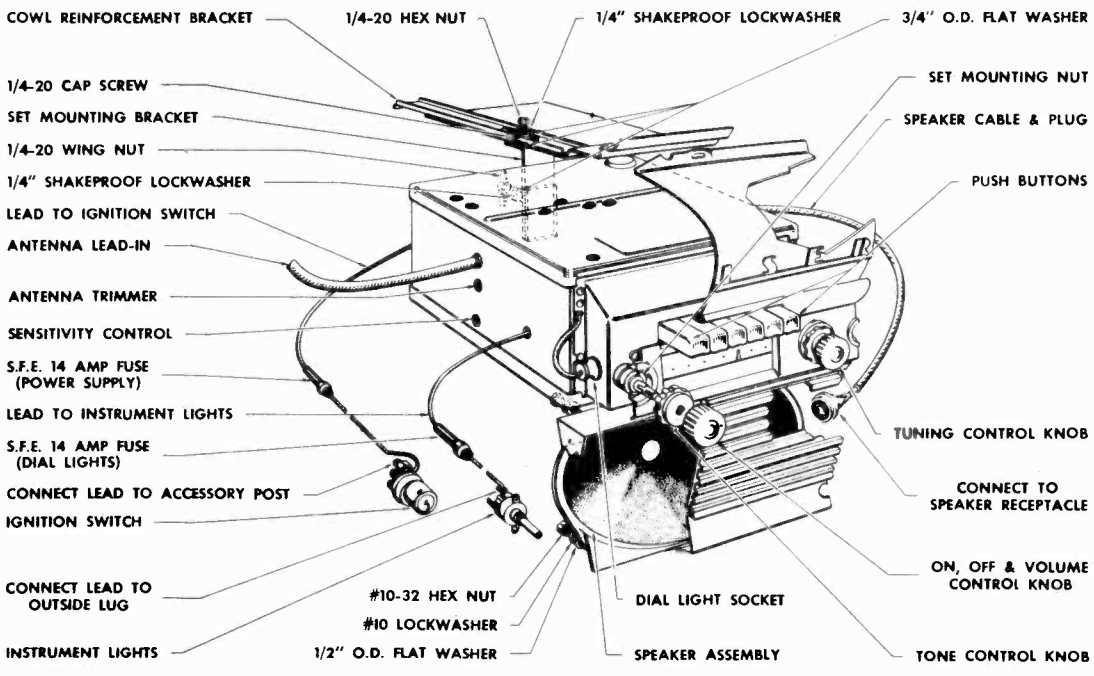


Fig. 1. Installation Details, Kaiser

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.

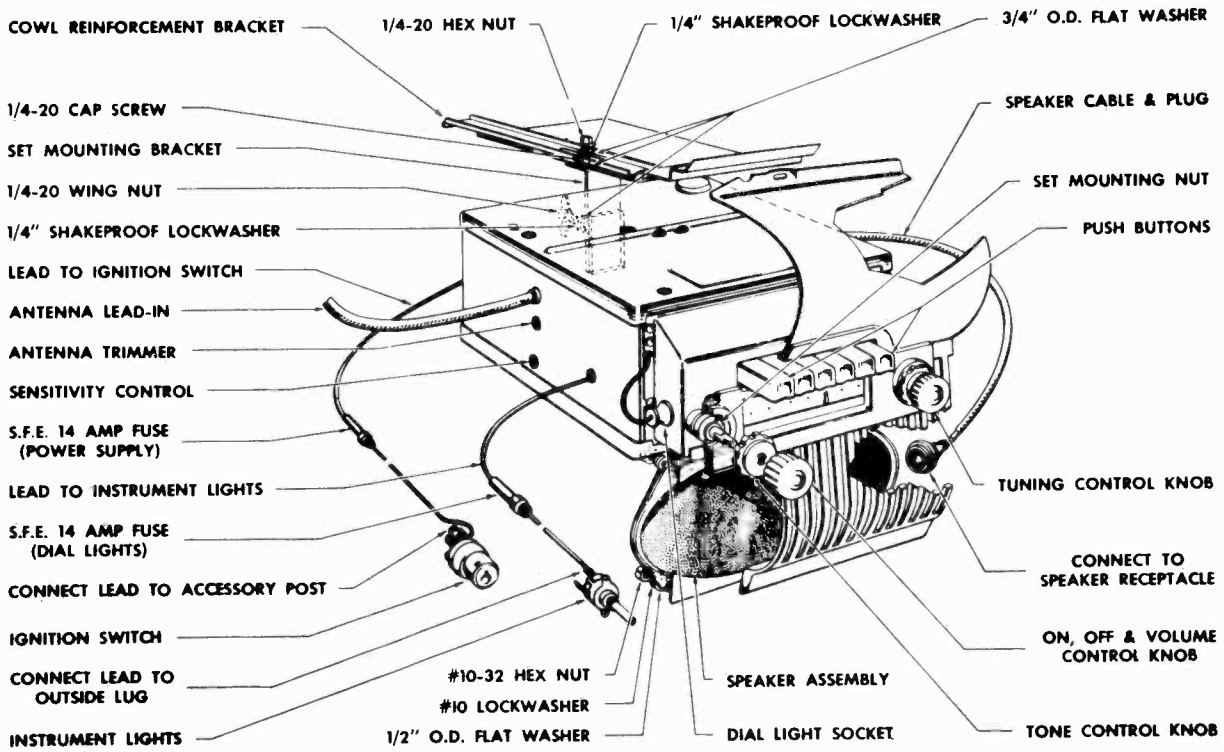


Fig. 2. Installation Details, Frazer

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 4) 6SK7 (V3) I-F	265 kc	*1605 kc	2nd I-F, T2, Trimmers C35 and C34
2	†Grid (Pin 6) 7B8 (V2) conv.	265 kc	*1605 kc	1st I-F, T1, Trimmer C33 and C32
3	Repeat Steps 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 cores fully withdrawn from tuner.

NOTES IN CONNECTION WITH ALIGNMENT TABLE I

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.

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.

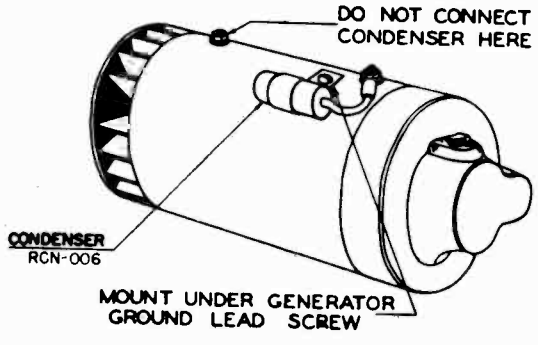


Fig. 5. Generator Noise Condenser

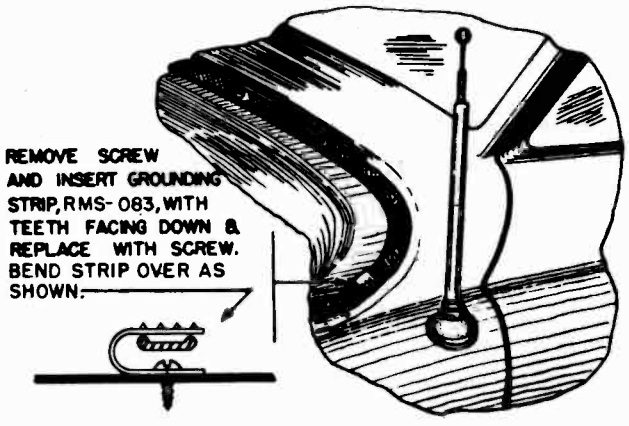


Fig. 6. Hood Bonding

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.

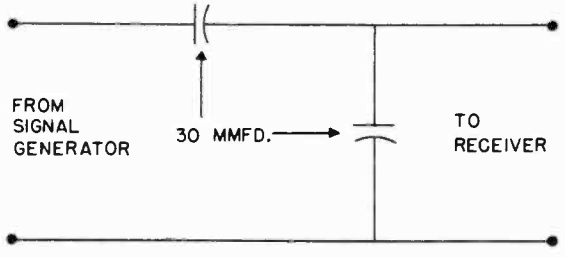


Fig. 7. Dummy Antenna

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.

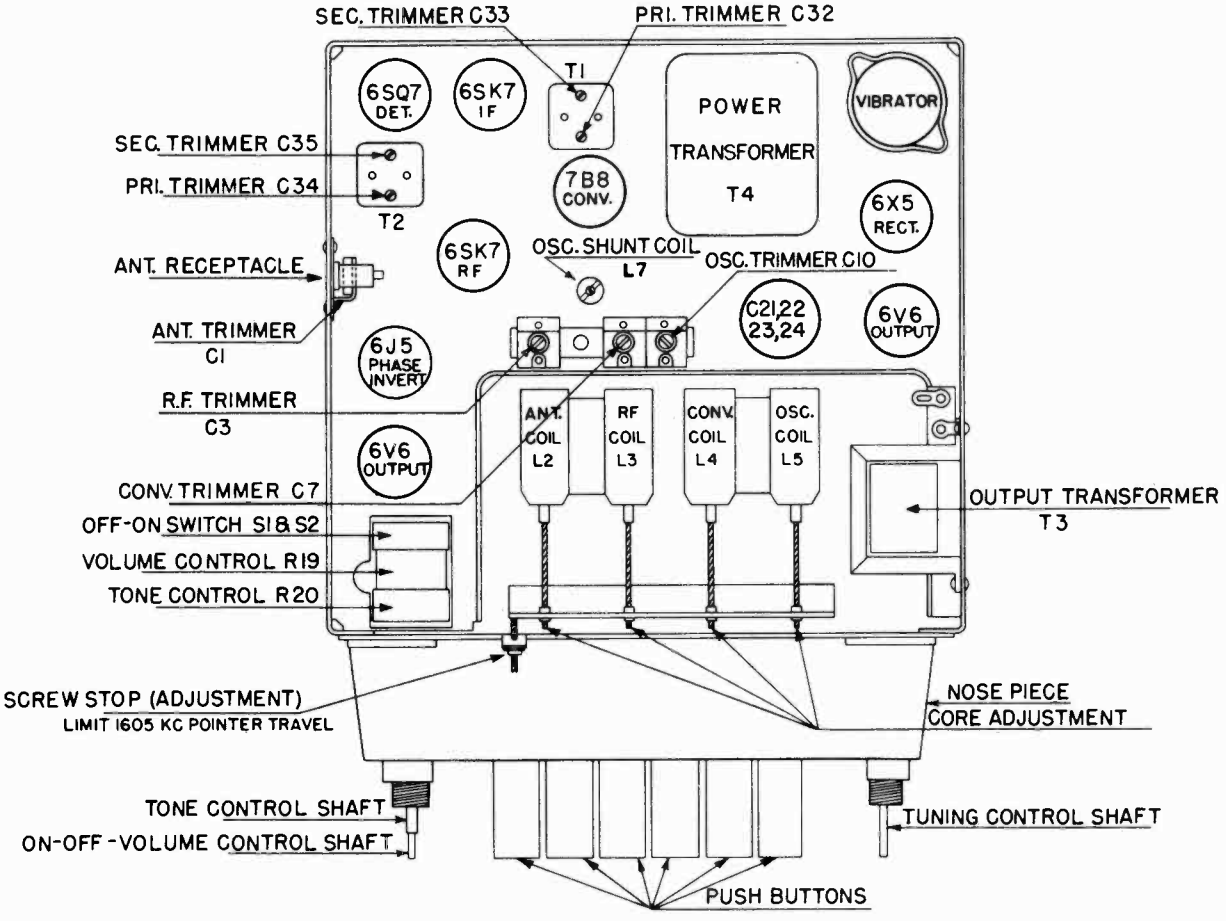


Fig. 8. Top View of Chassis

MODEL 233
KAISER-FRAZER

GENERAL ELECTRIC CO.

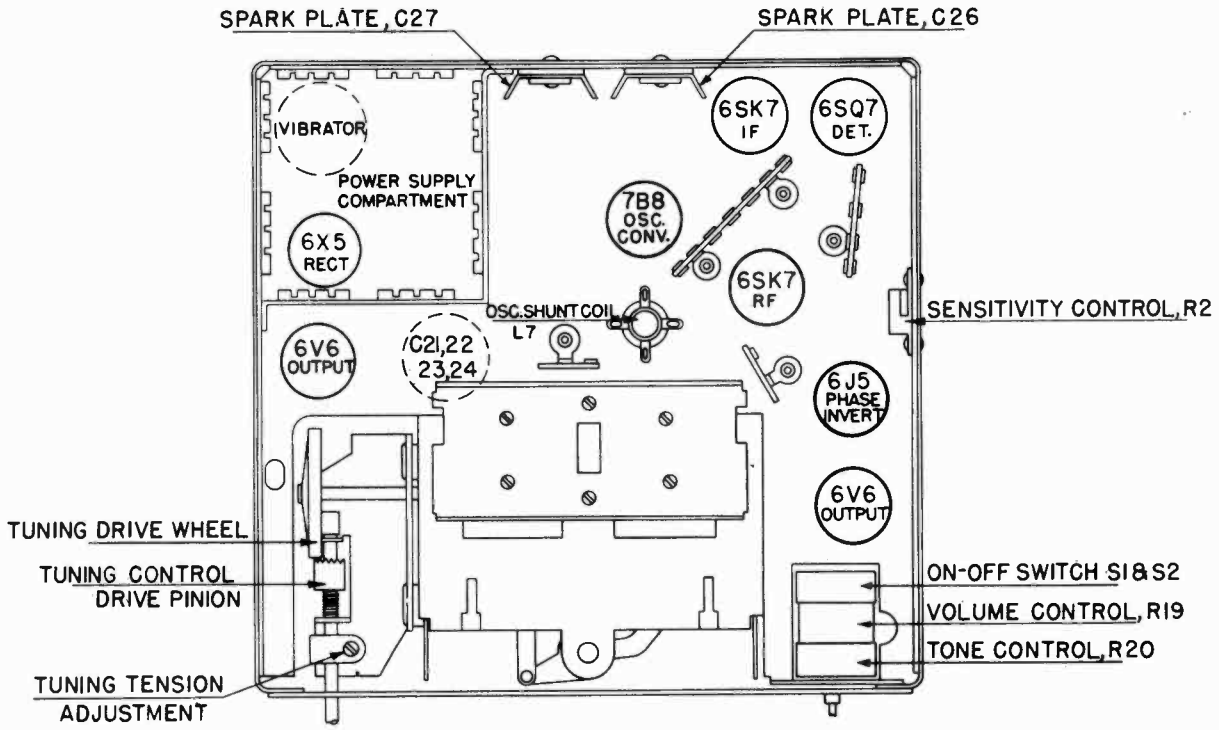
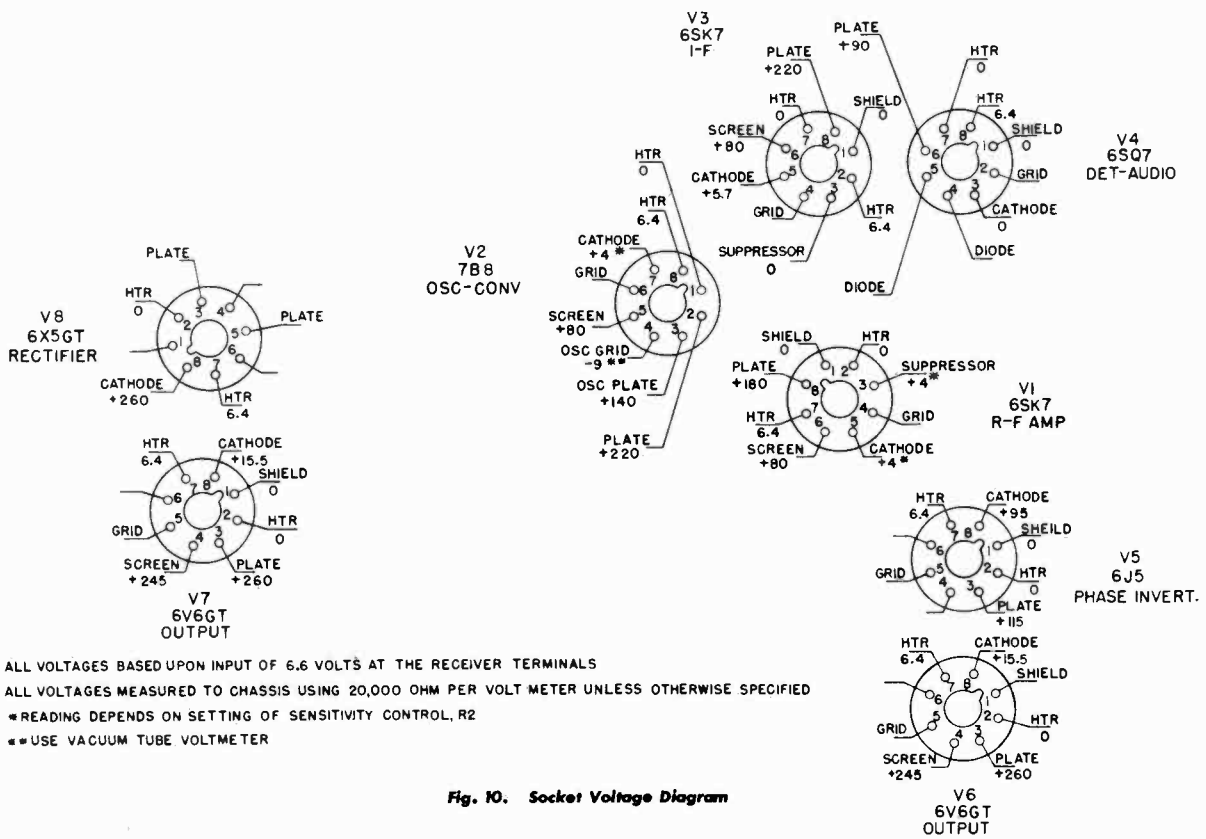


Fig. 9. Bottom View of Chassis



ALL VOLTAGES BASED UPON INPUT OF 6.6 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

GENERAL ELECTRIC CO. MODEL 233
KAISER-FRAZER

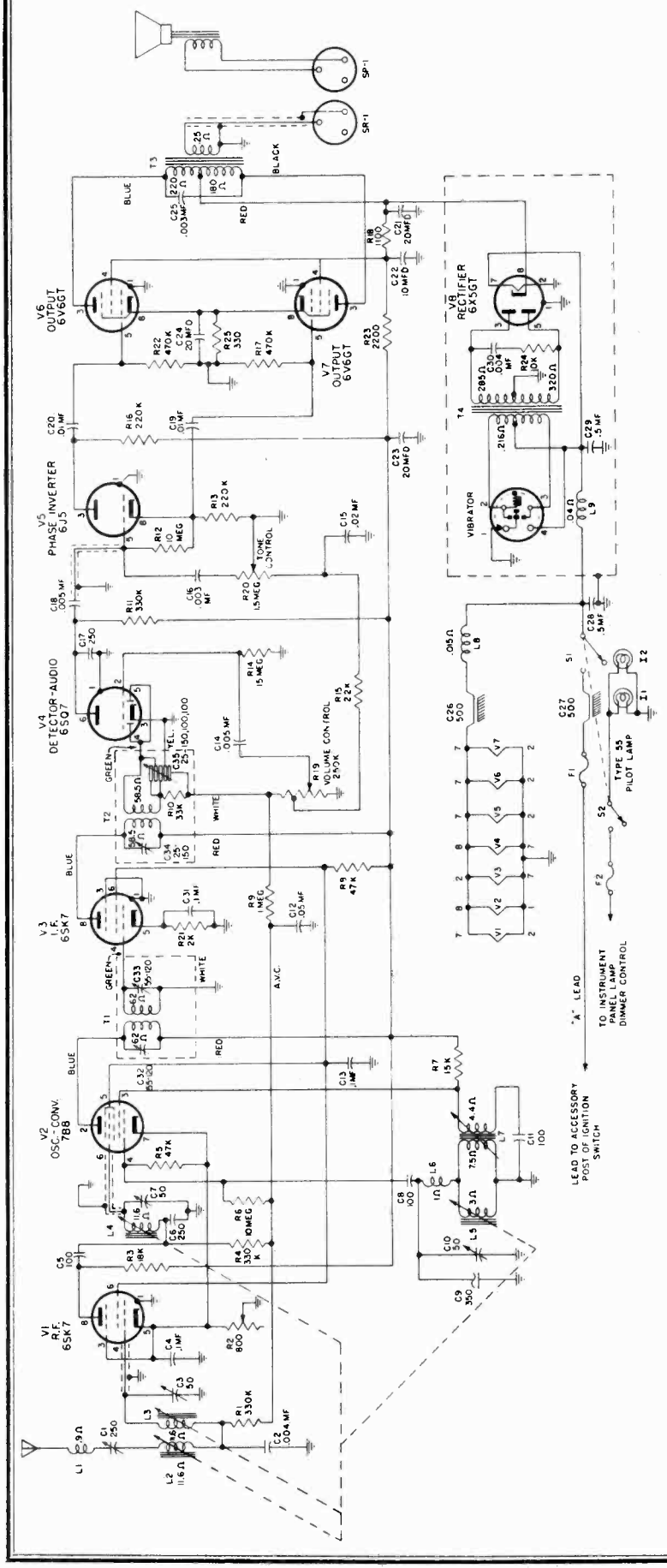


Fig. 11. Schematic Diagram

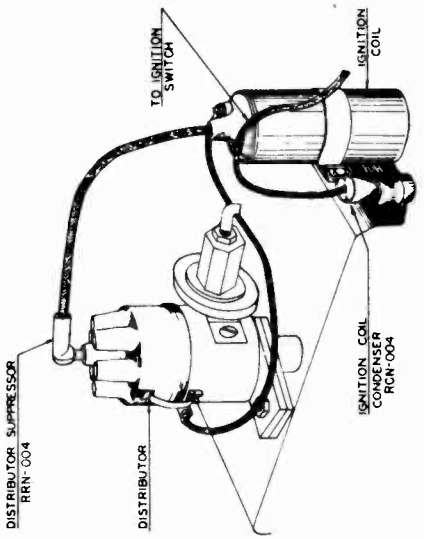


Fig. 4. Distributor and Ignition Coil Suppression

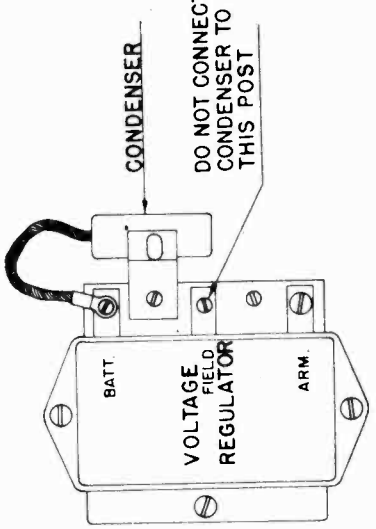
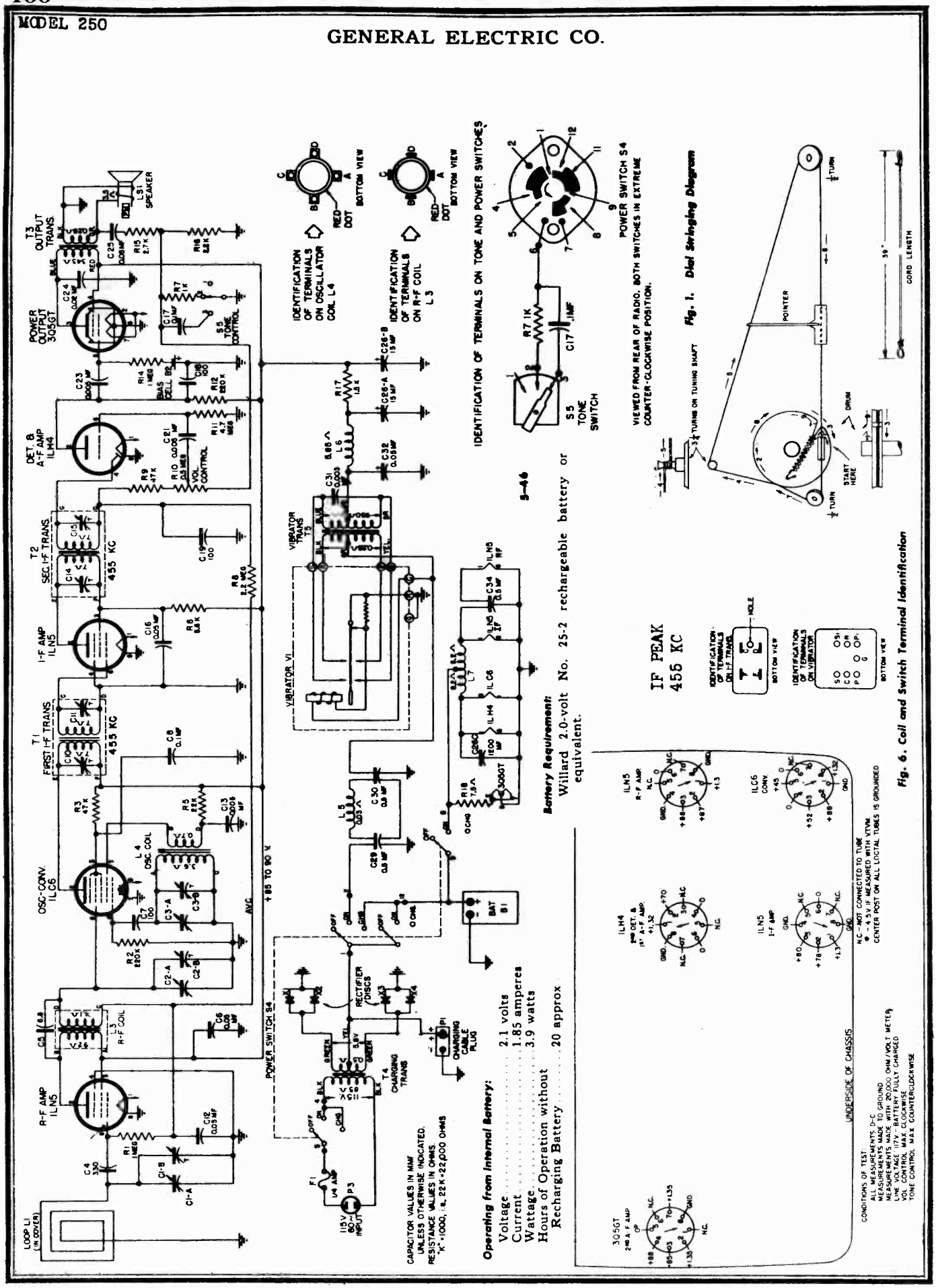


Fig. 3. Voltage Regulator Condenser

MODEL 250

GENERAL ELECTRIC CO.



Operating from Internal Battery:

Voltage	2.1 volts
Current	1.85 amperes
Wattage	3.9 watts
Hours of Operation without Recharging Battery	20 approx

Battery Requirement:
Willard 2.0-volt No. 25-2 rechargeable battery or equivalent.

Fig. 1. Dial Swinging Diagram

Fig. 6. Coil and Switch Terminal Identification

GENERAL ELECTRIC CO.

MODEL 250 ----- Battery Filler Cap.

It is important that the battery filler cap be sufficiently tight so that the washer is compressed, otherwise battery acid will leak out and damage the radio. Make sure the washer is replaced when the cap is removed and that possible thread burrs do not prevent the cap from being tightened completely. Use a screwdriver to tighten the cap.

A quantity of Model 250 radios was shipped with the oscillator adjustment plug not locked after alignment. This causes the low frequency calibration to be considerably in error and reduces sensitivity at this end of the band.

Realign the oscillator adjustment (adjacent to 1st IF transformer), L4, then tighten down the lock nut.

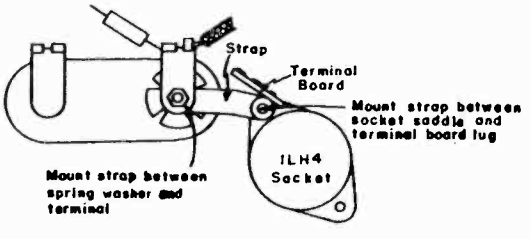
Failure of the vibrator unit REU-001 may be treated in the following manner:

1. The vibrator should be removed from the receiver and a resistance check made with an ohmmeter across terminals C and R.
2. If the resistance checks approximately six ohms and the vibrator will not start, it should be replaced with a new one.
3. If the resistance checks an infinite or high value, the vibrator should be opened up by unsoldering the base from the can. A resistance check should then be made across the terminals of the operating coil, and across the 220 ohm resistor. The operating coil should check approximately six ohms. If the coil is open, the vibrator must be replaced with a new one. If the resistor is open, the resistor should be replaced.
4. If the resistance across terminals C and R checks approximately 220 ohms, the starting contacts that short out the 220 ohm resistor do not make contact. This condition may be corrected by opening the vibrator and turning the small adjustment screw on the resistor side of the vibrator very slowly in the clockwise direction until the resistance across terminals C and R reads approximately six ohms. Care should be taken to see that this adjustment screw is not turned beyond the point where contact is made, and the 220 ohm resistor is shorted out.

A few radios were shipped that did not have the IF transformers peaked for maximum sensitivity. For sets with low sensitivity, realign the IF amplifier

When hum is experienced, the following checks should be made in the order of their listing:

1. Check the battery electrolyte level. It should be maintained at the recommended level.
2. A battery which is nearly discharged caused an excessive hum level.
3. A dirty or loose negative battery terminal contact causes excessive hum. Remove the battery and clean the terminals. Also, clean the negative prong located in the battery compartment, with fine emery; spread the battery spring contacts; and install a rubber insert, V61J551, up through the center of the split spring contacts. Early production radios did not have the rubber insert so that the normal handling causes these spring contacts to be compressed resulting in a high resistance connection. For those receivers not equipped, write your requirements to the Technical Service Section in Bridgeport and they will be forwarded immediately. When reinstalling the battery, spread a thin layer of petroleum jelly on the contacts.
4. Where the previous checks do not remedy the trouble, check the spring washer on the opposite end of the negative prong for a good chassis bond. This requires that the front part of receiver case be removed and then install a bonding strap as shown in the illustration. The factory is now installing an auxiliary copper strap made of 3/8" x .010" soft copper strip, fastened between the spring washer and the 1LH4 socket saddle hole as shown in the illustration. Drill out the rivet at the socket saddle and install a bolt and nut to hold it and the socket and terminal board.



In a few remote cases it has been found that the storage battery (25-2) terminals have loosened internally where they are swedged to the plate holder of the battery. This causes low voltage when under load and results in a "dead" or intermittent set. To remedy replace the battery.

GENERAL ELECTRIC CO.

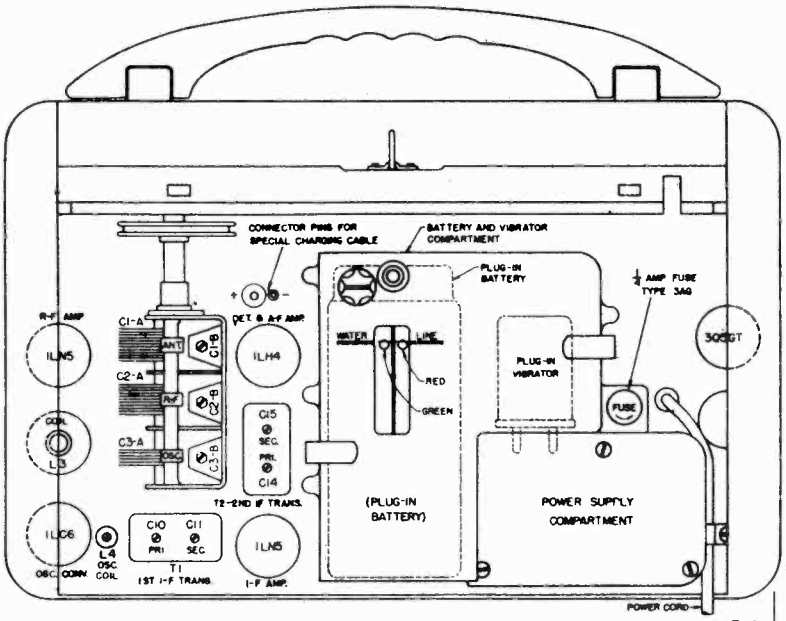


Fig. 3. Tube and Trimmer Location

ELECTRICAL RATING:

Charging from A-c Line:

Voltage	105–125 volts, a-c only
Frequency	50/60 cps
Wattage	10 watts

Fuse:

G-E No. 2548, ¼-ampere rating.

OPERATING FREQUENCIES:

Broadcast Band	540–1600 kc
I-F Amplifier	455 kc

POWER OUTPUT:

Undistorted	248 milliwatts
Maximum	365 milliwatts

LOUDSPEAKER:

Type	Alnico PM
Outside Cone Diameter	5¼ inches
Voice Coil Impedance (400 cps)	3.2 ohms

ALIGNMENT CHART

Turn Tone Control CCW (Treble)

Turn Volume Control CW (Maximum)

Step	Connect Signal Generator to	Signal Generator Setting	Dial Setting	Adjust
1	Stator of C2-A in series with 0.05 mf.	455 kc	Reference Point Below 550 kc (Gang Closed)	2nd i-f (T-2) Trimmers for Max.
2	Stator of C2-A in series with 0.05 mf.	455 kc	Reference Point Below 550 kc (Gang Closed)	1st i-f (T-1) Trimmers for Max.
3	†Inductively Coupled	580 kc	580 kc	*L3 and L4 for Maximum.
4	†Inductively Coupled	1500 kc	1500 kc	**C3-B, C2-B, and C1-B for maximum in sequence given.

† Use loop on output of signal generator.

* Adjust L3 and L4 alternately several times to obtain peak.

** Make all adjustments of C1B, C2B, and C3B with rear cover closed, through the three ports provided on cover. Remove snap buttons for access.

ELECTRICAL CIRCUIT ALIGNMENT

1. *EQUIPMENT REQUIRED.*

1. Signal generator with audio tone modulation.
2. A-c output meter, 1 or 1½ volts full scale, 1000 ohms volt.
3. Insulated screwdriver.

2. *ALIGNMENT PROCEDURE.*

1. *General.*—The alignment procedure is given in table form for convenience. Reference is made to Fig. 3 for the trimmer locations. The low side of the signal generator should be connected to the chassis of the receiver for i-f alignment; the high side should be connected as indicated in the Alignment Chart. A meter or some other suitable indicating device must be connected to the output of the receiver. Two methods for connecting an output meter are given in later paragraphs.

When aligning the receiver, the Volume Control on the receiver should be turned to its maximum position (clockwise), and the Tone Control should be turned to the position of maximum treble (extreme counterclockwise). The output signal of the signal generator should be kept as low as possible at all times; the reading of a meter connected across the voice coil leads of the receiver should be kept below ½ volt by changing the signal generator output. If the signal level is too high, the AVC becomes effective and alignment errors may result.

The following paragraphs give greater details regarding the connection of the output meter and the signal generator to the receiver during alignment.

2. *Connecting the Output Meter.*—In aligning the receiver, some means for indicating differences in the output voltage will be required. Either of the following methods is satisfactory. The first requires more disassembly of the receiver case than the second, but the second requires additional test equipment.

Method 1.—A satisfactory method for indicating differences in output is to connect a rectifier-type a-c meter of 1 or 1½ volts full scale deflection across the speaker voice coil terminals. To gain access to the speaker, remove the front panel from the radio as previously described. A short green lead will be found connected to one terminal of the speaker. This may be pushed through one of the holes in the chassis so that it will be accessible from the back of the radio. The front panel is reinstalled in place so that the stray capacities in the set will be the same as when the set is operating normally. Connect the meter between this lead and ground. A convenient ground connection is to remove the tone control knob and use a clip lead to the shaft.

Method 2.—The following is an alternate method which eliminates the necessity of removing the front panel of the set, but which requires additional test equipment. Make an indicating device by connecting a 4- to 6-inch diameter magnetic speaker or the high-impedance leads from the output transformer of a good p m dynamic speaker to the terminals of a rectifier-type microammeter with a full scale deflection of 100 microamperes or less. For convenience, the meter and speaker may be mounted in a small box in such a way that the meter will be visible when the speaker is placed in front of the speaker on the receiver being aligned.

To use this device, place its speaker in front of and about an inch away from the speaker of the receiver being aligned. The meter will then deflect in proportion to the intensity of the sound produced by the speaker, and therefore may be used as an output meter. The meter must not be moved during alignment.

3. *Connecting the Signal Generator.*—For aligning the i-f transformers, the output of the signal generator should be coupled through a 0.05 mf. capacitor to the grid (pin 6) of the 1LC6 oscillator-converter tube. This may be accomplished easily by connecting the capacitor to the stator of C2-A, the middle section of the tuning gang, as this stator is connected directly to the converter grid. The low side of the signal generator output should be connected to the chassis ground to complete the circuit.

For aligning the oscillator and r-f coils, the r-f signal should be inductively coupled by connecting a three- or four-turn, 6-inch diameter, loop of bell wire across the signal generator output terminals and then locate the loop about one foot from the radio cover, with cover open. To prevent possible errors in peak readings, the position of the loop with respect to the receiver should not be changed during any one set of adjustments.

1. POWER SUPPLY

All power necessary for the operation of the receiver is supplied by the 2-volt built-in rechargeable battery. Power to the 1.4-volt tube filaments is supplied by the battery through suitable voltage dropping resistors. The high voltage for the screens and plates of the tubes is furnished by a synchronous vibrator used in conjunction with a step-up power transformer and its associated filter circuit. The synchronous vibrator operates directly from the battery voltage.

The receiver power is obtained from the battery at all times in the manner just described, whether the power cord is connected to a power source or not. When the power cord is connected to a receptacle supplying from 105 to 125 volts, 50 or 60 cps, a-c, and the power selector is in either the CHARGE or ON position, the power supplied from the line will be used to charge the battery. The CHARGE position on the three-position power selector switch allows the battery to be charged from the house current when the receiver is not operating. The ON position of the switch permits the radio to be operated at the same time that the battery is being charged. Under this condition, the battery floats in the circuit to keep the voltage at its proper voltage and, with high line voltage, the battery may be charged slowly while the radio is operating.

The battery-charging unit consists of a step-down transformer which converts the house current to approximately 5.8 volts center-tapped at 117 volts line, and a full-wave copper-oxide rectifier circuit which supplies the battery with d-c charging current.

A charging cable is available, which provides a convenient means of charging the radio battery from an automobile or 6-volt storage battery. The cable plug is inserted over the two pins provided, see Fig. 3, and the plug and socket on the other end of the cable are connected to a 6-volt supply. Complete installation instructions are provided with each cable.

2. CHARGER CHARACTERISTICS

Testing the operation of the rectifier unit.—A ¼-ampere fuse is used in series with the primary of the charger transformer. If the battery does not show any signs of becoming charged after a reasonable length of time, check the fuse. If it is necessary to replace the fuse, use a ¼-ampere, Type 3AG fuse.

If one or more of the copper-oxide discs of the rectifier unit are defective, the charger will not operate properly. To test the rectifier unit operation, remove the battery from the unit and reconnect it in series with a d-c ammeter capable of reading at least two amperes. Plug the power cord into a 105–125 volt, 50 or 60 cps, a-c supply, and turn the power selector switch to the CHARGE position. With the a-c line voltage at 117 volts, the average charging current should read about 1.8 amperes at 2.1 volts battery. Care must be exercised in making this test as the charging circuit is of extremely low resistance. *Very heavy* leads must be used, and the use of an ammeter having only 0.05 ohms resistance will introduce considerable error. If the line voltage is greater than 117, or the battery voltage is lower than 2.1 volts, the charging current will be greater. If the current is much less than 1.8 amperes at the rated line voltage of 117 volts, one or more of the copper-oxide discs may be defective.

Testing the individual rectifier discs. Two rectifier assemblies are used in the receiver, each assembly consisting of two rectifier discs held together by an eyelet. A cross section of a rectifier assembly is shown in Fig. 2. The center plate of the assembly is positive and is provided with a soldering tab. A copper-oxide rectifier disc is located on each side of the center plate. The rectifier disc conducts when the positive potential is applied to the copper-oxide surface. The copper oxide is a dark purple coating which has been plated with nickel to afford a good surface contact to the copper oxide. If either or both of the rectifier discs in an assembly become defective, the entire assembly should be replaced.

To check the rectifier assembly, the following tests are recommended. In the conducting direction, the rectifier assembly should pass 0.5 ampere or more when ½ volt is impressed across it. If a d-c ammeter is not available for measuring currents as high as 0.65 ampere, the circuit shown in Fig. 2 can be used for this check. The 2.00-ohm resistance should be fairly accurate. The voltage across the rectifier assembly should read 0.7 volt or less; if this voltage exceeds 0.7 volt, the assembly is defective and should be replaced.

The reverse current flow is as important as the above test and is made as follows: Reverse the battery polarity in the test circuit described for current check, disconnect the voltmeter, and place a milliammeter that will read 10 ma. in series with a lead to one of the battery terminals. A suitable meter fuse should be used in series with the milliammeter to prevent damage to the meter in case the assembly under test

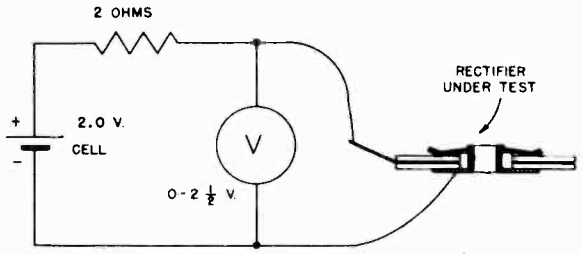


Fig. 2. Rectifier Test Circuit

is shorted. The reverse current should not exceed 10 ma. If the current is considerably above this value, the rectifier assembly should be discarded.

If a milliammeter is not available, a rough check may be made by measuring the resistance of the assembly in the nonconducting direction on the low-resistance range of an ohmmeter. The resistance should measure at least 300 ohms.

3. DISASSEMBLY OF THE RECEIVER

The following outlines should be of assistance in gaining access to the various compartments of the receiver and in dismantling it for replacement of panels.

To Gain Access to Power Supply Compartment.

1. Open the back cover and unsnap the battery compartment cover. Remove the cover by prying gently with a screwdriver.
2. Remove the three flat-head screws on the power supply compartment cover (see Fig. 3).
3. Pry the lid from the power supply compartment and lift it straight outward. All of the power supply components are attached to the lid and will come out with it as far as the connecting leads will permit. In replacing this cover, be careful not to short circuit the B + lead.

To Gain Access to Underside of Radio Chassis.

1. Open the top cover and remove the four Phillips-head screws from the front edge of the escutcheon.
2. Unscrew the three flat-head screws from the bottom of the case, and remove the single sheet of metal which forms the front and bottom of the case. Disconnect the speaker plugs from the speaker to free the front panel from the chassis.

To Remove the Right End Panel.

1. Open the top cover and pull off the four knobs.
2. Remove the two cover stay-arms by unscrewing the screw which holds each to the cover. This allows the loop to fall to its extreme position. Care should be taken to see that the loop connection springs are not broken while the stay-arms are off.
3. Remove the eight Phillips-head screws which hold the escutcheon in place.
4. Bend the ends of the escutcheon inward slightly to free them from the end panels, and remove the escutcheon and dial assembly.
5. Remove the three speed-nuts which hold the end in place. Two of these are located in the top part of the case; the third one is in the bottom rear.
6. Pull off the end panel.

To Remove the Left End Panel.

1. Remove the escutcheon and dial assembly as outlined in steps one through four in the preceding paragraph.
2. Unscrew the three flat-head screws from the bottom of the case, and remove the single sheet of metal which forms the front and bottom of the case. Disconnect the speaker plugs from the speaker to free the front panel from the chassis.
3. Remove the three speed-nuts which hold the end in place. Two of these are located in the top part of the case; the third is in the bottom front.

To Remove Top and Rear Cover Assembly.

1. Open the back cover and unsolder the two antenna loop leads. To facilitate replacement, mark each of the metal strips with the color code of the wire which was unsoldered from it.
2. Remove the escutcheon and dial assembly as outlined in steps one through four of the preceding paragraph, "To Remove the Right End Panel."
3. Unscrew the three flat-head screws located near the ends of the hinge on the top of the chassis, and remove the entire top and rear cover assembly.
4. Pull out the hinge pin to separate the top and rear covers.

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 Gains.
   R-F Amplifier grid (1LN5, pin 6) to Osc.-Conv. grid (1LC6, pin 6) ..... 25.0 at 1000 kc
   Osc.-Conv. grid (1LC6, pin 6) to I-F Amp. grid (1LN5, pin 6) ..... 33 at 1000 kc
2. Audio Gain.
   The power output across the speaker voice coil should be approximately 50 milliwatts with a 400 cps signal of 0.07 volts applied across C19 (Volume Control max.—Tone Control CCW).
3. Oscillator Grid Bias.
   The d-c voltage developed across the oscillator grid leak (R2) averages 8.1 volts at 1000 kc.
4. Socket Pin Voltages.
   Fig. 4 shows typical tube pin voltages. All readings should be made from the pins to ground unless otherwise indicated.

BATTERY INFORMATION

The receiver uses a 2-volt Willard Radio Battery No. 25-2 or equivalent. It has a 25 ampere-hour capacity and should be cared for in the same manner as any other storage battery.

Charge Indicator

The degree of charge of the battery can be determined by raising the back cover of the radio and referring to the charge ball indicators visible through the hole in the metal battery case.

If the battery is fully charged, two indicator balls will be visible at the surface of the liquid in the battery. When the battery discharges, these ball indicators will sink and disappear in the following order:

1. Green indicator sinks when approximately 20 per cent of battery capacity has been discharged.
2. The red ball sinks when battery is 80 per cent discharged.

On charge, the balls rise or float in the reverse order and the charge is complete and may be stopped when both balls appear in the opening.

To Charge Battery

The battery is charged by merely plugging the receiver power cord in the rated a-c power outlet and turning the selector switch to CHARGE. Frequent check should be taken of the charge indicator and when both indicator balls are visible, the battery is fully charged. Charging the battery after all indicator balls are visible will not harm the battery except that it will evaporate the water faster. A completely discharged battery will be restored usually within 20 to 30 hours.

When operating the receiver from the a-c house current, the battery floats or is being charged at a slow rate. Thus, if you wish to operate the receiver at the same time that you are charging even a fully discharged battery, plug the power cord in the a-c receptacle and turn the power selector switch to the ON position. Prolonged and repeated operation on this position will assure that the battery is always maintained in a nearly fully charged condition.

Battery Operating Instructions

1. Add distilled or tap water in the filler cap at sufficiently frequent intervals to keep liquid level at indicator mark as viewed through opening in battery case. DO NOT OVER-FILL as this impairs nonspill feature.

2. A fully charged battery will operate the radio in the ON position without being connected to a-c outlet for about 20 hours before recharging is required. Whenever possible, it is best not to allow the battery to become discharged to the extent that both indicators disappear.

However, if both indicators have sunk, the battery should be recharged immediately or within 24 hours.

3. A battery will continually discharge at a slow rate even when not in use. For this reason, monthly checks should be made of the charge condition and the battery placed on charge when necessary. This will prevent damage to the battery such as freezing during cold weather.

BATTERY INSTALLATION

The following instructions should be carefully followed in installing a battery:

1. Remove battery from packing carton.

2. If needed, add water to bring liquid level to indicator mark on battery container. *Do not overfill.*

3. Raise back cover on radio, remove battery case cover. The latter is removed by unclipping the two catches. Pry off cover.

4. Unplug battery and replace with new battery.

5. Place battery on charge, if necessary, as described in a previous paragraph, until both indicators are showing in the opening in the case cover.

UNIVERSAL G-E REPLACEMENT PARTS LIST

CAT. NO.	SYMBOL	DESCRIPTION
UCC-030	C8, 17	CAPACITOR—0.1 mf., 400 v., paper
UCC-039	C13, 21, 23	CAPACITOR—0.005 mf., 600 v., paper
UCC-041	C24	CAPACITOR—0.02 mf., 600 v., paper
UCN-506	C5	CAPACITOR—6.8 mmf., ceramic
UCU-028	C7, 18, 19	CAPACITOR—100 mmf., mica
UCU-040	C4	CAPACITOR—330 mmf., mica
UOP-009	LS1	LOUDSPEAKER—5¼-inch PM speaker
URD-049	R7	RESISTOR—1,000 ohms, ½ w., carbon
URD-057	R16	RESISTOR—2,200 ohms, ½ w., carbon
URD-059	R15	RESISTOR—2,700 ohms, ½ w., carbon
URD-067	R6	RESISTOR—5,600 ohms, ½ w., carbon
URD-081	R5	RESISTOR—22,000 ohms, ½ w., carbon
URD-089	R3, 9	RESISTOR—47,000 ohms, ½ w., carbon
URD-105	R2, 12	RESISTOR—220,000 ohms, ½ w., carbon
URD-121	R1, 14	RESISTOR—1 meg., ½ w., carbon
URD-129	R8	RESISTOR—2.2 meg., ½ w., carbon
URD-137	R11	RESISTOR—4.7 meg., ½ w., carbon
URE-053	R17	RESISTOR—1,500 ohms, 1 w., carbon

SPECIALIZED G-E REPLACEMENT PARTS

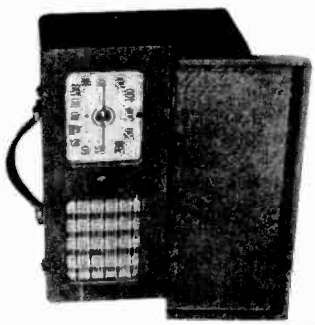
RAC-002		COVER—Battery compartment cover
RAC-003		COVER—Power supply compartment cover
RAC-006		COVER—Case back cover (brown)
RAC-007		COVER—Case back cover (gray)
RAC-010		COVER—Case left end cover (brown)
RAC-011		COVER—Case left end cover (gray)
RAC-012		COVER—Case right end cover (brown)
RAC-013		COVER—Case right end cover (gray)
RAG-002		COVER—Case front and grille (brown)
RAG-003		COVER—Case front and grille (gray)
RAI-001		BRACE—Case cover brace assembly (brown)
RAI-002		BRACE—Case cover brace assembly (gray)
RAX-004		COVER—Case cover assembly (brown)
RAX-005		ASSEMBLY—Cover stay arm assembly
RAX-006		COVER—Case cover assembly (gray)
RBC-001	B2	CELL—Bias cell
RCC-028	C6, 12, 16, 25, 32	CAPACITOR—0.05 mf., 400 v., paper
RCC-069	C34	CAPACITOR—0.5 mf., 120 v., paper
RCC-070	C29, 30	CAPACITOR—0.5 mf., 120 v., paper
RCC-073	C31	CAPACITOR—0.003 mf., 1500 v., paper

SPECIALIZED G-E REPLACEMENT PARTS

CAT. NO.	SYMBOL	DESCRIPTION
RCE-007	C26A, B, C	CAPACITOR—15 mf., 150 v.; 15 mf., 150 v.; 1200 mf., 1.5 v. electrolytic
RCT-008	C1A, B, 2A, B, 3A, B	CONDENSER—Tuning condenser and trimmers
RDC-007		CORD—Drive cord and tension spring
RDE-006		ESCUTCHEON—Dial scale escutcheon
RDK-020		KNOB—Control knob (plain)
RDK-021		KNOB—Control knob (pointer)
RDP-008		POINTER—Dial pointer assembly
RDS-013		SCALE—Dial scale
REF-001	F1	FUSE—¼-amp. fuse, Type 3AG
REU-001	V1	VIBRATOR—Vibrator unit
REX-001	X1, 2, 3, 4	RECTIFIER—Copper-oxide rectifier assembly
RHF-001		FOOT—Cabinet foot
RHK-001		KNOB—Cover lock knob
RHQ-002		TUBE—Battery vent tube
RHX-003		HARDWARE—Tuning condenser mtg. hardware
RIG-001		GASKET—Dial scale gasket
RJS-019		SOCKET—Vibrator socket
RJS-020		SOCKET—Loktal tube socket
RJS-021		PLATE—Electrolytic capacitor mounting plate
RJS-026		SOCKET—Octal base tube socket
RJW-001		HOLDER—Fuse holder
RLB-002	L3	COIL—R-f coil
RLC-008	L4	COIL—Oscillator coil
RLF-001	L5, 6	CHOKE—Vibrator and B+ choke
RLF-002	L7	CHOKE—Filament choke
RLL-008	L1	BEAM-A-SCOPE Loop antenna assembly (in cover)
RMC-008		CAM—Cover lock mechanism cam
RMC-009		CATCH—Cover lock mechanism catch
RMU-010		SHAFT—Tuning shaft
RMW-004		PULLEY—Pulley and stud (small pulley)
RMW-009		PULLEY—Pulley and stud (large pulley)
RMX-013		CATCH—Battery case catch
RRC-008	R10	VOLUME CONTROL—0.5 meg., potentiometer
RRG-001	R18	RESISTOR—7.5 ohms, ½ w., carbon
RSW-009	S4	SWITCH—Power selector switch
RSW-010	S5	SWITCH—Tone selector switch
RTC-001	T4	TRANSFORMER—Rectifier transformer
RTL-011	T1	TRANSFORMER—1st i-f transformer
RTL-012	T2	TRANSFORMER—2nd i-f transformer
RTO-007	T3	TRANSFORMER—Output transformer
RTV-001	T5	TRANSFORMER—Vibrator transformer
RWL-005	P3	PLUG—Power cord and plug

GENERAL ELECTRIC CO.

MODEL 254



CONDITIONS OF TEST

MEASUREMENTS TAKEN WITH 20,000 OHMS PER VOLT METER
READINGS TAKEN BETWEEN SOCKET PIN & B-
A-C LINE VOLTS - 117 V.
SWITCH S2 IN AC-DC POSITION

* 10 VOLT SCALE
≠ 2.5 VOLT SCALE

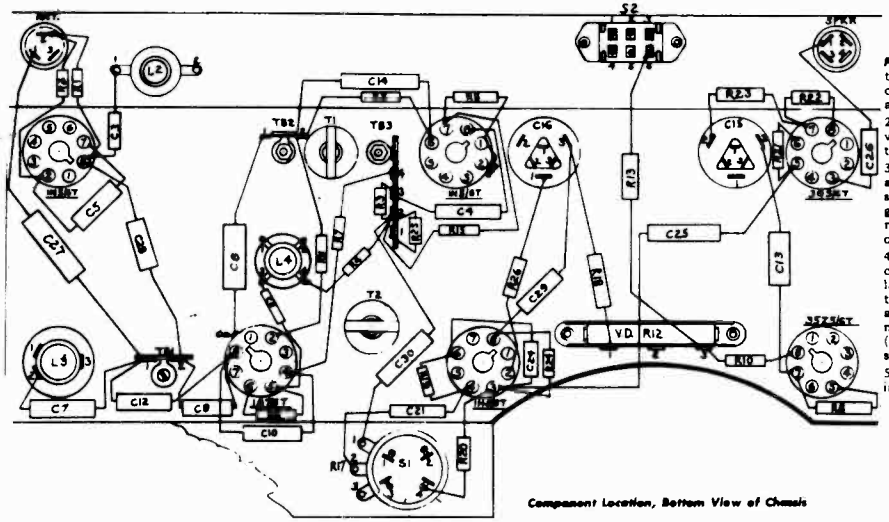
BOTTOM VIEW OF CHASSIS

IF PEAK
455 KC

REPLACEMENT PARTS LIST—MODEL 254

CAT. NO.	SYMBOL	DESCRIPTION
SPECIALIZED REPLACEMENT PARTS (CONT'D)		
SCE-021	C15A, B, C	CAPACITOR—40 mf., 150 v.; 40 mf., 150 v.; 40 mf., 150 v.; electrolytic
SCT-010	C1A, B, C	CONDENSER—Tuning condenser, pulley, and trimmers
SDC-002		CORD—Dial cord
SDE-036		KNOB—Control knob
SDP-003		POINTER—Dial pointer
SDS-012		SCALE—Dial scale
SDW-003		WINDOW—Dial scale window
SDX-006		DRIVE—Dial drive assembly
SJJ-009		CONNECTOR—Female speaker connector
SJJ-010		CONNECTOR—Female antenna connector
SJP-007		CONNECTOR—Male 2-contact "A" battery connector
SJP-008		CONNECTOR—Male 3-contact "B" battery connector
SJP-009		CONNECTOR—Male speaker connector, 4-contact
SJS-031		SOCKET—Octal tube socket
SJS-035		SOCKET—Octal tube socket
SLA-002	L2	COIL—Antenna loading coil
SLB-002	L3	COIL—R-F transformer
SLC-011	L4	COIL—Oscillator coil
SLL-003	L1	BEAM-A-SCOPE—Loop antenna assembly
SMS-012		SPRING—Dial cord spring
SMS-013		SPRING—Indicator spring
SMX-014		TRIGGER—Trigger bushing assembly
SRC-044	R17, S1	VOLUME CONTROL—1.0 meg., potentiometer and switch
SRW-024	R12A, B	RESISTOR—1900 ohms, CT, 5 w., w.w.
SRW-025	R8	RESISTOR—39 ohms, 5 w., w.w.
SRW-026	R10	RESISTOR—340 ohms, 5 w., w.w.
SSS-009	S2	SWITCH—Battery-line selector slide switch
STL-009	T1	TRANSFORMER—1st I-F transformer
STL-010	T2	TRANSFORMER—2nd I-F transformer
STO-007	T3	TRANSFORMER—Output transformer
SWL-006		CORD—Power cord

CAT. NO.	SYMBOL	DESCRIPTION
UNIVERSAL REPLACEMENT PARTS		
UCC-018	C29	CAPACITOR—0.001 mfd., 400 v., paper
UCC-025	C14, 28, 30	CAPACITOR—0.01 mfd., 400 v., paper
UCC-030	C7, 8	CAPACITOR—0.1 mfd., 400 v., paper
UCC-039	C21, 26	CAPACITOR—0.005 mfd., 400 v., paper
UCC-041	C5, 25	CAPACITOR—0.02 mfd., 600 v., paper
UCC-045	C4, 9, 10, 12, 13, 27	CAPACITOR—0.05 mfd., 600 v., paper
UCU-1004	C6	CAPACITOR—10 mmfd., 500 v., mica
UCU-1022	C11	CAPACITOR—56 mmfd., 500 v., mica
UCU-1028	C24	CAPACITOR—100 mmfd., 500 v., mica
UCU-1038	C3	CAPACITOR—270 mmfd., 500 v., mica
UOP-546		LOUDSPEAKER—5 ¼-inch PM speaker
UOX-008		CONE—Replacement cone
URD-049	R26	RESISTOR—1000 ohms, ½ w., carbon
URD-057	R11	RESISTOR—2200 ohms, ½ w., carbon
URD-093	R7	RESISTOR—68,000 ohms, ½ w., carbon
URD-101	R24	RESISTOR—150,000 ohms, ½ w., carbon
URD-105	R5, 6	RESISTOR—220,000 ohms, ½ w., carbon
URD-113	R25	RESISTOR—470,000 ohms, ½ w., carbon
URD-121	R20, 21	RESISTOR—1 meg., ½ w., carbon
URD-129	R1, 4	RESISTOR—2.2 meg., ½ w., carbon
URD-133	R9	RESISTOR—3.3 meg., ½ w., carbon
URD-137	R2, 3	RESISTOR—4.7 meg., ½ w., carbon
URD-145	R15	RESISTOR—10 meg., ½ w., carbon
URD-149	R19	RESISTOR—15 meg., ½ w., carbon
URE-033	R13	RESISTOR—200 ohms, 1 w., carbon
URE-035	R22	RESISTOR—270 ohms, 1 w., carbon
URE-1042	R23	RESISTOR—510 ohms, 1 w., carbon
URF-075	R18	RESISTOR—12,000 ohms, 2 w., carbon
SPECIALIZED REPLACEMENT PARTS		
SAT-001		CABINET—Tan finish cabinet
SCE-020	C16A, B, C	CAPACITOR—20 mf., 150 v.; 40 mf., 150 v.; 100 mf., 50 v.; electrolytic



Component Location, Bottom View of Chassis

POWER SUPPLY:

(AC-DC Operation)	
Voltage	105 125 volts
Frequency (on a-c)	50-60 cycles
Power Consumption	18 watts
(Battery Operation)	
2—4 ½-volt "A" Batteries	Eveready No. 746 or equivalent
2—45-volt "B" Batteries	Eveready No. 482 or equivalent

OPERATING FREQUENCIES:

Broadcast Band	540-1620 kc
I-F Amplifier	455 kc

POWER OUTPUT:

Undistorted	0.15 watts
Maximum	0.27 watts

LOUDSPEAKER:

Type	Alnico PM
Outside Cone Diameter	5¼ in.
Voice Coil Impedance (400 cycles)	3.2 ohms

TUBE COMPLEMENT:

R-F Amplifier	1N5GT
Oscillator-Converter	1A7GT
I-F Amplifier	1N5GT
Detector-Audio	1H5GT
Power Output	3Q5GT
Rectifier	117Z6GT

ELECTRICAL CIRCUIT ALIGNMENT

ALIGNMENT FREQUENCIES:

R-F	1620, 1500 kc and 600 kc
I-F	455 kc

EQUIPMENT REQUIRED:

1. Test oscillator with tone modulation
2. A-C output meter
3. .05 mfd. paper capacitor
4. Insulated screwdriver

PROCEDURE—GENERAL. 1. 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. The location of the i-f and r-f adjustments is shown in Figure 1.

2. Adjustment of L2 is accomplished by loosening the lock washer and turning the slug with a screwdriver. Retighten the lock washer, being careful not to turn the slug.

3. For accurate frequency calibration, set the test oscillator at 1000 kc, and turn the dial to tune in maximum a 1000-kc signal. Set pointer to read 100 on the dial, making sure the gang condenser does not turn. This adjustment should be made only after all steps on the alignment chart are carried out.

4. The output meter should be connected across the voice coil terminals on the speaker. The low side of the test oscillator output should be connected to the chassis ground; the high side of the oscillator output should be connected as indicated in the alignment chart. During the entire alignment procedure, the volume control should be at its maximum (clockwise) position. The test oscillator should be attenuated so that the output meter reading doesn't exceed ½ volt.

5. For alignment of the 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 output 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.

ALIGNMENT CHART

Step	Connect Test Oscillator to	Test Oscillator Setting	Pointer Setting on Radio	Adjustment for Maximum Output
1	1N5GT I-F grid in series with .05 mfd	455 kc	550 kc	2nd I-F Trans. (T2) Trimmers
2	1A7GT Conv. grid in series with .05 mfd	455 kc	550 kc	1st I-F Trans. (T1)
3	Repeat Steps 1 and 2			
4	Inductively coupled	1620 kc	Max. freq. cond. open	C1B OSC
5	Inductively coupled	1500 kc	1500 kc	C1A Ant. C1C RF
6	Inductively coupled	600 kc	600 kc	L2 Ant. Loading Coil
7	Inductively coupled	1500 kc	1500 kc	C1A Ant. C1C RF
8	Recheck Steps 5, 6, and 7			

STAGE GAIN AND VOLTAGE CHECKS

Stage gain by vacuum tube voltmeter or similar measuring devices may be used to check circuit performances and isolate trouble. The gain values listed may have tolerances of 20 per cent. Readings should be taken with low signal input so that the AVC is not effective.

(1) RF STAGE GAINS.

1N5GT r-f grid to 1A7GT grid	25 at 1000 kc
1A7GT grid to 1N5GT i-f grid	25 at 1000 kc
1A7GT grid to 1N5GT i-f grid	30 at 455 kc
1N5GT i-f grid to 1H5GT diode plate	65 at 455 kc

(2) AUDIO GAIN.

.06 volt at 400 cycles across volume control (R17) with control set at maximum will give approximately .05 watt output across speaker voice coil.

(3) DC voltage developed across oscillator grid resistor (R6) averages 13 volts at 1000 kc.

(4) SOCKET PIN VOLTAGES.

Figure 3 shows voltages from all tube pins to B—. Voltage readings much lower than those specified may help localize defective components or tubes.

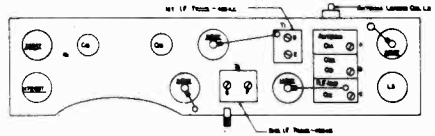
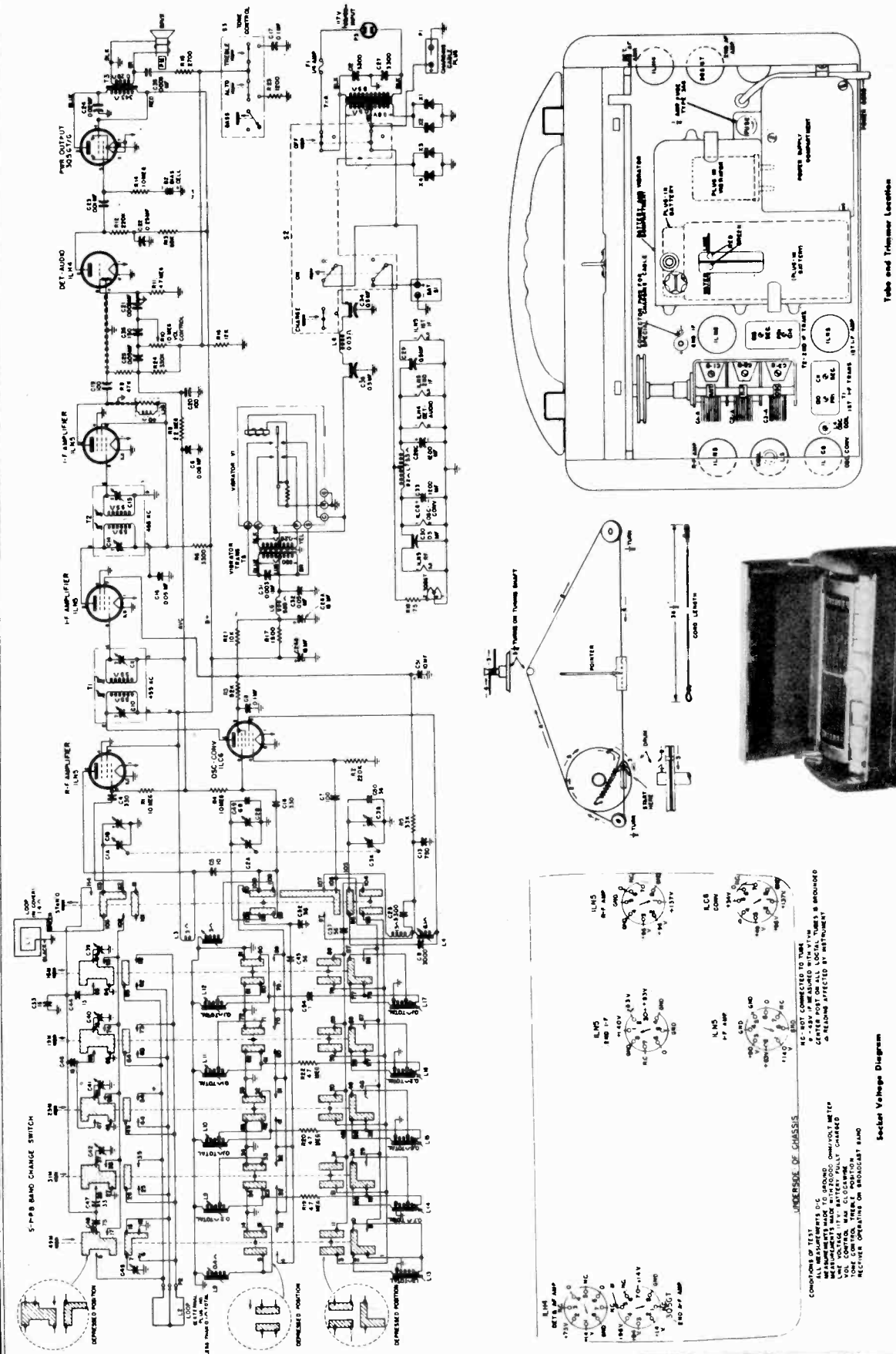


Fig. 1. Tube and Trimmer Location

GENERAL ELECTRIC CO.

