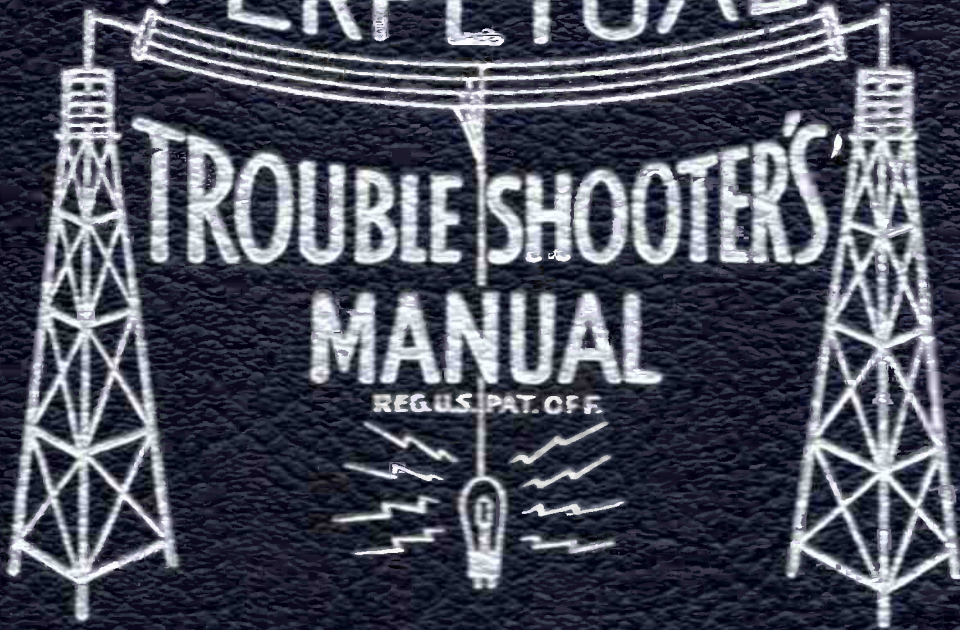


VOLUME XX

PERPETUAL

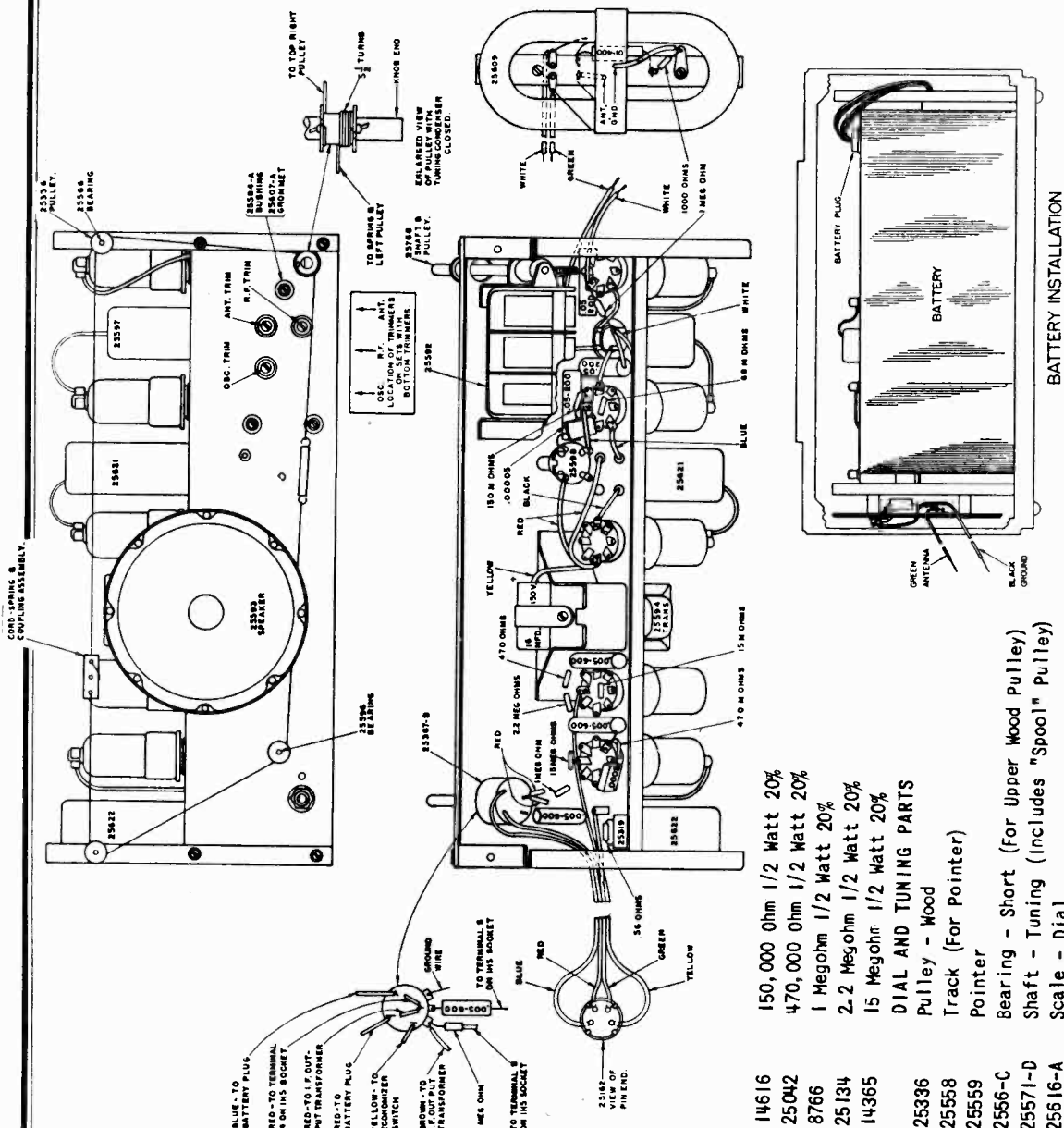
TROUBLE SHOOTER'S
MANUAL

REG. U.S. PAT. OFF.



JOHN F. RIDER

MODEL 43-6485



Part No.	Description
25774	DIAL AND TUNING PARTS Screw - Set 8-32 x 1/8 (Used in Worm Gear of Tuning Condenser)
25806	Plate - Assembly (Includes Dial Backing Plate with Bracket, Track and Pointer)
26281	Cord - Dial (Includes Spring and Pointer Coupling)
25594	TRANSFORMERS AND COILS Transformer - Speaker (Includes Mounting Clamp)
25597	Coil - R.F. (Includes Shield Can and 10 MMF Condenser)
25598	Coil - Oscillator
25609	Loop Antenna (Includes Mounting Strips and Terminals)
25621	Transformer - IF Input
25622	Transformer - IF Output (Complete In Can - Includes 2 - 100 MMF. Capacitors Built-In With Trimmers)
25319	S.P.S.T. Slide Switch
25553-A	Back - Chassis (Removable Back Plate)
25593	5" P.M. Speaker
25603	Cap - Grid
25612	Plug - 4 Prong (For Battery Cable)
25618-A	Screw - 10-32 x 7/8 (For Mounting Chassis)
25620	Socket - Octal (For Tubes)
25696	Knob - Bakelite
26259	End - L.H.
26268-A	Cabinet - Wood
26271	End - R.H.
25592	CAPACITORS 3 Gang Tuning Capacitor Including Trimmers
25600	Electrolytic 16 MFD. 150V.
14061	.005 MFD. 500V. Tubular
8661	.05 MFD. 300V. Tubular
8583	.01 MFD. 400V. Tubular
17091	50 MMF. Mica
14370	200 MMF. Mica
25367	RESISTORS Control-Volume Including On-Off Switch
25613	.56 Ohm 1/2 Watt 10% Wire Wound
25085	470 Ohm 1/2 Watt 20%
25414	1,000 Ohm 1/2 Watt 20%
17164	15,000 Ohm 1/2 Watt 20%
25144	33,000 Ohm 1/2 Watt 20%

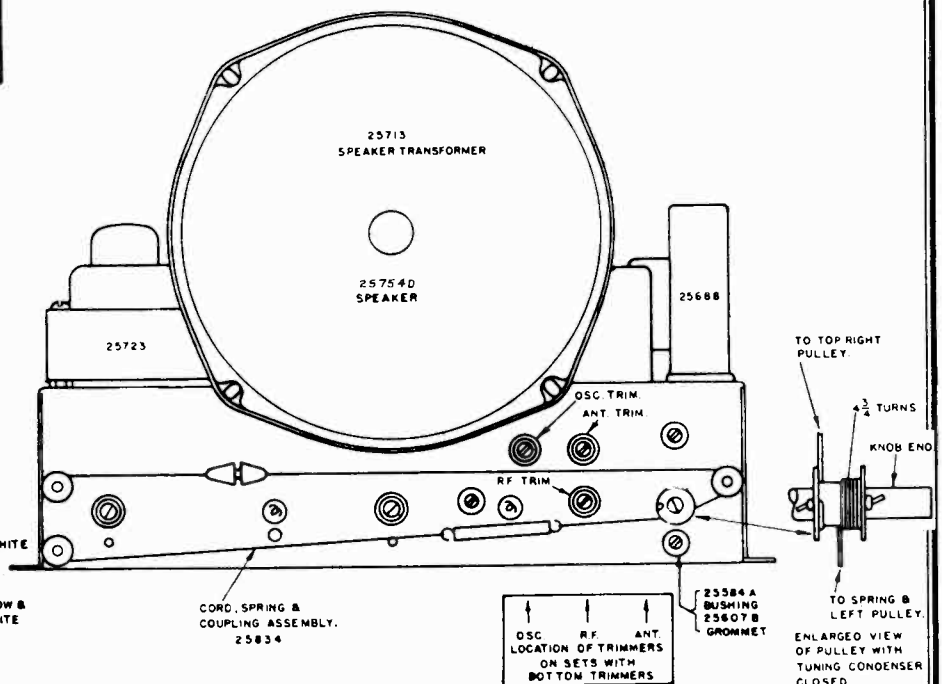
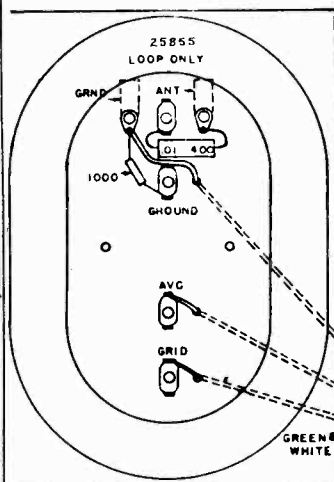
- 14616 150,000 Ohm 1/2 Watt 20%
- 25042 470,000 Ohm 1/2 Watt 20%
- 8766 1 Megohm 1/2 Watt 20%
- 25134 2.2 Megohm 1/2 Watt 20%
- 14365 15 Megohm 1/2 Watt 20%
- DIAL AND TUNING PARTS**
- 25336 Pulley - Wood
- 25558 Track (For Pointer)
- 25559 Pointer
- 2556-C Bearing - Short (For Upper Wood Pulley)
- 25571-D Shaft - Tuning (Includes "Spool" Pulley)
- 25616-A Scale - Dial
- 255696-C Bearing - Long (For Lower Wood Pulley)
- 25654 Screw - Wood #4 x 1/4 (Mounting Dial Back Plate)

REMOVAL OF CHASSIS—If it is found necessary for any reason to remove the radio chassis from the cabinet, proceed as follows: Remove knobs by pulling straight off, disconnect battery by removing plug, and remove two screws inserted through bottom of cabinet. Chassis can be removed now. (Note—After installing chassis in cabinet, see that the bakelite strip attached to dial cord is engaged with the pin on the dial pointer.)



DIAL CORD REPLACEMENT—Is best accomplished by replacing complete cord assembly No. 25834 which is made up to correct length. In an emergency 30 lb. fish line may be used. See picture of chassis for correct installation.

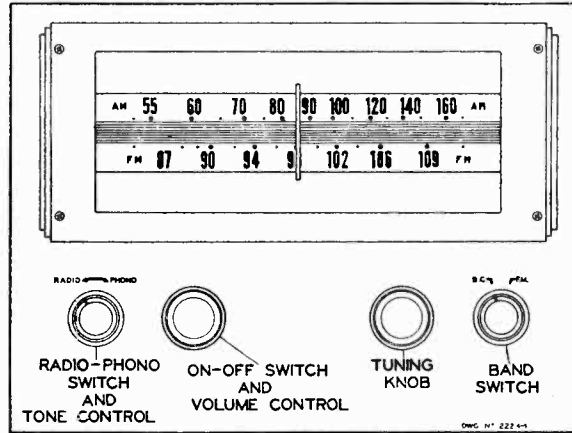
DIAL SCALE REPLACEMENT—Remove chassis. Remove pointer track by removing the two wood screws holding it to the cabinet. Dial scale may now be lifted out from front of cabinet. When installing new scale—see that long screws in track bracket engage the notches in the ends of the scale.



ALIGNMENT PROCEDURE

Volume control at maximum volume and output from signal generator no higher than is necessary to obtain output reading. Use insulated alignment screw driver for adjusting.

DUMMY ANT.	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
.1 mfd	High side to top (grid) cap 1A7. Low side to chassis.	465 kc.	High freq. and tuning gang at minimum capacity	Across voice coil	T5 output I.F., T4 input I.F.	Adjust for maximum output
.0001 mfd	High side to ant. wire (green). Low side to chassis.	1620 kc.	High freq. and tuning gang at minimum capacity	Across voice coil	C3, Osc. Trim	Adjust for maximum output
.0001 mfd	High side to ant. wire (green). Low side to chassis.	1400 kc.	Tune in 1400 kc. signal.	Across voice coil	C1, C2 Ant. Trim and R.F. Trim	Adjust for maximum output



ELECTRICAL SPECIFICATIONS

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

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

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

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

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

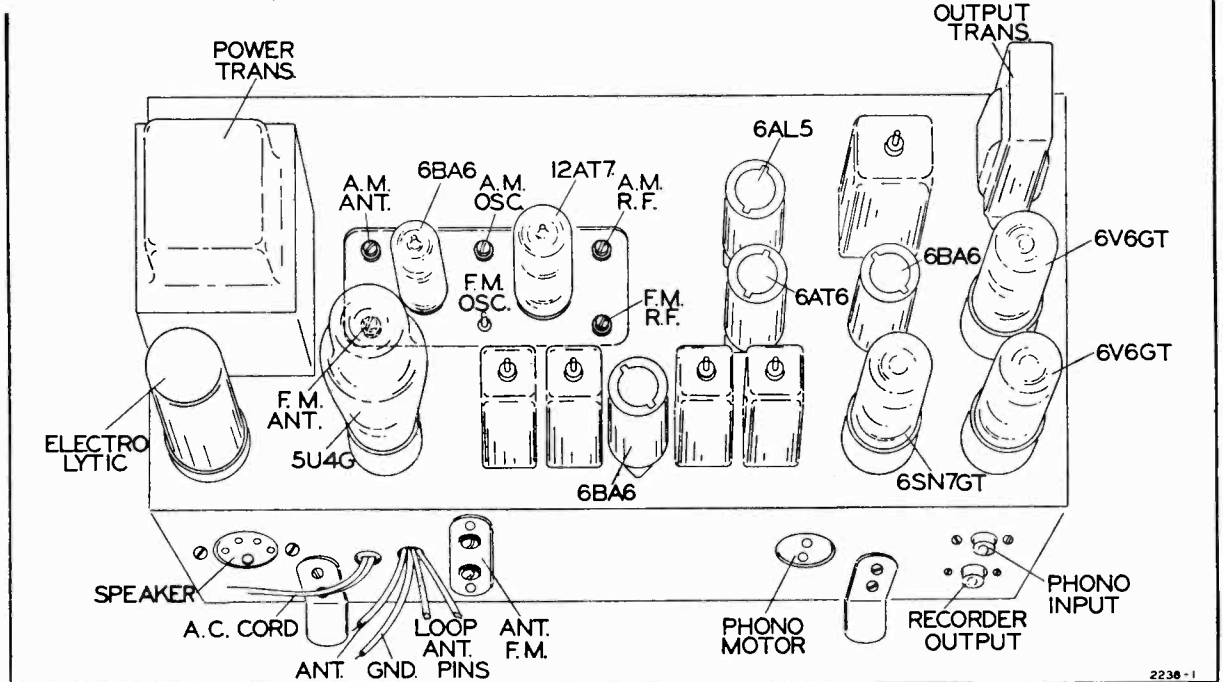
FM Sensitivity..... (For .5 watt output)—10 microvolts average.

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

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

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

Automatic changer.. Webster 50 with QT Cart-ridge. (Manual 619-4).



Chassis — top view

MODEL 43-7660B

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	ADJUSTMENT TO BE MADE	ADJUST FOR
10.7 Mc. Use about .1 volt	Pin No. 1 of 6BA6 No. 3 and ground	Pin No. 2 of 6AL5 and ground	Primary of T5	Resonance should be about 3 volts
10.7 Mc. Use about .1 volt	Pin No. 1 of 6BA6 No. 3 and ground	See note "A"	Secondary of T5	Zero. Use zero center scale See note "B"
10.7 Mc. Use about 3300 microvolts	Pin No. 1 of 6BA6 No. 2 and ground	Pin No. 2 of 6AL5 and ground	Primary and Secondary of T4A 10.7 m.c. windings See I.F. view	Resonance should be about 3 volts
10.7 Mc. Use about 200 microvolts	Pin No. 2 of 12AT7 and ground	Pin No. 2 of 6AL5 and ground	Primary and Secondary of 10.7 m.c. windings of T3A See I.F. view	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 reasonable level at this point and will give the truest indication of correct alignment with the procedure specified.

FM - R. F. ALIGNMENT

Check pointer so that it coincides with the right hand 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.

A M - I . F . ALIGNMENT

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

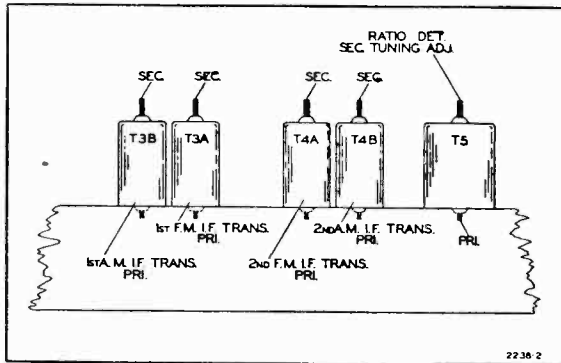
SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	ADJUSTMENTS TO BE MADE	ADJUST FOR
455 Kc. Use 1000 microvolts	Pin No. 1 of 6BA6 No. 2 and ground	Primary and Secondary of T4B AM windings See I. F. view	Maximum output Should be 1/2 watt.
455 Kc. Use 30 microvolts	Pin No. 2 of 12AT7 and ground	Primary and Secondary of T3B AM windings See I. F. view	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

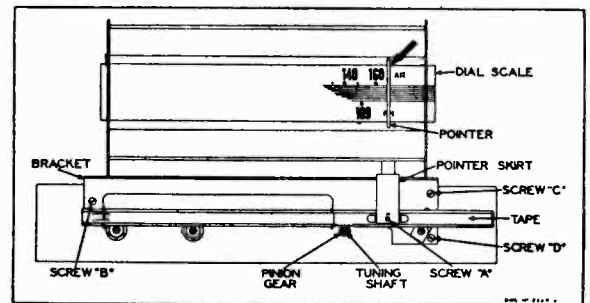
Check pointer so that it coincides with the right band marker to the extreme right when iron cores are all the way out.

For adjustment, see dial mechanism illustration.

SIGNAL GENERATOR FREQ.	CONNECTION TO RADIO	DUMMY ANTENNA	ADJUST
1620 Kc. Use 3 microvolts	AM Antenna and Ground	200 mmf.	C59, C57, C61. For maximum, 1/2 watt



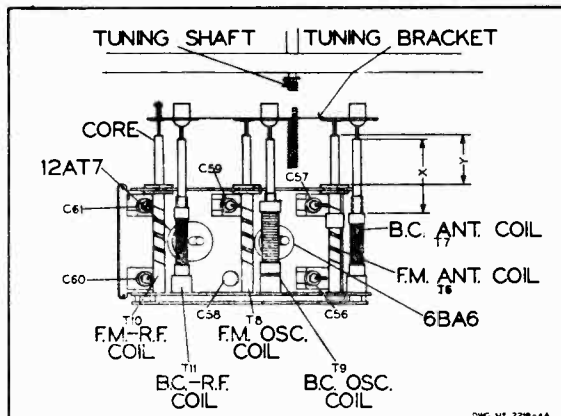
I. F. VIEW



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

TUNER ADJUSTMENT

With tuner all the way out, dimension "X" should be 1 1/2 inches. "Y" should be 1-1/32 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.



MODEL 43-7660B

ALL POTENTIALS OTHER THAN BIAS VALUES TAKEN ON 500 VOLT RANGE, 1000 OHM-PER-VOLT METER USED FOR ALL VALUES

6AL5

6BA6

6BA6

12AT7

6BA6

5U4G

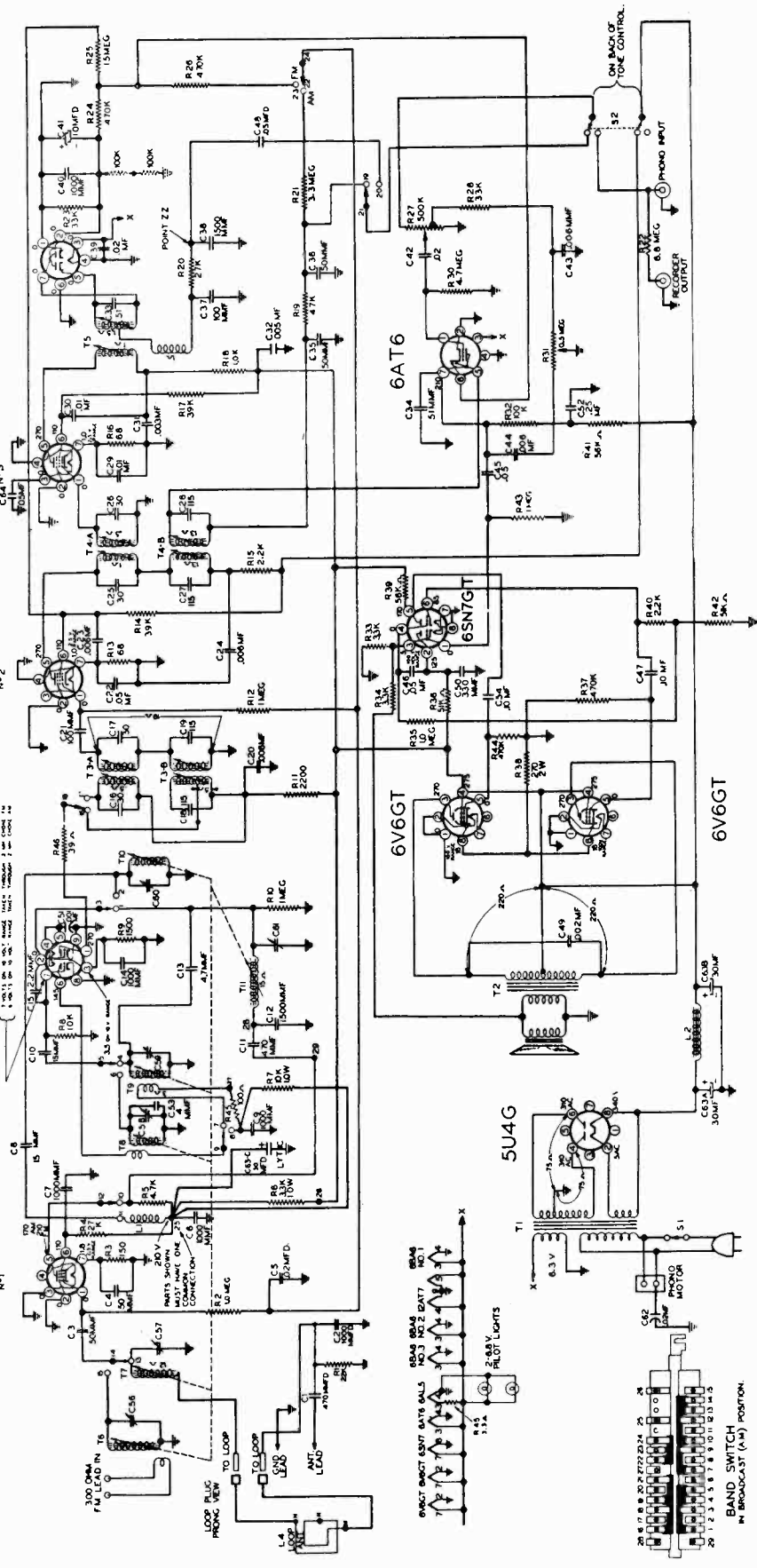
6V6GT

6AT6

6SN7GT

6V6GT

2239-A



NOTE: Two 100K ohm resistors in series from Pin No. 2 of the 6AL5 to ground are connected as shown only when aligning the FM I. F. Refer to FM I. F. alignment procedure.

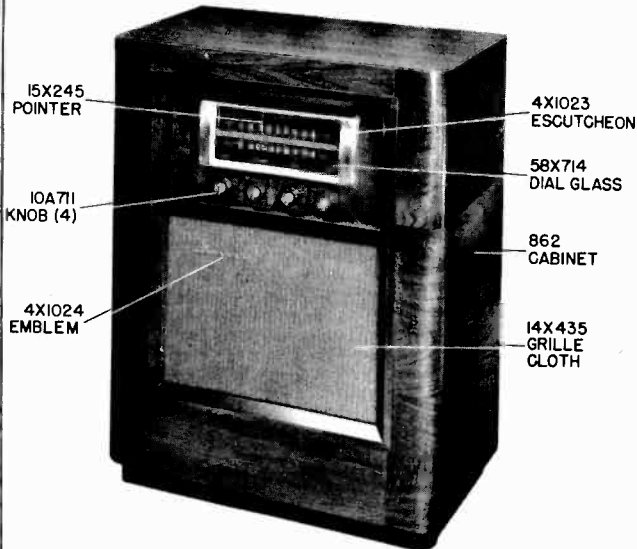
NOTE: Some sets used 250 ohm—5 watt resistor for R38.

RECORD CHANGER: See Webster Model 50, Page RCD.CH. 15-1 through RCD.CH. 15-9

Ref. No.	Part No.	Description	Qty. Used
TUNER PARTS			
Condensers			
C58	A-8H-15444	Trimmer, FM oscillator	1
C56, 57, 59, 61	A-2M-12618	Trimmer plate, large	4
C60	A-2M-14368	Trimmer plate, small	1
	A-5M-12615	Locator, for trimmer plates	5
C59, C61	B-6M-12616-S-2	Silvered mica film	2
C56, 57, 60	A-6M-12616	Clear mica film	3
	A-3C-12617	Spacer, for trimmer plates	5
C1, C11	C-8G-11732	470 mmf, ceramic	2
C2	C-8G-13695	1000 mmf, ceramic	1
C6, 7, 9, 14, 51	C-8G-13201	1000 mmf, ceramic	5
C12	C-8G-11731	1500 mmf, ceramic	1
C10, C8	C-8G-13017	15 mmf, ceramic	2
C3, C4	C-8G-11484	50 mmf, ceramic	2
C13	A-8G-12495-6	4.7 mmf, ceramic	1
C15	A-8G-12495-4	2.2 mmf, ceramic	1
C53	C-8G-15859	4 mmf, ceramic	1
C5	C-8D-16677	.02 x 200 volts, paper	1
Resistors			
R4	C-9B2-79	27K ohms, 1 watt	1
R1	C-9B1-21	22K ohms, 1/2 watt	1
R3	C-9B1-52	150 ohms, 1/2 watt	1
R5	C-9B1-17	4700 ohms, 1/2 watt	1
R8	C-9B1-19	10K ohms, 1/2 watt	1
R2, R10	C-9B1-31	1 megohm, 1/2 watt	2
R21	C-9B1-34	3.3 megohms, 1/2 watt	1
R45	C-9B1-50	100 ohms, 1/2 watt	1
R46	C-9B1-45	39 ohms, 1/2 watt	1
R9	C-9B1-64	1500 ohms, 1/2 watt	1
R6	C-9B2-6	3300 ohms, 1 watt	1
R7	C-9B2-74	10K ohms, 1 watt	1
Coils			
T8	B-13D-13027-1	F.M. oscillator coil	1
—	B-51A-13056	Core for F.M. oscillator coil	1
T6	B-13E-13028	FM antenna coil	1
—	B-51A-13058	Core for FM antenna coil	1
T10	B-13C-13029	FM R.F. coil	1
—	B-51A-13057	Core for FM R.F. coil	1
T9	A-13D-15704	B.C. oscillator coil	1
—	B-51A-12722	Core for B.C. oscillator coil	1
T7	B-13E-13031	B.C. Antenna coil	1
T11	B-13C-13032	B.C. R.F. coil	1
—	B-51A-12723	Core for B.C. ant. and R.F. coil	2
Miscellaneous			
B-20B-15628	Slide switch	1	
A-15B-12997	7-prong min., tube socket	1	
A-15B-13430	9-prong min., tube socket	1	
B-3A-15415	Lead screw	1	
A-3J-12309	Pinion gear	1	
A-49A-14439	Drive pring	2	
A-49A-13228	Tension spring	1	
A-49A-12394	Spiral spring for slugs	3	
B-2J-13006	Rack tape with teeth and pointer bracket	1	
B-2D-15416	Guide for rack tape	1	
B-2D-15649	Pointer carriage	1	
A-5M-13741	Pointer	1	
32F4SE-11488	4-40 x 1/8" screw for pointer 2		
MAIN CHASSIS PARTS			
Condensers			
C63A, C63B, C63C	B-8C-13601	Electrolytic filter condenser, 30-30-30 x 450 volts	1
C52	C-8D-13439	.25 mfd x 400 volts	1
C54, C47	C-8D-10760	.1 mfd x 400 volts	2
C31	C-8D-11013	.003 x 600 volts	1
C44, 43, 24, 23, 20	C-8D-10785	.006 x 600 volts	5
C29, C30	C-8D-10761	.01 x 400 volts	2
C46, C45	C-8D-10813	.05 x 400 volts	2
C49	C-8D-10789	.002 x 600 volts	1
C48, C22	C-8D-10770	.05 x 200 volts	2
C64	C-8D-15860	.05 x 200 volts	1
C41	A-8C-13132	Electrolytic, 10 mfd x 50 volts	1
C62	C-8J-11321	.02 x 600 volts, molded case	1
C35	A-8G-13962	.005 x 500 volts, ceramic	1
C21	C-8G-11734	100 mmf, ceramic	1
C38	C-8G-13059	1500 mmf, ceramic	1
C34	C-8G-13060	51 mmf, ceramic	1
C40	C-8G-13201	1000 mmf, ceramic	1
C50	C-8G-11741	330 mmf, ceramic	1

Ref. No.	Part No.	Description	Qty. Used
C37	C-8F3-225	100 mmf, mica	1
C39, C42	C-8D-11304	.02 x 200 volts, paper	2
C35, C36	A-8F-13047	Mica condenser, 50 mmf, dual	1
Resistors			
R27, S1	A-10A-13114	Volume control and switch, 500K ohms	1
R31, S2	A-11A-15645	Tone control and phono radio switch	1
R22	C-9B1-36	6.8 megohms, 1/2 watt	1
R32	C-9B1-86	100K ohms, 1/2 watt	1
R44, R37	C-9B1-94	470K ohms, 1/2 watt	2
R41, R39	C-9B1-83	56K ohms, 1/2 watt	2
R33, R34	C-9B1-68	3300 ohms, 1/2 watt	2
R30	C-9B1-35	4.7 megohms, 1/2 watt	1
R23, R28	C-9B1-80	33K ohms, 1/2 watt	2
R20	C-9B1-79	27K ohms, 1/2 watt	1
R13, R16	C-9B1-48	68 ohms, 1/2 watt	2
R14, R17	C-9B2-81	39K ohms, 1 watt	2
R24, R26	C-9B1-29	470K ohms, 1/2 watt	2
R25	C-9B1-302	15 megohms, 1/2 watt	1
R19	C-9B1-23	47K ohms, 1/2 watt	1
R12, R43, R35	C-9B1-31	1 megohm, 1/2 watt	3
R40	C-9B1-66	2200 ohms, 1/2 watt	1
R36, R42	C-9B1-200	51K ohms, 1/2 watt	2
R38	C-9B4-55	270 ohms, 2 watts	1
R18	C-9B1-13	1000 ohms, 1/2 watt	1
R11, R15	C-9B2-15	2200 ohms, 1 watt	2
R45	C-9B1-1069	3.3 ohms, 1/2 watt	1
Coils			
B-13A-15680	Input I.F. transformer, 455 kc.	1	
B-13B-15681	Output I.F. transformer, 455 kc.	1	
B-13A-15682	Input I.F. transformer, 10.7 megohms	1	
B-13B-15683	Second I.F. transformer, 10.7 megohms	1	
B-13M-15684	Ratio detector, 10.7 megs.	1	
C-13E-15687	Loop antenna assembly	1	
Transformers			
T1	B-12A-13038-1	Power transformer, 105-125 volts, 50-60 cycles, primary	1
T2	B-12C-13042-1	Output transformer, for speaker	1
Speaker			
B-18B-13043-1	Electrodynamic speaker, 12" less output transformer	1	
Miscellaneous			
C-30B-13734	Dial scale	1	
B-30B-13943	Dial glass	1	
2G-13596	Escutcheon	1	
56D2-12463	Screws for escutcheon	4	
B-5B-13737-56	Knob, mahogany—small with dot	2	
B-5B-13738-56	Knob, mahogany—large, without dot	2	
A-3A-15630	Shaft for band switch	1	
A-43D-12934	"U" speed clip	1	
A-55C-12935	Ball bearing	1	
B-47A-13801	Pilot lite assembly	1	
A-46A-11739	Pilot lite bulb, 6-8 volts	2	
A-2H-10974	Tube shield	4	
A-15C-13174	7-prong, min., tube socket	4	
A-15B-10440	8-prong, octal, socket	4	
A-7B-13050	FM dipole socket	1	
A-15B-11538	Speaker socket	1	
A-19B-12468	Phono-motor socket	1	
A-19B-11044	Recorder socket	1	
A-19B-12170	Phono input socket	1	
B-14M-11479	AC line cord	1	
32K10-14306	10-32 x 1 inch, chassis mounting screws	4	
RECORD CHANGER			
B-201-13109	Record changer (Webster 50) with QT cartridge	1	
See Coronado Phono Service Manual No. 619-4	QT	Crystal Cartridge with needle	1
		Needle only	1

MODEL 94RA1-43-6945A



GENERAL DESCRIPTION

This is a two band, six tube (plus rectifier tube) receiver for the reception of both AM and FM stations. The I-F stages use the latest type high gain miniature type tubes and built-in Aerials are provided for the FM and Broadcast bands. Features include, compensator circuits to prevent oscillator drift, automatic volume control, beam power output stage, PM dynamic loud speaker and an electrostatic shield in the power transformer to reduce power line noise.

The receiver is housed in a console cabinet with controls provided for tuning, volume, tone and band or phone selection.

TUBE SOCKET VOLTAGES

Socket voltages are shown on the schematic diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube volt-meter. Conditions of measurement are:

Line voltage.....117 Volts AC
Signal Input.....None

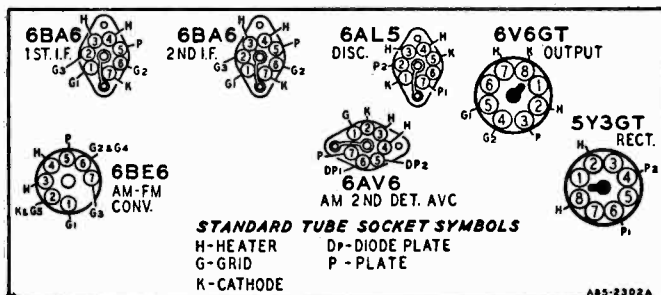
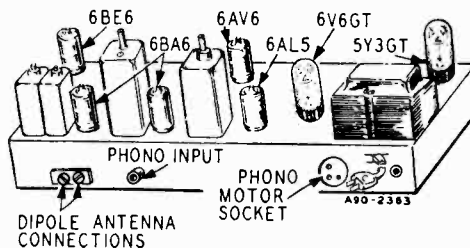
A variation of ±10% is usually permissible.

ELECTRICAL SPECIFICATIONS

- Power Supply..... 105-125 volts AC 50-60 cycles, 60 watts.
- Frequency Ranges..... Broadcast 540-1600 KC
Frequency Modulation 88-108 MC
- Intermediate Frequency... AM—455KC
FM—10.7 MC
- Selectivity..... AM—50 KC broad at 1000 times signal, measured at 1000 KC
I.F. FM—200 KC broad at 2 times down
I.F. FM—800 KC broad at 200 times down
- AM Sensitivity..... (For .5 watt output with external antenna) 20 microvolts average
- FM Sensitivity..... (For .5 watt output) 200 microvolts average
- Power Output..... 4.5 watts maximum
2.5 watts 10% distortion
- Loud Speaker..... 10" PM Dynamic
- Voice Coil Impedance..... 3.2 ohms 400 cycles

Tube and Dial Lamp Complement

- 1 6BE6 FM-AM Converter
- 1 6BA6 1st I-F Amplifier
- 1 6BA6 2nd I-F Amplifier
- 1 6AL5 FM Discriminator
- 1 6AV6 Audio Amplifier, AM 2nd Detector and AVC
- 1 6V6GT Audio Output
- 1 5Y3GT Rectifier
- 2 No. 47 Dial Lamps



ALIGNMENT PROCEDURES AM STAGES

The following is required for aligning:
An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.
Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas — .1 mf, and 50mmf.

Volume Control Maximum all Adjustments.
Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.
Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.

SIGNAL GENERATOR				GANG CONDENSER SETTING	ADJUST	ADJUST FOR
FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	CONNECT GROUND TO			
455 KC	Control Grid 1st 6BA6 Pin No. 1	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. C-14 and C-15	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7 1st Det.	.1 mf	Chassis Base	Rotor Fully Open	1st I.F. Pri. and Sec. (7) and (8)	Maximum Output
1620 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	Oscillator C-39	Maximum Output
1400 KC	External Antenna Lead	50 mmf	Chassis Base	Turn Rotor to Max. Output. Set Pointer to 1400 KC See Note A	Antenna C-35	Maximum Output

NOTE A—If the pointer is not at 1400 KC on the dial, reset pointer to the 1400 KC mark on the dial scale.

FM STAGES

The following is required for aligning:
An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.
Non-metallic screwdriver.
Dummy Antennas and I-F Loading Resistor — .01 mf, 300 ohms and 100K ohms

Zero center scale DC vacuum tube voltmeter having a range of approximately 3 volts.
(If a zero center scale meter is not available, a standard scale vacuum tube voltmeter may be used by reversing the meter connections for negative readings).
Allow chassis and signal generator to "Heat Up" for several minutes.

SIGNAL GENERATOR			THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO					
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Pri. (1) Note A	Maximum Deflection
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Sec. (2) Note B	
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotgr Fully Open	Disc. Pri. (1) Note A	Maximum Deflection
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Sec. (2) Note B	
I-F	10.7 MC Note E	6BA6 1st I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	2nd I-F (3) Note C	Maximum Deflection
	10.7 MC	Unsolder lead from Pin 7 to band switch. Insert 100K ohm resistor between Pin 7 and Ground and feed signal into Pin 7 of 6BE6	.01 mf	FM	Rotor Fully Open	1st I-F Pri. (5) Note C	Maximum Deflection
	10.7 MC	Same as above	.01 mf	FM	Rotor Fully Open	1st I-F Sec. (6) Note C	Maximum Deflection

RECHECK I-F ADJUSTMENTS IN ORDER GIVEN

Ant. and Osc.	108.5 Note D	Disconnect built-in dipole antenna and connect generator to dipole terminals with resistor in series	300 ohms	FM	Rotor Fully Open	Osc. C-38	Maximum Deflection
	104.5	Same as above	300 ohms	FM	Tune rotor for max. AVC voltage	Ant. C-37	Maximum Deflection

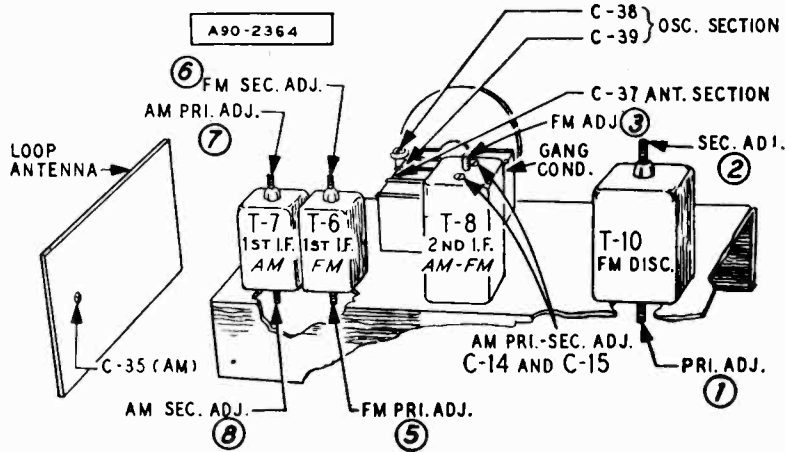
RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN

FM ALIGNMENT NOTES

NOTE A—The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line. A signal of .1 volt must be fed into the receiver for this adjustment.
Note output voltage on the zero center DC vacuum tube voltmeter.
NOTE B—Disconnect zero center DC vacuum tube voltmeter from AVC and connect it at the audio takeoff point at the 27 K ohm resistor (R-11) and its junction with the terminal

strip. Adjust for zero voltage indication.
NOTE C—Connect zero center DC vacuum tube voltmeter as in Note A. Adjust input to give same output on the zero center DC vacuum tube voltmeter as in Note A.
NOTE D—Remove the 100 K. ohm load resistor and solder the lead from pin 7 of 6BE6 tube to the band switch before attempting to check the antenna and oscillator adjustments.
NOTE E—2nd I-F trimmers (AM) must be aligned before attempting to adjust 2nd I-F (FM) tuning slug.

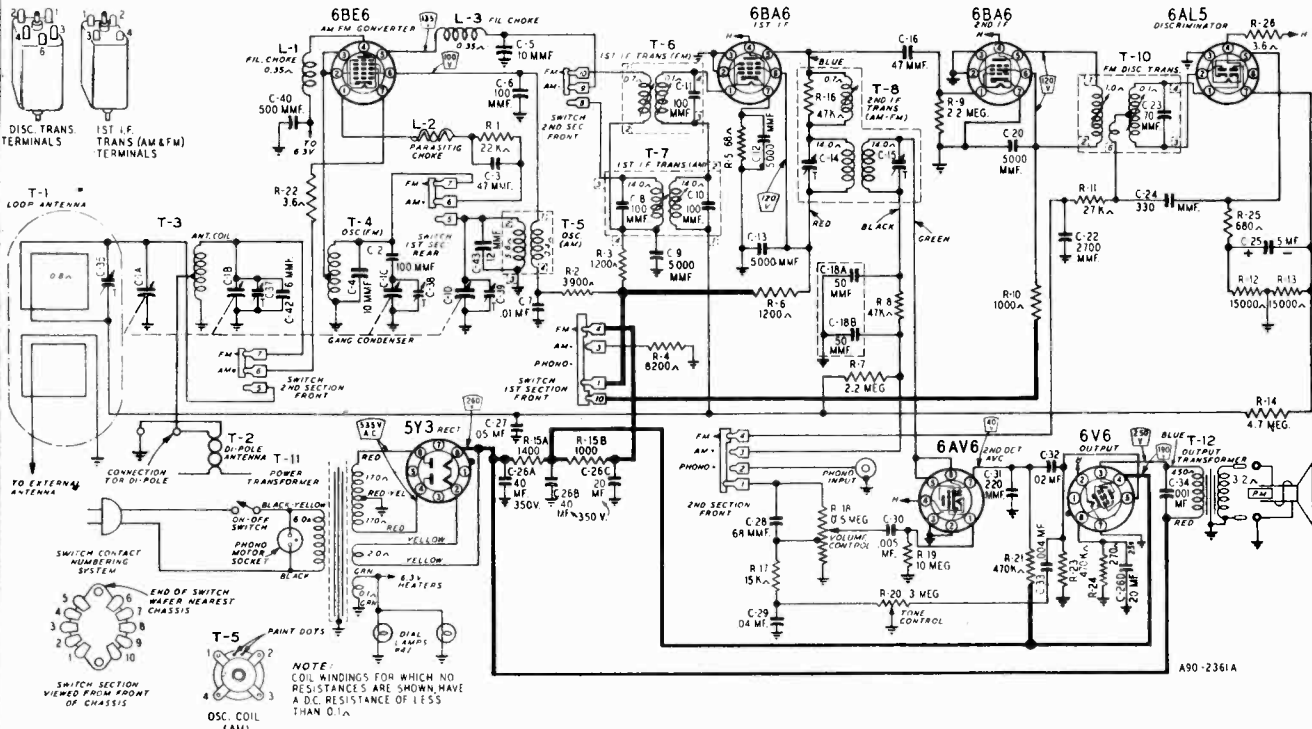
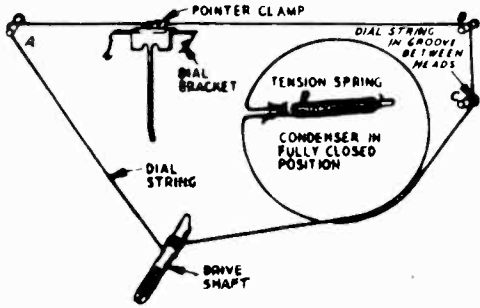
MODEL 94RA1-43-6945A



DRIVE CORD REPLACEMENT

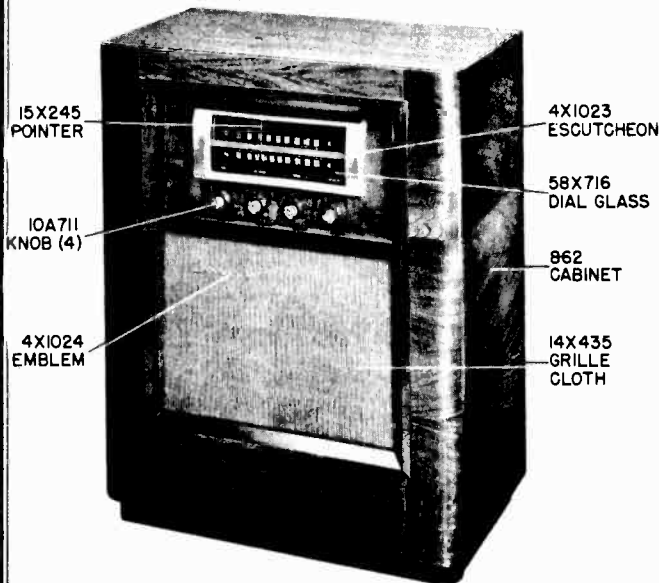
DIAL POINTER CORD

Use a new 10X38 drive cord assembly or a new length of cord 46 inches long for the installation. Install the cord as shown in the illustration, winding three turns clockwise around the drive shaft with the turns progressing away from the chassis. After completing the installation rotate the drive shaft a few turns to take up the slack in the cord.



SYMBOL	PART NO.	DESCRIPTION	VALUE	TOL.	RATING	SYMBOL	PART NO.	DESCRIPTION	VALUE	TOL.	RATING
CAPACITORS						TRANSFORMERS AND COILS					
C-1A } C-1B } C-1C } C-1D }	14A204	Gang Condenser & Pulley				R-15A } R-15B }	43X224	Wire Wound	1400 ohm		6.0W
C-2 } C-3 } C-4 } C-5 } C-6 } C-7 }	47X511 47X517 47X523 47X512 47X476 D66103	Ceramic Ceramic Ceramic Ceramic Molded Mica Tubular	100 MMF 47 MMF 10 MMF 10 MMF 100 MMF .01 MF	5% 10% 10% 5% 20% 25%	400V	R-16 } R-21 } R-23 }	Part of T-8 (2nd I.F. Transformer AM-FM) 885474 36X379	Carbon (2) Volume Control & Switch Carbon	470K ohm .5 megohm 10 megohm		0.5W
C-8 } C-10 }	Part of T-7 (1st I.F. Trans.-AM)					R-19 } R-20 }	885106 40X288	Carbon Tone Control	3 megohm		0.5W
C-11 } C-9 }	Part of T-6 (1st I.F. Trans.-FM)					R-22 } R-26 }	43X233	Wire Wound (-2)	3.6 ohm		0.5W
C-12 } C-13 } C-20 }	47X507	Silvered Ceramic (4)	5000 MMF			R-24 } R-25 }	884271 884681	Carbon Carbon	270 ohm 680 ohm		0.5W
C-14 } C-15 }	Part of T-8 (2nd I.F. Trans.-AM-FM)					TRANSFORMERS AND COILS					
C-16 } C-18A }	47X463	Ceramic	47 MMF	20%		L-1 } L-3 }	9A1882	Filament Choke (2)			
C-18B }	47X112	Dual Mica	50-50 MMF			L-2 } T-1 }	9A1940 9A1972	Parasitic Choke "B" Range Loop Antenna Assembly			
C-22 } C-23 }	47X492	Molded Mica	2700 MMF	10%		T-2 } T-3 }	9A2003 9A1956	Dipole Antenna Assembly Antenna Coil Assembly			
C-24 } C-25 }	47X529	Silvered Mica	330 MMF	10%		T-4 } T-5 }	9A1938 9A1929	Oscillator Coil Assembly (FM) Oscillator Coil Assembly (AM)			
C-26A } C-26B }	45X359	4 section Electrolytic	40 MF		100V	T-6 } T-7 }	9A1932 9A1934	1st I.F. Coil Assembly (FM) 1st I.F. Coil Assembly (AM)			
C-26C } C-26D }			20 MF		350V	T-8 } T-10 }	9A1973 9A1970	2nd I.F. Coil Assembly (AM-FM) Discriminator Coil Assembly			
C-27 } C-28 }	B66503	Tubular	.05 MF	25%	200V	T-11 } T-12 }	53X290 51X134	Power Transformer Output Transformer			
C-29 } C-30 }	B66403	Tubular	.04 MF	25%	200V	MISCELLANEOUS					
C-31 } C-32 }	D66502	Tubular	.005 MF	25%	400V	2A383	Band Change Switch				
C-33 } C-34 }	D66203	Tubular	.02 MF	25%	400V	3A303	Molded Octal Tube Socket (2)				
C-35 } C-37 }	366402	Tubular	.004 MF	25%	200V	3A304	Phono Motor Socket				
C-39 }	H66102	Tubular	.001 MF	25%	800V	3A305	Phono Socket (Single Pin)				
C-40 }	17A235	Trimmer	2-24 MMF			3A426	Tube Socket (miniature) (4)				
C-42 }	Part of C-1 Gang Condenser					3A427	Tube Socket (miniature for AM-FM converter)				
C-43 }	26A489	*Trimmer Ass'y.	1-8 MMF			7A103	#47 Pilot Light (2)				
	47X508	Ceramic	500-MMF	20%		7A215	Pilot Light Socket Assembly				
	47X521	Ceramic	6 MMF	10%		12A480	10" P.M. Speaker				
	47X522	Ceramic	12 MMF	10%		S-25X31	Dial Bracket Assembly				
	* Consists of:					Consists of:					
	17A257	Tubular Trimmer	Slug			25X1610	Dial Bracket				
	17A258	Tubular Trimmer	Sleeve			20X1508	Eyelet				
RESISTORS						20X1580	Shoulder Rivet (2)				
R-1 } R-2 }	884223 883392	Carbon	22K ohm 3900 ohm		0.5W	20X1581	Shoulder Rivet				
R-3 } R-6 }	884122	Carbon (2)	1200 ohm		0.5W	25X1611	Support Bracket, L.H.				
R-4 } R-5 }	884822 883680	Carbon	8200 ohm 68 ohm		2.0W 0.5W	25X1612	Support Bracket, R.H.				
R-7 } R-9 }	885225	Carbon (2)	2.2 megohm		0.5W	20X1564	Tubular Rivet 3/16" (2)				
R-8 } R-10 }	885473 884102	Carbon	47K ohm 1000 ohm		0.5W 0.5W	S-58X21	Dial Assembly				
R-11 } R-12 }	884273	Carbon	27K ohm		0.5W	Consists of:					
R-13 } R-17 }	884153	Carbon (3)	15K ohm		0.5W	S25X31	Dial Bracket Assembly				
R-14 }	885475	Carbon	4.7 megohm		0.5W	58X714	Dial Glass				
						41X86	Light Shield (2)				
						8X195	Rubber Strip (2)				
						28X564	Spring (4)				
						28X56	Trimount Stud (4)				
						6X21	Rubber Grommet (4)				
						10X38	Drive Cord Assembly				
						13X546	Line Cord and Plug Assembly				
						15X245	Pointer				
						19X179	Flat Washer (Mtg. Set to Cabinet) (3)				
						19X192	"C" Washer (Drive Shaft) (2)				
						19X434	#8 Flat Washer (Mtg. 53X290) (2)				
						20X260	Condenser Cushion Stud (3)				
						26X509	Drive Shaft				
						28X113	Drive Cord Tension Spring				
						30X547	Line Cord Clamp				

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ELECTRICAL SPECIFICATIONS

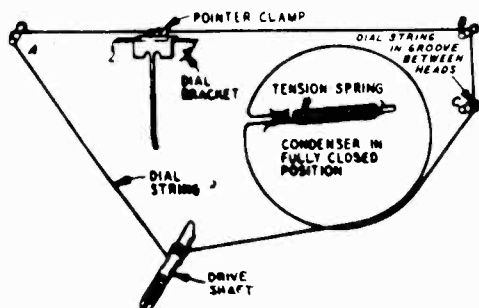
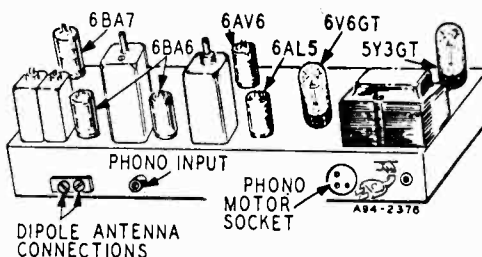
Power Supply.....	105-125 volts AC 50-60 cycles, 60 watts.
Frequency Ranges.....	Broadcast 540-1600 KC Frequency Modulation 88-108 MC
Intermediate Frequency.....	AM—455KC FM—10.7 MC
Selectivity.....	AM—45°KC broad at 1000 times signal, measured at 1000 KC I.F. FM—200 KC broad at 2 times down I.F. FM—950 KC broad at 200 times down
AM Sensitivity.....	(For .5 watt output with external antenna) 10 microvolts average
FM Sensitivity.....	(For .5 watt output) 100 microvolts average
Power Output.....	4.5 watts maximum 2.5 watts 10% distortion
Loud Speaker.....	10" PM Dynamic
Voice Coil Impedance.....	3.2 ohms 400 cycles

GENERAL DESCRIPTION

This is a two band, six tube (plus rectifier tube) receiver for the reception of both AM and FM stations. The I-F stages use the latest type high gain miniature type tubes and built-in Aerials are provided for the FM and Broadcast bands. Features include, compensator circuits to prevent oscillator drift, automatic volume control, beam power output stage, PM dynamic loud speaker and an electrostatic shield in the power transformer to reduce power line noise.

The receiver is housed in a console cabinet with controls provided for tuning, volume, tone and band or phono selection.

Tube and Dial Lamp Complement	1 6BA7 FM-AM Converter 1 6BA6 1st I-F Amplifier 1 6BA6 2nd I-F Amplifier 1 6AL5 FM Discriminator 1 6AV6 Audio Amplifier, AM 2nd Detector and AVC 1 6V6GT Audio Output 1 5Y3GT Rectifier 2 No. 47 Dial Lamps
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DRIVE CORD REPLACEMENT

DIAL POINTER CORD

Use a new 10X38 drive cord assembly or a new length of cord 46 inches long for the installation. Install the cord as shown in the illustration, winding three turns clockwise around the drive shaft with the turns progressing away from the chassis. After completing the installation rotate the drive shaft a few turns to take up the slack in the cord.

**ALIGNMENT PROCEDURES
AM STAGES**

The following is required for aligning:
An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.
Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas — .1 mf, and 50mmf.

Volume Control Maximum all Adjustments.
Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.
Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.

SIGNAL GENERATOR						
FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	CONNECT GROUND TO	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
455 KC	Control Grid 1st 6BA6 Pin No. 1	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. C-21 and C-22	Maximum Output
455 KC	Control Grid 6BA7 Pin No. 7 1st Det.	.1 mf	Chassis Base	Rotor Fully Open	1st I.F. Pri. and Sec. (7) and (8)	Maximum Output
1620 KC	Control Grid 6BA7 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	Oscillator C-7	Maximum Output
1400 KC	External Antenna Lead	50 mmf	Chassis Base	Turn Rotor to Max. Output Set Painter to 1400 KC See Note A	Antenna C-2	Maximum Output

NOTE A—If the pointer is not at 1400 KC on the dial, reset painter to the 1400 KC mark on the dial scale.

FM STAGES

The following is required for aligning:
An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.
Non-metallic screwdriver.
Dummy Antennas and I-F Loading Resistor—2500 mmf, 300 ohms and a 3300 ohm .5 watt resistor with short leads.

Zero center scale DC vacuum tube voltmeter having a range of approximately 3 volts.
(If a zero center scale meter is not available, a standard scale vacuum tube voltmeter may be used by reversing the meter connections for negative readings).
Allow chassis and signal generator to "Heat Up" for several minutes.

SIGNAL GENERATOR							
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (1) Note A	Maximum Deflection
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (2) Note B	
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (1) Note A	Maximum Deflection
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (2) Note B	
I-F	10.7 MC Note E	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	2nd I-F (3) Note C	Maximum Deflection
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (1) Note A	Maximum Deflection
I-F	10.7 MC	Antenna and Chassis	2500 mmf	FM	Rotor Fully Open	1st. I-F Pri. and Sec. (5) and (6) Note C	Maximum Deflection
	10.7 MC	Antenna and Chassis Solder a 3300 ohm resistor across terminals 3 and 4 of 1st. I-F trans.	2500 mmf	FM	Rotor Fully Open	1st. I-F Pri. (5) Note C	Maximum Deflection
	10.7 MC	Antenna and Chassis Note D	2500 mmf	FM	Rotor Fully Open	1st. I-F Sec. (6) Note C	Maximum Deflection

RECHECK I-F ADJUSTMENTS IN ORDER GIVEN

Oscillator	108.4 Note F	Disconnect built-in dipole antenna and connect generator to dipole terminals with resistor in series	300 ohms	FM	Rotor Fully Open	Osc. C-12	Maximum Deflection
Antenna	104.5	Same as above	300 ohms	FM	Tune rotor for max. AVC voltage	Ant. C-3	Maximum Deflection

RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN

FM ALIGNMENT NOTES

NOTE A—The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line. A signal of .1 volt must be fed into the receiver for this adjustment.
Note output voltage on the zero center DC vacuum tube voltmeter

NOTE B—Disconnect zero center DC vacuum tube voltmeter from AVC and connect it at the audio takeoff point at the 27 K ohm resistor (R-11) and its junction with the terminal strip. Adjust for zero voltage indication.

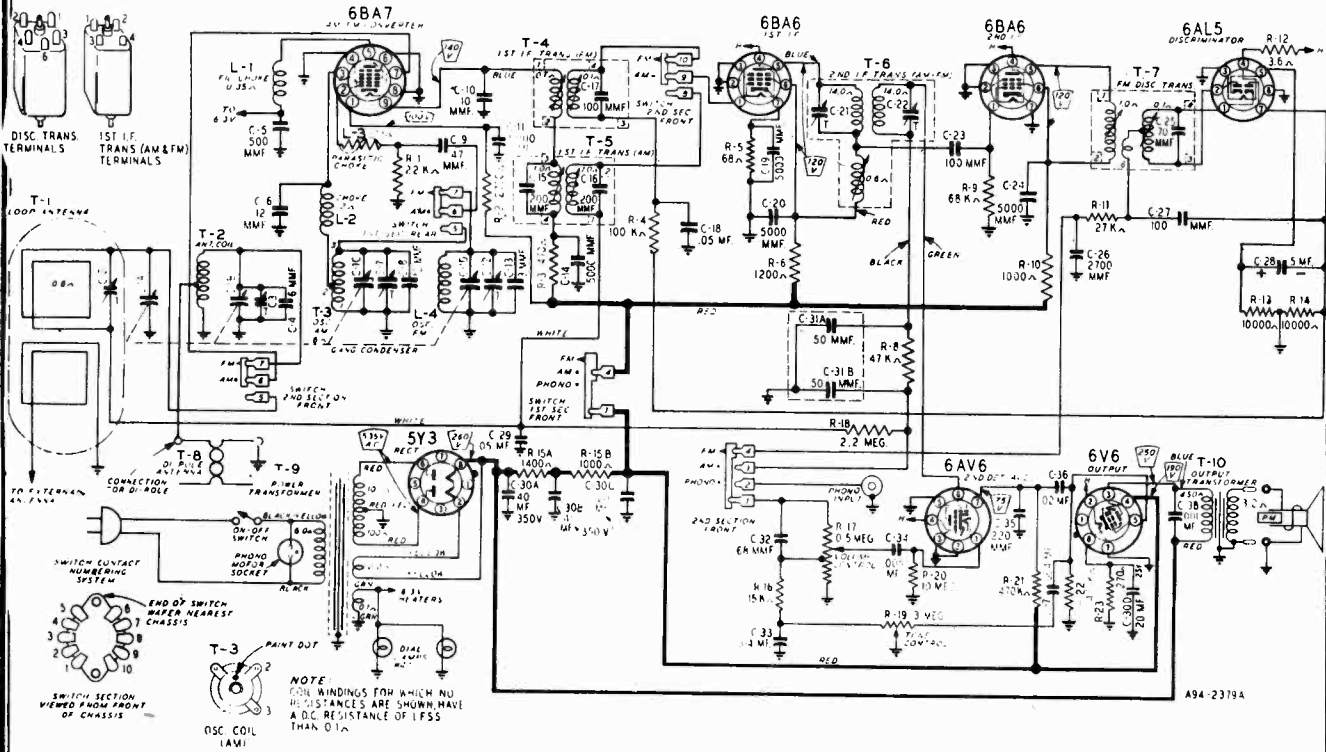
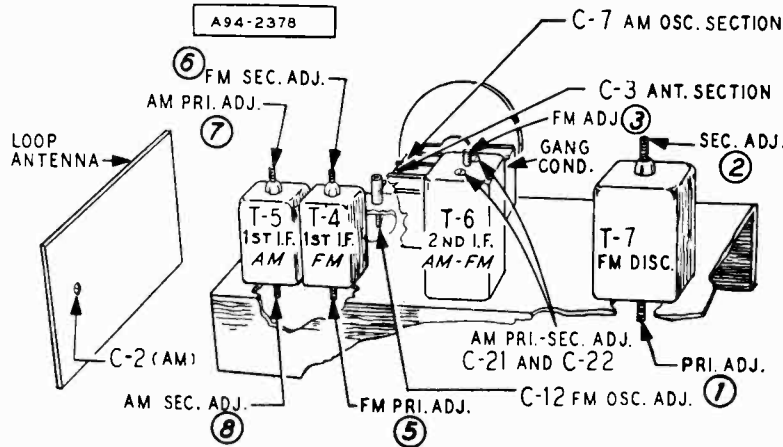
NOTE C—Connect zero center DC vacuum tube voltmeter as in Note A. Adjust input to give same output on the zero center DC vacuum tube voltmeter as in Note A.

