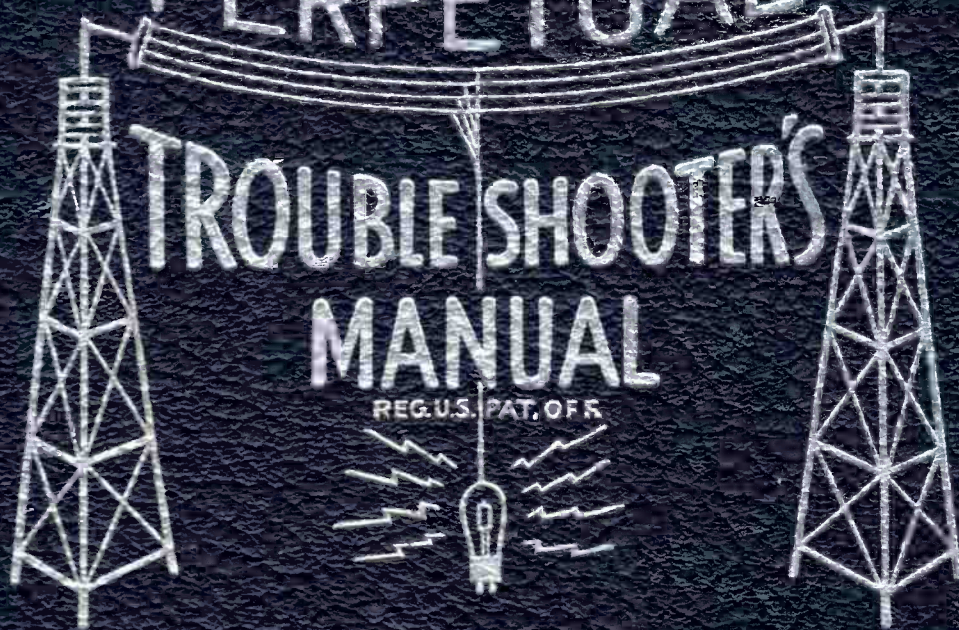


VOLUME XVIII

PERPETUAL



TROUBLE SHOOTER'S  
MANUAL

REG. U.S. PAT. OFF.

JOHN F. RIDER

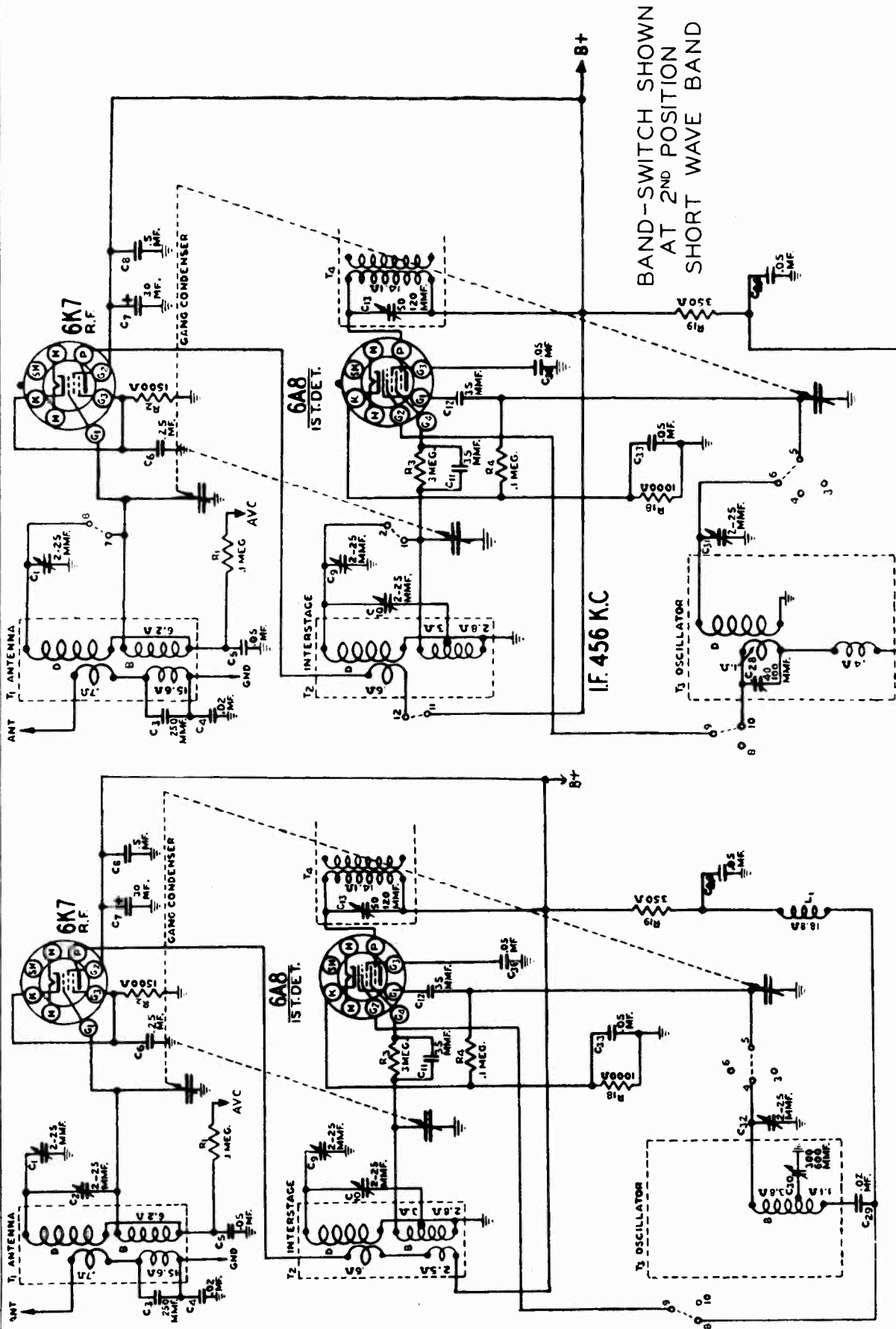


# CLARI-SKEMATIX

Registered Trademark

MODEL 7P SERIES

GAMBLE-SKOGMO, INC.



BAND-SWITCH SHOWN AT 2<sup>ND</sup> POSITION SHORT WAVE BAND

BAND-SWITCH SHOWN AT 1<sup>ST</sup> POSITION. BROADCAST BAND

## Series 7P - Replacement Parts

NOTICE—There is a large letter on the chassis which identifies the set as to major part changes. When ordering parts, please be sure to mention the series number and this large letter.

### MISCELLANEOUS

SOCKETS	
Part No.	Description
P-3A245	6A8 Tube Socket
P-3A242	6K7 Tube Socket
P-3A247	85 Tube Socket
P-3A247	43 Tube Socket
P-3A246	6A6 Tube Socket
P-3A58	5 Prong Speaker Socket

### SPEAKERS

P-12A237 B" Dynamic Speaker Complete with Output Transformer T8

### KNOBS

Specify Name of Knob and Name and Model of Radio	Tuning Control—Spring Type	Band Switch—Set Screw Type	Volume Control—Spring Type	Tone Control—Spring Type

### GENERAL

P-2X38	Felt Washers (Used behind knobs)
P-8X23	Rubber Chassis Mounting Cushions
P-8X43	Rubber Mounting Cushions (Front) For Gang Condenser
P-8X44	Rubber Mounting Cushion (Rear) for Gang Condenser
P-8X45	Rubber Mounting Cushion (Rear—under Chassis) for Gang Condenser
P-4A18	Terminal Strip (2 lugs, Insulated—Mounting foot center)
P-30X14	Grid Clip Only (Glass Tube)
P-30X44	Grid Clip Only (Metal Tube)
P-13X229	Line Cord and Plug
P-13X214	Antenna and Ground Lead Assembly
P-32X30	Tube Shield Base
P-32X32	Tube Shield
P-25X221	Mounting Feet for Chassis (Front)
P-25X231	Mounting Feet for Chassis (Rear)
P-2A59	1 Section, 2 Position Band Change Switch

### TRANSFORMERS AND COILS

Part No.	Code	Description
P-9A696	T1	Antenna Transformer and Can Assembly
P-9A697	T2	R. F. Interstage Transformer and Can Assembly
P-9A698	T3	Oscillator Coil and Can Assembly
P-9A699	T4	1st I. F. Transformer and Can Assembly
P-9A700	T5	2nd I. F. Transformer and Can Assembly
P-9A701	T6	3rd I. F. Transformer and Can Assembly
P-50X22	T7	Input Transformer
P-51X45	T8	Output Transformer (Part of Speaker Assembly)
P-9A555	L1	"B" Reactor
P-52X33	L2	"B" Choke (Iron Core)

### CONDENSERS

#### TUBULAR

Part No.	Code	Capacitance	Voltage
P-46X187	C4	.02 mf.	180
P-46X80	C5	.05 mf.	180
P-46X117	C6	.25 mf.	180
P-46X123	C8	.5 mf.	180
P-46X80	C17	.05 mf.	180
P-46X187	C19	.02 mf.	180
P-46X124	C23	.01 mf.	180
P-46X124	C24	.01 mf.	180
P-46X98	C26	.1 mf.	180
P-46X117	C27	.25 mf.	180
P-46X187	C29	.02 mf.	180
P-46X80	C33	.05 mf.	180
P-46X80	C34	.05 mf.	180
P-46X80	C36	.05 mf.	180
P-46X80	C36	.05 mf.	180

#### ELECTROLYTIC

P-48Q217	{ C7 C25	30 mf. 12 mf.	50 25	Dry
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#### MOLDED

P-47X59	C3	250 mmf.
P-47X47	C11	35 mmf.
P-47X53	C12	35 mmf.
P-47X54	C20	50 mmf.
P-47X54	C21	50 mmf.
P-47X57	C22	100 mmf.

#### TRIMMER

P-17A58 Trimmer Strip	C1	2-25 mmf. Range "D" Antenna Trimmer
	C2	2-25 mmf. Range "B" Antenna Trimmer
	C9	2-25 mmf. Range "D" Interstage Trimmer
	C10	2-25 mmf. Range "B" Interstage Trimmer
	C31	2-25 mmf. Range "D" Oscillator Trimmer
	C32	2-25 mmf. Range "B" Oscillator Trimmer

See Part Number P-17A36 for replacement of any one section

### CONDENSERS (Continued)

Part No.	Code	Capacitance	Voltage
P-17A57	{ C13 C14	50-120 mmf. 50-120 mmf.	1st I.F. Trimmers
P-17A57	{ C15 C16	50-120 mmf. 50-120 mmf.	2nd I.F. Trimmers
P-17A38	C18	40-100 mmf.	3rd I.F. Trimmer
P-17A35	{ C28 C30	40-100 mmf. 300-600 mmf.	Oscillator Padding Condensers
P-17A36		2-25 mmf.	(To be used for replacement of any one section of Trimmer Strip P-17A55)

### MISCELLANEOUS

P-14A58 1 Gang Condenser less Dial and Drive Assembly

### RESISTORS

#### CARBON

Part No.	Code	Resistance	Wattage
P-A95104	R1	100,000 Ohm	0.2
P-A94152	R2	1500 Ohm	0.2
P-A95305	R3	3 Megohm	0.2
P-A94104	R4	100,000 Ohm	0.2
P-A94202	R5	2000 Ohm	0.2
P-A95401	R6	400 Ohm	0.2
P-A95105	R7	1 Megohm	0.2
P-A95503	R8	50,000 Ohm	0.2
P-A95205	R9	2 Megohm	0.2
P-A94351	R11	350 Ohm	0.2
P-A95803	R12	80,000 Ohm	0.2
P-A94402	R13	6000 Ohm	0.2
P-A94401	R14	400 Ohm	0.2
P-A95105	R15	1 Megohm	0.2
P-A94102	R18	1000 Ohm	0.2
P-A95351	R19	350 Ohm	0.2

#### WIRE WOUND

P-43X73	{ R20 R21	18 Ohm 51 Ohm	4.0 6.0
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#### VARIABLE

P-36X213	R10	500,000 Ohm	Volume Control and On-Off Switch
P-40X209	R17	75,000 Ohm	Tone Control

### INTERFERENCE ELIMINATION PARTS

Part No.	Description
P-21A7	Spark Plug Suppressor
P-48X34	Dual .5 mf. Generator Condenser

### DIAL AND DRIVE ASSEMBLY

#### DIAL ASSEMBLY

Part No.	Description
	Specify Name and Model of Radio { Dial Assembly Complete with Dial Glass; Dial Plate; Dial Cardboard; Small Pointers; Reflectors; Small Pointer Cords, Springs, Pulleys and Collars; and Band Indicator Assembly less Large Station Pointer and Micrometer Pointer.
	See above Dial Glass Only
P-25A125	Dial Assembly Mounting Plate, Includes Small Pointer Shafts and Pulleys, and Band Indicator Assembly
P-25X297	Dial Assembly Support Brackets (Attached to Gang Condenser)
P-15X59	Large Station Pointer
P-15X60	Micrometer Pointer
P-15X57	Small Volume or Tone Control Pointer
P-9X16	Dial Cardboard
P-11X41	Fibre Strip (At Bottom of Dial Glass)
P-41X12	Dial Lamp Reflectors (At each side of Dial Plate)
P-7A37	Dial Lamp Sockets and Clips
P-7A32	Dial Lamps
P-29X20	10" Black Cord for Small Pointers Brass Collars with Set Screws for Securing Small Pointer Cords to Shafts.
P-28X44	Tension Springs for Small Pointer Cords
P-26X229	Small Pointer Shafts and Pulleys
P-17X15	Glass Crystal (Mounted in Escutcheon Plate)
P-28X58	Crystal Retaining Ring

#### DRIVE ASSEMBLY

P-5A34	Planetary Assembly Complete with Hex Nut and Lockwasher (This is the unit mounted at the front of the chassis base. It is integral with the tuning shaft)
P-10X14	Black Tuning Drive Cord Only
P-28X69	Tension Spring for Tuning Drive Cord
P-25X269	Drive Assembly Bracket Only (Mounted on Gang Condenser)
P-25X283	Rear Mounting Foot for Gang Condenser
P-24X239	Drive Drum Assembly Complete with Gears, Micrometer and Main Pointer Shaft
P-28X84	Spreader Spring for Rotary Gear (Part of Above Assembly)
P-28X83	Spreader Spring for Stationary Gear (Part of Above Assembly)



# ALIGNMENT PROCEDURE

Output meter across 3.2-ohm output load.

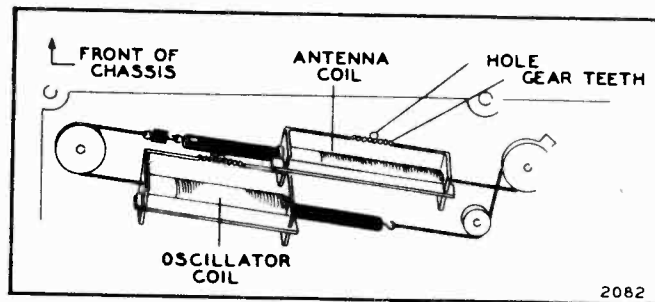
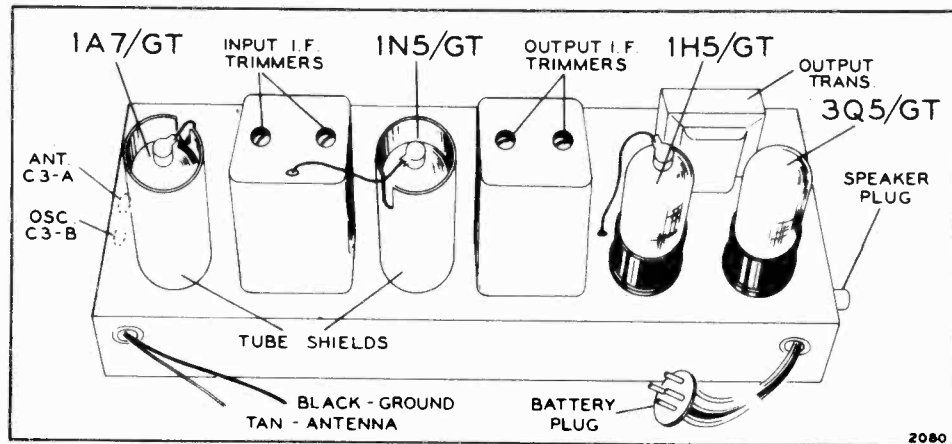
Volume control at maximum for all adjustments.

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

Connect ground post of signal generator to radio chassis.

FREQUENCY	SIGNAL GENERATOR		TUNER SETTING	ADJUST FOR MAXIMUM OUTPUT (in order shown)
	DUMMY ANTENNA	CONNECTION TO RADIO		
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.

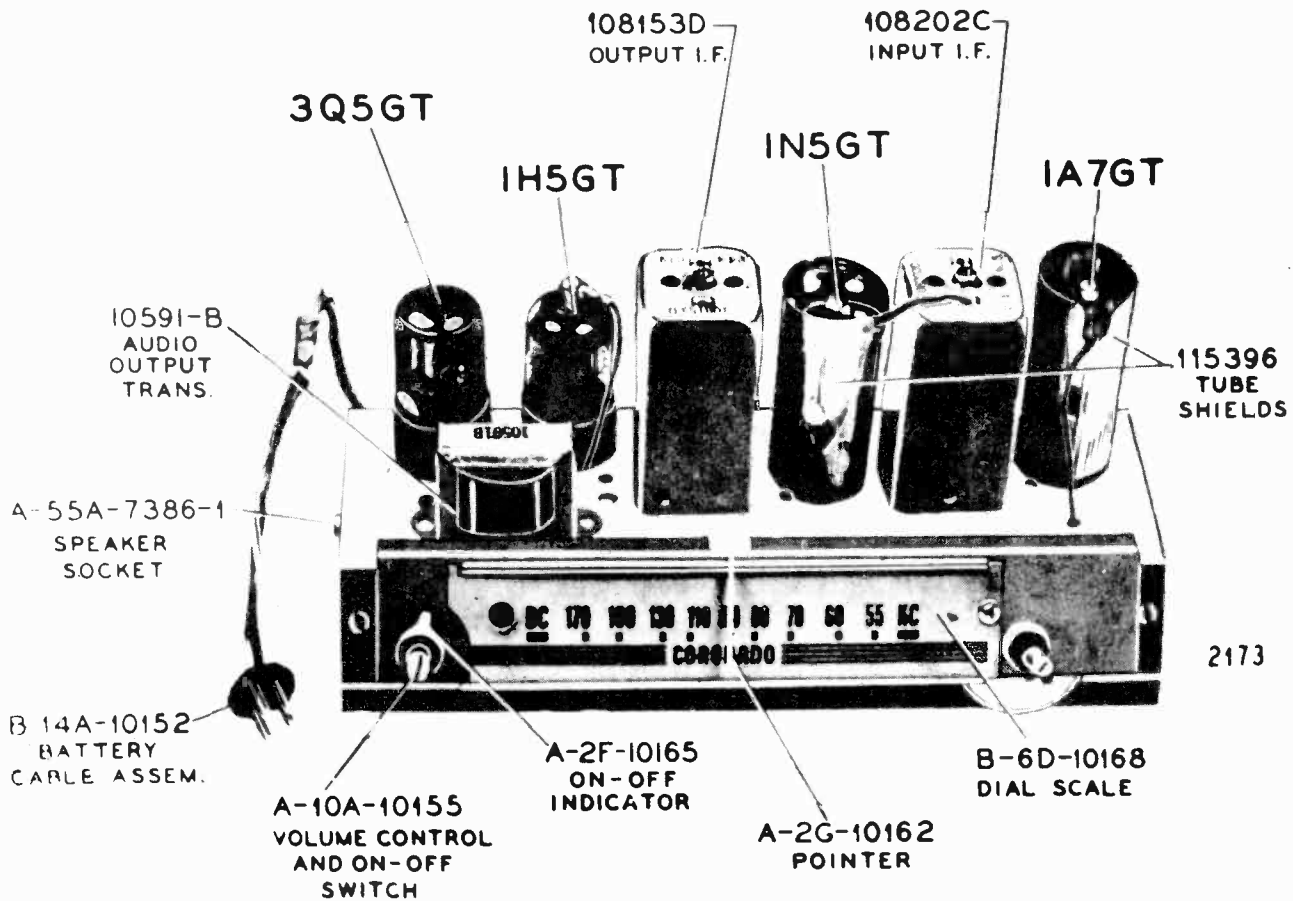
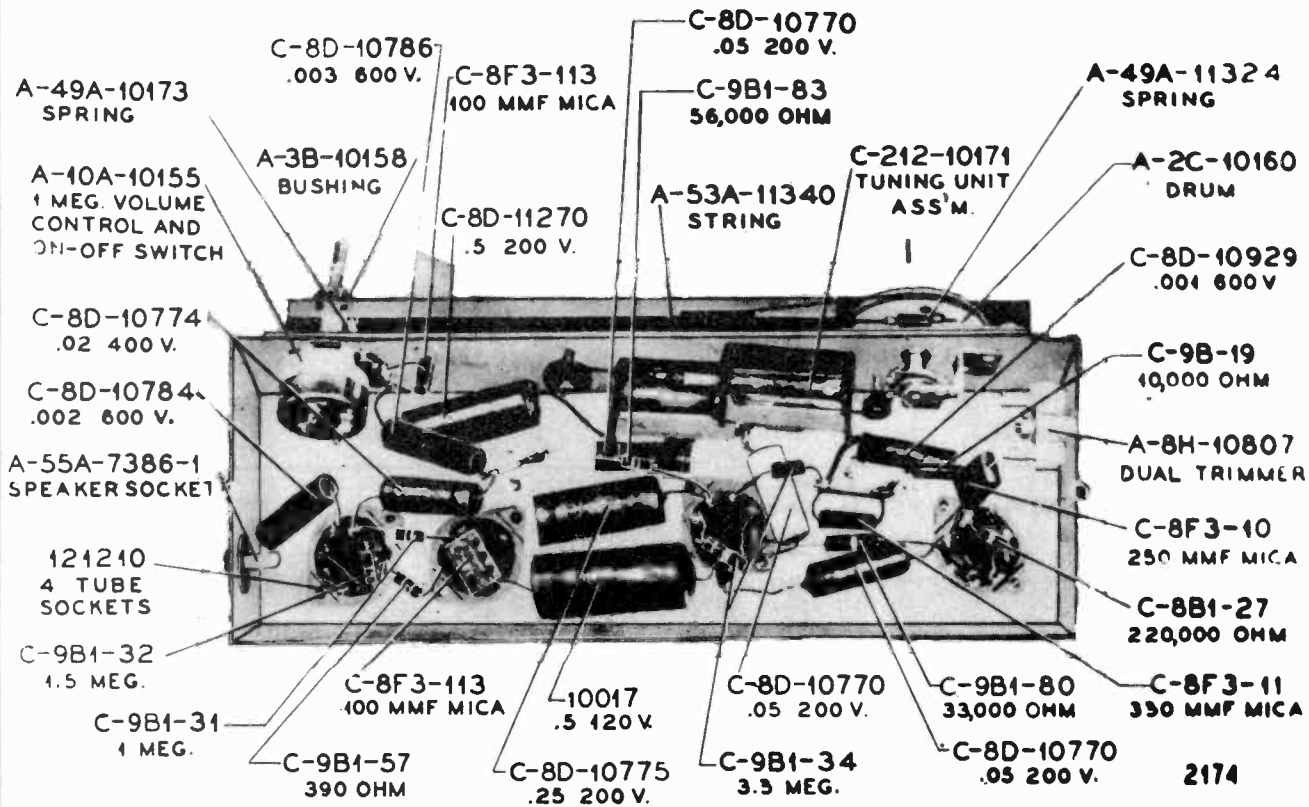


## SPECIFICATIONS

4 Tube Superheterodyne		Speaker	5 in. P.M., 1.5 oz., magnet, voice coil imp. 3.2 ohms
Power Output	160 mw. undistorted, 250 mw. maximum	Tuning	Two permeability-tuned circuits
Selectivity	48 kc. broad at 1,000 times signal at 1,000 kc.	Sensitivity	20 mv. avg. for 50 mw. output
Antenna	External only. Also external ground.	Frequency Range	535 to 1,720 kc.
Intermediate Frequency	455 kc.	Power Supply	A battery 1.5 v. 250 ma., B battery 90 v. 14 ma.

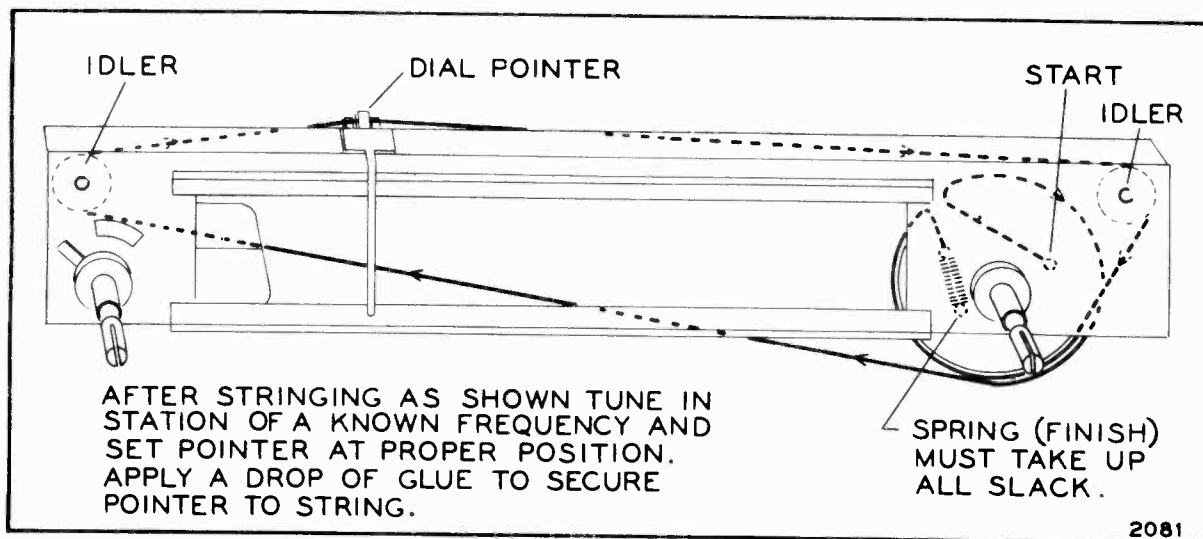
MODEL 43-6321

GAMBLE-SKOGMO, INC.

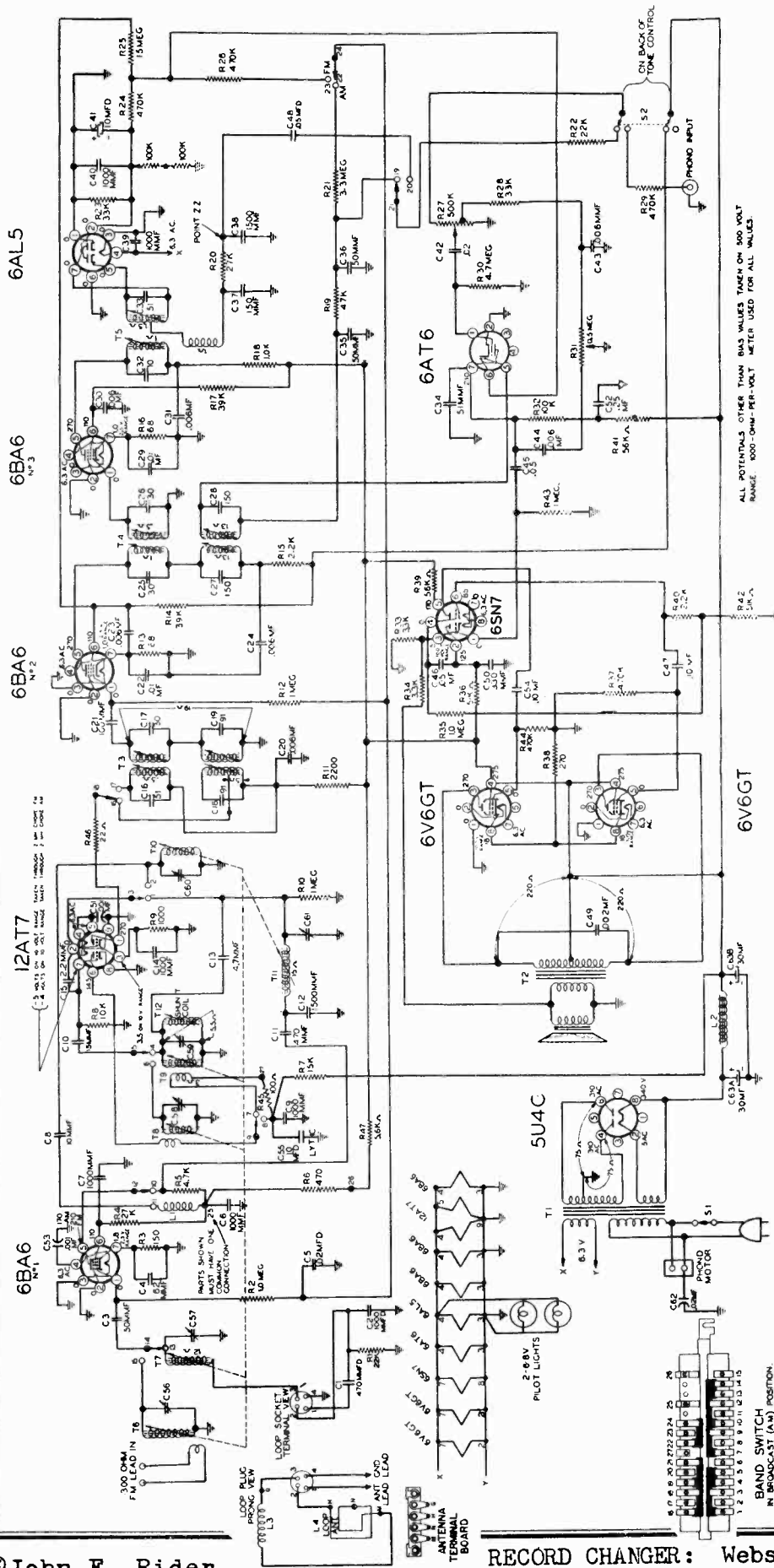


Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
<b>CAPACITORS *</b>			<b>TRANSFORMERS AND COILS</b>		
C1	C-8F3-11	330 mmf, 20%, mica	T1-A,-B	C-211-10171	Tuning assembly complete, including antenna and oscillator coils
C2	C-8D-10929	.001 mf, 600 volts, 10%	T2	108202C	Input I.F. coil, complete in can (range of trimmers: pri. 60-110 mmf, sec. 40-70 mmf)
C3-A,-B	A-8H-10807	Dual trimmer; antenna (42-78 mmf) and oscillator (84-156 mmf)	T3	108153D	Output I.F. coil, complete in can (range of trimmers: 40-70 mmf each)
C4,C6, C9	C-8D-10770	.05 mf, 200 volts, 20%	T4	10591B	Output transformer
C5	C-8F3-10	220 mmf, 20%, mica	<b>MISCELLANEOUS</b>		
C7	C-8D-10775	.25 mf, 200 volts, +20%—10%	B-18A-10164	Speaker, 5", P.M.	
C8	C-8D-11270	.5 mf, 200 volts, +20%—10%	121210	Socket, for tubes (4 used)	
	or		A-55A-7386-1	Connector, for speaker plug	
	119117	10 mf, 150 volts, electrolytic	10724	Plug, on speaker leads	
C10,C12	C-8F3-113	100 mmf, 10%, mica	B-14A-10152	Battery cable assembly	
C11	C-8D-10786	.003 mf, 600 volts, 20%	A-2G-10162	Pointer, for dial	
C13	C-8D-10774	.02 mf, 400 volts, 20%	115396	Tube shield (for 1N5GT, 1A7GT)	
C14	10017	.5 mf, 120 volts, +50%—10%	A-5B-10170-1	Knob (volume control, tuning)	
C15	C-8D-10784	.002 mf, 600 volts, 25%	B-6D-10618	Dial scale	
<b>RESISTORS *</b>			B-2M-7758	Snap-in rivet for dial scale	
R1	C-9B1-19	10,000 ohms, 1/2 watt, 20%	A-6D-10163	Crystal for dial	
R2,R5	C-9B1-34	3.3 megohms, 1/2 watt, 20%	A-2F-10165	On-off indicator	
R3	C-9B1-80	33,000 ohms, 1/2 watt, 10%	A-49A-10173	Spring for on-off indicator	
R4	C-9B1-27	220,000 ohms, 1/2 watt, 20%	A-3A-10156	Tuning shaft	
R6	C-9B1-83	56,000 ohms, 1/2 watt, 10%	A-53A-10576	Cord, for dial pointer drive (32")	
R7,S1	A-10A-10155	Volume control (1 megohm) and on-off switch	A-49A-11324	Spring for dial pointer drive cord	
R8	C-9B1-35	4.7 megohms, 1/2 watt, 20%			
R9	C-9B1-31	1 megohm, 1/2 watt, 20%			
R10	C-9B1-32	1.5 megohms, 1/2 watt, 20%			
R11	C-9B1-57	390 ohms, 1/2 watt, 10%			

**DRIVE CORD REPLACEMENT**



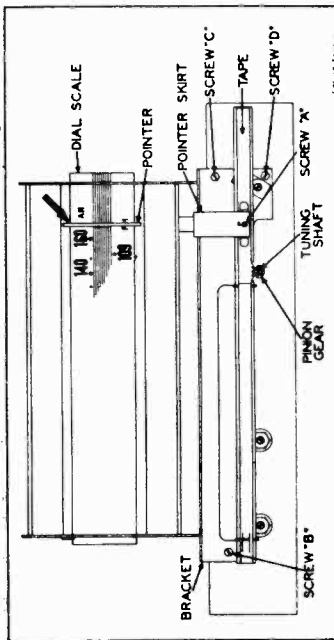


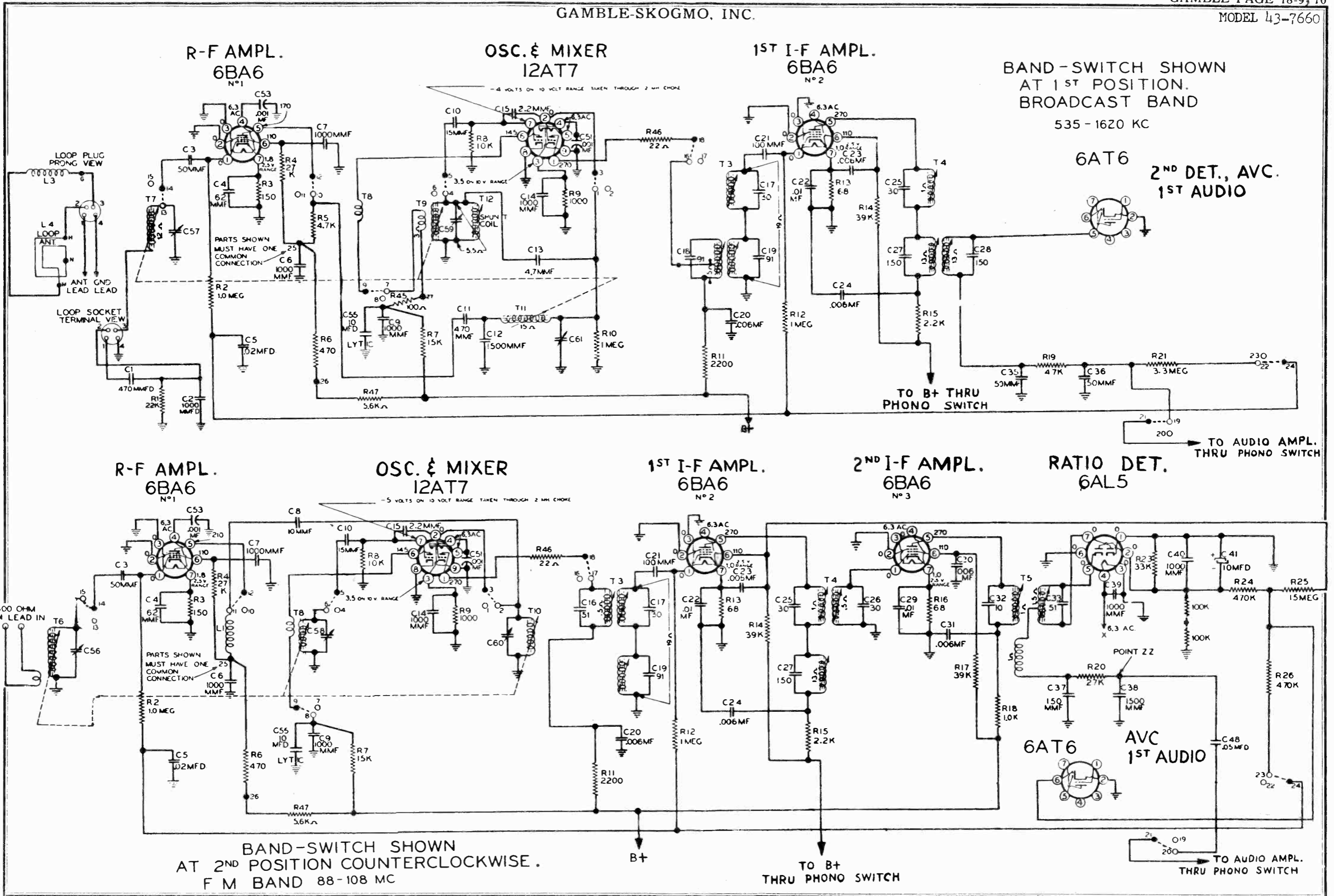


NOTE: The two 100K ohm resistors in series from PIN No. 2 to ground are connected as shown only when aligning the FM I. F. Refer to FM I. F. alignment procedure.  
 NOTE: On some sets R46—22 ohm resistor is replaced with a 39 ohm resistor, Part No. C-9B1-45.

**Procedure for disassembly and assembly of dial mechanism**

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





**ALIGNMENT PROCEDURE**

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

A non-metallic alignment tool must be used.

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

are extremely stable and the tuned circuits should require no adjustment over a long period of time.  
**NOTE**—The following alignment is based on the use of the new Simpson vacuum tube voltmeter which has a "floating ground". In other

words, the meter, when used as a vacuum tube volt-meter, can have both the positive and negative sides connected to points above ground and still give true readings.  
A standard AM signal generator is required.

**FM - I. F. ALIGNMENT**

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

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

**NOTES ON FM — I. F. ALIGNMENT**

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

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

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

**FM - R. F. ALIGNMENT**

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

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

**NOTE:** If a signal generator with the above fundamental frequency is not available, it is sometimes possible to use harmonics. Use extreme care in picking harmonics. An alternate procedure is to use a local station carrier of known frequency to align the FM Band and to use the vacuum tube volt-meter

as above for resonance indication. A weak carrier, however, will not produce 3 volts.  
**NOTE:** Connect 300 ohms in series with hot side of generator and connect to one screw. Connect cold side of generator to other screw.

**ALIGNMENT PROCEDURE**

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

The alignment procedure below includes the sensitivities at the inputs of various stages. All signal input values are based on an output of 1/2 watt. This may be measured by disconnecting the speaker voice coil and substituting a 3.2-ohm resistor across the secondary winding of the output transformer. A reading of 1.3 volts AC across this resistor will be approximately equivalent to a 1/2-watt output with the speaker con-

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

**AM - I. F. ALIGNMENT**

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

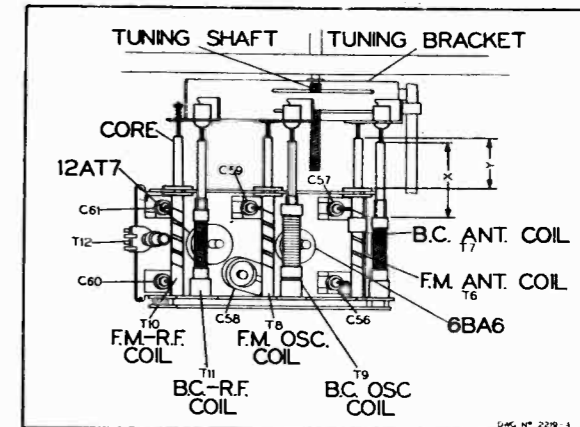
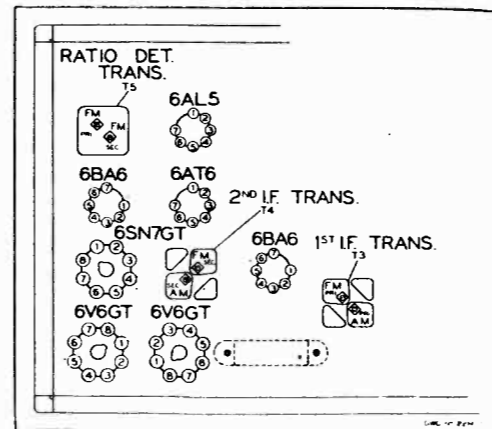
SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	ADJUSTMENTS TO BE MADE	ADJUST FOR
455 Kc. Use 1000 microvolts	Pin No. 1 of 6BA6 No. 2 and ground	Primary and Secondary of T4 AM windings See top and bottom views	Maximum output Should be 1/2 watt
455Kc. Use 30 microvolts	Pin No. 2 of 12AT7 and ground	Primary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

**BROADCAST BAND - R. F. ALIGNMENT**

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

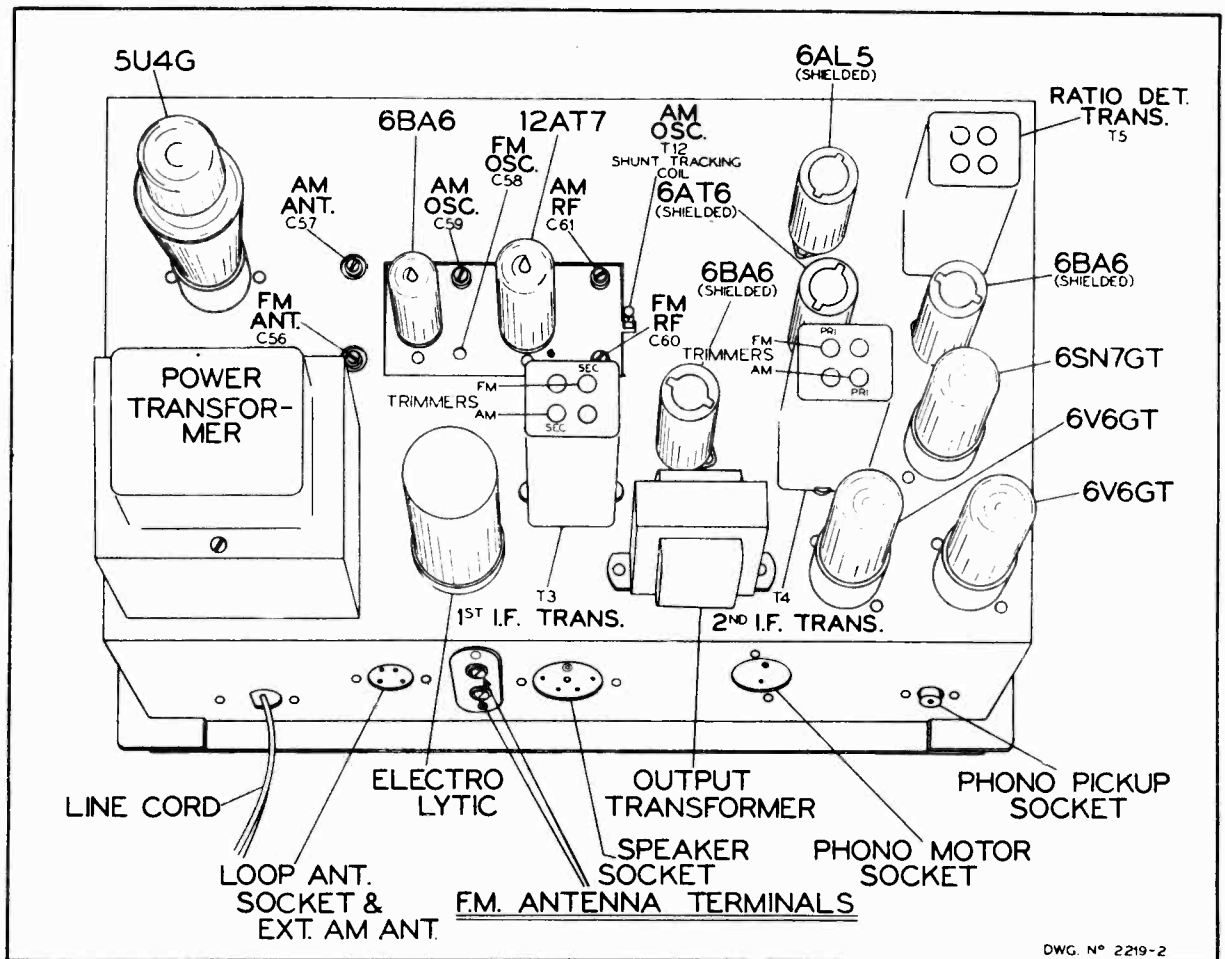
SIGNAL GENERATOR FREQ.	CONNECTION TO RADIO	DUMMY ANTENNA	ADJUST
1620 Kc.	AM Antenna and Ground	200 mmf.	C59 Osc. trimmer for maximum
535 Kc.	AM Antenna and Ground	200 mmf.	T12 for maximum 1/2 watt
1620 Kc. Use 3 microvolts	AM Antenna and Ground	200 mmf.	C57 and C61 for max. 1/2 watt. See note

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



**TUNER ADJUSTMENT**

With tuner all the way out, dimension "X" should be 1 1/2 inches. "Y" should be 1-1/16 inches. "X" is from the end of the slug to edge of the coil winding. Check these dimensions before R.F. alignment is attempted of either the AM or FM Band. No slug adjustment should be necessary since the slugs are properly set at the factory.



DWG. N° 2219-2

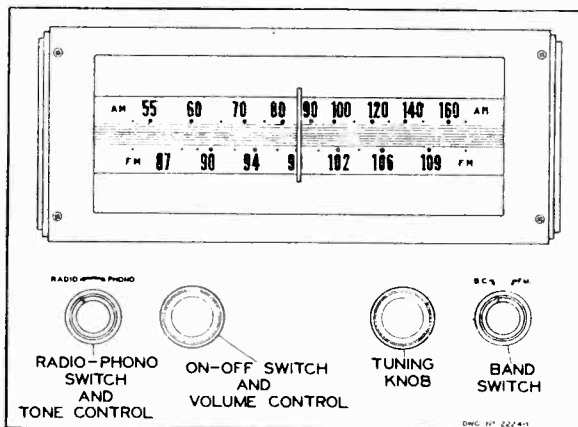
**Chassis—top view**

**GENERAL DESCRIPTION—** This is a 2-band, nine tube (plus rectifier) superheterodyne receiver for the reception of both AM and FM stations. It features the most advanced type of FM ratio detector, permeability tuning of both bands, combination double-frequency I. F. coils and miniature tubes. Built-in

antennas are provided for broadcast and FM reception; provision is also made for connection of an external broadcast antenna as well as an FM antenna with 300 ohm lead-in. Both antennas may be connected to the radio at the same time.

**ELECTRICAL SPECIFICATIONS**

- Power Supply**.....105 to 125 volts, AC, 60-cycles; Chassis only 122 watts. With phono operation 150 watts.
- Frequency Range**.....Broadcast Band—535 to 1620 kc.  
FM—Band 88 to 108 mc.
- Intermediate Freq.**.....AM-455 kc; FM-10.7 mc.
- Selectivity**.....AM-48 kc. broad at 1000 times signal, measured at 1000 kc.  
I.F. FM-180 kc. broad at 2 times down.  
I.F. FM-320 kc. broad at 10 times down.
- AM Sensitivity**.....(For .5 watt output with external antenna)—3 microvolts average.
- FM Sensitivity**.....(For .5 watt output)—10 microvolts average.
- Power Output**.....8 watts, 10% distortion. 10 watts maximum.

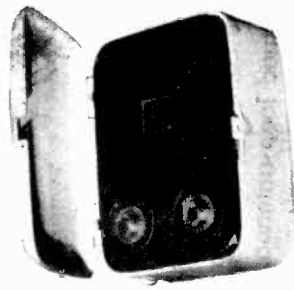
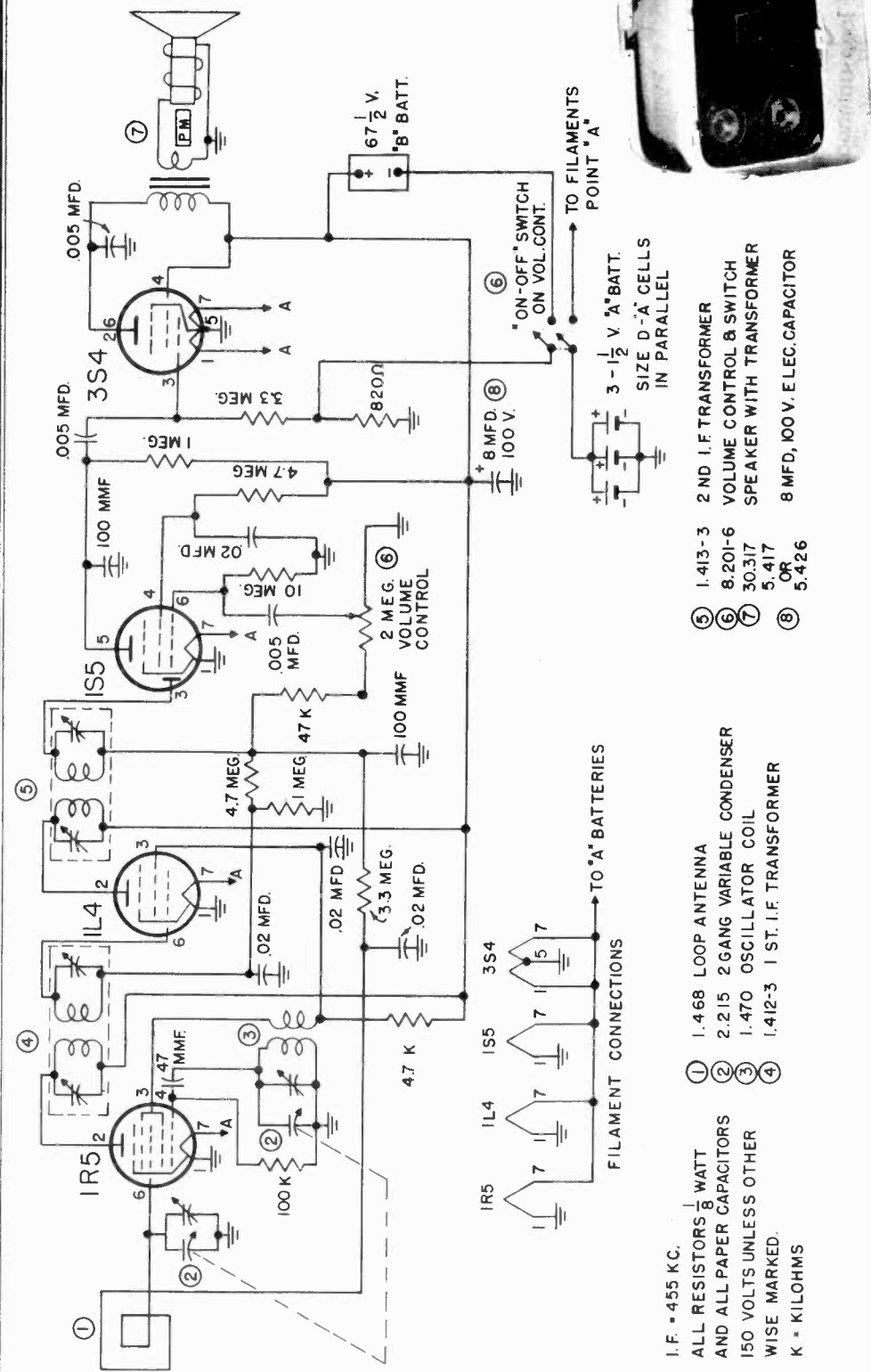


**Loud Speaker**.....12" electrodynamic. Voice coil impedance 3.2 ohms, 400 cycles.

MODEL 43-7660

## REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description	Qty. Used	Ref. No.	Part No.	Description	Qty. Used
<b>TUNER PARTS</b>							
<b>Condensers</b>							
C58	A-8E-13575	Trimmer condenser	1	C52	C-8D-13439	.25 mf x 400 volts	1
C56, 57, 59, 60, 61	A-2M-12618	Trimmer cond. plate	5	C47, 54	C-8D-10760	.1 mf x 400 volts	2
C1, C11	C-8G-11732	470 mmf, $\pm 20\%$	2	C35, 36	A-8F-13047	50 mmf, dual mica	1
C2	C-8G-13695	1000 mmf, $\pm 20\%$	1	C32	C-8G-11789	10 mmf, ceramic, 10%	1
C6, 7, 9, 14, 51, 53	C-8G-13201	1000 mmf, $+20\%$ -10%	6	C33	C-8G-11891	51 mmf, ceramic, 5%	1
C4	C-8G-13018	62 mmf, $\pm 10\%$	1	C27, 28	C-8G-13025	150 mmf, ceramic	2
C12	C-8G-11731	1500 mmf, $\pm 20\%$	1	C17, 25, 26	C-8G-12159	30 mmf, ceramic	3
C10	C-8G-13017	15 mmf, $+10\%$	1	C18, 19	C-8G-12160	91 mmf, ceramic	2
C3	C-8G-11484	50 mmf, $\pm 10\%$	1	C16	C-8G-13026	51 mmf, ceramic	1
C8	C-8G-11789	10 mmf, $\pm 10\%$	1	<b>Resistors</b>			
C13	A-8G-12495-6	4.7 mmf, $\pm 20\%$	1	R27	A-10A-13001	Volume control (500K) and switch	1
C15	A-8G-12495-4	2.2 mmf, $\pm 20\%$	1	R31	A-11A-12988	Tone control (500K) and radio-phono switch	1
C5	C-8D-11304	.02 mfd, 200 volts, $\pm 20\%$	1	R32	C-9B1-86	100K ohms, $\frac{1}{2}$ watt, 10%	1
<b>Resistors</b>				R29, 44	C-9B1-94	470K ohms, $\frac{1}{2}$ watt, 10%	2
R4	C-9B2-79	27K ohms, 1 watt, 10%	1	R39, 41	C-9B1-83	56K ohms, $\frac{1}{2}$ watt, 10%	2
R1	C-9B1-21	22K ohms, $\frac{1}{2}$ watt, 20%	1	R33, 34	C-9B1-68	3300 ohms, $\frac{1}{2}$ watt, 10%	2
R3	C-9B1-52	150 ohms, $\frac{1}{2}$ watt, 10%	1	R30	C-9B1-35	4.7 megohms, $\frac{1}{2}$ watt, 20%	1
R5	C-9B1-17	4700 ohms, $\frac{1}{2}$ watt, 20%	1	R23, 28	C-9B1-80	33K ohms, $\frac{1}{2}$ watt, 10%	2
R6	C-9B1-11	470 ohms, $\frac{1}{2}$ watt, 20%	1	R20	C-9B1-79	27K ohms, $\frac{1}{2}$ watt, 10%	1
R8	C-9B1-19	10K ohms, $\frac{1}{2}$ watt, 20%	1	R22	C-9B1-78	22K ohms, $\frac{1}{2}$ watt, 20%	1
R2, R10	C-9B1-31	1 megohm, $\frac{1}{2}$ watt, 20%	2	R13, 16	C-9B1-48	68 ohms, $\frac{1}{2}$ watt, 10%	2
R9	C-9B1-62	1000 ohms, $\frac{1}{2}$ watt, 10%	1	R14, 17	C-9B2-81	39K ohms, 1 watt, 10%	2
R21	C-9B1-34	3.3 megohms, $\frac{1}{2}$ watt, 20%	1	R24, 26, 37	C-9B1-29	470K ohms, $\frac{1}{2}$ watt, 20%	3
R45	C-9B1-50	100 ohms, $\frac{1}{2}$ watt, 10%	1	R25	C-9B1-302	15 megohms, $\frac{1}{2}$ watt, 10%	1
R46	C-9B1-42	22 ohms, $\frac{1}{2}$ watt, 10%	1	R19	C-9B1-23	47K ohms, $\frac{1}{2}$ watt, 20%	1
<b>Coils</b>				R7	C-9B4-76	15K ohms, 2 watts, 10%	1
T8	B-13D-13027	FM oscillator coil assembly	1	R12, 35, 43	C-9B1-31	1 megohm, $\frac{1}{2}$ watt, 20%	3
T6	B-13E-13028	FM antenna coil assembly	1	R40	C-9B1-66	2200 ohms, $\frac{1}{2}$ watt, 10%	1
T10	B-13C-13029	FM R.F. coil assembly	1	R36, 42	C-9B1-200	51K ohms, $\frac{1}{2}$ watt, 5%	2
T9	B-13D-13030	AM oscillator coil assembly	1	R38	C-9B4-55	270 ohms, 2 watts, 10%	1
T7	B-13E-13031	AM antenna coil assembly	1	R47	C-9B1-71	5600 ohms, $\frac{1}{2}$ watt, 10%	1
T11	B-13C-13032	AM R.F. coil assembly	1	R18	C-9B1-13	1000 ohms, $\frac{1}{2}$ watt, 20%	1
L1	A-16A-13033	Choke coil assembly	1	R15, 11	C-9B2-15	2200 ohms, 1 watt, 20%	2
T12	B-13D-12974	AM osc. shunt coil assembly	1	<b>Coils</b>			
<b>Miscellaneous</b>				T3	C-13A-13009-1	Input I.F. transformer, combination 455 kc. and 10.7 mc	1
B-208-13553	Band change slide switch	1	T4	C-13B-13014-1	Output transformer, combination 455 kc. and 10.7 mc.	1	
or			T5	C-203-11745-1	Ratio det. coil assembly	1	
B-201-12967	Band change slide switch	1	L3	A-16A-13243	Loop loading coil	1	
A-15B-12997	7 prong, miniature tube socket	1	L4	B-14MA-11066	Loop antenna—B.C. Band	1	
A-15B-13430	9 prong, miniature tube socket	1	<b>Transformers</b>				
N-200-13802	Pointer guide and bracket assembly	1	T2	B-12C-13042	Output transformer for speaker	1	
A-3A-12308-1	Lead screw	1	B-12A-13038	Power transformer, primary, 50-60 cycles, 105-125 volts, AC	1		
A-3J-12309	Pinion gear for lead screw	1	<b>Speaker</b>				
A-49A-13447	Tension spring for lead screw	1	B-18B-13043	Electrodynamic speaker, 12" less output transformer	1		
A-25A-13019	Core grommets, for AM Band	3	<b>Miscellaneous</b>				
A-3M-13020	Insert for core grommet	3	C-30B-13943	Dial glass	1		
A-49A-12394	Spiral spring for FM cores	3	B-30A-13734	Dial scale	1		
C-2D-12990	Tape guide	1	B-5B-13738-41	Knob, small, with dot, mahogany	2		
B-2J-13006	Rack, with teeth, with A-2D-11194 bracket	1	B-5B-13737-41	Knob, large, without dot, mahog.	2		
A-5M-13741	Pointer	1	B-2G-13596	Escutcheon	1		
32F6SE-5274	6-32 x $\frac{1}{4}$ " screw to mount pointer	1	B-14M-11479	A.C. line cord	1		
<b>MAIN CHASSIS PARTS</b>				A-3A-13003	Switch shaft	1	
<b>Condensers</b>				A-2D-12983	Detent bracket (U shaped on front of set)	1	
63A, 63B	B-8C-11629	Electrolytic condenser, dual, 30-30 x 450 volts	1	A-43D-12934	"U" speed clip	1	
C21	C-8G-11734	100 mmf, 20%, ceramic	1	A-55C-12935	Ball bearing	1	
C37	C-8F3-229	150 mmf, mica	1	A-2D-13004	Switch activator bracket	1	
C38	C-8G-13059	1500 mmf, ceramic	1	A-47A-13801	Pilot lite assembly	1	
C34	C-8G-13060	51 mmf, ceramic	1	A-46A-11739	Pilot lite, 6-8 volts, T-44	2	
C20, 23, 24, 30, 31, 43, 44	C-8D-10785	.006 mf x 600 volts, paper	7	A-15C-10717	7 prong, miniature tube socket	4	
C22, C29	C-8D-10761	.01 mf x 400 volts, paper	2	A-15B-10440	8 prong, octal socket	4	
C45, 46	C-8D-10813	.05 mf x 400 volts, paper	2	A-19B-12644	Antenna socket	1	
C55	A-8C-12154	Electrolytic condenser 10 mf x 450 volts	1	A-7B-13050	FM dipole, 2-screw strip	1	
C49	C-8D-10789	.002 mf x 600 volts, paper	1	A-15B-11538	Speaker socket	1	
C39, 40	C-8G-13201	1000 mmf, ceramic	2	A-19B-12468	Phono motor socket	1	
C41	A-8C-13132	Electrolytic condenser 10 mf x 50 volts	1	A-19B-12170	Phono input socket	1	
C62	C-8J-11321	.02 mf x 600 volts	1	<b>RECORD CHANGER</b>			
C48	C-8D-10770	.05 mf x 200 volts	1	B-201-13109	Record changer (Webster 50) with QT cartridge	1	
C50	C-8G-11741	330 mmf, ceramic	1	QT	Crystal cartridge with needle	1	
C42	C-8D-11304	.02 mf x 200 volts	1		Needle only	1	



- ① I.F. = 455 KC.
- ② ALL RESISTORS 1/8 WATT
- ③ AND ALL PAPER CAPACITORS
- ④ 150 VOLTS UNLESS OTHERWISE MARKED.
- ⑤ K = KILOHMS
- ① 1.468 LOOP ANTENNA
- ② 2.215 2 GANG VARIABLE CONDENSER
- ③ 1.470 OSCILLATOR COIL
- ④ 1.412-3 1 ST. I.F. TRANSFORMER

- ⑤ 1.413-3 2ND I.F. TRANSFORMER
- ⑥ 8.201-6 VOLUME CONTROL & SWITCH
- ⑦ 30.317 SPEAKER WITH TRANSFORMER
- ⑧ 5.417 8 MFD, 100 V. ELEC. CAPACITOR
- OR 5.426

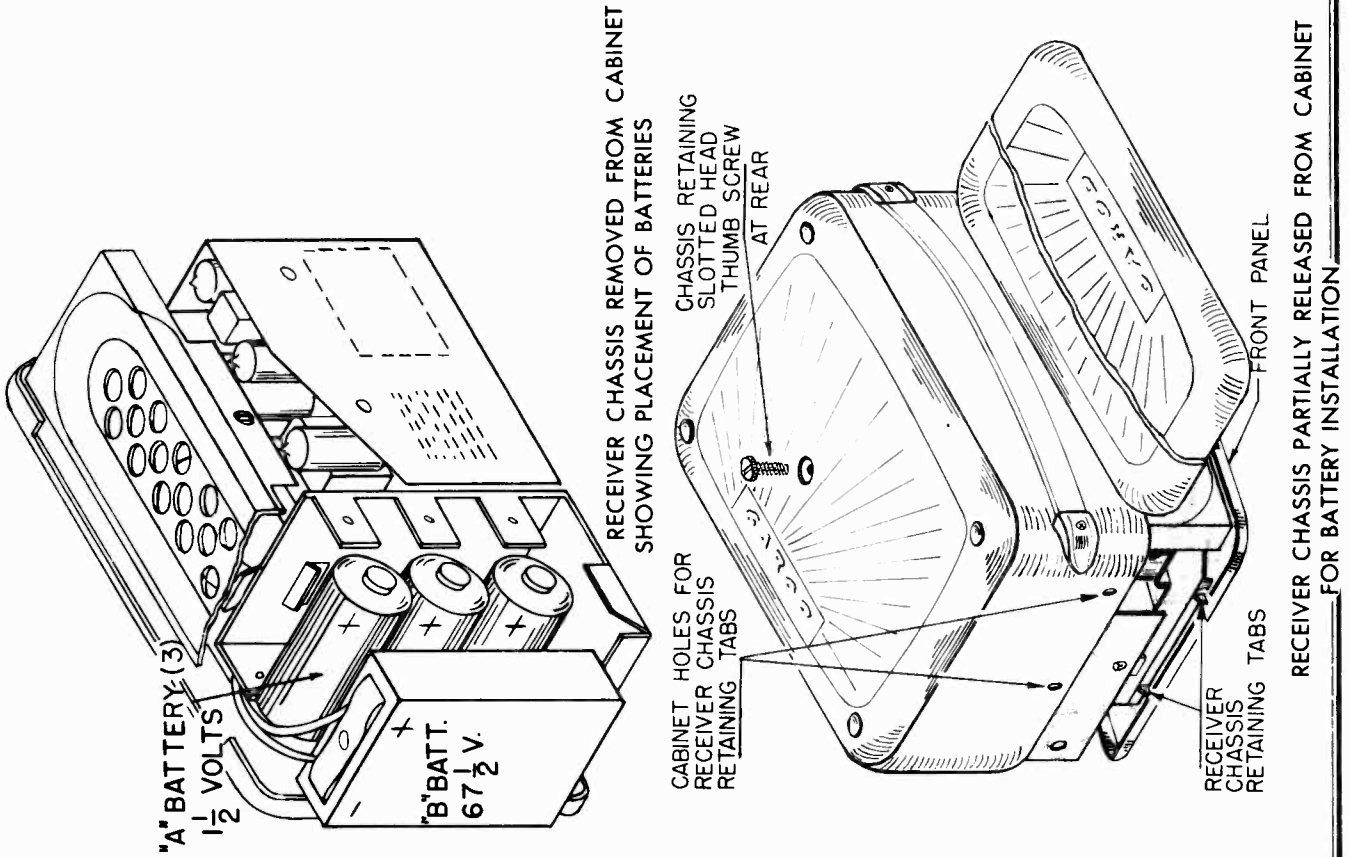
**TUNING RANGE:** Broadcast 540 to 1650 Kilocycles (180 to 555 meters).  
**DIAL SCALE:** The dial scale is calibrated in kilocycles. Example: Read "60" as 600 Kc.

**TUBES:** The tubes used and their functions are as follows:  
 1R5 Converter  
 1L4 IF. Amplifier  
 IS5 Detector, AVC and Audio Amp.  
 3S4 Power Amplifier  
 For the placement of these tubes, see the diagram showing tube layout.

**BATTERY VOLTAGE:** This personal receiver is designed for operation from three self contained 1 1/2 volt "A" batteries and a 67 1/2 volt "B" battery.

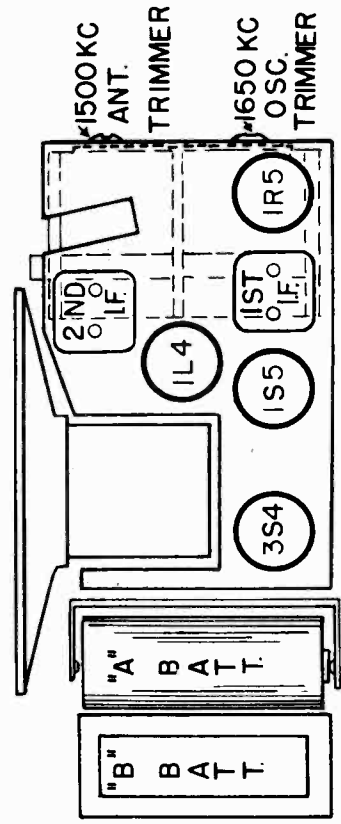
**BATTERY REQUIREMENTS:** The following batteries are required:

QUANTITY	TYPE	MANUFACTURER
3	1 1/2 volt "A"	Eveready size "D", Burgess No. 2, Ray-O-Vac size "D" or equivalent.
1	67 1/2 volt "B"	Eveready #467, Burgess Type XXD, Ray-O-Vac Type 4367 or equivalent.