MODEL 260



Tube and Trimmer Location

Socket Voltage Diagram

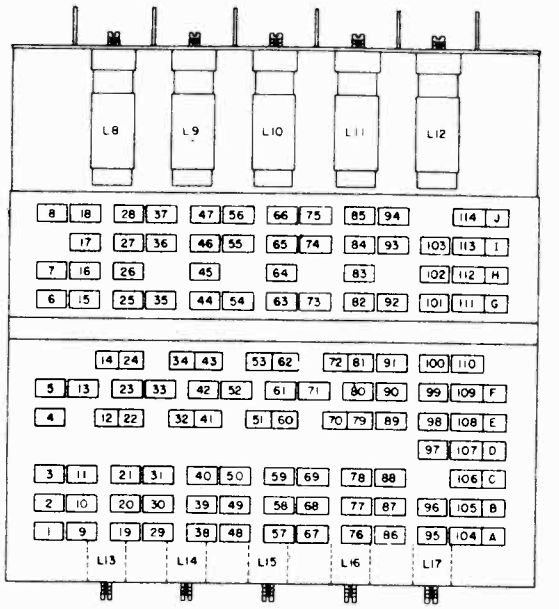
REPLACEMENT PARTS LIST—MODEL 260

UNIVERSAL REPLACEMENT PARTS

Part No.	Symbol	Description
UCC-030	C8, 17	CAPACITOR—1 mfd., 400 v., paper
UCC-032	C22	CAPACITOR—.25 mfd., 400 v., paper
UCC-039	C21, 38	CAPACITOR—.005 mfd., 600 v., paper
UCC-040	C23	CAPACITOR—.01 mfd., 600 v., paper
UCC-041	C24	CAPACITOR—.02 mfd., 600 v., paper
UCC-048	C6, 16, 25, 32	CAPACITOR—.05 mfd., 400 v., paper
UCG-3049	C13	CAPACITOR—750 mmf., silver mica
UCM-501	C54	CAPACITOR—1.0 mmf., ceramic
UCM-2506	C49	CAPACITOR—6.8 mmf., ceramic
UCU-028	C19, 20	CAPACITOR—100 mmf., mica
UCU-064	C12, 27, 28	CAPACITOR—3300 mmf., mica
UCU-1032	C36	CAPACITOR—150 mmf., mica
UCU-1040	C4, 18	CAPACITOR—330 mmf., mica
UCU-2563	C9	CAPACITOR—3000 mmf., mica
UCW-1004	C5	CAPACITOR—10 mmf., ceramic
UCW-2007	C44	CAPACITOR—13 mmf., ceramic
UCW-2009	C53	CAPACITOR—16 mmf., ceramic
UCW-2010	C46	CAPACITOR—18 mmf., ceramic
UCW-2016	C47	CAPACITOR—33 mmf., ceramic
UCW-2017	C50, 52	CAPACITOR—36 mmf., ceramic
UCW-2022	C37, 45	CAPACITOR—56 mmf., ceramic
UCW-2025	C48	CAPACITOR—75 mmf., ceramic
UIC-001		CEMENT—Cement for speaker cone replacement
UIC-002		THINNER—Speaker cement thinner
UOP-545	SPKR	SPEAKER—5 ¼-in. P.M. speaker
UOX-006		CONE—Replacement cone kit
URD-051	R23	RESISTOR—1200 ohms, ½ w., carbon
URD-059	R15	RESISTOR—2700 ohms, ½ w., carbon
URD-061	R6	RESISTOR—3300 ohms, ½ w., carbon
URD-073	R21	RESISTOR—10,000 ohms, ½ w., carbon
URD-075	R16	RESISTOR—12,000 ohms, ½ w., carbon
URD-085	R5	RESISTOR—33,000 ohms, ½ w., carbon
URD-090	R9	RESISTOR—47,000 ohms, ½ w., carbon
URD-093	R13	RESISTOR—68,000 ohms, ½ w., carbon
URD-095	R3	RESISTOR—82,000 ohms, ½ w., carbon
URD-105	R2, 12	RESISTOR—220,000 ohms, ½ w., carbon
URD-109	R24	RESISTOR—330,000 ohms, ½ w., carbon
URD-121	R1, 4, 14	RESISTOR—1.0 meg., ½ w., carbon
URD-129	R8	RESISTOR—2.2 meg., ½ w., carbon
URD-137	R11, 19, R20, 22	RESISTOR—4.7 meg., ½ w., carbon
URE-053	R17	RESISTOR—1500 ohms, 1 w., carbon

SPECIALIZED REPLACEMENT PARTS

RAC-002		COVER—Battery compartment cover
RAC-003		COVER—Power supply compartment cover
RAC-006		COVER—Case back cover (crinkle brown)
RAC-007		COVER—Case back cover (crinkle grey)
RAC-008		COVER—Case right end cover (crinkle brown)
RAC-009		COVER—Case right end cover (crinkle grey)
RAC-012		COVER—Case left end cover (crinkle brown)
RAC-013		COVER—Case left end cover (crinkle grey)
RAC-018		COVER—Back cover (Hammertone grey)
RAC-019		COVER—Back cover (Hammertone blue-green)
RAC-020		COVER—Back cover (Hammertone copper)
RAC-024		COVER—Left end cover (Hammertone grey)
RAC-025		COVER—Left end cover (Hammertone blue-green)
RAC-026		COVER—Left end cover (Hammertone copper)
RAC-030		COVER—Right end cover (Hammertone grey)
RAC-031		COVER—Right end cover (Hammertone blue-green)
RAC-032		COVER—Right end cover (Hammertone copper)
RAC-036		COVER—Antenna plug (crinkle brown)
RAC-037		COVER—Antenna plug (crinkle grey)
RAC-038		COVER—Antenna plug (Hammertone grey)
RAC-039		COVER—Antenna plug (Hammertone blue-green)
RAC-040		COVER—Antenna plug (Hammertone copper)
RAC-041		COVER—Trimmer cover (crinkle brown)
RAC-042		COVER—Trimmer cover (crinkle grey)
RAC-043		COVER—Trimmer cover (Hammertone grey)
RAC-044		COVER—Trimmer cover (Hammertone blue-green)
RAC-045		COVER—Trimmer cover (Hammertone copper)
RAG-005		COVER—Case front and grille cover (crinkle brown)
RAG-006		COVER—Case front and grille cover (crinkle grey)
RAG-013		COVER—Case front and grille cover (Hammertone grey)
RAG-014		COVER—Case front and grille cover (Hammertone blue-green
RAG-015		COVER—Case front and grille cover (Hammertone copper
RAI-001		BRACE—Cover brace assembly, supports hinge (crinkle brown
RAI-002		BRACE—Cover brace assembly supports hinge (crinkle grey
RAI-004		BRACE—Cover brace assembly, supports cover (Hammertone grey
RAI-005		BRACE—Cover brace assembly, supports cover (Hammertone blue-green)
RAI-006		BRACE—Cover brace assembly, supports cover (Hammertone copper)
RAX-004		COVER—Case top cover assembly (crinkle brown)
RAX-005		STAY ARM ASSEMBLY
RAX-006		COVER—Case top cover assembly (crinkle grey)
RAX-011		COVER—Top cover (Hammertone grey)
RAX-012		COVER—Top cover (Hammertone blue-green)
RAX-013		COVER—Top cover (Hammertone copper)
RBC-001	B2	CELL—Bias cell assembly
RCC-068	C30	CAPACITOR—0.5 mfd., 120 v., paper
RCC-069	C29	CAPACITOR—0.5 mfd., 120 v., paper
RCC-070	C34, 35	CAPACITOR—0.5 mfd., 120 v., paper
RCC-073	C31	CAPACITOR—.003 mfd., 1500 v., paper
RCE-007	C26A, B, C	CAPACITOR—15 mfd., 150 v.; 15 mfd., 150 v.; 1200 mfd., 1.5 v.; dry electrolytic
RCE-012	C51	CAPACITOR—10 mfd., 150 v., dry electrolytic
RCE-016	C33	CAPACITOR—1200 mfd., 1.5 v., dry electrolytic
RCT-011	C1A, B; C2A, B; C3A, B	CONDENSER—Tuning condenser and trimmers
RCW-062	C7	CAPACITOR—100 mmf., ceramic
RCY-012	C30, 40, 41, C42, 43	TRIMMER STRIP—Antenna trimmer strip
RDB-005		PUSH BUTTON—Single push button
RDC-011		ASSEMBLY—Dial cord and spring
RDE-009		ESCUTCHEON—Main dial escutcheon
RDK-020		KNOB—Tuning knob
RDK-033		KNOB—Volume control knob
RDP-013		POINTER—Dial pointer assembly
RDS-019		SCALE—Dial scale
RDX-017		PUSH BUTTON—Charge-Tone push button and escutcheon assembly
RDX-018		PUSH BUTTON—Band selector push button and escutcheon assembly
RDX-022	S1	SWITCH—Push button band switch assembly
REF-001	F1	FUSE—¼ amp. fuse, Type 3AG-¼
REV-001	V1	VIBRATOR—Vibrator unit
REX-001	X1, 2, 3, 4	RECTIFIER—Copper oxide rectifier assembly
RHF-001		FOOT—Cabinet foot
RHK-001		KNOB—Lock mechanism (crinkle brown)
RHK-002		KNOB—Lock mechanism (crinkle grey)
RHK-003		KNOB—Lock mechanism (Hammertone grey)
RHK-004		KNOB—Lock mechanism (Hammertone blue-green)
RHK-005		KNOB—Lock mechanism (Hammertone copper)
RHX-003		HARDWARE—Tuning condenser mounting hardware
RHX-008		STUD—Handle stud and cotter
RHY-001		HANDLE—Case cover handle (crinkle brown)
RHY-002		HANDLE—Case cover handle (crinkle grey)
RHY-003		HANDLE—Case cover handle (Hammertone grey)
RHY-004		HANDLE—Case cover handle (Hammertone blue-green)
RHY-005		HANDLE—Case cover handle (Hammertone copper)
RIG-001		GASKET—Dial scale gasket
RJB-004	P2	BOARD—Loop antenna terminal board
RJP-016		PLUG—Battery terminal contact pins
RJS-019		SOCKET—Vibrator socket
RJS-020		SOCKET—Loktal base tube socket
RJS-021		SOCKET—Electrolytic mounting plate socket
RJS-026		SOCKET—Octal base tube socket
RJW-001		HOLDER—Fuse holder
RLB-011	L3	COIL—Broadcast RF coil
RLB-012	L8	COIL—RF coil, 49 meter
RLB-013	L9	COIL—RF coil, 31 meter
RLB-014	L10	COIL—RF coil, 25 meter
RLB-015	L11	COIL—RF coil, 19 meter
RLB-016	L12	COIL—RF coil, 16 meter
RLC-018	L4	COIL—Broadcast oscillator coil
RLC-035	L13	COIL—Oscillator coil, 49 meter
RLC-036	L14	COIL—Oscillator coil, 31 meter
RLC-037	L15	COIL—Oscillator coil, 25 meter
RLC-038	L16	COIL—Oscillator coil, 19 meter
RLC-039	L17	COIL—Oscillator coil, 16 meter
RLF-001	L5 and 6	CHOKE—Vibrator and B + choke
RLF-004	L7	CHOKE—Filament choke
RLL-007	L2	BEAM-A-SCOPE—SW band loop antenna (external)
RLL-012	L1	BEAM-A-SCOPE—"B" band loop in cover (crinkle brown)
RLL-019	L1	BEAM-A-SCOPE—"B" band loop in cover (crinkle grey)
RLL-020	L1	BEAM-A-SCOPE—"B" band loop in cover (Hammertone grey)
RLL-021	L1	BEAM-A-SCOPE—"B" band loop in cover (Hammertone blue-green)
RLL-022	L1	BEAM-A-SCOPE—"B" band loop in cover (Hammertone copper)
RLP-009	L18	CHOKE—I-F plate choke
RMC-008		CAM—Cover lock mechanism cam
RMC-009		CATCH—Cover lock mechanism catch
RMU-013		SHAFT—Tuning shaft and retainer ring
RMW-004		PULLEY—Dial drive pulley (small), and stud
RMW-009		PULLEY—Dial drive pulley (large), and stud
RMX-013		CATCH—Battery compartment cover catch
RMX-020		CHAIN—Trimmer cover chain
RMX-082		CATCH—Spring catch for rear cabinet cover
RMX-083		TUBE—Vent tube and casing
RRC-015	R10	VOLUME CONTROL—1.0 megohm potentiometer
RRW-018	R18	RESISTOR—7.5 ohm, ½ w., w.w.
RSP-003	S2 and 3	SWITCH—Operation and tone push button switch
RTC-001	T4	TRANSFORMER—Charging transformer
RTC-002	T6	TRANSFORMER—Charging transformer
RTI-028	T1 and 2	TRANSFORMER—IF transformer, 1st or 2nd
RTO-007	T3	TRANSFORMER—Output transformer
RTV-001	T5	TRANSFORMER—Vibrator transformer
RWL-005	P3	CORD—Power cord



TERMINALS A THROUGH J ARE NON-OPERATING LUGS ON THE SWITCH AND ARE USED ONLY FOR TIE-IN CONNECTIONS.

Band Selector Switch Terminal Diagram

ELECTRICAL RATING:

Charging from A-C Line:

Voltage	105-125 volts, a-c only
Frequency	50/60 cycles/sec.
Wattage	12 watts

Operating from Internal Battery:

Voltage	2.1 volts
Current	1.9 amperes
Wattage	4 watts
Hours of Operation without Recharging Battery	10-13 Approx.

Battery Requirement:

Willard 2.0 volt, No. 25-2, rechargeable battery or equivalent.

Fuse:

GE, No. 2548, ¼-ampere rating.

OPERATING FREQUENCIES:

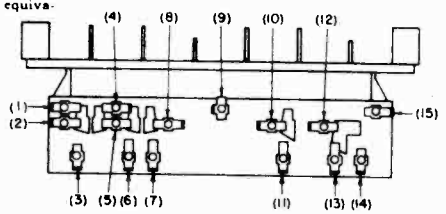
I-F Amplifier	455 kc
Broadcast Band	540-1600 kc
49 M. Band	5.9-6.5 mc
31 M. Band	9.5-9.85 mc
25 M. Band	11.65-11.9 mc
19 M. Band	15.07-15.35 mc
16 M. Band	17.65-17.9 mc

POWER OUTPUT:

Undistorted	248 milliwatts
Maximum	365 milliwatts

LOUDSPEAKER:

Type	Alnico PM
Outside Cone Diameter	5¼ inches
Voice Coil Impedance (400 cps)	3.2 ohms



(1) TO F1
(2) TO JUNCTION T4 & C12
(3) TO JUNCTION R18 & 305GT F/L (28T)
(4) TO P1 & CENTER TAP T4 SECONDARY
(5) TO BATTERY (+)
(6) TO C34
(7) TO L7 (CENTER) & R18
(8) TO BATTERY (+)
(9) TO GND.
(10)(12) TO R15
(11) TO R23
(13) TO C17
(14) TO R10 & C21
(15) TO C21 & R11

Operations Switch Wiring Diagram

ELECTRICAL CIRCUIT ALIGNMENT

1. EQUIPMENT REQUIRED.

1. Signal Generator with Audio Tone Modulation.
2. A-c output meter, 1 or 1½ volts full scale, 1000 ohms volt.
3. Insulated screwdriver.

2. ALIGNMENT PROCEDURE.

1. General.—The alignment procedure is given in table form for convenience. Reference is made to Figures 3, 5, and 6 for the trimmer locations. The low side of the signal generator should be connected to the chassis of the receiver for i-f alignment; the high side should be connected as indicated in the Alignment Chart. A meter or some other suitable indicating device must be connected to the output of the receiver. Two methods for connecting an output meter are given in later paragraphs.

When aligning the receiver, the Volume Control on the receiver should be turned to its maximum position and the TREBLE push button should be depressed. The output signal of the signal generator should be kept as low as possible at all times; the reading of a meter connected across the voice coil leads of the receiver should be kept below ½ volt by changing the signal generator output. If the signal level is too high, the AVC becomes effective and alignment errors may result.

The following paragraphs give greater details regarding the connection of the output meter and the signal generator to the receiver during alignment.

2. Connecting the Output Meter.—In aligning the receiver, some means for indicating differences in the output voltage will be required. Either of the following methods is satisfactory. The first requires more disassembly of the receiver case than the second, but the second requires additional test equipment.

Method 1.—A satisfactory method for indicating differences in output is to connect a rectifier-type a-c meter of 1 or 1½ volts full scale deflection across the speaker voice coil terminals. To gain access to the speaker, remove the front panel from the radio as previously described. Connect a lead to the green lead that connects to the ungrounded side of the speaker voice coil. Thread this lead through into the rear compartment. The front panel is reinstalled in place so that the stray capacities in the set will be the same as when the set is operating normally. Connect the meter between this lead and ground. A convenient ground connection may be obtained by removing the push-button band change switch escutcheon, and connecting a clip lead to the exposed chassis.

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 20%.

1. R-F and I-F Stage Gains.

R-F amplifier grid (6) to converter grid (6)	8.0 at 1000 kc
R-F amplifier grid (6) to converter grid (6)	6.0 at 6100 and 9600 kc
R-F amplifier grid (6) to converter grid (6)	5.0 at 11.8, 15.2 and 17.8 mc
Converter grid (6) to 1st IF grid (6)	26 at 455 kc
Converter grid (6) to 1st IF grid (6)	15 at 1000 kc
Converter grid (6) to 1st IF grid (6)	15 at 6100 kc, 9600 kc, 11.8 mc, 15.2 mc, and 17.8 mc
1st IF grid (6) to 2nd IF grid (6)	69 at 455 kc
2nd IF grid (6) to diode plates	3.9 at 455 kc

2. Audio Gain.

The power output across the speaker voice coil should be approximately 50 milliwatts with a 400 cps audio signal of 0.07 volts applied across the volume control, R10 (volume control maximum—TREBLE push button depressed).

3. Oscillator Grid Bias.

The d-c voltage developed across the oscillator grid leak (R2) averages 6.5 volts at 1000 kc.

Method 2.—The following is an alternate method which eliminates the necessity of removing the front panel of the set, but which requires additional test equipment. Make an indicating device by connecting a 4- to 6-inch diameter magnetic speaker or the high-impedance leads from the output transformer of a good p-m dynamic speaker to the terminals of a rectifier-type microammeter with a full scale deflection of 100 microamperes or less. For convenience, the meter and speaker may be mounted in a small box in such a way that the meter will be visible when the speaker is placed in front of the speaker on the receiver being aligned.

To use this device, place its speaker in front of and about an inch away from the speaker of the receiver being aligned. The meter will then deflect in proportion to the intensity of the sound produced by the speaker, and therefore may be used as an output meter. The meter must not be moved during alignment.

3. Connecting the Signal Generator.—For aligning the i-f transformers, the output of the signal generator should be coupled through a 0.05 mf. capacitor to the grid (pin 6) of the 1LC6 oscillator-converter tube. This may be accomplished easily by connecting the capacitor to the stator of C2-A, the middle section of the tuning gang, as this stator is connected to the converter grid through a blocking condenser. The low side of the signal generator output should be connected to the chassis ground to complete the circuit.

For aligning the oscillator, r-f, and loop circuits, the r-f signal should be inductively coupled by means of a three- or four-turn, 6-inch diameter, loop of bell wire across the signal generator output terminals. The loop should be located about one foot from the radio cover, with cover open for broadcast alignment, and about one foot away from the external loop when making the shortwave band alignment. To prevent possible errors in peak readings, the position of the loop with respect to the receiver should not be changed during any one set of adjustments.

4. Alignment Suggestions.—The dial pointer should fall under the extreme left end mark on the dial scale when the gang condenser is fully closed. If necessary, move the dial pointer along the dial drive cord until such registration is obtained.

To gain access to the shortwave oscillator tuning slugs, L13 through L17, remove the snap cover from the bottom of the receiver. The short-wave antenna and converter trimmers are accessible when the push-button band-change switch escutcheon (right-hand side) is removed. When aligning the trimmers on the gang condenser (for broadcast band alignment), close the cabinet back cover and make the adjustments through the snap button openings in the back cover.

The oscillator operates on the high frequency side of the signal on all bands. With this method of operation, and with the dial set at an alignment point, the image response should be heard when the signal generator is tuned to a frequency 910 kc higher than the alignment frequency.

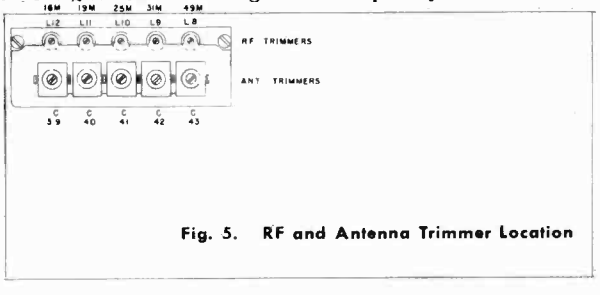


Fig. 5. RF and Antenna Trimmer Location

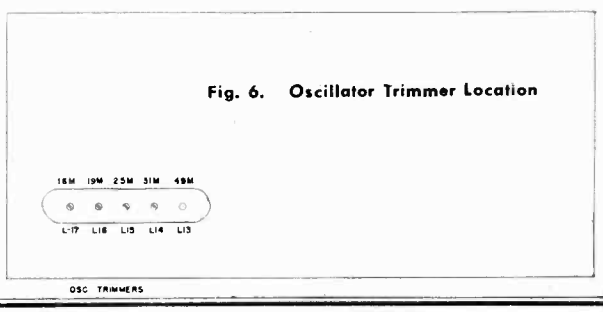


Fig. 6. Oscillator Trimmer Location

ALIGNMENT CHART

Depress Treble Push Button
Turn Volume Control to Maximum

Step	Sig. Gen. Setting	Connect Signal Generator to	Depress Push Button	Dial Scale Setting	Adjust
1	455 kc	Stator of C-2A in series with .05 mf	Standard	Below 550 kc	2nd i-f (T2) trimmers for max.
2	455 kc	Stator of C-2A in series with .05 mf	Standard	Below 550 kc	1st i-f (T1) trimmers for max.
3	1500 kc	Inductively coupled	Standard	1500 kc	**C-3B, C-2B, and C-1B for max in sequence given
4	580 kc	Inductively coupled	Standard	580 kc	* L4 and L3 for max.
5	Repeat Step 3				
6	6.1 mc	Inductively coupled	49 M	6.1 mc	L13 for max.
7	6.1 mc	Inductively coupled	49 M	6.1 mc	* L8 and C43 for max.
8	9.6 mc	Inductively coupled	31 M	9.6 mc	L14 for max.
9	9.6 mc	Inductively coupled	31 M	9.6 mc	* L9 and C42 for max.
10	11.8 mc	Inductively coupled	25 M	11.8 mc	L15 for max.
11	11.8 mc	Inductively coupled	25 M	11.8 mc	* L10 and C41 for max.
12	15.22 mc	Inductively coupled	19 M	15.22 mc	L16 for max.
13	15.22 mc	Inductively coupled	19 M	15.22 mc	* L11 and C40 for max.
14	17.8 mc	Inductively coupled	16 M	17.8 mc	L17 for max.
15	17.8 mc	Inductively coupled	16 M	17.8 mc	* L12 and C39 for max.

* Alternately peak circuits to obtain peak while rocking gang condenser.
** Remove snap buttons on back cover to permit these adjustments and close back cover while aligning.
NOTE.—The oscillator operates on the high frequency side of the signal on all bands.

BATTERY INFORMATION

The receiver uses a 2-volt Willard Radio Battery No. 25–2 or equivalent. It has a 25 ampere-hour capacity and should be cared for in the same manner as any other storage battery.

Charge Indicator

The degree of charge of the battery can be determined by raising the back cover of the radio and referring to the charge ball indicators visible through the hole in the metal battery case.

If the battery is fully charged, two indicator balls will be visible at the surface of the liquid in the battery. When the battery discharges, these ball indicators will sink and disappear in the following order:

1. Green indicator sinks when approximately 20 per cent of battery capacity has been discharged.
2. The red ball sinks when battery is 80 per cent discharged.

On charge, the balls rise or float in the reverse order and the charge may be stopped when both balls appear in the opening.

To Charge Battery

The battery is charged by merely plugging the receiver power cord in the rated a-c power outlet and depressing the CHARGE push button. Frequent check should be made of the charge indicator and when both indicator balls are visible, the battery is adequately charged. Charging the battery after all indicator balls are visible will not harm the battery except that it will evaporate the water faster. A completely discharged battery will be restored usually within 20 to 30 hours.

When operating the receiver from the a-c house current, the battery floats or is being charged at a slow rate. Thus, if you wish to operate the receiver at the same time that you are charging even a fully discharged battery, plug the power cord in the a-c receptacle and depress the ON push button. Prolonged operation in this manner usually will cause the battery potential to stabilize at some voltage determined by the line voltage and the characteristics of the charging circuit components. The degree of charge obtainable with this method of operation likewise is dependent on the line voltage and the characteristics of the charging circuit components.

Battery Operating Instructions

1. Add distilled or tap water in the filler cap at sufficiently frequent intervals to keep liquid level at indicator mark as viewed through opening in battery case. DO NOT OVERFILL as this impairs the nonspill feature.
2. Whenever possible, it is best not to allow the battery to become discharged to the extent that both indicators disappear.

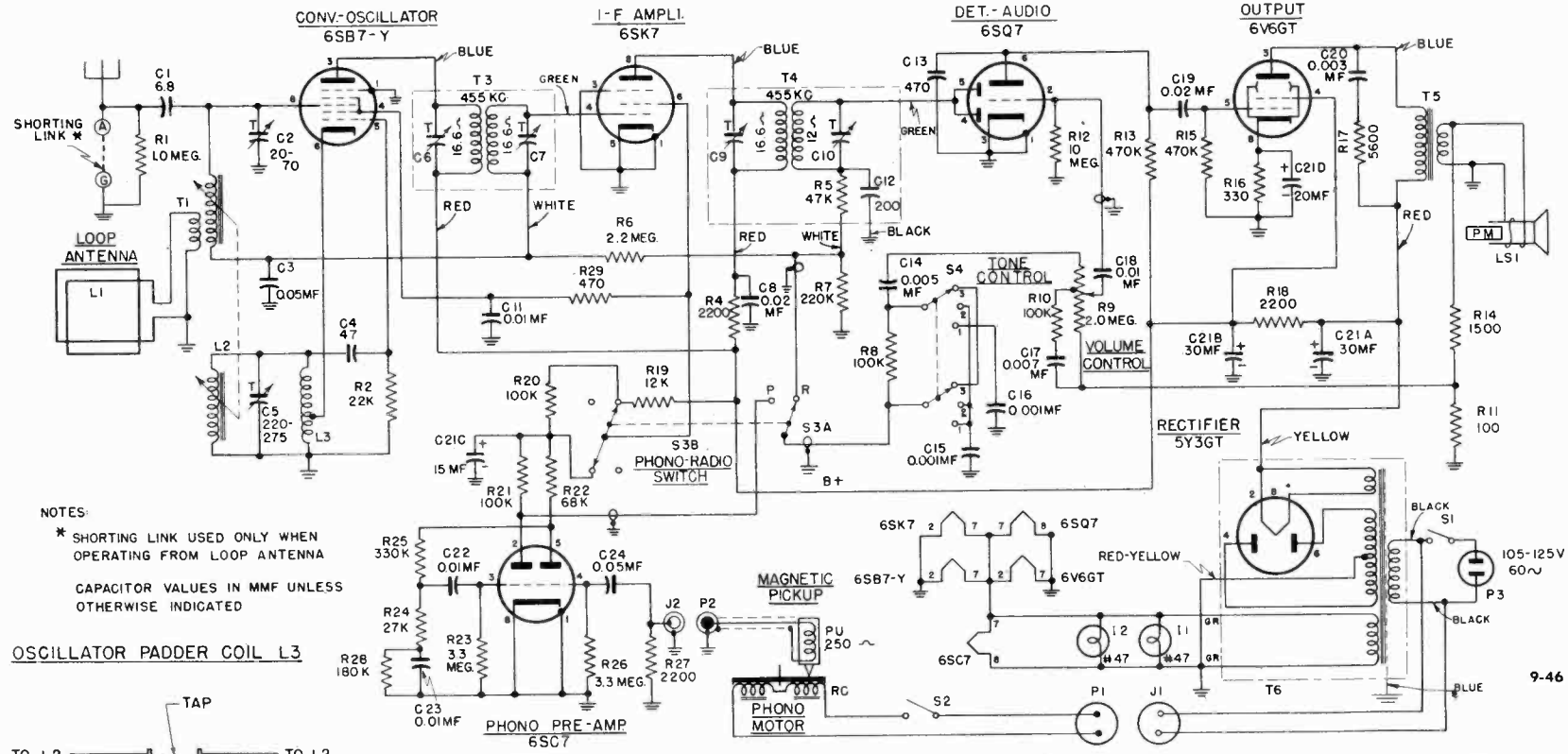
However, if both indicators have sunk, the battery should be recharged immediately or within 24 hours.

3. A battery will continually discharge at a slow rate even when not in use. For this reason, monthly checks should be made of the charge condition, and the battery should be placed on charge when necessary. This will prevent damage to the battery such as freezing during cold weather.

BATTERY INSTALLATION

The following instructions should be carefully followed in installing a battery, or replacing an old one:

1. Remove new battery from packing carton.
2. If needed, add water to bring liquid level to indicator mark on battery container. *Do not overfill.*
3. Raise back cover on radio, remove battery case cover. The latter is removed by unclipping the two catches. Pry off cover.
4. Unplug old battery if present, and replace with new battery.
5. Place battery on charge, if necessary, as described in a previous paragraph, until both indicators are showing in the opening in the case cover.

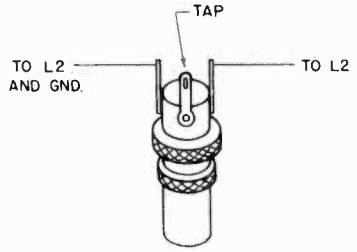


NOTES:

* SHORTING LINK USED ONLY WHEN OPERATING FROM LOOP ANTENNA

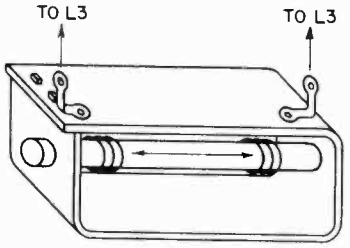
CAPACITOR VALUES IN MMF UNLESS OTHERWISE INDICATED

OSCILLATOR PADDER COIL L3

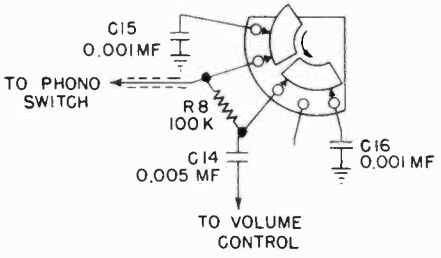


VIEW FROM REAR OF CHASSIS

OSCILLATOR INDUCTANCE L2



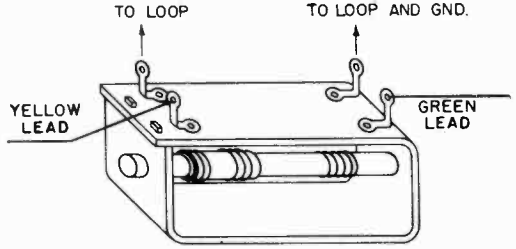
VIEW FROM REAR OF CHASSIS



KNOB IN "NUMBER 1" POSITION
SWITCH VIEWED FROM BACK OF CHASSIS

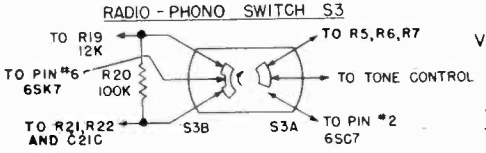
Fig. 5. Tone Control Switch, S4

ANTENNA INDUCTANCE T1



VIEW FROM REAR OF CHASSIS

RADIO - PHONO SWITCH S3



SWITCH IN RADIO POSITION
VIEWED FROM REAR OF CHASSIS

Fig. 6. Radio-Phono Switch, S3

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.

ELECTRICAL CIRCUIT ALIGNMENT

ALIGNMENT FREQUENCIES

R-F—1620, 1500, 1000 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 μμf. 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 i-f and r-f 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. Adjustment of inductances L_7 and T_1 is accomplished by loosening the adjustment screws and sliding the inductance to the correct position using the chassis hole as a fulcrum. Retighten the adjustment screw after alignment.

For accurate 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 (slugs fully in the coils) 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 5.25 inches for accurate 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 1¼ 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	6SB7Y 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. Shorting link removed.	1620 kc	Extreme Right	Osc. Trimmer C5
4	Antenna post in series with 200 mmf. capacitor. Shorting link removed.	1620 kc	Extreme Right	Ant. Trimmer C2
5	Antenna post in series with 200 mmf. capacitor. Shorting link removed.	1500 kc	*1500 kc	Oscillator Inductance L2
6	Antenna post in series with 200 mmf. capacitor. Shorting link removed.	1000 kc	1000 kc	Antenna Inductance T1
7	Recheck Steps 3, 4, 5, and 6.			
8	Replace shorting link unless installing for antenna operation.			

* 1500 kc is 5.25 inches from extreme low frequency pointer position. (See alignment procedure.)

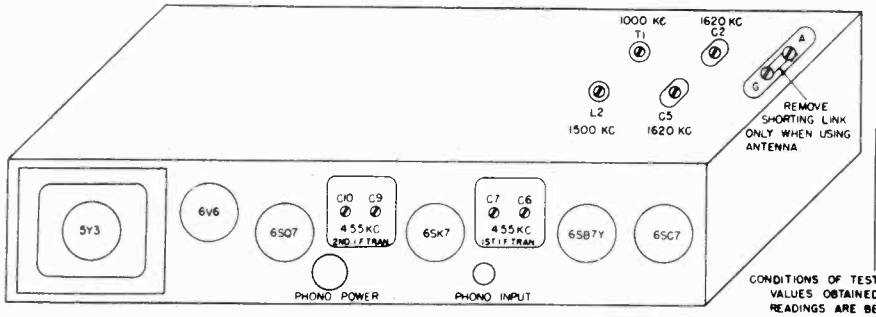


Fig. 4. Tube and Trimmer Location

PART NO.	SYMBOL	DESCRIPTION
UNIVERSAL G-E REPLACEMENT PARTS		
UCC-038	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-042	C5, 24	CAPACITOR .05 mfd., 600 v., paper
UCC-057	C20	CAPACITOR .003 mfd., 1000 v., paper
UCN-506	C1	CAPACITOR 6.8 mmf., ± v., ceramic
UCU-020	C4	CAPACITOR 47 mmf., 600 v., mica
UCU-044	C13	CAPACITOR 470 mmf., 500 v., mica
UIC-001		CEMENT Speaker cone replacement cement
UOP-636	SPKR	SPEAKER 6 inch permanent magnet
UOX-001		CONE Speaker cone and dust cap
URD-038	R11	RESISTOR 100 ohms, ½ w., carbon
URD-041	R22	RESISTOR 180,000 ohms, ½ w., carbon
URD-052	R16	RESISTOR 1800 ohms, ½ w., carbon
URD-057	R4, 27	RESISTOR 2200 ohms, ½ w., carbon
URD-067	R17	RESISTOR 8400 ohms, ½ w., carbon
URD-081	R5	RESISTOR 22,000 ohms, ½ w., carbon
URD-083	R24	RESISTOR 27,000 ohms, ½ w., carbon
URD-093	R25	RESISTOR 68,000 ohms, ½ w., carbon
URD-097	R8, 20, 21, 10	RESISTOR 100,000 ohms, ½ w., carbon
URD-103	R28	RESISTOR 180,000 ohms, ½ w., carbon
URD-106	R7	RESISTOR 220,000 ohms, ½ w., carbon
URD-109	R26	RESISTOR 330,000 ohms, ½ w., carbon
URD-113	R13, 14	RESISTOR 470,000 ohms, ½ w., carbon
URD-121	R1	RESISTOR 1.0 meg., ½ w., carbon
URD-125	R6	RESISTOR 2.2 meg., ½ w., carbon
URD-133	R23, 26	RESISTOR 3.3 meg., ½ w., carbon
URD-146	R15	RESISTOR 10.0 meg., ½ w., carbon
URE-037	R18	RESISTOR 320 ohms, 1 w., carbon
URF-087	R12	RESISTOR 2500 ohms, 2 w., carbon
URF-075	R19	RESISTOR 15,000 ohms, 5 w., carbon
SPECIALIZED G-E REPLACEMENT PARTS		
RAC-015		COVER Cabinet bottom
RAD-016		BRACKET For pilot light
RCC-001	C17	CAPACITOR .007 mf., 600 v., paper
RCD-001		SHAFT Tuner assembly consisting of slide shaft and bracket (less iron cores)

PART NO.	SYMBOL	DESCRIPTION
SPECIALIZED G-E REPLACEMENT PARTS (Cont'd)		
RCE-033	C21A	CAPACITOR 20 mf., 350 v., dry electrolytic
	C21B	CAPACITOR 30 mf., 350 v., dry electrolytic
	C21C	CAPACITOR 15 mf., 250 v., dry electrolytic
	C21D	CAPACITOR 20 mf., 25 v., dry electrolytic
RCY-013	C3	CAPACITOR—Antenna trimmer, 90-75 mmf.
RCY-014	C6	CAPACITOR—Oscillator trimmer, 220-275 mmf.
RDC-013		CORD Dial drive cord 46½ in.
RDC-014		CORD Tuning mechanism drive cord 8½ in.
RDF-005		WASHER Felt washers for control knobs
RDK-002		KNOB Phono-radio and tone control (pointer)
RDK-005		KNOB Tuning and volume control (plain)
RDP-014		POINTER Dial pointer and slide
RDS-050		SCALE Dial scale and cushion
REI-005		CORE Iron core for tuning antenna and oscillator coils
RHG-003		GROMMET Mounting grommet for 6SC7 socket
RHH-004		FASTENER Holds bottom plate on
RJA-001		ADAPTER Connects control knobs to control shaft
RJC-001		PLUG Connects to speaker
RJP-010	J3	SOCKET Phono input socket on chassis
RJS-002		SOCKET 6SB7-Y socket
RJS-004		SOCKET Octal socket
RJS-021		SOCKET 6SC7 socket
RJS-023		SOCKET Pilot light socket
RJS-049	J1	SOCKET Phono power socket
RLA-010	T1	COIL Antenna coil assembly (less iron core)
RLC-019	L3	COIL Oscillator coil assembly (less iron core)
RLC-020	L2	COIL Oscillator padder
BEAM-A-SCOPE	L1	Loop antenna assembly
RMS-004		SPRING Tuning Drive Cord Tension Spring
RMS-006		SPRING Main Drive Cord Tension Spring
RMW-003		PULLEY Idler pulley for dial string
RMX-013		SHAFT Shaft assembly for driving tuning mechanism
RMX-014		SHAFT Tuning control shaft assembly
RPX-010	PU	PICK-UP Magnetic pick-up cartridge
RRC-026	R9	VOLUME CONTROL AND POWER SWITCH 2 meg. tapped at 1 meg.
RSW-018	S3	SWITCH Radio phono
RSW-019	S1	SWITCH Tone control
RTL-090	T4	TRANSFORMER—2nd IF Transformer
RTL-091	T5	TRANSFORMER—1st IF Transformer
RTO-013	T6	TRANSFORMER—Output transformer
RTP-051	T8	TRANSFORMER—Power transformer
RWL-009		CORD Power cord and plug

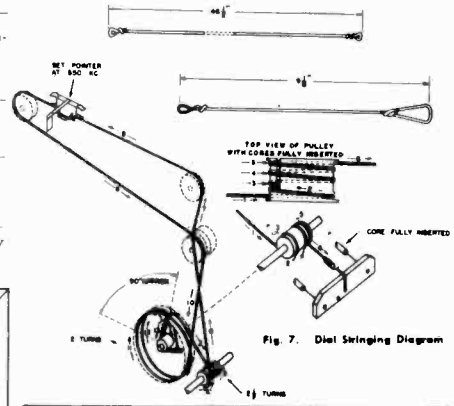


Fig. 7. Dial Stringing Diagram

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 6SB7Y grid ..... .3 at 1000 kc
   6SB7Y grid to 6SK7 grid ..... .70 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. (See Fig. 1).

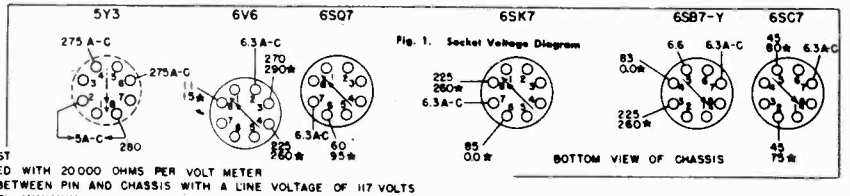
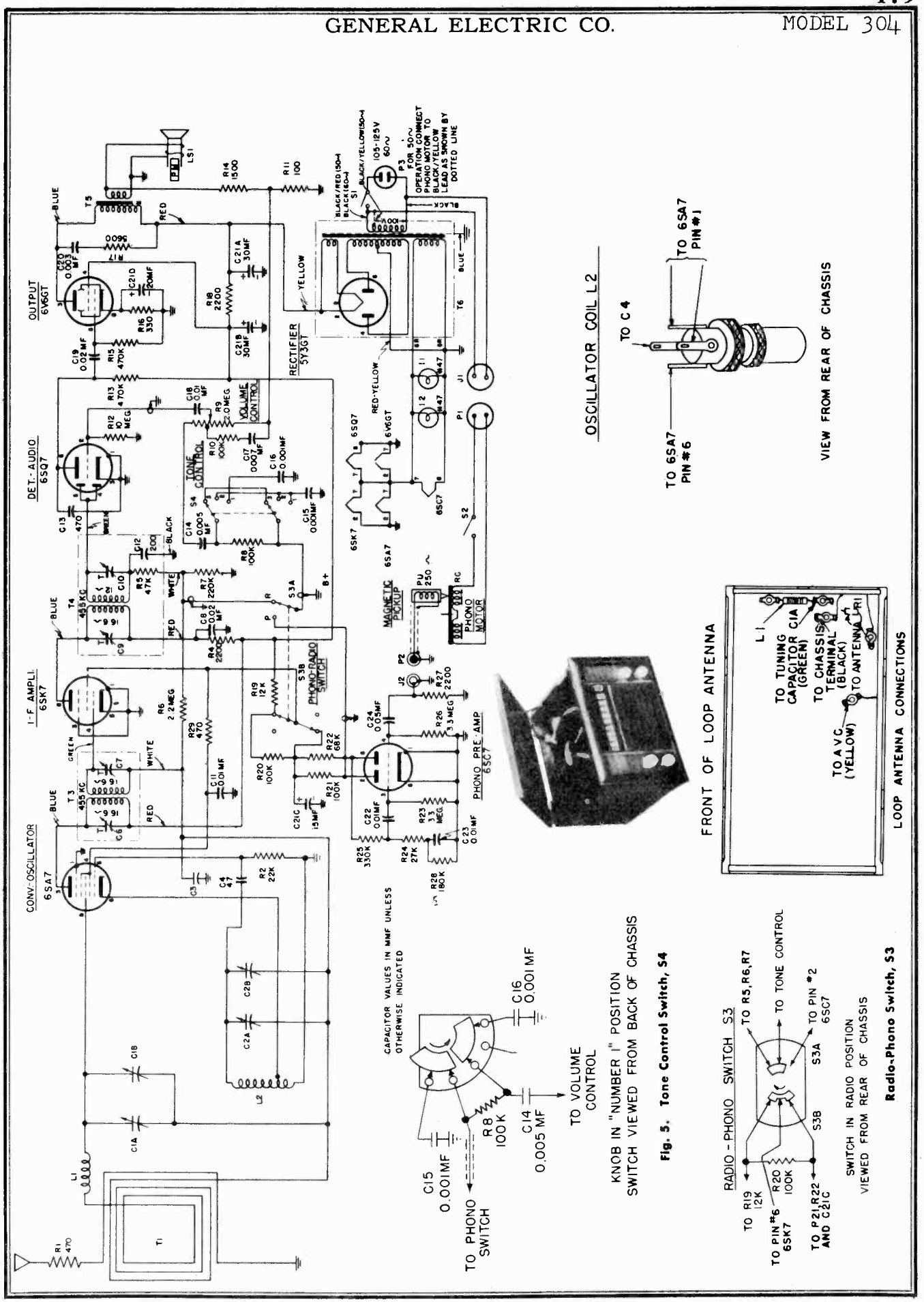


Fig. 1. Socket Voltage Diagram

CONDITIONS OF TEST
VALUES OBTAINED WITH 20,000 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

GENERAL ELECTRIC CO. MODEL 304



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, 1 1/2 volts full scale.
3. .05 Paper Condenser.
4. Insulated Screwdriver.
5. 200 μμf. 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.

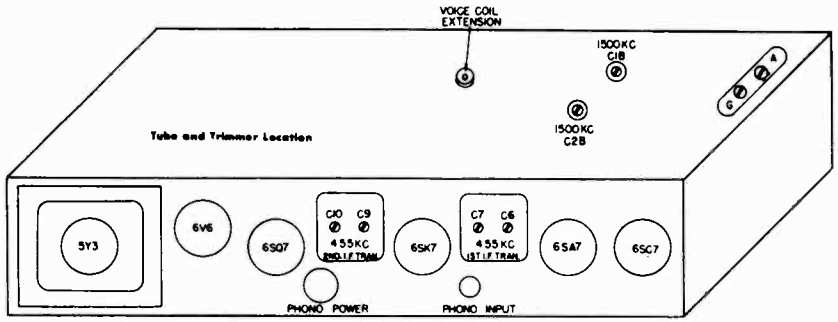
For calibration, the position of the pointer should be established prior to r-f alignment as follows. If no dial scale is available or if the chassis is removed from the cabinet, turn the tuning control knob fully counterclockwise (gang condenser closed) and secure the pointer to the dial string at some 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 1/4 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.

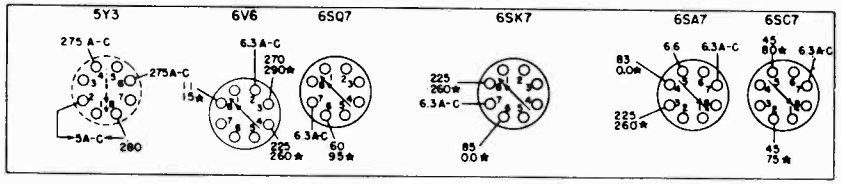
The output meter should be connected across the loudspeaker voice coil terminal. A voice coil terminal is accessible at an insulated rivet in the bottom of the chassis. The low side of the test oscillator output should be connected to the chassis ground; the high side of the test oscillator output should 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 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 1/4 inches from extreme low frequency pointer position. (See alignment procedure.)





Socket Voltage Diagram

CONDITIONS OF TEST
VALUES OBTAINED WITH 20,000 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

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

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 1/2 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 1/2 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.

LOUDSPEAKER

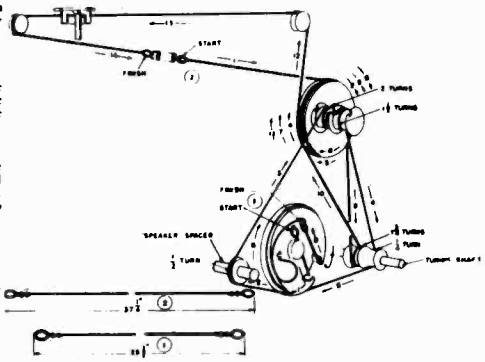
Cone Diameter	6 in.
Voice Coil Impedance	3.5 ohms
Type	Alnico P.M.

PHONOGRAPH PICKUP

Type	Magnetic
D-C Resistance	780 ohms

TUBE COMPLEMENT

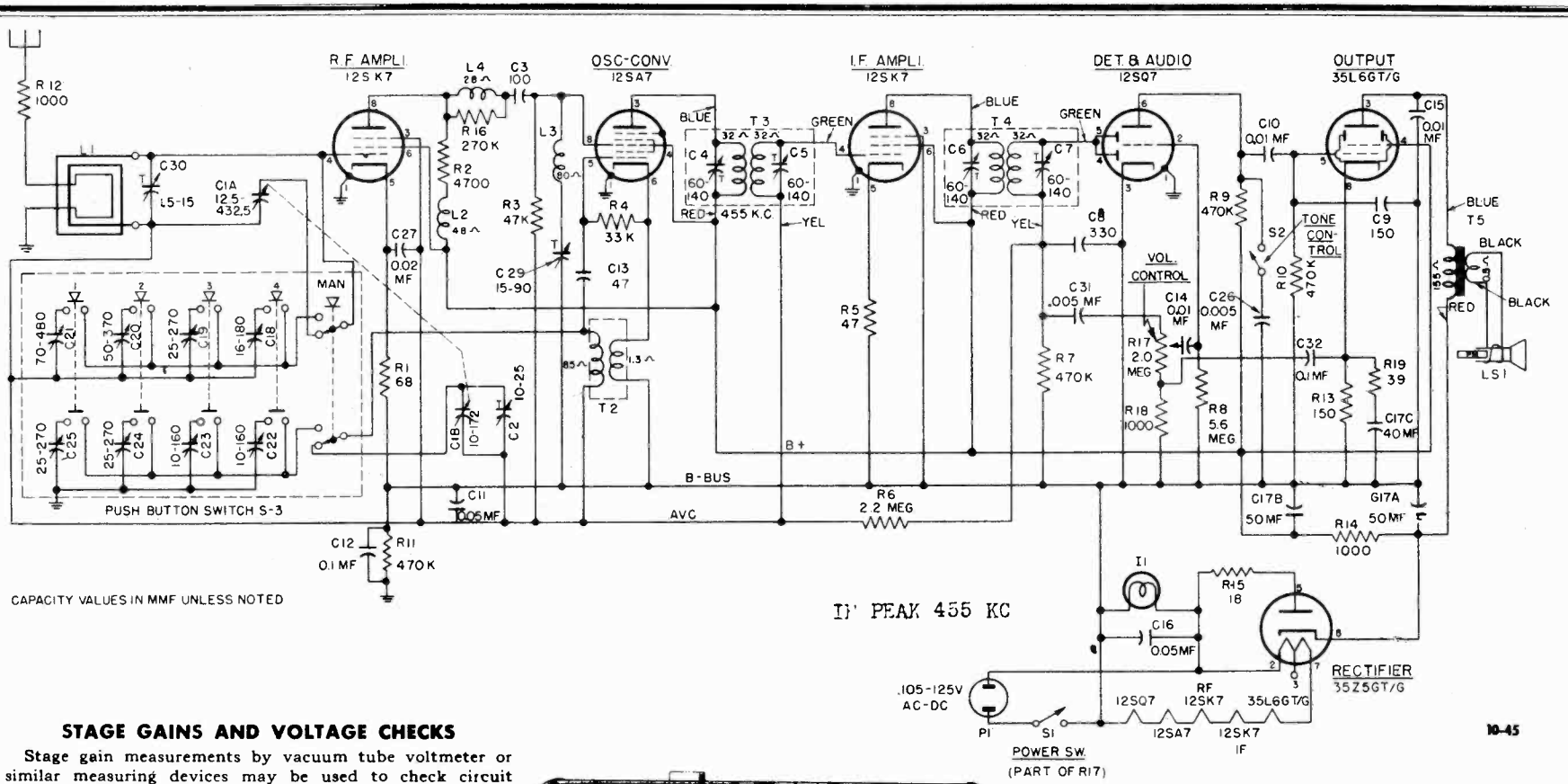
Oscillator-Converter	Type 6SA7
I-F Amplifier	Type 6SK7
Detector-Audio	Type 6SQ7
Power Output	Type 6V6GT
Phono Pre-amplifier	Type 6SC7
Rectifier	Type 5Y3GT
Pilot Lamps (2)	G.E. No. 47



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, 23, 23	CAPACITOR—.01 mfd., 600 v., paper
UCC-041	C6, 19	CAPACITOR—.02 mfd., 600 v., paper
UCC-048	C5, 26	CAPACITOR—.05 mfd., 600 v., paper
UCC-067	C20	CAPACITOR—.003 mfd., 1000 v., paper
UCU-020	CA	CAPACITOR—47 mmf., mica
UCU-044	C12	CAPACITOR—470 mmf., mica
UDL-006	I1, 2	LAMP No. 47 pilot lamp
UIC-001		CEMENT Speaker cone replacement cement
UOP-088	LS1	SPEAKER 6-inch PM speaker
URD-028	R11	RESISTOR 100 ohms, 1/2 w., carbon
URD-041	R1, 28	RESISTOR 470 ohms, 1/2 w., carbon
URD-043	R14	RESISTOR 1500 ohms, 1/2 w., carbon
URD-047	R4, 27	RESISTOR 3300 ohms, 1/2 w., carbon
URD-057	R17	RESISTOR 6800 ohms, 1/2 w., carbon
URD-061	R3	RESISTOR 22,000 ohms, 1/2 w., carbon
URD-063	R24	RESISTOR 27,000 ohms, 1/2 w., carbon
URD-065	R8	RESISTOR 47,000 ohms, 1/2 w., carbon
URD-068	R25	RESISTOR 68,000 ohms, 1/2 w., carbon
URD-097	R5, 10, 20, 21	RESISTOR 10,0000 ohms, 1/2 w., carbon
URD-102	R16	RESISTOR 150,000 ohms, 1/2 w., carbon
URD-106	R7	RESISTOR 220,000 ohms, 1/2 w., carbon
URD-109	R22	RESISTOR 330,000 ohms, 1/2 w., carbon
URD-112	R13, 15	RESISTOR 470,000 ohms, 1/2 w., carbon
URD-139	R6	RESISTOR 2.2 meg., 1/2 w., carbon
URD-122	R23, 26	RESISTOR 3.3 meg., 1/2 w., carbon
URD-148	R12	RESISTOR 10 meg., 1/2 w., carbon
URE-027	R18	RESISTOR 330 ohms, 1 w., carbon
URF-067	R18	RESISTOR 2500 ohms, 2 w., carbon
URF-078	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-022	C21A, B, C, D	CAPACITOR 20 mfd., 250 v., 20 mfd., 250 v., 10 mfd., 25 v., 20 mfd., 25 v. electrolytic
RCT-020	C1A, B, 2A, B	CONDENSER—2-section tuning condenser and trimmers (includes drive drum)
RDC-022		CORD Dial pointer drive cord
RDC-024		CORD Gang condenser drive cord

CAT. NO.	SYMBOL	DESCRIPTION
SPECIALIZED REPLACEMENT PARTS (Cont'd)		
RDF-002		WASHER—Felt washer for control knobs
RDK-002		KNOB Control knob (pointer)
RDK-006		KNOB Control knob (plain)
RDP-014		POINTER—Dial pointer and dilda 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-002		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-002		SOCKET 6SA7 tube socket
RJS-006		SOCKET Octal tube socket
RJS-031		SOCKET 6SC7 tube socket
RJS-049	J1	SOCKET Phono power socket
RJS-066		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-002		PULLEY Idler pulley for pointer drive cord
RMW-026		DRUM Idler drum (consists of 1 1/8-inch drum and brass drive bushing)
RMX-016		SHAFT Tuning control shaft
RPX-010	PU	PICK-UP Magnetic pick-up unit
RRC-025	R9, S1	VOLUME CONTROL 5 meg. (includes power switch)
RSW-018	S3	SWITCH Phono-radio switch
RSW-019	S4	SWITCH Tone control switch
RTL-020	T4	TRANSFORMER 2nd I-F transformer
RTL-021	T3	TRANSFORMER 1st I-F transformer
RTO-013	T5	TRANSFORMER Output transformer
RTP-021	T6	TRANSFORMER 60-cycle power transformer
RTP-023	T6	TRANSFORMER 50-cycle power transformer
RWL-009	P3	CORD Power cord and plug
RYM-001		SCALE Cardboard scale for backplate



STAGE GAINS 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 taken with low signal input so that AVC is not effective.

(1) R-F Stage Gains.
Antenna Post to 12SK7 r-f grid . . . . . 3 at 1000 kc
12SK7 r-f grid to 12SA7 grid . . . . . 13 at 1000 kc
12SA7 grid to 12SK7 i-f grid . . . . . 30 at 455 kc
12SK7 i-f grid to 12SQ7 diode plate . . 60 at 455 kc

(2) Audio Gain.
0.10 volts at 400 cycles across volume control (R17) with control set at maximum, will give approximately ½ watt speaker output.

(3) Oscillator Grid Bias.
D-c voltage developed across the oscillator grid leak (R4) averages 7.5 volts at 1000 kc.

(4) Socket Pin Voltages.
Fig. 5 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.

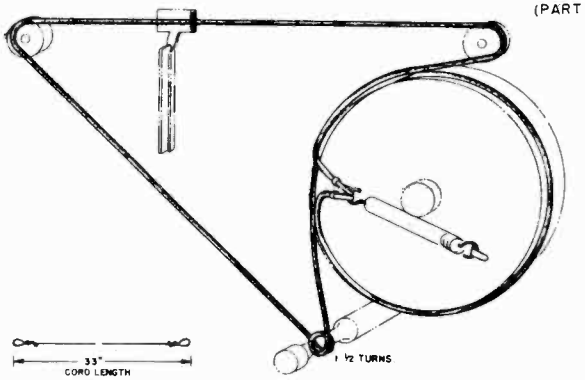


Fig. 1. Dial Cord Stringing

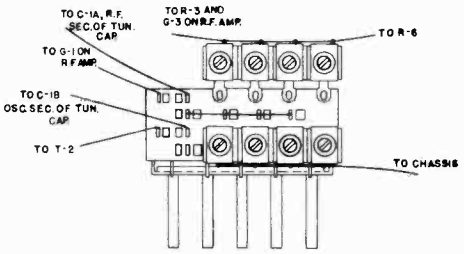


Fig. 3. Selector Switch Wiring Diagram

ALIGNMENT PROCEDURE

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 control until pointer is as far to the left as it will go. The pointer should coincide with the first marking at the left of the scale. If it doesn't, remove chassis and slip pointer along drive cord until pointer is under reference mark when chassis is bolted in place.

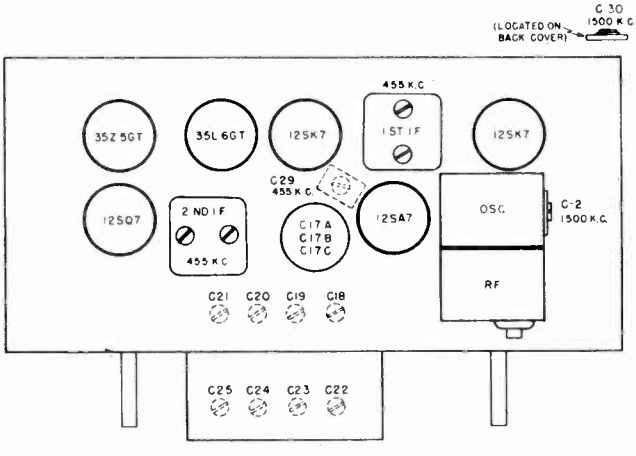


Fig. 4. Tube and Trimmer Location

ALIGNMENT CHART

Step	Connect Test Oscillator To	Test Osc. Setting	Pointer Setting on Radio	Adjustment For Maximum Output
*1	12SK7 i-f grid in series with 0.05 mf. capacitor.	455 kc	1500 kc	2nd i-f trans. trimmers
*2	12SA7 grid in series with 0.05 mf. capacitor.	455 kc	1500 kc	1st and 2nd i-f trans. trimmers
3	Ant. post in series with 50 mmf.	455 kc	1500 kc	C-29 (wavetrap) adjust for minimum output
4	Ant. post in series with 50 mmf.	1500 kc	1500 kc	C2 (Osc.)
5	Ant. post in series with 50 mmf.	1500 kc	1500 kc	C30 (r-f)

*Disconnect wavetrap (L3, C29) from circuit before making these alignments.

2. For i-f and r-f alignments, the output meter is connected across the loudspeaker voice coil terminals.
3. Keep radio volume control set at maximum and attenuate test oscillator signal output so that the output meter reading never exceeds 1¼ volts.
4. For i-f alignment, remove chassis from cabinet. For r-f alignment, the chassis should be bolted in the cabinet. Since the oscillator trimmer (C-2) is not accessible when the chassis is bolted in the cabinet, before C-2 adjustment, set pointer and test oscillator to 1500 kc and then remove chassis carefully from cabinet, so as not to disturb the setting of the dial pointer. Adjust oscillator trimmer (C-2) for maximum output and replace chassis in cabinet, then proceed with r-f trimmer (C-30) alignment.
5. Connect the capacitor as listed in column 2 between the "high side" of the test oscillator and the point of input specified. The ground terminal of the test oscillator may be connected to B — in the chassis providing an isolating transformer is used between the radio and the line input, otherwise use a suitable capacitor.

ELECTRICAL RATING (INPUT)

Voltage	105-125 volts a-c or d-c
Frequency (on a-c)	25 to 60 cycles
Wattage	40 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 inches
Voice Coil Impedance (400 cycles)	3.5 ohms

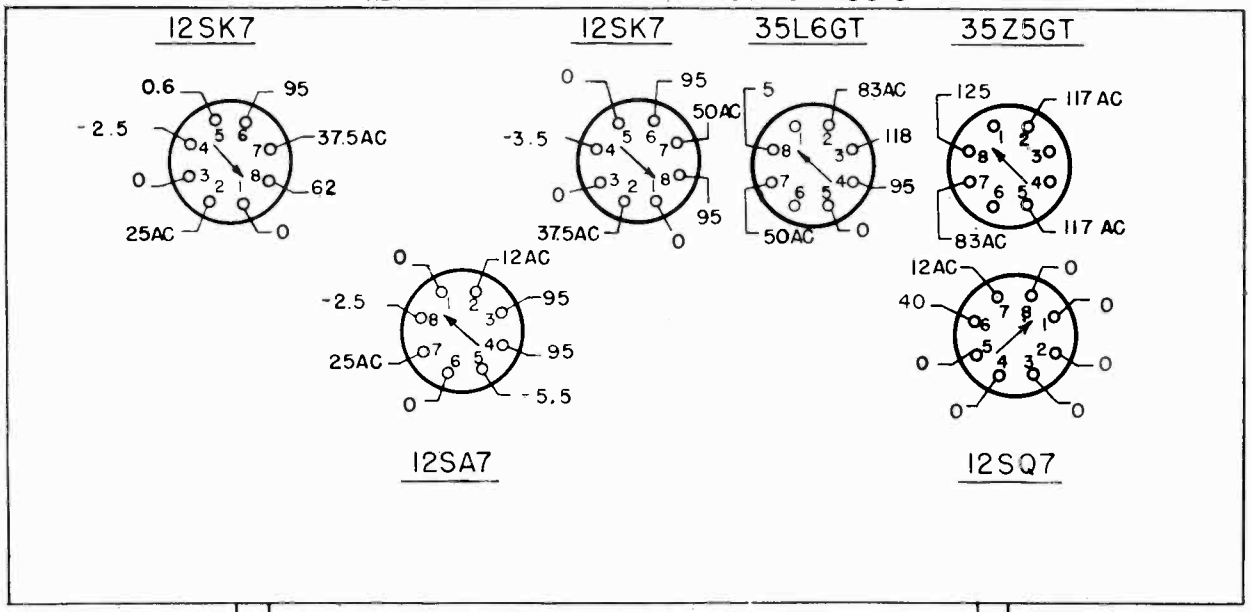
STATION KEY ADJUSTMENTS—The station key adjustments are located on the bottom of the cabinet through the slots designated as "Osc." and "R-F." The extreme left trimmers in rows "Osc." and "R-F" are corresponding adjustments for the first or extreme left station key. The second set of adjustment trimmers is for the No. 2 or second key from the left; correspondingly the remaining sets of trimmers are for the station keys No. 3 and No. 4. Turn power ON and allow radio to operate 15 minutes before making the following adjustments.

1. List the desired station on key, then depress the "Manual" key. Tune in the station desired for the key.
2. Push in station key to be set up, to its depressed position.
3. Adjust its corresponding "Osc." adjustment for the station signal which you tuned in step 1 and which is listed for the key. Peak the adjustment for the clearest program reception.
4. Adjust corresponding "R-F" adjustment for maximum signal strength.
5. Proceed in like manner for adjustment of the remaining keys.

Note: Clockwise rotation of adjustment screws lowers the frequency.

GENERAL ELECTRIC CO.