NOTE D—Unsolder 3300 ohm resistor from terminals 3 and 4 of 1st I-F transformer and resolder across terminals 1 and 2.

NOTE E—2nd I-F trimmers (AM) must be aligned before attempting to adjust 2nd I-F (FM) tuning slug.

NOTE F—Remove the 3300 ohm load resistor before attempting to check the antenna and oscillator adjustments.

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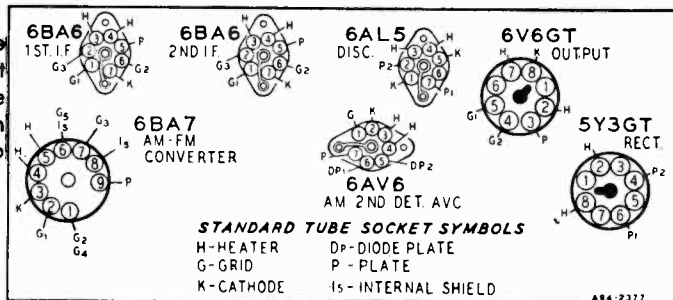


TUBE SOCKET VOLTAGES

Socket voltages are shown on the schematic diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube volt-meter. Conditions of measurement are:

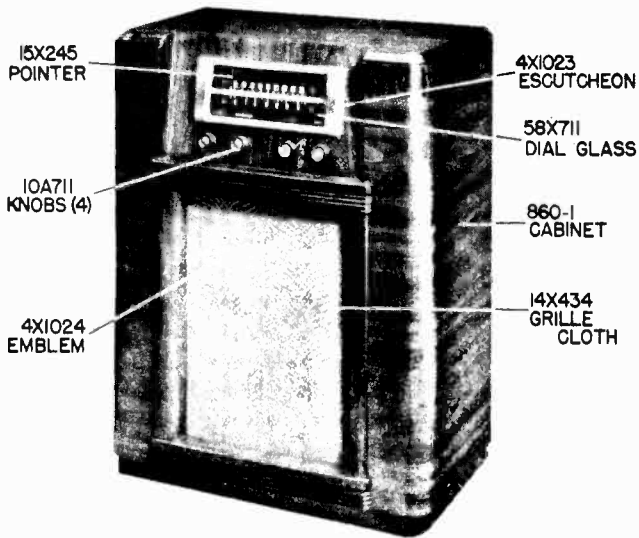
- Line voltage.....117 Volts AC
- Signal Input.....None

A variation of ±10% is usually permissible.



SYMBOL	PART NO.	DESCRIPTION	VALUE	TOL.	RATING	SYMBOL	PART NO.	DESCRIPTION	VALUE	TOL.	RATING
CAPACITORS						R-20	B85106	Carbon	10 Megohms		0.5W
C-1A						R-21	B85474	Carbon (2)	470K Ohms		0.5W
C-1B	14A204	Gang Condenser and Pulley				R-22					
C-1C						R-23	B84271	Carbon	270 Ohms		0.5W
C-1D						TRANSFORMERS AND COILS					
C-2	17A235	Trimmer	2-24 MMF			L-1	9A1882	Filament Choke			
C-4	47X521	Ceramic	6 MMF	10%		L-2	35A1	Insulated Choke	2 μh		
C-5	47X508	Ceramic	500 MMF	20%		L-3	9A1940	Parasitic Choke			
C-6	47X522	Ceramic (2)	12 MMF	10%		L-4	9A2021	Oscillator Coil Assembly (FM)			
C-8								T-1	9A1972	"B" Range Loop Antenna Assembly	
C-9	47X517	Ceramic	47 MMF	10%		T-2	9A1956	Antenna Coil Assembly			
C-10	47X512	Ceramic	10 MMF	5%		T-3	9A1997	Oscillator Coil Assembly (AM)			
C-11						T-4	9A1932	1st. I.F. Coil Assembly (FM)			
C-14						T-5	9A1998	1st. I.F. Coil Assembly (AM)			
C-19	47X507	Silvered Mica (5)	5000 MMF			T-6	9A1999	2nd. I.F. Coil AM-FM Assembly			
C-20							T-7	9A1970	Discriminator Coil Assembly		
C-24						T-8	9A2003	Dipole Antenna Assembly			
C-12	17A255	Tubular Trimmer				T-9	53X290	Power Transformer			
C-13	47X547	Ceramic	3 MMF	10%		T-10	51X134	Output Transformer			
C-18	866503	Tubular (2)	.05 MF	25%	200V	MISCELLANEOUS					
C-29										2A383	Band Change Switch
C-23	47X497	Ceramic	100 MMF	20%		3A303	Molded Octal Tube Socket (2)				
C-26	47X492	Molded Mica	2700 MMF	10%		3A304	Phono Motor Socket				
C-27	47X526	Molded Mica	100 MMF	10%		3A305	Phono Socket (Single Pin)				
C-28	45X361	Dry Electrolytic	5 MF		100V	3A426	Tube Socket (miniature) (4)				
C-30A			40 MF		350V	3A443	Tube Socket (miniature for AM-FM converter)				
C-30B			40 MF		350V	7A103	#47 Pilot Light (2)				
C-30C	45X359	4 Section Electrolytic	20 MF		250V	7A215	Pilot Light Socket Assembly				
C-30D			20 MF		25V	12A480	10" P.M. Speaker				
C-31A	47X112	Dual Mica	50-50 MMF			S-25X31	Dial Bracket Assembly				
C-31B								Consists of:			
C-32	47X471	Molded Mica	68 MMF	20%		25X1610	Dial Bracket				
C-33	866403	Tubular	.04 MF	25%	200V	20X1508	Eyelet				
C-34	D66502	Tubular	.005 MF	25%	400V	20X1580	Shoulder Rivet (2)				
C-35	47X468	Ceramic	220 MMF	20%		20X1581	Shoulder Rivet				
C-36	D66203	Tubular	.02 MF	25%	400V	25X1611	Support Bracket, L.H.				
C-37	866402	Tubular	.004 MF	25%	200V	25X1612	Support Bracket, R.H.				
C-38	H66102	Tubular	.001 MF	25%	800V	20X1564	Tubular Rivet 3/16" (2)				
RESISTORS						S-58X24	Dial Assembly				
R-1	884223	Carbon	22K Ohms		0.5W	Consists of:					
R-2	883272	Carbon	2700 Ohms		0.5W	S25X31	Dial Bracket Assembly				
R-3	884471	Carbon	470 Ohms		0.5W	58X716	Dial Glass				
R-4	884104	Carbon	100K Ohms		0.5W	41X86	Light Shield (2)				
R-5	883680	Carbon	68 Ohms		0.5W	8X195	Rubber Strip (2)				
R-6	884122	Carbon	1200 Ohms		0.5W	28X564	Spring (4)				
R-8	885473	Carbon	47K Ohms		0.5W	28X56	Trimount Stud (4)				
R-9	885683	Carbon	68K Ohms		0.5W	6X21	Rubber Grommet (4)				
R-10	884102	Carbon	1000 Ohms		0.5W	10X38	Drive Cord Assembly				
R-11	884273	Carbon	27K Ohms		0.5W	13X546	Line Cord and Plug Assembly				
R-12	43X233	W.W. Resistor	3.6 Ohms		0.5W	19X179	Flat Washer (Mtg. Set to Cabinet) (3)				
R-13	884103	Carbon (2)	10K Ohms		0.5W	19X192	"C" Washer (Drive Shaft) (2)				
R-14								19X434	#8 Flat Washer (Mtg. 53X290) (2)		
R-15A	43X224	W.W. Resistor				20X260	Condenser Cushion Stud (3)				
R-15B							26X509	Drive Shaft			
R-16	884153	Carbon	15K Ohms		0.5W	28X113	Drive Cord Tension Spring				
R-17	36X379	Volume Control and Switch				30X547	Line Cord Clamp				
R-18	885225	Carbon	2.2 Megohms		0.5W						
R-19	40X288	Tone Control									

MODEL 94RA1-43-7605A



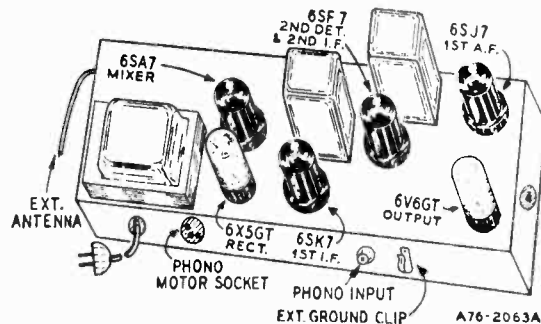
ELECTRICAL SPECIFICATIONS

Power Supply.....	105-125 volts AC, 60 cycles, 45 watts. (65 watts phono operating)
Frequency Range.....	B range—540-1600 KC D range—5.75 to 18.3 MC
Intermediate Frequency.....	455 KC
Selectivity.....	40 KC broad at 1000 times signal, 1000 KC
Sensitivity.....	(for .5 watt output) with external antenna B range—9 microvolts average D range—20 microvolts average
Power Output.....	4 watts maximum 2.3 watts, 10% distortion
Loud Speaker.....	10" PM dynamic
Voice Coil Impedance.....	3.2 ohms at 400 cycles
Record Changer.....	VM-800 RECORD CHANGER *
Tube and Dial Light Complement	1 6SA7 Mixer 1 6SK7 1st I-F Amplifier 1 6SF7 2nd I-F Amplifier & 2nd Det. 1 6SJ7 1st A-F Amplifier 1 6V6GT Power Output 1 6X5GT Rectifier 2 No. 47 Dial Lamps

GENERAL DESCRIPTION

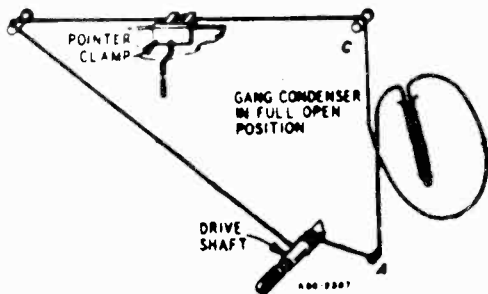
This model is a five tube (plus rectifier tube) AC console receiver with automatic record changer. Controls are provided for tuning, volume, tone, and band selection. The dial scale is calibrated in two bands, the broadcast band in channel numbers to cover frequencies between 540-1600 KC and the short wave band directly in megacycles from 5.75 to 18.3 MC. Other features include a built-in loop antenna, automatic volume control, beam power audio output stage and a PM dynamic speaker. A switch is provided on the tone control for selection of either radio or phono operation.

* See Manual No. 619-5 under Phonographs for parts.



DRIVE CORD REPLACEMENT

Turn the gang condenser to the fully open position. Use a new 10X53 drive cord assembly or a piece of cord 48 inches long and tie one end to the tension spring. Hook the other end of the tension spring to the tab on the drive pulley. Pass the cord through the slot in the drive pulley rim around idler stud A and wind three and one-half turns clockwise around the tuning shaft (turns must progress away from chassis). Then pass cord over idler studs B and C. Wrap cord counterclockwise around drive pulley, stretch tension spring and fasten free end of cord to spring.



ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.

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

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

The following equipment is required for aligning:

An All Wave Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.

Output Indicating Meter; Non-Metallic Screwdriver.

Dummy Antennas—.1 mf., 50 mmf., and 400 ohms.

	SIGNAL GENERATOR		Dummy Antenna	Band Switch Setting	CONDENSER SETTING	ADJUST TRIMMERS TO MAXIMUM
	Frequency Setting	Connection at Radio				
I-F	455 kc	6SA7, Pin 8	.1 mf	B Range	Turn Rotor to Full Open	2nd I-F (C-20) & (C-21) 1st I-F (C-15) & (C-16)
RANGE B	1620 kc	Antenna Lead	50 mmf	B Range	Turn Rotor to Full Open	Oscillator Range B (C9)
	1400 kc	Antenna Lead	50 mmf	B Range	Tune Rotor to Max. Output. Set Indicator to 1400 KC. See Note A	Antenna Range B (C3)
	600 kc	Antenna Lead	50 mmf	B Range	Tune Rotor to Max. Output	600 kc (C8) Rock Rotor—See Note B

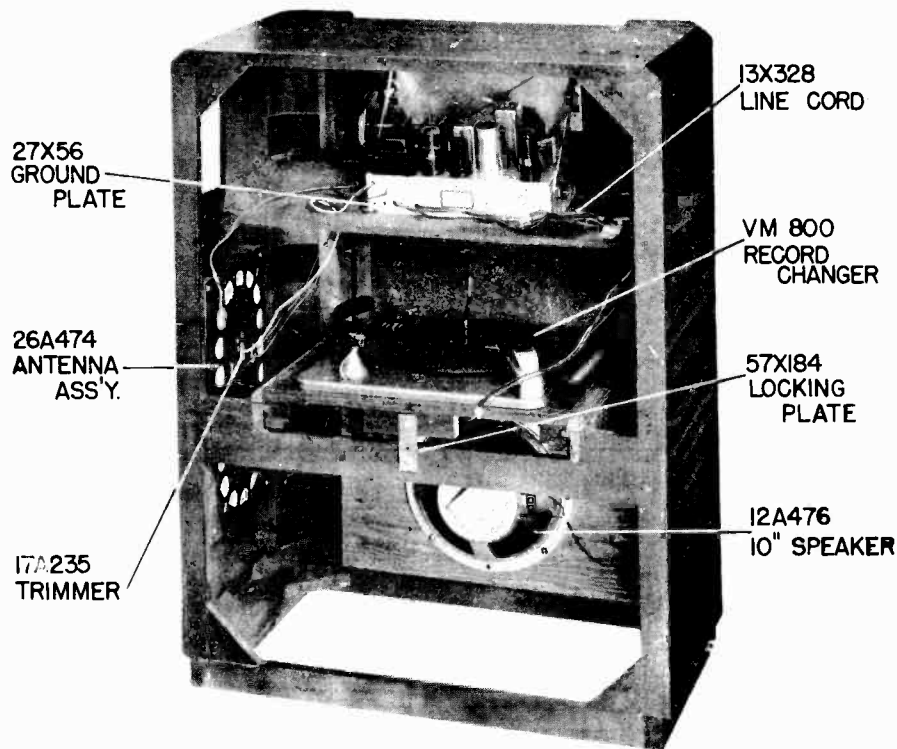
After each range is completed, repeat the procedure as a final check.

NOTE A—If the pointer is not at 1400 KC on the dial, re-set pointer at the 1400 KC mark on the dial scale.

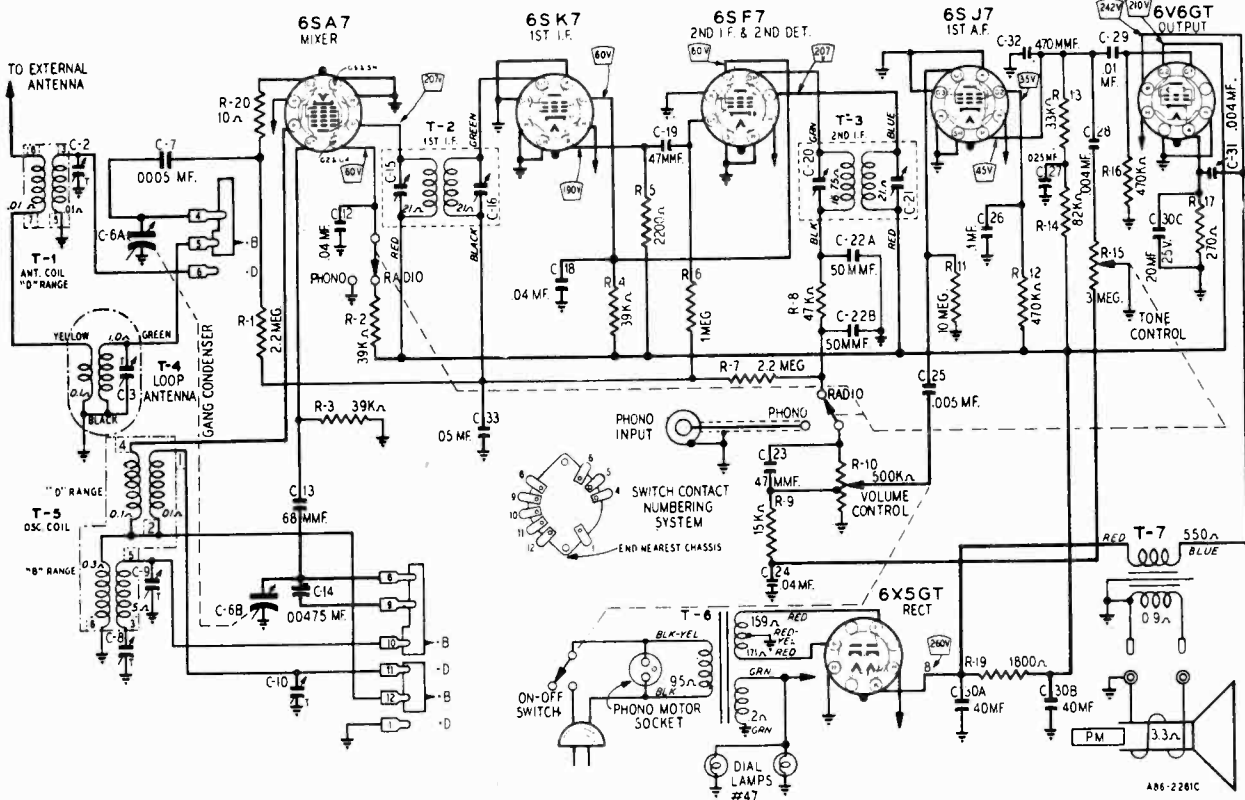
NOTE B—Turn the rotor back and forth and adjust the trimmer until the peak of greatest intensity is obtained.

Repeat above oscillator adjustments at 1620 and 600 KC until readjusting the oscillator Range B Trimmer (C9) causes no further improvement in output.

RANGE D	18.3 mc	Antenna Lead	400 Ohm	D Range	Turn Rotor to Full Open	Oscillator Range D (C10)
	16 mc	Antenna Lead	400 Ohm	D Range	Tune Rotor to Max. Output	Antenna Range D (C2) Rock Rotor—See Note B
LOOP RANGE B	Reassemble chassis in cabinet.					
	1400 kc	Antenna Lead	50 mmf	B Range	Tune Rotor to Max. Output	Antenna Range B (C3)



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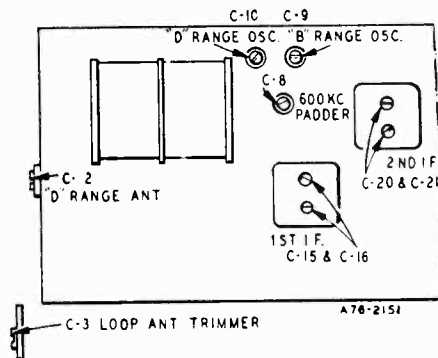
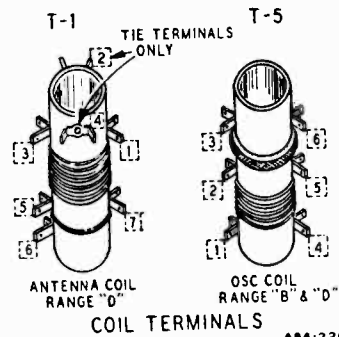
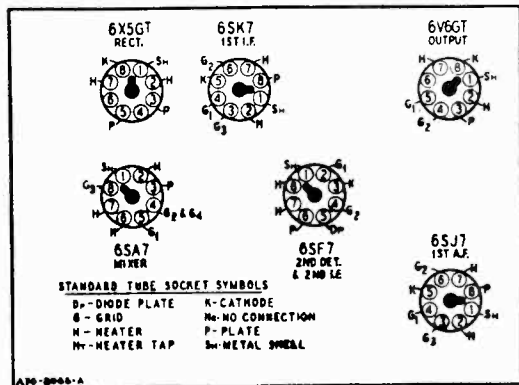
TUBE SOCKET VOLTAGES

Socket voltages are shown on the schematic diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground.

The readings were taken with a 1000 ohm per volt meter and all plate and screen voltages read on a 500 volt scale. Conditions of measurement are:

- Line voltage.....117 volts AC
- Volume control.....maximum
- Signal input.....none

A variation of +10% is usually permissible.



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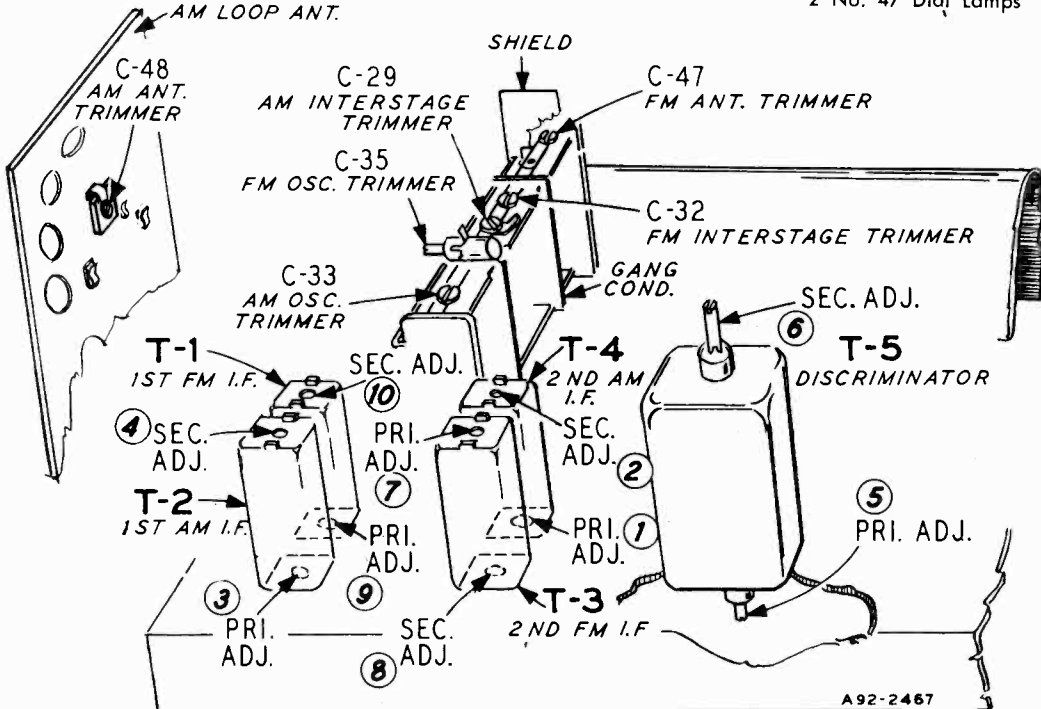
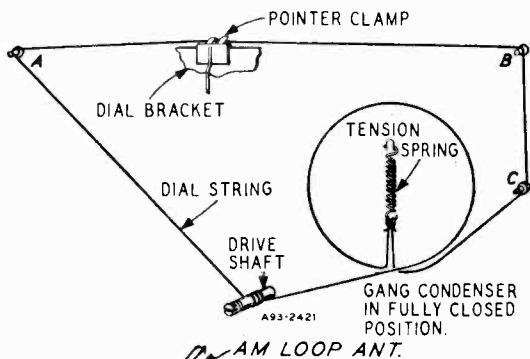
SYMBOL	PART NO.	DESCRIPTION	VALUE	RATING
CAPACITORS				
C-2	17A164	Trimmer	5-50 MMF	
C-3	17A235	Trimmer	2-24 MMF	
C-6A } C-6B }	14A206	Gang condenser with drive pulley		
C-7	B66501	Tubular	.0005 MF	200 V
C-8	17A155	Trimmer	350-430 MMF	
C-9 } C-10 }	17A109	Dual Trimmer	2.5-35 MMF	
C-12 } C-18 }	D66403	Tubular (2)	.04 MF	400V
C-13	47X466	Moulded	68 MMF	
C-14	46X289	Tubular	.00475 MF	
C-15 } C-16 }		Part of T-2 (1st I-F coil assembly)		
C-19 } C-23 }	47X463	Moulded (2)	47 MMF	
C-20 } C-21 }		Part of T-3 (2nd I-F coil assembly)		
C-22A } C-22B }	47X112	Dual mica	50-50 MMF	
C-24	D64403	Tubular	.04 MF	400V
C-25	D66502	Tubular	.005 MF	400V
C-26	D67104	Tubular	.10 MF	400V
C-27	D64253	Tubular	.025 MF	400V
C-28	D66402	Tubular	.004 MF	400V
C-29	D66103	Tubular	.01 MF	400V
C-30A } C-30B }	45X346	3 section Electrolytic	40 MF	450V
C-30C }			20 MF	25V
C-31	H66402	Tubular	.004 MF	800V
C-32	47X467	Moulded	47C MMF	
C-33	B66503	Tubular	.05 MF	200V
RESISTORS				
R-1 } R-7 }	B85225	Carbon (2)	2.2 megohm	0.5W
R-2 } R-4 }	C34393	Carbon (2)	39K ohm	1.0W
R-3	B84393	Carbon	39K ohm	0.5W
R-5	B84222	Carbon	2200 ohm	0.5W
R-6	B85105	Carbon	1 megohm	0.5W
R-8	B85473	Carbon	47K ohm	0.5W
R-9	B84153	Carbon	15K ohm	0.5W
R-10	36X358	Volume control & line switch	500K ohm	
R-11	B85106	Carbon	10 megohms	0.5W
R-12 } R-16 }	B85474	Carbon (2)	470K ohm	0.5W
R-13	B84333	Carbon	33K ohm	0.5W
R-14	B84823	Carbon	82K ohm	0.5W
R-15	40X276	Tone control & radio phono switch	3.0 megohm	
R-17	C84271	Carbon	270 ohm	1.0W
R-19	C84182	Carbon	1800 ohm	2.0W
R-20	B85100	Carbon	10 ohm	0.5W
TRANSFORMERS AND COILS				
T-1	9A1917	"D" Range antenna coil assembly		
T-2	9A1814	1st I-F coil assembly		
T-3	9A1815	2nd I-F coil assembly		
T-4	26A474	"B" Range loop antenna assembly		
T-5	9A1918	"B" & "D" Range oscillator coil assembly		
T-6	53X282	60 cycle, Standard power transformer		117V
T-7	51X134	Output transformer		
DIAL AND DRIVE ASSEMBLY				
S-58X20		Dial bracket ass'y (including dial bracket, idler pulley, rivets, and dial glass)		
	6X21	Rubber grommet (3)		
	20X329	Cond. cushion stud (3) } Mtg. gang cond.		
	26X435	Drive shaft		
	19X192	"C" Washer (for drive shaft) (2)		
	15X245	Pointer		
	28X113	Drive cord tension spring		
	10X53	Drive cord assembly		
	7A103	No. 47 Pilot light bulb (2)		
	7A224	Pilot light socket assembly		
	53X711	Dial glass		
	4X1023	Escutcheon		
MISCELLANEOUS				
	12A476	10" P.M. speaker		
	3A303	Tube socket-octal (8 prong) moulded (6)		
	3A304	Phono motor socket		
	3A305	Phono socket-single pin tip		
	2A372	Band change switch		
	13X328	Line cord and plug assembly		
	10A711	Knob (tuning) (4)		

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DRIVE CORD REPLACEMENT

Use a new 10X38 drive cord assembly or a new length of cord 46 inches long for the installation, winding three turns clockwise around the drive shaft with the turns progressing away from the chassis. After completing the installation, rotate the drive shaft a few turns to take up the slack in the cord.



ELECTRICAL SPECIFICATIONS

- Power Supply 105-125 volts AC 60 cycles, 80 watts, 100 watts with record changer
- Frequency Ranges..... Broadcast 540-1600 KC
Frequency Modulation 88-108 MC
- Intermediate Frequency. AM—455 KC
FM—10.7 MC
- Selectivity AM—43 KC broad at 1000 times signal, measured at 1000 KC
I.F. FM—200 KC broad at 2 times down
I.F. FM—760 KC broad at 200 times down
- AM Sensitivity (For .5 watt output with external antenna)
10 microvolts average
- FM Sensitivity (For .5 watt output)
30 microvolts average
- Power Output 8.5 watts maximum
6.0 watts 10% distortion
- Loud Speaker 12" PM Dynamic
- Voice Coil Impedance.. 3.2 ohms 400 cycles
- Record Changer Webster No. 146

Tube and Dial Lamp Complement

- 1 6BA6 AM-FM R-F Amplifier
- 1 12AT7 FM & AM Osc. & Mixer
- 1 6BA6 FM-AM 1st I-F Amplifier
- 1 6BA6 FM 2nd I-F Amplifier
- 1 6AL5 FM Detector
- 1 6AV6 Audio Amplifier, AM 2nd Detector and AVC
- 2 6K6-GT Audio Output
- 1 5Y3-GT Rectifier
- 1 6AV6 Phase Inverter
- 2 No. 47 Dial Lamps

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ALIGNMENT PROCEDURE AM STAGES

The following is required for aligning:
An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.
Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas
---.1 mf, 200 mmf.

Volume Control—Maximum all Adjustments
Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.
Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.

SIGNAL GENERATOR		CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
	FREQUENCY SETTING						
I-F	455 kc	12AT7 Pin 7 and Chassis	.1 mf	Broadcast	Rotor Fully Open	2nd I-F Pri. & Sec. ① & ② 1st I-F Pri. & Sec. ③ & ④	Maximum Output
Broadcast	1620 kc	External ant. lead	200 mmf	Broadcast	Rotor Fully Open	Broadcast Oscillator C-33	
	1400 kc	External ant. lead	200 mmf	Broadcast	Turn Rotor to Max. Output Set pointer to 1400 kc See Note A	Broadcast Interstage C-29 Loop Antenna C-48	
	1400 kc	External ant. lead	200 mmf	Broadcast			

Note A—If the pointer is not at 1400 KC on dial, reset pointer at the 1400 KC mark on the dial scale.

FM STAGES

The following equipment is required for aligning:
An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.
Non-metallic screwdriver.
Dummy Antennas and I-F Loading Resistor---.01 mf, 300 ohms and 1000 ohms.

Zero center scale DC vacuum tube voltmeter having a range of approximately 3 volts.
(If a zero center scale meter is not available, a standard scale vacuum tube voltmeter may be used by reversing the meter connections for negative readings.)
Allow chassis and signal generator to warm up for several minutes.

SIGNAL GENERATOR		CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
	FREQUENCY SETTING						
Discriminator	10.7 MC Note B	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Pri. ⑤ Note A	Maximum Deflection
	10.7 MC Note B	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Sec. ⑥ Note C	Zero Center
I-F	10.7 MC Note F	6BA6 1st I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	2nd I-F Pri. Note A and D ⑦ 2nd I-F Sec. Note A and E ⑧	Maximum Deflection
Discriminator	10.7 MC Note F	6BA6 1st I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Pri. ⑤ Note A	Maximum Deflection
	10.7 MC Note F	6BA6 1st I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Sec. ⑥ Note C	Zero Center
	10.7 MC Note F	FM-RF Gang Condenser terminal	.01 mf	FM	Rotor Fully Open	1st I-F Pri. ⑨ 1st I-F Sec. ⑩ Notes A, D & E	Maximum Deflection

Recheck I-F Adjustments in order given

R-F & Osc.	108.4 Note H	Disconnect dipole and connect generator to dipole terminals with resistor in series	300 ohms	FM	Rotor Fully Open	Oscillator C-35 Note G	Maximum Deflection
	104.5	Disconnect dipole and connect generator to dipole terminals with resistor in series	300 ohms	FM	Tune Rotor for Max. AVC voltage	FM Interstage C-32	Maximum Deflection
	104.5	Disconnect dipole and connect generator to dipole terminals with resistor in series	300 ohms	FM	Tune Rotor for Max. AVC voltage	Ant. C-47	Maximum Deflection

Recheck R-F and Osc. Adjustments in order given

NOTE A—Test Equipment connections are as given in the table. The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line at the junction of resistor R-22 and condenser C-18 for all adjustments except the discriminator secondary adjustment, for which See Note C.

NOTE B—A signal of .1 volt must be fed into the receiver for this adjustment.

NOTE C—Disconnect zero center DC vacuum tube voltmeter from AVC and connect to junction of R-18 and C-62. Adjust for zero voltage indication.

NOTE D—Before adjusting Pri. core connect 1000 ohm load resistor across the 2nd I.F. secondary terminals. Input may have to be increased to .1 volt if receiver is badly mis-aligned.

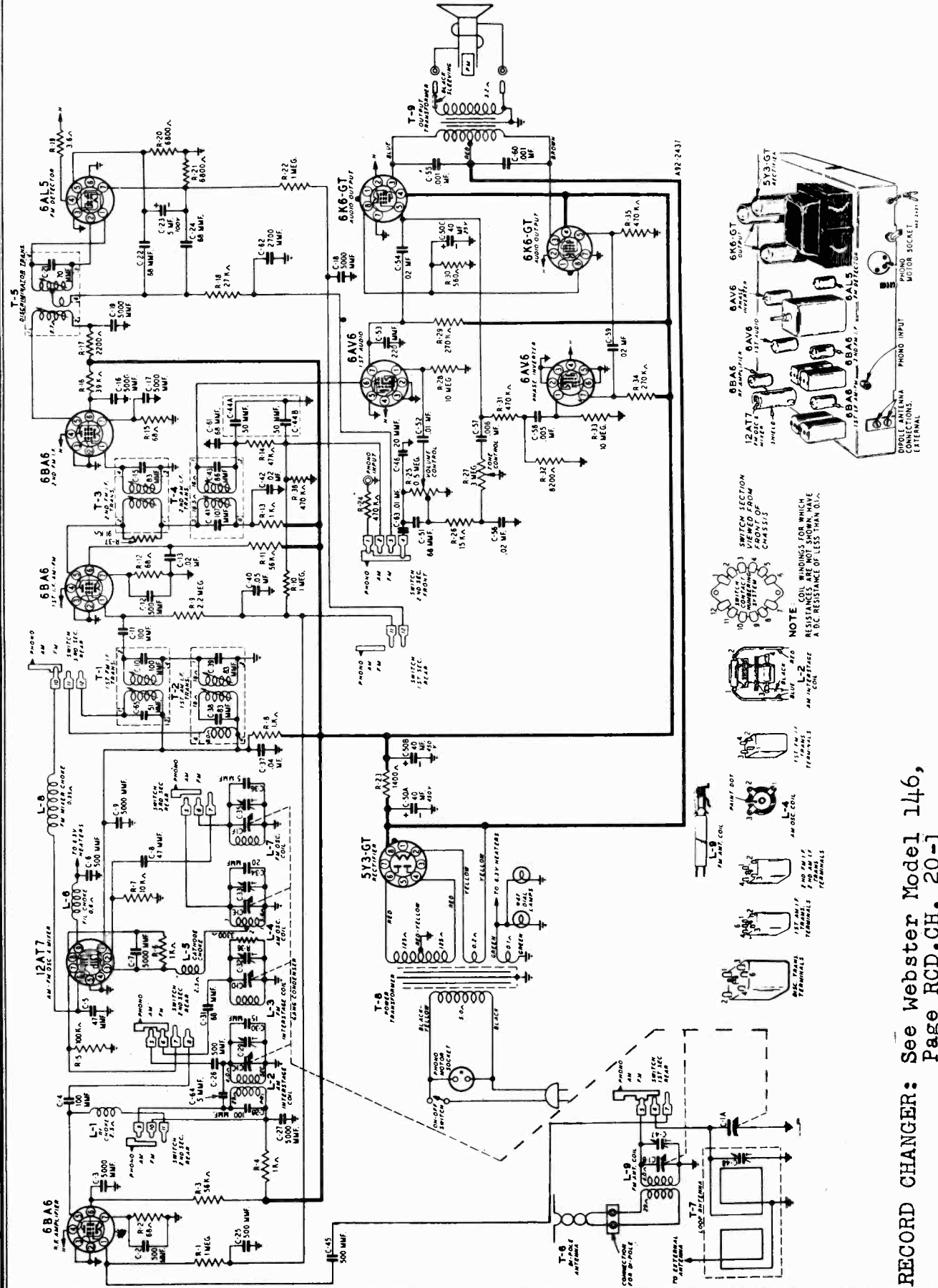
NOTE E—Disconnect 1000 ohm load resistor from secondary terminals and connect across the 2nd I.F. primary terminals. Input may have to be increased to .1 volt if receiver is badly mis-aligned.

NOTE F—Input can be reduced to 10,000 microvolts.

NOTE G—Oscillator frequency above signal frequency.

NOTE H—Remove the 1000 ohm load resistor before attempting to check the R-F and oscillator adjustments.

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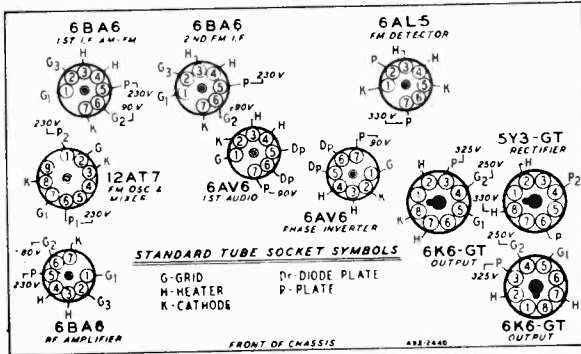
RECORD CHANGER: See Webster Model 146,
Page RCD.CH. 20-1

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TUBE SOCKET VOLTAGES

Socket voltages are shown on the Bottom Socket diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube volt-meter. Conditions of measurement are:

- Line voltage 117 Volts AC
- Signal Input None
- A variation of $\pm 10\%$ is usually permissible.



Ref. No.	DESCRIPTION	Part No.
CAPACITORS		
C-1	Gang Condenser and Pulley	14A207
C-2 } C-6 } C-12 } C-25 } C-26 } C-45 }	Capacitor, Ceramic 500 mmf $\pm 20\%$	47X496
C-3 } C-7 } C-9 } C-16 } C-17 } C-18 } C-19 } C-27 }	Capacitor, Silvered Mica, 5000 mmf	47X507
C-4	Capacitor, Ceramic, 100 mmf $\pm 20\%$	47X497
C-5	Capacitor, Ceramic, 47 mmf $\pm 5\%$	47X499
C-8	Capacitor, Ceramic 47 mmf $\pm 10\%$	47X498
C-10 } C-65 }	Part of T-1	
C-11 } C-28 }	Capacitor, Ceramic, 100 mmf $\pm 10\%$	47X550
C-13 } C-42 } C-54 } C-59 }	Capacitor, Tubular, .02 mf 600 V	F66203
C-15	Part of T-3	
C-21	Part of T-5	
C-22 } C-24 } C-31 } C-51 }	Capacitor, Ceramic, 68 mmf $\pm 10\%$	47X501
C-23	Capacitor, Dry Electrolytic, 5 mf 100 V	45X361
C-29 } C-32 } C-33 } C-47 }	Part of C-1	
C-30	Capacitor, Ceramic, 15 mmf $\pm 10\%$	47X552
C-34 } C-46 }	Capacitor, Ceramic 20 mmf $\pm 10\%$	47X516
C-35	Capacitor, Trimmer, 1-8 mmf	26A489
C-36 } C-64 }	Capacitor, Ceramic, 5 mmf $\pm 10\%$	47X549

Ref. No.	DESCRIPTION	Part No.										
C-37	Capacitor, Tubular, .04 mf 600 V	F66403										
C-38 } C-39 }	Part of T-2											
C-40	Capacitor, Tubular, .05 mf 200 V	B66503										
C-41 } C-43 }	Part of T-4											
C-44A } C-44B }	Capacitor, Dual Mica, 50-50 mmf	47X112										
C-48	Part of T-7											
C-50A } C-50B } C-50C }	Capacitor, 3 section Electrolytic	<table style="display: inline-table; border: none;"> <tr> <td style="border: none;">{</td> <td style="border: none;">40 mf 450 V.</td> <td style="border: none;">}</td> </tr> <tr> <td style="border: none;">{</td> <td style="border: none;">40 mf 450 V.</td> <td style="border: none;">}</td> </tr> <tr> <td style="border: none;">{</td> <td style="border: none;">40 mf 25 V.</td> <td style="border: none;">}</td> </tr> </table>	{	40 mf 450 V.	}	{	40 mf 450 V.	}	{	40 mf 25 V.	}	45X374
{	40 mf 450 V.	}										
{	40 mf 450 V.	}										
{	40 mf 25 V.	}										
C-52	Capacitor, Tubular, .01 mf 600 V	F66103										
C-53	Capacitor, Ceramic, 220 mmf $\pm 20\%$	47X468										
C-55 } C-60 }	Capacitor, Tubular, .001* mf 600 V	F66102										
C-56	Capacitor, Tubular, .02 mf 200 V	B66203										
C-57	Capacitor, Tubular, .006 mf 600 V	F66602										
C-58	Capacitor, Tubular, .005 mf 200 V	B66502										
C-61	Capacitor, Ceramic, 68 mmf $\pm 20\%$	47X471										
C-62	Capacitor, Molded Mica, 2700 mmf $\pm 10\%$	47X492										
C-63	Capacitor, Tubular, .01 mf 120 V	46X328										
RESISTORS												
R-1 } R-10 } R-22 }	Resistor, Carbon 1 Megohm .5 W.	B85105										
R-2 } R-12 } R-15 }	Resistor, Carbon 68 Ohms .5 W.	B83680										
R-3 } R-11 }	Resistor, Carbon 56K Ohms .5 W.	B84563										
R-4 } R-6 } R-8 } R-13 }	Resistor, Carbon 1000 Ohms .5 W.	B84102										
R-5	Resistor, Carbon 100K Ohms .5W.	B85104										
R-7	Resistor, Carbon 10K Ohms .5 W.	B84103										
R-9	Resistor, Carbon 2.2 Megohm .5 W.	B85225										

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Ref. No.	DESCRIPTION	Part No.
R-14	Resistor, Carbon 47K Ohms .5 W.	B85473
R-16	Resistor, Carbon 39K Ohms 1.0 W.	C84393
R-17	Resistor, Carbon 2200 Ohms .5 W.	B85222
R-18	Resistor, Carbon 27K Ohms .5 W.	B84273
R-19	Resistor, Wire Wound 3.6 Ohms .5 W.	43X233
R-20 } R-21 }	Resistor, Carbon 6800 Ohms .5 W.	B83682
R-23	Resistor, Wire Wound 1400 Ohms 5.0 W.	43X242
R-24 } R-31 } R-35 } R-38 }	Resistor, Carbon, 470 K Ohms .5 W.	B85474
R-25	Volume Control & Switch .5 meg.	36X381
R-26	Resistor, Carbon 15K Ohms .5 W.	B85153
R-27	Tone Control 3 meg.	40X289
R-28 } R-33 }	Resistor, Carbon 10 Megohm .5 W.	B85106
R-29 } R-34 }	Resistor, Carbon 270K Ohms .5 W.	B85274
R-30	Resistor, Carbon 560 Ohms 2.0 W.	D83561
R-32	Resistor, Carbon 8200 Ohms .5 W.	B84822
R-36	Resistor, Carbon 3300 Ohms .5 W.	B84332
R-37	Resistor, Carbon 91K Ohms .5 W.	B84913

COILS AND TRANSFORMERS

L-1 } L-5 }	Choke, Insulated 2 uh	35A1
L-2	Coil, Interstage (AM)	9A2025
L-3	Coil, Interstage (FM)	9A2024
L-4	Coil, Oscillator (AM)	9A2022
L-6	Choke, Filament	9A1881
L-7	Coil, Oscillator (FM)	9A2023
L-8	Choke (FM Mixer Plate 1/2 uh)	35A3
L-9	Coil, Antenna (FM)	9A2027
T-1	1st I.F. Coil Assembly (FM)	9A2034
T-2	1st I.F. Coil Assembly (AM)	9A2029
T-3	2nd I.F. Coil Assembly (FM)	9A2030
T-4	2nd I.F. Coil Assembly (AM)	9A1963
T-5	Discriminator Coil Assembly	9A1970
T-6	Dipole Antenna Assembly	9A2004
T-7	"B" Range Loop Antenna Assembly	9A1972
T-8	Power Transformer	53X286
T-9	Output Transformer	51X142

Ref. No.	DESCRIPTION	Part No.
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DIAL AND TUNING PARTS

Escutcheon	4X1023
Rubber Grommets	6X21
Condenser Cushion Stud } Mtg. Gang Condenser	20X260
Drive Cord Assembly	10X38
Pointer	15X245
"C" Washer (Drive Shaft)	19X192
Drive Shaft	26X510
Drive Cord Tension Spring	28X113
Dial Bracket Assembly	S-25X31
Consisting of:	
Tubular Rivet	20X1564
Shoulder Rivet	20X1580
Shoulder Rivet	20X1581
Eyelet	20X1508
Dial Bracket	25X1610
Support Bracket, L. H.	25X1611
Support Bracket, R. H.	25X1612
Dial Assembly	S-58X26
Consisting of:	
Dial Bracket Assembly	S-25X31
Rubber Strip	8X195
Trimount Stud	28X56
Spring	28X564
Light Shield	41X86
Dial Glass	58X720

MISCELLANEOUS

Band Change Switch	2A387
Phono Motor Socket	3A304
Phono Socket (Single Pin)	3A305
Molded Octal Tube Socket	3A435
Tube Socket (miniature, for AM-FM Converter)	3A436
Tube Socket (Miniature)	3A439
No. 47 Pilot Light	7A103
Pilot Light Socket Assembly	7A215
Knobs (Blonde)	10A728
Knobs (Mahogany)	10A729
12" P.M. Speaker	12A490
Line Cord & Plug Assembly	13X546
Tube Shield (Miniature)	32X390
Tube Shield (AM-FM Converter)	32X388

GENERAL DESCRIPTION

This radio is a 7 tube (including rectifier tube) AC receiver with automatic record changer, designed for reception of stations in the standard broadcast band between 540 and 1600 kilocycles and FM (Frequency Modulation) stations in the newly allocated FM Band of 88 - 108 megacycles. Controls are provided on the front panel for tuning, tone, volume and band or phono selection. Special features include two built-in antennas, automatic volume control, compensator circuits to prevent oscillator drift, beam power output stage, permanent magnet dynamic speaker and an electrostatic shield in the power transformer to reduce power line noise.



MODEL 94RA1-43-7751A

- Tube and Dial Lamp Complement**
- 1 6BA7 FM-AM Converter
 - 1 6BA6 1st I-F Amplifier
 - 1 6BA6 2nd I-F Amplifier
 - 1 6AL5 FM Discriminator
 - 1 6AV6 Audio Amplifier, AM 2nd Detector and AVC
 - 1 6V6GT Audio Output
 - 1 6X5GT Rectifier
 - 2 No. 47 Dial Lamp

ELECTRICAL SPECIFICATIONS

Power Consumption —
 117 volts AC—60 cycles 35 Watts
 55 watts phono operating

Power Output —
 1.5 watts maximum
 .9 watts 10% distortion

Speaker—8" PM dynamic

Frequency Ranges —
 Broadcast 540-1600 KC
 Frequency modulation 88-108 MC

Intermediate Frequency —
 AM 455 KC — FM 10.7 MC

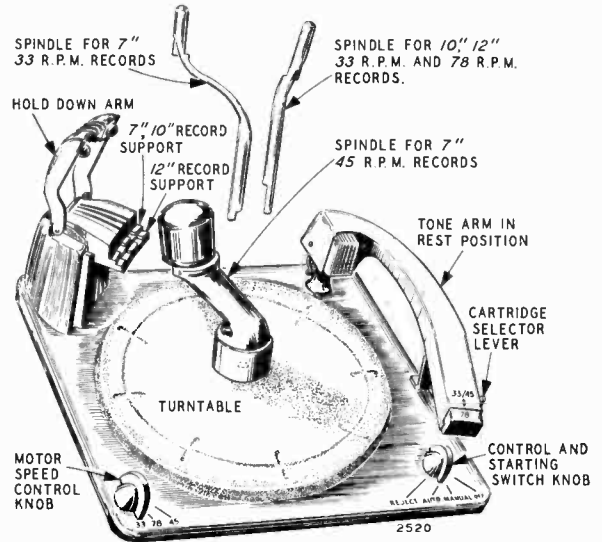
Selectivity — AM — 60 KC broad at 1000 times signal, measured at 1000 KC

I.F. FM—200 KC broad at 2 times down

I.F. FM — 700 KC broad at 200 times down

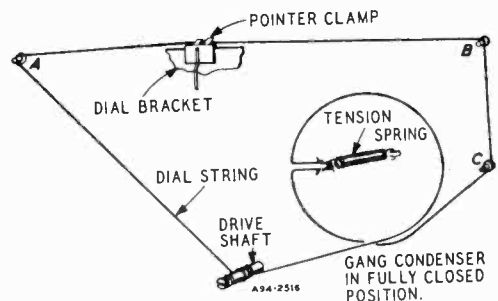
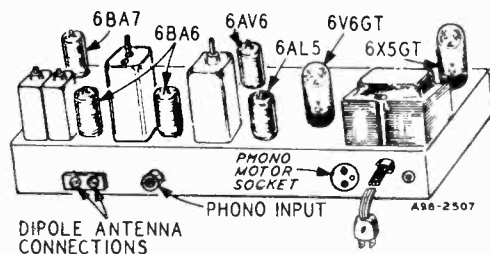
AM Sensitivity—(For .5 watt output with external antenna) 10 microvolts average

FM Sensitivity—(For .5 watt output) 100 microvolts average



DRIVE CORD REPLACEMENT

Replacement of the drive cord may be accomplished as shown in the illustration. For this purpose use the new drive cord assembly listed in the Replacement Parts List. Turn the gang condenser until the plates are fully meshed. Then install the string as shown, winding three turns clockwise around the tuning shaft with the turns progressing away from the chassis. After the cord is installed, rotate the tuning shaft several times in order to take up any slack in the cord.



ALIGNMENT PROCEDURES

AM STAGES

Volume Control Maximum all Adjustments.
 Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.
 Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.

The following is required for aligning:
 An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.
 Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas — .1 mf, and 50 mmf.

FREQUENCY SETTING	SIGNAL GENERATOR CONNECTION AT RADIO	GROUND CONNECTION	DUMMY ANTENNA	GANG CONDENSER SETTING	ADJUST TUNING SLUGS AND TRIMMERS
455 KC	Control Grid 1st 6BA6 Pin No. 1	Chassis Base	.1 mf	Turn Rotor to Full Open	2nd I.F. C-21 & C-22
455 KC	Control Grid 6BA7 Pin No. 7 1st Det.	Same as above	.1 mf	Turn Rotor to Full Open	1st I.F. Pri. & Sec.
1620 KC	Control Grid 6BA7 Pin No. 7	Same as above	.1 mf	Turn Rotor to Full Open	Oscillator C-7
1400 KC	External Antenna Clip	Same as above	50 mmf	Turn Dial to 1400 KC. See Note A	Antenna C-2

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

FM STAGES

Allow chassis and signal generator to warm up for several minutes. The following equipment is required for aligning:
 An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.
 Non-metallic screwdriver.
 Dummy Antennas and I-F Loading Resistor—2500 mmf, 300 ohms and a 3300 ohm .5 watt resistor with short leads.

Zero center scale DC vacuum tube voltmeter having a range of approximately 3 volts.
 (If a zero center scale meter is not available, a standard scale vacuum tube voltmeter may be used by reversing the meter connections for negative readings.)

	SIGNAL GENERATOR				BAND SWITCH SETTING	CONDENSER SETTING	ADJUSTMENT FOR MAX. METER DEFLECTION
	FREQUENCY SETTING	CONNECTION AT RADIO	DUMMY ANTENNA				
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 & Chassis	2500 mmf		FM	Rotor Fully Open	Disc. Pri. Note A
	10.7 MC	Same as above	2500 mmf		FM	Rotor Fully Open	Disc. Sec. Note B
	10.7 MC	Same as above	2500 mmf		FM	Rotor Fully Open	Disc. Pri. Note A
	10.7 MC	Same as above	2500 mmf		FM	Rotor Fully Open	Disc. Sec. Note B
I-F	10.7 MC Note E	6BA6 1st I-F Pin 1 & Chassis	2500 mmf		FM	Rotor Fully Open	2nd I-F Note C
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 & Chassis	2500 mmf		FM	Rotor Fully Open	Disc. Pri. Note A
I-F	10.7 MC	Antenna and Chassis	2500 mmf		FM	Rotor Fully Open	1st. I-F Pri. and Sec. and Note C
	10.7 MC	Antenna and Chassis Solder a 3300 ohm resistor across terminals 3 and 4 of 1st. I-F trans.	2500 mmf		FM	Rotor Fully Open	1st. I-F Pri. Note C
	10.7 MC	Antenna and Chassis Note D	2500 mmf		FM	Rotor Fully Open	1st. I-F Sec. Note C

RECHECK I-F ADJUSTMENTS IN ORDER GIVEN

Oscillator	108.4 Note F	Disconnect dipole antenna and connect generator to dipole terminals with resistor in series	300 ohms	FM	Rotor Fully Open	Osc. C-12
Antenna	104.5	Same as above	300 ohms	FM	Tune rotor for max. AVC voltage	Ant. C-3

RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN

FM ALIGNMENT NOTES

NOTE A—The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line. A signal of .1 volt must be fed into the receiver for this adjustment.
 Note output voltage on the zero center DC vacuum tube voltmeter.

NOTE B—Disconnect zero center DC vacuum tube voltmeter from AVC and connect it to the audio takeoff point at the 27 K ohm resistor (R-11) and its junction with the terminal strip. Adjust for zero voltage indication.

NOTE C—Connect zero center DC vacuum tube voltmeter as in Note A. Adjust input to give same output on the zero center DC vacuum tube voltmeter as in Note A.

NOTE D—Unsolder 3300 ohm resistor from terminals 3 and 4 of 1st I-F transformer and resolder across terminals 1 and 2.

NOTE E—2nd I-F Trimmers (AM) must be aligned before attempting to adjust 2nd I-F (FM) tuning slug.

NOTE F—Remove the 3300 ohm load resistor before attempting to check the antenna and oscillator adjustments.

MODEL 94RA1-43-7751A

REPLACEMENT PARTS LIST

When ordering parts, specify part number, model number and any other pertinent information.

Ref. No.	DESCRIPTION	Part No.
CAPACITORS		
C-1	Gang Condenser & Pulley	14A204
C-2	Capacitor, Trimmer; 2-24 mmf	17A256
C-3 } C-7 }	Part of C-1 (Gang Condenser)	
C-4	Capacitor, Ceramic; 6 mmf	47X521
C-5 } C-11 } C-14 } C-19 } C-20 } C-24 } C-39 }	Capacitor, Ceramic; 5000 mmf	47X507
C-6	Capacitor, Ceramic; 15 mmf	47X552
C-8	Capacitor, Ceramic; 12 mmf	47X522
C-9	Capacitor, Ceramic; 47 mmf \pm 10%	47X517
C-10	Capacitor, Ceramic; 10 mmf	47X512
C-12	Capacitor, Trimmer; 1-8 mmf	17A255
C-15 } C-16 }	Part of T-5 (1st I-F Trans. AM)	
C-17	Part of T-4 (1st I-F Trans. FM)	
C-18 } C-29 }	Capacitor, Tubular; .05 mf 200 V	B66503
C-21 } C-22 }	Part of T-6 (2nd I-F Trans. AM-FM)	
C-23	Capacitor, Ceramic; 100 mmf	47X476
C-25	Part of T-7 (FM Disc. Trans.)	
C-26	Capacitor, Molded Mica; 2700 mmf	47X492
C-27 } C-35 }	Capacitor, Ceramic; 220 mmf	47X468
C-28	Capacitor, Dry Electrolytic; 5 mf 100 V	45X361
C-30A } C-30B } C-30C }	Capacitor, Dry Electrolytic; 40 mf 200 V 40 mf 150 V 20 mf 25 V	45X360
C-31A } C-31B }	Capacitor, Dual Mica; 50-50 mmf	47X112
C-32	Capacitor, Molded Mica; 68 mmf	47X471
C-33	Capacitor, Tubular; .04 mf 200 V	B66403
C-34	Capacitor, Tubular; .005 mf 400 V	D66502
C-36	Capacitor, Tubular; .02 mf 400 V	D66203
C-37	Capacitor, Tubular; .004 mf 200 V	B66402
C-38	Capacitor, Tubular; .001 mf 800 V	H66102
C-40	Capacitor, Ceramic; 47 mmf \pm 20%	47X509

Ref. No.	DESCRIPTION	Part No.
RESISTORS		
R-1	Resistor, Carbon; 22K ohms 0.5 W	B84223
R-2	Resistor, Carbon; 2700 ohms 0.5 W	B84272
R-3	Resistor, Carbon; 470 ohms 0.5 W	B84471
R-4	Resistor, Carbon; 100K ohms 0.5 W	B85104
R-5	Resistor, Carbon; 68 ohms 0.5 W	B83680
R-6	Resistor, Carbon; 1200 ohms 0.5 W	B85122
R-8	Resistor, Carbon; 47K ohms 0.5 W	B85473
R-9	Resistor, Carbon; 68K ohms 0.5 W	B84683
R-10	Resistor, Carbon; 1000 ohms 0.5 W	B85102
R-11	Resistor, Carbon; 27K ohms 0.5 W	B85273
R-12	Resistor, Wirewound; 3.6 ohms 0.5 W	43X233
R-13 } R-14 }	Resistor, Carbon; 6800 ohms 0.5 W	B84682
R-15	Resistor, Carbon; 1000 ohms 2.0 W	DB4102
R-16	Resistor, Carbon; 15K ohms 0.5 W	B85153

Ref. No.	DESCRIPTION	Part No.
R-17	Volume Control & Switch; .5 megohm	36X372
R-18	Resistor, Carbon; 2.2 megohms 0.5 W	B85225
R-19	Tone Control; 3 megohms	40X285
R-20	Resistor, Carbon; 10 megohms 0.5 W	B85106
R-21 } R-22 }	Resistor, Carbon; 470K ohms 0.5 W	B85474
R-23	Resistor, Carbon; 270 ohms 0.5 W	B84271
R-24	Resistor, Carbon; 100 ohms 0.5 W	B84101
TRANSFORMERS AND COILS		
L-1 } L-5 }	Choke, Filament	9A2044
L-2	Choke, Insulated 2 uh.	35A5
L-3	Choke, Parasitic	9A1940
L-4	Coil, Oscillator (FM)	9A2021
T-1	"B" Range Loop Antenna Assembly	9A2052
T-2	Coil, Antenna	9A1956
T-3	Coil, Oscillator (AM)	9A1997
T-4	1st I-F Trans. (FM)	9A2037
T-5	1st I-F Trans. (AM)	9A2038
T-6	2nd I-F Trans. (AM-FM)	9A1999
T-7	Discriminator Coil Assembly	9A2036
T-8	Dipole Antenna	9A2003
T-9	Power Transformer	53X291
T-10	Output Transformer	51X134

DIAL AND TUNING PARTS	
Rubber Grommets (mtg. Gang Cond.)	6X67
Pointer	15X251
"C" Washer (Drive Shaft)	19X192
Condenser Cushion Stud	20X260
Drive Shaft	26X486
Drive Cord Tension Spring	28X113
Dial Glass	58X725

MISCELLANEOUS	
Band Change Switch	2A375
Tube Socket, Molded (Octal)	3A303
Phono Motor Socket	3A304
Phono Socket (Single Pin)	3A305
Tube Socket (Miniature)	3A426
Tube Socket (AM-FM Converter)	3A443
No. 47 Pilot Light	7A103
Pilot Light Socket Assembly	7A199
Knob (Tuning)	10A699
Knob (Off-Volume)	10A700
Knob (Tone)	10A701
Knob (FM-BC-PH)	10A702
Speaker, 8" P.M.	12A477
Record changer—3 speed	28A165
Escutcheon	4X1060
Drive Cord Assembly	10X72
Line Cord & Plug Assembly	13X546
Line Cord Clamp	30X547

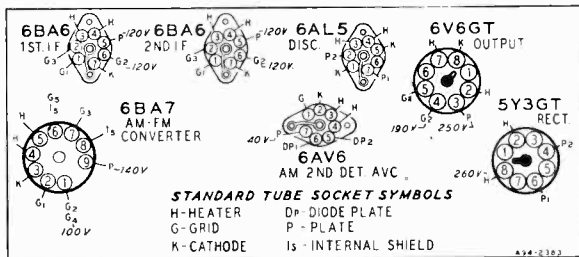
MODEL 94RA1-43-7853A



GENERAL DESCRIPTION

This radio is a 7 tube (including rectifier tube) AC receiver with automatic record changer, designed for reception of stations in the standard broadcast band between 540 and 1600 kilocycles and FM (Frequency Modulation) stations in the newly allocated FM Band of 88-108 megacycles. Controls are provided on the front panel for tuning, tone, volume and band or phono selection. Special features include two built-in antennas, automatic volume control, compensator circuits to prevent oscillator drift, beam power output stage, permanent magnet dynamic speaker and an electrostatic shield in the power transformer to reduce power line noise.