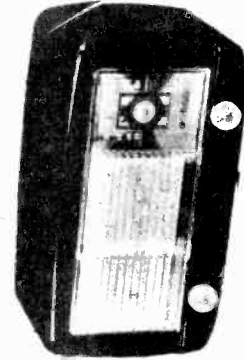
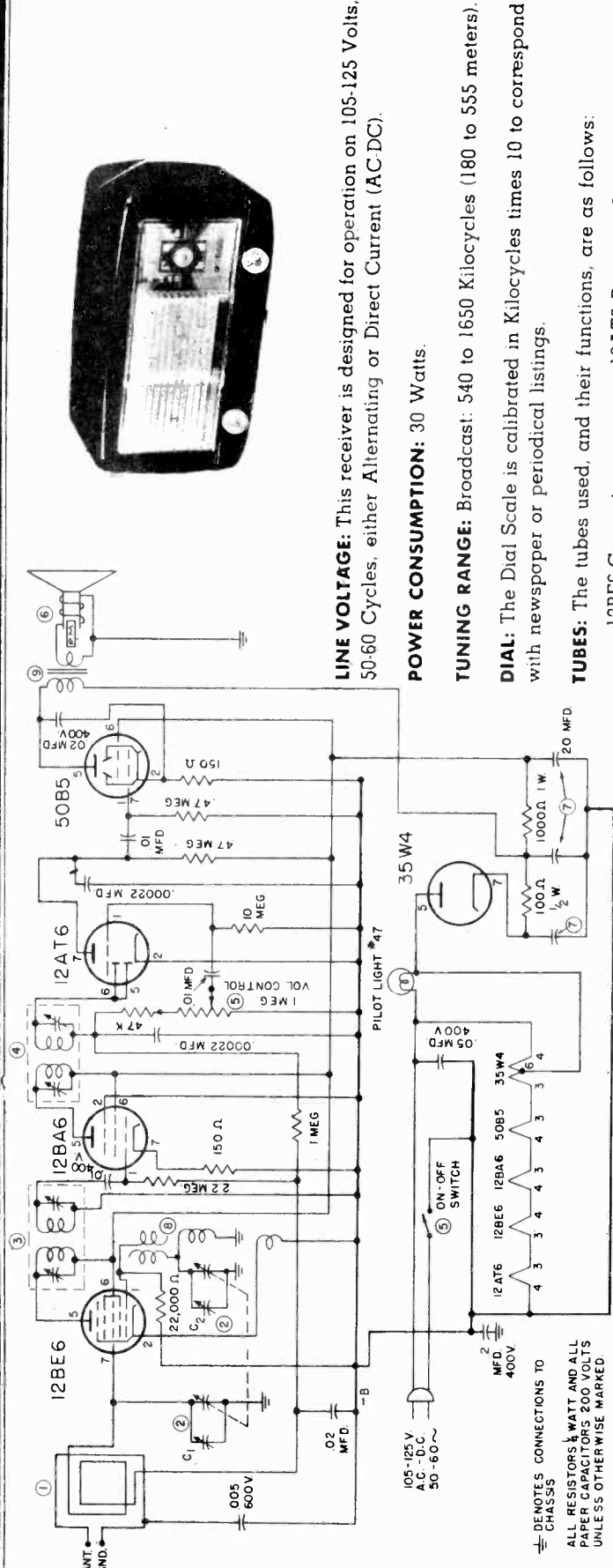


**ALIGNMENT:** (Receiver removed from cabinet.) Should it become necessary at any time to check the alignment of this receiver, proceed as follows:

- (1) Set the signal generator to 455KC and connect to the Stator Lug or green wire (front section) of Variable Capacitor. Connect the signal generator ground lead to the chassis. Connect a suitable output meter across the speaker voice coil connections. Turn the Volume Control to the maximum position. Turn the Variable Capacitor to the extreme clockwise position (minimum capacity). Remove P.K. screws holding loop in place and move loop away from I.F. transformers.
- (2) Adjust the trimmers located at the top of the first and second I.F. Transformers for maximum output, as indicated on the output meter. Replace the loop in its original position.
- (3) Loosely couple the signal generator lead to the loop and set to 1650 KC.
- (4) With the Variable Capacitor set at minimum capacity, tune in the 1650 KC signal by means of the oscillator trimmer on the Variable Capacitor (Rear Section).
- (5) Set the signal generator to 1500 KC and turn the tuning control until this frequency is heard. Adjust the antenna trimmer on the Variable Capacitor (front section) for maximum output. No other adjustments are necessary.



TUBE AND TRIMMER LOCATION DIAGRAM



**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:

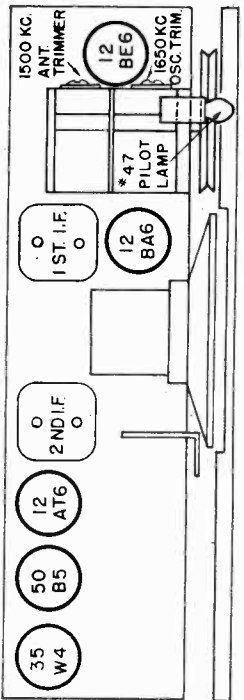
- 12BE6 Converter
- 12BA6 I.F. Amplifier
- 12AT6 Detector, Avc and Audio Amp.
- 50B5 Beam Power Amplifier
- 35W4 Rectifier

(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.

**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.



TRIMMER AND TUBE LOCATION DIAGRAM

- ① 1.464 LOOP ANTENNA
- ② 2.215 2 GANG VARIABLE COND.
- ③ 1.259 1ST I.F. TRANSFORMER
- ④ 1.409 2ND I.F. TRANSFORMER
- ⑤ 9.200 OUTPUT TRANSFORMER
- ⑥ 8.200-1 VOLUME CONTROL & SWITCH
- ⑦ 30.300 P.M. SPEAKER
- ⑧ 5.415-1 ELECTROLYTIC CAP 40-40-20MFD.
- ⑨ 1.402-1 OSCILLATOR COIL

⊖ DENOTES CONNECTIONS TO CHASSIS  
 ALL RESISTORS 1/2 WATT AND ALL PAPER CAPACITORS 200 VOLTS UNLESS OTHERWISE MARKED





GAROD RADIO CORP.

MODELS 9FMP,  
9FMPA, 9FMPU

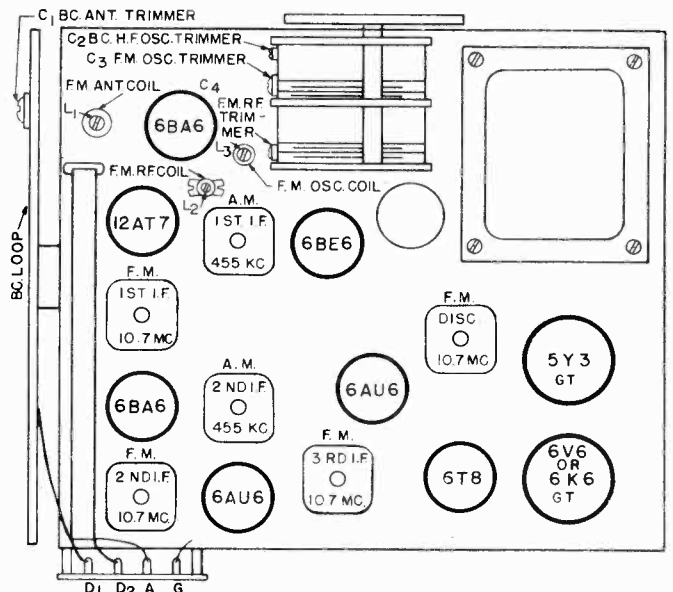
ALIGNMENT CHART  
(Follow Sequence as Indicated)

CIRCUIT ALIGNED	STEP	RCVR. DIAL POINTER	SIGNAL GENERATOR		METER	METER CONNECTIONS	TRIMMER OR CORE ADJ.	PROCEDURE
			FREQUENCY	CONNECTIONS				
B.C. I.F.	1	1650 KC. B.C. Band	455 KC. 30% Mod.	Through .1 MFD CAP. TO GRID of 6BE6.	A.C. Output Meter	Across voice coil	Cores on top and bottom of 1st and 2nd I.F. trans.	Adjust for maximum output
F.M. I.F.	2	108.5 MC. F.M. Band	10.7 MC. unmod.	Through .01 MFD. Cap. to grid of 12AT7.	D.C. VTVM	From Pin 1 limiter grid and ground	Top and bottom cores of 1st, 2nd and 3rd I.F. Trans. F-M	Same as step 1
F.M. I.F.	3							Repeat step 2
F.M. Disc.	4	108.5 MC. F.M. Band	10.7 MC. unmod.	Same as step 2	D.C. VTVM	From junction of 100K disc. load resistor point "A" and ground	Bottom core of 10.7 MC Disc. Trans.	Same as step 1
F.M. Disc.	5	108.5 MC. F.M. Band	10.7 MC. unmod.	Same as step 2	D.C. VTVM	From Pin 3 6T8 and ground	Top core of 10.7 Mc Disc. Trans.	Adjust for zero between positive and negative meter reading
F.M. Osc. (high Freq. end)	6	108.5 MC. F.M. Band	108.5 MC. unmod.	Through balanced 300 ohm dummy ant. to D1, D2 and ground terminals	D.C. VTVM	From Pin 1 limiter grid and ground	C3	Same as step 1
F.M. Osc. (low freq. end)	7	87.5 MC. Band 1	87.5 MC. unmod.	Same as #6	D.C. VTVM	Same as #6	Oscillator coil core L3	Same as step 1
F.M. Osc.	8	REPEAT STEPS 6 AND 7 AS NECESSARY						
F.M. R.F. Circuit	9	105 MC. Band 1	105 MC. unmod.	Same as #6	D.C. VTVM	Same as #6	C4	Same as step 1
	10	90 MC. Band 1	90 MC. unmod.	Same as #6	D.C. VTVM	Same as #6	R.F. coil core L2	Same as step 1
F.M. ANT. Circuit	11	105 MC.	105 MC.	Same as #6	D.C. VTVM	Same as #6	C5	Same as step 1
	12	90 MC. Band 1	90 MC. unmod.	Same as #6	VTVM D.C.	Same as #6	Antenna coil core L1	Same as step 1
B.C. Osc.	13	1650 KC. Band 2	1650 KC. 30% mod.	Through loop, or coupled to receiver loop by a 2 or 3 turn loop.	Output meter	Across voice coil	C2	Same as step 1
B.C.R.F.	14	1500 KC. Band 2	1500 KC 30% mod.	Same as #13	Output meter	Across voice coil	C1	Same as step 1

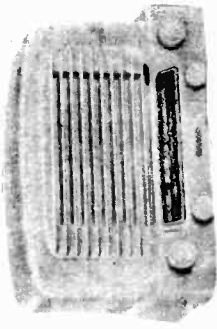
During the alignment procedure all adjustments should be made under the following conditions:

- (A) Line voltage set at 117 volts A.C.
- (B) Volume control at maximum position.
- (C) Tone control set at extreme left position (Treble).
- (D) Minimum input from the signal generator. This procedure should be adhered to, otherwise adjustments will be broad, due to the action of the automatic volume control.

Refer to the trimmer and tube location diagram below for trimmer and core location. Follow the sequence in the alignment chart for proper alignment procedure.



TUBE AND TRIMMER LOCATION DIAGRAM



**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 (160 to 555 Meters). Short Wave: 5.7 to 18.5 Megacycles (16 to 33 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:

- 6B16 R. F. Amplifier
- 12AT6 Detector, Avc and Audio Amp.
- 12BE6 Beam Power Amplifier
- 6B16 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 is used to select the desired broadcast or shortwave station along the slide-rule dial, the frequency of which is indicated by the dial pointer.

(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.

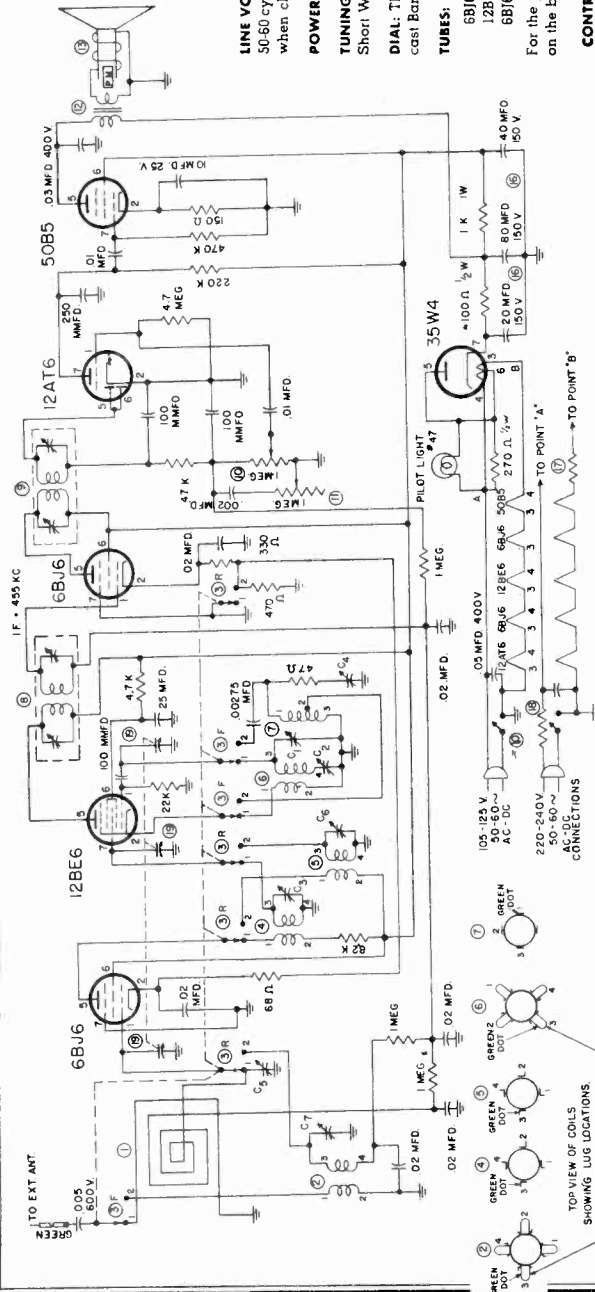
(4) Set the signal generator to 600 KC and turn the Tuning Control so that this frequency is indicated on the dial. Adjust the broadcast oscillator paddler capacitor (C2) for maximum response while "rocking" the variable capacitor. Repeat the last three steps until no further improvement can be made.

**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.



- ① 435 LOOP ASSEMBLY
- ② 433 SW ANT COIL
- ③ 1209-B BAND SWITCH
- ④ 1432 BC INTERSTAGE COIL
- ⑤ 1434 SW INTERSTAGE COIL
- ⑥ 1436 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 4.05 TRIMMER STRIP - C<sub>1</sub>, C<sub>2</sub>, C<sub>3</sub>, C<sub>4</sub>
- ⑭ 4.07 TRIMMER STRIP - C<sub>5</sub>, C<sub>6</sub>, C<sub>7</sub>
- ⑮ 5.400-7 ELECTROLYTIC CAP 80-40-20MFD-50V
- ⑯ 6.206 160 Ω WIRE WOUND RESISTOR-5W, 1250-400V
- ⑰ 6.201 380 Ω LINE CORD RESISTOR-40W OPERATION ONLY
- ⑱ 2.202 VARIABLE CAP - SCANG

**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)**

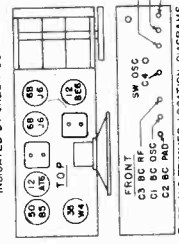
**I. F. Adjustment:**

(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.

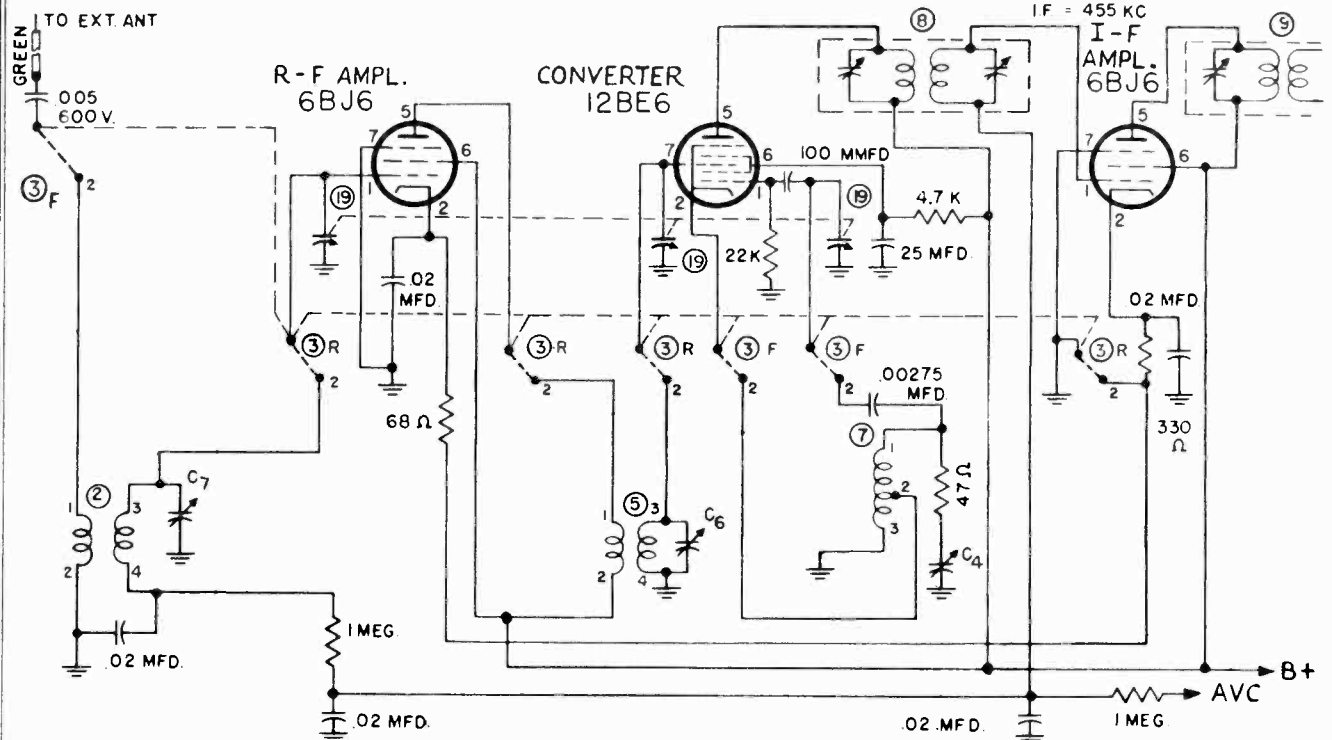


# CLARI-SKEMATIX

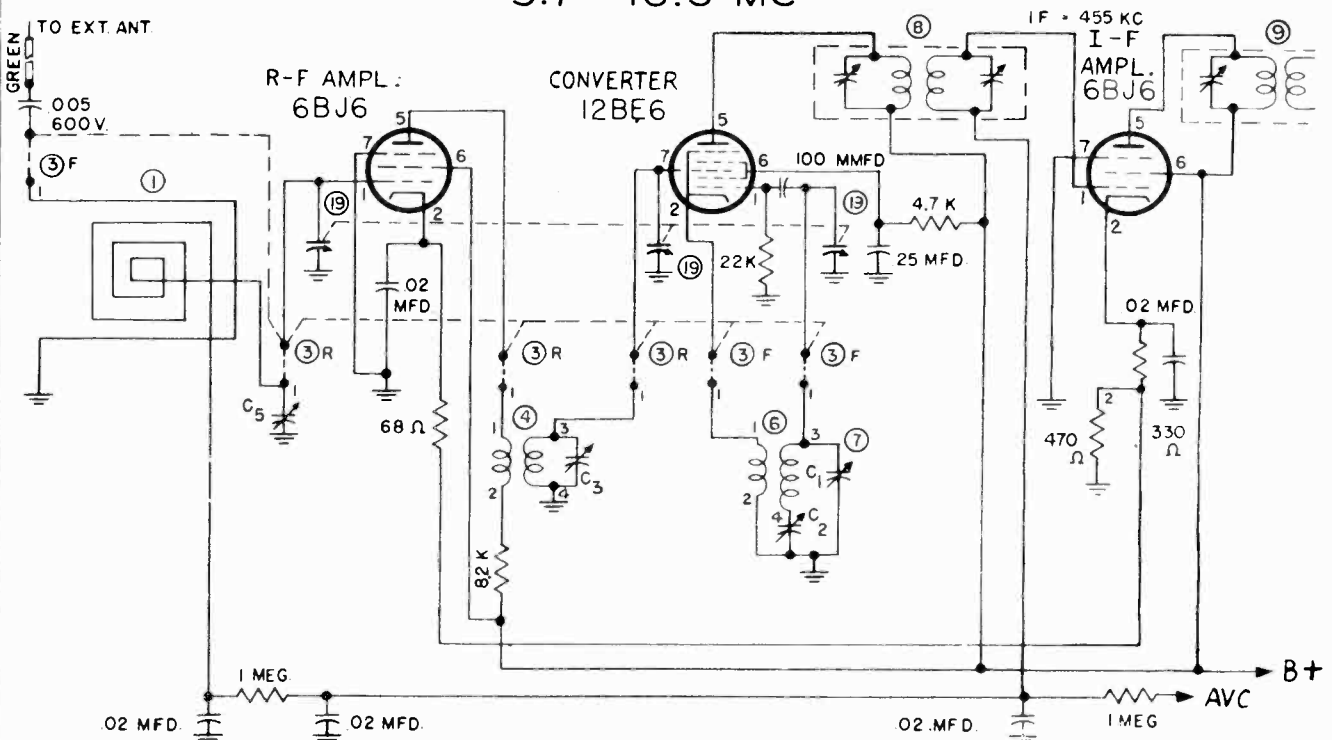
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## GAROD RADIO CORP.

MODEL 62B



BAND-SWITCH SHOWN AT 1ST POSITION. SHORT WAVE BAND. 5.7 - 18.5 MC

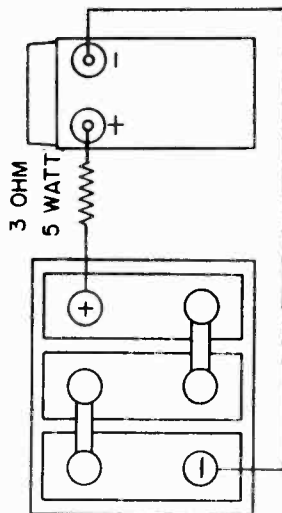
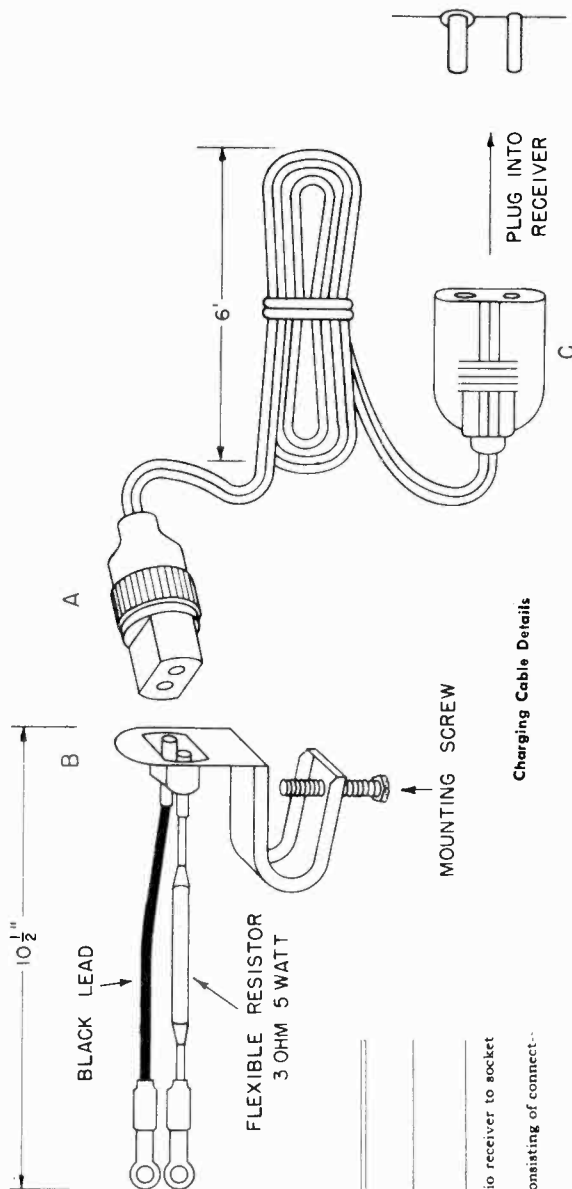


BAND-SWITCH SHOWN AT 2ND POSITION CLOCKWISE. BROADCAST BAND 540 - 1650 KC



GENERAL ELECTRIC CO.

MODEL LMLA  
CHARGING CABLE



6 VOLT STORAGE BATTERY (AUTOMOBILE)  
2 VOLT STORAGE BATTERY (RADIO)  
**IMPORTANT: TERMINALS OF LIKE POLARITY MUST BE CONNECTED TOGETHER.**

Basic Charging Circuit

**REPLACEMENT PARTS LIST**

CAT. NO.	SYMBOL	DESCRIPTION
<b>SPECIALIZED REPLACEMENT PARTS</b>		
RJX-012		CORD—6-foot cord assembly, connecting radio receiver to socket on automobile dashboard
RJX-013		BRACKET ASSEMBLY—Socket assembly, consisting of connecting leads, socket, clamp, and flexible resistor
RRW-017		RESISTOR—3 ohm, 5 w., flexible resistor

**GENERAL INFORMATION**

The Model LM-1A charging cable may be used with General Electric receivers using a 2-volt rechargeable battery unit. It provides a convenient means of charging the radio battery directly from your automobile battery when the 115-volt house current is not available, such as when traveling or camping.

With a fully charged automobile battery, it is normally unnecessary to run the engine of your car while charging the radio battery. However, operating the automobile engine during part of the charging cycle will hasten the charging process.

The cable is supplied in two sections as shown in the illustration. The short section is permanently installed to the underside of the automobile dashboard and connects the longer cable to the 6-volt automobile battery at the ammeter or fuse block. The leads connected to the shorter cable must not be cut nor lengthened. The longer cable connects the receiver to the end of the short cable to which receptacle "B" is attached.

**INSTALLATION**

1. Determine the polarity of the car battery. If the positive battery terminal is connected to the frame of the car, the black lead of the short cable should be connected to the ammeter terminal.

**CAUTION:** If the positive terminal of the automobile battery is grounded, avoid contact between the metal of the receiver case and the metal of the car.

If the negative terminal is connected to the frame of the car, the colored lead or the lead with the flexible resistor should be connected to the ammeter terminal.

**(NOTE:** Connection may be made to either terminal of the ammeter. If this connection is made to the battery side of the ammeter, the ammeter will not indicate discharge while the radio battery is being charged.)

2. The remaining terminal on the short cable must be securely fastened to the car dashboard or frame of the car.

3. Fasten the male plug B to the underside of the dashboard so that it is convenient to insert plug A of the remainder of the charging cable.

**HOW TO CHARGE THE RADIO BATTERY**

1. Open the rear door of the radio. Two prongs will be found mounted on the chassis near the tuning capacitor. Plug "C" of the charging cable should be pressed fully on these prongs with the larger prong fitting into the larger hole of the plug.

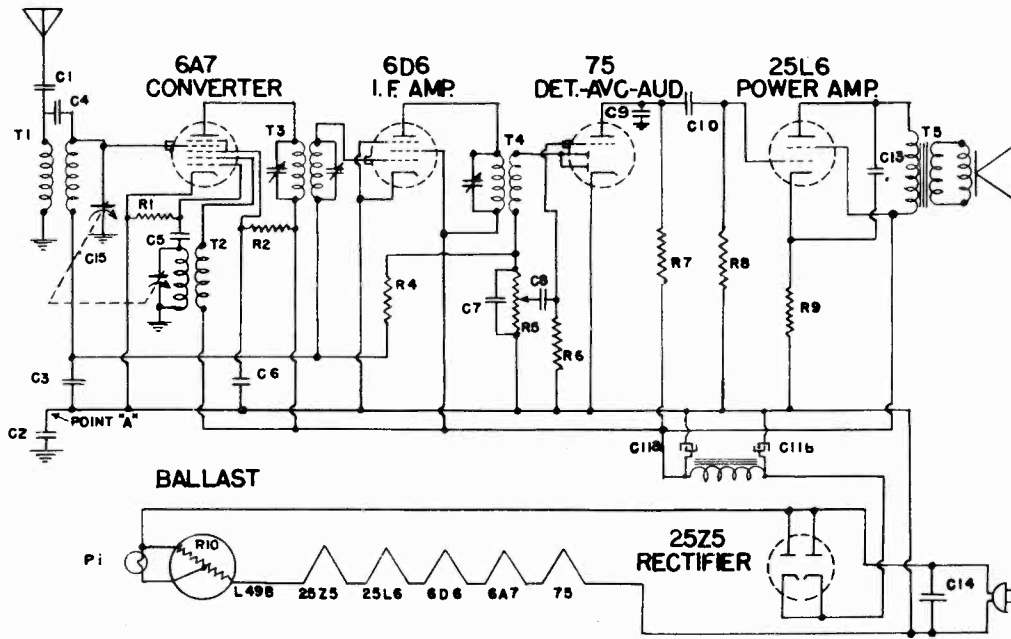
2. Insert plug "A" into the receptacle "B" which is installed on the dashboard.

3. With the receiver switched to the CHARGE position, a completely discharged battery will in most cases be fully charged within 20 hours. After the red ball in the radio battery has risen, checks should be made every two hours to determine the degree of charge. When both indicator balls are visible, the charging should be discontinued.

4. If the receiver is switched to the ON position, it can be operated while the battery is being charged. However, since the receiver will be consuming power at about the same rate as the radio battery is being charged, little or no improvement in the condition of the radio battery will result.

Charging Cable Details

MODELS GD-510, GD-511, GENERAL ELECTRIC CO.  
 GD-512, GD-512W,  
 GD-512X,  
 GD-513



**GENERAL INFORMATION**

Models GD-510 and GD-513 are five-tube AC-DC superheterodyne receivers employing five General Electric Pre-Tested Tubes plus a ballast tube. One side of the power line is connected directly to the chassis ground in either receiver; therefore, caution should be exercised in servicing.

Models GD-511, GD-512, GD-512W, and GD-512X, are five-tube AC-DC superheterodyne receivers, employing five General Electric Pre-Tested Tubes plus a ballast tube. These models are fully approved by Underwriters' Laboratories.

When operating from a DC source of power, it is necessary to insert the power plug with proper polarity; otherwise, the receiver will fail to function. If excessive hum is noticed when the receiver is used on AC, reverse the power plug in the receptacle.

**ALIGNMENT PROCEDURE**

**Alignment Frequencies**

I.F.—456 kc. . . . . Broadcast—1500 kc  
 The location of all trimmers is shown in Fig. 1.

**I.F. Alignment**

Connect an output meter across the voice coil. Set the volume control for maximum.

Set test oscillator to 456 kc and apply signal to the control grid of the 6A7 tube through a .05 mfd. capacitor. Do not remove the grid lead from the 6A7. Keep the test oscillator output as low as possible to give a readable output. Adjust all three I.F. trimmers for maximum output.

**R.F. Alignment**

Set test oscillator to 1500 kc and connect one output lead to the receiver chassis† and the other through a 250 mmf. capacitor in series with 200 ohms to the receiver antenna lead. Adjust the oscillator trimmer (C-15) and antenna trimmer (C-16) for a maximum output.

† **Precaution**—In Models GD-510 and GD-513, one side of the power supply is connected to the chassis. Do not connect chassis to any external ground. If the signal generator is AC operated, connect a .05 mfd. capacitor in series with the ground side before connecting it to the receiver chassis.

**NOTE:**

C2 USED ON MODELS GD-511, 512, 512W, 512X ONLY. ON MODELS GD-510 AND GD-513 POINT "A" IS CONNECTED TO CHASSIS.

**VOLTAGE CHART**

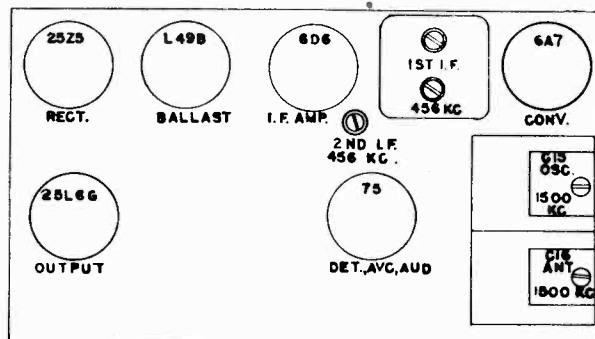
Tube No.	6A7	6D6	75	25L6	25Z5
Plate to -B Volts	90	90	55*	75	120 AC
Screen to -B Volts	40	90	..	90	..
Cathode to -B Volts	0	0	0	7	135
Filament Volts	6.3	6.3	6.3	25	25

Voltage measured when volume control is set to minimum.

Line Voltage—120 AC. No signal input.

\* Measured on 500-volt scale.

On DC, voltages should read approximately 10 per cent lower.



**Trimmer Location**

GENERAL ELECTRIC CO. MODELS GD-510, GD-511, GD-512, GD-512W, GD-512X, GD-513

**Tuning Control Drive Ratio**.....7-1/2:1

**Electrical Specifications**

105-125 V. AC-DC, 40-60 Cycles, 45 Watts

**Tuning Frequency Range**

Band "B".....540-1700 kc

**Electrical Power Output**

Undistorted.....1.1 watts  
Maximum.....2.0 watts

**Loud-speaker—Electrodynamic**

Outside Cone Diameter.....5 inches  
Voice Coil Impedance (400 cycles).....6 ohms  
Field Resistance (cold).....450 ohms

**Tubes**

Oscillator and Converter.....GE-6A7  
I.F. Amplifier.....GE-6D6  
Det., AVC, 1st Audio.....GE-75  
Power Output.....GE-25L6  
Rectifier.....GE-25Z5  
Ballast.....BL-49-B  
Pilot Lamp.....Mazda No. 44

Symbol	Description	Symbol	Description	Symbol	Description
C-1	.005 mfd., paper capacitor	C-10	.01 mfd., paper capacitor	R-6	5 megohms. carbon resistor
C-2	.25 mfd., paper capacitor (Used on Models GD-511, 512, 512W, 512X)	C-11a	20 mfd., dry electrolytic	R-7	250,000 ohms. carbon resistor
C-3	.02 mfd., paper capacitor	C-11b	20 mfd., dry electrolytic	R-8	500,000 ohms. carbon resistor
C-4	.5 mmf., Gimmik	C-13	.005 mfd., paper capacitor	R-9	150 ohms. carbon resistor
C-5	50 mmf. mica capacitor	C-14	.05 mfd., paper capacitor	R-10	Ballast resistor
C-6	.05 mfd., paper capacitor	C-15	Tuning condenser	T-1	Antenna transformer
C-7	250 mmf., mica capacitor	P-1	Pilot light	T-2	Oscillator transformer
C-8	.01 mfd., paper capacitor	R-1	50,000 ohms. carbon resistor	T-3	1st I.F. transformer
C-9	250 mmf., mica capacitor	R-2	30,000 ohms. carbon resistor	T-4	2nd I.F. transformer
		R-4	2 megohms. carbon resistor	T-5	Output transformer
		R-5	500,000 ohms. volume control		

**REPLACEMENT PARTS LIST**  
Models GD-510, GD-511, GD-512, GD-512X, GD-512W, and GD-513

Stock No.	Description	Stock No.	Description
RB-907R	BACK COVER—Cabinet back cover, for GD-512, GD-512X, GD-512W, GD-513	*RQ-1317	RESISTOR—250,000 ohm, 1/2-W. carbon (R-7) (Pkg. of 5)
RB-908R	BACK COVER—Cabinet back cover, for GD-510 and GD-511	*RQ-1324	RESISTOR—0.5 megohm, 1/2-W. carbon (R-8) (Pkg. of 5)
*RC-023	CAPACITOR—.005 mfd., 600 V. paper (C-1, -13)	*RQ-1339	RESISTOR—2.0 megohm, 1/2-W. carbon (R-4) (Pkg. of 5)
*RC-039	CAPACITOR—.01 mfd., 600 V. paper (C-8, -10)	*RQ-1347	RESISTOR—5.0 megohm, 1/2-W. carbon (R-6) (Pkg. of 5)
*RC-048	CAPACITOR—.02 mfd., 600 V. paper (C-3)	*RR-749	RESISTOR—Ballast resistor BL-49B (R-10)
*RC-092	CAPACITOR—.05 mfd., 600 V. paper (C-6, -14)	RS-199R	SHIELD—Tube shield, base and cap (complete)
*RC-216	CAPACITOR—50 mmf. mica (C-5)	RS-245R	SOCKET—Tube socket, 6 prong
*RC-259	CAPACITOR—250 mmf. mica (C-7, -9)	RS-246R	SOCKET—Tube socket, 7 prong
RC-740R	CONDENSER—Tuning condenser (C-15)	*RS-200	SOCKET—Tube socket, Octal (Pkg. of 5)
RC-5126R	CAPACITOR—20 mfd., 150 V. electrolytic (C-11a, -11b)	RS-248R	SOCKET—Pilot lamp socket
RC-8113R	CORD—Line cord	RS-1006R	SPEAKER—Speaker complete with transformer
RC-9006R	CONE—Speaker cone and voice coil assembly	RT-305R	TRANSFORMER—1st I.F. transformer (T-3)
RK-038R	KNOB—Control knob (walnut)	RT-306R	TRANSFORMER—2nd I.F. transformer (T-4)
RK-039R	KNOB—Control knob (ivory)	RT-458R	TRANSFORMER—Output transformer (T-5)
RL-079R	COIL—Antenna coil (T-1)	RV-062R	VOLUME CONTROL—Volume control and power switch (R-5)
RL-282R	COIL—Oscillator coil (T-2)	RW-033R	WINDOW—Celluloid dial scale window
RP-120R	POINTER—Dial pointer	RZ-142R	CABINET—Cabinet for GD-512X
*RQ-1239	RESISTOR—150 ohm, 1/2-W. carbon (R-9) (Pkg. of 5)	RZ-143R	CABINET—Cabinet for GD-512W
*RQ-1295	RESISTOR—30,000 ohm, 1/2-W. carbon (R-2) (Pkg. of 5)	RZ-144R	CABINET—Cabinet for GD-512 and GD-513
*RQ-1299	RESISTOR—50,000 ohm, 1/2-W. carbon (R-1) (Pkg. of 5)	RZ-149R	CABINET—Cabinet for GD-510 and GD-511

\* Used on previous receivers.



MODEL X-415

GENERAL ELECTRIC CO.



## SPECIFICATIONS

### CABINET:

Model	X415
Material	Wood
Color	Mahogany
Height	14½ in.
Width	20 in.
Depth	12½ in.

### ELECTRICAL RATING (INPUT):

50-60 Cycles	105 Watts
Nominal Voltage	Range in Volts
110	103-117
125	117-133
150	140-160
200	185-213
225	213-234
245	234-260

### OPERATING FREQUENCIES:

Standard Band	540 to 1600 kc
Short Wave 1	9.4 to 9.9 mc
Short Wave 2	11.6 to 12.1 mc
Frequency Modulation 1	42 to 50 mc
Frequency Modulation 2	88 to 108 mc
AM I-F Frequency	455 kc
FM I-F Frequency	10.7 mc

### POWER OUTPUT (117 volts line):

Undistorted	4.0 watts
Maximum	5.5 watts

### LOUDSPEAKER:

Type	Alnico PM
Size	8 inches
Voice Coil Impedance (400 cps)	3.5 ohms

### ANTENNA INPUTS:

Broadcast and Shortwave—conventional antenna
FM—300-ohm input for folded dipole

### TUBE COMPLEMENT:

R-F Amplifier	6AK5
Converter	6AK5
Oscillator	6AK5
1st I-F Amplifier	6SG7
2nd I-F Amplifier	6SV7
FM Limiter—AM Detector	6SH7
Discriminator—1st A-F Amplifier	6AQ7-GT
Power Amplifier	6V6GT
Rectifier	5Y3GT
Dial Lamp (2)	G-E No. 44

## GENERAL INFORMATION

### THE TUNING SYSTEM

The "r-f end" of the receiver is unusual in a number of respects. Variable inductance tuning is employed instead of using a conventional tuning capacitor. This design makes possible two distinct advantages. First, it provides a high efficiency FM circuit in the 88 to 108 megacycle range which would not be possible with the more conventional methods of tuning. Second, it provides stable short-wave spread-bands which tune as easily as the broadcast band. Other advantages are also obtained but the two mentioned above are the most important.

Tuning is accomplished by an "elevator" which consists of a rigid plastic horizontal plate raised and lowered by means of a windlass controlled by the tuning knob at the panel. From this plate are suspended three powdered iron cores which tune the broadcast r-f, converter, and oscillator coils; and three tuning "vanes" which tune three low-inductance circuits. These latter circuits are employed in both FM bands and both short wave bands, with the exception of the antenna circuit for the shortwave spread bands when a broad tuned antenna coil is used and the r-f guillotine tuner is switched out. They are called "guillotine" tuners because of their appearance.

### FACTS ABOUT "GUILLOTINE" TUNING

The "guillotine" tuners are designed primarily for the 88-108 megacycle FM band where special technique is needed to realize high gain and circuit stability. Ordinary coils, tuned by a variable capacitor are inefficient at these frequencies, first, because of the low inductances required to reach these frequencies when a variable tuning capacitor is employed and, second, because shunt capacity reduces the gain of the amplifier circuit; shunt capacity must be kept very low. Another disadvantage of standard tuning arrangements at these frequencies is that common coupling is obtained through the shaft of a ganged tuning capacitor unless insulated single sections are used (cumbersome and costly). Common coupling of this type tends to cause oscillation or general instability and precludes high gain per stage. The guillotines make possible short leads, completely isolated sections, stable tuning, high Q circuits, low shunt capacity, and location of each tuner in the best physical and electrical position in the assembly. Furthermore, since the shunt capacity is small and the inductance is consequently at its highest corresponding value, the additional unavoidable inductance introduced in the wiring, bandswitch, etc., produces a minimum of circuit losses and unbalance.

The guillotine tuner consists of a heavy, silver-plated, two-turn square coil, rigidly supported between two plastic posts. A flat, solid vane slides up and down between the two turns. It is guided in grooves in the plastic posts so that it passes between the two sections of the coil without touching them. The posts are so moulded and the coil so constructed that the whole assembly is held rigidly at a predetermined spacing. The tuning vane is raised and lowered by the tuning elevator. When the elevator is all the way up (set tuned to lowest frequency), the vane is completely above the coil which then acts as a simple two-turn coil. As the set is tuned toward the higher frequencies, the vane moves downward into the field of the coil until, finally, it is all the way in. The vane reduces the inductance of the coil through two principles. First, it acts as a shorted turn, and thus reduces inductance directly; second, it provides a barrier between the two turns of the coil which reduces the mutual coupling and thus also reduces inductance.

The tuners described above are identified as T2, T4, and T5, on the schematic diagram.

### FM BANDS

Guillotine tuners T2, T5, and T4 are used as the tuned circuits for the r-f amplifier, converter, and local oscillator respectively, in both FM bands. In the higher frequency band, the tuner is used with only a small shunt trimmer for adjusting distributed capacity. In the lower band, a higher value shunt trimmer is used to reduce the frequency. The layout of band switch, tuners, and tube sockets is arranged to give the shortest possible leads when the FM bands are in use. The lead length in the other bands is not nearly so critical.

**SHORT WAVE SPREAD-BANDS**

Bandspread tuning in the short wave bands is obtained in the converter and oscillator circuits by inserting the guillotine tuners in series with a higher inductance so that the two inductances together form the "L" part of the short wave tuned circuit. The small percentage change in inductance obtained in the tuner provides smooth, wide, and stable tuning. The "C" part of the tuned circuit consists primarily of a shunt trimmer. Switching from one short wave band to the other is accomplished by selecting a different shunt trimmer.

The converter grid circuit, as an example, includes L7 and T5 in series in both the SW1 and SW2 bands. Tuner T5 is in the ground end of the circuit and the signal is fed into the grid end through C10. The shunt tuning capacity is either C56 or C57, depending upon which of the two short wave bands is used. Additional oscillator coupling capacitors, C72 or C73, are also added to compensate for the lower coupling through C67 when the higher shunt capacitors are in the circuit.

In the r-f stage, a section of the antenna tracking coil is used as the grid circuit. It is tuned for resonance by a shunt capacitor (C54 and C55) and a shunt inductance (L20). Because a tuned circuit of this type is inherently broad, tuning through the relatively narrow spread-band offers little advantage and is not done.

**STANDARD BROADCAST BAND**

When manual tuning is employed (Band Switch in STD position), the receiver employs an r-f stage, a converter, and an oscillator, all of which are tuned by iron slugs suspended from the tuning elevator. In the automatic position (Band Switch in the AUTO position), the r-f stage is not used. Instead, a separate antenna coil is used which couples the antenna directly into the converter. A separate coil is used in order to make the tuning circuit independent of the dial tuning mechanism so that it may be turned by trimmers in the push-button assembly.

Switching from manual to automatic tuning is accomplished in the oscillator by using an oscillator coil which is tuned by a separate shunt inductance. In manual tuning, the inductance is one which is tuned by the tuning elevator. In automatic tuning, a fixed shunt capacity (C76) plus one of a series of push-button selected coils tunes the oscillator.

**I-F AMPLIFIER**

The i-f amplifier consists of a composite 455 kc and 10.7 mc circuit. The electrical changes required to transfer between

AM and FM service are made by the Band Switch. When the switch is in either the FM1 or FM2 position, the amplifier operates at 10.7 megacycles and delivers the i-f signal into an FM discriminator circuit. When the switch is in any of the other positions, the amplifier operates at 455 kc. Screen voltage is removed from the tube which acted as an FM limiter and this tube then acts as an AM diode detector. Thus, the AM audio signal appears across R16 while the FM audio signal appears across R22. A section of the Band Switch switches the audio input circuit from one to the other. The AVC bus is also shorted out for FM.

**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 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.....	4 @ 1000 kc
Antenna post to V1 grid.....	2 @ 9.6 mc
Antenna post to V1 grid.....	2 @ 11.8 mc

Signal applied through 300-ohms, including signal generator impedance:

Dipole terminals to V1 grid.....	1.5 @ 45 mc
Dipole terminals to V1 grid.....	2 @ 98 mc

These checks with oscillator tube (V3) removed:

V1 grid to V2 grid.....	13 @ 1000 kc
V1 grid to V2 grid.....	6 @ 9.6 mc
V1 grid to V2 grid.....	9 @ 11.8 mc
V1 grid to V2 grid.....	13 @ 45 mc
V1 grid to V2 grid.....	10 @ 98 mc

These checks with oscillator tube (V3) removed:

V2 grid to V4 grid.....	23 @ 455 kc
V2 grid to V4 grid.....	37 @ 10.7 mc
V4 grid to V5 grid.....	23 @ 455 kc
V4 grid to V5 grid.....	58 @ 10.7 mc
V5 grid to V6 grid.....	40 @ 455 kc
V5 grid to V6 grid.....	17 @ 10.7 mc

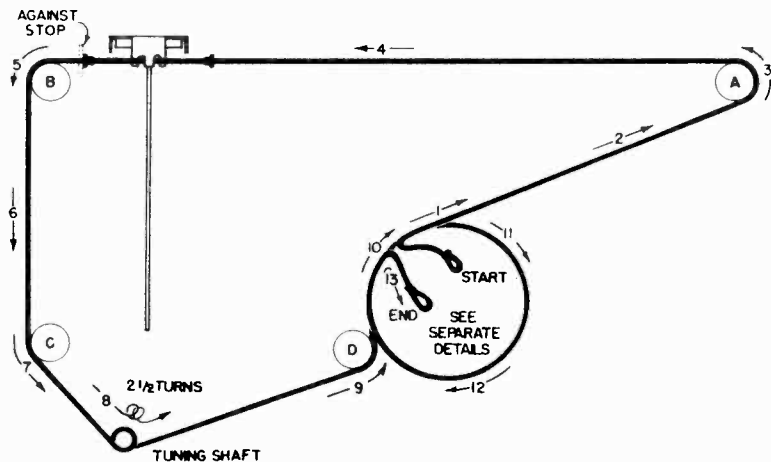


Figure 1—Dial Stringing Diagram Showing Spring Details at Right

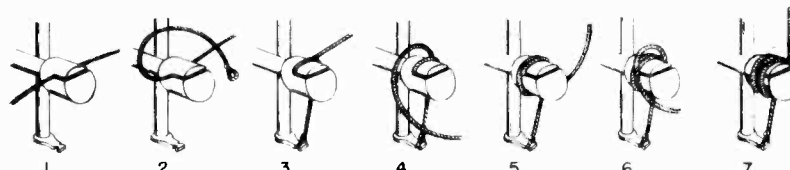
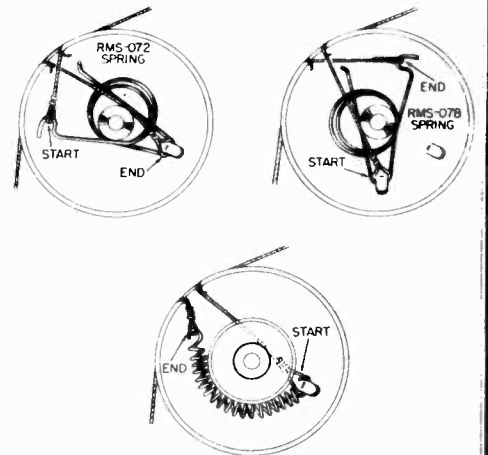


Figure 2—Elevator Windlass Stringing Procedure

**(2) Audio Gain**

.07 volts at 400 cps across volume control with control set at maximum will give approximately 1/2 watt output across the speaker voice coil.

**(3) Oscillator Grid Bias**

D-c voltage developed across R5 (average):  
 13 v. @ 1000 kc      2.7 v. @ 11.8 mc  
 2.7 v. @ 9.6 mc      5.5 v @ 45 mc  
 7 v. @ 98 mc

**(4) Socket Pin Voltages**

Fig. 8 shows typical tube pin voltages. All readings should be made from the pins to ground unless otherwise indicated.

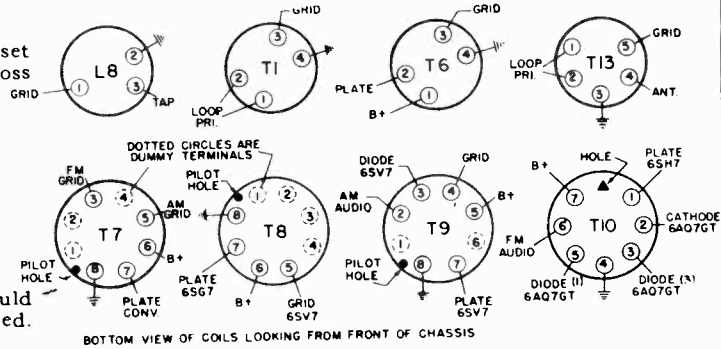


Figure 3—Terminal Identification of Coil Assemblies  
 (Numbers correspond with schematic)

**REPLACEMENT OF DRIVE CORDS**

**Dial Stringing**

Push the tuning elevator all the way down and string the dial as shown in Figure 1. This illustration shows the stringing as viewed from behind the dial scale, as you would see it when working on it. The number and arrows indicate the progression of the dial cord from start to finish. The procedure will be easier if pulley C is by-passed until the rest of the work is finished after which the cord can be pulled tight over that pulley. During the procedure, locate the two brass eyelets so that they fall between pulleys A and B. When finished, crimp the eyelets on the cord in the proper positions to act as minimum and maximum stops for the tuning mechanism and clip the pointer on the cable half-way between the eyelets.

Separate detail drawings are given to show the three different methods of attaching the ends of the cord. The arrangement with the standard helical spring was used in some earlier production receivers. If the cord and spring are to be replaced, the Type 1 spring should be used. It fits the same drum and is an improved type. The Type 2 spring should be used with the later type of drum (with two tabs). When stringing the mechanism with either the Type 1 or Type 2 spring, load the spring by pulling the hook over the projection at the other end of the spring, string the dial and, as a final step, release the hook so that it pulls up the slack in the dial cord.

**Elevator Stringing**

The step-by-step procedure for stringing the elevator windlass is shown in Figure 2. (The view is from the rear of the mechanism.) This is done with the elevator up. Start by inserting the metallic cord in the slot as shown in 1. Then loop the left-hand free end over (2) and solder it to the lug provided at the bottom of the vertical shaft (3). The other free end is then given two turns around the pulley, first on one side of the first half turn (4-5) and then on the other side (6-7). In making these two loops, the free end of the cord passes on *this* side of the end which is already secured. Similarly, in view 2, the end which is to be secured to the bottom of the shaft, passes on *this* side of the right-hand free end of the cord. Observe these relationships. Finally, after completing the seven steps shown, pull the upper end of the cord through the hole in the top of the elevator mechanism and solder it to the spring provided.

**Concluding Comments**

After replacing the dial cord or the elevator cord, it may be found that some correction in relative positioning is needed. This can be done by loosening the set screws in the large drive pulley directly behind the dial scale and re-positioning it on the shaft. The object, of course, is to permit the tuning control to drive the elevator through its full tuning range. Slight errors in final setting are not serious since leeway is provided in the location of the dial pointer itself.

**WIRING OF BAND SWITCH**

In order to facilitate repair, replacement, and circuit tracing, a table and diagrams are supplied with reference to the connections made in the band switch. If used properly, these will be of invaluable aid. The remarks which follow are intended to clarify the make-up of the tables and diagrams—read them carefully before using the table.

The table is broken down into six parts, one for each switch wafer. Section 1 is nearest the front and section 6 is the rear-most wafer.

Individual lugs on each wafer are numbered from 1 to 12, depending upon their position on the wafer. The method of numbering is illustrated in Fig. 5. In determining the number, turn the chassis upside down and look from the front toward the rear of the chassis. Thus, lugs 1 and 12 are the ones which are at the bottom when the set is in its normal position; lugs 3 and 4 are on the side with the broadcast band coils; and lugs 9 and 10 are on the side with the 6AK5 tubes. The numbering refers to lugs whether they be on the front or rear of the wafer.

Fig. 4 shows the physical location of various components and terminals to which reference is made in the table.

In those cases where a component symbol number is given in column two, instead of a wire, that component is connected by its own lead wire directly to the switch lug and the connection of the *other* end of the component is given in the last column.

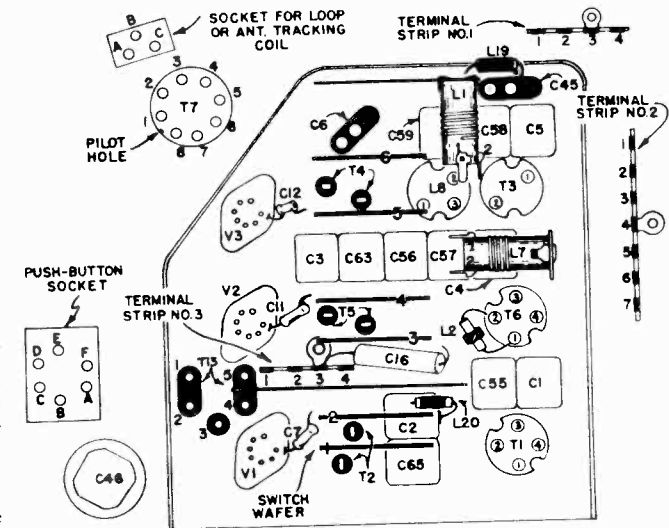


Figure 4—Physical Location of Components  
 Listed in Band Switch Wiring Table

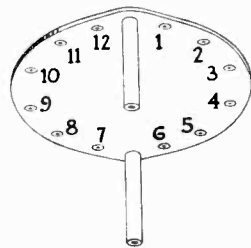


Figure 5—Identification of Switch Lugs  
 —Set Inverted and Viewed  
 from Panel

**WIRING OF BAND SWITCH**

(Wire length given from end to end before stripping)

**SECTION 1**

At this lug—	—connect this—	—the other end of which is connected to this—
1	Insulated wire, 5" lg.	Antenna transformer T13, terminal 4
2	a. Insulated wire, 11 1/2" lg. b. Insulated wire, 2" lg. c. Capacitor C50	Antenna terminal at rear of chassis Switch section 1, lug 6 Switch section 2, lug 1
3	Capacitor C52	Switch section 2, lug 3
4	a. Insulated wire, 1 1/4" lg. b. Insulated wire, 1 1/4" lg. c. Insulated wire, 5 1/2" lg.	Antenna transformer T1, terminal 1 Antenna tracking coil, terminal A Antenna transformer T13, terminal 2
5	a. Short bare bus b. Resistor R15	Ground lug on C65 Switch section 1, lug 11
6	See lug 2b, above	
7	Insulated wire, 11" lg.	Terminal strip 1, lug 4
8	Capacitor C31	Front terminal of T2
9	a. Insulated wire, 9" lg. b. Insulated wire, 7" lg.	Terminal strip 2, lug 5 Filter capacitor, C46C
11	See lug 5b, above	

**SECTION 2**

At this lug—	—connect this—	—the other end of which is connected to this—
1	See section 1, lug 2c	
3	a. Insulated wire, 2 1/2" lg. b. See section 1, lug 3	Trimmer C1, lug nearer T1
4	Insulated wire, 1 1/2" lg.	Trimmer C55, lug nearer T1
5	Coil L20	Ground lug on trimmer C2
6	Short bare bus	Trimmer C65, left-hand terminal*
7	Short bare bus	Trimmer C2, left-hand terminal*
8	Capacitor C7	Tube socket V1, pin 1
9	Insulated wire, 4" lg.	Antenna transformer T13, terminal 1
10	Insulated wire, 3 1/2" lg.	Antenna transformer T1, terminal 2
11**	Insulated wire, 11 1/2" lg.	Antenna tracking coil, terminal C

**SECTION 3**

At this lug—	—connect this—	—the other end of which is connected to this—
1	Shielded wire, 8 3/4" lg.	Terminal strip 2, lug 6
2	Insulated wire, 1 1/2" lg.	Switch section 3, lug 12
3	a. Insulated wire, 2 1/2" lg. b. Capacitor C16 c. Choke L3	Converter coil T6, terminal 1 Ground lug on terminal strip 3 Switch section 3, lug 11
4	Insulated wire, 7 1/2" lg.	Terminal strip 2, lug 3
5	Insulated wire, 1 3/8" lg.	Converter coil T6, terminal 2
6	Short bus with spaghetti	Chassis
7	Short bare bus	Terminal strip 3, lug 4
10	Shielded wire, 10 1/2" lg.	Terminal strip 2, lug 2
11	a. See lug 3c, above b. Capacitor C10	Switch section 4, lug 3
12	a. See lug 2, above b. Shielded wire, 7 3/4" lg.	Push-button socket, Terminal B

**SECTION 4**

At this lug—	—connect this—	—the other end of which is connected to this—
1	a. Insulated wire, 5 1/2" lg. b. Insulated wire, 7 1/4" lg.	Antenna transformer T13, terminal 5 Push-button socket, terminal F
2	Insulated wire, 2 1/2" lg.	Trimmer C4, lug nearer T6
3	a. See Section 3, lug 11b b. Short bus with spaghetti c. Short jumper	Coil L7, terminal 2 (toward front) Switch Section 4, lug 4 (adjacent)
4	See lug 3c, directly above	
5**	Short bare bus	Trimmer C63, lug nearer front
6	Capacitor C88	Tuner T5, left-hand terminal*
7	Short bare bus	Tuner T5, left-hand terminal
8	Capacitor C11	Tube socket V2, pin 1
9	a. Capacitor C72 b. Insulated wire, 2 1/2" lg.	Section 5, lug 11 Trimmer C56, front terminal
10	a. Capacitor C73 b. Insulated wire, 2 1/2" lg.	Section 5, lug 12 Trimmer C57, front terminal
12	Bus with spaghetti, 2 1/2" lg.	Coil L7, terminal 1

**SECTION 5**

At this lug—	—connect this—	—the other end of which is connected to this—
1	a. Bus with spaghetti, 1 3/4" lg. b. Resistor R33	Coil L1, terminal 1 Section 5, lug 4
2	a. Insulated wire, 3" lg. b. Insulated wire, 1 3/8" lg.	Coil L8, terminal 1 Section 6, lug 4
4	See Section 5, lug 1b	
5	Bus with spaghetti, 3" lg.	Coil L1, terminal 2
6	a. Bus with spaghetti, 3" lg. b. Bus with spaghetti, 1 1/2" lg.	Capacitor C45, left-hand terminal* Section 5, lug 10
7**	Short bare bus	Tuner T4, left-hand terminal*
8	Capacitor C12	Tube socket V3, pin 1
9	Insulated wire, 4" lg.	Trimmer C5, lug nearer T3
10	a. See Section 5, lug 6b b. Capacitor C41	Section 6, lug 6
11	a. Insulated wire, 3 3/4" lg. b. See Section 4, lug 9a	Trimmer C59, lug nearer front
12	a. Insulated wire, 3 1/2" lg. b. See Section 4, lug 10a	Trimmer C58, lug nearer front

**SECTION 6**

At this lug—	—connect this—	—the other end of which is connected to this— *
1	Insulated wire, 4 1/2" lg.	I-F transformer T7, terminal 8
2	Bus with spaghetti, 1 1/2" lg.	Coil L1, terminal 2
4	See Section 5, lug 2b	
5	Insulated wire, 12" lg.	Push-button socket, terminal A
6	a. Bus with spaghetti, 2" lg. b. Capacitor C75 c. See section 5, lug 10b	Trimmer C45, center terminal Ground at C59
7	Short bare bus	Trimmer C6, center terminal
8	Bare bus, 1" lg.	Tube socket V3, pin 7
9	Insulated wire, 2 1/4" lg.	I-F transformer T7, terminal 5
10	Insulated wire, 2 3/4" lg.	I-F transformer T7, terminal 3
12	Insulated wire, 3 1/2" lg.	Coil L8, terminal 3

\* Looking from front, chassis inverted.  
\*\* Double lug (front and rear) soldered together

ALIGNMENT

EQUIPMENT REQUIRED:

1. Test Oscillator with tone modulation. (See Table.)
2. D-C Voltmeter or Microammeter. (See notes 2 and 3.)
3. A-C Voltmeter, 2-volts. (See note 6.)
4. Insulated hex wrench, 1/4". (See steps 1, 10, 13.)
5. .01 MF Paper Capacitor. (See steps 1 to 5.)

6. 400-ohm, 1/2 watt resistor. (See steps 16 to 21.)
  7. 200 mmf. mica capacitor. (See steps 22 to 28.)
- Important detailed instructions and references in connection with the alignment table which follows are keyed in by means of column 7, headed "See Note." The notes are included in numerical order after the table. They are important—refer to them carefully.

Step	Signal Generator Frequency	Signal Input Point	Band Switch	Dial Setting	Adjust	See Note	Remarks
<b>F-M I-F ALIGNMENT</b>							
1	10.7 mc	6SH7 grid thru .01 mf	FM1		C49 for zero**	1, 2	Adjust C49 for zero meter reading. Apply 1 volt signal input.
2	See last column	6SH7 grid thru .01 mf	FM1		Signal Generator	1, 2	Detune signal generator to point of maximum meter reading.
3	As in step 2	6SG7 grid thru .01 mf	FM1		Peak C48	1, 2	
4	10.7 mc	6SV7 grid thru .01 mf	FM1		Peak C28	1, 3	6AQ7GT tube removed from its socket.
5	10.7 mc	6SG7 grid thru .01 mf	FM1		Peak C26	1, 3	6AQ7GT tube removed from its socket.
6	10.7 mc	Conv. grid directly	FM1		Peak C24 & L10	1, 3, 4	6AQ7GT tube removed from its socket.
<b>AM I-F ALIGNMENT</b>							
7	455 kc	Conv. grid directly	STD		Peak C86 & C61	5, 6	
8	455 kc	Conv. grid directly	STD		Peak C15 & C23	5, 6	
9	455 kc	Conv. grid directly	STD		Peak C13 & C14	5, 6	
<b>FM R-F ALIGNMENT</b>							
10	88 mc	DIPOLE terminals	FM2	88 mc—6.8 to 6.9 in.*	Peak C6**	1, 3, 7, 10	Set dial accurately—then adjust C6.
11	98 mc	DIPOLE terminals	FM2	For max. output	Peak C3	1, 3, 8	Tube dial for maximum output, then peak C3 while rocking dial.
12	98 mc	DIPOLE terminals	FM2	Do not change	Peak C2	1, 3	
13	43 mc	DIPOLE terminals	FM1	43 mc—6 to 6.1 in.*	Peak C45**	1, 3, 7	Set dial accurately—then adjust C45.
14	46 mc	DIPOLE terminals	FM1	For max. output	Peak C63	1, 3, 8	Tune dial for maximum output, then peak C63 while rocking dial.
15	46 mc	DIPOLE terminals	FM1	Do not change	Peak C65	1, 3	
<b>S.W. R-F ALIGNMENT</b>							
16	11.8 mc	Antenna thru 400-ohms	SW2	11.8 mc—4.5 to 4.6 in.*	Peak C58	5, 6, 7, 10	Set dial accurately—then adjust C58.
17	11.8 mc	Antenna thru 400-ohms	SW2	Do not change	Peak C57	5, 6, 8	Peak C57 while rocking dial.
18	11.8 mc	Antenna thru 400-ohms	SW2	Do not change	Peak C54	5, 6	C54 is located on back apron of chassis.
19	9.6 mc	Antenna thru 400-ohms	SW1	9.6 mc—4.5 to 4.6 in.*	Peak C59	5, 6, 7, 10	Set dial accurately—then adjust C59.
20	9.6 mc	Antenna thru 400-ohms	SW1	Do not change	Peak C56	5, 6, 8	Peak C56 while rocking dial.
21	9.6 mc	Antenna thru 400-ohms	SW1	Do not change	Peak C55	5, 6	
<b>BROADCAST R-F ALIGNMENT</b>							
22	1620 kc	Antenna via 200 mmf	STD	Extreme right-hand position	Peak C5	5, 6	
23	1620 kc	Antenna via 200 mmf	STD	Extreme right-hand position	Peak C4	5, 6	
24	1620 kc	Antenna via 200 mmf	STD	Extreme right-hand position	Peak C1	5, 6	
25	1500 kc	Antenna via 200 mmf	STD	1500 kc—1.4 to 1.5 in.*	Osc. coil T3 iron slug	5, 6, 7, 9	T3 iron slug is the rear one on the left side. Adjust for peak.
26	1000 kc	Antenna via 200 mmf	STD	For max. output	Conv. coil T6 iron slug	5, 6, 9	T6 iron slug is the center one on the left side. Adjust for peak.
27	1000 kc	Antenna via 200 mmf	STD	Do not change	R-F coil T1 iron slug	5, 6, 9	T1 iron slug is the front one on the left side. Adjust for peak.
28	580 kc	Antenna via 200 mmf	STD	For max. output	Peak L8	5, 6, 8	Peak L8 while rocking dial.
29							Repeat steps 22 to 28.

\* Important! See Note 7.  
 \*\* Use insulated hex wrench, 1/4".