VIEWED FROM BOTTOM OF CHASSIS



CONDITIONS OF TEST

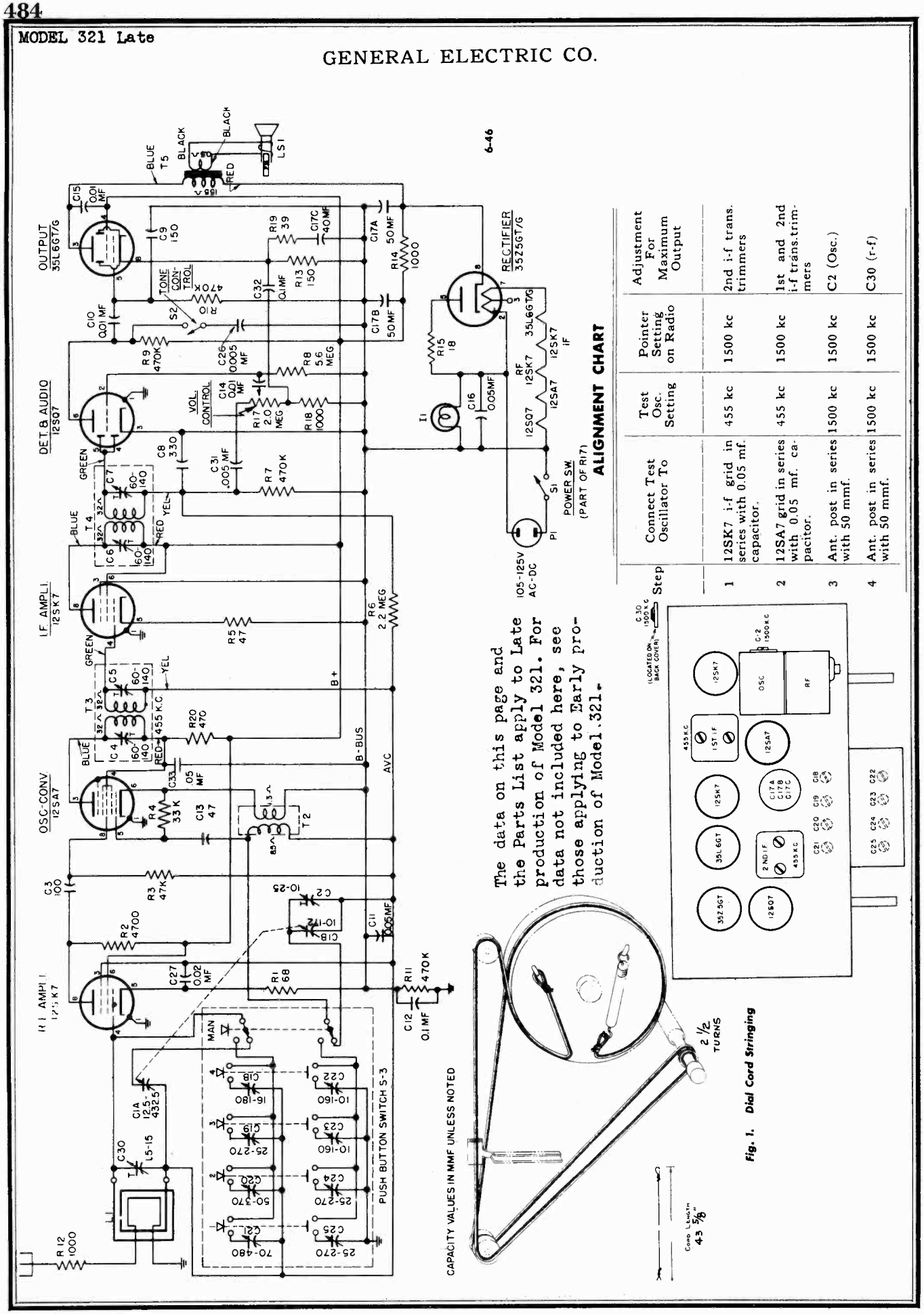
MEASURED AT 117 VOLTS LINE ON A 20,000 OHMS PER VOLT METER.
READINGS TAKEN BETWEEN TUBE PIN TERMINALS AND B-BUS.
NO SIGNAL INPUT

Cat. No.	Symbol	Description
UNIVERSAL G-E REPLACEMENT PARTS		
UCC-009	C27	Capacitor—0.02 mfd., 200 V., paper
UCC-013	C32	Capacitor—0.1 mfd., 200 V., paper
UCC-025	C10, 14	Capacitor—0.01 mfd., 400 V., paper
UCC-030	C12	Capacitor—0.1 mfd., 400 V., paper
UCC-039	C26, 31	Capacitor—0.005 mfd., 600 V., paper
UCC-040	C15	Capacitor—0.01 mfd., 600 V., paper
UCC-045	C11, 16	Capacitor—0.05 mfd., 600 V., paper
UDL-018	I1	Pilot Lamp—115 V., 10 watt candelabra base
URD-015	R19	Resistor—39 ohms, ½ W., carbon
URD-017	R5	Resistor—47 ohms, ½ W., carbon
URD-021	R1	Resistor—68 ohms, ½ W., carbon
URD-029	R13	Resistor—150 ohms, ½ W., carbon
URD-049	R12, 18	Resistor—1000 ohms, ½ W., carbon
URD-065	R2	Resistor—4700 ohms, ½ W., carbon
URD-085	R4	Resistor—33,000 ohms, ½ W., carbon
URD-089	R3	Resistor—47,000 ohms, ½ W., carbon
URD-113	R7, 9, 10, 11	Resistor—470,000 ohms, ½ W., carbon
URD-129	R6	Resistor—2.2 megohms, ½ W., carbon
URD-139	R8	Resistor—5.6 megohms, ½ W., carbon
URE-007	R15	Resistor—18 ohms, 1 W., carbon
URF-049	R14	Resistor—1000 ohms, 2 W., carbon
SPECIALIZED G-E REPLACEMENT PARTS		
RAV-001		Cabinet—Cabinet, less escutcheon and back
RCE-001	C17A, 17B, 17C	Capacitor—50 mfd., 150 V., 50 mfd., 150 V., 40 mfd., 25 V., dry electrolytic
RCT-003	C1A, 1B, 2	Capacitor—Tuning capacitor assembly
RCU-110	C13	Capacitor—47 mmf., 500 V., mica
RCU-112	C3	Capacitor—100 mmf., 500 V., mica
RCU-113	C9	Capacitor—150 mmf., 500 V., mica
RCU-115	C8	Capacitor—330 mmf., 500 V., mica
RCX-001	C18, 19, 20, 21	Trimmer Strip—Station selector adjustments (r-f)
RCX-002	C22, 23, 24, 25	Trimmer Strip—Station selector adjustments (osc.)
RCY-001	C29	Capacitor—Wave trap trimmer
RCY-002	C30	Capacitor—1.5-15 mmf. antenna trimmer
RDF-002		Washer—Felt washer, ½ in. O.D.
RDF-003		Washer—Felt washer, ⅝ in. O.D.
RDF-004		Washer—Felt washer, 1 1/16 in. O.D.
RDK-004		Knob—Control knob (tuning)

Cat. No.	Symbol	Description
SPECIALIZED G-E REPLACEMENT PARTS (Cont'd)		
RDK-007		Key—Station selector key
RDK-009		Knob—Control knob (volume)
RDK-010		Knob—Tone control wafer knob
RDP-003		Pointer—Dial scale pointer
RDS-004		Scale—Dial scale
RDX-003		Assembly—Dial scale back plate assembly
RDX-004		Assembly—Drive cord assembly
RHC-001		Cotter—Hairpin shaft retaining cotter
RHG-001		Grommet—Tuning capacitor mtg. grommet
RHM-007		Stud—Idler pulley stud
RHM-008		Cam—Tone switch cam
RHM-009		Link—Tone switch cam link
RHM-010		Clip—Tone control shaft clip
RHM-011		Bushing—Tuning shaft bushing
RHX-001		Assembly—Chassis mounting assembly
RIT-001		Cover—Electrolytic capacitor cardboard cover
RJC-003		Terminal—Loudspeaker lead terminals
RJS-007		Socket—Pilot lamp socket
RJS-008		Socket—Octal base tube socket
RJS-009		Socket—Mtg. socket for electrolytic capacitor
RLC-002	T2	Coil—Oscillator coil
RLL-004	L1	Beam-a-scope—Cabinet back and antenna assembly
RLP-001	L2	Coil—Plate choke
RLP-002	L4, R16	Coil—Series peaking coil and resistor assembly
RLW-001	L3	Coil—Wavetrap coil
RMM-001		Shield—Tube shield and clip
RMM-002		Shield—Light shield
RMS-001		Spring—Drive cord spring
RMS-003		Spring—Station selector button spring
RMU-003		Shaft—Tuning shaft and cotter pin
RMW-001		Pulley—Drive cord idler pulley
ROP-005	LS1	Speaker—5¼ in. permanent magnet loudspeaker
RRC-003	R17	Volume Control—2 meg. potentiometer
RSP-001	S3	Switch—Station selector push button switch
RSW-003	S2	Switch—Tone control switch
RTL-003	T3	Transformer—1st I-F transformer
RTL-004	T4	Transformer—2nd I-F transformer
RTO-002	T5	Transformer—Output transformer
RWL-002	P1	Cord—Power cord and plug
RYC-001		Card—Station letter cards

MODEL 321 Late

GENERAL ELECTRIC CO.



The data on this page and the Parts List apply to Late production of Model 321. For data not included here, see those applying to Early production of Model 321.

ALIGNMENT CHART

Step	Connect Test Oscillator To	Test Osc. Setting	Pointer Setting on Radio	Adjustment For Maximum Output
1	12SK7 i-f grid in series with 0.05 mf. capacitor.	455 kc	1500 kc	2nd i-f trans. trimmers
2	12SA7 grid in series with 0.05 mf. capacitor.	455 kc	1500 kc	1st and 2nd i-f trans. trimmers
3	Ant. post in series with 50 mmf.	1500 kc	1500 kc	C2 (Osc.)
4	Ant. post in series with 50 mmf.	1500 kc	1500 kc	C30 (r-f)

Fig. 1. Dial Cord Stringing

GENERAL ELECTRIC CO.

MODEL 321 Late
MODELS 326,327

MODEL 321 (LATE)

UNIVERSAL G-E REPLACEMENT PARTS

Cat. No.	Symbol	Description
UCC-009	C27	Capacitor—0.02 mfd., 200 V., paper
UCC-013	C32	Capacitor—0.1 mfd., 200 V., paper
UCC-025	C10,14	Capacitor—0.01 mfd., 400 V., paper
UCC-030	C12	Capacitor—0.1 mfd., 400 V., paper
UCC-039	C26, 31	Capacitor—0.005 mfd., 600 V., paper
UCC-040	C15	Capacitor—0.01 mfd., 600 V., paper
UCC-045	C11, 16, 33	Capacitor—0.05 mfd., 600 V., paper
UDL-018	I1	Pilot Lamp—115 V., 10 watt candelabra base
UOP-525	LS1	Speaker—5¼ in. permanent magnet loudspeaker
URD-015	R19	Resistor—39 ohms, ½ W., carbon
URD-017	R5	Resistor—47 ohms, ½ W., carbon
URD-021	R1	Resistor—68 ohms, ½ W., carbon
URD-029	R13	Resistor—150 ohms, ½ W., carbon
URD-041	R20	Resistor—470 ohms, ½ W., carbon
URD-049	R12, 18	Resistor—1000 ohms, ½ W., carbon
URD-065	R2	Resistor—4700 ohms, ½ W., carbon
URD-085	R4	Resistor—33,000 ohms, ½ W., carbon
URD-089	R3	Resistor—47,000 ohms, ½ W., carbon
URD-113	R7, 9, 10, 11	Resistor—470,000 ohms, ½ W., carbon
URD-129	R6	Resistor—2.2 megohms, ½ W., carbon
URD-139	R8	Resistor—5.6 megohms, ½ W., carbon
URE-007	R15	Resistor—18 ohms, 1 W., carbon
URF-049	R14	Resistor—1000 ohms, 2 W., carbon

SPECIALIZED G-E REPLACEMENT PARTS

RAV-001		Cabinet—Cabinet, less escutcheon and back
RCE-001	C17A, 17B, 17C	Capacitor—50 mfd., 150 V., 50 mfd., 150 V., 40 mfd., 25 V., dry electrolytic
RCT-003	C1A, 1B, 2	Capacitor—Tuning capacitor assembly
RCU-110	C13	Capacitor—47 mmf., 500 V., mica
RCU-112	C3	Capacitor—100 mmf., 500 V., mica
RCU-113	C9	Capacitor—150 mmf., 500 V., mica
RCU-115	C8	Capacitor—330 mmf., 500 V., mica
RCX-001	C18, 19, 20, 21	Trimmer Strip—Station selector adjustments (r-f)
RCX-002	C22, 23, 24, 25	Trimmer Strip—Station selector adjustments (osc.)
RCY-002	C30	Capacitor—1.5-15 mmf. antenna trimmer

SPECIALIZED G-E REPLACEMENT PARTS (Cont'd)

RDK-004		Knob—Control Knob (tuning)
RDK-007		Key—Station selector key
RDK-009		Knob—Control knob (volume)
RDK-023		Knob—Tone control wafer knob
RDP-003		Pointer—Dial scale pointer
RDS-004		Scale—Dial scale
RDX-003		Assembly—Dial scale back plate assembly
RDX-004		Assembly—Drive cord assembly
RHC-001		Cotter—Hairpin shaft retaining cotter
RHG-001		Grommet—Tuning capacitor mtg. grommet
RHM-007		Stud—Idler pulley stud
RHM-008		Cam—Tone switch cam
RHM-009		Link—Tone switch cam link
RHM-010		Clip—Tone control shaft clip
RHM-011		Bushing—Tuning shaft bushing
RHX-001		Assembly—Chassis mounting assembly
RIT-006		Cover—Electrolytic capacitor cardboard cover
RJC-001		Terminal—Loudspeaker lead terminals
RJS-007		Socket—Pilot lamp socket
RJS-008		Socket—Octal base tube socket
RJS-004		Socket—Mtg. socket for electrolytic capacitor
RLC-002	T2	Coil—Oscillator coil
RLL-004	L1	Beam-a-scope—Cabinet back and antenna assembly
RLP-001	L2	Coil—Plate choke
RLP-002	L4, R16	Coil—Series peaking coil and resistor assembly
RLW-001	L3	Coil—Wavetrap coil
RMM-001		Shield—Tube shield and clip
RMM-002		Shield—Light shield
RMS-001		Spring—Drive cord spring
RMS-003		Spring—Station selector button spring
RMU-003		Shaft—Tuning shaft and cotter pin
RMW-001		Pulley—Drive cord idler pulley
RRC-003	R17	Volume Control—2 meg. potentiometer
RSP-001	S3	Switch—Station selector push button switch
RSW-003	S2	Switch—Tone control switch
RTL-003	T3	Transformer—1st I-F transformer
RTL-004	T4	Transformer—2nd I-F transformer
RTO-002	T5	Transformer—Output transformer
RWL-009	P1	Cord—Power cord and plug
RYC-001		Card—Station letter cards

MODELS 326, 327

UNIVERSAL G-E REPLACEMENT PARTS

UCC-037	C15	CAPACITOR—0.003 mf., 600 v., paper
UCC-039	C14	CAPACITOR—0.005 mf., 600 v., paper
UCC-040	C19, 26, 27, 28, 30, 103	CAPACITOR—0.01 mf., 600 v., paper
UCC-041	C10, 104	CAPACITOR—0.02 mf., 600 v., paper
UCC-045	C11, 101, 102	CAPACITOR—0.05 mf., 600 v., paper
UDL-005	I1, 2, 3, 4	PILOT LAMP—G.E. No. 44, 6-8 v., 0.25 amp.
UIC-001		CEMENT—Speaker cone replacement cement
UOP-1206	LS	SPEAKER—12 inch PM speaker
UOX-005		CONE—Replacement speaker cone kit
URD-025	R11	RESISTOR—100 ohms, ½ w., carbon
URD-029	R5	RESISTOR—150 ohms, ½ w., carbon
URD-035	R1	RESISTOR—270 ohms, ½ w., carbon
URD-037	R13	RESISTOR—330 ohms, ½ w., carbon
URD-041	R24, 27	RESISTOR—470 ohms, ½ w., carbon
URD-049	R17, 19	RESISTOR—1000 ohms, ½ w., carbon
URD-053	R12	RESISTOR—1500 ohms, ½ w., carbon
URD-065	R2	RESISTOR—4700 ohms, ½ w., carbon
URD-067	R14	RESISTOR—5600 ohms, ½ w., carbon
URD-077	R101	RESISTOR—6800 ohms, ½ w., carbon
URD-081	R4	RESISTOR—22,000 ohms, ½ w., carbon
URD-083	R104	RESISTOR—27,000 ohms, ½ w., carbon
URD-085	R107, 109	RESISTOR—33,000 ohms, ½ w., carbon
URD-089	R3, 15	RESISTOR—47,000 ohms, ½ w., carbon
URD-093	R106, 108	RESISTOR—68,000 ohms, ½ w., carbon
URD-097	R22, 23	RESISTOR—100,000 ohms, ½ w., carbon
URD-105	R21	RESISTOR—220,000 ohms, ½ w., carbon
URD-113	R9, 10, 26	RESISTOR—470,000 ohms, ½ w., carbon
URD-129	R6	RESISTOR—2.2 meg., ½ w., carbon
URD-133	R102, 103	RESISTOR—3.3 meg., ½ w., carbon
URD-145	R8	RESISTOR—10 meg., ½ w., carbon
URF-055	R16	RESISTOR—1800 ohms, 2 w., carbon
URF-073	R20	RESISTOR—10,000 ohms, 2 w., carbon

SPECIALIZED G-E REPLACEMENT PARTS

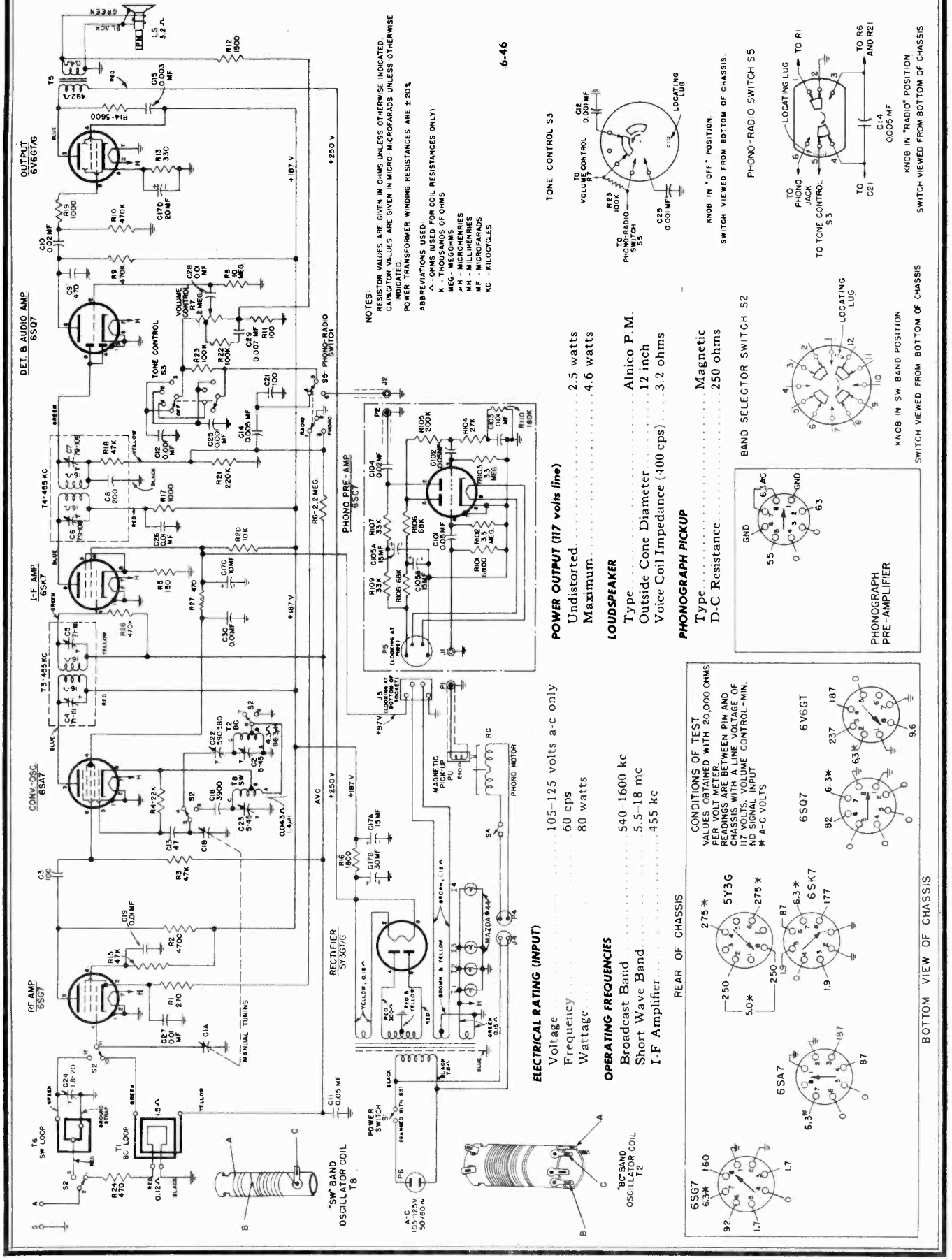
RAC-001		COVER—Beam-a-scope Cover
RAL-001		JEWEL—Pilot light jewel
RCC-001	C29	CAPACITOR—0.007 mfd., 600 v., paper
RCC-035	C12, 25	CAPACITOR—0.001 mf., 600 v., paper
RCE-002	C105A	CAPACITOR—15 mf., 350 v., dry electrolytic
	C105B	CAPACITOR—15 mf., 350 v., dry electrolytic
	C17A	CAPACITOR—15 mf., 350 v., dry electrolytic
RCE-003	C17B	CAPACITOR—30 mf., 350 v., dry electrolytic
	C17C	CAPACITOR—10 mf., 250 v., dry electrolytic
	C17D	CAPACITOR—20 mf., 25 v., dry electrolytic
RCT-005	C1A, 1B	CAPACITOR—2 gang tuning capacitor
RCU-064	C9	CAPACITOR—470 mmf., mica
RCU-110	C13	CAPACITOR—47 mmf., mica
RCU-112	C3, 21	CAPACITOR—100 mmf., mica
RCU-189	C18	CAPACITOR—3900 mmf., mica
	C2	CAPACITOR—Trimmer, 5-45 mmf.
RCX-020	C16	CAPACITOR—Trimmer, 15-90 mmf.
	C22	CAPACITOR—Trimmer, 590 = 80 mmf.
	C23	CAPACITOR—Trimmer, 5-45 mmf.
RCY-004	C24	CAPACITOR—Trimmer, 1.8-20 mmf.
RDC-004		CORD—Dial drive cord, 41½ in. long
RDD-003		DRUM—Dial drum assembly
RDE-005		ESCUTCHEON—Dial escutcheon
RDF-005		WASHER—Felt washer for knobs
RDK-036		KNOB—Mahogany knob (plain)
RDK-038		KNOB—Oak knob (plain)
RDK-039		KNOB—Mahogany knob (pointer)

SPECIALIZED G-E REPLACEMENT PARTS

RDK-041		KNOB—Oak knob (pointer)
RDP-005		POINTER—Dial scale pointer
RDS-016		SCALE—Dial scale
RDX-008		BACKPLATE—Dial backplate assembly
RHG-001		GROMMET—Tuning capacitor mounting grommet
RHG-003		GROMMET—Rubber grommet, ⅛ in. I.D. for ½ in. hole
RHG-004		GROMMET—Rubber grommet, ¼ in. I.D. for ⅝-in. hole
RHM-012		CUSHIONS—Rubber dial scale cushions
RHM-014		STUD—Shaft for upper pulleys on backplate
RHM-015		BUSHING—Tuning shaft bushing, washer, and nut
RHU-002		SPACER—Tuning capacitor mounting spacer
RJB-001		RECEPTACLE—Two-pin speaker receptacle
RJB-002		TERMINAL STRIP—Terminal strip for phono pre-amplifier, 2 terminals
RJC-001		PLUG—Tip plug for speaker leads
RJC-002		CONNECTOR—Clip for antenna loop connections
RJP-002	P5	PLUG—4-prong plug for pre-amplifier
RJP-004	P2	PLUG—Phono pre-amplifier output plug
RJS-003		SOCKET—Octal socket for receiver chassis
RJS-011		SOCKET—Pilot light socket for cabinet jewel
RJS-012		PLATE—Mounting plate for capacitor C17A, B, C, D
RJS-013		SOCKET—Pilot light socket for chassis lights
RJS-014	J5	RECEPTACLE—Four prong receptacle (Power to pre-amp.)
RJS-015		SOCKET—Octal socket for pre-amplifier (shock mounted)
RJX-001	J2	RECEPTACLE—Phono input receptacle on receiver chassis
RJS-049	J4	RECEPTACLE—Phono motor connector (female)
RJX-003	J1	RECEPTACLE—Phono input receptacle on pre-amplifier
RLC-004	T2	COIL—BC Band oscillator coil
RLC-005	T8	COIL—SW Band oscillator coil
RLL-005	T6	LOOP—SW Band antenna loop
RLL-006	T1	LOOP—Beam-a-scope BC Band loop
RMC-001		CLAMP—Mounts BC Band oscillator coil
RMC-002		CLAMP—Mounts SW Band oscillator coil
RMM-003		SHIELD—Bottom shield for 2nd I-F transformer
RMS-001		SPRING—Drive cord tension spring
RMU-004		SHAFT—Tuning shaft with cotter pin and "C" clip
RMW-001		PULLEY—Upper back plate pulley
RMW-002		PULLEY—Chassis idler pulley
ROC-001		CONE—Speaker cone and dust cap
RPX-010	PU	PICKUP—Magnetic pickup cartridge
RRC-005	R7	POTENTIOMETER—Volume control, 2 meg. tapped at 1 meg.
RRD-089	R18	RESISTOR—47,000 ohms, ½ w., carbon
RRD-104	k105	RESISTOR—200,000 ohms, ½ w., carbon
RSW-006	S5	SWITCH—Phono-Radio switch
RSW-007	S2	SWITCH—Band switch
RSX-003	S1	SWITCH—Power switch
	S3	SWITCH—Tone control switch
RTL-005	T3	TRANSFORMER—1st I-F transformer
RTL-006	T4	TRANSFORMER—2nd I-F transformer
RTO-004	T5	TRANSFORMER—Output transformer
RTP-010	T7	TRANSFORMER—Power transformer
RWL-004	P6	CORD—Power cord and plug

MODELS 326, 327

GENERAL ELECTRIC CO.



ELECTRICAL RATING (INPUT)

Voltage	105-125 volts a-c only
Frequency	60 cps
Wattage	80 watts

OPERATING FREQUENCIES

Broadcast Band	540-1600 kc
Short Wave Band	5.5-18 mc
I-F Amplifier	455 kc

POWER OUTPUT (117 volts line)

Undistorted	2.5 watts
Maximum	4.6 watts

LOUDSPEAKER

Type	Alnico P.M.
Outside Cone Diameter	12 inch
Voice Coil Impedance (400 cps)	3.2 ohms

PHONOGRAPH PICKUP

Type	Magnetic
D-C Resistance	250 ohms

ELECTRICAL CIRCUIT ALIGNMENT

EQUIPMENT REQUIRED

1. Test oscillator with audio tone modulation.
2. A-C output meter, 1½ volts full scale.
3. Insulated screwdriver.

ALIGNMENT PROCEDURE

The alignment procedure is given in table form. All i-f alignments may be made with the chassis removed from the cabinet. However, the r-f alignments should be made with the chassis and loop antennas securely fastened in the cabinet, as the relative position of the loop antenna with respect to the chassis materially affects the alignment. All oscillator and r-f trimmers are accessible from the rear of the cabinet when the chassis is installed; the location of these trimmers is shown in Fig. 1.

The r-f signal should be capacity coupled by placing a two-foot wire on the output post (high side) of the test oscillator to act as an antenna. This antenna should be kept two feet or more away from the receiver loop to insure freedom from too much coupling. Metal objects such as meters and tools should not be placed on top of the receiver cabinet.

The output meter should be connected across the loudspeaker voice coil terminals. 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 radio volume control should be in its maximum position. The test oscillator output signal should be attenuated so that the output meter reading never exceeds 1¼ volts.

ALIGNMENT CHART

Step	Connect Test Oscillator to	Test Oscillator Setting	Dial Settings	Adjust Trimmers
1	6SK7, pin 4, in series with 0.05 mf	455 kc	"BC" Band 550 kc	C6 and C7 for maximum
2	6SA7, pin 8, in series with 0.05 mf	455 kc	"BC" Band 550 kc	C4 and C5 for maximum
3	‡Capacity Coupled	1500 kc	"BC" Band 1500 kc	*C2 (Osc.) for maximum
4	‡Capacity Coupled	580 kc	"BC" Band 580 kc	*C22 (Osc) for maximum
5	‡Capacity Coupled	1500 kc	"BC" Band 1500 kc	*C2 (Osc) for maximum
6	‡Capacity Coupled	18 mc	"SW" Band 18 mc	**C23 (Osc.) to signal
7	‡Capacity Coupled	18 mc	"SW" Band 18 mc	*C24 (Ant.) for maximum

‡ Use two-foot antenna on output of test oscillator.
* Rock gang condenser when making alignment.
** Use minimum capacity peak.

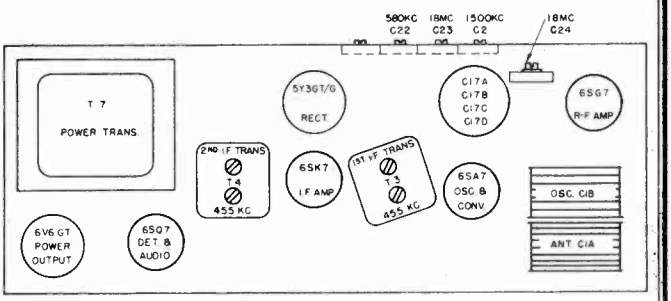


Fig. 1—Tube and Trimmer Location

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%. Readings should be taken with the AVC shorted out. This may be done conveniently by connecting the yellow Beam-a-Scope lead to ground.

1. R-F Stage Gains.
   Antenna to 6SG7 grid ..... 4 at 1000 kc
   6SG7 grid to 6SA7 grid ..... 14 at 1000 kc
   6SA7 grid to 6SK7 grid ..... 74 at 455 kc

2. Audio Gain.
   The power output across the speaker voice coil should be approximately ½ watt with 0.06 volts at 400 cps applied between the high side of the volume control and ground.

3. Oscillator Grid Bias.
   The d-c voltage developed across the oscillator grid leak (R4) averages 5.7 volts at 1000 kc.

4. Socket Pin Voltages.
   Fig. 4 shows typical tube pin voltages. All readings should be made from the pins to ground unless otherwise indicated.

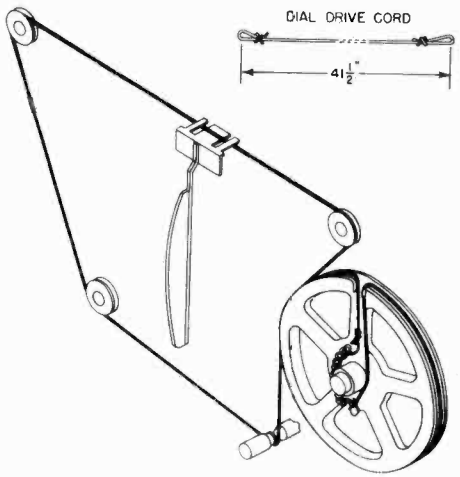
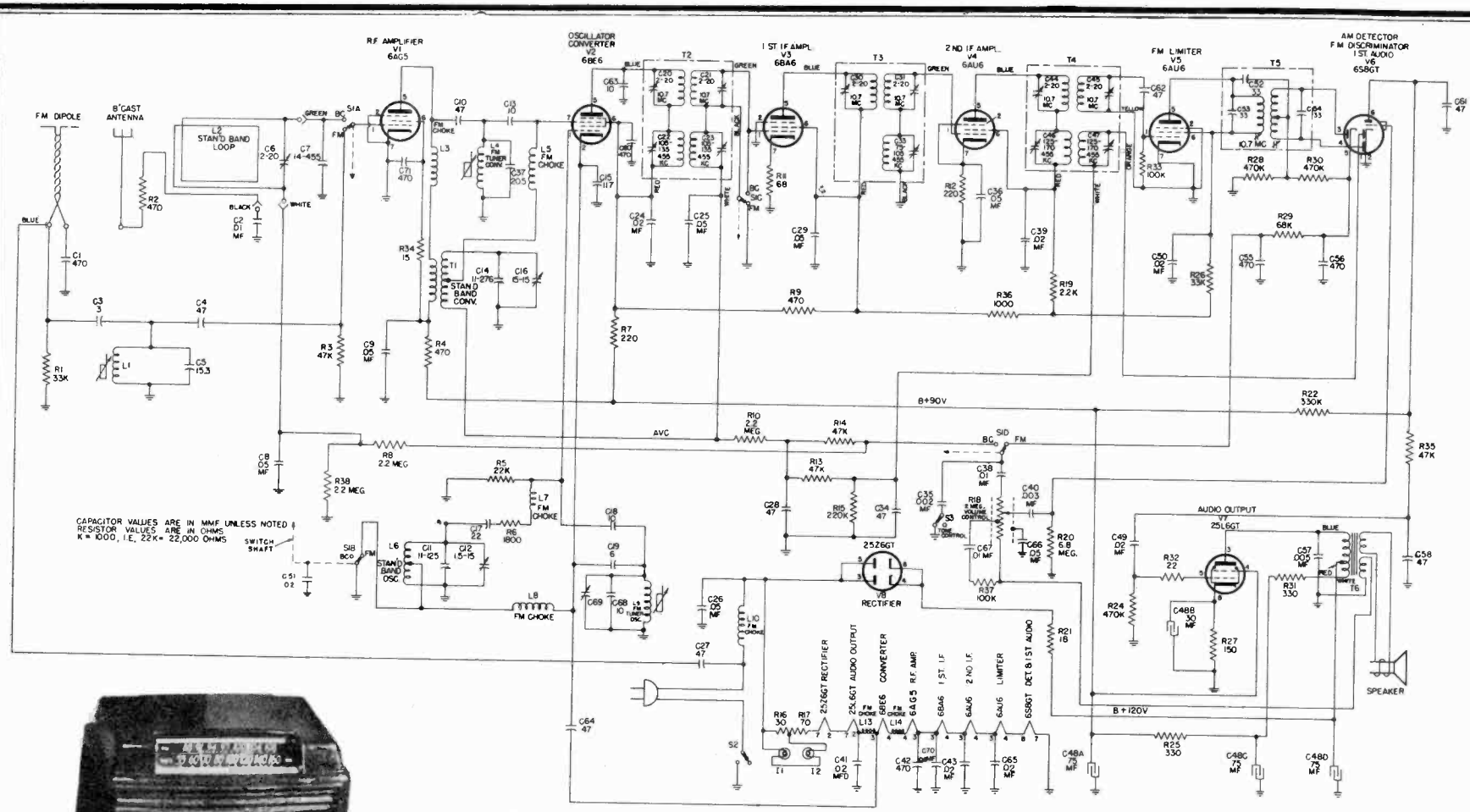
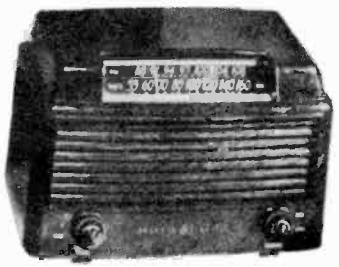


Fig. 3—Dial Stringing Diagram





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:

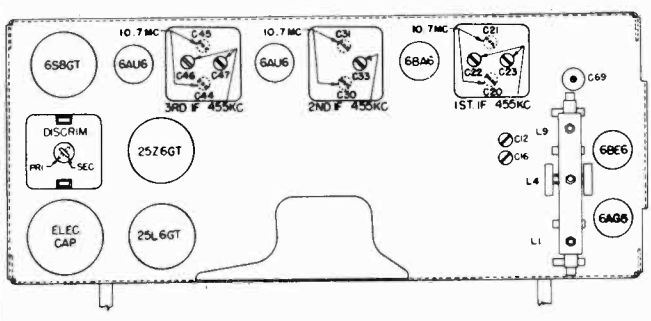
1. General Electric YGS-3 AM and FM signal generator, or equivalent.
2. General Electric CRO-5A oscilloscope, or equivalent.
3. 330,000 ohm resistor, ½ watt.
4. 20,000 ohm per volt meter.

NOTES IN CONNECTION WITH METER ALIGNMENT:

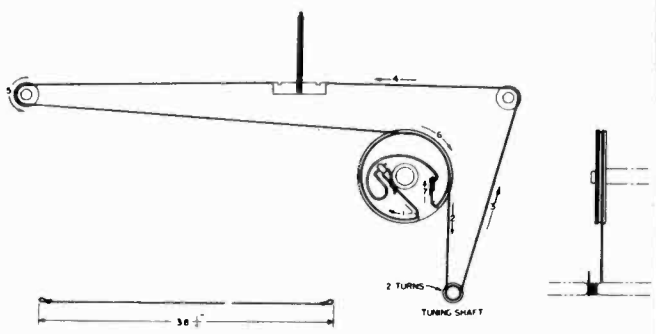
1. Use unmodulated signal.
2. Connect 20,000 ohm-per-volt meter from junction of R29 and C55.
3. Connect 20,000 ohm-per-volt meter from grid pin 1 of (V5) 6AU6 limiter to chassis with a 200,000-ohm resistor in series. The resistor must be connected directly to the grid to minimize capacity loading and 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

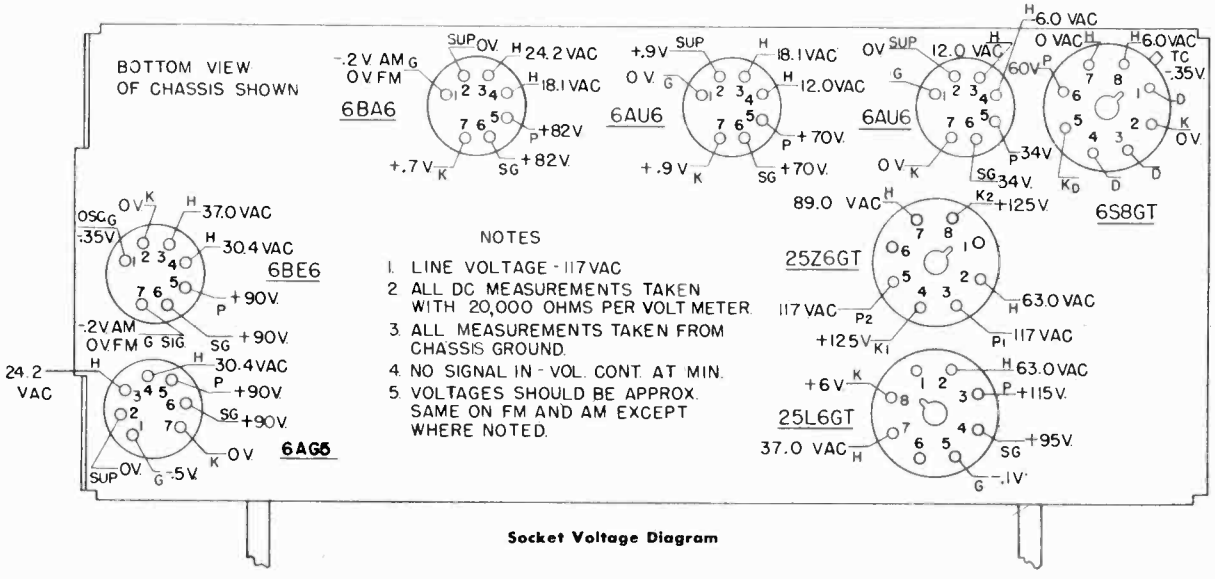
ALIGNMENT CHART

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 3⅜ 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 4⅜ 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	

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 and min. distortion of curve on 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 and 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. amplitude.
8	Same as Step 7	Same as Step 7	FM	.....	Secondary of T5	1, 3, 11	Adjust secondary for vertical symmetry with respect to midpoint horizontal traces.
9	Same as Step 7	Same as Step 7	FM	.....	Primary of T5	1, 3, 11	Adjust primary of T5 for straightest possible slope of straight line trace.
			FM R-F VISUAL ALIGNMENT				
10	98 mc	Dipole terminals thru dummy antenna	FM	98 mc or 3⅜ in.	Adjust C69*	2, 6, 7, 8, 10	*Set dial pointer accurately, then adjust for steepest slope of 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 scope, 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 4⅜ in.	Adjust C12	4, 6, 7	Adjust C12 for steepest slope of straight line trace on scope.
14	1500 kc Note 5	Antenna thru 200 mmf	STD	1500 kc or 4⅜ in.	Adjust C16	4, 5, 7, 9	Adjust C14 for max. amplitude.
15	1500 kc Note 5	Antenna thru 200 mmf	STD	1500 kc or 4⅜ in.	Adjust C6	4, 5, 7	Adjust C6 for max. amplitude.

GENERAL ELECTRIC CO.

MODELS 356, 357, 358



NOTES

1. LINE VOLTAGE - 117 VAC
2. ALL DC MEASUREMENTS TAKEN WITH 20,000 OHMS PER VOLT METER.
3. ALL MEASUREMENTS TAKEN FROM CHASSIS GROUND.
4. NO SIGNAL IN - VOL. CONT. AT MIN.
5. VOLTAGES SHOULD BE APPROX. SAME ON FM AND AM EXCEPT WHERE NOTED.

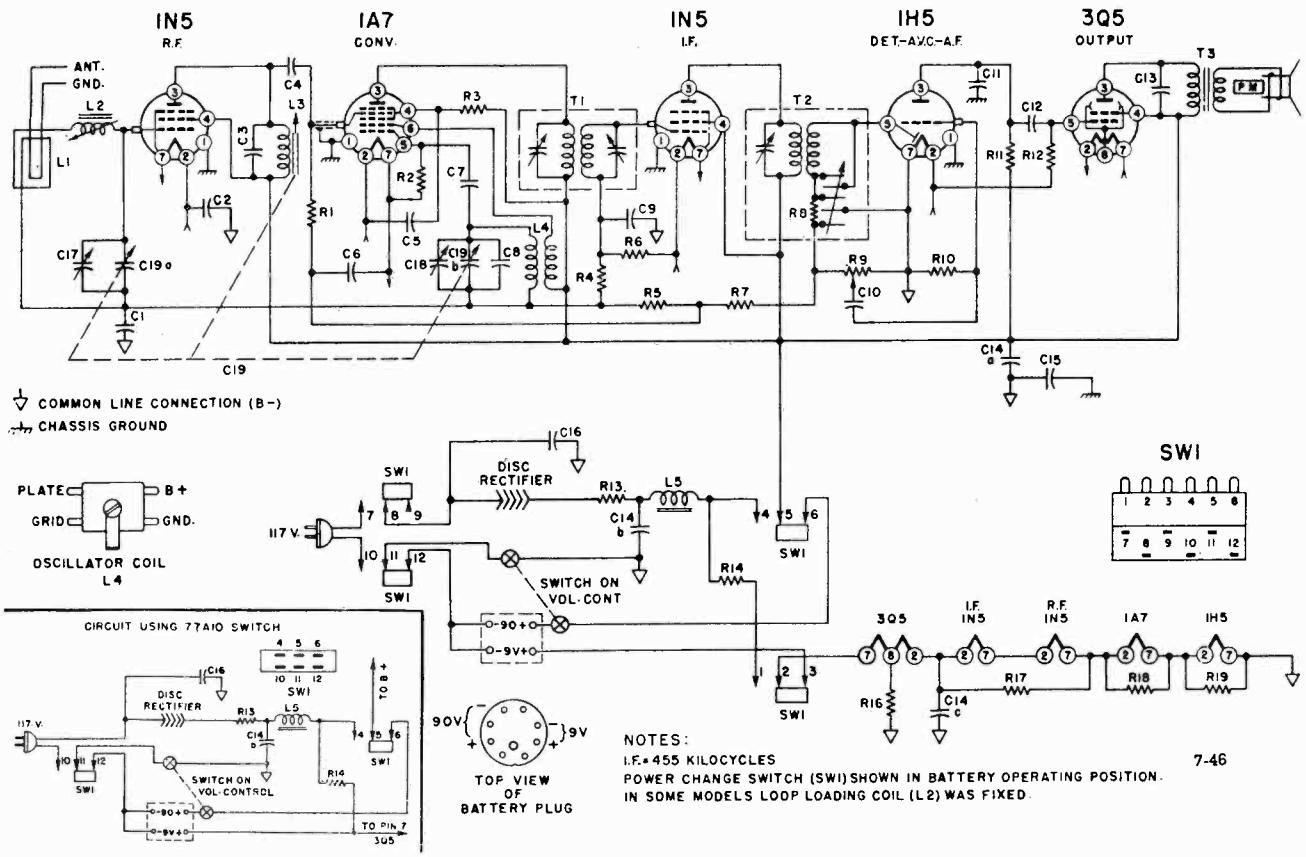
Socket Voltage Diagram

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, 10, 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

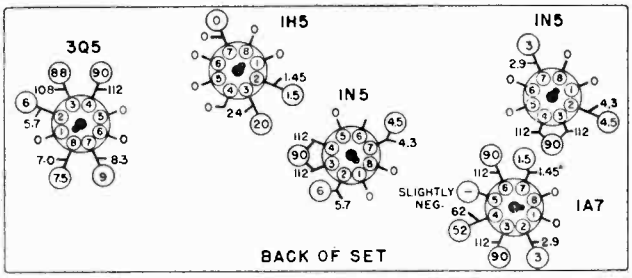
Cat. No.	Symbol	Description
SPECIALIZED REPLACEMENT PARTS (Cont'd)		
RCW-1056	C37	CAPACITOR—20.5 mmf., ceramic
RCY-016	C6	CAPACITOR—Trimmer capacitor
RCY-038	C69	CAPACITOR—Trimmer capacitor
RDC-032		CORD—Dial drive cord (10 yard min.)
RDD-009		DRUM—Tuner drum
RDK-110		KNOB—Black knob for band change 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 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

MODELS R652, R652-N

B. F. GOODRICH CO.



VOLTAGE CHART



VOLTAGE DATA

1. Voltage readings circled (O) are for Battery Operation.
2. All readings made between Tube Socket Terminals and Pin No. 7 on the 1H5.
3. A.C. Voltages measured on a 117 Volt A.C. line
4. Battery Voltages measured with a fresh battery.
5. Dial turned to low frequency end, no signal.
6. All Voltages measured with a 1000 ohm-per-volt meter.

CONDENSERS

Symbol	Description	Part No.
C1	.05 Mfd., 200 Volt, Paper	64B1-32
C2	.25 Mfd., 200 Volt, Paper	64B1-28
C3	.00042 Mfd., Mica	65B1-13
C4, C11	.00025 Mfd., Mica	65B5-22
C5, C6, C9, C10, C12	.01 Mfd., 400 Volt, Paper	64B1-25
C7	.00005 Mfd., Mica	65B5-11
C8	.000015 Mfd., Mica	65B5-3
C13	.002 Mfd., 600 Volt, Paper	64B1-14
C14a	50 Mfd., 150 Volt	Elect. Cond. 67C7-42
C14b	30 Mfd., 150 Volt	
C14c	100 Mfd., 25 Volt	
C15	.2 Mfd., 400 Volt, Paper	64A2-1
C16	.05 Mfd., 400 Volt, Paper	64B1-22
C17	Antenna Trimmer	66A12-5
C18	Oscillator Trimmer (Part of Gang)	
C19 (C19a, C19b)	Condenser, Gang	68B4

RESISTORS

R1	100,000 Ohms, ½ Watt, Carbon	60B8-104
R2	220,000 Ohms, ½ Watt, Carbon	60B8-224
R3	47,000 Ohms, ½ Watt, Carbon	60B8-473
R4, R5	4.7 Megohms, ¼ Watt, Carbon	60B2-475

RESISTORS

Symbol	Description	Part No.
R6	4.7 Megohms, ¼ Watt, Carbon	60B2-475
R7	3.3 Megohms, ¼ Watt, Carbon	60B2-335
R8	47,000 Ohms, ½ Watt, Carbon	60B8-473
R9	1 Megohm Volume Control	75B1-10C
R10	15 Megohms, ¼ Watt, Carbon	60B2-156
R11	1 Megohm, ¼ Watt, Carbon	60B2-105
R12	2.2 Megohms, ¼ Watt, Carbon	60B2-225
R13	68 Ohms, Wire Wound, 1 Watt	60B28-4
R14	2,275 Ohms, Wire Wound, 5 Watt	61A3-6
R16	1,500 Ohms, ½ Watt, Carbon	60B8-152
R17	560 Ohms, ½ Watt, Carbon	60B8-561
R18	220 Ohms, ½ Watt, Carbon	60B8-221
R19	120 Ohms, ½ Watt, Carbon	60B8-121

COILS & TRANSFORMERS

L2	Coil, Loop Loading, (fixed)	AA114
	Coil, Loop Loading, (variable)	AA115
L3	Iron Slug for plate coil	71B1-3
	Coil, Plate	AB100-5
L4	Oscillator Coil	69A7
L5	Choke Filter	74A5
T1	1st I.F. Transformer	72B9-2

COILS & TRANSFORMERS

Symbol	Description	Part No.
T2	2nd I.F. Transformer	72B10-2
T3	Transformer, Output	*
	* When ordering, specify all numbers on the speaker and transformer.	
SW1	Switch, Power Change (R652)	77A6
	Switch, Power Change (R652N)	77A10

MISCELLANEOUS

Description	Part No.
Dial Background	21A18-2
Dial Cord, 12"	50A1-3
Dial Cord Tension Spring	19A1-2
Escutcheon and Dial Scale	23C14
Knob, Tuning	33A14-6
Knob, Volume	33A14-5
Plug, Battery (9 prong)	88A3-3
Pointer, Cream Tenite	25A15-1
Rectifier, Selenium	93A1-2
Speaker & Output Transformer	78B8
Tube Shields	87A8

ALIGNMENT PROCEDURE

1. Be sure both set and signal generator are thoroughly warmed up before starting alignment.
2. Make alignment, using a battery whenever possible.
3. Disconnect Loop Antenna leads from clips on set and remove chassis from cabinet.
4. Connect a 50,000 ohm carbon resistor across the two clips from which the Loop Antenna was removed.
5. Connect Output Meter across the Voice Coil.
6. Connect a fresh battery to the set.
7. Turn receiver Volume Control full on.

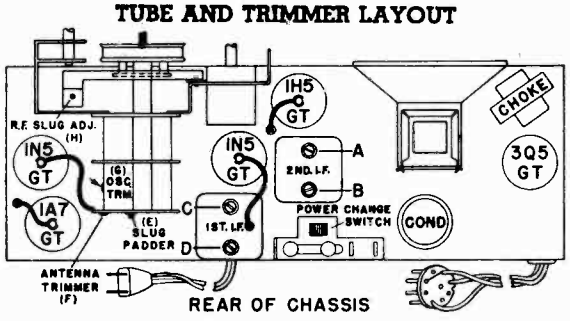
Step	Dummy Antenna Used in Series with Signal Generator	Connect High Side Signal Generator to	Signal Generator Frequency	Gang Condenser Setting	Trimmer Description and Designation	Type of Adjustment
1	.00025 Mfd. when using A.C. .1 Mfd. when using Battery	Grid Cap 1A7	455 K.C.	Any point where it does not affect Signal	2nd I.F. (A), (B). 1st I.F. (C), (D).	Maximum Deflection. Then repeat
2	.00025 Mfd. when using A.C. .1 Mfd. when using Battery	Grid Cap 1N5	1620 K.C.	Rotor full open (Plates out of mesh)	Oscillator Trimmer (G)	Maximum Deflection
3	.00025 Mfd. when using A.C. .1 Mfd. when using Battery	Grid Cap 1N5	1400 K.C.	Tune in Generator Signal	R.F. Slug (H)	Maximum Deflection
4	Replace Set in Cabinet					
5	.00025 Mfd.	Antenna and Ground Leads	1400 K.C.	Tune in Generator Signal	Antenna Trimmer (F)	Maximum Deflection
6	Disregard the next two steps if the set being aligned is a model with a fixed loop loading coil (L2).					
7	.00025 Mfd.	Antenna and Ground Leads	600 K.C.	Tune in Generator Signal	Loop Loading Coil Slug (E)	Maximum Deflection
8	.00025 Mfd.	Antenna and Ground Leads	1400 K.C.	Tune in Generator Signal	Reset Antenna Trimmer (F)	Maximum Deflection

Seal adjusting screw on the loop loading coil with any quick drying cement.

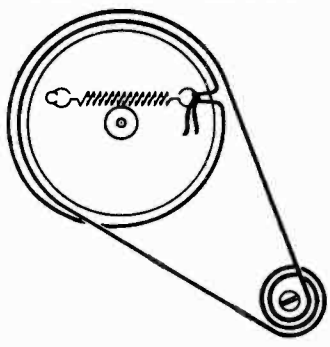
REPLACING R.F. TUNING SLUG

If the R.F. Tuning Slug has to be changed, use the following procedure. Set the gang condenser to the point where the plates are fully meshed. Screw the slug adjusting screw about halfway down. Place the slug in the coil in such a position that the top of the slug is flush with the top of the coil. Solder the slug wire to the adjusting screw. Be sure that the position of the slug does not change during the soldering and that the slug wire is straight. Proceed to re-align the set as shown in the chart.

TUBE AND TRIMMER LAYOUT

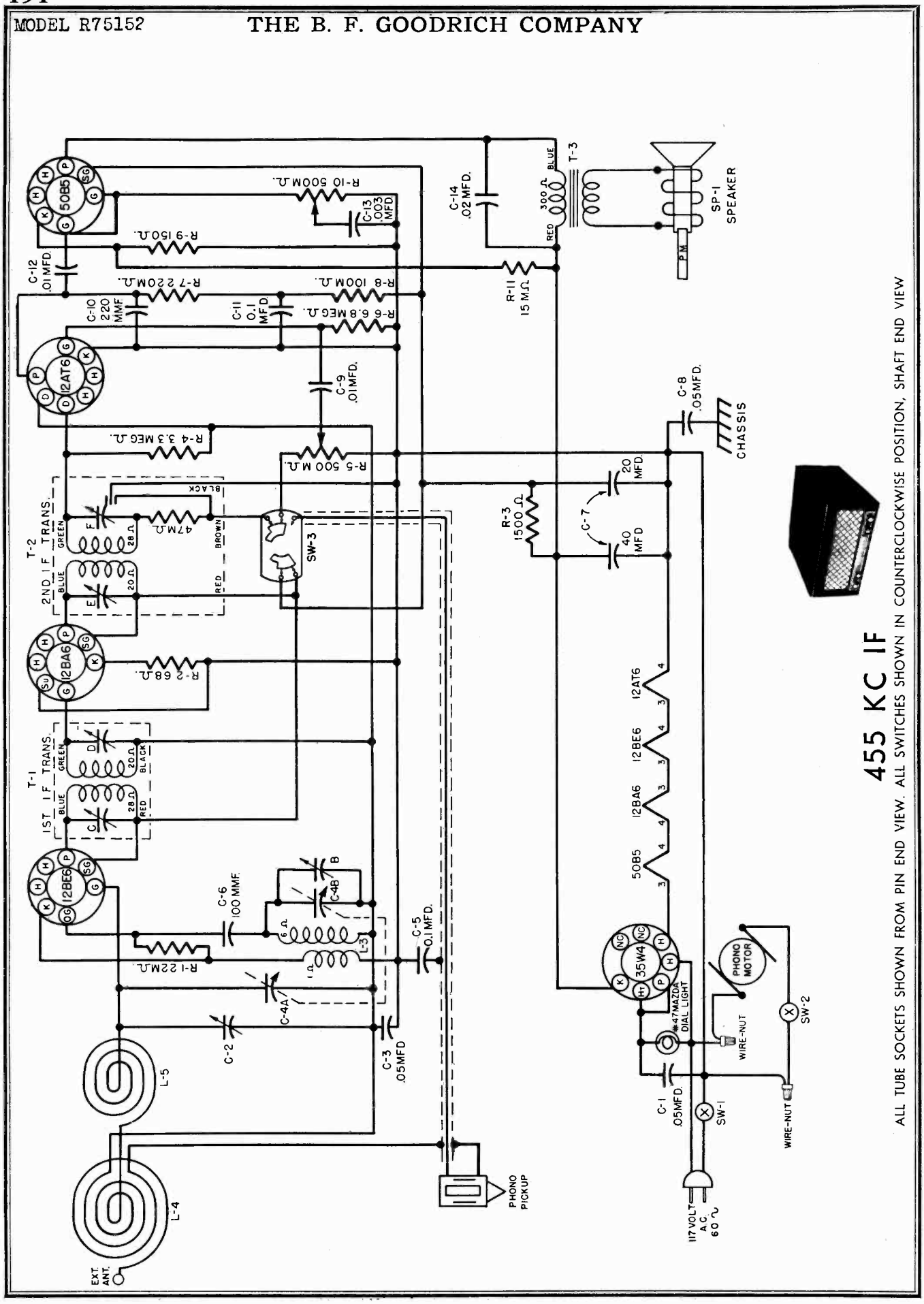


DIAL CORD STRINGING



MODEL R75152

THE B. F. GOODRICH COMPANY



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. — RMA loop.

NOTE: Intermediate Frequency and Oscillator adjustments may be made with the loop disconnected provided a resistor of 10,000 to 50,000 ohms is substituted to close the 12BE6 grid circuit. The loop alignment must be done with the loop and chassis mounted in operating position in the cabinet. A single turn loosely coupled to loop may be substituted for RMA loop.

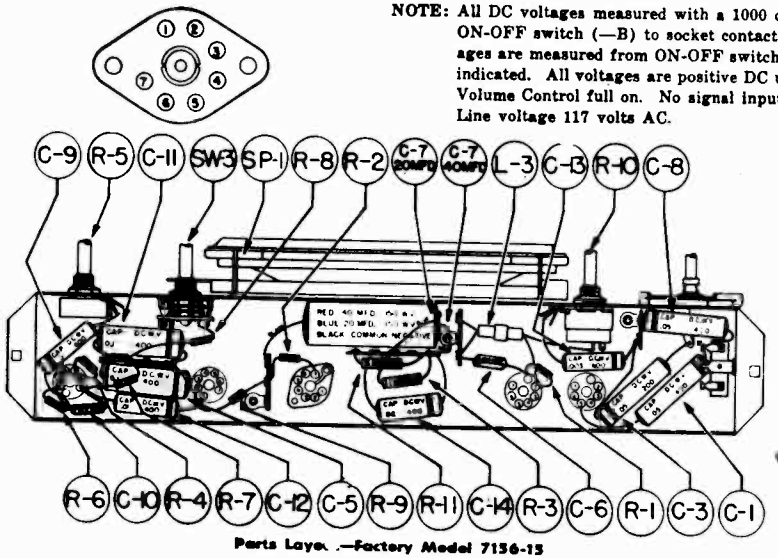
GENERATOR	CONNECTION AT RADIO	DUMMY ANTENNA	DIAL	TO TUNE TRIMMERS	REMARKS
IF 455 kc.	12BE6 grid	.1 mfd.	HF end	IF trimmers C D E F	Tune to max.
1620 kc.	12BE6 grid	RMA loop	HF end	Osc. trimmer B	Set limit of band
1400 kc.	Through loop*	RMA loop	1400 kc.	Ant. trimmer C-2	Tune to max.

* Loop trimmer accessible through back of cabinet.

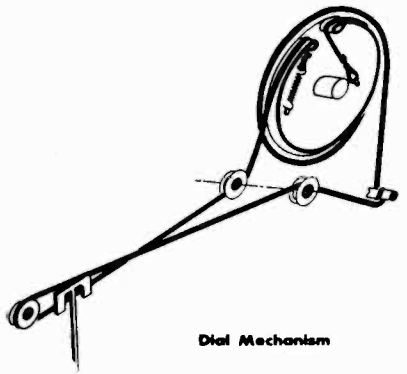
SOCKET VOLTAGES

TUBE	POSITION	1	2	3	4	5	6	7
12BE6	Converter	-5	0	24 AC	12 AC	88	88	0
12BA6	I.F. Amplifier	0	0	24 AC	35 AC	88	88	0.7
12AT6	2nd DET.—1st AF—AVC	0	0	12 AC	0	0	0	12
50B5	Power Output	0	5	85 AC	35 AC	115	88	0
35W4	Rectifier	0	0	85 AC	117 AC	112 AC	112 AC	122

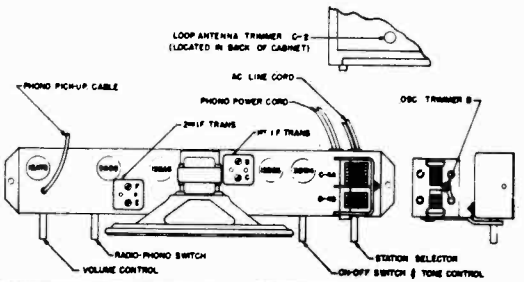
NOTE: All DC voltages measured with a 1000 ohm-per-volt meter from ON-OFF switch (—B) to socket contact indicated. All AC voltages are measured from ON-OFF switch (—B) to socket contact indicated. All voltages are positive DC unless otherwise marked. Volume Control full on. No signal input. Line voltage 117 volts AC.



Parts Layout—Factory Model 7156-15



Dial Mechanism

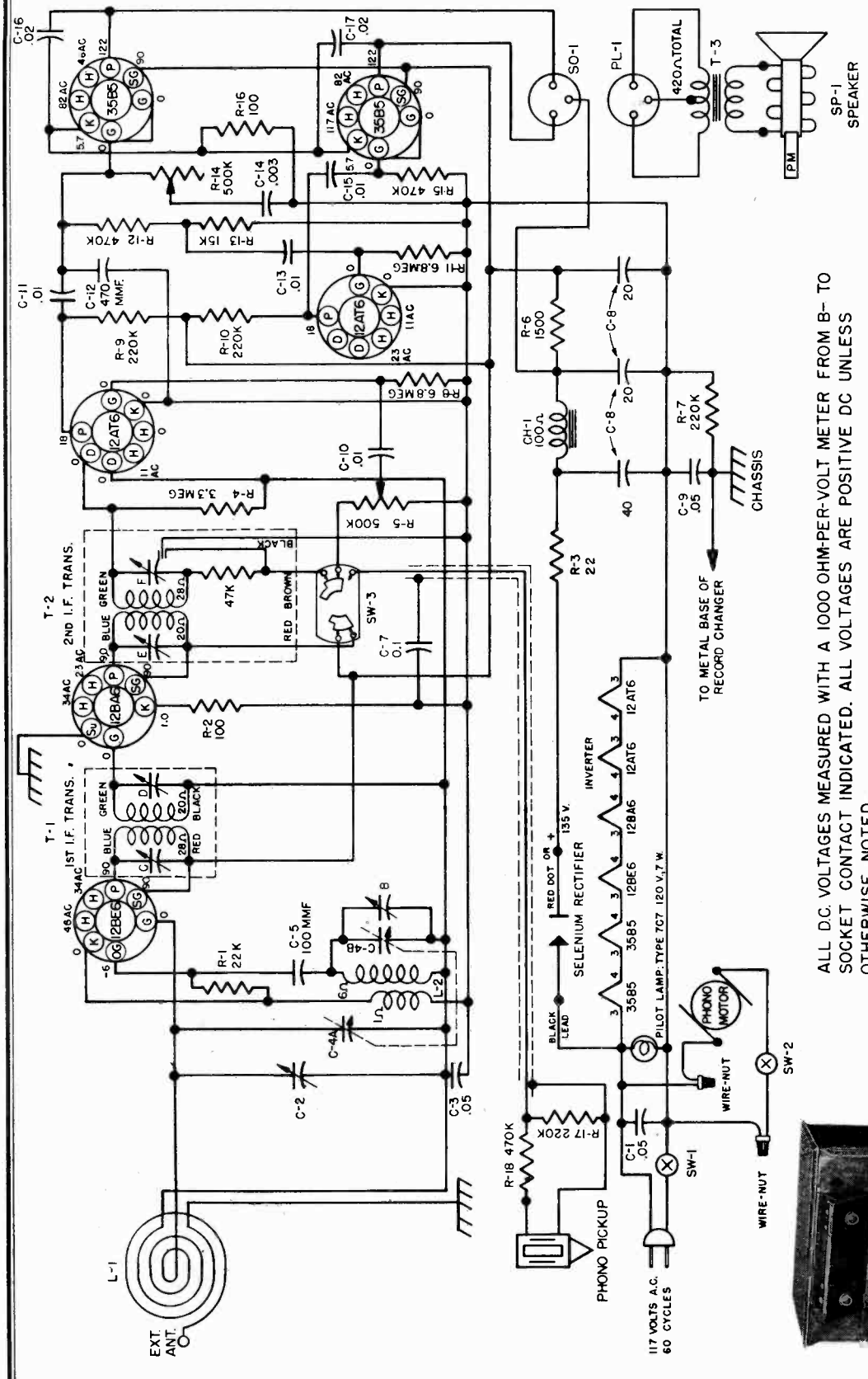


Tube Layout

Symbol	Part No.	Description
	B-51427-5	Grommet (large)
	B-51427-8	Grommet (small)
SW-3	B-51576-2	Switch, Radio-Phono
	A-51787	Spring, for Dial Cable
	A-54122	Button, Plug
R-5	B-54466-2	Control, Volume, 500,000 ohm
T-2	B-56718-1	Transformer Assembly, 2nd IF
T-1	B-56722-1	Transformer Assembly, 1st IF
	B-57262-6	Cord, AC Phono.
R-10	B-57841-1	Control, Tone & Switch, 500,000 ohm
	B-57842	Coil Assembly, Oscillator
SP-1	C-57843	Speaker, 5x7 PM
	B-57848-1	Shaft, Tuning Drive
	B-57857-1	Pointer, Dial
	B-57858-1	Strip Assembly, Light Diffusing
C-4	C-57859-1	Capacitor, Variable
L-4 & L-5	D-57870	Coil Assembly, Loop
	C-57872-1	Knob
	A-57878	Clip, Gang Mounting
C-2	B-57879-1	Capacitor Assembly, Trimmer
	C-59414	Crystal and Indicator, Dial
	B-58069-1	Cord, AC Power

Symbol	Part No.	Description
C-3	BD210503	Capacitor, Paper, .05 mfd., 200 v.
C-9, C-12	BD410103	Capacitor, Paper, .01 mfd., 400 v.
C-5, C-11	BD410104	Capacitor, Paper, 0.1 mfd., 400 v.
C-14	BD410203	Capacitor, Paper, .02 mfd., 400 v.
C-1, C-8	BD410503	Capacitor, Paper, .05 mfd., 400 v.
C-13	BD610302	Capacitor, Paper, .003 mfd., 600 v.
C-6	BM74A101	Capacitor, Mica, 100 mmf.
C-10	BM74A221	Capacitor, Mica, 220 mmf.
R-2	BR16B680	Resistor, 68 ohm, ½ w.
R-9	BR16C151	Resistor, 150 ohm, ½ w.
R-8	BR17B104	Resistor, 100,000 ohm, ½ w.
R-1	BR17B223	Resistor, 22,000 ohm, ½ w.
R-7	BR17B224	Resistor, 220,000 ohm, ½ w.
R-4	BR17B335	Resistor, 3,3 megohm, ½ w.
R-6	BR17B685	Resistor, 6.8 megohm, ½ w.
R-3	BR17E152	Resistor, 1500 ohm, 1 w.
R-11	BR17E153	Resistor, 15,000 ohm, 1 w.
	A-2163	Cable, Drive
	A-6158	Lamp, Pilot, No. 47 Mazda, 6.3 v.
	A-6182-1	Socket, Dial Light
C-7	B-9564-1	Cap., Electro., 40-20 mfd., 150 v.
	A-51163	Clip, Spring

MODEL R76162 THE B. F. GOODRICH COMPANY



ALL D.C. VOLTAGES MEASURED WITH A 1000 OHM-PER-VOLT METER FROM B- TO SOCKET CONTACT INDICATED. ALL VOLTAGES ARE POSITIVE DC UNLESS OTHERWISE NOTED.