- Tube and Dial Lamp Complement**
- 1 6BA7 FM-AM Converter
 - 1 6BA6 1st I-F Amplifier
 - 1 6BA6 2nd I-F Amplifier
 - 1 6AL5 FM Discriminator
 - 1 6AV6 Audio Amplifier, AM 2nd Detector and AVC
 - 1 6V6GT Audio Output
 - 1 5Y3GT Rectifier
 - 2 No. 47 Dial Lamps



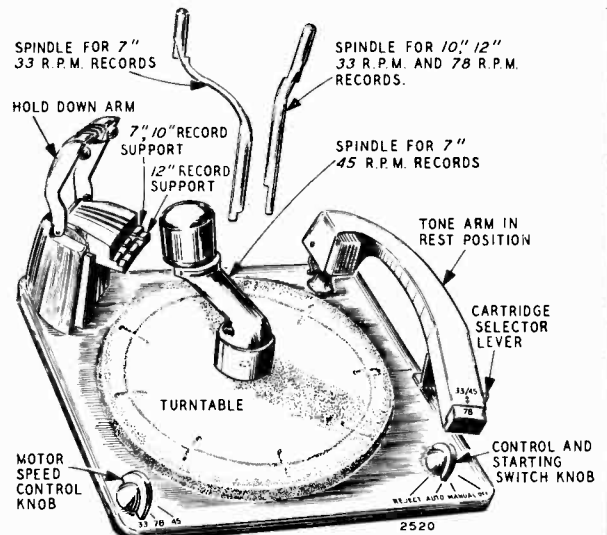
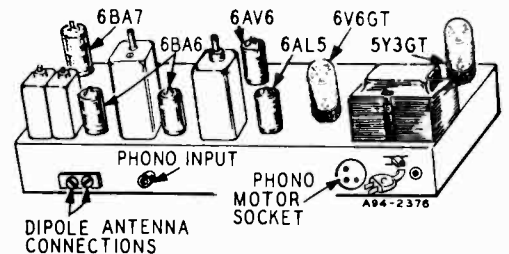
TUBE SOCKET VOLTAGES

Socket voltages are shown on the Bottom Socket diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube volt-meter. Conditions of measurement are:

- Line voltage117 Volts AC
- Signal InputNone
- A Variation of $\pm 10\%$ is usually permissible.

ELECTRICAL SPECIFICATIONS

- Power Supply 105-125 volts AC 60 cycles, 60 watts. 80 watts with record changer.
- Frequency Ranges Broadcast 540-1600 KC
Frequency Modulation 88-108 MC
- Intermediate Frequency. AM-455 KC
FM-10.7 MC
- Selectivity..... AM-45 KC broad at 1000 times signal, measured at 1000 KC
I.F. FM-200 KC broad at 2 times down
I.F. FM-950 KC broad at 200 times down
- AM Sensitivity..... (For .5 watt output with external antenna) 10 microvolts average
- FM Sensitivity (For .5 watt output) 100 microvolts average
- Power Output 4.5 watts maximum
2.5 watts 10% distortion
- Loud Speaker 8" PM Dynamic
- Voice Coil Impedance... 3.2 ohms 400 cycles



MODEL 94RA1-43-7853A

ALIGNMENT PROCEDURES

AM STAGES

Volume Control Maximum all Adjustments.

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

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

The following is required for aligning:

An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.

Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas — .1 mf, and 50 mmf.

SIGNAL GENERATOR		GROUND CONNECTION	DUMMY ANTENNA	GANG CONDENSER SETTING	ADJUST TUNING SLUGS AND TRIMMERS
FREQUENCY SETTING	CONNECTION AT RADIO				
455 KC	Control Grid 1st 6BA6 Pin No. 1	Chassis Base	.1 mf	Turn Rotor to Full Open	2nd I.F. C-21 & C-22
455 KC	Control Grid 6BA7 Pin No. 7 1st Det.	Same as above	.1 mf	Turn Rotor to Full Open	1st I.F. Pri. & Sec.
1620 KC	Control Grid 6BA7 Pin No. 7	Same as above	.1 mf	Turn Rotor to Full Open	Oscillator C-7
1400 KC	External Antenna Clip	Same as above	50 mmf	Turn Dial to 1400 KC. See Note A	Antenna C-2

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

FM STAGES

Allow chassis and signal generator to warm up for several minutes.

The following equipment is required for aligning:

An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.

Non-metallic screwdriver.

Dummy Antennas and I-F Loading Resistor—2500 mmf, 300 ohms and a 3300 ohm .5 watt resistor with short leads.

Zero center scale DC vacuum tube voltmeter having a range of approximately 3 volts.

(If a zero center scale meter is not available, a standard scale vacuum tube voltmeter may be used by reversing the meter connections for negative readings.)

	SIGNAL GENERATOR			BAND SWITCH SETTING	CONDENSER SETTING	ADJUSTMENT FOR MAX. METER DEFLECTION
	FREQUENCY SETTING	CONNECTION AT RADIO	DUMMY ANTENNA			
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 & Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. Note A
	10.7 MC	Same as above	2500 mmf	FM	Rotor Fully Open	Disc. Sec. Note B
	10.7 MC	Same as above	2500 mmf	FM	Rotor Fully Open	Disc. Pri. Note A
	10.7 MC	Same as above	2500 mmf	FM	Rotor Fully Open	Disc. Sec. Note B
I-F	10.7 MC Note E	6BA6 1st I-F Pin 1 & Chassis	2500 mmf	FM	Rotor Fully Open	2nd I-F Note C
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 & Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. Note A
I-F	10.7 MC	Antenna and Chassis	2500 mmf	FM	Rotor Fully Open	1st. I-F Pri. and Sec. and Note C
	10.7 MC	Antenna and Chassis Solder a 3300 ohm resistor across terminals 3 and 4 of 1st. I-F trans.	2500 mmf	FM	Rotor Fully Open	1st. I-F Pri. Note C
	10.7 MC	Antenna and Chassis Note D	2500 mmf	FM	Rotor Fully Open	1st. I-F Sec. Note C

RECHECK I-F ADJUSTMENTS IN ORDER GIVEN

Oscillator	108.4 Note F	Disconnect dipole antenna and connect generator to dipole terminals with resistor in series	300 ohms	FM	Rotor Fully Open	Osc. C-12
Antenna	104.5	Same as above	300 ohms	FM	Tune rotor for max. AVC voltage	Ant. C-3

RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN

FM ALIGNMENT NOTES

NOTE A—The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line. A signal of .1 volt must be fed into the receiver for this adjustment.
Note output voltage on the zero center DC vacuum tube voltmeter.

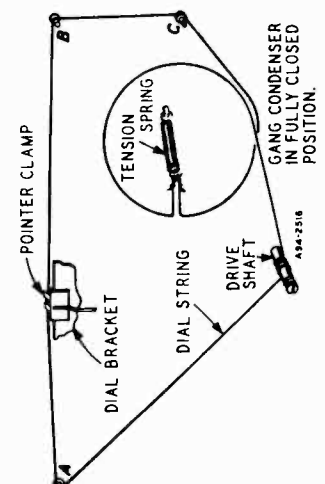
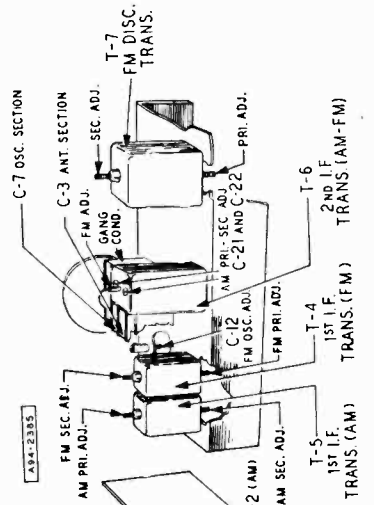
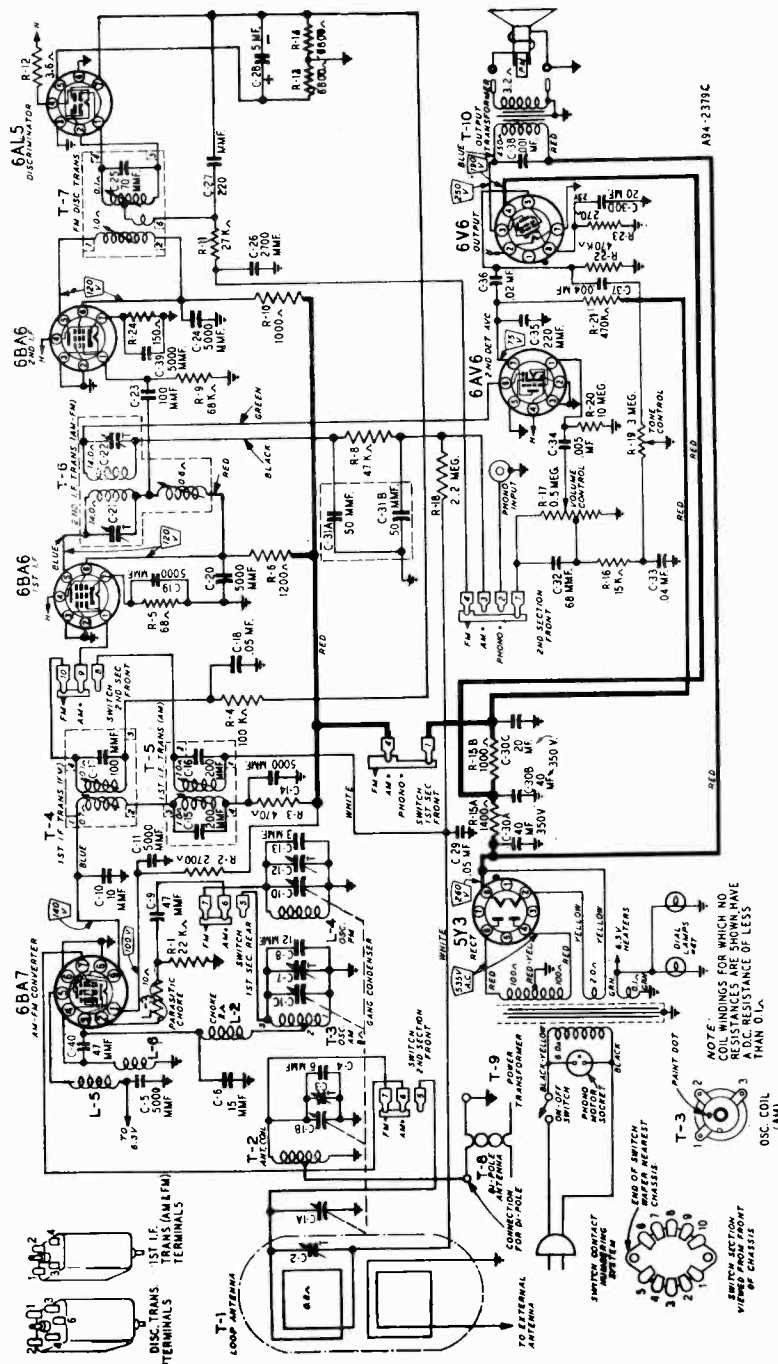
NOTE B—Disconnect zero center DC vacuum tube voltmeter from AVC and connect it to the audio takeoff point at the 27 K ohm resistor (R-11) and its junction with the terminal strip. Adjust for zero voltage indication.

NOTE C—Connect zero center DC vacuum tube voltmeter as in Note A. Adjust input to give same output on the zero center DC vacuum tube voltmeter as in Note A.

NOTE D—Unsolder 3300 ohm resistor from terminals 3 and 4 of 1st I-F transformer and resolder across terminals 1 and 2.

NOTE E—2nd I-F Trimmers (AM) must be aligned before attempting to adjust 2nd I-F (FM) tuning slug.

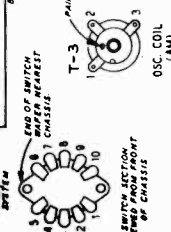
NOTE F—Remove the 3300 ohm load resistor before attempting to check the antenna and oscillator adjustments.



DRIVE CORD REPLACEMENT

Replacement of the drive cord may be accomplished as shown in the illustration. For this purpose use the new drive cord assembly listed in the Replacement Parts List. Turn the gang condenser until the plates are fully meshed. Then install the string as shown, winding three turns clockwise around the tuning shaft with the turns progressing away from the chassis. After the cord is installed, rotate the tuning shaft several times in order to take up any slack in the cord.

NOTE: COIL WINDINGS FOR WHICH NO RESISTANCES ARE SHOWN, HAVE A TOLERANCE OF LESS THAN 0.1%.



MODEL 94RA1-43-7853A

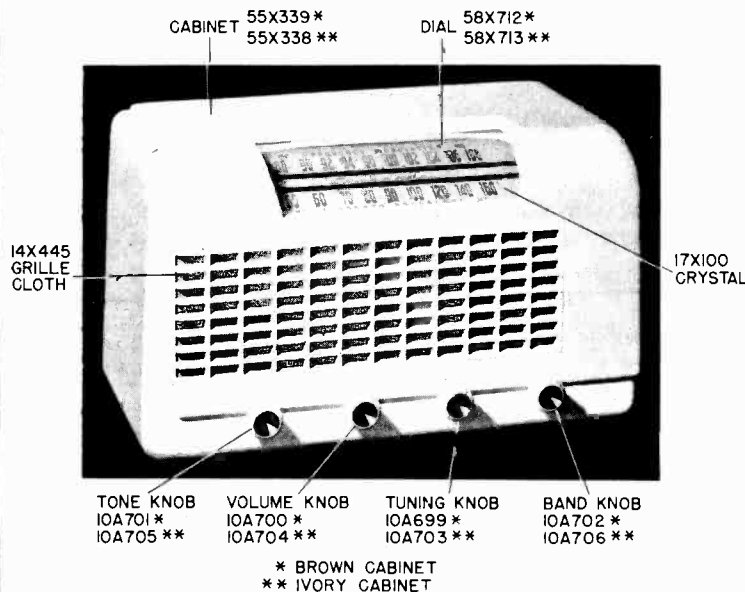
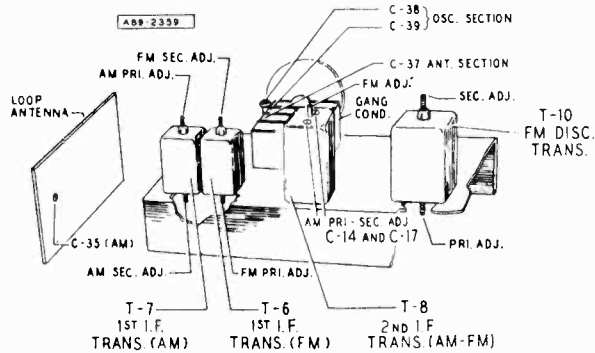
REPLACEMENT PARTS LIST

When ordering parts, specify part number, model number and any other pertinent information.

Ref. No.	DESCRIPTION	Part No.
CAPACITORS		
C-1	Gang Condenser & Pulley	14A204
C-2	Capacitor, Trimmer; 2-24 mmf	17A256
C-3 } C-7 }	Part of C-1 (Gang Condenser)	
C-4	Capacitor, Ceramic; 6 mmf	47X521
C-5 } C-11 } C-14 } C-19 } C-20 } C-24 } C-39 }	Capacitor, Ceramic; 5000 mmf	47X507
C-6	Capacitor, Ceramic; 15 mmf	47X552
C-8	Capacitor, Ceramic; 12 mmf	47X522
C-9	Capacitor, Ceramic; 47 mmf \pm 10%	47X517
C-10	Capacitor, Ceramic; 10 mmf	47X512
C-12	Capacitor, Trimmer; 1-8 mmf	17A255
C-15 } C-16 }	Part of T-5 (1st I-F Trans. AM)	
C-17	Part of T-4 (1st I-F Trans. FM)	
C-18 } C-29 }	Capacitor, Tubular; .05 mf 200 V	B66503
C-21 } C-22 }	Part of T-6 (2nd I-F Trans. AM-FM)	
C-23	Capacitor, Ceramic; 100 mmf	47X476
C-25	Part of T-7 (FM Disc. Trans.)	
C-26	Capacitor, Molded Mica; 2700 mmf	47X492
C-27 } C-35 }	Capacitor, Ceramic; 220 mmf	47X468
C-28	Capacitor, Dry Electrolytic; 5 mf 100 V	45X361
C-30A } C-30B } C-30C } C-30D }	Capacitor, Dry Electrolytic; 40 mf 350 V	45X359
C-31A } C-31B }	Capacitor, Dual Mica; 50-50 mmf	47X112
C-32	Capacitor, Molded Mica; 68 mmf	47X471
C-33	Capacitor, Tubular; .04 mf 200 V	B66403
C-34	Capacitor, Tubular; .005 mf 400 V	D66502
C-36	Capacitor, Tubular; .02 mf 400 V	D66203
C-37	Capacitor, Tubular; .004 mf 200 V	B66402
C-38	Capacitor, Tubular; .001 mf 800 V	H66102
C-40	Capacitor, Ceramic; 47 mmf \pm 20%	47X509
RESISTORS		
R-1	Resistor, Carbon; 22K ohms 0.5 W	B84223
R-2	Resistor, Carbon; 2700 ohms 0.5 W	B84272
R-3	Resistor, Carbon; 470 ohms 0.5 W	B84471
R-4	Resistor, Carbon; 100K ohms 0.5 W	B85104
R-5	Resistor, Carbon; 68 ohms 0.5 W	B83680
R-6	Resistor, Carbon; 1200 ohms 0.5 W	B85122
R-8	Resistor, Carbon; 47K ohms 0.5 W	B85473
R-9	Resistor, Carbon; 68K ohms 0.5 W	B84683
R-10	Resistor, Carbon; 1000 ohms 0.5 W	B85102
R-11	Resistor, Carbon; 27K ohms 0.5 W	B85273
R-12	Resistor, Wirewound; 3.6 ohms 0.5 W	43X233
R-13 } R-14 }	Resistor, Carbon; 6800 ohms 0.5 W	B84682
R-15A } R-15B }	Resistor, Wirewound; 1000 ohms 4.0 W	43X224
	1400 ohms 6.0 W	

Ref. No.	DESCRIPTION	Part No.
R-16	Resistor, Carbon; 15K ohms 0.5 W	B85153
R-17	Volume Control & Switch; .5 megohm	36X372
R-18	Resistor, Carbon; 2.2 megohms 0.5 W	B85225
R-19	Tone Control; 3 megohms	40X285
R-20	Resistor, Carbon; 10 megohms 0.5 W	PE5105
R-21 } R-22 }	Resistor, Carbon; 470K ohms 0.5 W	B85474
R-23	Resistor, Carbon; 270 ohms 0.5 W	B84271
R-24	Resistor, Carbon; 150 ohms 0.5 W	B84151
TRANSFORMERS AND COILS		
L-2	Choke, Insulated 2 uh.	35A5
L-3	Choke, Parasitic	9A1940
L-4	Coil, Oscillator (FM)	9A2021
L-5 } L-6 }	Choke, Filament	9A2044
T-1	"B" Range Loop Antenna Assembly	9A2051
T-2	Coil, Antenna	9A1956
T-3	Coil, Oscillator (AM)	9A1997
T-4	1st I-F Trans. (FM)	9A2037
T-5	1st I-F Trans. (AM)	9A2038
T-6	2nd I-F Trans. (AM-FM)	9A1999
T-7	Discriminator Coil Assembly	9A2036
T-8	Dipole Antenna	9A2005
T-9	Power Transformer	53X290
T-10	Output Transformer	51X134
DIAL AND TUNING PARTS		
	Rubber Grommets (mtg. Gang Cond.)	6X21
	Pointer	15X252
	"C" Washer (Drive Shaft)	19X192
	Condenser Cushion Stud	20X260
	Drive Shaft	26X486
	Drive Cord Tension Spring	28X113
	Dial Glass	58X726
MISCELLANEOUS		
	Band Change Switch	2A384
	Tube Socket, Molded (Octal)	3A303
	Phono Motor Socket	3A304
	Phono Socket (Single Pin)	3A305
	Tube Socket (Miniature)	3A426
	Tube Socket (AM-FM Converter)	3A443
	No. 47 Pilot Light	7A103
	Pilot Light Socket Assembly	7A197
	Knob	10A729
	Speaker, 8" P.M.	12A477
	Record changer—3 speed	28A165
	Escutcheon	4X1060
	Drive Cord Assembly	10X72
	Line Cord & Plug Assembly	13X546
	Line Cord Clamp	30X547

MODELS 94RA1-43-8510A,
94RA1-43-8511A



ELECTRICAL SPECIFICATIONS

Power Consumption—
117 volts AC—35 watts

Power Output—
1.5 watts maximum
.9 watts 10% distortion

Speaker—4 x 6 inch oval PM dynamic

Frequency Ranges—
Broadcast 540-1600 KC
Frequency modulation 88-108 MC

Intermediate Frequency—
AM 455 KC — FM 10.7 MC

Selectivity — AM — 60 KC broad
at 1000 times signal, measured
at 1000 KC

I.F. FM—200 KC broad at 2 times
down

I.F. FM—700 KC broad at 200
times down

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

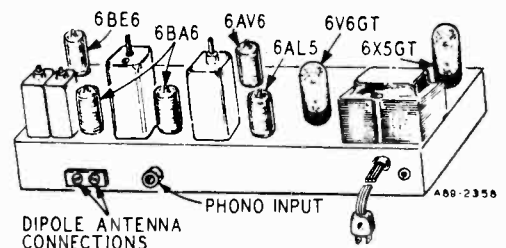
FM Sensitivity—(For .5 watt output)
150 microvolts average

GENERAL DESCRIPTION

Your new radio is a 7 tube (including rectifier tube) AC receiver designed for reception of stations in the standard broadcast band between 540 and 1600 kilocycles and FM (Frequency Modulation) stations in the newly allocated FM band of 88 - 108 megacycles. Controls are provided on the front panel for tuning, tone, volume and band or phono selection. Special features include two built-in antennas, automatic volume control, compensator circuits to prevent oscillator drift, beam power output stage, permanent magnet dynamic speaker and an electrostatic shield in the power transformer to reduce power line noise. A socket labeled PHONO is provided on the back of the chassis to which an external record player may be connected.

Tube and Dial Lamp Complement

- 1 6BE6 FM-AM Converter
- 1 6BA6 1st I-F Amplifier
- 1 6BA6 2nd I-F Amplifier
- 1 6AL5 FM Discriminator
- 1 6AV6 Audio Amplifier, AM 2nd Detector and AVC
- 1 6V6GT Audio Output
- 1 6X5GT Rectifier
- 1 No. 47 Dial Lamp



MODELS 94RA1-43-8510A,
94RA1-43-8511A

ALIGNMENT PROCEDURES

AM STAGES

Volume Control Maximum all Adjustments.

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

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

The following is required for aligning:

An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.

Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas — .1 mf, and 50 mmf.

SIGNAL GENERATOR					
FREQUENCY SETTING	CONNECTION AT RADIO	GROUND CONNECTION	DUMMY ANTENNA	GANG CONDENSER SETTING	ADJUST TUNING SLUGS AND TRIMMERS
455 KC	Control Grid 1st 6BA6 Pin No. 1	Chassis Base	.1 mf	Turn Rotor to Full Open	2nd I.F. C-14 & C-17
455 KC	Control Grid 6BE6 Pin No. 7 1st Det.	Same as above	.1 mf	Turn Rotor to Full Open	1st I.F. Pri. & Sec.
1620 KC	Control Grid 6BE6 Pin No. 7	Same as above	.1 mf	Turn Rotor to Full Open	Oscillator C-39
1400 KC	External Antenna Clip	Same as above	50 mmf	Turn Dial to 1400 KC. See Note A	Antenna C-35

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

FM STAGES

Allow chassis and signal generator to warm up for several minutes. The following equipment is required for aligning:

An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.

Non-metallic screwdriver.

Dummy Antennas and I-F Loading Resistor—.01 mf, 300 ohms and 100 K ohms.

Zero center scale DC vacuum tube voltmeter having a range of approximately 3 volts.

(If a zero center scale meter is not available, a standard scale vacuum tube voltmeter may be used by reversing the meter connections for negative readings.)

SIGNAL GENERATOR						
	FREQUENCY SETTING	CONNECTION AT RADIO	DUMMY ANTENNA	BAND SWITCH SETTING	CONDENSER SETTING	ADJUSTMENT FOR MAX. METER DEFLECTION
Discriminator		6BA6 2nd I-F Pin 1 & Chassis	.01 mf	FM	Rotor to Full Open	Disc. Pri. Note A
	10.7 MC	Same as above	.01 mf	FM	Same as above	Disc. Sec. Note B
	10.7 MC	Same as above	.01 mf	FM	Same as above	Disc. Pri. Note A
	10.7 MC	Same as above	.01 mf	FM	Same as above	Disc. Sec. Note B
I-F	10.7 MC Note E	6BA6 1st IF Pin 1 & Chassis	.01 mf	FM	Same as above	2nd I-F Note C
	10.7 MC	Unsolder lead from Pin 7 to band switch. Insert 100K ohm resistor between Pin 7 & Ground and feed signal into Pin 7 of 6BE6	.01 mf	FM	Same as above	1st I-F Pri. Note C
	10.7 MC	Same as above	.01 mf	FM	Same as above	1st I-F Sec. Note C
RECHECK I-F ADJUSTMENTS IN ORDER GIVEN						
Ant. & Osc.	108.5 Note D	Disconnect built-in line antenna and connect generator to dipole terminals with resistor in series.	300 ohms	FM	Rotor to Full Open	Osc. C-38
	104.5	Same as above	300 ohms	FM	Tune rotor for max. AVC voltage	Ant. C-37

RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN

FM ALIGNMENT NOTES

NOTE A—The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line. A signal of .1 volt must be fed into the receiver for this adjustment.

Note output voltage on the zero center DC vacuum tube voltmeter

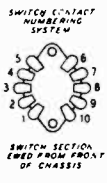
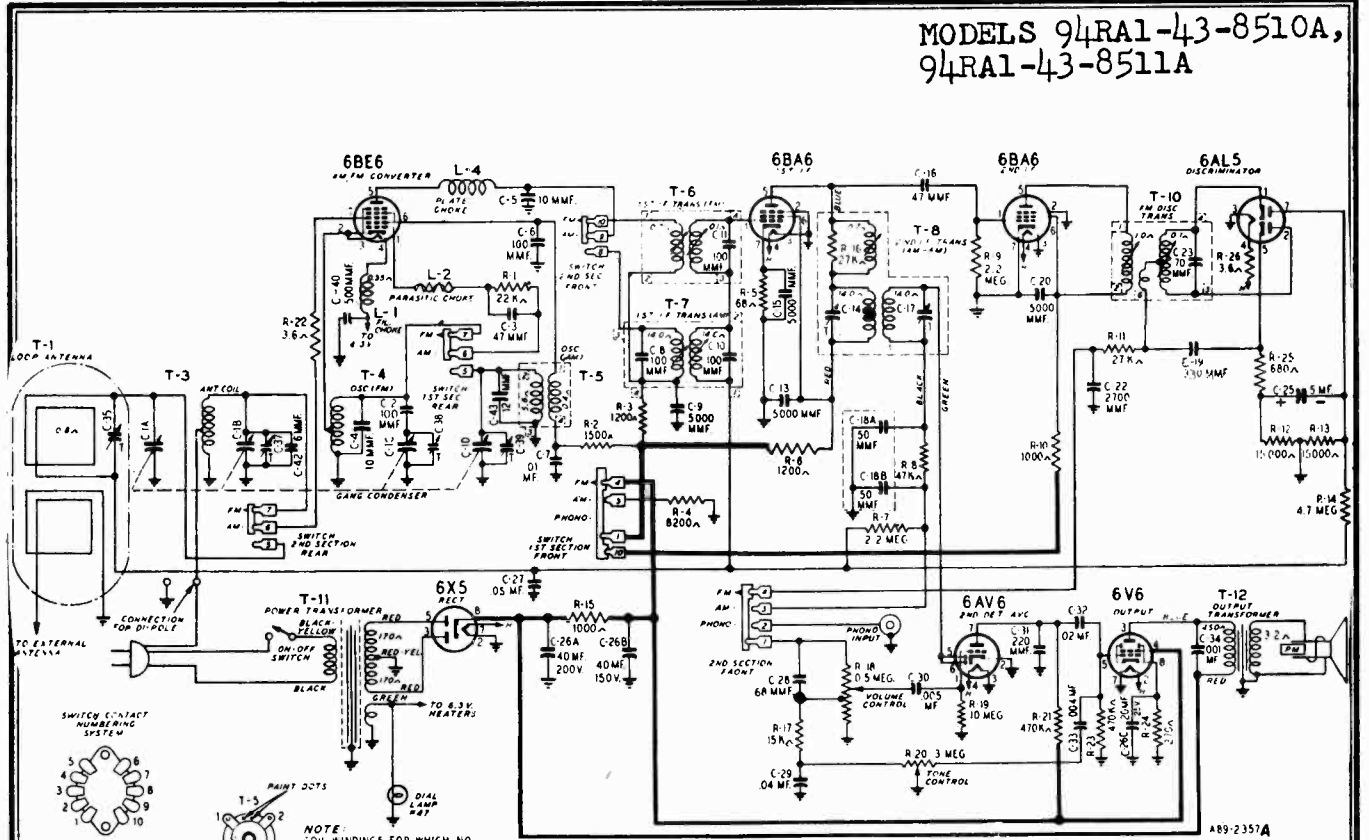
NOTE B—Disconnect zero center DC vacuum tube voltmeter from AVC and connect it at the audio takeoff point at the 27 K ohm resistor (R-11) and its junction with the terminal strip. Adjust for zero voltage indication.

NOTE C—Connect zero center DC vacuum tube voltmeter as in Note A. Adjust input to give same output on the zero center DC vacuum tube voltmeter as in Note A.

NOTE D—Remove the 100 K ohm load resistor and solder the lead from pin 7 of 6BE6 tube to the band switch before attempting to check the antenna and oscillator adjustments.

NOTE E—2nd I-F trimmers (AM) must be aligned before attempting to adjust 2nd I-F (FM) tuning slug.

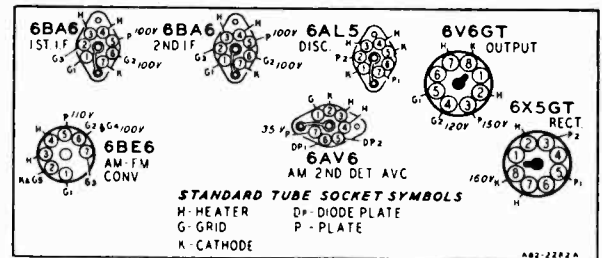
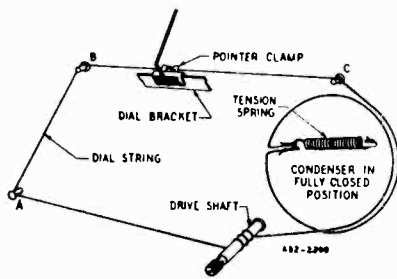
MODELS 94RA1-43-8510A,
94RA1-43-8511A



NOTE: COIL WINDINGS FOR WHICH NO RESISTANCES ARE SHOWN HAVE A DC RESISTANCE OF LESS THAN 0.1Ω

DRIVE CORD REPLACEMENT

Replacement of the drive cord may be accomplished as shown in the illustration. For this purpose use the new drive cord assembly listed in the Replacement Parts List. Turn the gang condenser until the plates are fully meshed. Then install the string as shown, winding three turns clockwise around the tuning shaft with the turns progressing away from the chassis. After the cord is installed, rotate the tuning shaft several times in order to take up any slack in the cord.



TUBE SOCKET VOLTAGES

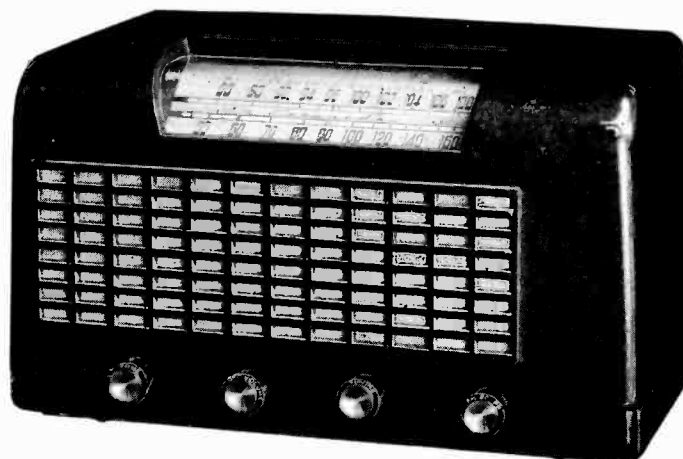
Socket voltages are shown on the Bottom Socket diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube volt-meter. Conditions of measurement are:

- Line voltage 117 Volts AC
- Signal Input None
- A Variation of ±10% is usually permissible.

MODELS 94RA1-43-8510A,
94RA1-43-8511A

SYMBOL	PART NO.	DESCRIPTION	VALUE	TOL.	RATING	SYMBOL	PART NO.	DESCRIPTION	VALUE	TOL.	RATING
CAPACITORS						R-18	36X372	Volume Control and Switch			
C-1	14A204	Gang Condenser and Pulley				R-19	B85106	Carbon	10 Megohms		0.5W
C-2	47X511	Ceramic	100 MMF	5%		R-20	40X285	Tone Control			
C-3	47X517	Ceramic	47 MMF	10%		R-21	B85474	Carbon (2)	470K Ohms		0.5W
C-4	47X523	Ceramic	10 MMF	10%		R-23					
C-5	47X512	Ceramic	10 MMF	5%		R-22	43X233	W.W. Resistor (2)	3.6 Ohms		0.5W
C-6	47X476	Molded Mica	100 MMF	20%		R-26					
C-7	D66103	Tubular	.01 MF	25%	400V	R-24	B84271	Carbon	270 Ohms		0.5W
C-9						R-25	B84681	Carbon	680 Ohms		0.5W
C-13	47X507	Silvered				TRANSFORMERS AND COILS					
C-15		Mica (4)	5000 MMF			L-1	9A1882	Filament Choke (2)			
C-20						L-4					
C-16	47X463	Ceramic	47 MMF	20%		L-2	9A1940	Parasitic Choke			
C-18A	47X112	Dual Mica	50-50 MMF			T-1	9A1994	"B" Range Loop Antenna Assembly			
C-18B						T-3	9A1956	Antenna Coil Assembly			
C-19	47X529	Ceramic	330 MMF	10%		T-4	9A1938	Oscillator Coil Assembly (FM)			
C-22	47X492	Molded Mica	2700 MMF	10%		T-5	9A1929	Oscillator Coil Assembly (AM)			
C-25	45X361	Dry Electro-lytic	5 MF		100V	T-6	9A1932	1st I.F. Coil Assembly (FM)			
C-26A	45X360	3 Section Elec-	40 MF		200V	T-7	9A1934	1st I.F. Coil Assembly (AM)			
		trolytic	40 MF		150V	T-8	9A1973	2nd I.F. Coil AM-FM Assembly			
C-26B			20 MF		25V	T-10	9A1970	Discriminator Coil Assembly			
C-26C						T-11	53X291	Power Transformer			
C-27	B66503	Tubular	.05 MF	25%	200V	T-12	12A478	4" x 6" P.M. Speaker (oval) with output transformer			
C-28	47X471	Molded Mica	68 MMF	20%		MISCELLANEOUS					
C-29	B66403	Tubular	.04 MF	25%	200V	2A375	Band Change Switch				
C-30	D66502	Tubular	.005 MF	25%	400V	3A303	Molded Octal Tube Socket (2)				
C-31	47X468	Ceramic	220 MMF	20%		3A305	Phono Socket (Single Pin)				
C-32	D66203	Tubular	.02 MF	25%	400V	3A426	Tube Socket (miniature) (4)				
C-33	B66402	Tubular	.004 MF	25%	200V	3A427	Tube Socket (miniature for AM-FM converter)				
C-34	H66102	Tubular	.001 MF	25%	800V	7A103	#47 Pilot Light				
C-35	17A256	Trimmer Condenser				7A216	Pilot Light Socket Assembly				
C-38	26A489	*Trimmer Assembly				25A1044	Diffuser and Clamp Assembly				
C-40	47X508	Ceramic	500 MMF	20%		Consists of:					
C-42	47X521	Ceramic	6 MMF	10%		30X541 Diffuser Clamp					
C-43	47X522	Ceramic	12 MMF	10%		41X82 Diffuser					
* Consists of:						6X21 Rubber Grommet (4)					
17A257 Tubular Trimmer Slug						10X68 Drive Cord Assembly					
17A258 Tubular Trimmer Sleeve						S-13X613 Line Cord and Plug Assembly					
RESISTORS						15X236 Pointer					
R-1	B84223	Carbon	22K Ohms		0.5W	19X107	Flat Washer (Mtg. Speaker) (4)				
R-2	B84152	Carbon	1500 Ohms		0.5W	19X434	#8 Flat Washer (Mtg. 53X291) (2)				
R-3	B84122	Carbon (2)	1200 Ohms		0.5W	19X432	Flat Washer (Mtg. Set to Cabinet & Loop to set) (6)				
R-6											
R-4	D84822	Carbon	8200 Ohms		2.0W	19X192	"C" Washer (Drive Shaft) (2)				
R-5	383680	Carbon	68 Ohms		0.5W	20X260	Condenser Cushion Stud (3)				
R-7	B85225	Carbon (2)	2.2 Megohms		0.5W	20X1609	Tinnerman Speed Nut (Mtg. Crystal to cabinet) (3)				
R-9											
R-8	B85473	Carbon	47K Ohms		0.5W	22X476	Chassis Base (with bracket)				
R-10	B84102	Carbon	1000 Ohms		0.5W	25X1606	Dial Bracket				
R-11	B84273	Carbon	27K Ohms		0.5W	26X486	Drive Shaft				
R-12	B84153	Carbon (3)	15K Ohms		0.5W	28X113	Drive Cord Tension Spring				
R-13											
R-17											
R-14	B85475	Carbon	4.7 Megohms		0.5W	30X532	Dial Clamp (2)				
R-15	D84102	Carbon	1000 Ohms		2.0W	30X547	Line Cord Clamp				

MODELS 94RA1-43-8510B,
94RA1-43-8511B



GENERAL DESCRIPTION

This radio is a 7 tube (including rectifier tube) AC receiver designed for reception of stations in the standard broadcast band between 540 and 1600 kilocycles and FM (Frequency Modulation) stations in the newly allocated FM Band of 88-108 megacycles. Controls are provided on the front panel for tuning, tone, volume and band or phono selection. Special features include a built-in loop antenna for broadcast reception, a hank antenna for the reception of FM stations, automatic volume control, compensator circuits to prevent oscillator drift, beam power output stage, permanent magnet dynamic speaker and an electrostatic shield in the power transformer to reduce power line noise. A socket labeled PHONO is provided on the back of the chassis to which an external record player may be connected.

Tube and Dial Lamp Complement

- 1 6BA7 FM-AM Converter
- 1 6BA6 1st I-F Amplifier
- 1 6BA6 2nd I-F Amplifier
- 1 6AL5 FM Discriminator
- 1 6AV6 Audio Amplifier, AM 2nd Detector and AVC
- 1 6V6GT Audio Output
- 1 6X5GT Rectifier
- 1 No. 47 Dial Lamp

ELECTRICAL SPECIFICATIONS

Power Consumption —
117 volts AC—35 Watts

Power Output —
1.5 watts maximum
.9 watts 10% distortion

Speaker—5" PM dynamic

Frequency Ranges —
Broadcast 540-1600 KC
Frequency modulation 88-108 MC

Intermediate Frequency —
AM 455 KC — FM 10.7 MC

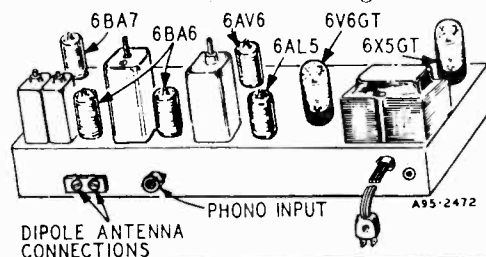
Selectivity — AM — 60 KC broad
at 1000 times signal, measured
at 1000 KC

I.F. FM—200 KC broad at 2 times
down

I.F. FM — 700 KC broad at 200
times down

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

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



MODELS 94RA1-43-8510B,
94RA1-43-8511B

ALIGNMENT PROCEDURES

AM STAGES

Volume Control Maximum all Adjustments.

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

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

The following is required for aligning:

An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.

Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas — .1 mf, and 50 mmf.

SIGNAL GENERATOR					
FREQUENCY SETTING	CONNECTION AT RADIO	GROUND CONNECTION	DUMMY ANTENNA	GANG CONDENSER SETTING	ADJUST TUNING SLUGS AND TRIMMERS
455 KC	Control Grid 1st 6BA6 Pin No. 1	Chassis Base	.1 mf	Turn Rotor to Full Open	2nd I.F. C-21 & C-22
455 KC	Control Grid 6BA7 Pin No. 7 1st Det.	Same as above	.1 mf	Turn Rotor to Full Open	1st I.F. Pri. & Sec.
1620 KC	Control Grid 6BA7 Pin No. 7	Same as above	.1 mf	Turn Rotor to Full Open	Oscillator C-7
1400 KC	External Antenna Clip	Same as above	50 mmf	Turn Dial to 1400 KC. See Note A	Antenna C-2

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

FM STAGES

Allow chassis and signal generator to warm up for several minutes. The following equipment is required for aligning:

An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.

Non-metallic screwdriver.

Dummy Antennas and I-F Loading Resistor—2500 mmf, 300 ohms and a 3300 ohm .5 watt resistor with short leads.

Zero center scale DC vacuum tube voltmeter having a range of approximately 3 volts.

(If a zero center scale meter is not available, a standard scale vacuum tube voltmeter may be used by reversing the meter connections for negative readings.)

SIGNAL GENERATOR						
	FREQUENCY SETTING	CONNECTION AT RADIO	DUMMY ANTENNA	BAND SWITCH SETTING	CONDENSER SETTING	ADJUSTMENT FOR MAX. METER DEFLECTION
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 & Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. Note A
	10.7 MC	Same as above	2500 mmf	FM	Rotor Fully Open	Disc. Sec. Note B
	10.7 MC	Same as above	2500 mmf	FM	Rotor Fully Open	Disc. Pri. Note A
	10.7 MC	Same as above	2500 mmf	FM	Rotor Fully Open	Disc. Sec. Note B
I-F	10.7 MC Note E	6BA6 1st I-F Pin 1 & Chassis	2500 mmf	FM	Rotor Fully Open	2nd I-F Note C
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 & Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. Note A
I-F	10.7 MC	Antenna and Chassis	2500 mmf	FM	Rotor Fully Open	1st. I-F Pri. and Sec. and Note C
	10.7 MC	Antenna and Chassis Solder a 3300 ohm resistor across terminals 3 and 4 of 1st. I-F trans.	2500 mmf	FM	Rotor Fully Open	1st. I-F Pri. Note C
	10.7 MC	Antenna and Chassis Note D	2500 mmf	FM	Rotor Fully Open	1st. I-F Sec. Note C

RECHECK I-F ADJUSTMENTS IN ORDER GIVEN

Oscillator	108.4 Note F	Disconnect hank antenna and connect generator to dipole terminals with resistor in series	300 ohms	FM	Rotor Fully Open	Osc. C-12
Antenna	104.5	Same as above	300 ohms	FM	Tune rotor for max. AVC voltage	Ant. C-3

RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN

FM ALIGNMENT NOTES

NOTE A—The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line. A signal of .1 volt must be fed into the receiver for this adjustment.
Note output voltage on the zero center DC vacuum tube voltmeter.

NOTE B—Disconnect zero center DC vacuum tube voltmeter from AVC and connect it to the audio takeoff point at the 27 K ohm resistor (R-11) and its junction with the terminal strip. Adjust for zero voltage indication.

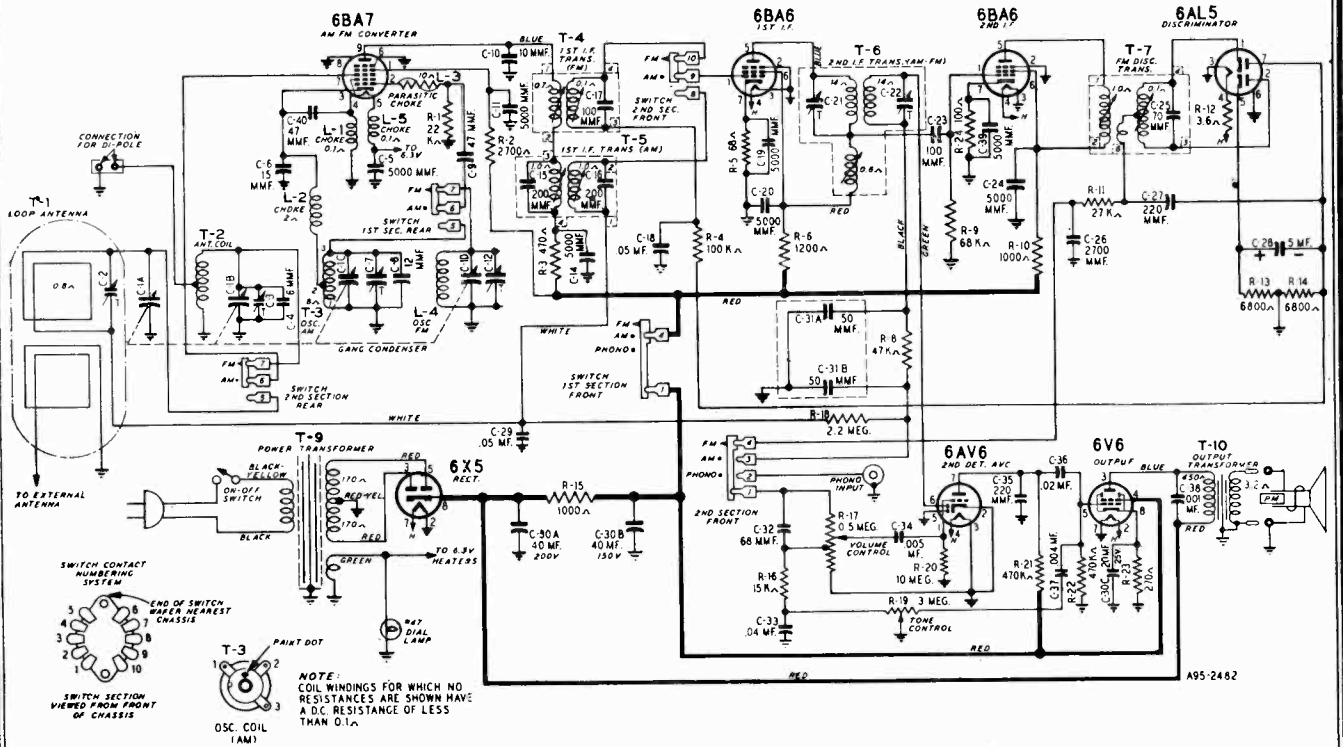
NOTE C—Connect zero center DC vacuum tube voltmeter as in Note A. Adjust input to give same output on the zero center DC vacuum tube voltmeter as in Note A.

NOTE D—Unsolder 3300 ohm resistor from terminals 3 and 4 of 1st I-F transformer and resolder across terminals 1 and 2.

NOTE E—2nd I-F Trimmers (AM) must be aligned before attempting to adjust 2nd I-F (FM) tuning slug.

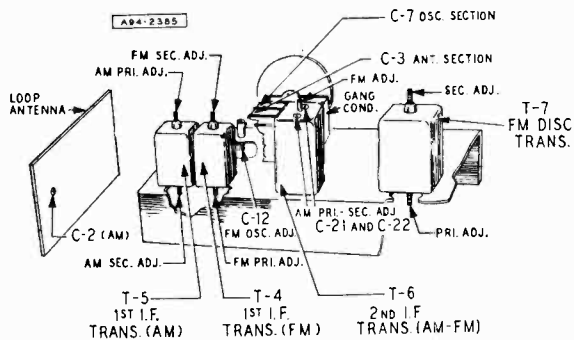
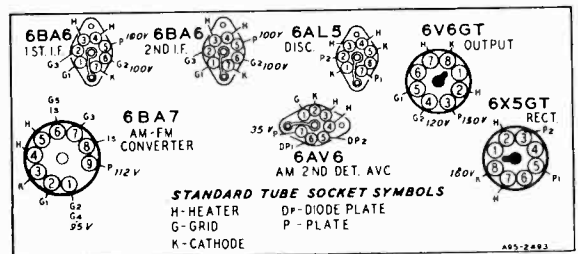
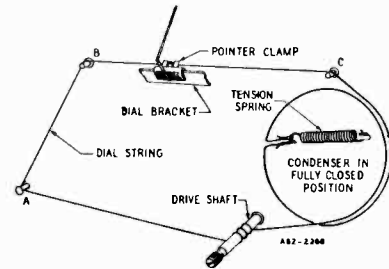
NOTE F—Remove the 3300 ohm load resistor before attempting to check the antenna and oscillator adjustments.

MODELS 94RA1-43-8510B,
94RA1-43-8511B



DRIVE CORD REPLACEMENT

Replacement of the drive cord may be accomplished as shown in the illustration. For this purpose use the new drive cord assembly listed in the Replacement Parts List. Turn the gang condenser until the plates are fully meshed. Then install the string as shown, winding three turns clockwise around the tuning shaft with the turns progressing away from the chassis. After the cord is installed, rotate the tuning shaft several times in order to take up any slack in the cord.



TUBE SOCKET VOLTAGES

Socket voltages are shown on the Bottom Socket diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube volt-meter. Conditions of measurement are:

- Line voltage117 Volts AC
- Signal InputNone
- A Variation of ±10% is usually permissible.

MODELS 94RA1-43-8510B,
94RA1-43-8511B

REPLACEMENT PARTS LIST

Ref. No.	DESCRIPTION	Part No.
CAPACITORS		
C-1	Gang Condenser & Pulley	14A204
C-2	Capacitor, Trimmer; 2-24 mmf	17A256
C-3	Part of C-1 (Gang Condenser)	
C-7		
C-4	Capacitor, Ceramic; 6 mmf	47X521
C-5		
C-11		
C-14		
C-19	Capacitor, Ceramic; 5000 mmf	47X507
C-20		
C-24		
C-39		
C-6	Capacitor, Ceramic; 15 mmf	47X552
C-8	Capacitor, Ceramic; 12 mmf	47X522
C-9	Capacitor, Ceramic; 47 mmf ± 10%	47X517
C-10	Capacitor, Ceramic; 10 mmf	47X512
C-12	Capacitor, Trimmer; 1-8 mmf	17A255
C-15	Part of T-5 (1st I-F Trans. AM)	
C-16		
C-17	Part of T-4 (1st I-F Trans. FM)	
C-18	Capacitor, Tubular; .05 mf 200 V	
C-29		B66503
C-21	Part of T-6 (2nd I-F Trans. AM-FM)	
C-22		
C-23	Capacitor, Ceramic; 100 mmf	47X476
C-25	Part of T-7 (FM Disc. Trans.)	
C-26	Capacitor, Molded Mica; 2700 mmf	47X492
C-27	Capacitor, Ceramic; 220 mmf	
C-35		47X468
C-28	Capacitor, Dry Electrolytic; 5 mf 100 V	45X361
C-30A	40 mf 200 V	
C-30B	Capacitor, Dry Electrolytic; 40 mf 150 V	45X360
C-30C	20 mf 25 V	
C-31A	Capacitor, Dual Mica; 50-50 mmf	
C-31B		47X112
C-32	Capacitor, Molded Mica; 68 mmf	47X471
C-33	Capacitor, Tubular; .04 mf 200 V	B66403
C-34	Capacitor, Tubular; .005 mf 400 V	D66502
C-36	Capacitor, Tubular; .02 mf 400 V	D66203
C-37	Capacitor, Tubular; .004 mf 200 V	B66402
C-38	Capacitor, Tubular; .001 mf 800 V	H66102
C-40	Capacitor, Ceramic; 47 mmf ± 20%	47X509

Ref. No.	DESCRIPTION	Part No.
RESISTORS		
R-1	Resistor, Carbon; 22K ohms 0.5 W	B84223
R-2	Resistor, Carbon; 2700 ohms 0.5 W	B84272
R-3	Resistor, Carbon; 470 ohms 0.5 W	B84471
R-4	Resistor, Carbon; 100K ohms 0.5 W	B85104
R-5	Resistor, Carbon; 68 ohms 0.5 W	B83680
R-6	Resistor, Carbon; 1200 ohms 0.5 W	B85122
R-8	Resistor, Carbon; 47K ohms 0.5 W	B85473
R-9	Resistor, Carbon; 68K ohms 0.5 W	B84683
R-10	Resistor, Carbon; 1000 ohms 0.5 W	B85102
R-11	Resistor, Carbon; 27K ohms 0.5 W	B85273
R-12	Resistor, Wirewound; 3.6 ohms 0.5 W	43X233
R-13	Resistor, Carbon; 6800 ohms 0.5 W	
R-14		B84682
R-15	Resistor, Carbon; 1000 ohms 2.0 W	D84102
R-16	Resistor, Carbon; 15K ohms 0.5 W	B85153
R-17	Volume Control & Switch; .5 megohm	36X372
R-18	Resistor, Carbon; 2.2 megohms 0.5 W	B85225
R-19	Tone Control; 3 megohms	40X285
R-20	Resistor, Carbon; 10 megohms 0.5 W	B85106
R-21	Resistor, Carbon; 470K ohms 0.5 W	
R-22		B85474
R-23	Resistor, Carbon; 270 ohms 0.5 W	B84271
R-24	Resistor, Carbon; 100 ohms 0.5 W	B84101

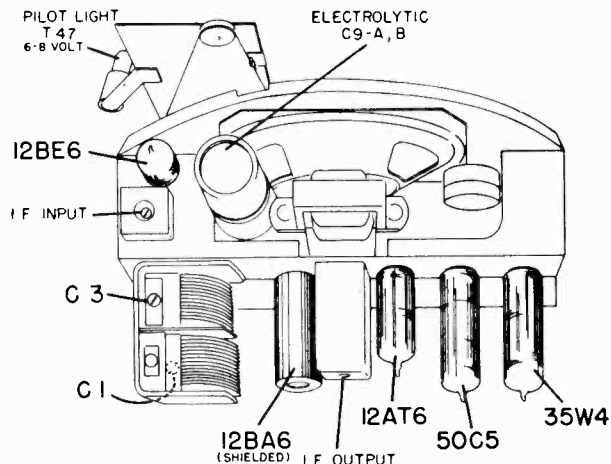
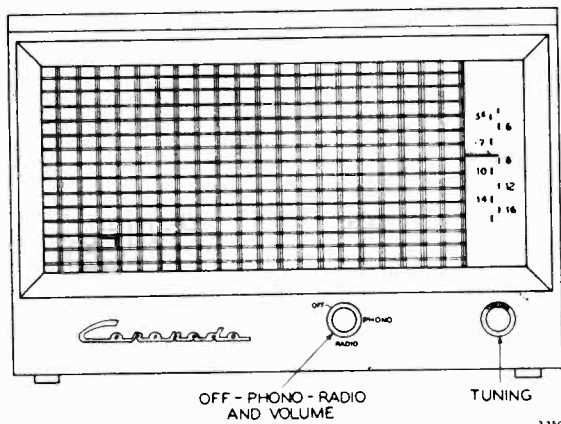
Ref. No.	DESCRIPTION	Part No.
TRANSFORMERS AND COILS		
L-1 } L-5 }	Choke, Filament	9A2044
L-2	Choke, Insulated 2 uh.	35A5
L-3	Choke, Parasitic	9A1940
L-4	Coil, Oscillator (FM)	9A2021
T-1	"B" Range Loop Antenna Assembly	9A2040
T-2	Coil, Antenna	9A1956
T-3	Coil, Oscillator (AM)	9A1997
T-4	1st I-F Trans. (FM)	9A2037
T-5	1st I-F Trans. (AM)	9A2038
T-6	2nd I-F Trans. (AM-FM)	9A1999
T-7	Discriminator Coil Assembly	9A2036
T-9	Power Transformer	53X291
T-10	Output Transformer (See Miscellaneous)	

DIAL AND TUNING PARTS		
Diffuser & Clamp Assembly		25A1044
consisting of:		
Diffuser Clamp		30X541
Diffuser		41X82
Rubber Grommets (mtg. Gang Cond.)		6X67
Pointer		15X236
Crystal		17X100
"C" Washer (Drive Shaft)		19X192
Condenser Cushion Stud		20X260
Drive Shaft		26X486
Drive Cord Tension Spring		28X113
Dial Clamp		30X532
Dial Glass (Brown Cabinet)		58X712
Dial Glass (Ivory Cabinet)		58X713
Dial Bracket Assembly		S-25X28
consisting of:		
Rivet		20X1580
Dial Bracket		25X1606

MISCELLANEOUS		
Band Change Switch		2A375
Tube Socket, Molded (Octal)		3A303
Phono Socket (Single Pin)		3A305
Tube Socket (Miniature)		3A426
Tube Socket (AM-FM Converter)		3A443
No. 47 Pilot Light		7A103
Pilot Light Socket Assembly		7A216
Knob (Tuning)	Brown Cabinet	10A699
Knob (Off-Volume)		10A700
Knob (Tone)	Ivory Cabinet	10A701
Knob (FM-BC-PH)		10A702
Knob (Tuning)	Ivory Cabinet	10A703
Knob (Off-Volume)		10A704
Knob (Tone)	Ivory Cabinet	10A705
Knob (FM-BC-PH)		10A706
Speaker, 5" P.M. with Output Transformer		12A493
Drive Cord Assembly		10X68
Line Cord & Plug Assembly		13X546
Line Cord Clamp		30X547
Grille Cloth (Ivory Cabinet)		14X444
Grille Cloth (Brown Cabinet)		14X445
Speaker Eaffle		14X463
Cabinet (Ivory)		55X338
Cabinet (Brown)		55X339

Power Supply.....105-125 volts, AC or DC
Frequency on AC.....50 to 60 cycles
Power Consumption...Radio 25 watts, Phono 50 watts
Frequency Range.....540 to 1650 KC
Intermediate Freq......455 KC
Antenna.....Built in loop, provision for external antenna
Tuning.....2-gang condenser, vernier drive
Speaker.....4-inch PM Dynamic, V.C. Impedance 3.2 ohms
Power Output.....1.0 watt undistorted, 1.5 watts maximum

Antenna Sensitivity.....75 microvolts average for 50 milliwatt output
Selectivity.....70 KC wide at 1000 x signal at 1000 KC
Tube Complement.....12BE6 Converter; 12BA6 IF Amp.; 12AT6 Det.-AVC-Audio; 50C5 Output; 35W4 Rectifier.
Phonograph.....VM Type 800 (See Manual 619-5)
Volume Control.....Fader type, clockwise radio, counterclockwise phono, center minimum volume



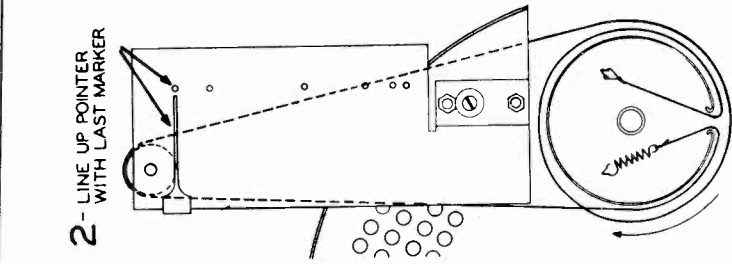
ALIGNMENT PROCEDURE

Allow unit to heat for a few minutes before starting alignment.
 Volume control set to maximum.
 Output meter across speaker.

- Align for maximum output.
- Keep input as low as readable meter reading of output will permit.

SIGNAL GENERATOR				TUNER SETTING	ADJUST TRIMMERS FOR MAXIMUM OUTPUT (in order shown)
Frequency	Coupling Capacitor	Connection to Radio	Connection Ground		
455 KC	0.1 mfd	12BE6 Grid (pin 7)	B-	Rotor full open	2nd IF transformer trimmers 1st IF transformer trimmers
1650 KC	0.1 mfd	12BE6 Grid	B-	Rotor full open	Oscillator Trimmer C3
1400 KC	200 mmf	External Ant. Clip	B-	Tune for maximum at 1400 on dial	Antenna Trimmer C1

MODEL 94RA2-43-9195A



2 - LINE UP POINTER WITH LAST MARKER

1 - TURN TUNING SHAFT COMPLETELY CLOCKWISE - PROCEED TO RESTRING AS SHOWN.

2250-2

DRIVE CORD REPLACEMENT

BRC(5D153) - Part No. 23D-17670
PRO. 8-30 G-3M-5-500-041849

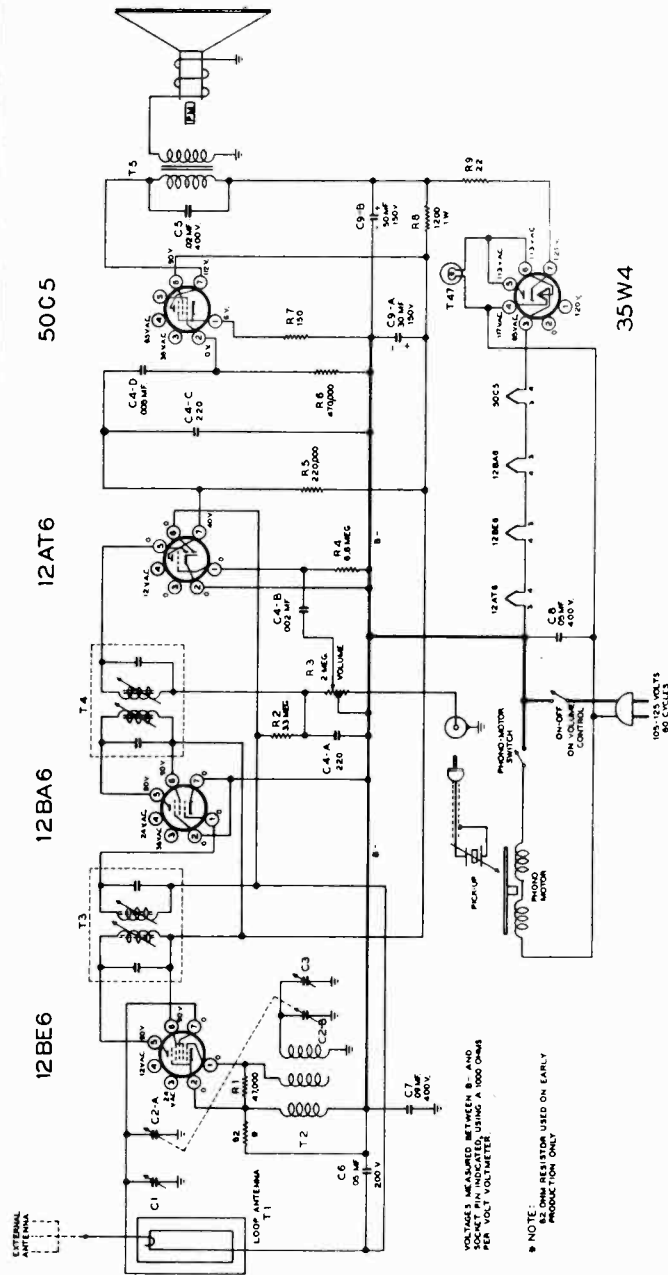
50C5

12AT6

12BA6

12BE6

35W4



VOLTAGES MEASURED BETWEEN B+ AND GROUND. MEASURED WITH A 1000 OHM PER VOLT VOLTMETER.