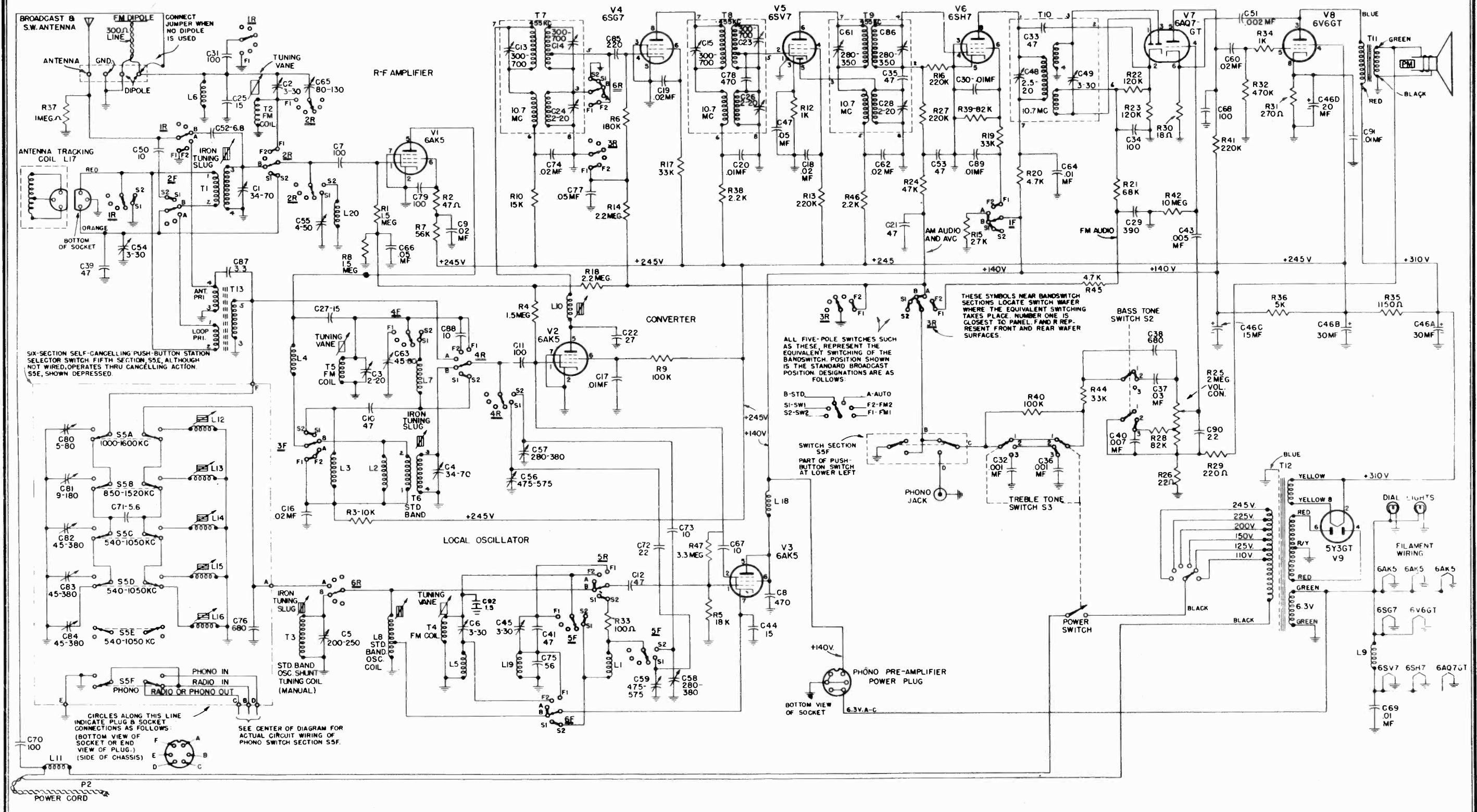
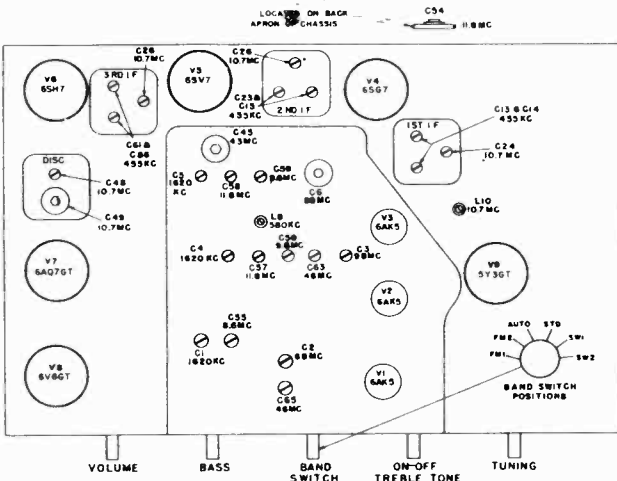


Figure 6—Schematic Diagram, Model X415

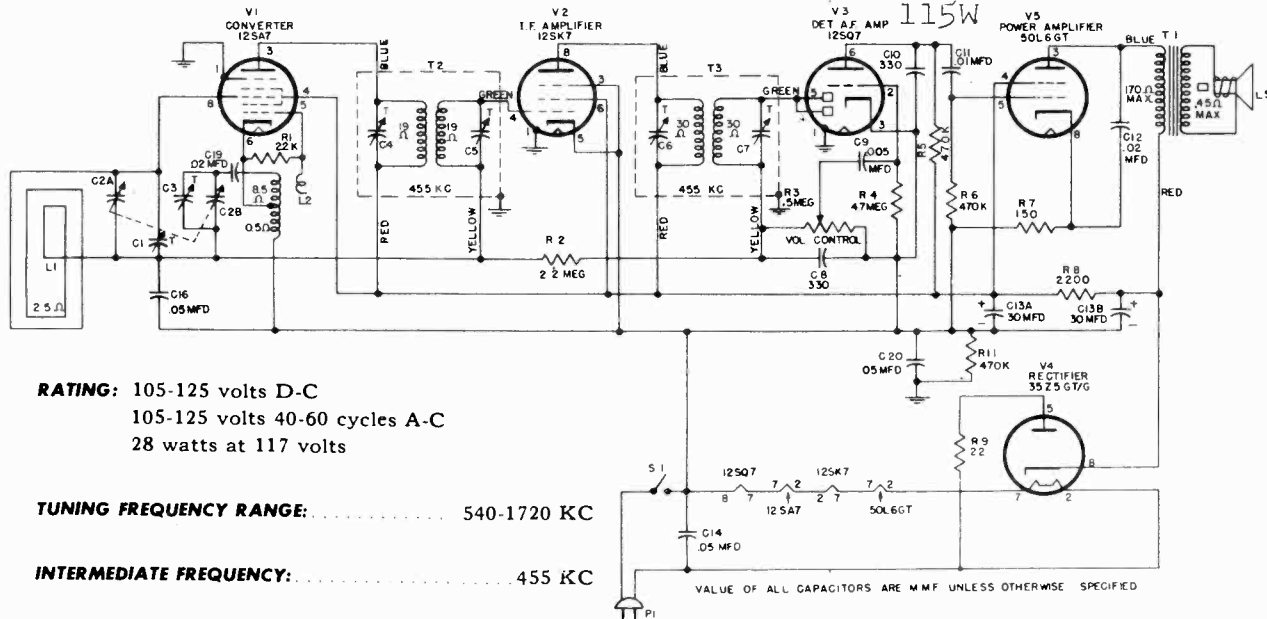
Notes in Connection with Alignment Table

- 1. Use unmodulated signal.
2. Connect 20,000-ohm-per-volt meter from junction of R21 and C29 to chassis. Use ten-volt scale. (Steps 1-3.)
3. Connect 20,000-ohm-per-volt meter from grid pin 4 of 6SH7 to chassis with a 200,000-ohm resistor in series. The resistor must be connected directly to the grid so that capacity loading will be negligible and so that the meter is isolated from the i-f signal voltage. Keep signal generator output down so that the meter indicates not more than one volt at the grid (5 micro-amperes through 200,000-ohms). (Alignment steps 4 to 6, 10 to 15.)
4. Connect signal generator directly to the converter grid at some convenient point. The generator lead must be shielded up to this connection so that not more than 1/16 inch of exposed lead exists. Ground the shield solidly by clamping it firmly to the chassis or a shield as close to the connection as possible. (Steps 6-9.)
5. Use 400-cycle modulation. (Steps 7 to 9, 16 to 28.)
6. Connect a standard output meter across speaker voice coil. Turn volume control fully on. Keep signal gener-

- 7. If dial scale is not available, index pointer as follows: Turn pointer to right-hand limit of travel. Mark the dial back plate at a reference edge of the pointer slider. Then set pointer by turning dial knob until the indicated dimension exists between the reference edge and the mark.
8. "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. Rocking is necessary and is permissible only when interlocking circuits are being adjusted.
9. The main tuning iron slugs are suspended from the left side of the tuning "elevator." They are individually adjustable by loosening the locknut and turning the supporting screw into which the suspending wire is soldered.
10. Two oscillator settings will give response. The higher frequency response point is the correct one; the other is the image. If in doubt, start with the trimmer screw loosened completely and adjust for the first response.



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

VALUE OF ALL CAPACITORS ARE MFD UNLESS OTHERWISE SPECIFIED

**ALIGNMENT PROCEDURE**

**ALIGNMENT FREQUENCIES**

I-F ..... 455 KC  
R-F ..... 1720 and 1500 KC

The location of all trimmers is shown in Fig. 1.

**LOUDSPEAKER "ALNICO V" MAGNET DYNAMIC**

Outside Cone Diameter ..... 4 in.  
Voice Coil Impedance (400 cyc) ..... 3.2 ohms

**I-F ALIGNMENT**

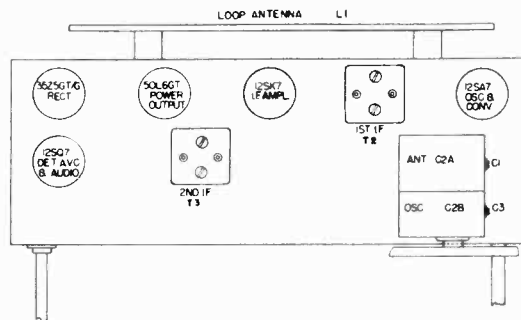
Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 KC and keep the oscillator output as low as a readable meter reading will permit. Apply signal to the converter grid through a .05 mfd. capacitor and align progressively the trimmers in the 2nd 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.

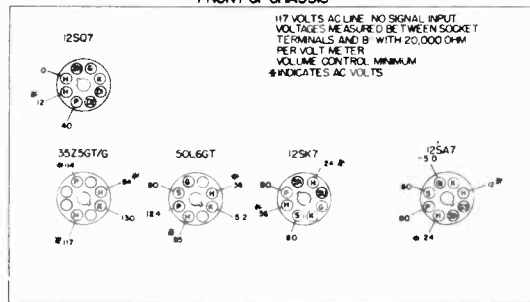
**PRECAUTION**

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.



**Tube and Trimmer Location**

**FRONT OF CHASSIS**



**BOTTOM VIEW OF CHASSIS**

**Socket Voltage Diagram**

**GENERAL INFORMATION**

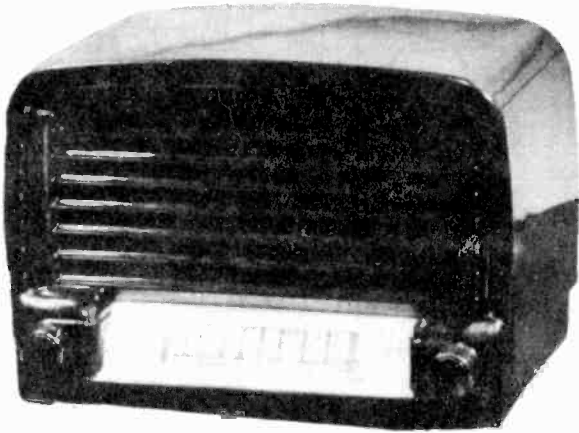
These models are 5-tube (including rectifier) superheterodyne receivers in distinctively styled brown plastic and white urea cabinets. These receivers incorporate built-in antenna, automatic volume control, oversize permanent magnet speaker and beam power output.

**TUBES**

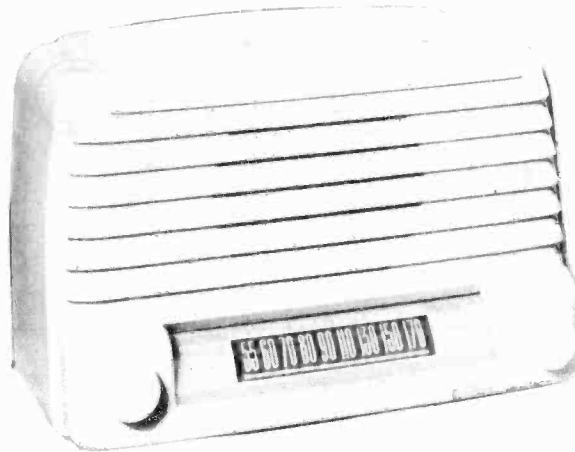
- Converter and Oscillator ..... 12SA7
- I.F. Amplifier ..... 12SK7
- Det. Audio, AVC ..... 12SQ7
- Power Output ..... 50L6GT
- Rectifier ..... 35Z5GT



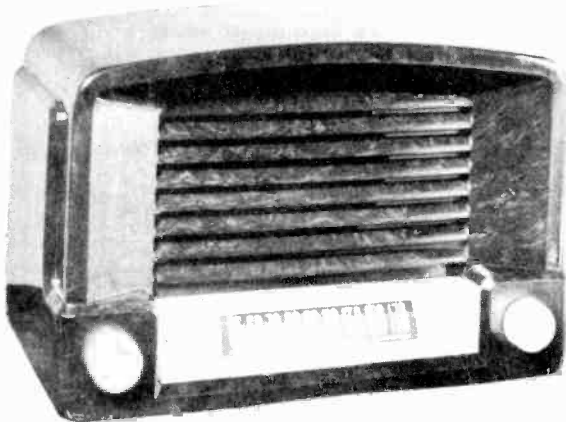
MODELS 102, 102W, 107, GENERAL ELECTRIC CO.  
107W, 114, 114W, 115, 115W



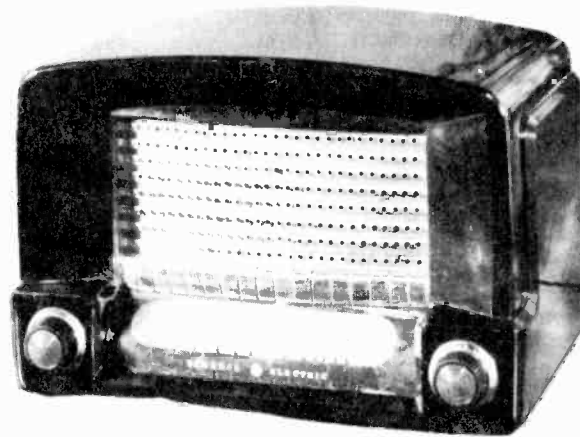
MODEL 102



MODEL 107W



MODEL 114



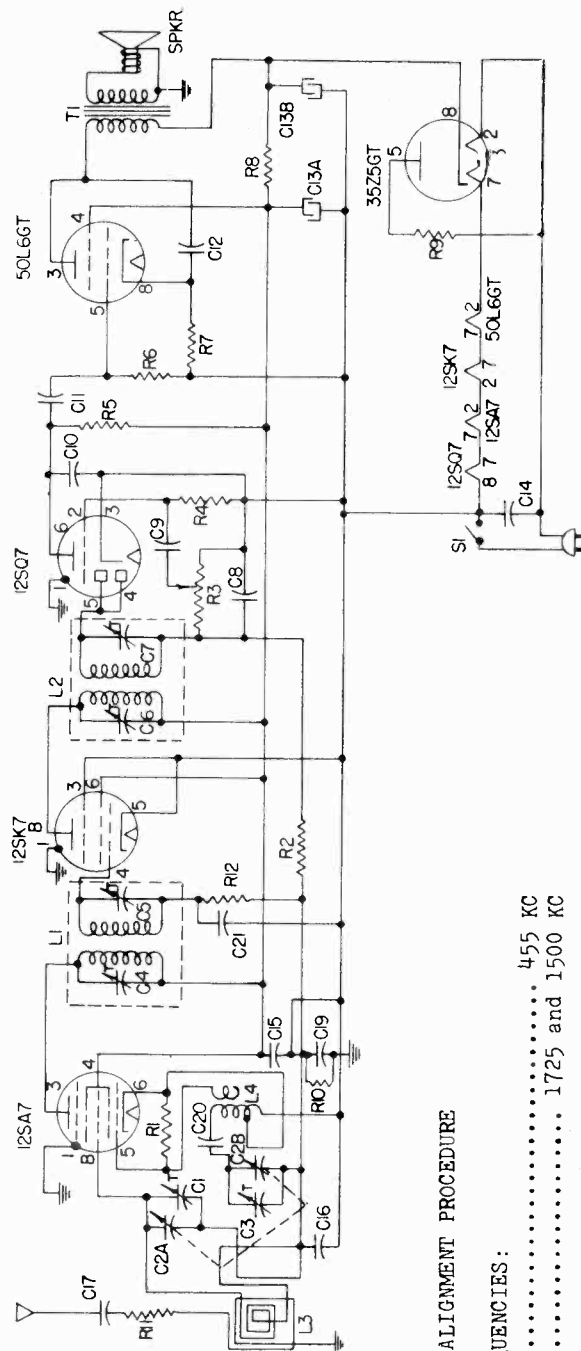
MODEL 115

Cat. No.	Symbol	Description
<b>UNIVERSAL REPLACEMENT PARTS</b>		
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, 1/2 w., carbon
URD-029	R7	RESISTOR—150 ohms, 1/2 w., carbon
URD-081	R1	RESISTOR—22,000 ohms, 1/2 w., carbon
URD-113	R5, 6, 11	RESISTOR—470,000 ohms, 1/2 w., carbon
URD-129	R2	RESISTOR—2.2 meg., 1/2 w., carbon
URD-137	R4	RESISTOR—4.7 meg., 1/2 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
<b>SPECIALIZED REPLACEMENT PARTS (Cont'd)</b>		
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		POINTNER—Dial scale pointer
SDS-019		SCALE—Dial scale for Models 102, 102W, 107, 107W, 114, and 114W
SLC-020	L4	COIL—Oscillator coil
SMS-013		SPRING—Dial cord tension spring
SRC-003	R3, S1	VOLUME CONTROL and switch with flat shaft
STL-007	T2	TRANSFORMER—1st IF transformer
STL-008	T3	TRANSFORMER—2nd IF transformer
STO-005	T1	TRANSFORMER—Output transformer
SWL-001		CORD—Power cord



ALIGNMENT PROCEDURE

ALIGNMENT FREQUENCIES:

- I-F..... 455 KC
- R-F..... 1725 and 1500 KC

I-F ALIGNMENT:

Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 kc and keep oscillator output down so that meter reads 1/2 watt output or less. Apply signal to the converter grid (pin 8 of 12SA7) through a .05 mfd. capacitor and align progressively the trimmer capacitors in the second and first i-f transformer.

R-F ALIGNMENT:

Apply the r-f alignment signals through a standard IRE dummy antenna to the receiver antenna post. With the tuning condenser completely open, align the oscillator trimmer (C3) to 1725 kc. Tune the signal generator to 1500 kc and tune the receiver for maximum signal output, then peak antenna trimmer (C1) while rocking the generator.

PRECAUTION:

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

SPECIFICATIONS

- Rating..... 105-125 v. DC, 28 watts
- Tuning Range..... 105-125 v. 25-60 CPS AC, 540-1725 KC
- Intermediate Frequency..... 455 KC

LOUDSPEAKER:

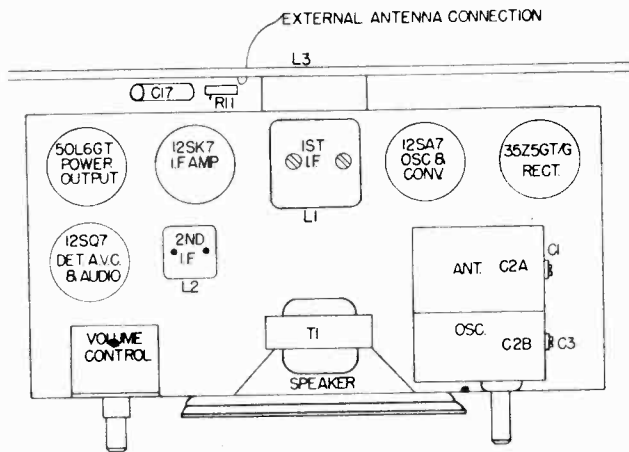
- Type..... Alnico V., permanent magnet
- Cone Diameter..... 4 inches
- Voice Coil Impedance (400 cycles)..... 3.5 ohms

TUBE COMPLEMENT:

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

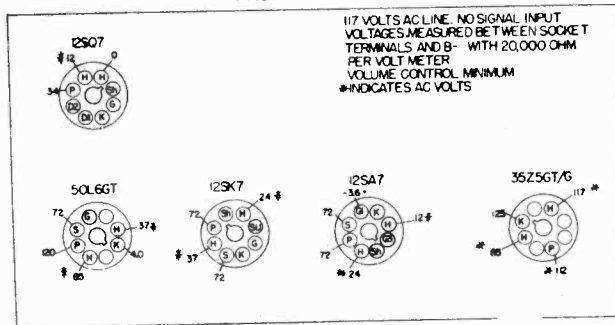
Cat. No.	Symbol	Description
UNIVERSAL REPLACEMENT PARTS		
UCC-040	C11,17	CAPACITOR - .01 mf., 600 v., paper
UCC-041	C12,20	CAPACITOR - .02 mf., 600 v., paper
UCC-044	C9,21	CAPACITOR - .005 mf., 600 v., paper
UCC-045	C14,15,16	CAPACITOR - .05 mf., 600 v., paper
UCC-048	C19	CAPACITOR - .1 mf., 600 v., paper
UCU-036	C8,10	CAPACITOR - 220 mmf., mica
URD-007	R9	RESISTOR - 18 ohms, 1/2 w., carbon
URD-029	R7	RESISTOR - 150 ohms, 1/2 w., carbon
URD-041	R11	RESISTOR - 470 ohms, 1/2 w., carbon
URD-081	R1	RESISTOR - 22,000 ohms, 1/2 w., carbon
URD-113	R5,6,10,12	RESISTOR - 470,000 ohms, 1/2 w., carbon
URD-129	R2	RESISTOR - 2.2 meg., 1/2 w., carbon

Cat. No.	Symbol	Description
UNIVERSAL REPLACEMENT PARTS		
URD-137	R4	RESISTOR - 4.7 meg., 1/2 w., carbon
URF-059	R8	RESISTOR - 2700 ohms, 1/2 w., carbon
SPECIALIZED REPLACEMENT PARTS		
SCE-001	C13A,B	CAPACITOR - Electrolytic capacitor
SCT-013	C2A,B	CAPACITOR - Tuning capacitor
SJS-003		SOCKET - Tube socket
SLC-001	L4	COIL - Oscillator coil
SLL-006	L3	LOOP - Antenna loop
SOP-003		SPEAKER
SRC-070	R3,S1	VOLUME CONTROL
STL-007	L1	TRANSFORMER - 1st I-F transformer
STL-015	L2	TRANSFORMER - 2nd I-F transformer
STO-004	T1	TRANSFORMER - Output transformer
SWL-001		CORD - Power cord



TUBE AND TRIMMER LOCATION

FRONT OF CHASSIS



BOTTOM VIEW OF CHASSIS

SOCKET VOLTAGE DIAGRAM

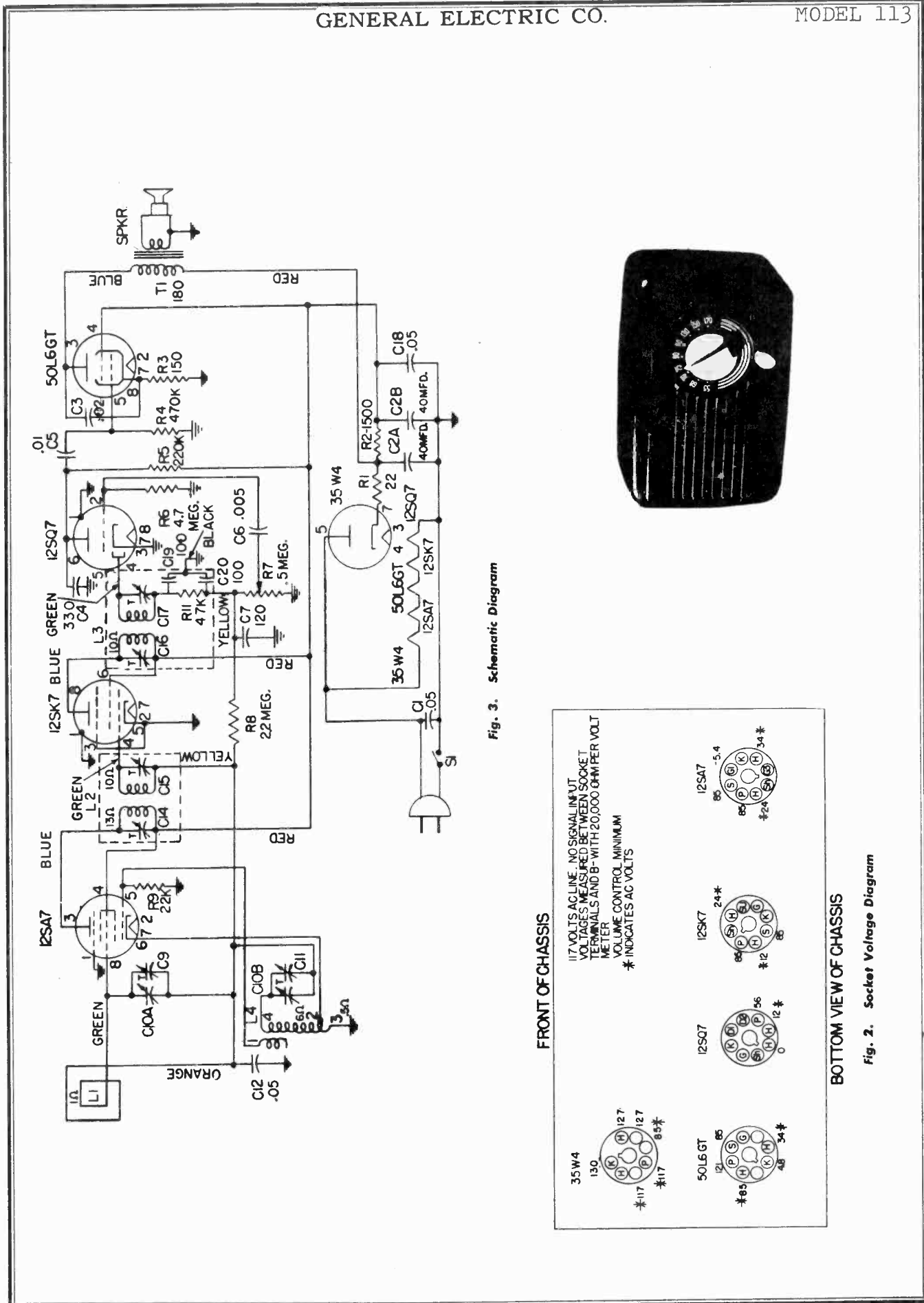
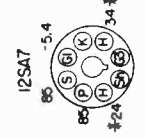
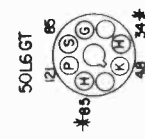
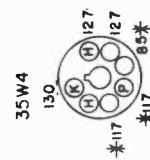


Fig. 3. Schematic Diagram

FRONT OF CHASSIS

117 VOLTS AC LINE. NO SIGNAL INPUT  
VOLTAGES MEASURED BETWEEN SOCKET  
TERMINALS AND B-WITH 20,000 OHM PER VOLT  
METER  
VOLUME CONTROL MINIMUM  
\* INDICATES AC VOLTS



BOTTOM VIEW OF CHASSIS

Fig. 2. Socket Voltage Diagram

MODEL 113

GENERAL ELECTRIC CO.

**SPECIFICATIONS**

**CABINET:**

**OVER-ALL DIMENSIONS:**

Height ..... 6 in.  
 Width ..... 9 1/4 in.  
 Depth ..... 4 3/4 in.

**ELECTRICAL RATING:**

Voltage ..... 105-125 v. AC or DC  
 Frequency on AC ..... 40-60 cps  
 Wattage (at 117 volts) ..... 28 watts

**OPERATING FREQUENCIES:**

Broadcast Band ..... 540-1725 kc  
 Intermediate Frequency ..... 455 kc

**LOUDSPEAKER** ..... "ALNICO V" MAGNET DYNAMIC

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

**TUBES COMPLEMENT:**

Converter-Oscillator ..... 12SA7  
 I-F Amplifier ..... 12SK7  
 Detector, AVC Audio ..... 12SQ7  
 Power Output ..... 50L6GT  
 Rectifier ..... 35W4

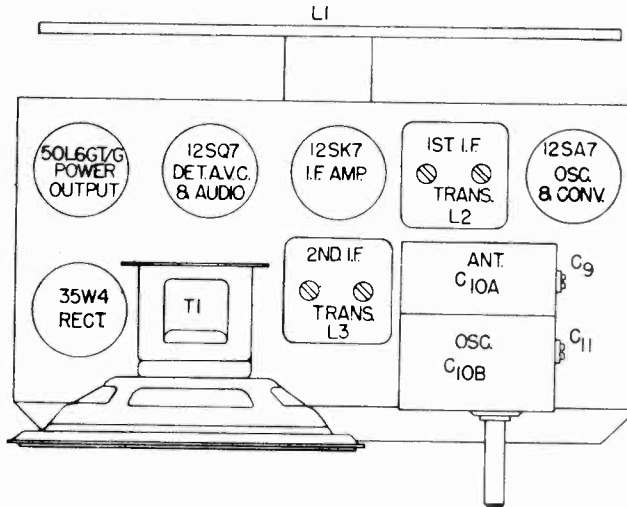


Fig. 1. Tube and Trimmer Location

**GENERAL INFORMATION**

Model 113 is a five-tube (including rectifier) AC-DC super-heterodyne broadcast receiver in a distinctly styled cabinet. This receiver incorporates automatic volume control, attached antenna, permanent magnet "Alnico V" speaker, and beam power output.

**ALIGNMENT PROCEDURE**

**ALIGNMENT FREQUENCIES:**

I-F ..... 455 kc  
 R-F ..... 1725 kc and 1500 kc

The location of all trimmers is shown in Figure 1.

**I-F ALIGNMENT:**

Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 kc and keep the oscillator output as low as a readable meter reading will

permit. Apply signal to the converter grid through a .05 mfd. capacitor and align progressively the trimmers in the 2nd and 1st i-f transformer cans.

**R-F ALIGNMENT:**

Apply the r-f alignment signals through a standard IRE dummy antenna to C9. With the gang condenser wide open, align the oscillator trimmer (C11) to 1725 kc. Change the generator signal to 1500 kc, tune the receiver to the signal, and peak antenna trimmer (C9) for maximum output.

**PRECAUTION:**

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

**-REPLACEMENT PARTS LIST**

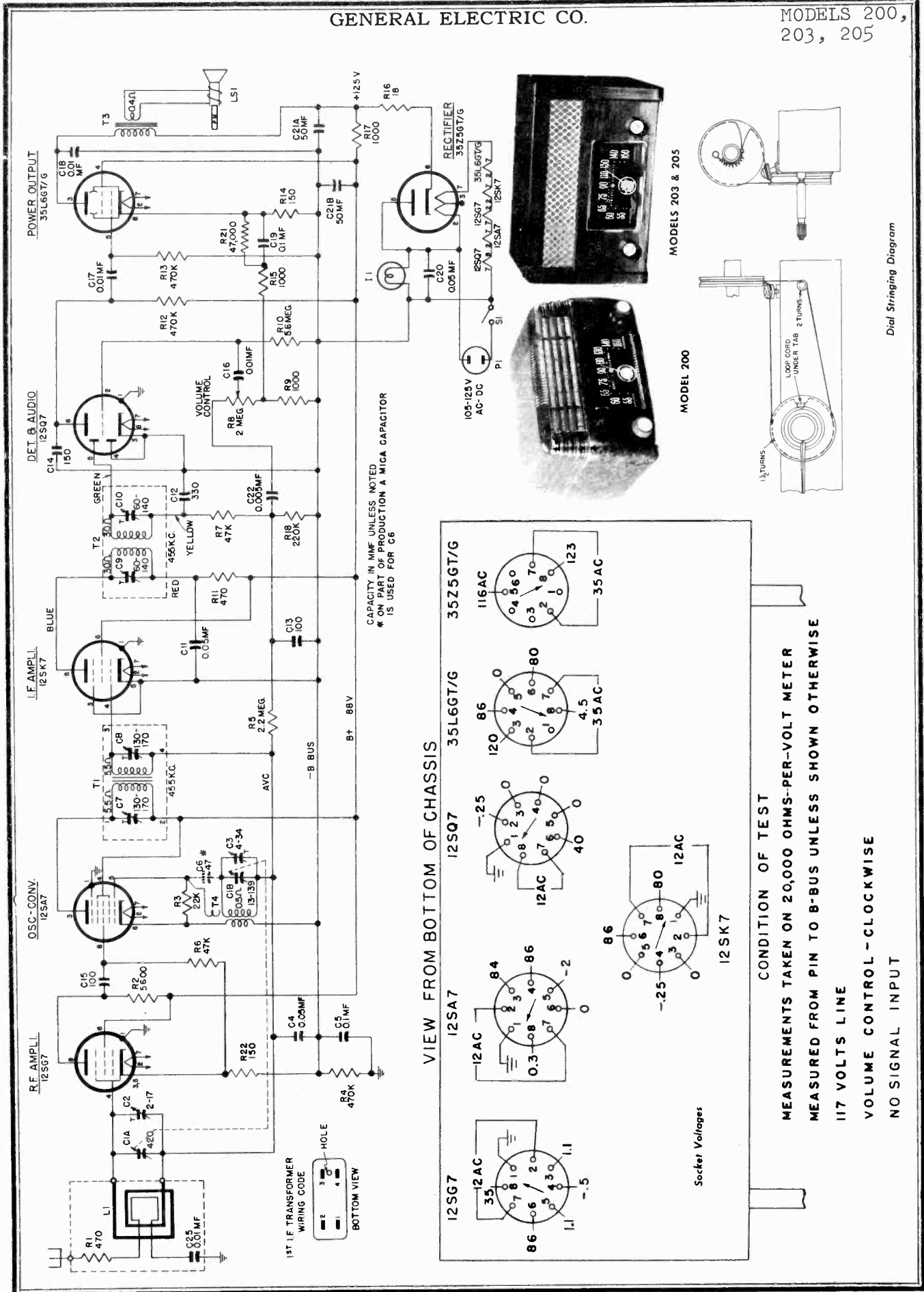
Cat. No.	Symbol	Description	Cat. No.	Symbol	Description
<b>UNIVERSAL REPLACEMENT PARTS</b>			<b>SPECIALIZED REPLACEMENT PARTS</b>		
UCC-625	C6	CAPACITOR—.005 mf., 600 v., paper	RCW-2032	C4	CAPACITOR—330 mmf., mica
UCC-630	C5	CAPACITOR—.01 mf., 600 v., paper	RDK-008		KNOB—Volume control (Mahogany)
UCC-631	C3	CAPACITOR—.02 mf., 600 v., paper	RDK-041		KNOB—Tuning knob with set screw
UCC-635	C1, 12, 18	CAPACITOR—.05 mf., 400 v., paper	RDK-144		KNOB—Tuning knob (Mahogany) for plain shaft
UCU-036		CAPACITOR—220 mmf., mica	RJS-003		SOCKET—Tube socket (octal)
UCU-1030*	C7	CAPACITOR—120 mmf., mica	RJS-092		SOCKET—Tube socket
UOP-487	SPKR	SPEAKER—4-inch PM speaker	RWL-009		POWER CORD
URD-009	R1	RESISTOR—22 ohms, 1/2 w., carbon	SAB-001		BACK—Cabinet back
URD-029	R3	RESISTOR—150 ohms, 1/2 w., carbon	SAU-022		CABINET—Plastic
URD-081	R9	RESISTOR—22,000 ohms, 1/2 w., carbon	SCE-009		CAPACITOR—40 x 40 mf., electrolytic
URD-105	R5	RESISTOR—220,000 ohms, 1/2 w., carbon	SCT-005	C2A, B C10A, B	CAPACITOR—Tuning capacitor (knurled with split shaft)
URD-113	R4	RESISTOR—470,000 ohms, 1/2 w., carbon	SDK-005**		KNOB—Tuning knob, for knurled shaft
URD-129	R8	RESISTOR—2.2 meg., 1/2 w., carbon	SDK-007		KNOB—Knob for volume control
URD-137	R6	RESISTOR—4.7 meg., 1/2 w., carbon	SLC-020	L4	COIL—Oscillator coil
URF-053	R2	RESISTOR—1500 ohms, 2 w., carbon	SLL-002	L1	LOOP—Loop antenna
			SRC-004	R7	VOLUME CONTROL AND SWITCH
			STL-007	L2	I-F TRANSFORMER—1st i-f transformer
			STL-008	L3	I-F TRANSFORMER—2nd i-f transformer
			STO-004	T1	OUTPUT TRANSFORMER

\* To be used with STL-008.

\*\*To be used with SCT-005.

GENERAL ELECTRIC CO.

MODELS 200,  
203, 205



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MODELS 200,  
203, 205

GENERAL ELECTRIC CO.

ELECTRICAL RATING (INPUT)

Voltage 105-125 volts a-c or d-c  
Frequency on a-c 25 to 60 cycles  
Wattage 45 watts

OPERATING FREQUENCIES

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

POWER OUTPUT (117 VOLTS LINE)

Undistorted 1.2 watts  
Maximum 1.5 watts

LOUDSPEAKER

Type Alnico P.M.  
Outside Cone Diameter 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

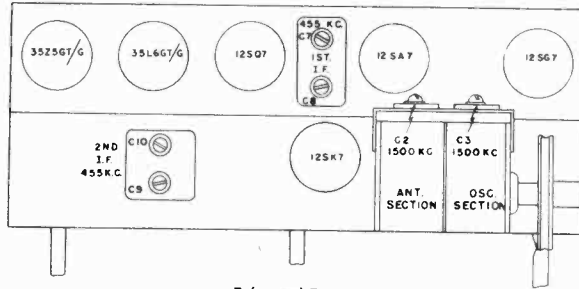
R-F 1500 kilocycles  
I-F 455 kilocycles

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 1/2 volts.
4. The chassis must be removed from the cabinet during I-F alignment. For R-F alignment bolt the chassis in the cabinet securely.
5. Connect the capacitor as listed in column 2, between the output "High Side" of test oscillator and the point of input specified.



Tube and Trimmer Location

ALIGNMENT CHART

Step	Connect Test Oscillator to	Test Osc Setting	Pointer Setting on Radio	Adjustment for Maximum Output
1	12SK7 grid in series with 0.05 mf cap.	455 kc	1500 kc	2nd I-F Trans. Trimmers
2	12SA7 grid in series with 0.05 mf cap.	455 kc	1500 kc	1st and 2nd I-F Trans. Trimmers
3	Ant. Post in series with 50 mmf	1500 kc	1500 kc	C3 (Osc.)
4	Ant. Post in series with 50 mmf	1500 kc	1500 kc	C2 (R-F)

STAGE GAIN AND VOLTAGE CHECKS

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

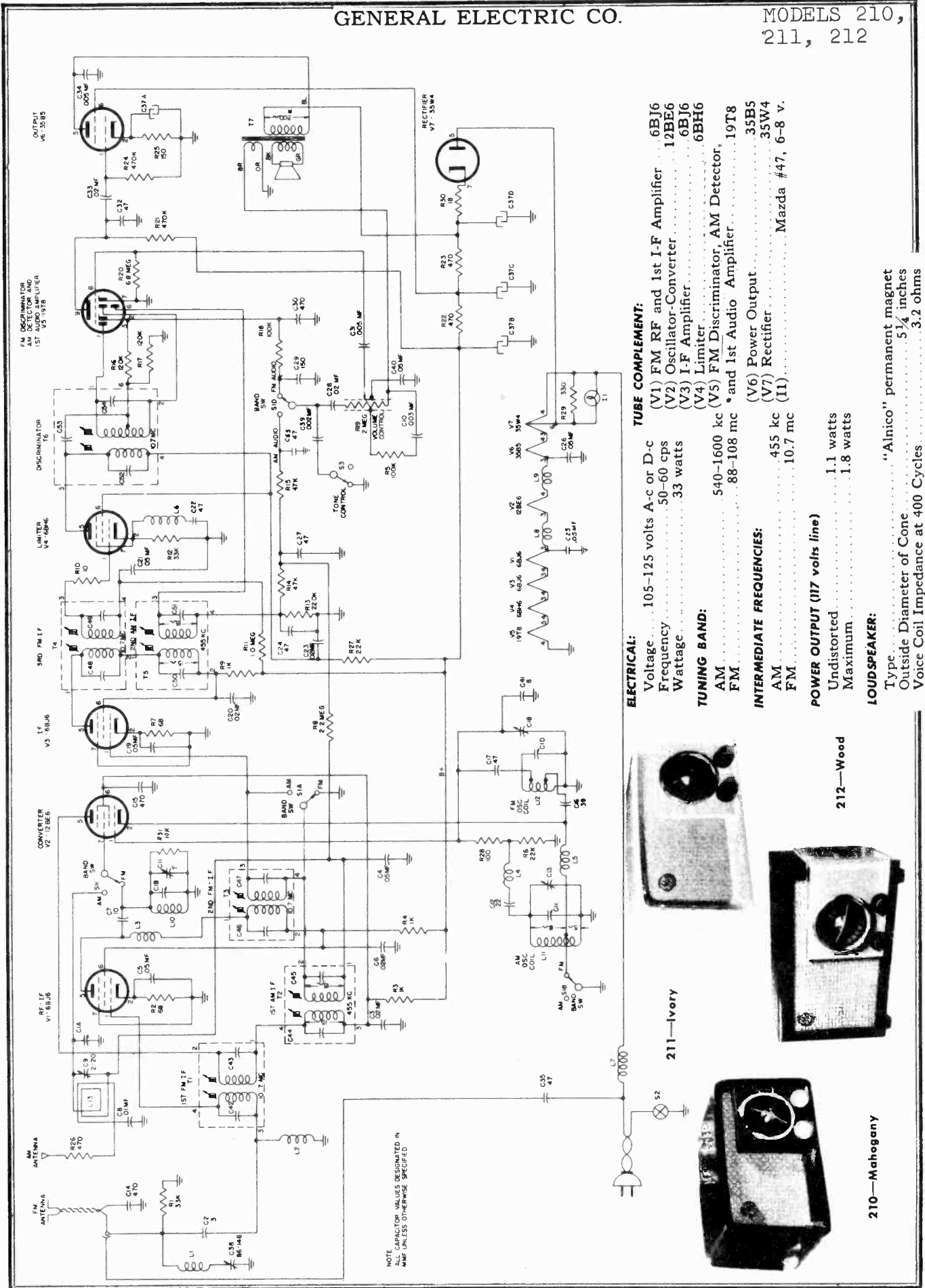
- (1) R-F Stage Gains.
  - Antenna post to 12SG7 grid 4 at 1000 kc
  - 12SG7 grid to 12SA7 grid 8 at 1000 kc
  - 12SA7 grid to 12SK7 grid 30 at 455 kc
  - 12SK7 grid to 12SQ7 diode plate 57 at 455 kc
- (2) Audio Gain.
  - 0.12 volt at 400 cycles across volume control (R8) with control set at maximum will give approximately 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.

REPLACEMENT PARTS LIST—MODELS 200, 203, & 205

PART NO.	SYMBOL	DESCRIPTION	PART NO.	SYMBOL	DESCRIPTION
<b>UNIVERSAL REPLACEMENT PARTS</b>					
UCC-039	C22	CAPACITOR .005 mfd, 600 v, paper	RAX-001		PULLEY Idler pulley assembly
UCC-040	C25	CAPACITOR .01 mfd, 600 v, paper	RCC-013	C19	CAPACITOR .01 mfd, 200 v, paper
UCC-048	C5	CAPACITOR .01 mfd, 600 v, paper	RCC-040	C16, 17, 18	CAPACITOR .01 mfd, 600 v, paper
UCU-020	C6	CAPACITOR .07 mmf, 500 v, mica	RCC-045	C4, 11, 20	CAPACITOR .05 mfd, 600 v, paper
UCU-028	C13, 15	CAPACITOR 100 mmf, 500 v, mica	RCE-037	C21A, 21B	CAPACITOR 50-50 mfd, 150 v, dry electrolytic
UCU-032	C14	CAPACITOR 150 mmf, 500 v, mica	RCT-015	C1A, 1B	CONDENSER Tuning condenser (includes C2 and C3)
UCU-040	C12	CAPACITOR 330 mmf, 500 v, mica	RDC-001		CORD Drive cord assembly
UIC-001		CEMENT Loudspeaker cone cement	RDD-001		DRUM Drive drum and shaft assembly
UIC-002		THINNER Cone cement thinner	RDE-001		ESCUTCHEON Dial escutcheon (Models 203, 205)
UOP-528	LS1	SPEAKER 5 1/4 in. P.M.	RDG-002		PLATE Dial back plate assembly
UOX-001		CONE Replacement cone kit	RDK-006		KNOB Control knob
URD-029	R14, 22	RESISTOR 150 ohms, 1/2 w, carbon	RDS-030		SCALE Dial scale (Models 203, 205)
URD-041	R1, 11	RESISTOR 470 ohms, 1/2 w, carbon	RDS-031		SCALE Dial scale (Models 200, 201)
URD-057	R9, 15	RESISTOR 1000 ohms, 1/2 w, carbon	RHM-004		CLIP Speed clip for dial scale (Model 200)
URD-067	R2	RESISTOR 47,000 ohms, 1/2 w, carbon	RHM-005		CLIP Speed clip for dial scale (Models 203, 205)
URD-081	R3	RESISTOR 5600 ohms, 1/2 w, carbon	RHW-016		CLIP Osc. coil mtg. clip
URD-089	R6, 7, 21	RESISTOR 22,000 ohms, 1/2 w, carbon	RJS-003		TUBE SOCKET Octal base tube socket (12SA7)
URD-105	R18	RESISTOR 47,000 ohms, 1/2 w, carbon	RJS-006		TUBE SOCKET Octal base tube socket
URD-113	R4, 12, 13	RESISTOR 220,000 ohms, 1/2 w, carbon	RJS-053		SOCKET Pilot lamp socket
URD-129	R5	RESISTOR 470,000 ohms, 1/2 w, carbon	RLC-021	T4	COIL Oscillator coil
URD-139	R10	RESISTOR 2.2 meg, 1/2 w, carbon	RRC-002	R8, S1	VOLUME CONTROL 2.0 meg potentiometer, includes power switch
URF-049	R17	RESISTOR 5.6 meg, 1/2 w, carbon	RRW-008	R10	RESISTOR 18 ohms, 1 w, wirewound
		RESISTOR 1000 ohms, 2 w, carbon	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
<b>SPECIALIZED REPLACEMENT PARTS</b>					
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)			

GENERAL ELECTRIC CO.

MODELS 210,  
211, 212

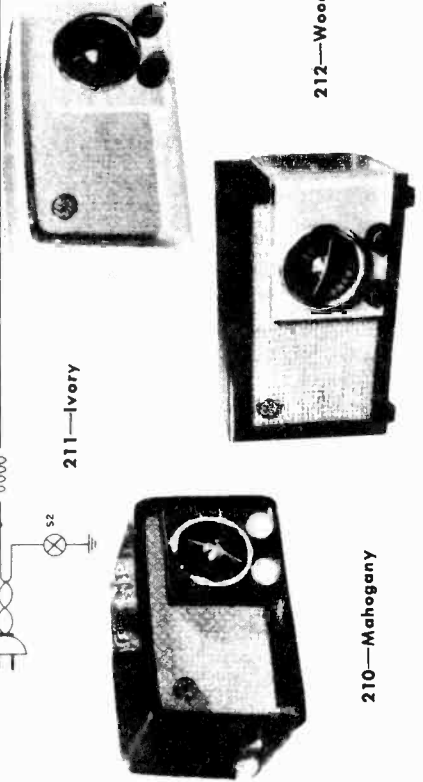


NOTE: ALL CAPACITOR VALUES DESIGNATED IN MUF UNLESS OTHERWISE SPECIFIED

- 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 . . . . . 5 1/4 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  
 (II) . . . . . Mazda #47, 6-8 v.



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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  $\pm 20\%$ . 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  $\frac{1}{2}$  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,  $\frac{1}{2}$  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  $\frac{1}{2}$  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 input 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:**

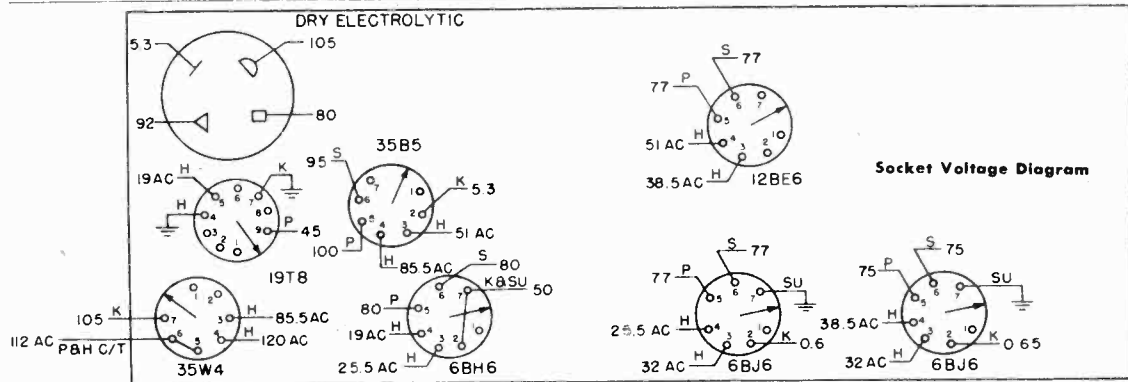
1. Use unmodulated signal.
2. Connect a 20,000 ohm-per-volt meter from junction of C29 and R18 to chassis. Use ten-volt scale.
3. Connect a 20,000 ohm-per-volt meter from cathode of limiter (pin 2 or 7 of V4) to junction of C21 and R11 in series with 200,000-ohm resistor. The resistor should be connected 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  $\frac{1}{2}$  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

ALIGNMENT CHARTS

STEP	SIGNAL GENERATOR FREQUENCY	SIGNAL INPUT POINT	BAND SWITCH SETTING	DIAL SETTING	ADJUST	SEE NOTE
<b>AM I-F METER ALIGNMENT</b>						
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
<b>FM I-F AND DISCRIMINATOR METER ALIGNMENT</b>						
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
<b>AM R-F METER ALIGNMENT</b>						
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
<b>FM R-F METER ALIGNMENT</b>						
12	108 mc	**Dipole terminals	FM	108 mc	Adjust for C18 for maximum.	1, 3, 9**
13	98 mc	Dipole terminals	FM	For maximum output	Adjust C11 for maximum while rocking generator.	1, 3
14	10.7 mc	Dipole terminals	FM	.....	Adjust C38 for minimum.	1, 3



ALL VOLTAGES ARE +DC UNLESS OTHERWISE SPECIFIED ALL VOLTAGES TO CHASSIS

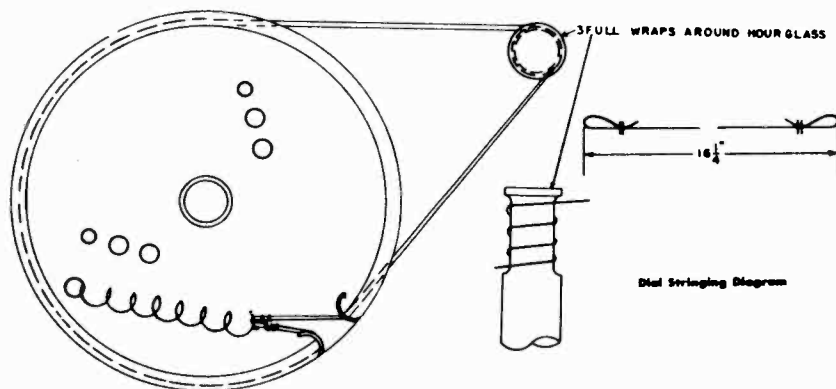
BACK OF CHASSIS BOTTOM VIEW OF CHASSIS

VOLTAGES MEASURED WITH E<sub>L</sub> = 120 V DC VOLTAGES WITH 20,000 OHMS PER VOLT METER AC VOLTAGES WITH 1,000 OHMS PER VOLT METER

MODELS 210,  
211, 212

GENERAL ELECTRIC CO.

STEP	SIGNAL GENERATOR FREQUENCY	SIGNAL INPUT POINT	BAND SWITCH SETTING	DIAL SETTING	ADJUST	SEE NOTE
<b>AM I-F VISUAL ALIGNMENT</b>						
1	455 kc $\pm$ 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 $\pm$ 20 kc at 60-cycle sweep rate	Same as Step 1.	AM	.....	Two slugs of T2 for maximum.	3
<b>FM I-F AND DISCRIMINATOR VISUAL ALIGNMENT</b>						
3	10.7 mc $\pm$ 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 $\pm$ 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 $\pm$ 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 $\pm$ 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 $\pm$ 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 $\pm$ 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
<b>AM R-F VISUAL ALIGNMENT</b>						
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 $\pm$ 20 kc at 60 cps rate	Inductively coupled	AM	For max. output	Adjust C9 for maximum amplitude and minimum distortion.	3, 5 9
<b>FM R-F VISUAL ALIGNMENT</b>						
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 $\pm$ 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 $\pm$ 300 kc at 60-cycle rate	Dipole terminals	FM	.....	Adjust C38 of minimum amplitude.	1, 6



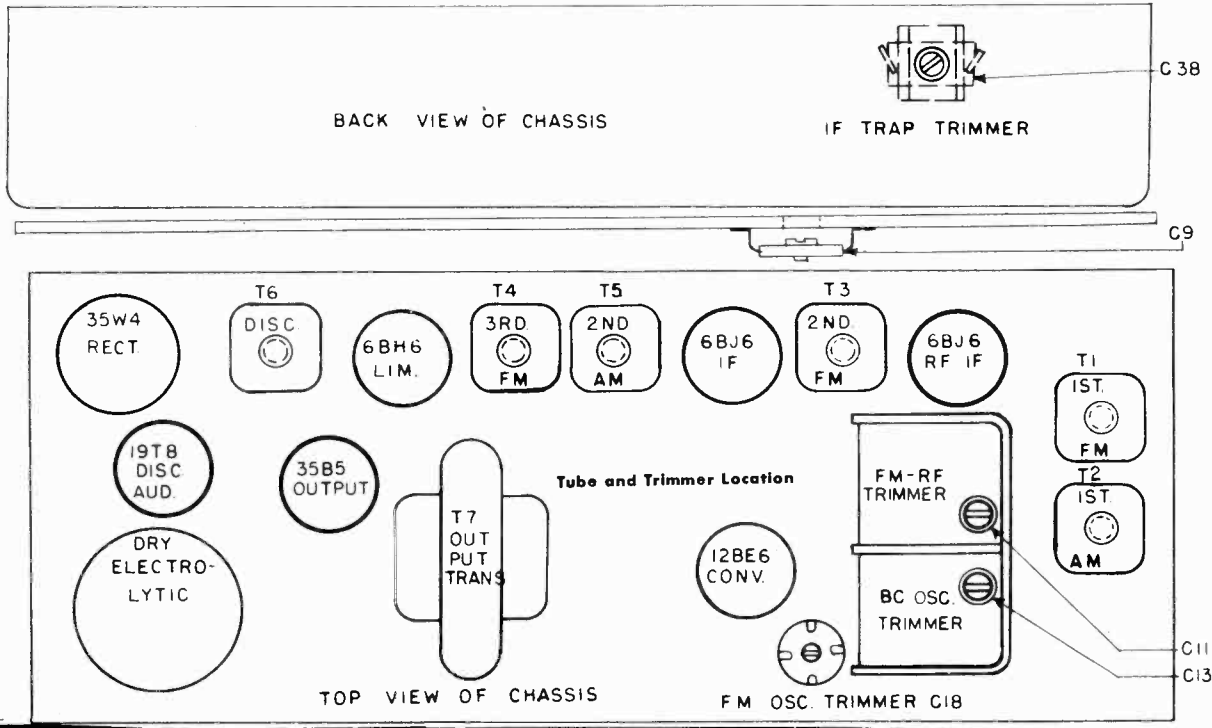
GENERAL ELECTRIC CO.

MODELS 210,  
211, 212

Cat. No.	Symbol	Description
<b>UNIVERSAL REPLACEMENT PARTS</b>		
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—5 1/2-inch PM speaker
URD-001	R10	RESISTOR—10 ohms, 1/2 w., carbon
URD-025	R2, 7, 28	RESISTOR—100 ohms, 1/2 w., carbon
URD-037	R29	RESISTOR—330 ohms, 1/2 w., carbon
URD-041	R26	RESISTOR—470 ohms, 1/2 w., carbon
URD-049	R3, 4, 9	RESISTOR—1000 ohms, 1/2 w., carbon
URD-057	R27	RESISTOR—2200 ohms, 1/2 w., carbon
URD-081	R6	RESISTOR—22,000 ohms, 1/2 w., carbon
URD-085	R1, 12	RESISTOR—33,000 ohms, 1/2 w., carbon
URD-089	R14, 15	RESISTOR—47,000 ohms, 1/2 w., carbon
URD-097	R5, 18	RESISTOR—100,000 ohms, 1/2 w., carbon
URD-099	R16, 17	RESISTOR—120,000 ohms, 1/2 w., carbon
URD-105	R13	RESISTOR—220,000 ohms, 1/2 w., carbon
URD-113	R21, 24	RESISTOR—470,000 ohms, 1/2 w., carbon
URD-121	R11	RESISTOR—1.0 meg., 1/2 w., carbon
URD-129	R8	RESISTOR—2.2 meg., 1/2 w., carbon
URD-141	R20	RESISTOR—6.8 meg., 1/2 w., carbon
URE-029	R25	RESISTOR—150 ohms, 1 w., carbon
URE-041	R22, 23	RESISTOR—470 ohms, 1 w., carbon

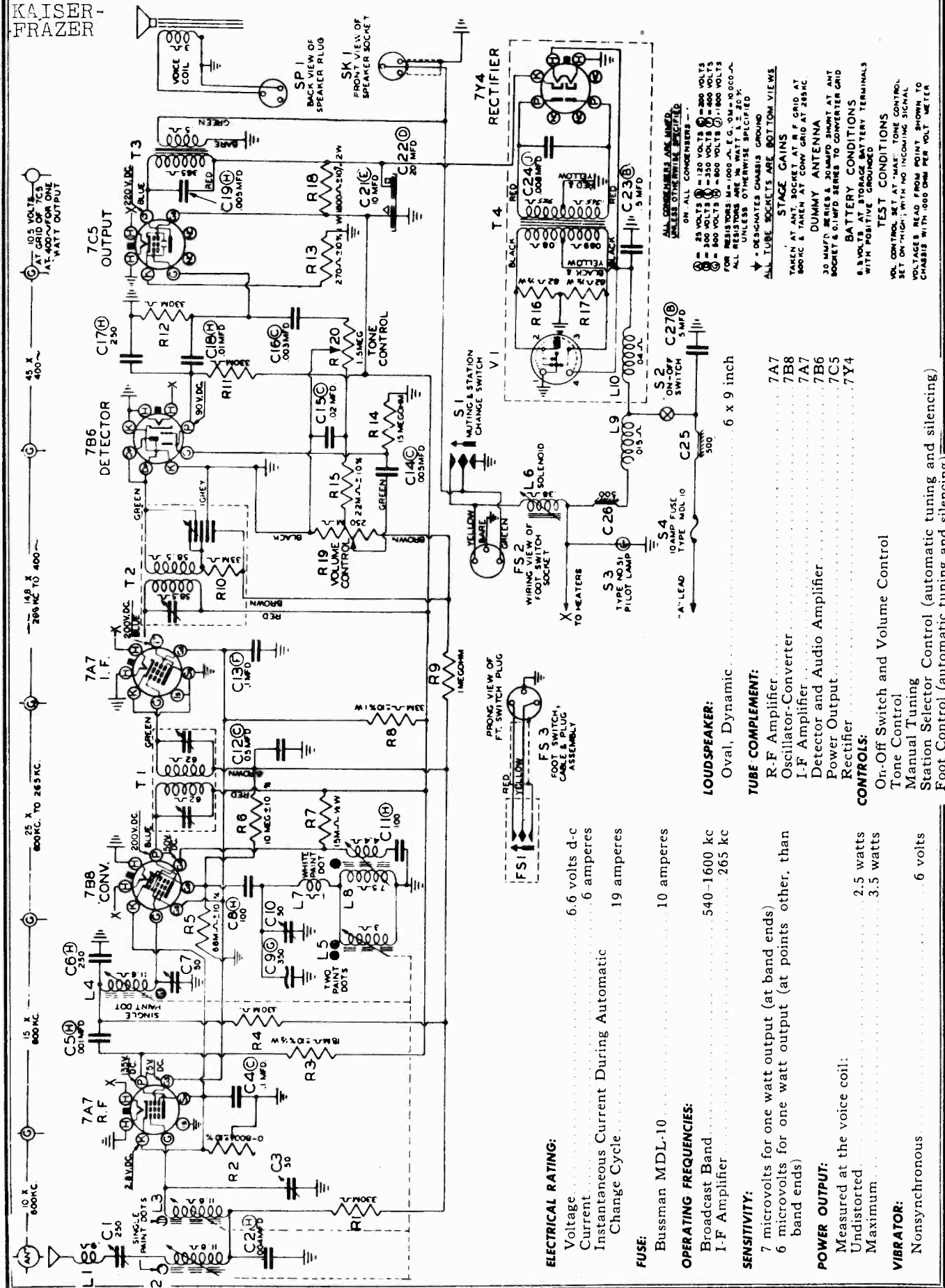
Cat. No.	Symbol	Description
<b>SPECIALIZED REPLACEMENT PARTS</b>		
RAA-007		ARM—Switch arm for tone control
RAB-074	L13	LOOP AND BACK ASSEMBLY FOR MODELS 210 AND 211
RAB-075	L13	LOOP AND BACK ASSEMBLY FOR MODEL 212
RAU-036		CABINET—White plastic cabinet for Model 211
RAU-037		CABINET—Brown plastic cabinet 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
<b>SPECIALIZED REPLACEMENT PARTS (Cont'd)</b>		
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 capacitor
RCY-044	C38	CAPACITOR—86-146 mmf., trimmer capacitor
RDE-031		ESCUTCHEON
RDK-130		KNOB—Fawn for Model 210 tone control
RDK-131		KNOB—Fawn for Model 210 tuning control
RDK-132		KNOB—Fawn for Model 210 volume control and band switch
RDK-133		KNOB—Maroon for volume control and band switch on Models 211, 212
RDK-134		KNOB—Maroon for tone control on Models 211, 212
RDK-135		KNOB—Maroon for tuning on Models 211, 212
RDP-039		POINTER ASSEMBLY
RDS-071		SCALE, DIAL SCALE
RDW-009		WINDOW
RHG-015		GROMMET—Rubber grommet
RJS-033		SOCKET—For dial light
RJS-105		SOCKET—7-prong tube socket
RJS-118		SOCKET—9-prong tube socket
RJX-019		SOCKET—Female interlock socket on power cord
RLA-012	L4	CHOKE—FM oscillator grid choke
RLB-026	L10	COIL—FM R-F coil
RLC-066	L11	COIL—AM oscillator coil
RLC-067	L12	COIL—FM oscillator coil (length of 300-ohm line between tuning condenser and terminal board tapped at the converter tube)
RLI-005	L3, 8, 9	CHOKE—FM choke
RLI-044	L7	CHOKE—Power line choke
RLI-056	L2	CHOKE—FM antenna choke
RLI-057	L5	CHOKE—FM oscillator cathode choke
RLI-058	L6	CHOKE—Limiter cathode choke
RLI-062	L1	CHOKE—FM Choke
RMG-009		GEAR SEGMENT—For tone control
RMS-004		SPRING—Dial cord tension spring
RRC-082	R19, S2	VOLUME CONTROL AND POWER SWITCH
RRW-008	R30	RESISTOR—Flexible resistor, 18 ohms, 1 w., ±10%
RSI-003		SOCKET—Male interlock on chassis
RSW-056	S1	SWITCH—Bandchange switch
RSW-057	S3	SWITCH—Tone control switch
RTD-006	T6	TRANSFORMER—Discriminator transformer
RTL-054	T5	TRANSFORMER—AM-2nd I-F transformer
RTL-077	T1, 3, 4	TRANSFORMER—1st, 2nd and 3rd FM I-F transformer
RTL-078	T2	TRANSFORMER—AM 1st I-F transformer
RTO-049	T7	TRANSFORMER—Output transformer



MODEL 230  
KAISER-  
FRAZER

GENERAL ELECTRIC CO.



**ELECTRICAL RATING:**  
Voltage ..... 6.6 volts d-c  
Current ..... 6 amperes  
Instantaneous Current During Automatic Change Cycle ..... 19 amperes

**FUSE:**  
Bussman MDL-10 ..... 10 amperes

**OPERATING FREQUENCIES:**  
Broadcast Band ..... 540-1600 kc  
I-F Amplifier ..... 265 kc

**SENSITIVITY:**  
7 microvolts for one watt output (at band ends)  
6 microvolts for one watt output (at points other, than band ends)

**POWER OUTPUT:**  
Measured at the voice coil:  
Undistorted ..... 2.5 watts  
Maximum ..... 3.5 watts

**VIBRATOR:**  
Nonsynchronous ..... 6 volts

**LOUDSPEAKER:**  
Oval, Dynamic

**TUBE COMPLEMENT:**  
7A7 R-F Amplifier  
7B8 Oscillator-Converter  
7A7 I-F Amplifier  
7B6 Detector and Audio Amplifier  
7C5 Power Output  
7Y4 Rectifier

**CONTROLS:**  
On-Off Switch and Volume Control  
Tone Control  
Manual Tuning  
Station Selector Control (automatic tuning and silencing)  
Foot Control (automatic tuning and silencing)

**STAGE GAINS**  
TAKEN AT ANT. TAP AND CONY. GRID AT WORK & TAKEN AT CONY. GRID AT 250VAC.  
DIJUNNY ANTENNA  
30 MFD. SERIES 8.0 MFD. SHUNT AT ANT. SOCKET & 0.1 MFD. SERIES TO CONVERTER GRID  
8.0 VOLTS. BATTERY TERMINALS WITH POSITIVE GROUND

**TEST CONDITIONS**  
VOL. CONTROL SET AT "MAX." TONE CONTROL SET ON "HIGH." MET. NO. INCOMING SIGNAL VOLTAGES REL. FROM POINT SHOWN TO CHASSIS WITH .005 ONE PER VOLT. METER

**ALL CONDENSERS ARE MINER. UNLESS OTHERWISE SPECIFIED**  
ON ALL CONDENSERS -  
⊖ = 25 VOLTS ⊕ = 120 VOLTS ⊕ = 500 VOLTS  
⊖ = 50 VOLTS ⊕ = 350 VOLTS ⊕ = 600 VOLTS  
FOR RESISTORS ⊖ = 1000 OHMS ⊕ = 10,000 OHMS  
ALL RESISTORS ARE 1% T.C. UNLESS OTHERWISE SPECIFIED

↓ = DESIGNATES CHASSIS GROUND  
↑ = DESIGNATES CHASSIS GROUND

ALL TUBE SOCKETS ARE BOTTOM VIEWS  
STAGE GAINS  
TAKEN AT ANT. TAP AND CONY. GRID AT WORK & TAKEN AT CONY. GRID AT 250VAC.  
DIJUNNY ANTENNA  
30 MFD. SERIES 8.0 MFD. SHUNT AT ANT. SOCKET & 0.1 MFD. SERIES TO CONVERTER GRID  
8.0 VOLTS. BATTERY TERMINALS WITH POSITIVE GROUND

**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.

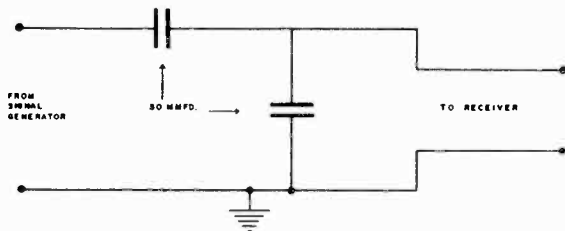
**ALIGNMENT CHART, TABLE I**

Step	Connect Signal Generator to	Signal Generator Setting	Dial Setting	Adjust for Maximum
<b>I-F ALIGNMENT</b>				
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			
<b>R-F ALIGNMENT</b>				
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.

Cat. No.	Symbol	Description
<b>DIAL AND TUNING MECHANISM ASSEMBLY</b>		
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
<b>CHASSIS COMPONENTS (Cont'd)</b>		
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—Speaker cable and socket
RWX-005	SK1	CAPACITOR—0.05 mfd., 200 v., paper
UCC-003	C16	CAPACITOR—0.003 mfd., 200 v., paper
UCC-005	C14	CAPACITOR—0.005 mfd., 200 v., paper
UCC-009	C15	CAPACITOR—0.02 mfd., 200 v., paper
UCC-011	C12	CAPACITOR—0.05 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—0.001 mfd., 600 v., paper
UCC-038	C2	CAPACITOR—0.004 mfd., 600 v., paper
UCC-039	C19	CAPACITOR—0.005 mfd., 600 v., paper
UCC-040	C18	CAPACITOR—0.01 mfd., 600 v., paper
UCU-1028	C8, 11	CAPACITOR—100 mmf., mica
URD-023	R16, 17	RESISTOR—82 ohms, 1/2 w., carbon
URD-027	R22	RESISTOR—120 ohms, 1/2 w., carbon
URD-077	R7	RESISTOR—15,000 ohms, 1/2 w., carbon
URD-079	R3	RESISTOR—18,000 ohms, 1/2 w., carbon
URD-081	R15	RESISTOR—22,000 ohms, 1/2 w., carbon
URN-085	R10	RESISTOR—33,000 ohms, 1/2 w., carbon
URD-097	R21	RESISTOR—100,000 ohms, 1/2 w., carbon
URD-109	R1, 4, 11, 12	RESISTOR—330,000 ohms, 1/2 w., carbon
URD-113	R23	RESISTOR—47,000 ohms, 1/2 w., carbon
URD-117	R5	RESISTOR—68,000 ohms, 1/2 w., carbon
URD-121	R9	RESISTOR—1 meg., 1/2 w., carbon
URD-145	R6	RESISTOR—10 meg., 1/2 w., carbon
URD-149	R14	RESISTOR—15 meg., 1/2 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.

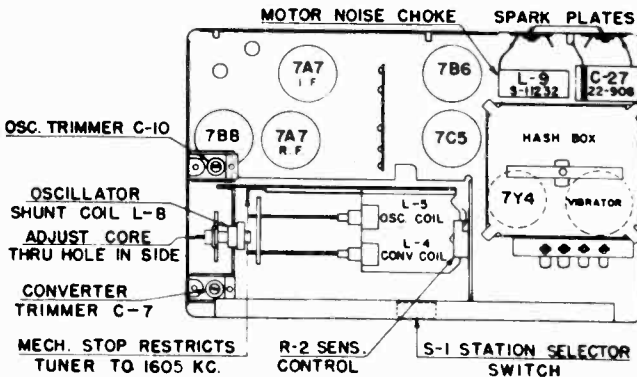
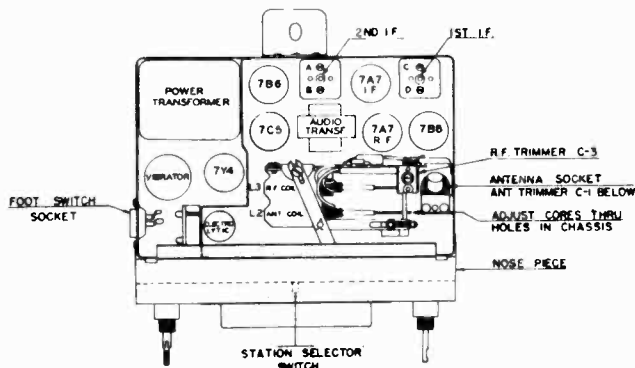
**MOTOR NOISE SUPPRESSION KIT**

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, 1/4-20 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.