VOLUME CONTROL FULL ON. NO SIGNAL INPUT.

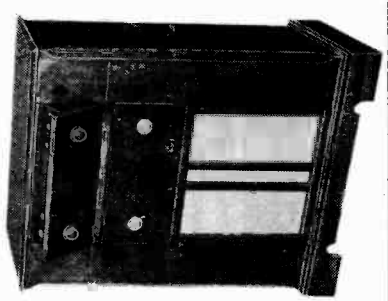
RADIO-PHONO SWITCH SHOWN IN RADIO POSITION, SHAFT END VIEW.

ALL TUBE SOCKETS SHOWN FROM PIN END VIEW.

455 KC IF

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.



ALIGNMENT PROCEDURE

The following equipment is necessary to properly align this chassis:

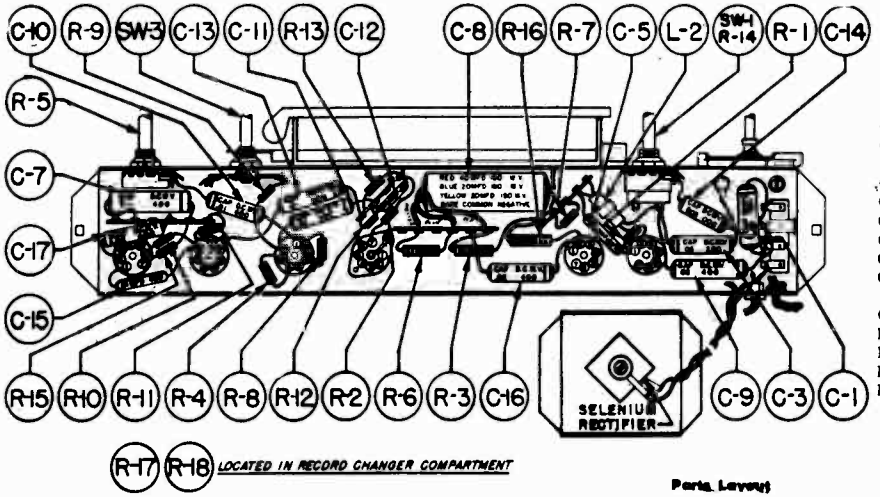
1. A signal generator which will provide an accurately calibrated signal at the frequencies listed.
2. An output meter.
3. A non-metallic screwdriver.
4. Dummy antenna: — .1 mfd. — RMA loop.

NOTE: Intermediate Frequency and Oscillator adjustments may be made with the loop disconnected provided a resistor of 10,000 to 50,000 ohms is substituted to close the 12BE6 grid circuit. The loop alignment must be done with the loop and chassis mounted in operating position in the cabinet. A single turn loosely coupled to loop may be substituted for RMA loop.

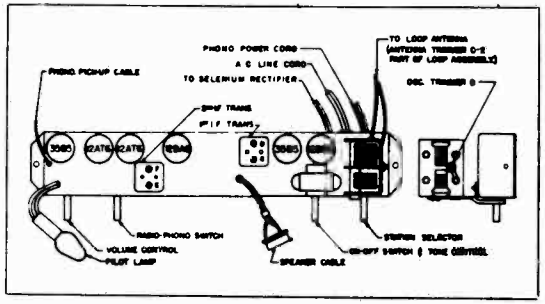
GENERATOR	CONNECTION AT RADIO	DUMMY ANTENNA	DIAL	TO TUNE TRIMMERS	REMARKS
IF 455 kc.	12BE6 grid	.1 mfd.	HF end	IF trimmers C D E F	Tune to max.
1620 kc.	12BE6 grid	RMA loop	HF end	Osc. trimmer B	Set limit of band
1400 kc.	Through loop	RMA loop	1400 kc.	Ant. trimmer C-2	Tune to max.

Electrical and Mechanical Specifications

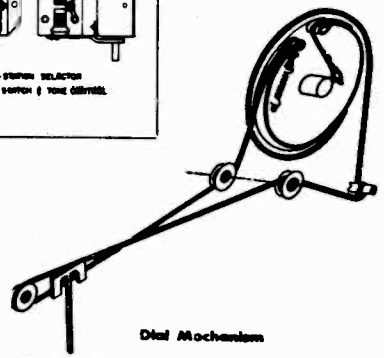
Frequency Range	540-1600 kc.	V.C. Impedance	3.2 ohms at 400 cycles
Intermediate Frequency	455 kc.	Power Output (Undistorted)	.2 watts
Power Supply	105 to 125 volts AC, 60 cycle	Power Output (Maximum)	3.2 watts
Loudspeaker	10-inch, PM	Tuning Drive Ratio	7 to 1



Parts Layout



Tube Layout



Dial Mechanism

Symbol	Part No.	Description
	E59413-1	Cabinet
C-4	C57859-1	Capacitor, Variable
	A2163	Cable, Dial
C-8	B55487-1	Cap., Elect. 40-20-20 mfd., 150v.
C-15	BC31B103	Cap., Mold. Paper .01 mfd., 400v.
C-3	BD210503	Cap., Paper .05 mfd., 200v.
C-10, 11, 13	BD41013	Cap., Paper .01 mfd., 400v.
C-7	BD410104	Cap., Paper 0.1 mfd., 400v.
C-16, 17	BD410203	Cap., Paper .02 mfd., 400v.
C-1, 9	BD410503	Cap., Paper .05 mfd., 400v.
C-14	BD610302	Cap., Paper .003 mfd., 600v.
C-5	BM74A101	Cap., Mica 100 mmf.
C-12	BM74A471	Cap., Mica 470 mmf.
	B55823	Carton, Complete
CH-1	B58635-1	Choke, Filter
L-2	B57842	Coil Assy., Osc.
L-1	C59420	Coil Assy., Loop
R-5	B54466-2	Control, Pot. 500 000 ohm, (V.C.)
R-14	B57841-1	Control, Pot. & Sw. 500,000 ohm (T.C.)
	C-59414	Crystal & Indicator, Dial
	B57262-8	Cord, (A.C. Phono)
	B58069-3	Cord, Power
	C59416-1	Knob, Magnifying Insert
	A55431	Lamp, Pilot, 7w., 120v.

Symbol	Part No.	Description
	B51524-5	Lead Shielded
	A58723	Needle, Osmium Point
	B57857-1	Pointer, Dial
	A9027	Pulley, Idler
	A58612	Rectifier, Selenium
	A58700	Retainer, Dial Crystal
R-2	BR16B101	Resistor, 100 ohm, ½w.
R-16	BR16E101	Resistor, 100 ohm, 1w.
R-13	BR16B153	Resistor, 15,000 ohm, ½w.
R-12, 18	BR16B474	Resistor, 470,000 ohm, ½w.
R-1	BR17B223	Resistor, 22,000 ohm, ½w.
R-7, 9, 10, 17	BR17B224	Resistor, 220,000 ohm, ½w.
R-4	BR17B335	Resistor, 3.3 megohm, ½w.
R-15	BR17B474	Resistor, 470,000 ohm, ½w.
R-8, 11	BR17B685	Resistor, 6.8 megohm, ½w.
R-6	BR17E152	Resistor, 1,500 ohm, 1w.
R-3	BR17E220	Resistor, 22 ohm, 1w.
	B57848-1	Shaft, Drive
	B55440-1	Socket, Dial Light
SO-1	B59417-1	Socket & Cable Assy.
SP-1	C59415	Speaker, 10-inch PM
	C58711-1	Strip, Light Diffusing
SW-3	B51576-2	Switch, (Radio-Phono)
T-2	B56718-2	Transformer Assy., 2nd IF
T-1	B56722-2	Transformer Assy., 1st IF

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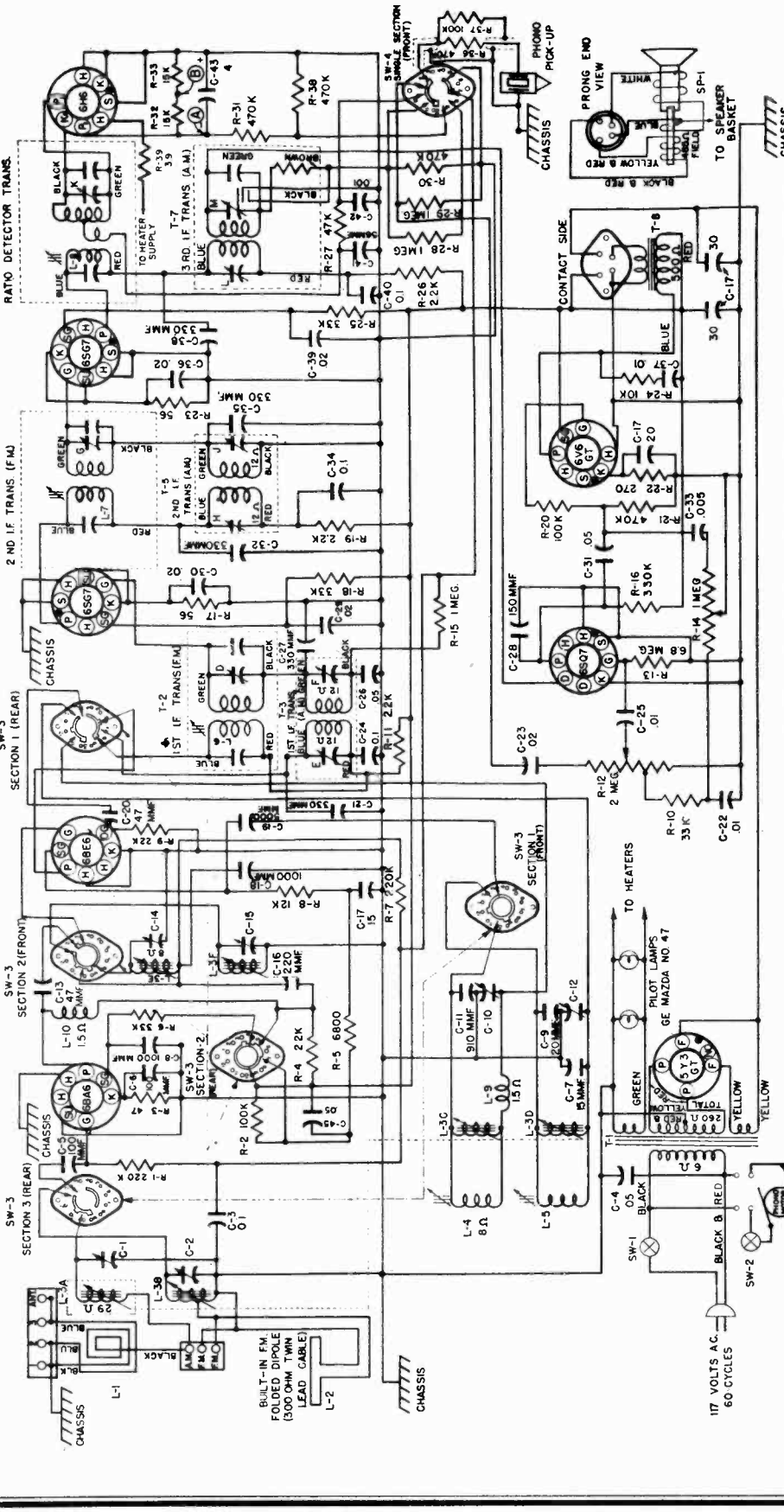


Frequency Range	(AM) 535 KC to 1620 KC
Intermediate Frequency	(FM) 87.25 MC to 103.75 MC (AM) 455 KC (FM) 10.7 MC
Power Supply	105 to 125 volts AC, 60 cycles
Speaker	12 inch, Electro-Dynamic
V.C. Impedance	3.2 ohms at 400 cycles
Power Output (Undistorted)	3.5 watts
Power Output (Maximum)	5 watts

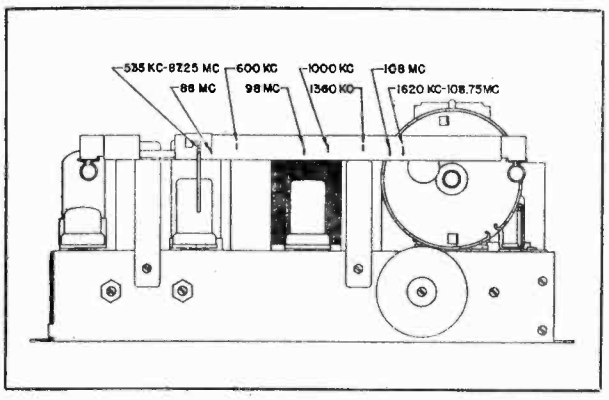
ALIGNMENT PROCEDURE

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.

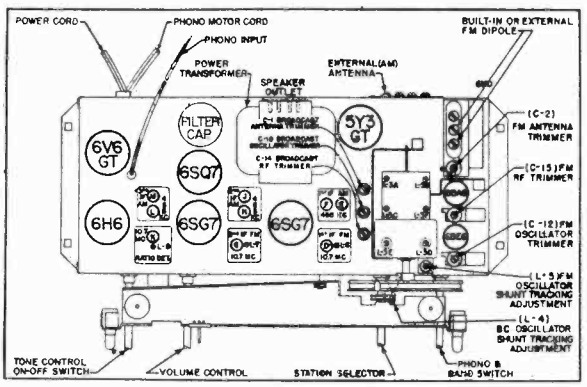
The following equipment is necessary to properly align this receiver:

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.

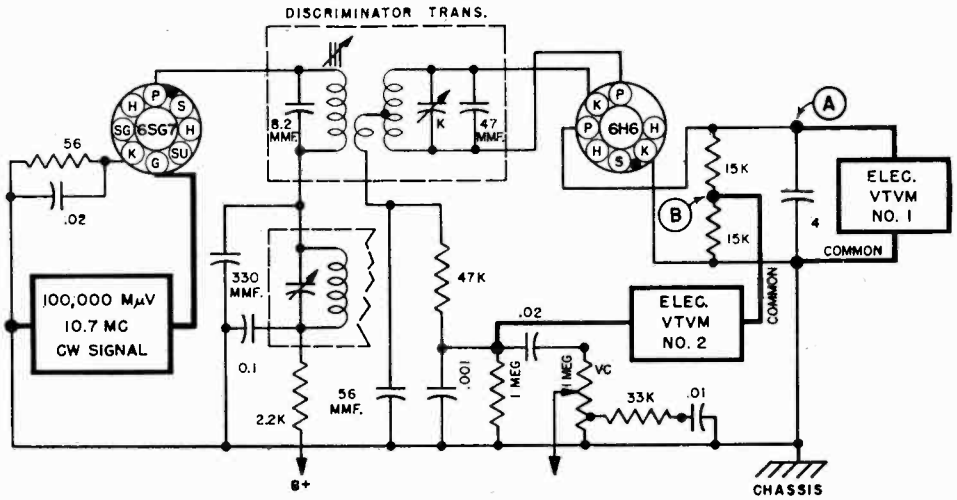
Note 3—For all tests requiring an FM signal, the generator output (22.5 kc. deviation, 400 cycles) must be adjusted to give approximately one-half watt receiver output before final adjustments are made. Either STEP 8A or 8B may be used depending on equipment available.

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.

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.

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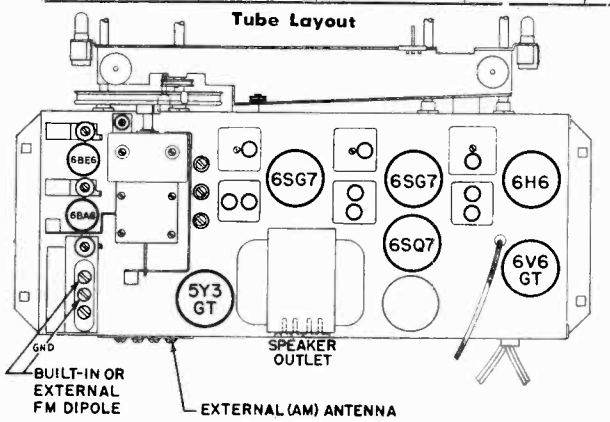
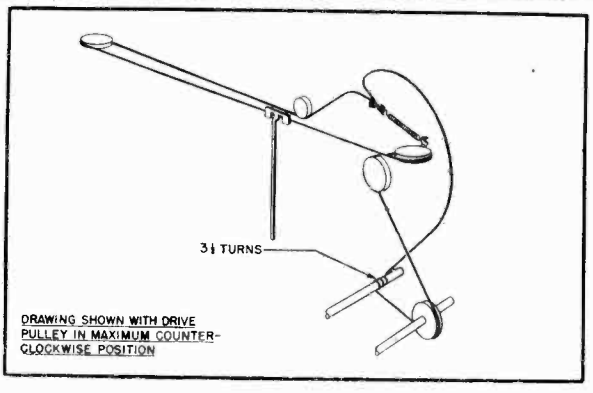
ALIGNMENT CHART

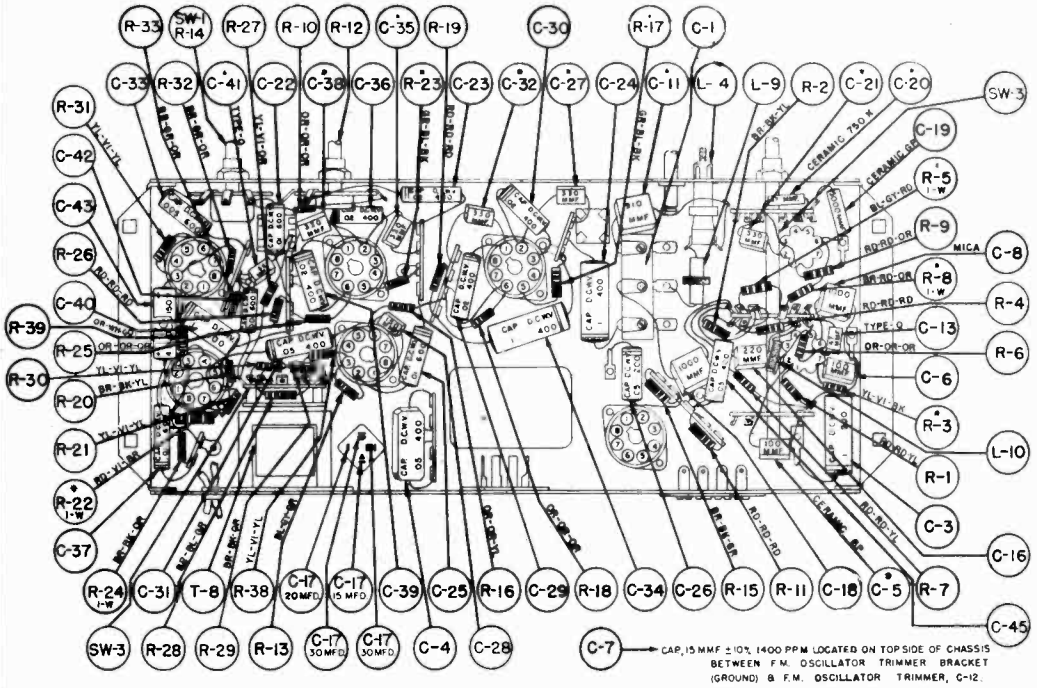
Step No.	Band Switch Position	Signal Generator	Connection at Receiver	Dummy Antenna	Dial Setting	Adjust Trimmer	Remarks
1	AM	455 kc.	6BE6 Converter Grid Pin No. 7	0.1 mfd.	HF end	E, F, H, J, L, M, AM IF Trimmers	Adjust for Maximum Output.
2	AM	535 kc.	6BA6 Grid Pin No. 1	0.1 mfd.	LF end	C-10 AM Osc. 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



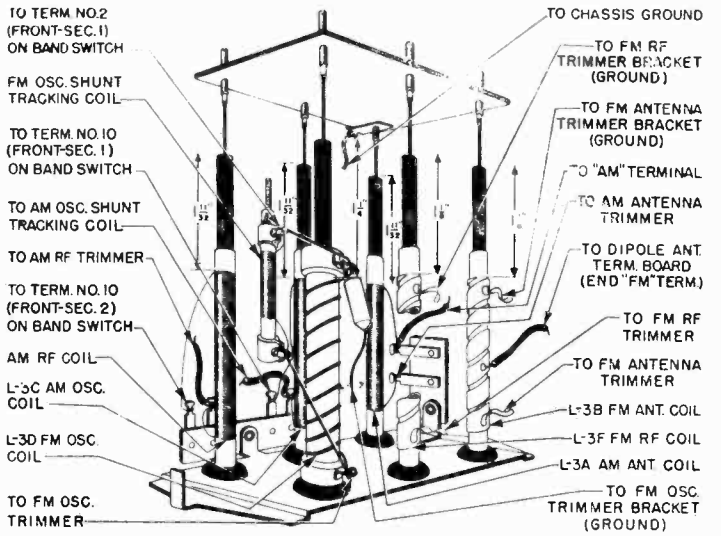


Dial Stringing



*10% TOLERANCE

Bottom View — Parts Layout



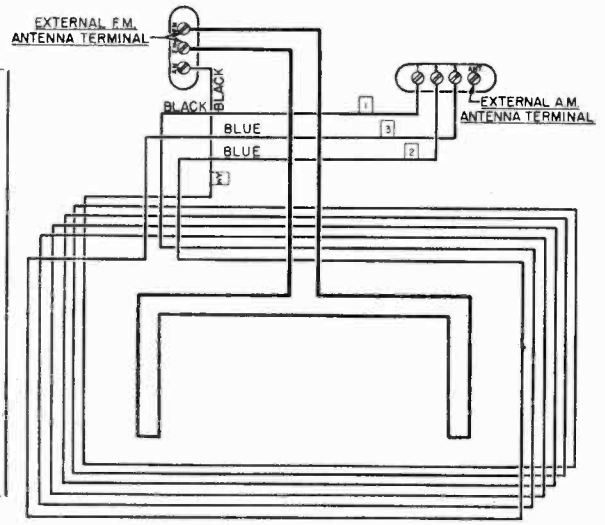
Permeability Tuner Illustration

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.



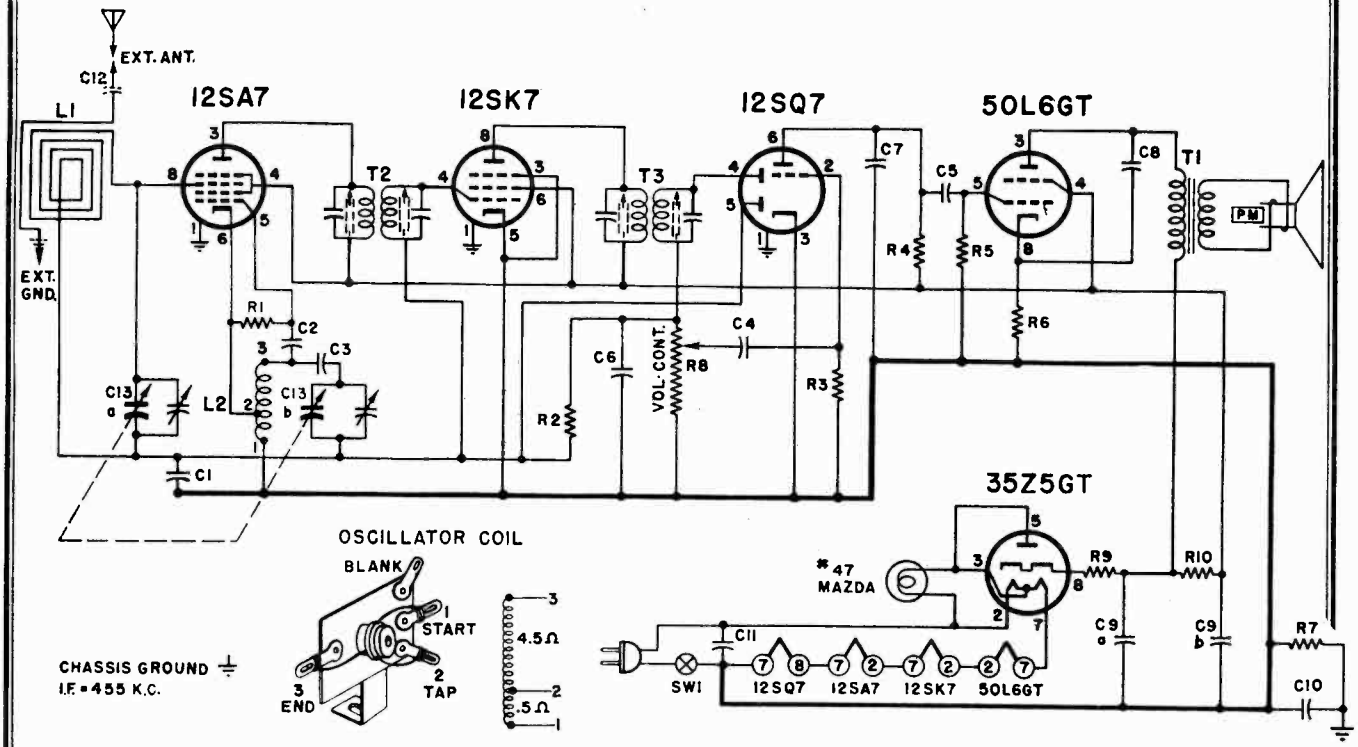
Loop Antenna Connections

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

MODELS 92503, 92504

THE B. F. GOODRICH COMPANY



REPLACEMENT PARTS

RESISTORS

Symbol		Part No.
R1	22,000 Ohms, ½ Watt	60B 8-223
R2	1 Megohm, ½ Watt	60B 8-105
R3	47 Megohms, ½ Watt	60B 8-475
R4	220,000 Ohms, ½ Watt	60B 8-224
R5	470,000 Ohms, ½ Watt	60B 8-474
R6	150 Ohms, ½ Watt	60B 8-151
R7	150,000 Ohms, ½ Watt	60B 8-154
R8	1 Megohm Volume Control and Switch SW1	75B 1-6
R9	33 Ohms, 1 Watt	60B 28-3
R10	1,000 Ohms, 1 Watt	60B 28-2

CONDENSERS

Symbol		Part No.
C1	.1 mfd., 200 Volts, Paper	64B 1-30
C2	50 mmfd., Mica	65B 7-11
C3	.02 mfd., 400 Volts, Paper	64B 1-24
C4	.01 mfd., 400 Volts, Paper	64B 1-25
C5	.01 mfd., 400 Volts, Paper	64B 1-25
C6	250 mmfd, Mica	65B 7-22
C7	500 mmfd., Mica	65B 7-27
C8	.02 mfd., 400 Volts, Paper	64B 1-24
C9a	50 mfd., 150 Volts, Elect. }	67A 10
C9b	30 mfd., 150 Volts, Elect. }	
C10	.18 mfd., 200 Volts, Paper	64A 2-2
C11	.05 mfd., 400 Volts, Paper	64B 1-22
C12	.005 mfd., 600 Volts, Paper (Used in early production only)	64B 1-12
C13a	0 to 420 mmfd., R.F. Section } Gang	68A 18
C13b	0 to 108 mmfd., Osc. Section } Gang	

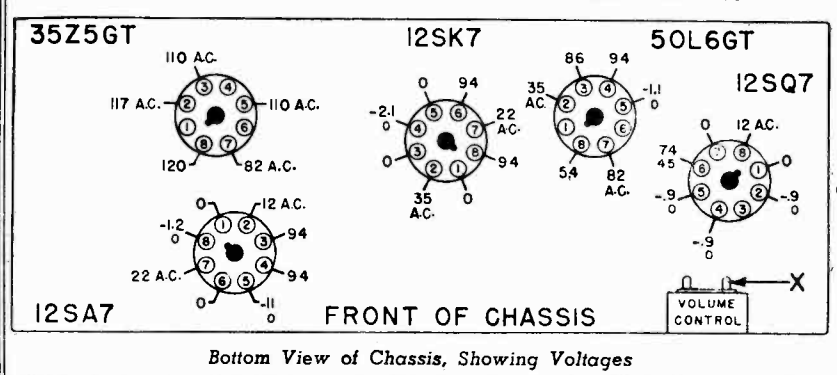
COILS & TRANSFORMERS

L1	Loop Antenna	69C 44
L2	Oscillator Coil	69A 43
T1	Transformer, Output	98A 4
T2	Transformer, 1st I.F.	72B 50
T3	Transformer, 2nd I.F.	72B 51

MISCELLANEOUS

Description	Part No.
Background, Dial	X22C 3-1
Bracket, Loop Retainer	15A 14
Cabinet, Ivory (Model 92503)	34D 5-1
Cabinet, Mahogany (Model 92504)	34D 5-2
Clip, Dial Glass Mounting	18A 2
Cord, Dial (62")	50A 1-3
Cover, Back and Loop Antenna	69C 44
Dial Scale, Glass	21B 8-2
Drum and Hub Assembly, Dial	A1012
Knob, Ivory (Model 92503)	33A 7-1
Knob, Mahogany (Model 92504)	33A 7-2
Pilot Light No 47	81A 1-8
Pilot Light Socket and Leads	82A 2-4
Pointer, Metal Dial	25A 4-1
Pulley, Fibre Dial	17A 1-3
Shaft, Tuning	28A 1-1
Socket, Laminated Octal Tube	87A 10-2
Speaker (5" PM) and Output Trans.	78B 4-4
Spring, Dial Cord Tension	19B 1-3
Washer, Fibre Flat	5A 1-6
Washer, Fibre Offset	5A 2-5
Washer, C	4A 4-6
Washer, Spring	4A 6-3-0

VOLTAGE DATA



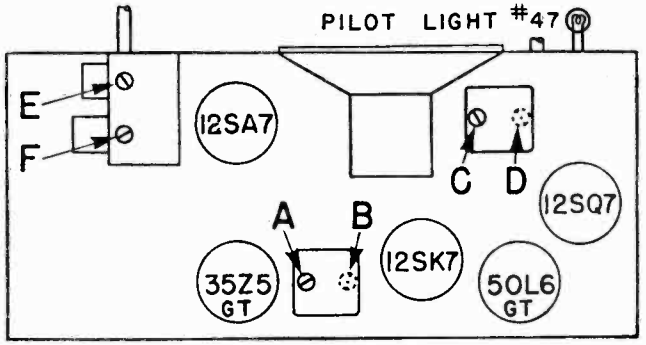
Bottom View of Chassis, Showing Voltages

- Readings made between point indicated and Volume Control Lug (Point "X" on drawing).
- Measured on a 117 Volt A.C. line.
- Dial turned to low frequency end, no signal.
- Measured with 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.

ALIGNMENT PROCEDURE

- Check setting of Pointer Extremes and note correct 600 K.C. and 1400 K.C. positions on Dial Background. (See Dial Diagram.)
- Connect the signal generator ground lead through a .1 mfd. condenser to B— (point "X" on voltage chart).
- Connect Output Meter across Voice Coil of Speaker.
- Turn Receiver Volume Control full on.
- Use lowest Output setting of Signal Generator capable of producing adequate Output Meter indication and then proceed as outlined in chart below.
- Repeat adjustments to insure good results.

TOP VIEW TUBE AND TRIMMER LOCATION



BACK OF CHASSIS

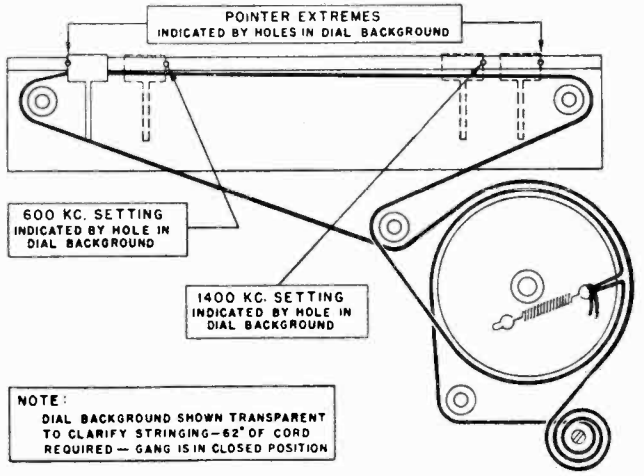
Connect Signal Generator to—	*Dummy Antenna Between Radio and Generator*	*Set Generator Frequency to—*	*Set Receiver Dial Frequency to—*	*Adjust Following Trimmers*	*Type of Adjustment*
Tuning Condenser Antenna Stator	250 mmfd. Condenser	455 KC.	High frequency end of Dial	C—D 2nd I. F. A—B 1st I. F. (See note below)	Adjust to maximum Output
Tuning Condenser Antenna Stator	250 mmfd. Condenser	1630 KC.	High frequency end of Dial	E—Oscillator	Adjust to maximum Output
Loop radiator (or place pickup lead from generator close to loop of set to obtain adequate signal).	No actual connection between set and generator.	1400 KC.	Tune in generator signal	F—Antenna	Adjust to maximum Output

NOTE: The B and D adjustments are made from the underside of the chassis.

POWER SUPPLY

This receiver is designed to operate from any AC (Alternating Current) power supply main of 110-120 volts, 50-60 cycles or DC (Direct Current) power supply main of 110-120 volts. If the receiver fails to operate on DC (Direct Current), reverse the power line plug.

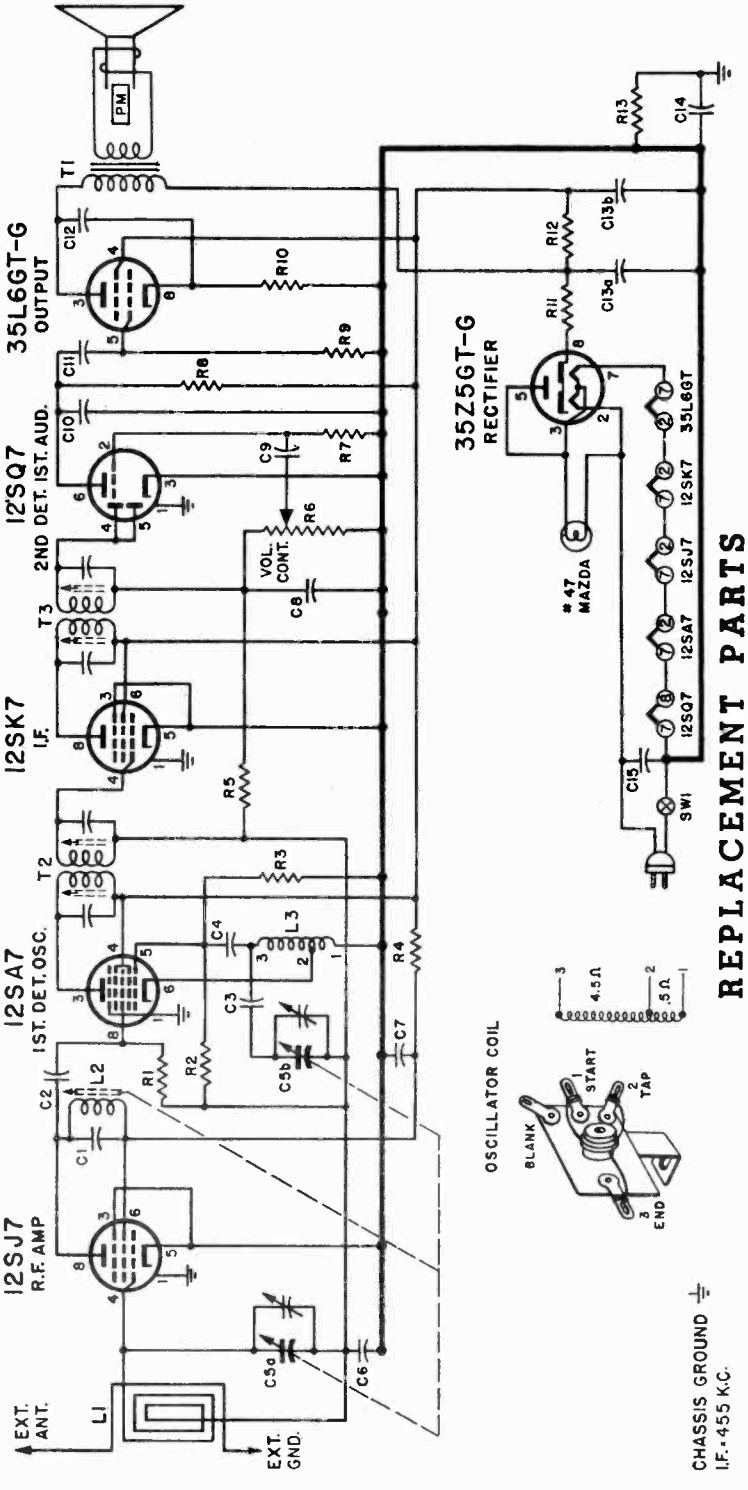
On AC only the line plug should be tried both ways and left in the position that gives minimum hum.



DIAL STRINGING AND POINTER SETTINGS

MODELS 92505, 92506

THE B. F. GOODRICH COMPANY



REPLACEMENT PARTS

RESISTORS

Symbol		Part No.
R1	10,000 Ohms, ½ Watt	60B 8-103
R2	10 Megohms, ½ Watt	60B 8-106
R3	22,000 Ohms, ½ Watt	60B 8-223
R4	100 Ohms, ½ Watt	60B 8-101
R5	1 Megohm, ½ Watt	60B 8-105
R6	½ Megohm, Volume Control & Switch	75B 1-6
R7	4.7 Megohms, ½ Watt	60B 8-475
R8	270,000 Ohms, ½ Watt	60B 8-274
R9	470,000 Ohms, ½ Watt	60B 8-474
R10	150 Ohms, ½ Watt	60B 8-151
R11	33 Ohms, 1 Watt	60B 28-3
R12	1,000 Ohms, 1 Watt	60B 28-2
R13	150,000 Ohms, ½ Watt	60B 8-154

CONDENSERS

Symbol		Part No.
C1	785 mmfd., ±5%, Silver Mica	65B 1-8
C2	250 mmfd., Mica	65B 7-22
C3	.02 mfd., 400 Volts, Paper	64B 1-24
C4	50 mmfd., Mica	65B 7-11
C5a	0 to 420 mmfd. } Gang	68A 18
C5b	0 to 108 mmfd. }	
C6	.1 mfd., 200 Volts, Paper	64B 1-30
C7	.05 mfd., 400 Volts, Paper	64B 1-22
C8	250 mmfd., Mica	65B 7-22
C9	.01 mfd. 400 Volts, Paper	64B 1-25
C10	500 mmfd., Mica	65B 7-27
C11	.01 mfd., 400 Volts, Paper	64B 1-25
C12	.02 mfd., 400 Volts, Paper	64B 1-24
C13a	50 mfd., 150 Volts } Elect.	67A 10
C13b	30 mfd., 150 Volts }	
C14	.18 mfd., 200 Volts, Paper	64A 2-2
C15	.05 mfd., 400 Volts, Paper	64B 1-22

COILS & TRANSFORMERS

		Part No.
L1	Loop Antenna	69C 44
L2	R.F. Coil and Mounting	A1052
L3	Oscillator Coil	69A 43
T1	Transformer, Output	98A 4
T2	Transformer, 1st I.F.	72B 50
T3	Transformer, 2nd I.F.	72B 51

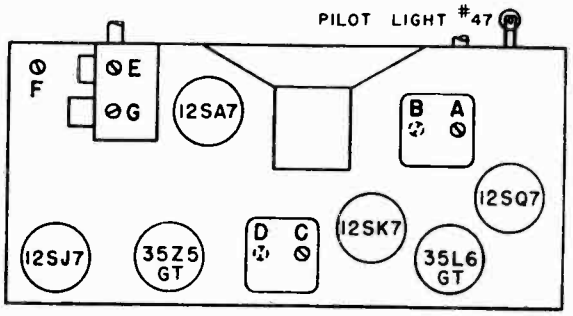
MISCELLANEOUS

Description	Part No.
Background, Dial	X22C3-1
Bracket Plate, Loop Retainer	15A 14
Buttons, Snap (for R.F. Coil)	13A 1-2-2
Cabinet, Ivory (Model 92505)	34D 8-1
Cabinet, Mahogany (Model 92506)	34D 8-2
Clip, Dial Glass	18A 2
Cord, Dial	50A 1-3
Cover, Back (Incl. Loop Antenna)	69C 44
Dial Scale, Glass	21B 10-2
Drum and Cam Assembly	A1049
Knob, Mahogany (Model 92506)	33A 7-2
Knob, Ivory (Model 92505)	33A 7-1
Lever Arm Assembly (R.F.)	A1050
Pilot Light, No. 47	81A 1-8
Pilot Light Socket and Leads	82A 2-3
Pointer	25A 13-1
Pulley, Fibre; ⅛x½" OD	17A 1-3
Screw, Set; 8/32x⅛" (Dial Drum)	1A 5-58
Shaft, Tuning	28A 1-1
Slug, R.F. Iron Core (with wire)	71B 1-2
Socket, Octal Tube	87A 10-2
Speaker (5" PM) and Transformer	78B 4-4
Spring, Tension (Dial)	19B 1-3
Spring, Lever Arm (R.F.)	19A 4
Spacer, T (R.F.)	29A 2-3-21
Stud, Slug Adj. (R.F.)	27A 4
Washer, C (Tuning Shaft)	4A 4-6
Washer, Spring (Tuning Shaft)	4A 6-3-0

THE B. F. GOODRICH COMPANY

MODELS 92505, 92506

TOP VIEW TUBE & TRIMMER LOCATION



ALIGNMENT PROCEDURE

Check setting of Pointer Extremes and note correct 600 K.C. and 1400 K.C. positions on Dial Background. (See Dial Diagram.)

Connect Output Meter across Voice Coil of Speaker.

Turn Receiver Volume Control full on.

Use lowest Output setting of Signal Generator capable of producing adequate Output Meter indication and then proceed as outlined in chart below.

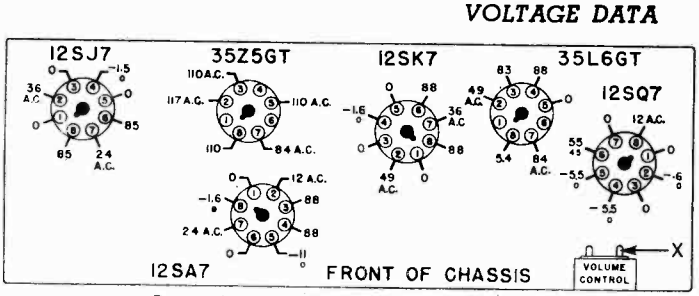
Repeat adjustments to insure good results.

Connect Signal Generator To—	Dummy Antenna Between Radio and Generator	Set Generator Frequency To—	Set Receiver Dial Frequency To—	Adjust Following Trimmers	Type of Adjustment
12SA7 Control Grid	250 mmfd. Mica Condenser	455 KC.	High frequency end of Dial	A and B—2nd I. F. C and D—1st I. F. (See Note 1 below)	Adjust to maximum Output
External Antenna Wire on Loop	250 mmfd. Mica Condenser	1630 KC.	High frequency end of Dial	E—Osc.	Adjust to maximum Output
External Antenna Wire on Loop	250 mmfd. Mica Condenser	1400 KC.	Tune in Generator signal	F—R. F. (Iron Core)	See Note 2 Below
Loop radiator (or place lead from generator close to loop of set to obtain adequate signal).	No actual connection between set and generator.	1400 KC.	Tune in Generator signal	G—Ant.	Adjust to maximum Output

NOTE 1: The B and D adjustments are made from the underside of the chassis.

NOTE 2: Adjustment F is the threaded stud at the top end of the slug wire. Screw stud up or down in the bakelite for maximum output. Alignment is correct if the output is reduced when the position of the lever arm is changed slightly in either direction (up or down).

VOLTAGE DATA



Bottom View of Chassis, Showing Voltages

- Readings made between point indicated and Volume Control Lug (Point "X" on drawing).
- Measured on a 117 Volt A.C. line.
- Dial turned to low frequency end, no signal.
- Measured with 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.

DIAL DRUM POSITION

If the dial drum position is disturbed, it should be carefully re-positioned to insure correct tuning of the permeability tuned coil. With the gang fully meshed, the drum will be properly positioned if the center of the condenser shaft and the dial cable hole on the drum are in a straight line parallel to the chassis base. Note that the dial cable hole should be on the right side (looking at front) of the chassis.

R.F. SLUG POSITION

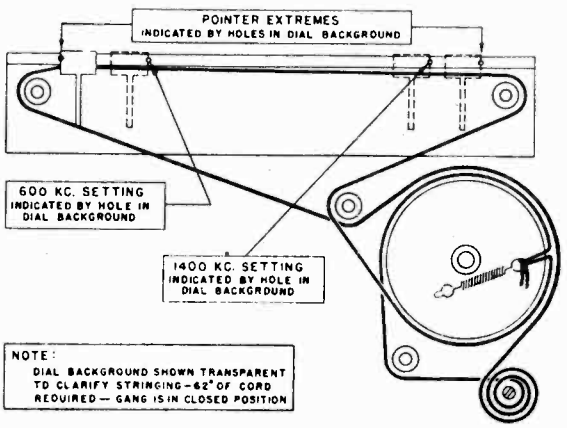
If the tuned coil slug needs replacing or re-positioning, first see that the dial drum is in its proper position. Then with the gang condenser fully meshed and the threaded stud half-way through the bakelite, note that the top of the slug is flush with the top of coil form. Then re-align.

POWER SUPPLY

This receiver is designed to operate from any AC (Alternating Current) power supply main of 110-120 volts, 50-60 cycles or DC (Direct Current) power supply main of 110-120 volts. If the receiver fails to operate on DC (Direct Current), reverse the power line plug.

On AC only the line plug should be tried both ways and left in the position that gives minimum hum.

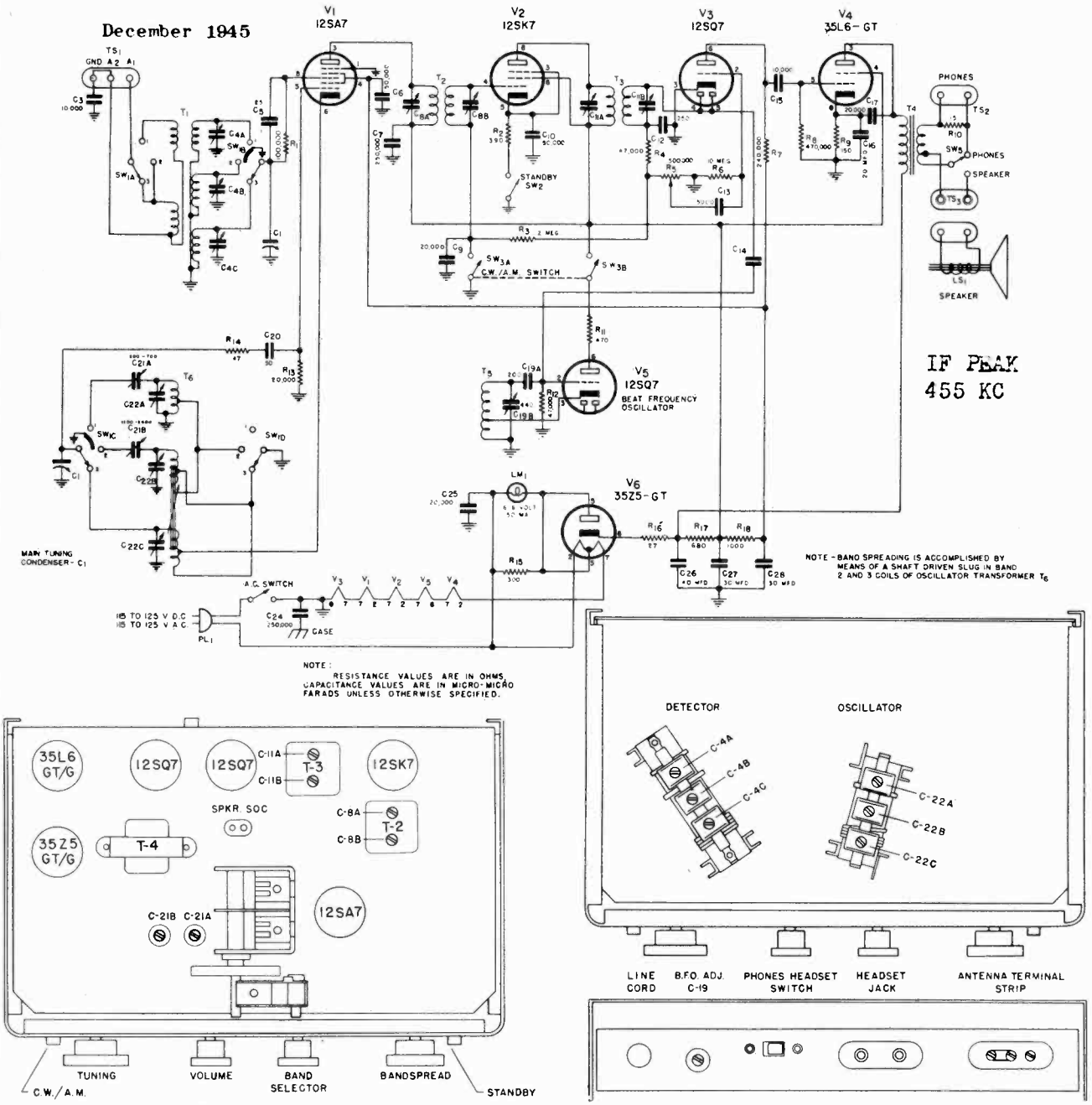
DIAL STRINGING AND POINTER SETTINGS



THE HALLICRAFTERS CO.

MODEL EC-1B, Echophone

December 1945

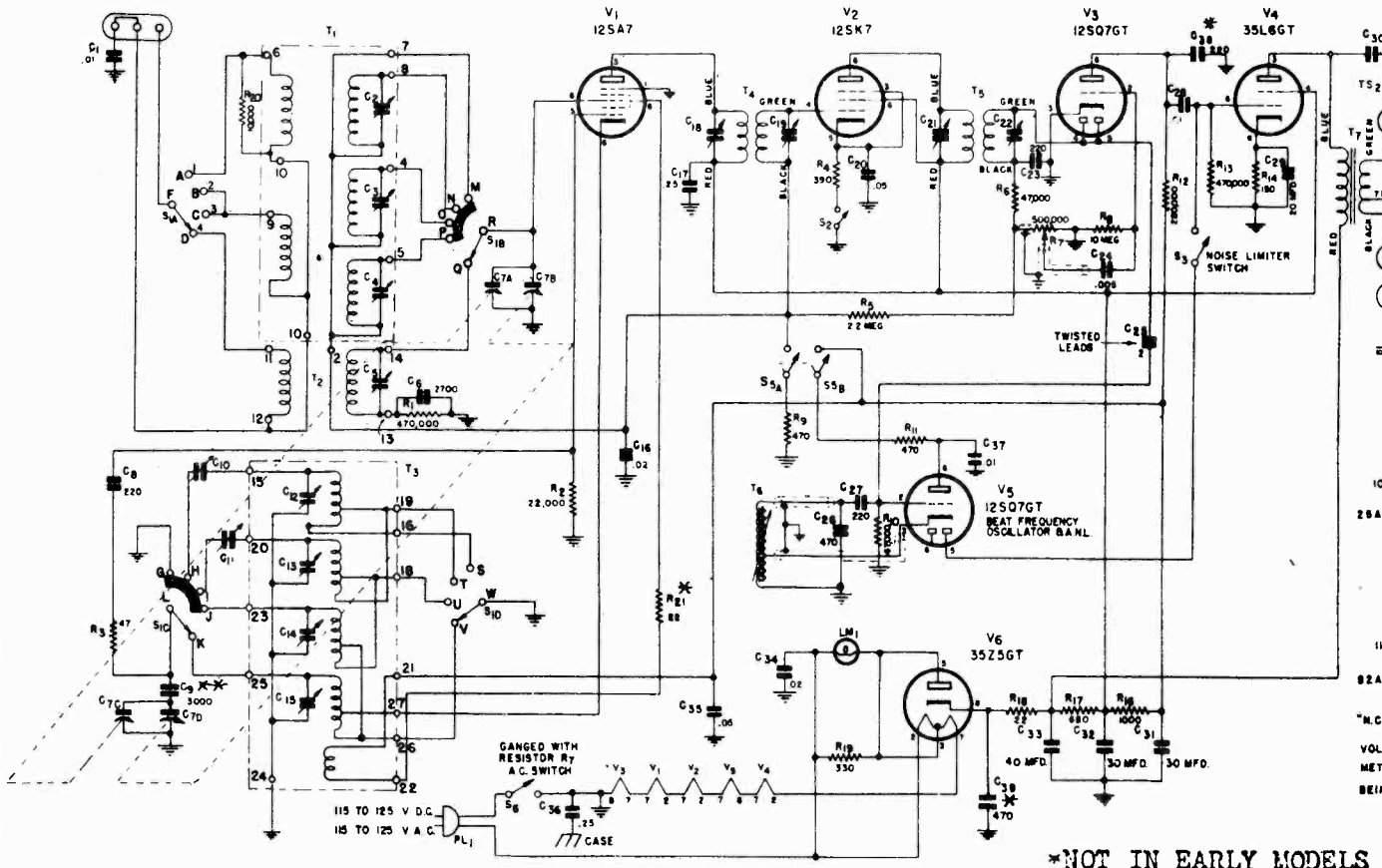


Listed below in table form, are the alignment frequencies and adjustments necessary to align the receiver. CAUTION - Do not connect signal generator ground directly to the chassis, connect it to the "G" terminal of the antenna terminal strip.

NOTE - Set BANDSPREAD dial at "0" before attempting alignment. (Slug should be between Band 1 and Band 2 coils.)

ALIGNMENT DATA

BAND	Signal Generator Frequency	Dummy Antenna	Adjust Pads	Adjust Trimmers
I-F	455 kc.	None	None	C-8A, C-8B, C-11A, C-11B
BFO	455 kc.	None	Adjust capacitor C-19 for zero beat.	
1	600 kc. 1800 kc	330 ohm 330 ohm	C-21A None	None C-22A, C-4A
2	2.4 mc. 7.0 mc.	330 ohm 330 ohm	C-21B None	None C-22B, C-4B
3	No low frequency adjustment on this band. 28 mc.	330 ohm	None	C-22C, C-4C

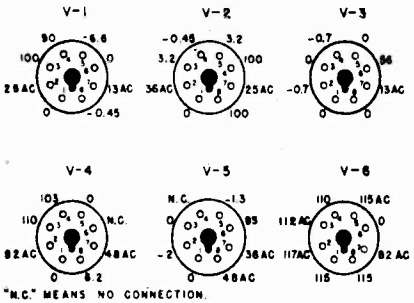


**C9 WAS 2700 μμf IN EARLY MODELS

*NOT IN EARLY MODELS

VOLTAGES AT TUBE TERMINALS

ALL VOLTAGES ARE DC UNLESS OTHERWISE SPECIFIED



"N.C." MEANS NO CONNECTION.

VOLTAGES LISTED WERE TAKEN WITH AN ELECTRONIC VOLT METER; AT 117 V. A-C LINE VOLTAGE; NO SIGNAL BEING RECEIVED. CONTROLS SET AS FOLLOWS:

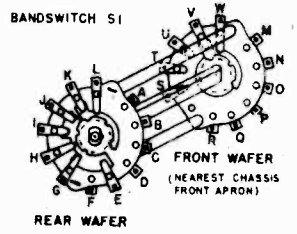
VOLUME	MAX. CLOCKWISE
TUNING	SET AT 550 KC
BANDSPREAD	SET AT 100
A.M./C.W.	SET AT "C.W."
RECEIVE/STANDBY	SET AT "RECEIVE"
NOISE LIMITER	SET AT "OFF"
BAND SELECTOR	SET AT "1"
SPEAKER/PHONES	SET AT "SPEAKER"

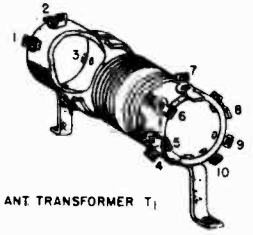
NOTE: RESISTANCE VALUES ARE IN OHMS; MICA CAPACITOR VALUES ARE IN MMF.; PAPER CAPACITOR VALUES ARE IN DECIMAL EQUIVALENTS OF MFD; ELECTROLYTIC CAPACITOR VALUES ARE IN MFD.

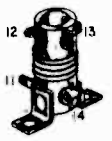
IF PEAK 455 KC

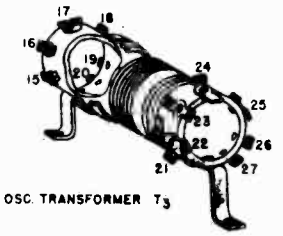
- - - - DENOTES ELECTRICAL SHIELD.
——— DENOTES UNSHIELDED UNIT ASSEMBLY.
- - - - > DENOTES MECHANICAL GANGING.

LETTERS AT BANDSWITCH (S_1) AND NUMERALS AT ANTENNA AND OSCILLATOR TRANSFORMERS (T_1, T_2 & T_3) IDENTIFY CORRESPONDING TERMINAL LUGS ON PICTORIAL VIEWS.









August 1946

NOTE: DIMENSIONS & PROPORTIONS SHOWN IN PICTORIAL VIEWS HAVE BEEN EXAGGERATED FOR CLARITY OF TERMINAL LUG LOCATION.

GENERAL: Model S-38 is a 6 tube AC/DC superheterodyne table model, radio receiver, incorporating 4 bands of AM/CW reception, as follows: band #1, 540 kc to 1650 kc; band #2, 1650 kc to 5.0 mc; band #3, 5.0 mc to 14.5 mc; band #4, 13.5 mc to 32.0 mc.

POWER SUPPLY DATA: 105 to 125 volts AC/DC line voltage. Power drain is 30 watts.

IF FREQUENCY	IF SELECTIVITY	IMAGE RATIO	SENSITIVITY	AUDIO OUTPUT
455 kc	7 kc wide at 6 db down 65 kc wide at 60 db down (for 50 milliwatt output)	2.7:1 at 30 mc 6:1 at 14 mc 10:1 at 5 mc 35:1 at 1500 kc	12 microvolt at 600 kc 12 microvolt at 5 mc 11 microvolt at 14 mc 23 microvolt at 30 mc (for 50 milliwatt output)	675 milliwatt with less than 10% distortion at 400 cycles

EQUIPMENT:

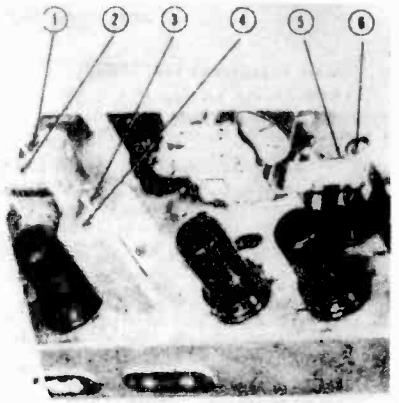
1. Signal Generator capable of the ranges indicated in the Alignment Chart, including a 400 cycle audio modulator.
2. Output meter capable of handling 1 watt of audio power.
3. Standard RMA dummy consisting of a 200 mmf condenser in series with a 20uh r-f choke which is shunted by a 400 mmf condenser in series with a 400 ohm carbon resistor.
4. Non-metallic screw driver.

CONNECTIONS: Connect the Sig. Gen. "cold" lead to "G" on the antenna strip; the "hot" lead is connected as indicated in the Chart.

Connect the output meter across the terminals of socket SO-1 and remove the speaker plug from the socket and adjust the meter for 3 ohms impedance.
Caution: Set the meter at a sufficiently high range to prevent possible damage from overload.

CONTROL SETTINGS: After allowing about a ten minute warm up period, set the receiver's control as follows:

SPEAKER/PHONES switch at "SPEAKER."
VOLUME control at full clockwise (maximum).
CW/AM switch at "AM" (except for BFO adjustment).
NOISE LIMITER switch at "OFF."
BANDSPREAD TUNING control at "0," (min. cap.).
STANDBY/RECEIVE switch at "RECEIVE."

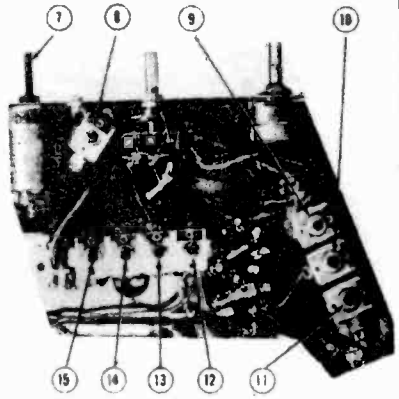


TOP VIEW OF CHASSIS

Fig. 5, Top and bottom views of the receiver locating slugs, padders and trimmers for alignment purposes.

DUMMY ANT. IN SERIES WITH SIG. GENERATOR	CONNECTION OF SIG. GENERATOR OUTPUT TO RECEIVER	SIG. GEN. FREQUENCY SETTING	BAND SWITCH SETTING	RECEIVER DIAL SETTING	ADJUST SLUG, PADDER, OR TRIMMER NO.	DESCRIPTION	TYPE OF ADJUSTMENT —MAKE ADJUSTMENT FOR:	STEP NO.
				*IF ADJUSTMENT				
None	Stator plates of rear sect. of tuning gang	455 kc	"1"	1000 kc	3 and 4 1 and 2	2nd IF 1st IF	Maximum output Maximum output Repeat steps 1 and 2	1 2
BFO ADJUSTMENT—NOTE: Turn off Sig. Gen. 400 cycle modulation; set CW/AM switch at "CW"; remove Pitch Control knob and adjust slotted screw shaft.								
None	Stator plates of rear sect. of tuning gang	455 kc	"1"	1000 kc	7	BFO slug	Zero beat	3
BAND #4 ADJUSTMENT—NOTE: Make sure 400 cycle audio modulator is turned on; AM/CW switch should be at "AM."								
STANDARD RMA Dummy	"A1" on antenna strip	30 mc 30 mc	"4"	30 mc 30 mc	12 † 8	Osc. Trimmer Mix. Trimmer	Maximum output Maximum output	4 5
				BAND #3 ADJUSTMENT				
STANDARD RMA Dummy	"A1" on antenna strip	14 mc 14 mc	"3"	14 mc 14 mc	13 † 9	Osc. Trimmer Mix. Trimmer	Maximum output Maximum output	6 7
				*BAND #2 ADJUSTMENT				
STANDARD RMA Dummy	"A1" on antenna strip	5 mc 1.8 mc 5 mc	"2"	5 mc 1.8 mc 5 mc	14 6 †10	Osc. Trimmer Osc. Padder Mix. Trimmer	Maximum output Maximum output and repeat step 8 Maximum output	8 9 10
				*BAND #1 ADJUSTMENT				
STANDARD RMA Dummy	"A1" on antenna strip	1500 kc 600 kc 1500 kc	"1"	1500 kc 600 kc 1500 kc	15 5 11	Osc. Trimmer Osc. Padder Mix. Trimmer	Maximum output Maximum output and repeat step 11 Maximum output	11 12 13

*It may be necessary to repeat the indicated adjustments several times.
†Rock the main tuning capacitor slightly (turn back and forth) when making these adjustments.



BOTTOM VIEW OF CHASSIS

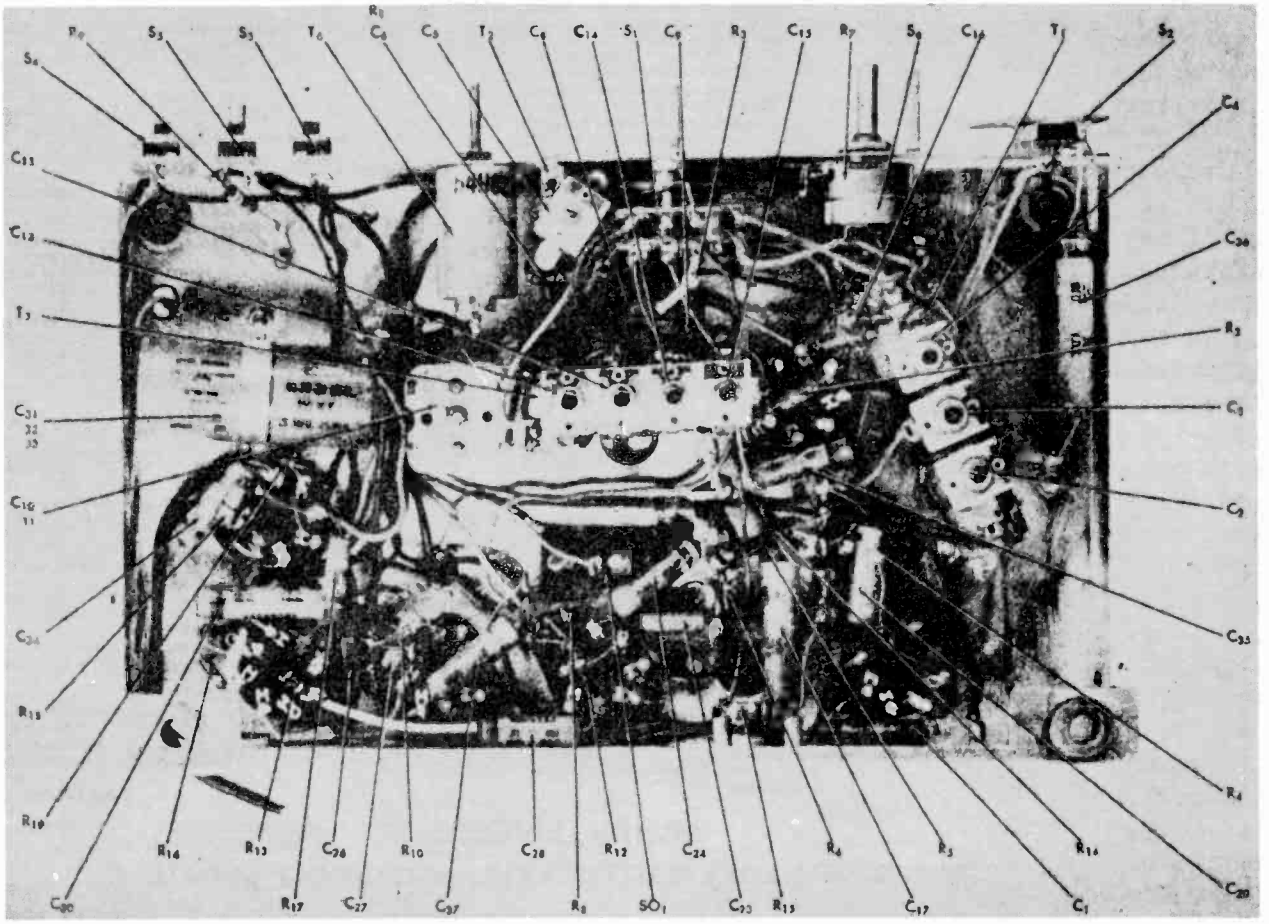


Fig. 4. Bottom view of the receiver showing components location.