* NOTE: PHONO MOTOR SWITCH USED ON EARLY PRODUCTION FOR ONLY.

Ref. No.	Part No.	Description	Quantity
CONDENSERS			
C1	On gang	Antenna trimmer	1
C2 A, B	B-8A-16493	2-Gang condenser	1
C3	On gang	Oscillator trimmer	1
C4 A, B, C, D	A-201-14397	Capacitor strip, ceramic	1
		220 mmf, .002 mf, 220 mmf, .005 mf	
C5	C-8D-10774	.02 mf, 400 volts, paper	1
C6	C-8D-10770	.05 mf, 200 volts, paper	1
C7	C-8D-11251	.09 mf, 400 volts, paper	1
C8	C-8D-10813	.05 mf, 400 volts, paper	1
C9 B, A	A-8C-15924	Electrolytic, 50-30 mf, 150 volts	1
RESISTORS			
R1	C-9B1-23	47K ohms, 1/2 watt, 10%	1
R2	C-9B1-34	3.3 megohms, 1/2 watt, 20%	1
R3	A-10A-16497	2 megs. vol. cont. w/switch	1
R4	C-9B1-36	6.8 megohms, 1/2 watt, 20%	1
R5	C-9B1-27	220K ohms, 1/2 watt, 10%	1
R6	C-9B1-29	470K ohms, 1/2 watt, 10%	1
R7	C-9B1-22	150 ohms, 1/2 watt, 10%	1
R8	C-9B2-63	1200 ohms, 1 watt, 10%	1
R9	C-9B1-3	22 ohms, 1/2 watt, 10%	1
	C-9B1-49	82 ohms, 1/2 watt, 10%	1
COILS and TRANSFORMERS			
T1	C-13E-16494	Loop antenna	1
T2	B-13D-15914	Oscillator coil	1
T3	B-13A-13071	Input IF transformer	1
T4	B-13B-13072	Output IF transformer	1
T5	B-18A-16537	Output transformer and speaker	1
DIAL PARTS			
A-2M-16492	Dial Drum	1	
B-30A-16466	Dial scale	1	
A-2C-16465	Background plate	1	
A-3H-10622	Pulley	1	
A-53A-10989	Dial cord (20" approx.)	1	
A-2G-16491	Dial pointer	1	
A-49A-10887	Cord tension spring	1	
B-2C-16469	Chassis mtg. plate	1	
A-23G-16467	Dial scale background	1	
MISCELLANEOUS			
A-14M-11479-3	Line cord and plug	1	
A-47A-11470	Pilot light assy.	1	
A-46A-10793	No. 47 Pilot bulb	1	
B-2M-15200	Cinch button (loop mtg.)	6	
A-2M-10096	Cinch button (front cover)	3	
B-5B-16511-41	Knob tuning	1	
B-5B-16535-41	Knob volume	1	
A-23M-13157	Connector cap (motor leads)	1	
B-201-13304-5	Record changer	2	

MODELS 94RA31-43-8115A,
94RA31-43-8115B, 94RA31-43-8116A

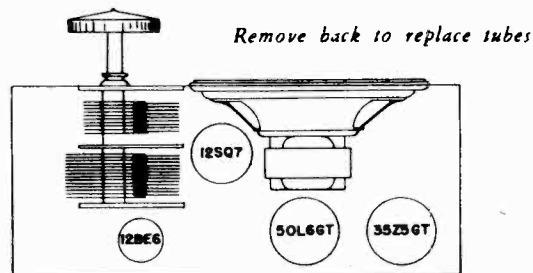
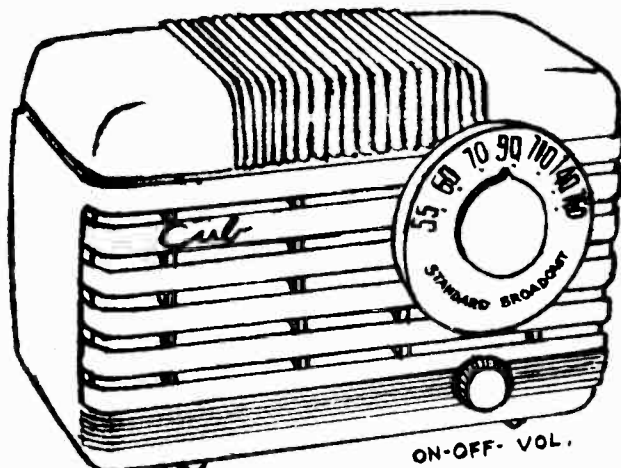
POWER SUPPLY

This receiver is designed to operate on either an A.C. or D.C. power supply. The following operation ratings should be observed:

Voltages 105-125 Volts, A.C. or D.C.
Frequency 50 to 60 cycles on A.C.

If in doubt as to the voltage and frequency supplied to your home, telephone your local power company.

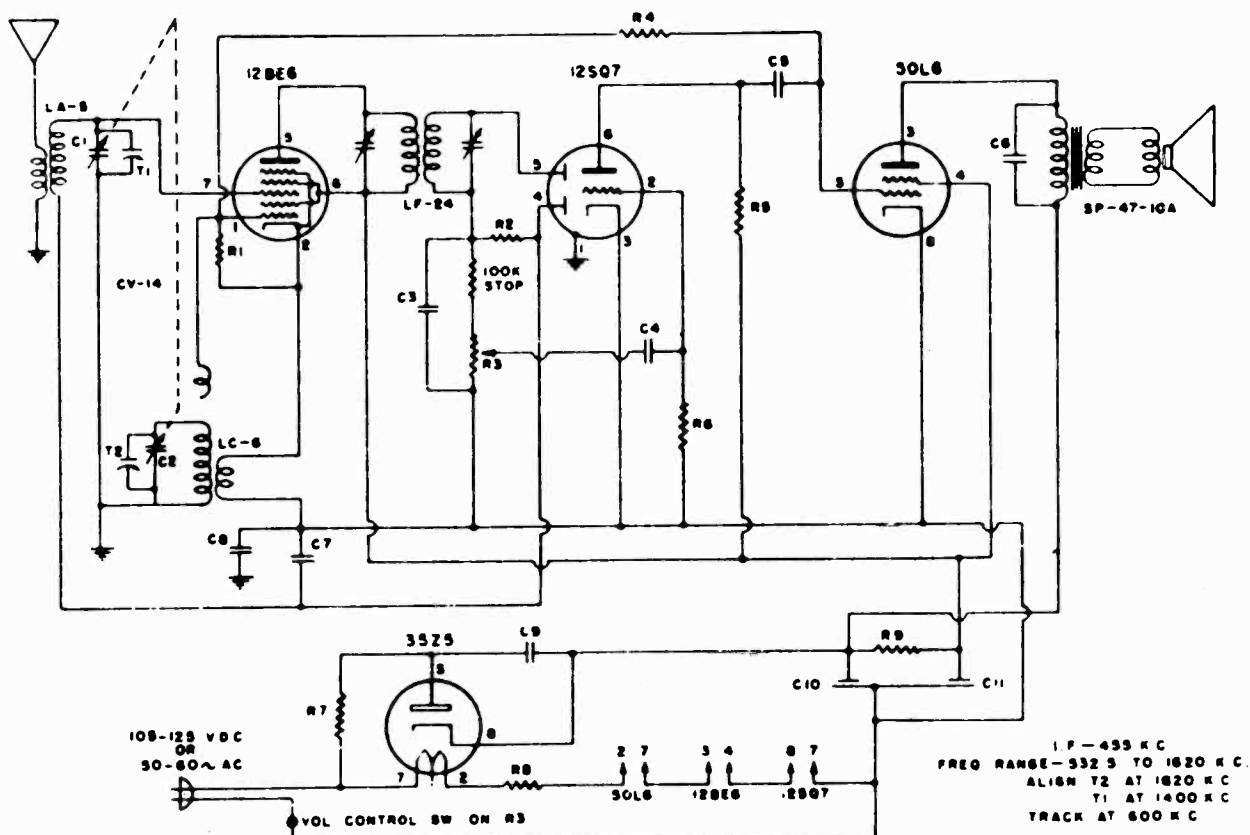
When operating on a D.C. source, it is necessary to insert the power plug with the proper polarity. If the set fails to function after an interval sufficient for the tubes to reach their operating temperature, reverse the power plug in the outlet.



TUBE LOCATIONS FOR "BH" DIAGRAM

NOTE:
**REPLACEMENT PARTS LIST WILL
SERVE FOR ALL THREE MODELS.**

MODEL No. 94RA31-43-8116A

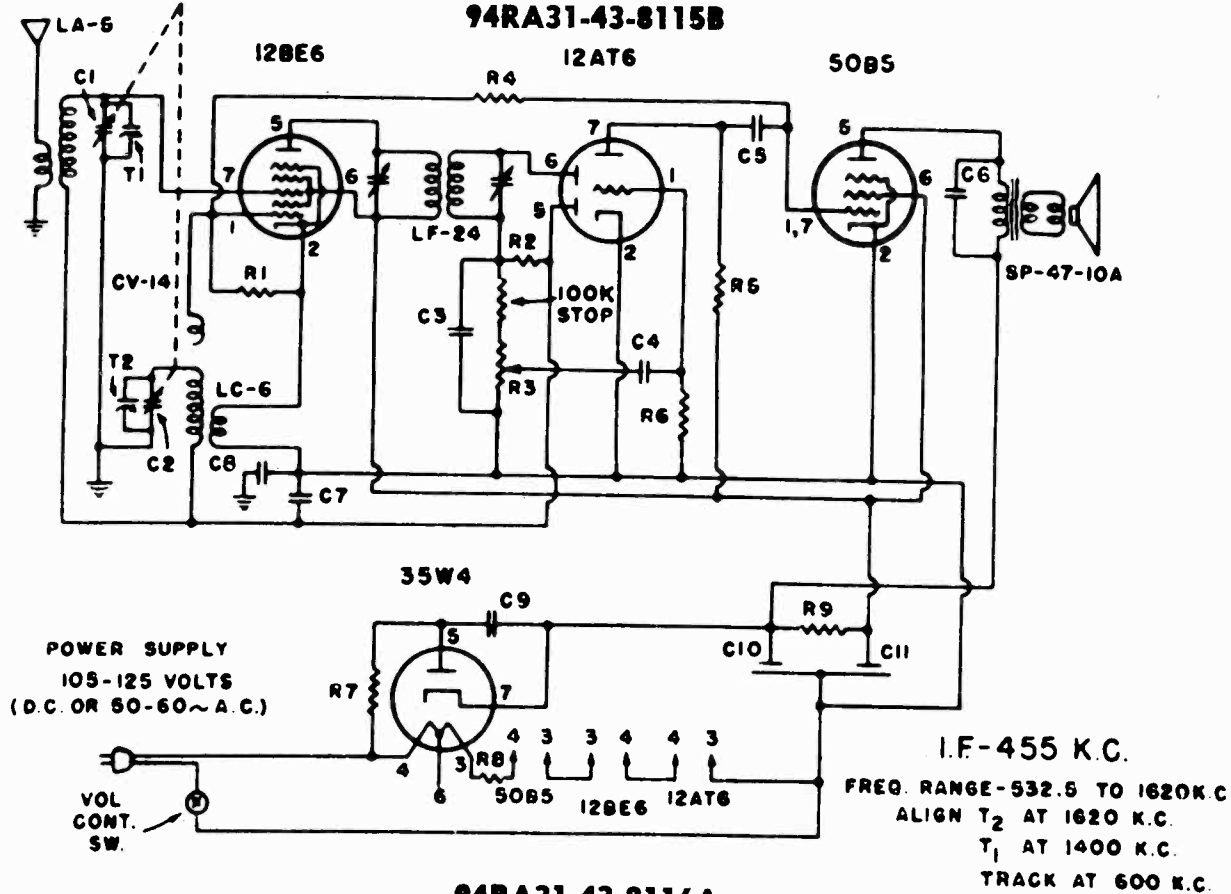


1 F - 495 KC
FREQ RANGE - 532.5 TO 1620 KC
ALIGN T2 AT 1620 KC
T1 AT 1400 KC
TRACK AT 600 KC

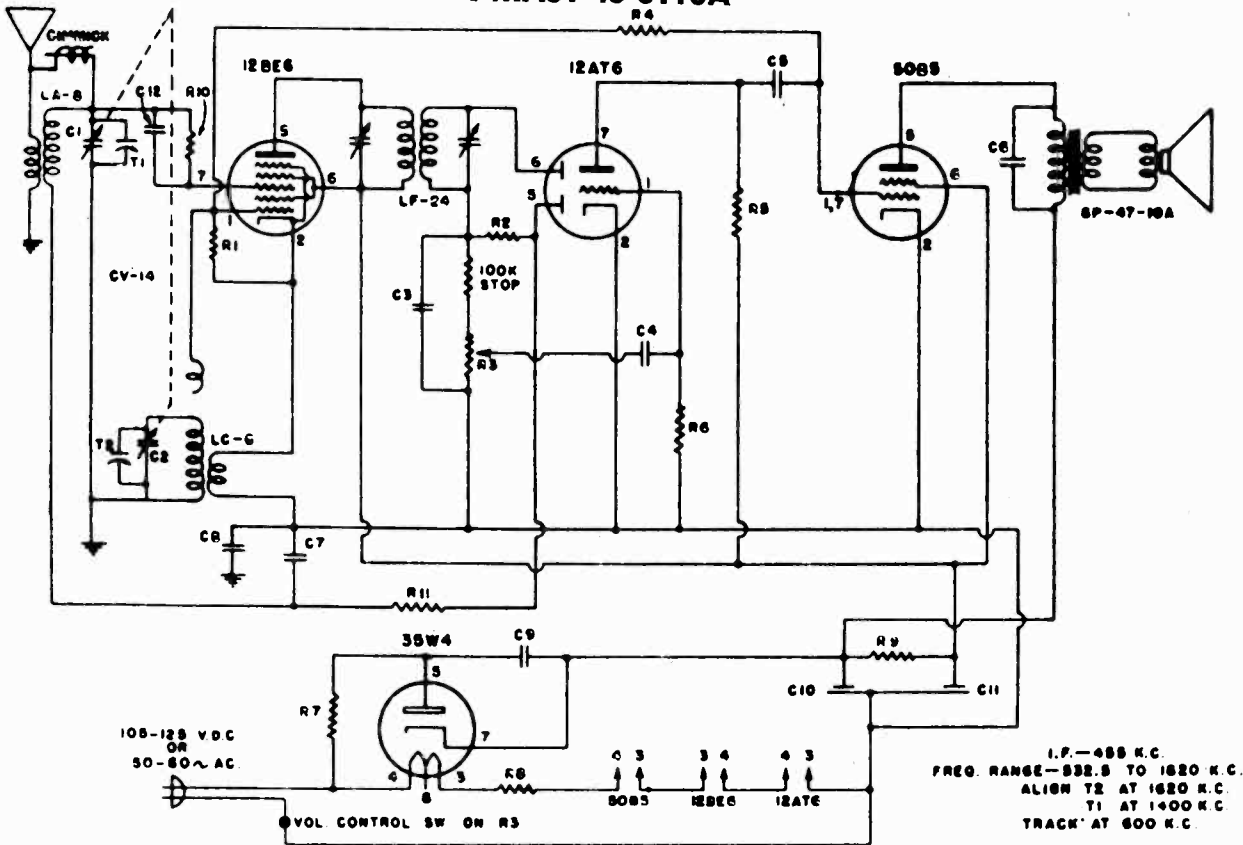
CHASSIS SERIES "BH"

MODELS 94RA31-43-8115B,
94RA31-43-8116A

94RA31-43-8115B



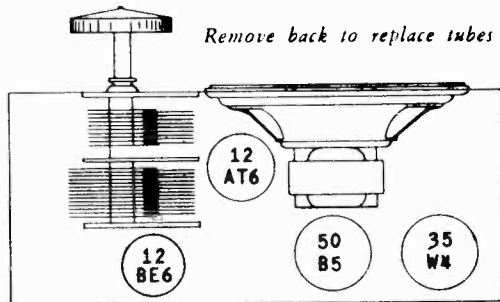
94RA31-43-8116A



MODELS 94RA31-43-8115A,
94RA31-43-8115B, 94RA31-43-8116A

ELECTRICAL SPECIFICATIONS

- Power Supply** 105-125 Volts D.C. or 50-60 Cycles A.C. 30 Watts
- Frequency Range** 532.5 to 1620 kc.
- Intermediate Freq.** 455 kc.
- Tuning** Two gang capacitor
- Speaker** 4 inch PM 3.5 ohm voice coil impedance
- Power Output** 1 watt undistorted
1.5 watt maximum
- Sensitivity** 800 Microvolts at 50 milli-watts Output
- Selectivity** 120 kc broad at 1000 times signal at 1000 kc.



TUBE LOCATIONS FOR "AG" & "AR" DIAGRAMS

REPLACEMENT PARTS LIST

When ordering parts, specify part number, model number and series

Ref. No.	Part No.	Description
CAPACITORS		
C1, C2	CV14	Variable Condenser (2 gang)
C3	CM151-1	.00015 mfd 500V mica cond.
C4	CP202-2	.002 mfd 400V paper cond.
C5	CP502-2	.005 mfd 200V paper cond.
C6, C9	CP203-1	.02 mfd 400V paper cond.
C7, C8	CP503-4	.05 mfd 200V paper cond.
C10, C11	CE15**	2 x 40 mfd 150V Elect.

** CE-20 May Be Substituted.

RESISTORS		
R1	RC183-2	18,000 ohms 1/2W 10%
R2	RC475-1	4.7 megohms 1/2W 20%
R3	VC-11	2 meg. vol. cont., 100 K Stop
R4	RC334-1	330,000 ohms 1/2W 20%
R5	RC224-1	220,000 ohms 1/2W 20%
R6	RC106-1	10 megohms 1/2W 20%
R7	RC180-1	18 ohms 1/2W 20%
R8	RC390-5	39 ohms 1W 10%
R9	RC222-5	2200 ohms 1W 10%

COILS & TRANSFORMERS

- LA-5 Antenna Coil
- LC-6 Oscillator Coil
- LF-24 I.F. Transformer

MISCELLANEOUS

- CB-100A Walnut
- KN-20-2 Knob
- KN-21-2 Pointer Knob
- SP-47-10A 4" PM Speaker

ADDITIONS TO MODEL No. 94RA31-43-8116A FOR UNDERWRITERS APPROVAL

R10	RC183-2	18,000 ohms 1/2W 10%
R11	RC224-1	220,000 ohms 1/2W 20%
C12	CM501-1	500 mmf mica cond.
LA-8	Antenna Coil	

ALIGNMENT PROCEDURE

- Output meter across 3.5 ohm output load.
- Volume control at maximum for all adjustments.
- Align for maximum output. Reduce input as needed to keep output near 0.4 volts.

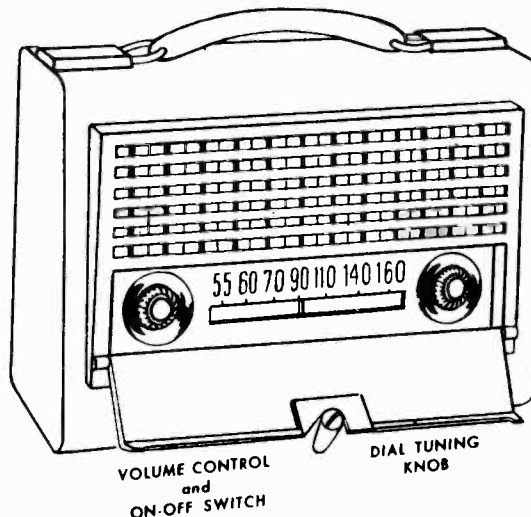
SIGNAL GENERATOR				SETTING TUNER	ADJUST TRIMMERS TO MAXIMUM OUTPUT (in order shown)
Frequency	Coupling Factor	Connection to Receiver	Ground Connection		
455 kc	.1 mfd	12BE6 Grid	B—	Rotor full open (Plates out of mesh)	Input and output trimmers on IF cans
1620 kc	.1 mfd	12BE6 Grid	B—	Rotor full open (Plates out of mesh)	Oscillator trimmer T2
1400 kc	.75 mmf	Hank	B—	1400 kc	Antenna trimmer T1

MODEL 94RA31-43-9841A

SERVICE DATA

ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts DC or 50-60 cycles AC 15 watts
Batteries	A—4½ volts. 100 ma. B—67½ volts. 8 ma. average.
Frequency Range	532½ to 1620 kc.
Intermediate Freq.	455 kc.
Tuning	Two-gang capacitor
Antenna	Built-in loop
Speaker	4 inch PM; voice coil Impedance 3.5 ohms.
Power Output	80 milliwatts undistorted 140 milliwatts maximum
Sensitivity	750 microvolts per meter for 50 milliwatt output
Selectivity	55 kc broad at 1000 times signal at 1000 kc.



INSTALLATION

TUBES

Be sure each of the tubes is in place and inserted firmly in its socket.

The tube location of each tube is shown on the card attached to the back of the cabinet. Your receiver is equipped and tested at the factory with the tubes that are shipped with it.

POWER SUPPLY

This receiver is designed to operate on either an A.C. or D.C. power supply. The following operation ratings should be observed:

Voltages105 125 Volts, A.C. or D.C.
Frequency 50 to 60 cycles on A.C.

If in doubt as to the voltage and frequency supplied to your home, telephone your local Power Company.

When operating on a D.C. source, it is necessary to insert the power plug with the proper polarity. If the set fails to function after an interval sufficient for the tubes to reach their operating temperature, reverse the power plug in the outlet.

The battery supply to be used with this receiver is as follows:

"A" supply	4½ volts
Use Coronado No. 42-266 or equivalent.	
"B" supply	67½ volts.
Use Coronado No. 42-304 or equivalent.	

ANTENNA SYSTEM

This receiver is equipped with a built in Antenna System, which obviates the necessity of using an antenna connection for receiving most local, and some distant stations.

When tuning Broadcast Stations, it may be found advisable to rotate the radio about its position of rest until the most distant station regularly enjoyed is heard the clearest. In some vicinities where there is a localized noise interference prevalent, it is best to rotate the radio cabinet to a position which gives a minimum of noise.

OPERATION

TO OPERATE ON AC OR DC

Plug the line cord into the nearest convenient wall outlet through the opening provided in the back.

TO OPERATE ON BATTERIES

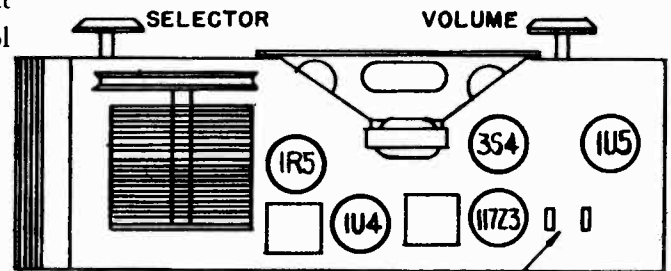
To operate on batteries insert line cord plug in chassis receptacle as shown in diagram.

TUNING CONTROL

The knob at the right is the tuning control. Stations are tuned manually by turning this tuning control. The dial calibration numbers are in tenths of the actual kilocycle readings. To convert these calibrations to kilocycles, as is shown in most radio log books, add a "0" to the end of each number. After the desired station is heard, adjust this knob to the point of maximum volume and most realistic reproduction. This position of exact tune is very important as it is only when the receiver is in this position that the full, rich tone is available. The volume control may now be set to give the desired volume.

VOLUME CONTROL and POWER SWITCH

The volume control and power switch are operated by a common control knob at the left of the cabinet. When the control is in extreme counter-clockwise position, the receiver power is off. From this position a slight clockwise rotation will turn the power on and by further clockwise rotation, volume may be increased until the full output of the receiver is obtained. To conserve batteries and tubes, be sure that the receiver is turned off when it is not in use.



INSERT LINE CORD PLUG HERE FOR BATTERY OPERATION

MAINTENANCE

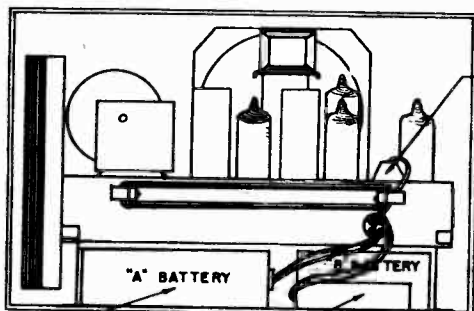
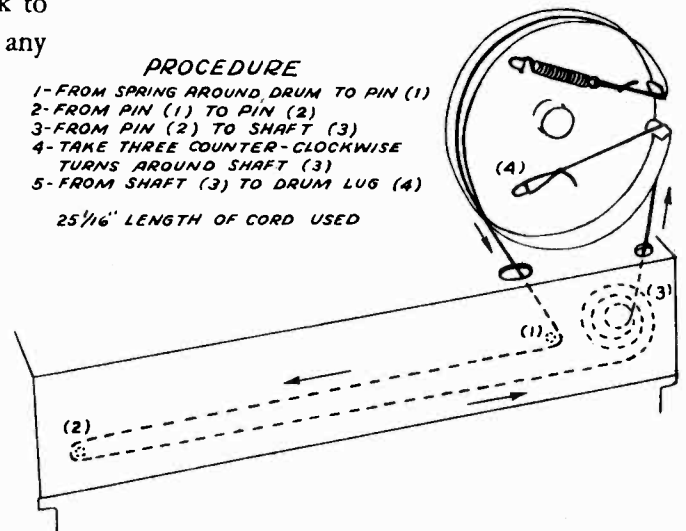
CAUTION

Always remove the power cord from its receptacle before starting to replace tubes or batteries.

Do not allow cells which have become too weak to operate the set properly to remain in the set for any length of time.

PROCEDURE

- 1- FROM SPRING AROUND DRUM TO PIN (1)
 - 2- FROM PIN (1) TO PIN (2)
 - 3- FROM PIN (2) TO SHAFT (3)
 - 4- TAKE THREE COUNTER-CLOCKWISE TURNS AROUND SHAFT (3)
 - 5- FROM SHAFT (3) TO DRUM LUG (4)
- 25 1/16" LENGTH OF CORD USED

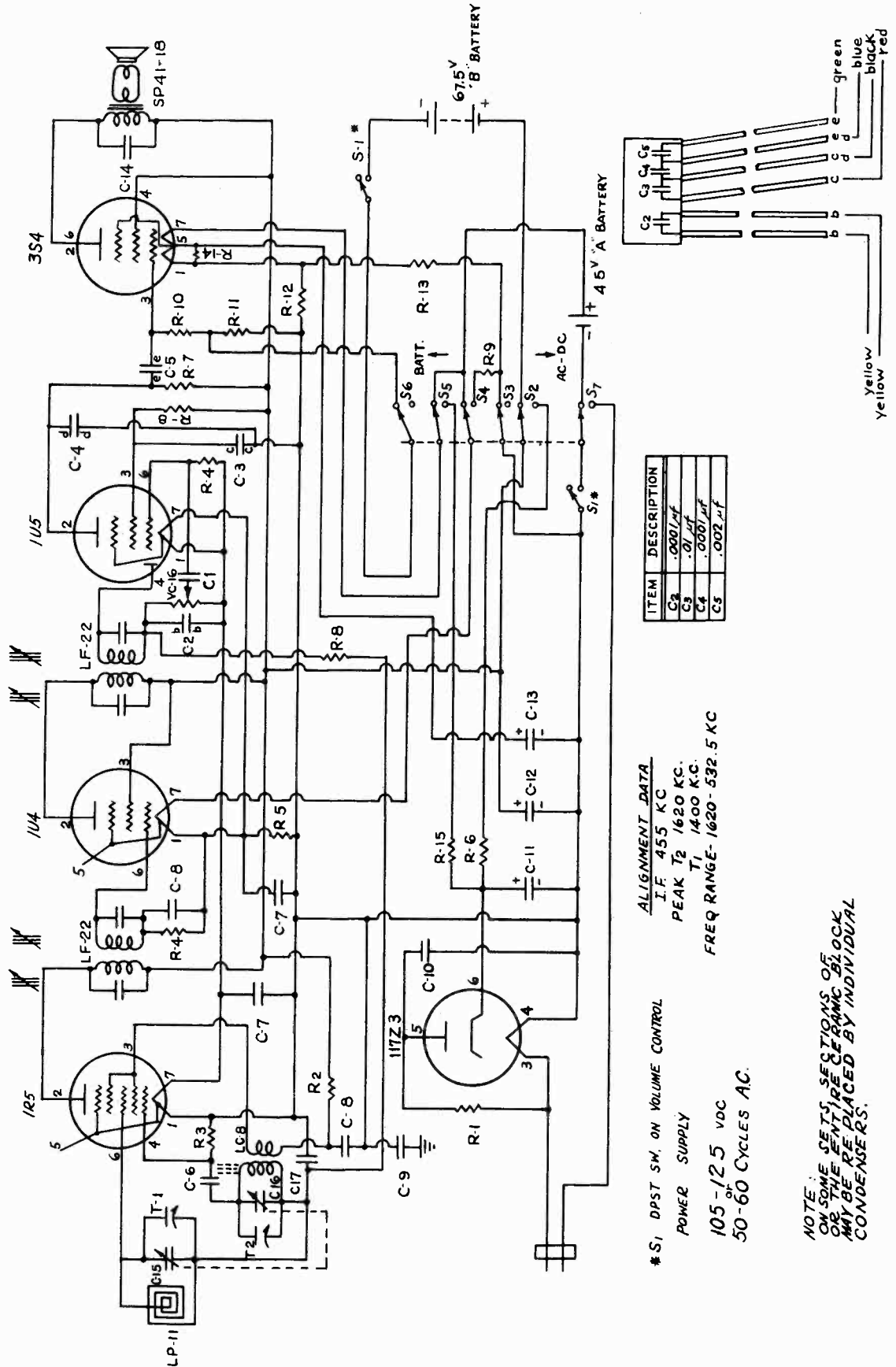


Line cord plug shown in position for battery operation, with line cord wrapped around line cord retainers.

For A.C.-D.C. operation remove plug from chassis, unwrap cord and bring out of notch in side of cover.

Insert two-prong plug into "A" BATTERY. Make sure large pin engages large contact in battery. Excessive force is not required to push plug into battery.

Place "B" BATTERY so that contacts are toward bottom. Snap fasteners onto battery.



ITEM	DESCRIPTION
C2	.0001 μf
C3	.01 μf
C4	.0001 μf
C5	.002 μf

ALIGNMENT DATA

I.F. 455 KC
 PEAK T₂ 1620 KC.
 T₁ 1400 KC.
 FREQ RANGE- 1620-532.5 KC

#S1 DPST SW. ON VOLUME CONTROL

POWER SUPPLY

105-125 VDC
 50-60 CYCLES AC.

NOTE:
 ON SOME SETS, SECTIONS OF
 OR THE ENTIRE CERAMIC BLOCK
 MAY BE REPLACED BY INDIVIDUAL
 CONDENSERS.

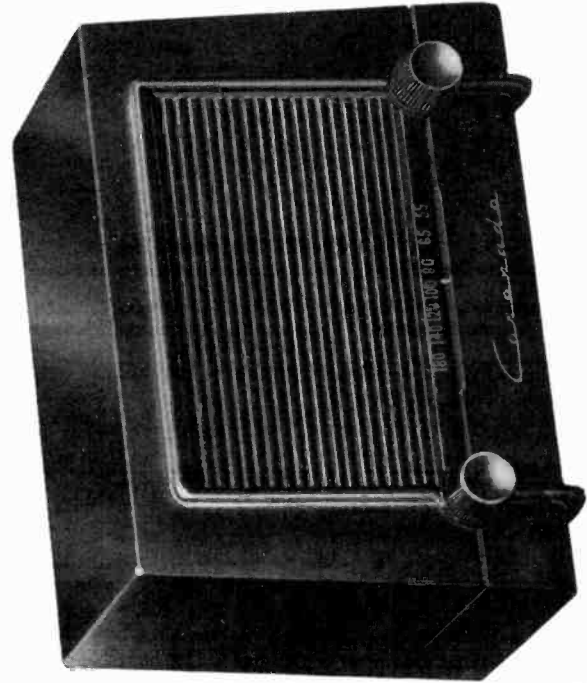
MODELS 94RA33-43-8130C,
94RA33-43-8131C

SPECIFICATIONS

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

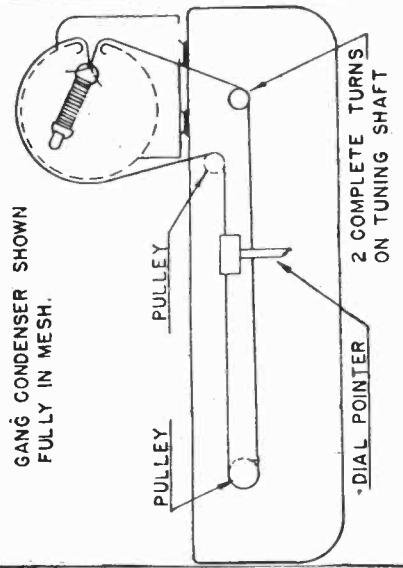
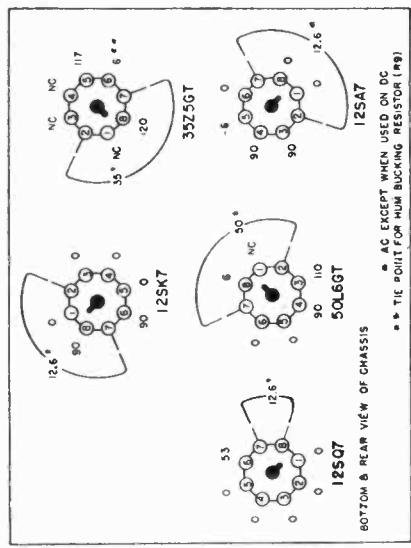
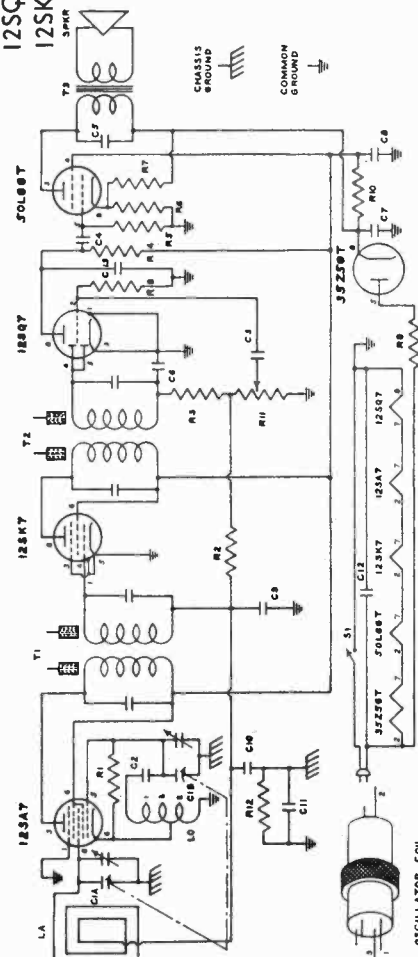
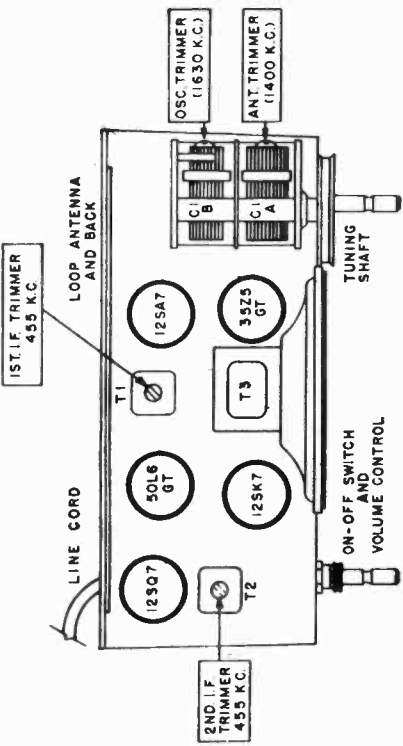
50L6GT Power Output
35Z5GT Power Rectifier
12SA7 Oscillator-Converter
12SQ7 AVC, Detector and Audio
12SK7 I.F. Amplifier

MODELS 94RA33-43-8130C, 94RA33-43-8131C

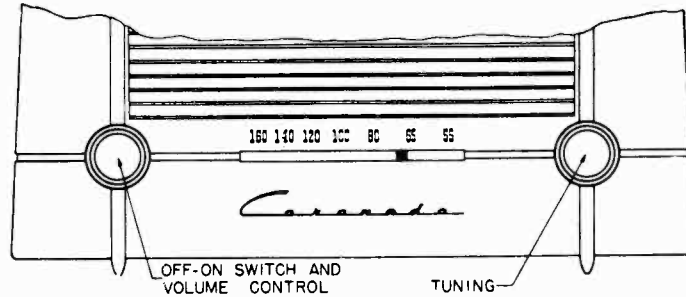


Power Supply
Frequency Range
Intermediate Frequency
Antenna
Tuning
Speaker
Power Output
Sensitivity
Selectivity

Tubes used are as follows:



MODELS 94RA33-43-8130C,
94RA33-43-8131C



ALIGNMENT PROCEDURE

The following procedure is for use only by competent servicemen having the proper equipment. The alignment should be made with volume control fully on, and the output from the Signal Generator as low as possible, to prevent AVC action from interfering with proper alignment. With the output meter connected across the voice coil of the speaker, the output meter reading for 50 milliwatts is 0.4 volts, using a signal which is modulated 400 c.p.s. Adjust all trimmers for maximum output. Repeat the alignment procedure given below as a final check. CAUTION: This is an AC/DC receiver and when aligning the set it is necessary to isolate the Signal Generator or the Receiver from the line by use of a transformer, or to place a .2 MFD condenser in each test lead of the Signal Generator.

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

Connect low side of Signal Generator to common negative.

PARTS VALUES FOR T-65 GAMBLE'S AC-DC MUSETTE

CIRCUIT SYMBOL	COMPONENTS PART NO.	DESCRIPTION	VALUE	RATING
CIA-C1B	E81650-1	Condenser, 2 gang		
C2	C026	Condenser, paper	.02 MFD	600 volts
C3, C4, C5	C0056	Condenser, paper	.005 MFD	600 volts
C6, C13	C2505M	Condenser, mica	250 MMF	500 volts
C7	C40-20-1.5	Electrolytic	40 MFD	150 volts
C8	C40-20-1.5	Electrolytic	20 MFD	150 volts
C9, C10, C11	C052	Condenser, paper	.05 MFD	200 volts
C12	C054	Condenser, paper	.05 MFD	400 volts
R1	R223.5	Resistor	22K ohm	1/2 watt
R2	R105.5	Resistor	1 megohm	1/2 watt
R3	R473.5	Resistor	47K ohm	1/2 watt
R4, R5, R12	R474.5	Resistor	470K ohm	1/2 watt
R6	R121.5	Resistor	120 ohm	1/2 watt
R7	R1031	Resistor	10K ohm	1 watt
R8	R106.5	Resistor	10 megohm	1/2 watt
R9	R270.5	Resistor	27 ohm	1/2 watt
R10	R1021	Resistor	1000 ohm	1 watt
R11	R105VCS	Volume control and switch	1 megohm	
LA	T65-L	Antenna loop		
LO	T65-O	Oscillator coil		
T1	T111-31-A	I.F. transformer		
T2	T111-31-A	I.F. transformer		
T3	E-81645-T	Output transformer		
SI	R105VCS	Switch S.P.S.T. on volume control		

MECHANICAL PARTS

PART NO.	DESCRIPTION	PART NO.	DESCRIPTION
M1605	Chassis	H81644-5	Octal tube socket, wafer
M1607	Dial bracket	W1602	Line cord and plug
T111-31-B	I.F. mounting clip	P1601	Cabinet, ivory
A1601	Dial cord assembly	P1601A	Cabinet, brown
M1602	Dial drive shaft	H81649-8	Knob, ivory
M1601	Dial pointer	H81649-8A	Knob, brown
M1604-A	Small idler pulley	E-81645-S	Speaker, 4" P.M.
M1604-B	Idler pulley rivet	H1601	Snap-in trimount
M1603	Large idler pulley		

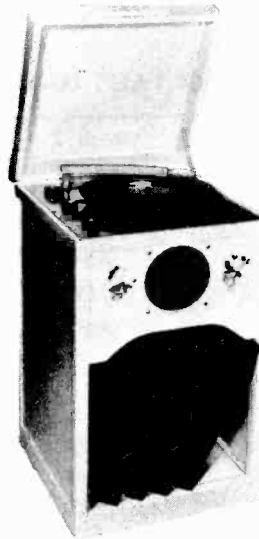
SPECIFICATIONS

Physical Dimensions:
 Width 14½ in.
 Depth 14½ in.
 Height 23½ in.
 Weight 18 lbs.

Power Consumption 50 watts

Electrical Data:
 Tuning Range—500-1600 kc.
 Intermediate Freq.—455 kc.
 Power Output—½ watt

Model
4SJ3A1



Loudspeaker
 5¼ in. PM, voice coil 3.20 ohms at 400 cycles

Pickup—High impedance crystal

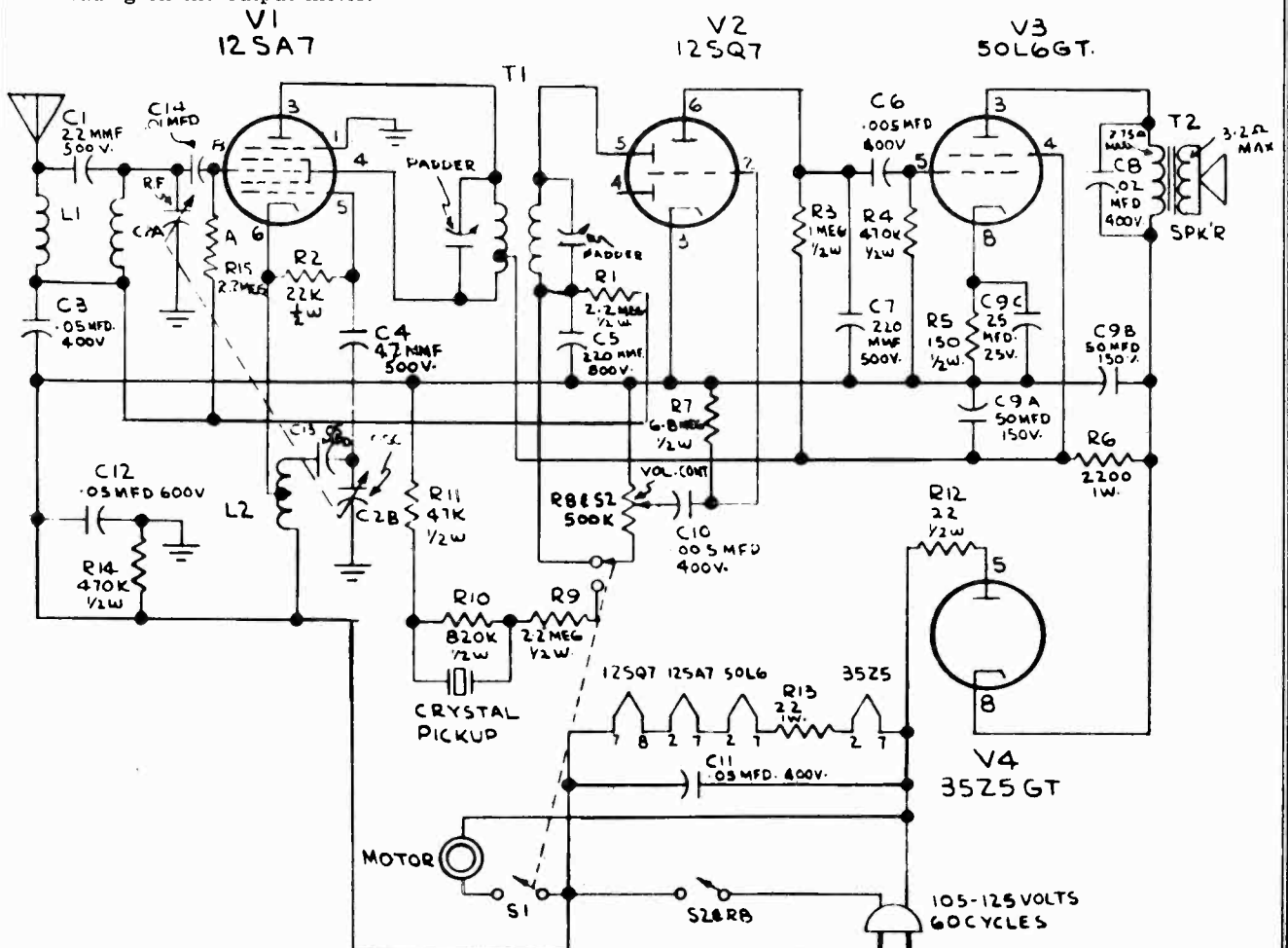
Tube Complement:
 1 12SA7 Converter
 1 12SQ7 Detector, 1st Audio Amplifier
 1 50L6GT Power Output
 1 35Z5GT Rectifier

DESCRIPTION

The model 4SJ3A1 is an AC toy radio-phonograph employing a superheterodyne circuit.

ALIGNMENT INSTRUCTIONS

1. Turn S1 to Radio and volume to maximum. Connect an output meter across the speaker voice coil. Connect generator ground to B- through a .1 mfd. condenser, and the high side to pin 8 of the 12SA7 tube through .03 mfd. Tune generator to 445 kc. and tune T1 trimmers for maximum output reading.
2. Remove generator connection to pin 8, unsolder antenna and attach generator to L1 through 25 mmfd. Turn tuning condenser of set fully open. Set generator to 1620 kc. Tune oscillator trimmer on tuning gang for maximum reading; set R.F. trimmer for maximum output reading. Use only enough generator output to get a reading on the output meter.



MODEL 4SJ3A1

SOCKET VOLTAGE DATA

12SA7	12SQ7	50L6GT	35Z5GT
Pin	Pin	Pin	Pin
1 Gnd	1 Gnd	1 0	1
2 24VAC	2 0	2 24VAC	2 80VAC
3 95V	3 Gnd	3 115V	3 90VAC
4 95V	4 0	4 95V	4
5 6½V	5 0	5 0	5 110VAC
6 0	6 35V	6	6
7 12VAC	7 0	7 75VAC	7 110VAC
8 0	8 12VAC	8 5V	8 120V

REPLACEMENT PARTS LIST

Cat. No.	Symbol No.	Description
SAW-017		Cabinet, Ivory
SMX-036	B1	Motor and Turntable
S527 D-7		Loudspeaker
SAA-013		Arm, Pickup (only)
SAG-005		Grille
SAG-004		Screen
SDK-069		Knob
SPC-002	Cp	Crystal only
SMU-013		Shaft, extension
SWA-001		Wire, antenna
SCT-018	C2	Capacitor, tuning
UCC-045	C3	Capacitor, paper, .05mfd., 400v.
UCC-2021	C4	Capacitor, mica, 47mmf, 500v.
UCU-036	C5	Capacitor, mica, 220mmf, 500v.
UCC-039	C6	Capacitor, paper, .005 mfd., 400v.
UCU-036	C7	Capacitor, mica, 220mmf., 500v.
UCC-041	C8	Capacitor, paper, .02 mfd., 400v.
SCE-059	C9	Capacitor, electrolytic, 50-50-25mfd., 150-150-25v.
UCC-039	C10	Capacitor, paper, .005 mfd., 400v.
UCC-045	C11	Capacitor, paper, .05 mfd., 400v.
SCC-053	C12	Capacitor, paper, .05 mfd., 600v.
SLC-022	L1	Coil, oscillator
SLR-006	L2	Coil, R.F.
URD-129	R1	Resistor, carbon, 2.2 meg., ½w.
URD-081	R2	Resistor, carbon, 22k, ½w.
URD-121	R3	Resistor, carbon, 1 meg., ½w.
URD-113	R4	Resistor, carbon, 470k, ½w.
URD-029	R5	Resistor, carbon, 150, 1w.
URE-057	R6	Resistor, carbon, 2200, 1w.
URD-141	R7	Resistor, carbon, 6.8 meg., ½w.
SRC-068	R8	Potentiometer, carbon, 500k., with switch
URD-129	R9	Resistor, carbon, 2.2 meg., ½w.
URD-119	R10	Resistor, carbon, 820k., ½w.
URD-089	R11	Resistor, carbon, 47k., ½w.
URD-009	R12	Resistor, carbon, 22, ½w.
SRW-060	R13	Resistor, W.W., 22, 1w.
URD-113	R14	Resistor, carbon, 470k., ½w.
RSS-005	S1	Switch, Radio-Phono
STL-023	T1	Transformer, I.F.
STO-008	T2	Transformer, Output

SPECIFICATIONS

CABINET:

Model	64	65
Color	Brown Mahogany	Ivory
Height	6 ³ / ₈ in.	6 ³ / ₈ in.
Width	11 ¹ / ₂ in.	11 ¹ / ₂ in.
Depth	6 ¹ / ₄ in.	6 ¹ / ₄ in.

ELECTRICAL RATING (INPUT):

Voltage	105-120 volts, a-c
Frequency	60 cycles
Wattage	30 watts

OPERATING FREQUENCIES:

Intermediate Frequency	455 kc
Broadcast Band	540-1600 kc

POWER OUTPUT:

Undistorted	1
Maximum	1.75

LOUDSPEAKER:

Type	Alnico 5 PM
Outside Cone Diameter	4-inch
Voice Coil Impedance (400 cycles)	3.5 ohms

TUBE COMPLEMENT:

Oscillator-Converter	Type 12SA7
I-F Amplifier	Type 12SK7
Detector and 1st Audio	Type 12SQ7
Power Output	Type 50C5
Rectifier	Type 35W4

CAUTION: One side of the power line is connected to B-. Avoid any ground connections direct to B-. Use an isolating transformer when making service adjustments with the chassis removed from the cabinet.

RADIO CIRCUIT ALIGNMENT

ALIGNMENT FREQUENCIES:

R-F	1500 kc
R-F	1620 kc
I-F	455 kc

EQUIPMENT REQUIRED:

1. Test oscillator with tone modulation.
2. A-c output meter, 1 1/2 volts full scale.
3. 0.05 mf. paper capacitor.
4. Loop.
5. Insulated screwdriver.

PROCEDURE—GENERAL:

1. With the tuning scale control wheel turned so that the gang condenser plates are fully meshed, the index should read approximately 1/8 inch to the right of the 550 kc scale calibration mark. If it does not, remove the control wheel from the gang condenser shaft and replace it for correct position. **CAUTION:** Do not attempt to correct the position by rotating the wheel on the shaft as this will cause the knob to slip.
2. For i-f alignment, it is necessary to remove the chassis from the cabinet.
3. Connect the output meter across the loudspeaker voice coil terminals.
4. Keep radio volume control at maximum and attenuate the test oscillator signal output so that the output meter reading never exceeds 1.0 volt.
5. Connect the capacitor as listed in column 2 between the output "High Side" of the test oscillator and the point of input specified. The oscillator output cable ground lead is connected to receiver chassis.
6. For alignment of the oscillator and antenna trimmers, the input signal should be inductively coupled to the radio loop antenna, L1, by connecting a four-turn, six-inch diameter loop of bell wire across the signal generator output terminals, and then locating the loop to face the radio antenna loop about one foot away. To prevent possible errors in reference to previous signal measurement readings, the loop with respect to the radio loop should not be changed during any one set of adjustments.

ALIGNMENT CHART

Step	Connect Test Oscillator to	Test Osc. Setting	Dial Drum Setting	Adjust Trimmers for Maximum Output
1	12SK7 grid (4) in series with 0.05 mf. cap.	455 kc	Minimum Capacity	2nd i-f trans. trimmers, C14 and C15
2	12SA7 grid (8) in series with 0.05 mf. cap.	455 kc	Minimum Capacity	1st i-f trans. trimmers, C8 and C9
3	Inductively coupled to radio loop	1620 kc	Minimum Capacity	C4 (oscillator)
4	Inductively coupled to radio loop	1500 kc	Tune for Maximum	C3 (antenna)

STAGE GAIN AND VOLTAGE CHECKS

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

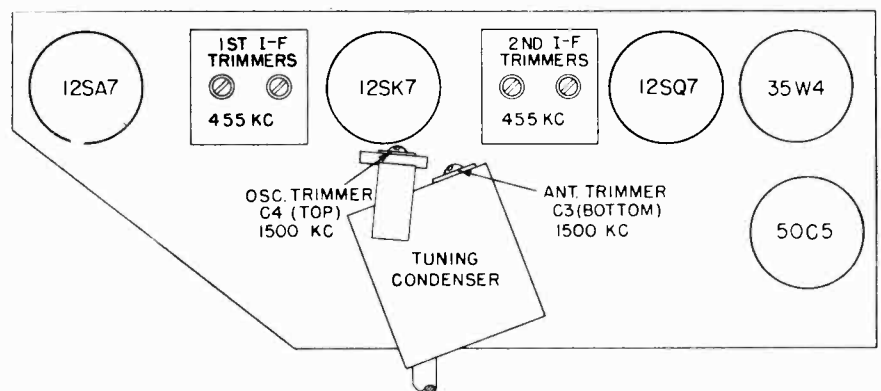
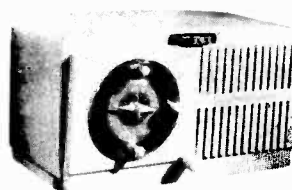
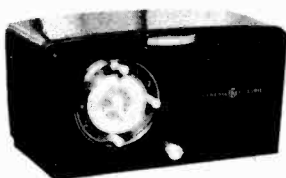
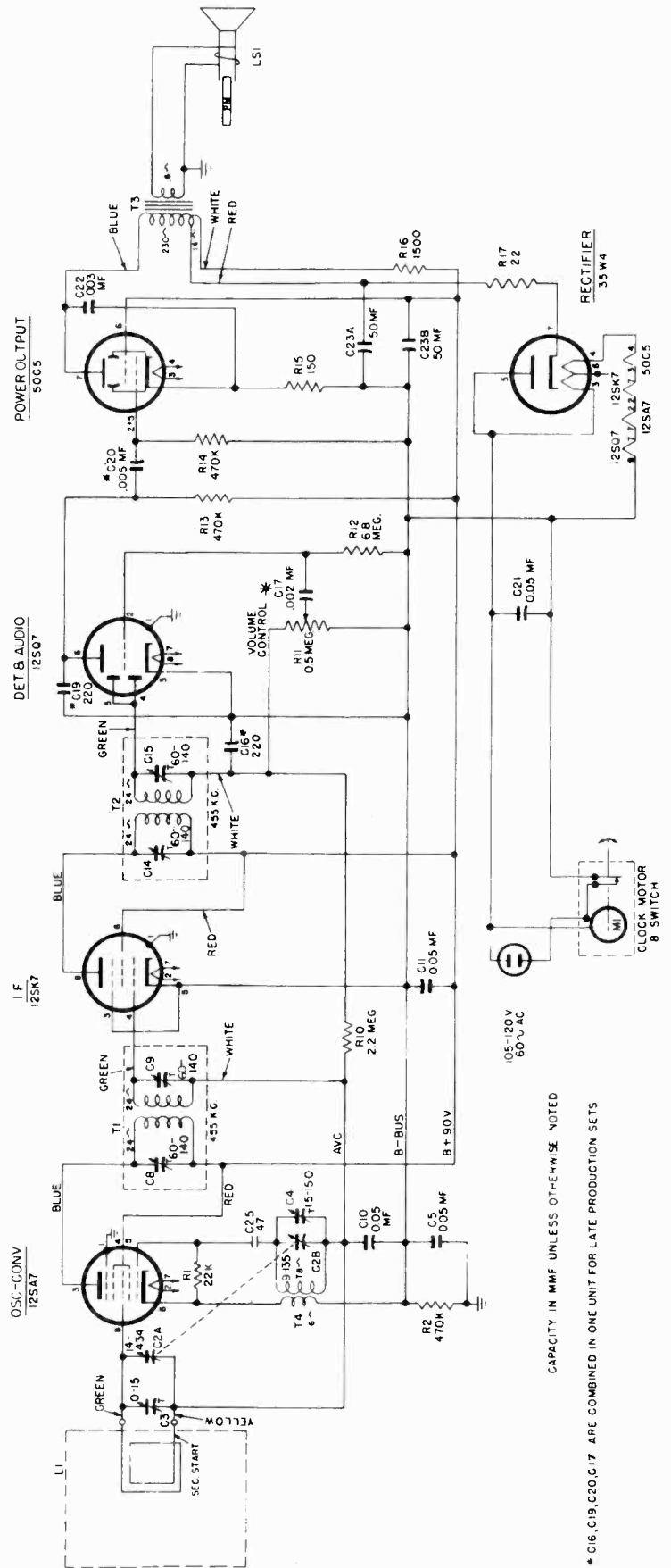


Fig. 1. Tube and Trimmer Location

ER-S-64

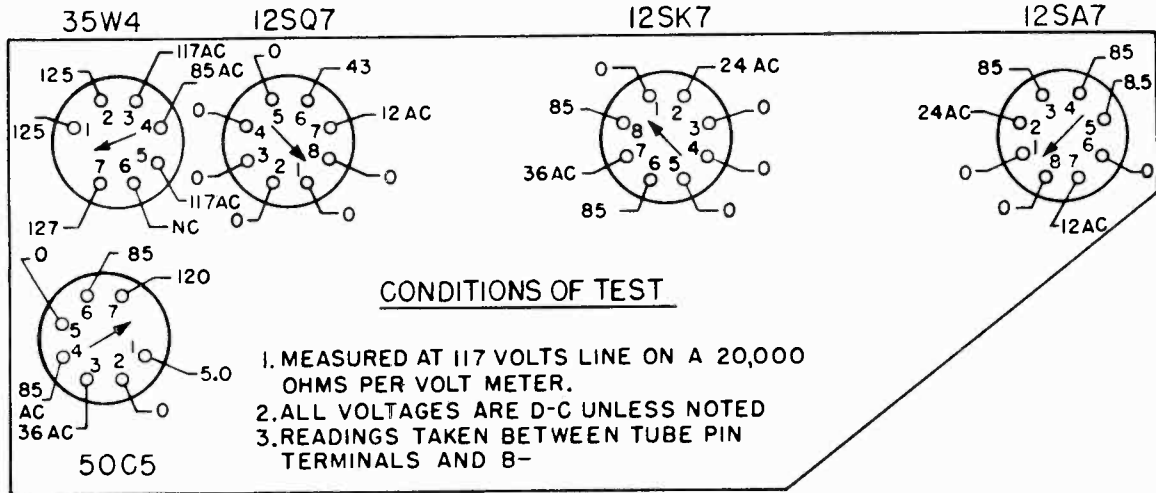
MODELS 64, 65



ER-5-64

Fig. 2. Schematic Diagram, Models 64 and 65

- (1) I-F Stage Gains.
 12SA7 Grid to 12SK7 Grid 50 @ 455 kc
 12SK7 Grid to 12SQ7 Diode Plate 50 @ 455 kc
- (2) Audio Gain.
 0.15 volts at 400 cycles across the volume control (R11) with control set at maximum will give approximately 1/2-watt output across the loudspeaker, LS1, voice coil.
- (3) Oscillator Grid Bias.
 D-c voltage developed across the oscillator grid leak (R1) average 8.5 volts at 1000 kc.
- (4) Socket Pin Voltages.
 Figure 3 shows voltages from all tube pins to B- unless otherwise specified. Voltage readings much higher or lower than those specified may help localize defective components or tubes.



VIEWED FROM BOTTOM OF CHASSIS

Fig. 3. Socket Voltages

CLOCK SERVICE

Figures 4 and 5 show clock parts referred to in the following paragraphs and the parts list.

CLOCK MOVEMENT DISASSEMBLY

1. Remove clock movement from case. When removing knobs, note that the Alarm-Set knob is a left-hand thread, while Wake Up-Manual and Sleep are pull-off knobs.
2. Remove Bezel, Hands and Dial Faces.
3. Remove the motor assembly by removing two screws (3 and 4) and break two soldered joints on Field. The Field and Rotor Assembly (11 and 2) can now be removed. The Rotor is held by friction only, to the Field.
4. Remove Switch Assembly by removing two screws (12) from base plate.
5. Remove Switch Shaft Assembly (13) and spacer.
6. Remove Alarm-Set Shaft Assembly (6) and spacer.
7. Remove the three front plate assembly screws that are located under the Dial Face and then remove Front Plate.
8. Remove the following gear assemblies and control levers in the order listed below:
 - (a) Sweep Control Shaft and Segment Gear (30)
 - (b) Alarm Dial Gear (16)
 - (c) Hour Hand Gear (17)
 - (d) Alarm Signal Cam and Gear, and Friction Washer (27, 26)
 - (e) Sweep Control Switch Lever (29)
 - (f) Pinion Drive Gear Assembly (15) (drives Sleep Control Segment Gear)
 - (g) Alarm Control Switch Cam Lever (8)
 - (h) Time Set Shaft and Gear, and Spacer (14, 20)
 - (i) Drive Gear and Pinion Assembly (28)
 - (j) Minute Hand Gear (18)
 - (k) Sweep Second Hand Gear (19)

CLOCK MOVEMENT REASSEMBLY

- Reassemble in the reverse order of disassembly, observing the following precautions:
1. The spring washer (26) should curve away from the gear when placed on the Alarm Cam Gear Assembly (27).
 2. The Switch Cam Lever fork (8) must straddle the base plate post as shown in the illustration.

3. After reassembly of front plate, check the Sweep Second Gear (19) through the hole in the base plate to make sure it is free to turn.
4. Proceed with Alarm and Switch Adjustments as described below before installing hands.

ALARM AND SWITCH ADJUSTMENTS

1. Turn Wake Up-Manual shaft to ALARM position.
2. Slowly rotate Time Set shaft clockwise until the contacts 21 and 22 of the Switch Assembly close.
3. Replace Dial Face, Alarm Dial, the Minute, Hour and Second Hands. Set all Hands and Dial so that they indicate 12 o'clock. Make sure all Hands and Alarm Dial are tight on their respective shafts.
4. With Alarm Set knob pulled out, continue to rotate Time Set shaft clockwise and note that the Alarm vibrator arm drops against field core approximately 7-10 minutes later.
5. Set alarm at some other selected position and make sure mechanism actuates within limits (± 1 minute).
6. Check alarm tone of vibrator. This can be adjusted by either bending vibrator arm nearer or farther away from field core. Bend arm near anchor point.