**SPECIFICATIONS**

**CABINET:**

Material.....	Steel
Height.....	5 1/4 inches
Depth.....	13 1/8 inches
Width.....	9 1/8 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 super-heterodyne 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.



MODEL 233  
KAISER-FRAZER

GENERAL ELECTRIC CO.

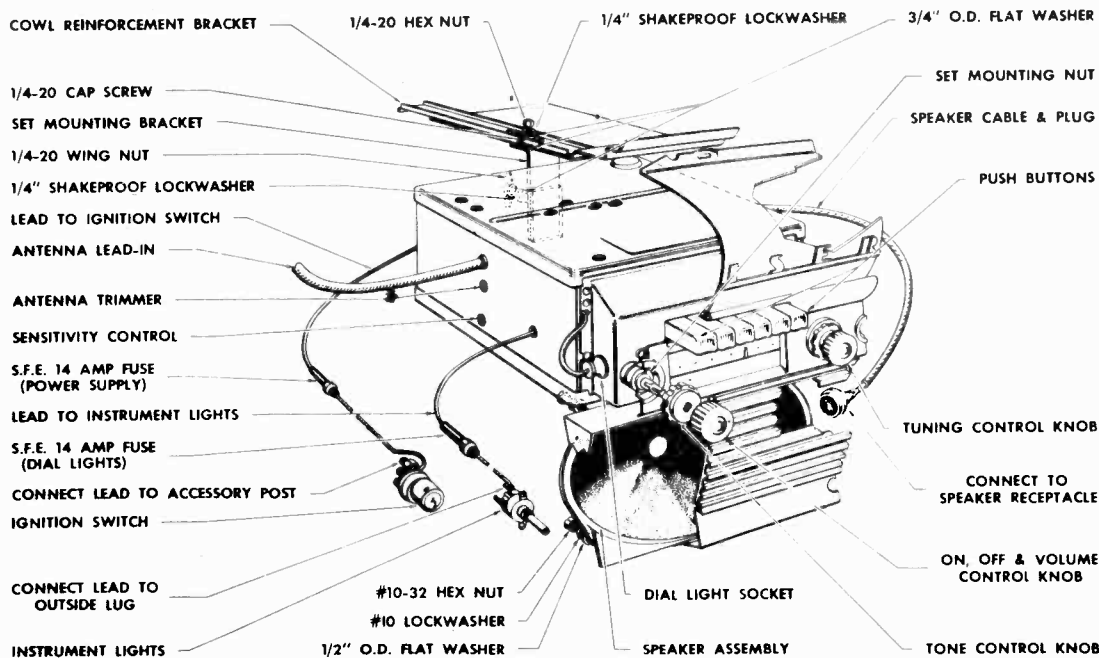


Fig. 1. Installation Details, Kaiser

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  $\frac{3}{4}$ " O.D. flatwasher,  $\frac{1}{4}$ " 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  $\frac{1}{4}$ -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  $\frac{3}{4}$ " O.D. flatwasher is placed through the set mounting bracket hole, cowl, and cowl reinforcement bracket. Apply the  $\frac{3}{4}$ " O.D. flatwasher,  $\frac{1}{4}$ " shakeproof lockwasher, and  $\frac{1}{4}$ -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  $\frac{1}{4}$ -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  $\frac{1}{2}$ " 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.

GENERAL ELECTRIC CO.

MODEL 233  
KAISER-FRAZER

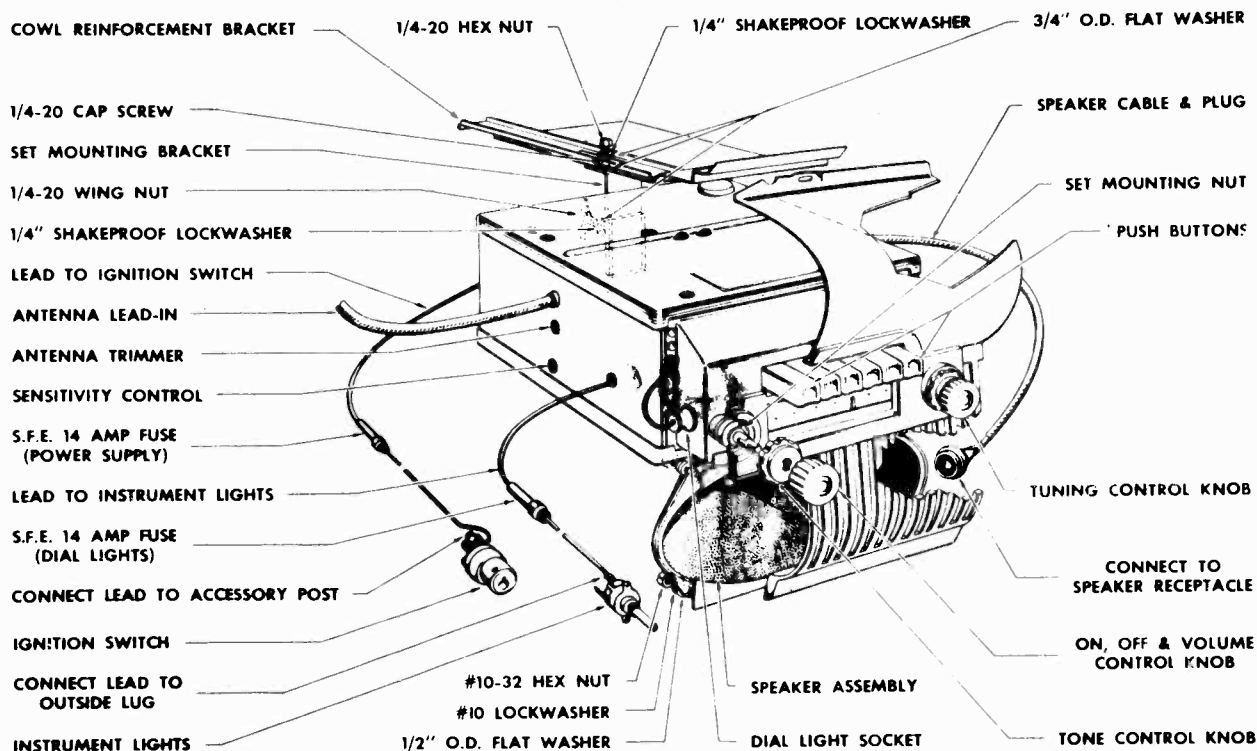


Fig. 2. Installation Details, Frazer

**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
<b>I-F ALIGNMENT</b>				
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			
<b>R-F ALIGNMENT</b>				
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.

MODEL 233  
KAISER-FRAZER

GENERAL ELECTRIC CO.

**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.

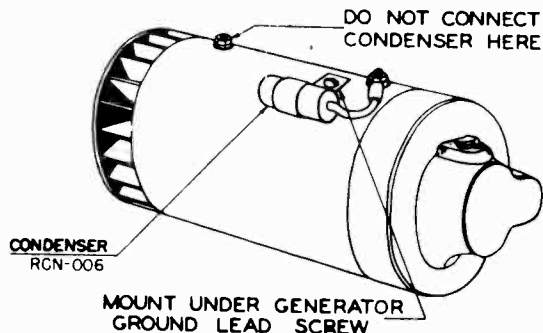


Fig. 5. Generator Noise Condenser

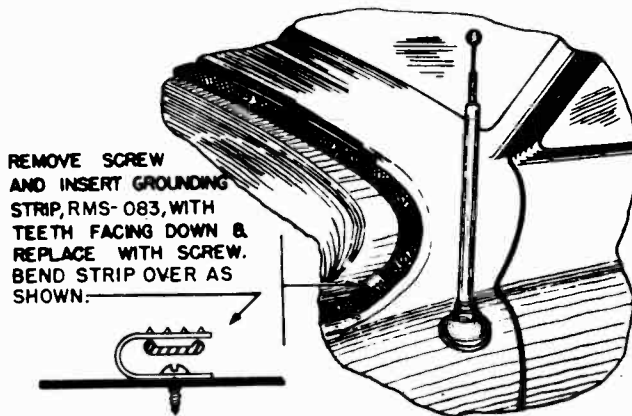


Fig. 6. Hood Bonding

**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.

**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 volt meter.

**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.

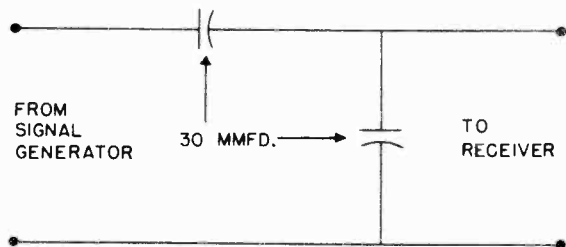


Fig. 7. Dummy Antenna

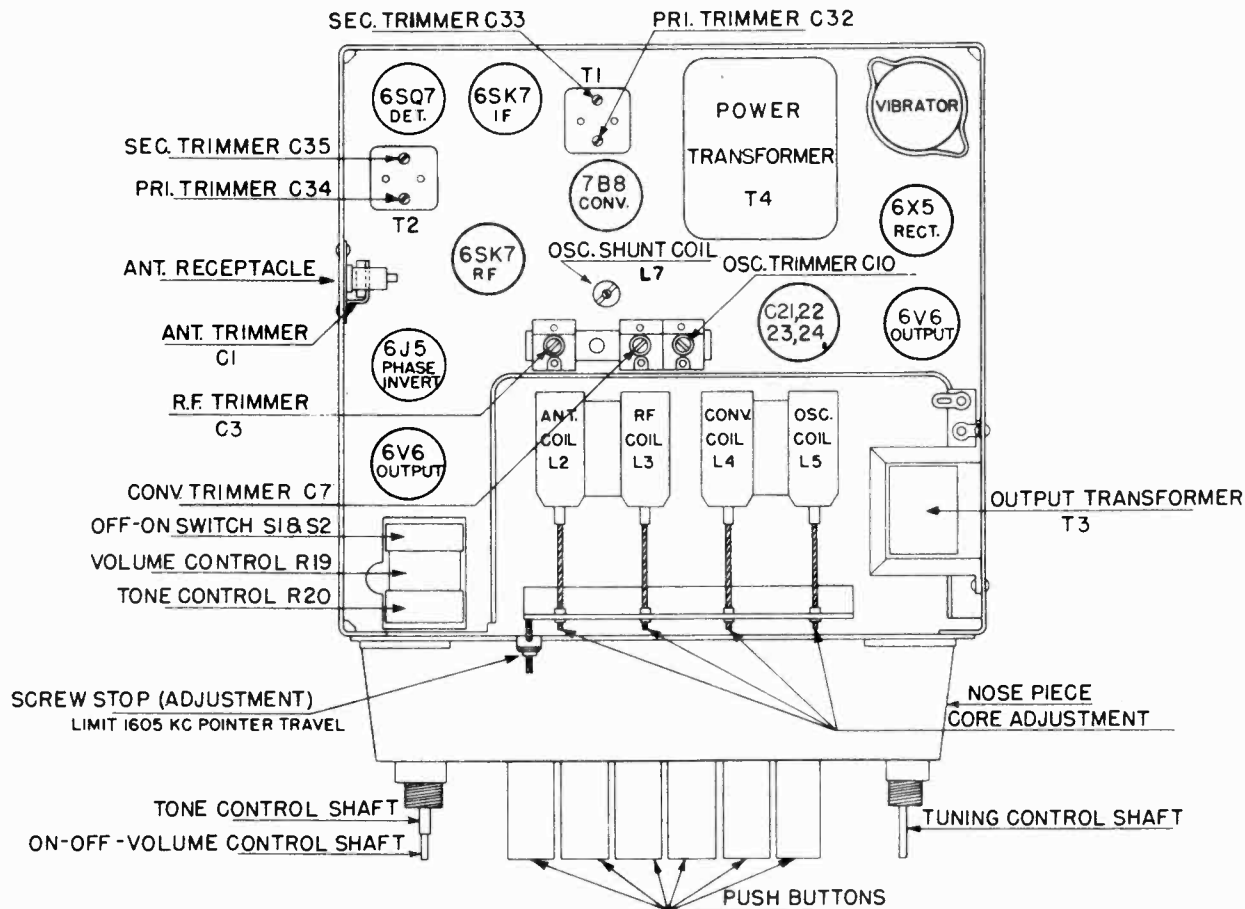


Fig. 8. Top View of Chassis

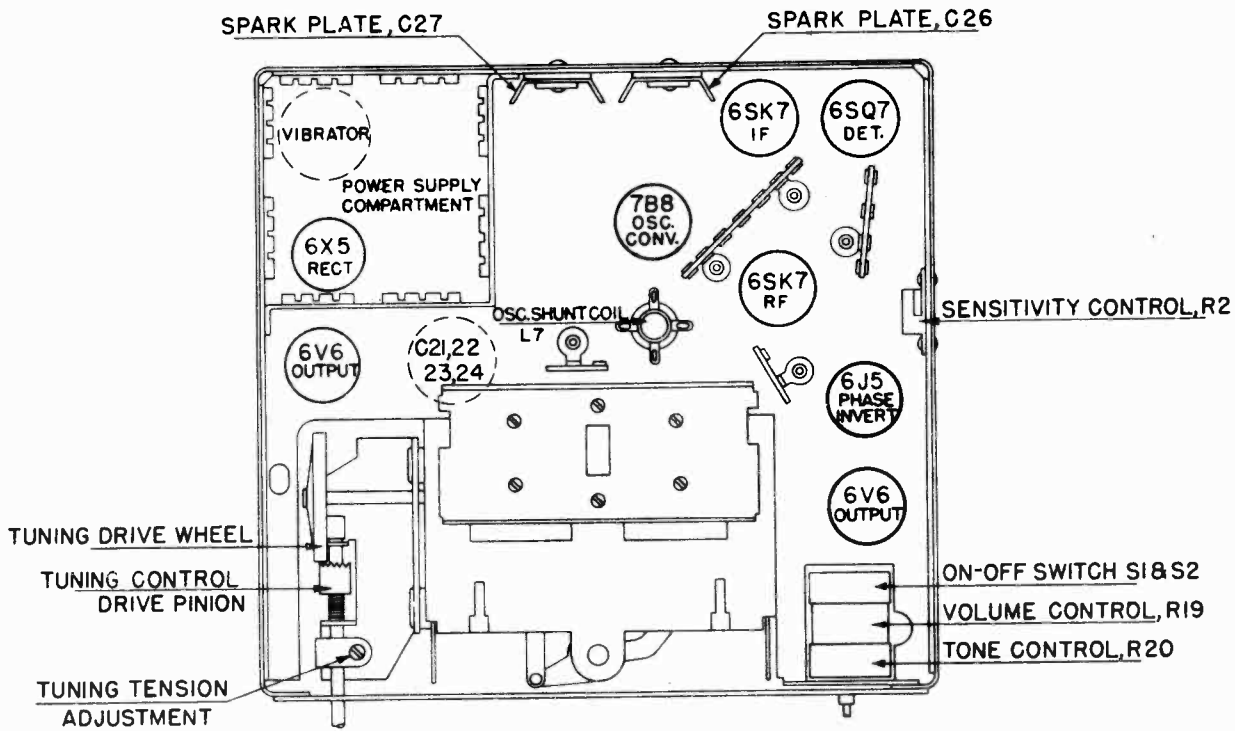


Fig. 9. Bottom View of Chassis

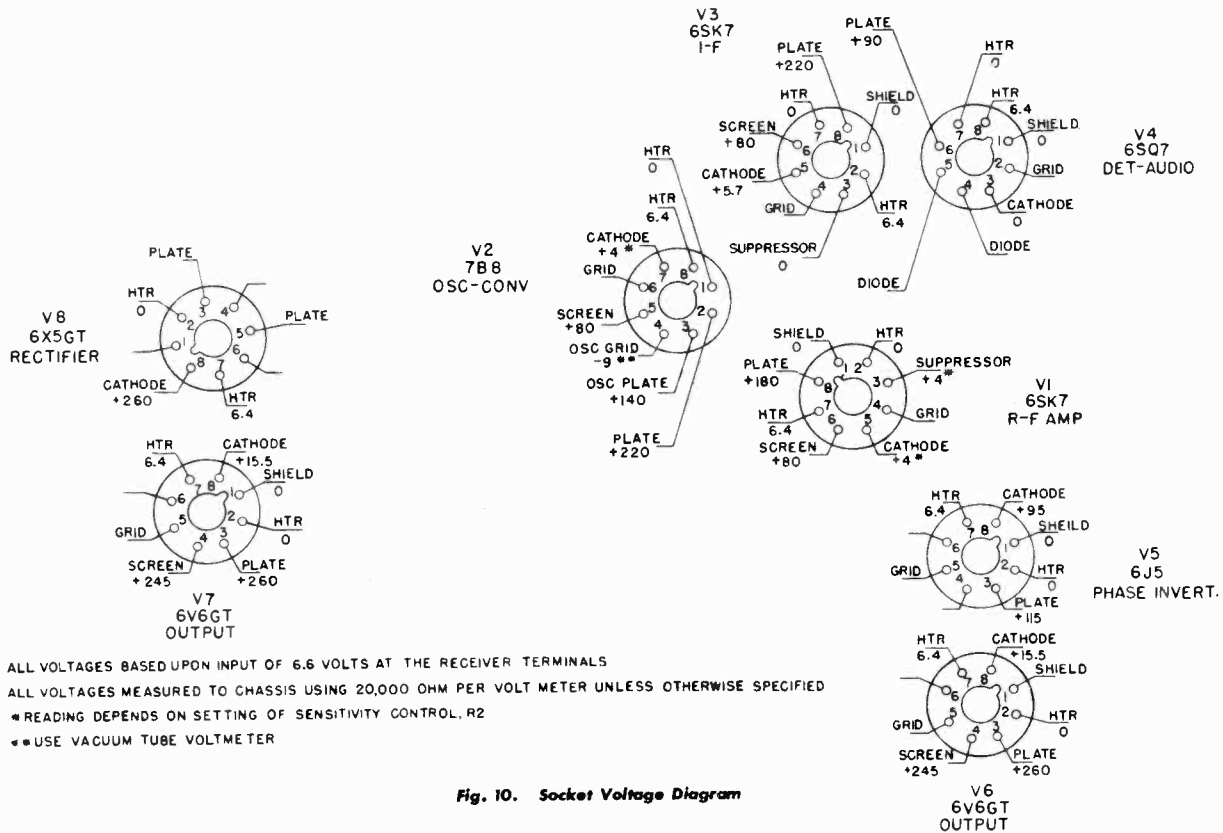


Fig. 10. Socket Voltage Diagram

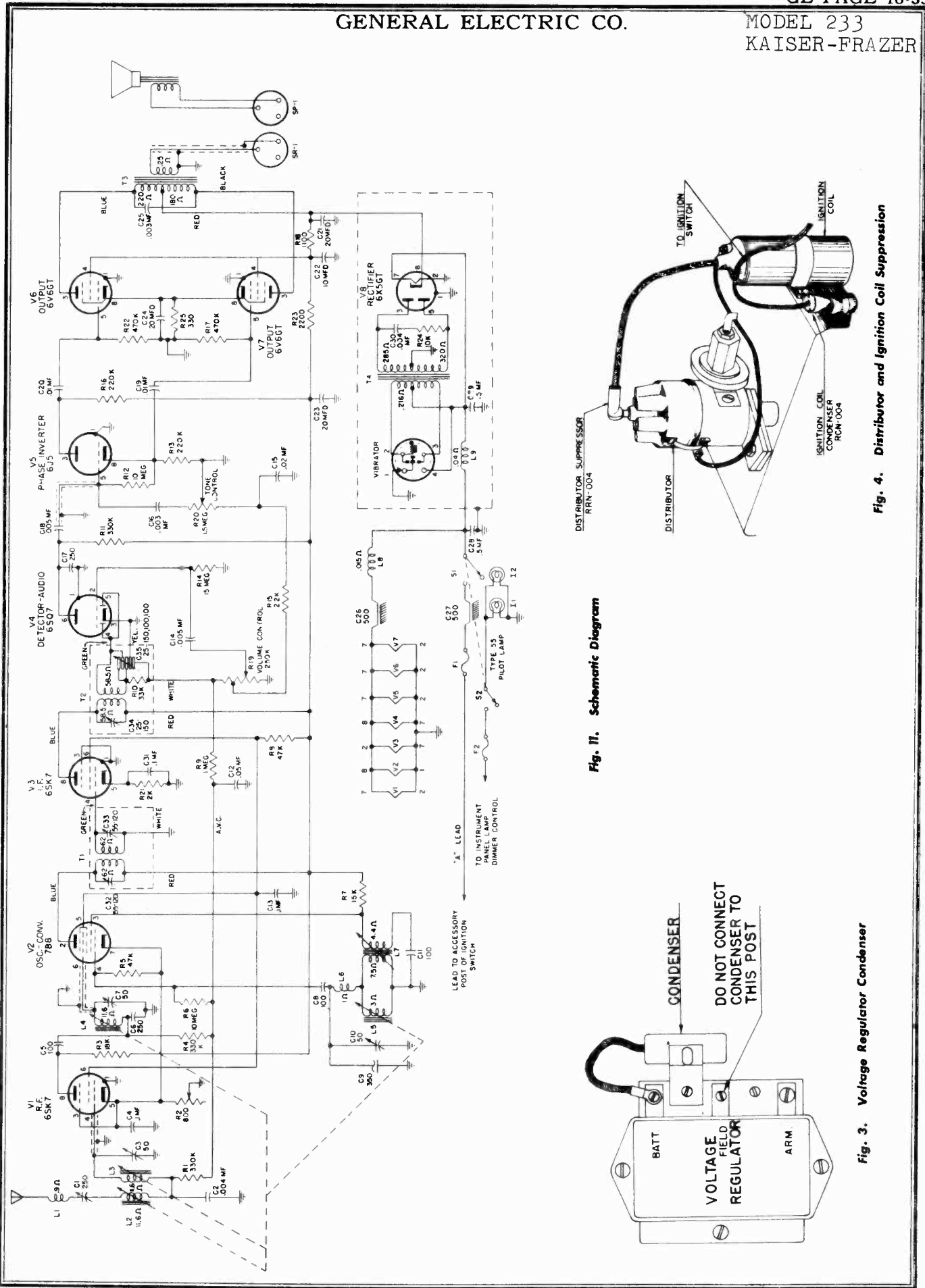


Fig. 11. Schematic Diagram

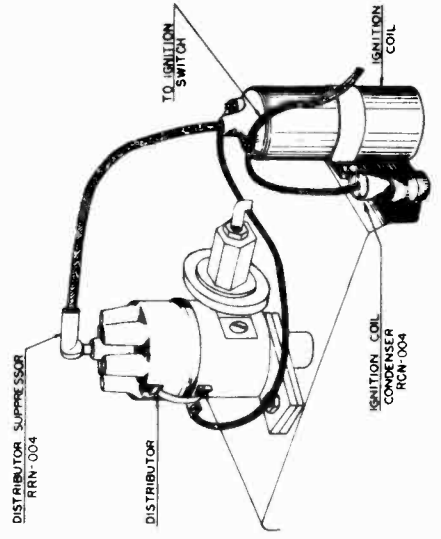


Fig. 4. Distributor and Ignition Coil Suppression

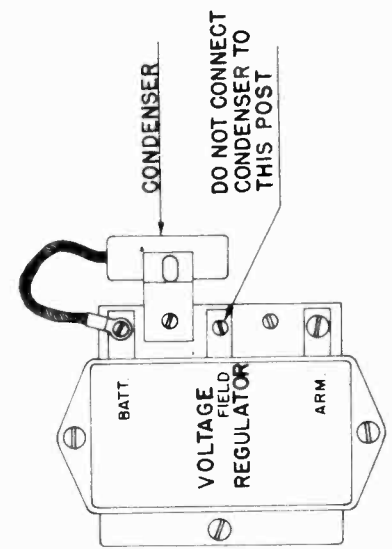


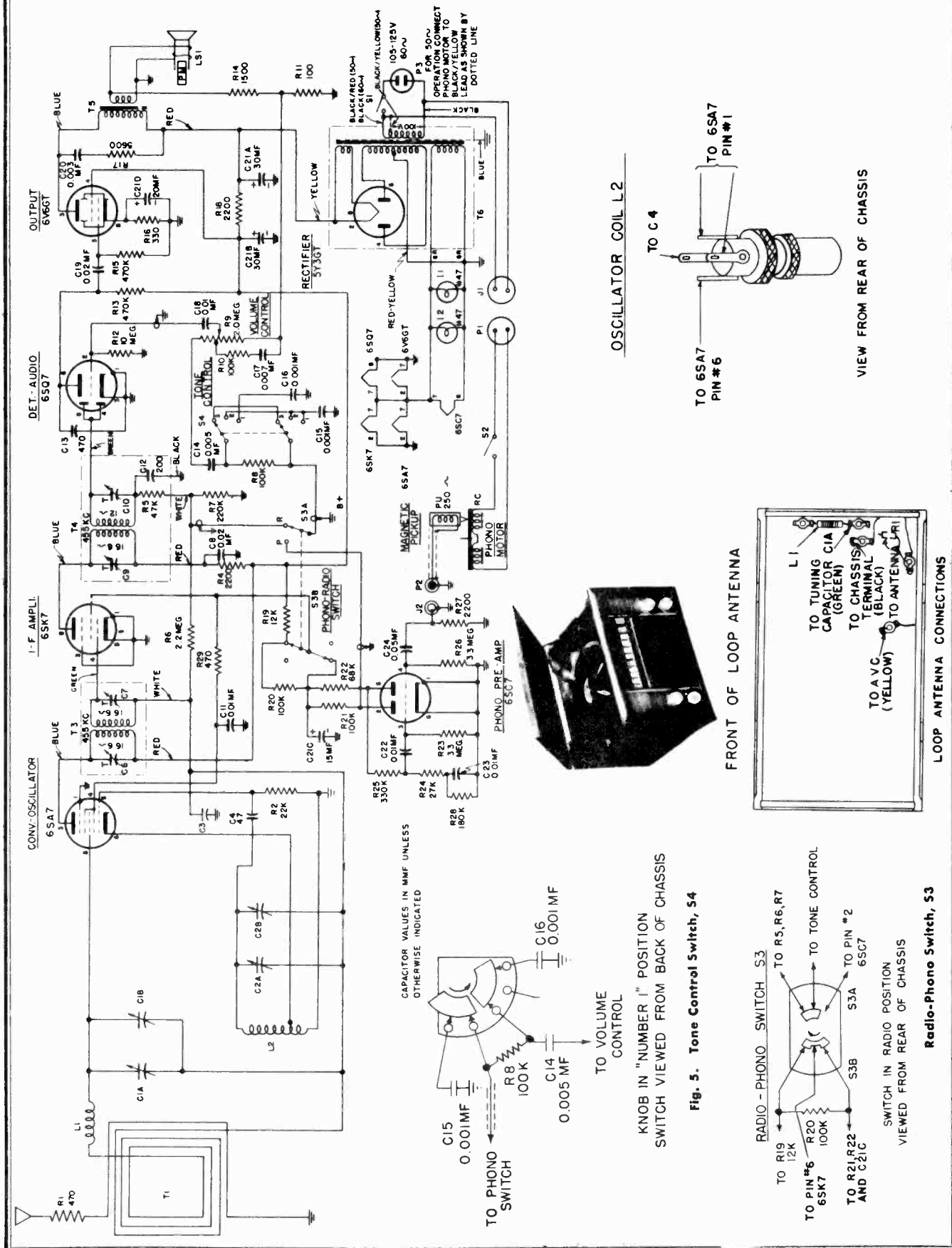
Fig. 3. Voltage Regulator Condenser

## REPLACEMENT PARTS LIST

Cat. No.	Symbol	Description	Cat. No.	Symbol	Description
<b>UNIVERSAL REPLACEMENT PARTS</b>			<b>SPECIALIZED REPLACEMENT PARTS (Cont'd)</b>		
UCC-623	C16	CAPACITOR—.003 mf., 600 v., paper	RDK-145		KNOB—Tone control knob
UCC-625	C14, 18	CAPACITOR—.005 mf., 600 v., paper	RDK-146		KNOB—Volume control knob
UCC-630	C19, 20	CAPACITOR—.01 mf., 600 v., paper	RDK-147		KNOB—Tuning control knob
UCC-631	C15	CAPACITOR—.02 mf., 600 v., paper	RDP-043		POINTER—Dial scale pointer
UCC-635	C12	CAPACITOR—.05 mf., 600 v., paper	RDS-079		DIAL SCALE
UCC-640	C4, 19, 20, 31	CAPACITOR—.1 mf., 600 v., paper	RDW-011		WINDOW—Dial scale window
UCC-645	C28, 29	CAPACITOR—.5 mf., 600 v., paper	RDX-042		PUSHBUTTON—Pushbutton with retaining spring
UCU-1028	C5	CAPACITOR—100 mmf., 600 V., mica	*REI-020		CORE—Tuning core (coded red)
URD-077	R7	RESISTOR—15,000 ohms, ½ w., carbon	*REI-021		CORE—Tuning core (coded green)
URD-079	R3	RESISTOR—18,000 ohms, ½ w., carbon	*REI-022		CORE—Tuning core (coded yellow)
URD-081	R15	RESISTOR—22,000 ohms, ½ w., carbon	*REI-023		CORE—Tuning core (coded blue)
URD-089	R5	RESISTOR—47,000 ohms, ½ w., carbon	REV-002		VIBRATOR
URD-105	R13, 16	RESISTOR—220,000 ohms, ½ w., carbon	RII-015		INSULATOR—Textolite strip insulator for tuning core stem support
URD-109	R1, 4, 11	RESISTOR—330,000 ohms, ½ w., carbon	RIS-002		LIGHT SHIELD—Rubber strip (channeled) used as dial light barrier
URD-113	R17, 22	RESISTOR—470,000 ohms, ½ w., carbon	RJS-015		SOCKET—Octal socket for 6SK7, 6AQ7, 6J5, 6V6GT, and 6X5GT tubes
URD-121	R9	RESISTOR—1 meg., ½ w., carbon	RJS-069		SOCKET—Loktal socket for 7B8 tube
URD-145	R6, 12	RESISTOR—10 meg., ½ w., carbon	RJS-071		SOCKET—Vibrator socket
URD-1056	R21	RESISTOR—2,000 ohms, ½ w., carbon	RJS-121		SOCKET—Antenna connector socket
URE-057	R23	RESISTOR—2,200 ohms, 1 w., carbon	RJS-122		SOCKET—Dial lamp socket and leads
URE-073	R24	RESISTOR—10,000 ohms, 1 w., carbon	RJX-024		SOCKET AND CABLE—Speaker socket and cable
URE-089	R8	RESISTOR—47,000 ohms, 1 w., carbon	RJX-025		CABLE ASSEMBLY—Cable and fuse ferrule (lead to instrument light control)
URE-1050	R18	RESISTOR—1,100 ohms, 1 w., carbon	RKP-005		INSTALLATION KIT—Knobs, mounting hardware, ignition and noise filter components, etc.
URF-037	R25	RESISTOR—330 ohms, 1 w., carbon	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)
<b>SPECIALIZED REPLACEMENT PARTS</b>					
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			

\* Be certain to specify color code marking to insure proper coil tracking.

GENERAL ELECTRIC CO.





**ELECTRICAL CIRCUIT ALIGNMENT**

**ALIGNMENT FREQUENCIES**

- R-F—1500 KC
- I-F—455 KC

**EQUIPMENT REQUIRED**

1. Test Oscillator with Tone Modulation.
2. A-C Output Meter, 1½ volts full scale.
3. .05 Paper Capacitor.
4. Insulated Screwdriver.
5. 200 µf. Mica Capacitor.

**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 5¼ 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.

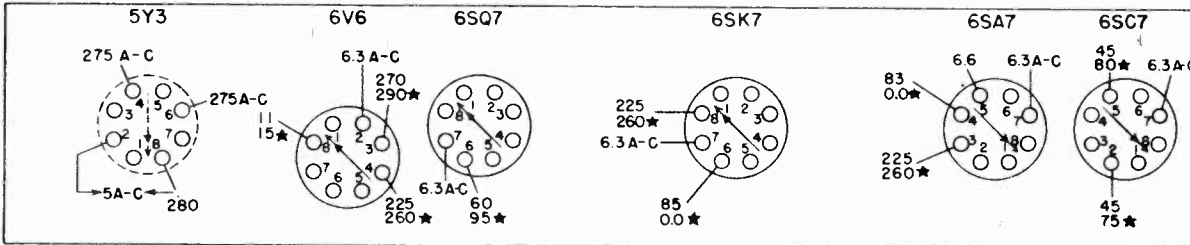
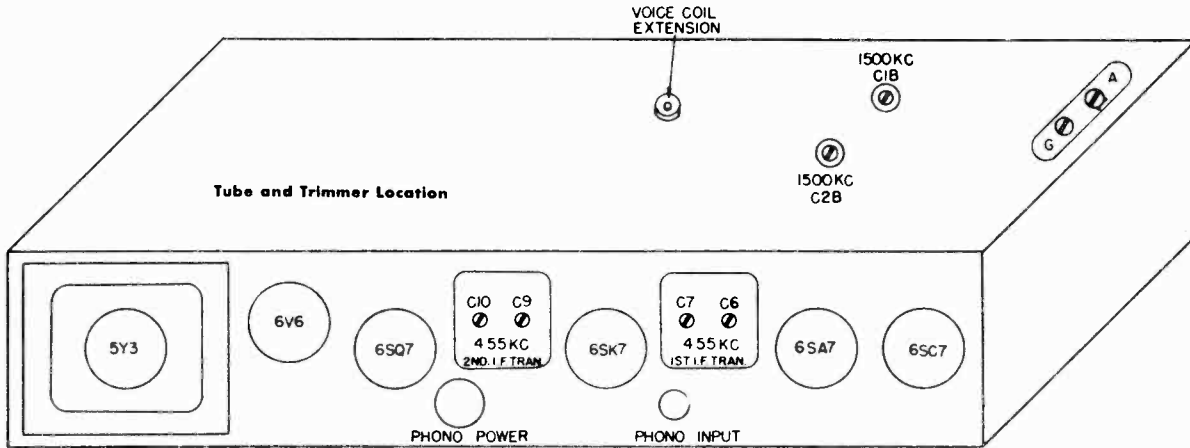
The output meter should be connected across the loud-speaker voice coil terminal. A voice coil terminal is accessible at an insulated rivet in the bottom of the chassis. The low side of the test oscillator output should be connected to the

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	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 5¼ inches from extreme low frequency pointer position. (See alignment procedure.)



BOTTOM VIEW OF CHASSIS

Socket Voltage Diagram

**CONDITIONS OF TEST**

VALUES OBTAINED WITH 20000 OHMS PER VOLT METER  
 READINGS ARE BETWEEN PIN AND CHASSIS WITH A LINE VOLTAGE OF 117 VOLTS  
 VOLUME CONTROL MINIMUM  
 NO SIGNAL INPUT

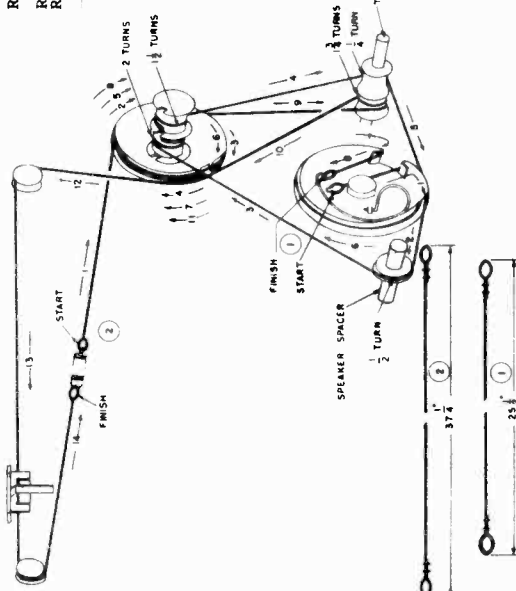
★ VALUES OBTAINED WITH RADIO-PHONO SWITCH IN PHONO POSITION

ALL READINGS TAKEN WITH RADIO-PHONO SWITCH IN RADIO POSITION UNLESS OTHERWISE INDICATED

**STAGE GAIN AND VOLTAGE CHECKS**

Stage gain measurements may be made with a vacuum tube voltmeter to check circuit performance and to locate stages which are not operating properly. The gain values listed may have a tolerance of 20%.

- 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
- 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.
- Oscillator Grid Bias.**  
The d-c voltage developed across the oscillator grid leak R2 should be approximately 6.6 volts at 1000 kc.
- 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-phonograph switch.



Dial Stringing Diagram

CAT. NO.	SYMBOL	DESCRIPTION
UCC-088	C16, 16	CAPACITOR—.001 mfd., 600 v., paper
UCC-089	C14	CAPACITOR—.006 mfd., 600 v., paper
UCC-090	C11, 18, 23, 23	CAPACITOR—.01 mfd., 600 v., paper
UCC-091	C9, 19	CAPACITOR—.02 mfd., 600 v., paper
UCC-092	C8, 24	CAPACITOR—.05 mfd., 600 v., paper
UCC-093	C4	CAPACITOR—.07 mfd., 1000 v., paper
UCG-080	C4	CAPACITOR—.47 mfd., mica
UDL-008	IL, 2	LAMP—No. 47 pilot lamp
UIC-001	LS1	CEMENT—Speaker cone replacement cement
UDP-628	LS1	SPEAKER—6-inch PM speaker
URD-025	R11	RESISTOR—100 ohms, 1/2 w., carbon
URD-041	R1, 28	RESISTOR—470 ohms, 1/2 w., carbon
URD-055	R14	RESISTOR—1600 ohms, 1/2 w., carbon
URD-067	R17, 27	RESISTOR—2200 ohms, 1/2 w., carbon
URD-081	R21	RESISTOR—5600 ohms, 1/2 w., carbon
URD-083	R24	RESISTOR—27,000 ohms, 1/2 w., carbon
URD-089	R6	RESISTOR—47,000 ohms, 1/2 w., carbon
URD-093	R22	RESISTOR—68,000 ohms, 1/2 w., carbon
URD-097	R8, 10, 20, 21	RESISTOR—10,000 ohms, 1/2 w., carbon
URD-103	R28	RESISTOR—160,000 ohms, 1/2 w., carbon
URD-106	R7	RESISTOR—220,000 ohms, 1/2 w., carbon
URD-109	R25	RESISTOR—330,000 ohms, 1/2 w., carbon
URD-113	R13, 15	RESISTOR—470,000 ohms, 1/2 w., carbon
URD-133	R23, 26	RESISTOR—3.2 meg., 1/2 w., carbon
URD-145	R12	RESISTOR—3.3 meg., 1/2 w., carbon
URE-070	R16	RESISTOR—390 ohms, 1/2 w., carbon
URF-067	R18	RESISTOR—2200 ohms, 1/2 w., carbon
URF-075	R19	RESISTOR—12,000 ohms, 1/2 w., carbon

CAT. NO.	SYMBOL	DESCRIPTION
RDF-009		WASHER—Felt washer for control knobs
RDK-003		KNOB—Control knob (pointer)
RDK-006		KNOB—Control knob (plain)
RDP-011		POINTER—Dial pointer and slide assembly
RDS-049		SCALE—Dial scale and cushion
RHC-013		COTTER—Hair pin cotter for dial cord idler pulleys
RHC-013		COTTER—Hair pin cotter for tuning shaft and idler drum shaft
RHG-003		GROMMET—Mounting grommet for 6SC7 tube
RHX-011		HARDWARE—Tuning condenser mounting hardware
RJA-001	J2	ADAPTER—Wood extension shaft for control shafts
RJP-010		PLUG—Speaker lead plug
RJS-003		SOCKET—Phono input socket
RJS-006		SOCKET—6SA7 tube socket
RJS-031		SOCKET—6SA7 tube socket
RJS-048	J1	SOCKET—Phono power socket
RJA-031	L1	SOCKET—Pilot lamp socket
RJA-031	L2	SOCKET—Antenna compensating coil
RLL-014	T1	BEAM-A-SCOPE—Loop antenna assembly
RMC-017		CLAMP—Electrolytic capacitor mounting clamp
RMS-004		SPRING—Drive cord tension spring (in pointer drive cord)
RMS-076		SPRING—Drive cord tension spring (inside condenser drive drum)
RMW-003		PULLEY—Idler pulley for pointer drive cord
RMW-036		DRUM—Idler drum (consists of 1 1/4-inch drum and tuning control shaft)
RMX-014	PU	SPRING—Tuning control shaft
RPY-010	R9, S1	PICK-UP—Magnetic pick-up unit
RRC-029		VOLUME CONTROL—2 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
RTR-021	T7	TRANSFORMER—60-cycle power transformer
RWL-009	P3	CORD—Power cord and plug
RYM-001		SCALE—Cardboard scale for backplate

**LOUDSPEAKER**

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

**PHONOGRAPH PICKUP**

Type ..... Magnetic  
D-C Resistance ..... 280 ohms

**TUBE COMPLEMENT**

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

**ELECTRICAL RATING**

Voltage ..... 105-125 v a-c  
Frequency ..... 60 cycles  
Wattage (Phonograph Operation) ..... 75  
Wattage (Radio Operation) ..... 50

**OPERATING FREQUENCIES**

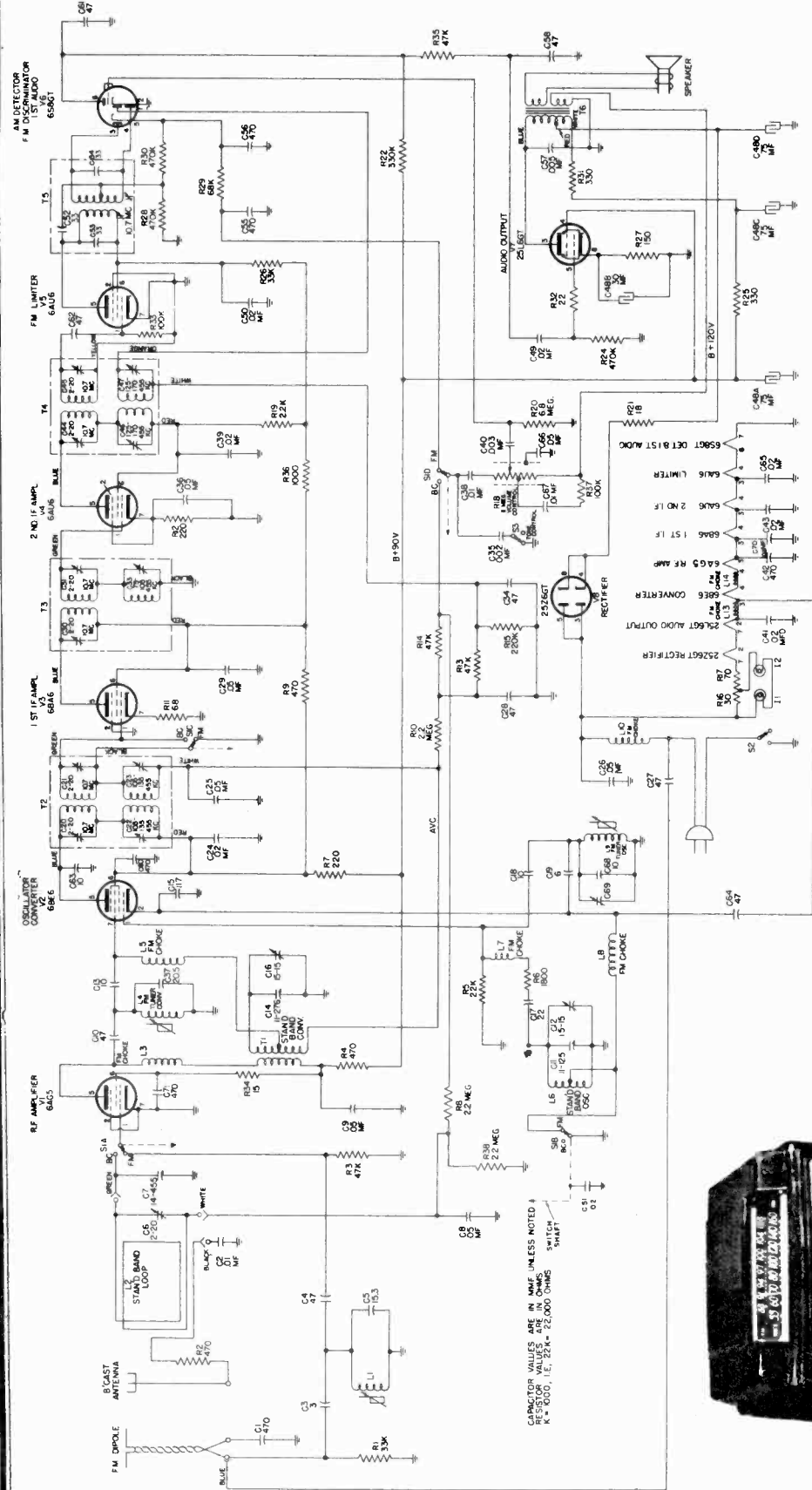
Tuning Frequency Range ..... 540 KC to 1600  
Intermediate Frequency ..... 455 kc

**POWER OUTPUT**

Undistorted ..... 3 watts  
Maximum ..... 5 watts

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**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 FM ..... 540-1600 kc  
 Intermediate Frequency: Standard Broadcast FM ..... 455 kc  
 ..... 10.7 mc

**POWER OUTPUT (117 Volts Line):**

Undistorted ..... 1.2 watts  
 Maximum ..... 2.0 watts

**ANTENNA:**

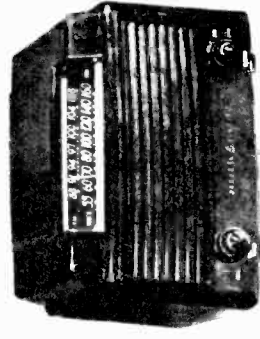
Broadcast ..... Loop antenna or outside antenna  
 FM ..... Power cord antenna or external dipole antenna

**LOUD-SPEAKER:**

Type ..... "Alnico" permanent magnet  
 Outside Cone Diameter ..... 5 1/4 in.  
 Voice Coil Impedance (400 cycles) ..... 3.2 ohms

**TUBE COMPONENT:**

- (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
- II 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  $\pm 20\%$ . 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  $\frac{1}{2}$  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.  $\frac{1}{2}$  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,  $\frac{1}{2}$  watt.
4. 20,000 ohm per volt meter.

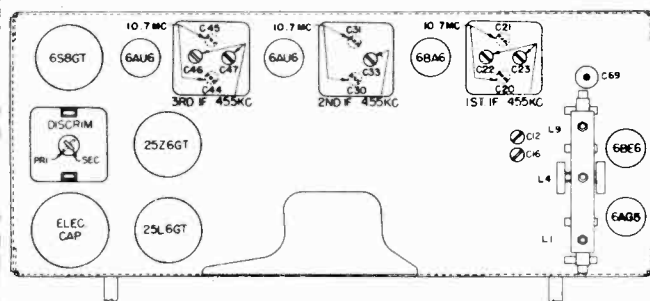
**NOTES IN CONNECTION WITH METER ALIGNMENT:**

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).

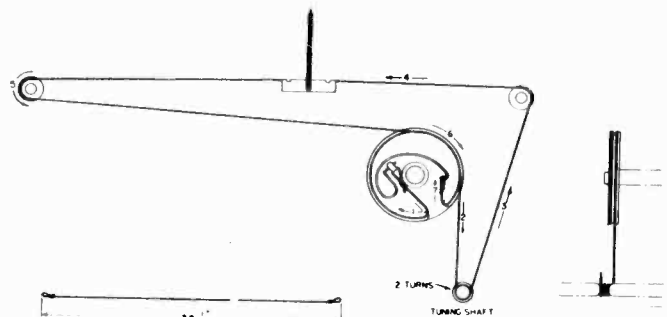
4. Use 400-cycle modulation (Steps 1, 2, 3, 15, 16, 17, and 18).
5. Connect a standard output meter across speaker voice coil. Turn volume control full on. Keep signal generator output down so that meter indicates not more than  $\frac{1}{2}$  watt output (2 volts) during alignment.
6. Two oscillator 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  $\pm 300$  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  $\pm 20$  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

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## ALIGNMENT CHART

STEP	SIGNAL GENERATOR FREQUENCY	SIGNAL INPUT POINT	BAND SWITCH	DIAL SETTING	ADJUST	SEE NOTE	REMARKS
<b>AM I-F METER ALIGNMENT</b>							
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.
<b>FM DISCRIMINATOR AND I-F METER ALIGNMENT</b>							
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.
<b>FM R-F METER ALIGNMENT</b>							
10	98 mc	Dipole terminals thru dummy antenna	FM	98 mc or $3\frac{3}{8}$ inches	Peak C69	1, 3, 6, 9, 10	
11	98 mc	Dipole terminals thru dummy antenna	FM	For max. output	Peak L4 vane	1, 3, 9	
12	Repeat steps 10 and 11 until no further improvement in sensitivity.						
13	98 mc	Dipole terminals thru dummy antenna	FM	98 mc	Peak L1 vane	1, 3, 9	
14	Repeat steps 10, 11, 12.						
<b>AM R-F METER ALIGNMENT</b>							
15	1500 kc	Inductively coupled	STD	1500 kc or $4\frac{1}{8}$ inches	Peak C12	4, 5, 7, 10	
16	1500 kc	Inductively coupled	STD	For max. output	Peak C16	4, 5, 7	
17	Repeat steps 15 and 16 until no further improvement in sensitivity.						
18	1500 kc	Inductively coupled	STD	1500 kc	Peak C6	4, 5, 7	

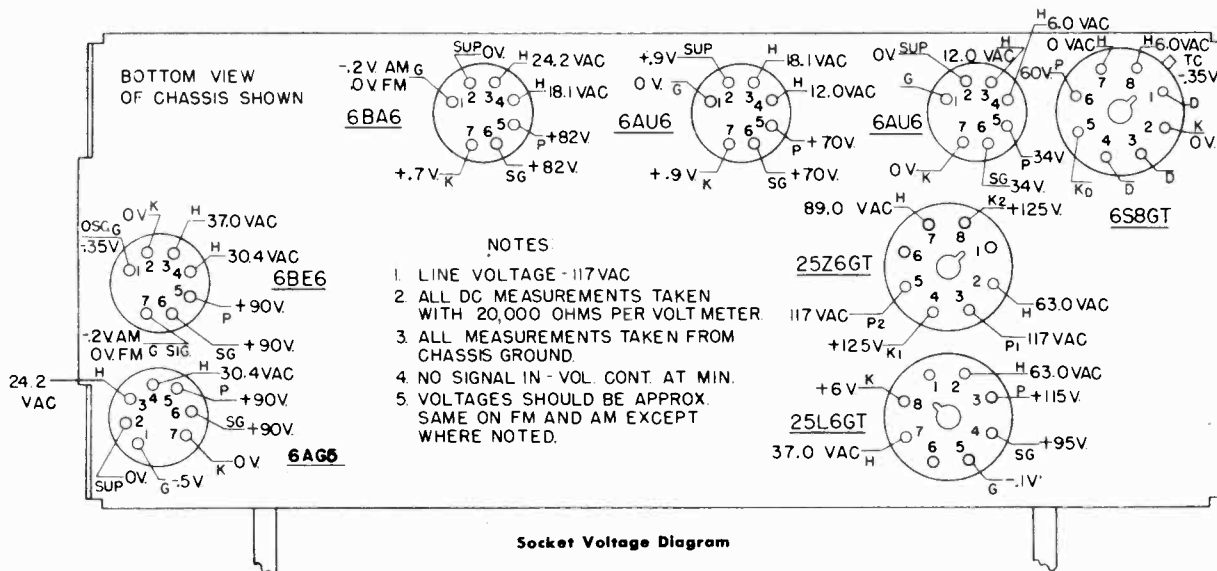
GENERAL ELECTRIC CO.

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STEP	SIGNAL GENERATOR FREQUENCY	SIGNAL INPUT POINT	BAND SWITCH	DIAL SETTING	ADJUST	SEE NOTE	REMARKS
<b>AM I-F VISUAL ALIGNMENT</b>							
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.
<b>FM I-F VISUAL ALIGNMENT</b>							
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.
<b>DISCRIMINATOR VISUAL ALIGNMENT</b>							
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 mid-point 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.
<b>FM R-F VISUAL ALIGNMENT</b>							
10	98 mc	Dipole terminals thru dummy antenna	FM	98 mc or 3 <sup>3</sup> / <sub>8</sub> 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.
<b>AM R-F VISUAL ALIGNMENT</b>							
13	1500 kc Note 6	Antenna thru 200 mmf	STD	1500 kc or 4 <sup>1</sup> / <sub>8</sub> 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 4 <sup>1</sup> / <sub>8</sub> 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 4 <sup>1</sup> / <sub>8</sub> in.	Adjust C6	4, 5, 7	Adjust C6 for max. amplitude.

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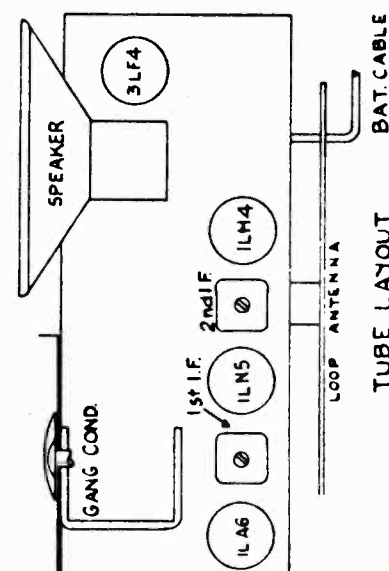
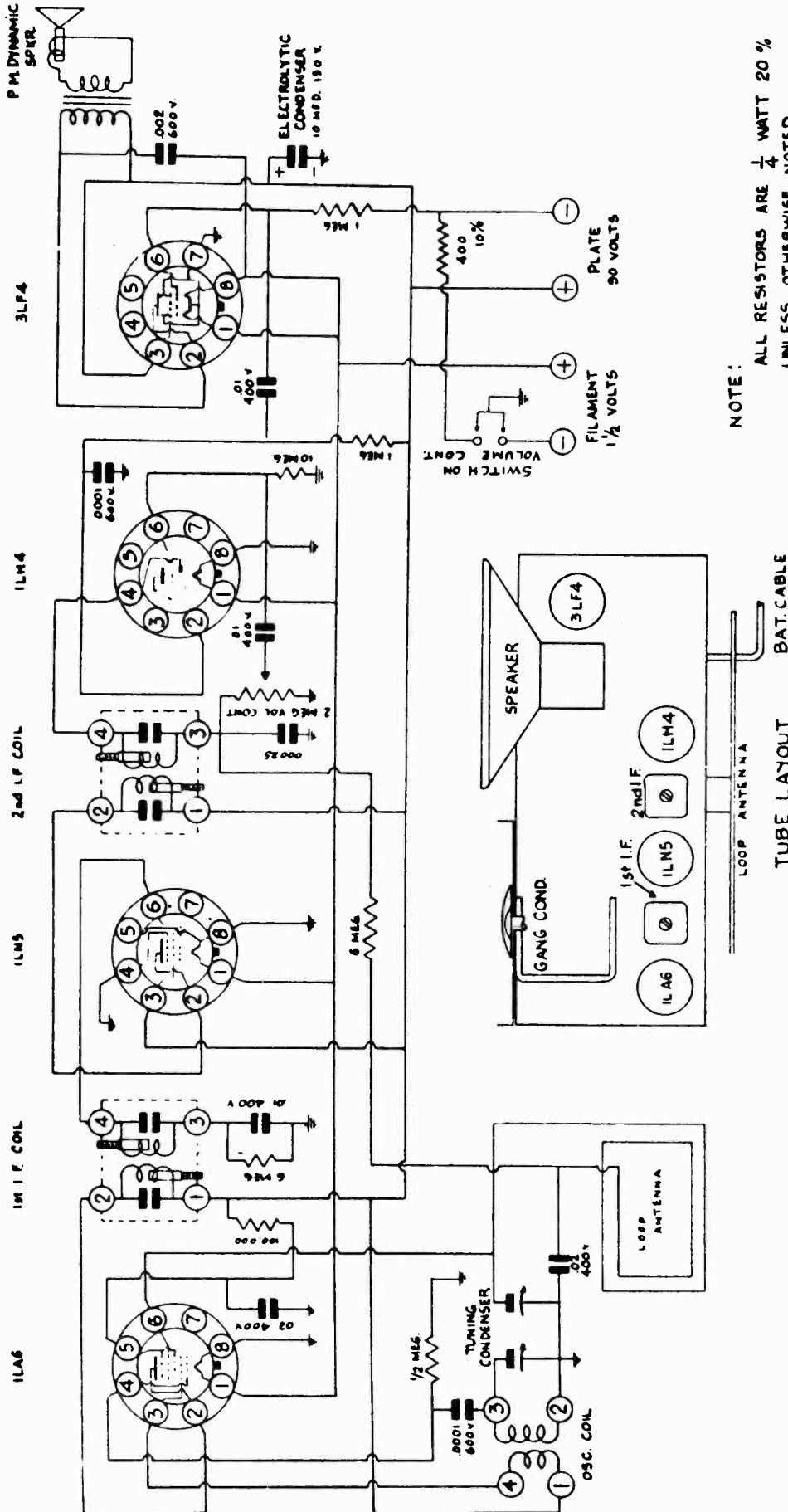


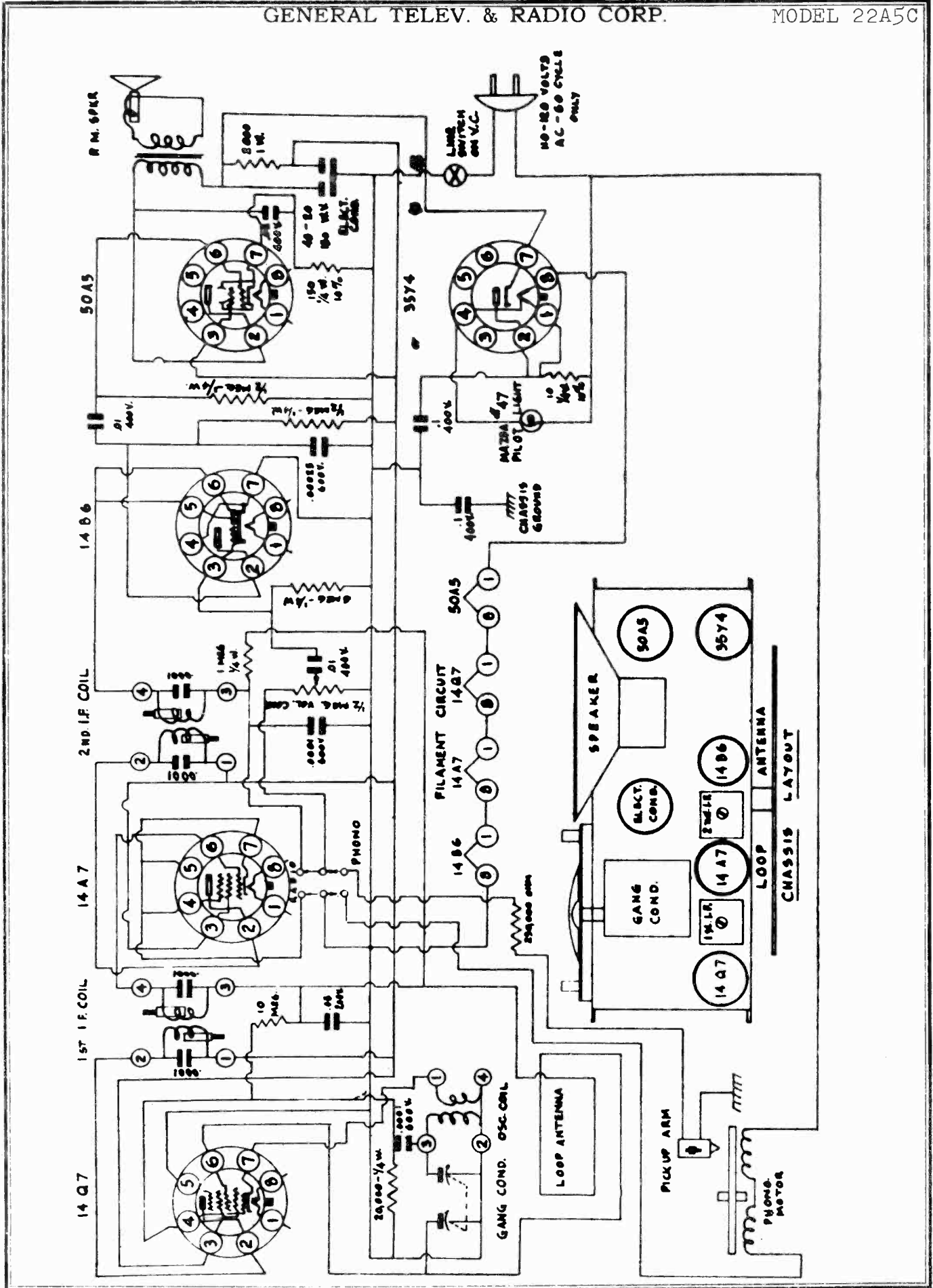
Socket Voltage Diagram

Cat. No.	Symbol	Description	Cat. No.	Symbol	Description
<b>UNIVERSAL REPLACEMENT PARTS</b>			<b>SPECIALIZED REPLACEMENT PARTS (Cont'd)</b>		
UCC-003	C40	CAPACITOR—003 mf., 200 v., paper	RCW-1056	C37	CAPACITOR—20.5 mmf., ceramic
UCC-008	C38	CAPACITOR—01 mf., 200 v., paper	RCY-016	C6	CAPACITOR—Trimmer capacitor
UCC-011	C8, 25, 36	CAPACITOR—05 mf., 200 v., paper	RCY-038	C69	CAPACITOR—Trimmer capacitor
UCC-025	C43, 65, 2, 70	CAPACITOR—01 mf., 400 v., paper	RDC-032	CORD	Dial drive cord (10 yard min.)
UCC-026	C24, 39, 49, 50	CAPACITOR—02 mf., 400 v., paper	RDD-009	DRUM	Tuner drum
UCC-028	C9, 26, 29, 66	CAPACITOR—05 mf., 400 v., paper	RDK-110	KNOB	Black knob for band change and volume control
UCC-039	C57	CAPACITOR—005 mf., 600 v., paper	RDK-123	KNOB	Ivory for band change and volume control
UCC-621	C35	CAPACITOR—002 mf., 200 v., paper	RDK-124	KNOB	Black for tone control
UCU-020	C27, 28, 34, 58	CAPACITOR—47 mmf., mica	RDK-126	KNOB	Ivory for tone control
UCU-044	C1, 55	CAPACITOR—470 mmf., mica	RDK-127	KNOB	Black for tuning control
UCU-520	C61	CAPACITOR—470 mmf., mica	RDS-065	SCALE	Dial scale for Models 356, 357
UCU-544	C56	CAPACITOR—470 mmf., mica	RDS-066	SCALE	Dial scale for Model 358
UCW-044	C41, 42, 60, 71	CAPACITOR—470 mmf., ceramic	RDX-039	POINTER	Dial pointer assembly
UCW-2004	C18, 68	CAPACITOR—10 mmf., ceramic	RHJ-006	SPACERS	For mounting tuner assembly, 3 required
URD-005	R34	SPEAKER—PM speaker	RHM-038	TUNER FRAME	—2 required for coils L1, L4 and L9
URD-009	R32	RESISTOR—15 ohms, 1/2 w., carbon	RHX-011	GROMMET	For mounting tuner assembly, three required
URD-021	R11	RESISTOR—22 ohms, 1/2 w., carbon	RII-010	INSULATOR	Tuner insulator
URD-033	R7, 12	RESISTOR—220 ohms, 1/2 w., carbon	RJS-003	SOCKET	Octal tube socket
URD-041	R2, 49	RESISTOR—470 ohms, 1/2 w., carbon	RJS-098	SOCKET	Pilot light socket
URD-049	R36	RESISTOR—1000 ohms, 1/2 w., carbon	RJS-105	SOCKET	Miniature tube socket
URD-055	R6	RESISTOR—1800 ohms, 1/2 w., carbon	RJX-019	INTERLOCK ASSEMBLY	
URD-057	R19	RESISTOR—2200 ohms, 1/2 w., carbon	RLA-012	COIL	FM R-F choke coil
URD-081	R5	RESISTOR—22,000 ohms, 1/2 w., carbon	RLB-024	TRANSFORMER	B-C R-F transformer
URD-085	R1, 26	RESISTOR—33,000 ohms, 1/2 w., carbon	RLC-060	COIL	B-C oscillator coil
URD-089	R3, 13, 14, 35	RESISTOR—47,000 ohms, 1/2 w., carbon	RLF-012	COIL	FM oscillator choke coil
URD-093	R29	RESISTOR—68,000 ohms, 1/2 w., carbon	RLI-005	COIL	FM oscillator choke coil
URD-097	R33, 37	RESISTOR—100,000 ohms, 1/2 w., carbon	RLI-044	COIL	FM power line choke coil
URD-105	R15	RESISTOR—220,000 ohms, 1/2 w., carbon	RLX-014	LOOP AND BACK ASSEMBLY	For Model 358
URD-109	R22	RESISTOR—330,000 ohms, 1/2 w., carbon	RLX-016	LOOP AND BACK ASSEMBLY	For Models 356 and 357
URD-113	R24, 28, 30	RESISTOR—470,000 ohms, 1/2 w., carbon	RMG-009	GEAR	Plastic gear segment on tone control
URD-129	R8, 10, 38	RESISTOR—2.2 meg., 1/2 w., carbon	RMS-076	SCREW	Adjusting screw for tuning vane
URD-141	R20	RESISTOR—6.8 meg., 1/2 w., carbon	RMS-125	SPRING	Tuner arm return spring
URE-029	R27	RESISTOR—150 ohms, 1 w., carbon	RMS-126	SPRING	Vane holder spring
URE-037	R25, 31	RESISTOR—330 ohms, 1 w., carbon	RMS-130	SPRING	Dial cord tension spring
<b>SPECIALIZED REPLACEMENT PARTS</b>			RMX-110	TUNER VANE AND WIRE ASSEMBLY	For L1 and L4
RAU-012		CABINET—Brown plastic, for Model 356	RRC-076	TUNER VANE AND WIRE ASSEMBLY	For L9
RAU-013		CABINET—Ivory plastic, for Model 357	RMW-004	PULLEY	Dial cord idler pulley
RAV-052		CABINET—Wood, for Model 358	RRC-076	VOLUME CONTROL AND POWER SWITCH	
RCC-087	C67	CAPACITOR—01 mf., 200 v.	RRW-008	RESISTOR	—Flexible, 18 ohms
RCE-065	C48A, B, C, D	CAPACITOR—Electrolytic	RRW-025	RESISTOR	—70 ohms, tapped at 30 ohms, wirewound
RCT-028		CAPACITOR—Tuning capacitor	RSI-003	INTERLOCK ASSEMBLY	(Male)
RCW-020	C13, 63	CAPACITOR—10 mmf., ceramic	RSW-049	SWITCH	Band change switch
RCW-1048	C3	CAPACITOR—3 mmf., ceramic	RTD-006	SWITCH	Tone control switch
RCW-1050	C19	CAPACITOR—6 mmf., ceramic	RTL-062	TRANSFORMER	Discriminator
RCW-1052	C4, 10, 64	CAPACITOR—47 mmf., ceramic	RTL-064	TRANSFORMER	1st I F transformer
RCW-1053	C17	CAPACITOR—22 mmf., ceramic	RTL-072	TRANSFORMER	3rd I F transformer
RCW-1054	C5	CAPACITOR—15.3 mmf., ceramic	RTO-044	TRANSFORMER	2nd I F transformer
RCW-1055	C15	CAPACITOR—11.7 mmf., ceramic	RWL-009	TRANSFORMER	Output transformer
				CORD	Power cord