CONTROL SETTINGS FOR PRELIMINARY TEST OPERATION (Broadcast Band)

NAME	FUNCTION	SETTING
STANDBY/ RECEIVE	Receiver temporary standby	At "RECEIVE"
VOLUME	Audio gain control and receiver on/off switch	Half clockwise; adj. as necessary
BAND SELECTOR	Operating band selector	Clockwise to "1"
PITCH CONTROL	CW beat note pitch selector	Any position (not in use)
SPEAKER/ PHONES	Output selector switch	At "SPEAKER"
CW/AM	BFO on/off switch AVC on/off switch	At "AM" (AVC on)
NOISE LIMITER	Noise peak limiting	At "OFF"
TUNING	Main tuning control	To local station freq. on main dial scale
BAND SPREAD	Short wave band spreading	To "0" on small dial scale

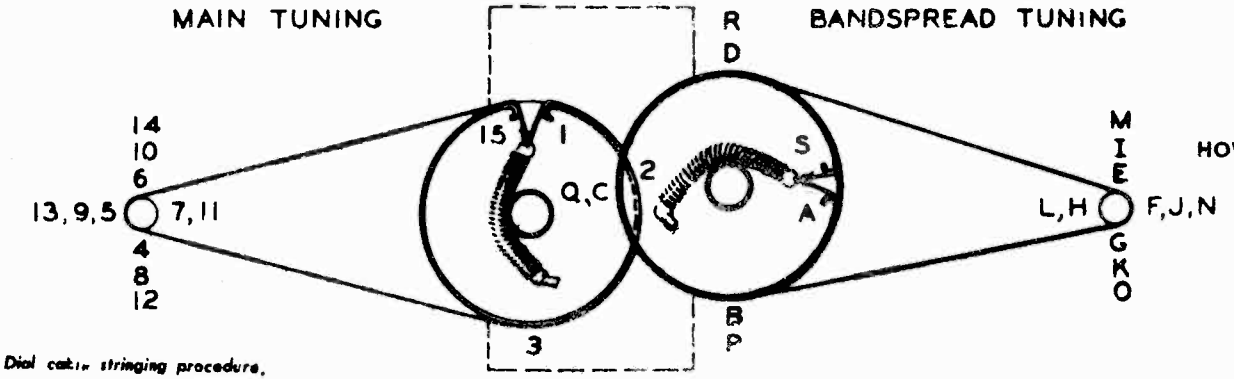


Fig. 2. Dial cable stringing procedure.

TUNING CAPACITOR FULLY CLOSED (BOTH SECTIONS). FRONT VIEW

REF. NO.	DESCRIPTION	HALLICRAFTER'S PART NUMBER
	CAPACITORS	
C-1	0.01 mfd; 600 vdcw; paper	46AY103J
C-2, 3 & 4	Trimmer Unit for antenna transformer T-1	44B129
C-5	Trimmer for antenna transformer T-2	44A039
C-6	2700 mmf; ± 5%; 500 vdcw; mica	CM30A272J
C-7	Tuning capacitor; air; 2 sections ganged	48C162
C-8, 23, 27 & 38	220 mmf; 500 vdcw; mica	CM20A221K
C-9	3000 mmf; 5%; 500 vdcw; mica	CM30A302J
C-10 & 11	Dual padder for oscillator transformer T-3	44A152
C-12, 13, 14 & 15	Trimmer Unit for oscillator transformer T-3	44B159
C-16 & 34	0.02 mfd; 400 vdcw; paper	46AW203J
C-17 & 36	0.25 mfd; 200 vdcw; paper	46AT254J
C-18, 19, 21 & 22	Trimmers for IF transformers T-4 and T-5	44A097
C-20 & 35	0.05 mfd; 200 vdcw; paper	46AU503J
C-24	0.005 mfd; 400 vdcw; paper	46AW502J
C-25	2 mmf; twisted insulated wire leads; NOT AVAILABLE AS A SPARE PART.	
C-26 & 39	470 mmf; 500 vdcw; mica	CM20A471K
C-28 & 37	0.01 mfd; 400 vdcw; paper	46AW102J
C-29, 31, 32 & 33	Electrolytic; four section unit; color coded leads; sect. 1(C-29) 20 mfd, 25 vdcw; sect. 2 & 3(C-31 & 32) 30 mfd, 150 vdcw; sect. 4(C-33) 40 mfd, 150 vdcw	45B091
C-30	0.02 mfd; 600 vdcw; paper	46AY203J
	PILOT LAMP	
LM-1	6/8 v @ 150ma; brown bead; G. E. type 47	39A004
	LOUDSPEAKER	
LS-1	5" P.M. speaker; 3.2 ohm voice coil	85C035
	PLUGS	
PL-1	AC line cord with two prong plug at one end	87A078
PL-2	Speaker voice coil connector plug	88A072
	RESISTORS	
R-1 & 13	470,000 ohm; ½ watt; carbon	RC20AE474M
R-2	22,000 ohm; ½ watt; carbon	RC20AE223M
R-3	47 ohm; ½ watt; carbon	RC20AE470M
R-4	390 ohm; ± 10%; ½ watt; carbon	RC20AE391K
R-5	2.2 megohm; ½ watt; carbon	RC20AE225M
R-6 & 10	47,000 ohm; ½ watt; carbon	RC20AE473M
R-7 & S-6	Volume Control; ½ megohm; includes SPST toggle action switch assembly on rear	25B094
R-8	10 megohm; ½ watt; carbon	RC20AE106M
R-9 & 11	470 ohm; ± 10%; ½ watt; carbon	RC20AE471K
R-12	220,000 ohm; ½ watt; carbon	RC20AE224M
R-14	150 ohm; ± 10%; ½ watt; carbon	RC20AE151K
R-15	15 ohm; ½ watt; carbon	RC20AE150M
R-16	1,000 ohm; ½ watt; carbon	RC20AE102M
R-17	680 ohm; 1 watt; carbon	RC30AE681M
R-18 & 21	22 ohm; ½ watt; carbon	RC20AE220M
R-19	330 ohm; ½ watt; carbon	RC20AE331M
R-20	10,000 ohm; ½ watt; carbon	RC20AE103M
	SWITCHES	
S-1a, b, c & d	Bandswitch; two sections ganged; rotary four position	60A240
S-2 & 3	"RECEIVE-STANDBY" and "NOISE LIMITER" switches; slide action; SPST	60A244
S-4	"SPEAKER-PHONES" switch; slide action; SPDT	60A243
S-5	"A.M.-C.W." switch; slide action; DPST	60A245
	TRANSFORMERS	
T-1	Antenna coil for bands 1, 2 and 3	51C821
T-2	Antenna coil for band 4	51C818
T-3	Oscillator coil for bands 1, 2, 3 and 4	51C822
T-4	Input IF transformer; 455 kc	50C183
T-5	Diode IF transformer; 455 kc	50B184
T-6	Beat frequency oscillator coil; 455 kc	54B031
T-7	Audio output transformer; 3,000 ohm primary —15 ohm secondary tapped at 3 ohms	55A075
	TERMINAL STRIPS	
TS-1	Antenna and ground connector strip	88A032
TS-2	Headset plug connector strip; bakelite	88A071

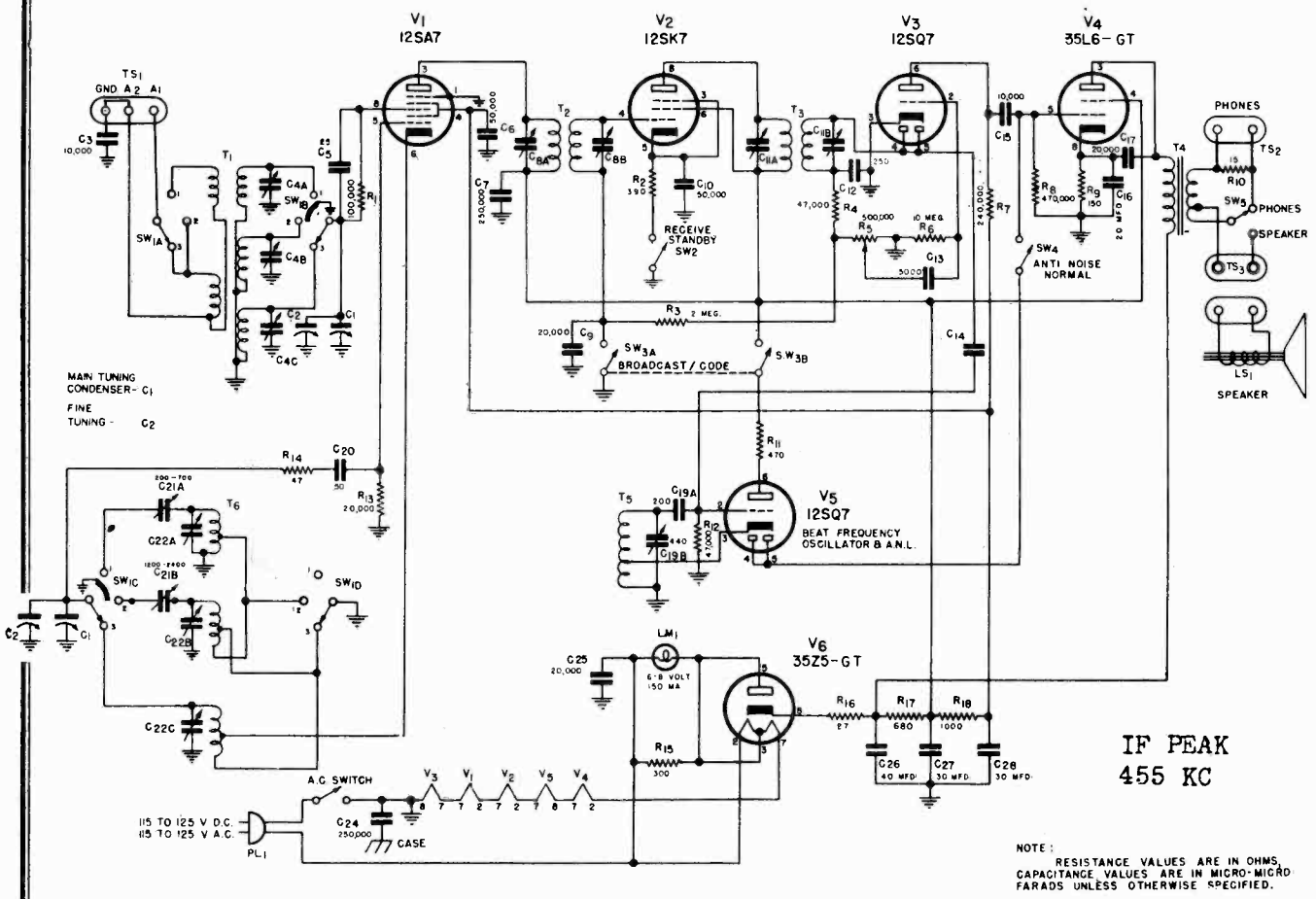
MISCELLANEOUS MECHANICAL COMPONENTS

QUANT. IN EQUIPMENT	DESCRIPTION	HALLICRAFTER'S PART NUMBER
2	Knob; for Volume Control and Band Selector switches	15A049
1	Knob; for C. W. PITCH Control	15A058
2	Knob; for main TUNING and BANDSPREAD tuning Controls	15A047
1	Pointer; for main tuning dial	82A102
1	Pointer; for bandspread tuning dial	82A103
1	Calibrated dial assembly, complete	83B267
1	Dial window; glass	22B157
6	Octal tube sockets; Amphenol type MIP-8	6A036
1	Dial lamp socket; bayonet	96A011
2	Tuning capacitor dial drive pulley	28A002
1	Tuning capacitor rear mounting bracket	67A568
1	Tuning capacitor front mounting bracket	67A559
1	Left hand switch mounting bracket	67B560
1	Right hand switch mounting bracket	67B561
4	Rubber mounting feet for cabinet	16A007
2	Spring washers for grounding tuning capacitor drive shafts	4A043
4	"C" washers; (hair-pin type)	75A062
1	Rear cover plate; cardboard	32C331
1	Bottom cover plate; painted steel	63C220

HOW TO RESTRING DIAL CORDS

To restring the main tuning dial cord, cut a 14" length of 30 lb. test dial cord and tie one end to the tension spring of the main tuning capacitor drive pulley at position "1" on the diagram. Following the numbers 1 through 15, wind the cord on the pulley and knob drive shaft. At position "15", stretch the tension spring and tie the cord securely. Cut off the excess cord. Note that two complete turns are wound on the knob drive shaft.

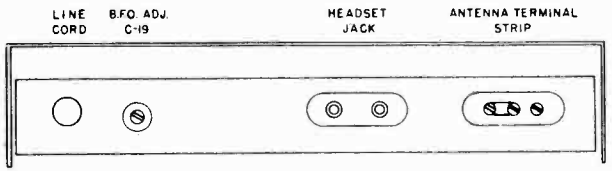
To restring the bandspread tuning dial cord, cut a 16" length of dial cord and follow the procedure as explained above, except start at position "A" on the diagram and proceed through position "S". Note that the knob drive shaft has two complete turns.

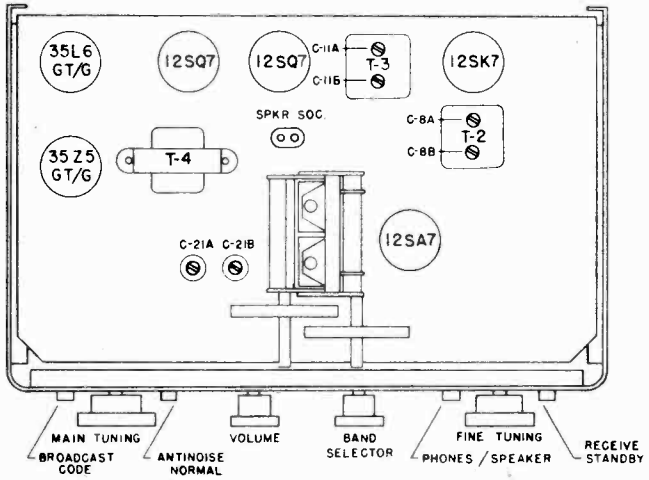


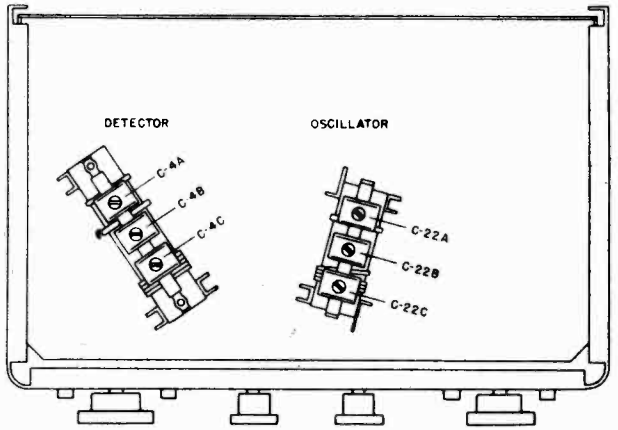
Foreign and Domestic Broadcast Reception. - To receive broadcast stations set the controls as follows:

VOLUME control	- Set at OFF when the receiver is not in use. Turn to the right until desired volume is obtained after tuning in the station.
BAND SELECTOR switch	- Set at band number corresponding to the range covering desired frequency of reception.
BROADCAST-CODE switch	- Set at Broadcast. This switch may be set at CODE to help tune in weak phone signals by tuning for zero beat and then switching back to BROADCAST.
PHONES/SPEAKER switch	- Set at PHONES for headset reception; set at SPEAKER for loudspeaker reception.
RECEIVE-STANDBY switch	- Set at RECEIVE when listening, set at STANDBY during short standby periods.
FINE TUNING control	- Set at zero when tuning in stations with the MAIN TUNING control. Tuning dial calibrations are true only when the FINE TUNING pointer is set at zero. Use the FINE TUNING control for amateur band reception or for vernier tuning in the short wave bands.
MAIN TUNING control	- Set main tuning pointer at frequency of desired station. FINE TUNING pointer must be set at zero for true calibration.
ANTI NOISE-NORMAL switch	- Set at NORMAL unless background noise is excessive.

Foreign and Domestic Code Reception. - To receive code stations set the BROADCAST-CODE switch at CODE. All other controls are to be handled as for foreign and domestic broadcast.







Listed below in table form, are the alignment frequencies and adjustments necessary to align the receiver. CAUTION - Do not connect signal generator ground directly to the chassis, connect it to the "G" terminal of the antenna terminal strip.

ALIGNMENT DATA

Band	Signal Generator Frequency	Dummy Antenna	Adjust Pads	Adjust Trimmers
I-F	455 kc.	None	None	C-8A, C-8B, C-11A, C-11B
BFO	455 kc.	None	Adjust capacitor C-19 for zero beat.	
1	600 kc. 1800 kc.	330 ohm 330 ohm	C-21A None	None C-22A
2	2.4 mc. 7.0 mc.	330 ohm 330 ohm	C-21B None	None C-22B
3	No low frequency adjustment on this band. 28 mc.	 330 ohm	 None	 C-22C

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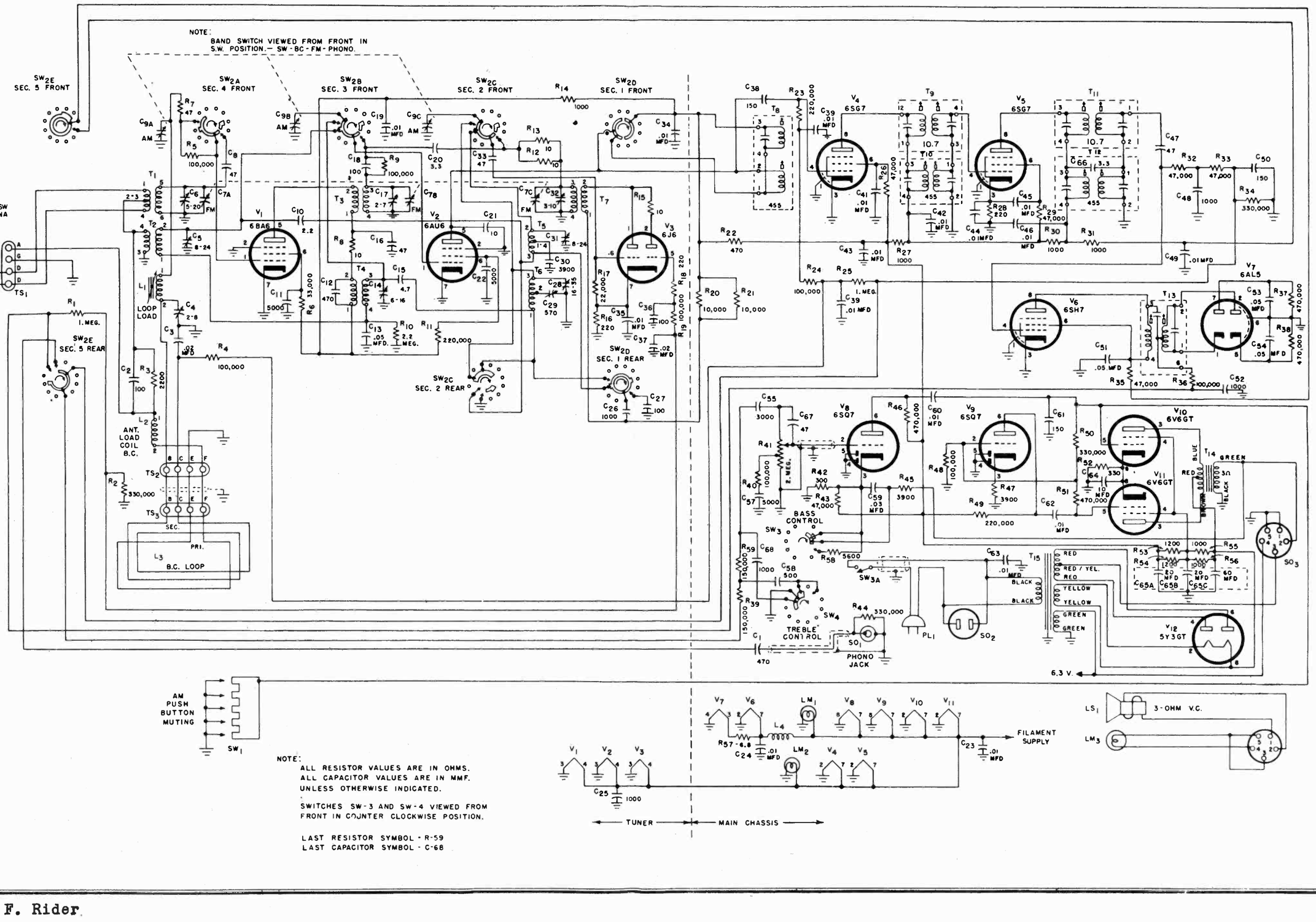


NOTE:
ALL RESISTOR VALUES ARE IN OHMS.
ALL CAPACITOR VALUES ARE IN MMF.
UNLESS OTHERWISE INDICATED.

SWITCHES SW-3 AND SW-4 VIEWED FROM FRONT IN COUNTER CLOCKWISE POSITION.

LAST RESISTOR SYMBOL - R-59
LAST CAPACITOR SYMBOL - C-68

REPLACING DIAL AND PILOT LAMPS

Refer to Fig. 11 for location of the two dial lamps used in the receiver. To gain access to them, remove the dial escutcheon. The pilot lamp at the base of the cabinet is removed by slipping the socket assembly straight back a short distance releasing it from its mounting tongue. The defective lamp may now be brought out in the open for replacement. Replace all lamps with 6-8 volt Mazda #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.

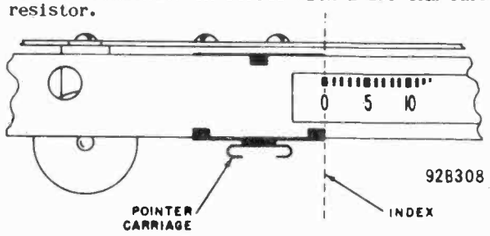
To use these calibration strips, it is necessary to remove the dial plate (brown metal cover) in the following manner.

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 screws.

With the variable condensers fully mashed, the right hand side of the pointer carriage will be indexed to zero on the calibration strips. Refer to Fig. 4.

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 released before tuning 450kc passed 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.

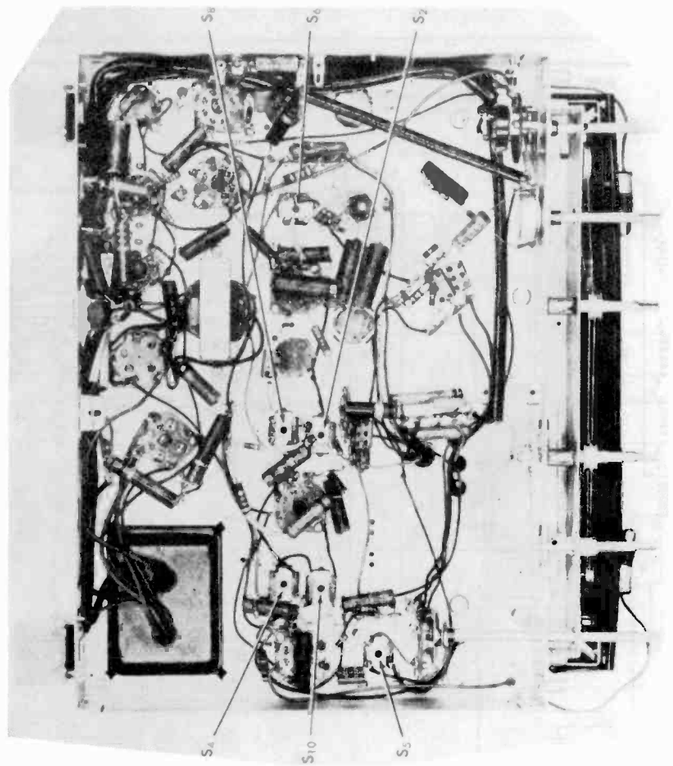


Calibration strip detail.

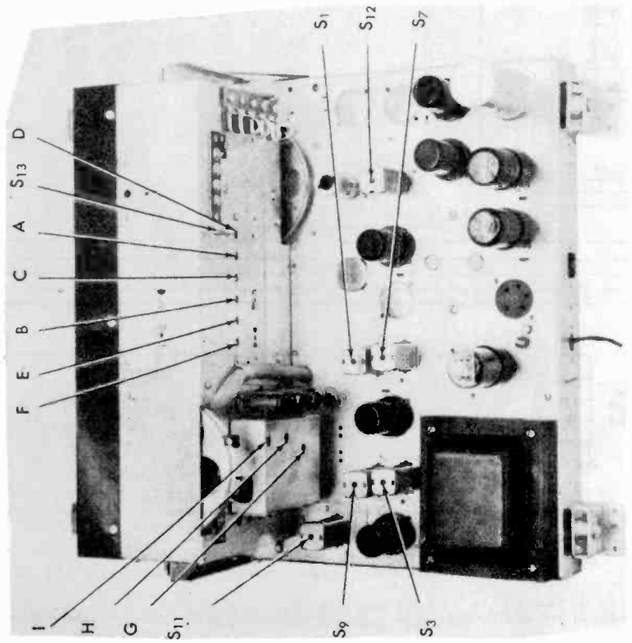
ALIGNMENT CHART

Step	Dummy Antenna	Signal Generator Coupling	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 cap.	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 cap	10.7 mc (No modulation)	"FM"	Mid-scale	55	S6,S7,S8 S9,S10, & S11	Adjust for max. AVC voltage as measured between pin #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 cap.	10.7 mc (No modulation)	"FM"	Mid-scale	55	S12	Adjust for zero voltage as measured between the junction of C55 and C68 ground with a 20,000-ohm per volt meter.
4	Std. RMA dummy.	To terminals "A" and "G" on ant. term. strip	1500 kc	"BC"	1500 kc	82	A*, B, & C	Adjust for max. output
			600 kc	"BC"	600 kc	15.5	D* & S13	
5	Std. RMA	To terminals "A" and "G" on ant. term. strip.	16 mc	"SW"	16 mc	84	E* & F	Adjust for max. output.
6	Two 150 ohm carbon resistors	To "D" terminals on ant. term. stup;	106 mc	"FM"	106 mc	83.5	G*, H & 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.



Bottom view showing alignment points.



Top view showing alignment points.

GENERAL

Tuning Range.....Band - BC 550 kc - 1700 kc.
SW 5.8 mc - 18 mc.
FM 88 mc - 108 mc.

Intermediate Frequency.455 kc/10.7 mc.

Power Supply.....105-125 V. 60 cycles AC.

Power Consumption.....120 Watts (140 watts with changer).

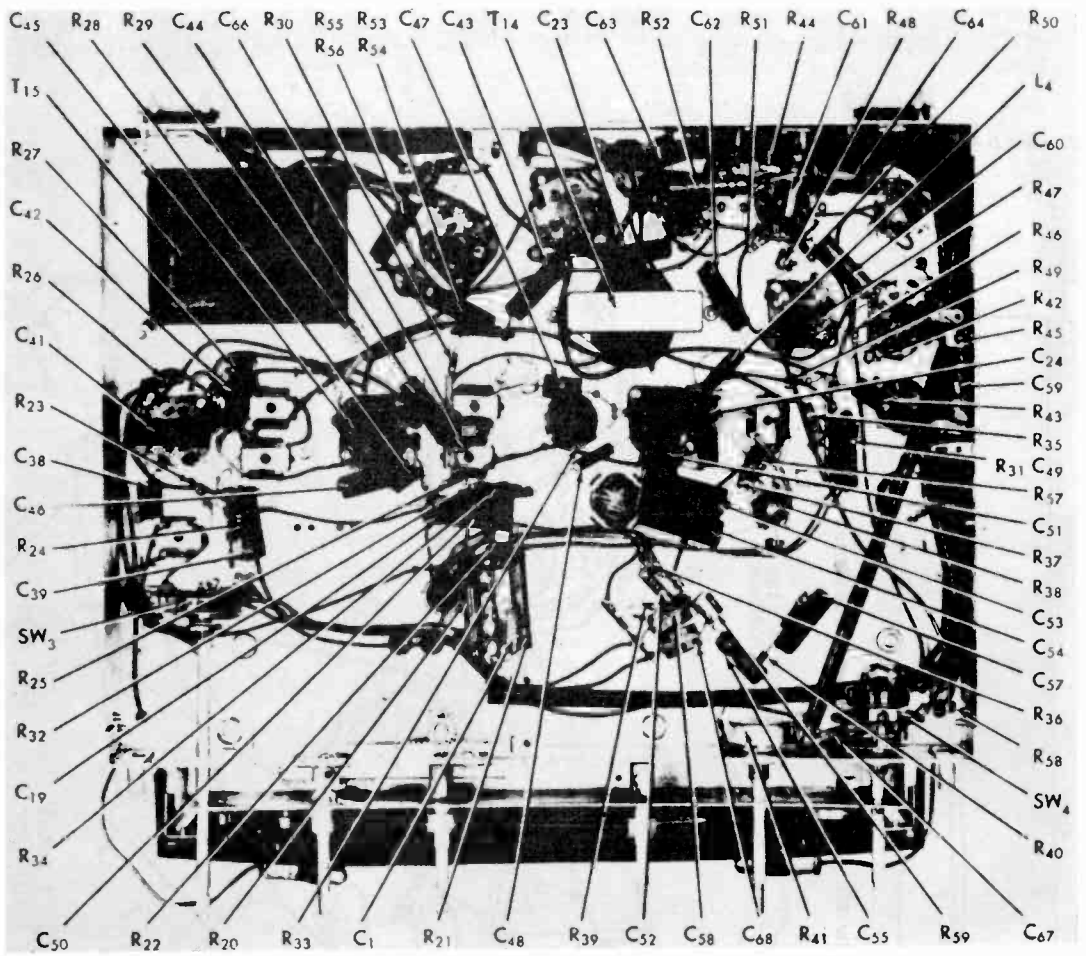
Tubes.....Eleven plus rectifier

Speaker.....12-inch PM

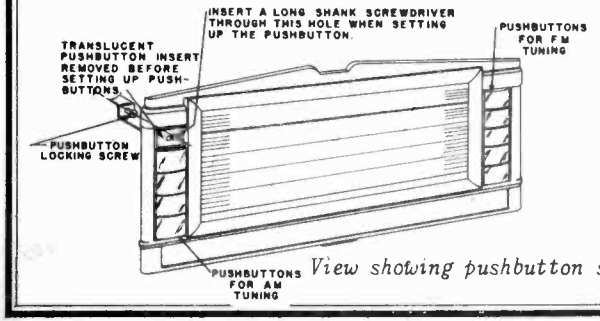
Voice Coil Impedance...3.2 ohms

Antenna.....Built-in loop, "AM" Built-in dipole, "FM" and shortwave. Provisions for external antennas.

Tuning.....Manual and mechanical push-buttons; five P.B. for "AM", five P.B. for "FM".



Bottom view of receiver showing component location.



View showing pushbutton setup.

BUTTON SETTING

Insulate the muting switch contacts before setting the left hand group of AM push buttons.

1. Select any one pushbutton.
2. Pull translucent insert straight out.
3. Insert screw driver blade through large hole of pushbutton into slot of locking screw
4. Loosen locking screw about one-half turn (Not more than one full turn.)
5. With pushbutton 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.

INSERTING CALL LETTERS

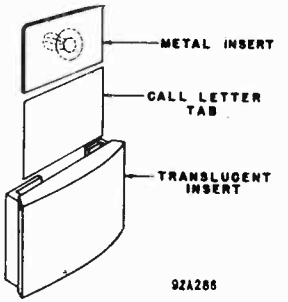
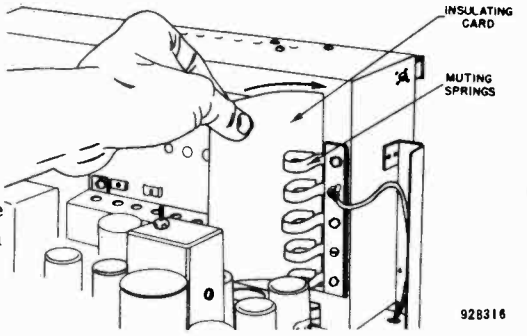


Fig. 2. View showing call letter installation.

1. Slide out metal insert from translucent insert assembly. (See Fig. 2.)
2. Insert desired call letter tab.
3. Replace metal insert behind call letter tab.
4. Replace translucent insert assembly into pushbutton mechanism.



Insulating the muting switch contacts.

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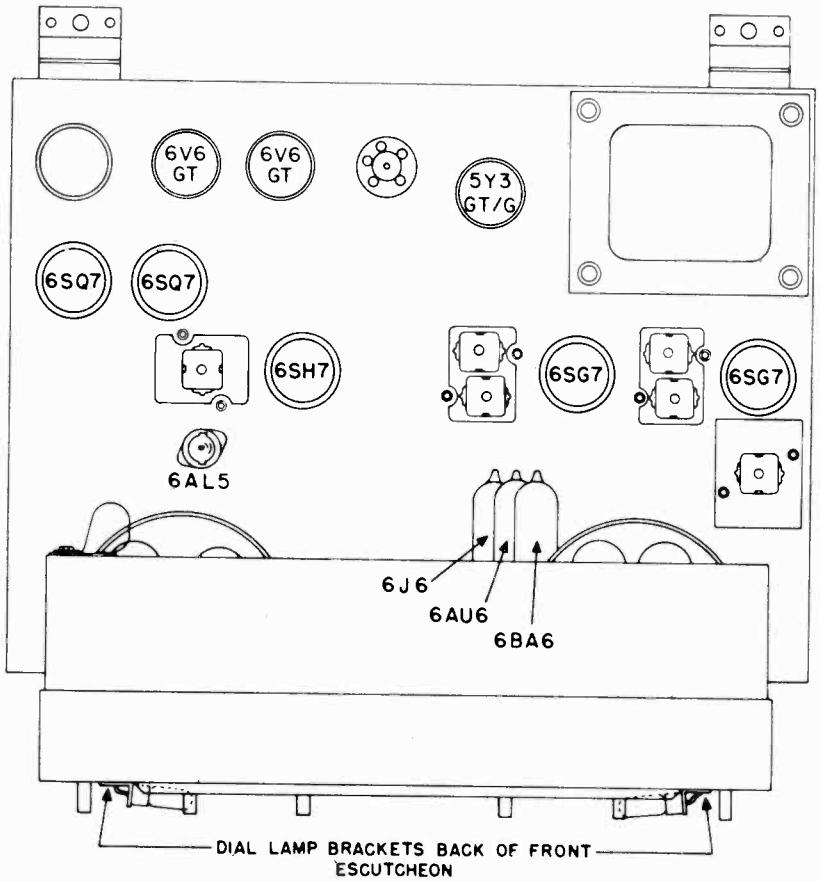
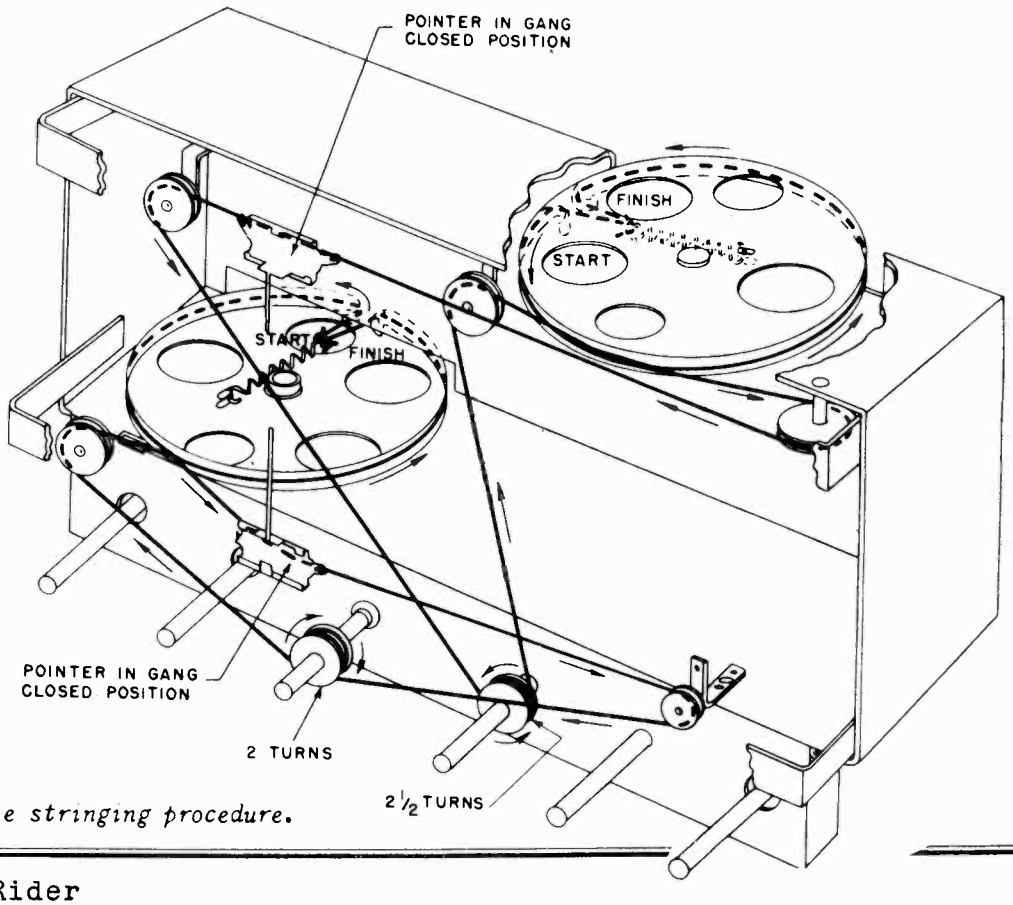
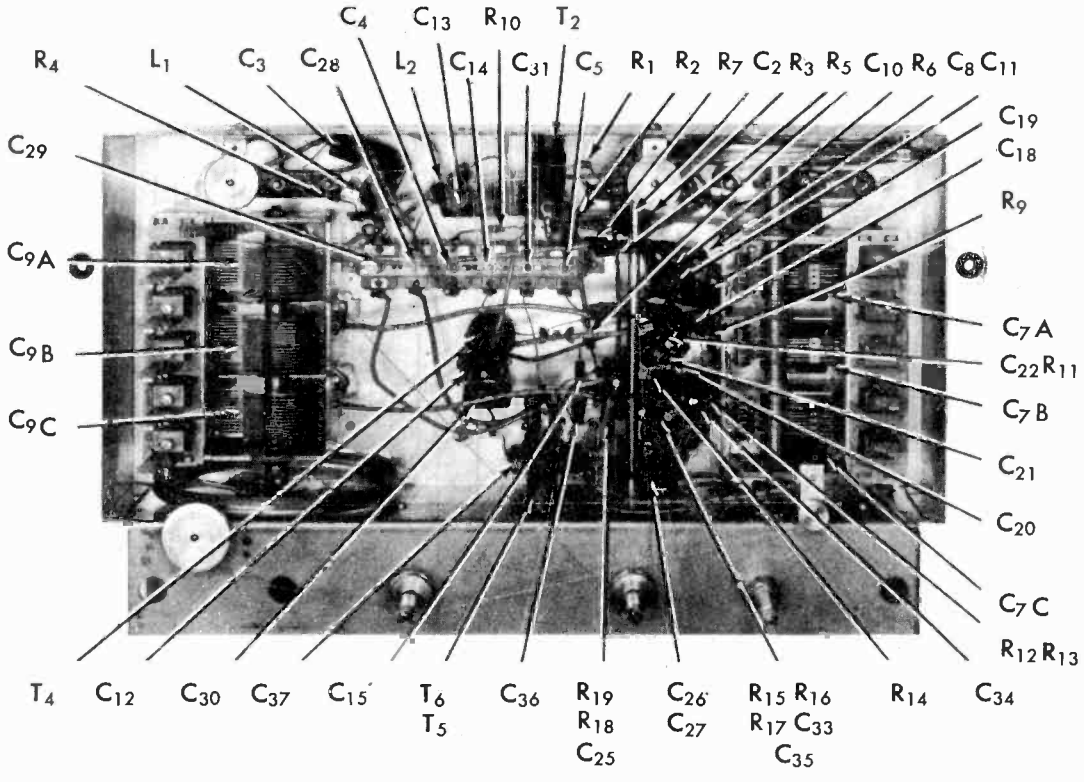


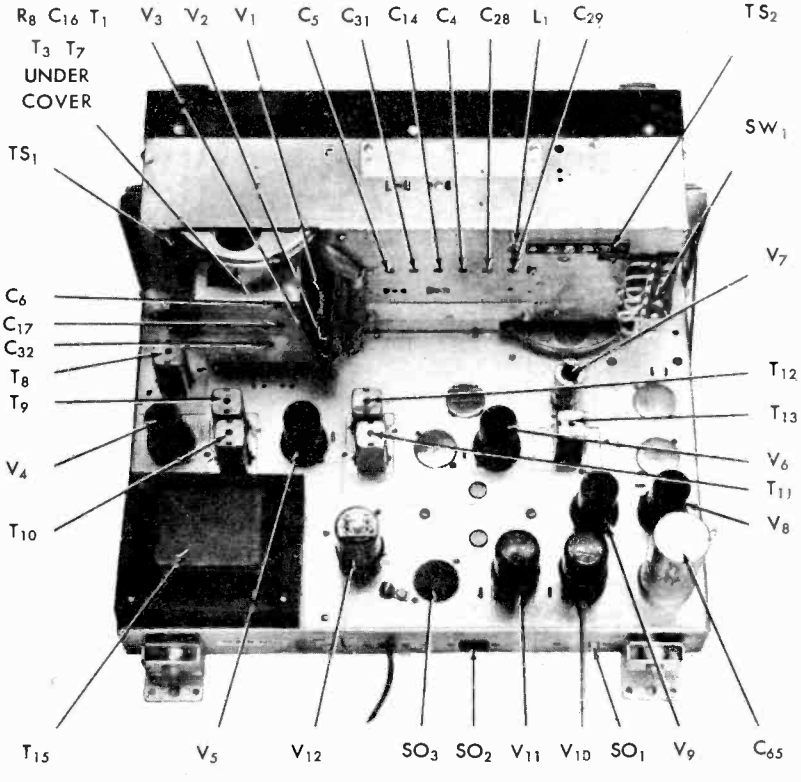
Top view showing location of tubes and dial lamps.



Dial cable stringing procedure.



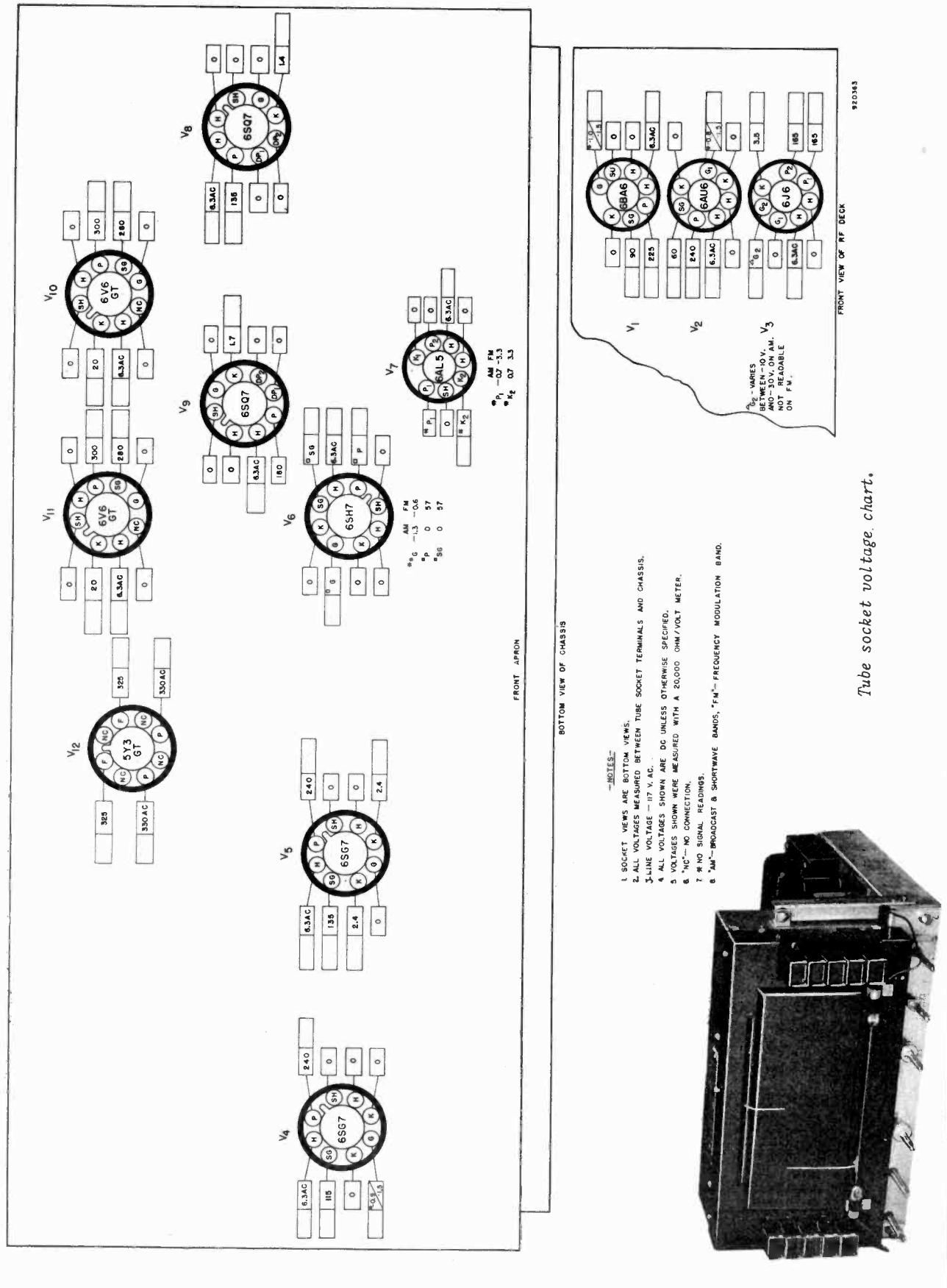
Front view of R.F. chassis showing component location.



Top view showing component location.

MODELS 400, 406, 409, 410, 411, 412

THE HALLICRAFTERS CO.



—NOTES—

1. SOCKET VIEWS ARE BOTTOM VIEWS.
2. ALL VOLTAGES MEASURED BETWEEN TUBE SOCKET TERMINALS AND CHASSIS.
3. LINE VOLTAGE — 117 V. AC.
4. ALL VOLTAGES SHOWN ARE DC UNLESS OTHERWISE SPECIFIED.
5. VOLTAGES SHOWN WERE MEASURED WITH A 20,000 OHM/VOLT METER.
6. "NC"— NO CONNECTION.
7. * NO SIGNAL READINGS.
8. "AM"— BROADCAST & SHORTWAVE BANDS, "FM"— FREQUENCY MODULATION BAND.

Tube socket voltage chart.

THE HALLICRAFTERS CO.

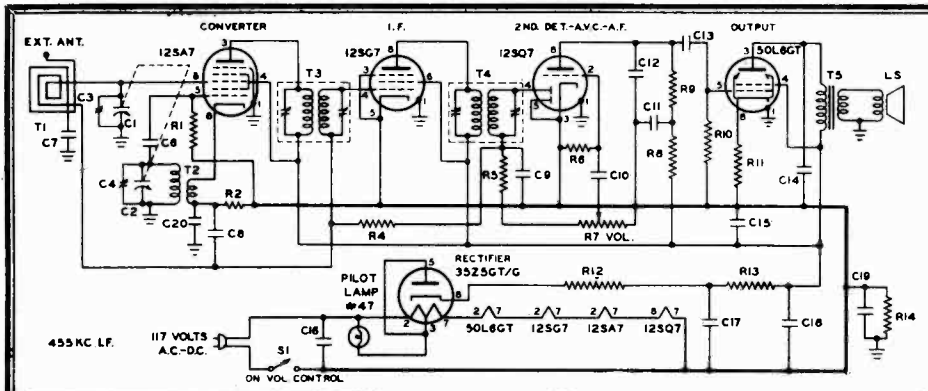
MODELS 400, 406, 409, 410, 411, 412

SERVICE PARTS LIST

Ref. No.	Description	Hallicrafters Part No.
	CONDENSERS	
C-1	470 mmf. 500 V., mica	CM20A471M
C-2,36	100 mmf. 500 V., mica	CM20A101M
C-3,37	.02 mfd. 600 V., tubular paper	46AY203F
C-4,5,14,28,29, 31	Trimmer assembly	44B348
C-6	Trimmer, FM, ant. stage	44A194
C-7	Tuning condenser, FM	48C175
C-8,33	47 mmf. 500 V., ceramic	47A150
C-9	Tuning condenser, AM	48C176
C-10	2.2 mmf., ceramic	47A160-4
C-11,22	5000 mmf. 500 V., ceramic	47A168
C-12	470 mmf. 500 V., mica	CM20A471K
C-13,51,53,54	.05 mfd. 600 V., tubular paper	46AY503F
C-15	4.7 mmf., ceramic	47A160-6
C-16,47, 67	47 mmf. 500 V., mica	CM20A470M
C-17	Trimmer, FM, mixer stage	44A192
C-18,27	100 mmf. 500 V., ceramic	47A045
C-19,23,24,34, 39,40,41,42,43, 44,45,46,49,60, 62	.01 mfd. 600 V., tubular paper	46AZ103F
C-20,66	3.3 mmf., ceramic	47A160-5
C-21	10 mmf. 500 V., ceramic	47A149
C-25,26,48,52	1000 mmf. 500 V., ceramic	47A148
C-30	3900 mmf. 500 V., mica	CM35A392J
C-32	Trimmer, FM, osc. stage	44A218
C-35	.008 mfd. 150 V., ceramic	47B32802N1
C-38,50,61	150 mmf. 500 V., mica	CM20A151M
C-55	.003 mfd. 600 V., tubular paper	46AZ302J
C-57	.005 mfd. 600 V., tubular paper	46AZ502J
C-58	500 mmf. 350 V., ceramic	47A147
C-59	.03 mfd. 200 V., tubular paper	46AU303J
C-63	.01 mfd. 600 V., molded paper	46AG103J
C-64	10 mfd. 25 V., electrolytic	45A121
C-65	60-20 mfd. 450 V., 20 mfd. 400 V., electrolytic	45B113
C-68	1000 mmf. 500V., mica	CM20A102M
	RESISTORS	
R-1,25	1 megohm ½ watt, carbon	RC20AE105M
R-2,34,44	330,000 ohms ½ watt, carbon	RC20AE334M
R-3	2200 ohms ½ watt, carbon	RC20AE222M
R-4,5,9,19,24, 36,40	100,000 ohms ½ watt, carbon	RC20AE104M
R-6	33,000 ohms 1 watt, carbon	RC30AE333M
R-7	47 ohms ½ watt, carbon	RC20AE470M
R-8,12,13,15	10 ohms ½ watt, carbon	RC20AE100M
R-10	2.2 megohms ½ watt, carbon	RC20AE225M
R-11,23,49	220,000 ohms ½ watt, carbon	RC20AE224M
R-14,27,30,31	1000 ohms ½ watt, carbon	RC20AE102M
R-16,18,28	220 ohms ½ watt, carbon	RC20AE221M
R-17	22,000 ohms ½ watt, carbon	RC20AE223M
R-20,21	10,000 ohms 2 watts, carbon	RC40AE103M
R-22	470 ohms 1 watt, carbon	RC30AE471M
R-26,29,35	47,000 ohms 1 watt, carbon	RC30AE473M
R-32,33	47,000 ohms ½ watt, carbon	RC20AE473M
R-37,38,51	470,000 ohms ½ watt, carbon	RC20AE474K
R-39,59	150,000 ohms ½ watt, carbon	RC20AE154M
R-41	Resistor, variable, 2 megohms (tapped)	25B622
R-42	300 ohms ½ watt, carbon	RC20AE301J
R-43	47,000 ohms 2 watts, carbon	RC40AE473K
R-45,47	3900 ohms ½ watt, carbon	RC20AE392K
R-48	470,000 ohms ½ watt, carbon	RC20AE474M
R-46	100,000 ohms ½ watt, carbon	RC20AE104K
R-50	330,000 ohms ½ watt, carbon	RC20AE334K
R-52	330 ohms 2 watts, carbon	RC40AE331M
R-53,54	1200 ohms 2 watts, WW	24BV122E
R-55,56	1000 ohms 2 watts, WW	24BV102E
R-57	6.8 ohms 1 watt, carbon	RC30AE068K
R-58	5600 ohms ½ watt, carbon	RC20AE562K
	TRANSFORMERS AND COILS	
T-1	Transformer, FM, antenna stage	51B916
T-2	Transformer, SW, antenna stage	51B993
T-3	Transformer, FM, mixer stage	51B915
T-4	Transformer, BC, mixer stage	51B910
T-5	Transformer, SW, osc. stage	51B908
T-6	Transformer, BC, osc. stage	51B911
T-7	Transformer, FM, osc. stage	51B914
T-8	Transformer, 1st I.F.	50C298
T-9,11	Transformer, FM, interstage I.F.	50C237
T-10	Transformer, AM, interstage I.F.	50C236
T-12	Transformer, AM, detector stage I.F.	50C235
T-13	Transformer, FM, detector stage I.F.	50C263

SERVICE PARTS LIST

Ref. No.	Description.	Hallicrafters Part No.
	TRANSFORMERS AND COILS (Continued)	
T-14	Transformer, audio output	55B105
T-15	Transformer, power	52C153
L-1	Coil, loop loading	51B907
L-2	Coil, antenna loading	51B994
L-3	Loop antenna(Models 400,406,409)	57C114
L-3	Loop antenna(Models 410,411,412)	57C116
L-4	Coil, R.F. choke	53B009
	SWITCHES	
SW-1	Switch, muting	18A092
SW-2	Band switch assembly	60C308
SW-3	Switch, power and bass tone cont.	60B265
SW-4	Switch, treble tone control	60B325
	PLUGS AND SOCKETS	
PL-1	Line cord and plug	87B1625
SO-1	Receptacle, phono pickup	36A034
SO-2	Receptacle, phono motor	10A015
SO-3	Socket, speaker (5 pin)	6A277
-	Socket, octal (tube)	6A190
-	Socket, octal (6V6GT tubes)	6A296
-	Socket, miniature (tube)	6A276
-	Socket & bracket, dial light, L.H.	86A046
-	Socket & bracket, dial light, R.H.	86A047
-	Socket, cabinet pilot light	B6B050-2
	TUBES, RECTIFIERS AND LAMPS	
V-1	Type 6BA6, antenna	90X6BA6
V-2	Type 6AU6, mixer	90X6AU6
V-3	Type 6J6, osc.	90X6J6
V-4,5	Type 6SG7, 1st & 2nd I.F.	90X6SG7
V-6	Type 6SH7,FM limiter, AM detector	90X6SH7
V-7	Type 6AL5, FM detector	90X6AL5
V-8,9	Type 6SQ7, audio amp.	90X6SQ7
V-10,11	Type 6V6GT/G, power amp.	90X6V6GT/G
V-12	Type 5Y3GT, rectifier	90X5Y3GT
LM-1,2,3	Lamp, 6-8 V., 250 MA., G.E. #44	39A003
	MISCELLANEOUS	
	Shield, tube base (miniature tube)	69A169
	Shield, tube (miniature tube)	69A104
	Spring, tube retainer	75A076
	Shield, dial light	86A037
	Shield, pilot light	69A197
	Shield, FM coil section	69C172
	Carriage, pointer	67B645
	Pointer, FM	82A145
	Pointer, AM	82A146
	Spring, pointer	75A132
	Push-button (brown)	17B028
	Insert, push-button, lucite	17A027
	Insert, push-button, metal	17A029
	Call letters	17A025
	Spring, dial drive	75A006
	Cord, dial drive	38A017
	Plate, dial drive cover	83A300
	Escutcheon (Models 409,410)	7DC39
	Escutcheon (Models 400, 406 411, 412)	7D039-2
	Dial glass, upper	22D195
	Dial glass, lower	22B207
	Clips, dial glass	76A331
	Knob, power switch & tone control (Models 400,406,411,412)	15B96-1
	Knob, power switch & tone control (Models 409,410)	15BC96
	Knob, tuning & volume controls (Models 400, 406,411,412)	15B095-2
	Knob, tuning & volume controls (Models 409,410)	15B093
	Knob,& pin ass'y bandswitch (Models 400,406,411,412)	15A136
	Knob & pin ass'y, bandswitch (Models 409,410)	15A129
TS-1	Terminal strip, antenna	88A277
TS-2	Terminal strip, loop	88A278
	Transmission line, loop	87A1615-1
	FM folded doublet	57C108-1
	Jewel, pilot lamp	86A057
	Bracket, pilot lamp	67A765
LS-1	Speaker assembly	85C069
	Record changer	115C017



SYMBOL	DESCRIPTION	HOFFMAN NO.
C1-C2	Two-Section Variable (388-180 Mmf.)	4401
C3, C4	Trimmers; Part of Variable Cond.	
C6	100 Mmf. ±20%, Mica	4000
C7, C10, C13	.005 Mfd., 600 Volt, Tubular Paper	4102
C8, C11, C15	.05 Mfd., 200 Volt, Tubular Paper	4100
C9, C12	270 Mmf. ±20%, Mica	4001
C14	.02 Mfd., 400 Volt, Tubular Paper	4106
C16	.01 Mfd., 600 Volt, Tubular Paper	4103
C17-C18	Dry Electrolytic (30-50 Mfd/150V)	4201
C19, C20	.1 Mfd. 200 Volt, Tubular Paper	4111
LS	5" PM Loudspeaker	9003
R1	22,000 Ohm ±20%, ½ Watt	4501
R2	68 Ohm ±20%, ½ Watt	4524
R4	2.2 Megohm ±20%, ½ Watt	4502
R5	47,000 Ohm ±20%, ½ Watt	4504
R6	10 Megohm ±20%, ½ Watt	4505
R7	.5 Megohm Pot. with Switch (Volume)	4802
R8	.1 Megohm ±20%, ½ Watt	4511
R9	.22 Megohm ±20%, ½ Watt	4500
R10, R14	.47 Megohm ±20%, ½ Watt	4506
R11	150 Ohm ±20%, ½ Watt	4510
R12	47 Ohm, ±20%, ½ Watt	4508
R13	500 Ohm ±10%, 5 Watt, W.W.	4700
S1	On-Off Switch (On Volume Control)	
T1	Antenna Loop	5207
T2	Oscillator Coil	5208
T3	Input I.F. Transformer (455 K.C.)	5205
T4	Output I.F. Transformer (455 K.C.)	5206
T5	Audio Output Transformer	5101

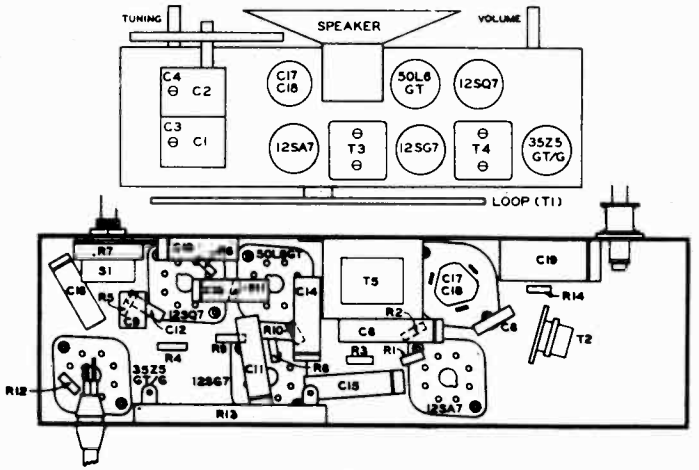


Fig. 2 Bottom of Chassis

NORMAL OPERATING CURRENTS

35Z5	Cathode Current	57 Ma.
50L6	Cathode Current	33 Ma.

NORMAL OPERATING VOLTAGES

The following table lists the normal operating voltages to be expected at the various tube socket terminals.

PIN NO.	1	2	3	4	5	6	7	8
12SA7		24.5AC	+87	+87	—7	0	12AC	—.9
12SG7		36AC	0	—.9	0	+87	24AC	+87
12SQ7		—.5	0	0	0	+62	0	12AC
50L6GT/G		87AC	+85	+87	0	+77 *	36AC	+5.3
35Z5GT/G		117AC	112AC	—	112AC	—	87AC	+117

D.C. voltages measured with 20,000 ohm/volt meter
A.C. voltages measured with 1,000 ohm/volt meter
All voltages measured with reference to B-
Line voltage 117.5

* Means tie point

NOTE: The above readings are obtained with no signal input to receiver.

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.

EQUIPMENT REQUIRED:

1. Signal Generator.
2. Output Meter with 2.5 Volt Scale.
3. .1 Mfd. Condenser.

I.F. ALIGNMENT:

1. Connect output meter across speaker voice coil; set meter on 2.5 volt scale.
2. Connect output of signal generator directly to antenna post on loop; connect ground side of generator to chassis of receiver through .1 Mfd. condenser. Set signal generator on 455 Kc (modulated).
3. Adjust I.F. trimmers (first T4 and then T3) for maximum reading on output meter.

Note: Keep signal level low, just enough to keep maximum reading on lower half of meter scale. Tuning condenser plates should be all the way out; volume control should be on full.

R.F. ALIGNMENT:

1. Set tuning condenser with plates completely out.
2. Set signal generator at 1650 Kc (modulated) and feed its output into a loop of wire about 6" in diameter. Place this loop about one foot away from and parallel to the receiver loop antenna.
3. Tune in signal by adjusting oscillator trimmer (C4).
4. Adjust output of signal generator to obtain deflection on lower half of meter scale.
5. Adjust oscillator trimmer for maximum output.
6. Set signal generator at 1400 Kc and tune in signal with tuning condenser.
7. Adjust antenna trimmer (C3) while rocking gang condenser for maximum reading on output meter. Feed only enough signal from generator to keep maximum reading on lower half of meter scale.

DIAL ADJUSTMENT:

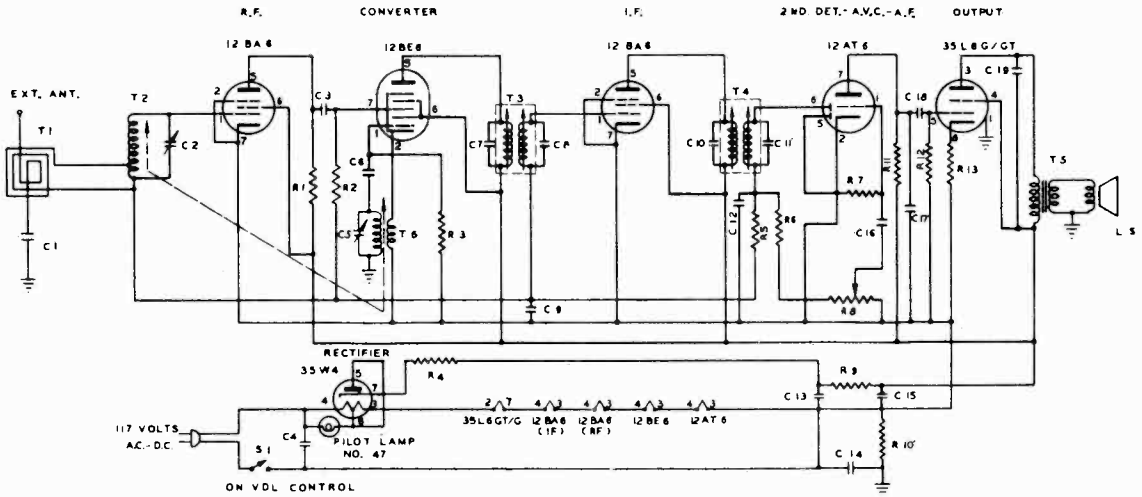
To set the dial on calibration, pick up a station of known frequency near the center of the dial and move the pointer by hand as required.

Power Consumption .....26 Watts
Undistorted Audio Output .....1.0 Watt
Maximum Audio Output .....1.5 Watts
Loudspeaker .....5-inch round P.M.

MAY, 1946

HOFFMAN RADIO CORP.

MODELS A202, A309, Chassis 119



SYMBOL	DESCRIPTION	HOFFMAN No.
C1	.005 Mfd. 600 Volt Tubular Paper	4102
C2, C5	Dual Padder 280 Mmf. Per Section	4307
C3, C6	100 Mmf. ± 20% Mica	4000
C4	.05 Mfd. 400 Volt Tubular Paper	4101
C7, C8	100 Mmf. ± 10% Ceramic	4012
C9	.05 Mfd. 200 Volt Tubular Paper	4100
C10, C11	100 Mmf. ± 10% Ceramic	4012
C12	270 Mmf. ± 20% Mica	4001
C13, C15	Dry Electrolytic (30-50 Mfd./150 V)	4201
C14	.2 Mfd. 200 Volt Paper Tubular	4108
C16	.005 Mfd. 600 Volt Paper Tubular	4102
C17	270 Mmf. ± 20% Mica	4001
C18	.005 Mfd. 600 Volt Tubular Paper	4102
C19	.02 Mfd. 400 Volt Tubular Paper	4106
LS	5" PM Loudspeaker	9003
R1	2200 Ohm ± 20% ½ Watt	4512
R2, R6	47,000 Ohm ± 20% ½ Watt	4504
R3	22,000 Ohm ± 20% ½ Watt	4501
R4	47 Ohm ± 20% ½ Watt	4508
R5	2.2 Megohm ± 20% ½ Watt	4502
R7	10 Megohm ± 20% ½ Watt	4505
R8	.5 Megohm Pot. with Switch (Volume)	4802
R9	500 Ohm ± 10% 5 Watt	4700
R10, R12	.47 Megohm ± 20% ½ Watt	4506
R11	.22 Megohm ± 20% ½ Watt	4500
R13	150 Ohm ± 20% ½ Watt	4510
S1	On-Off Switch (on Volume Control)	
T1	Antenna Loop	5238
T2	R.F. Coil	55203
T3	Input I.F. Transformer (455 Kc.)	55201
T4	Output I.F. Transform (455 Kc.)	55202
T5	Audio Output Transformer	5101
T6	Oscillator Coil	55204

MODELS A202 & A309

DESCRIPTION

Hoffman Models A202 and A309 are electrically identical and differ in cabinet design only. The receiver consists of a 6-tube broadcast band AC-DC Superheterodyne incorporating a built-in loop antenna.

SPECIFICATIONS

Tuning Range ..... 540 Kc to 1650 Kc
Intermediate Frequency ..... 455 Kc.
Power Supply ..... 115 V. D.C. or 115 V. A.C. 50-60 C.P.S.
Power Consumption ..... 28 Watts
Undistorted Audio Output ..... .6 Watt
Maximum Audio Output ..... .9 Watt
Loudspeaker ..... 5-inch round P.M.