CLEANING AND LUBRICATION

To clean, completely disassemble and clean all moving parts in carbon tetrachloride or some similar cleaner.
 The inside of the sleeves and shaft surfaces may be cleaned of oxidized oil by rubbing with a fine grade of steel wool dampened in carbon tetrachloride.
 Do not use too much oil and apply by means of a small wire (drop oiler). Too much oil collects dust and later oxidizes. Use only recommended clock oil, such as Nye's Celebrated Oil which may be purchased from Wm. F. Nye Co., Inc., New Bedford, or equivalent.

CLOCK TROUBLES

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

MODELS 64, 65

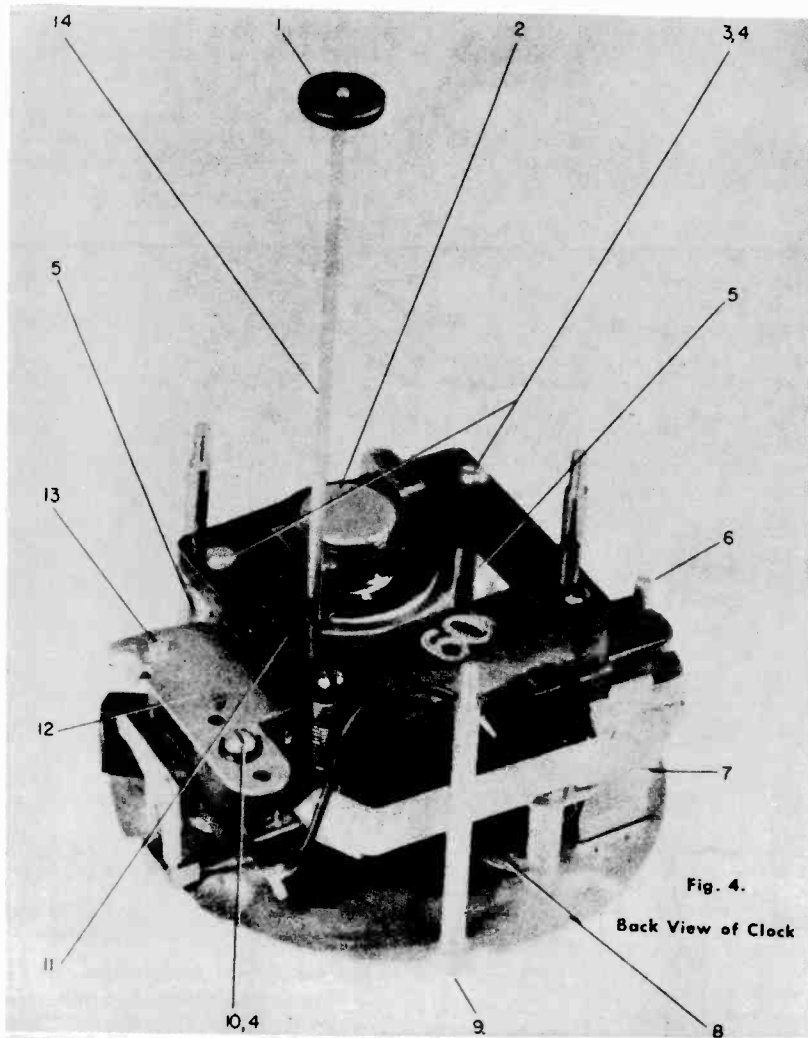


Fig. 4.
Back View of Clock

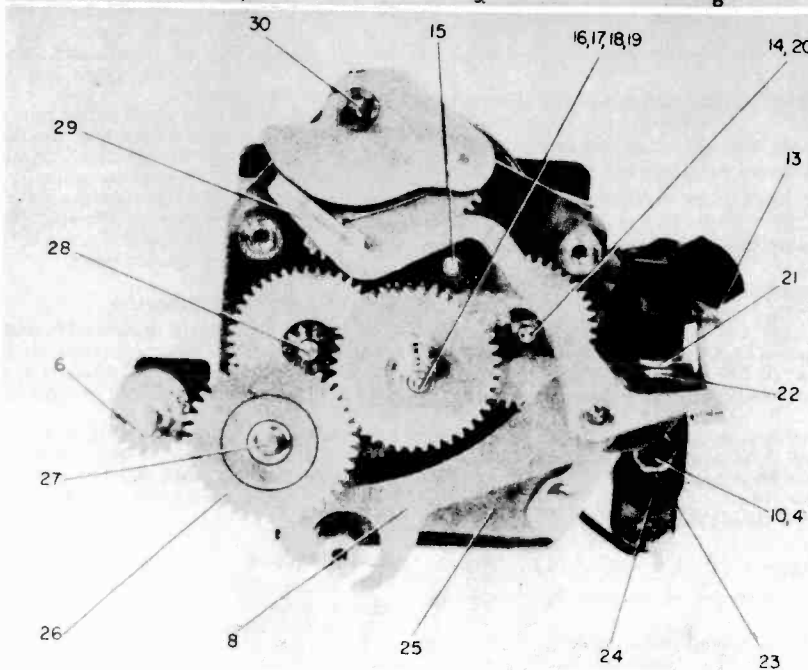


Fig. 5. Front View of Clock, Front Plate Removed

C16, C17, C19, AND C20

PRODUCTION CHANGES

Early production receivers use individual component capacitors C16, C17, C19, and C20, while other chassis incorporate these in a single four-section unit, catalogued RCW-3013. Some differences in capacitor values for the above components may be noted in early receivers from that shown in the schematic diagram. These values are not critical, however, and the stock catalogue item corresponding to the capacitor symbol in the parts list can be used when replacement is necessary.

The lead identification for the four-section ceramic capacitor RCW-3013 (K67J836) can be observed from the illustration of Figure 6.

The two cabinet backs are interchangeable on all the above models.

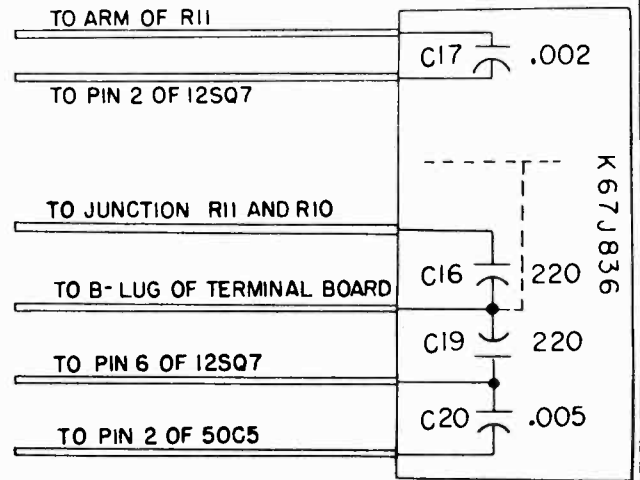


Fig. 6. Capacitor RCW-3013 (K67J836)

ANTENNA LOOP, RAB-054 AND RAB-097

Though the Models 64, 65, 66, and 67 Clock-Radio receivers have been designed and connected to operate with a single loop input inductance, some production was made using the loop and antenna primary assembly (RAB-054) of earlier model clock-radios (Models 60 and 62). This assembly of Cabinet Back with loop and antenna primary is illustrated with circuit connections for the Models 64, 65, 66, and 67, as shown in Figure 7. Connections to the primary circuit winding are not made.

In other productions of the Models 64, 65, 66, and 67 the single pick-up loop, L1 (antenna primary omitted) was incorporated in Cabinet Back RAB-097 whose circuit connections are given in Figure 8.

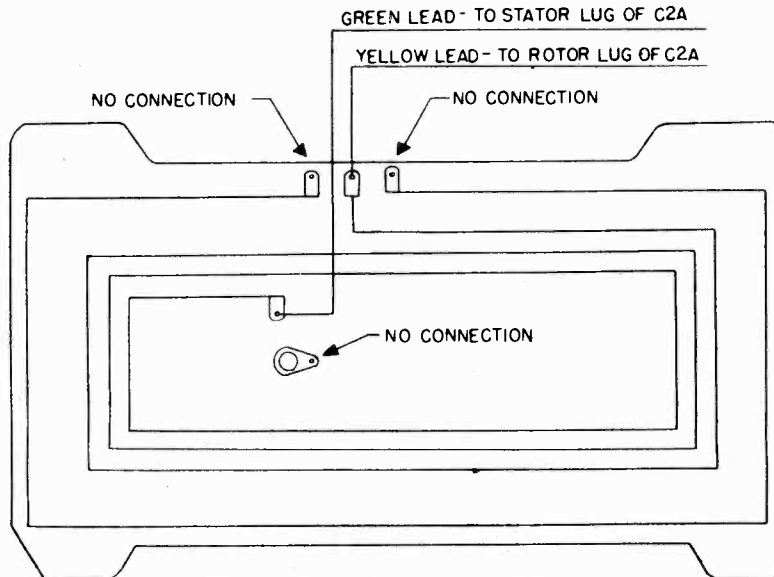


Fig. 7. Cabinet Back and Loop, RAB-054

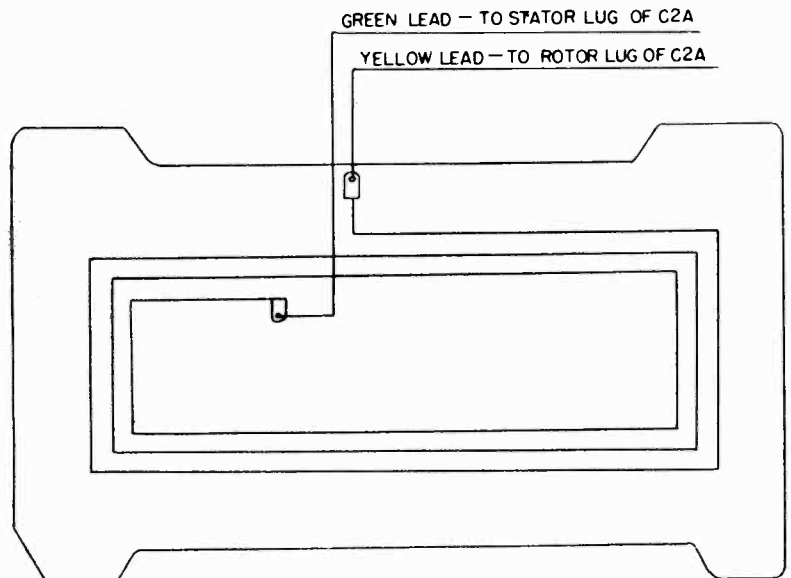


Fig. 8. Cabinet Back and Loop, RAB-097

MODELS 64, 65

RADIO REPLACEMENT PARTS LIST

Cat. No.	Symbol	Description	Cat. No.	Symbol	Description
UNIVERSAL REPLACEMENT PARTS			SPECIALIZED REPLACEMENT PARTS (Cont'd)		
UCC-028	C5, 10, 11	CAPACITOR—.05 mf., 400 v., paper	RAU-304		CABINET—Brown plastic (Model 64)
UCC-036	C17	CAPACITOR—.002 mf., 600 v., paper; see production change	RAU-305		CABINET—White plastic (Model 65)
UCC-039	C20	CAPACITOR—.005 mf., 600 v., paper; see production change	RCC-045	C21	CAPACITOR—.05 mf., 600 v., paper
UCU-1036	C16, 19	CAPACITOR—220 mmf., mica; see production change	RCC-074	C22	CAPACITOR—.003 mf., 600 v., paper
UOP-421	LS1	SPEAKER—PM loudspeaker	RCE-050	C23A, 23B	CAPACITOR—50 mf., 150 v.; 50 mf., 150 v., dry electrolytic
URD-009	R17	RESISTOR—22 ohms, 1/2 w., carbon	RCT-021	C2A, 2B	CAPACITOR—Tuning capacitor (oscillator and r-f section)
URD-029	R15	RESISTOR—150 ohms, 1/2 w., carbon	RCW-1043	C25	CAPACITOR—47 nmf., ceramic
URD-081	R1	RESISTOR—22,000 ohms, 1/2 w., carbon	RCW-3013	C16, 17, 19, 20	CAPACITOR—220 mmf., .002 mf., 220 mmf., .005 mf., (4 section ceramic)
URD-113	R2, 13, 14	RESISTOR—470,000 ohms, 1/2 w., carbon	RDK-028		KNOB—Volume control knob
URD-129	R10	RESISTOR—2.2 meg., 1/2 w., carbon	RDK-094		KNOB—Tuning dial wheel
URD-141	R12	RESISTOR—6.8 meg., 1/2 w., carbon	RDS-082		SCALE—Dial scale
URF-053	R16	RESISTOR—1500 ohms, 2 w., carbon	RHC-018		SNAP FASTENER—For cabinet back
SPECIALIZED REPLACEMENT PARTS			RJC-004		CLIP—Loop connector clip
RAB-054	L1	BACK—Cabinet back cover (includes loop L1 and antenna primary)	RJS-092		SOCKET—Tube socket for 50C5, 35W4
RAB-097	L1	BACK—Cabinet back cover includes loop L1 (antenna primary omitted)	RJS-116		SOCKET—Tube socket for 12SA7
RAC-060		SHIELD PLATE—Metal plate covers bottom of chassis	RJS-117		SOCKET—Tube socket for 12SK7, 12SQ7
RAC-073		MOUNTING BRACKET—Metal back cover holds clock to cabinet	RLC-090	T4	COIL—Oscillator coil
			RRC-054	R11	POTENTIOMETER—.05 meg., volume control
			RTL-094	T1	TRANSFORMER—1st I-F transformer
			RTL-095	T2	TRANSFORMER—2nd I-F transformer
			RTO-036	T3	TRANSFORMER—Output transformer
			RWL-009		CORD—Power cord (brown) for Model 64
			RWL-016		CORD—Power cord (white) for Model 65
			RZC-009	M1	CLOCK—60 cycle, 105-125 v., clock assembly

† CLOCK REPLACEMENT PARTS LIST

Cat. No.	Symbol	Description	Cat. No.	Symbol	Description
MISCELLANEOUS			CLOCK MOVEMENT (Cont'd)		
XC3X36	1	KNOB—Time set shaft knob (bronze)	XC35X93	25	BASE PLATE AND BACK GEAR—Base plate assembled complete with studs, back gear and pinion, and vibrator
XC4X5		KNOB—Alarm set knob (ivory)	XC40X76	24	SWITCH INSULATOR ASSEMBLY—Consists of: two plastic and one fibre switch contact spring spacers
XC31X26		HAND—Sweep second hand	XC40X77	28	GEAR AND SPRING ASSEMBLY—Drives alarm dial gear and hour hand gear (complete with pinion and shaft, pinion and gear, spring, washers and retaining clip)
XC32X199		HANDS—Hour and minute hands (luminous)	XC40X80	21	CONTACT ASSEMBLY—Lower switch contact and spring
XC53X31		BEZEL—Outer mounting rim	XC40X185		SPRING—Switch control shaft index spring (for cam indexed control shafts)
XC53X117		BEZEL—Numeral ring (gold finish)	XC40X194	29	LEVER—Sleep control switch lever
XC55X15		DIAL—Alarm dial scale	XC40X196	15	GEAR AND SPRING ASSEMBLY—Pinion drive for sleep control segment gear (consists of pinion gear, pinion gear and shaft, spring, washers, and retaining clip)
XC58X16		CRYSTAL—Glass crystal	XC40X197	8	LEVER—Alarm control switch cam lever
XC59X247		RING—Color ring for numeral bezel	XC40X198	22	CONTACT ASSEMBLY—Upper switch contact and spring with attached fibre arm
XC59X716		KNOB—Wake-up Manual and Sleep control knob (ivory)	XC40X202	5	SPACER BUSHING—Field core spacer at screw mounting to base plate
XC61X937		DIAL—Clock dial scale (luminous)	XC40X252	26	WASHER—Alarm signal cam and gear friction washer
CLOCK MOVEMENT			XC40X275		SPACER BUSHING—Wake-up Manual switch control shaft bushing
XC1X1	3	SCREW—Holds field core to baseplate, #4-40 x 1 1/2" long, round head	XC40X276	20	SPACER BUSHING—For time set shaft
XC1X2	4	LOCK WASHER—Under screw head of switch assembly mounting screw and field core mounting	XC40X277	30	SHAFT—Sleep control shaft and gear segment assembly
XC1X6	10	SCREW—Used to assemble switch assembly to switch bracket	XC44X38	2	MOTOR ROTOR ASSEMBLY—Cased rotor and pinion (60 cycles)
XC1X43	23	HEX NUT—For screw mounting switch assembly to switch bracket	XC45X69	11	MOTOR FIELD ASSEMBLY—Consists of: core, shading poles, and field coil (60 cycles)
XC10X141	14	SHAFT ASSEMBLY—Time set shaft and gear assembly	XC59X699	13	SHAFT ASSEMBLY—Wake-up Manual control shaft assembly (detent spring index type)
XC11X11	6	SHAFT ASSEMBLY—Alarm set shaft and gear assembly	XC59X723	13	SHAFT ASSEMBLY—Wake-up Manual control shaft assembly (cam index type)
XC13X11	17	GEAR ASSEMBLY—Hour hand gear and sleeve assembly	XC64X1		SCREW—Switch bracket and front plate mounting screws
XC14X32	18	GEAR ASSEMBLY—Minute hand friction gear, pinion gear and sleeve assembly			
XC15X3	16	GEAR ASSEMBLY—Alarm dial gear and sleeve assembly			
XC16X14	19	GEAR ASSEMBLY—Sweep second hand gear and shaft assembly			
XC17X8	27	GEAR AND CAM—Alarm signal cam and gear assembly			
XC34X173	9	FRONT PLATE ASSEMBLY—Complete with case studs and alarm set shaft spring (7)			

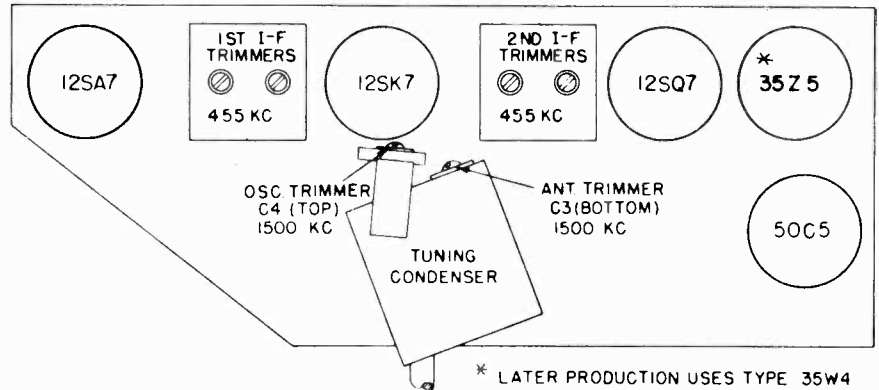
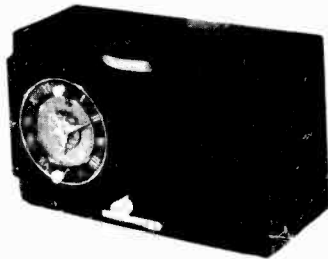


Fig. 1. Tube and Trimmer Location

SPECIFICATIONS

CABINET:		
Model	66	67
Color	Mahogany	Ivory
Height	6 ³ / ₁₆ in.	6 ³ / ₁₆ in.
Width	10 ¹ / ₂ in.	10 ¹ / ₂ in.
Depth	5 ³ / ₈ in.	5 ³ / ₈ in.

ELECTRICAL RATING (INPUT):	
Voltage	105-120 volts, a-c
Frequency	60 cycles
Wattage	30 watts

OPERATING FREQUENCIES:	
Intermediate Frequency	455 kc
Broadcast Band	540-1600 kc

POWER OUTPUT:	
Undistorted	1
Maximum	1.75

LOUDSPEAKER:	
Type	Alnico 5 PM
Outside Cone Diameter	4-inch
Voice Coil Impedance (400 cycles)	3.5 ohms

TUBE COMPLEMENT:	
Oscillator-Converter	Type 12SA7
I-F Amplifier	Type 12SK7
Detector and 1st Audio	Type 12SQ7
Power Output	Type 50C5
Rectifier (early production)	Type 35Z5GT
Rectifier (late production)	Type 35W4

CAUTION: One side of the power line is connected to B-. Avoid any ground connections direct to B-. Use an isolating transformer when making service adjustments with the chassis removed from the cabinet.

PRODUCTION CHANGES:

- Later production receivers use a 35W4 type rectifier tube in place of the Type 35Z5 tube in the first production chassis. Insets in Figure 2 and Figure 3 show the changes in wiring and voltage measurements respectively, where the 35W4 type rectifier is substituted for the 35Z5.
- Early production receivers also use individual component capacitors C16, 17, 19, and 20; while later chassis incorporate these capacitors in a four-section unit cataloged RCW-3013.

RADIO CIRCUIT ALIGNMENT

ALIGNMENT FREQUENCIES:	
R-F	1500 kc
R-F	1620 kc
I-F	455 kc

EQUIPMENT REQUIRED:

- Test oscillator with tone modulation.

- A-c output meter, 1¹/₂ volts full scale.
- 0.05 mf. paper capacitor.
- Loop.
- Insulated screwdriver.

PROCEDURE—GENERAL:

- With the tuning scale control wheel turned so that the gang condenser plates are fully meshed, the index should read approximately ³/₁₆ inch to the right of the 550 kc scale calibration mark. If it does not, remove the control wheel from the gang condenser shaft and replace it for correct position. **CAUTION:** Do not attempt to correct the position by rotating the wheel on the shaft as this will cause the knob to slip.
- For i-f alignment, it is necessary to remove the chassis from the cabinet.
- Connect the output meter across the loudspeaker voice coil terminals.
- Keep radio volume control at maximum and attenuate the test oscillator signal output so that the output meter reading never exceeds 1.0 volt.
- Connect the capacitor as listed in column 2 between the output "High Side" of the test oscillator and the point of input specified.
- For alignment of the oscillator and antenna trimmers, the input signal should be inductively coupled to the radio loop antenna, L1, by connecting a four-turn, six-inch diameter loop of bell wire across the signal generator output terminals, and then locating the loop to face the radio antenna loop about one foot away. To prevent possible errors in reference to previous signal measurement readings, the loop with respect to the radio loop should not be changed during any one set of adjustments.

ALIGNMENT CHART

Step	Connect Test Oscillator to—	Test Osc. Setting	Dial Drum Setting	Adjust Trimmers for Maximum Output
1	12SK7 grid (4) in series with 0.05 mf. cap.	455 kc	Minimum Capacity	2nd i-f trans. trimmers, C14 and C15
2	12SA7 grid (8) in series with 0.05 mf. cap.	455 kc	Minimum Capacity	1st i-f trans. trimmers, C8 and C9
3	Inductively coupled to radio loop	1620 kc	Minimum Capacity	C4 (oscillator)
4	Inductively coupled to radio loop	1500 kc	Tune for Maximum	C3 (antenna)

STAGE GAIN AND VOLTAGE CHECKS

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

MODELS 66, 67,
Clock Radio

- (1) R-F and I-F Stage Gains.
12SA7 Grid to 12SK7 Grid 50 @ 455 kc
12SK7 Grid to 12SQ7 Diode Plate 50 @ 455 kc
- (2) Audio Gain.
0.15 volts at 400 cycles across the volume control (R11) with control set at maximum will give approximately 1/2-watt output across the loudspeaker, LS1, voice coil.
- (3) Oscillator Grid Bias.
D-c voltage developed across the oscillator grid leak (R1) averages 8.5 volts at 1000 kc.
- (4) Socket Pin Voltages.
Figure 3 shows voltages from all tube pins to B— unless otherwise specified. Voltage readings much higher or lower than those specified may help localize defective components or tubes.

CLOCK SERVICE

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

CLOCK MOVEMENT DISASSEMBLY

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

CLOCK MOVEMENT REASSEMBLY

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

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

ALARM AND SWITCH ADJUSTMENTS

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

CLEANING AND LUBRICATION

To clean, completely disassemble and clean all moving parts in carbon tetrachloride or some similar cleaner.
The inside of the sleeves and shaft surfaces may be cleaned of oxidized oil by rubbing with a fine grade of steel wool dampened in carbon tetrachloride.
Do not use too much oil and apply by means of a small wire (drop oiler). Too much oil collects dust and later oxidizes. Use only recommended clock oil, such as Nye's Celebrated Oil which may be purchased from Wm. F. Nye Co., Inc., New Bedford, or equivalent.

CLOCK TROUBLES

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

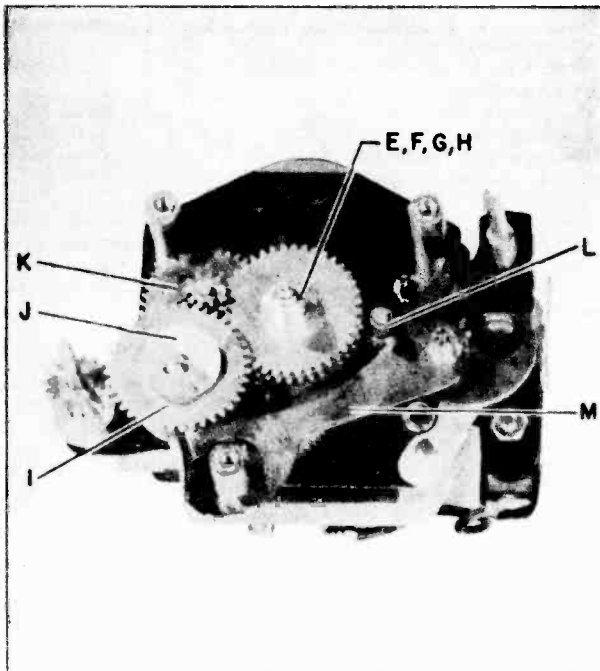
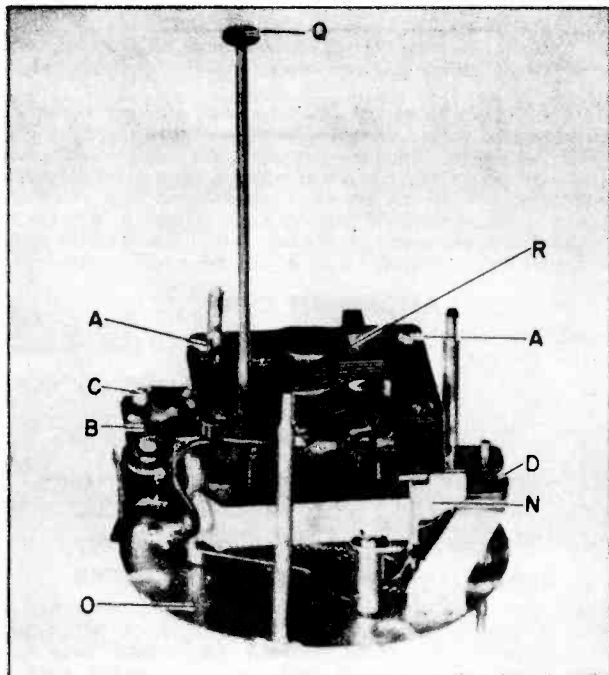


Fig. 4. Clock Part Identification

MODELS 66, 67,
Clock Radio

MODEL 66 AND 67 REPLACEMENT PARTS

Cat. No.	Symbol	Description
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UNIVERSAL REPLACEMENT PARTS

UCC-028	C5, 10, 11	CAPACITOR—.05 mf., 400 v., paper
UCC-630	C17, 20	CAPACITOR—.01 mf., 600 v., paper (used in early production) (may replace respective sections of RCW-3013)
UCU-036	C16, 19	CAPACITOR—220 mmf., mica (used in early production) (may replace respective sections of RCW-3013)
UOP-421	LS1	SPEAKER—PM loudspeaker
URD-009	R17	RESISTOR—22 ohms, 1/2 w., carbon
URD-029	R15	RESISTOR—150 ohms, 1/2 w., carbon
URD-081	R1	RESISTOR—22,000 ohms, 1/2 w., carbon
URD-113	R2, 13, 14	RESISTOR—470,000 ohms, 1/2 w., carbon
URD-129	R10	RESISTOR—2.2 meg., 1/2 w., carbon
URD-141	R12	RESISTOR—6.8 meg., 1/2 w., carbon
URE-053	R16	RESISTOR—1500 ohms, 2 w., carbon

SPECIALIZED REPLACEMENT PARTS

RAB-054	L1	BACK—Cabinet back cover (includes loop L1)
RAC-074		MOUNTING BRACKET—Metal back cover holds clock to cabinet
RAU-020		CABINET—Brown plastic (Model 66)
RAU-021		CABINET—White plastic (Model 67)
RCC-045	C21	CAPACITOR—.05 mf., 600 v., paper
RCC-074	C22	CAPACITOR—.003 mf., 600 v., paper

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

RCE-050	C23A, 23B	CAPACITOR—50 mf., 150 v., 50 mf., 150 v., dry electrolytic
RCT-021	C2A, 2B	CAPACITOR—Tuning capacitor (oscillator and r-f section)
RCW-1043	C25	CAPACITOR—47 mmf., ceramic
RCW-3013	C16, 17, 19, 20	CAPACITOR—220 mmf., .002 mf., 220 mmf., .005 mf., (4 section ceramic) (see UCC-630 UCU-036)
RDK-028		KNOB—Volume control knob
RDK-094		KNOB—Tuning dial wheel
RDS-047		SCALE—Dial scale (Model 66)
RDS-050		SCALE—Dial scale (Model 67)
RJC-004		CLIP—Loop connector clip
RJS-092		SOCKET—Tube socket for 50C5, 35W4
RJS-116		SOCKET—Tube socket for 12SA7
RJS-117		SOCKET—Tube socket for 12SK7, 12SQ7, 35Z5-GT
RLC-051	T4	COIL—Oscillator coil
RHH-004		SNAP FASTENER—For cabinet back
RRC-054	R11	POTENTIOMETER—0.5 meg., volume control
RTL-004	T1	TRANSFORMER—1st I-F transformer
RTL-095	T2	TRANSFORMER—2nd I-F transformer
RTO-036	T3	TRANSFORMER—Output transformer
RWL-009		CORD—Power cord (brown) for Model 66
RWL-016		CORD—Power cord (white) for Model 67
RZC-005	M1	LOCK—60 cycle, 105-125 v., clock assembly

CLOCK REPLACEMENT PARTS LIST

Cat. No.	Symbol	Description
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MISCELLANEOUS

XC3X49	Q	TIME SET SHAFT KNOB—Bronze
XC4X5		ALARM SET KNOB—Ivory
XC10X131	L	TIME SET GEAR AND SHAFT ASSEMBLY
XC11X11	D	ALARM SET SHAFT ASSEMBLY
XC31X26		SWEEP SECOND HAND
XC32X167		HOUR AND MINUTE HANDS
XC34X139	O	FRONTPLATE ASSEMBLY
XC53X100		INNER BEZEL—2 9/16 in., round, maroon
XC54X29		OUTER BEZEL—Brass
XC55X11		ALARM DIAL
XC58X16		CRYSTAL—2 9/16 in., round
XC59X234		NUMERAL COLOR RING—Bronze
XC59X699	C	SWITCH SHAFT ASSEMBLY
XC59X716		SWITCH KNOB—Ivory
XC60X712		DIAL FACE—(On frontplate)

CLOCK MOVEMENT

XC1X1	A	SCREW—Holds Field, No. 4-40X1 1/8 in. R. H.
XC1X2		No. 1204 LOCKWASHER
XC1X6		SCREW No. 4-40 x 1/8 in. R. H.
XC1X43		HEX NUT

Cat. No.	Symbol	Description
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CLOCK MOVEMENT (Cont'd)

XC13X11	F	HOUR GEAR SLEEVE ASSEMBLY
XC14X15	G	MINUTE GEAR SLEEVE ASSEMBLY
XC15X3	E	ALARM GEAR SLEEVE ASSEMBLY
XC16X14	H	SWEEP SECOND GEAR SHAFT ASSEMBLY
XC17X8	I	ALARM GEAR SHAFT ASSEMBLY
XC35X39		BASEPLATE ASSEMBLY
XC40X13		RIVET—Vibrator
XC40X76		SWITCH ASSEMBLY—Consists of Contact Block (top), Contact Block (bottom), Contact Spring Insulator
XC40X77	K	ALARM SET GEAR ASSEMBLY
XC40X78	M	SWITCH CAM LEVER ASSEMBLY
XC40X79		UPPER CONTACT SPRING ASSEMBLY
XC40X80		LOWER CONTACT SPRING AND TIP ASSEMBLY
XC40X202		SPREADER POST
XC40X252	J	CAM GEAR SPRING WASHER
XC40X260		SPACER—Switch shaft
XC40X261		TIME SET SHAFT SPACER
XC40X262		TIME SET SHAFT SPACER
XC40X263		ALARM SHUT-OFF SPACER
XC44X38		ROTOR UNIT—60 cycles
XC45X69	R	FIELD COIL ASSEMBLY—60 cycle
XC64X1-		FRONTPLATE SCREW

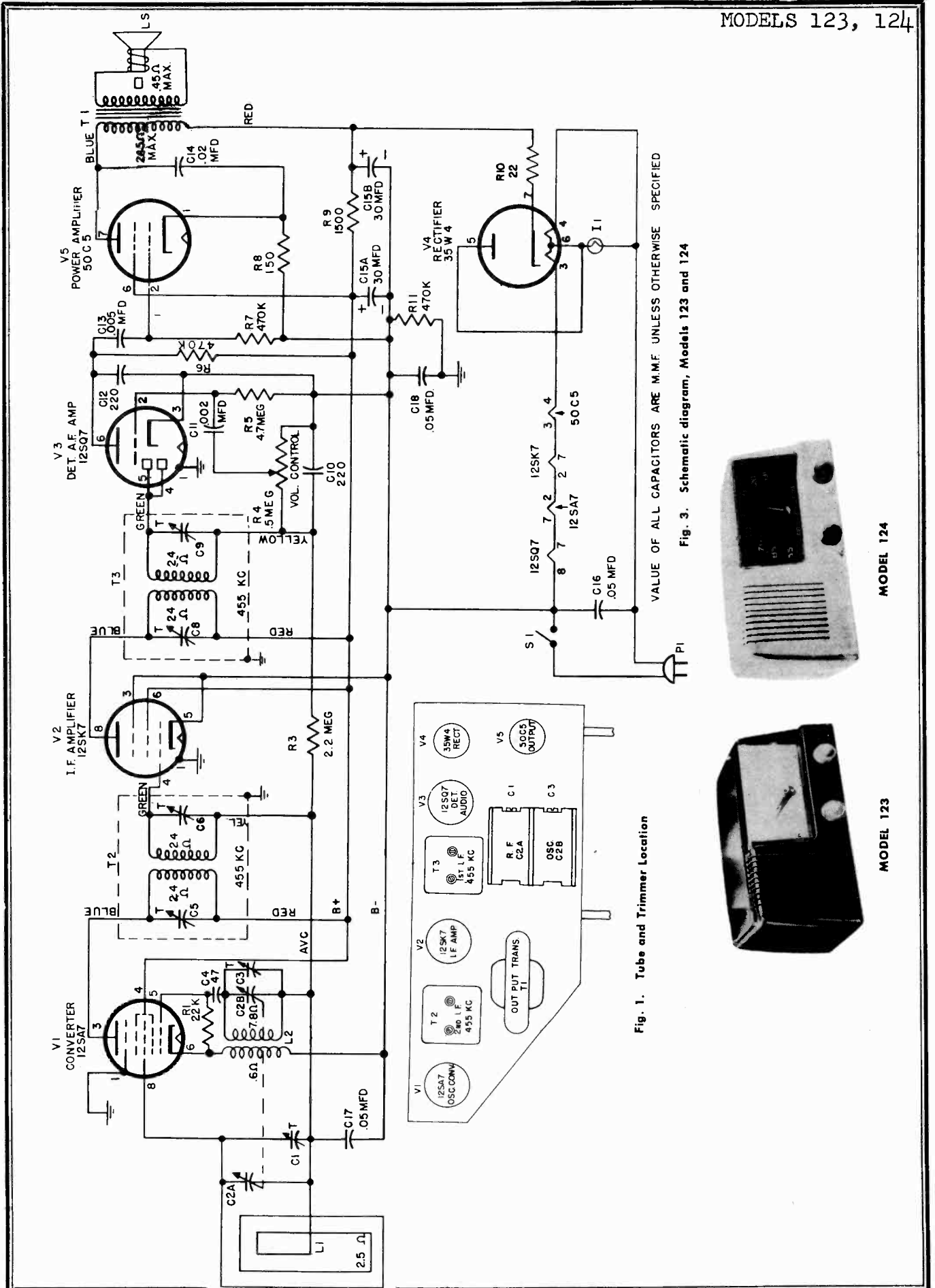
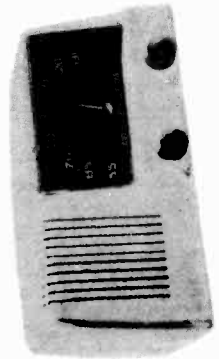
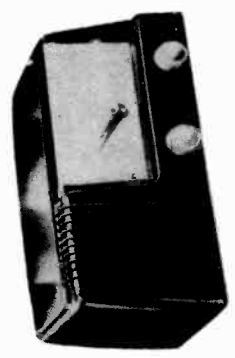


Fig. 1. Tube and Trimmer Location

Fig. 3. Schematic diagram, Models 123 and 124



MODEL 124



MODEL 123

MODELS 123, 124

SPECIFICATIONS

CABINET	Description	Model 123	Model 124
	Material	Brown	Ivory
	Height	6 1/8 in.	6 1/8 in.
	Width	12 1/2 in.	12 1/2 in.
	Depth	7 1/4 in.	7 1/4 in.
ELECTRICAL RATING	Voltage	105-125	
	Frequency	50-60 cycles or DC	
	Wattage	26 at 117 volts input	
OPERATING FREQUENCIES	Standard Broadcast	540-1600 kc	
	I-F Amplifier	455 kc	
POWER OUTPUT	Undistorted	1 watt	
	Maximum	1.75 watts	
LOUDSPEAKER	Type	Alnico VPM	
	Outside Cone Diameter	4 inches	
	Voice Coil Impedance at 400 Cycles	3.2 ohms	
TUBE COMPLEMENT	(V1) Oscillator-Converter	12SA7	
	(V2) I-F Amplifier	12SK7	
	(V3) Detector-Audio	12SQ7	
	(V4) Rectifier	35W4	
	(V5) Audio Power Amplifier	50C5	
	(I1) Pilot Lamp	G-E Mazda No. 47	

pacitor to the points indicated in the Alignment Chart. The low side of the output cable is connected to the receiver chassis.

6. To align the oscillator and r-f trimmers, the signal generator output is inductively coupled to the radio loop, L1, by connecting a four-turn, six-inch diameter loop of bell wire across its output terminals and then locating the loop about one foot from the radio loop antenna. To prevent possible errors in comparative peak readings, the position of signal generator loop with respect to the radio loop antenna should not be changed during measurement.

ALIGNMENT CHART

Step	Connect Test Oscillator to:	Test Osc. Setting	Radio Dial Setting	Adjust Trimmers for Maximum
I-F ALIGNMENT				
1	V2, 12SK7 grid ((Pin 4), in series with .05 mfd.	455 KC	.....	C9 and C8 of second i-f transformer, T3
2	V1, 12SA7 grid (Pin 8), in series with .05 mfd.	455 KC	.....	C6 and C5 of first i-f transformer, T2
3	V1, 12SA7 grid (Pin 8), in series with .05 mfd.	455 KC	.....	Recheck adjustment of C9, C8, C6, C5, for maximum
R-F ALIGNMENT				
4	Inductively coupled to radio loop	1620 KC	Minimum capacity C2A, C2B	C3, oscillator trimmer
5	Inductively coupled to radio loop	1500 KC	1500 KC	C1, r-f trimmer

GENERAL INFORMATION

The Model 123 and 124 is a five-tube a-c or d-c superheterodyne AM standard broadcast receiver equipped with an efficient built-in antenna loop and incorporating automatic volume control, an oversize permanent magnet speaker, and beam power output.

ELECTRICAL CIRCUIT ALIGNMENT

EQUIPMENT REQUIRED

1. Test oscillator, tone amplitude-modulated.
2. A-C output meter, 1 1/2 volts full scale.
3. .05 mfd., paper capacitor.
4. Insulated screwdriver.
5. Coupling loop for test oscillator (see text).
6. Isolation power transformer.

ALIGNMENT PROCEDURE

The alignment steps are given in the table form of the Alignment Chart. Adjustment trimmers are shown in the illustration of Fig. 1.

1. The chassis is removed from the cabinet with the antenna loop and back attached and the speaker leads reconnected.
2. An isolation transformer should be used for the receiver power source when aligning or servicing, AC-DC receivers, to prevent short circuiting of equipment and shock hazard.
3. The output meter is connected across the terminals of the loudspeaker voice coil.
4. The receiver volume control should be turned to maximum and test oscillator signal output attenuated during alignment to develop not more than 1 1/4 volts output meter reading at the loudspeaker.
5. For i-f alignment, the high side of the signal generator output cable should be connected through a .05 mfd. paper ca-

STAGE GAINS AND VOLTAGE CHECKS

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

1. I-F GAIN

- 12SA7 Grid to 12SK7 Grid 50 @ 455 KC
- 12SK7 Grid to 12SQ7 Diode Plate 50 @ 455 KC

2. AUDIO GAIN

Input of 0.15 volts at 400 cycles across volume control (R4) with control set at maximum will develop approximately 1/2 watt output across the speaker voice coil terminals.

3. OSCILLATOR GRID BIAS

D-C voltage developed across the oscillator grid leak (R1) averages 8.5 volts at 1000 kc.

4. TUBE SOCKET PIN VOLTAGES

Fig. 4 shows voltages from tube pins to B-. Voltage readings differing greatly from those specified may help localize defective components.

RSM-1

ER-S-123

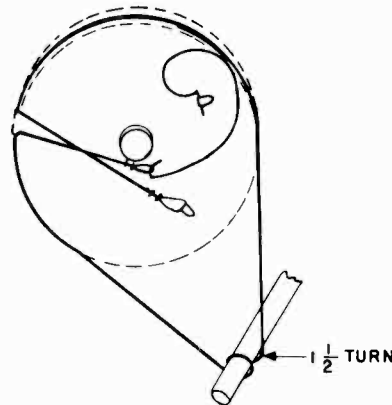


Fig. 2. Dial Stringing Diagram

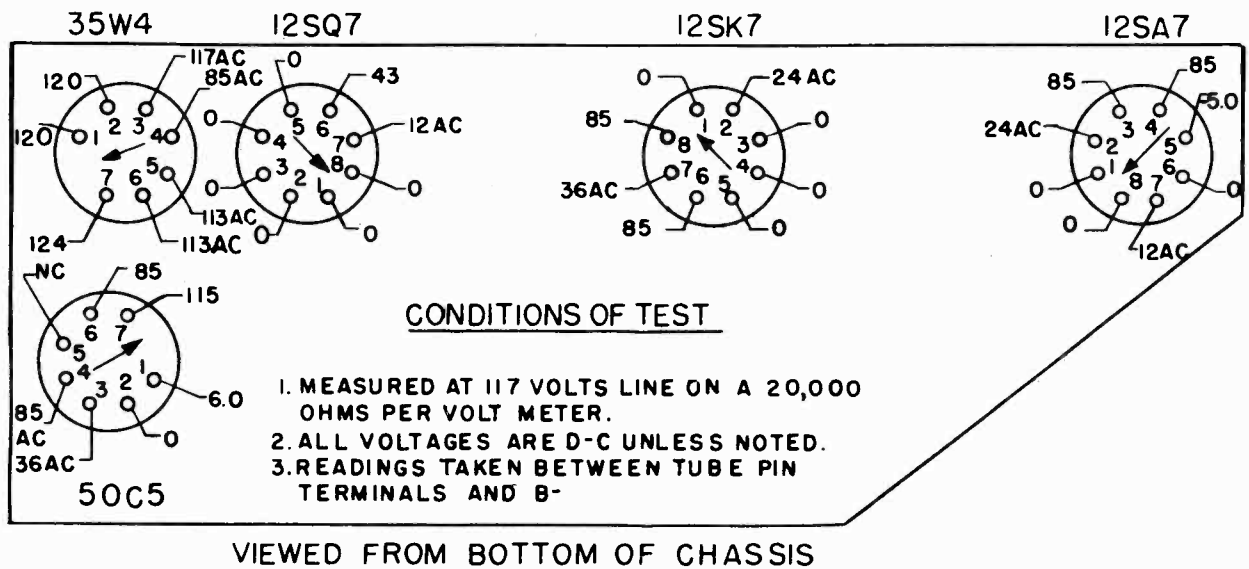


Fig. 4. Socket Voltages

ER-5-123

UNIVERSAL REPLACEMENT PARTS

UCC-028	C17, 18	CAPACITOR—05. mf., 400 v., paper
UCC-041	C14	CAPACITOR—.02 mf., 600 v., paper
UCC-045	C16	CAPACITOR—.05 mf., 600 v., paper
UCU-020	C4	CAPACITOR—47 mmf., ceramic
UOP-487	LS1	LOUDSPEAKER
URD-009	R10	RESISTOR—22 ohms, 1/2 w., carbon
URD-029	R8	RESISTOR—150 ohms, 1/2 w., carbon
URD-081	R1	RESISTOR—22,000 ohms, 1/2 w., carbon
URD-113	R6, 7, 11	RESISTOR—470,000 ohms, 1/2 w., carbon
URD-127	R5	RESISTOR—4.7 meg., 1/2 w., carbon
URD-129	R3	RESISTOR—2.2 meg., 1/2 w., carbon
URF-053	R9	RESISTOR—1500 ohms, 2 w., carbon

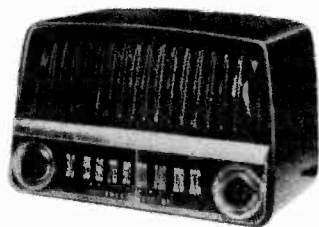
SPECIALIZED REPLACEMENT PARTS

RAB-095	L1	LOOP AND BACK—Cabinet back and antenna loop
RAU-037		CABINET—Model 124 plastic cabinet (ivory)
RAU-306		CABINET—Model 123 plastic cabinet (brown)
RCE-046	C15A, B	CAPACITOR—30-30 mf., 150 volt, dual section electrolytic
RCT-037	C2A, B	CAPACITOR—Tuning capacitor
RCW-3025	C10, 11, 12, 13	CAPACITOR—220 mmf., .002 mf., 220 mmf., .005 mf., four-section ceramic
RDC-032		DIAL CORD—Bulk dial cord
RDK-174		KNOB—Off-volume or tuning control knob (Model 123)

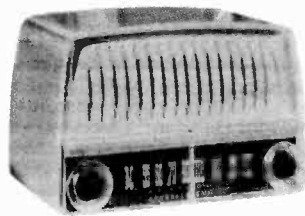
CAT. NO. | SYMBOL | DESCRIPTION
SPECIALIZED REPLACEMENT PARTS (CONT'D)

RDK-175		KNOB—Off-volume or tuning control knob (Model 124)
RDP-048		POINTER—Dial scale pointer
RDS-083		DIAL SCALE
RDW-021		DIAL SCALE WINDOW
RHC-017		CLIP—Mounting clip for oscillator coil, L2
RHG-018		GROMMET—Cushion grommet for mounting tuning capacitor
RHH-002		FASTENER—For mounting dial scale window to cabinet
RHJ-005		SPACER WASHER—Used with cushion grommet to mount tuning capacitor
RHM-061		SPEED NUT—Clip holds loudspeaker to Model 124 cabinet
RJC-004		CONNECTOR—For loudspeaker or antenna loop leads
RJS-003		SOCKET—Tube socket for 12SA7, 12SK7, or 12SG7
RJS-092		SOCKET—Tube socket for 50C5 or 35W4
RJX-031		SOCKET ASSEMBLY—Pilot light socket and bracket
RLC-090		COIL—Oscillator coil, L2
RMS-118		SPRING—Dial cord tension spring on tuning drive drum
RRC-106	R4, S1	POTENTIOMETER—500,000 ohm volume control and switch
RTL-094	T2	TRANSFORMER—1st i-f transformer
RTL-095	T3	TRANSFORMER—2nd i-f transformer
RTO-069	T1	TRANSFORMER—Output transformer
RWL-009		POWER CORD—

MODELS 135, 136



MODEL 135



MODEL 136

SPECIFICATIONS

CABINET	Description	Model 135	Model 136
	Material	Brown	Ivory
	Height	8 $\frac{3}{8}$ in.	8 $\frac{3}{8}$ in.
	Width	12 $\frac{5}{8}$ in.	12 $\frac{5}{8}$ in.
	Depth	7 in.	7 in.
ELECTRICAL RATING	Voltage	105-125	
	Frequency	50-60 cycles or DC	
	Wattage	25 at 117 volts input	
OPERATING FREQUENCIES	Standard Broadcast	540-1600 kc	
	I-F Amplifier	455 kc	
POWER OUTPUT	Undistorted	1 watt	
	Maximum	1.75 watts	
LOUDSPEAKER	Type	Alnico V PM	
	Outside Cone Diameter	4 inches	
	Voice Coil Impedance at 400 Cycles	3.2 ohms	
TUBE COMPLEMENT	(V1) Oscillator-Converter	12SA7	
	(V2) I-F Amplifier	12SK7	
	(V3) Detector-Audio	12SQ7	
	(V4) Rectifier	35Z5GT	
	(V5) Audio Power Amplifier	50L6GT	
	(I1) Pilot Lamp	G-E Mazda No. 47	

GENERAL INFORMATION

The Model 135 and 136 are four-tube (plus rectifier tube) a-c or d-c superheterodyne AM standard broadcast receivers equipped with an efficient built-in antenna loop and incorporating automatic volume control, an oversize permanent magnet speaker, and beam power output.

ELECTRICAL CIRCUIT ALIGNMENT

EQUIPMENT REQUIRED

1. Test oscillator, tone amplitude-modulated.
2. A-C output meter, 1 $\frac{1}{2}$ volts full scale.
3. .05 mfd., paper capacitor.
4. Insulated screwdriver.
5. Coupling loop for test oscillator (see text).
6. Isolation power transformer.

ALIGNMENT PROCEDURE

The alignment steps are given in the table form of the Alignment Chart. Adjustment trimmers are shown in the illustration of Fig. 3.

1. The chassis is removed from the cabinet with the antenna loop and back attached and the speaker leads reconnected.
2. An isolation transformer should be used for the receiver power source when aligning or servicing AC-DC receivers, to prevent short circuiting of equipment and shock hazard.
3. The output meter is connected across the terminals of the loudspeaker voice coil.
4. The receiver volume control should be turned to maximum and test oscillator signal output attenuated during alignment to develop not more than 1 $\frac{1}{4}$ volts output meter reading at the loudspeaker.
5. For i-f alignment, the high side of the signal generator output cable should be connected through a .05 mfd. paper capacitor to the points indicated in the Alignment Chart. The low side of the output cable is connected to the receiver chassis.

6. To align the oscillator and r-f trimmers, the signal generator output is inductively coupled to the radio loop, L1, by connecting a four-turn, six-inch diameter loop of bell wire across its output terminals and then locating the loop about one foot from the radio loop antenna. To prevent possible errors in comparative peak readings, the position of signal generator loop with respect to the radio loop antenna should not be changed during measurement.

ALIGNMENT CHART

Step	Connect Test Oscillator to:	Test Osc. Setting	Radio Dial Setting	Adjust Trimmers for Maximum
I-F ALIGNMENT				
1	V2, 12SK7 grid (Pin 4), in series with .05 mfd.	455 KC		C9 and C8 of second i-f transformer, T3
2	V1, 12SA7 grid (Pin 8), in series with .05 mfd.	455 KC		C6 and C5 of first i-f transformer, T2
3	V1, 12SA7 grid (Pin 8), in series with .05 mfd.	455 KC		Recheck adjustment of C9, C8, C6, C5, for maximum
R-F ALIGNMENT				
4	Inductively coupled to radio loop	1620 KC	Minimum capacity C2A, C2B	C3, oscillator trimmer
5	Inductively coupled to radio loop	1500 KC	1500 KC	C1, r-f trimmer

STAGE GAINS AND VOLTAGE CHECKS

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

1. **I-F GAIN**
 12SA7 Grid to 12SK7 Grid 50 @ 455 KC
 12SK7 Grid to 12SQ7 Diode Plate 50 @ 455 KC
2. **AUDIO GAIN**
 Input of 0.15 volts at 400 cycles across volume control (R4) with control set at maximum will develop approximately $\frac{1}{2}$ watt output across the speaker voice coil terminals.
3. **OSCILLATOR GRID BIAS**
 D-C voltage developed across the oscillator grid leak (R1) averages 8.5 volts at 1000 kc.
4. **TUBE SOCKET PIN VOLTAGES**
 Fig. 5 shows voltages from tube pins to B-. Voltage readings differing greatly from those specified may help localize defective components.

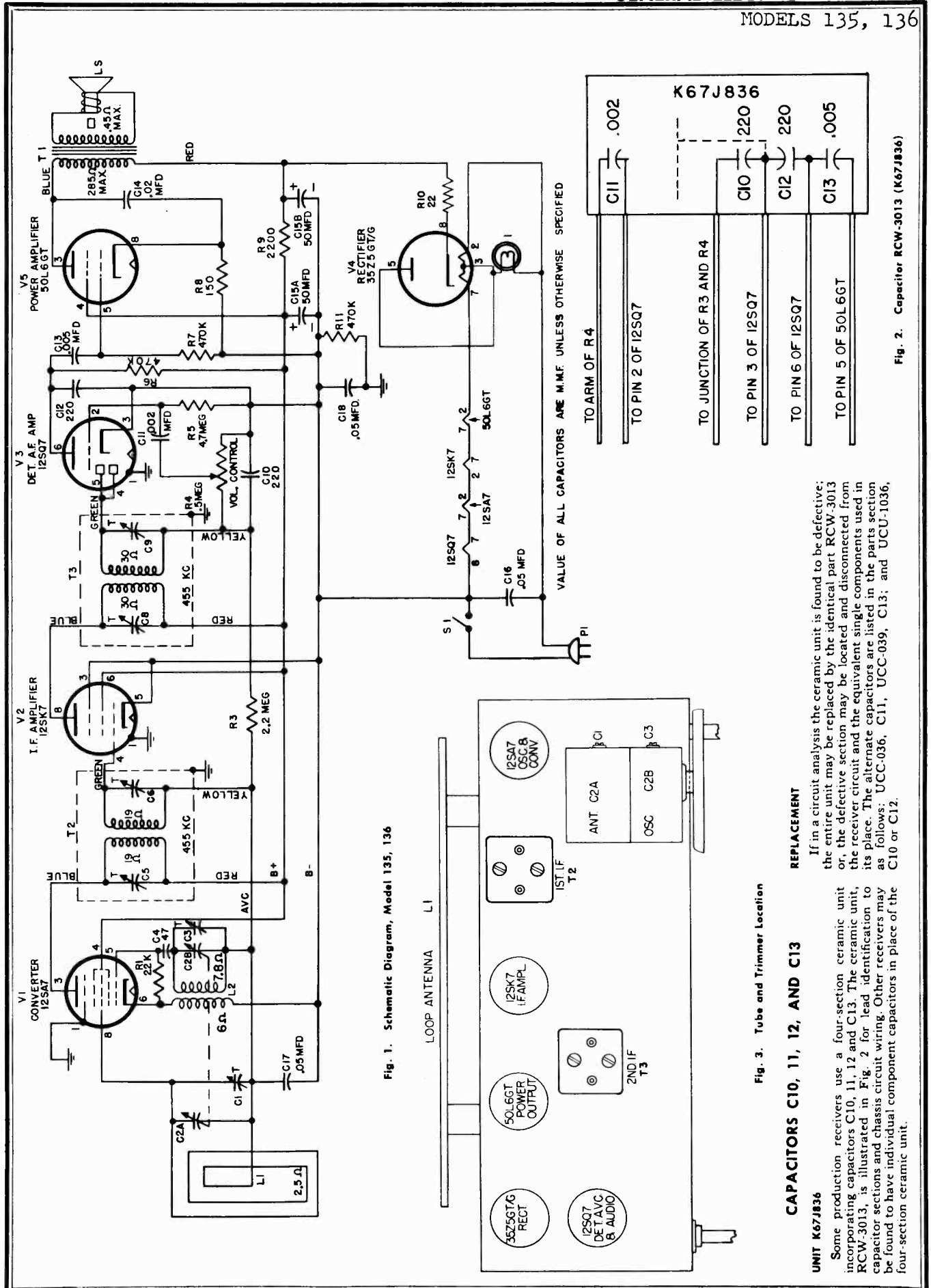


Fig. 1. Schematic Diagram, Model 135, 136

Fig. 3. Tube and Trimmer Location

CAPACITORS C10, 11, 12, AND C13

REPLACEMENT

If in a circuit analysis the ceramic unit is found to be defective; the entire unit may be replaced by the identical part RCW-3013 or, the defective section may be located and disconnected from the receiver circuit and the equivalent single components used in its place. The alternate capacitor values are listed in the parts section as follows: UCC-036, C11, UCC-039, C13; and UCU-1036, C10 or C12.

Some production receivers use a four-section ceramic unit incorporating capacitors C10, 11, 12 and C13. The ceramic unit, RCW-3013, is illustrated in Fig. 2 for lead identification to capacitor sections and chassis circuit wiring. Other receivers may be found to have individual component capacitors in place of the four-section ceramic unit.

Fig. 2. Capacitor RCW-3013 (K67J836)

MODELS 135, 136 REPLACEMENT PARTS LIST

CAT. NO.	SYMBOL	DESCRIPTION
UNIVERSAL REPLACEMENT PARTS		
UCC-028	C17, 18	CAPACITOR—.05 mf., 400 v., paper
UCC-036	C11	CAPACITOR—.002 mf., 600 v., paper (alternate replacement for RCW-3013)
UCC-039	C13	CAPACITOR—.003 mf., 600 v., paper
UCC-045	C16	CAPACITOR—.02 mf., 600 v., paper
UCC-631	C4	CAPACITOR—.02 mf., 600 v., paper
UCU-020	C10, 12	CAPACITOR—.220 mf., ceramic (alternate replacement for RCW-3013)
UOP-487	LS	LOW SPEAKER
URD-009	R5	RESISTOR—22 ohms, 1/2 w., carbon
URD-029	R6	RESISTOR—150 ohms, 1/2 w., carbon
URD-081	R1	RESISTOR—22,000 ohms, 1/2 w., carbon
URD-113	R6, 7, 11	RESISTOR—470,000 ohms, 1/2 w., carbon
URD-120	R3	RESISTOR—2.2 meg., 1/2 w., carbon
URD-137	R5	RESISTOR—4.7 meg., 1/2 w., carbon
URF-057	R9	RESISTOR—2200 ohms, 2 w., carbon

SPECIALIZED REPLACEMENT PARTS

RAB-070	L1	LOOP AND BACK—Antenna loop and cabinet back
RAC-059		COVER—Cover shield for bottom of chassis
RAU-302		CABINET—Brown, plastic cabinet with dial scale (Model 135)
RAU-303		CABINET—Ivory, plastic cabinet with dial scale (Model 136)
RAX-026	C15A, B	BACK PLATE—Dial scale back plate
RCE-050		CAPACITOR—50 mf., 150 v.; 50 mf., 150 v.; electrolytic
RCT-036	C2A, B	TUNING CAPACITOR—(2)-section gang with trimmers, C1 and C3
RCW-3013	C10, 11, 12, 13	CAPACITOR—.270 mf., .002 mf., 220 mf., .005 mf. for section; ceramic
RDC-032		CORP—UCC-031, UCC-039, UCU-1056
RDX-020		KNOB—Bulk dial cord
RDK-031		KNOB—Volume or tuning control knob (Model 136)
RDP-045		KNOB—Volume or tuning control knob (Model 135)
RHC-017		POINTER—Dial scale pointer
RHG-018		CLIP—Mounting clip for oscillator coil L2
RHH-004		GROMMET—Cushion mounting for tuning capacitor C2A, B
RHJ-005		SNAP FASTENER—Holds loop back to cabinet
RHM-039		SPACER—Spacer bushing for mounting tuning capacitor C2A, B
RHM-063		CLIP—Clip for pilot light
RJC-004		SPEED NUT—Speed nut clip fastening speaker to cabinet bosses
RJS-003		CONNECTOR—Antenna loop lead connecting clip
RJS-096		SOCKET—Tube socket
RLC-090	L2	SOCKET—Pilot light socket and leads
RMM-093		COIL—Oscillator coil
RMS-118		SHIELD—Light shield for pilot light
RMU-051		SPRING—Dial cord tension spring
RRC-100	R4, S1	SHAFT—Tuning shaft
RTL-092	T2	POTENTIOMETER—500,000 ohms, volume control and switch S1
RTL-093	T3	TRANSFORMER—First i-f transformer
RTO-063	T1	TRANSFORMER—Second i-f transformer
RWL-009		TRANSFORMER—Audio output transformer
		POWER CORD—A-C power cord and plug

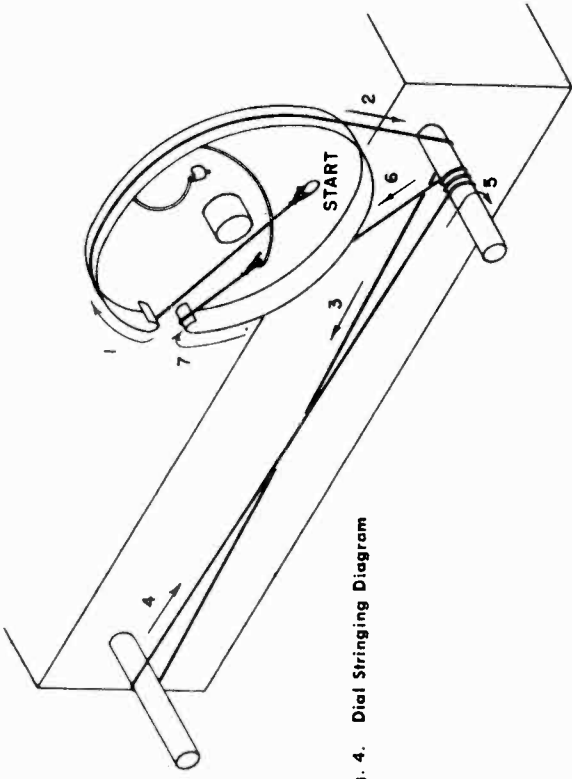
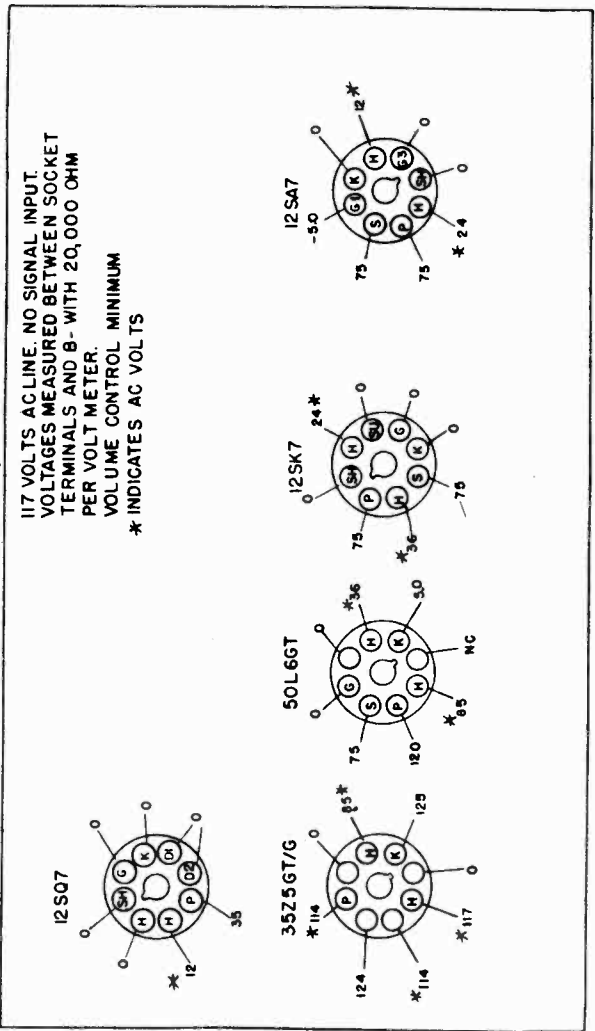


Fig. 4. Dial Stringing Diagram

FRONT OF CHASSIS



BOTTOM VIEW OF CHASSIS

Fig. 5. Socket Voltages



POWER SUPPLY:	Model 141 Battery Operation only. Battery..... Eveready No. 756, or equivalent Model 143 (AC or DC Operation) Voltage..... 105-120 volts Frequency (on AC)..... 50-60 cycles Power Consumption..... 15 watts Battery Operation Battery..... Eveready No. 756 or equivalent
OPERATING FREQUENCIES:	Broadcast Band..... 540-1600 KC I-F Amplifier..... 455 KC
POWER OUTPUT:	Undistorted, Model 141..... 130 milliwatts Maximum, Model 141..... 200 milliwatts Undistorted, Model 143..... 130 milliwatts Maximum, Model 143..... 200 milliwatts
LOUDSPEAKER:	Type..... Alnico PM Outside Cone Diameter..... 4 inches Voice Coil Impedance (400 cycles)..... 3.2 ohms
TUBE COMPLEMENT:	Oscillator-Converter..... 1R5 I-F Amplifier..... 1T4 Detector Audio Amplifier..... 1S5 Power Amplifier..... 3V4

GENERAL INFORMATION

The Model 141 or 143 portable radio is a four-tube superheterodyne broadcast receiver with a range of 540 to 1600 kc. The Model 141 operates on battery only, while for the Model 143 the power source may be either 105 to 125 volts, 50 to 60 cycles, or direct current, when a power outlet is available. The receiver will also operate from its battery source, thus making it independent of external electric power, providing excellent operation in any location where external power is not available.