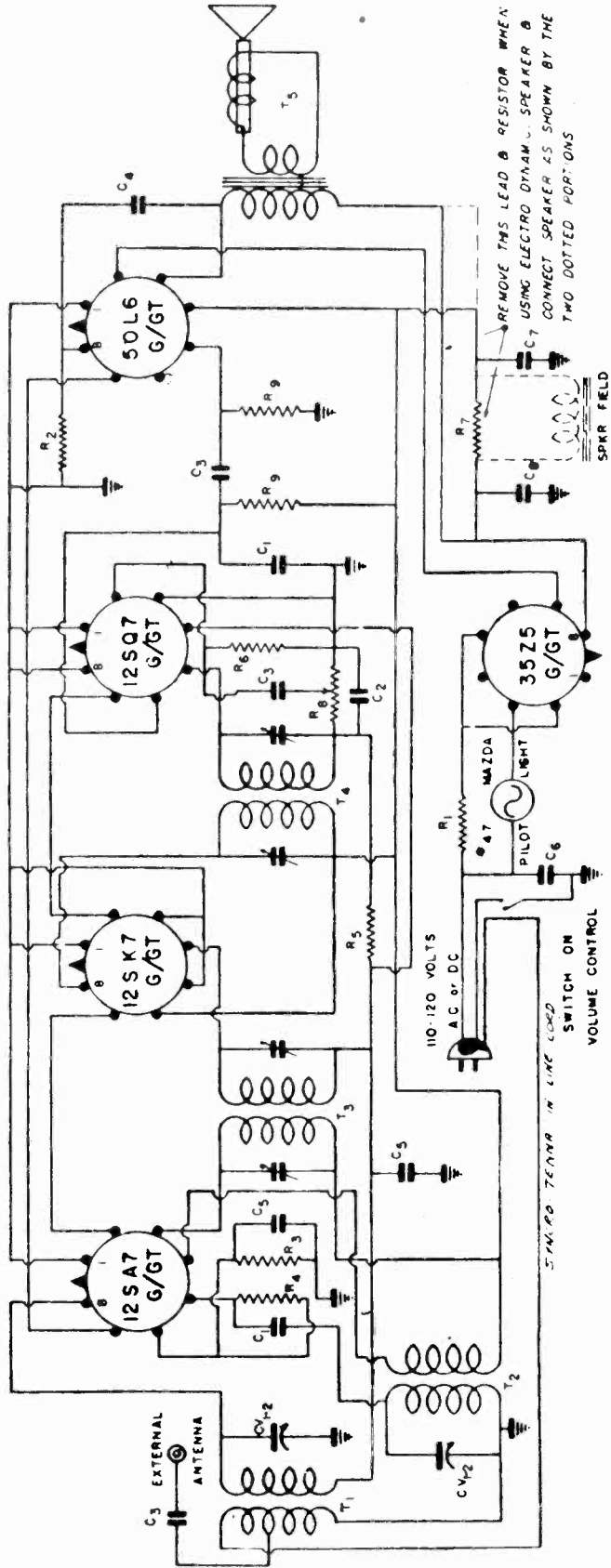




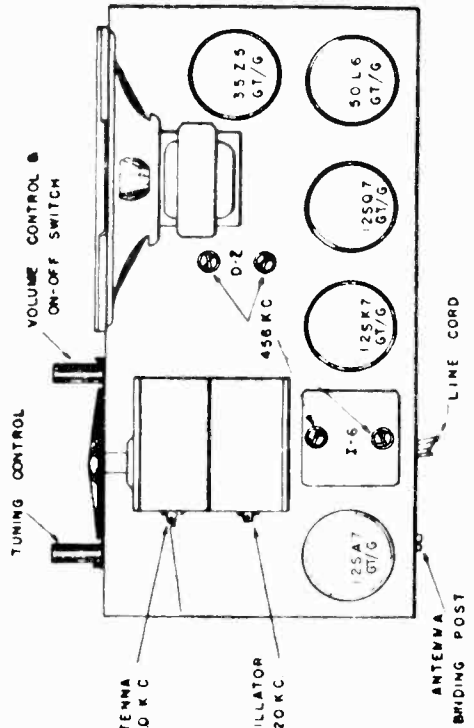




5 TUBE AC-DC SUPERHETERODYNE CIRCUIT



TUBE LOCATION AND CHASSIS LAYOUT

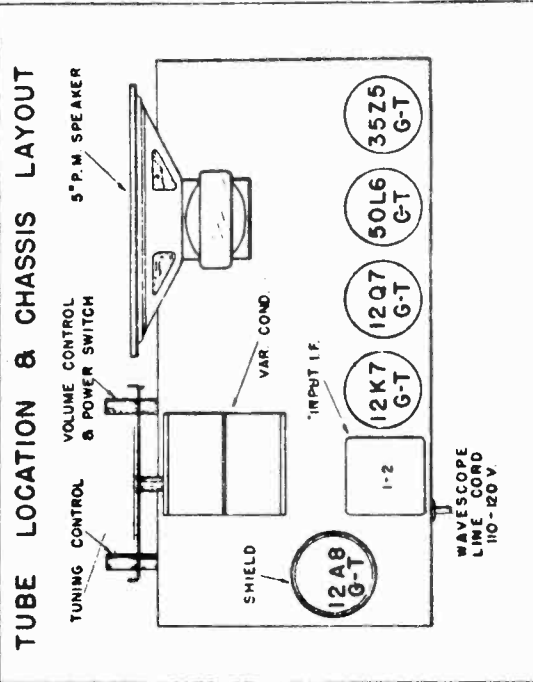
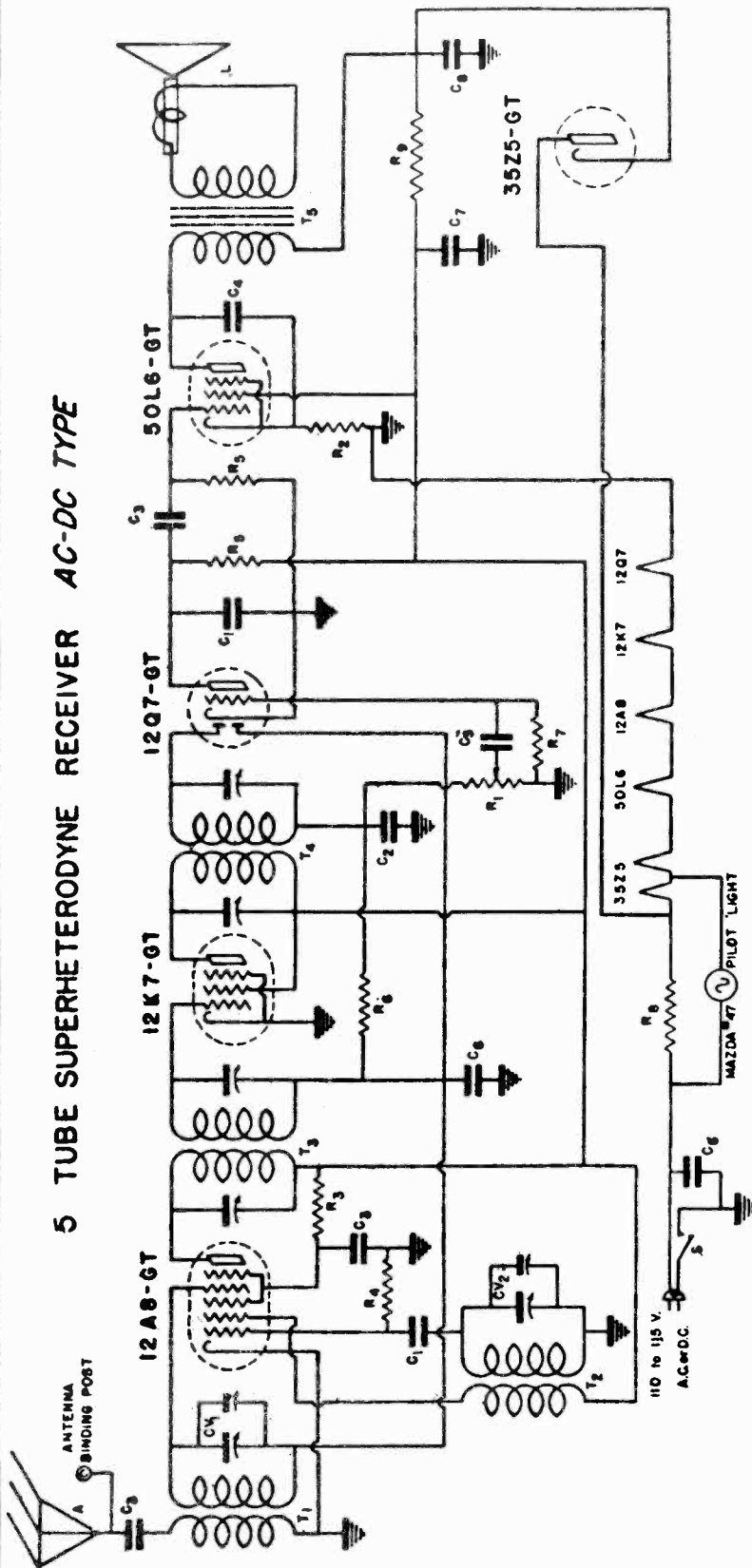


C1	.0025 MFD. 600 V. PAPER CONDENSER
C2	.0005 MFD 600 V "
C3	.01 MFD 400V "
C4	.02 MFD 400V "
C5	.05 MFD 200V "
C6	.1 MFD 400V "
C7	346 20 MFD. 150 W.V. ELECTROLYTIC CONDENSER
C8	346 40 MFD 150 W.V. "
C4-1, 2	TWO 500 OHM VARIABLE CONDENSER
R1	10 OHM 1/4 WATT CARBON RESISTOR
R2	150 OHM 1/4 " "
R3	600 OHM 1/4 " "
R4	50000 OHM 1/4 " "
R5	2 MEGOHM 1/4 " "
R6	6 MEGOHM 1/4 " "
R7	2500 OHM 1/2 " "
R8	1/2 MEGOHM VOLUME CONTROL
R9	1/2 MEGOHM 1/4 WATT CARBON RESISTOR
T1	ANTENNA COIL
T2	OSCILLATOR COIL
T3	1-6 I F TRANSFORMER
T4	D-2 DIODE I F TRANSFORMER
T5	630W 5" P M SPEAKER

MODELS 526, 534,  
547, 549, 558,  
588, 591 (Double-  
ended tubes)

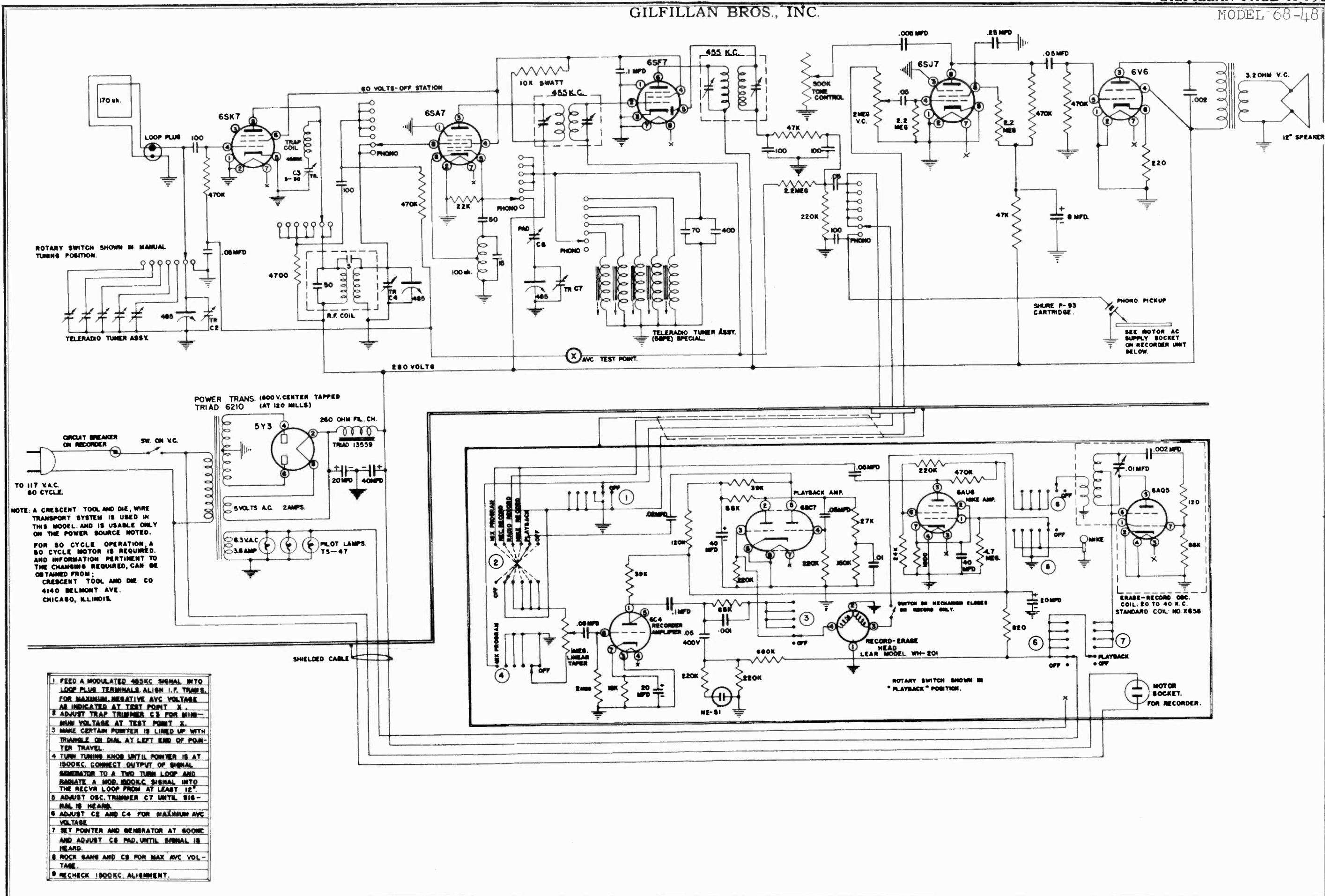
GENERAL TELEV. & RADIO CORP.

5 TUBE SUPERHETERODYNE RECEIVER AC-DC TYPE



DIA. PART NO.	DESCRIPTION
R <sub>1</sub>	2000Ω 500,000 OHM VOLUME CONTROL
R <sub>2</sub>	150 OHM 1/4 WATT CARBON RESISTOR-107
R <sub>3</sub>	50000 OHM 1/4 WATT CARBON RESISTOR
R <sub>4</sub>	50000 OHM 1/4 WATT CARBON RESISTOR
R <sub>5</sub>	500,000 OHM 1/4 WATT CARBON RESISTOR
R <sub>6</sub>	2 MEGOHM 1/4 WATT CARBON RESISTOR
R <sub>7</sub>	6 MEGOHM 1/4 WATT CARBON RESISTOR
R <sub>8</sub>	10 OHM 1/4 WATT CARBON RESISTOR
T <sub>1</sub>	A-5-A ANTENNA COIL
T <sub>2</sub>	O-5 OSCILLATOR COIL
T <sub>3</sub>	I-2 INPUT I.F. TRANSFORMER
T <sub>4</sub>	D-2 OUTPUT I.F. TRANSFORMER
T <sub>5</sub>	I <sub>IN</sub> S-3 B SPEAKER TRANSFORMER

DIA. PART NO.	DESCRIPTION
C <sub>1</sub>	.0025 MFD. 800 V. TUBULAR CONDENSER
C <sub>2</sub>	.0005 MFD. 200V TUBULAR CONDENSER
C <sub>3</sub>	.01 MFD. 400V. TUBULAR CONDENSER
C <sub>4</sub>	.02 MFD. 400 V. TUBULAR CONDENSER
C <sub>5</sub>	.05 MFD. 200V. TUBULAR CONDENSER
C <sub>6</sub>	.1 MFD. 400V. TUBULAR CONDENSER
C <sub>7</sub>	20 MFD. 35 W. ELECTROLYTIC COND.
C <sub>8</sub>	40 MFD. 150 W. ELECTROLYTIC COND.
CV-1-2	2 GANG VARIABLE CONDENSER
R <sub>5</sub>	2500 OHM 1/2 W. CARBON RESISTOR
A	WAVESCOPE AERIAL
L	P. M. SPEAKER
S	LINE SWITCH ON VOLUME CONTROL



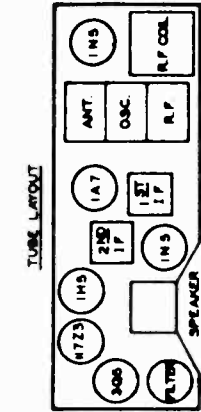
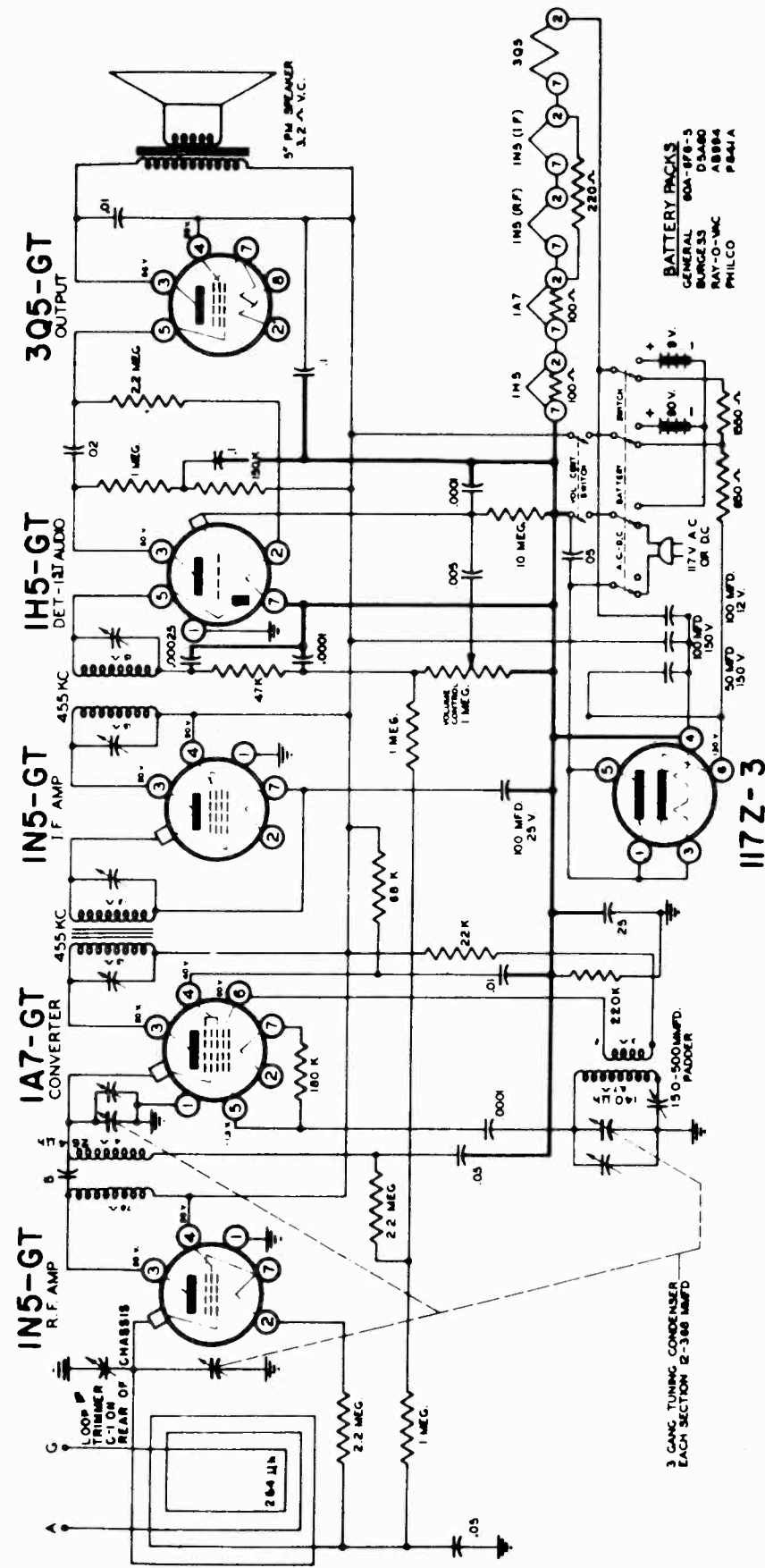
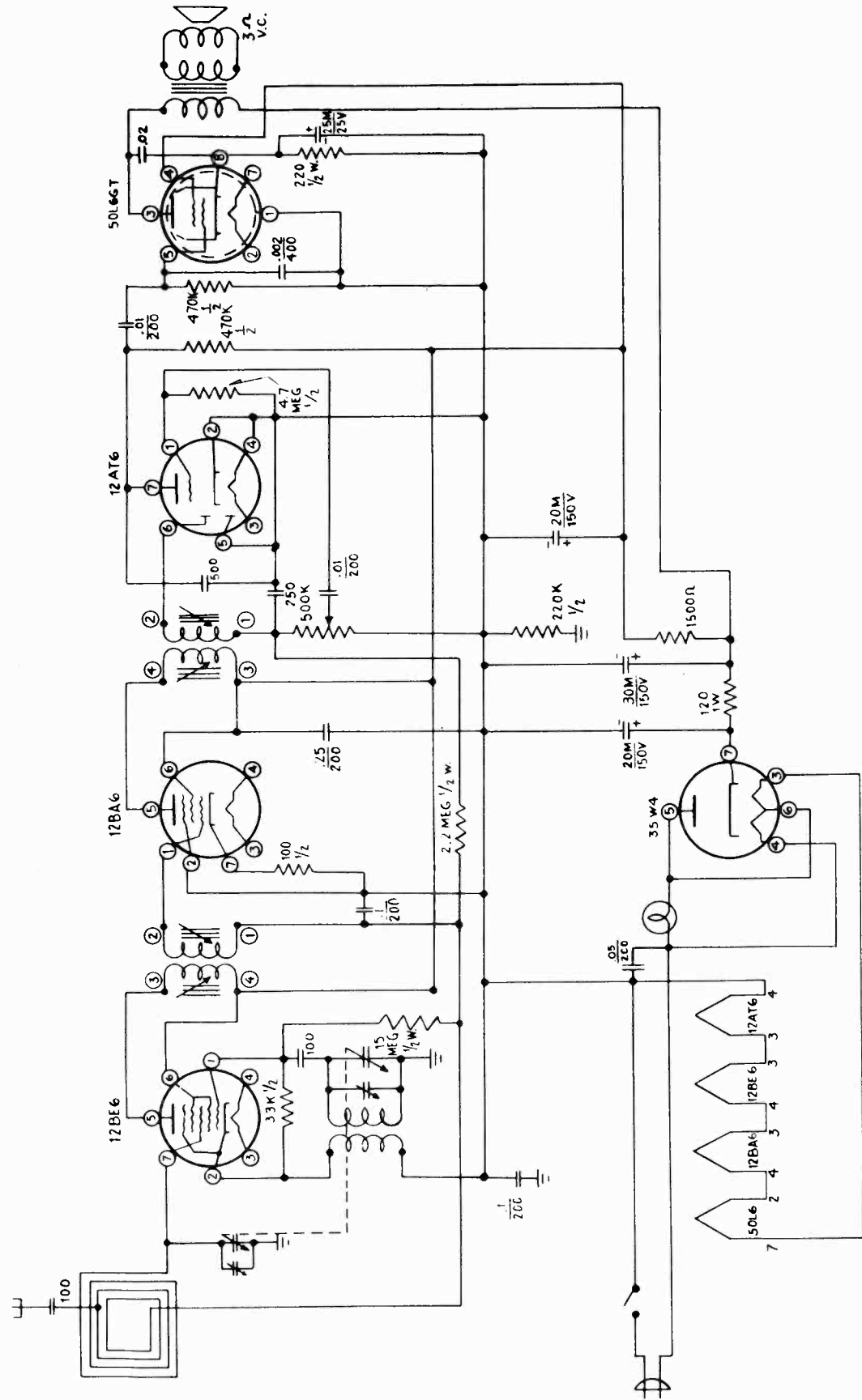
ROTARY SWITCH SHOWN IN MANUAL TUNING POSITION.

NOTE: A CRESCENT TOOL AND DIE, WIRE TRANSPORT SYSTEM IS USED IN THIS MODEL AND IS USABLE ONLY ON THE POWER SOURCE NOTED.

FOR 50 CYCLE OPERATION, A 50 CYCLE MOTOR IS REQUIRED, AND INFORMATION PERTINENT TO THE CHANGES REQUIRED, CAN BE OBTAINED FROM:

CRESCENT TOOL AND DIE CO  
4140 BELMONT AVE.  
CHICAGO, ILLINOIS.

- 1 FEED A MODULATED 485KC SIGNAL INTO LOOP PLUG TERMINALS ALIGN I.F. TRANS. FOR MAXIMUM NEGATIVE AVC VOLTAGE AS INDICATED AT TEST POINT X.
- 2 ADJUST TRAP TRIMMER C3 FOR MINIMUM VOLTAGE AT TEST POINT X.
- 3 MAKE CERTAIN POINTER IS LINED UP WITH TRIANGLE ON DIAL AT LEFT END OF POINTER TRAVEL.
- 4 TURN TUNING KNOB UNTIL POINTER IS AT 1900KC. CONNECT OUTPUT OF SIGNAL GENERATOR TO A TWO TURN LOOP AND RADIATE A MOD. 1900KC. SIGNAL INTO THE RECV LOOP FROM AT LEAST 12\"/>



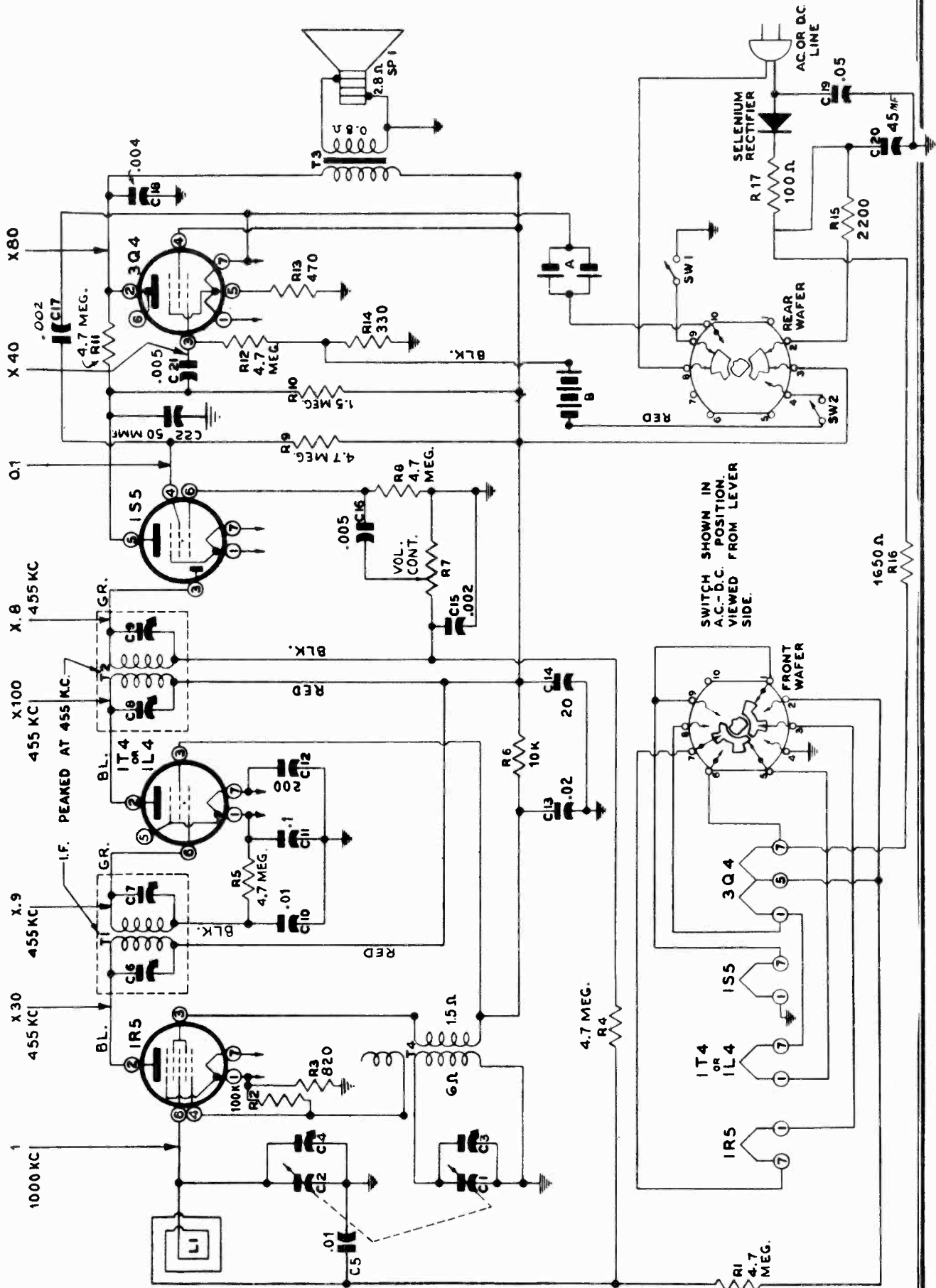
**ALIGNMENT INSTRUCTIONS**

- REMOVE CHASSIS BATTERY AND LOOP FROM CABINET AND PLACE IN SAME RELATIVE POSITION AS IF SET WERE IN CABINET. LOOP MUST BE CLOSED TO BACK OF CHASSIS TO OBTAIN PROPER ALIGNMENT.
- CONNECT SIGNAL GENERATOR LEADS TO EXTERNAL LOOP AS IN STEP 3. CONNECT ALSO OUTPUT METER LEADS TO EXTERNAL VOICE COIL TERMINALS. DO NOT EXCEED .5 VOLT READING ON METER. ADJUST FORWARD TO HORIZONTAL POSITION WITH GANG CLOSED.

STEP	TUNE TEST OSCILLATOR TO	TUNE RADIO	ADJUST TRIMMERS FOR
1	455 KC	1800 KC	I F TRANSFORMERS
2	1400 KC	1400 KC	OSC., R.F., ANT.
3	800 KC	800 KC	PADDER CONDENSER

- IN SOME CASES IT IS IMPOSSIBLE TO OBTAIN SUFFICIENT ATTENUATION OF THE GENERATOR SIGNAL FOR ACCURATE ALIGNMENT. IN SUCH CASES THE GENERATOR SHOULD BE CONNECTED TO AN AUXILIARY LOOP PLUGGED A FOOT OR SO FROM THE RECEIVER LOOP.

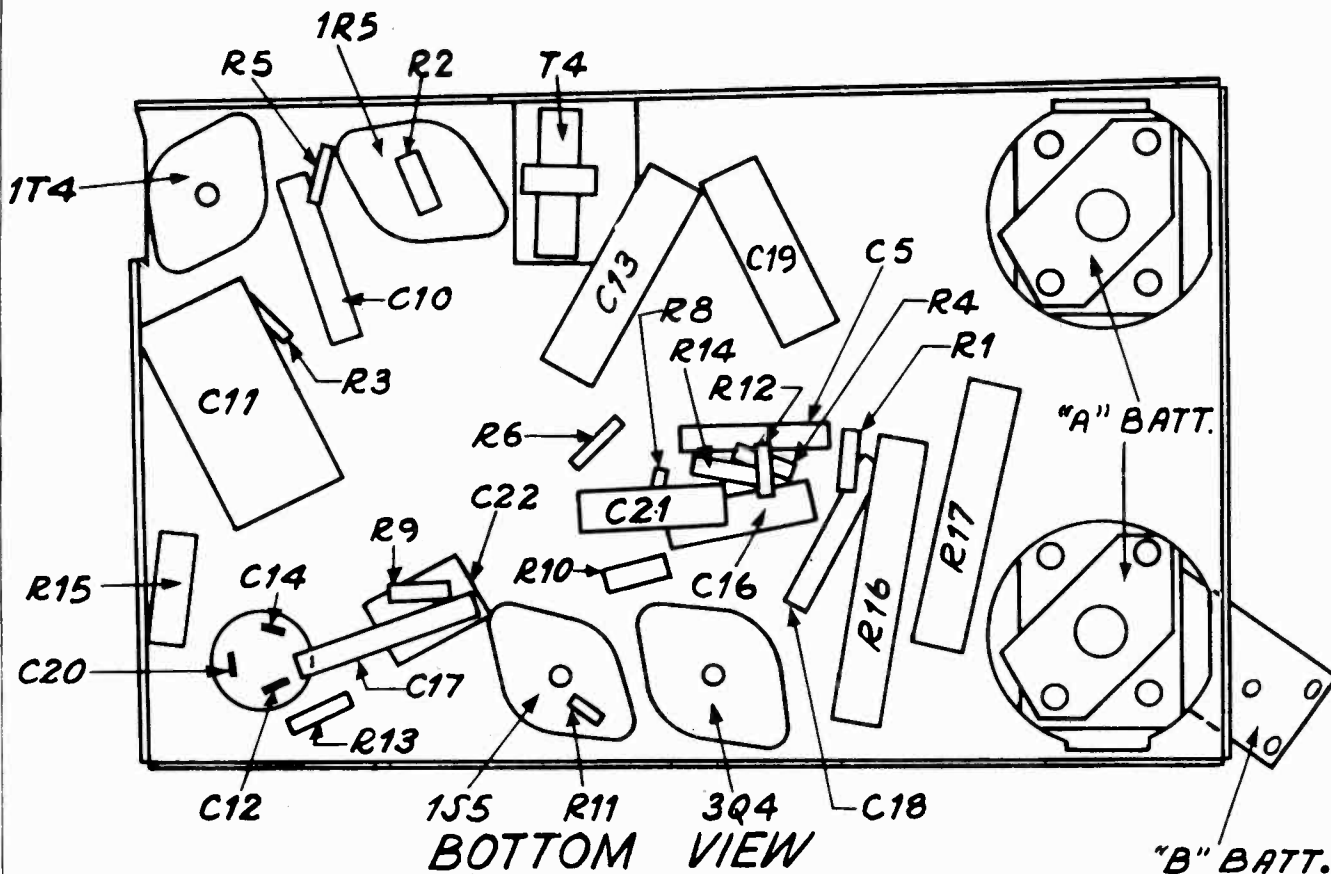
APPROX. GAIN PER STAGE USING CHANALYST  
WITH A FIXED BIAS OF -3 V.



SWITCH SHOWN IN  
A.C.-D.C. POSITION.  
VIEWED FROM LEVER  
SIDE.

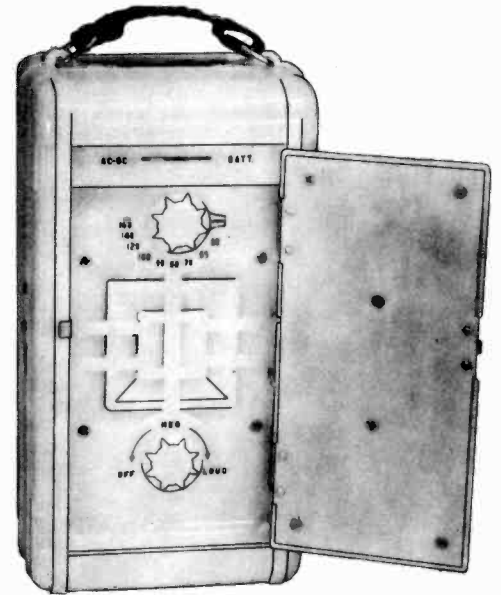
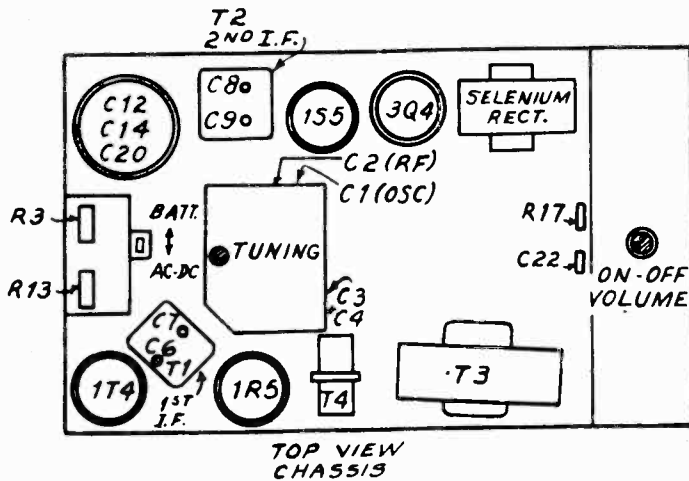


GLOBE 454



**BOTTOM VIEW**

TUBE	PIN	VTVM	20,000Ω/V	1,000Ω/V	RESISTANCE
1R5 CONV.	1	1.5	1.4	1.4	10 Ω
	2	82	86	80	4200 Ω
	3	5.5	5.6	56	15000 Ω
	4	-6.9	-2.4	0	105K
	5	---	---	--	Ω
	6	2.2	0	0	2.4 Meg
	7	3	2.7	2.8	26 Ω
1T4 IF AMP.	1	3	2.7	2.8	22 Ω
	2	82	86	80	4000 Ω
	3	55	55	50	15000 Ω
	4	2.2	0	0	4.6 Meg
	5	3	2.7	2.7	26 Ω
	6	2.1	0	0	4.6 Meg
	7	4.2	3.9	4	33 Ω
1S5 DET AVC 1st AUD	1	0	0	0	0
	2	0	0	0	0
	3	-0.5	0	0	1 Meg
	4	20	16	0	5 Meg
	5	32	24	6	1 Meg
	6	0.2	0	0	5 Meg
	7	1.5	1.3	1.3	14 Ω
3Q4 OUTPUT	1	4	4	4	32 Ω
	2	80	82	77	4600 Ω
	3	0	0	0	4.4 Meg
	4	82	86	79	4500 Ω
	5	5.5	5.3	5.4	40Ω
	6	80	82	77	4600 Ω
	7	7.2	7	7	50 Ω



ITEM	DESCRIPTION
C1, C2	TWO GANG VARIABLE CONDENSER
C3	TRIMMER - PART OF C1
C4	TRIMMER - PART OF C2
C5	.01 MF 150 VOLTS
C6, C7	TRIMMERS - PART OF T1
C8, C9	TRIMMERS - PART OF T2
C10	.01 MF 150 VOLTS
C11	.1 MF 150 VOLTS
C12	200 MF 10 VOLTS - SECTION OF ELECT.
C13	.02 MF 150 VOLTS
C14	20 MF 150 VOLTS - SECTION OF ELECT.
C15	.002 PAPER
C16	.005 MF 150 VOLTS
C17	.002 MF 150 VOLTS
C18	.004 MF 200 VOLTS
C19	.05 MF 400 VOLTS
C20	.45 MF 150 VOLTS - SECTION OF ELECT.
C21	.005 MF 150 VOLTS
C22	50 MMF NCA
L1	LOOP ANTENNA
R1	4.7 MEG OHMS 1/4 WATT
R2	100000 OHMS 1/4 WATT
R3	820 OHMS 1/4 WATT
R4	4.7 MEG OHMS 1/4 WATT
R5	4.7 MEG OHMS 1/4 WATT
R6	10000 OHMS 1/4 WATT
R7	1 MEG. VOLUME CONTROL
R8	4.7 MEG OHMS 1/4 WATT
R9	4.7 MEG OHMS 1/4 WATT
R10	15 MEG OHMS 1/4 WATT
R11	4.7 MEG OHMS 1/4 WATT
R12	4.7 MEG OHMS 1/4 WATT
R13	470 OHMS 1/4 WATT
R14	330 OHMS 1/4 WATT
R15	2200 OHMS 1 WATT
R16	1650 OHMS 10 WATTS
R17	100 OHMS
SPI	3 P.M. SPEAKER
SW1, SW2	ON-OFF SWITCH ON VOLUME CONTROL
T1	FIRST I.F. TRANSFORMER
T2	SECOND I.F. TRANSFORMER
T3	OUTPUT TRANSFORMER
T4	OSCILLATOR COIL
A	TWO 1 1/2 VOLT TYPE "D" CELLS
B	8 1/2 VOLTS NO. 487 MINIMAX BATT.

ALIGNMENT PROCEDURE

Connect output meter across the voice coil.

Connect the signal generator to the standard Hazeltine Loop Model 1150 and couple it loosely to the receiver loop. Set the volume control at maximum, and fully mesh the tuning capacitor.

The output of the signal generator should be just sufficient to give a readable deflection on the output meter.

Set the signal generator to 455 kc and adjust 1-f trimmers for maximum output in the following order: C9, C8, C7, C6. Repeat sequence if trimmers were badly maladjusted.

Set the signal generator and receiver to 1600 kc and adjust the oscillator trimmer C3 for maximum output.

Set the signal generator and receiver to 1400 kc and adjust the antenna trimmer C4 for maximum output.

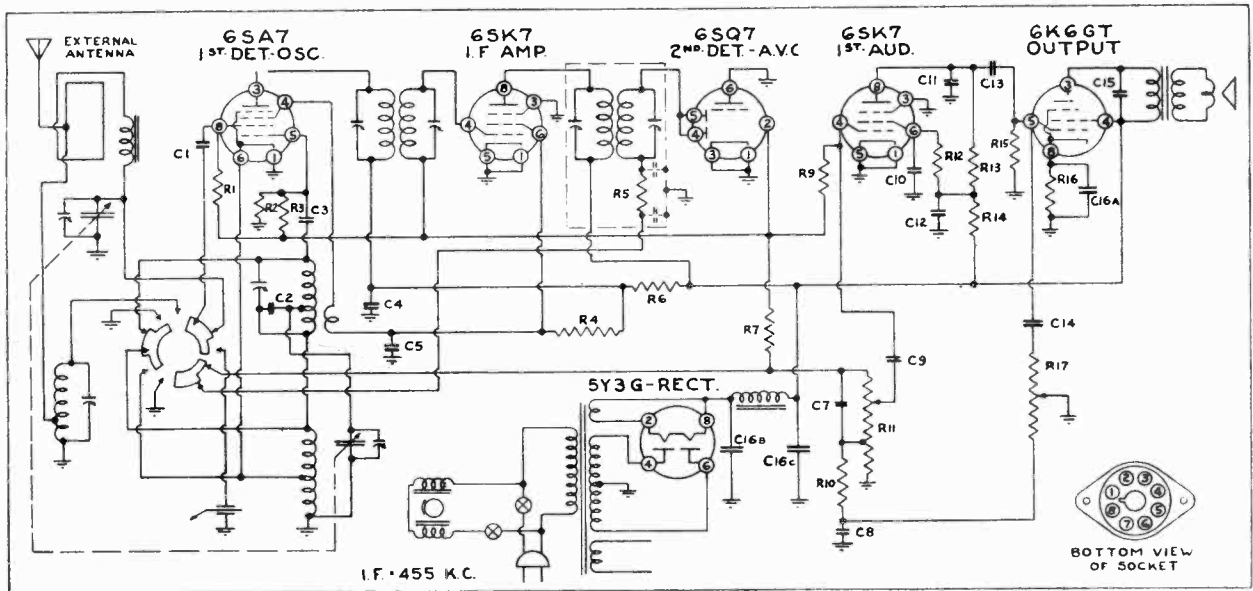
Set the signal generator and receiver to 1600 kc and readjust oscillator trimmer C3 for maximum output.

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RESISTORS			CONDENSERS								
No.	Ohms	Watts	No.	Ohms	Watts	No.	Capacity (Mfd.)	Volts	No.	Capacity (Mfd.)	Volts
R1	2,000,000	1/2	R10	20,000	1/2	C1	.00025	Mica	C10	.05	400
R2	20,000	1/2	R11	500,000	V.C.	C2	.00025-5%	Mica	C11	.00025	Mica
R3	10,000,000	1/2	R12	1,000,000	1/2	C3	.00005	Mica	C12	.1	400
R4	15,000	1	R13	200,000	1/2	C4	.05	400	C13	.01	400
R5	70,000	1/2	R14	50,000	1/2	C5	.05	400	C14	.002	400
R6	100,000	1/2	R15	500,000	1/2	C6	.05	200	C15	.005	400
R7	1,000,000	1/2	R16	500,000	1/2	C7	.00025	Mica	C16a	20.	25
R8	1,000,000	1/2	R17	500,000	T.C.	C8	.02	200	C16b	20.	350
R9	1,000,000	1/2				C9	.01	400	C16c	20.	350

R8 and C6 were used only on early models.

### SERVICE INFORMATION

**Speaker** (Part No. P5078) 10" Dyn.

D.C. voice coil resistance.....3.7 ohms  
Field coil (hot) .....1000 ohms

**B.C. and S.W. Oscillator Coil** (Part No. P4804)

Looking at the mounting strip end in a clockwise direction starting at the chassis, the terminals are: No. 1, S.W. pri.; No. 2, B.C. pri.; other end, No. 3, B.C. tap; No. 4, S.W. pri.; No. 5, S.W. sec.; No. 6, S.W. sec. tap; No. 7, S.W. and B.C. sec:

S.W. Primary—No. 4 and No. 1—  
Resistance ..... .2 ohm

S.W. Secondary—No. 7 and No. 5—  
Resistance ..... .11 ohm

B.C. Primary—No. 2 and No. 3—  
Resistance ..... .3 ohm

B.C. Secondary—No. 3 and No. 7—  
Resistance ..... 3.7 ohms

**First I.F. Transformer** (Part No. P-4108)

Primary—Blue, plate; red, B+  
Resistance .....18.2 ohms

Secondary—White, grid; black, AVC  
Resistance .....15.1 ohms

**Second I.F. Transformer** (Part No. P-4858)

Primary—Blue, plate; red, B+  
Resistance .....20.8 ohms

Secondary—White, diode; other end inside can  
Resistance .....17.4 ohms

### VOLTAGE CHART

All voltages measured with a 20,000 ohm per volt meter on the 300 volt scale. Line voltage 117 volts A.C. Volume control maximum and no signal tuned in. Power consumption 70 watts.

#### 6SA7 TUBE

Plate (3) to ground..... 270  
Screen (4) to ground..... 105

#### 6SK7 (I.F.) TUBE

Plate (8) to ground..... 270  
Screen (6) to ground..... 105

#### 6SK7 (A.F.) TUBE

Plate (8) to ground..... 64  
Screen (6) to ground..... 23

#### 6K6GT TUBE

Plate (3) to ground..... 270  
Screen (4) to ground..... 245  
Cathode (8) to ground..... 19

#### 6X5GT TUBE

Filament (8) to ground..... 340

### ALIGNMENT DATA

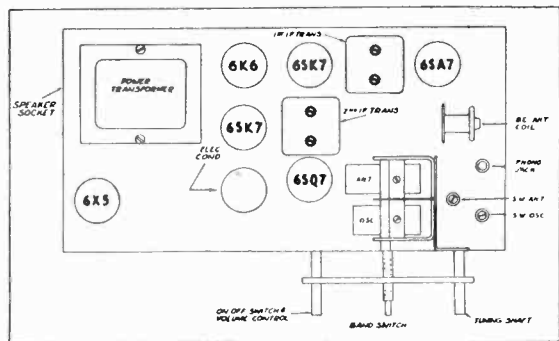


Fig. 2—Top View of Chassis

All of the adjustments have been very carefully set with signal generators at the factory and require no further adjustment, unless it becomes necessary to replace a coil or transformer, or if the adjustments have been tampered with in the field. Under no circumstances attempt any adjustments without first making certain that adjustment is necessary and only after voltages, tubes and condensers have been checked and found to be normal.

The alignment of this receiver requires the use of a signal generator that will cover the frequencies of 455, 1400, 1630 and 9500 kc., and an output meter to be connected across the primary or secondary of the output transformer. All alignments should be

made with the volume control in the **maximum** position, to prevent the AVC from operating and giving false readings.

#### LF. ALIGNMENT

Adjust the signal generator to 455 KC and connect the output to the grid of the first detector tube (6SA7) through a .05 or .1 mfd. condenser. Align all I. F. trimmers to peak or maximum reading on the output meter.

#### B.C. AND S.W. BAND ALIGNMENT

Disconnect loop leads and set the band switch to the broadcast position. Adjust signal generator to 1630 K.C. and connect thru a .0002 mfd. mica condenser to the green loop lead. Set the gang condenser to minimum capacity and adjust the B.C. oscillator trimmer (see fig. 2) to receive this signal. Set the band switch to the short wave position, adjust the signal generator to exactly 9,500 K.C. and connect thru a 400 ohm resistor to the green loop lead. Set the dial pointer at 9.5 megacycles and carefully peak S.W. oscillator trimmer and then peak S.W. antenna trimmer. Re-install chassis in cabinet and connect loop leads. Set the band switch to the broadcast position. Adjust the signal generator to 1400 K.C. and connect the output to a shielded loop radiator and place this loop about two feet from the loop antenna. If no loop radiator is available the output of the signal generator should be connected to the green loop lead thru a .0002 mfd. mica condenser. Tune signal and carefully peak the B.C. antenna trimmer.

### REPLACEMENT PARTS LIST

#### PAPER CONDENSERS

P904	.002 mfd. 600 volt.....
P1322	.005 mfd. 600 volt.....
P164	.01 mfd. 400 volt.....
P393	.02 mfd. 200 volt.....
P148	.05 mfd. 200 volt.....
P334	.05 mfd. 400 volt.....
P276	.1 mfd. 400 volt.....

#### MICA CONDENSERS

P1382	.00005 mfd.....
P817	.00025 mfd.....
P4806	.00025 mfd. 5%.....

#### ELECTROLYTIC CONDENSERS

P4130	{	20 mfd. 25 volt
		20 mfd. 350 volt
		20 mfd. 350 volt

#### VARIABLE CONDENSERS

P4728	Gang condenser.....
P4609	Trimmer condenser.....

#### RESISTORS

P3800	100 ohm 1/2 watt.....
P3821	600 ohm 1/2 watt.....
P4807	15,000 ohm 1 watt.....
P3844	20,000 ohm 1/2 watt.....
P3853	50,000 ohm 1/2 watt.....
P3864	200,000 ohm 1/2 watt.....

P3876	500,000 ohm 1/2 watt.....
P3882	1,000,000 ohm 1/2 watt.....
P3883	2,000,000 ohm 1/2 watt.....
P3889	10,000,000 ohm 1/2 watt.....

#### VARIABLE RESISTORS

P4089	Volume control and switch..
P4729	Tone control.....
RC4010	Record changer mounting spring.....
RC7017	Record changer mounting screw.....
RC6008	Needle.....
RC3020	Center post.....
RC50	Record changer (60 cycle)
RC51	Record changer (50 cycle)
P3948	Chassis mounting screw.....

#### TRANSFORMERS AND COILS

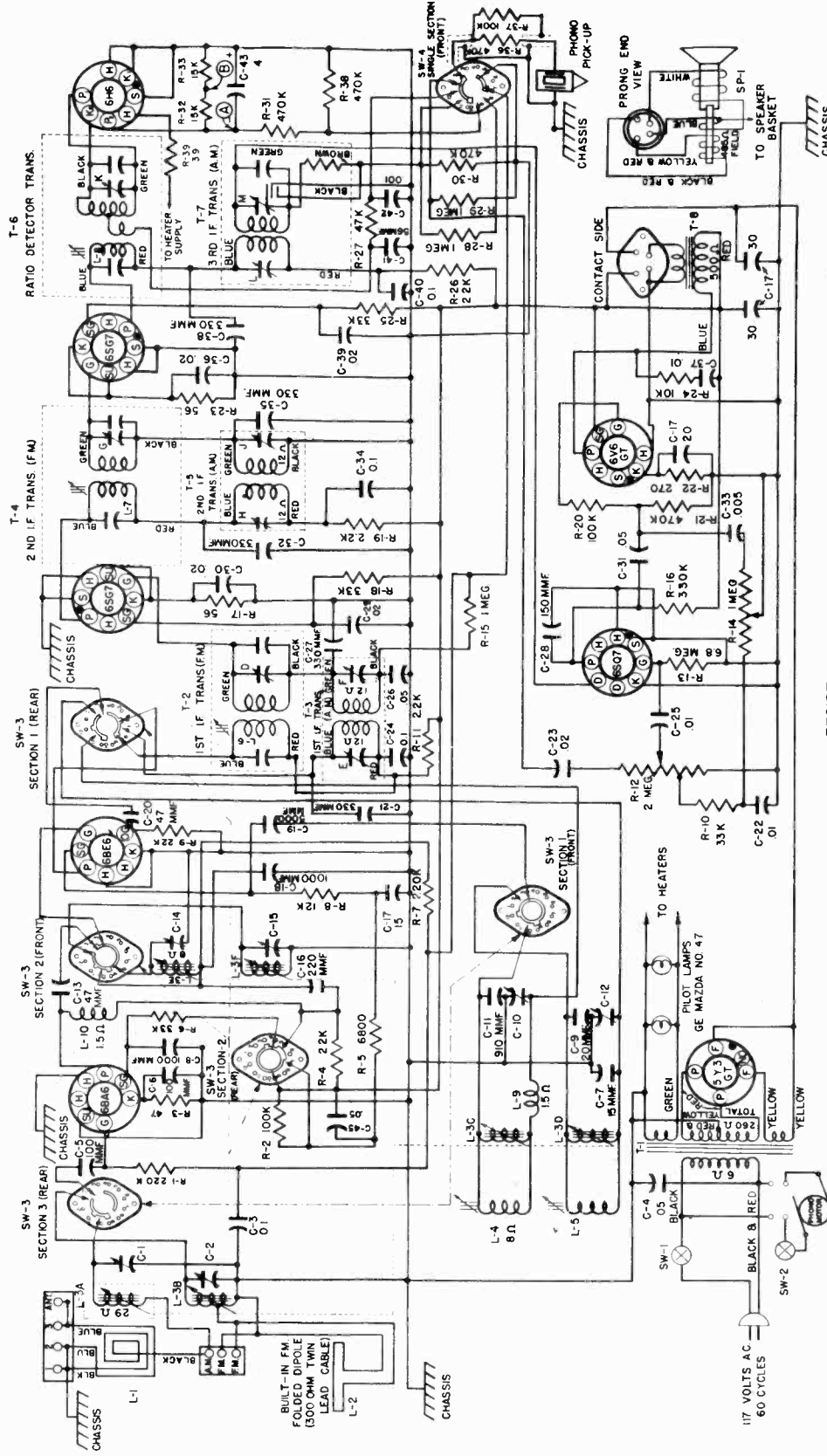
G6425	B.C. antenna coil.....
P4802	S.W. antenna coil.....
P4804	B.C. and S.W. oscillator coil..
P4108	1st I.F. transformer.....
P4858	2nd I.F. transformer.....
P3926	Filter choke.....
P4512	Power transformer (60 cycle)
P4513	Power transformer (50 cycle)

#### MISCELLANEOUS

P3005	Tube socket.....
P945	Speaker socket.....
P4138	Electrolytic mounting base..
P4404	Phono jack.....
P929	Line cord.....
P3557	Line cord clamp.....
P4800	Dial background.....
	Pointer; order by name and model number.....
P4179	Drive shaft.....
P1399	Horseshoe washer (for drive shaft).....
P1587	Spring washer (for drive shaft).....
P2925	Takeup spring.....
	Knobs; order by name and model number.....
P4205	Band switch lever.....
P4197	Pilot light socket.....
P1713	Pilot light bulb.....
P4248	Pilot light reflector.....
P4801	Band switch.....
P4805	10" PM speaker and output transformer.....
P4784	Phono cable.....
P4542	Phono motor AC cord.....

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MODELS R-78162,  
R-78262



RESISTANCE VALUES ARE IN OHMS UNLESS OTHERWISE NOTED.  
"K" EQUALS 1000 OHMS, "MEG" EQUALS 1,000,000 OHMS.

CAPACITY VALUES ARE IN MICROFARADS UNLESS OTHERWISE NOTED.

F.M.- 107 MC I.F.

ALL TUBE SOCKETS ARE SHOWN FROM PIN END VIEW.  
SWITCHES ARE SHOWN IN EXTREME COUNTERCLOCKWISE POSITION (PHONO POSITION) SHAFT END VIEW.

A.M.-455 KC I.F.

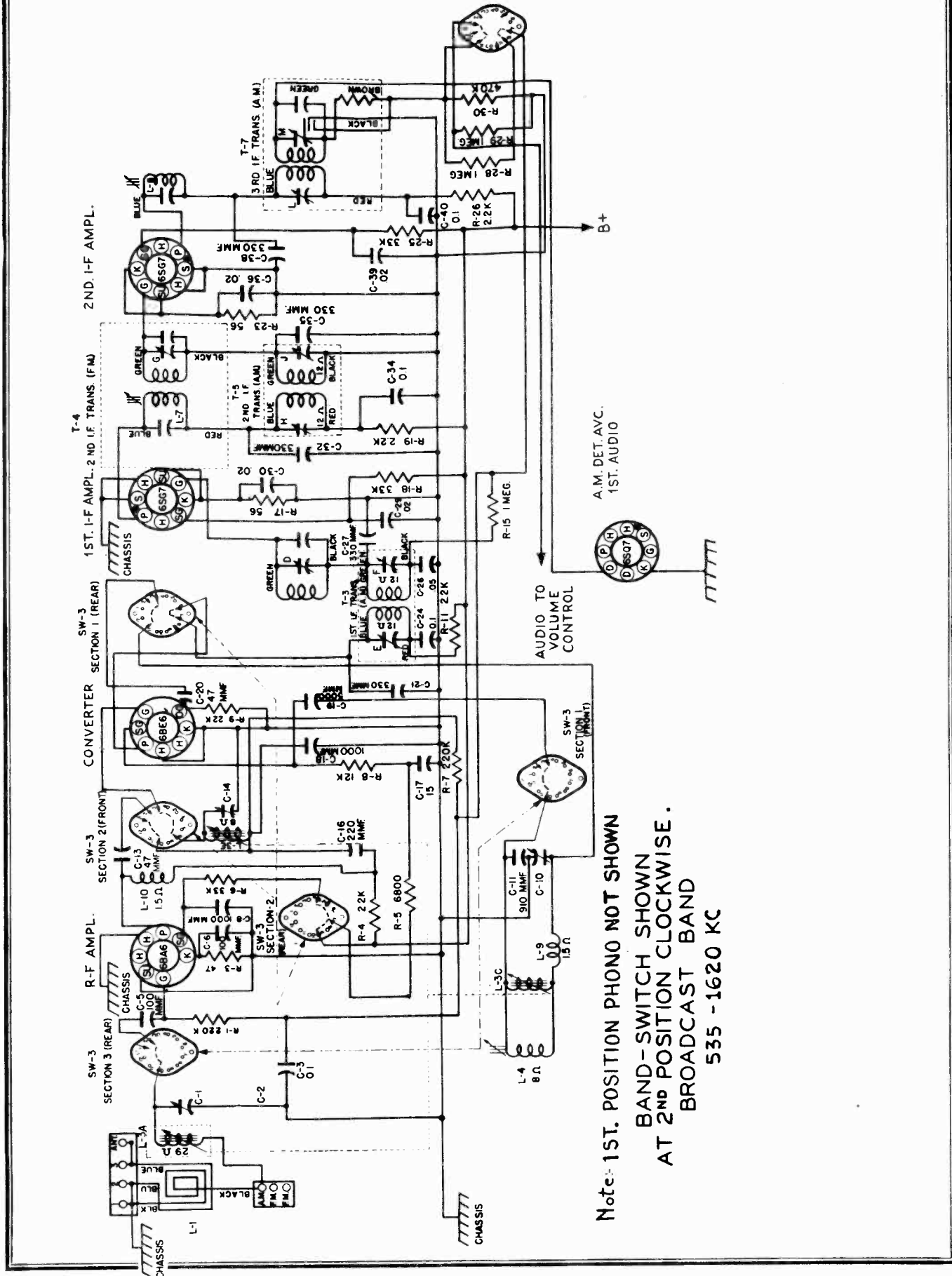
- Frequency Range (AM) 535 KC to 1620 KC
- Intermediate (FM) 87.25 MC to 103.75 MC
- Frequency (AM) 455 KC (FM) 10.7 MC
- Power Supply 105 to 125 volts AC, 60 cycles
- Speaker 12 inch, Electro-Dynamic
- V.C. Impedance 3.2 ohms at 100 cycles
- Power Output (Undistorted) 3.5 watts
- Power Output (Maximum) 5 watts

# CLARI-SKEMATIX

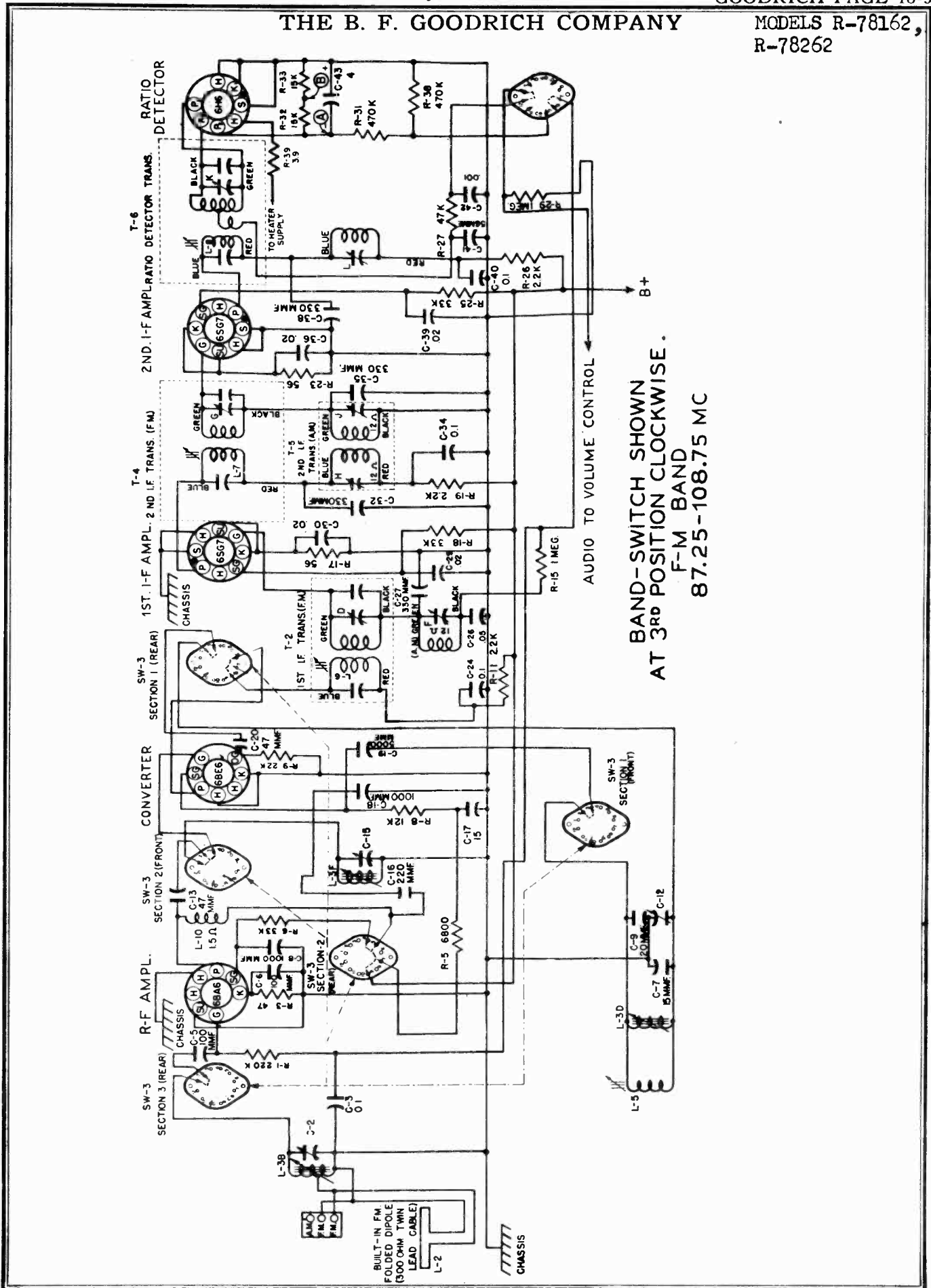
Registered Trademark

MODELS R-78162,  
R-78262

THE B. F. GOODRICH COMPANY



Note: 1ST. POSITION PHONO NOT SHOWN  
BAND-SWITCH SHOWN  
AT 2ND POSITION CLOCKWISE.  
BROADCAST BAND  
535 - 1620 KC



BAND-SWITCH SHOWN  
AT 3rd POSITION CLOCKWISE.  
F-M BAND  
87.25-108.75 MC



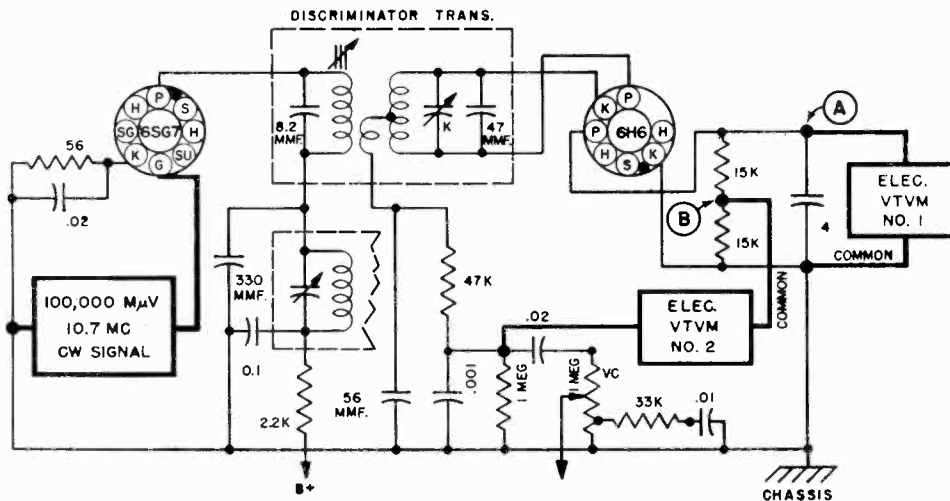
MODELS R-78162,  
R-78262

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**RATIO DETECTOR**

Proper operation of the ratio detector stage is extremely important for best performance on the FM band of this receiver.

The performance of the ratio detector stage may be checked by closely following the procedure and diagram given below.



Wiring Diagram—Ratio Detector

1. After setting up the signal generator and VTVM, turn the trimmer adjustment screw "K" until tight. Turn the core adjustment "L" to maximum counterclockwise position. These two adjustments are on the top of the Ratio Detector transformer. (See Trimmer Location diagram.)

2. Now turn adjustment "L" clockwise until VTVM in No. 1 position indicates maximum voltage. This maximum value should be from five to seven volts with input as indicated in above diagram. Then slowly turn adjustment "K" in a counterclockwise direction, observing VTVM in No. 2 position. It will approach a maximum value and then rapidly drop to zero. If adjustment "K" is turned beyond this point, VTVM in No. 2 position will indicate a polarity change. The proper adjustment of "K" is at the point where the VTVM indicates zero volts between the polarity change.

3. Shift the 10.7 mc. signal to 10.725 mc. (10.7 mc. +25 kc.). VTVM in No. 2 position should now indicate a plus .3 volts minimum.

4. Change the 10.725 mc. signal to 10.675 mc. (10.7 mc. -25 kc.). VTVM in No. 2 position should indicate a minus .3 volts minimum. STEPS 3 and 4 constitute a sensitivity check on the ratio detector transformer.

5. Place the polarity switch of VTVM in No. 2 position to "plus" position and observe VTVM as the frequency of the signal generator is increased above 10.7 mc. It should indicate an increasing positive voltage. Continue increasing the frequency until the meter indicates a peak and begins to decrease. Reduce the generator frequency slightly until the peak is obtained. Record the generator frequency.

6. Set the polarity switch of VTVM to "minus" position. Repeat STEP 5, reducing the generator frequency from 10.7 mc. instead of increasing. Record the generator frequency when VTVM in No. 2 position indicates a peak.

7. The difference between the generator frequencies noted in STEPS 5 and 6 is the "Static Band Width" of the Ratio Detector transformer. This should be approximately 220 kc.

**ALIGNMENT PROCEDURE**

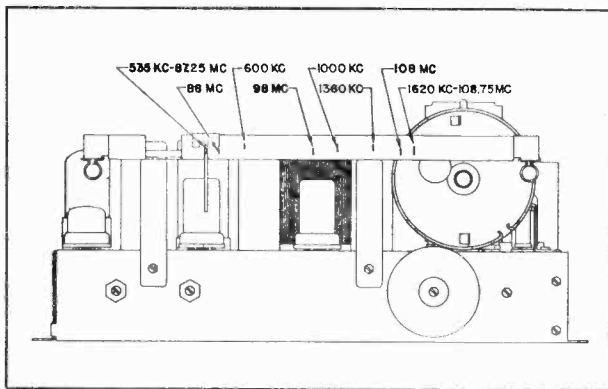
First determine if factory adjustments of the permeability tuner cores have been altered. This may be done by checking core positions against dimensions shown in tuner illustration. Broken wax seals on the core adjustments may also indicate altering. If the slug adjustments have been changed, it will be necessary to first adjust them in accordance with the dimensions given in tuner illustration before proceeding with alignment.

The following equipment is necessary to properly align this receiver:

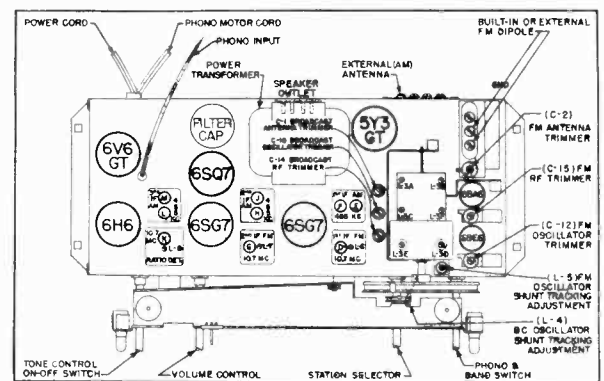
1. AM signal generator with frequency coverage from 455 kc. to 1700 kc.
2. FM or CW signal generator covering the FM band from 87.25 mc. to 108.75 mc. and the 10.7 mc. frequency for FM IF alignment.
3. Vacuum Tube Voltmeter (VTVM).
4. Output meter—to match 4 ohms, 5 watts maximum.
5. Insulated alignment screwdriver.
6. Dummy antenna—0.1 mfd. capacitor, 300 ohm carbon resistor and inductive loop (fashioned from several turns of wire).