NORMAL OPERATING CURRENTS

35W4	Cathode Current	60 Ma.
35L6	Cathode Current	30 Ma.

Meter inserted in circuit at cathode.

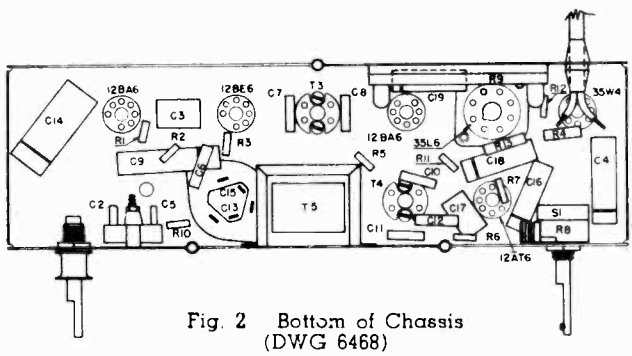


Fig. 2 Bottom of Chassis (DWG 6468)

NORMAL OPERATING VOLTAGES

The following table lists the normal operating voltages to be expected at the various tube socket terminals.

PIN NO.	1	2	3	4	5	6	7	8
12BA6(R.F.)	— .45	0.	25. A.C.	37.5 A.C.	+65.	+80.	0.	
12BE6	4.6*	0.	12.5 A.C.	25. A.C.	+80.	+80.	0.	
12BA6 (I.F.)	— .45	0.	37.5 A.C.	50. A.C.	+80.	+80.	0.	
12AT6	—1.5*	0.	0.	12.5 A.C.	0.	—15.	+37.5	
35L6	0.	85 A.C.	+75 D.C.	+80. D.C.	0.	0.	50. A.C.	+4.6
35W4	115 A.C.	0.	85. A.C.	115. A.C.	110. A.C.	110. A.C.	+110. D.C.	

D.C. voltages measured with 1000 ohm/volt meter
A.C. voltages measures with 1000 ohm/volt meter
All voltages measured with reference to B-
Line voltage 115.

* These readings taken with V. T.V .M.

NOTE: The above readings are obtained with no signal input to receiver.

MODELS A202, A309
MODEL B400

HOFFMAN RADIO CORP.

A202, A309

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:

EQUIPMENT REQUIRED:

1. Signal Generator.
2. Output Meter with 2.5 Volt Scale.
3. .25 Mfd. Condenser.

I.F. ALIGNMENT:

1. Connect output meter across speaker voice coil; set meter on 2.5 volt scale.
2. Connect output of signal generator directly to 12BE6 control grid; connect ground side of generator to chassis of receiver through .25 Mfd. condenser. Set signal generator on 455 Kc (modulated).
3. Adjust I.F. slugs (first T4 and then T3) for maximum reading on output meter.
   Note: Keep signal level low, just enough to keep maximum reading on lower half of meter scale. Tuning condenser plates should be all the way out; volume control should be on full. After adjustment, put a drop of wax on each I.F. tuning slug to hold it in place.

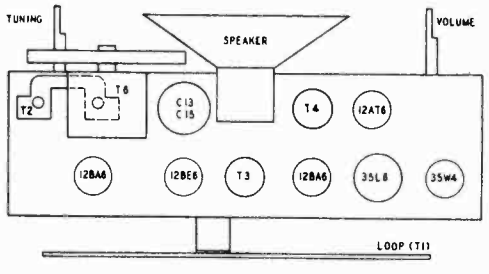


Fig. 1 Top of Chassis
(DWG 1023-4)

R.F. ALIGNMENT: control slugs

1. Set receiver tuning ~~condenser~~ with ~~plates~~ all the way in.
2. Set signal generator on 540 Kc (modulated) and connect generator output to antenna post on receiver. The ground side of the generator should be connected to receiver B- through a .25 Mfd. condenser.
3. Tune in signal by adjusting oscillator trimmer C5.
4. Adjust output of signal generator to obtain deflection on lower half of meter scale.
5. Adjust oscillator trimmer for maximum output.
6. Set signal generator on 1650 Kc and check signal with tuning condenser plates all the way out.
7. Set signal generator on 1470 Kc.
8. Tune in signal on receiver and adjust rf trimmer C2 for maximum reading on output meter. Feed only enough signal from the generator to keep maximum reading on lower half of meter scale.
9. Recheck at 600 Kc, 1000 Kc and 1410 Kc for tracking and readjust as required.

DIAL ADJUSTMENT:

To set the dial on calibration, pick up a station of known frequency near the center of the dial and move the pointer by hand as required.

B400

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:

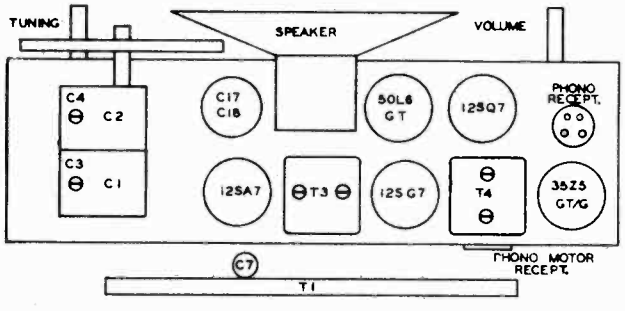
EQUIPMENT REQUIRED:

1. Signal Generator.
2. Output Meter with 2.5 Volt Scale.
3. .1 Mfd. Condenser.

I. F. ALIGNMENT:

1. Connect output meter across speaker voice coil; set meter on 2.5 volt scale.
2. Connect output of signal generator directly to antenna post on loop; connect ground side of generator to chassis of receiver through .1 Mfd. condenser. Set signal generator on 455 Kc (modulated
3. Adjust I.F. trimmers (first T4 and then T3) for maximum reading on output meter.

NOTE: Keep signal level low, just enough to keep maximum reading on lower half of meter scale. Tuning condenser plates should be all the way out, volume control should be on full.



R.F. ALIGNMENT:

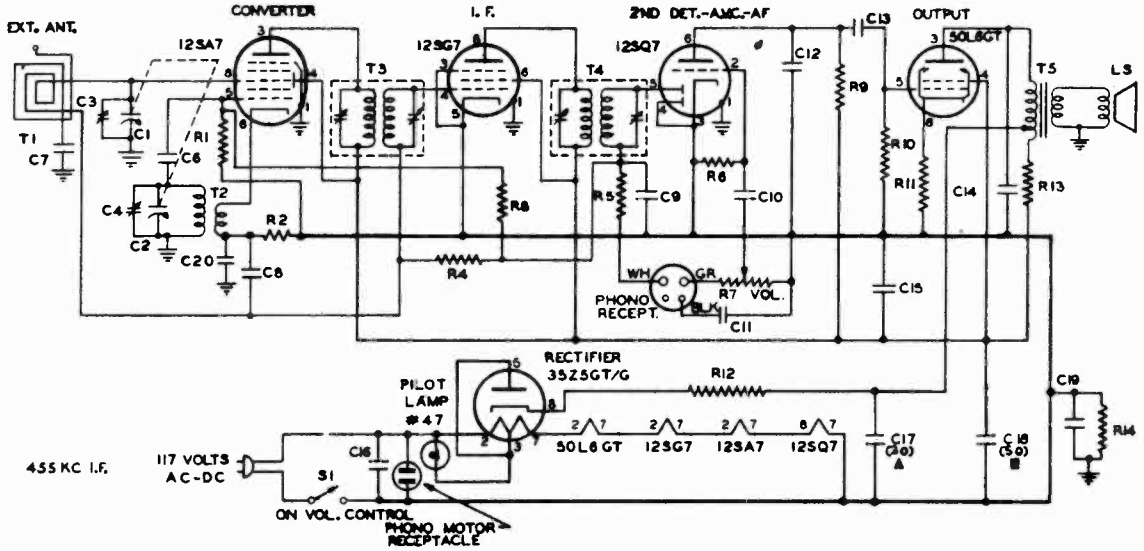
1. Set tuning condenser with plates completely out.
2. Set signal generator at 1650 Kc (modulated) and feed its output into a loop of wire about 6" in diameter. Place this loop about one foot away from and parallel to the receiver loop antenna.
3. Tune in signal by adjusting oscillator trimmer (C4).
4. Adjust output of signal generator to obtain deflection on lower half of meter scale.
5. Adjust oscillator trimmer (C4) for maximum output.
6. Set signal generator at 1400 Kc and tune in signal with tuning condenser.
7. Adjust antenna trimmer (C3) while rocking gang condenser for maximum reading on output meter. Feed only enough signal from generator to keep maximum reading on lower half of meter scale.

DIAL ADJUSTMENT:

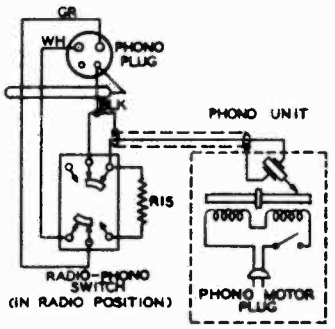
To set the dial on calibration, tune in a station of known frequency near the center of the dial and move the pointer by hand as required.

HOFFMAN RADIO CORP.

MODEL B400, Chassis 118



SYMBOL	DESCRIPTION	HOFFMAN No.
C1, C2	Two Section Variable (388-180 Mmf.)	4401
C3, C4	Trimmer: Part of Variable Cond.	
C6	100 Mmf. ±20% Mica	4000
C7, C10, C13	.005 Mfd. 600 Volt Tubular Paper	4102
C8, C11, C15	.05 Mfd. 200 Volt Tubular Paper	4100
C9, C12	270 Mmf. ±20% Mica	4001
C14	.02 Mfd. 400 Volt Tubular Paper	4106
C16	.05 Mfd. 400 Volt Tubular Paper	4101
C17, C18	Dry Electrolytic (50-30 Mfd. 150 V.)	4201
C19	.2 Mfd. 200 Volt Tubular Paper	4108
C20	.001 Mfd. 600 Volt Tubular Paper	4104
R1	22,000 Ohm ±20% ½Watt	4501
R4	2.2 Megohm ±20% ½Watt	4502
R5	47,000 Ohm ±20% ½Watt	4504
R6, R8	10 Megohm ±20% ½Watt	4505
R7	.5 Megohm Pot. with Switch (Vol.)	4802
R9	.22 Megohm ±20% ½Watt	4500
R10, R14, R15	.47 Megohm ±20% ½Watt	4506
R11	150 Ohm ±20% ½Watt	4510
R12	47 Ohm ±20% ½Watt	4508
R13	1500 Ohm ±20% 1 Watt	4552
S2	Phono-Radio-Tone Switch	6021
LS	PM Loudspeaker	9023
S1	On-Off Switch (on Vol. Control)	
T1	Antenna Loop	5255
T2	Oscillator	5208
T3	Input I.F. Transformer (455Kc.)	5205
T4	Output I.F. Transformer (455Kc.)	5206
T5	Audio Output Transformer	5117



DESCRIPTION

Hoffman model B400 is a table model radio-phonograph combination. The radio section consists of a 5-tube AC-DC superheterodyne receiver with a built-in loop antenna. The phonograph section consists of an automatic record changer which plays either fourteen 10-inch records or twelve 12-inch records at one loading. The record changer may also be operated manually.

SPECIFICATIONS

Tuning Range	540 Kc to 1650 Kc
Intermediate Frequency	455 Kc
Power Supply	115 V. D.C. or A.C. 50-60 C.P.S.
Power Consumption	48 Watts
Audio Output	1.25 Watts

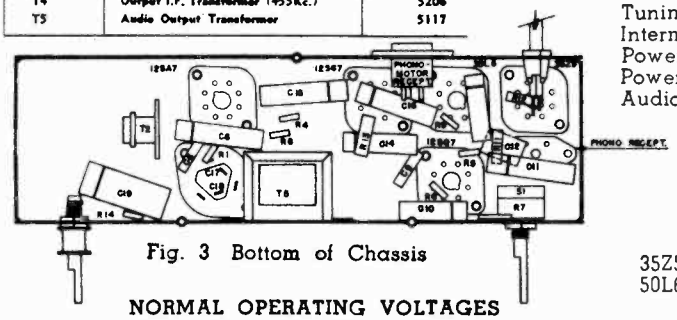


Fig. 3 Bottom of Chassis

NORMAL OPERATING CURRENTS

35Z5	Cathode Current	57 Ma
50L6	Cathode Current	33 Ma

NORMAL OPERATING VOLTAGES

The following table lists the normal operating voltages to be expected at the various tube socket terminals.

PIN NO.	1	2	3	4	5	6	7	8
12SA7	0	24 A.C.	+85	+92	−5.5	0	11.5 A.C.	−.4
12SG7	0	22 A.C.	0	−.4	0	+92	36 A.C.	+86
12SQ7	0	−.8	0	0	−1.0	+60	0	9 A.C.
50L6	0	36 A.C.	+101	+93	+.2	0	87 A.C.	+7.5
35Z5	0	117 A.C.	114 A.C.	+112	114 A.C.	0	87 A.C.	+116

D.C. voltages measured with 20,000 ohm/volt meter.
A.C. voltages measured with 1,000 ohm/volt meter.
All voltages measured with reference to B−.
Line voltage 117.

NOTE: The above readings are obtained with no signal input to the receiver, radio-phono switch in the RADIO position, and volume control full on.

MODEL A300, Chas. 100, 100S

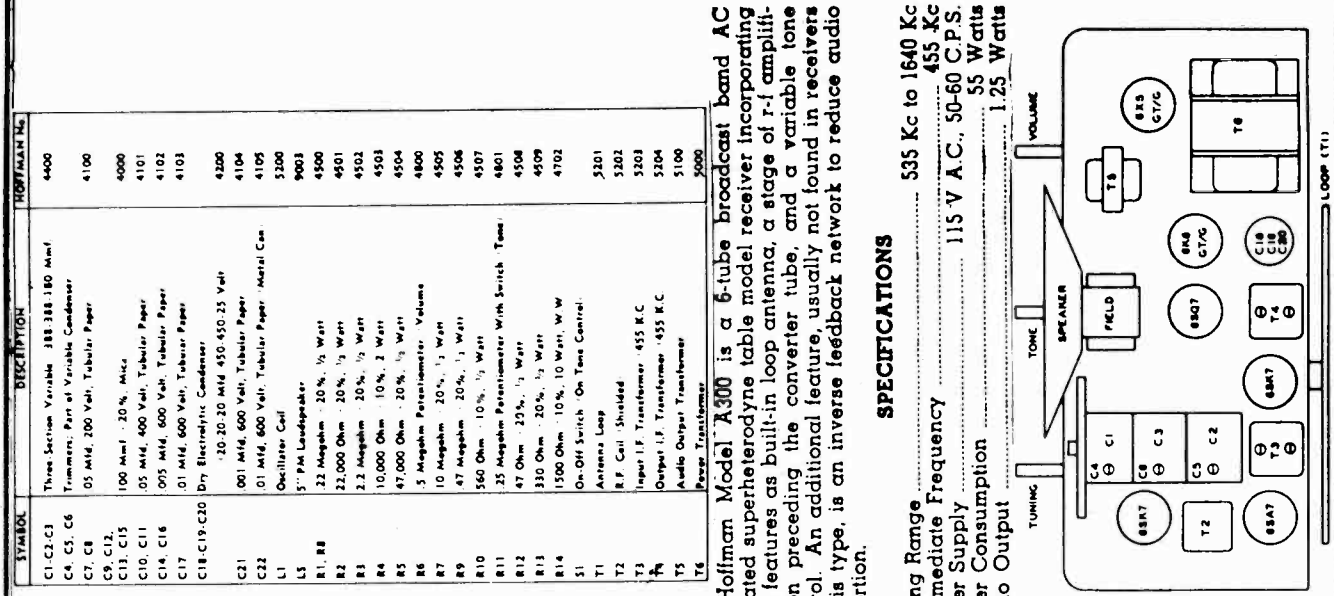
HOFFMAN RADIO CORP.

SYMBOL	DESCRIPTION	HOFFMAN No.
C1, C2, C3	Three Section Variable .388-.388-.180 Mmf	4400
C4, C5, C6	Trimmers, Part of Variable Condenser	
C7, C8	.05 Mfd, 200 Volt, Tubular Paper	4100
C9, C12, C13, C15	100 Mmf, 20% Mica	4000
C10, C11	.05 Mfd, 600 Volt, Tubular Paper	4101
C14, C16	.005 Mfd, 600 Volt, Tubular Paper	4102
C17	.01 Mfd, 600 Volt, Tubular Paper	4103
C18-C19-C20	Dry Electrolytic Condenser -20-20-20 Mfd 450-450-25 Volt	4200
C21	.001 Mfd, 600 Volt, Tubular Paper	4104
C22	.01 Mfd, 600 Volt, Tubular Paper - Metal Can	4105
L1	Oscillator Coil	5200
L3	5" PM Loudspeaker	9003
R1, R8	.22 Megohm ± 20%, ½ Watt	4500
R2	22,000 Ohm ± 20%, ½ Watt	4501
R3	2.2 Megohm ± 20%, ½ Watt	4502
R4	10,000 Ohm ± 10%, 2 Watt	4503
R5	47,000 Ohm ± 20%, ½ Watt	4504
R6	.5 Megohm Potentiometer - Volume	4800
R7	10 Megohm ± 20%, ½ Watt	4505
R9	.47 Megohm ± 20%, ½ Watt	4506
R10	560 Ohm ± 10%, ½ Watt	4507
R11	.25 Megohm Potentiometer With Switch - Tone	4801
R12	47 Ohm ± 5%, ½ Watt	4508
R13	330 Ohm ± 20%, ½ Watt	4509
R14	1500 Ohm ± 10%, 10 Watt, W W	4702
S1	On-Off Switch - On Tone Control	
T1	Antenna Loop	5201
T2	R.F. Coil - Shielded	5202
T3	Input I.F. Transformer - 455 K.C.	5203
T4	Output I.F. Transformer - 455 K.C.	5204
T5	Audio Output Transformer	5100
T6	Power Transformer	5000

Hoffman Model A300 is a 6-tube broadcast band AC operated superheterodyne table model receiver incorporating such features as built-in loop antenna, a stage of r-f amplification preceding the converter tube, and a variable tone control. An additional feature, usually not found in receivers of this type, is an inverse feedback network to reduce audio distortion.

SPECIFICATIONS

Tuning Range	535 Kc to 1640 Kc
Intermediate Frequency	455 Kc
Power Supply	115 V A.C., 50-60 C.P.S.
Power Consumption	55 Watts
Audio Output	1.25 Watts



Hoffman Model A300 with Chassis number 100S is electrically identical with Chassis number 100 except for the following:

1. Five-inch P.M. speaker, part number 9003, has been substituted for 4 x 6 inch oval dynamic speaker, part number 9000.
2. A 1500-ohm resistor, part number 4701, has been connected in the filter circuit in place of the 1500-ohm speaker field.

These changes have been incorporated in the schematic diagram shown below.

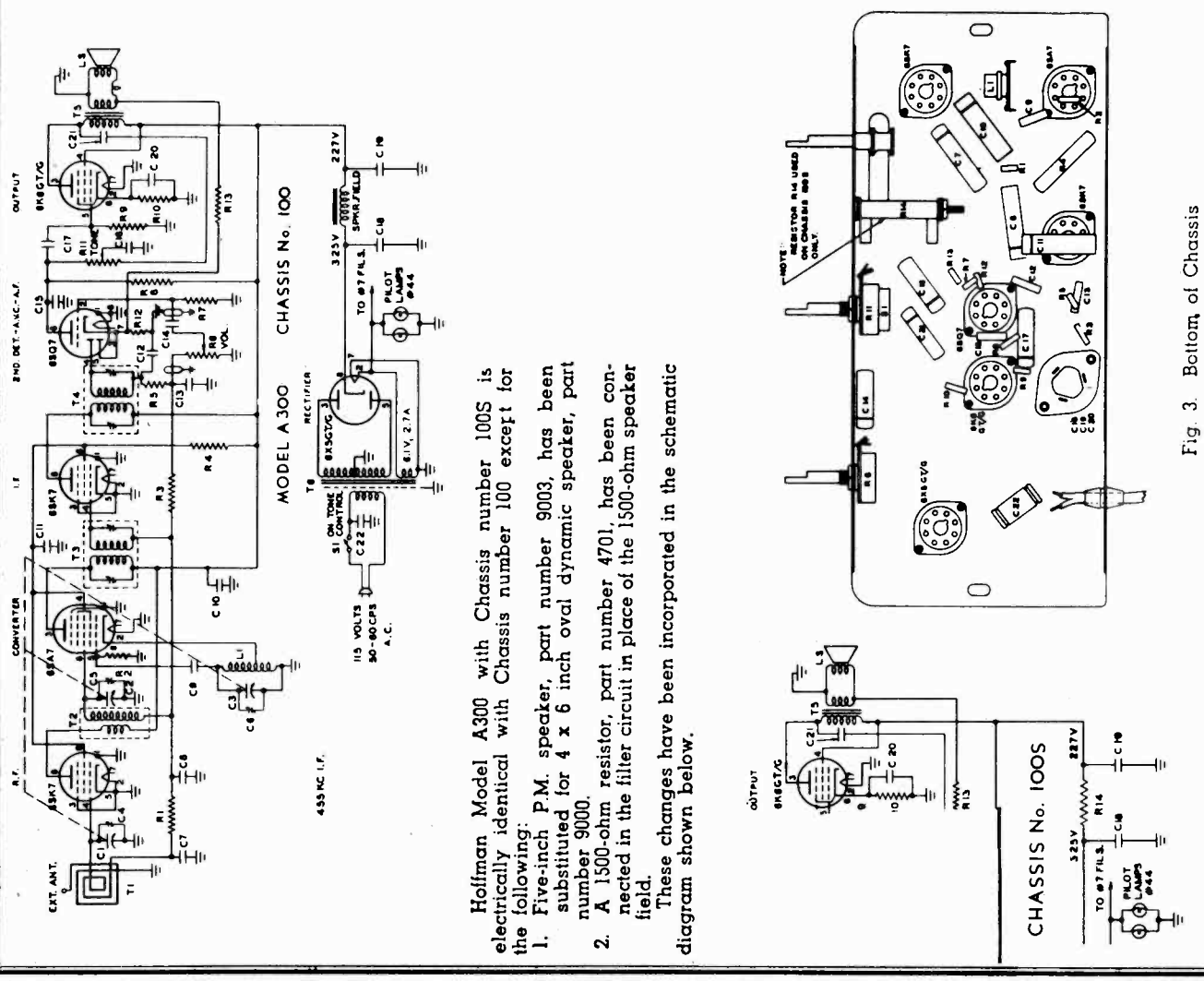


Fig. 3. Bottom of Chassis

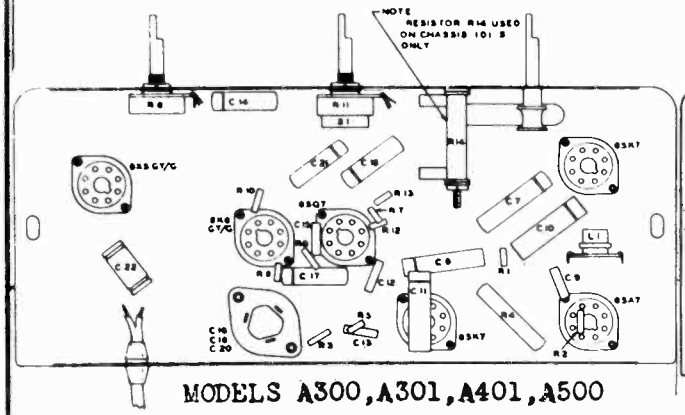
HOFFMAN RADIO CORP.

MODEL A300
MODEL A301
MODEL A401
MODEL A500

MODEL A300, Chassis 100, 100S
MODEL A301, Chassis 101, 101S

DIAL ADJUSTMENTS:

To set the dial on calibration, tune in a station of known frequency near the center of the dial and move the pointer by hand as required.



MODELS A300, A301, A401, A500

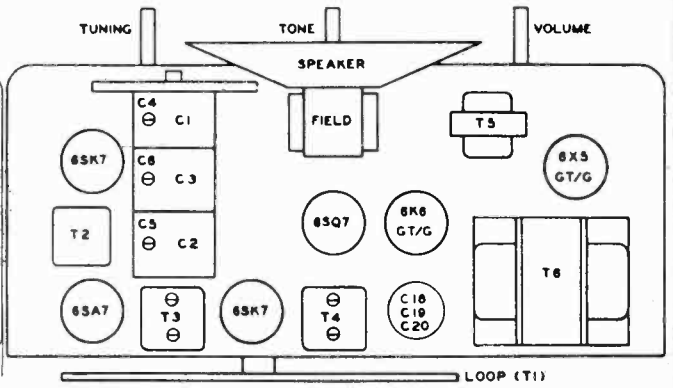


Fig. 1 Top of Chassis

NORMAL OPERATING VOLTAGES

The following table lists the normal operating voltages to be expected at the various tube socket terminals.

PIN NO.	1	2	3	4	5	6	7	8
6SK7 (R.F.)	0	0	0	−.5	0	+85	6.1A.C.	+227
6SA7	0	0	+227	+85	−7	0	6.1A.C.	−.7
6SK7 (I.F.)	0	0	0	−.7	0	+85	6.1A.C.	+227
6SQ7	0	−.5	0	−.25	0	+95	6.1A.C.	0
6K6GT/G	0	0	+217	+227	0	+325 *	6.1A.C.	+15
6X5GT/G	0	6.1A.C.	290A.C.	—	290A.C.	—	0	+325

D.C. voltages measured with 20,000 ohm/volt meter.
A.C. voltages measured with 1,000 ohm/volt meter.
All voltages measured with reference to chassis.
Line voltage 117.5.

* Means tie point.

NOTE: The above readings are obtained with no signal input to the receiver.

MODELS A300, A301, A401, A500

NORMAL OPERATING CURRENTS

6X5GT/G	Cathode Current	65 Ma
6K6GT/G	Cathode Current	24.5 Ma

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:

EQUIPMENT REQUIRED:

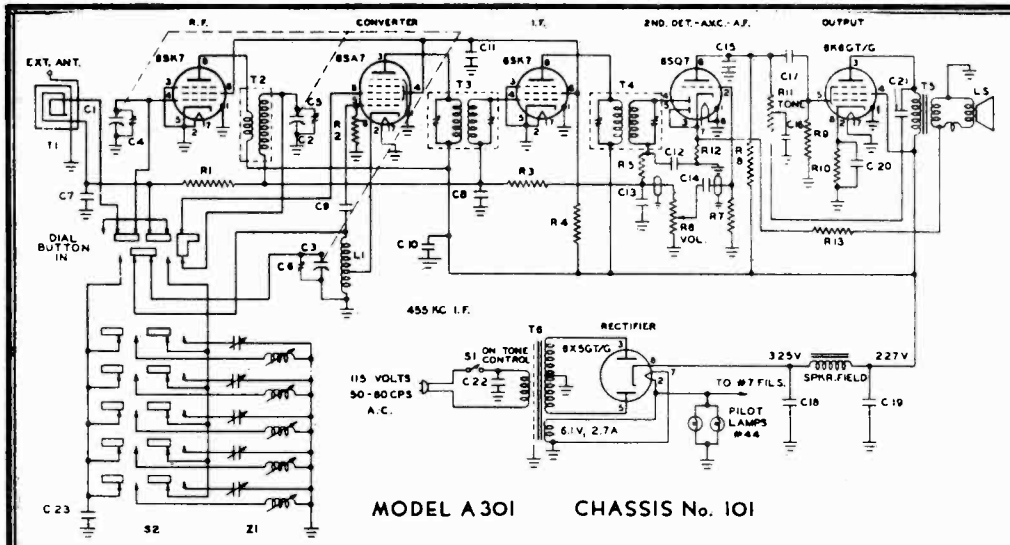
1. Signal Generator
2. Output Meter with 2.5 Volt Scale.
3. .1 Mfd. Condenser

I.F. ALIGNMENT:

1. Connect output meter across speaker voice coil; set meter on 2.5 Volt Scale.
2. Connect output of signal generator to stator of C2 (see schematic) through a .1 Mfd. condenser; connect ground side of generator directly to chassis of receiver. Set signal generator on 455 Kc (modulated).
3. Adjust I.F. trimmers (first T4 and then T3) for maximum reading on output meter. (Note: Keep signal level low, just enough to keep maximum reading on lower half of meter scale.) The tuning condenser plates should be all the way out; volume and tone controls should be in extreme clockwise position.

R.F. ALIGNMENT:

1. Set tuning condenser with plates completely out.
2. Set signal generator at 1650 Kc (modulated) and feed its output into a loop of wire about 6 inches in diameter. Place this loop about one foot away from and parallel to the receiver loop antenna.
3. Tune in signal by adjusting oscillator trimmer (C6).
4. Adjust output of signal generator to obtain deflection on lower half of meter scale.
5. Adjust oscillator trimmer for maximum output.
6. Set signal generator at 1400 Kc and tune in signal with tuning condenser.
7. Adjust antenna and RF trimmers (C4 and C5) while rocking gang condenser for maximum reading on output meter. Feed only enough signal from generator to keep maximum reading on lower half of meter scale.

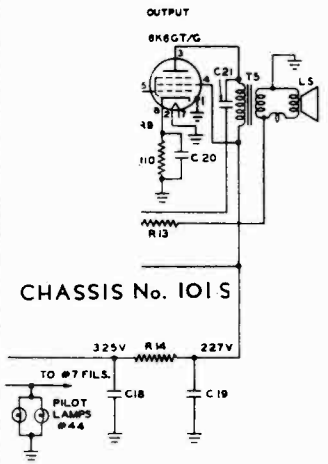


MODEL A301 CHASSIS No. 101

Hoffman Model A301 with Chassis 101S is electrically identical with Chassis 101 except for the following:

1. Five-inch P.M. speaker, part number 9003, has been substituted for 4 x 6-inch oval dynamic speaker, part number 9000.
2. A 1500-ohm resistor, part number 4701, has been connected in the filter circuit in place of the 1500-ohm speaker field.

These changes have been incorporated in the schematic diagram shown below.



CHASSIS No. 101S

SPECIFICATIONS

Tuning Range	535 Kc to 1640 Kc
Intermediate Frequency	455 Kc
Power Supply	115 V A.C., 50-60 C.P.S.
Power Consumption	55 Watts
Audio Output	1.25 Watts

MODELS A301, A500, A501 MAY, 1946

SYMBOL	DESCRIPTION	HOFFMAN No.
C1-C2-C3	Three-Section Variable (388-388-180 Mmf.)	4400
C4, C5, C6	Trimmers; Part of Variable Condenser	
C7, C8	.05 Mfd, 200 Volt, Tubular Paper	4100
C9, C12, C13, C15	100 Mmf ± 20%, Mica	4000
C10-C11	.05 Mfd, 400 Volt, Tubular Paper	4101
C14, C16	.005 Mfd, 600 Volt, Tubular Paper	4102
C17	.01 Mfd, 600 Volt, Tubular Paper	4103
C18-C19-C20	Dry Electrolytic Condenser (20-20-20 Mfd 450-450-25 Volt)	4200
C21	.001 Mfd, 600 Volt, Tubular Paper	4104
C22	.01 Mfd, 600 Volt, Tubular Paper (Metal Can)	4105
C23	500 Mmf ± 5%, Silver Mica	4004
L1	Oscillator Coil	5200
LS	Loudspeaker, 5" P.M.	9003
R1, R8	.22 Megohm ± 20%, ½ Watt	4500
R2	22,000 Ohm ± 20%, ½ Watt	4501
R3	2.2 Megohm ± 20%, ½ Watt	4502
R4	10,000 Ohm ± 10%, 2 Watt	4503
R5	47,000 Ohm ± 20%, ½ Watt	4504
R6	.5 Megohm Potentiometer (Volume)	4804
R7	10 Megohm ± 20%, ½ Watt	4505
R9	.47 Megohm ± 20%, ½ Watt	4506
R10	560 Ohm ± 10%, ½ Watt	4507
R11	.25 Megohm Potentiometer With Switch (Tone)	4805
R12	47 Ohm ± 20%, ½ Watt	4508
R13	330 Ohm ± 20%, ½ Watt	4509
R14	1500 Ohm ± 5%, 6½ Watt	4701
S1	On-Off Switch (On Tone Control)	
S2	Pushbutton Switch Assembly	6000
T1	Antenna Loop	5201
T2	R.F. Coil (Shielded)	5212
T3	Input I.F. Transformer (455 K.C.)	5203
T4	Output I.F. Transformer (455 K.C.)	5204
T5	Audio Output Transformer	5100
T6	Power Transformer	5000
Z1	Pushbutton Tuning Assembly	55200

PUSHBUTTON ADJUSTMENTS

The frequency ranges for the pushbuttons are given in figure 3. A layout of the pushbutton adjustments is shown in figure 4. 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 4) until the station is accurately tuned in again.
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.

PUSHBUTTON NO.	1	2	3	4	5
FREQUENCY RANGE IN KILOCYCLES	550-800	550-800	720-1200	720-1200	900-1500

Fig. 3 Pushbuttons

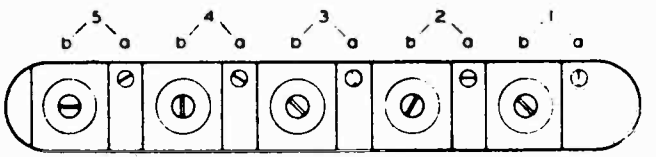
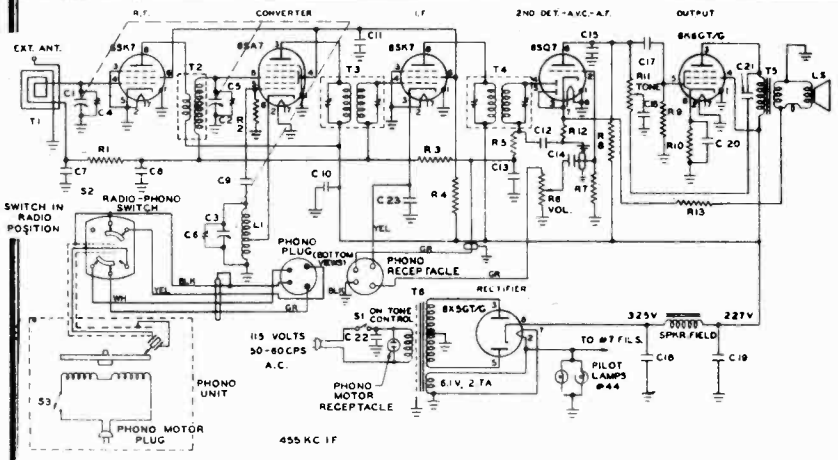
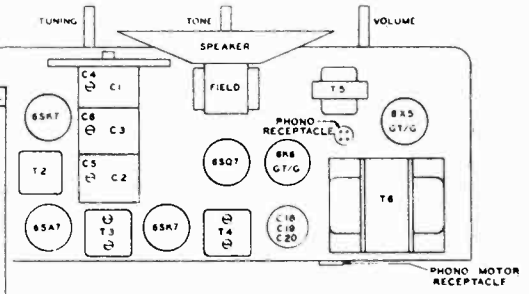


Fig. 4 Adjustment Screws



AUTOMATIC RECORD CHANGER MODEL A401 CHASSIS No. 102

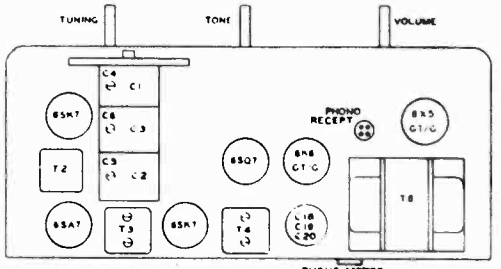
The automatic record changer used with this receiver is a General Instrument, Model 205.



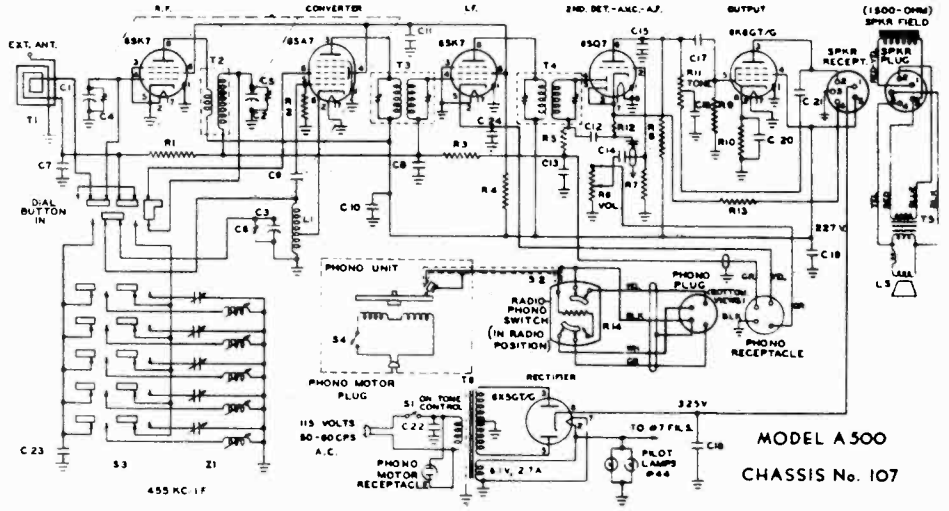
SYMBOL	DESCRIPTION	HOFFMAN No.
C1-C2-C3	Three-Section Variable (388-388-180 Mmf.)	4400
C4, C5, C6	Trimmers; Part of Variable Condenser	
C7, C8	.05 Mfd, 200 Volt, Tubular Paper	4100
C9, C12, C13, C15	100 Mmf ±20%, Mica	4000
C10, C11, C23	.05 Mfd, 400 Volt, Tubular Paper	4101
C14, C16	.005 Mfd, 600 Volt, Tubular Paper	4102
C17	.01 Mfd, 600 Volt, Tubular Paper	4103
C18-C19-C20	Dry Electrolytic Condenser (20-20-20 Mfd 450-450-25 Volt)	4200
C21	.001 Mfd, 600 Volt, Tubular Paper	4104
C22	.01 Mfd, 600 Volt, Tubular Paper (Metal Can)	4105
L1	Oscillator Coil	5200
LS	Loudspeaker, 4" x 6" (1500-Ohm Field)	9000
R1, R8	.22 Megohm ±20%, ½ Watt	4500
R2	22,000 Ohm ±20%, ½ Watt	4501
R3	2.2 Megohm ±20%, ½ Watt	4502
R4	10,000 Ohm ±10%, 2 Watt	4503
R5	47,000 Ohm ±20%, ½ Watt	4504
R6	.5 Megohm Potentiometer (Volume)	4804
R7	10 Megohm ±20%, ½ Watt	4505
R9	.47 Megohm ±20%, ½ Watt	4506
R10	560 Ohm ±10%, ½ Watt	4507
R11	.25 Megohm Potentiometer With Switch (Tone)	4805
R12	47 Ohm ±20%, ½ Watt	4508
R13	330 Ohm ±20%, ½ Watt	4509
S1	On-Off Switch (On Tone Control)	
S2	Radio-Phono Switch	6001
S3	Phono Motor Switch (Part of Phono Unit)	
T1	Antenna Loop	5223
T2	R.F. Coil (Shielded)	5202
T3	Input I.F. Transformer (455 K.C.)	5203
T4	Output I.F. Transformer (455 K.C.)	5204
T5	Audio Output Transformer	5100
T6	Power Transformer	5000
	Phono Unit—Automatic Record Player	9011

AUTOMATIC RECORD CHANGER

The automatic record changer used with this receiver is a Seeburg Model "K".



MAY, 1946



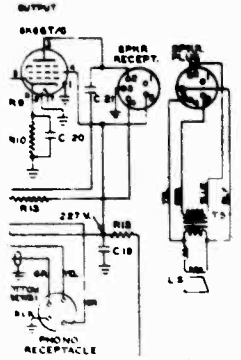
MODEL A500 CHASSIS No. 107

Hoffman Model A500 with Chassis 107S is electrically identical with Chassis 107 except for the following:

1. Ten-inch P.M. speaker, part number 9010, has been substituted for ten-inch electrodynamic speaker, part number 9012.
2. A 1500-ohm resistor, part number 4701, has been connected in the filter circuit in place of the 1500-ohm speaker field.

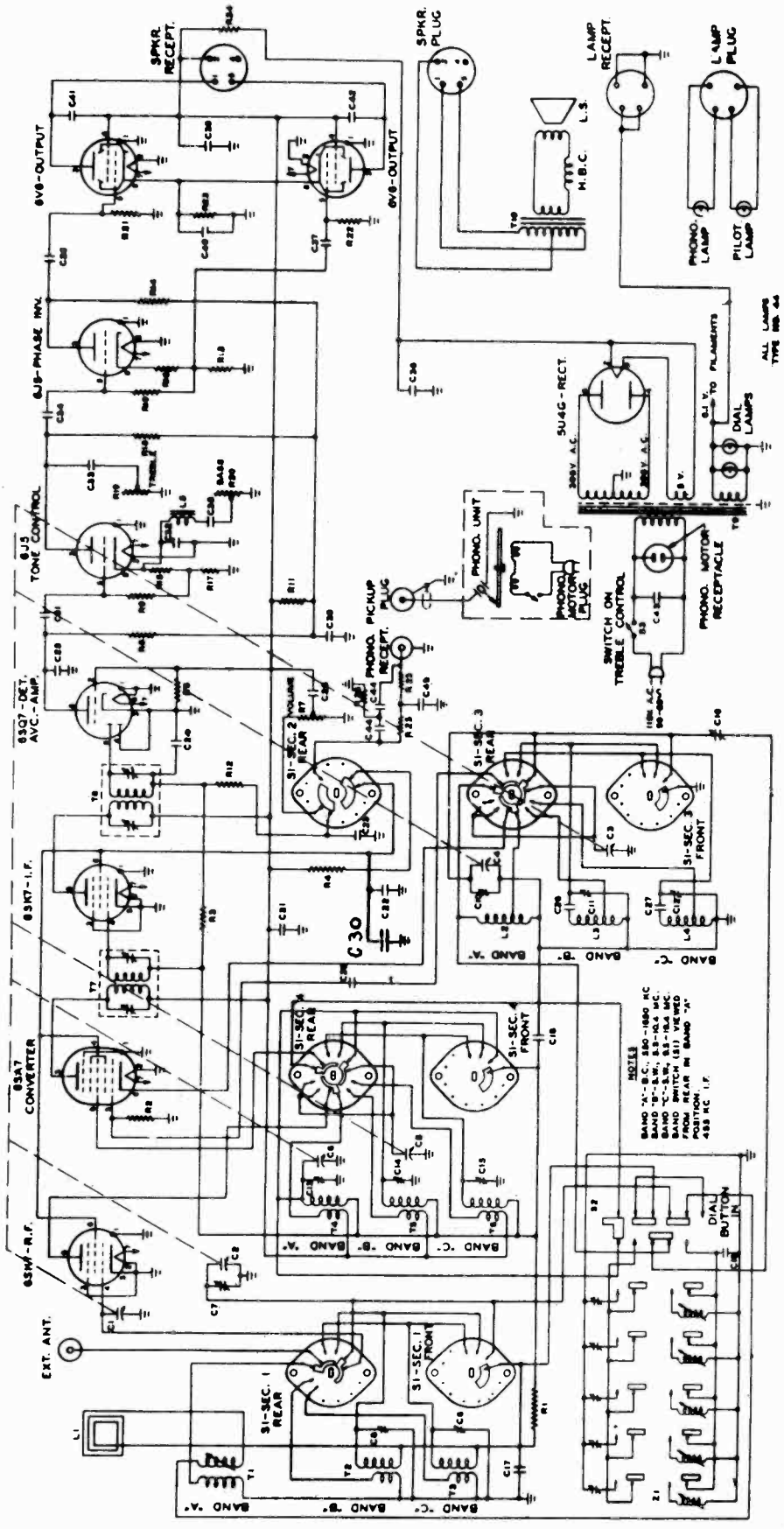
These changes have been incorporated in the schematic diagram shown below.

SYMBOL	DESCRIPTION	HOFFMAN No.
C1-C2-C3	Three-Section Variable (388-388-180 Mmf.)	4400
C4, C5, C6	Trimmers; Part of Variable Condenser	
C7, C8	.05 Mfd, 200 Volt, Tubular Paper	4100
C9, C12, C13, C15	100 Mmf ±20%, Mica	4000
C10-C11-C23	.05 Mfd, 400 Volt, Tubular Paper	4101
C14, C16	.005 Mfd, 600 Volt, Tubular Paper	4102
C17	.01 Mfd, 600 Volt, Tubular Paper	4103
C18-C19-C20	Dry Electrolytic Condenser (20-20-20 Mfd 450-450-25 Volt)	4200
C21	.001 Mfd, 600 Volt, Tubular Paper	4104
C22	.01 Mfd, 600 Volt, Tubular Paper (Metal Can)	4105
C23	500 Mfd ±5%, Silver Mica	4004
L1	Oscillator Coil	5200
LS	10" Loudspeaker, Permanent Magnet	9010
R1, R8, R14	.22 Megohm ±20%, ½ Watt	4500
R2	22,000 Ohm ±20%, ½ Watt	4501
R3	2.2 Megohm ±20%, ½ Watt	4502
R4	10,000 Ohm ±10%, 2 Watt	4503
R5	47,000 Ohm ±20%, ½ Watt	4504
R6	.5 Megohm Potentiometer (Volume)	4804
R7	10 Megohm ±20%, ½ Watt	4505
R9	.47 Megohm ±20%, ½ Watt	4506
R10	560 Ohm ±10%, ½ Watt	4507
R11	.25 Megohm Potentiometer With Switch (Tone)	4805
R12	47 Ohm ±20%, ½ Watt	4508
R13	330 Ohm ±20%, ½ Watt	4509
R15	1500 Ohm ±5%, 6½ Watt	4701
S1	On-Off Switch (On Tone Control)	
S2	Radio-Phono Switch	6001
S3	Pushbutton Switch Assembly	6000
S4	Phono Motor Switch (Part of Record Player Unit)	
T1	Antenna Loop	5226
T2	R.F. Coil (Shielded)	5202
T3	Input I.F. Transformer (455 K.C.)	5203
T4	Output I.F. Transformer (455 K.C.)	5204
T5	Audio Output Transformer (on Speaker)	5107
T6	Power Transformer	9000
Z1	Pushbutton Tuning Assembly	5120D
	Automatic Record Player	9016



MODEL A501, Ch. 108S, 108ST

HOFFMAN RADIO CORP.



HOFFMAN RADIO CORP.

MODEL A501, Ch. 1088
108ST

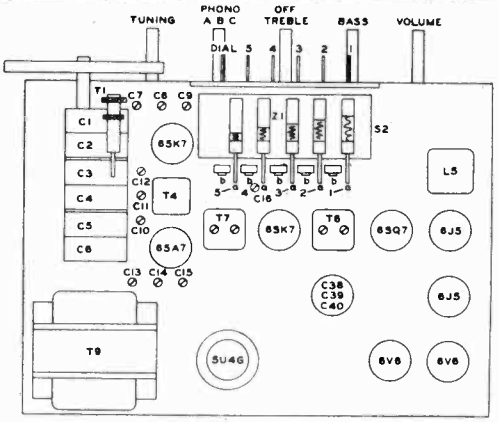
OPERATIONS IN ORDER	SIGNAL GENERATOR		RECEIVER		TRIMMER ADJ. IN ORDER
	CONNECTIONS TO REC.	FREQUENCY	CONTROL SETTINGS	DIAL SETTING	
1	To stator of C-6 through .1 mfd. cond.	455 Kc	Vol. Max. Range Sw. on "A" Band	Minimum Capacity	T-8 and T-7
2	To Ant. Term. through a 400-ohm resistor.	18 Mc	Vol. Max. Range Sw. on "C" Band	18 Mc	C-12, C-15, C-9
3	To Ant. Term. through a 400-ohm resistor	10 Mc	Vol. Max. Range Sw. on "B" Band	10 Mc	C-11, C-13, C-8
4	To Ant. Term. through 200 mmf. condenser	1400 Kc	Vol. Max. Range Sw. on "A" Band	1400 Kc	C-10, C-13, C-7
5	To Ant. Term. through 200 mmf. condenser	600 Kc	Vol. Max. Range Sw. on "A" Band	600 Kc	C-16, T-1 tuning slug
6	To Ant. Term. through 200 mmf. condenser	1400 Kc	Vol. Max. Range Sw. on "A" Band	1400 Kc	C-10, C-13, C-7

NOTE: Rocking the condenser gang on the higher frequencies (bands "B" and "C") is necessary in order to avoid a false point of alignment due to "pulling action" between r-f and oscillator circuits.

NOTE: Be sure that the image frequency is not picked up during this adjustment. Note that the signal may be readily heard at two points as C-11 is adjusted. The correct setting for C-11 is with the trimmer in its looser position (adjusting screw further out).

NOTE: It is necessary to align the "C" band first so that "B" band and broadcast band alignment will not be adversely affected by subsequent "C" band adjustment.

Alignment of "C" Band:



NORMAL OPERATING VOLTAGES

The following table lists the normal operating voltages to be expected at the various tube socket terminals.

PIN NO.	1	2	3	4	5	6	7	8
6SK7 (R.F.)	0	0	0	−.1	0	+95	6.2 AC	+290
6SA7 (Conv.)	0	0	+290	+95	−5 to −10	0	6.2 AC	−.15
6SK7 (I.F.)	0	0	0	−.15	0	+95	6.2 AC	+290
6SQ7	0	−.2	0	−.25	0	+75	6.2 AC	0
6J5 (Tone)	0	0	+130	0	+20 □	0	6.2 AC	+22
6J5 (Inverter)	0	0	+105	0	+50 #	0	6.2 AC	+43
6V6	0	0	+290	+290	0	0	6.2 AC	+17
6V6	0	0	+290	+290	0	0	6.2 AC	+17
5U4G	0	+350 5.2 AC*	0	335 AC	0	335 AC	0	+350 5.2 AC *

D.C. voltages measured with 20,000 ohm/volt meter.
A.C. voltages measured with 1,000 ohm/volt meter.
Line voltage 117.
measured at junction of R13 and R16.
□ measured at junction of R15 and R17.

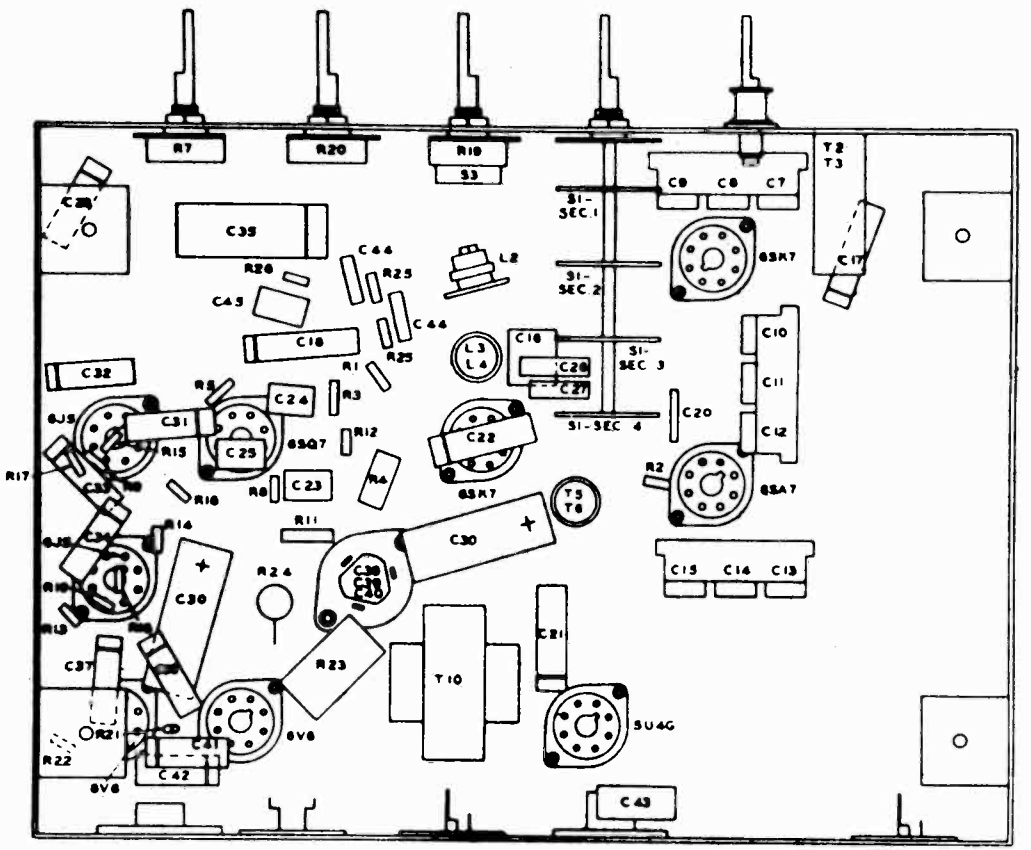
All voltages measured with reference to chassis except as follows:

* measured between pins 2 and 8; not to chassis.

NOTE The above readings are obtained with no signal input to receiver and band switch in position "A".

NORMAL OPERATING CURRENTS

5U4G	Cathode Current	115 Ma.
6V6	Cathode Current (both tubes)	70 Ma.



TUNING RANGES:

Band "A"	540 Kc to 1600 Kc.
Band "B"	5.6 Mc to 10.4 Mc
Band "C"	9.4 Mc to 19.4 Mc
Intermediate Frequency	455 Kc
Power Supply	115V A.C., 50-60 C.P.S.
Power Consumption (incl. phono)	125 Watts
Undistorted Audio Output	12 Watts

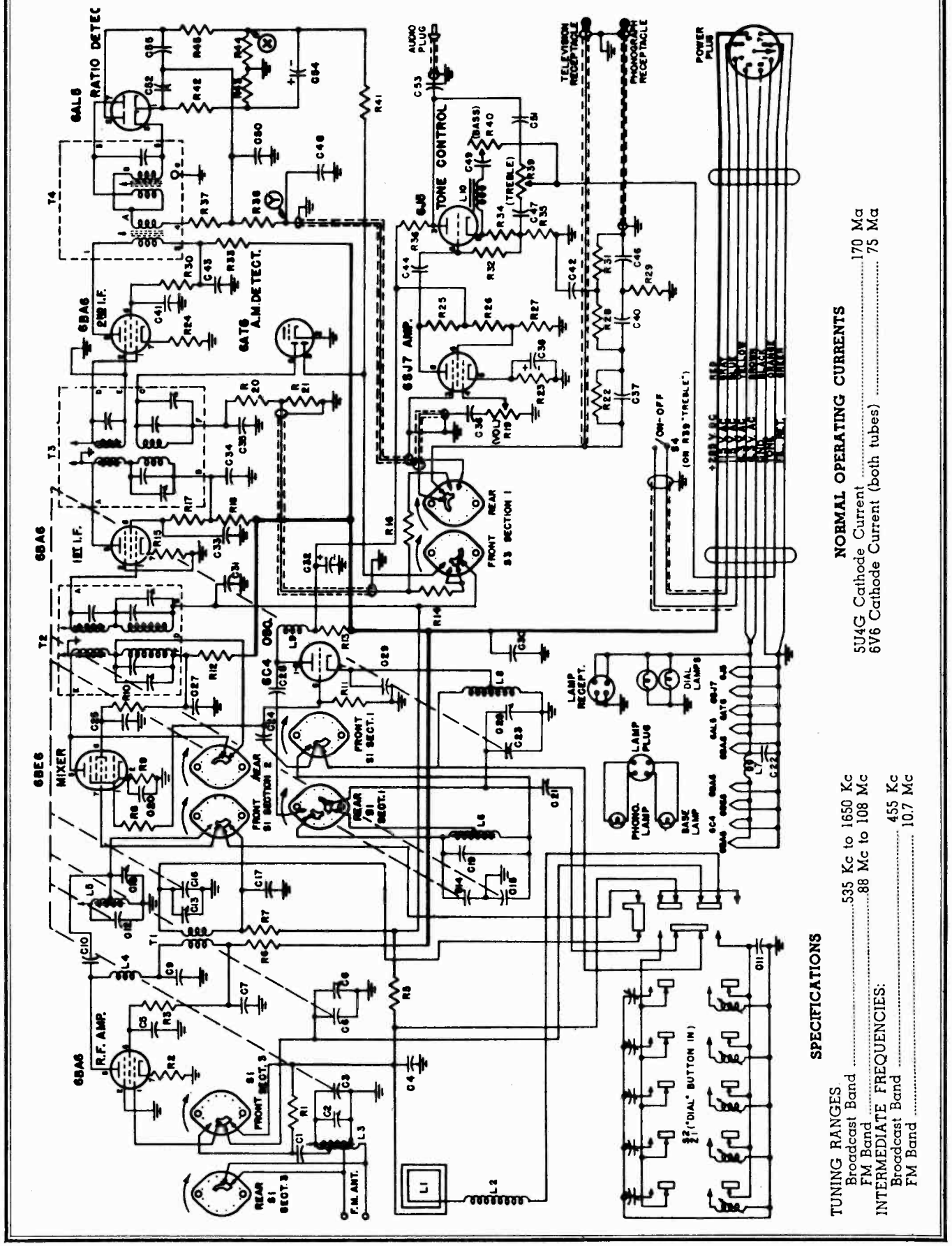
Model A501 with Chassis 108S is electrically identical with Chassis 108ST, except for: Cutput transformer, Part No.5110 substituted for Part No.5107.

These are electrically identical.

A 10-mf, 450-volt electrolytic condenser, Part No.4203, has been added from screen to ground on the 6SK7 r-f and i-f tubes to eliminate a hum modulation. It is suggested that this condenser be added on all Model A501 receivers not having it.

SYMBOL	DESCRIPTION	Hoffman No.
C1-C2, C3-C4, C5-C6	Three-section Variable with Split Stator, (160-260, 160-260, 160-260 Mmf.)	4403
C7, C8, C9	Three-section Trimmer Assembly	4300
C10, C11, C12	Three-section Trimmer Assembly	4300
C13, C14, C15	Three-section Trimmer Assembly	4300
C16	110-560 Mmf. Padder, Band "A"	4301
C17, C18	.05 Mfd., 200 Volt, Tubular Paper	4100
C19	500 Mmf. ±5%, Silver Mica	4004
C20	47 Mmf. ±10%, Mica	4007
C21, C22	.05 Mfd., 400 Volt, Tubular Paper	4101
C23, C24, C25	100 Mmf. ±20%, Mica	4000
C26	1050 Mmf. ±5%, Mica	4005
C27	2300 Mmf. ±5%, Mica	4006
C28, C29	.005 Mfd., 600 Volt, Tubular Paper	4102
C30	10 Mfd., 450 Volt, Tubular Electrolytic	4203
C31, C32, C33, C34	.01 Mfd., 400 Volt, Tubular Paper	4112
C35	.5 Mfd., 200 Volt, Tubular Paper	4110
C36, C37	.02 Mfd., 400 Volt, Tubular Paper	4106
C38-C39-C40	20-20-20 Mfd./450-450-25 V. Electrolytic	4200
C41, C42	.01 Mfd., 600 Volt, Tubular Paper	4103
C43	.01 Mfd., 600 Volt, Tubular Paper (Metal Can)	4105
C44	330 Mmfd., 5%, Mica	4010
C45	650 Mmfd., 5%, Mica	4011
L1	Loop Antenna	5221
L2	Oscillator Coil (Band "A")	5215
L3-L4	Oscillator Coil (Bands "B" and "C")	5218
L5	5 Hy Choke (Bass Boost)	5103
LS	12-inch Loudspeaker, Permanent Magnet	9020
R1	.1 Megohm ±20%, ½ Watt	4511
R2	22,000 Ohm ±20%, ½ Watt	4501
R3	2.2 Megohm ±20%, ½ Watt	4502
R4	10,000 Ohm ±20%, 3 Watt	4520
R5	10 Megohm ±20%, ½ Watt	4505
R6	15,000 Ohm ±20%, ½ Watt	4521
R7	.5 Megohm Potentiometer (Volume Control)	4804
R8	.22 Megohm ±20%, ½ Watt	4500
R9, R10	1 Megohm ±20%, ½ Watt	4513
R11	47,000 Ohm ±20%, 1 Watt	4516
R12, R13, R14	47,000 Ohm ±20%, ½ Watt	4504
R15, R16	2200 Ohm ±20%, ½ Watt	4512
R17, R18	10,000 Ohm ±20%, ½ Watt	4515
R19	.25 Meg. Pot. with Switch (Treble Control)	4805
R20	50,000 Ohm Potentiometer (Bass Control)	4806
R21, R22	.47 Megohm ±20%, ½ Watt	4506
R23	220 Ohm ±20%, 3 Watt	4519
R24	500 Ohm ±10%, 20 Watt	4702
R25	47,000 Ohm ±10%, ½ Watt	4537
R26	22,000 Ohm ±10%, ½ Watt	4538
S1	Band Change Switch	6005
S2	Pushbutton Switch Assembly	6004
S3	On-Off Switch (On Treble Control)	
T1	Antenna Coil (Band "A")	5220
T2-T3	Antenna Coil (Bands "B" and "C")	5217
T4	R.F. Coil, Shielded (Band "A")	5216
T5-T6	R.F. Coil (Bands "B" and "C")	5219
T7	Input I.F. Transformer	5213
T8	Output I.F. Transformer	5214
T9	Power Transformer	5001
T10	Audio Output Transformer (On Speaker)	5107
Z1	Pushbutton Tuning Assembly	55200

HOFFMAN RADIO CORP. MODELS B502, C502, C512, Ch. 113; B504, C504, C514, Ch. 123



NORMAL OPERATING CURRENTS

5U4G Cathode Current ..... 170 Ma
6V6 Cathode Current (both tubes) ..... 75 Ma

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

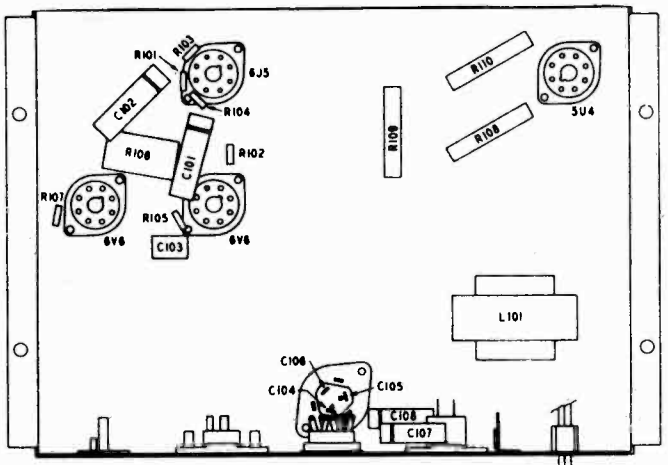
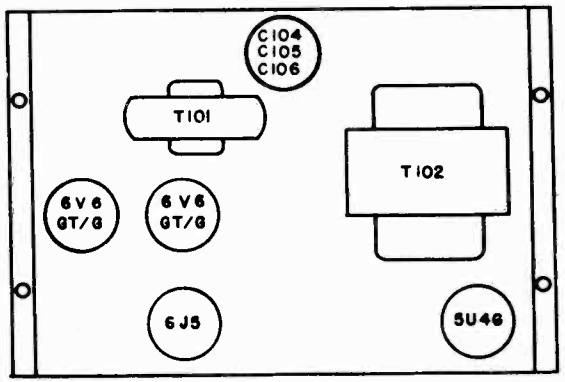


Fig. 4—Bottom of Power Supply Chassis



Power Supply Chassis

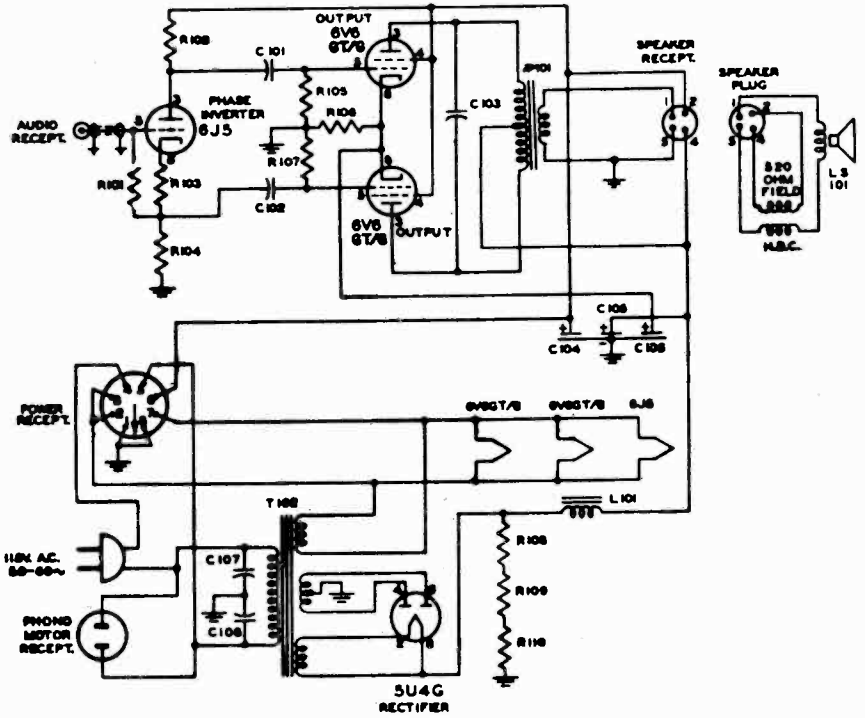


Fig. 5—Power Supply Schematic Diagram

AUTOMATIC RECORD CHANGER

The automatic record changer used with this receiver is a Webster Model 56.

POWER SUPPLY CHASSIS

SYMBOL	DESCRIPTION	HOFFMAN NO.
C101, C102	.05 Mfd. 400 Volt Tub. Paper	4101
C103	470 Mmf. ±20% Mica	4003
C104, C105 C106	20/20 Mfd. 450V. 20 Mfd. 25V. Electrolytic	4200
C107, C108	.01 Mfd. 600 Volt, Metal Case	4105
R101	1 Meg. ±20% ½ Watt	4513
R102, R104	47000 Ohm ±10% ½Watt	4559
R103	2200 Ohm ±20% ½Watt	4512
R105, R107	.22 Meg. ±20% ½Watt	4500
R106	220 Ohm ±20% 3 Watt W.W.	4706
R108, R109 R110	10,000 Ohm ±10% 2 Watt	4503
L101	Filter Choke	5116
T101	Audio Output Transformer	5108
T102	Power Transformer	5007
LS101	Speaker—12" Electrodynamic	9044

*Prices Subject To Change Without Notice

HOFFMAN RADIO CORP.