BATTERY—AC OR DC OPERATION (MODEL 143 ONLY)

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

For AC or DC supply (105-120 volts, 50 to 60 cycle operation), the same knob switches on the power when the power plug is pulled out of its socket on the chassis and inserted into the house outlet.

ELECTRICAL CIRCUIT ALIGNMENT

ALIGNMENT FREQUENCIES

R-F.....	1620 and 1500 KC
I-F.....	455 KC

EQUIPMENT REQUIRED

1. Test Oscillator with Tone Modulation.
2. AC Output Meter.
3. .05 Mf. Paper Capacitor.
4. Insulated Screwdriver.
5. Antenna Loop.

PROCEDURE—GENERAL

The Alignment Chart gives the alignment procedure with correct sequence of trimmer adjustments.

ALIGNMENT CHART

Step	Test-Osc. Connected to:	Test-Osc. Frequency	Radio Pointer Setting	Adjust for Maximum Meter Reading
1	1T4 grid (Pin 6) in series with .05 mf capacitor	455 KC	550 KC	2nd I-F transformer (T2) primary and secondary coils.
2	1R5 grid (Pin 6) in series with .05 mf capacitor	455 KC	550 KC	1st I-F transformer (T1) primary and secondary coils.
3	Inductively coupled	1620 KC	Gang condenser completely open	C2B
4	Inductively coupled	1500 KC	Tune for max. signal. Then set dial pointer at 1500 KC on dial mark	C1B

The chassis must be removed from the cabinet during i-f alignment.

The test oscillator output signal should be attenuated so that the output meter reading never exceeds 1/2 volt. Connect the capacitor listed in column 2 of Alignment Chart between the "high side" of the test oscillator and the point of input specified.

The output meter should be connected to the chassis ground; the "high side" of the oscillator output should be connected as indicated in the Alignment Chart. During the entire alignment procedure, the volume control should be at its maximum position. For alignment of the oscillator and r-f trimmers, the input signal should be inductively coupled to the radio loop antenna by connecting a 4-turn, 6-inch diameter loop of bell wire across the signal generator output terminals, and locate the loop about one foot from the radio loop antenna. To prevent possible errors in peak readings, the position of the loop with respect to the radio loop antenna should not be changed during any one set of adjustments.

STAGE GAIN AND VOLTAGE CHECKS

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

1. R-F STAGE GAINS

	141	143	
IR5 Grid (Pin 6) to 1T4 (Pin 6)	17	20	@ 1000 KC
1T4 Grid (Pin 6) to 1S5 Diode Plate (Pin 3)	65	50	@ 455 KC

2. AUDIO GAINS

.02 volt at 400 cycles across volume control (R4) with control set at maximum will give approximately .050 watts output across speaker voice coil.

3.

DC voltage developed across oscillator grid resistor (R1) averages 2.0 volts at 1000 kc with respect to B minus.

4. SOCKET PIN VOLTAGES

Fig. 5 and 6 show voltages from all tube pins to B-. Voltage readings much lower than those specified may help localize defective components or tubes.

MODELS 141, 143

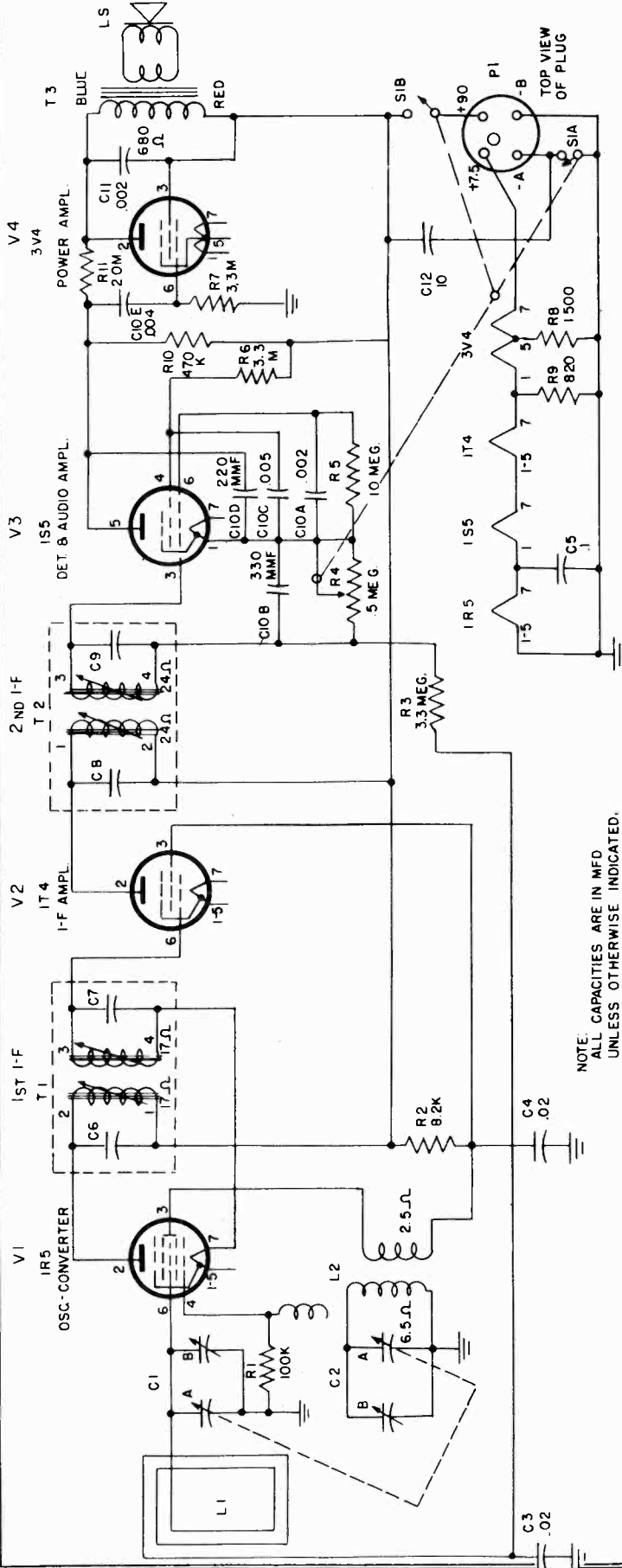


Fig. 1. Schematic Diagram, Model 141

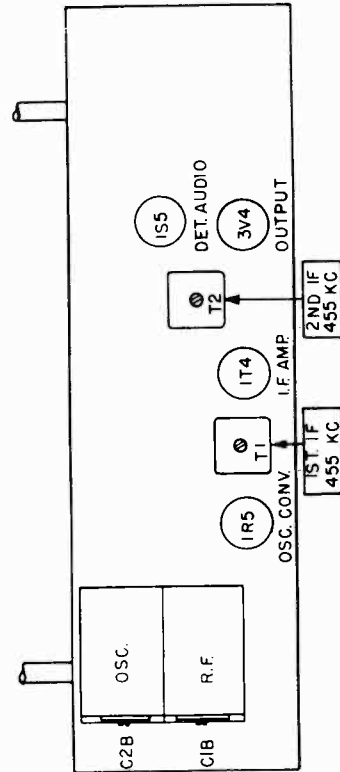


Fig. 2. Tube and Trimmer Location (Model 141 and 143)

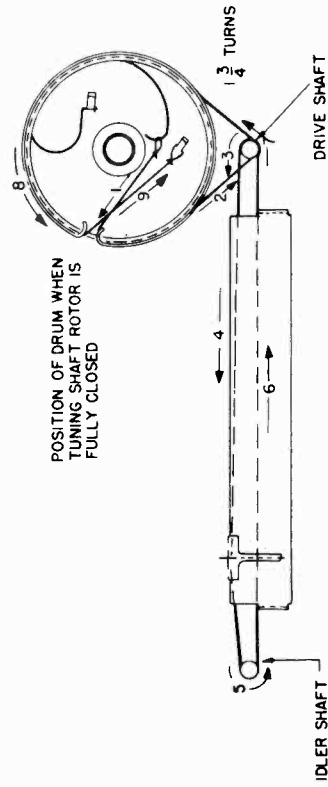


Fig. 3. Dial Stringing Diagram (Model 141 and 143)

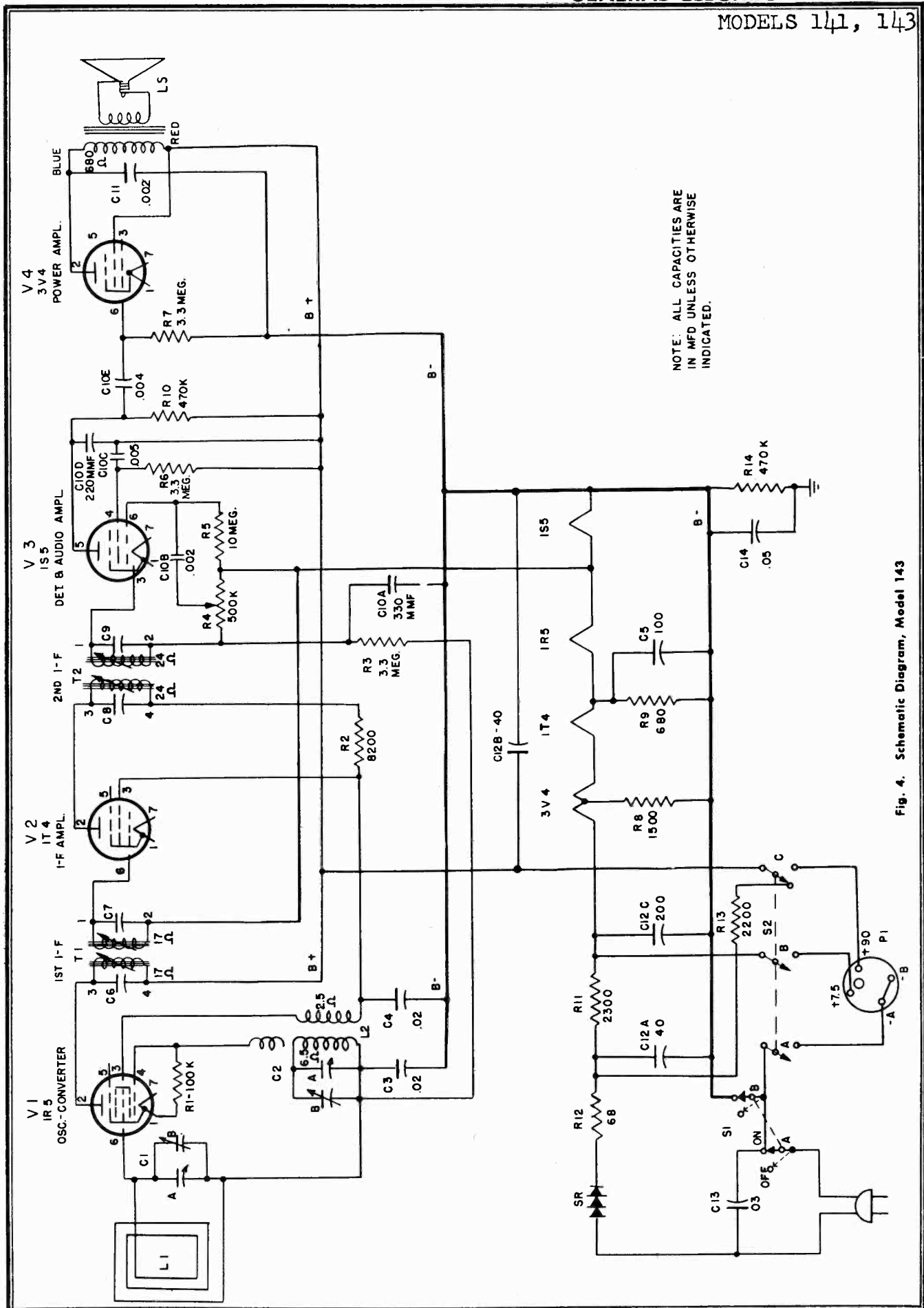
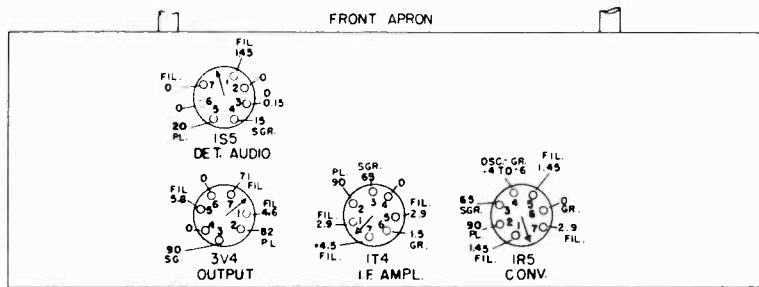
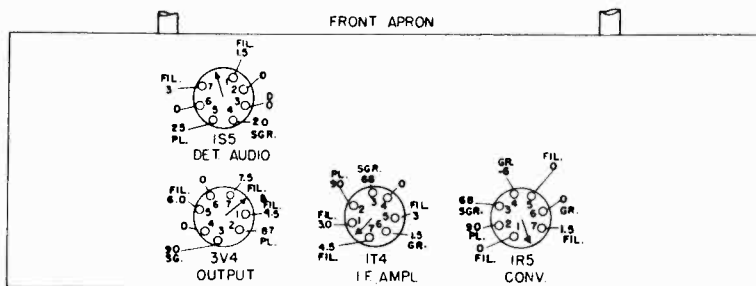


Fig. 4. Schematic Diagram, Model 143



BOTTOM VIEW OF CHASSIS
DC VOLTAGE TO B MINUS MEASURED WITH 20,000 OHMS PER VOLT METER RECEIVER OPERATING ON 120 VOLTS A.C. BATTERY VOLTAGES ARE SIMILAR.

Fig. 5. Socket Voltages, Model 141



BOTTOM VIEW OF CHASSIS
DC VOLTAGE TO B MINUS MEASURED WITH 20,000 OHMS PER VOLT METER RECEIVER OPERATING ON FRESH BATTERY.

Fig. 6. Socket Voltages, Model 143

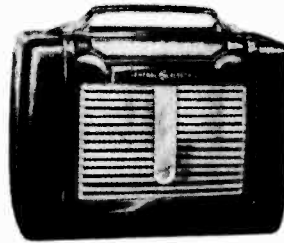
MODELS 141, 143

REPLACEMENT PARTS LIST

Cat. No.	Symbol	Description
UNIVERSAL REPLACEMENT PARTS		
UCC-002	C11	CAPACITOR—.002 mf, 200 v, paper
UCC-009	C3, 4	CAPACITOR—.02 mfd, 200 v, paper
UCC-028	C14	CAPACITOR—.05 mfd, 400 v, paper
UCC-042	C13	CAPACITOR—.03 mfd, 400 v, paper
UCC-048	C5	CAPACITOR—.1 mfd, 400 v, paper
URD-045	R9**	RESISTOR—680 ohms, 1/2 w, carbon
URD-047	R9*	RESISTOR—820 ohms, 1/2 w, carbon
URD-053	R8	RESISTOR—1500 ohms, 1/2 w, carbon
URD-071	R2	RESISTOR—8200 ohms, 1/2 w, carbon
URD-097	R1	RESISTOR—100,000 ohms, 1/2 w, carbon
URD-113	R10**, 14**	RESISTOR—470,000 ohms, 1/2 w, carbon
URD-133	R3, 6, 7	RESISTOR—3.3 meg, 1/2 w, carbon
URD-145	R5	RESISTOR—10 meg, 1/2 w, carbon
URE-021	R12**	RESISTOR—68 ohms, 1 w, carbon
URE-057	R13**	RESISTOR—2200 ohms, 1 w, carbon
UOP-457		SPEAKER—PA speaker, 4 inches
RHJ-005**		SPACER—For tuning capacitor
RHM-061		CLIP—Speaker clip
RHY-010		HANDLE—Handle for cabinet
RJC-016		TERMINAL—Speed nut
RJS-024**		MOUNTING PLATE—For electrolytic capacitor
RJS-100		SOCKET—Tube socket for IR5
RJS-124		SOCKET—Tube socket for IS5 & 3V4
RJS-125		SOCKET—Tube socket for IT4 tube
RHC-015		CLIP—Oscillator coil clip
RJC-016		TERMINAL—Speed nut
RLC-089	L2	COIL—Oscillator coil
RL-035	L1	LOOP—Loop antenna
RMC-040		CATCH—Spring catch
RMS-118		SPRING—Dial spring
RMU-049		SHAFT—Tuning shaft

Cat. No.	Symbol	Description
RRC-107	R4, S1	VOLUME CONTROL—Volume control and switch
RRD-1015	R11*	RESISTOR—20 meg, 1/2 w, carbon
RRW-042	R11**	RESISTOR—2300 ohms, 10 w, w.w.
RSW-058	S2**	SWITCH—Power plug switch
RTL-052	T1**	TRANSFORMER—I-F transformer
RTL-051	T2*	TRANSFORMER—I-F transformer
RTL-079	T1*, 2**	TRANSFORMER—I-F transformer
RTO-070	T3	TRANSFORMER—Output transformer
RWL-005**		POWER CORD
SPECIALIZED REPLACEMENT PARTS		
RAB-096		BACK—Cabinet back
RAU-308		CABINET—Plastic cabinet
RCE-095**	C12A, B, C	CAPACITOR—Electrolytic capacitor 40 mf, 150 v; 40 mf, 250 v; 200 mf, 20 v
RCE-098*	C12	CAPACITOR—Electrolytic capacitor 10 mf
RCE-099	C5	CAPACITOR—Electrolytic capacitor, 100 mfd
RCT-036	C1, 2	CAPACITOR—Tuning capacitor
RCW-3015	C10A, B, 10C, D, E	CAPACITOR—Ceramic combination 220 mmf, .002 mf, .005, 220 mmf, .004 mf
RDC-032		DIAL CORD
RDK-136		KNOB
RDP-047		POINTER—Dial pointer
REX-005	SR	RECTIFIER—Selenium rectifier
RHB-006		BUTTON—Plug button
RHC-015		CLIP—Oscillator coil clip
RHC-016		COTTER PIN—For drive axle
RHC-020		COTTER PIN—Cotter pin for handle
RHE-009		EYELET—Eyelet for cabinet
RHG-006**		GROMMET—For power cord
RHG-018**		GROMMET—For tuning capacitor
RHI-009		HINGE—Hinge for cabinet

*For Model 141 only.
**For Model 143 only.



SPECIFICATIONS

CABINET:	Composition Plastic Height 9½ inches Length 12½ inches Width 5½ inches Weight (with batteries) 11 pounds
POWER SUPPLY:	Battery Eveready No. 753, or equivalent AC or DC operation 105-115 volts Frequency (on AC) 60 cycles Power Consumption 25 watts
OPERATING FREQUENCIES:	Broadcast Band 540-1600 kc I-F Amplifier 455 kc
POWER OUTPUT:	Undistorted 180 milliwatts Maximum 250 milliwatts
LOUDSPEAKER:	Type Alnico PM Outside Cone Diameter 4 inches Voice Coil Impedance (400 cycles) ... 3.2 ohms
TUBE COMPLEMENT:	R-F Amplifier 1T4 Oscillator-Converter 1R5 I-F Amplifier 1T4 Detector Audio Amplifier 1S5 Power Amplifier 3V4

ALIGNMENT CHART

Step	Test-Osc. Connected to:	Test-Osc. Frequency	Radio Pointer Setting	Adjust for Maximum Meter Reading
1	1T4 I-F grid in series with .05 mf. capacitor	455 KC	550 KC	Iron cores of I-F transformer T2
2	1R5 converter grid in series with .05 mf. capacitor	455 KC	550 KC	Iron cores of I-F transformer T1
3	Repeat Step 1 and 2			
4	Inductively coupled	1500 KC	1500 KC	Trimmers C15 and C16*
5	Inductively coupled	600 KC	600 KC	Iron core of T4 on back apron of chassis.

*Chassis in cabinet and cabinet back (with loop) closed; remove plug buttons for adjustment.

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

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

3. The output meter should be connected across the voice coil terminals of the speaker.

4. During the entire alignment procedure the volume control should be rotated clockwise to its maximum position.

5. For alignment of the oscillator and r-f trimmers, the input signal should be inductively coupled to the radio loop antenna by connecting a 4-turn, 6-inch diameter loop of bell wire across the signal generator output terminals, and locate the loop about one foot from the radio loop for alignment. The position of the loop with respect to the radio loop should not be changed during any one set of adjustments to prevent possible errors in peak readings.

6. The antenna loop acquires a different inductance in the position when the back is closed. Therefore, the adjustment of the antenna and r-f trimmers has to be made with the back closed, through the two openings on the right side of the cabinet which normally are closed by plug buttons. After adjustments have been completed, the two plug buttons have to be put in place again.

GENERAL INFORMATION

The Model 165 portable radio is a five-tube superheterodyne broadcast receiver with a range of 540 to 1600 kc. The power source may be either 105-115 volts, 50-60 cycles a-c, or d-c, when a power outlet is available. The receiver will also operate from its battery source, thus making it independent of external electrical power, providing excellent operation in any location where external power is not available.

BATTERY-AC OR DC OPERATION.

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

For a-c or d-c supply (105-115 volts, 50 to 60 cycle operation), the same knob switches on the power when the power plug is pulled out of its socket in the chassis and inserted into the house outlet.

ELECTRICAL CIRCUIT ALIGNMENT

EQUIPMENT REQUIRED:

1. Test Oscillator with Tone Modulation.
2. A-C Output Meter.
3. Paper Capacitor .05 Mf.
4. Insulated Screwdriver.
5. Coupling Loop for Test Oscillator (see text).
6. Isolation Transformer.

PROCEDURE-GENERAL.

1. The Alignment Chart gives the alignment procedure with correct sequence of trimmer adjustments. The chassis must be removed from the cabinet during i-f alignment. The locations of the i-f and r-f adjustments are shown in Figure 2.

2. The "low" side of the test oscillator output should be connected to the chassis ground; the "high" side should be connected as indicated in the alignment chart. The test oscillator output

STAGE GAINS AND VOLTAGE CHECKS

In order to check circuit performance and facilitate trouble shooting, the measurement of stage gain by means of a vacuum voltmeter or similar measuring device is recommended. The gain values listed may have tolerances of 20%. Readings should be taken with low signal input so that the AVC is not effective.

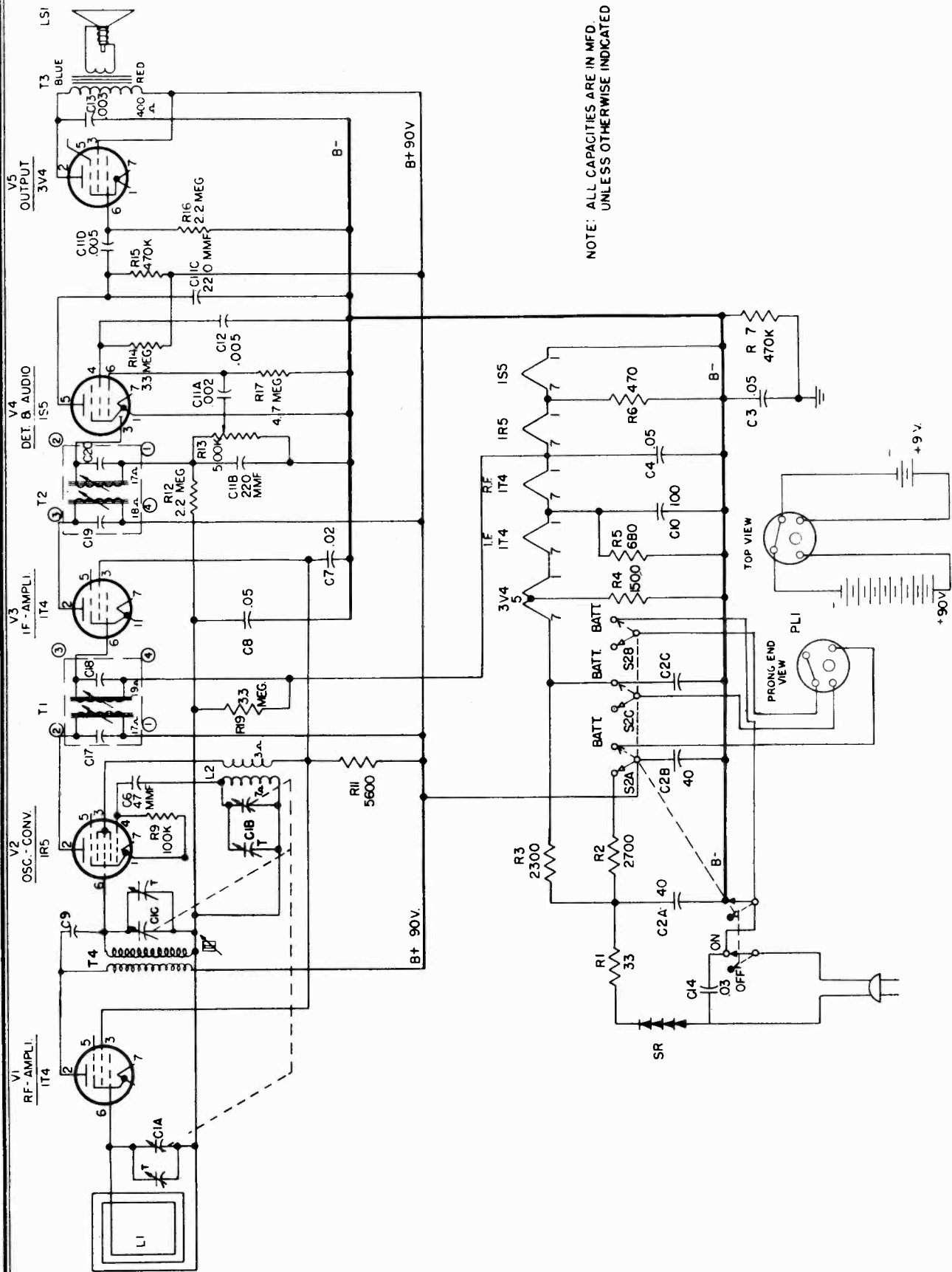
(1) R-F STAGE GAINS.

- 1T4 R-F Grid (Pin 6) to 1R5 Grid (Pin 6) 12 @ 1000 KC
- 1R5 Grid (Pin 6) to 1T4 Grid (Pin 6) 18 @ 1000 KC
- 1T4 Grid (Pin 6) to 1S5 Diode Plate (Pin 3) ... 45 @ 455 KC

(2) AUDIO GAIN.

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

MODEL 165



NOTE: ALL CAPACITIES ARE IN MFD. UNLESS OTHERWISE INDICATED.

Fig. 1. Schematic Diagram, Model 165

(3) D-C voltage developed across oscillator grid resistor (R9) averages -8 volts at 1000 kc with respect to B-.

(4) **HUM**
The hum voltage measured at the primary of the output transformer should not exceed 0.4 volts. This measurement should be made with an a-c voltmeter of a sensitivity of 20,000 ohm/volt in series with .5 mf. capacitor.

(5) **SOCKET PIN VOLTAGES.**
Figure 4 shows voltages from all tube pins to B-. Voltage

readings much lower than those specified may help localize defective components or tubes.

(6) **MULTIPLE CERAMIC CAPACITOR (K68J128).**
This multiple capacitor unit is of the ceramic capacitor type and contains five capacitors C11A, B, C, D and C12. This unit, RCW-3015, is illustrated in Figure 5 for lead identification. If during service the ceramic capacitor unit is found to be defective, the entire unit may be replaced by the identical part, RCW-3015, or the defected section may be located and disconnected from the receiver circuit and the equivalent single components used in its place.

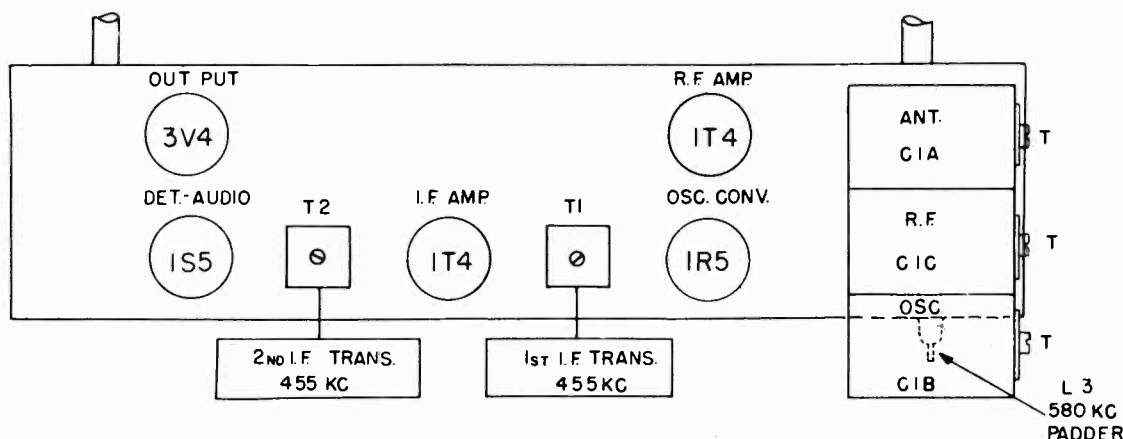
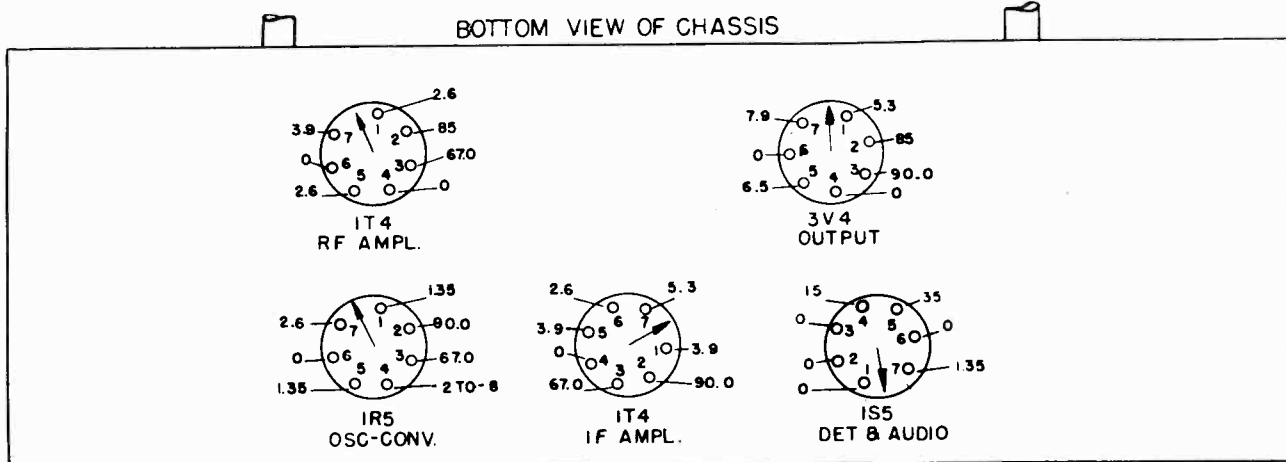


Fig. 2. Tube and Trimmer Location (Model 165)

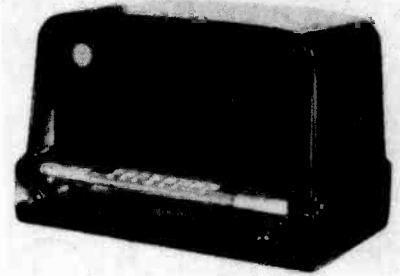


D C VOLTAGES TO GROUND UNLESS OTHERWISE SPECIFIED
ALL RATINGS ARE A C OPERATION MEASURED WITH REFERENCE TO B-
RATINGS FOR BATTERY ARE SIMILAR TO AC RATINGS
VOLTAGE IS MEASURED WITH 20,000 OHMS PER VOLT METER

Fig. 4. Socket Voltages, (Model 165)

SPECIFICATIONS

CABINET	Material Plastic (brown) Height 8 ⁵ / ₈ in. Width 13 ¹ / ₈ in. Depth 8 in.
ELECTRICAL RATING	Voltage 105-125 Frequency 50-60 cycles or DC Wattage 26 at 117 volts input
OPERATING FREQUENCIES	Standard Broadcast 540-1600 kc I-F Amplifier 455 kc
POWER OUTPUT	Undistorted 1 watt Maximum 1.75 watts
LOUDSPEAKER	Type Alnico V PM Outside Cone Diameter 5 ¹ / ₄ inches Voice Coil Impedance at 400 Cycles 3.2 ohms
TUBE COMPLEMENT	(V1) R-F Amplifier 12SK7 (V2) Oscillator-Converter 12SA7 (V3) I-F Amplifier 12SK7 (V4) Detector-Audio 12SQ7 (V5) Rectifier 35Z5 (V6) Audio Power Amplifier 35L6 (I1) Pilot Lamp G-E Mazda No. 47



MODEL 226

ALIGNMENT CHART

Step	Connect Test Oscillator to:	Test Osc. Setting	Radio Dial Setting	Adjust Trimmers for Maximum
I-F ALIGNMENT				
1	V3, 12SK7 grid (Pin 4), in series with .05 mfd.	455 KC	.....	C9 and C8 of second i-f transformer, T3
2	V2, 12SA7 grid (Pin 8), in series with .05 mfd.	455 KC	.....	C7 and C6 of first i-f transformer, T2
3	V2, 12SA7 grid (Pin 8), in series with .05 mfd.	455 KC	.....	Recheck adjustment of C9, C8, C7, C6, for maximum
R-F ALIGNMENT				
4	Inductively coupled to radio loop	1620 KC	Minimum capacity C1A, C1B	C3, oscillator trimmer
5	Inductively coupled to radio loop	1500 KC	1500 KC	C2, r-f trimmer

GENERAL INFORMATION

The Model 226 is a five-tube (plus rectifier tube) table model a-c or d-c superheterodyne Standard AM Broadcast receiver. It is equipped with an efficient built-in antenna loop which is connected to an R-F amplifier stage providing increased gain. This receiver employs automatic volume control, beam power output and an oversize permanent magnet loudspeaker.

ELECTRICAL CIRCUIT ALIGNMENT

EQUIPMENT REQUIRED

1. Test oscillator, tone amplitude-modulated.
2. A-C output meter, 1¹/₂ volts full scale.
3. .05 mfd., paper capacitor.
4. Insulated screwdriver.
5. Coupling loop for test oscillator (see text).
6. Isolation power transformer.

ALIGNMENT PROCEDURE

The alignment steps are given in the table form of the Alignment Chart. Adjustment trimmers are shown in the illustration of Fig. 3.

1. The chassis is removed from the cabinet with the antenna loop and back attached and the speaker leads reconnected.
2. An isolation transformer should be used for the receiver power source when aligning or servicing AC-DC receivers, to prevent short circuiting of equipment and shock hazard.
3. The output meter is connected across the terminals of the loudspeaker voice coil.
4. The receiver volume control should be turned to maximum and test oscillator signal output attenuated during alignment to develop not more than 1¹/₄ volts output meter reading at the loudspeaker.
5. For i-f alignment, the high side of the signal generator output cable should be connected through a .05 mfd. paper capacitor to the points indicated in the Alignment Chart. The low side of the output cable is connected to the receiver chassis.
6. To align the oscillator and r-f trimmers, the signal generator output is inductively coupled to the radio loop, L1, by connecting a four-turn, six-inch diameter loop of bell wire across its output terminals and then locating the loop about one foot from the radio loop antenna. To prevent possible errors in comparative peak readings, the position of signal generator loop with respect to the radio loop antenna should not be changed during measurement.

STAGE GAINS AND VOLTAGE CHECKS

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

1. I-F GAIN

- 12SA7 Grid to 12SK7 Grid 50 @ 455 KC
- 12SK7 Grid to 12SQ7 Diode Plate 50 @ 455 KC

2. AUDIO GAIN

Input of 0.15 volts at 400 cycles across volume control (R6) with control set at maximum will develop approximately 1/2 watt output across the speaker voice coil terminals.

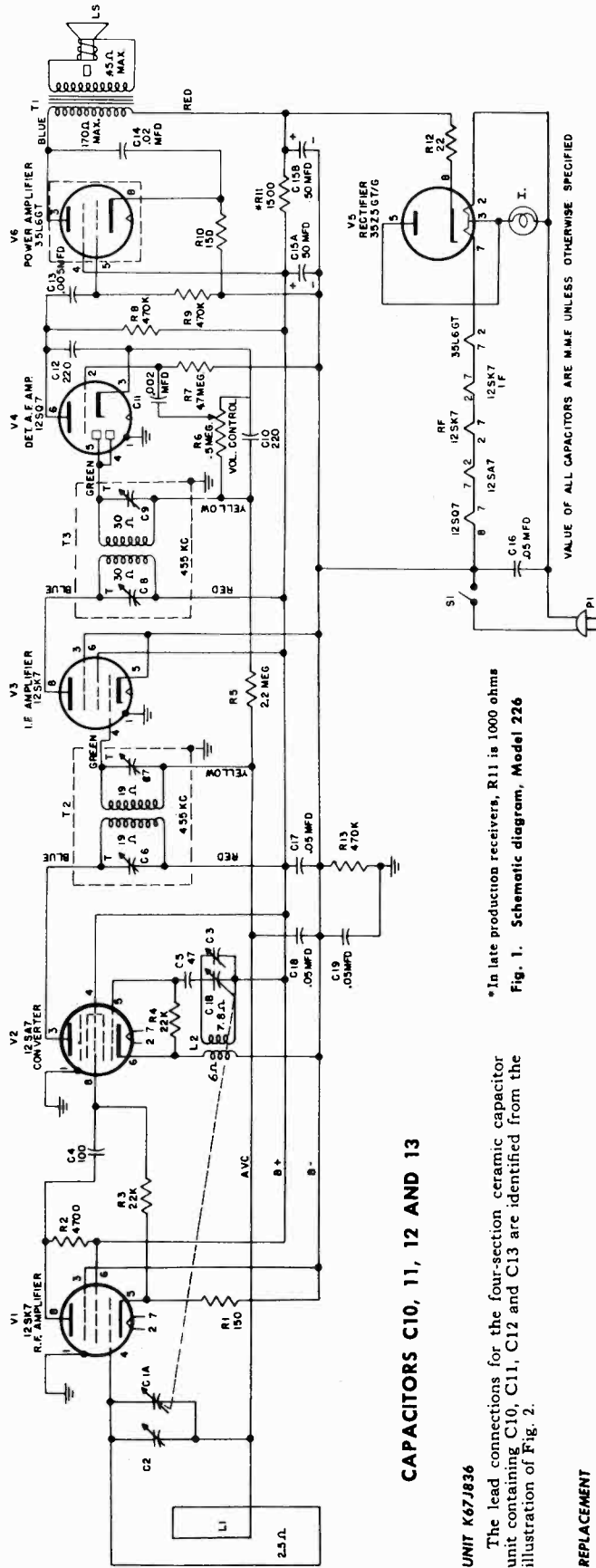
3. OSCILLATOR GRID BIAS

D-C voltage developed across the oscillator grid leak (R4) averages 8.5 volts at 1000 kc.

4. TUBE SOCKET PIN VOLTAGES

Fig. 5 shows voltages from tube pins to B-. Voltage readings differing greatly from those specified may help localize defective components.

MODEL 226



*In late production receivers, R11 is 1000 ohms
 Fig. 1. Schematic diagram, Model 226

CAPACITORS C10, 11, 12 AND 13

UNIT K67J836

The lead connections for the four-section ceramic capacitor unit containing C10, C11, C12 and C13 are identified from the illustration of Fig. 2.

REPLACEMENT

The four-section unit is catalogued RCW-3013 in the parts list for direct replacement. However, any single section may be replaced by one of the single unit capacitors catalogued for the respective capacitor symbol. These items are: UCC-036, C11; UCC-039, C13; and UCU-1036, C10 or C12.

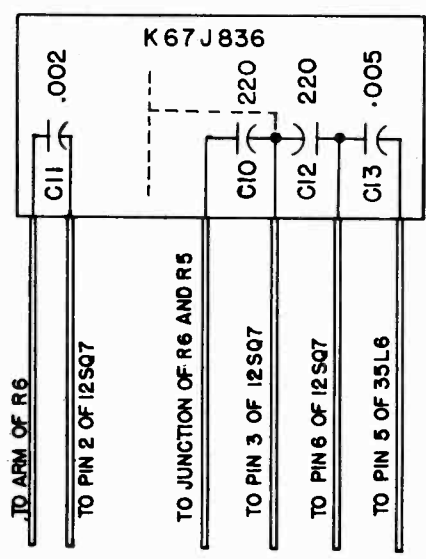


Fig. 2. Capacitor RCW-3013 (K67J836)

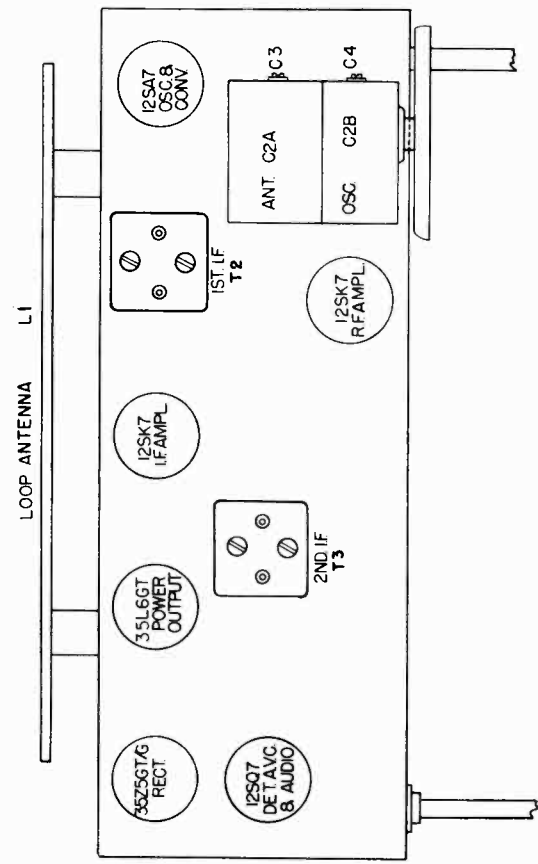
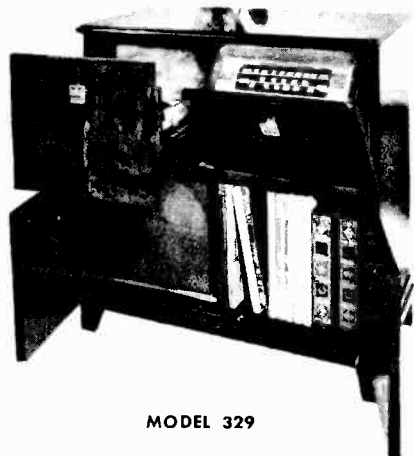
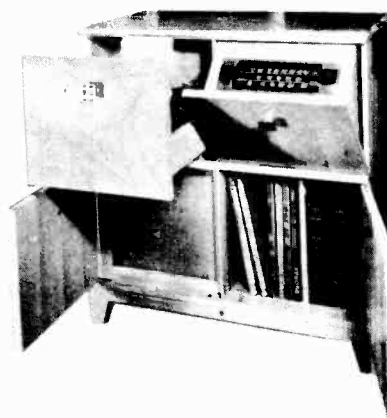


Fig. 3. Tube and Trimmer Location

MODELS 329, 330



MODEL 329



MODEL 330

For Service Data; See G.E. Model 324, Vol. 19, Pages 19-22 through 19-27.

SPECIFICATIONS

CABINET		
Model	329	330
Material	Wood	Wood
Color	Mahogany	Blonde
Height	32½ in.	32½ in.
Width	31⅝ in.	31⅝ in.
Depth	16⅞ in.	16⅞ in.

ELECTRICAL		
Voltage	105-125	
Frequency	60 cps	
Wattage (Radio)	65 watts	
Wattage (Phono)	80 watts	

OPERATING FREQUENCIES		
AM	540-1620 kc	
FM	88-108 mc	

INTERMEDIATE FREQUENCIES		
AM	455 kc	
FM	10.7 mc	

POWER OUTPUT		
Undistorted	3.0 watts	
Maximum	5.0 watts	

LOUDSPEAKER		
Type	Alnico permanent magnet	
Outside Diameter of Cone	12 inches	
Voice Coil Impedance at 400 cycles	3.2 ohms	

TUBE COMPLEMENT		
(V1) Converter	6BE6	
(V2) R-F and 1st FM-IF Amplifier	6BA6	
(V3) Second FM and 1st AM-IF Amplifier	6BA6	
(V4) FM Limiter	6AU6	
(V5) AM Detector, FM Discriminator, and Audio Amplifier	6T8	
(V6) Power Output	6V6	
(V7) Rectifier	5Y3GT	
(V8) Phono Preamplifier	6SC7	

PHONOGRAPH PICK-UP		
Type	Variable reluctance	
D-C Resistance	340 ohms	

ANTENNA		
AM	Built-in loop or outside antenna	
FM	Power cord antenna, or 300 ohm FM dipole antenna	

GENERAL

Models 329 and 330 are combination AM and FM receivers and phonograph. Model 329 is housed in a dark mahogany cabinet, while Model 330 is housed in a blonde cabinet.

The P15 phonograph in Models 329 and 330 is designed to play either automatically or manually 45 rpm seven-inch records 33⅓ rpm, 7-, 10- or 12-inch records or the standard 78 rpm 10- or 12-inch records. The pickup has a stylus selector to select either a 3 mil radius stylus for playing standard or wide groove records or a 1 mil radius stylus for playing the 33⅓ LP, 45 rpm records.

For service information and replacement parts on the P15 record changer, refer to ER-S-P15.

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 of the rear of the chassis, to the left-hand terminal screw of the antenna terminal strip. For operation from a 300-ohm FM dipole, remove this green wire from the terminal and connect the 300-ohm transmission line to the terminals marked "DIPOLE."

On AM, the limiter tube, V4-6AU6, is not used. The i-f signal is fed from T5 to the detector V5.

On FM, the set uses a reflex circuit, the Armstrong type discriminator, and a special limiter circuit.

SERVICE INFORMATION—Alignment, socket voltages, dial stringing, tube and trimmer location, etc., refer to ER-S-324.

REPLACEMENT PARTS—Refer to replacement parts list of ER-S-324 except for those parts listed below.

Cabinet and knobs for Model 329 are the same as those listed for Model 324. Cabinet and knobs for Model 330 are the same as those listed for Model 328.

Cat. No.	Symbol	Description
RL1-029	L4	COIL—FM r-f coil COIL—FM antenna coil SPRING—Dial cord tension spring TRANSFORMER—Power transformer for 60 cycle
RL1-056	L2	
RMS-004	T8	
RTP-302		

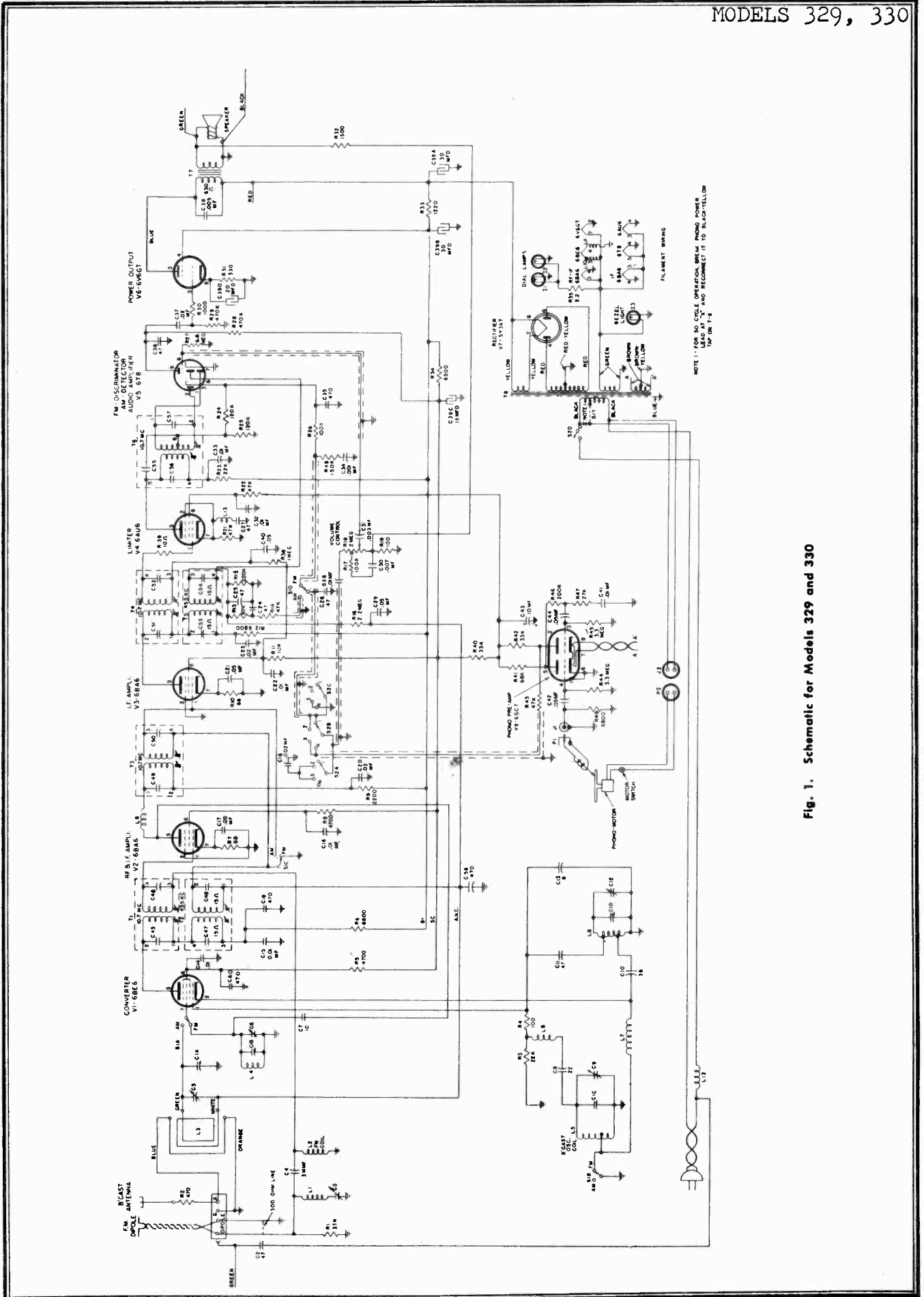


Fig. 1. Schematic for Models 329 and 330

MODELS 92-523,
92-524, 92-525, 92-526

GENERAL INFORMATION

TYPE -AC-DC table model superheterodyne with loop antenna

TUNING RANGE - 535 to 1620 Kc

IF FREQUENCY - 455 Kc

TUBE COMPLEMENT - 12BE6 - Converter
12BA6 - IF Amplifier
12AT6 - Detector, AVC & 1st AF Amp
50C5 - Power Amplifier
35W4 - Rectifier

POWER SUPPLY - 117V AC (50 to 60 cycles) or DC, 30 watts

CAUTION: Never connect antenna or chassis to water pipe, radiator or other ground.

ALIGNMENT

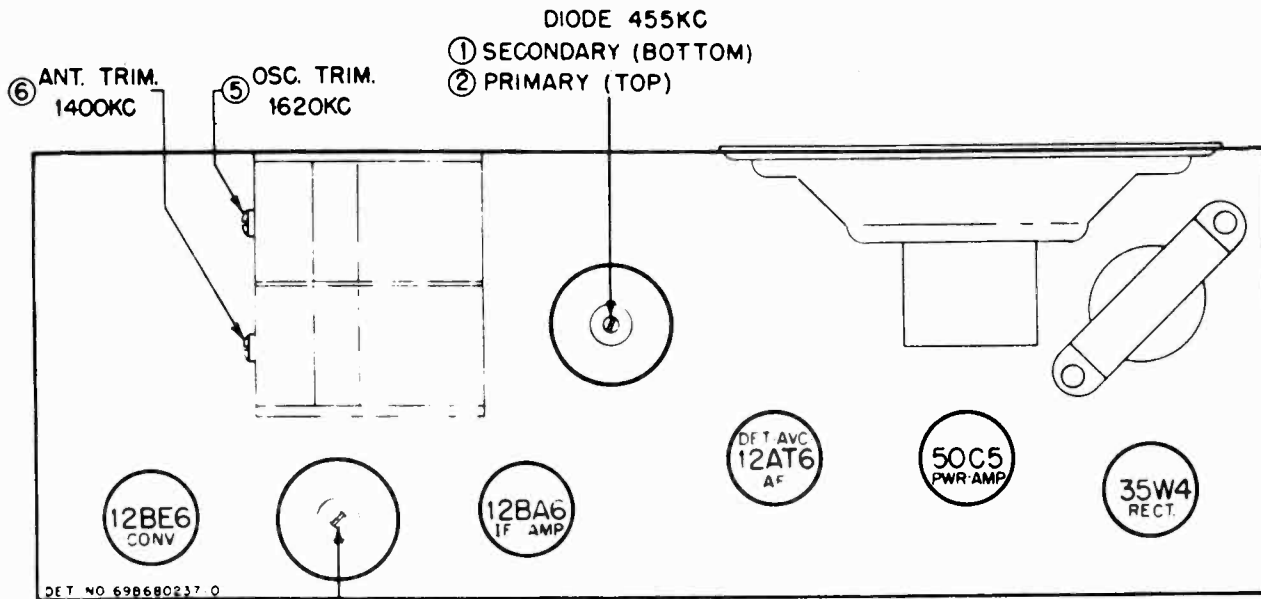
If AC power is used, use an isolation transformer between power line and receiver. If isolation transformer is not available, connect low side of signal generator to B- through .1 mf capacitor.

Connect low range output meter across speaker voice coil and set volume control at maximum. For greatest accuracy, keep output of receiver at approximately .05 watt (.05 watt = .40 volt on output meter) throughout alignment by reducing signal generator output as stages are brought into alignment. Use a small fibre screwdriver for aligning IF & diode transformers.

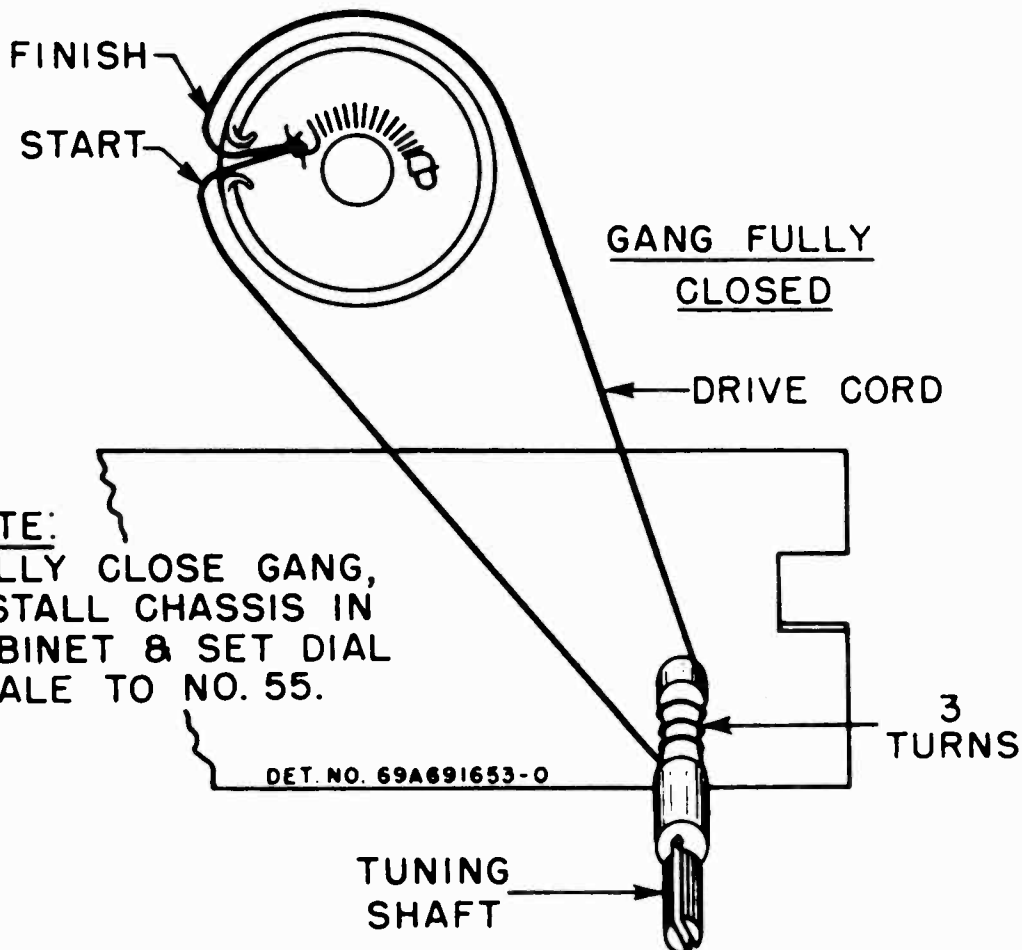
<u>STEP</u>	<u>DUMMY ANTENNA</u>	<u>GENERATOR CONNECTION</u>	<u>GENERATOR FREQUENCY</u>	<u>POINTER SET TO</u>	<u>ADJUST</u>	<u>REMARKS</u>
IF ALIGNMENT						
1.	.1 mf	Rear stator of tuning cap	455 Kc	Gang opened	1, 2, 3 & 4	Adjust for maximum.
RF ALIGNMENT						
2.	"	"	1620 Kc	"	5	Adjust for maximum.
3.	None	Radiation loop*	1400 Kc	Tune for maximum	6	Adjust for maximum.

*Connect generator output to 5" diameter, 3 turn loop & couple to receiver loop. Keep loops at least 12" apart.