NOTE: Oscilloscope equipment not required if aligned according to the following procedure:

The accuracy of the AM and FM 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.

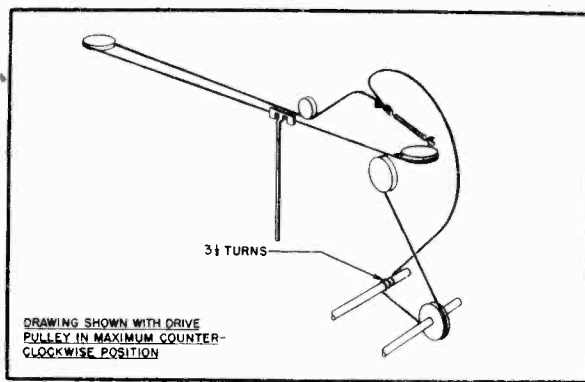
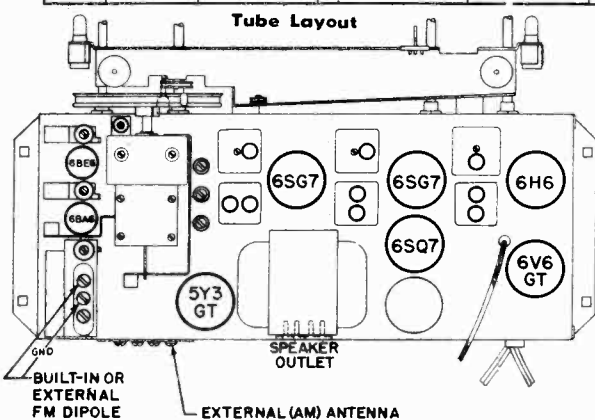


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MODELS R-78162,  
R-78262

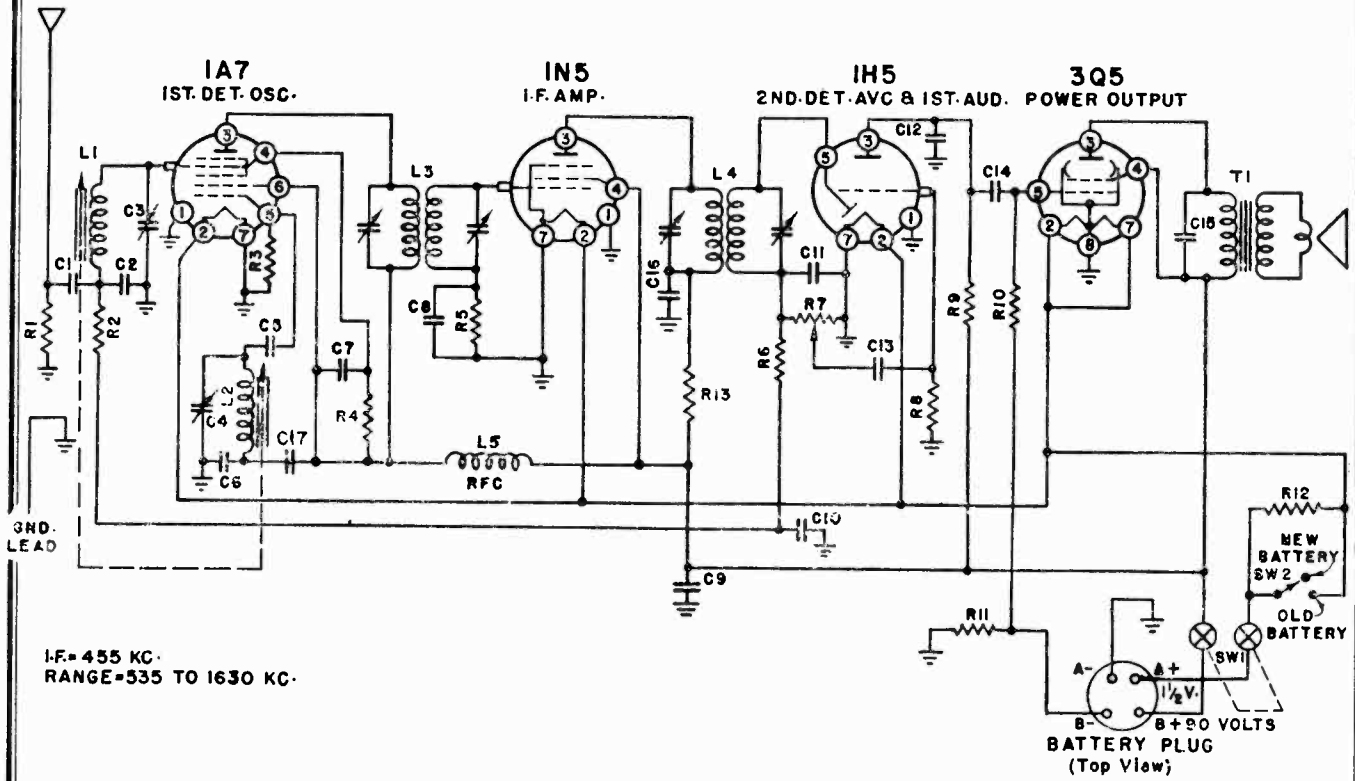
ALIGNMENT CHART

Step No.	Band Switch Position	Signal Generator	Connection at Receiver	Dummy Antenna	Dial Setting	Adjust Trimmer	Remarks
1	AM	455 kc.	6BE6 Converter Grid Pin No. 7	0.1 mfd.	HF end	E, F, H, J, L, M, AM IF Trimmers	Adjust for Maximum Output.
2	AM	535 kc.	6BA6 Grid Pin No. 1	0.1 mfd.	LF end	C-10 AM Osc. Trimmer	Adjust for Maximum Output.
3	AM	1620 kc.	6BA6 Grid Pin No. 1	0.1 mfd.	HF end	L-4 AM Osc. Shunt Tracking Adjustment. (Remove Fly-wheel 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.



## SERVICE PARTS LIST

Symbol	Part No.	Description	Symbol	Part No.	Description
	A-51729	Bushing, Shaft .....		C-59351-1	Knob, Magnifying Insert (Indicator) .....
	A-54848	Bushing, Strain Relief .....		A-6158	Lamp, Pilot No. 47 .....
	E-59350-2	Cabinet .....		B-51524-4	Lead, Shielded .....
	A-58341	Cable, Dial .....		B-57922	Link, Band Switch .....
C-33	BD610502	Capacitor, .005 mfd., 600 v.....	L-3A, 3B, D-57920		Permeability Tuner Assy.....
C-42	BD610102	Capacitor, .001 mfd., 600 v.....	3C, 3D,		
C-22, 35, 37	BD610103	Capacitor, .01 mfd., 600 v.....	3E, 3F,		
C-23, 29, 30, 36, 39	BD410203	Capacitor, .02 mfd., 400 v.....	and L-5		Perm. Tuner Assembly (on exchange basis only)....
C-26	BD210503	Capacitor, .05 mfd., 200 v.....		A-59316-1	Pointer, Dial .....
C-31, 45	BD410503	Capacitor, .05 mfd., 400 v.....	R-39	B-55513-1	Resistor, 3.9 ohm, 1/2 w. ....
C-4	BC31B503	Capacitor, .05 mfd., 400 v.....	R-3	BR16B470	Resistor, 47 ohm, 1/2 w. ....
C-3	BD210104	Capacitor, .1 mfd., 200 v.....	R-17, 23	BR16B560	Resistor, 56 ohm, 1/2 w. ....
C-24, 34, 40	BD410104	Capacitor, .1 mfd., 400 v.....	R-22	BR16E271	Resistor, 270 ohm, 1 w. ....
C-1	B-57942-1	Capacitor Assy., Trimmer (3 sec.) .....	R-4, 11, 19, 26	BR17B222	Resistor, 2,200 ohm, 1/2 w.....
C-19	B-58802-11	Capacitor, Ceramic, 5000 mmf., G.P. ....	R-5	BR16E682	Resistor, 6,800 ohm, 1 w.....
C-5	B-58801-18	Capacitor, Ceramic, 100 mmf., G.P. ....	R-24	BR17E103	Resistor, 10,000 ohm, 1 w.....
C-20	B-58800-27	Capacitor, Ceramic, 47 mmf. (-750 ppm) .....	R-8	BR16E123	Resistor, 12,000 ohm, 1 w.....
C-7	B-58803-16	Capacitor, Ceramic, 15 mmf. (-1400 ppm) .....	R-32, 33	BR17B153	Resistor, 15,000 ohm, 1/2 w.....
C-43	B-55520-1	Cap., Electro., 4 mfd., 150 v....	R-9	BR17B223	Resistor, 22,000 ohm, 1/2 w.....
C-17	A-57950	Cap., Electro., 30-30-75 mfd., 400 v.—20 mfd., 25 v.....	R-6, 10, 18, 25	BR17B333	Resistor, 33,000 ohm, 1/2 w.....
C-8, 18	BM74A102	Capacitor, Mica, 1000 mmf.....	R-27	BR17B473	Resistor, 47,000 ohm, 1/2 w.....
C-11	BM64A911	Capacitor, Mica, 910 mmf.....	R-2, 20, 37	BR17B104	Resistor, 100,000 ohm, 1/2 w.....
C-21, 27, 32, 35, 38	BM55A331	Capacitor, Mica, 330 mmf.....	R-1, 7,	BR17B224	Resistor, 220,000 ohm, 1/2 w....
C-16	BM74A221	Capacitor, Mica, 220 mmf.....	R-16	BR17B334	Resistor, 330,000 ohm, 1/2 w....
C-28	BM74A151	Capacitor, Mica, 150 mmf.....	R-21, 30, 31, 36, 38	BR17B474	Resistor, 470,000 ohm, 1/2 w....
C-6	BM74A101	Capacitor, Mica, 100 mmf.....	R-15, 28, 29	BR17B105	Resistor, 1 megohm, 1/2 w. ....
C-41	B-58902-11	Capacitor, Mica Mold., Type Q, 56 mmf.....	R-13	BR17B685	Resistor, 6.8 megohm, 1/2 w....
C-13	B-58900-6	Capacitor, Mica Mold., Type Q, 47 mmf.....	A-51801		Rivet, Pronged .....
C-2	B-57939-2	Cap., Trimmer, 10-25 mmf.....	B-55280-1		Shaft, Drive .....
C-12, 15	B-57939-1	Cap., Trimmer, 1.5—14 mmf.....	B-51469-3		Socket, Dial Light .....
	B-55260-1	Clip, Capacitor Mtg. ....	A-57996		Socket, Miniature .....
	A-57925	Cup, Spring .....	A-54726		Socket, Octal .....
L-10	A-57931	Coil Assy., R.F. Choke .....	A-51403		Socket, Speaker .....
L-9	B-57933	Coil Assy., Series Track. BC Osc. ....	B-55180-3		Spacer, Metal .....
L-4	B-57929	Coil Assy., Shunt Track. BC Osc. ....	SP-1	D-58228-1	Speaker, 12-in., Electro-Dyn.
R-14	B-58219-1	Control, Pot. and Sw., 1 megohm (T.C.) .....	A-51787		Spring, Cable .....
R-12	B-58218-1	Control, Pot., 2 meg. (V.C.) ..	A-50147		Spring, Conical .....
	B-57262-7	Cord, AC-Phono. ....	A-59333		Strip, Crystal Holder (Trim)
	B-58069-2	Cord, Power .....	T-3	B-57954-1	Transformer Assembly, 1st IF AM .....
	A-57999	Crank, Switch Lever .....	T-5	B-57958-1	Transformer Assembly, 2nd IF AM .....
	C-59352-1	Crystal and Indicator, Dial...	T-7	B-57963-1	Transformer Assembly, 3rd IF AM .....
	A-59321	Flywheel, Tuning Shaft .....	T-2	B-57972-1	Transformer Assembly, 1st IF FM .....
	B-59355-4	Holder, Crystal, Right-Hand	T-4	B-57976-1	Transformer Assembly, 2nd IF FM .....
	B-59355-3	Holder, Crystal, Left-Hand...	T-6	B-57994-1	Transformer Assembly, Ratio Det. ....
	B-57998	Hub, Crank .....	T-8	B-57997-1	Transformer, Output .....
	C-59416-1	Knob, Magnifying Insert .....	T-1	C-57934	Transformer, Power .....



REPLACEMENT PARTS

CONDENSERS

Symbol	Description	Part No.
C1	Paper, .01 mfd., 400 V.	64B1-25
C2	Mica, .0008 mfd. ±10%	65B5-31
C3	Trimmer, Antenna	66A21-1
C4	Trimmer, Oscillator	
C5	Mica, .0001 mfd. ±20%	65B7-17
C6	Mica, .0008 mfd. ±10%	65B5-31
C7	Paper, .01 mfd., 400 V.	64B1-25
C8	Paper, .002 mfd., 600 V.	64B1-14
C9	Elect., 4 mfd., 150 V.	67A4-2
C10	Paper, .05 mfd., 200 V.	64B1-32
C11	Mica, .00025 mfd. ±20%	65B7-22
C12	Mica, .00025 mfd. ±20%	65B7-22
C13	Paper, .01 mfd., 400 V.	64B1-25
C14	Paper, .01 mfd., 400 V.	64B1-25
C15	Paper, .005 mfd., 600 V.	64B1-12
C16	Paper, .01 mfd., 400 V.	64B1-25
C17	Paper, .01 mfd., 400 V.	64B1-25

RESISTORS

R1	15,000 ohm ±10%, 1/2W.	60B8-153
R2	470,000 ohm ±10%, 1/4W.	60B2-474
R3	220,000 ohm ±10%, 1/2W.	60B8-224
R4	33,000 ohm ±10%, 1/2W.	60B8-333
R5	4,700,000 ohm ±10%, 1/4W.	60B2-475
R6	2,200,000 ohm ±10%, 1/4W.	60B2-225
R7	1 megohm Volume Control & Switch	75B1-1
R8	4,700,000 ohm ±10%, 1/4W.	60B2-475
R9	1,000,000 ohm ±10%, 1/4W.	60B2-105
R10	1,000,000 ohm ±10%, 1/4W.	60B2-105
R11	390 ohm ±10%, 1/4W.	60B2-391
R12	0.75 ohm ±10%, 1/2W. (Wire)	61A2-1
R13	2200 ohm ±10%, 1/4W.	60B2-222

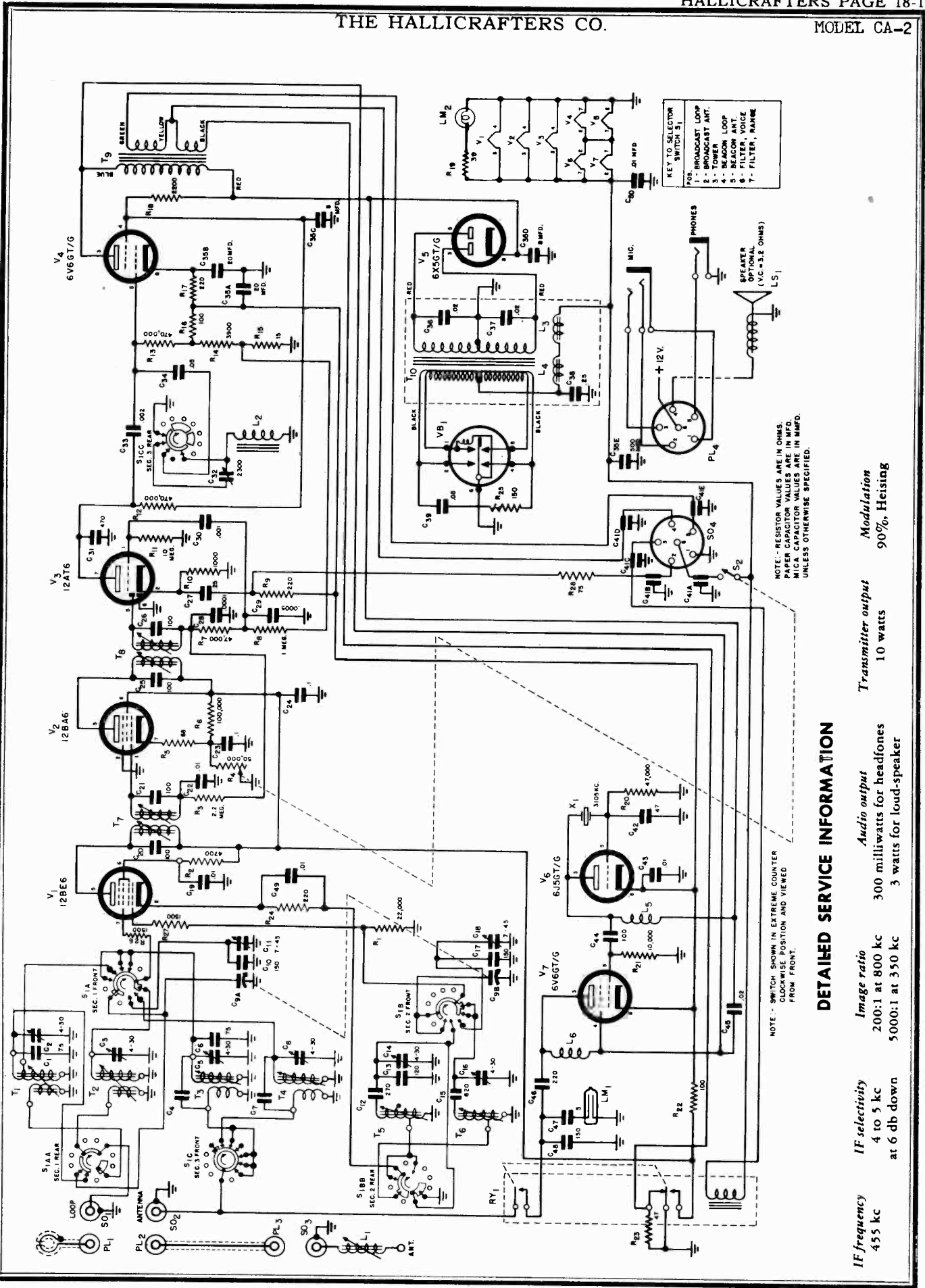
TRANSFORMERS AND COILS

L1	Antenna Coil	AC105-1
L2	Oscillator Coil	A1020
L3	1st I.F. Transformer	72B5
L4	2nd I.F. Transformer	72B6
L5	Choke Coil (RF)	AB103-1
T1	Output Transformer	98A5

MISCELLANEOUS

Description	Part No.
Background, Dial	X22C5-1
Cabinet	34D10
Cable, Battery (complete with plug)	A1026
Cap, Grid	90A1-2
Clip, Dial Glass	18A2
Cord, Dial (5" on tuner and 63" on dial drive)	50A1-3
Dial Scale, glass	21B25
Drum and Hub, Tuning	A1035
Grille Cloth	36B3-1
Iron Slug, with wire (Oscillator)	71B1-3
Iron Slug, with wire (Antenna)	71B1-4
Knob	33A7-2
Plug, Battery, 4 Prong	88A4-4
Pointer, Dial	25A9-1
Pulley, Fibre Dial (Single)	17A1-3
Pulley, Fibre Dial (Dual)	17A5-1
Screw Studs (for iron cores)	27A4
Shaft, Tuning	28A1-1
Shaft and Pulley (Tuner)	A1040
Shield, Tube	87A8
Socket, Octal Tube	87A5-1
Socket, Speaker	87A4-3
Speaker and Output Transformer	78B15-2
Speaker Guard	36A5-2
Spring, Dial Drum Cord Tension	19B1-7
Spring, Hairpin (To hold Ant. or Osc. coil)	19A3-1
Spring, Tuner Slide Cord Tension	19A1-4
Spring, Tuner, back bearing takeup	19A6
Spring, Tuner, front bearing takeup	19A5
Spring, Tuner Slide Pressure	18A9
Switch, SPST (Economizer) SW2	77B1-6
Washer, C	4A4-1
Washer, spring (coils)	4A6-12-0
Washer, spring (shaft)	4A6-3-0





KEY TO SELECTOR SWITCH S1

POS.

- 1 - BROADCAST LOOP
- 2 - BROADCAST ANT.
- 3 - BEACON LOOP
- 4 - BEACON ANT.
- 5 - FILTER, VOICE
- 6 - FILTER, PHONE
- 7 - FILTER, PHONE

NOTE: - RESISTOR VALUES ARE IN OHMS.  
PAPER CAPACITOR VALUES ARE IN MFD.  
MICA CAPACITOR VALUES ARE IN MMFD.  
UNLESS OTHERWISE SPECIFIED.

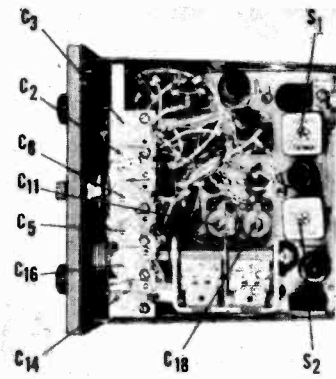
DETAILED SERVICE INFORMATION

IF frequency	455 kc	IF selectivity	4 to 5 kc at 6 db down	Image ratio	200:1 at 800 kc 5000:1 at 350 kc	Audio output	300 milliwatts for headphones 3 watts for loud-speaker	Transmitter output	10 watts	Modulation	90%, Heising
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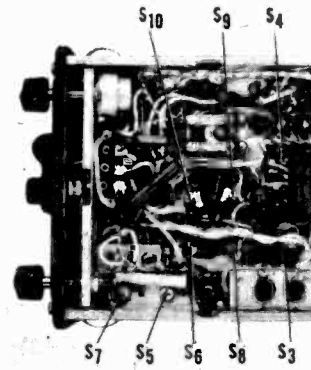




# ALIGNMENT INSTRUCTIONS



Top view.



Bottom view.

## EQUIPMENT

- SIGNAL GENERATOR** capable of ranges indicated in the Alignment chart including a 400 cycle audio modulator.
- OUTPUT METER** capable of handling 3 watts of audio power.
- ANTENNA DUMMY LOAD** consisting of a 100 uuf condenser in series with the "hot" side of the signal generator bypassed with a 51 uuf condenser to ground on the load side of the series condenser.
- LOOP DUMMY LOAD** consisting of a 20 uh coil (3/4" form, 1 1/8" winding of #22 dcc wire) bypassed by a 150 uuf condenser to ground.
- AUDIO SIGNAL GENERATOR** capable of 1020 cps output.

## ALIGNMENT CHART

Step Number	Connection of Sig. Generator Output to Receiver	Signal Gen. Frequency Setting	Band Switch Setting	Receiver Dial Setting	Adjust Slug, Padder, or Trimmer No.	Trimmer Description	Type of Adjustment
1	I-F ADJUSTMENT Pin No. 7 of V-1 (12BE6)	455 kc	Broadcast ant.	1000 kc	1 & 4	Input IF	Maximum output
2					2 & 3	Diode IF	Maximum output
3							Repeat steps 1 & 2
<b>BROADCAST BAND</b>							
4	SO-2	600 kc	Broadcast ant.	600 kc	S-10	Osc. slug	Maximum output
5	SO-2	1400 kc	Broadcast ant.	1400 kc	C-16	Osc. trimmer	Maximum output
6	SO-2	600 kc	Broadcast ant.	600 kc	S-8	Slug in T-4	Maximum output
7	SO-2	1400 kc	Broadcast ant.	1400 kc	C-8	Ant. trimmer	Maximum output
8	SO-2	2110 kc (image freq.)	Broadcast ant.	1200 kc	NOTE: Check for minimum image. If minimum image is not indicated, twist or untwist wire gimmick on top of coil until a minimum image is secured.		
9							Check and repeat steps 4, 5, 6, 7, & 8 if necessary
<b>BEACON BAND</b>							
10	SO-2	220 kc	Beacon ant.	220 kc	S-9	Osc. slug	Maximum output
11	SO-2	220 kc	Beacon ant.	220 kc	C-14	Osc. trimmer	Maximum output
12	SO-2	220 kc	Beacon ant.	220 kc	S-7	Beacon ant.	Maximum output
13	SO-2	380 kc	Beacon ant.	380 kc	C-5	Beacon ant. trimmer	Maximum output
14	SO-2	1260 kc (image freq.)	Beacon ant.	350 kc	NOTE: Check for minimum image. If minimum image is not indicated, twist or untwist wire gimmick on top of beacon antenna coil T-3 until a minimum image is received.		
15							Check steps 10, 11, 12, 13, & 14 and repeat adjustments if necessary
<b>TOWER</b>							
16	SO-2	278 kc	Tower		C-18	278 kc osc. trimmer	Adjust to frequency
17	SO-2	278 kc	Tower		C-11	278 kc ant. trimmer	Adjust to frequency
18							Repeat steps 16 & 17 for maximum output
<b>BROADCAST LOOP</b>							
19	Remove dummy antenna and connect dummy loop to loop socket SO-1 on unit.	600 kc	Broadcast loop	600 kc	S-6	Slug in broadcast loop trans. T-2	Maximum output
20	Dummy loop	1400 kc	Broadcast loop	1400 kc	C-3	Broadcast loop trimmer	Maximum output
21							Repeat steps 19 & 20 for maximum output
<b>BEACON LOOP</b>							
22	Dummy loop	220 kc	Beacon loop	220 kc	S-5	Slug in beacon loop trans. T-1	Maximum output
23	Dummy loop	380 kc	Beacon loop	380 kc	C-2	Beacon loop trimmer	Maximum output
24							Repeat steps 22 & 23 for maximum output
<b>FILTER VOICE ADJUSTMENT</b>							
25	*Same as for r-f alignment; connect audio oscillator to external modulation terminals on sig. gen. and set at 1020 C.P.S. 30% modulation.	300 kc	Filter voice	300 kc	C-32	Range filter condenser	Minimum output of receiver

\*This adjustment should be made with a 500 microvolt input. 1020 C.P.S. should be down approximately 18 db. from 400 C.P.S. level.

## TRANSMITTER ADJUSTMENT

Equipment required: Antenna loading coil, part #51B885-2, Capacitor, 27 mmfd, mica, ±10%, Resistor, 6 ohm, 2 watt carbon, ±10%, RF ammeter, 0-1 amp., Alignment tool, part #74A208, Transmission line part #87B1613-1, Microphone T-17 or M1-1. Series connect antenna loading coil to 27 mmfd capacitor, 6 ohm resistor and 0-1 RF ammeter to ground. Connect dummy antenna across transmission line with load coil to center conductor, plug transmission line into SO-1. Connect a 12 volt battery to power cable, turn on set and allow a few minutes warm-up period. Plug in microphone to jack, J-1. Set bandswitch to position No. 3 (Tower) and press microphone button. Tune antenna loading coil slug for maximum current reading on RF meter. For 12 volts DC power source, antenna current should be in the vicinity of .7 amperes. Whistling or talking in to the microphone should cause the antenna current to rise approximately 20%. Do not hold the press-to-talk microphone button down for more than 10 seconds at a time until all tuning adjustments are completed.

**GENERAL:** The Model CA-2 is a 7 tube Crystal controlled transmitter and a Superheterodyne receiver. The receiver incorporates two frequency ranges; 195 to 410 kc Beacon band and 540 to 1610 kc Broadcast band. The transmitter uses any one frequency range between 2 to 7 mc depending upon the crystal used—a 3105 kc crystal is provided.

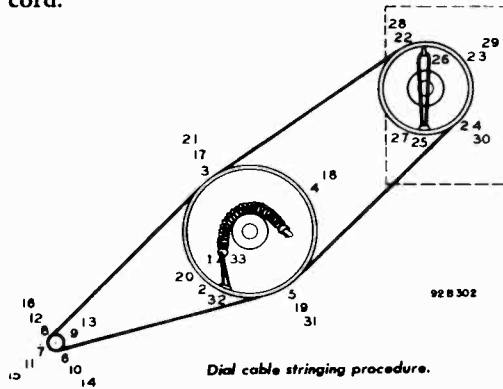
**CORD CONNECTIONS:** Consist of an audio and power cable, Antenna, and Direction finding loop antenna. All are located at the bottom of the set.

**POWER SUPPLY DATA:** Vibrator with rectifier, 12 volts DC, 13.75 volts nominal DC. Power drain is 3.5 amps on "Receive" and 5.3 amps on "Transmit."

**TUBE COMPLIMENT AND FUNCTIONS:** 12BE6 pentagrid converter, 12BA6 I.F. amplifier, 12AT6 detector, delayed AVC, and 1st audio, 6V6 output amplifier. The 12AT6 is used as a speech amplifier and the 6V6 as a Modulator when transmitting. The transmitter proper uses a 6J5 crystal oscillator and a 6V6 power amplifier.

**HOW TO RESTRING DIAL CORDS**

Cut a 30" length of 12 lb. test dial cord and tie one end to the tension spring on the pulley mounted on the hub of the bandswitch at position "1" on the diagram. Follow the numbers from "1" to "33," stretch the tension spring and tie cord securely. Cut off excess cord.



**TROUBLE SHOOTING CHART**

**SET IS DEAD**

Cause	Remedy
Defective power cable.....	Repair or replace cable.
Battery connections disconnected..	Check and make the connections.
Defective master switch on plane..	Repair or replace switch.
Blown fuse.....	Replace fuse.

**NO PLATE VOLTAGE**

Dead rectifier tube.....	Replace tube.
Defective vibrator.....	Replace vibrator.
Open plate circuit.....	Check continuity of plate circuit and repair.

**RECEIVER PERFORMS BUT TRANSMISSION IS DEAD**

Cause	Remedy
Inoperative crystal.....	Check and replace if necessary.
Defective microphone switch.....	Check and replace or repair if possible.
Defective relay or relay contacts.	Check and repair or replace if necessary.
Antenna not tuned properly.....	Retune

**FILAMENTS DO NOT LIGHT**

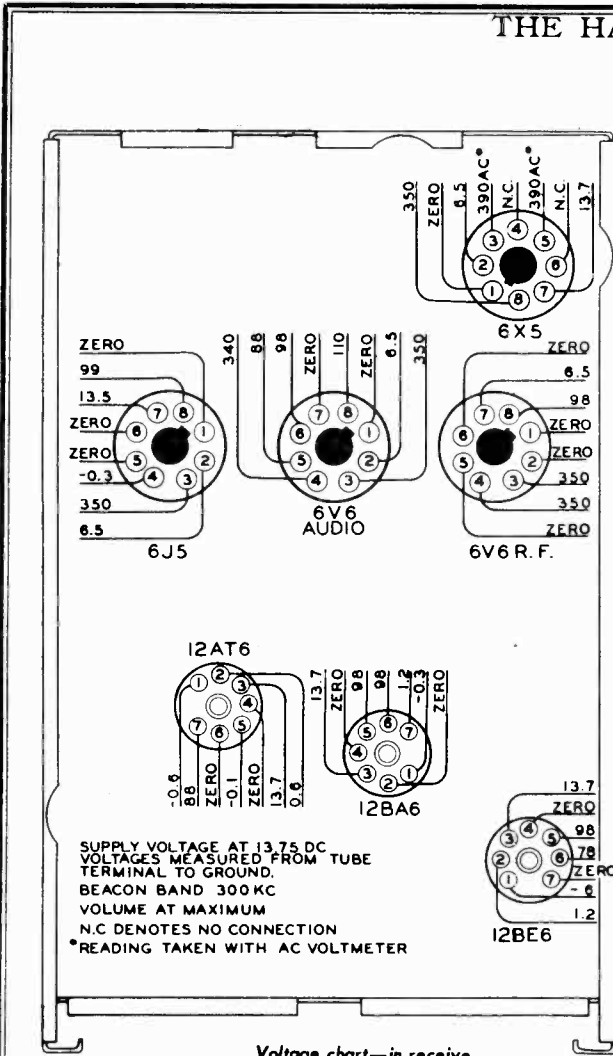
Defective filament circuit.....	Check filament wiring and repair.
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NOTE; Series parallel wiring on 6V6, 6X5 and 6J5 tubes.

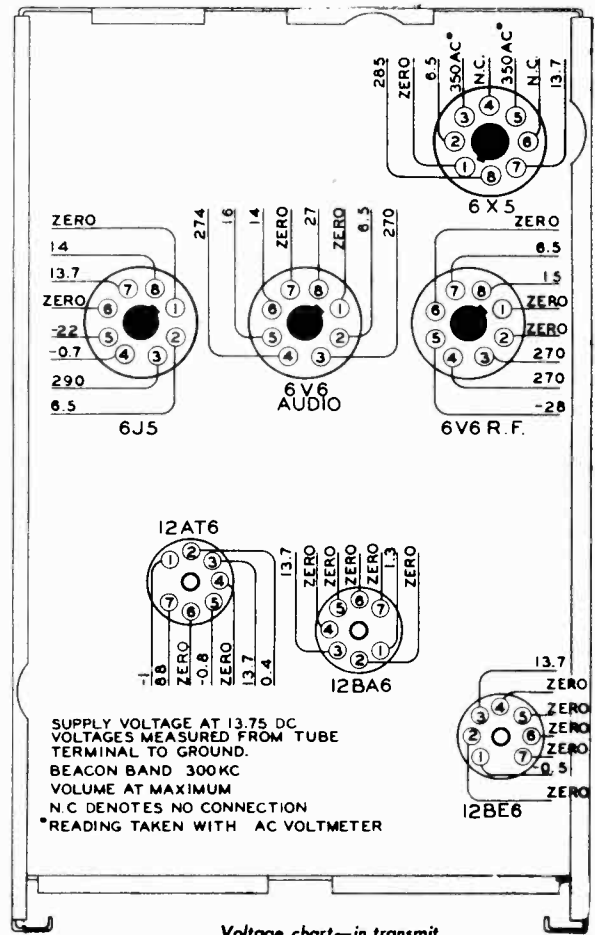
**SYMPTON:** Ignition Interference

**ANALYSIS:** Ignition noise is greatly reduced by inserting "damping" resistors in the grids of the oscillator mixer tube and a "limiting" resistor in the cathode circuit of the 2nd detector tube.

1. Install a 1500 ohm resistor in series with lead to pin no. 7 of V-1, 12BE6 tube. (R26)
2. Install a 1500 ohm resistor in series with lead to pin no. 1 of V-1, 12BE6 tube. (R27)
3. Install a 75 ohm resistor in series with lead to spark plate that is connected to pin no. 2 of socket, S0-4. (R28)



Voltage chart—in receive.

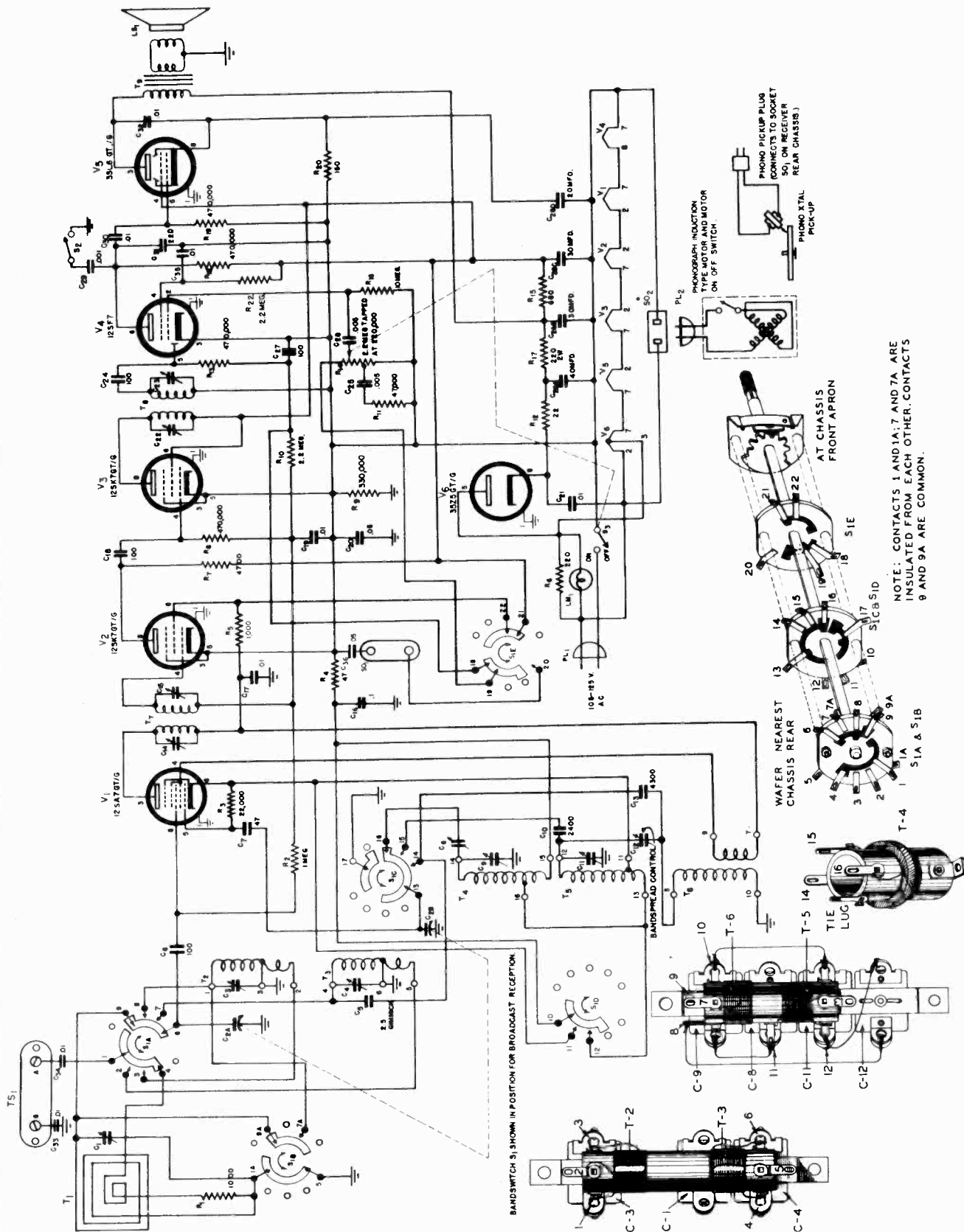


Voltage chart—in transmit.

REPLACEMENT PARTS LIST FOR MODEL CA-2 SKYFONE TRANSCEIVER

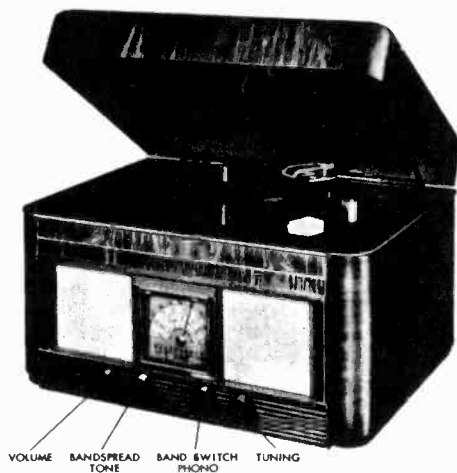
REF. NO.	DESCRIPTION	HALLICRAFTERS PART NUMBER	REF. NO.	DESCRIPTION	HALLICRAFTERS PART NUMBER
<b>CONDENSERS</b>			<b>RESISTORS—Continued</b>		
C-36, 37	.02 mfd; 600 vdcw; paper tubular	46AY203J	R-12, 13	470,000 ohm; 20%; 1/2 watt; carbon	RC20AE474M
C-45	.02 mfd; 1600 vdcw; paper tubular	46A098-1	R-5, 19	68 ohm; 20%; 1/2 watt; carbon	RC20AE680M
C-19, 22, 49, 43, 50	.01 mfd; 150 vdcw; paper tubular	46A099-2	R-16	100 ohm; 20%; 1 watt; carbon	RC30AE101M
C-23, 24	.1 mfd; 150 vdcw; paper tubular	46A099-4	R-17	220 ohm; 20%; 1 watt; carbon	RC30AE221M
C-39, 34	.05 mfd; 150 vdcw; paper tubular	46A099-3	R-19	39 ohm; 20%; 2 watt; carbon	RC40AE390M
C-30	.001 mfd; 150 vdcw; paper tubular	46A099-5	R-26, 27	1500 ohm; 20%; 1/2 watt; carbon	RC20AE152M
C-38	.25 mfd; 150 vdcw; paper tubular	46A099-6	R-28	75 ohm; 20%; 1/2 watt; carbon	RC20AE750M
C-33	.002 mfd; 600 vdcw; paper tubular	46A100-1	R-25	150 ohm; 20%; 1/2 watt; carbon	RC20AE151M
C-30	.0001 mfd; 600 vdcw; paper tubular	46A100-2			
C-29	.0005 mfd; 600 vdcw; paper tubular	46A100-3			
C-9A, B	Variable main tuning condenser	46C182			
C-47	5 mmf; 20%; 500 vdcw; mica	CM20A050M	T-7	IF, 1st	50B206
C-44, 28	100 mmf; 20%; 500 vdcw; mica	CM20A101M	T-8	IF, 2nd	50B207
C-10, 17	150 mmf; 2%; 500 vdcw; mica	CM20A151G	T-3	Converter, "Beacon"	51B859
C-42	47 mmf; 20%; 500 vdcw; mica	CM20A470M	T-4	Converter, Broadcast	51B860
C-31	470 mmf; 20%; 500 vdcw; mica	CM20A471M	T-6	Osc. "Beacon"	51B861
C-1, 6	75 mmf; 5%; 500 vdcw; ceramic	CC25UK750J	T-5	Osc. Broadcast	51B862
C-13	120 mmf; 5%; 500 vdcw; ceramic	CC30UK121J	T-1	Loop, "Beacon"	51B863
C-48	150 mmf; 10%; 500 vdcw; ceramic	CC36UK151K	T-2	Loop, Broadcast	51B864
C-46	220 mmf; 10%; 500 vdcw; ceramic	CC36UK221K	T-10	Power Transformer	52C126
C-12	270 mmf; 2%; 500 vdcw; ceramic	CC40TK271G	T-9	Output Transformer	53A075
C-15	620 mmf; 5%; 500 vdcw; ceramic	CC45UK621J	L-3, 4	Hash choke	53A100
C-2, 3, 5, 8, 11, 14, 16, 18	4-30 mmf trimmer; ceramic	44A103	L-5, 6	RF choke	53A101
C-32	2300 mmf trimmer; compression	44B108	L-2	Range filter choke	56B072
C-35A, B, C, D, E	Capacitor assembly	45C104			
C-41A, B, C, D, E	Ignition filter assembly	46B133			
<b>RESISTORS</b>			<b>TRANSFORMERS AND CHOKES</b>		
R-14	3900 ohms; 10%; 10 watt; wire wound	24BC392E	T-7	IF, 1st	50B206
R-4 & S-2	VOLUME control including switch	25A568	T-8	IF, 2nd	50B207
R-22	100 ohms; 20%; 1/2 watt; carbon	RC20AE101M	T-3	Converter, "Beacon"	51B859
R-10	1000 ohm; 20%; 1/2 watt; carbon	RC20AE102M	T-4	Converter, Broadcast	51B860
R-21	10,000 ohm; 20%; 1/2 watt; carbon	RC20AE103M	T-6	Osc. "Beacon"	51B861
R-6	100,000 ohm; 20%; 1/2 watt; carbon	RC20AE104M	T-5	Osc. Broadcast	51B862
R-8	1 megohm; 20%; 1/2 watt; carbon	RC20AE105M	T-1	Loop, "Beacon"	51B863
R-11	10 megohm; 20%; 1/2 watt; carbon	RC20AE106M	T-2	Loop, Broadcast	51B864
R-15	15 ohm; 20%; 1/2 watt; carbon	RC20AE150M	T-10	Power Transformer	52C126
R-9, 24	220 ohm; 20%; 1/2 watt; carbon	RC20AE221M	T-9	Output Transformer	53A075
R-18	2200 ohm; 20%; 1/2 watt; carbon	RC20AE222M	L-3, 4	Hash choke	53A100
R-1	22,000 ohm; 20%; 1/2 watt; carbon	RC20AE223M	L-5, 6	RF choke	53A101
R-3	2.2 megohm; 20%; 1/2 watt; carbon	RC20AE225M	L-2	Range filter choke	56B072
R-23	47 ohm; 20%; 1/2 watt; carbon	RC20AE470M			
R-2	4700 ohm; 20%; 1/2 watt; carbon	RC20AE472M			
R-7, 20	47,000 ohm; 20%; 1/2 watt; carbon	RC20AE473M			
			LM-2	Lamp, pilot, No. 44	39A003
			LM-1	Lamp, neon indicator	39A012
			RY-1	Relay, complete	21B072
			VB-1	Vibrator, nonsynchronous	27A139
				Knob, volume and tuning	15A074-1
			LS-1	Speaker	15A073-1
				Antenna and loop socket assembly	10A247
				Bandswitch	60C260
				Dial light socket	86A041-1
				Octal socket	6A273
			SO-4	Socket, 6 prong, power	6A282
			PL-4	Plug, 6 prong, power	10A241
				Socket, 7 prong min.	6A264
				Cable, power, audio, Microphone—GENERAL	87C1567*
			X-1	Crystal, 3105 kc.	19A1210
				Dial window	22B170
				Dial scale	83C291

\* Specify Aircraft Type and make when ordering.

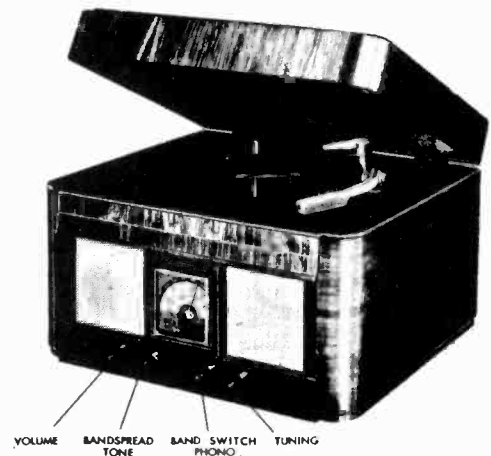


THE HALLICRAFTERS CO.

MODELS EC-306,  
EX-306



Model EX-306 Front view of receiver showing control locations.



Model EC-306 Front view of receiver showing control locations.

**GENERAL:** The EC-306 and EX-306 are six tube AC, table model radio-phonographs.

These receivers incorporate a superheterodyne circuit and are capable of receiving both domestic and short-wave reception in three bands as follows: Band #1, domestic broadcast, 540 kc 1625 kc (position 2). Band #2, short wave range #1, 2.2 to 7.1 mc (position 3). Band #3, short wave range #2, 6.9 to 22 mc. (position 4).

Both models have built in antennas, plus provisions for external antenna and ground systems.

**PHONOGRAPH:** Position #1 on band switch is for "phono" operation. The record changer is of the automatic type and will handle either ten twelve inch or twelve ten inch records. Detailed Service instructions for the automatic changers are available on request. The EC-306 uses changer model 205 and the EX-306 uses changer model 204.

**POWER SUPPLY DATA:** Both receiver models are designed to operate from a line voltage of 105 to 125 volts AC 50-60 cycles with a power drain of 30 watts nominal. Power to the receivers is supplied through the line cord extending from the rear of the cabinets.

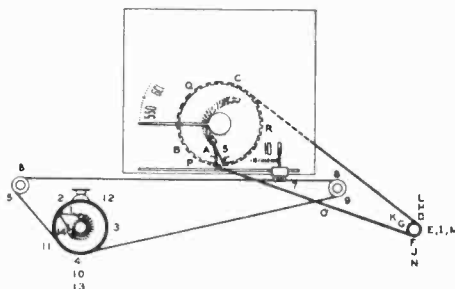
**TUBE TYPES AND FUNCTIONS:** 12SA7GT/G-mixer-oscillator; 2-12SK7GT/G's as I-F amplifiers; 12SF7-Detector, AVC and First audio amplifier; 35L6GT/G-Audio power amplifier; 35Z5GT/G-Power rectifier.

**DETAILED SERVICE INFORMATION**

IF FREQUENCY	RECEIVER OVERALL SELECTIVITY	IMAGE RATIO	*RECEIVER OVERALL SENSITIVITY	AUDIO OUTPUT
455kc	8.5kc wide at 6db down 16kc wide at 20db down 32kc wide at 40db down (for 500 milliwatt output)	65:1 at 1000kc (loop) 20:1 at 2.5mc (ant.) 8:1 at 7.0mc (ant.) 6:1 at 15.0mc (ant.) 3:1 at 20.0mc (ant.)	45 microvolt at 1000 kc 80 microvolt at 2.5 mc 35 microvolt at 6mc 140 microvolt at 8mc 50 microvolt at 20mc	0.8 watt with less than 10% distortion

\*Readings for 500 milliwatt constant output. Speaker disconnected and replaced with a 3.2 ohm load resistor. Signal from generator modulated 30% at 400 cycles.

**HOW TO RESTRING DIAL CORDS**



Dial cable stringing procedure; main tuning is indicated by letters, and band spread tuning is indicated by numbers.

To restring the main tuning dial cord, cut a 25" length of 18 lb test dial cord and tie one end to the tension spring of the main tuning capacitor drive pulley at position "A" on the diagram. Following the letters "A" through "S", wind the cord on the pulley and knob drive shaft. At position "S", stretch the tension spring and tie the cord securely. Cut off the excess cord. Note that three turns are wound on the knob drive shaft.

To restring the bandspread tuning dial cord, cut a 30" length of the dial cord and follow the procedure as explained above, except start at position "1" on the diagram and proceed through position "14". Then turn knob pulley maximum clockwise, slide pointer to 100 and insert cord in clip on pointer. Note that the knob pulley has two turns.

MODELS EC-306,  
EX-306

THE HALLICRAFTERS CO.

# ALIGNMENT INSTRUCTIONS

**EQUIPMENT:**

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

**CONNECTIONS:** Connect the Sig. Gen. "cold" lead to "G" on the antenna terminal strip except for i-f adjustments (see chart below); the "hot" lead is connected as indicated in the chart.

Connect the output meter across voice coil of the speaker and adjust the meter for 3 ohm impedance.

**Caution:** Set the meter at a sufficiently high range to prevent possible damage from overload. Band 3 must be aligned before band 2 in all instances.

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

- VOLUME control at full clockwise.
- BANDSPREAD tuning control at "0", (min. cap.).

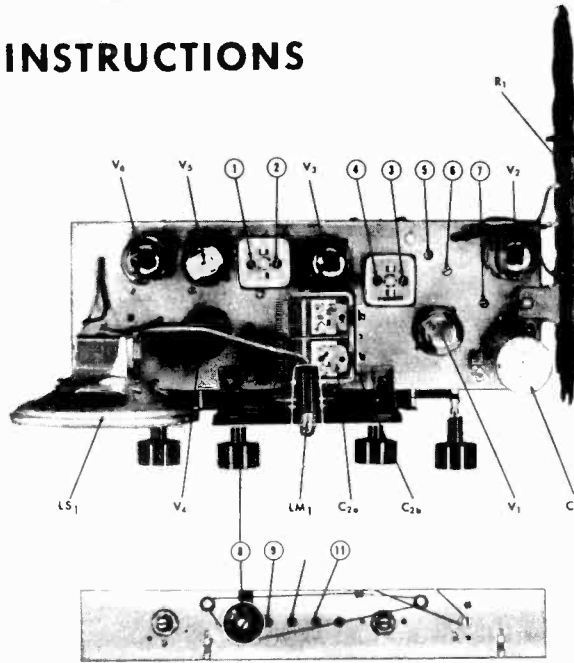


Fig. 6. Top and front views of the receiver showing tube locations and location of padder, trimmer and i-f adjustment points.

## ALIGNMENT CHART

DUMMY ANT. IN SERIES WITH SIG. GENERATOR	CONNECTION OF SIG. GENERATOR OUTPUT TO RECEIVER	SIGNAL GEN. FREQUENCY SETTING	BAND SWITCH SETTING	RECEIVER DIAL SETTING	ADJUST SLUG PADDER, OR TRIMMER NO.	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT MAKE ADJUSTMENT FOR:	STEP NO.
<b>IF ADJUSTMENT</b>								
None	**On mixer section stator of tuning condenser gang	455kc	Range 1 (Broadcast)	1625kc	3 & 4 1 & 2	Diode IF Input IF	Maximum output Maximum Output Repeat steps 1 & 2	1 2 3
<b>RANGE 1 (Broadcast band)—</b>								
Standard RMA Dummy*	Couple to loop aerial	1500kc 1500kc	Range 1 (Broadcast)	1500kc 1500kc	11 6	Osc. Trimmer Antenna shunt trimmer	Maximum output Maximum output	4 5
		600kc		600kc	10	Osc. padder	Maximum output Repeat step 4	6 7
<b>RANGE 3 (Short wave range 6.9 to 22mc)—</b> Align oscillator for this band with bandspread indicator drive pulley set screw loose and pointer set at zero. After completing the OSCILLATOR alignment, tighten the screws securely without changing the pointer setting from zero.								
Standard RMA Dummy*	"A" on antenna terminal strip	22mc	Range 3	22mc	8	Bandspread & Osc. trimmer	Maximum output	8
		20mc		20mc	†5	Antenna shunt trimmer	Maximum output	9
<b>RANGE 2 (Short wave range 2.2 to 7.1mc.)—</b>								
Standard* RMA Dummy*	"A" on antenna terminal strip	6mc 6mc	Range 2	6mc 6mc	9 7	Osc. trimmer Antenna shunt trimmer	Maximum output Maximum output	10 11

**NOTE:** Bandsread indicator MUST be at ZERO when making all adjustments.

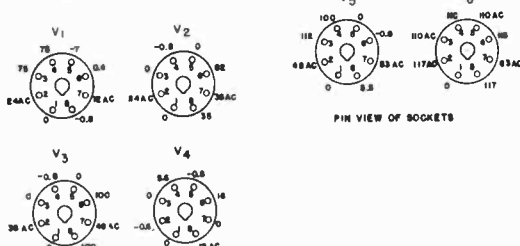
Band 2 oscillator trimmer (9) must be set AFTER bandsread trimmer (8) (Range 3 oscillator trimmer) is aligned.

\*Standard RMA dummy antenna consists of a 200mmf condenser in series with a 20uh r-f choke, the choke being shunted by a 400 mmf condenser in series with a 400 ohm carbon resistor.

\*\*Connect Sig. Gen. ground lead to receiver negative return, not to chassis. This applies only for I-F adjustment.

†When making these adjustments turn tuning capacitor slowly back and forth.

**TUBE TERMINAL VOLTAGES**



ALL VOLTAGES ARE POSITIVE DC UNLESS OTHERWISE SPECIFIED. VOLTAGES TAKEN WITH A VACUUM TUBE VOLTMETER; NO SIGNAL BEING RECEIVED; NEG. METER LEAD TO B-(AT VOLUME CONTROL LOW SIDE) POSITIVE LEAD TO EACH TUBE TERMINAL; BANDSWITCH SET FOR BROADCAST BAND; TUNE TO APPROX. 1000KC. AC LINE 117 VOLTS.

ALL VOLTAGES ARE ±10% OR 1 VOLT, WHICH EVER IS GREATER.

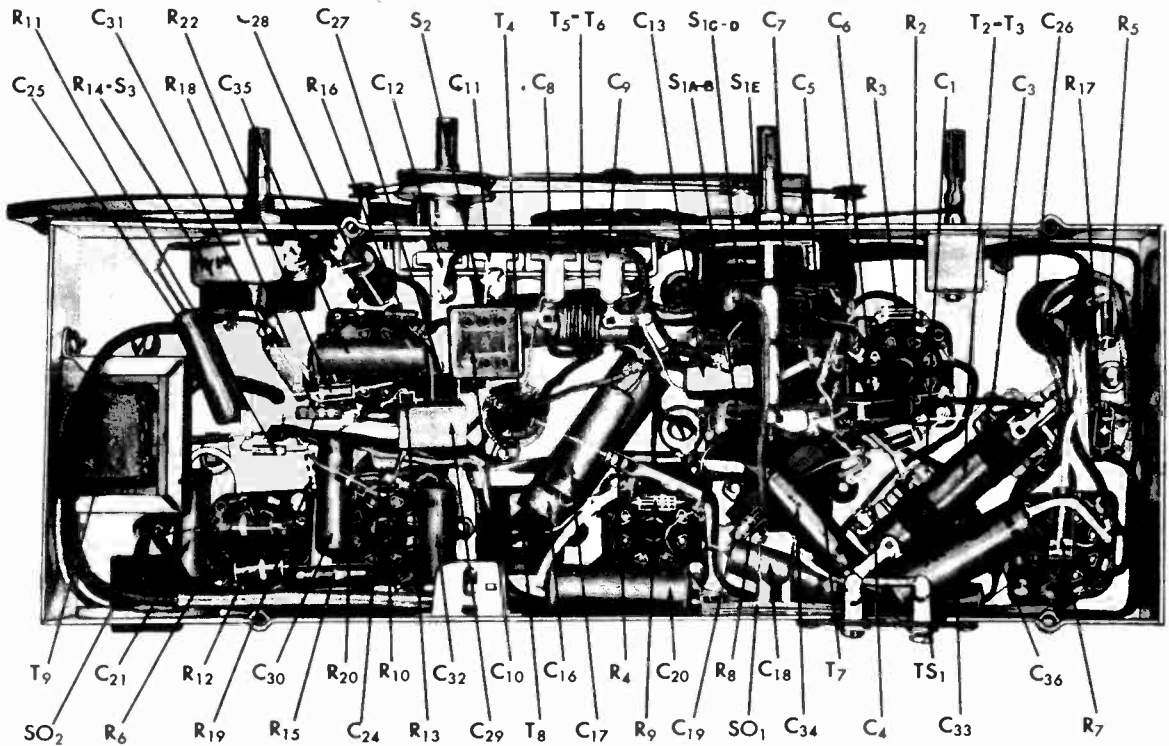
RESISTANCE VALUES ARE IN OHMS; MICA CAPACITOR VALUES ARE IN MUF; PAPER CAPACITOR VALUES ARE IN DECIMAL EQUIVALENTS OF MPD; ELECTROLYTIC CAPACITOR VALUES ARE IN MPD.

--- DENOTES UNSHIELDED UNIT ASSEMBLY.

--- DENOTES MECHANICAL GANGING.

THE HALLICRAFTERS CO.

MODELS EC-306,  
EX-306

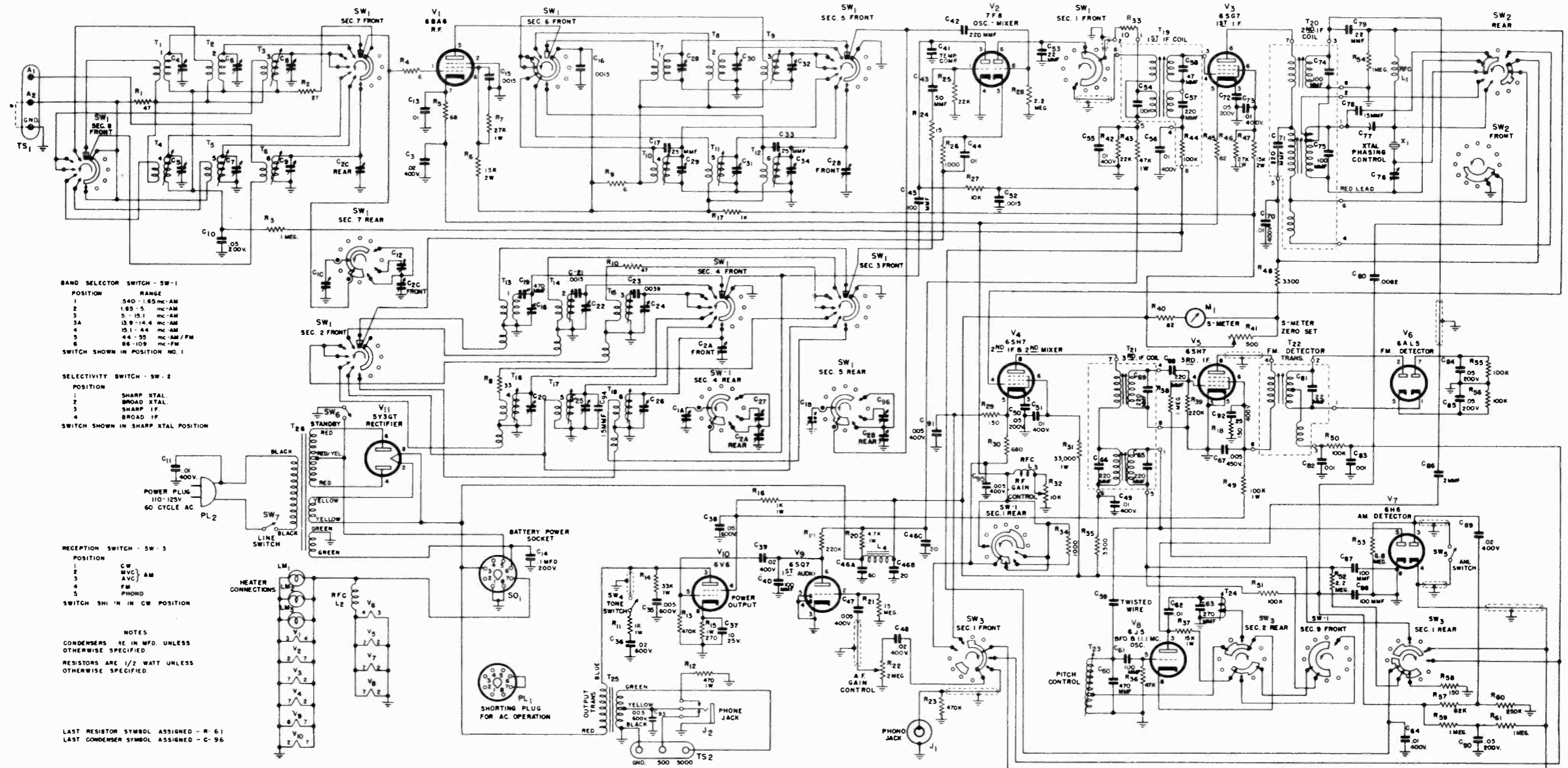


Model EC-306 and EX-306 bottom view of chassis showing location of component parts.

REF. NO.	DESCRIPTION	HALLICRAFTER'S PART NUMBER	REF. NO.	DESCRIPTION	HALLICRAFTER'S PART NUMBER
<b>CAPACITORS</b>					
C-1, 3 & 4	Antenna trimmers; 3 section unit	44A162	S-1	Bandswitch; rotary; 3 section, 4 position	60B251
C-2	Main tuning capacitor; 2 sections, ganged; 12.3 to 354.6 mmf, each section; air	48B165	S-2	Tone control switch	60A246
C-5	2.5mmf gimmick; twisted insulated leads. NOT FURNISHED AS A REPLACEMENT PART SHOWN FOR REFERENCE ONLY.		S-3	Receiver on/off switch; part of resistor R-14 assembly. NOT FURNISHED AS A SEPARATE REPLACEMENT PART. SEE LISTING REF. NO. R-14.	
C-6, 18, 24 & 27	100 mmf; 20%; 500 vdcw; mica	CM20A101M	<b>TRANSFORMERS</b>		
C-7	47 mmf; 20%; 500 vdcw; mica	CM20A470M	T-1	Antenna loop assembly; includes resistor R-1	57C104
C-8, 9, 11 & 12	Oscillator trimmer; 4 section	44B161	T-2 & 3	Mixer coil assembly for short wave bands, both short wave ranges	51B814
C-10	2400 mmf; 20%; 500 vdcw; mica	CM30A242M	T-4	Oscillator coil for local broadcast band	51A811
C-13	4300 mmf; 10%; 500 vdcw; mica	CM35A432K	T-5 & 6	Oscillator coil assembly for short wave bands, both short wave ranges	51B815
C-14 & 15	Trimmers for IF transformer, T-7. NOT A REPLACEABLE PART. FURNISHED WITH REPLACEMENT TRANSFORMER T-7. SEE LISTING REF. NO. T-7.		T-7	Input IF transformer; 455kc; trimmer tuned	50B196-5
C-16	0.1 mfd; +40-15%; 600 vdcw; tubular paper	46AX104J	T-8	Diode IF transformer; 455kc; trimmer tuned	50B196-2
C-17, 19, 21, 30, 32, 33, 34, 35 & 36	0.01 mfd; 20%; 600 vdcw; tubular paper	46AX103F	T-9	Audio output transformer; matches output tube to 3 ohm voice coil of PM speaker	55B080-2
C-28	0.001 mfd; +40 -15%; 600 vdcw; tubular paper 46AZ502J		T-10	Autotransformer, 220 to 110 volts, AC, 50-60 cycles	52B145
C-20	0.05 mfd; +40 -15%; 600 vdcw; tubular paper 46AY503J		<b>TERMINAL STRIPS</b>		
C-22 & 23	Trimmers for IF transformer, T-8. NOT A SEPARATE REPLACEMENT PART. FURNISHED WITH REPLACEMENT TRANSFORMER T-8. SEE LISTING REF. NO. T-8.		TS-1	External antenna and ground connector strip	88A569
C-26A, B, C & D	Electrolytic; 4 section unit; sect. A—40 mfd, 150 vdcw; sect. B & C—are each 30 mfd, 150 vdcw; Sect. D—20 mfd, 25 vdcw.	45B095	<b>MISCELLANEOUS COMPONENTS COMMON TO BOTH MODELS</b>		
C-29	0.001 mfd; 20%; 600 vdcw; tubular paper	46AZ102H	QUANT. IN EQUIPMENT	DESCRIPTION	HALLICRAFTER'S PART NUMBER
C-31	220 mmf; 20%; 500 vdcw; mica	CM20A221M	1	Pilot lamp dial socket; bayonet base	86A036-1
C-35	0.005 mfd; 20%; 600 vdcw; tubular paper	46AZ502J	1	Bracket; tuning capacitor mounting	67B581
<b>PILOT LAMPS</b>					
LM-1	6/8 volt @ 150 ma; brown bead; bayonet base; G.E. type 47	39A004	1	Bracket; tuning shaft mounting	67A582
<b>LOUD SPEAKER</b>					
LS-1	Loud Speaker	85B038	1	Steel tuning shaft	74A176
<b>PLUGS</b>					
PL-1	Line cord with two prong plug; 6 ft cord	87A078	1	Acetate dial window	22B161
<b>RESISTORS</b>					
R-1 & 5	1000 ohm; 20%; 1/2 watt; carbon; (NOTE: R-1 is included with antenna loop transformer ref. no. T-1, but is available as a separate replacement part.)	RC20A102M	1	Main tuning dial scale pointer	82A106
R-2	1 megohm; 20%; 1/2 watt; carbon	RC20AE105M	1	Bandspread tuning dial scale pointer	82A107
R-3 & 11	47,000 ohm; 20%; 1/2 watt; carbon	RC20AE473M	1	Calibrated dial scale	83B271
R-4	47 ohm; 20%; 1/2 watt; carbon	RC20AE470M	1	Drive pulley	28A022
R-6	220 ohm; 20%; 1 watt; carbon	RC20AE221M	2	Idler pulley	28A023
R-7	4700 ohm; 20%; 1 watt; carbon	RC20AE472M	1	Line cord lock	76A299
R-8, 13, 18 & 19	470,000 ohm; 20%; 1/2 watt; carbon	RC20AE474M	1	Electrolytic capacitor (C-26) hold down clamp	76A300
R-9	330,000 ohm; 20%; 1/2 watt; carbon	RC20AE334M	1	Cam for switch, S—	77A207
R-10	2.2 megohm; 20%; 1/2 watt; carbon	RC20AE225M	6	Tube sockets; octal; Amphenol type MIP-B	6A256
R-12	22 ohm; 20%; 1 watt; carbon	RC30AE220M	1	Receptical, Phono	10A015
R-14 & S-3	VOLUME control; 2.2 megohm, tapped at 220,000 ohm, variable; includes SPST toggle action switch, S-3 on rear	25A561	1	Receptical, Motor	88A072
R-15	680 ohm; 20%; 1 watt; carbon	RC30AE681M	3	Knob, bakelite, walnut finish	15B067-2
R-16	10 megohm; 20%; 1/2 watt; carbon	RC20AE106M	1	Knob, bakelite, walnut finish with dot	15B076-1
R-17	470 ohm; 20%; 1/2 watt; carbon	RC20AE471M	<b>MISCELLANEOUS COMPONENTS FOR MODEL EC-306 ONLY</b>		
R-20	150 ohm; 20%; 1/2 watt; carbon	RC20AE151M	1	Cabinet, wood	66F325
R-22	2.2 megohm; 20%; 1/2 watt; carbon	RC20AE225M	1	**Record Changer	115C001-1
<b>MISCELLANEOUS COMPONENTS FOR MODEL EX-306 ONLY</b>					
			1	Cabinet, wood	66F326
			1	**Record Changer	115C003-1







**BAND SELECTOR SWITCH - SW-1**

POSITION	RANGE
1	540 - 1.65 mc-AM
2	1.65 - 5 mc-AM
3	5 - 15.1 mc-AM
3A	13.9 - 14.4 mc-AM
4	15.1 - 44 mc-AM
5	44 - 55 mc-AM/FM
6	86 - 109 mc-FM

SWITCH SHOWN IN POSITION NO. 1

**SELECTIVITY SWITCH - SW-2**

POSITION	SETTING
1	SHARP XTAL
2	BROAD XTAL
3	SHARP IF
4	BROAD IF

SWITCH SHOWN IN SHARP XTAL POSITION

**RECEPTION SWITCH - SW-3**

POSITION	SETTING
1	CW
2	MVC AM
3	AVC
4	FM
5	PHONO

SWITCH SHOWN IN CW POSITION

**NOTES**  
 CONDENSERS 25 IN MFD. UNLESS OTHERWISE SPECIFIED  
 RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED

LAST RESISTOR SYMBOL ASSIGNED - R-61  
 LAST CONDENSER SYMBOL ASSIGNED - C-96

Tubes . . . . . Eleven  
 Speaker Output . . . . . 500/5000 Ohms.  
 Headset Output . . . . . High Impedance.  
 Antenna Input . . . . . For 72 to 600-ohm line or single wire lead-in.  
 Phono Input . . . . . High Impedance.  
 External Power Connector. Std. Octal Socket.