MODELS B502, C502, C512, Ch. 113; B504, C504, C514, Ch. 123

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 position.
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.
10. 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.

PUSHBUTTON NO.	1	2	3	4	5
FREQUENCY RANGE IN KILOCYCLES	880 TO 890	880 TO 890	890 TO 1570	890 TO 1570	1580 TO 1740

Figure 2—Pushbutton Frequencies

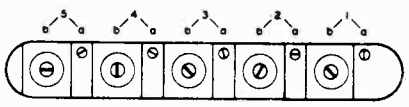


Figure 3—Pushbutton Adjustments

MODELS B502,C502,C512,Ch.HOFFMAN RADIO CORP. 113;B504,C504,C514,Ch.123

POWER SUPPLY CHASSIS

Pin No.	1	2	3	4	5	6	7	8
6J5	0	0	+190	—	+65*	+80	6.3 AC	+85
6V6	0	0	+310	+285	0	—	6.3 AC	+16.5
6V6	0	0	+310	+285	0	—	6.3 AC	+16.5
5U4	0	+335 5.0 AC★	—	370 AC	—	370 AC	—	+335 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:

★Meosured between pin numbers 2 and 8 on 5U4 socket.

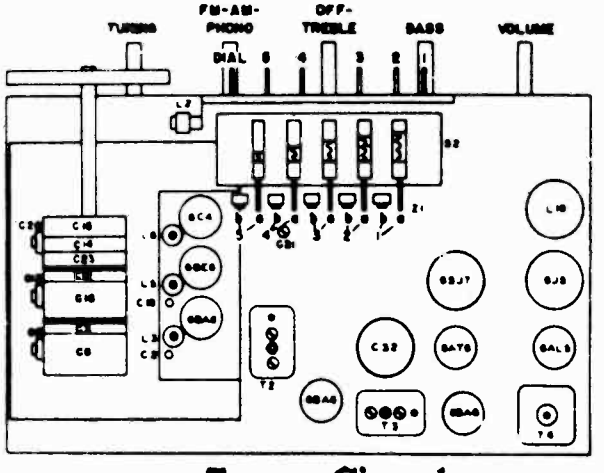
NOTE: Above readings are obtained with no signal input to receiver and band switch in phono position.

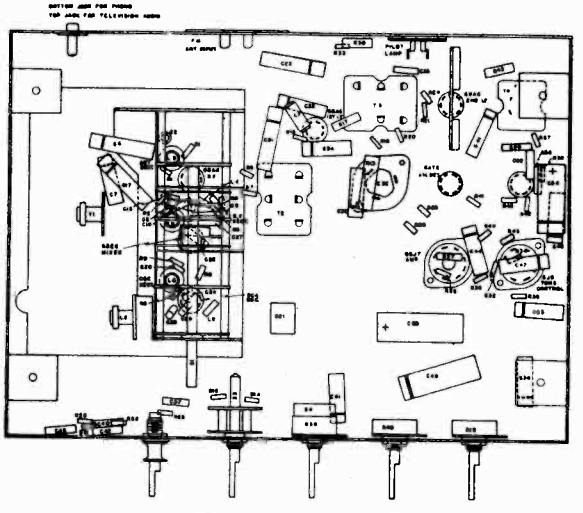
NORMAL OPERATING VOLTAGES

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.)	—.4*	0	6.3AC	0	+260	+97	+1.0	—
6BE6 (Conv.)	—14*	—.4	6.3AC	0	+270	+65	—.4*	—
6C4 (Osc.)	+230	—	6.3AC	0	+230	—14*	0	—
6BA6 (1st I.F.)	—.4*	0	6.3AC	0	+260	+97	+1.0	—
6BA6 (2nd I.F.)	0	0	6.3AC	0	+260	+93	+1.0	—
6AL5 Ratio Det.	+.5*	—.5*	6.3AC	0	+.25*	—	+.25*	—
6AT6 AM Det.	—	0	6.3AC	0	—.5*	—.5*	—	—
6SJ7 A.F.	0	6.3AC	0	0	+1.0	+23	0	+155
6J5 Tone Control	0	6.3AC	+180	+230	+40*	+44	0	+50





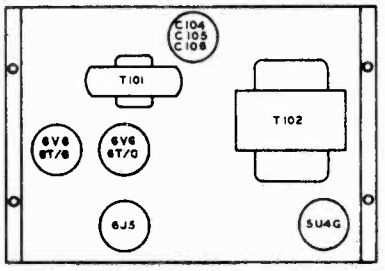
Tuner Chassis

TUNER CHASSIS

SYMBOL	DESCRIPTION	HOFFMAN NO.
C1, C9, C10, C28, C35, C37	100 Mmf. ±10% Ceramic	4012
C2, C18	1 - 8 Mmf. Trimmer	4315
C3, C6, C12, C14, C15, C16, C23	3 Sect. Variable with Split Stator	4408
C4, C17, C22, C31	.05 Mfd. 200 Volt Tub. Paper	4100
C5, C25	470 Mmf. ±20% Mica	4003
C7, C30, C34, C44, C51, C53	.01 Mfd. 400 Volt Tub. Paper	4112
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	4301
C24	22 Mmf. ±10% Ceramic	4021
C27	5000 Mmf. (Min.) Ceramic	4029
C29	50 Mmf. ±20% Ceramic	4031
C32	20 Mfd. 450 Volt Electrolytic	4207
C33, C41	.001 Mfd. 600 Volt Tub. Paper	4104
C36	.02 Mfd. 400 Volt Tub. Paper	4106
C38	25 Mfd. 25 Volt Electrolytic	4205
C40, C46, C50, C52, C55	330 Mmf. ±5% Mica	4010
C42	650 Mmf. ±5% Mica	4011
C47	.005 Mfd. 600 Volt Tub. Paper	4102
C48	.002 Mfd. 600 Volt Tub. Paper	4118
C49	.5 Mfd. 200 Volt Tub. Paper	4110
C54	5 Mfd. 50 Volt Electrolytic	4209
C43	2300 Mmf. ±5% Mica	4006
R1	.27 Meg. ±20% ½Watt	4545
R2, R9, R15, R24	56 Ohm ±10% ½Watt	4561
R3, R10, R17, R30	33,000 Ohm ±20% 1 Watt	4556
R5, R7	.1 Meg. ±20% ½Watt	4511
R6, R12, R18, R33	1500 Ohm ±20% ½Watt	4534
R8	22 Ohm ±20% ½Watt	4560
R11, R35, R36	22,000 Ohm ±20% ½Watt	4501
R13	4700 Ohm ±20% 2 Watt	4551
R14	2.2 Meg. ±20% ½Watt	4502
R16, R32	1 Meg. ±20% ½Watt	4513
R19	.5 Meg. Pot. (Volume)	4804
R20, R38	47,000 Ohm ±20% ½Watt	4506
R21	.68 Meg. ±20% ½Watt	4555
R22	4.7 Meg. ±20% ½Watt	4544
R23, R34	2200 Ohm ±20% ½Watt	4512
R25	.22 Meg. ±20% ½Watt	4500
R26	.12 Meg. ±10% ½Watt	4548
R27	15,000 Ohm ±20% ½Watt	4521
R28, R31	47,000 Ohm ±10% ½Watt	4559
R29	22,000 Ohm ±5% ½Watt	4538
R37	120 Ohm ±10% ½Watt	4546
R39	.25 Meg. Pot. With Switch (Treble)	4805
R40	50,000 Ohm Pot. (Bass)	4806

Bottom of Tuner Chassis

R41	47 Meg. ±20% ½Watt	4506
R42, R45	390 Ohm ±10% ½Watt	4549
R43, R44	6800 Ohm ±10% ½Watt	4557
L1	Loop Antenna	55210
L2	Antenna Coil—Broadcast	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.	5263
L10	Choke—Bass	5103
S1	Band Switch (R.F.)	6014
S2	Pushbutton Switch Assem.	6004
S3	Band Switch (Audio)	6015
T1	Transformer—R.F. Interstage	5264
T2	Transformer—1st I.F.	5272
T3	Transformer—2nd I.F.	5273
T4	Transformer—Ratio Detect.	5270
Z1	Pushbutton Tuning Assembly	55200



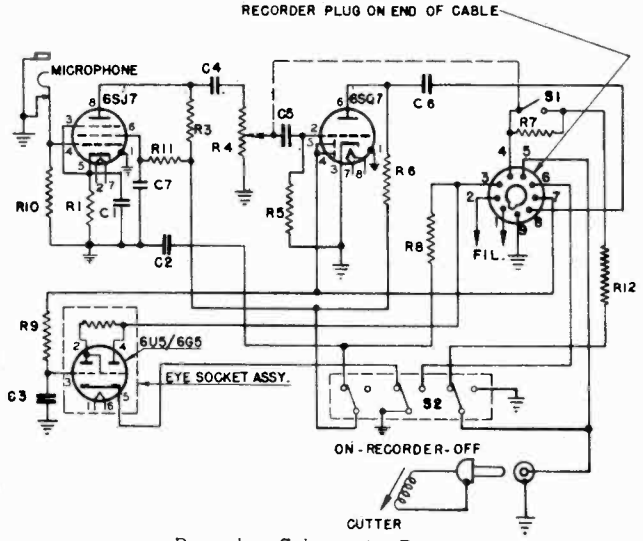
Power Supply Chassis

RECORDER CHASSIS		
SYMBOL	DESCRIPTION	HOFFMAN NO.
C1	25 Mfd—25 Volt, Electrolytic	4205
C2	10 Mfd. 450 Volt, Electrolytic	4203
C3, C4	.01 Mfd. 400 Volt, Tubular paper	4112
C5	.005 Mfd, 600 Volt, Tubular Paper	4102
C6	.02 Mfd. 400 Volt, Tubular Paper	4106
R1	2200 Ohm · 20% ½ Watt	4512
R2	10,000 Ohm · 20% ½ Watt	4515
R3	.47 Megohm · 20% 1 Watt	4506
R4	.5 Megohm Potentiometer	4802
R5	10 Megohm · 20% ½ Watt	4505
R6	.22 Megohm · 20% ½ Watt	4500
R7	1.0 Ohm · 20% ½ Watt Wire Wound	4707
R8	47,000 Ohm · 20% 1 Watt	4516
R9, R10	1.0 Megohm · 20% ½ Watt	4513
R11	.1 Megohm · 20% ½ Watt	4511
S1	Monitor on-off Switch (Part of R4)	
S2	Recorder On-off Switch	6003
R12	.5 Ohm · 20% ½ Watt Wire Wound	4708

POWER SUPPLY CHASSIS		
SYMBOL	DESCRIPTION	HOFFMAN NO.
C101, C102	.05 Mfd. 400 Volt, Tubular Paper	4101
C103	470 Mmf · 20% Mica	4003
C104, C105, C106	20 Mfd. 25V. 20 20 Mfd 450V. Electro.	4200
C107, C108	.01 Mfd. 600 Volt, Metal Case	4105
C109	.005 Mfd. 600 Volt Tubular Paper	4102
R101, R114	1 Meg. · 20% ½ Watt	4513
R102, R104	47000 Ohm · 10% ½ Watt	4559
R103	2200 Ohm · 20% ½ Watt	4512
R105, R107, R111, R112	.22 Meg. · 20% ½ Watt	4500
R106	220 Ohm · 20% 3 Watt W.W.	4706
R108, R109, R110	10,000 Ohm · 10% 2 Watt	4503
R113	.47 Meg. · 20% ½ Watt	4506
L101	Filter Choke	5116
T101	Audio Output Transformer	5108
T102	Power Transformer	5007
LS101	Speaker—12" Electrodynamic	9044

RECORDER CHASSIS

Microphone AMP	6SJ7
Audio AMP	6SQ7
Volume Level Indicator	6U5/6G5
Power Supply	115 V.A.C. 50-60 C.P.S.
Power Consumption (incl. Phono.)	185 Watts
Undistorted Audio Output	14 Watts



Recorder Schematic Diagram

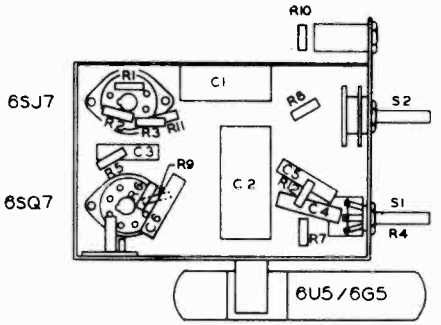
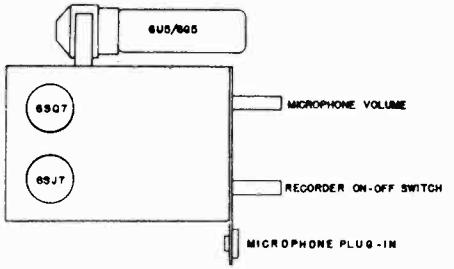
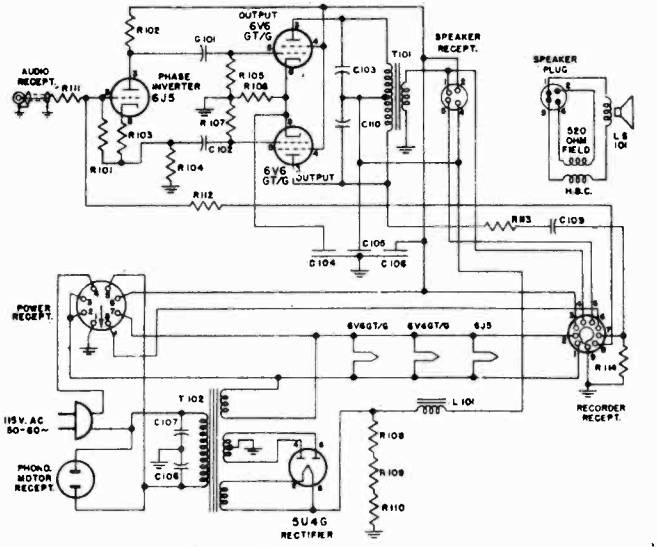


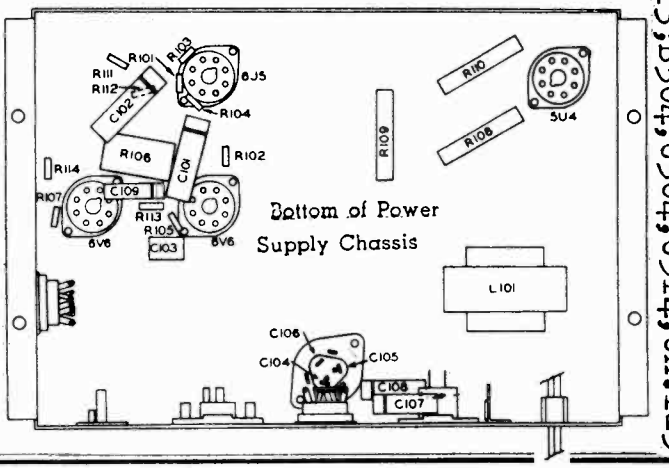
Fig. 6. Bottom of Recorder Chassis



Recorder Chassis
Figure 1—Top of Chassis



Power Supply Schematic Diagram



Bottom of Power Supply Chassis

RECORDER CHASSIS

Pin No.	1	2	3	4	5	6	7	8
6SJ7	0	3.3AC	+1.1	0	+1.1	+17	3.3AC	+49
6SQ7	0	−.4	0	−.5	−.5	+100	3.3AC	3.3AC
6U5/6G5	3.3AC	+60	−.5	+290	0	3.3AC	—	—

All Voltages measured with reference to chassis with No Signal input.

MODELS B502,C502,C512,Ch.113;B504,C504,C514,Ch.123 HOFFMAN RADIO CORP.

Hoffman C504, C514

These models are the same as model B504 except for the following. Push-pull parallel 6K6 tubes are used in the output instead of push-pull 6V6 tubes. See Fig. 1.

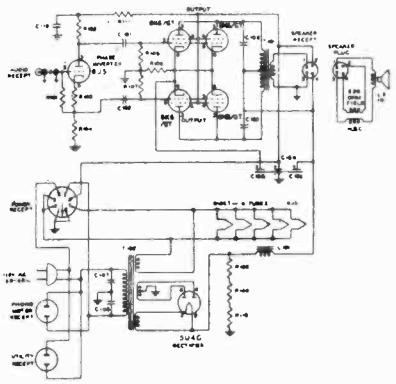


Fig. 1. Changes in the output stages of the Hoffman Models C504 and C514.

A resistance-capacitance filter (R111 and C110) has been inserted in the B-plus line feeding the phase inverter stage in order to reduce the inherent hum level of the receiver to a satisfactory level. See Fig. 1.

An "entertainment panel" has been wired into the tuner chassis to provide microphone input, a speaker on-off switch, a pillow speaker plug, and an auxilliary phono input to be used either for television sound or wire recorder input. See Fig. 2.

On the recorder amplifier, the screen-dropping resistor (R11) has been changed from 0.1 megohm to 2.2 megohms and the cathode resistor (R2) changed from 2200 ohms to 4700 ohms. This change allows the screen current of the 6SJ7 to be self-regulating to eliminate variations in gain between various 6SJ7 tubes.

Several changes were made in the late production. A 270,000-ohm resistor was added across the phono input jack of the radio chassis. This resistor was on the record changer (960260-2) in the early production (Serial Nos. B-1001 to B-6000 and B-28,500 to B-30,000).

The location of the resistor may be checked by measuring the shunt resistance across the phono input jack of the radio chassis and across the phono output cable of the changer mechanism.

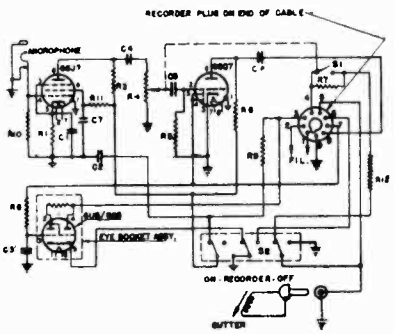


Fig. 2. Changes made to accomodate the "entertainment panel" of the Hoffman C504.

Hoffman C502 and C512, Chassis 113

These models are the same as Model B502, Chassis 113, except for the following changes. Four 6K6-GT tubes are used in push-pull parallel in the output stage instead of the 6V6 tubes in push-pull.

An "entertainment panel" has been wired into the tuner chassis to provide microphone input, a speaker off-on switch, a pillow speaker plug, and an auxiliary phono input to be used either for television sound or wire recorder input. See Fig. 1.

A resistance-capacity filter R111 and C110, has been inserted in the B-plus line of the phase inverter stage in order to reduce the inherent hum level of the receiver, as shown in Fig. 2.

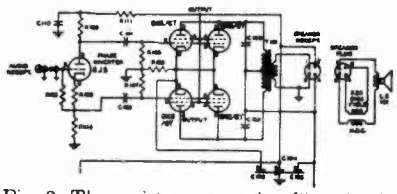


Fig. 2. The resistance-capacity filter in the Hoffman models C502 and C512.

The following changes should be made in the parts list:

Symbol	Description	Hoff. No.
C60	0.005 μf, 600 V, tubular, paper	4102
R16, R20, R50	100,000 ohms ± 20%, ½ watt	4511
R21, R48	47,000 ohms, ± 20%, ½ watt	4504
R49	10 megohms, ± 20%, ½ watt	4506
R27, R46	0.22 megohm, ± 20%, ½ watt	4500
R47, R51	0.47 megohm, ± 20%, ½ watt	4506
C110	10 μf, 450 V, electrolytic	4203
R111	10,000 ohms, ± 20%, ½ watt	4515

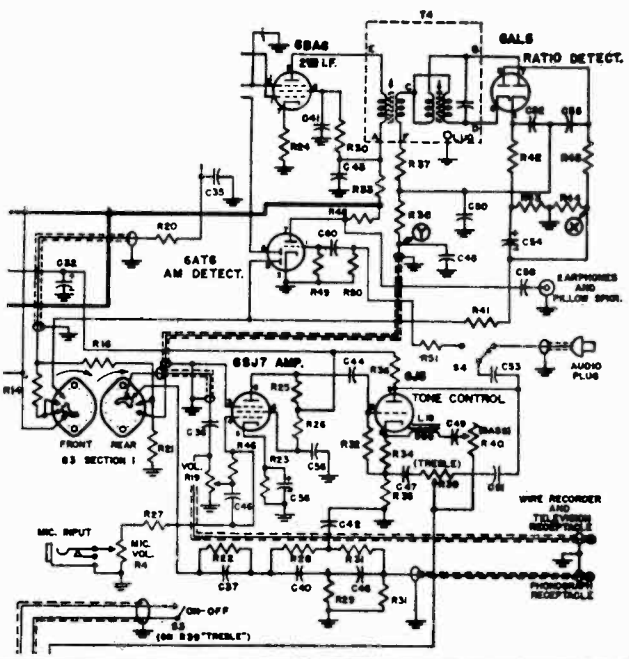
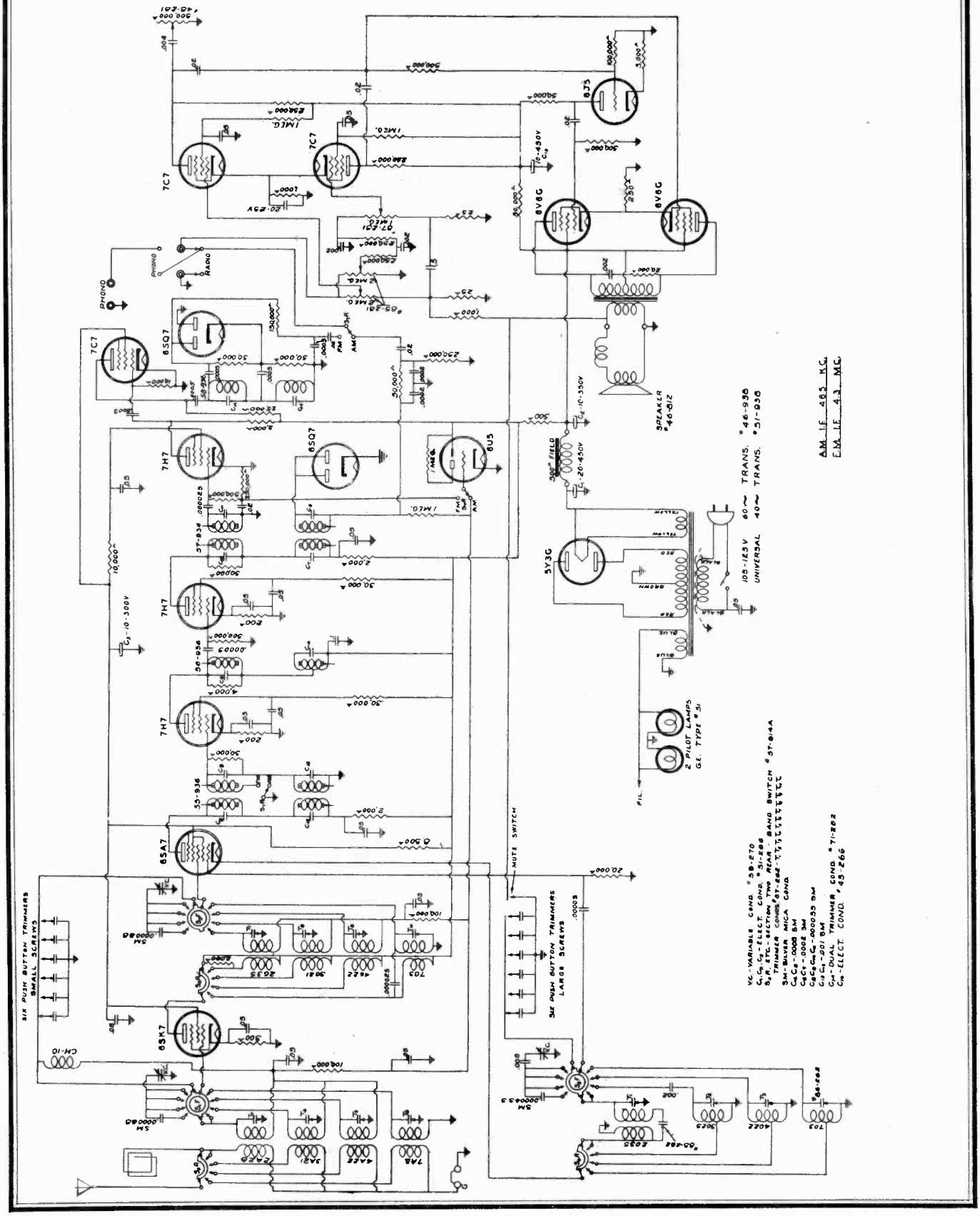


Fig. 1. The entertainment panel that is wired into the Hoffman models C502 and C512.

HOWARD RADIO CO

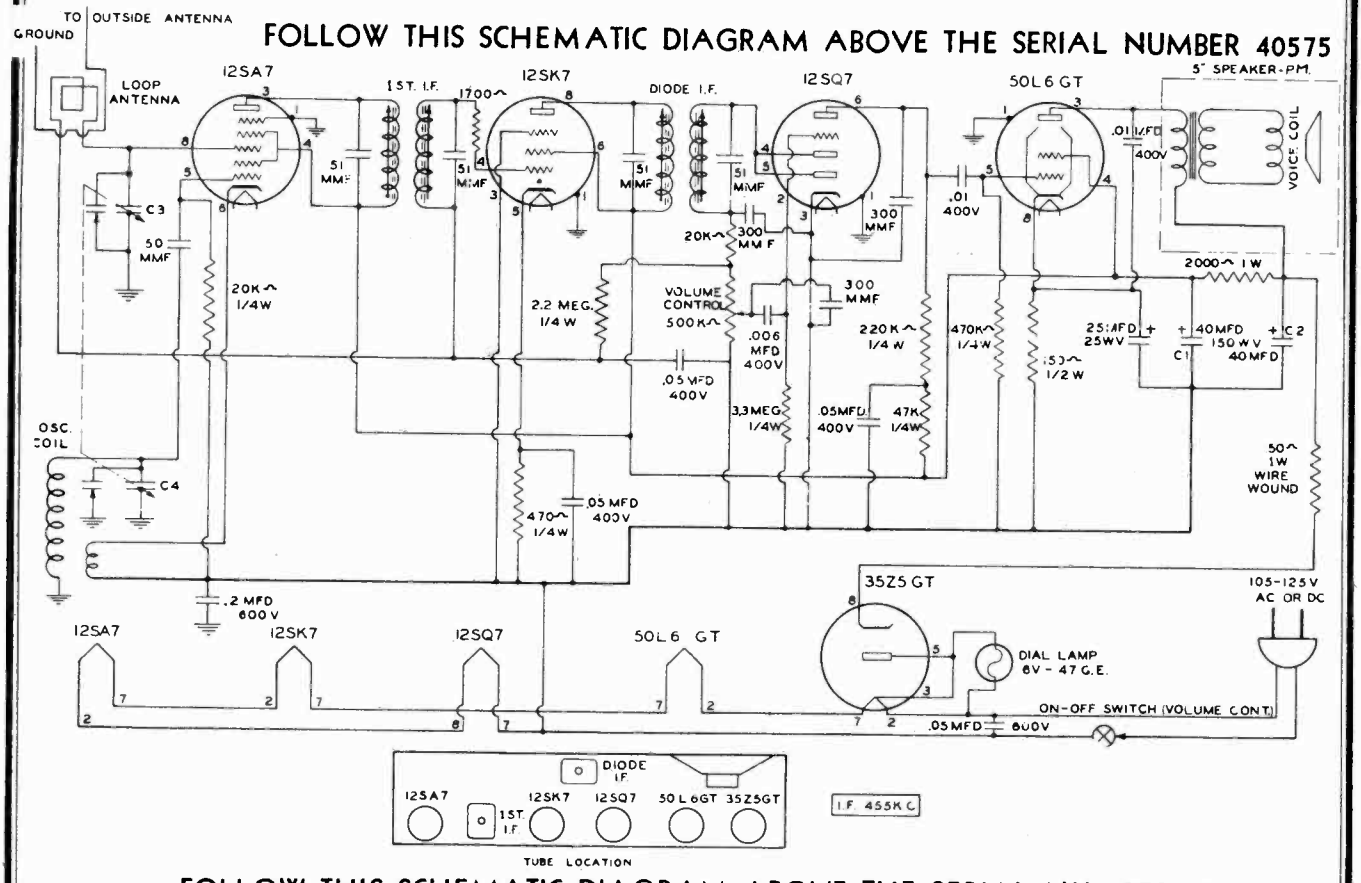
MODEL FM-718



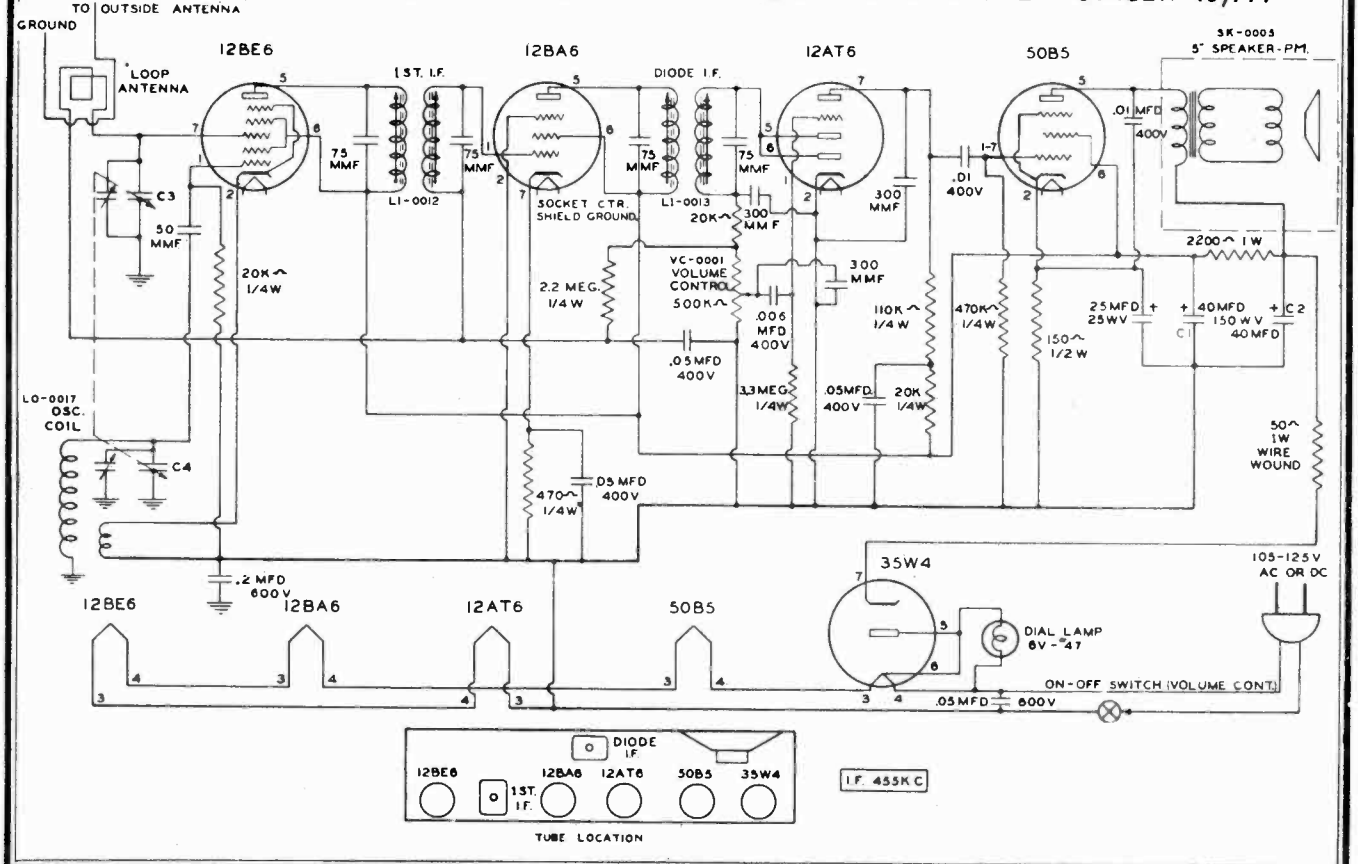
MODEL 901-A
MODEL M901-A

HOWARD RADIO CO.

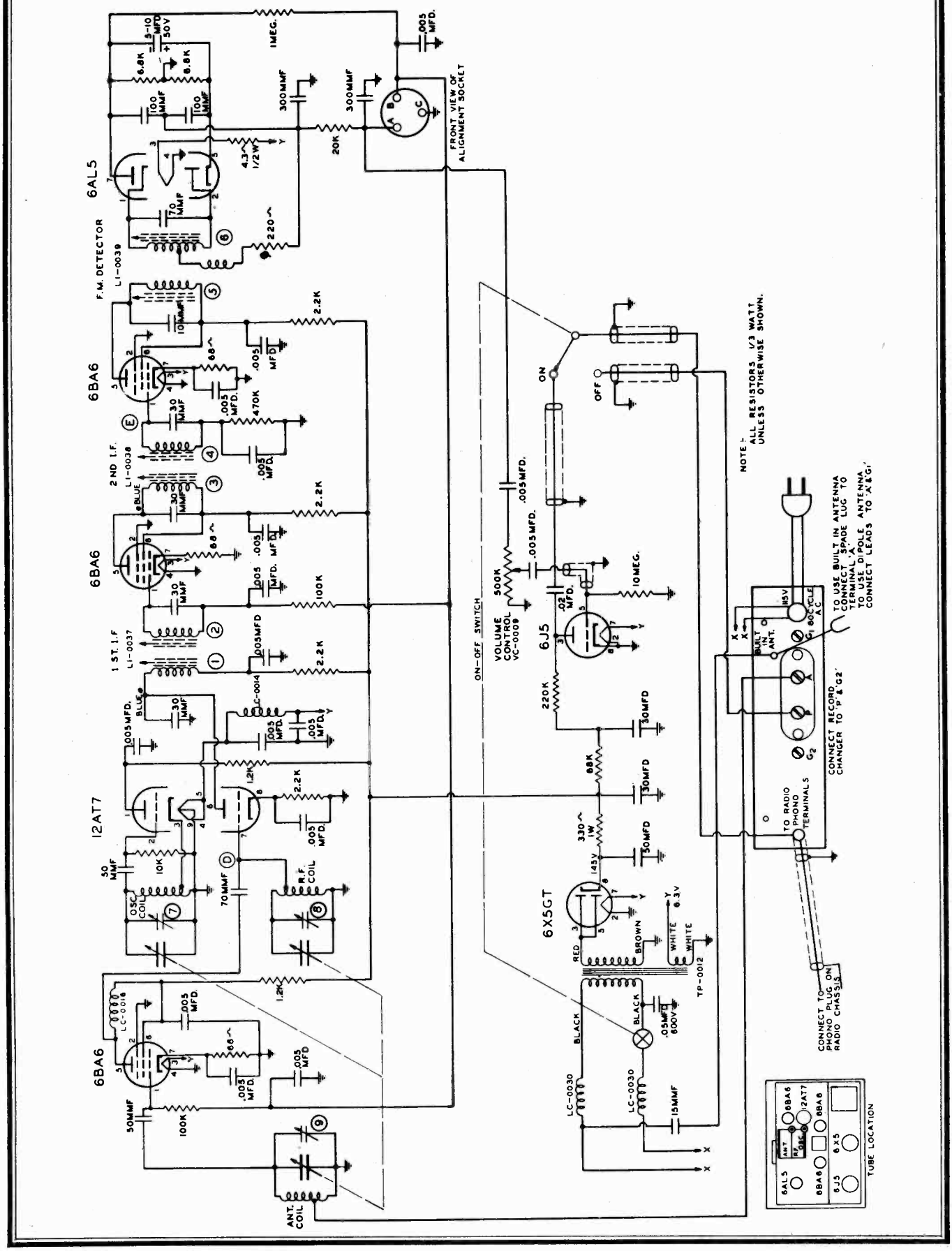
FOLLOW THIS SCHEMATIC DIAGRAM ABOVE THE SERIAL NUMBER 40575



FOLLOW THIS SCHEMATIC DIAGRAM ABOVE THE SERIAL NUMBER 45,771



HOWARD RADIO COMPANY MODEL 482



3. **BUILT-IN ANTENNA:-** The antenna built into the "482" Tuner is quite efficient in most localities within the primary coverage area of the transmitter. For best results the line cord should be stretched out straight and away from metal objects. The Tuner is shipped with the built-in antenna attached as shown in Fig. 3.

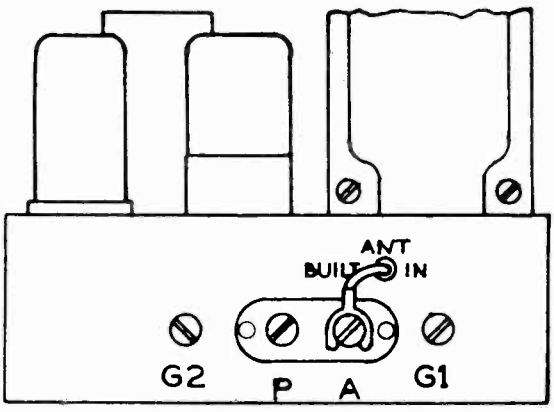
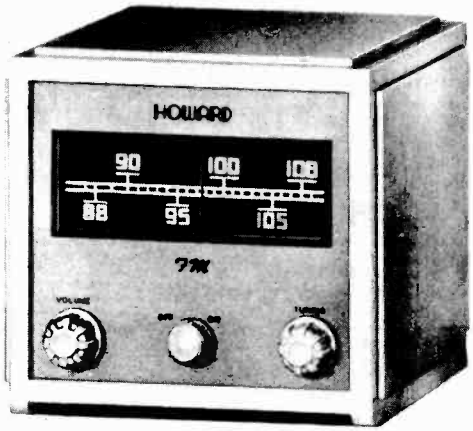
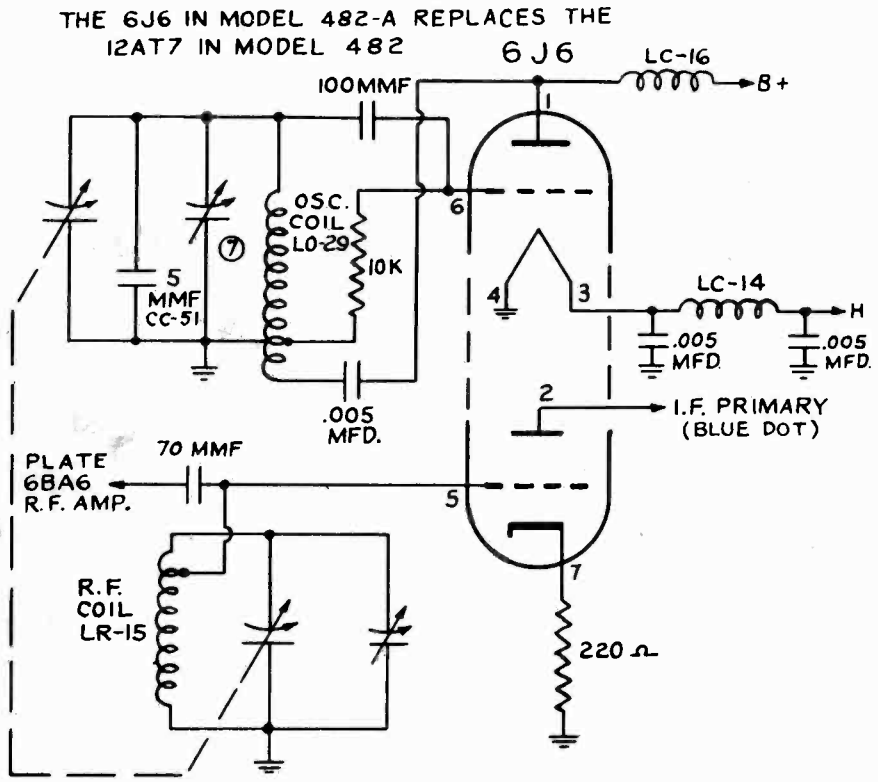


FIG. 3



CONNECTIONS TO RADIO RECEIVER



GENERAL:- Most receivers have connections in the rear of the chassis for a phonograph. The type of connection varies with different manufacturers, but it usually is in the form of a terminal strip marked PHONO and consists of two screws or a socket. In the following paragraphs each type of connection will be shown with the "482" Tuner connected in the proper manner. It will be necessary for you to determine which of the two screws or which terminal of the plug is "live". By "live" we mean which is the audio connection and which is the ground connection; no voltage capable of giving a shock will be encountered. To determine which is the "live" terminal, turn the radio on with the selector switch in the PHONO position and volume up; touch the two screws or the plug connections one at a time, the one which produces a loud hum in the speaker is the "live" terminal.

1. **RADIO HAVING NO PHONO CONNECTION:-** In this case it is advisable to call a competent serviceman to make the installation as the "482" Tuner will have to be connected internally to your receiver.

NOTE:

It is impossible to show all the means used to connect a record player to a radio, but by remembering to find the "live" connection going to the record player and attaching the Tuner insulated lead to this point and the cable shield to the chassis, then your Tuner will be connected properly. Then connect the lead from your record changer that went to the "live" terminal to "P" on your Tuner chassis and the other lead or shield to G-2 then your record player will play normally when the center switch on the "482" Tuner is turned to the left or OFF position.

The "482" Tuner is designed for AC operation only and should never be connected to a DC supply. It operates best with a receiver designed for AC operation as a slight hum may be noticed on high volume if the Tuner is connected to an AC-DC receiver. This may be eliminated by reversing the power cord plug in its socket on either the radio or the Tuner, or both.

TO OPERATE:

Plug power cord into 115 volt, 60 cycle, A.C. power outlet. Turn radio on, place radio in phono position, and turn radio volume control approximately half on. Turn FM Tuner to ON position, use volume control on Tuner to adjust volume level and carefully tune in FM Stations.

PARTS LIST

	CONTROLS
VC-0009	Volume Control
SW-0025	Switch (On-Off) (AM-FM)
	CONDENSERS
CV-0018	Tuning Gang and Drive Hub
CE-0007	Capacitor - Electrolytic 50x30x30 MFD 150 volts
CE-0028	Capacitor - Electrolytic 10 MFD 50 volts
CT-0005	Trimmer - Cap. 2.5-30MMF
CC-0005	Capacitor - Ceramic 30MMFD 500 V. D.C.
CC-0014	Capacitor - Ceramic 50MMFD 500 V. D.C.
CC-0050	Capacitor - Ceramic 68-72MMFD 500 V. D.C.
CC-0016	Capacitor - Ceramic 100MMFD 500 V. D.C.
CC-0020	Capacitor - Ceramic 10MMFD 500 V. D.C.
CC-0022	Capacitor - Ceramic 70MMFD 500 V. D.C.
CC-0028	Capacitor - Ceramic 300MMFD 500 V. D.C.
CC-0034	Capacitor - Ceramic 5000MMFD 500 V. D.C.
CC-0049	Capacitor - Ceramic 15MMFD 500 V. D.C.
	COILS
LA-0017	Antenna Coil
LC-0014	Choke Coil - Filament
LC-0016	F.M.-R.F. Choke Coil
LC-0030	Line Antenna Choke Coil
LI-0037	1st I.F. Transformer
LI-0038	2nd I.F. Transformer
LI-0039	Discriminator Transformer
LO-0028	Oscillator Coil
LR-0015	R.F. Coil

	DIAL AND CONTROL ACCESSORIES
DG-0021	Dial Scale
DC-0001	Dial Cord 28" long
HD-0003	Pointer - Dial
SL-0006	Dial Light Socket Assy.
LS-0001	Lamp Type #47
SP-0010	Spring-Dial 12 oz. Load Spr. Stl.
SM-0188	Shaft-tuning 2-9/64" long
	KNOBS
KB-0022-1	Knob - Moulded 3/4" Dia. Walnut
KB-0022-2	Knob - Moulded 3/4" Dia. Onyx
KB-0023-1	Knob - Moulded 1-1/32" Dia. Walnut
KB-0023-2	Knob - Moulded 1-1/32" Dia. Onyx
	TRANSFORMER
TP-0012	Power Transformer (60 Cycle,110 V.
	TUBES
TU -	6AL5
TU -	6BA6 (3 used)
TU -	6J5
TU -	6X5GT
TU -	12AT7
	SOCKETS
SO-0007	Socket - Octal - 8 Prong
SO-0019	Socket - Miniature - 7 Pin
SO-0022	Socket - Miniature - 9 Pin
SO-0029	Socket - Miniature - 7 Pin
SO-0030	Socket - - 3 Pin
TB-0018	Antenna Terminal Strip
	LINE CORD
CA-0038	A.C. Line Cord 6 ft. W/Plastic Plug
	CABINETS
CW-0012-1	Wood Cabinet (Mahogany)
CW-0012-2	Wood Cabinet (Blonde)
DG-0020	Cabinet Dial Escutcheon

ALIGNMENT NOTES

Volume control should be turned on full before aligning radio.
Tuning gang should be in a closed condition unless otherwise stated in the following data. Pointer on last line below 88 MC.
Use an F.M. Signal Generator.

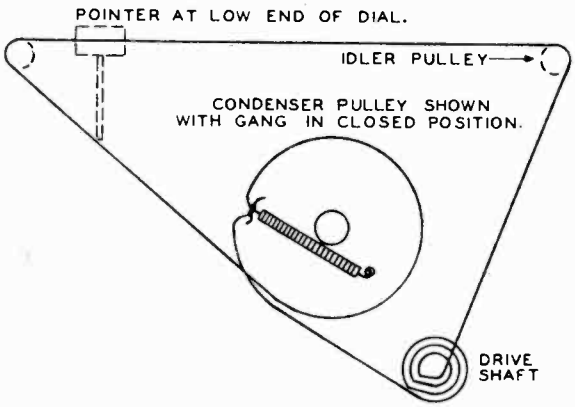
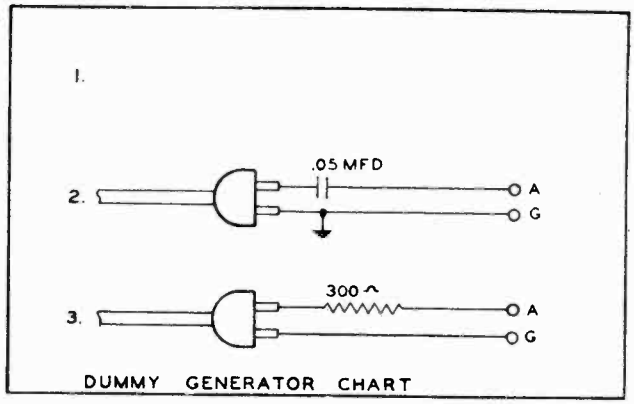


DIAGRAM SHOWING DIAL STRINGING FOR MODEL 482



DUMMY GENERATOR CHART

ALIGNMENT CHART USING MODULATED GENERATOR

SEE DUMMY GEN. CHART	SIG. GEN. CONNECTION	GEN. FREQ.	BAND SW. POSITION	DIAL SETTING	ORDER OF SLUG AND TRIMMER ADJUSTMENTS	TRIMMER OR SLUG FUNCTION	SEE NOTES BELOW
2	Point Ⓔ on Circuit Diagram	10.7 MC.	FM	Gang Closed	⑥	F.M. Det. Adj.	A & B
2	Point Ⓔ on Circuit Diagram	10.7 MC.	FM	Gang Closed	⑤ Adjust to zero Voltage	F.M. Det. Adj.	C
2	Point Ⓓ on Circuit Diagram	10.7 MC.	FM	Gang Closed	①②③④	F.M. - I.F.	D
3	Ant. and Grd. Back of Chassis	105 MC.	FM	105 MC.	⑦⑧⑨	Osc. and R.F.-F.M.	E F & G
3	Ant. and Gnd. Back of Chassis	90 MC.	FM	90 MC.		F.M. - R.F. Ind. Adj.	H & I

A. Signal generator modulation off and turned up to about 100,000 microvolts.
B. Connect electronic volt meter (equivalent to voltohmist) at point "B" of alignment socket as shown on the wiring diagram and turn slug (6) on trimmer location chart to extreme counter-clockwise position. Turn clockwise to 1st peak and adjust to maximum.

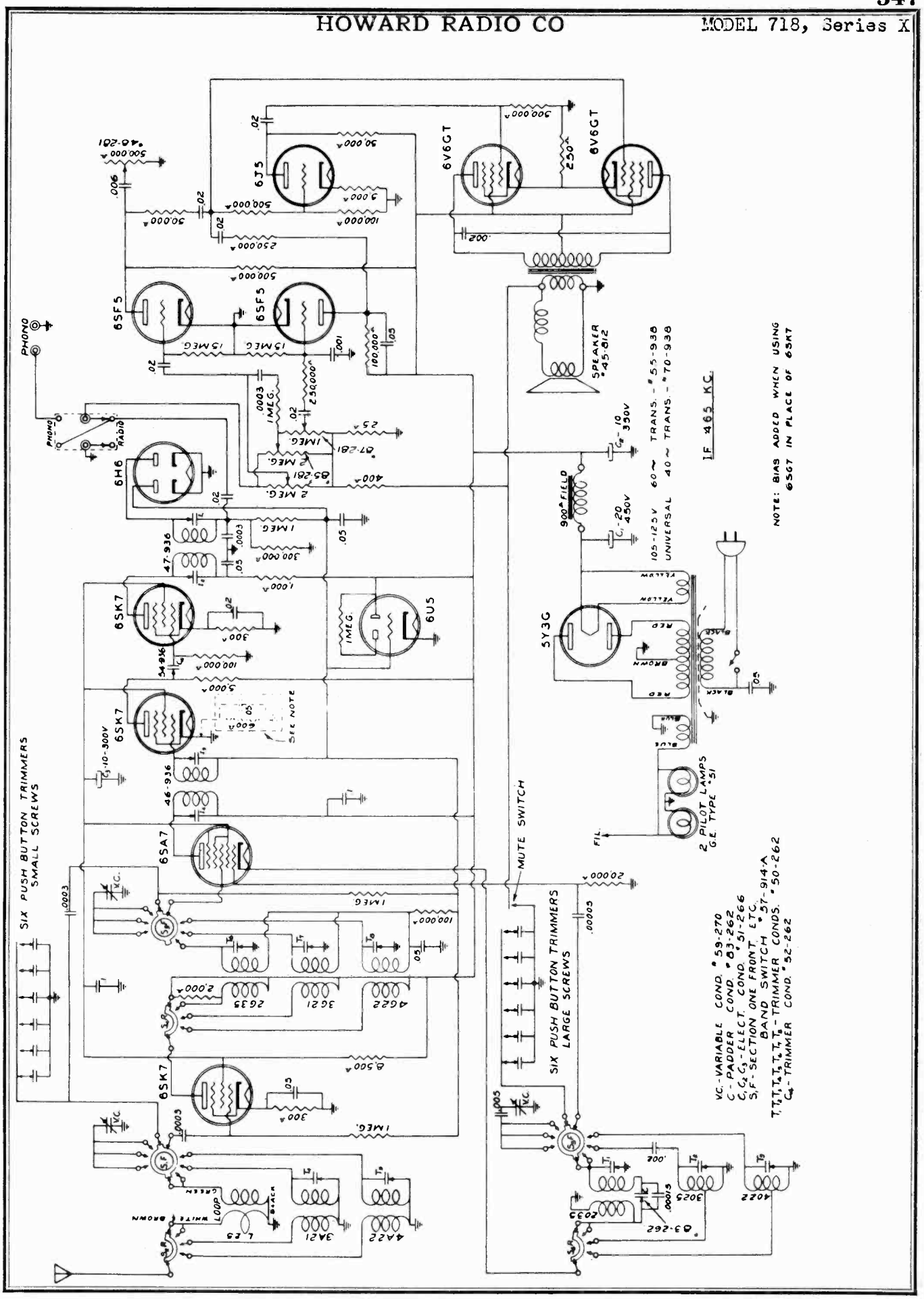
C. Turn slug (5) to extreme counter-clockwise position. Connect electronic voltmeter to Point A of alignment socket and turn slug (5) until voltmeter is to zero voltage. Repeat adjustments given in Notes B & C until no further improvement can be made.

D. Connect voltmeter to Point B and generator at Point D. Adjust (1) (2) (3) (4), then retrim (6). Move voltmeter to Point A and recheck zero voltage (retrim if necessary). These adjustments should be made with input signal necessary to pro duce approximately .7 volts at Point B.

E. Remove built-in antenna from the connection A on back of chassis.
F. Change generator dummy as shown on dummy antenna chart, Picture 3, and modulation on, and fasten generator to A & G-1.
G. 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 M.C. when turning Trimmer (7).

H. 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.
I. 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.
J. Repeat adjustments (7) (8) (9) until no further improvement can be made.

HOWARD RADIO CO — MODEL 718, Series X



MODEL 718, Series X

HOWARD RADIO CO

GENERAL SPECIFICATIONS

12 Tube, 3 Band, R. F. Stage on all bands, Loop for Broadcast band only, Electric Push Button Tuning with muting switch action, Built-in Phono Switch, Bass and Treble Controls, Beam Power Output, Inverse Feed-Back, 6 Ohm Voice Coil. Power Consumption 105 Watts, Alternating Current Only.

SOCKET VOLTAGE READINGS FOR MODEL 718-X

* Socket Terminal Number

Voltage taken from ground with voltage at 117 Volts AC. Drop across speaker field 105 V. Use at least a 1000 Ohm per Volt Meter. High voltage reading off rectifier 355 V. DC.

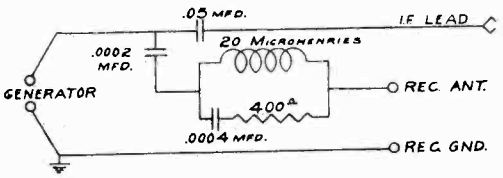
TUBE	FUNCTION	CATH.	*	SG.	*	PLATE	*		
6SK7	R. F.	1.7	5	110	6	250	8		
6SA7	Converter		6	110	4	245	3		
6SK7	1st I. F.		5	110	6	220	8		
6SK7	2nd I. F.	4	5	110	6	230	8		
6H6	Det.								
6U5	Tuning eye					250			

TUBE	FUNCTION	CATH.	*	SG.	*	PLATE	*		
6SF5	A. F.					115	5		
6SF5	Bass					65	5		
6J5	Inverter	8	8			155	3		
6V6GT	Output	16	8	250	4	240	3		
6V6GT	Output	16	8	250	4	240	3		
5Y3G	Rectifier								

ALIGNMENT PROCEDURE FOR 718-X SERIES

EQUIPMENT REQUIRED:

1. SIGNAL GENERATOR to accurately cover the alignment frequencies as shown below.
2. OUTPUT METER (0 to 3 V. AC if used in voice coil circuit).
3. DUMMY ANTENNA. Although the values as shown in below 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.



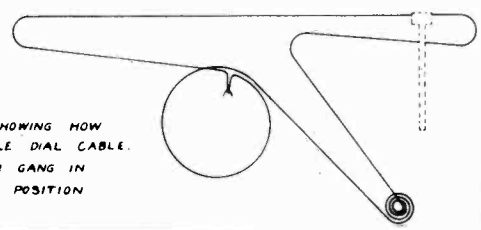
START ALIGNMENT WITH:

Treble and Bass controls turned toward left, Volume Control full ON to right and Band Switch in Broadcast position. After checking for pointer travel to last line above 550, set dial to point where there is no interference with generator signal and proceed with IF alignment.

DUMMY ANTENNA	SIG.GEN. CONNECTION TO	GEN. FREQ.	BAND SW. POSITION	DIAL SETTING	ORDER OF TRIMMER ADJUSTMENTS	TRIMMER FUNCTION	SEE NOTE
.05 Mfd.	Grid of 6SA7	465 KC	BC	Off Station	See Fig. 1. ①②③④⑤⑥	I.F. peak to Max. Output	1
400 Ohm Resistor	Ant.	1400 KC	BC	1400 KC	See Fig. 2. ⑦ then ⑧	BC Osc. - R.F.	2
"	"	600 KC	BC	600 KC	⑨ Rock Dial	BC Osc. Pad.	2
"	"	5 MC	Police Band	5 MC	⑩ ⑪ ⑫	Pol. Band Osc. RF Ant. Check Image at 4.1	2
"	"	16 MC	SW	16 MC	⑬ ⑭ ⑮	Short Wave Osc.-RF- Ant. Check Image at 15.1	2

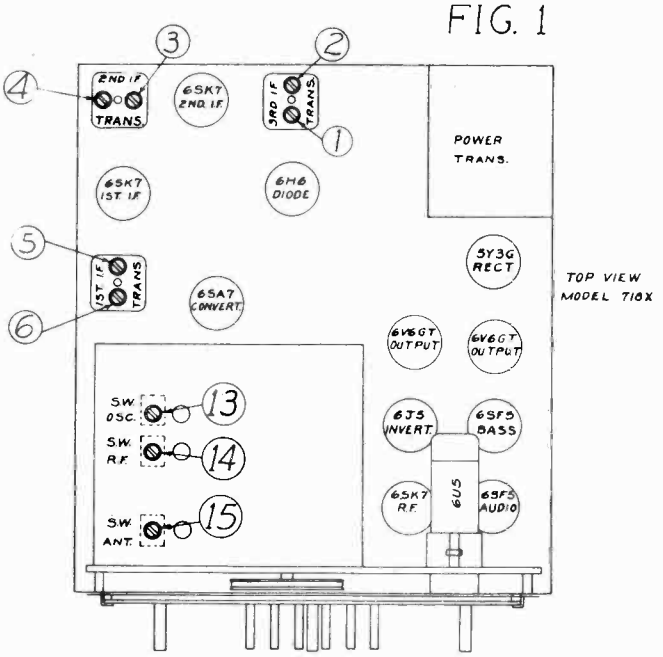
NOTE 1: The I.F. adjustments are reached through holes in top of cans on top of chassis.

NOTE 2: Peak for greatest deflection of output meter.



LAYOUT SHOWING HOW TO ASSEMBLE DIAL CABLE. CONDENSER GANG IN MAXIMUM POSITION

FIG. 1



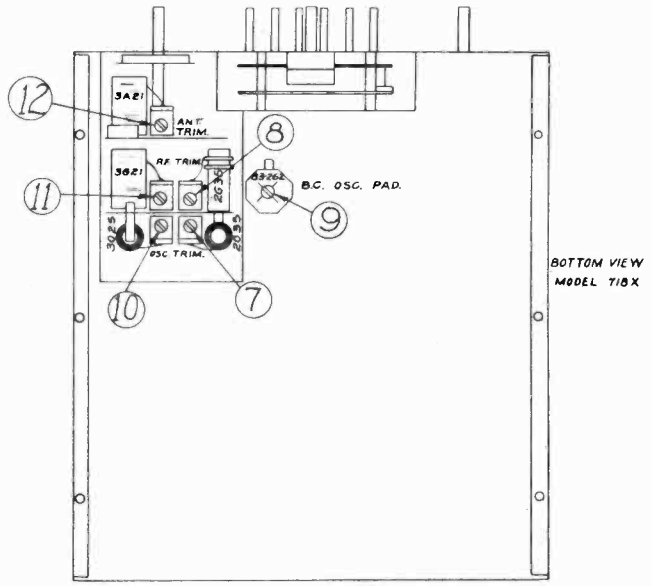


FIG. 2

REPLACEMENT PARTS LIST

For prompt and accurate service with any correspondence or replacement parts orders pertaining to this model, include the IDENTIFICATION NUMBERS as shown on black and white card accessible at back of cabinet.

The following parts list includes the vital receiver parts only. This list does not include any part pertaining to the cabinet or any type record mechanism. When the IDENTIFICATION NUMBER is specified to us we have the complete record of your model and can furnish complete service information for the particular type cabinet (or record mechanisms with combination models) that you may have.

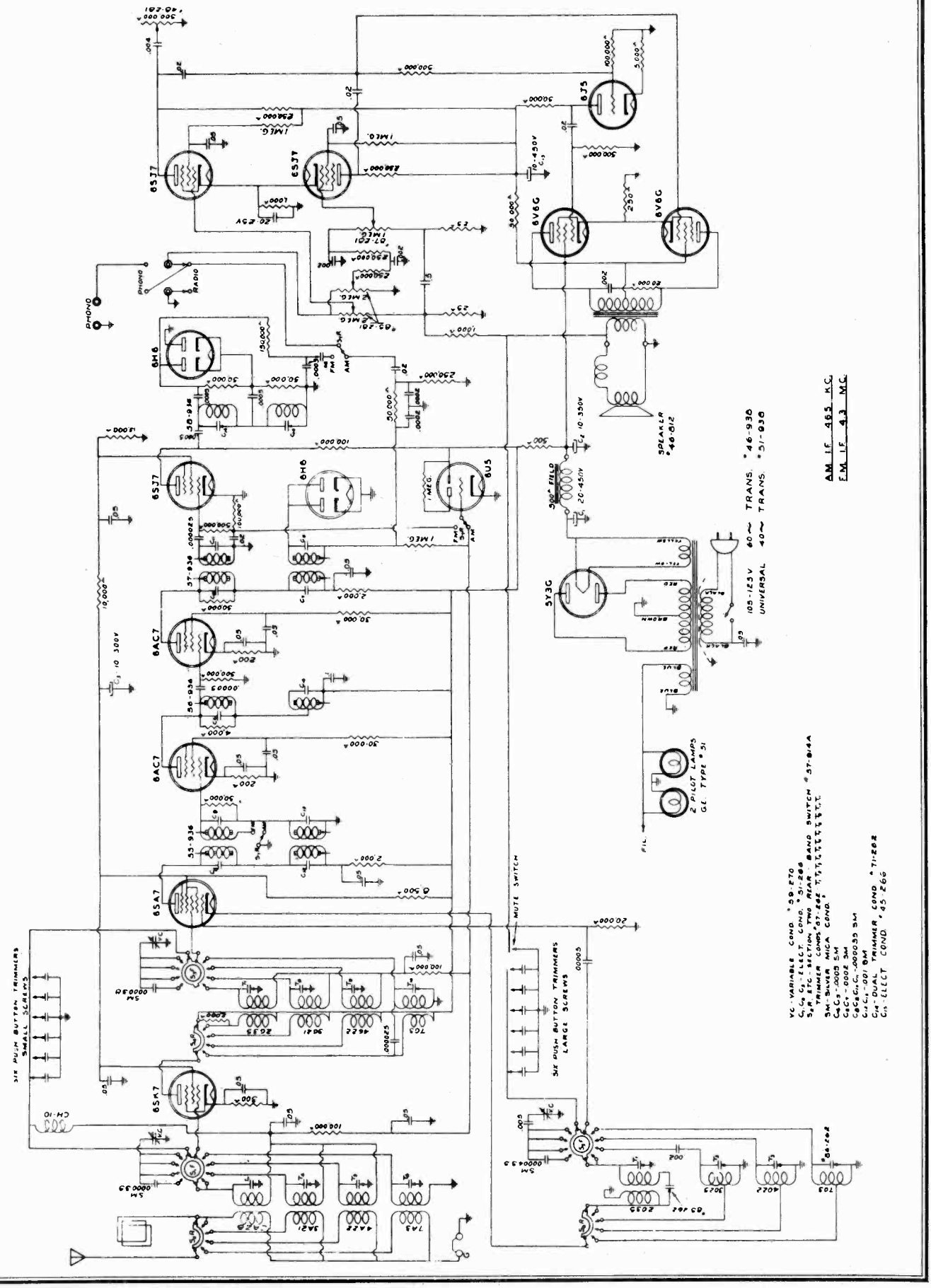
Part No.	DESCRIPTION
	CABINETS
51-190	Chippendale
53-190	"C" Type
54-190	"A" Type
	CONTROLS
48-281	Tone
87-281	Bass Boost
85-281	Radio-Phono Volume
	CONDENSERS
59-270	Tuning
83-262	Padding BC
50-262	Single trimmer
51-266	Filter, 20-10-10 mfd. 450,350,300 Volts
	COIL ASSEMBLIES
L25	Ant. Loop - Console
2035	Osc. Coil 1700-540 KC
2G35	R.F. Coil 1700-540 KC
3A21	Ant. Coil 5-1.8 MC
3025	Osc. Coil 5-1.8 MC
3G21	R.F. Coil 5-1.8 MC
4A22	Ant. Coil 18-5.5 MC
4022	Osc. Coil 18-5.5 MC
4G22	R.F. Coil 18-5.5 MC
46-936	1st I.F. Assembly Complete
54-936	2nd I.F. Assembly Complete
47-936	Last I.F. Assembly Complete
	DIAL & CONTROL PARTS
207-310A	Calibration - Tuning
2-498	Dial Lamp - Bayonet
22-427	Dial Window
1-288	Drive String
53-352	Escutcheon with Window
45-352	Escutcheon - Push Button Trim
31-448	Tuning Hand

Part No.	DESCRIPTION
	DIAL & CONTROL PARTS - Cont'd.
11-966	Push Button Tuning Assembly
17-182	Push Button Plain
5-609	Pulley with Hub
3-609	String Guide Pulleys
80-720	Shaft - Tuning
43-829	Spring, Drive Cord Tension
	KNOBS
19-490	Wood - 1-1/4
19-490-2	Wood - 1-1/4
	LINE CORDS
1-290	Standard
	MOUNTING HARDWARE
966	Rubber cushions, chassis mtg
1-703	Wing Screws ("C" cab. only)
	RECORD CHANGER - AUTOMATIC
10-615	117 V. 60 Cycle
	SOCKETS, PLUGS, JACKS, CONNECTORS
24-768	Dial Lamp Socket - Bayonet
6-772	Speaker Socket - 4 hole
25-771	Tuning Eye Socket & Cable
23-771	Tube Socket-Octal
14-844	Terminal ANT-GND
	SPEAKERS
45-812	12" Console ("C" & "A")
1-809	Twin to 2-809 (Chippendale)
2-809	Twin to 1-809 (Chippendale)
	SWITCHES
57-914A	Band Switch
26-917	Radio-Phono
	TRANSFORMERS
19-961	Output - Audio
55-938	105-120 V. 60 Cy. Stan.
70-938	117-135-230 V. 40/60 cy

NOTE When ordering any component part for any speaker, specify part number on speaker including the prefix letter that precedes the part number on certain models.

HOWARD RADIO CO

MODEL 718-FM-X-5-6



* Socket Terminal Number

Voltage taken from ground with voltage at 117 Volts AC. Drop across speaker field 65 V. Use at least a 1000 Ohm per Volt Meter. High voltage reading off rectifier 300 V. DC.

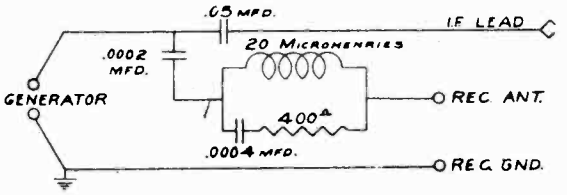
TUBE	FUNCTION	CATH.		SG.		PLATE			
6SK7	R.F.	5	* 5	100	6	230	8		
6SA7	Converter			100	4	220	3		
6AC7	1st. I.F.	3	5	155	6	225	8		
6AC7	2nd I.F.	3	5	155	6	210	8		
6SJ7	Limiter			65	6	65	8		
6H6	FM Des-Det.								
6H6	AM Det.								