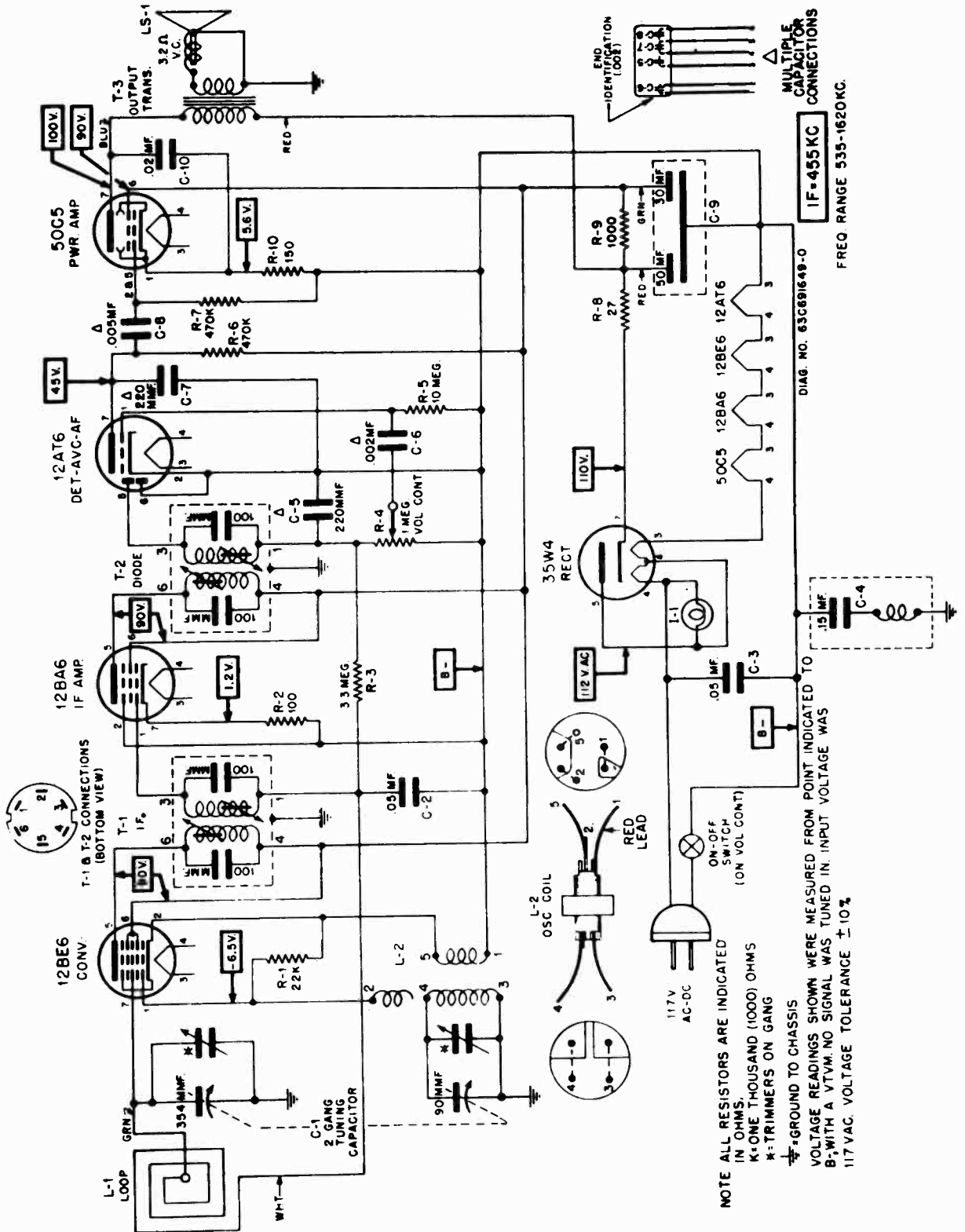
MODELS 92-523,
92-524, 92-525, 92-526



IF 455KC
 ③ SECONDARY (BOTTOM)
 ④ PRIMARY (TOP)



MODELS 92-523,
92-524, 92-525, 92-526

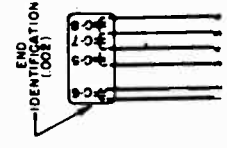


NOTE ALL RESISTORS ARE INDICATED IN OHMS.
K=ONE THOUSAND (1000) OHMS
M=TRIMMERS ON GANG
*GROUND TO CHASSIS
VOLTAGE READINGS SHOWN WERE MEASURED FROM POINT INDICATED TO B₁ WITH A VTVM NO SIGNAL WAS TUNED IN INPUT VOLTAGE WAS 117VAC. VOLTAGE TOLERANCE ± 10%

DIAG. NO. 83C691649-0

IF=455 KC
FREQ RANGE 535-1620KC.

MULTIPLE CAPACITOR CONNECTIONS



MODELS 92-523,
92-524, 92-525, 92-526

Ref.

No. Part No. Description

CHASSIS PARTS - ELECTRICAL

Capacitors

C-1	1X485960	Variable, 2-gang: includes pulley
C-2	8K691444	Paper: .05 mf 200V
C-3	8K691443	Paper: .05 mf 400V
C-4	8A691842	Paper: .15 mf (resonant at 455 Kc)
C-5, 6, 7, 8	21B482847	Ceramic, multiple: 220 mmf; .002 mf; 220 mmf; .005 mf (all 400 wv)
C-9	23A691441	Electrolytic: 50 mf - 30 mf/150V
C-10	8A691442	Paper: .02 mf 400V

Dial Light

I-1	65X11854	Bulb: 6.3V-.15A; tubular; clear; #47
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Coils

L-1	24K691446	Loop Antenna: includes back panel
L-2	24K690762	BC Oscillator Coil

Speaker

LS-1	50K691765 or 50C478138	Speaker, PM: 4"; 3.2 ohm VC
------	---------------------------	-----------------------------------

Resistors

Note: All resistors are insulated carbon type unless otherwise specified.

R-1	6R6028	22,000 20% 1/2W
R-2	6R6018	100 20% 1/2W
R-3	6R2118	3.3 meg 20% 1/2W
R-4	18A691440	Volume Control: 1 meg; includes ON-OFF switch
R-5	6R2109	10 meg 20% 1/2W
R-6	6R6032	470,000 20% 1/2W
R-7	6R6032	470,000 20% 1/2W
R-8	6R5683	27 10% 1/2W
R-9	6R3953	1000 20% 1W

MODELS 92-523,
92-524, 92-525, 92-526

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
<u>Resistors (cont'd)</u>		
R-10	6R3992	150 20% 1/2W
<u>Switch</u>		
S-1	-	SPST switch: part of volume control R-4
<u>Transformers</u>		
T-1	24B482863	IF, 455 Kc: complete
T-2	24B482865	Diode, 455 Kc: complete
T-3	25K485973	Output Transformer
CHASSIS PARTS - MECHANICAL		
	7K690449	Bracket, loop mtg
	7A690445	Bracket, pilot light mtg
	7A77337	Bracket, tuning shaft mtg
	11M8944	Cord, dial: 18 lb; blk
	30A470651	Core, line & plug: 6 ft long
	46K680318	Core, iron: threaded (for T-1 & T-2)
	5A19658	Eyelet, spacer (gang mtg)
	5A70404	Grommet, rubber (gang mtg)
	14A482844	Insulator, cord outlet
	29R3010	Lug, soldering: #6; hot tinned (gang)
	2S7051	Palnut, hex: 3/8-32 x 9/16; cad pl (volume control mtg)
	5S7771	Rivet: .088 x 3/16; stl; pol nkl (tube socket mtg)
	5S7707	Rivet: .122 x 5/32 stl; nkl pl (spring tube shield mtg & output transformer mtg)
	5S7701	Rivet: .122 x 3/16; stl; nkl pl (tuning shaft bracket mtg)
	3S2294	Screw, machine: 6-32 x 1/2 plain hex head; locking type; cad pl (gang mtg)
	3S7205	Screw, machine: 8-32 x 1/4 slotted hex head; locking type; cad pl (pilot light brkt mtg)

MODELS 92-523,
92-524, 92-525, 92-526

CHASSIS PARTS - MECHANICAL (cont'd)

3S3398 Screw, sheet metal: #6 x 3/8 PKZ plain hex head;
cad pl (bracket, loop mtg)

3S7454 Screw, sheet metal: #8 x 1/4 PKZ plain hex head;
cad pl (speaker mtg)

3S7455 Screw, sheet metal: #8 x 3/8 PKA slotted acorn
head; antique copper finish (loop mtg)

47A482845 Shaft, tuning

26K485936 Shield, coil (T-1 & T-2)

26A481521 Shield, spring (tube shield)

9A485979 Socket, pilot light & bracket

9A472534 Socket, tube: miniature

41A691088 Spring, tension coil (elect. cap retaining).....

41A14111 Spring, tension coil (dial cord)

4A70015 Washer, "C" (tuning shaft retainer)

4S7633 Washer, flat: 9/16 x 11/64 x .033 stl; cad pl
(loop mtg)

4K482859 Washer, insulated shoulder (loop mtg brkt)

CABINET PARTS

16E690434 Cabinet, table model: plastic; walnut (12-59W)..

16K690438 Cabinet, table model: plastic; ivory (12-59I)...

16K690436 Cabinet, table model: plastic; green (12-59G)...

16K691447 Cabinet, table model: plastic; maroon (12-59M)..

42A485984 Clip, dial scale retainer

36B690442 Knob, control: plastic; walnut (12-59W)

36K690444 Knob, control: plastic; ivory (12-59I)

36K691460 Knob, control: plastic; green (12-59G)

36K691459 Knob, control: plastic; maroon (12-59M)

38A25507 Plug, split (loop & back to cabinet mtg)

34C690441 Scale, dial

3S7374 Screw, machine: 8-32 x 5/16 plain hex head;
cad pl (chassis mtg)

MODELS EX-102,
EX-103

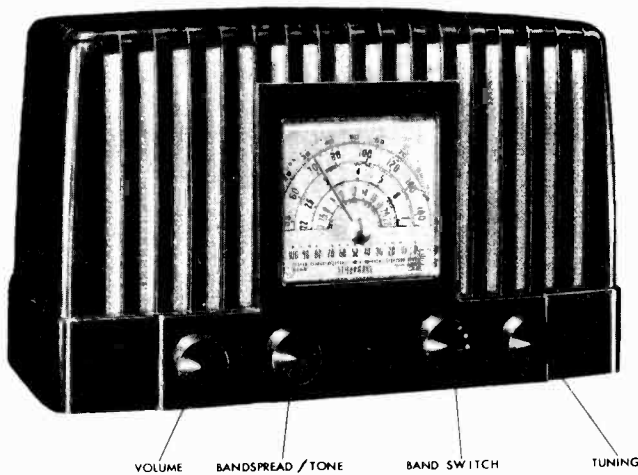


Fig. 1. Front view of Model EX-102 showing controls.

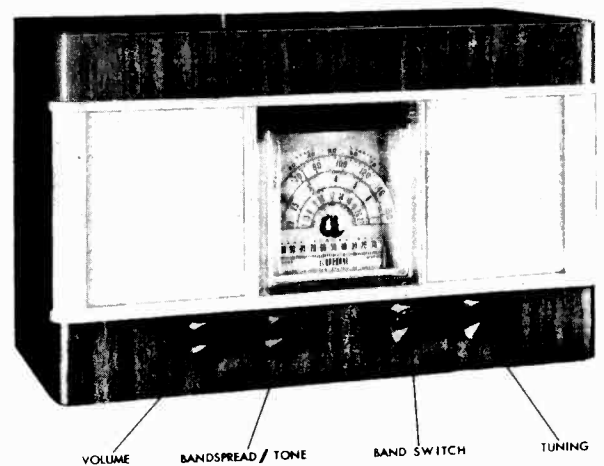


Fig. 2. Front view of Model EX-103 showing controls.

GENERAL: Models EX-102 and EX-103 are five tube, table model superheterodyne radio receivers, capable of receiving broadcast and short wave stations in three bands as follows: Band No. 1 (broadcast band)—540 to 1625 kc; Band No. 2 (short wave range 1)—2.2 to 7.1 mc; Band No. 3 (short wave range 2)—6.9 to 22 mc. Models EX-102 and EX-103 are electrically identical, but have different cabinets. Both models have ballast tubes which permit operation from 210 to 250 volts a-c/d-c as well as from 105 to 125 volts a-c/d-c power source. Both models have a built-in antenna plus provision for external antenna and ground system. Power drain is 25 watts at 117 volts for both models.

TUBE TYPES AND THEIR FUNCTIONS: type 12SA7GT/G—mixer/oscillator; type 12SK7GT/G—first i-f amplifier; type 12SQ7GT/G—detector, avc, and first audio amplifier; type 35L6GT/G—audio power amplifier; type 35Z5GT/G—power rectifier.

CONTROLS AND THEIR USE: **VOLUME** control—turn clockwise to turn on receiver and adjust volume; **BANDSPREAD/TONE** control—turn clockwise to operate bandspread and adjust tone; **BANDSWITCH** control—turn knob from left to right, as indicated by dots on knob, for bands 1, 2 or 3; **TUNING** control—turn knob clockwise or counterclockwise to locate desired station.

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.)	117 microvolt at 1000 kc 200 microvolt at 2.5 mc 140 microvolt at 6mc 322 microvolt at 8mc 115 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

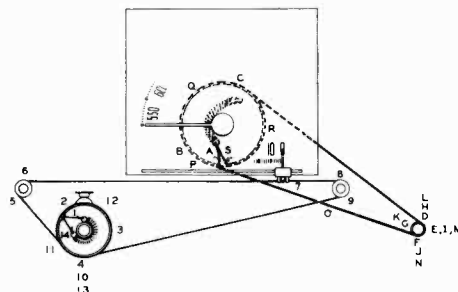


Fig. 3. Dial cable stringing procedure; main tuning is indicated by letters, and band spread tuning is indicated by numbers.

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 EX-102,
EX-103

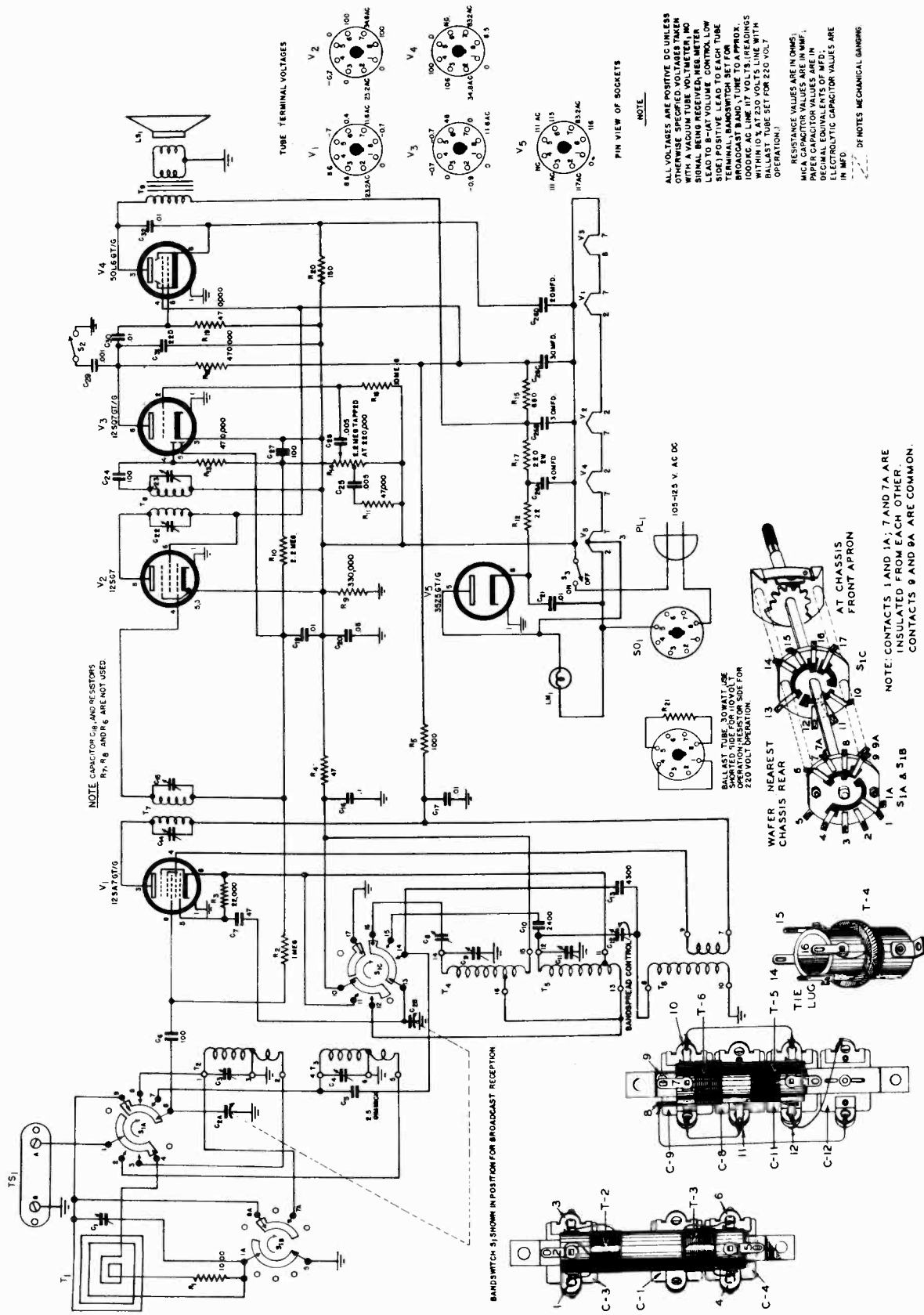


Fig. 4. Schematic Wiring Diagram of Models EX-102 and EX-103.

ALIGNMENT INSTRUCTIONS

EQUIPMENT:

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

CONNECTIONS: Connect signal generator "cold" lead to negative return of receiver circuits, NOT to chassis. The "hot" lead is connected as indicated in the chart below.

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

CAUTION: See that the ballast tube is in the proper position with respect to the power line voltage.

CONTROL SETTINGS: After allowing the receiver to warm up about ten minutes, set the controls as follows: VOLUME control full clockwise; BANDSPREAD tuning control at "0"; BANDSWITCH and main TUNING controls as indicated in the following chart.

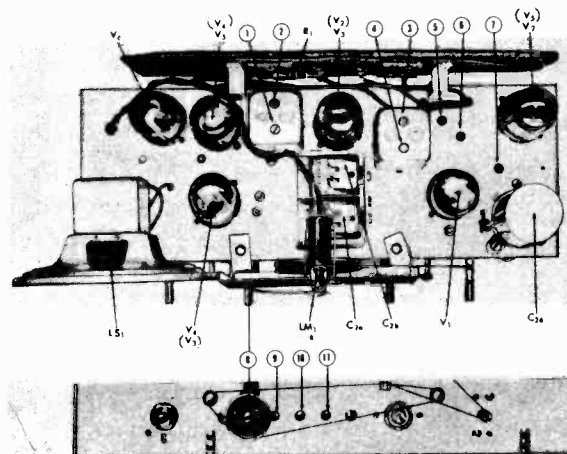


Fig. 6. Models EX-102 and EX-103, view showing alignment points.

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

NOTE: Bandspread indicator MUST be at ZERO when making all adjustments.
 Band 2 oscillator trimmer (9) must be set AFTER bandspread trimmer (8) (Range 3 oscillator trimmer) is aligned.
 †Rock the main tuning capacitor slightly (turn back and forth slowly) when making these adjustments.
 *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.

MODELS EX-102,
EX-103

REPLACEMENTS PARTS LIST

REF. NO.	DESCRIPTION	HALLICRAFTER'S PART NUMBER	REF. NO.	DESCRIPTION	HALLICRAFTER'S PART NUMBER
CAPACITORS					
C-1, 3 & 4	Antenna trimmers; 3 section unit	44A162	S-1	Barswitch; rotary; 2 section, 3 position	60B250
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. REFER TO REF. NO. R-14.	
C-6, 24 & 27	100 mmf; 20%; 500 vdcw; mica	CM20A101M	TRANSFORMERS		
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	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-25 & 28	0.005 mfd; +40-15%; 600 vdcw; tubular paper	46AZ502J	TERMINAL STRIPS		
C-20	0.05 mfd; +40-15%; 600 vdcw; tubular paper	46AY503J	TS-1	External antenna and ground connector strip	88A569
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.		MISCELLANEOUS COMPONENTS COMMON TO BOTH MODELS		
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	QUANT. IN EQUIPMENT	DESCRIPTION	HALLICRAFTER'S PART NUMBER
C-29	0.001 mfd; 20%; 600 vdcw; tubular paper	46AZ102H	1	Pilot lamp dial socket; bayonet base	86A036-1
C-31	220 mmf; 20%; 500 vdcw; mica	CM20A221M	1	Bracket; tuning capacitor mounting	67B581
PILOT LAMPS					
LM-1	6/8 volt @ 150 ma; brown bead; bayonet base; G. E. type 47	39A004	1	Bracket; tuning shaft mounting	67A582
LOUD SPEAKER					
LS-1	Loud Speaker	85B038	1	Steel tuning shaft	74A176
PLUGS					
PL-1	Line cord with two prong plug; 6 ft cord	87A078	1	Acetate dial window	22B161
RESISTORS					
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	22,000 ohm; 20%; 1/2 watt; carbon	RC20AE223M	1	Calibrated dial scale	83B271
R-4	47 ohm; 20%; 1/2 watt; carbon	RC20AE470M	1	Drive pulley	28A022
R-13, 18 & 19	470,000 ohm; 20%; 1/2 watt; carbon	RC20AE474M	2	Idler pulley	28A023
R-9	330,000 ohm; 20%; 1/2 watt; carbon	RC20AE334M	1	Line cord lock	76A299
R-10	2.2 megohm; 20%; 1/2 watt; carbon	RC20AE225M	1	Electrolytic capacitor (C-26) hold down clamp	76A300
R-11	47,000 ohm; 20%; 1/2 watt; carbon	RC20AE473M	1	Cam for switch, S—	77A207
R-12	22 ohm; 20%; 1 watt; carbon	RC30AE220M	5	Tube sockets; octal; Amphenol type MIP-8	6A256
R-14 & S-3	VOLUME control; 500,000 ohm variable; includes SPST toggle action switch, S-3 on rear.	25A561	1	Tube socket; octal; same as Amphenol type MIP-8 except has two keyways 180 degrees apart.	6A255
R-15	680 ohm; 20%; 1 watt; carbon	RC30AE681M	MISCELLANEOUS COMPONENTS FOR MODEL EX-102 ONLY		
R-16	10 megohm; 20%; 1/2 watt; carbon	RC20AE106M	1	Cabinet; bakelite; ebony finish	66E307-1
R-17	220 ohm; 20%; 1/2 watt; carbon	RC20AE221M	1	Knob; bakelite; ebony finish	15B067-3
R-20	150 ohm; 20%; 1/2 watt; carbon	RC20AE151M	1	Knob; bakelite; ebony finish with dot	15B075-3
R-21	Ballast tube; 460 ohm nominal; 30 watt; resistance is between pins 5 & 8; pins 1 and 4 are shorted.	24B856	1	Cabinet; bakelite; walnut finish	66E307-2
			3	Knob; bakelite; walnut finish	15B067-2
			1	Knob; bakelite; walnut finish with dot	15B075-2
			1	Cabinet; bakelite; ivory finish	66E307-3
			3	Knob; bakelite; ivory finish	15B067-1
			1	Knob; bakelite; ivory finish with dot	15B075-1
			1	Cabinet bottom plate.	63C246
MISCELLANEOUS COMPONENTS FOR MODEL EX-103 ONLY					
			1	Cabinet; wood	66E316
			4	Knob; wood	15B075-4
			1	Dial escutcheon; brass	7C027
			1	Cabinet back; cardboard	32C339

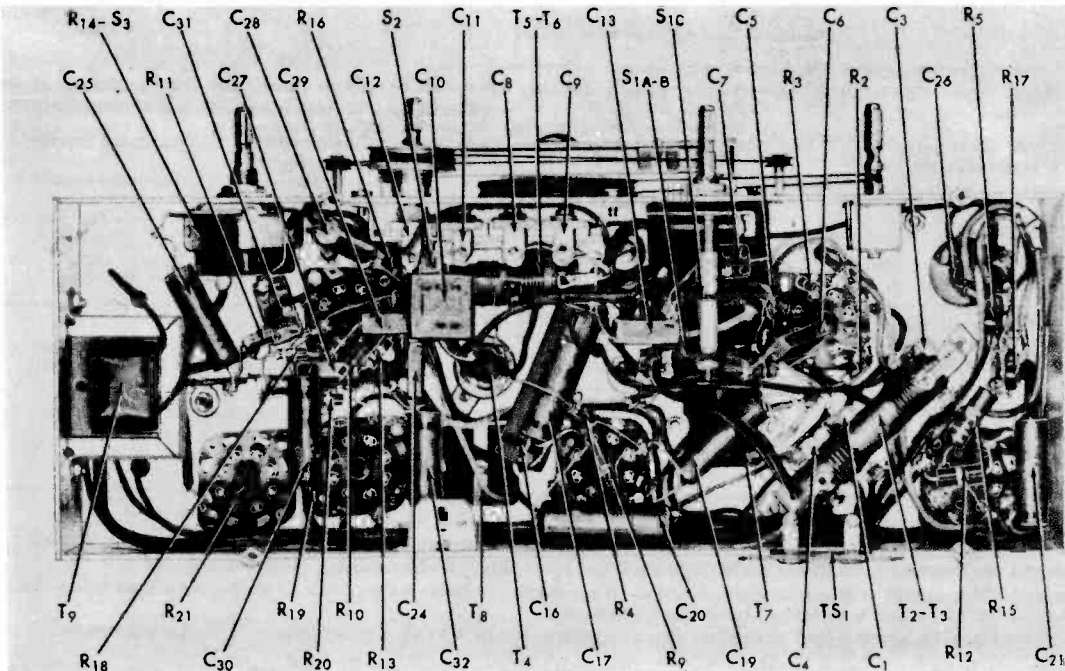


Fig. 5. Models EX-102 and EX-103 bottom view of chassis showing location of component parts.

GENERAL

- Tubes Five plus rectifier
- Speaker 6-inch P.M.
- Speaker V.C. Impedance 3.2 ohms
- Headset Output High Impedance
- Antenna
 - EX-104 Built-in cabinet antenna. Provisions for external long wire antenna.
 - EX-106 Provision for an external long wire antenna only. Supplied with shielded lead.
- Phono Input High Impedance
- Tuning Manual
- Tuning Range. Broadcast 540 kc - 1700 kc
 - Shortwave A - 2.2 mc - 7.5 mc
 - Shortwave B - 7 mc - 22 mc
 - Shortwave C - 9 mc - 12 mc
- Intermediate Frequency. 455 kc
- Power Supply
 - EX-104 105/125 V. or 210/250 V. 60 cycles AC
 - EX-106 6.8 V. DC @ 7 amperes

Note - A battery charger must not raise the supply voltage above 7.5 volts with the receiver operating.

- Power Consumption
 - EX-104 55 Watts
 - EA-106 48 Watts

RESTRINGING DIAL CORD

Restring the dial drive with 30 lb. test dial cord. Tie one end to the tension spring and follow the sequence outlined in Fig. 1. Stretch the tension spring and tie the end of the cord securely to the spring as shown.

Set the tuning condenser at maximum capacity (closed), attach the pointer to the string and line it up with the left hand index mark on the dial scale.

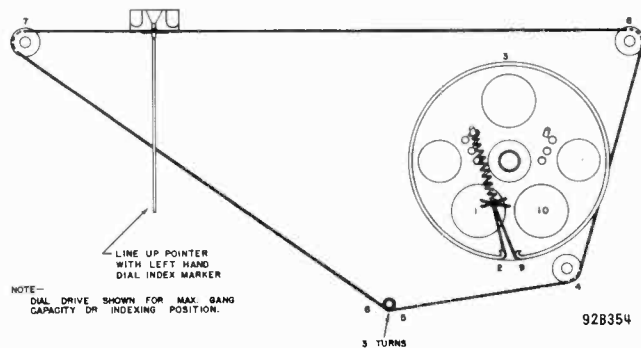
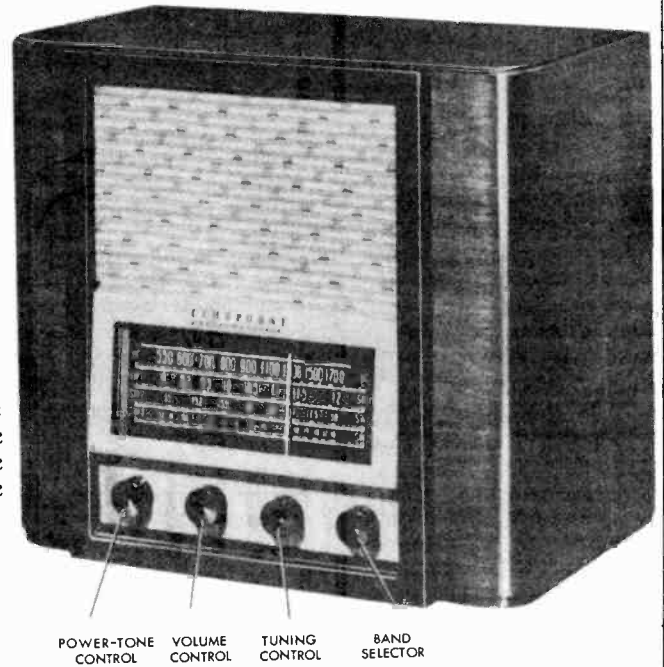


Fig. 1. Dial cable stringing procedure.



REPLACING LAMPS

Replace dial lamps with 6-8 V. Mazda #44 (Blue bead) pilot lamps or equivalent. To gain access to defective dial lamps, the chassis must be removed from the cabinet. Remove the four knobs (pull straight off the shafts), four mounting screws located at the bottom of the cabinet and disconnect the speaker plug to separate the chassis from the cabinet. On Model EX-104 the cabinet antenna lead must also be disconnected.

REPLACING FUSES

The Model EX-106 uses a battery cable fuse. Make replacements with a 15-ampere type 3AG fuse.

ALIGNMENT PROCEDURE:

Since all connections and adjustments necessary for alignment are accessible from the top of the chassis, the receiver may be aligned without removing the chassis from the cabinet. The output transformer is located on the under side of the chassis, hence, the output meter connection should be made at the speaker socket. (3-ohm V.C.).

All alignment adjustments are made at maximum volume. Refer to the alignment chart for the dial and band switch settings.

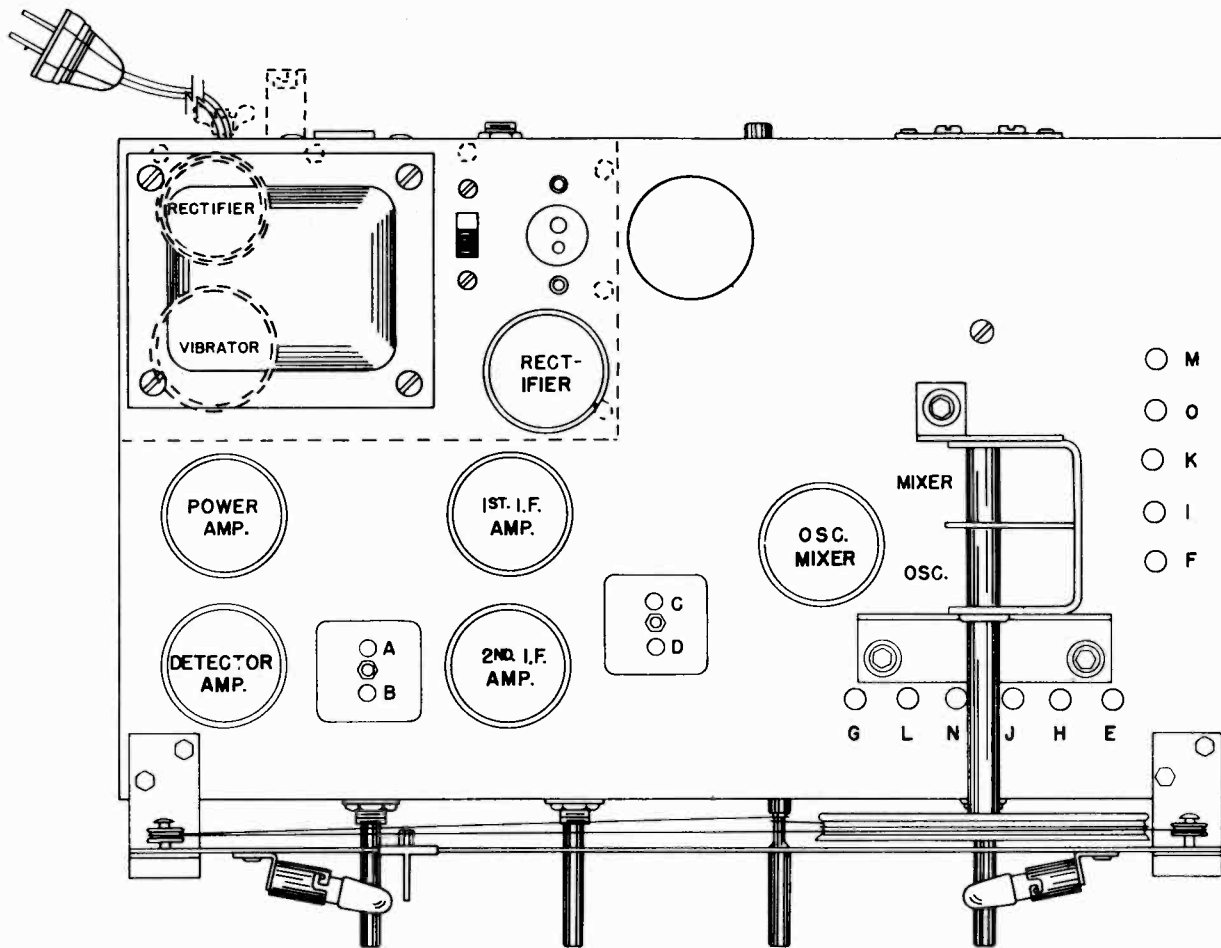
The standard RMA dummy antenna specified in the alignment chart consists of a 200 mmf condenser in series with a 20 uh r-f choke which is shunted by a 400 mmf condenser in series with a 400 ohm carbon resistor.

MODELS EX-104,
EX-106

ALIGNMENT CHART

Step	Dummy Antenna	Signal Generator Coupling	Signal Generator Frequency	Band Switch Setting	Receiver Dial Setting	Adjust
1	.01 mfd capacitor	Connect to rear section stator of tuning cap.	455 kc	BC	1000 kc	ABCD
2	Std RMA dummy	Connect to terminals "A" and "G" of antenna terminal strip TS ₁ .	1500 kc	BC	1500 kc	E*F
			600 kc		600 kc	G*
3	Std RMA dummy	See step 2.	6 mc	SW(A)	6 mc	H*I
4	Std RMA dummy	See step 2.	20 mc	SW(B)	20 mc	J*K
5	Std RMA dummy	See step 2.	11.5 mc	SW(C)	11.5 mc	L*M
			9.2 mc		9.2 mc	N*O

* Note - Calibration adjustment.



92C367

Fig. 2. Top view, alignment points.

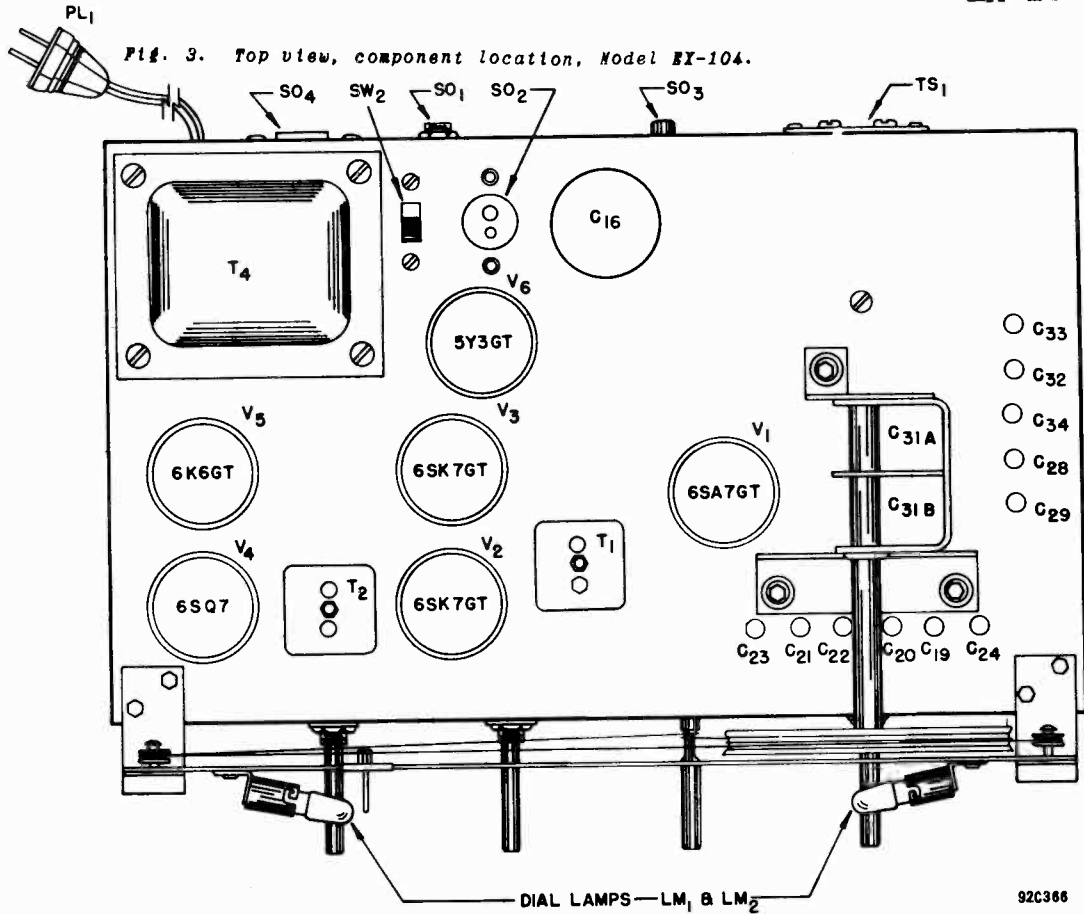
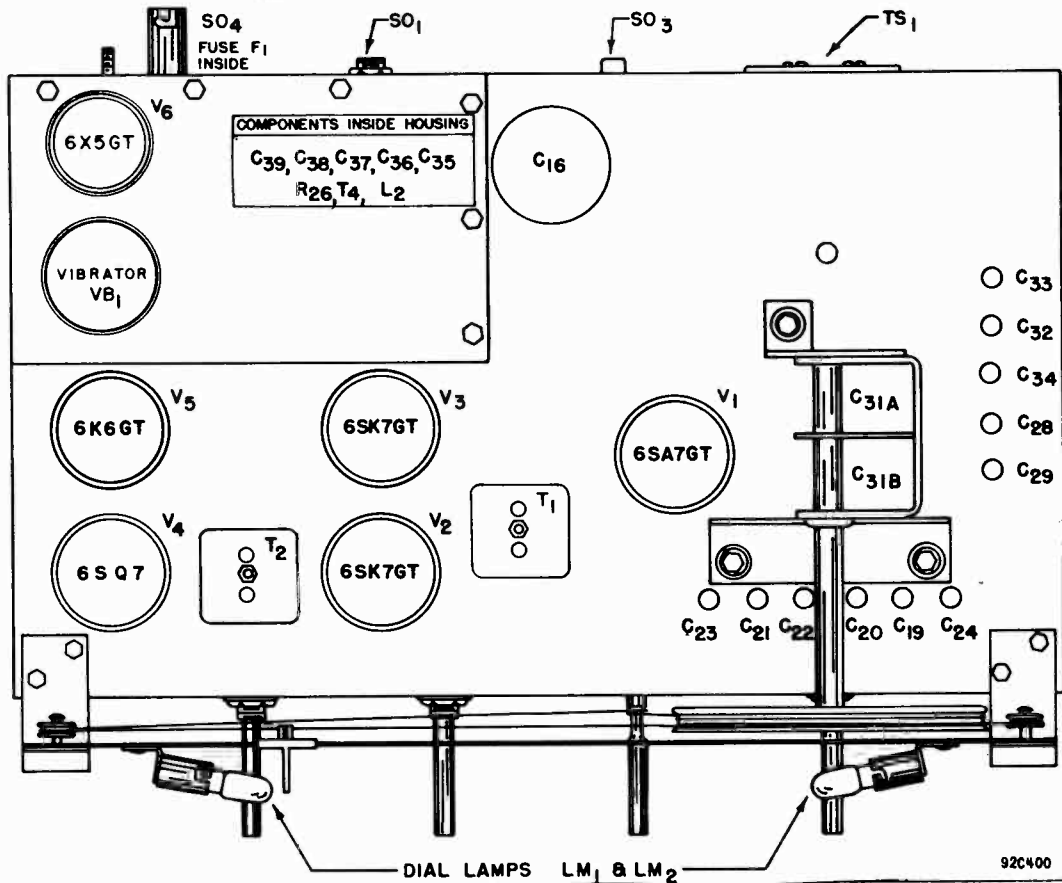


Fig. 4. Top view, component location, Model EX-106.



MODELS EX-104,
EX-106

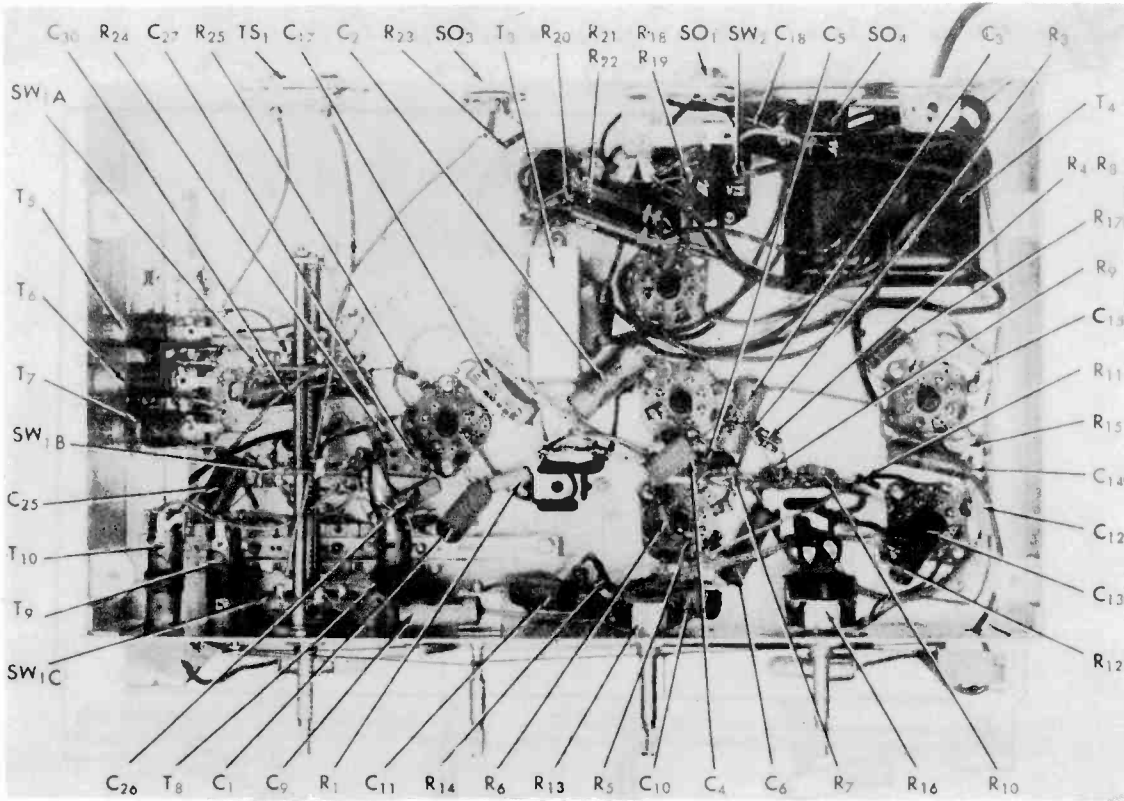


Fig. 5. Bottom view, component location, Model EX-104.

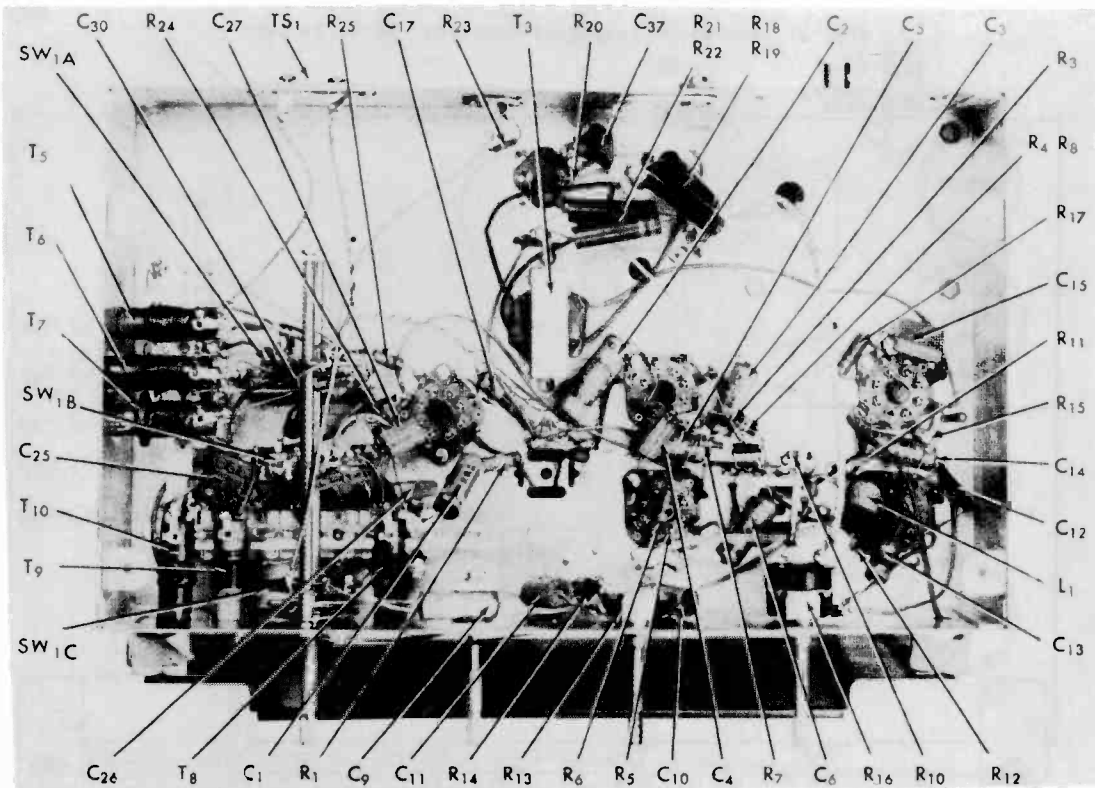
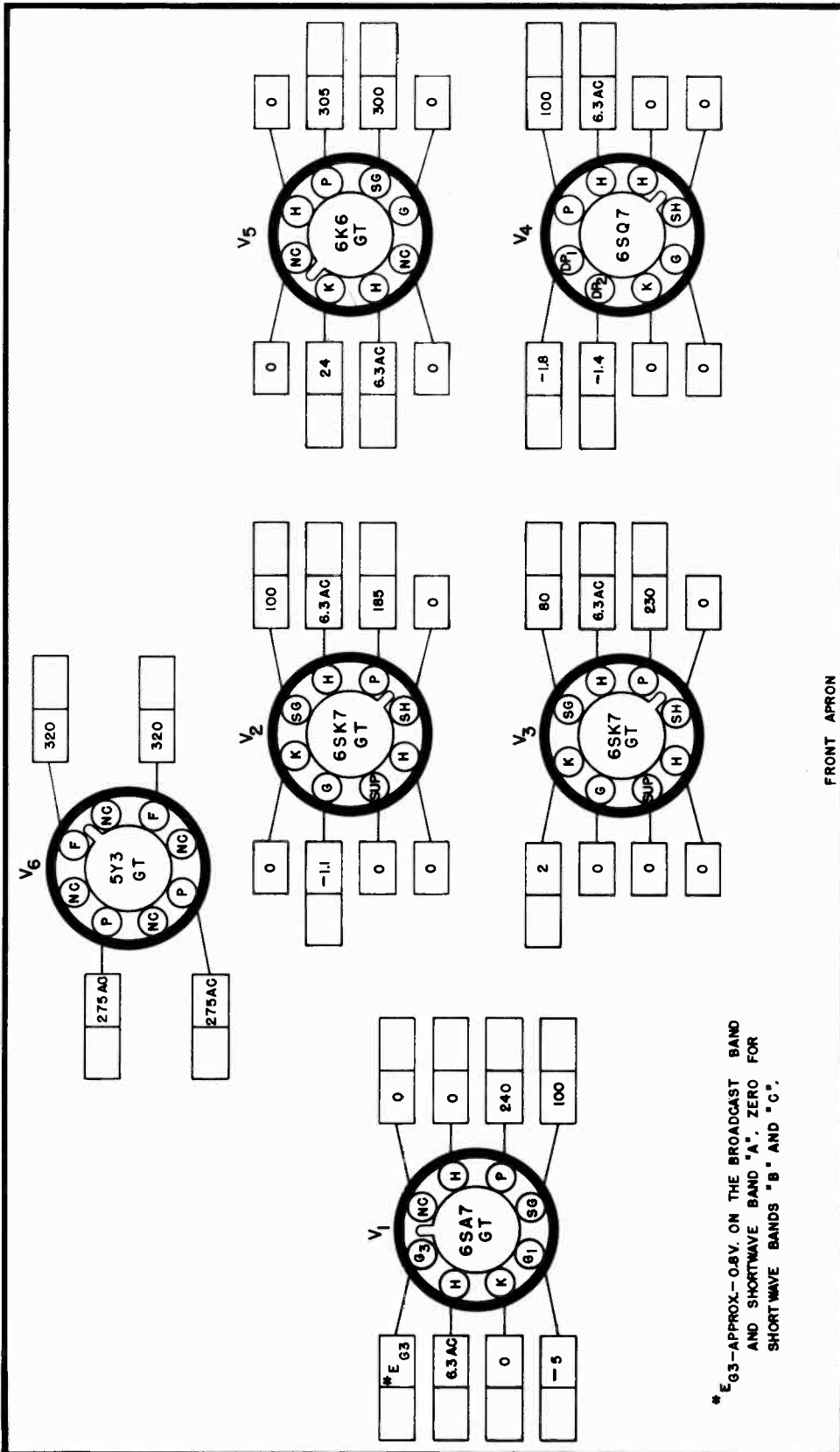


Fig. 6. Bottom view, component location, Model EX-106.



*E_{G5}-APPROX.-0.5V. ON THE BROADCAST BAND AND SHORTWAVE BAND "A". ZERO FOR SHORTWAVE BANDS "B" AND "C".

NOTES-

1. SOCKET VIEWS ARE BOTTOM VIEWS.
2. ALL VOLTAGES ARE MEASURED BETWEEN TUBE SOCKET TERMINALS AND CHASSIS WITH ZERO SIGNAL INPUT.
3. LINE VOLTAGE — 117 V. A.C. BATTERY VOLTAGE — 6.6 V. D.C.
4. ALL VOLTAGES SHOWN ARE DC UNLESS OTHERWISE SPECIFIED.
5. DC VOLTAGES SHOWN WERE MEASURED WITH A 20,000 OHM / VOLT METER.
6. "MG" — NO CONNECTION (VOLTAGE SHOWN FOR THIS TERMINAL ONLY WHEN TERMINAL IS USED AS A TIE LUG.)
7. SPACE PROVIDED FOR SERVICE METER READINGS.
8. WHEN USING THE CHART FOR MODEL EX-106 DISREGARD TUBE V-6. PLATE AND SCREEN VOLTAGES WILL RUN SLIGHTLY LOWER THAN SHOWN AND THE AC VOLTAGE SHOWN FOR THE HEATERS WILL BE A DC VOLTAGE EQUAL TO THE BATTERY SUPPLY VOLTAGE.

Fig. 7. Tube socket voltage chart.

MODELS EX-104,
EX-106

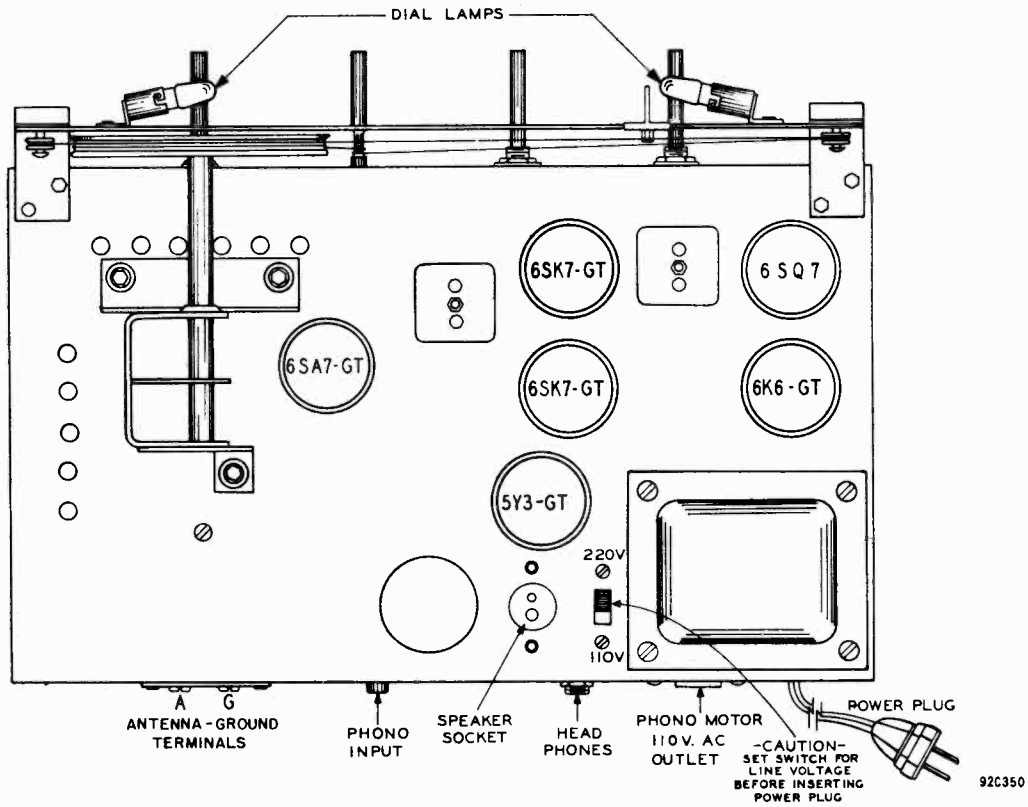


Fig. 8. Top view of Model EX-104 showing location of tubes and dial lamps.

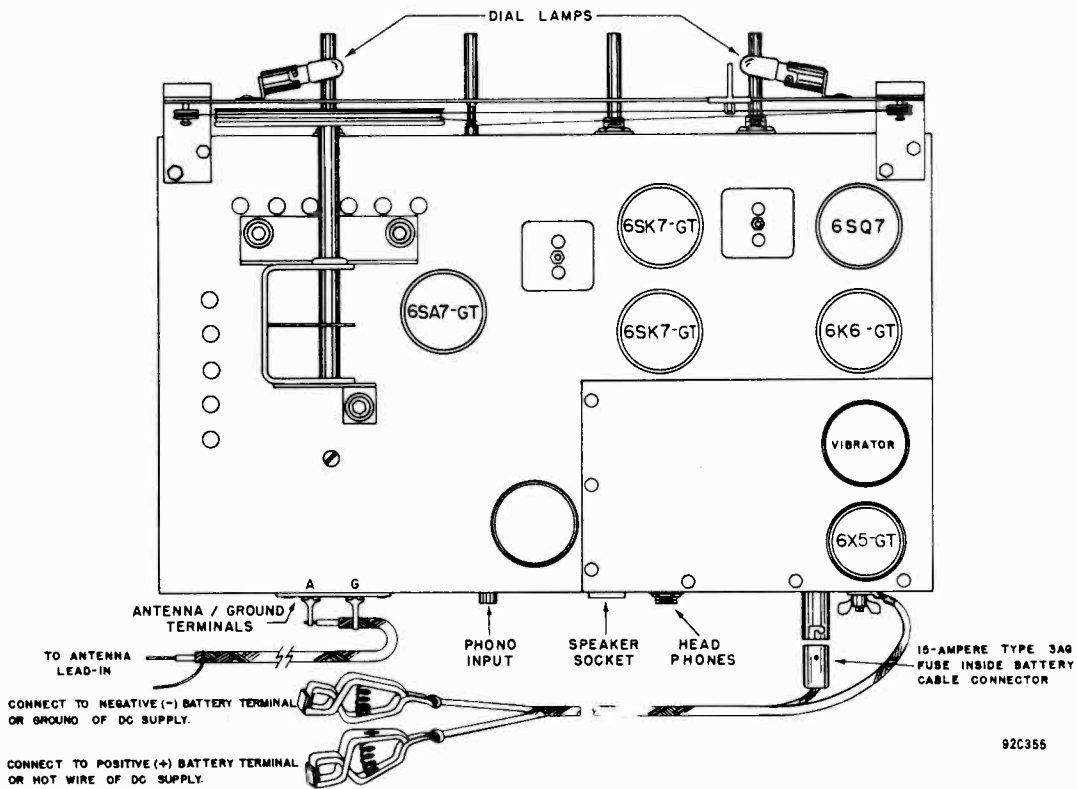
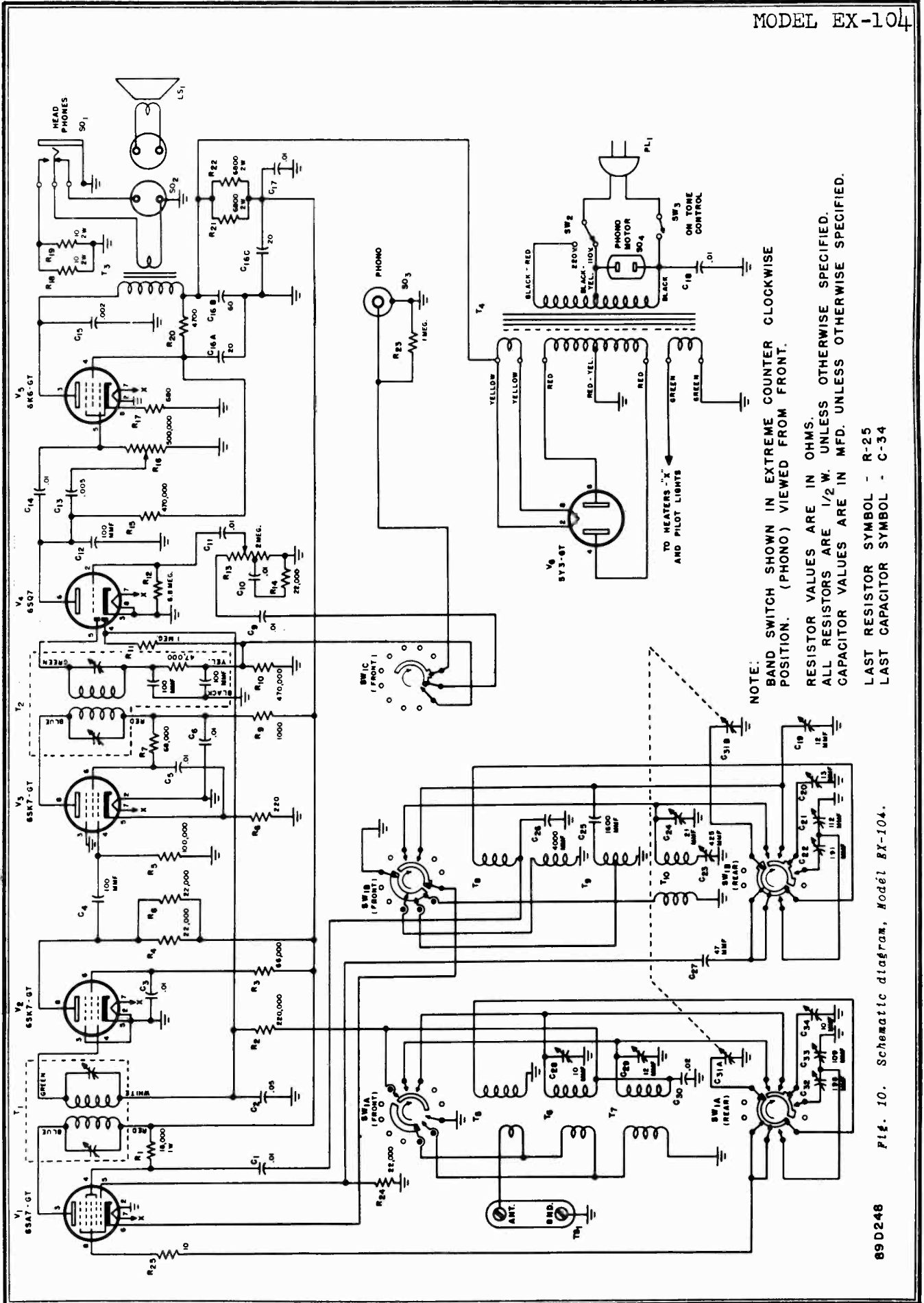


Fig. 9. Top view of Model EX-106 showing location of tubes and dial lamps.

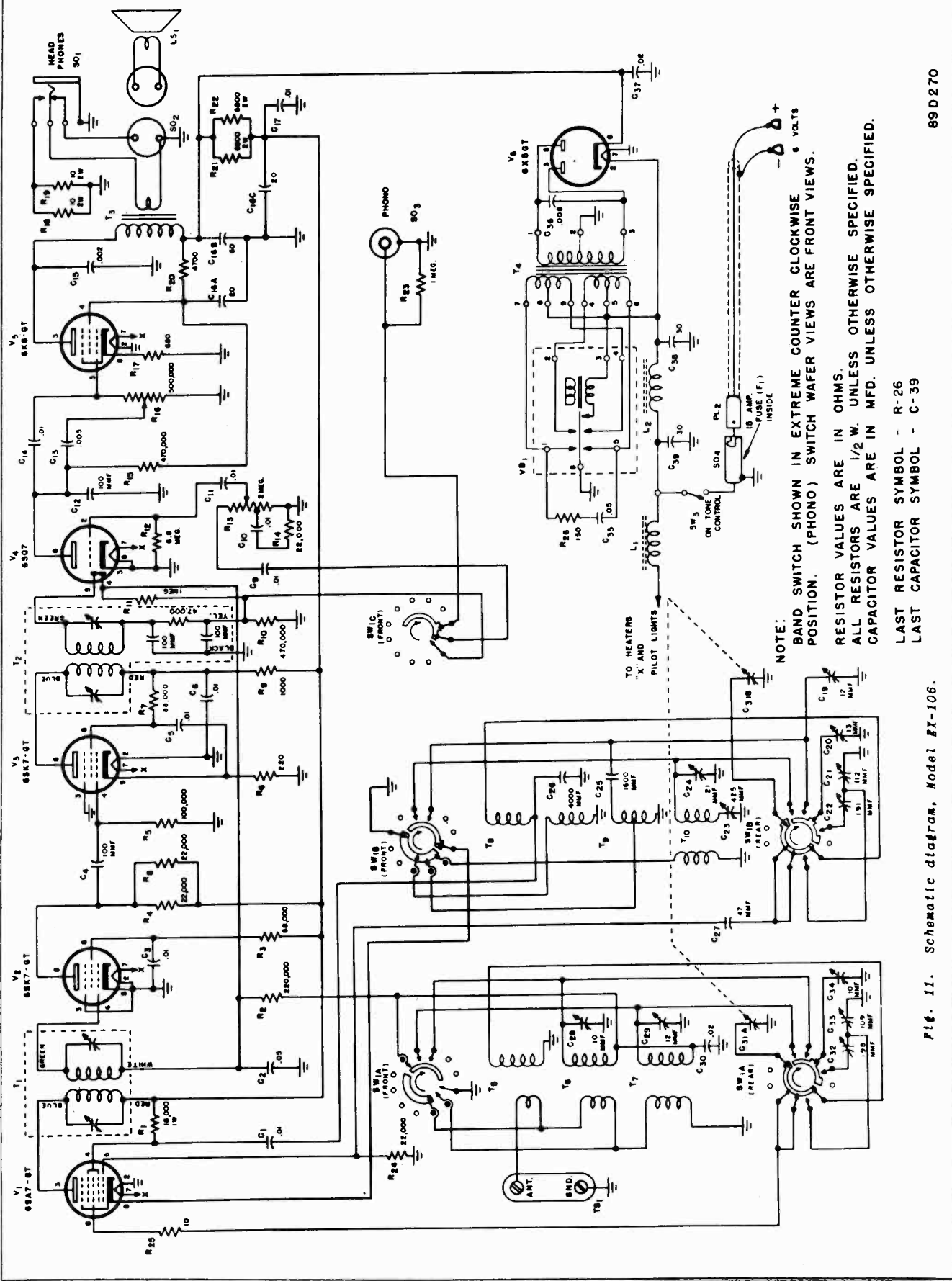


NOTE:
 BAND SWITCH SHOWN IN EXTREME COUNTER CLOCKWISE POSITION. (PHONO) VIEWED FROM FRONT.
 RESISTOR VALUES ARE IN OHMS.
 ALL RESISTORS ARE 1/2 W. UNLESS OTHERWISE SPECIFIED.
 CAPACITOR VALUES ARE IN MFD. UNLESS OTHERWISE SPECIFIED.