Tuning Range. . . . . Band 1. 540 kc - 1700 kc. AM.  
 2. 1.7 mc - 5 mc. AM.  
 3. 5 mc - 16 mc. AM.  
 3A. 14 mc - 14.4 mc. AM.  
 4. 15.5 mc - 44 mc. AM.  
 5. 44 mc - 55 mc. AM/FM  
 6. 86 mc - 109 mc. FM

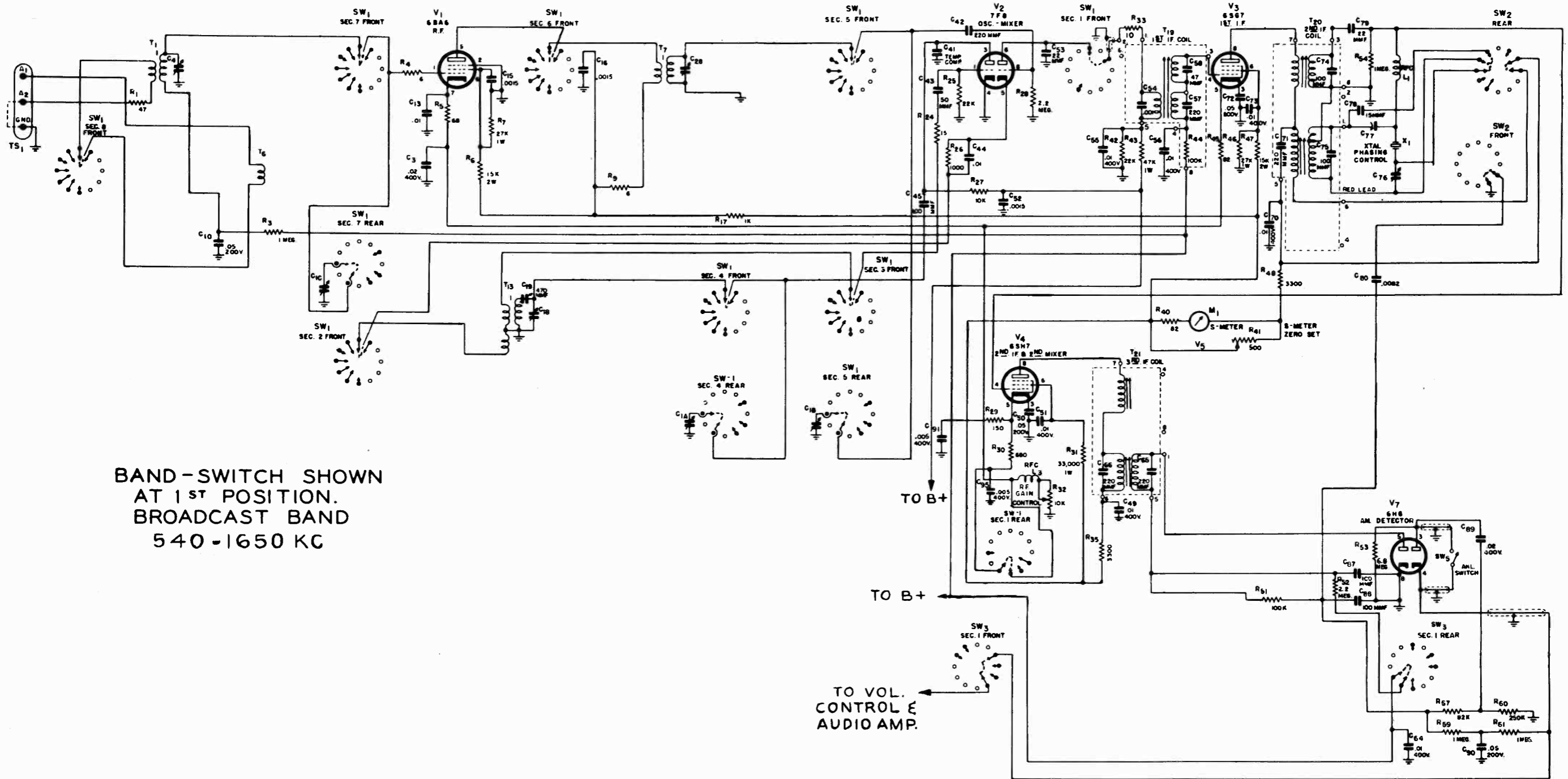
Intermediate Frequency. . . . . 455 kc/10.7 mc.  
 Power Supply. . . . . 105-125 V. 50/60 cycles AC.  
 Power Consumption . . . . . 90 Watts.

# CLARI-SKEMATIX

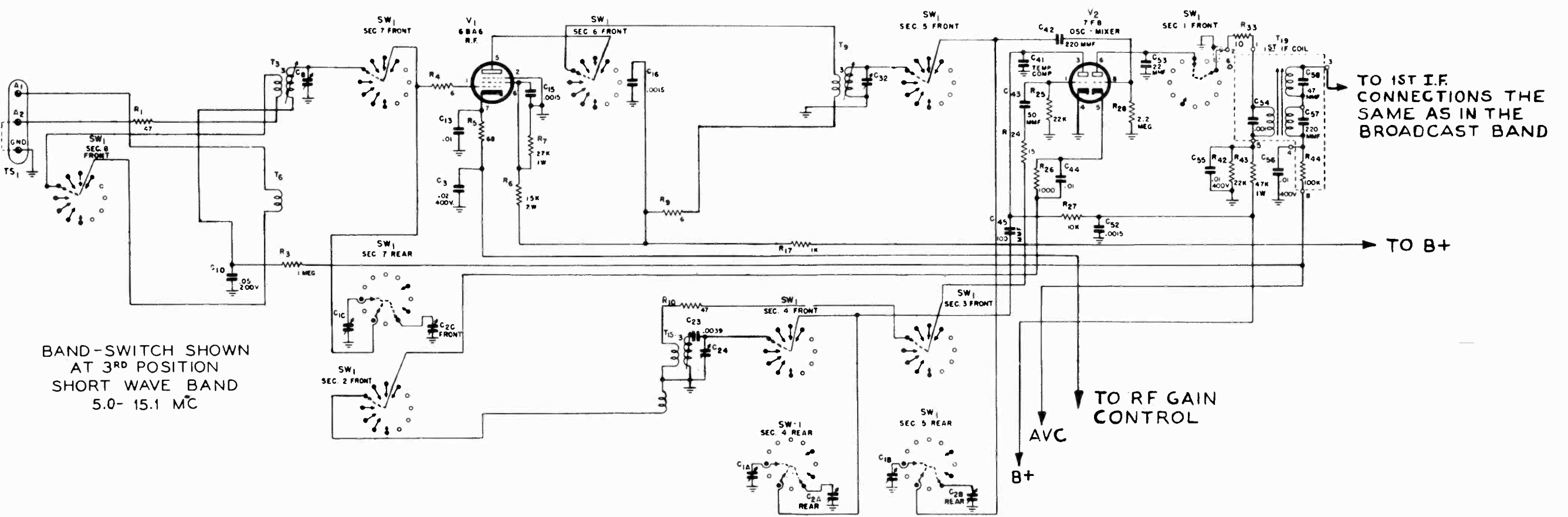
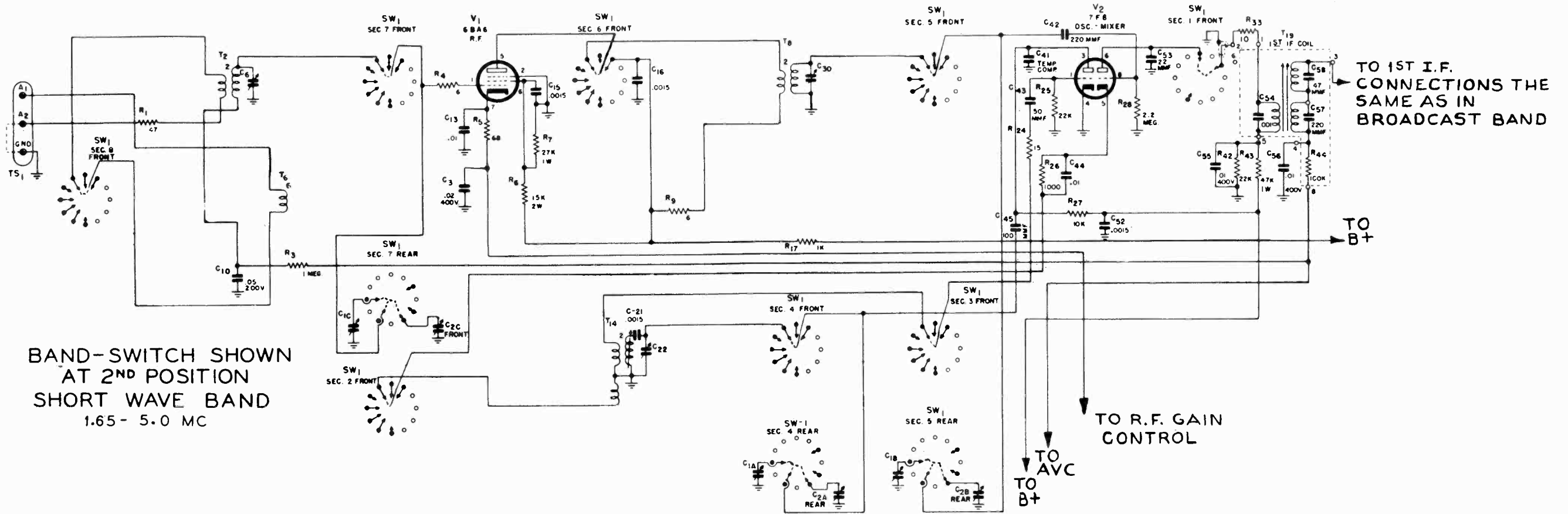
Registered Trademark

THE HALLICRAFTERS CO.

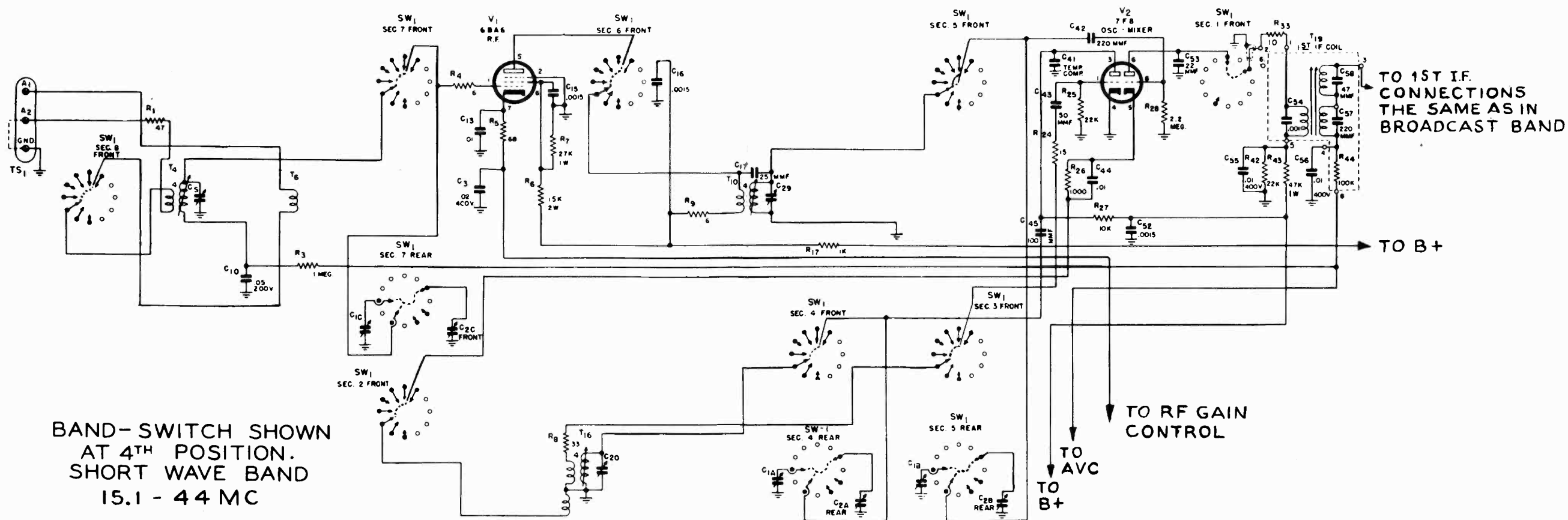
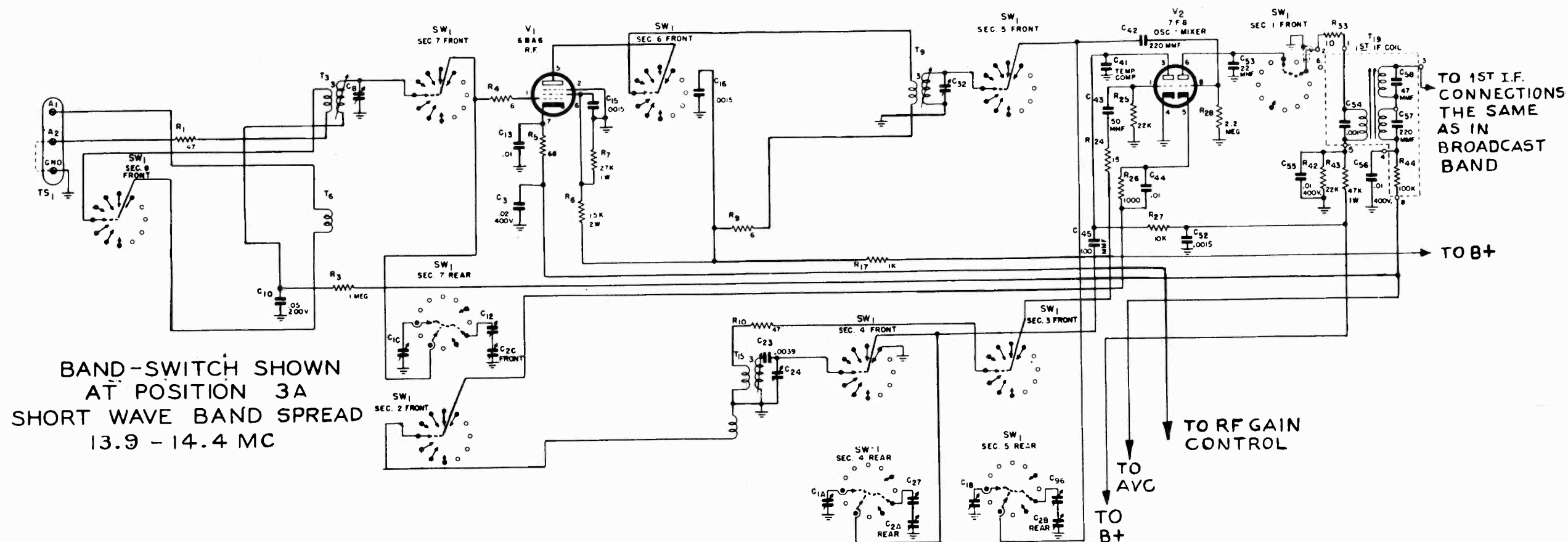
MODEL SX-43

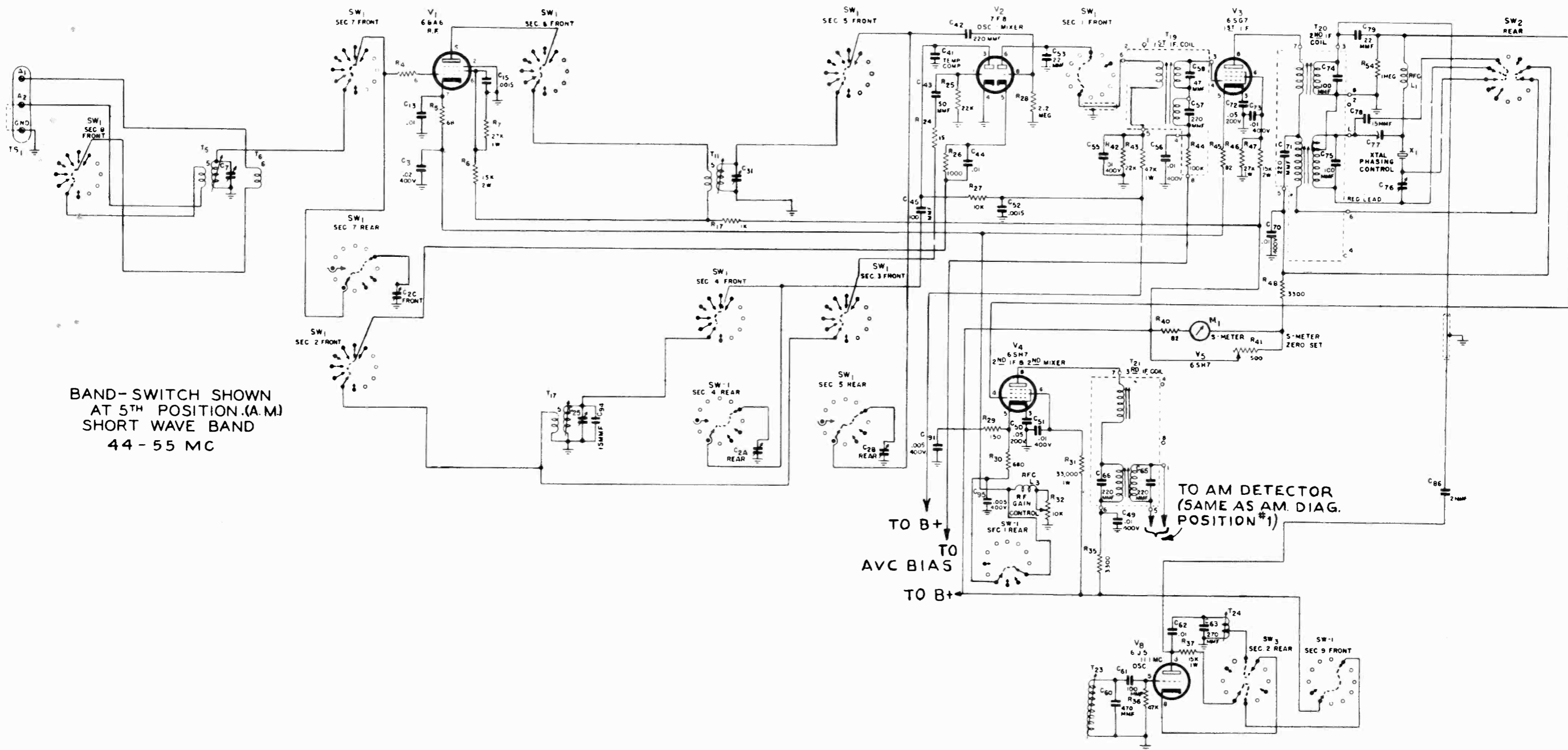


BAND-SWITCH SHOWN  
AT 1ST POSITION.  
BROADCAST BAND  
540-1650 KC



MODEL SX-43



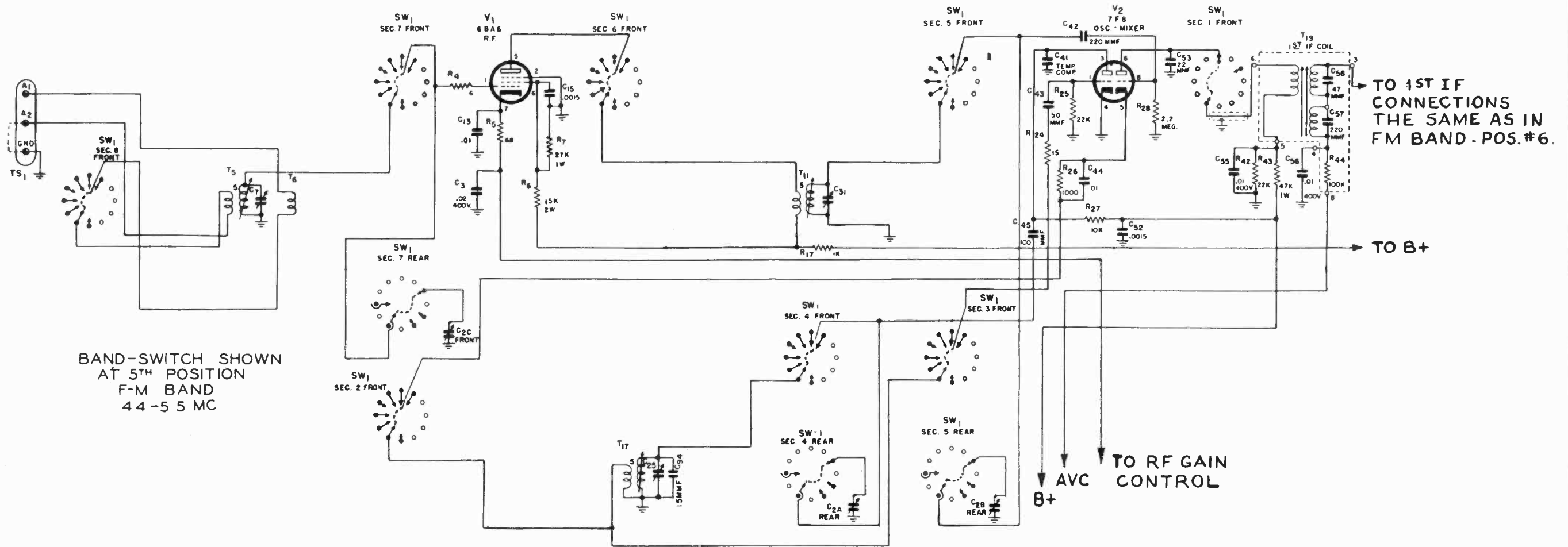


BAND-SWITCH SHOWN  
AT 5TH POSITION (A.M.)  
SHORT WAVE BAND  
44 - 55 MC

TO AM DETECTOR  
(SAME AS AM. DIAG.  
POSITION #1)

TO B+  
TO AVC BIAS  
TO B+

MODEL SX-43



BAND-SWITCH SHOWN AT 5<sup>TH</sup> POSITION  
F-M BAND  
44-55 MC

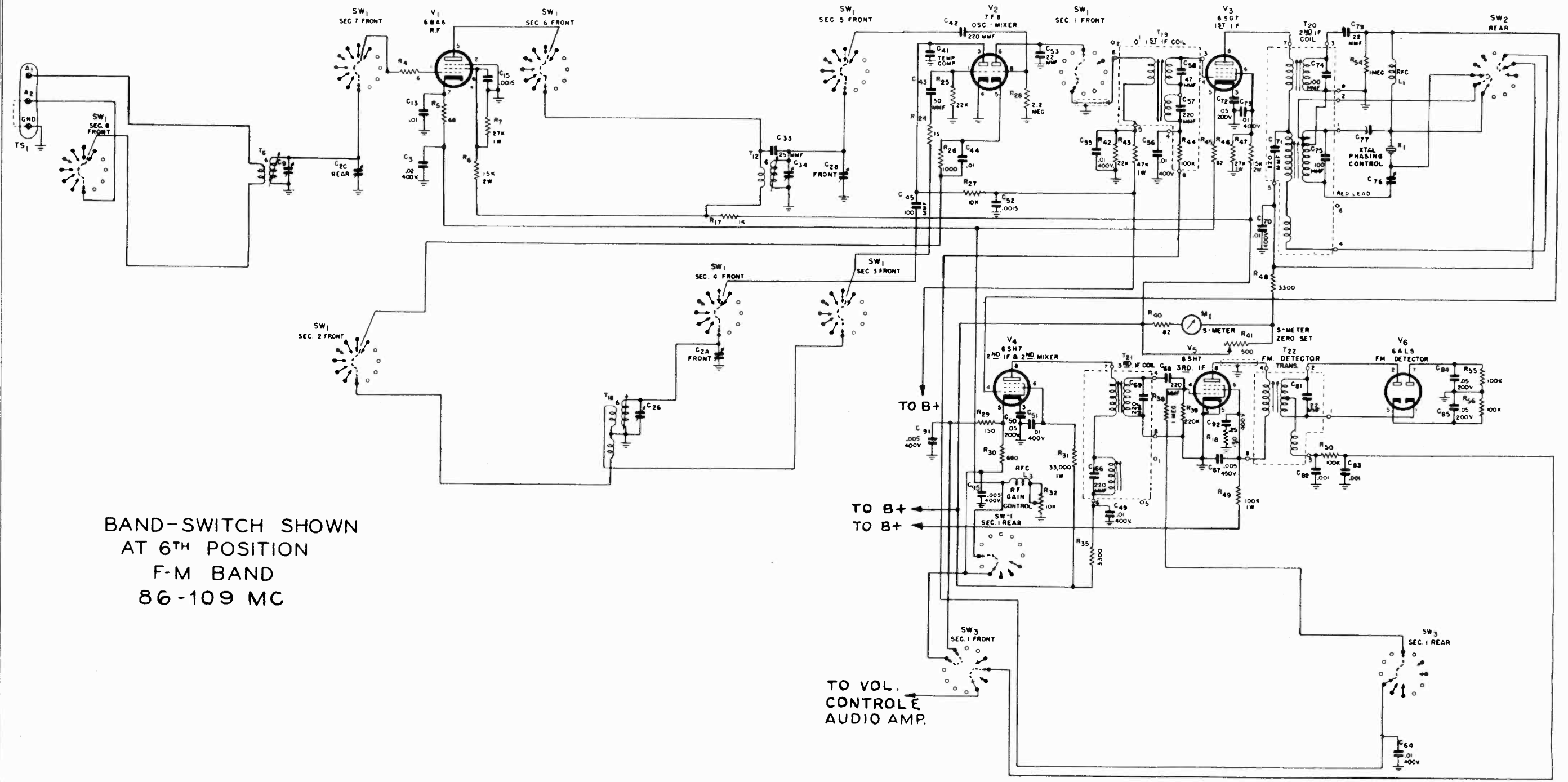


**CARRIER LEVEL METER ADJUSTMENT:**

1. Connect a jumper between the two antenna terminals and ground.
2. Set front panel controls as follows:  
 SENSITIVITY - Maximum.  
 RECEPTION - AM/AVC.  
 SELECTIVITY - NORMAL/SHARP.  
 BAND SELECTOR - 4.  
 VOLUME - Maximum. (No signal should be heard.)
3. Set "S" METER ADJ. (See Fig. 3.) on rear chassis apron for zero on the CARRIER LEVEL meter.

**POSITIONING CONTROL KNOBS:**

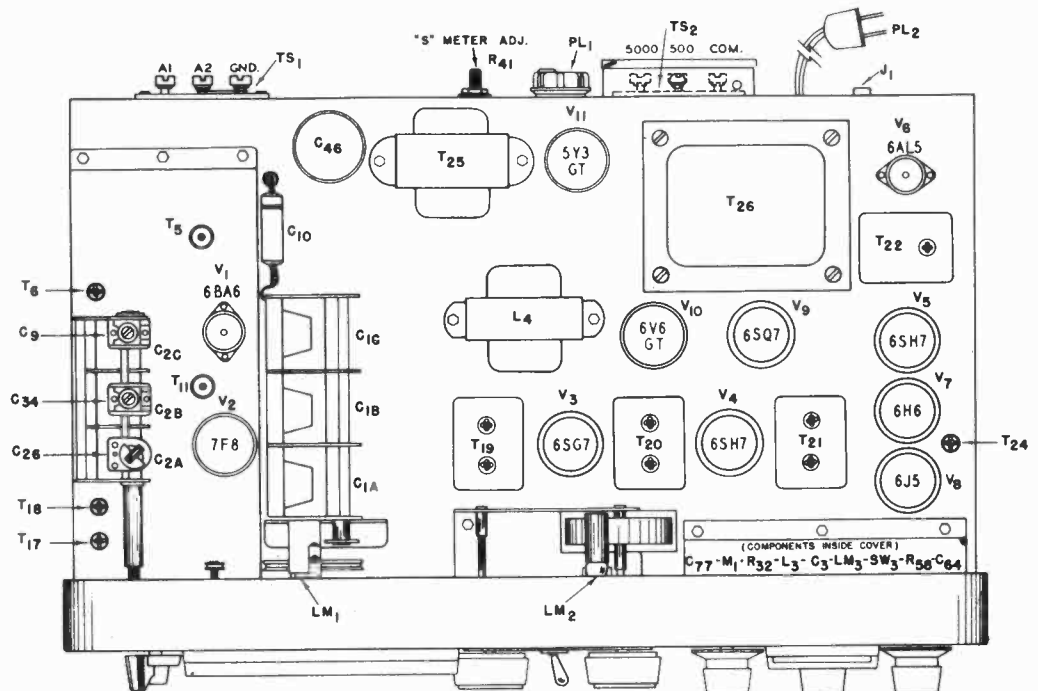
- BAND SELECTOR - As required by markings.  
 RECEPTION - As required by markings.  
 SELECTIVITY - As required by markings.  
 SENSITIVITY - Zero at full counter clockwise rotation.  
 VOLUME - Zero at full counter clockwise rotation.  
 CW PITCH - See alignment chart.  
 CRYSTAL PHASING - Zero with plates half meshed.



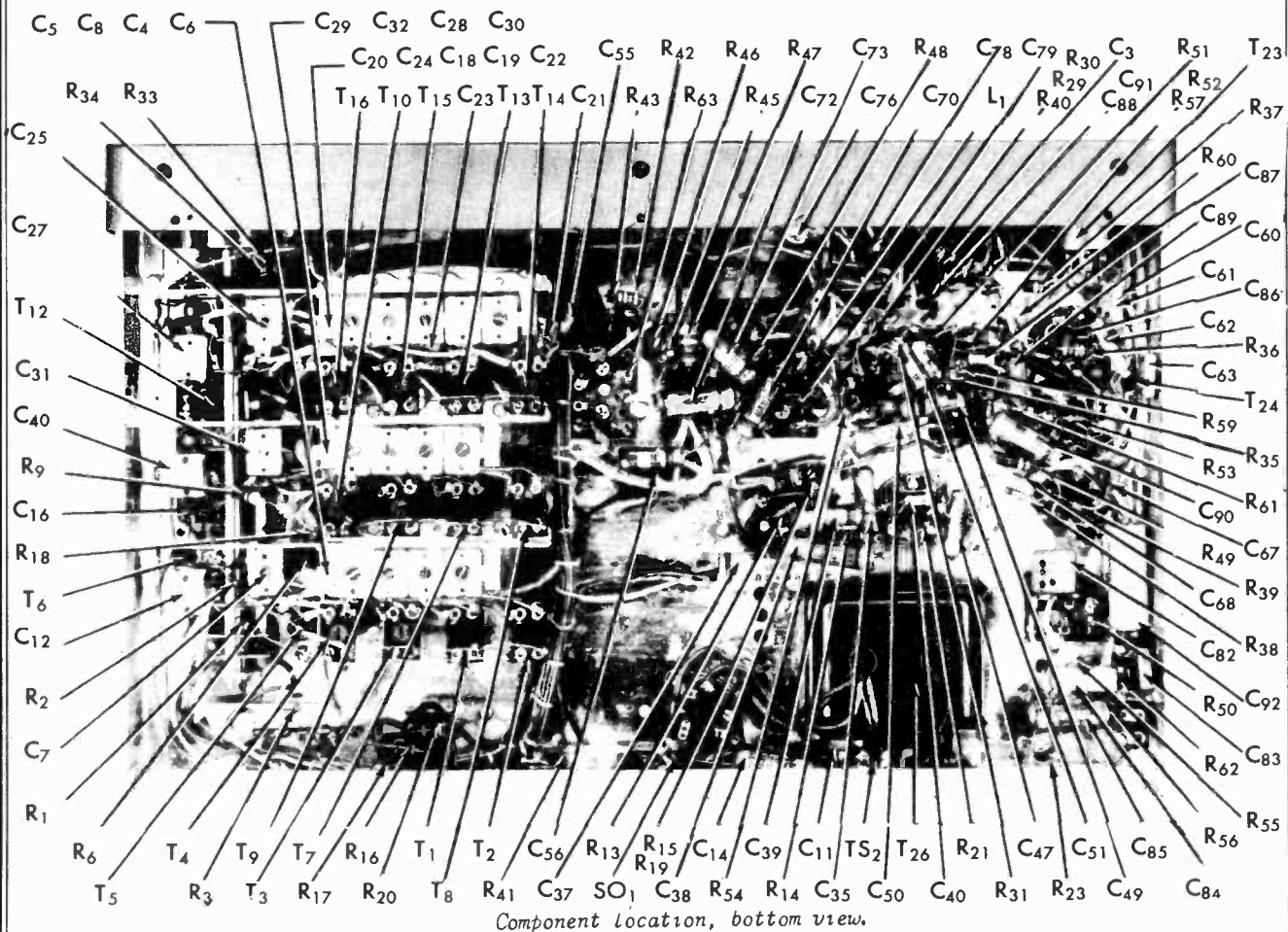
BAND-SWITCH SHOWN  
AT 6<sup>TH</sup> POSITION  
F-M BAND  
86-109 MC

TO VOL.  
CONTROL  
AUDIO AMP.





Component location, top view.



Component location, bottom view.

**ALIGNMENT PROCEDURE:**

It will be necessary to remove the receiver chassis from the cabinet to make alignment adjustments on the i-f stages. The r-f stages receive final alignment through the holes in the bottom of the cabinet to compensate for the close proximity of the cabinet to the r-f coils. The chassis is held in the cabinet by seven screws along the edge of the flange of the front panel and by three screws through the bottom of the cabinet along the rear edge.

The standard RMA dummy antenna mentioned in the alignment chart consists of a 200 mmf condenser in

series with a 20 uh r-f choke which is shunted by a 400 mmf condenser in series with a 400 ohm carbon resistor.

The following control settings are to be set before alignment:

- TONE Switch - HIGH
- STANDBY-REACTIVE - RECEIVE
- NOISE LIMITER - OFF
- VOLUME - Max. gain
- SENSITIVITY - Max. sensitivity
- Band Spread Dial - High frequency stop

**ALIGNMENT CHART**

Step	Dummy Antenna Coupling	Signal Generator Frequency	Receiver Control Settings	Receiver Dial Setting	Adjust	Remarks
1	None	Connect to center section (rear stator plates) of low capacity gang.	10.7 mc (No modulation)	BAND SEL.-5 REC. sw.-PM	General coverage dial at mid-scale	S1, S2, S3, S4, S5, S6, S7 Adjust for max. D.C. voltage as measured between pin #7 of the 6AL5 and ground with a V.T. voltmeter.
2	None	See step 1.	10.7 mc (No modulation)	See Step 1	See step 1.	S8 Adjust for zero D.C. voltage as measured between junction of R-50 and C-83 and ground with a V.T. voltmeter.
3	None	See step 1.	455 kc **	BAND SEL.-4 REC. sw.-AM-MVC SEL. sw.-NORMAL-SHARP	See step 1.	S9, S10, S12, S13, S14 Adjust for max. audio output.
4	None	See step 1.	455 kc **	BAND SEL.-4 REC. sw.-AM-MVC SEL. sw.-CRYSTAL-BROAD	See step 1.	S11 Adjust for max. audio output.
5	None	See step 1.	455 kc **	BAND SEL.-4 REC. sw.-AM-MVC SEL. sw.-NORMAL-SHARP	See step 1.	A Adjust for max. audio output.
6	None	See step 1.	455 kc ** (No modulation)	BAND SEL.-4 REC. sw.-CW SEL. sw.-NORMAL-SHARP	See step 1.	CW PITCH control. Remove CW PITCH control knob and set shaft for zero beat. Replace knob with zero at index line.
7	Repeat steps 1 & 2 for possible detuning during adjustments in steps 3, 4, and 5.					
8	None	See step 1.	10.7 mc	BAND SEL.-5 REC. sw.-AM-MVC SEL. sw.-NORMAL-SHARP	See step 1.	S15* Tune slug S15 to high freq. side of 10.7 mc (11.155 mc). Tune for max. audio output.
9	Std. RMA dummy	To terminals A1 and A2 with jumper between A2 and GND.	1500 kc 600 kc	BAND SEL.-1 REC. sw.-AM-MVC SEL. sw.-NORMAL-SHARP	1500 kc 600 kc	B*, C, D E* Adjust for max. audio output.
10	Std. RMA dummy	See step 9.	4.5 mc 2 mc	BAND SEL.-2 REC. sw.-AM-MVC SEL. sw.-NORMAL-SHARP	4.5 mc 2 mc	F*, G, H S16* Adjust for max. audio output.
11	330-ohm carbon res.	See step 9.	14 mc *** 6 mc ***	BAND SEL.-3 REC. sw.-AM-MVC SEL. sw.-NORMAL-SHARP	14 mc 6 mc	I*, J, K S17*, S18, S19 Adjust for max. audio output.
12	330-ohm carbon res.	See step 9.	14 mc	BAND SEL.-3A REC. sw.-AM-MVC SEL. sw.-NORMAL-SHARP	M.T. dial at 20M. band line. B.S. dial at 14 mc	L* Adjust for calibration. Check band spread calibration and reset trimmer L if necessary. Increase trimmer cap. to decrease bandspread etc.

\* Note - Calibration adjustment.

\*\* Note - Set generator frequency to exact crystal freq. as follows: Turn on BFO and set CW PITCH for approx. 1000 cycles with signal generator set at approx. 455 kc. Set SELECTIVITY control at CRYSTAL-SHARP and tune signal generator for weakest of two response frequencies on either side of zero beat; adjust CRYSTAL PHASING control for complete null, retune signal generator for maximum output on opposite side of zero beat for the exact IF alignment frequency.

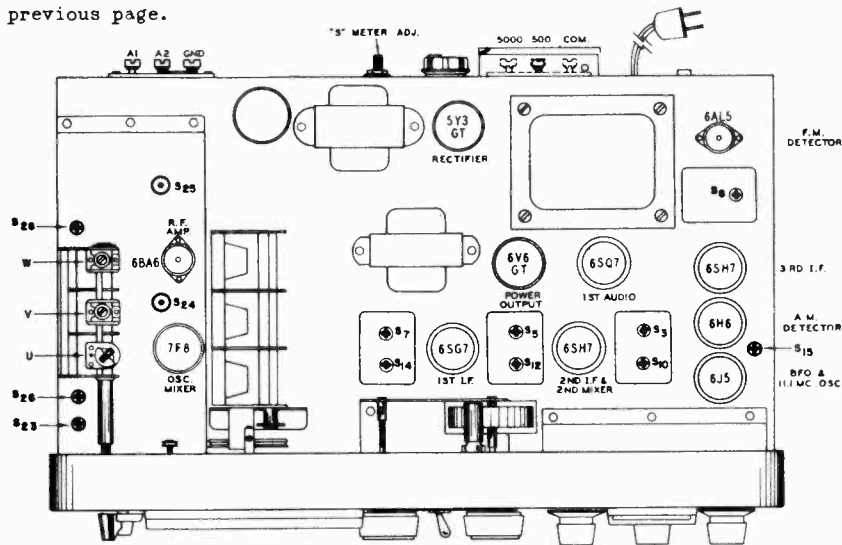
\*\*\* Note - Rock signal generator when making adjustments.

£ Note - Step 8. adjusts the 11.155 mc oscillator for the dual conversion char required for AM reception on band b. After aligning band b in step 15, tune to approx. 44.6 mc and pick up fourth harmonic of the oscillator. If the oscillator harmonic falls at approx. 51.3 mcs, the oscillator is oscillating at the low frequency side or image frequency and must be readjusted.

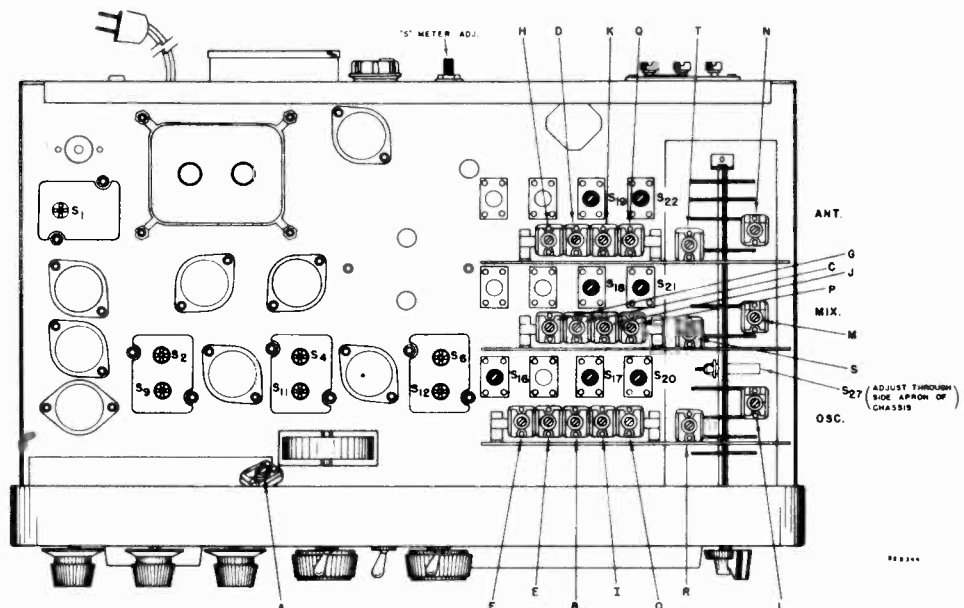
ALIGNMENT CHART —Continued

Step	Dummy Antenna	Signal Generator Coupling	Signal Generator Frequency	Receiver Control Settings	Receiver Dial Setting	Adjust	Remarks
13	330-ohm carbon res.	See step 9.	14.2 mc ***	BAND SEL.—3A REC. sw.—AM-MVC SEL. sw.—NORMAL—SHARP	M.T. dial at 20 M. band index line. B.S. dial at 14.2 mc.	M, N	Adjust for max. audio output.
14	330-ohm carbon res.	See step 9	36 mc ***	BAND SEL.—4 REC. sw.—AM-MVC SEL. sw.—NORMAL—SHARP	36 mc	O*, P, Q	Adjust for max. audio output. Osc. falls on low freq. side of signal.
			18 mc ***		18 mc		
15	330-ohm carbon res.	See step 9	54 mc ***	BAND SEL.—5 REC. sw.—AM-MVC SEL. sw.—NORMAL—SHARP	54 mc	R*, S, T	Adjust for max. audio output
			46 mc ***		46 mc		
16	330-ohm carbon res.	See step 9	106 mc ***	BAND SEL.—6 REC. sw.—AM-MVC SEL. sw.—NORMAL—SHARP	106 mc	U*, V, W,	See step 1.
			89 mc ***		89 mc		

For footnotes - see previous page.



Alignment adjustments, top view.



Alignment adjustments, bottom view.

MODEL SX-43

**SERVICE PARTS LIST**

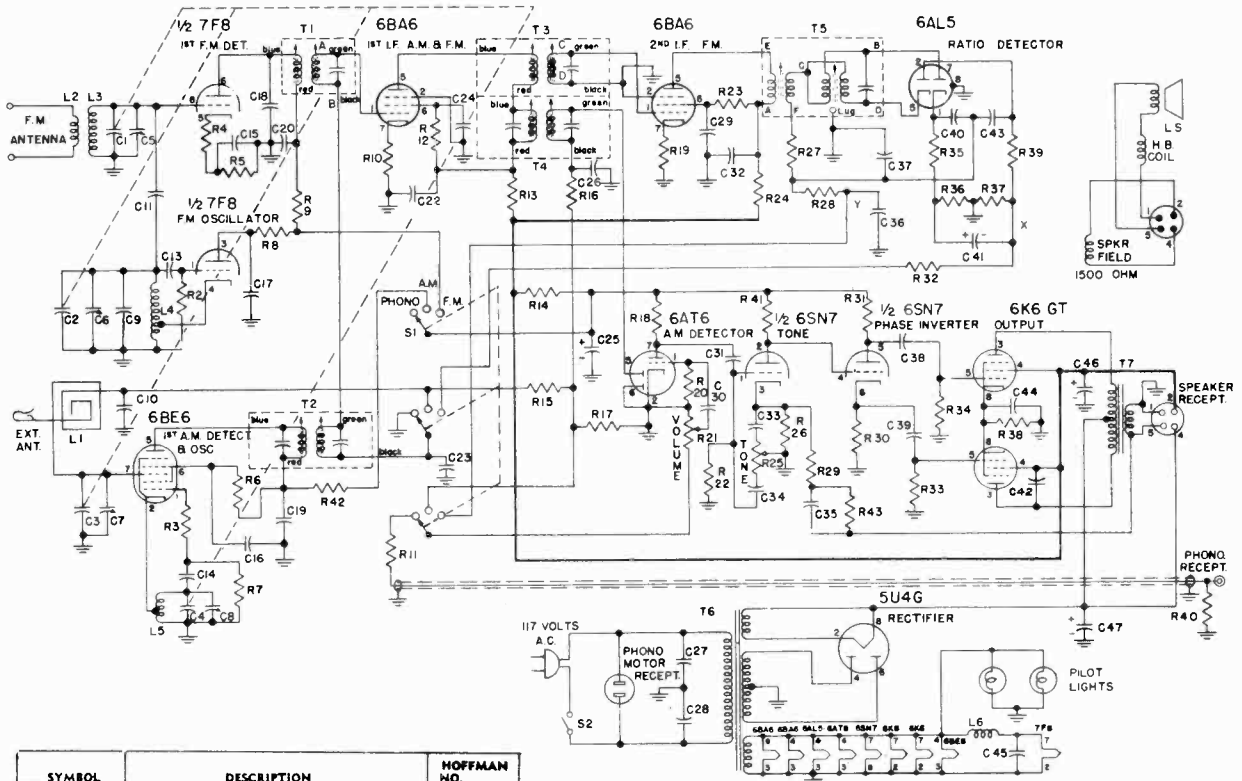
REF. NO.	DESCRIPTION	HALLICRAFTER'S PART NUMBER
<b>CAPACITORS</b>		
C-1	Capacitor, general coverage	48C174
C-2	Capacitor, band spread	48C173
C-3,39,48,89	.02 mfd 400 v., tubular paper	46AW203J
C-4,5,6,28,29,30,32	Capacitor, trimmer strip assy.	44B199
C-7,25,31	Capacitor, trimmer, 4-50 mmf	44A200
C-9,12,27,34,96	Capacitor, trimmer, 2-30 mmf	44A047
C-10	.05 mfd 200 v., tubular paper	46AC91
C-11	.01 mfd 400 v., molded paper	46AB103J
C-13,44,62	.01 mfd 350 v., ceramic	47A167
C-14	.1 mfd 200 v., tubular paper	46AU104J
C-15,16,52	1500 mmf 350 v., ceramic	47A161
C-17,33	25 mmf 500 v., ceramic	47A141
C-18,19,20,22,24	Capacitor, trimmer strip assy.	44B197
C-21	1500 mmf 500 v., mica	CM30A152J
C-23	3900 mmf 500 v., mica	CM35A392J
C-26	Capacitor, trimmer, 4-20 mmf	44A115
C-35,93	.005 mfd 600 v., tubular paper	46AY502J
C-36	.02 mfd 600 v., tubular paper	46AY203J
C-37	10 mfd 25 v., electrolytic	42A033
C-38	.05 mfd 600 v., tubular paper	46AY503J
C-40,45,61,87,88	100 mmf 500 v., ceramic	CC25UK101K
C-41	Capacitor, T.C.	44A158
C-42	220 mmf 500 v., mica	CM20B221K
C-43	51 mmf 500 v., ceramic	CC20UK510K
C-46	60-20-20 mfd 450 v., electrolytic	45B113
C-47,95	.005 mfd 400 v., tubular paper	46AW502J
C-49,51,55,56,64,70,73	.01 mfd 400 v., tubular paper	46AW103J
C-50,72,84,85,90	.05 mfd 200 v., tubular paper	46AU503J
C-53,79	22 mmf 500 v., mica	CM20A220K
C-60	470 mmf 500 v., mica	CM20A471J
C-63	270 mmf 500 v., mica	CM20A271J
C-67,91	.005 mfd 450 v., ceramic	47A168
C-68	220 mmf 500 v., mica	CM20A221K
C-76	Capacitor, trimmer, 2-30 mmf	44A047
C-77	Capacitor, variable, CRYSTAL PHASING	48A182
C-78,94	15 mmf 500 v., ceramic	CC20UK150K
C-80	820 mmf 500 v., mica	CM25AB21K
C-82,83	1000 mmf 500 v., mica	CM20A102K
C-86	2.2 mfd 500 v., ceramic	47A160-4
C-92	.25 mfd 400 v., tubular paper	46AV254J
<b>RESISTORS</b>		
R-1,10	47 ohms 1/2 watt, carbon	RC20AE470K
R-2	27 ohms 1/2 watt, carbon	RC20AE270K
R-3,38,54,59,61	1 meg-ohm 1/2 watt, carbon	RC20AE105K
R-4,9	6 ohms 1/2 watt, carbon	23A011
R-5	68 ohms 1/2 watt, carbon	RC20AE680K
R-6,47	15,000 ohms 2 watts, carbon	RC40AE153K
R-7,46	27,000 ohms 1 watt, carbon	RC30AE273K
R-8,18	33 ohms 1/2 watt, carbon	RC20AE330K
R-11,16	1000 ohms 1 watt, carbon	RC30AE102K
R-12	470 ohms 1 watt, carbon	RC30AE471K
R-13,23	470,000 ohms 1/2 watt, carbon	RC20AE474K
R-14,31	33,000 ohms 1 watt, carbon	RC30AE333K
R-15	270 ohms 1 watt, carbon	RC30AE271K
R-17,26,34	1000 ohms 1/2 watt, carbon	RC20AE102K
R-19,39	200,000 ohms 1/2 watt, carbon	RC20AE224K
R-20	4700 ohms 1 watt, carbon	RC30AE472K
R-21	15 megohms 1/2 watt, carbon	RC20AE156K
R-22	Resistor, variable, VOLUME control	25B601
R-24	15 ohms 1/2 watt, carbon	RC20AE150K
R-25	22,000 ohms 1/2 watt, carbon	RC20AE223K
R-27	10,000 ohms 1 watt, carbon	RC30AE103K
R-28,52	2.2 megohms 1/2 watt, carbon	RC20AE225K
R-29,58,62	150 ohms 1/2 watt, carbon	RC20AE151K
R-30	680 ohms 1/2 watt, carbon	RC20AE681K
R-32	Resistor, variable, SENSITIVITY control	25B577
R-33	2200 ohms 1/2 watt, carbon	RC20AE222K
R-35,48	3300 ohms 1/2 watt, carbon	RC20AE332K
R-36	47,000 ohms 1/2 watt, carbon	RC20AE473K
R-37	15,000 ohms 1 watt, carbon	RC30AE153K
R-40,45	82 ohms 1/2 watt, carbon	RC20AE820K
R-41	Resistor, variable, "S" meter control	25A569
R-42	22,000 ohms 1/2 watt, carbon	RC20AE223K
R-43	47,000 ohms 1 watt, carbon	RC30AE473K
R-49	100,000 ohms 1 watt, carbon	RC30AE104K
R-50,51,55,56	100,000 ohms 1/2 watt, carbon	RC20AE104K
R-53	6.8 megohms 1/2 watt, carbon	RC20AE685M
R-57	82,000 ohms 1/2 watt, carbon	RC20AE823K
R-60	250,000 ohms 1/2 watt, carbon	23BX254E
R-63	10 ohms 1/2 watt, carbon	RC20AE100K

**SERVICE PARTS LIST (Continued)**

REF NO	DESCRIPTION	HALLICRAFTER'S PART NUMBER
<b>COILS AND TRANSFORMERS</b>		
L-1	R-F choke, special	53A108
L-2	R-F choke, special	53B009
L-3	R-F choke, 540 uh	53A107
L-4	Filter choke, 11 h. 75 ma.	56B067
T-1	Transformer, antenna, band 1	51B92B
T-2	Transformer, antenna, band 2	51B927
T-3	Transformer, antenna, band 3	51B926
T-4	Transformer, antenna, band 4	51B925
T-5	Transformer, antenna, band 5	51B924
T-6	Transformer, antenna, band 6	51B923
T-7	Transformer, mixer, band 1	51B934
T-8	Transformer, mixer, band 2	51B933
T-9	Transformer, mixer, band 3	51B932
T-10	Transformer, mixer, band 4	51B931
T-11	Transformer, mixer, band 5	51B930
T-12	Transformer, mixer, band 6	51B929
T-13	Transformer, oscillator, band 1	51B939
T-14	Transformer, oscillator, band 2	51B938
T-15	Transformer, oscillator, band 3	51B937
T-16	Transformer, oscillator, band 4	51B936
T-17	Transformer, oscillator, band 5	51B935
T-18	Transformer, oscillator, band 6	51B941
T-19	Transformer, 1st I-F	50C212
T-20	Transformer, 2nd I-F	50C213
T-21	Transformer, 3rd I-F	50C214
T-22	Transformer, F-M detector	50C208
T-23	Transformer, B.F.O.	54B033-1
T-24	Transformer, oscillator, 11 mc.	51B984
T-25	Transformer, output	55B095
T-26	Transformer, power, 105-125V. 60 cycles	52C143
T-26*	Transformer, power 115/130/150/220/250 v. 25/60 cycles	52C142
* Note — Used on special universal model only.		
<b>TUBES AND LAMPS</b>		
V-1	Tube, type 6BA6	90X6BA6
V-2	Tube, type 7F8	90X7F8
V-3	Tube, type 6SG7	90X6SG7
V-4,5	Tube, type 6SH7	90X6SH7
V-6	Tube, type 6AL5	90X6AL5
V-7	Tube, type 6H6	90X6H6
V-8	Tube, type 6J5	90X6J5
V-9	Tube, type 6SQ7	90X6SQ7
V-10	Tube, type 6V6GT	90X6V6GT
V-11	Tube, type 5Y3GT/G	90X5Y3GT
LM-1,2	Lamp, dial illumination, 6-8 V. 250 ma. G.E. #44	39A003
LM-3	Lamp, meter illumination, 6-8 V. 150 ma. G.F. #47	39A004
<b>SWITCHES</b>		
SW-1	Switch assembly, BAND SELECTOR	60C261
SW-2	Switch assembly, SELECTIVITY	60B263
SW-3	Switch assembly, RECEPT40N	60B262
SW-4,5,6	Switch, toggle, SPST	60A138
SW-7	Switch, power, part of R-22	
<b>PLUGS AND SOCKETS</b>		
PL-1	Plug, octal, jumpers for a-c operation	35A003
PL-2	Plug and cord assy, a-c power	87A078
J-1	Jack, phono input	36A029
J-2	Jack, headphones	36A036
	Socket, octal, tube	6A035
	Socket, miniature, tube	6A193
	Socket, loctal, tube	6A223
	Socket, pilot lamp, dial	86B050
	Socket, pilot lamp, meter	6A262
<b>MISCELLANEOUS COMPONENTS</b>		
M-1	Meter, carrier level	82B125
	Knob, TUNING and BANDSPREAD	15A048
	Knob, CW PITCH	15A089
	Knob, BAND SELECTOR	15B088-1
	Knob, RECEPTION	15A094
	Knob, SELECTIVITY	15A095
	Knob, VOLUME and SENSITIVITY	15A097
	Knob, CRYSTAL PHASING	15A087
	Crystal, 455KC	19A123
X-1	Terminal strip, antenna or speaker	88A567
TS-1, TS-2	Screw, knurled (For TS-1 or TS-2)	3A1371
	Cover, speaker terminals	69B173

HOFFMAN RADIO CORP.

MODELS B-508, B-509,  
B-510, CHASSIS 129



SYMBOL	DESCRIPTION	HOFFMAN NO.
C1, C2, C3, C4	4 Section Variable	4409
C5, C6	Trimmer (F.M. Section)	4308
C7, C8	Trimmer (A.M. Section)	4313
C9, C18	8 Mmf. -10% Ceramic NPO	4019
C10, C23	.05 Mfd. 200 V. Paper	4100
C11	1.5 Mmf. -20% Ceramic	4908
C12	220 Mmf. -20% Ceramic M750	4636
C13	22 Mmf. -10% Ceramic N150	4021
C14, C26	100 Mmf. -10% Ceramic	4012
C15, C17, C45	650 Mmf. +20% Ceramic	4011
C16, C19, C21, C22, C24, C29, C30, C31	.01 Mfd. 400 V. Paper	4112
C20, C32	2300 Mmf. -5% Mica	4006
C25	10 Mfd. 450 V. Electrolytic	4203
C27, C28	.01 Mfd. 600 V. Paper	4103
C33	.02 Mfd. 400 V. Paper	4106
C34	.005 Mfd. 600 V. Paper	4102
C35	1 Mfd. 200 V. Paper	4111
C36, C42	.002 Mfd. 600 V. Paper	4118
C37, C40, C43	270 Mmf. -20% Mica	4001
C38, C39	.05 Mfd. 400 V. Paper	4101
C41	5 Mfd. 50 V. Electrolytic	4209
C44	20 Mfd. 25 V. Electrolytic	4200
C46, C47	20 Mfd. 450 V. Electrolytic	
R1, R33, R34	47 Meg. -20% 1/2 Watt	4506
R2, R7, R28	22000 Ohm -20% 1/2 Watt	4501
R3	22 Ohm -20% 1/2 Watt	4560
R4	68 Ohm -20% 1/2 Watt	4524
R5	1200 Ohm -10% 1/2 Watt	4553
R6	15000 Ohm -20% 1 Watt	4539
R8, R9, R13, R24	1500 Ohm -20% 1/2 Watt	4534
R10, R19	56 Ohm -10% 1/2 Watt	4551
R11, R15, R20	2.2 Meg. -20% 1/2 Watt	4502
R12, R23	33000 Ohm -20% 1 Watt	4556
R14	2200 Ohm -20% 1 Watt	4540
R16, R17	.1 Meg. -20% 1/2 Watt	4511
R18, R40, R41	22 Meg. -20% 1/2 Watt	4500
R21	5 Meg. Pot. (Volume Control)	4804
R22	1.0 Meg. -20% 1/2 Watt	4513
R25	25 Meg. Pot. (Tone Control)	4805
R26	2200 Ohm -20% 1/2 Watt	4512
R27	120 Ohm -10% 1/2 Watt	4546
R29	4700 Ohm -20% 1/2 Watt	4543
R30, R31	47000 Ohm -10% 1/2 Watt	4559
R32	47000 Ohm -20% 1/2 Watt	4504
R35, R39	390 Ohm -10% 1/2 Watt	4549
R36, R37	6800 Ohm -10% 1/2 Watt	4557
R38	400 Ohm -20% 3 Watt	4517
L1	A.M. Loop Antenna	5279
L2	F.M. Antenna Primary Coil	5281
L3	F.M. Antenna Secondary Coil	5283
L4	F.M. Oscillator Coil	5280
L5	A.M. Oscillator Coil	5282
L6	Filament Choke	5266
T1	1st F.M. I.F. Transformer	5274
T2	1st A.M. I.F. Transformer	5276
T3	2nd F.M. I.F. Transformer	5275
T4	2nd A.M. I.F. Transformer	5277
T5	Discriminator Ratio Detector Coil	5278
T6	Power Transformer	5001
T7	Audio Output Transformer	5111
L5	10\"/>	

**SPECIFICATIONS**

**TUNING RANGES:**  
 Broadcast Band ..... 535 Kc to 1650 Kc  
 FM Band ..... 88 Mc to 108 Mc

**INTERMEDIATE FREQUENCIES:**  
 Broadcast Band ..... 455 Kc  
 FM Band ..... 10.7 Mc

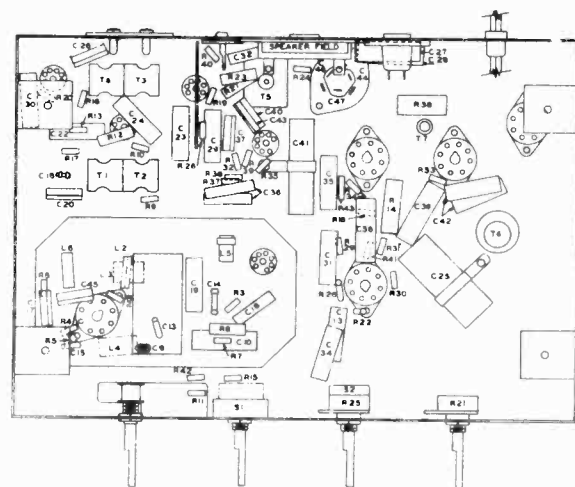
Power Supply ..... 115 V.A.C. 50-50 C.P.S.  
 Power Consumption (incl. phono.) ..... 110 watts  
 Undistorted Audio Output ..... 10 watts

**NORMAL OPERATING VOLTAGES**

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

**NORMAL OPERATING CURRENTS**

5U4G Cathode Current ..... 95-100 Ma  
 6K6 Cathode Current (both tubes) ..... 55 Ma



Bottom of Chassis

HOFFMAN RADIO CORP.

MODELS B-508, B-509,  
B-510, CHASSIS 129

ALIGNMENT PROCEDURE

**CAUTION:** No alignment adjustments should be attempted without first thoroughly checking over all other possible causes of trouble such as defective tubes, resistors, and condensers. In order to align the receiver properly, remove the chassis from the cabinet and proceed as follows:

**NOTE:** IT IS PARTICULARLY IMPORTANT THAT AM ALIGNMENT BE DONE BEFORE FM ALIGNMENT. THIS IS TO AVOID POSSIBLE INTERACTION BETWEEN FM AND AM ADJUSTMENTS.

AM ALIGNMENT

I.F. ALIGNMENT:

1. Set tuning condenser on high frequency end of tuning range (minimum capacity).
2. Set band switch to AM position.
3. Turn receiver on and let it warm up for fifteen minutes or longer in order to minimize drift effects.
4. Connect output meter across speaker voice coil and set meter on lowest range, but not below 2.5 volt scale.
5. Connect output of signal generator to stator of C3 (see schematic diagram and chassis layout) through a .1 mfd. condenser, connect ground side of generator directly to chassis of receiver. Set signal generator on 455 Kc modulated.
6. Adjust I.F. slugs on T2 and T4 for maximum reading on the output meter. Keep the meter reading on the lower half of the scale.

(NOTE: The above mentioned slugs are located on the top and bottom of their respective I.F. cans. Keep the signal generator output low and the volume control on the receiver wide open during adjustment.)

R.F. ALIGNMENT:

After following the steps outlined above for I.F. alignment, proceed as follows:

1. Connect signal generator to ext. antenna connection of loop.
2. Set signal generator to 1650 Kc (modulated) and adjust oscillator trimmer (C8) to signal frequency. (Tuning gang should be at minimum capacity setting for this adjustment.)
3. Set signal generator to 1400 Kc (modulated). Tune signal in by rotating condenser gang until signal is heard. Adjust trimmer C7 for maximum reading on output meter. Keep signal generator output low so that meter reading is on lower half of scale.
4. Set signal generator to 600 Kc (modulated). Tune signal in until signal is heard. Bend antenna condenser plates (C1) for maximum output on 600 Kc as required.

FM ALIGNMENT

I.F. ALIGNMENT:

1. Set band switch in the FM position.
2. Set tuning condenser to high frequency end of tuning range (minimum capacity).
3. Solder a 5,000 ohm 1/2w. carbon resistor between terminals A and B of T1. Solder another 5,000 ohm 1/2w. carbon resistor between terminals D and C of transformer T3. DO NOT USE WIRE WOUND RESISTORS
4. Connect the negative side of a 20,000 ohm/volt D.C. voltmeter or vacuum tube voltmeter to point "X" on diagram. Connect the positive side of meter to ground.
5. Connect output of signal generator directly to FM antenna input. Adjust signal generator to 10.7 Mc.
6. Adjust the tuning slugs on transformers T1 and T3 for maximum output. (Note: There are two slugs on each I.F. transformer, one on the top of the can and one on the bottom of the can under the chassis. It is desirable to make this adjustment with an insulated alignment screw

7. Adjust the iron slug on the top only of T5 for maximum reading on the meter as outlined in step 6 above.
8. Remove meter lead from point "X" and connect to point "Y". Set meter to most sensitive D.C. voltage range.
9. Adjust the iron slug on the bottom only of T5 for a zero reading on the meter. It will be noted that as this slug is adjusted the meter will go from a positive indication to a negative indication. Proper adjustment is obtained when the meter is at the zero point between negative and positive swings of the meter.

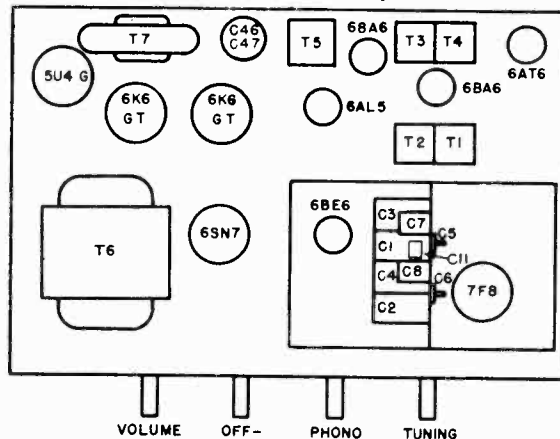
(CAUTION: This adjustment must be made with an insulated alignment screw driver.)

**NOTE:** The above adjustments must be made in sequence and the operator should take particular care that the frequency setting on the signal generator is not touched during alignment. BE SURE THAT THE TWO 5,000 OHM RESISTORS ARE REMOVED FROM THE CIRCUIT AFTER I.F. ALIGNMENT IS COMPLETED. The above adjustments should be made on the basis of meter readings only and no attention should be paid to what is heard coming out of the speaker.

R.F. ALIGNMENT:

1. Set tuning condenser to 107 Mc on the dial.
2. Set band switch to FM position.
3. Connect DC voltmeter to point "X" as outlined above in step 4.
4. Connect output of signal generator to antenna terminals on receiver through 150-ohm resistors. One resistor should be connected in series with the "hot" side of the signal generator and the other resistor should be connected in series with the ground side of the generator. Set signal generator on 107 Mc.
5. Adjust oscillator trimmer C6 for maximum indication on meter, then adjust R.F. trimmer C5.
6. Set signal generator to 90 Mc.
7. Tune set by rotating gang condenser until meter reads maximum. Bend condenser gang plates to bring signal in and to match dial calibration.

**CAUTION:** The above adjustments should be made on the basis of meter readings only and no attention should be paid to what is heard coming out of the speaker.