TUBE	FUNCTION	CATH.		SG.		PLATE			
6SJ7	A.F.	1	5	20	6	25	8		
6SJ7	Bass Boost	1	5	20	6	25	8		
6U5	Tuning Eye					230			
6J5	Inverter	6	8			80	3		
6V6GT	Output	14	8	235	4	225	3		
6V6GT	Output	14	8	235	4	225	3		
5Y3G	Rectifier								

ALIGNMENT PROCEDURE FOR FM718-5-6

EQUIPMENT REQUIRED:

1. SIGNAL GENERATOR to accurately cover the alignment frequencies as shown below.
2. GALVANOMETER 75 microamperes center "0" (Such as Simpson Type 25) USE SERIES RESISTOR OF 100,000 Ohms in positive lead. Leads from meter to set to be as short as possible.
3. OUTPUT METER (0 to 3 V. AC if used in voice coil circuit).
4. DUMMY ANTENNA. Although the values as shown in below 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.



START ALIGNMENT WITH:

Treble and Bass controls turned toward left, Volume Control full ON to right and Band Switch in Broadcast position. After checking for pointer travel to last line above 550, set dial to point where there is no interference with generator signal and proceed with AM-IF alignment.

DUMMY ANTENNA	SIG. GEN. CONNECTION TO	GEN. FREQ.	BAND SW. POSITION	DIAL SETTING	ORDER OF TRIMMER ADJUSTMENTS	TRIMMER FUNCTION	SEE NOTE
.05 Mfd.	Grid of 6SA7	465 KC	BC	Off Station	See Fig. 1 ① ② ③ ④ ⑤	AM I.F. peak to max. output	A
"	Grid of 6SA7 - remove tuned circuit	4.3 MC Unmod.	FM	"	See Fig. 2 ⑥ ⑦ ⑧ ⑨ ⑩	FM I.F. See Fig.1 Galvanometer Position	B
"	"	4.4 MC	FM	"	Turn ⑪ down tight - Then adjust ⑫	FM Detector See Fig. 2	C
"	"	4.3 MC	FM	"	After ⑫, adjust ⑪ for zero deflection	FM Detector See Fig. 2	D
400 Ohm Resistor	"A" Ant. post	1400 KC	BC	1400 KC	See Fig. 1 ⑬ then ⑭	BC Osc. and RF	E
"	"	600 KC	BC	600 KC	⑮ Rock Dial	BC Osc. Pad.	E
"	"	5 MC	Police	5 MC	⑯ ⑰ ⑱	Osc. - RF - Ant. Check image at 4.1	E
"	"	16 MC	S.W.	16 MC	⑲ ⑳ ㉑	Osc. - RF - Ant. Check image at 15.1	E
"	"	48 MC 8th Har. of 6 MC	FM	48 MC	㉒ ㉓ ㉔	FM Osc.- RF - Ant	E

NOTE A: When a re-alignment is made of either the AM I.F. or FM I.F. it should not be necessary to turn the adjustments very far in either direction. The AM I.F. adjustments are reached through holes in the base from underside of chassis. Should the screws be turned too far in, they might fall out of position which would require that the coil be re-assembled. At the other extreme, if the screws are forced too far out, there is danger of breaking the iron cores.

NOTE B: Connect Galvanometer from tap of limiter grid load circuit to ground. See Fig. 1. Adjust for max. current. Normal gain should give deflection (with meter as specified) of 22 with 2,000 to 3,000 microvolt input. Now shift generator frequency each side of 4.3; that is, to 4.2 and 4.4. The drop-in meter deflection should be approximately proportional to change in frequency. If not, recheck alignment.

NOTE C: With Galvanometer connected to FM Detector output (See Fig. 1) and Trimmer 11 turned all the way in temporarily, adjust Trimmer 12 for max. deflection at 4.4 MC. Normal gain should give deflection of 9 with 2,000 to 3,000 microvolts input.

NOTE D: After trimmer 12 is adjusted to 4.4, adjust Trimmer 11 to zero deflection at 4.3. Then shift generator to 4.2 MC. Meter should then show deflection approximately same as at 4.4 at reverse polarity. If the I.F. circuits are ever readjusted, always recheck detector afterwards.

NOTE E: Peak for greatest deflection of output meter.

MODEL 718-FM-X-5-6 HOWARD RADIO CO

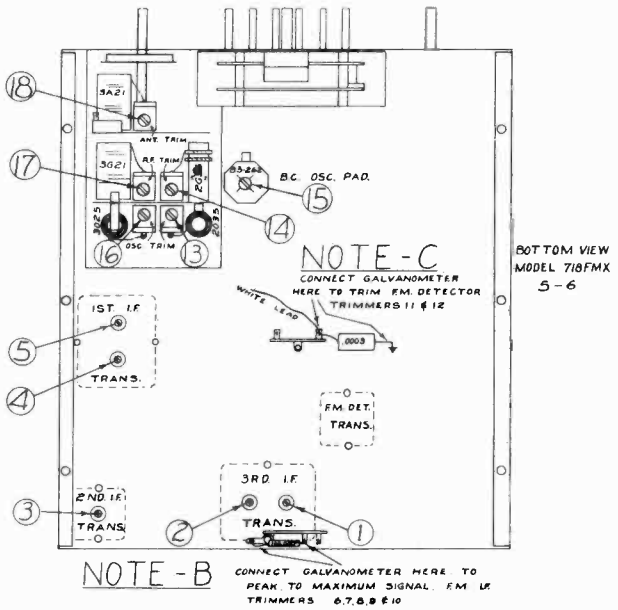


FIG.-1

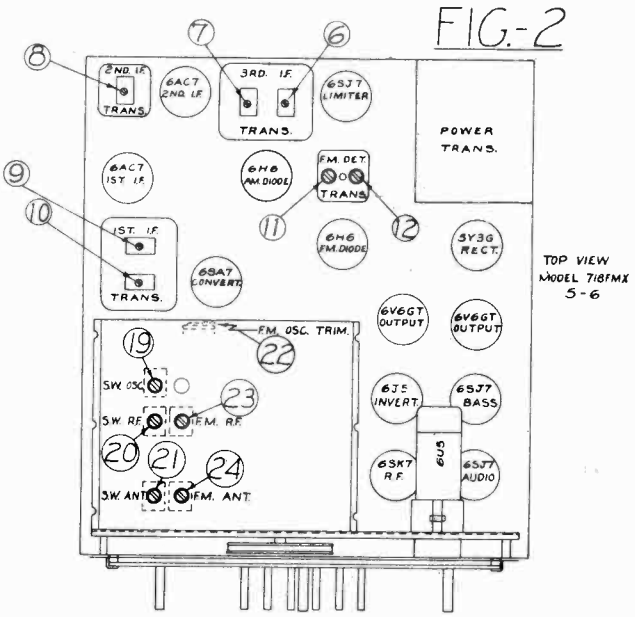
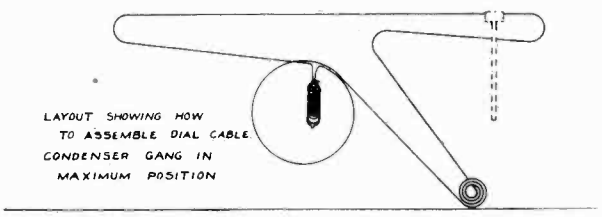


FIG.-2



REPLACEMENT PARTS LIST

- NOTICE -

For prompt and accurate service with any correspondence or replacement parts orders pertaining to this model, include the IDENTIFICATION NUMBER as shown on the black and white card accessible at the back of cabinet.

The following parts list includes the vital receiver parts only. This list does not include any parts pertaining to the cabinet or any type record mechanism. When the IDENTIFICATION NUMBER is specified to us we have the complete record of your model and can furnish complete service information for the particular type cabinet (or record mechanism with combination models) that you may have.

Part No.	DESCRIPTION
	CABINETS
51-190	Chippendale
53-190	"C" type.
54-190	"A" type.
	CONTROLS
48-281	Tone.
87-281	Bass Boost & Sw
54-281	Radio-Phono Volume (to 5th run)
85-281	Radio-Phono Volume.
	CONDENSERS
59-270	Tuning.
83-262	Padding BC.
50-262	Single Trimmer.
86-262	Single Trimmer.
51-266	Filter, 20-10-10-mfd. 450, 350, 300 Volts.
	COIL ASSEMBLIES
2A28	Ant. Coil
CH-10	Ant. Choke.
2035	Osc. Coil 1700-540 KC
2035	R.F. Coil 1700-540 KC
3A21	Ant. Coil 5-1.6 MC.
3025	Osc. Coil 5-1.8 MC.
3021	R.F. Coil 5-1.8 MC.
4A22	Ant. Coil 18-5.5 MC

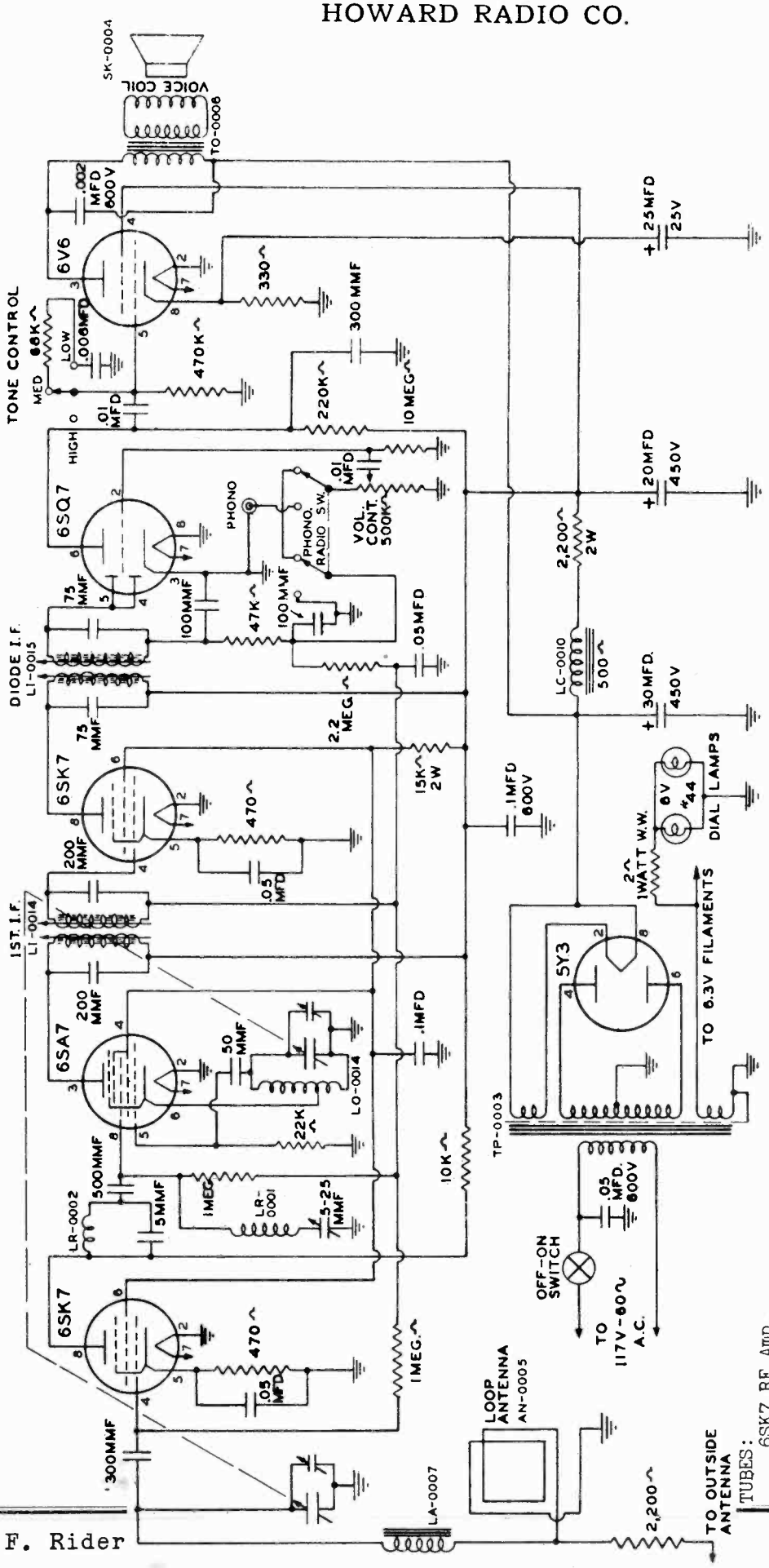
Part No.	DESCRIPTION
	COIL ASSEMBLIES--Continued
4022	Osc. Coil 18-5.5 MC
4G22	R.F. Coil 18-5.5 MC
7A3	Ant. Coil FM Band
703	Osc. Coil FM Band
703	R.F. Coil FM Band
55-936	1st Dual AM-IF.
56-936	2nd Dual AM-IF.
57-936	FM Descriminator AM Det
58-936	FM Det.-Limiter
	DIAL & CONTROL PARTS
210-310	Calibration - Tuning.
2-498	Dial lamp - Bayonet
22-427	Dial Window
1-288	Drive String.
53-552	Escutcheon with Window.
45-352	Escutcheon - P.B. trim.
31-448	Tuning Hand
11-966	Push Button Tuning Assembly
17-186	Push Button - Plain
5-609	Pulley with Hub
3-609	String Guide Pulleys.
80-720	Shaft - Tuning.
43-829	Spring Drive Cord Tension

Part No.	DESCRIPTION
	KNOBS
1y-490	Wood -1-1/4
	LINE CORDS
1-290	Standard.
	MOUNTING HARDWARE
966	Rubber cushions, chassis mtg.
1-703	Wing Screws ("C" cab. only)
	RECORD CHANGER - AUTOMATIC
10-615	117 V. 60 Cycle
	SOCKETS, PLUGS, JACKS, CONNECTORS
24-768	Dial Lamp Socket.
6-772	Speaker Socket - 4 hole
25-771	Tuning eye socket & cable
23-771	Tube Socket - Octal
31-771	Socket - Octal shielded
14-844	Terminal ANT-GND.
	SPEAKERS
46-812	Console 12"
	SWITCHES
57-914A	Band Switch
26-917	Radio-Phono
	TRANSFORMERS
21-961	Output - Audio.
46-938	105-120 V. 60 cy. Stan.
51-938	117-135-230 V.40/60 cy.

NOTE 1: All 200 Volt paper fixed condensers
NOTE 2: All 400 or 600 Volt paper fixed condensers.
NOTE 3: All 1/2 Watt Carbon Resistors
NOTE 4: When ordering any component part for any speaker, specify part number on speaker including the prefix letter that precedes the part number or certain models.

HOWARD RADIO CO.

MODEL 906



TUBES:
6SK7 RF Amp.
6SA7 Mixer & Oscillator
6SK7 IF Amp.
6SQ7 Diode Det. & 1st AF.
6U6 Output
5Y3 Rectifier

BEAM POWER OUTPUT:
Undistorted output over 3 watts. Maximum output 4-1/2 watts.

SPEAKER:
Rubber floated 6x9 inch HOWARD P.M., using large Alnico No. 5 core.

SOCKET VOLTAGE READINGS

Voltage reading taken from ground with voltage at line set at 110 volts A.C. These readings were taken with a vacuum tube voltmeter of the VoltOhmyst type.

TUBE	FUNCTION	CATH.		SC.		PLATE		B+	
6SK7	R.F	1.8	*5	79.	*6	210.	*8		*
6SA7	Converter .			79.	4	230.	3		
6SK7	1st. I.F. .	2.3	5	79.	6	240.	8		
6SQ7	Det. & 1st. Audio. . .					115.	6		
6V6	Output. . .	11.	8	235.	4	225.	3		
5Y3	Rectifier .							285	8

* Socket Terminal Number.

Voltage drop across filter choke 10 volts.

PARTS LIST

CONTROLS

VC-0005 Volume Control with Switch
or
VC-0006 Volume Control with Switch

CONDENSERS

AC-0004 Tuning Gang with Gears and Drive Hub.
CE-0009 Capacitor - Electrolytic 30-20-20 mfd. 450 volts or the following 3 capacitors.
CE-0005 Capacitor - 25 mfd. 25 volts.
CE-0011 Capacitor - 30 mfd. 450 volts.
CE-0012 Capacitor - 20 mfd. 450 volts.

COILS

AN-0005 Loop Antenna
LA-0007 Loop Load Coil
LI-0014 1st IF Transformer in can
LI-0015 2nd IF Transformer in can
LO-0014 Oscillator Coil
LR-0001 Wave Trap 455 KC
LR-0002 Untuned RF Coil

DIAL AND CONTROL ACCESSORIES

AS-0213 Tuning Shaft Assembly
AS-0217 Dial Pointer Assembly
AR-0019 Dial Light Bracket Assembly - Right Side
AR-0024 Dial Light Bracket Assembly - Left Side
ES-0001 Dial covering - Plastic escutcheon for cabinet
SP-0010 Dial Drive Spring
DC-0001 Dial Drive Cord 52" long
PR-0062 Dial Glass Snaps
GR-0001 Rubber Grommets for Tuning Gang and Speaker Mounting
DG-0004 Calibrated Lucite Dial
LS-0002 #44 Blue Bead Pilot Lamp

KNOBS

AR-0025 Thumb Wheel Assembly (Tone Control)
AR-0026 Thumb Wheel Assembly (Radio Phono)
KB-0015-1 Knobs Brown Bakelite

SPEAKER

SK-0004 Speaker 9" Elliptical PM Table Model

TRANSFORMERS

TO-0006 Speaker Output Transformer
TP-0003 Power Transformer - 60 cycle 110 volt
LC-0010 Power Choke (500 ohm D.C.)

TUBE COMPLEMENT

TU-5Y3 Tube
TU-6SK7 Tubes (2 used)
TU-6SA7 Tube
TU-6SQ7 Tube
TU-6V6 Tube

SOCKETS

SO-0010 Phono Socket
SO-0017 Tube Socket
TB-0007 Terminal Strip, External Antenna

SWITCHES

SW-0009 Radio Phono Switch D.P.D.T.
SW-0010 Tone Switch - 3 position

CABINET

CW-0008 Cabinet complete
AS-0240 Metal Grill Assembly (1 used)
BC-0003 Wood Baffle used with above item
or
MO-0026 Plastic Grill (2 used)

LINE CORD

CA-0038 Line Cord - 6 ft and Moulded Plug

Set controls at indicated positions before following alignment chart.

Tone switch high
Volume control on full
Set dial between stations
Radio phono control at radio

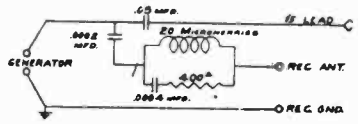
DUMMY ANTENNA	SIG. GEN. CONNECTION TO	GEN. FREQ.	BAND POSITION	DIAL SETTING	ORDER OF TRIMMER ADJUSTMENTS	TRIMMER FUNCTION	SEE NOTE
.05 Mfd.	Grid of 6SA7	455 KC	BC	Off Station	①②③④	I.F. Peak to Max. Output	A
.05 Mfd.	Ant.	455 KC	BC	Off Station	⑤	Null	B
400 Ohm. Resistor	"A" Ant. Post	1400 KC	BC	1400 KC	⑥⑦	BC Osc. and RF	C

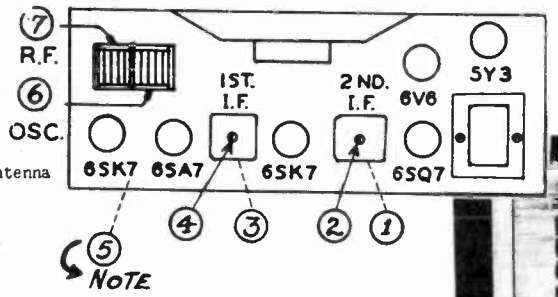
NOTE A. The I.F. adjustments are iron core slug tuning and it should not be necessary to move them very far in either direction from the factory setting, since they are of a very stable nature.

NOTE B. 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 in a turned up powerful position and adjust the wave trap trimmer to null.

NOTE C. Set dial at 1400 KC. Adjust oscillator and R.F. trimmer for maximum sensitivity.

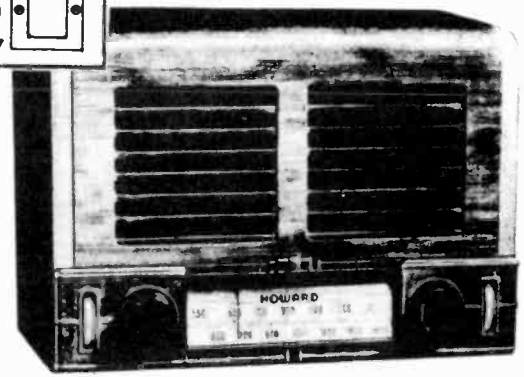
RECOMMENDED DUMMY ANTENNA. Although the values as shown in above table for antenna load may be satisfactory, we urgently recommend the circuit as shown at the right to properly take care of the various frequencies to accomplish the correct alignment.





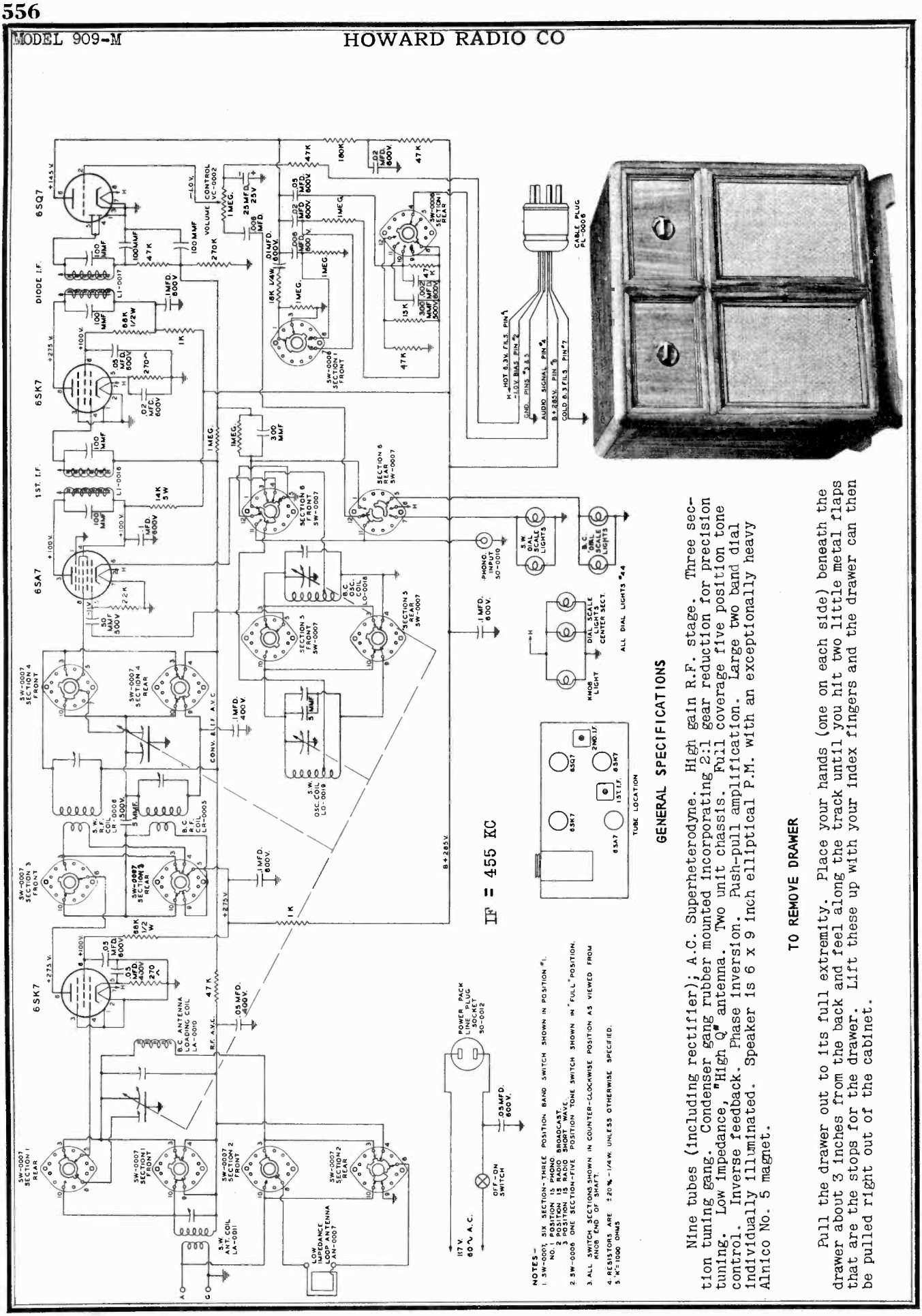
Wave Trap adjustment is located beneath chassis at this point. Adjustments 1 & 3 also beneath chassis.

TUBE LAYOUT



MODEL 909-M

HOWARD RADIO CO



NOTES—
1 SW-0007, SIX SECTION-THREE POSITION BAND SWITCH SHOWN IN POSITION #1.
NO. 1 POSITION 1S PHONO
2 POSITION 1S RADIO BROADCAST.
3 POSITION 1S RADIO SHORT WAVE.
2 SW-0006 ONE SECTION-FIVE POSITION TONE SWITCH SHOWN IN "FULL" POSITION.
3 ALL SWITCH SECTIONS SHOWN IN COUNTER-CLOCKWISE POSITION AS VIEWED FROM KNOB END OF SHAFT.
4 RESISTORS ARE ±20% - 1/4W. UNLESS OTHERWISE SPECIFIED.
5 K=1000 OHMS

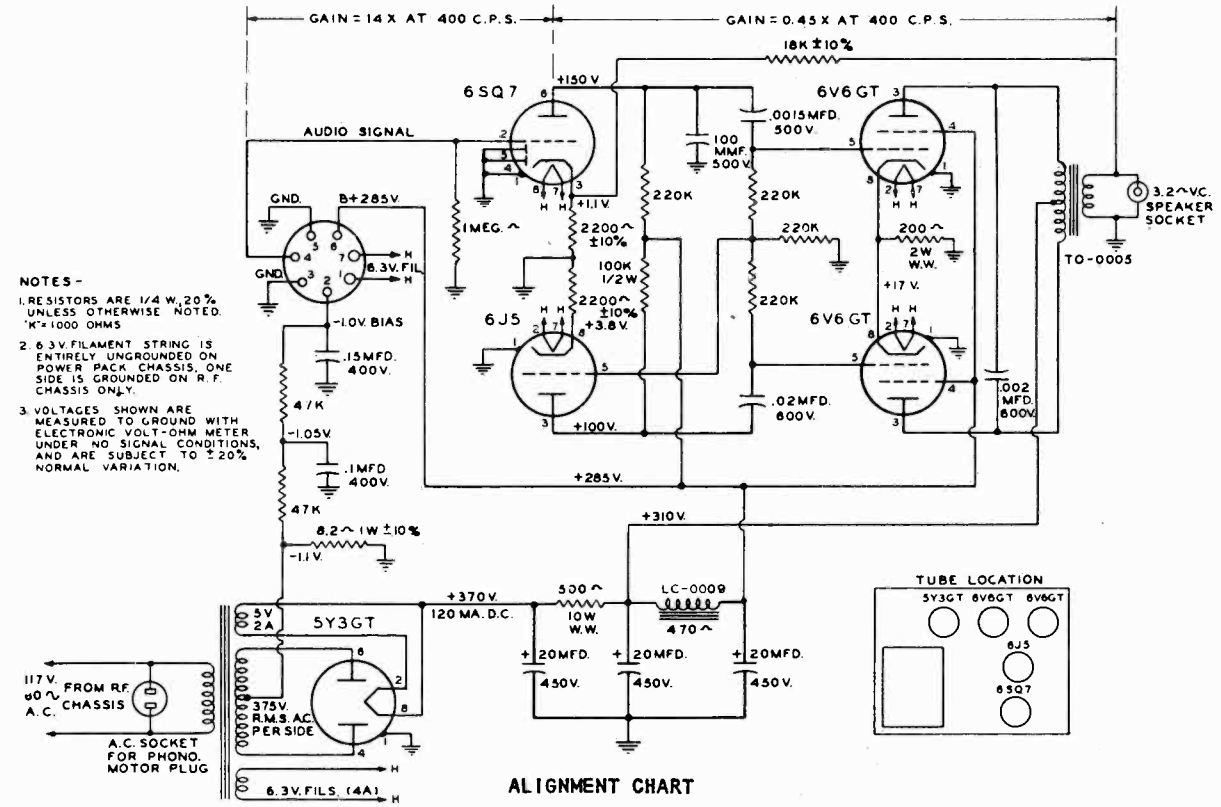
GENERAL SPECIFICATIONS

Nine tubes (including rectifier); A.C. Superheterodyne. High gain R.F. stage. Three section tuning gang. Condenser gang rubber mounted incorporating 2:1 gear reduction for precision tuning. Low impedance, "High Q" antenna. Two unit chassis. Full coverage five position tone control. Inverse feedback. Phase inversion. Push-pull amplification. Large two band dial individually illuminated. Speaker is 6 x 9 inch elliptical P.M. with an exceptionally heavy Alnico No. 5 magnet.

TO REMOVE DRAWER

Pull the drawer out to its full extremity. Place your hands (one on each side) beneath the drawer about 3 inches from the back and feel along the track until you hit two little metal flaps that are the stops for the drawer. Lift these up with your index fingers and the drawer can then be pulled right out of the cabinet.

MODEL 909-M HOWARD RADIO CO



NOTES -

1. RESISTORS ARE 1/4 W, 20% UNLESS OTHERWISE NOTED. "K" = 1000 OHMS
2. 6.3 V. FILAMENT STRING IS ENTIRELY UNGROUNDED ON POWER PACK CHASSIS, ONE SIDE IS GROUNDED ON R.F. CHASSIS ONLY.
3. VOLTAGES SHOWN ARE MEASURED TO GROUND WITH ELECTRONIC VOLT-OHM METER UNDER NO SIGNAL CONDITIONS, AND ARE SUBJECT TO ±20% NORMAL VARIATION.

ALIGNMENT CHART

Set controls at indicated positions before following chart:

Loop attached to chassis.
Volume control on full.
Set Dial 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.

	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	Low end of BC	1,2,3,4	I.F.	A
2	.05 Mfd.	Pin #4 6SK7	1400 KC	BC	1400 KC	5,6	BC Osc. and R.F.	
3	Note B	Note B	1400 KC	BC	1400 KC	7	Loop	B
4	400 Ohm. Line	Antenna on loop	11.9 MC	SW	11.9 MC	8,9,10	SW	C
5	Accurately set signal generator at one MC and check through short wave dial, harmonics to be one MC apart.							

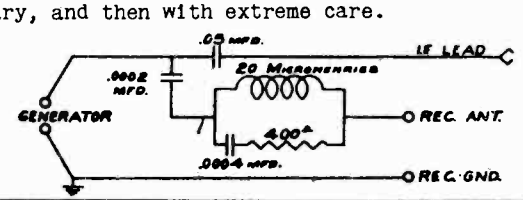
NOTE A. The I.F. adjustments are iron core slug tuning and it should not be necessary to move them very far in either direction from the factory setting, since they are of a very stable nature.

NOTE B. 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.

NOTE C. In adjusting trimmer #8, 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.

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.

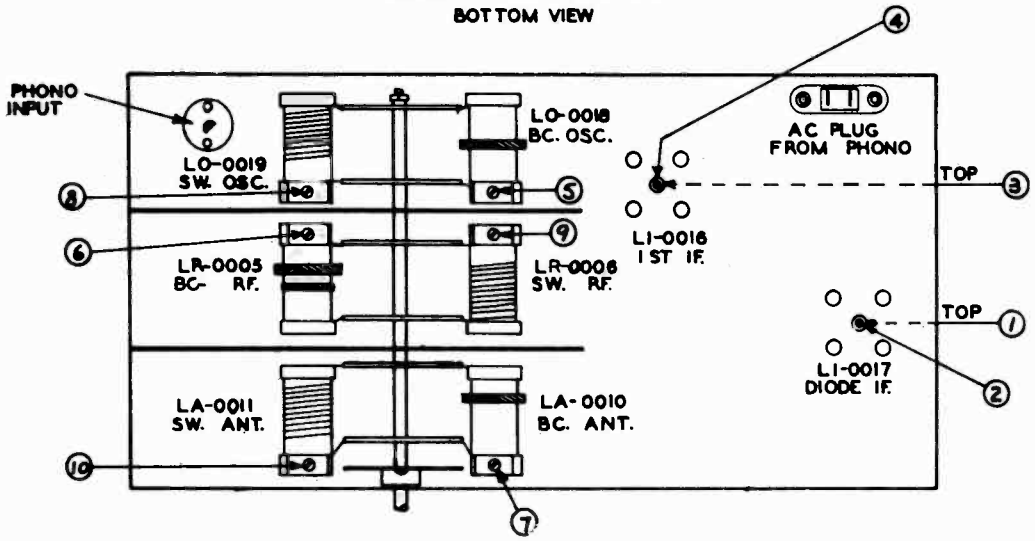


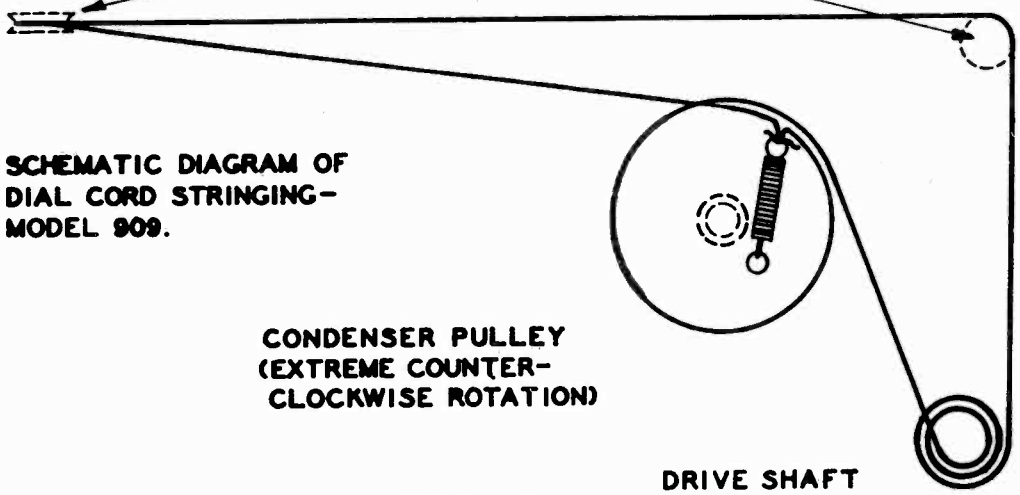
MODEL 909-M

HOWARD RADIO CO

TRIMMER LOCATION CHART

BOTTOM VIEW





SCHEMATIC DIAGRAM OF DIAL CORD STRINGING- MODEL 909.

CONDENSER PULLEY (EXTREME COUNTER-CLOCKWISE ROTATION)

DRIVE SHAFT

REPLACEMENT PARTS LIST

CONTROL

VC-0002	Volume Control with Switch

CONDENSERS

AC-0006	Tuning Gang with Gears and Drive Hub
CE-0006	Capacitor - Electrolytic 20-20-20 MFD 450 volts
CE-0005	Capacitor - 25 MFD 25 volts

COILS

AN-0007	Loop Antenna and Backboard
LA-0010	Antenna Coil - Broadcast
LA-0011	Antenna Coil - Shortwave
LO-0018	Oscillator Coil - Broadcast
LO-0019	Oscillator Coil - Shortwave
LR-0005	R.F. Coil - Broadcast
LR-0006	R.F. Coil - Shortwave
LI-0016	1st I.F. Transformer
LI-0017	2nd I.F. Transformer

SWITCHES

SW-0007	Band Switch - 6 Section - 3 position
SW-0006	Tone Switch - 5 position

DIAL AND CONTROL ACCESSORIES

AS-0220	Tuning Shaft Assembly
AS-0218	Pointer and Slide Assembly
DC-0001	Dial Cord 54"
SP-0010	Spring - Dial - 40 oz. Load Spring Steel
AS-0242	Dial Light Assembly - Left
AS-0243	Dial Light Assembly - Right
DG-0001	Dial - Broadcast (Lower)
DG-0002	Dial --Shortwave (Upper)
DG-0003	Dial - Howard Name
PL-0010	Antenna Cable Plug - 4 Prong
LS-0002	Pilot Lamp (Type #44) 6-8 volt .25 Amp. Blue Bead
LS-0003	Pilot Lamp (Type #51) 6-8 volt .20 Amp. White Bead
PR-0070-1	Metal Escutcheon (Mahogany)
PR-0070-2	Metal Escutcheon (Blond)

KNOBS

KB-0015-3	Knob - Tuning and Volume
KB-0007	Knob - Acousticolor
KB-0006	Knob - Selector Switch
KB-0018	Knob - 1" Dia. (door)
KB-0016	Knob - 2" Dia. (drawer)

TRANSFORMERS

TO-0005	Output Transformer
LC-0009	Filter Choke (395 Ohms D.C.)
TP-0001-1	Power Transformer (60 cycle 110 volts) or
TP-0001-2	Power Transformer (60 cycle 110 volts) or
TP-0004	Power Transformer (half shell type) (60 cycle 110 volts)

9-TUBE COMPLEMENT

TU-6SA7	Tube
TU-6SK7	Tube 2 used
TU-6SQ7	Tube 2 used
TU-6J5	Tube
TU-6V6	Tube 2 used
TU-5Y3	Tube

SOCKETS

SO-0010	Phono Socket
SO-0011	Socket - 7 prong wafer
SO-0012	Socket - Power Outlet
SO-0007	Tube Socket, Octal

LINE CORD

CA-0039	Line Cord with Plastic Plug - 8 ft.
CA-0038	Line Cord with Plastic Plug - 6 ft. for Changer
CA-0043	Line Cord with Plastic Plug - 42" (Power Pack Chassis)

CABINETS

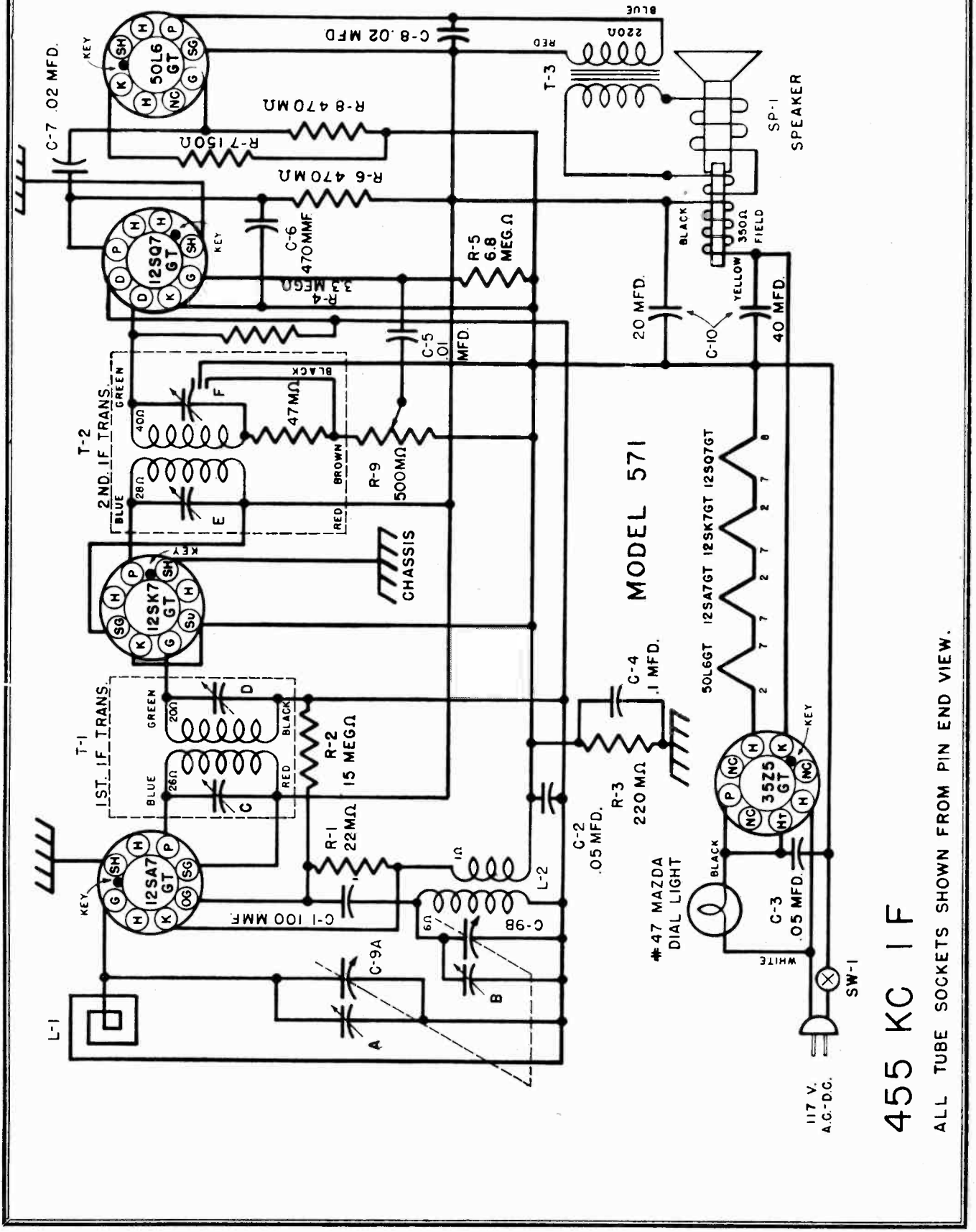
CW-0006-1	Cabinet (Mahogany)
CW-0006-2	Cabinet (Blond)
AA-0003-1	Radio Drawer (Mahogany)
AA-0003-2	Radio Drawer (Blond)

SPEAKER

SK-0008	Speaker 6" x 9" Elliptical P.M.

MODELS 571A, 571B

INTERNATIONAL DETROLA CORP.



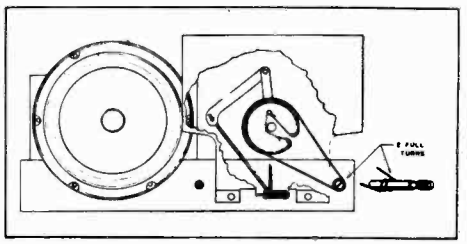
ALIGNMENT PROCEDURE

The following equipment is necessary to properly align this chassis:

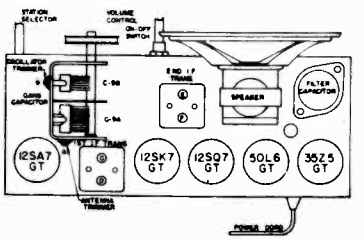
1. A signal generator which will provide an accurately calibrated signal at the frequencies listed.
2. An output meter.
3. A non-metallic screwdriver.
4. Dummy antenna: — .1 mfd., — RMA loop.

NOTE: Intermediate Frequency and Oscillator adjustments may be made with the loop disconnected provided a resistor of 10,000 to 50,000 ohms is substituted to close the 12SA7GT grid circuit. The loop alignment must be done with the loop and chassis mounted in operating position in the cabinet. A single turn loosely coupled to loop may be substituted for RMA loop.

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.
1620 kc.	Through loop	RMA loop	HF end	Osc. trimmer B	Set limit of band
1400 kc.	Through loop	RMA loop	1400 kc.	Ant. trimmer A	Tune to max.



Dial Mechanism



Tube Layout

TUBE COMPLEMENT

1—12SA7GT Oscillator and Mixer tube
1—50L6GT Power Output tube
1—12SK7GT IF Amplifier tube
1—35Z5GT Rectifier tube
1—12SQ7GT Second Detector and First Audio tube

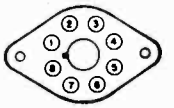
NOTE: The above glass tubes are interchangeable with their metal equivalent.

Electrical and Mechanical Specifications

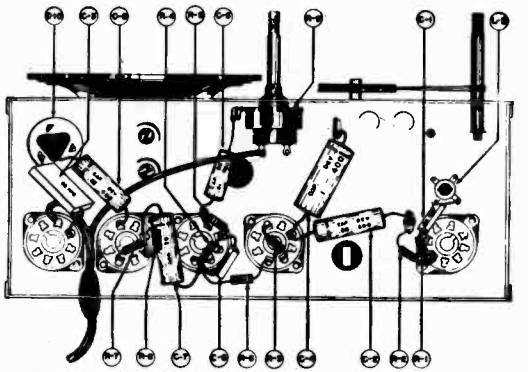
Frequency Range	540-1600 kc.
Intermediate Frequency	455 kc.
Power Supply	105-125 volts AC-DC
Loudspeaker	Dynamic
V.C. Impedence	3.5 ohms at 400 cycles
Power Output (Undistorted)	.75 watts
Power Output (Maximum)	1.5 watts
Tuning Drive Ratio	3 to 1

SOCKET VOLTAGES

TUBE	POSITION	1	2	3	4	5	6	7	8
12SA7GT	Osc. and Mixer	0	37.5 AC	99	99	-1.2	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.



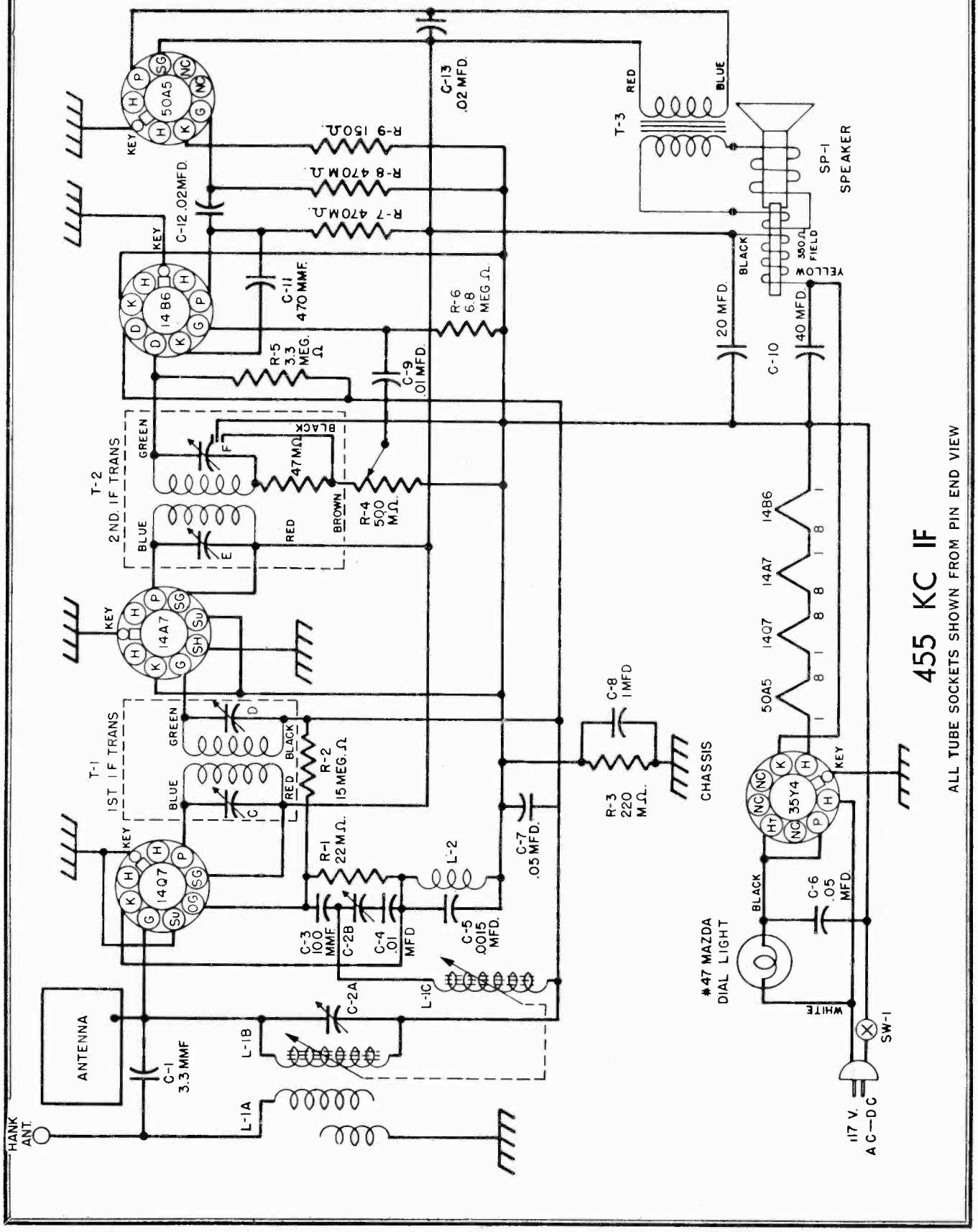
Parts Layout
Chassis Models 571A and 571B

SERVICE PARTS LIST

Symbol	Part No.	Description
C-1	BM78A101	Cap., Mica, 100 mmf.
C-2	BD210503	Cap., Paper, .05 mfd., 200 v.
C-3	BC31B503	Cap., Mold., Paper, .05 mfd.
C-4	BD410104	Cap., Paper, .1 mfd., 400 v.
C-5	BD410103	Cap., Paper, .01 mfd., 400 v.
C-6	BM78A471	Cap., Mica, 470 mmf.
C-7, 8	BD410203	Cap., Paper, .02 mfd., 400 v.
C-9	C-51155-1	Cap., Variable, 2 Section
C-10	A-8948	Cap., Electro., 40-20 mfd., 150 v.
L-1	B-51243	Loop, Antenna
L-2	B-51159	Coil, Osc. Assembly
R-1	BR17B223	Resistor, 22M ohm 1/3 w.
R-2	BR17B156	Resistor, 15 meg. 1/3 w.
R-3	BR17B224	Resistor, 220M ohm 1/3 w.
R-4	BR17B335	Resistor, 3.3 meg. 1/3 w.
R-5	BR17B685	Resistor, 6.8 meg. 1/3 w.
R-6, 8	BR17B474	Resistor, 470M ohm 1/3 w.
R-7	BR16C151	Resistor, 150 ohm. 1/2 w.
R-9	B-9051-1	Control, Vol. & Sw. 500M ohm.
T-1	B-51010	Trans., Assembly, 1st IF
T-2	B-51011	Trans., Assembly, 2nd IF
SP-1	C-51014	Speaker, 5" Dynamic, 350 ohm.
	A-2163	Cable, Drive
	A-6158	Lamp, Pilot No. 47 Mazda 6.3 v.
	A-51160-1	Cord, AC-DC Line, 6 ft.
	B-51162-1	Shaft, Drive
	A-51163	Clip, Spring
	B-51177	Bracket Assembly, Dial
	A-51202	Link, Insulating
	B-51204-1	Pointer
	A-51206	Arm, Dial Drive
	A-51237-1	Paper Back, Dial
	D-51240-1	Cabinet (571-1)
	A-51241-2	Knob
	C-51242-1	Dial, Glass Indicator
	C-51247	Back, Cabinet
	A-51249	Strip, Sponge Rubber
	A-51331	Spring, Dial Bracket
	A-51787	Spring, Cable
	B-54000	Carton Assembly

INTERNATIONAL DETROLA CORP.

MODEL 571X

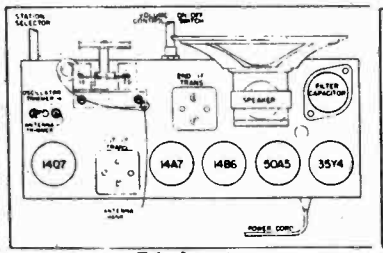


ALIGNMENT PROCEDURE

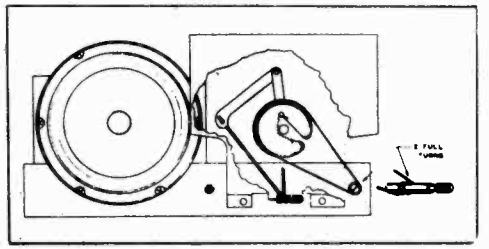
The following equipment is necessary to properly align this chassis:

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.	14Q7 grid	.1 mfd.	HF end	IF trimmers C D E F	Tune to max.
535 kc.	14Q7 grid	10 mmf.	LF end	Osc. trimmer B	Set limit of band
1400 kc.	14Q7 grid	10 mmf.	1400 kc.	Ant. trimmer A	Tune to max.



Tube Layout



Dial Mechanism

TUBE COMPLEMENT

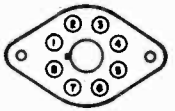
1—14Q7 Oscillator and Mixer tube
1—14A7 IF Amplifier tube
1—50A5 Power Output tube
1—35Y4 Rectifier tube
1—14B6 Second Detector and First Audio tube

Electrical and Mechanical Specifications

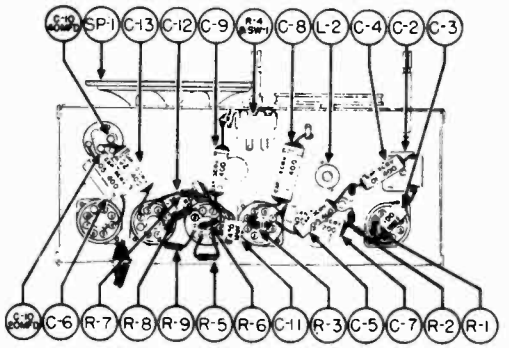
Frequency Range	540-1700 kc.	Power Output (Undistorted)	.75 watts
Intermediate Frequency	455 kc.	Power Output (Maximum)	1.5 watts
Power Supply	105-125 volts AC-DC	Tuning Drive Ratio	3 to 1
Loudspeaker	5-inch Dynamic		
V.C. Impedance	3.5 ohms at 400 cycles	Rated Power Input	32 watts

SOCKET VOLTAGES

TUBE	POSITION	1	2	3	4	5	6	7	8
14Q7	Osc. and Mixer	37.5 AC	99	99	–4.2	0	0	0	24.5 AC
14A7	IF Amplifier	12.5 AC	99	99	0	0	0	0	24.5 AC
14B6	2nd Det.—1st Audio	0	16	0	0	0	0	0	12.5 AC
50A5	Power Output	85 AC	91.5	99	0	0	0	5.9	37.5 AC
35Y4	Rectifier	117 AC	112 AC	0	112 AC	0	0	112	85 AC



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.



Parts Layout
Chassis Model 571X with Loctal Tubes

SERVICE PARTS LIST

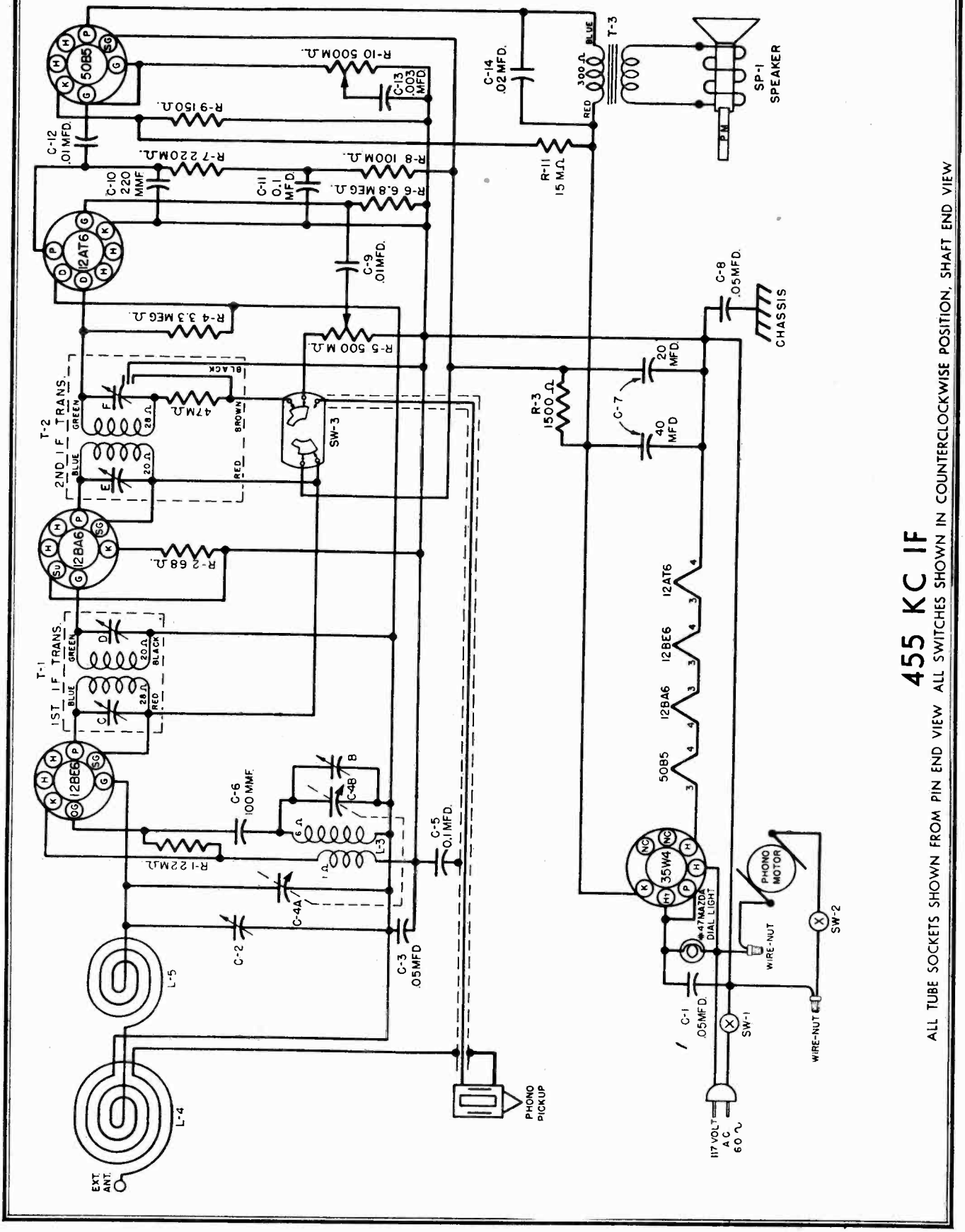
Symbol	Part No.	Description
C-6	BC31B503	Cap., Mold. Paper, .05 mfd., 400 v.
C-7	BD210503	Cap., Paper, .05 mfd., 200 v.
C-4, 9	BD410103	Cap., Paper, .01 mfd., 400 v.
C-8	BD410104	Cap., Paper, .1 mfd., 400 v.
C-12, 13	BD410203	Cap., Paper, .02 mfd., 400 v.
C-3	BM78A101	Cap., Mica, 100 mmf.
C-11	BM78A471	Cap., Mica, 470 mmf.
R-9	BR16C151	Resistor, 150 ohm, 1/2 w.
R-2	BR17B156	Resistor, 15 megohm, 1/3 w.
R-1	BR17B223	Resistor, 22,000 ohm, 1/3 w.
R-3	BR17B224	Resistor, 220,000 ohm, 1/3 w.
R-5	BR17B335	Resistor, 3.3 megohm, 1/3 w.
R-7, 8	BR17B474	Resistor, 470,000 ohm, 1/3 w.
R-6	BR17B685	Resistor, 6.8 megohm, 1/3 w.
	A-2163	Cable, Dial Drive
	A-6158	Lamp, Pilot, No. 47 Mazda, 6.3 v.
C-10	A-8948	Cap., Elec., 40-20 mfd., 150 v.
R-4	B-9051-1	Control, Vol. & Sw., 500,000 ohm.
C-5	A-9672	Cap., Paper, .0015 mfd., 400 v.

Symbol	Part No.	Description
T-1	B-51010-1	Transformer Assy., 1st IF
T-2	B-51011-1	Transformer Assy., 2nd IF
SP-1	C-51014	Speaker, 5-inch Dynamic, 350 ohm.
	A-51160-1	Cord, Power, 6 ft.
	B-51162-1	Shaft, Dial Drive
	A-51163	Spring Clip for Dial Drive Shaft
	A-51202	Link, Dial Drive
	B-51330-1	Rubber Channel
	A-51331	Spring, Dial Bracket
	A-51778	Service Sheet
	A-51787	Spring, Cable
	A-51869	Antenna Reel Assembly
L-1A, L-1B, L-1C	D-54902	Permeability Tuner Assembly
L-2	B-54903	Coil Assembly, Cathode
C-2A, C-2B	B-54904-1	Capacitor, Trimmer
	B-55120-1	Stud, for Dial Drive Link

Order parts not listed by specifying (1) Part Name, (2) Model Number (include number following dash), (3) Run Number

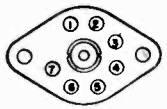
MODEL 7156

INTERNATIONAL DETROLA CORP.

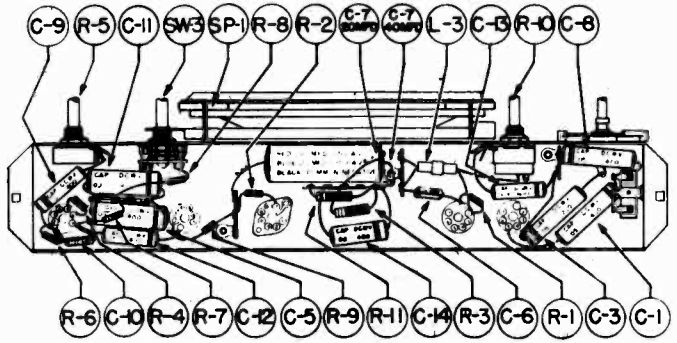


SOCKET VOLTAGES

TUBE	POSITION	1	2	3	4	5	6	7
12BE6	Converter	-5	0	24 AC	12 AC	88	88	0
12BA6	I.F. Amplifier	0	0	24 AC	35 AC	88	88	0.7
12AT6	2nd DET.—1st AF—AVC	0	0	12 AC	0	0	0	12
50B5	Power Output	0	5	85 AC	35 AC	115	88	0
35W4	Rectifier	0	0	85 AC	117 AC	112 AC	112 AC	122



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. No signal input. Line voltage 117 volts AC.



Parts Layout—Model 7156

SERVICE PARTS LIST

Symbol	Part No.	Description
C-3	BD210503	Capacitor, Paper, .05 mfd., 200 v.
C-9, C-12	BD410103	Capacitor, Paper, .01 mfd., 400 v.
C-5, C-11	BD410104	Capacitor, Paper, 0.1 mfd., 400 v.
C-14	BD410203	Capacitor, Paper, .02 mfd., 400 v.
C-1, C-8	BD410503	Capacitor, Paper, .05 mfd., 400 v.
C-13	BD610302	Capacitor, Paper, .003 mfd., 600 v.
C-6	BM74A101	Capacitor, Mica, 100 mmf.
C-10	BM74A221	Capacitor, Mica, 220 mmf.
R-2	BR16B680	Resistor, 68 ohm, ½ w.
R-9	BR16C151	Resistor, 150 ohm, ½ w.
R-8	BR17B104	Resistor, 100,000 ohm, ½ w.
R-1	BR17B223	Resistor, 22,000 ohm, ½ w.
R-7	BR17B224	Resistor, 220,000 ohm, ½ w.
R-4	BR17B335	Resistor, 3.3 megohm, ½ w.
R-6	BR17B685	Resistor, 6.8 megohm, ½ w.
R-3	BR17E152	Resistor, 1500 ohm, 1 w.
R-11	BR17E153	Resistor, 15,000 ohm, 1 w.
	A-2163	Cable, Drive
	A-6158	Lamp, Pilot, No. 47 Mazda, 6.3 v.
	A-6182-1	Socket, Dial Light
C-7	B-9564-1	Cap., Electro., 40-20 mfd., 150 v.
	A-51163	Clip, Spring
	B-51427-5	Grommet (large)
	B-51427-8	Grommet (small)
SW-3	B-51576-2	Switch, Radio-Phono
	A-51787	Spring, for Dial Cable
	A-54122	Button, Plug
R-5	B-54466-2	Control, Volume, 500,000 ohm
T-2	B-56718-1	Transformer Assembly, 2nd IF
T-1	B-56722-1	Transformer Assembly, 1st IF
	B-57262-6	Cord, AC Phono.
R-10	B-57841-1	Control, Tone & Switch, 500,000 ohm
	B-57842	Coil Assembly, Oscillator
SP-1	C-57843	Speaker, 5x7 PM
	B-57848-1	Shaft, Tuning Drive
	B-57857-1	Pointer, Dial
	B-57858-1	Strip Assembly, Light Diffusing
C-4	C-57859-1	Capacitor, Variable
L-4 & L-5	D-57870	Coil Assembly, Loop
	C-57872-1	Knob
	A-57878	Clip, Gang Mounting
C-2	B-57879-1	Capacitor Assembly, Trimmer
	B-58069-1	Cord, AC Power

TUBE COMPLEMENT

1—12BE6 Converter tube
1—12BA6 IF Amplifier tube
1—12AT6 Detector—AVC—First Audio tube
1—50B5 Power Output tube
1—35W4 Rectifier tube

ALIGNMENT PROCEDURE

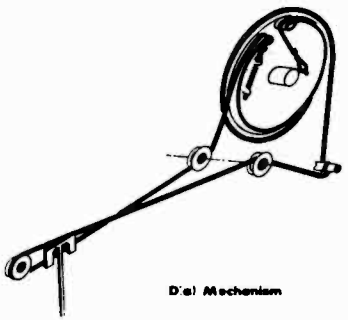
The following equipment is necessary to properly align this chassis:

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. — RMA loop.

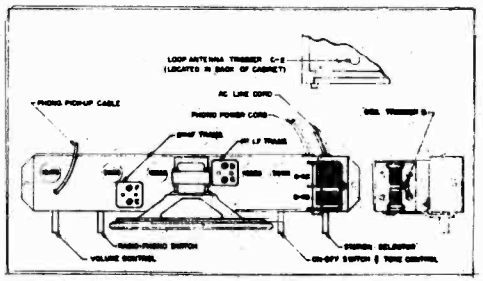
NOTE: Intermediate Frequency and Oscillator adjustments may be made with the loop disconnected provided a resistor of 10,000 to 50,000 ohms is substituted to close the 12BE6 grid circuit. The loop alignment must be done with the loop and chassis mounted in operating position in the cabinet. A single turn loosely coupled to loop may be substituted for RMA loop.

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.
1620 kc.	12BE6 grid	RMA loop	HF end	Osc. trimmer B	Set limit of band
1400 kc.	Through loop*	RMA loop	1400 kc.	Ant. trimmer C-2	Tune to max.

* Loop trimmer accessible through back of cabinet.



Dial Mechanism



Tube Layout

V.C. Impedance.....3.2 ohms at 400 cycles