Top of Chassis

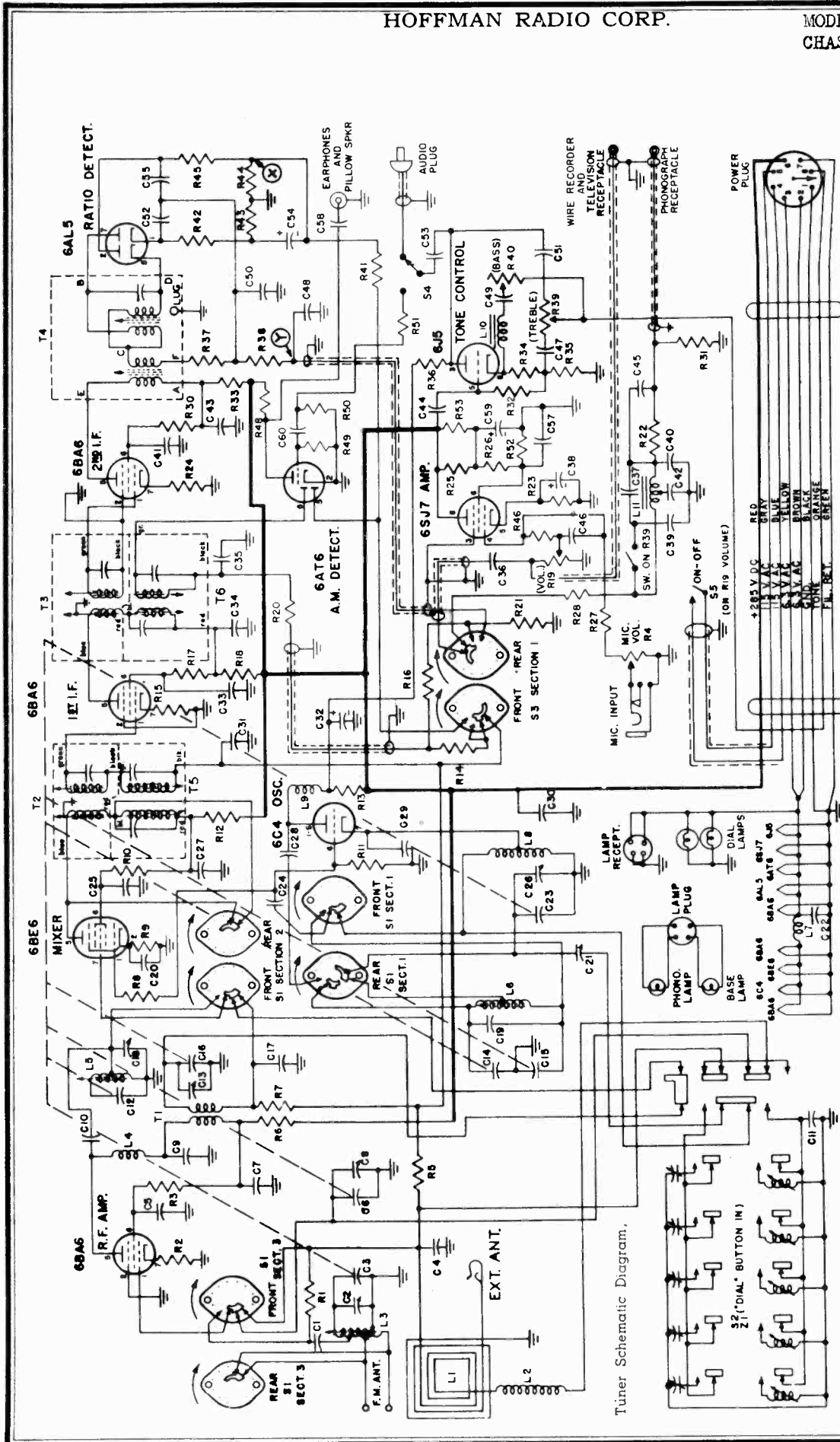
SOCKET VOLTAGES

Pin No.	1	2	3	4	5	6	7	8
7F8 (FM Det.—Osc.)	—3.0★	0	210	0	3.5	220	6.3 AC	0
6BE6 (AM Det.—Osc.)	—10.5★	0	0	6.3 AC	200	100	—1.5★	—
6BA6 (1st I.F.)	—24★	0	0	6.5 AC	235	115	1.0	—
6BA6 (2nd I.F.)	0	0	0	6.5 AC	230	110	1.1	—
6AT6 (AM Det.)	0	0	0	6.3 AC	—66★	0	65	—
6AL5 (Ratio Det.)	.25★	—26★	0	6.3 AC	—05★	0	—05★	—
6SN7 (Tone & P.I.)	0	45	7.2	—39★	170	50	6.3 AC	0
6K6 (Output)	0	6.3 AC	340	260	0	0	0	21
6K6 (Output)	0	6.3 AC	340	260	0	0	0	21

D.C. voltages measured with 20,000 ohm/volt meter.

A.C. voltages measured with 1,000 ohm/volt meter.

★ Must be measured with V.T.V.M. with 100,000 ohm ±10% carbon resistor in series with probe. All measurements made with gang closed and no signal input to receiver.



**POWER SUPPLY CHASSIS:**

Phase Inverter	615
Audio Output (4 tubes)	6K6GT/G
Rectifier	504G
Power Supply	115 V.A.C. 50-60 C.P.S.
Power Consumption (incl. phono.)	175 Watts
C1006	235 Watts
C1007	18 Watts
Undistorted Audio Output	18 Watts

**SPECIFICATIONS**

<b>TUNING RANGES:</b>	535 Kc to 1650 Kc
Broadcast Band	88 Mc to 108 Mc
FM Band	
<b>INTERMEDIATE FREQUENCIES:</b>	455 Kc
Broadcast Band	107 Mc
FM Band	
<b>NORMAL OPERATING CURRENTS</b>	
504G Cathode Current	190 Ma
6V6 Cathode Current (both tubes)	110 Ma

MODELS C1006, C1007,  
CHASSIS 131, 132

HOFFMAN RADIO CORP.

### ALIGNMENT PROCEDURE

#### CAUTION:

No alignment adjustments should be attempted without first thoroughly checking over all other possible causes of trouble such as defective tubes, resistors, and condensers. In order to align the receiver properly, remove the chassis from the cabinet and proceed as follows:

#### NOTE

IT IS PARTICULARLY IMPORTANT THAT AM ALIGNMENT BE DONE BEFORE FM ALIGNMENT. THIS IS TO AVOID POSSIBLE INTERACTION BETWEEN FM AND AM ADJUSTMENTS.

#### AM ALIGNMENT

##### I.F. ALIGNMENT:

1. Set tuning condenser on high frequency end of tuning range (minimum capacity).
2. Set band switch to AM position.
3. 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.
0. Repeat steps 6 through 9 inclusive twice for proper alignment.

CAUTION: The above adjustments should be made on the basis of meter readings only and no attention should be paid to what is heard coming out of the speaker.

#### PUSHBUTTON ADJUSTMENTS

The frequency ranges for the pushbuttons are given in figure 2. A layout of the pushbutton adjustments is shown in Figure 3. Note that in this figure, pushbutton number 1 is now to the extreme right, since the pushbutton assembly is being viewed from the rear. To make pushbutton adjustments, proceed as follows:

1. Turn the receiver on and let it warm up for fifteen minutes or longer in order to minimize drift effects.
2. Depress the DIAL pushbutton and tune in the station which is to be set on pushbutton number 1.
3. Now depress pushbutton number 1 and adjust tuning slug 1a and trimmer 1b (Figure 3) until the station is accurately tuned in again.

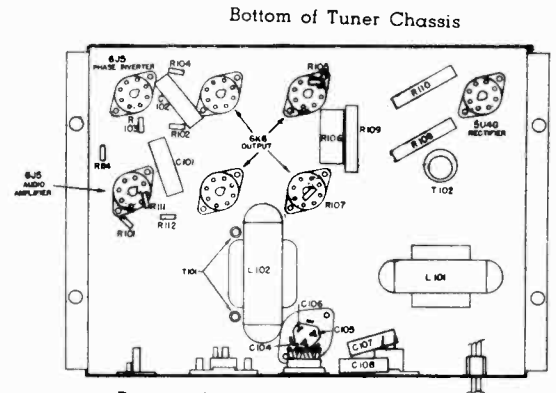
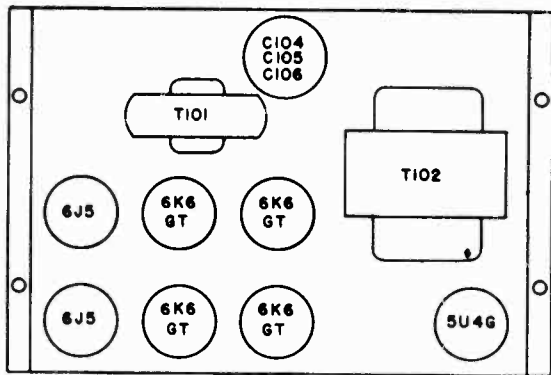
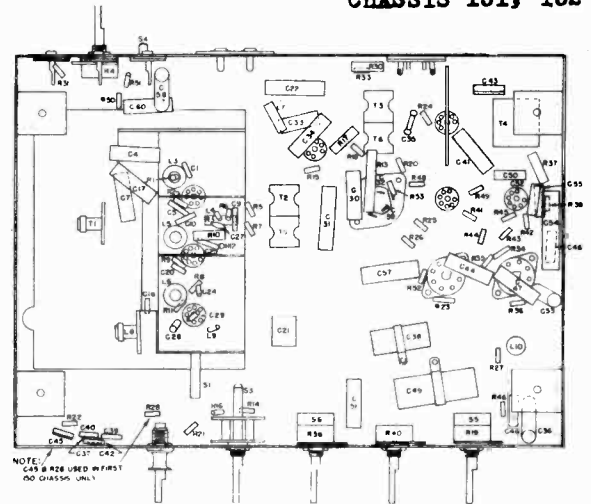
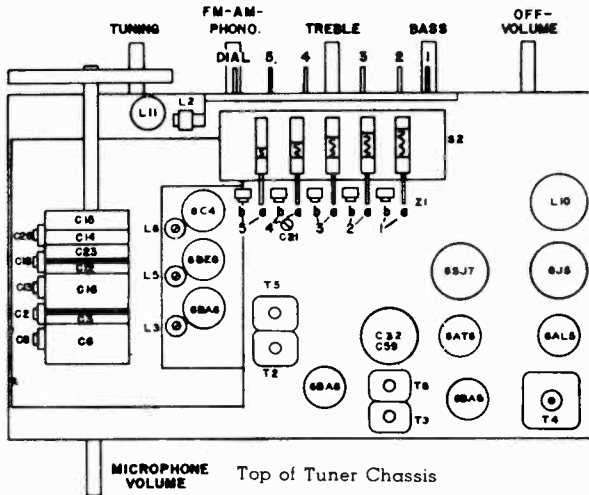
#### MODEL 8502

4. Repeat the above procedure for the remaining pushbuttons.

NOTE: When making oscillator coil pushbutton adjustments, it is desirable that this adjustment be made from the high-frequency end (slug all the way out). The proper oscillator coil slug setting will then be reached before there is any possibility of tuning the oscillator to the low frequency side of the carrier.

HOFFMAN RADIO CORP.

MODELS C1006, C1007,  
CHASSIS 131, 132



Top of Power Supply Chassis

Bottom of Power Supply Chassis

**NORMAL OPERATING VOLTAGES**

The following tables list the normal operating voltages to be expected at the various tube socket terminals.

**TUNER CHASSIS**

Pin No.	1	2	3	4	5	6	7	8
6BA6 (R.F.)	-6*	0	6.3 AC	0	290	195	.5	—
6BE6 (Conv.)	-11.5*	5	6.3 AC	0	290	70	-5.7*	—
6C4 (Osc.)	240	0	6.3 AC	0	240	-11.5*	0	—
6BA6 (1st I.F.)	-7*	0	6.3 AC	0	270	190	.6	—
6BA6 (2nd I.F.)	0	0	6.3 AC	0	250	100	1.0	—
6AL5 (Ratio Det.)	.25*	-25*	6.3 AC	0	-.1*	0	-.1*	—
6AT6 (AM Det.)	-4	0	6.3 AC	0	-1.5*	-12.5*	150	—
6SJ7 (A.F. Amp.)	0	0	0	0	3.5	65	6.3 AC	100
6J5 (Tone Control)	0	6.3 AC	200	245	43*	90	0	95

**POWER SUPPLY CHASSIS**

Pin No.	1	2	3	4	5	6	7	8
6J5	0	0	75	0	0	75	6.3 AC	3
6J5	0	6.3 AC	210	—	50	—	0	85
6K6	0	0	300	300	0	—	6.3 AC	0
5U4G	—	335	—	410	—	410	—	335
		5.0 AC ★						5.0 AC ★

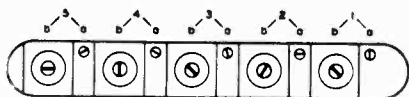
D.C. voltages measured with 20,000 ohm/volt meter.

A.C. voltages measured with 1000 ohm/volt meter.

\* Measured with V.T.V.M. (subject to wide variations because of tubes and V.T.V.M. used).

All voltages measured with reference to chassis except as follows:

★ Measured between pin numbers 2 and 8 on 5U4 socket.  
NOTE: Above readings are obtained with no signal input to receiver and band switch in phono position.



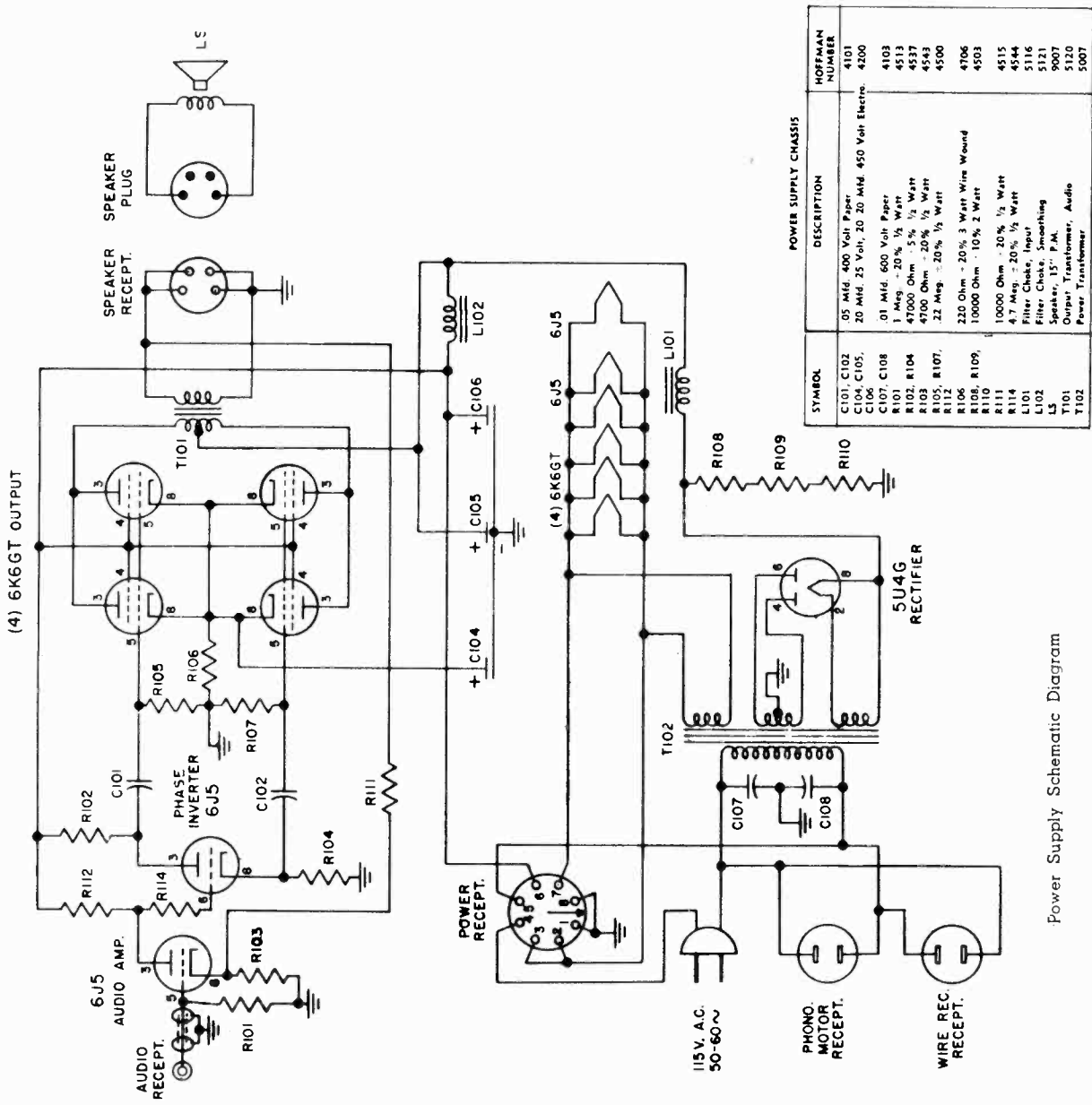
-Pushbutton Adjustments



Push-button Frequencies



SYMBOL	DESCRIPTION	HOFFMAN NUMBER
C1, C9, C10, C18, C35	100 Mmf. ± 10%	4012
C2, C18, C35	1.5-15 Mmf. Trimmer	4316
C3, C6, C12, C14, C15, C16, C23	3 Sect. Variable	4408
C4, C17, C22, C31, C36, C45, C46, C47, C48, C49, C51	.05 Mfd. 200 V.	4100
C7, C30, C34	470 Mmf. ± 20 %	4003
C8, C13, C16	.01 Mfd. 400 V.	4112
C11	1.8-30 Mmf. Trimmer	4313
C19	50 Mmf. ± 5 %	4004
C20	220 Mmf. ± 20 %	4023
C21	110-560 Mmf. Trimmer	4301
C27, C43	22 Mmf. ± 10%	4021
C28, C29	2000 Mmf. Min. ± 10%	4029
C32, C59	20, 450, 20, 450 Electrolytic	4200
C33, C41	.001 Mfd. 600 V.	4106
C38	.02 Mfd. 25 V.	4104
C50, C52, C53	330 Mmf. ± 10%	4205
C60	.005 Mfd. 600 V.	4010
C47, C48	.002 Mfd. 600 V.	4102
C54	2 Mfd. 200 V.	4118
C39, C40	5 Mfd. 50 V.	4209
C37, C42	270 Mmf. ± 20 %	4001
C58	100 Mmf. ± 20 %	4000
R1, R2, R9, R15, R16, R17, R20, R50	.05 Mfd. 400 V.	4101
R3	27 Meg. ± 20 %	4545
R4	56 Ohm ± 10 %	4561
R5, R7, R16, R20, R50	33000 Ohm ± 20 %	4556
R6, R12, R18	1 Meg. ± 20 %	4511
R33	1500 Ohm ± 20 %	4534
R8, R36	22 Ohm ± 20 %	4560
R13, R36	22,000 Ohm ± 20 %	4501
R14, R52	47000 Ohm ± 20 %	4502
R22, R26, R32	2.2 Meg. ± 20 %	4513
R4	5 Meg. Pot. (Micro. Volume)	4804
R21, R35, R38, R48, R53	47000 Ohm ± 20 %	4504
R49	10 Meg. ± 20 %	4505
R23, R34	2200 Ohm ± 20 %	4512
R25, R27, R28	22 Meg. ± 20 %	4500
R46	120 Ohm ± 10%	4546
R37, R39	25 Meg. Pot. with Switch (Treb. Volume)	4402
R40	50000 Ohm Pot. ± 20 %	4405
R31, R41, R51	47 Mfd. ± 20 %	4506
R42, R45	390 Ohm ± 10%	4509
R43, R44	6800 Ohm ± 10%	4537
C49	5 Mfd. 200 V.	4110
L1	Loop Antenna	55210
L2	Coil—Broadcast Antenna	5265
L3	Coil—F.M. Ant.	5253
L4, L9	Coil—R.F.	5254
L5	Coil—F.M. R.F.	5252
L6	Coil—F.M. Osc.	5251
L7	Coil—F.I. R.F.	5266
L8	Coil—F.C. Osc.	5263
L10	Choke—Bass	5113
L11	Choke—Scratch Filter	5114
S1	Band Switch (R.F.)	6004
S2	Band Switch (A.M.)	6005
S3	Band Switch	6015
S4	Speaker Switch	6007
T1	Transformer—R.F. Interstage	5264
T2	1st. F.M. I.F. Transformer	5274
T3	2nd F.M. I.F. Transformer	5275
T4	Transformer—Ratio Detect.	5278
T5	1st A.M. I.F. Transformer	5276
T6	2nd A.M. I.F. Transformer	5277
Z1	Pushbutton Tuning Assembly	55200

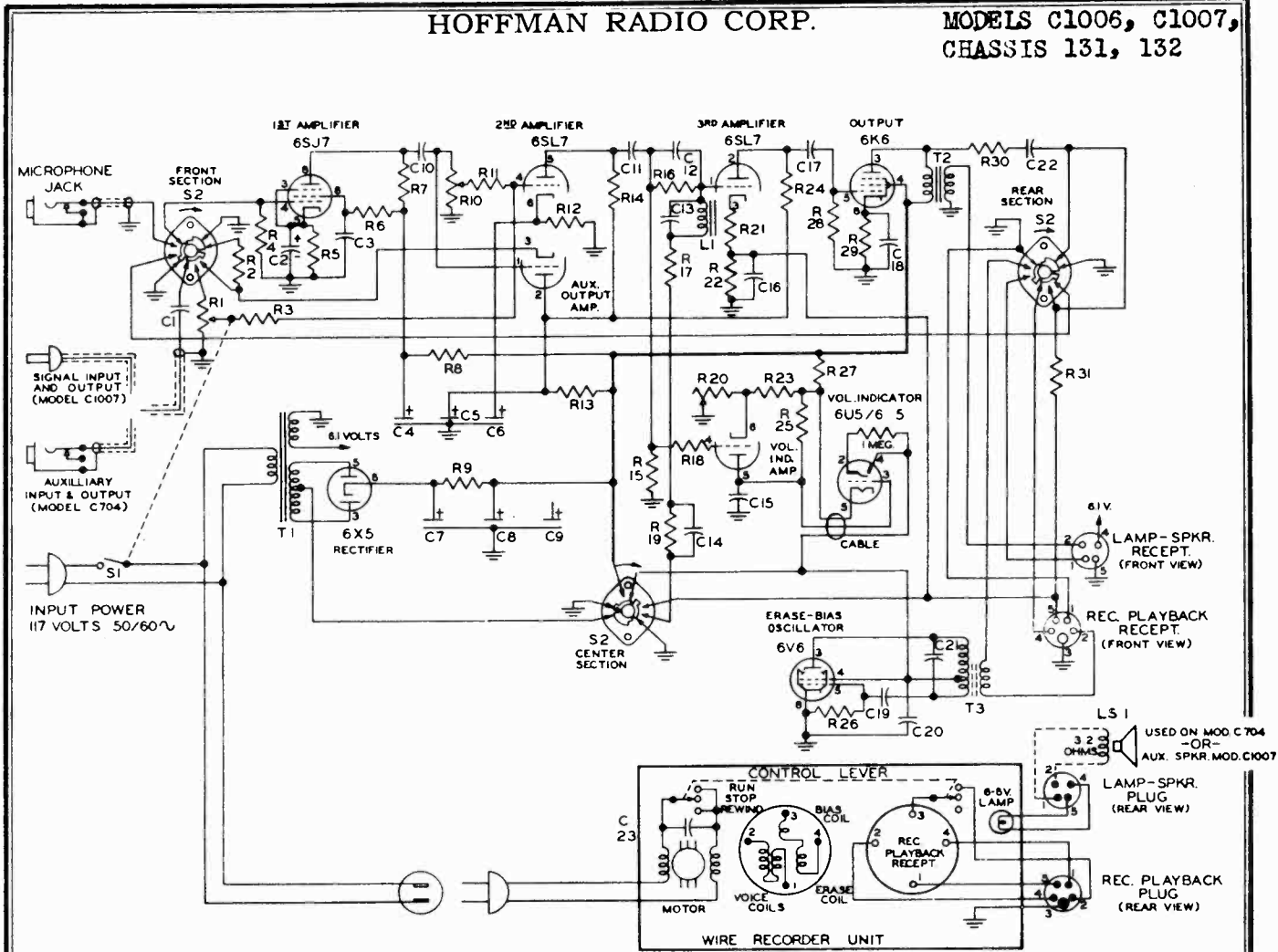


SYMBOL	DESCRIPTION	HOFFMAN NUMBER
C101, C102	05 Mfd. 400 Volt Paper	4101
C104, C105, C106	20 Mfd. 25 Volt, 20 Mfd. 450 Volt Electro	4200
C107, C108	01 Mfd. 600 Volt Paper	4103
R101	1 Meg. ± 20 % 1/2 Watt	4513
R102, R104	47000 Ohm ± 5 % 1/2 Watt	4537
R103	4700 Ohm ± 20 % 1/2 Watt	4543
R105, R107	22 Meg. ± 20 % 1/2 Watt	4500
R106	220 Ohm ± 20 % 3 Watt Wire Wound	4706
R108, R109	10000 Ohm ± 10 % 2 Watt	4503
R110	10000 Ohm ± 20 % 1/2 Watt	4515
R111	4.7 Meg. ± 20 % 1/2 Watt	4544
R114	Filter Choke, Input	5116
L101	Filter Choke, Smoothing	5121
L102	Speaker, 15" P.M.	9007
T101	Output Transformer, Audio	5120
T102	Power Transformer	5007

Power Supply Schematic Diagram

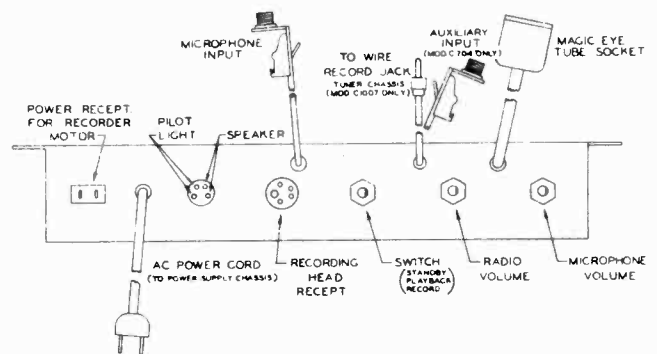
HOFFMAN RADIO CORP.

MODELS C1006, C1007,  
CHASSIS 131, 132



-Schematic Diagram

SYMBOL	DESCRIPTION	HOFFMAN NUMBER
C1	.05 Mfd. 200 V. Tub. Paper	4100
C2	.25 Mfd. 25 V. Electrolytic	4205
C3, C11, C20, C22, C23	.05 Mfd. 400 V. Tub. Paper	4101
C4, C5, C7, C8	.20 Mfd. 450 V. Electrolytic	4200
C6, C9	.20 Mfd. 25 V. Electrolytic	4200
C10, C14, C16, C17	.02 Mfd. 400 V. Tub. Paper	4106
C12	100 Mmf. ±20% Mica or Ceramic	4000
C13	330 Mmf. ±10% Mica or Ceramic	4010
C15	1 Mfd. 200 V. Tub. Paper	4111
C18	.01 Mfd. 400 V. Tub. Paper	4112
C19	.001 Mfd. 600 V. Tub. Paper	4104
C21	.01 Mfd. ±20% Mica	4020
R1	.25 Meg. (with switch) Potentiometer	4805
R2, R5, R12, R21	2200 Ohm ±20% ½ Watt	4512
R3, R4, R11	22 Meg. ±20% ½ Watt	4500
R6	2.2 Meg. ±20% ½ Watt	4502
R7, R16, R28, R31	.47 Meg. ±20% ½ Watt	4506
R8, R13, R17	47000 Ohm ±20% ½ Watt	4504
R9	1500 Ohm ±5% 6 ½ W.	4701
R10	5 Meg. Potentiometer	4804
R14, R19, R24, R26	1 Meg. ±20% ½ Watt	4511
R15, R25	1 Meg. ±20% ½ Watt	4513
R18	4.7 Meg. ±20% ½ Watt	4544
R20	1000 Ohm Wire Rheostat	4810
R22	4700 Ohm ±20% ½ Watt	4543
R23	15000 Ohm ±20% 1 Watt	4539
R27	1 Meg. ±20% 1 Watt	4558
R29	1000 Ohm ±20% 1 Watt	4522
R30	22000 Ohm ±20% ½ Watt	4501
L1	Peaking Coil	5240
LS1	Loudspeaker 4 x 6 P.M. 3.2 Ohm V.C.	9030
S1	On Off Switch (Part of R1)	
S2	Selector Switch (Shown in Stand-by Pos.)	66000
T1	Power Transformer	5000
T2	Output Transformer	5119
T3	Osc. Coil, Erase and Bias	5239



Front Apron of Chassis

MODELS C1006, C1007,  
CHASSIS 131, 132

HOFFMAN RADIO CORP.

WIRE RECORDER FOR MODELS C1006 and C1007

DESCRIPTION

The Hoffman WIRECORD consists of a wire recorder and associate amplifier. The amplifier is a special 6-tube (plus rectifier) AC-operated unit especially designed to work with the Webster wire recorder head.

TUBE COMPLEMENT

1st A.F. Amp	6SJ7
2nd A.F. Amp and Aux. output Amp.	6SL7
3rd A.F. Amp. and Volume Indicator Amp.	6SL7
Output Amp.	6K5
Volume Indicator	6U5/6E5
Erase-Bias Oscillator	6V6
Rectifier	6X5
Frequency Response	40 CPS to 9000 CPS

NORMAL OPERATING CURRENTS (6X5 Cathode)

Standby Position	0 Ma.
Play Back Position	30 Ma.
Record Position (Motor off)	50 Ma.
Record Position (Motor on)	54 Ma.

TEST PROCEDURE

No special test procedure is required to service the amplifier unit of the Hoffman Wirecord. If the amplifier fails to function properly, proceed as follows:

1. Check all tubes, preferably by replacing them one at a time with known good tubes.
2. Check all tube socket voltages and compare readings with the voltage table. Any appreciable discrepancy in voltage readings should be investigated by looking for shorted or leaky condensers, or defective resistors.
3. Whenever it is necessary to replace a resistor or a condenser in the amplifier, make certain that the replacement part has the proper resistance or capacitance value, otherwise the amplifier may fail to perform as it should.

VOLUME INDICATOR ADJUSTMENT

The recording level on the wire must be maintained within definite limits in order to obtain good performance from the wire recorder. If the recording level is too high, a permanent record that is difficult to erase will result. If the recording level is too low, the reproduction on playback will be noisy because of the low signal-to-noise ratio. To adjust the volume level indicator for correct indication of volume, proceed as follows:

1. Place switch in RECORD position.
2. Turn Radio volume and microphone volume controls to minimum volume (counterclockwise) position.
3. Rotate R20 (slot adjustment at rear of amplifier chassis) in a counterclockwise direction until the pattern on the indicator tube overlaps. If the indicator pattern cannot be made to overlap:
  - a. Replace indicator tube.
  - b. Replace 6SL7 tube used as 3rd Amp. and volume indicator amplifier.
  - c. Make necessary voltage checks according to voltage chart.
4. If indicator tube pattern overlaps satisfactorily, back off on the adjustment of R20 until the tube pattern is as wide open as it will go. Then move the R20 adjustment until the pattern JUST BEGINS TO CLOSE. This is the final and correct adjustment.

If the wire recorder is now operated so that volume peaks just close the pattern on the indicator tube, no trouble should be experienced in erasing the original material when using the wire for subsequent recordings.

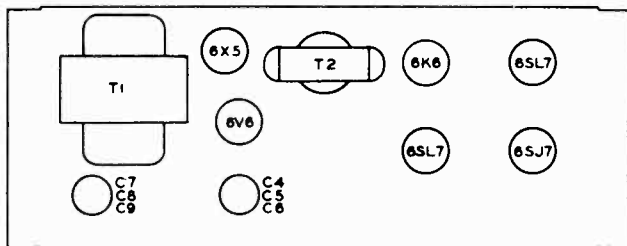
NORMAL OPERATING VOLTAGES

The following table lists the normal operating voltages to be expected at the various tube socket terminals. For tube socket terminal locations, refer to bottom view of chassis,

Pin No.	1	2	3	4	5	6	7	8
6SJ7 1st Ampl.	0	0	5	0	5	17	6.3 AC	65
6SL7 2nd Ampl.	0	200	3.6	0	125	1.0	6.3 AC	0
6SL7 3rd Ampl.	0	160	2.4	0	50	2.0	6.3 AC	0
6K6 Output	0	0	230	245	0	0	6.3 AC	0
6V6 Osc. #	0	0	250	250	-44	0	6.3 AC	0
6V6 Osc. ★	0	0	230	230	-37	—	—	0
6X5 Rectifier	0	6.3 AC ●	260	—	260	—	0	300
6U5 Indicator	0	75	29	245	50	6.3 AC	—	—

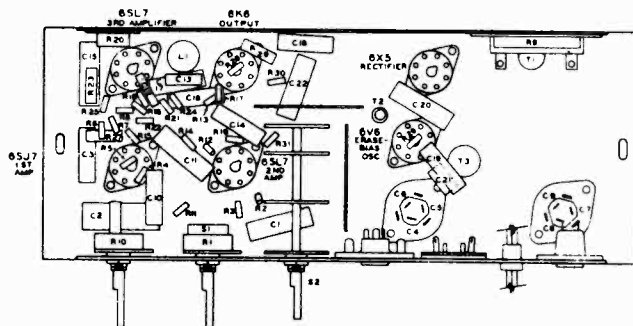
- Between Pins 2 and 8 on 6X5
- # Wire Recorder switch in "OFF" position
- ★ Wire Recorder switch in "RUN" position

All voltage readings are made with amplifier switch in record position.



SELECTOR SWITCH RADIO MICROPHONE VOLUME OFF-ON VOLUME

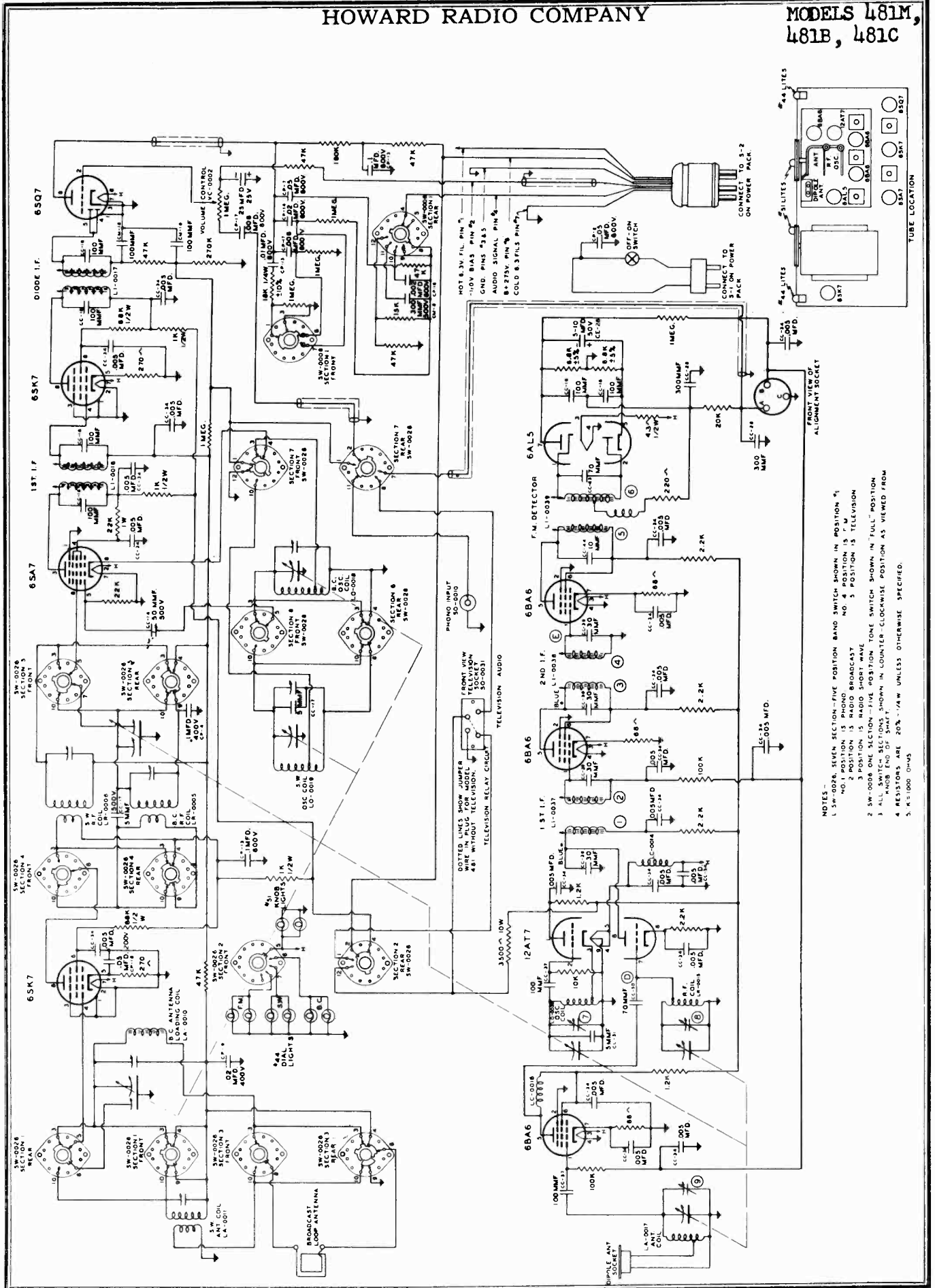
Top of Chassis



Bottom of Chassis

HOWARD RADIO COMPANY

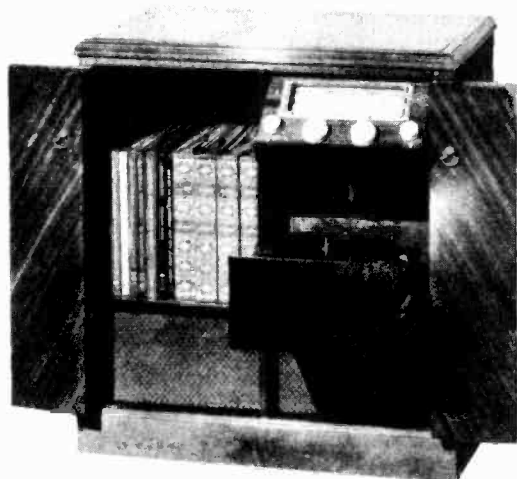
MODELS 481M, 481B, 481C





HOWARD RADIO COMPANY

MODELS 481M,  
481B, 481C

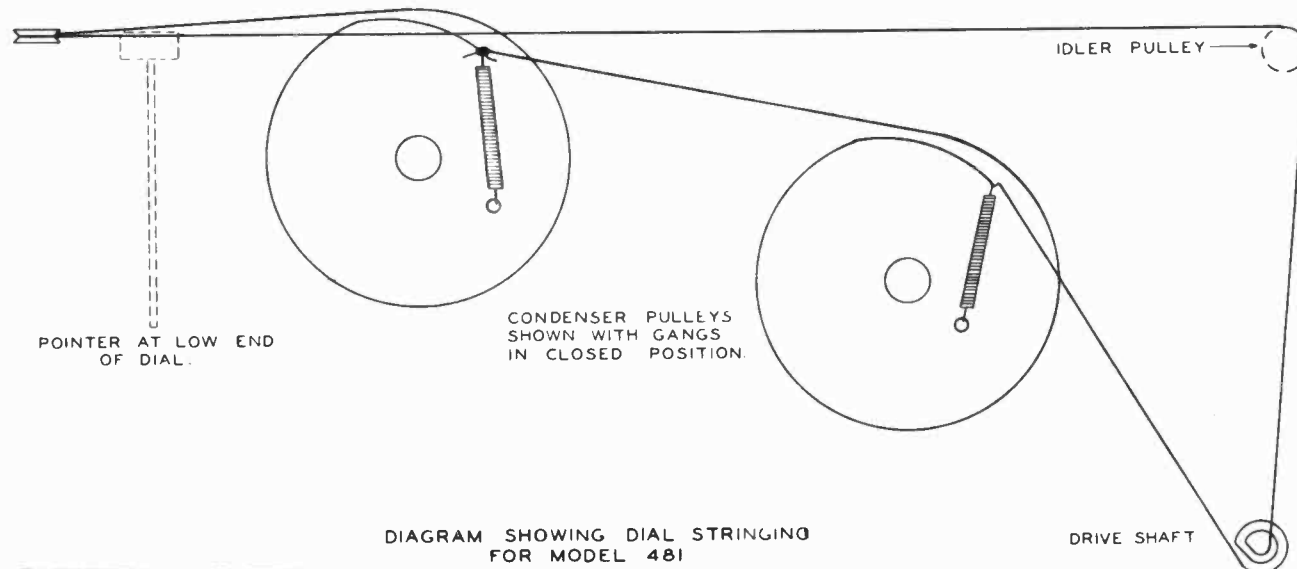


SERVICE DATA

FEATURES

Large, easy to read, unbreakable lucite dial with band in use only being illuminated. Coverage: Broadcast Band 540 to 1650 KC. Short Wave Band 9. to 12.5 MC. Personalized Tuning Gang - 6 sections. Individual sections for short wave with oscillator section double spaced. Frequency Modulated Band 88-108 MC. using its own Tuner, I.F., Ratio Detector, and special Tuning Gang double spaced. High Q Antenna Coils. Very large Loop. Separate Power Pack. Output 13 watts - 8.5 watts undistorted. Dual HOWARD built elliptical speakers. Webster Record Changer. Illuminated Selector Control. Five position illuminated Acousticolor Switch with pleasing treble and bass accentuation. Special Feature: Large storage space for records capable of holding the HOWARD Television Chassis 475-TV.

**ANTENNA REQUIREMENTS:** The HOWARD Model 481 Radio contains a very large loop aerial having exceptional pickup and in use upon the Broadcast Band. For the short wave band one end of this loop is disconnected and the loop then becomes the antenna. Also installed within the cabinet is a folded Dipole antenna for use upon the FM Band. Although the FM Band is the most sensitive built today, the successful operation of this Band depends on the signal strength of the transmitter and the efficiency of the antenna connected to the Band. In localities a number of miles from the sending station, it is advisable that a good antenna be used. It must be remembered that a great many things influence FM reception: elevations, high buildings or hills will intercept the waves and reduce signal strength. Each installation presents a different problem, however in most cases the built-in antenna will provide sufficient signal strength to operate the FM Band. If the folded Dipole within the cabinet does not have sufficient pick-up, we recommend the erection of a DIPOLE ANTENNA mounted as high as possible and away from all obstructions. Use a 300 ohm twin lead-in wire and place the horizontal arms of the antenna flat side to the transmitter.



MODELS 481M,  
481B, 481C

HOWARD RADIO COMPANY

AM ALIGNMENT CHART

Do the following before alignment:

- Remove condenser gang dust cover by taking out 4 P.K. sheet metal screws.
- With both gangs closed, put the dial pointer on the last vertical line at the low frequency end of the calibrated dial scale.
- Loop attached to chassis.
- Volume Control on full.
- Set pointer between broadcast stations at low frequency end of dial.
- Tone control set at clockwise position (normal).
- Band Switch at broadcast position.
- Adjust all trimmers for maximum sensitivity.

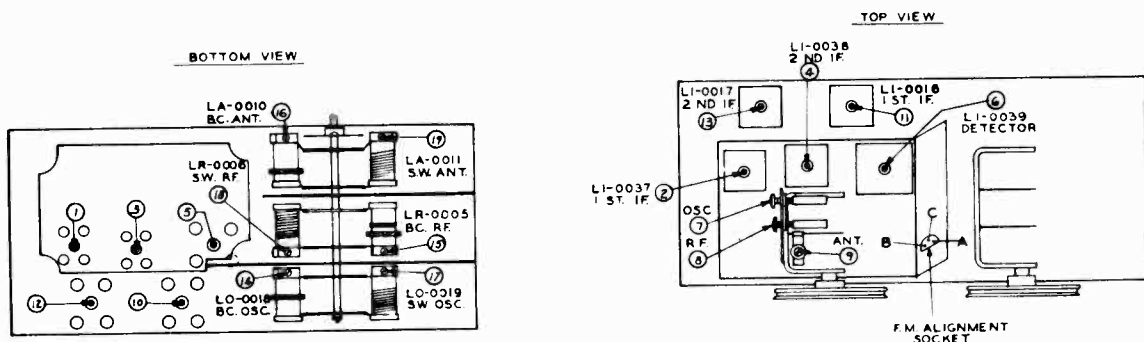
See Dummy Gen. Chart	Sig. Gen. Connection	Gen. Freq.	Band Switch Position	Dial Setting	Order of Slug and Trimmer Adjustments	Trimmer or Slug Function	See Notes Below
2	Grid of 6SA7	455 K.C.	BC	Low End of BC	⑩ ⑪ ⑫ ⑬	I.F.	J
1	Generator Inductively Coupled to Loop	11.9 M.C.	SW	11.9 M.C.	⑰ ⑱ ⑲	SW	K & L
Accurately set signal generator at one MC and check through short wave dial, harmonics to be one MC apart.							
1	Pin #4 6SK7	1400 K.C.	BC	1400 K.C.	⑭ ⑮	BC Osc. and R.F.	
1	Generator Inductively Coupled to Loop	1400 K.C.	BC	1400 K.C.	⑰	Loop	

NOTE J. The I.F. adjustments are iron core slug tuning and it should not be necessary to move them very far in either direction from the factory setting since they are of a very stable nature.

NOTE K & L. Inductively couple signal generator to loop by wrapping one or two turns of wire around outside wire of loop and fasten one end to the high side of the signal generator. Rock gang while adjusting trimmers ⑱ and ⑲. In adjusting trimmer ⑰, be sure the image of the I.F. is at approximately 11. MC.

CAUTION: Do not knife gang unless absolutely necessary, and then with extreme care. Replace gang dust cover before proceeding with FM alignment.

TRIMMER LOCATION CHARTS



## HOWARD RADIO COMPANY

MODELS 481M,  
481B, 481C

## FM ALIGNMENT CHART

Set controls at indicated positions before following chart:

FM Dipole attached to chassis.  
Volume control on full.  
Set pointer between FM stations at low frequency end of dial.  
Tone control in clockwise position.  
Band Switch in FM position.  
Adjust all trimmers for maximum sensitivity.

See Dummy Gen. Chart	Sig. Gen. Connection	Gen. Freq.	Band Switch Position	Dial Setting	Order of Slug and Trimmer Adjustments	Trimmer or Slug Function	See Notes Below
2	Point E on Circuit Diagram	10.7 MC	F.M.	Gang Closed	⑤	F.M. Det. Adj.	A & B
2	Point E on Circuit Diagram	10.7 MC	F.M.	Gang Closed	⑥ Adj. to zero voltage	F.M. Det.	C
2	Point D on Circuit Diagram	10.7 MC	F.M.	Gang Closed	①②③④	F.M.-I.F.	D
3	Ant. & Ground Socket on top F.M. Chassis	105 MC	F.M.	105	⑦⑧⑨	Osc. and R.F.-F.M.	E & F
3	Ant. & Ground Socket on top F.M. Chassis	90 MC	F.M.	90 MC		F.M.-R.F. Ind. Adj.	G H & I

- A. Signal generator modulation off and turned up to about 100,000 microvolts.
- B. Connect electronic voltmeter (equivalent to voltohmmist) at point "B" of FM alignment socket as shown on the wiring diagram and turn slug (5) on trimmer location chart to extreme counter-clockwise position. Turn clockwise to 1st peak and adjust to maximum. While making this adjustment, vary the output of the signal generator to a point which will give a reading of minus 2 volts.
- C. Turn slug (6) to extreme counter-clockwise position. Connect electronic voltmeter to Point A' of FM alignment socket and turn slug (6) until voltmeter is to zero voltage. Repeat adjustments given in Notes B & C until no further improvement can be made.
- D. Connect voltmeter to Point B and generator at Point D. Adjust (1) (2) (3) (4), then retrim (5). Move voltmeter to Point A and recheck zero voltage. (Retrim if necessary.) These adjustments should be made with input signal necessary to produce approximately .7 volts at Point B.
- E. Change generator dummy as shown on dummy antenna chart, Picture 3, and modulation on, and fasten generator to antenna socket on top of FM chassis.
- F. Turn the first Detector or R.F. Trimmer 8 well to the left - almost open - so you will not have a locking condition and be able to locate the signal at 105 MC when turning Trimmer 7.
- G. Should 90 M.C. signal not fall in at 90 M.C. on the dial, adjust F.M. oscillator coil to correct calibration. It is only necessary to press together or open the spacing on one turn of the coil to do so.
- H. After adjusting oscillator coil for the correct calibration at 90 M.C., check the detector and antenna coil for proper tracking with the oscillator. If they do not track it will be necessary to adjust the detector and antenna coils for perfect tracking.
- I. Repeat adjustments ⑦⑧⑨ until no further improvement can be made.



## HOWARD RADIO COMPANY

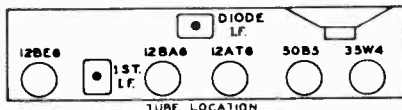
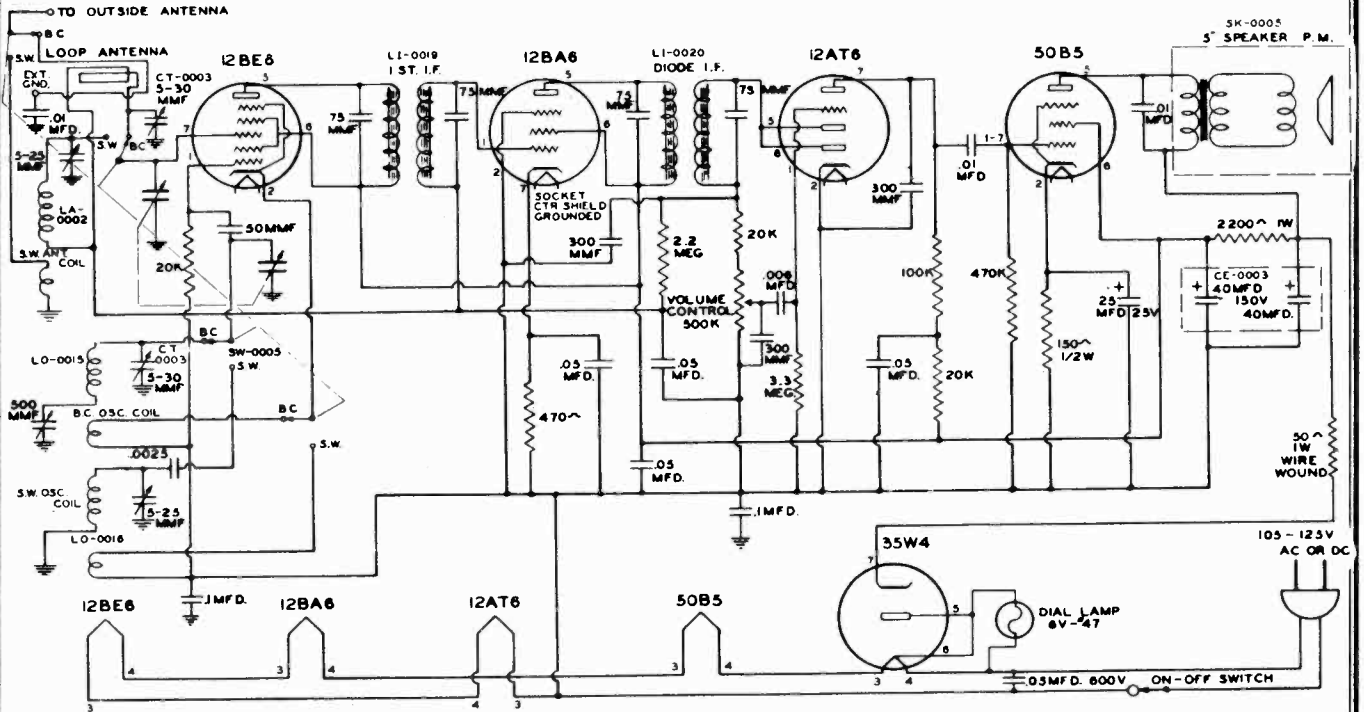
MODELS 481M,  
481B, 481C

## PARTS LIST

	<b>CONTROLS</b>		
VC-0002	Volume Control with Switch	SP-0010	12 oz. Load Spring Steel
	<b>CONDENSERS</b>	DG-0001	Dial Broadcast (Lower)
CV-0012	Variable - 3 Gang Tuning	DG-0002	Dial Shortwave (Upper)
CV-0018	Variable - F.M. Tuning	DG-0022	Dial F.M. (Center)
CE-0005	Capacitor - Electrolytic 25 MFD 25 V. D.C.	PR-0070-1	Escutcheon (Mahogany)
CE-0006	Capacitor - Electrolytic 3x20 MFD 450 V. D.C.	PR-0070-2	Escutcheon (Blond)
CE-0028	Capacitor - Electrolytic 5 to 10 MFD 50 V. D.C.	PL-0010	Antenna Cable Plug - 4 prong
CT-0005	Trimmer - Cap. 2.5-30MMFD	PL-0005	Phono Plug
CC-0005	Capacitor - Ceramic 30 MMFD 500 V. D.C.	PL-0018	Plug - 2 prong
CC-0014	Capacitor - Ceramic 50 MMFD 500 V. D.C.		<b>KNOBS</b>
CC-0050	Capacitor - Ceramic 68-72 MMFD 500 V. D.C.	KB-0007	Knob Acousticolor
CC-0016	Capacitor - Ceramic 100 MMFD 500 V. D.C.	KB-0024	Knob Selector Switch
CC-0020	Capacitor - Ceramic 10 MMFD 500 V. D.C.	KB-0015-3	Knob - Tuning and Volume
CC-0022	Capacitor - Ceramic 70 MMFD 500 V. D.C.	HW-0007	Door Pull
CC-0028	Capacitor - Ceramic 300 MMFD 500 V. D.C.		<b>TRANSFORMER</b>
CC-0034	Capacitor - Ceramic 5000 MMFD 500 V. D.C.	TP-0004	Power Transformer
CC-0049	Capacitor - Ceramic 15 MMFD 500 V. D.C.	LC-0009	Filter Choke (395 Ohms D.C.)
	<b>COILS</b>	TO-0009	Output Transformer (Dual Speaker)
AN-0014	F.M. Dipole Ant. Assy. 481 Cabinet		<b>TUBE COMPLEMENT</b>
AN-0017	F.M. Dipole Ant. Assy. 481 Chassis only	TU-5Z4	1 used
AN-0016	Ant. Loop Collapsible (chassis)	TU-6AL5	1 used
AN-0015	Back Board and Loop Ant. Assy. (cabinet)	TU-6BA6	3 used
LA-0010	Broadcast Ant. Coil Assy.	TU-6J5 GT	1 used
LA-0011	Shortwave Ant. Coil Assy.	TU-6SA7	1 used
LA-0017	Antenna Coil	TU-6SK7	2 used
LC-0014	Choke Coil - Filament	TU-6SQ7	2 used
LC-0016	F.M.-R.F. Choke Assy.	TU-6V6 GT	2 used
LI-0016	1st I.F. Assy.	TU-12AT7	1 used
LI-0017	2nd I.F. Assy.		<b>SOCKETS</b>
LI-0037	1st I.F. Assy. F.M.	SO-0007	Socket - Octal
LI-0038	2nd I.F. Assy. F.M.	SO-0008	Socket - Octal with shield
LI-0039	Discriminator Transformer Assy. F.M.	SO-0010	Socket - Phono
LO-0018	Broadcast Oscillator Coil Assy.	SO-0011	Socket - 7 prong wafer
LO-0019	Shortwave Oscillator Coil Assy.	SO-0012	Socket - Power Outlet
LO-0028	Oscillator Coil F.M.	SO-0018	Socket - Antenna
LR-0005	Broadcast R.F. Coil Assy.	SO-0019	Socket - Miniature - 7 Pin - Low Loss
LR-0006	Shortwave R.F. Coil Assy.	SO-0022	Socket - Miniature - 9 Pin
LR-0015	R.F. Coil F.M.	SO-0027	Socket - 2 Prong
	<b>SWITCHES</b>	SO-0029	Socket - Miniature - 7 Pin
SW-0006	Tone Switch - 5 position 1 section	SO-0030	Socket - Phasing - 3 Pin
SW-0026	Band Switch - 5 position 7 section	SO-0031	Socket - 4 Prong
	<b>DIAL AND CONTROL ACCESSORIES</b>	SO-0032	Socket - 2 Prong
AS-0220	Tuning Shaft Assy.		<b>LINE CORDS</b>
AS-0218	Pointer and Slide Assy.	CA-0039	Line Cord with Plastic Plug - 8 ft.
AS-0242	Dial Light Assy.	CA-0101	Line Cord with Plastic Plug - 3 ft.
DC-0001	Dial Cord, 58"		<b>CABINETS</b>
		CW-0013	Cabinet (state Mahogany or Blond)
		AA-0048	Drawer - Record Changer
		AA-0047	Drawer - Radio
			<b>RECORD CHANGER</b>
		PH-0009	Automatic Record Changer - Webster Model No. 148
			<b>SPEAKER</b>
		SK-0008	Speaker - 6 x 9 Elliptical (2 used)

HOWARD RADIO COMPANY

MODEL 902-A



BROADCAST BAND 535-1050KC  
SHORT WAVE BAND 6-17 MEGACYCLES  
I.F. 455KC

NOTE - ALL COND. ARE 400V. UNLESS OTHERWISE NOTED. ALL RESISTORS ARE 1/4W UNLESS OTHERWISE NOTED. BAND SWITCH, SW-0005, SHOWN IN BROADCAST POSITION

REPLACEMENT PARTS LIST

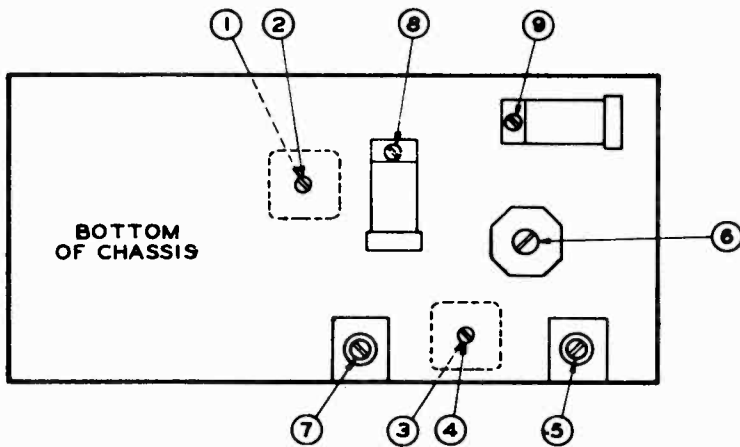
Part No.	DESCRIPTION	Part No.	DESCRIPTION
VC-0001	CONTROL Volume and on-off switch	KB-0003	KNOB Moulded - White
	CONDENSERS	KB-0005	Moulded - Brown
CV-0005	2 Gang Condenser. Variable Tuning	CA-0038	LINE CORDS Standard 110 Volt
CE-0003	40-40 MFD 150 Volts		SOCKETS
CE-0005	Filter, 25 MFD 25 volt (used with CE-0003)	SO-0013	Tube Socket - Min. 7 Pin
CT-0002	Condenser - Adjustable 500 M.M.F.D. Var. 100 M.M.F.D.	SO-0016	Tube Socket - Min. 7 Pin
CT-0003	Condenser - Adjustable 5-30 M.M.F.D.	SL-0004	Dial Lamp Socket - Bayonet Type
	COIL ASSEMBLIES		MISCELLANEOUS
LO-0015	B.C. Oscillator Coil	PR-0096	Miniature Tube Shield
LO-0016	S.W. Oscillator Coil	PR-0097	Miniature Tube Base Clip
LA-0002	S.W. Antenna Coil		SPEAKER
AN-0009	B.C. Antenna Coil	SK-0005	5" P.M. Speaker
LI-0019	1st I.F. Assembly	TO-0001	Speaker Output Transformer
LI-0020	2nd (Diode) I.F. Assembly		SWITCHES
	CABINETS	SW-0005	Band Switch
CB-0002	Cabinet - White Plastic Moulded		
CB-0004	Cabinet - Mottled Walnut		
CB-0006	Cabinet - Hammarloid		
	DIAL AND CONTROL PARTS		
DC-0001	Dial Drive Cord		
LS-0001	Dial Lamp - Bayonet Type #47		
WG-0001	Dial Window		
SP-0005	Tension Spring for Dial Drive Cord		
AR-0004	Calibrated Dial Plate		
HD-0001	Dial Indicator Hand		
SM-0074	Shaft Tuning		

VOLTAGE AND ALIGNMENT CHARTS

TUBE	FUNCTION	CATH.	SCR. GRID	PLATE	TUBE	FUNCTION	CATH.	SCR. GRID	PLATE
12BE6	Mixer	0	79	79	12AT6	Det.	0	--	56
12BA6	I.F. Det.	2	79	79	50B5	Output.	4.6	79	110

	DUMMY ANTENNA	SIG. GEN. CONNECTION	GEN. FREQ.	BAND POSITION	DIAL SETTING	ORDER OF TRIMMER ADJUSTMENTS	TRIMMER FUNCTION
1	.05 MFD.	Grid of 12BE6	445 KC	BC	Off Station	1 2 3 4	I.F. Peak to Max. Output
2	400 Ohm Resistor	Ant.	1400 KC	BC	1400 KC	5 7	BC Osc. and R.F.
3	400 Ohm Resistor	Ant.	600 KC	BC	600 KC	6	BC Osc., Pad.
4	400 Ohm Resistor	Ant.	16 MC	SW	16 MC	9, 8	SW Osc. and R.F.

TRIMMER LOCATIONS



12BE6 Mixer  
 12BA6 I.F.Amp.  
 12AT6 Diode 1st AF  
 50B5 Output  
 35W4 Rectifier

POWER SUPPLY -- (Standard Models) = 100-130 V. AC-DC CONSUMPTION 30 WATTS

SEE LABEL ON BACK OF CHASSIS

ANTENNA SYSTEM = Built-in loop on back of cabinet. Available connection for outside antenna from the back of the cabinet.

TUNING RANGE = 540-1600 KC and 6-18 MC.

I.F. - 455 KC TYPE = Iron Core Tuned POWER OUTPUT - (MAX.) 1.25W UPO .5 W.

TUNING SYSTEM = String Drive, Airplane Dial Full Vision.

SPEAKER = P.M. Size 5" V.C.IMP. (400CPS) = 3.2 Ohms

IMPORTANT: To operate this receiver with voltages higher than 130 volts A.C. or D.C., it is necessary to use a voltage reducer cord.



ALIGNMENT CHART

Set controls at indicated positions before following alignment chart.

Volume control on full  
Set dial between broadcast stations  
Radio phono control at radio

	DUMMY ANTENNA	SIG. GEN. CONNECTION	GEN. FREQ.	BAND POSITION	DIAL SETTING	ORDER OF TRIMMER ADJUSTMENTS	TRIMMER FUNCTION	SEE NOTE	
1	.05 Mfd.	Grid of 6SA7	455 KC	BC	Off Station	①②③④	I.F. Peak to Maximum		
2	.05 Mfd.	Ant.	455 KC	BC	Off Station	⑤	Null	A	
3	400 Ohm. Line	"A" Ant. Post	600 KC	BC	600 KC	⑦	Maximum	B	
4	400 Ohm. Line	"A" Ant. Post	1400 KC	BC	1400 KC	⑥⑧	BC Osc. and R.F.	C	
5	Repeat operations 3 and 4								D
6	400 Ohm. Line	"A" Ant. Post	6 MC	A	6 MC	⑨⑩	Maximum	E	
7	400 Ohm. Line	"A" Ant. Post	20 MC	B	20 MC	⑪⑫	Maximum	F	
8	Accurately set signal generator at one MC and check through both short wave dials, harmonics to be one MC apart.								

NOTE A Important. Connect the signal generator to the antenna screw on the outside of the radio chassis and keep the metal of the chassis between the generator lead and the wave trap coil. Use your signal generator to a turned up powerful position and adjust the wave trap trimmer to null.

NOTE B Padding condenser adjustment for calibration at low frequency end of broadcast band.

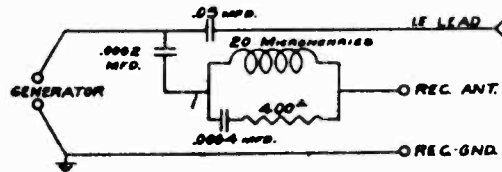
NOTE C Set dial at 1400 KC. Adjust oscillator and R.F. trimmer for maximum sensitivity.

NOTE D Check broadcast stations across dial for accuracy.

NOTE E True Signal at 6. Image at 5.

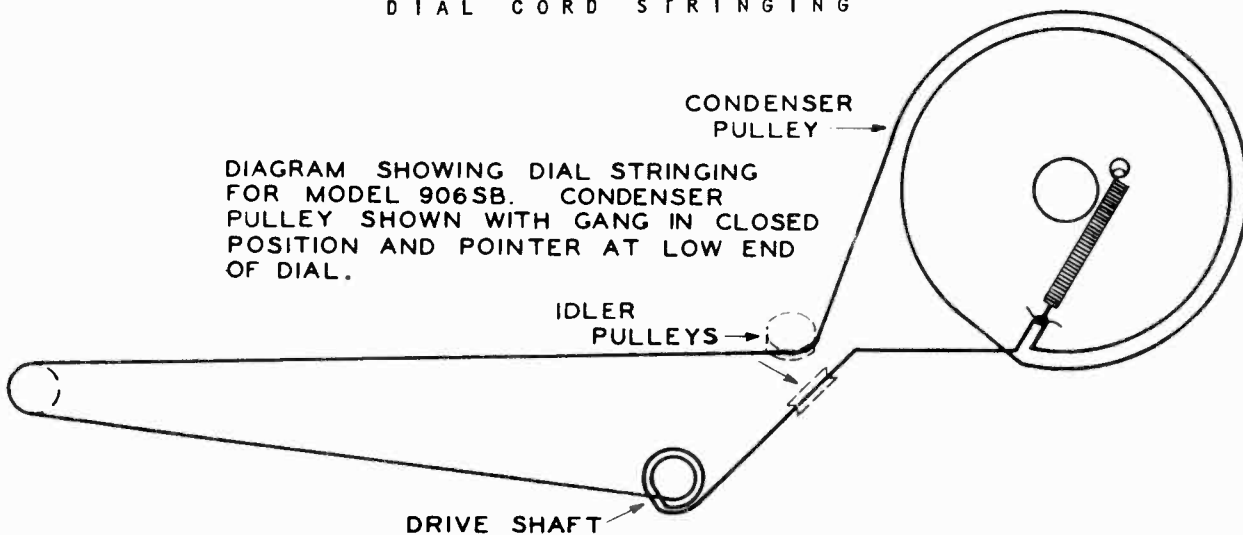
NOTE F True signal at 20. Image at 19.

RECOMMENDED DUMMY ANTENNA. Although the values as shown in above table for antenna load may be satisfactory, we urgently recommend the circuit as shown at the right to properly take care of the various frequencies to accomplish the correct alignment.



DIAL CORD STRINGING

DIAGRAM SHOWING DIAL STRINGING FOR MODEL 906SB. CONDENSER PULLEY SHOWN WITH GANG IN CLOSED POSITION AND POINTER AT LOW END OF DIAL.



HOWARD RADIO COMPANY

MODEL 906-SB

"SOCKET VOLTAGE READINGS"

Voltage reading taken from ground with voltage at line set at 6 volts D.C. These readings were taken with a vacuum tube voltmeter of the VoltOhmyst Junior type. Amperage drain 3. Amps.

TUBE	FUNCTION	CATH.	*	SC.	*	PLATE	*
6SQ7	R.F . . . . .	2.7	3	120	6	120	8
6SA7	Convertor . . .			-9.6 80	5 4	120	3
6SK7	1st. I.F. . .		5	80	6	120	8
6SQ7	Det. & 1st. Audio. . . . .					90	6
6K6	Output. . . . .	7.6	8	120	4	130	3

Voltage drop across filter choke 5 volts

\* Socket Terminal Number.

PARTS LIST

CONTROLS

- VC-0005 Volume Control with Switch  
or
- VC-0006 Volume Control with Switch

CONDENSERS

- AC-0005-1 Tuning Gang with Gears and Drive Hub
- CE-0007 Capacitor-Lytic 3 Section 50-20-30 MFD.
- CP-0005 Capacitor-Paper .006 MFD. 400 V.
- CP-0008 Capacitor-Paper .1 MFD. 400 V.
- CP-0010 Capacitor-Paper .05 MFD. 400 V.
- CP-0013 Capacitor-Paper .1 MFD. 600 V.
- CP-0015 Capacitor-Paper .01 MFD. 600 V.
- CP-0016 Capacitor-Paper .002 MFD. 600 V.
- CP-0022 Capacitor-Paper .25 MFD. 200 V.
- CM-0019 Capacitor-Mica .004 MFD. 500 V.  
+ or - 5%
- OT-0002 Oscillator Padding Condenser 500 MFD.

COILS

- LA-0016 Ant. Coil Broadcast Band
- LA-0008 Ant. Coil "A" Band
- LA-0009 Ant. Coil "B" Band
- LO-0022 Osc. Coil Broadcast Band
- LO-0021 Osc. Coil "A" Band
- LO-0020 Osc. Coil "B" Band
- LI-0021 1st I.F. Transformer in Can
- LI-0022 Diode I.F. Transformer in Can
- LR-0004 Wave Trap Coil Assy
- LR-0003 Untuned RF Coil Assy

DIAL AND CONTROL ACCESSORIES

- ES-0001 Dial Covering - Plastic Escutcheon for Cabinet
- SP-0010 Dial Drive Spring
- DC-0001 Dial Drive Cord 52" long
- GR-0001 Rubber Grommet for Tuning Gang and Speaker Mounting
- DG-0005 Calibrated Lucite Dial

DIAL AND CONTROL ACCESSORIES - Cont'd

- AR-0025 Thumb Wheel Assy (Tone Control)
- AR-0044 Thumb Wheel Assy (Phono Radio "A"-  
"B")
- KB-0015-1 Knobs - Brown Bakelite

SPEAKER

- SK-0004 Speaker 9" Elliptical P.M.

TRANSFORMERS

- TO-0006 Speaker Output Transformer
- LC-0010 Power Choke (395 ohms D.C.)
- TP-0010 Power Transformer

TUBE COMPLEMENT

- TU-6SQ7
- TU-6SA7
- TU-6SK7
- TU-6SQ7
- TU-6V6

SOCKETS

- SO-0010 Phono Socket
- SO-0017 Tube Socket
- TB-0007 Terminal Strip, External Antenna
- SO-0024 Vibrator Socket

CABINET

- CW-0008 Cabinet complete with Escutcheon
- AS-0240 Metal Grill Assy
- BC-0009 Baffle used with above item

MISCELLANEOUS

- VB-0002 Vibrator - 6 Volt - 6 Pin
- PR-0009 Ground Clip - Vib.
- PR-0026 Battery Clip - Negative
- PR-0027 Battery Clip - Positive