LAST RESISTOR SYMBOL - R-25
 LAST CAPACITOR SYMBOL - C-34

Fig. 10. Schematic diagram, Model EX-104.

89D248



89D270

Fig. 11. Schematic diagram, Model EX-106.

SERVICE PARTS LIST

SERVICE PARTS LIST (Cont.)

Ref. No.	Description	Hallicrafters Part Number	Ref. No.	Description	Hallicrafters Part Number
CAPACITORS			TRANSFORMERS AND COILS (Cont.)		
C-1,3,5,6,9,10,11,14,17	.01 mfd. 600 V., tubular paper	46AZ103F	T-8	Transformer, oscillator stage, SW(B) (C)	51B964
C-2	.05 mfd. 600 V., tubular paper	46AY503F	T-9	Transformer, oscillator stage, SW(A)	51B963
C-4,12	100 mmf. 500 V., mica	CM20A101M	T-10	Transformer, oscillator stage, BC	51B962
C-13	.005 mfd. 600 V., tubular paper	46AZ502J	**L-1, **2	Coil, hash filter	53A100
C-15	.002 mfd. 600 V., tubular paper	46AZ202J	SWITCHES		
C-16	60-20-20 mfd. 450 V., electrolytic	45B113	SW-1	Band switch assembly	60B290
*C-18	.01 mfd. 600 V., molded paper	46AG103J	*SW-2	Line voltage switch, S.P.D.T.	60A228
C-19,20,21,22,23,24	Trimmer assembly, 6 section oscillator stage	44B217	SW-3	Power switch, part of tone control R-16	
C-25	1600 mmf. 2% 500 V., mica	CM30C162G	PLUGS AND SOCKETS		
C-26	4000 mmf. 5% 500 V., mica	CM35A402J	*PL-1	Line cord and plug	87A078
C-27	47 mmf. 500 V., mica	CM20A470M	SO-1	Receptacle, headphone jack	36AO36-1
C-28,29,32,33,34	Trimmer assembly, 5 section, antenna stage	44B216	SO-2	Receptacle, speaker	88A072
C-30,**37	.02 mfd. 600 V., tubular paper	46AY203F	SO-3	Receptacle, phono	36A029
C-31	Tuning condenser, 2 section	48B184	SO-4	Receptacle, phono motor	10A015
**C-35	.05 mfd. 150 V., tubular paper	46A094	-	Socket, octal (tube)	6A190
**C-36	.008 mfd. 1600 V., tubular paper	46A098-3	-	Socket, 6 contact (vibrator)	**6A282
C-38,39	30 mfd. 25 V., electrolytic	45A034	-	Socket, dial light	86A054
RESISTORS			TUBES, RECTIFIERS AND LAMPS		
R-1	18,000 ohms 1 watt, carbon	RC30AE183M	V-1	Type 6SA7GT, mixer	90X6SA7GT
R-2	220,000 ohms 1/2 watt, carbon	RC20AE224M	V-2,3	Type 6SK7GT, 1st and 2nd I.F.	90X6SQ7
R-3,7	68,000 ohms 1/2 watt, carbon	RC20AE683M	V-4	Type 6SQ7, detector and 1st audio	90X6SQ7
R-4,8	22,000 ohms 1/2 watt, carbon	RC20AE223K	V-5	Type 6K6GT, audio power amp.	90X6K6GT
R-5	100,000 ohms 1/2 watt, carbon	RC20AE104M	*V-6	Type 5Y3GT, rectifier	90X5Y3GT
R-6	220 ohms 1/2 watt, carbon	RC20AE221M	**V-6	Type 6X5GT, rectifier	90X6X5GT
R-9	1000 ohms 1/2 watt, carbon	RC20AE102M	LM-1,2	Lamp, 6-8 V., 250 MA., Mazda #44	39A003
R-10,15	470,000 ohms 1/2 watt, carbon	RC20AE474M	MISCELLANEOUS		
R-11,23	1 megohm 1/2 watt, carbon	RC20AE105M	TS-1	Terminal strip, antenna	88A327
R-12	6.8 megohm 1/2 watt, carbon	RC20AE685M	-	Lock, line cord	*76A299
R-13	Resistor, variable, 2 megohms, tapped	25B621	-	Cable, dial drive	38A001
R-14,24	22,000 ohms 1/2 watt, carbon	RC20AE223M	-	Spring, dial drive	75A006
R-16	Resistor, variable, 500,000 ohms	25B640	-	Rail, pointer	67B727
R-17	680 ohms 1 watt, carbon	RC30AE681M	-	Dial scale	83C322
R-18,19	10 ohms 2 watts, carbon	RC40AE100M	-	Pointer	82A135
R-20	4700 ohms 1/2 watt, carbon	RC20AE472M	-	Escutcheon	7C057
R-21,22	6800 ohms 2 watts, carbon	RC40AE682M	-	Dial glass	22B189
R-25	10 ohms 1/2 watt, carbon	RC20AE100M	-	Speaker, P.M.	85C063
**R-26	150 ohms 1/2 watt, carbon	RC20AE151K	LS-1	Knob, volume, tone and tuning	15B068-3
TRANSFORMERS AND COILS			-	Knob, band switch	15B137
T-1	Transformer, 1st I.F.	50C365	-	Capacity plate (cabinet antenna) antenna)	*69B203-1
T-2	Transformer, detector stage	50C364	-	Clip, coil mtg.	76A326
T-3	Transformer, audio output	55B104-1	-	Clamp, vibrator	**76C075
*T-4	Transformer, power	52C149	-	Antenna cable assembly	**87A1666
**T-4	Transformer, power	52C162	-	Vibrator (6 Volt)	27B146
T-5	Transformer, antenna stage, SW(B) (C)	51B1018	**VB1	Battery cable assembly	**87C1665
T-6	Transformer, antenna stage, SW(A)	51B960	-	Fuse, 15 amp. (3AG)	39A317
T-7	Transformer, antenna stage, BC	51B957	**F1		

* Used on Model EX-104 only.
 ** Used on Model EX-106 only.

MODELS EC-403,
EC-404, Rev.

GENERAL

- Tubes Fourteen plus rectifier
- Speaker. 15" PM or twin 10" PM
- Antennas Built-in loop, "AM"
Built-in dipole, "FM"
- Provision for external Antennas.
- Tuning Manual and mechanical push-
button 5 P.B. for "AM" and
5 P.B. for "FM".
- Tuning Range (BC) 540 kc - 1700 kc
(A) 15 mc - 18 mc
(B) 9 mc - 12 mc
(C) 5.8 mc - 18 mc
(FM) 88 mc - 108 mc
- Intermediate Frequency 455 kc/10.7 mc
- Power Supply 105-125 V. 60 cycle AC
- Power Consumption 180 watts

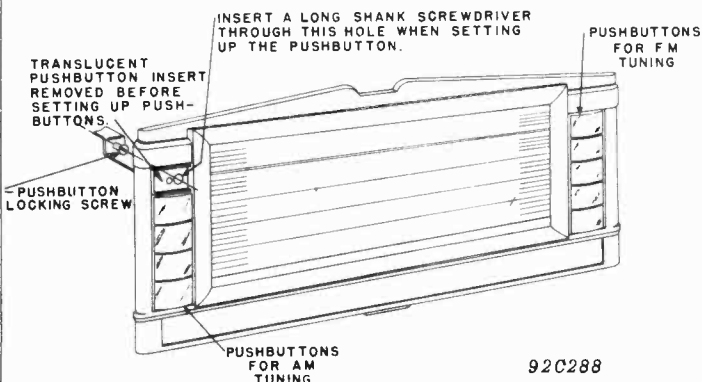


Fig. 1. View showing pushbutton setup.

INSERTING CALL LETTERS

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

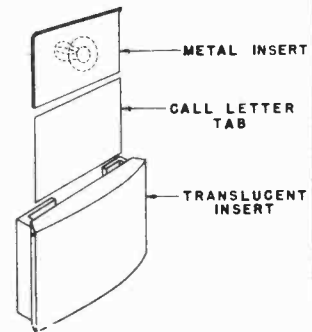


Fig. 2. Inserting call letters

BUTTON SETTING

Insulate the muting switch contacts before setting the lower group of AM pushbuttons. See Fig. 3.

1. Select any one pushbutton.
2. Pull translucent insert straight out.
3. Insert screw driver blade through large hole of pushbutton into slot of locking screw. (See Fig. 1).
4. Loosen locking screw about one-half turn. (Not more than one full turn.)
5. With pushbutton depressed, carefully tune in desired station with the manual control and tighten the locking screw.
6. Replace the translucent insert with the proper station call letters inserted.

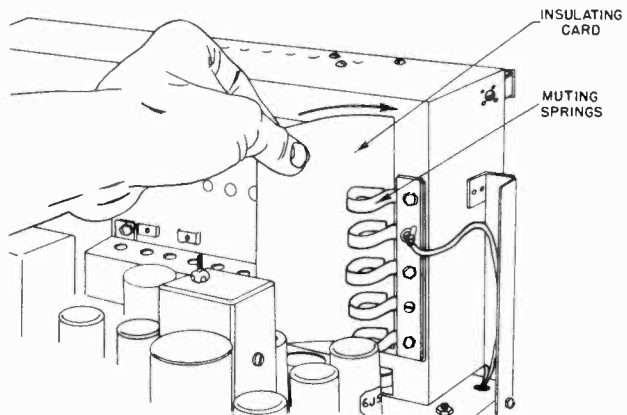
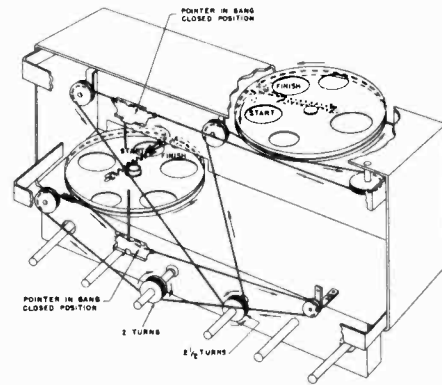


Fig. 3. Insulating the muting switch contacts.

DIAL CORD STRINGING INSTRUCTIONS

To restring either the "FM" or "AM" dial drive systems, cut a five foot length of 9 lb. test dial cord and follow the stringing procedure illustrated in Fig. 4. Note that the start and finish of both drives are located at the tension spring on the drum.

Index the pointer carriage as described under ALIGNMENT PROCEDURE.



92C278

Fig. 4. Dial cable stringing procedure.

ALIGNMENT PROCEDURE

Removal of the receiver chassis from the cabinet requires the use of other calibration means than the dial glass. Calibration strips mounted on the pointer rails are provided for alignment purposes.

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

1. Remove dial pointers. Pull them straight out of their spring clips.
2. Remove the two dial lamp sockets.
3. Remove dial plate fastened to the chassis with seven sheet metal screws.

With the variable condensers fully meshed, the right hand side of the pointer carriage will be indexed to zero on the calibration strips. Refer to Fig. 5.

The receiver is equipped with AUTOMATIC FREQUENCY CONTROL on the FM band to compensate for mechanical variations in the pushbutton mechanism. The correction factor is approximately 5 times: AFC takes hold 100 kc be-

fore the station frequency is reached and releases before tuning 450 kc beyond the station frequency when receiving a 0.1 volt signal.

The standard RMA dummy specified in the alignment chart consists of a 200 mmf condenser in series with a 20 ohm r-f choke which is shunted by a 400 mmf condenser in series with a 400 ohm carbon resistor.

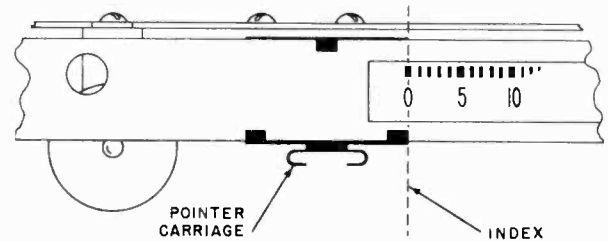


Fig. 5. Calibration strip detail.

ALIGNMENT CHART

Step	Dummy Antenna	Signal Generator Coupling	Signal Generator Frequency	Band Switch Pos.	Radio Tuned To	Cal. No.	Adjust	Remarks
1	0.01 mfd. cap.	To stator plates of center section of AM tuning cap.	455 kc	"BC"	1000 kc	55	S3, S6, S2, S5, S1 & S4	Adjust for max. output TREBLE tone control set at No. 1.
2	0.01 mfd. cap.	To stator plates of center section of FM tuning cap.	10.7 mc (No modulation)	"FM"	Mid-scale	55	S9, S12, S13, S8, S11, S7, & S10	Adjust for max. AVC voltage as measured between pin No. 7 of 6AL5 and ground with an electronic voltmeter.
3	0.01 mfd. cap.	To stator plates of center section of FM tuning cap.	10.7 mc (No modulation)	"FM"	Mid-scale	55	S14	Adjust for zero voltage as measured between junction L16 and C34 and ground with an electronic voltmeter.
4	Std. RMA dummy.	To terminals "A" and "G" on ant. term. strip. TS ₁ .	1500 kc	"BC"	1500 kc	82	F*, H, and I	Adjust for max. output as in step 1.
5	Std. RMA dummy	To terminals "A" and "G" on ant. term. strip. TS ₁ .	600 kc	"BC"	600 kc	15.5	G*	Adjust for max. output as in step 1.
6	Std. RMA dummy.	To terminals "A" and "G" on ant. term. strip. TS ₁ .	18 mc	"A"	18 mc	94.5	A*, O, and N	Adjust for max. output as in step 1.
			15 mc	"A"	15 mc	7.5	B*, P and Q	
7	Std. RMA dummy.	To terminals "A" and "G" on ant. term. strip. TS ₁ .	12 mc	"B"	12 mc	91.5	C*, J, and K	Adjust for max. output as in step 1.
8	Two 150 ohm carbon resistors.	To terminals "D" and "D" on ant. term. strip; one 150 ohm resistor in each lead.	108 mc	"FM"	108 mc	83.5	T*, U, and V	Adjust for max. limiter grid voltage as measured between pin No. 4 of the 6SH7 and ground with a 100,000 ohm resistor in series with the voltmeter probe.

* Note— Calibration adjustments.

MODELS EC-403, EC-404, Rev.

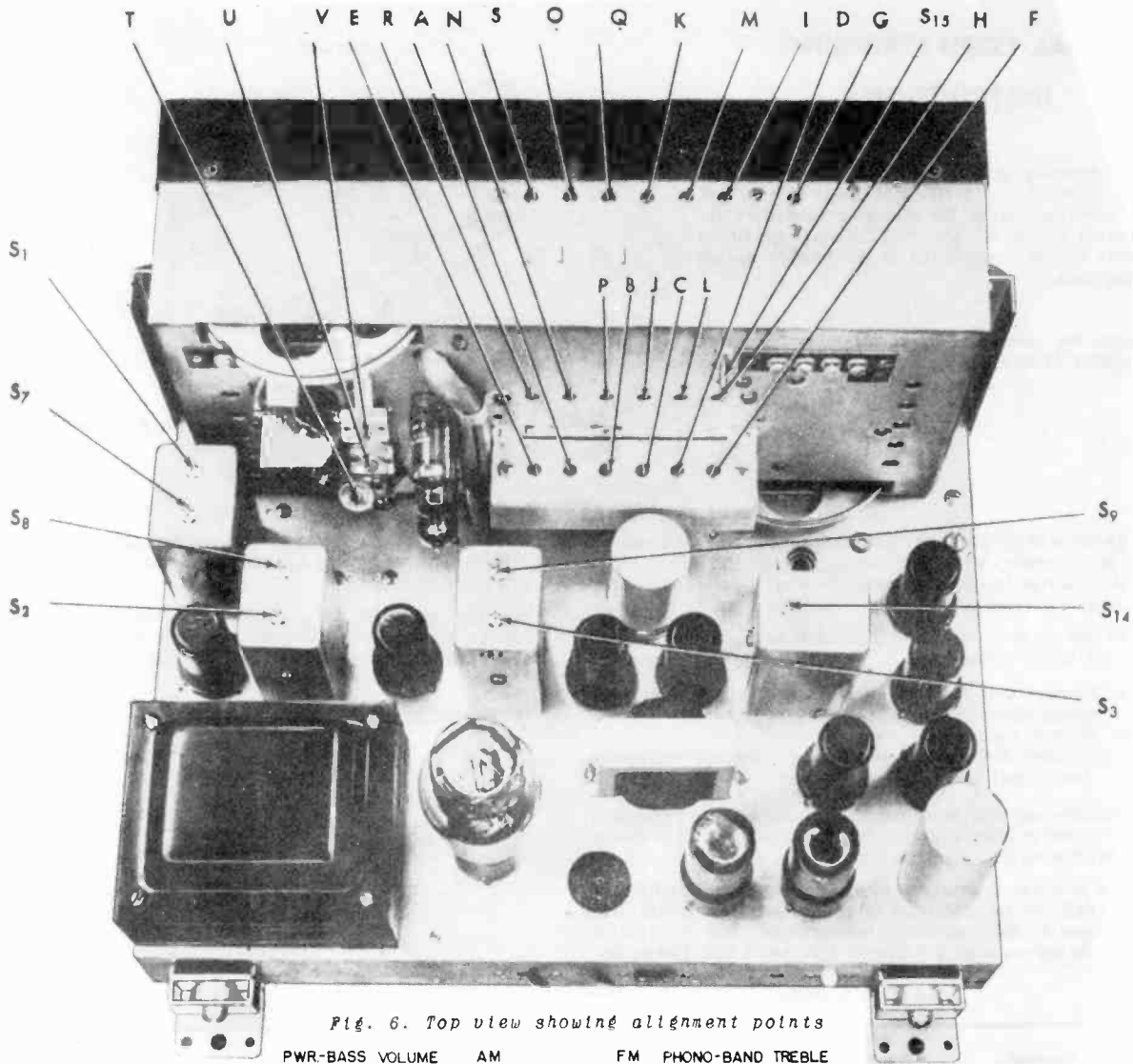


Fig. 6. Top view showing alignment points

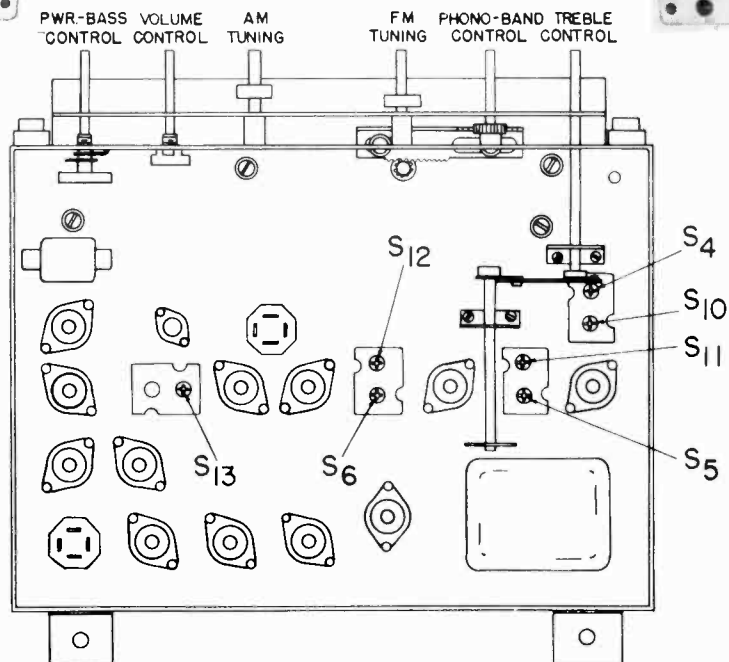


Fig. 7. Bottom view showing alignment points.

MODELS EC-403,
EC-404, Rev.

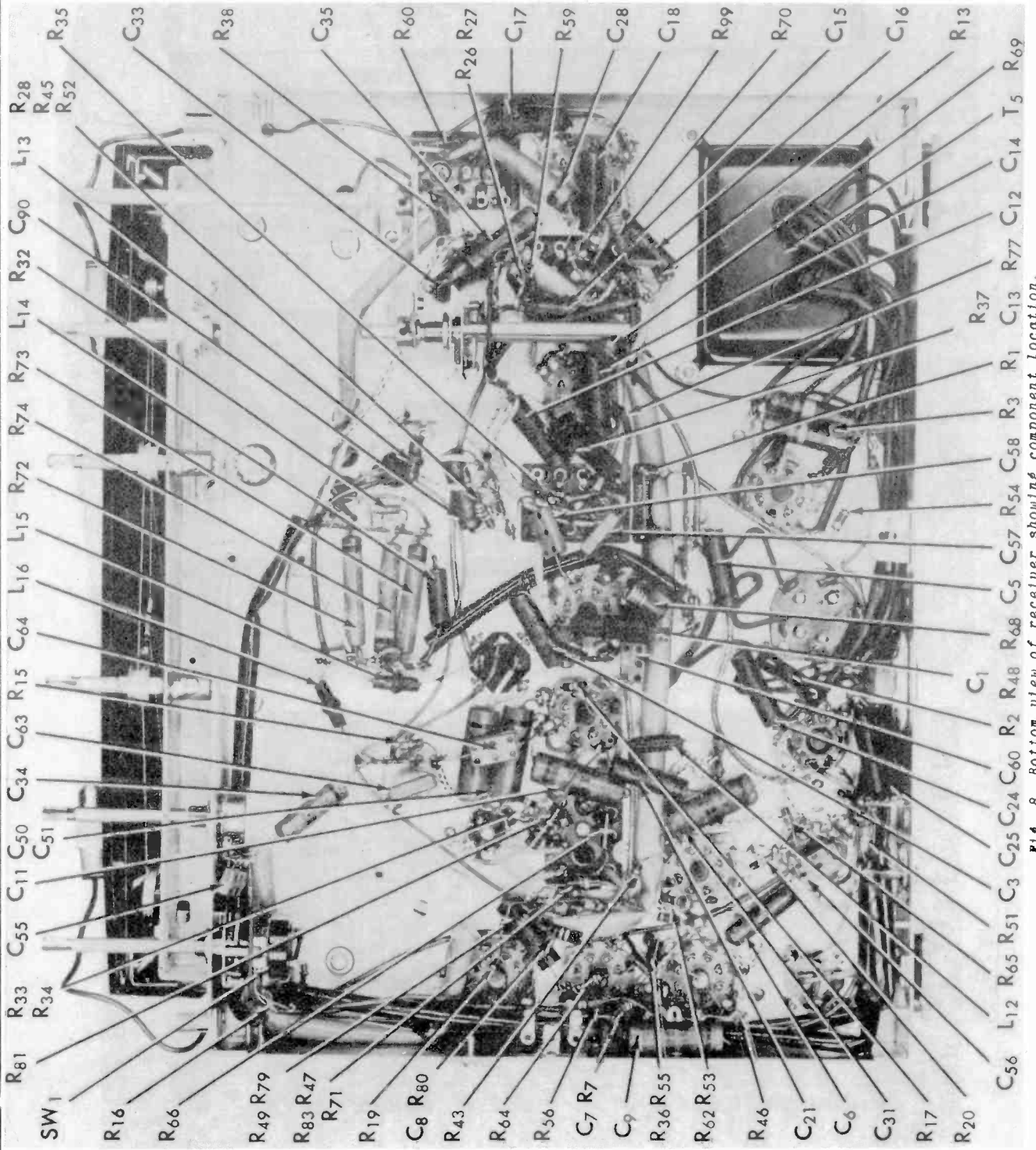


Fig. 8. Bottom view of receiver showing component location.

MODELS EC-403, EC-404, Rev.

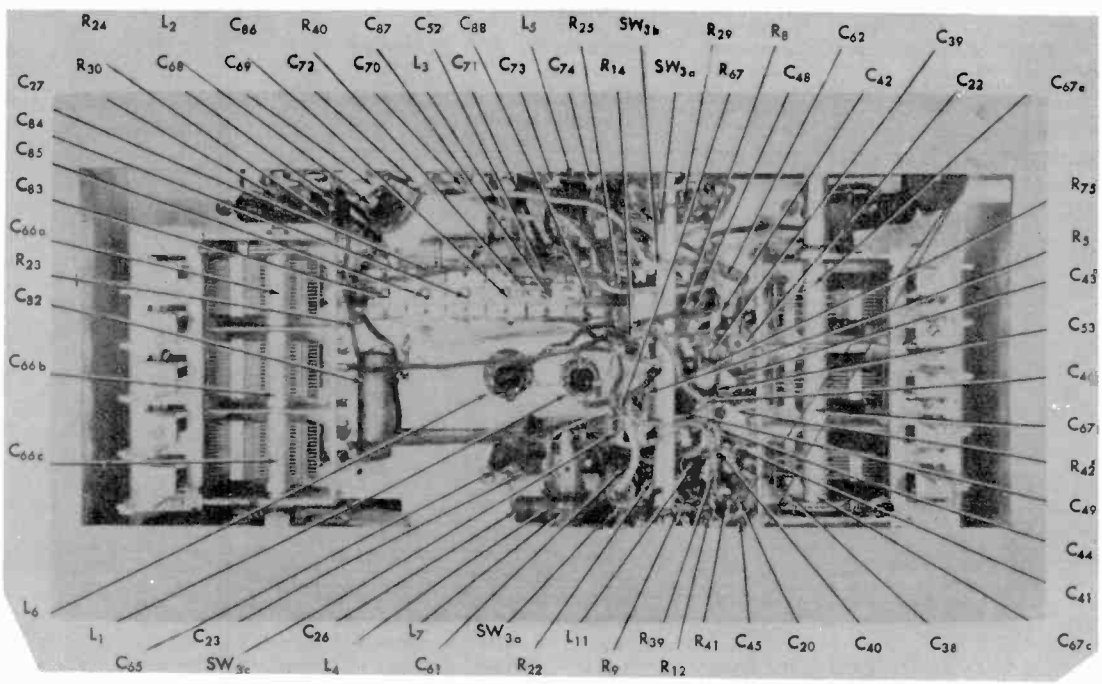
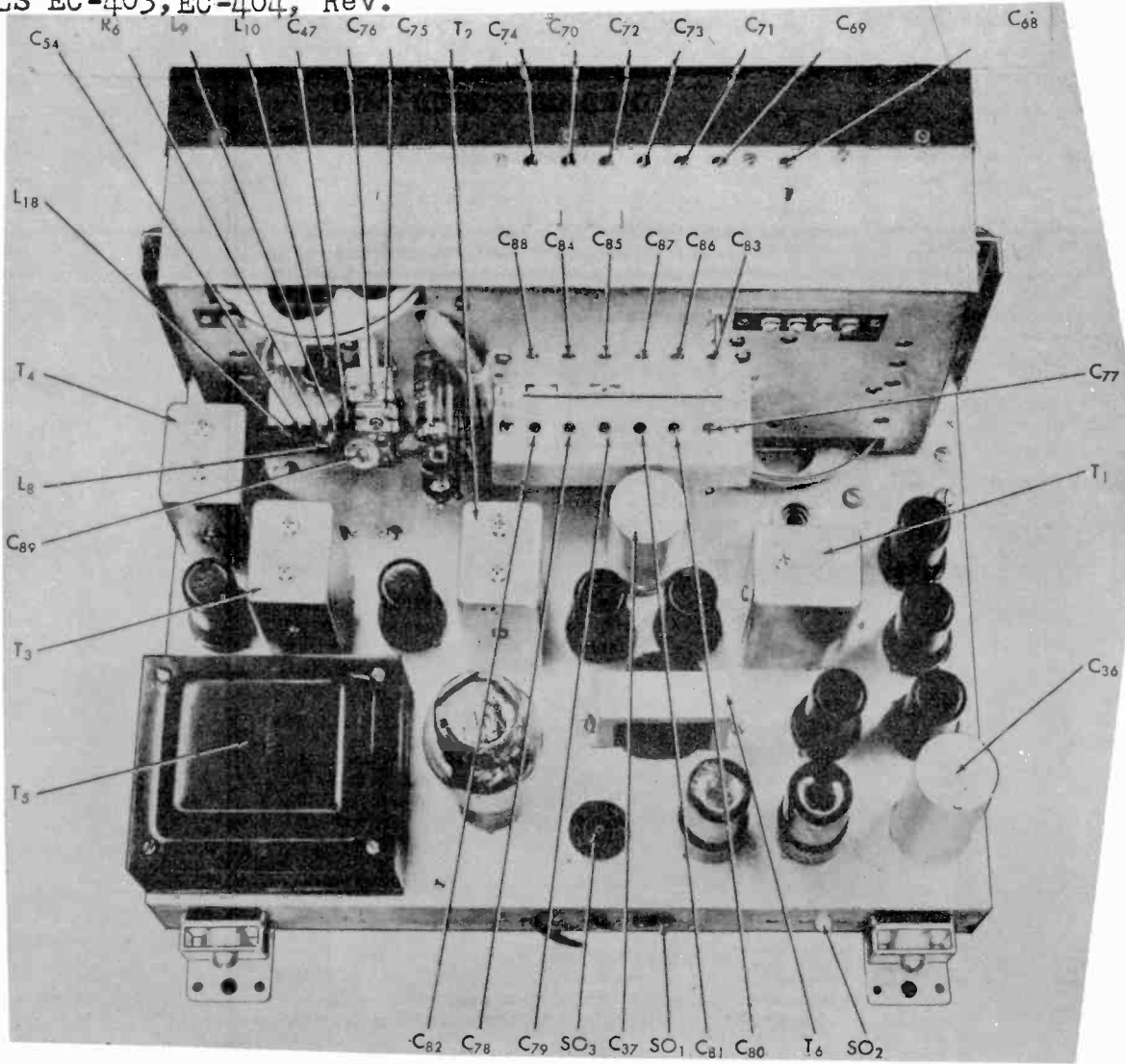


Fig. 10. Front view of R.F. chassis showing component location.

BOTTOM VIEW OF CHASSIS

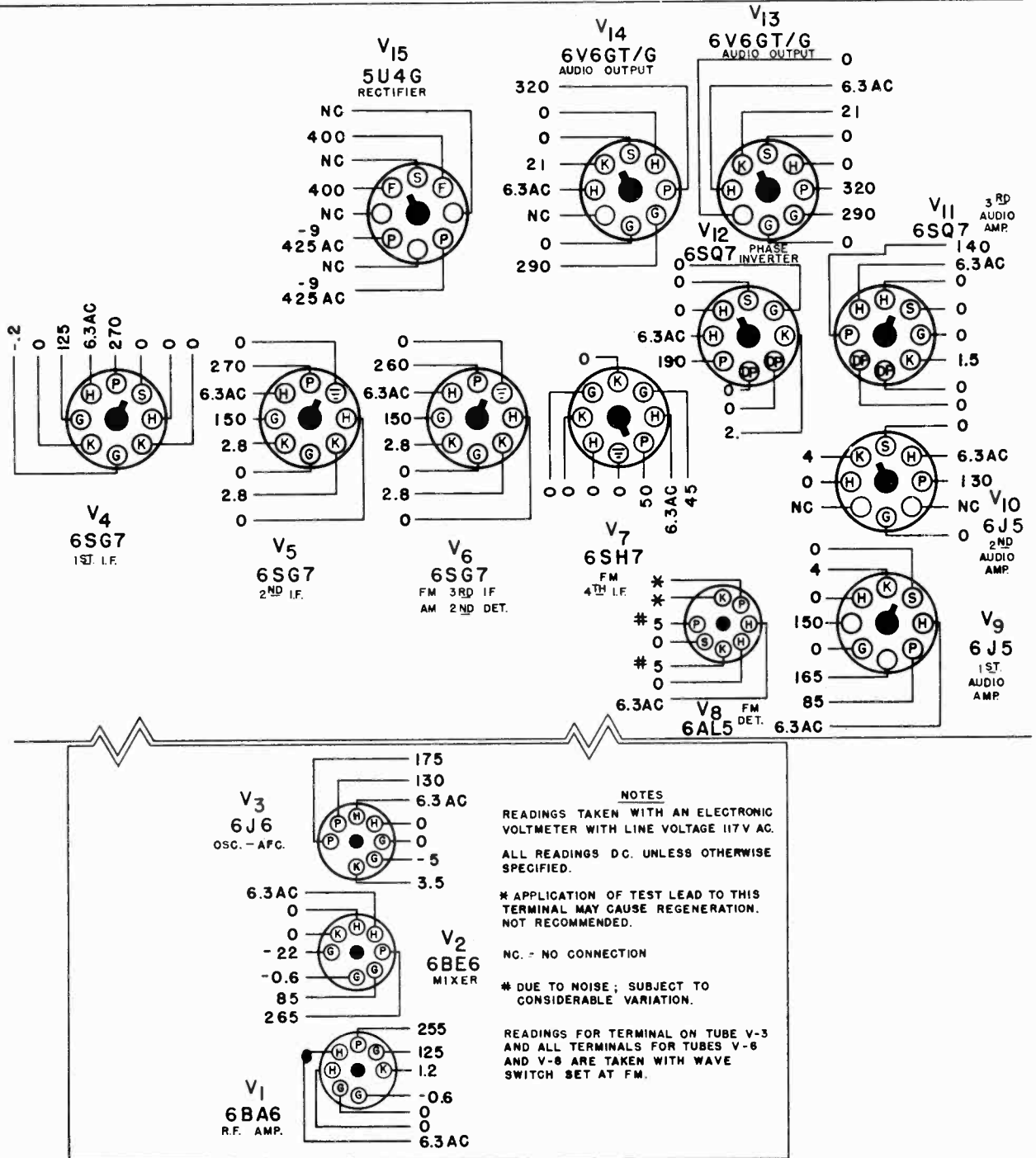


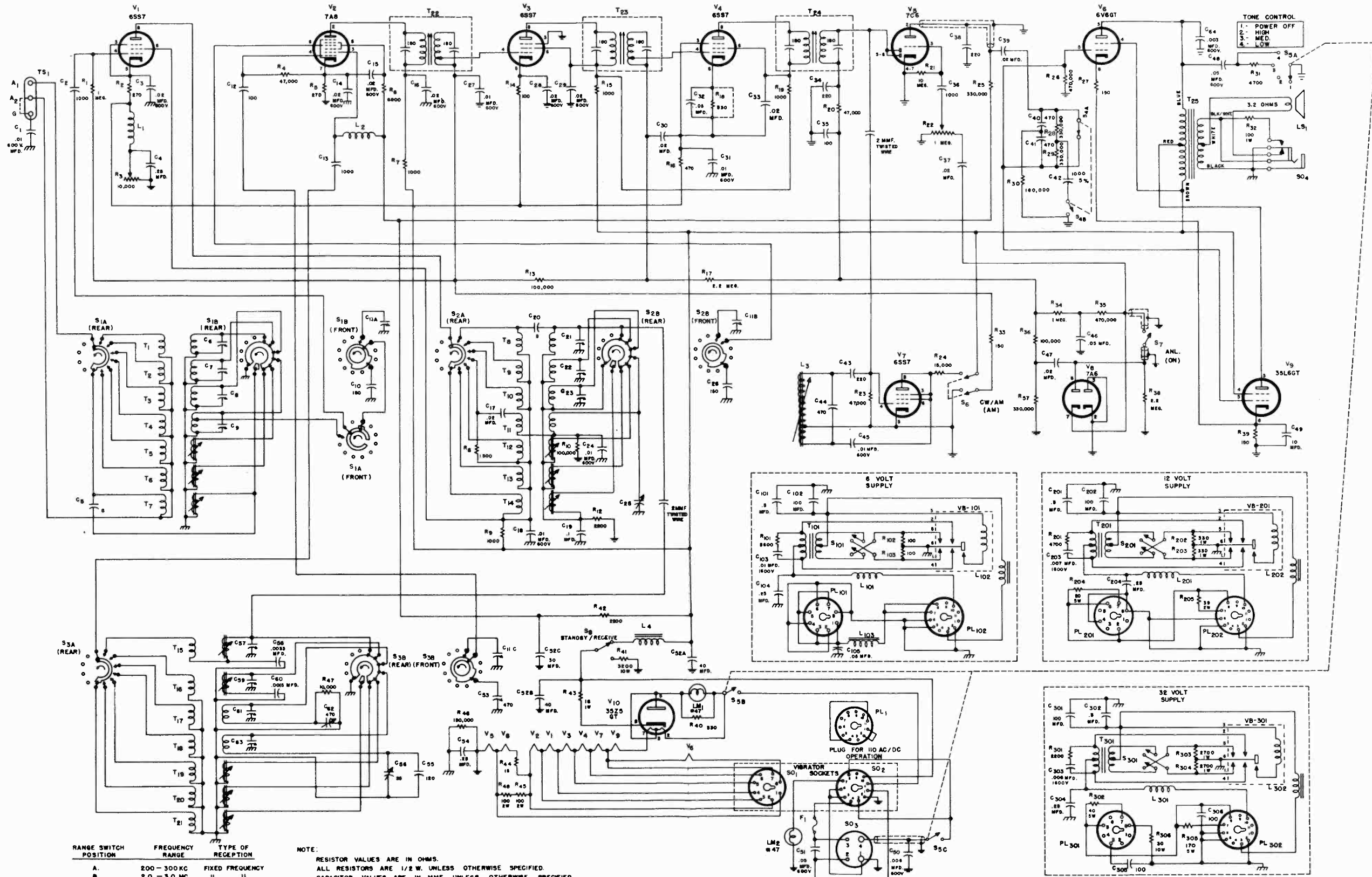
Fig. 11. Tube voltage chart.

MODELS EC-403,
EC-404, Rev.

SERVICE PARTS LIST

Ref. No.	Description	Hillicrafter's Part Number	Ref. No.	Description	Hillicrafter's Part Number
CONDENSERS					
C-1,4,5,6,8,12, 13,14,15,16,17, 18,20,21,22,23, 24,35,90	.01 mfd. 600 V., tubular	46A2103F	T-4	Transformer, 1st IF	50C210
C-3,26,27,28	.02 mfd. 600 V., tubular	46AY203F	T-5	Transformer, power	52C151
C-11,31,32,50, 51,93	.05 mfd. 600 V., tubular	46AY503F	T-6	Transformer, audio output	55B086
C-7,34	.003 mfd. 600 V., tubular	46A2302J	L-1	Mixer coil, SW band	51B905
C-25	.01 mfd. 600 V., molded	46AG103J	L-2	Antenna coil, BC band	51B906
C-30	.1 mfd. 200 V., tubular	46AU104H	L-3	Loading coil, loop	51B907
C-33	.005 mfd. 600 V., tubular	46AZ502J	L-4	Oscillator coil, SW band	51B908
C-36	60-20 mfd. 450 V., 20 mfd. 30 V., electrolytic	45B099	L-5	Antenna coil, SW band	51B909
C-37	40-10 mfd. 450 V., 20 mfd. 30 V., electrolytic	45B100	L-6	Mixer coil, BC band	51B910
C-38,39	500 mmf. 500 V., ceramic	47A147	L-7	Oscillator coil, BC band	51B911
C-40,42,43,44	1000 mmf. 500 V., ceramic	47A148	L-8	Oscillator coil, FM band	51B914
C-41	10,000 mmf. 150 V., ceramic	47B32103N1	L-9	Mixer coil, FM band	51B915
C-45	10 mmf. 500 V., ceramic	47A149	L-10	Antenna coil, FM band	51B916
C-46,47	47 mmf. 500 V., ceramic	47A150	L-11	Plate choke, oscillator stage	53B008
C-48	1.5 mmf. ceramic	47A160-3	L-12	Filament choke	53B009
C-49	10 mmf. 500 V., mica	CM20A100K	L-13,14,15,16	RF choke	53A106
C-52,64	100 mmf. 500 V., mica	CM20A101M	L-18	RF choke antenna stage	53A115
C-54	22 mmf. 500 V., mica	CM20A220K	L-19	BC loop antenna	57C106
C-55	22 mmf. 500 V., mica	CM20A220M	L-20	FM folded doublet	57C108-1
C-56,57,58	220 mmf. 500 V., mica	CM20A221M	SWITCHES		
C-60,61,62	47 mmf. 500 V., mica	CM20A470M	SW-1	Power & bass tone switch assembly	60B265
C-63	1000 mmf. 500 V., mica	CM30A102M	SW-2	Treble switch assembly	60B264
C-65	3900 mmf. 500 V., mica	CM35A392J	SW-3	Band switch	60C266
C-66	Tuning condenser, AM	48C176	SW-4	Muting switch	18A092
C-67	Tuning condenser, FM	48C175	PLUGS AND SOCKETS		
C-68	570 mmf. trimmer	44A189	PL-1	Line cord and plug	87B1625
C-69,70,71,72, 73,74	Trimmer assembly, antenna stage	44B190	SO-1	Receptacle, phono motor	10A015
C-75	Trimmer, FM, mixer stage	44A192	SO-2	Jack, phono pick-up	36A034
C-76	Trimmer, FM, antenna stage	44A194	SO-3	Socket, speaker	6A277
C-77,78,79, 80,81,82	Trimmer assembly, oscillator stage	44B195		Socket, octal (tube)	6A190
C-83,84,85, 86,87,88	Trimmer assembly, mixer stage	44B196		Socket, octal (6V6GT tubes)	6A296
C-89	Trimmer, FM, oscillator stage	44A218		Socket, miniature (tube)	6B297
C-92	39 mmf. 500 V., ceramic	CC30SH390M		Socket & bracket, dial light, L.H.	86A046
				Socket & bracket, dial light, R.H.	86A047
				Socket, cabinet pilot light	86B050-1
TUBES, RECTIFIERS AND LAMPS					
R-1,2	330 ohms 5 watts WW	24A864	V-1	Type 6BA6, R.F. amp.	90X6BA6
R-3	47 ohms 4 watts, carbon	RC65CE470M	V-2	Type 6BE6, mixer stage.	90X6BE6
R-4	2 megohms, volume control	25A571	V-3	Type 6J6, oscillator AFC.	90X6J6
R-5	10 ohms 1/2 watt, carbon	RC20AE100M	V-4,5,6	Type 6SG7, 1st, 2nd IF, 3rd FM IF, 2nd detector stage.	90X6SG7
R-6,8	100 ohms 1/2 watt, carbon	RC20AE101M	V-7	Type 6SH7, 4th FM IF	90X6SH7
R-9,12,13,14,77	1000 ohms 1/2 watt, carbon	RC20AE102M	V-8	Type 6AL5, FM detector.	90X6AL5
R-15	10,000 ohms 1/2 watt, carbon	RC20AE103M	V-9,10	Type 6J5, 1st and 2nd audio amp.	90X6J5
R-16	15,000 ohms 1/2 watt, carbon	RC20AE153M	V-11,12	Type 6SQ7, 3rd audio amp, phase inverter	90X6SQ7
R-17,19,20,21, 22,23,24	100,000 ohms 1/2 watt, carbon	RC20AE104M	V-13,14	Type 6V6GT/G, audio output stage.	90X6V6GT/G
R-26,27,28,29, 30,31,83	1 megohm 1/2 watt, carbon	RC20AE105M	V-15	Type 5U4G, rectifier.	90X5U4G
R-32	150 ohms 1/2 watt, carbon	RC20AE151M	LM-1,2	Lamp, dial, GE #44.	39A003
R-33,34	100,000 ohms 1/2 watt, carbon	RC20AE104K	LM-3	Lamp, pilot, GE #47.	39A004
R-35,36,37,38,39	220 ohms 1/2 watt, carbon	RC20AE221M	MISCELLANEOUS		
R-40	2200 ohms 1/2 watt, carbon	RC20AE222M	TS-1	Terminal strip, antenna	88A277
R-41,42	22,000 ohms 1/2 watt, carbon	RC20AE223M	TS-2	Terminal strip, loop	88A278
R-43,44,52,64	220,000 ohms 1/2 watt, carbon	RC20AE224M		Shield, tube base	69A169
R-45,50,51	330,000 ohms 1/2 watt, carbon	RC20AE334M		Shield, tube	69A104
R-46	680 ohms 1/2 watt, carbon	RC20AE681K		Spring, tube retainer	75A076
R-47,49	150,000 ohms 1/2 watt, carbon	RC20AE154M		Shield, FM coil section	69C172
R-48	3300 ohms 1/2 watt, carbon	RC20AE332M		Shield, dial light	86A037
R-53	3900 ohms 1/2 watt, carbon	RC20AE392K		Carriage, pointer	67B645
R-54	8200 ohms 1/2 watt, carbon	RC20AE822K		Pointer, FM	82B139
R-55	470 ohms 1/2 watt, carbon	RC20AE471M		Pointer, AM	82B143
R-58,59	47,000 ohms 1/2 watt, carbon	RC20AE473M		Spring, pointer	75A132
R-60	68,000 ohms 1/2 watt, carbon	RC20AE683K		Push-button (brown)	17B028
R-62,65	470,000 ohms 1/2 watt, carbon	RC20AE474M		Insert, push-button, lucite	17A027
R-63	390,000 ohms 1/2 watt, carbon	RC20AE394K		Insert, push-button, metal	17A029
R-66	100,000 ohms 1 watt, carbon	RC30AE104M		Call letters	17A026
R-67	33,000 ohms 1 watt, carbon	RC30AE333M		Spring, dial, drive	75A006
R-68,69,70	47,000 ohms 1 watt, carbon	RC30AE473M		Cord, dial drive	38A017
R-71	22,000 ohms 1 watt, carbon	RC40AE223M		Escutcheon	7DO39
R-72,73,74	10,000 ohms 2 watts, carbon	RC40AE103M		Dial glass (control)	22B177
R-75	33,000 ohms 2 watts, carbon	RC40AE333K		Dial glass (calibrated)	22D192
R-76	330 ohms 10 watts, WW	24BG331E		Knob (tuning and volume controls)	15B093
R-79	33,000 ohms 1/2 watt, carbon	RC30AE333M		Knob & pin ass'y (band switch and tone tone controls)	15A129
R-80	68,000 ohms 1 watt, carbon	RC30AE683K		Transmission line, loop	87A1615-1
R-81	6.8 ohms 1 watt, carbon	RC30AE068K		Jewel, pilot lamp	86A057
R-82	4700 ohms 1/2 watt, carbon	RC20AE472M		Bracket, pilot lamp	67A765
R-84	68 ohms 2 watts, carbon	RC40AE680M		Speaker, PM (model 403)	85C045
				Speaker, PM (4 pin plug) (model 404)	85C043
				Speaker, PM (5 pin plug) (model 404)	85C047
				Record changer	115C002-3
TRANSFORMERS AND COILS					
T-1	Transformer, FM detector	50C208			
T-2,3	Transformer, interstage IF	50C209			

MODEL S-51



RANGE SWITCH POSITION	FREQUENCY RANGE	TYPE OF RECEPTION
A.	200 - 300 KC	FIXED FREQUENCY
B.	2.0 - 3.0 MC	" "
C.	2.0 - 3.0 MC	" "
1.	152 - 40.5 KC	GENERAL COVERAGE
2.	485 - 1530 KC	" "
3.	1450 - 4650	" "
4.	4.2 - 13.0 MC	" "

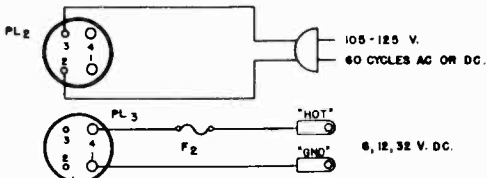
BAND SWITCH IN "A" BAND, EXTREME COUNTER CLOCKWISE POSITION.

NOTE: RESISTOR VALUES ARE IN OHMS. ALL RESISTORS ARE 1/2 W. UNLESS OTHERWISE SPECIFIED. CAPACITOR VALUES ARE IN MMF. UNLESS OTHERWISE SPECIFIED.

CHASSIS GROUND.
CIRCUIT GROUND.

LAST CAPACITOR — C64, C105, C204, C308.
LAST RESISTOR — R48, R103, R205, R308.

SOURCE VOLTAGE FUSE (F₂) RATING
6V. — 10 A.
12V. — 5 A.
32V. — 2 A.



GENERAL

- Tubes Nine plus rectifier
- Speaker 5-inch P.M.
- Speaker V.C. Impedance. 3.2 ohms
- Headset Output Low Impedance
- Antenna Provision for external antenna
- Tuning Manual

Tuning Range

Range	Frequency	Reception
A	200 kc - 300 kc	Fixed Frequency
B	2.0 mc - 3.0 mc	" "
C	2.0 mc - 3.0 mc	" "
1	132 kc - 405 kc	General Coverage
2	485 kc - 1530 kc	" "
3	1450 kc - 4550 kc	" "
4	4.2 mc - 13.0 mc	" "

- Intermediate Frequency. 445 kc
- Power Supply 105-125 V. DC or 60 cycles AC. Provisions for 6V., 12V., 32 V. DC operation.
- Power Consumption 30 Watts

6 V., 12 V., AND 32 V. OPERATION

The Model S-51 Receiver may be operated from a 6 V., 12 V., or 32 V. source by inserting the correct power supply adapter unit. This adapter unit is plugged into the dual socket located on the top of the receiver chassis. Remove the jumper plug before inserting the low voltage adapter unit. One adapter unit is available for each of the above source voltages.

DC Source Voltage	Adapter Unit Part No.	Identification Stamp	Use Cable No.	Fuse Rating
6 Volts	1X629	6 VOLTS	87B1661	10 amperes
12 Volts	1X630	12 VOLTS	87B1661-1	5 amperes
32 Volts	1X631	32 VOLTS	87B1661-2	2 amperes

When operating the receiver with the adapter, the power cable normally used for 117 V. AC/DC operation is replaced with the power cable supplied with the adapter unit and plugged into the same receptacle on the receiver. Connect the fused power cable lead to the "hot" side of the DC source and the unfused lead to the ground or "cold" side of the supply. Disregard polarity of the DC supply as this is taken care of by a reversing switch located on the back side of the adapter unit.

RESTRINGING DIAL CORD

To restringing the general coverage tuning dial cord, cut a 24-inch length of 30 lb. test dial cord and tie one end to the tension spring of the main tuning capacitor drive pulley at position "1" on the diagram. Follow the numbers "1" through "7" and at position "7" stretch the tension spring and tie the cord securely.

REPLACING LAMPS

Refer to Fig. 7. for location of the two dial lamps used in the receiver. Defective lamps may be replaced through the cabinet cover. Replace defective lamps with 6-8 V. Mazda #47 (Brown bead) lamps or equivalent.

REPLACING FUSES

A line fuse protects the receiver when operating from a 105-125 V. AC/DC source. This fuse is accessible at the rear apron of the receiver chassis. Replace defective fuses with type 3AG fuses with a one ampere rating.

Protective fuses for 6 V., 12 V., and 32 V. operation are located in the power cable. Refer to the paragraph on low voltage operation for fuse ratings. Replace defective fuses with the type 3AG body size.

CAUTION - Do not replace defective fuses with one of higher current rating than specified. Use the correct fuse and avoid costly repairs.

FIXED FREQUENCY CHANNEL ADJUSTMENTS

Adjustment of the fixed frequency channels for code and radio telephone reception in the 200 kc to 300 kc or 2000 kc to 3000 kc ranges is accomplished as described below. A total of three fixed frequency channels are available, one channel in the 200 kc to 300 kc range and two channels in the 2000 kc to 3000 kc range.

Set the band or range switch at "A" for a channel in the 200 kc to 300 kc band or either "B" or "C" for a channel in the 2000 kc to 3000 kc band.

Lift the hinged cabinet cover and with a small screwdriver, adjust the screws identified as "Ao", "Am", and "Aa" for the "A" band or "Bo", "Bm", and "Ba" for the "B" band, etc. Refer to Fig. 2. Make the adjustments in the order "O" "M" "A" (Oscillator, Mixer and Antenna),

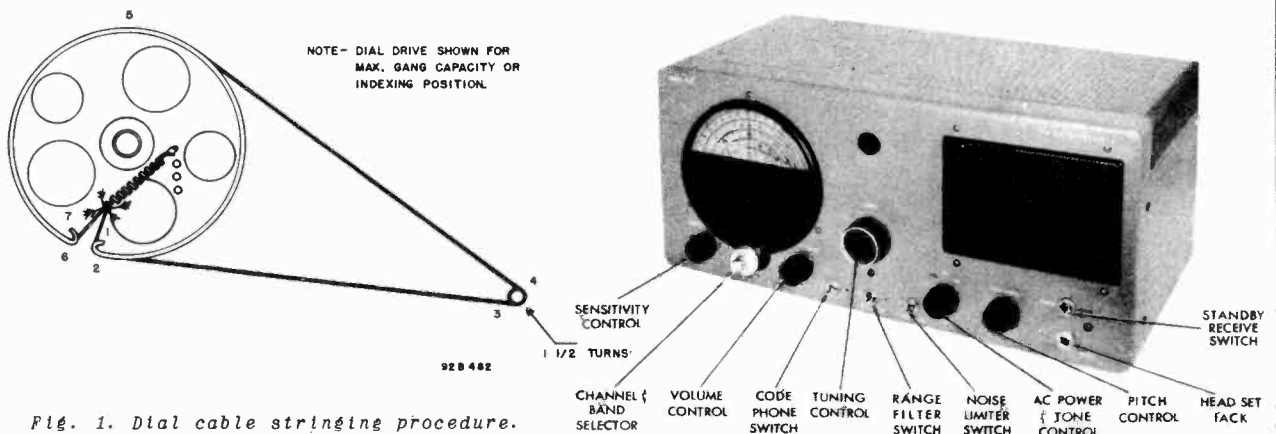
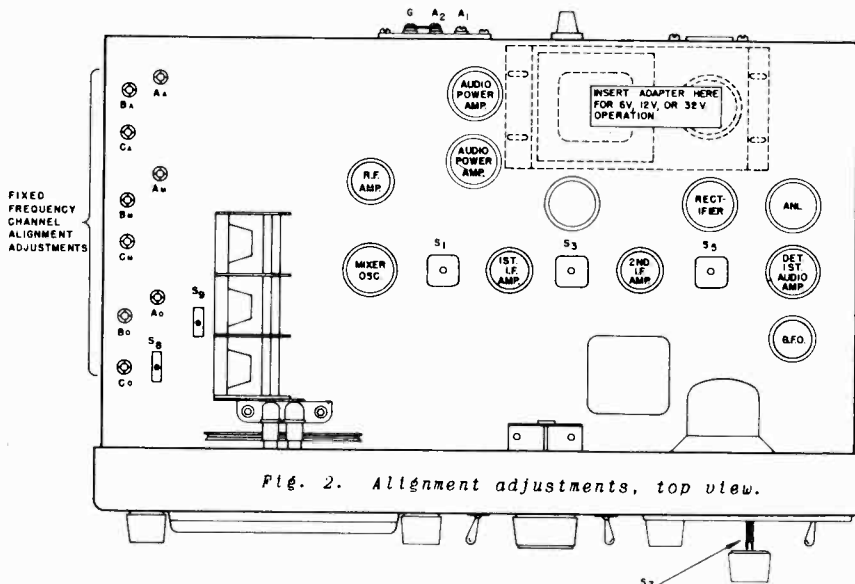


Fig. 1. Dial cable stringing procedure.

ALIGNMENT CHART

Step	Dummy Antenna	Signal Generator Coupling	Signal Generator Frequency	Band Switch Setting	Receiver Dial Setting	Adjust	Remarks
1	.1 mfd. If an isolation transformer is not used, change dummy ant. to .001 mfd. to reduce hum modulation	High side to stator plates in center section of tuning gang; low side to chassis.	445 kc	"2"	Tuning cap. fully open	S1,2,3, 4,5,6	Adjust for maximum audio output at speaker voice coil. Use just enough signal generator output to obtain a 50 mw audio level.
2	See step 1.	See step 1	445 kc (No modulation)	"2"	See step 1	S7	With the CW/AM switch set at CW remove the pitch control knob and adjust S-7 for zero beat. Replace the knob with the dot in the center position.
3	Std. RMA dummy	High side to "A1" on antenna strip; low side to chassis. Jumper connected between "A2" and "G"	350 kc 150 kc	"1"	350 kc 150 kc	*A,B,C *D	Maximum output as in step 1.
4	Std. RMA dummy	See step 3	1400 kc 600 kc	"2"	1400 kc 600 kc	*E,F,G *H	Maximum output as in step 1.
5	Std. RMA dummy	See step 3	4 mc 1800 kc	"3"	4 mc 1800 kc	*I,J,K *S8	Maximum output as in step 1.
6	Std. RMA dummy	See step 3	12 mc 5 mc	"4"	12 mc 5 mc	*L,M,N *S9	Maximum output as in step 1.

*Note - Calibration adjustments.



TONE Set at HIGH
STANBY-RECEIVE Set at RECEIVE

For the settings of the remaining controls, refer to the alignment chart.

It will be necessary to remove the receiver chassis from the cabinet to make some of the alignment adjustments. The chassis is held in the cabinet by three screws along both the bottom edge of the front panel and the rear of the cabinet, and two screws on either side of the front panel.

The standard RMA dummy 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.

adjusting the oscillator screw ("O") as you would normally tune in a station and adjusting the "M" and "A" screws for maximum volume. When setting up a channel for code reception, set the PITCH CONTROL at mid position and tune the "O" adjustment for zero beat. The PITCH CONTROL may then be set for the desired pitch when copying code signals on the particular fixed frequency channel.

ALIGNMENT PROCEDURE

Set the following controls before alignment:

- SENSITIVITY Set at maximum
- VOLUME Set at maximum
- CW/AM switch Set at AM (see step 2)
- RANGE FILTER Set at OFF
- NOISE LIMITER Set at OFF

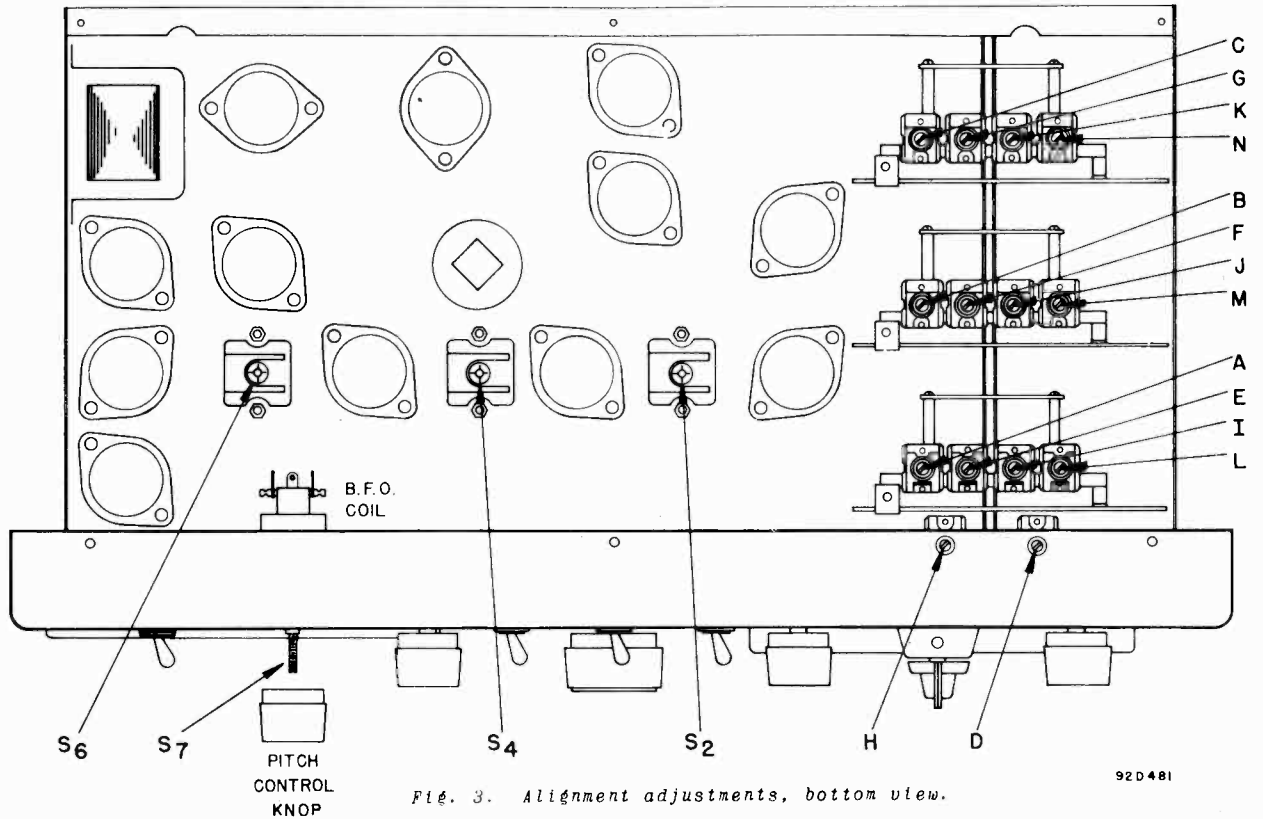


Fig. 3. Alignment adjustments, bottom view.

92D481

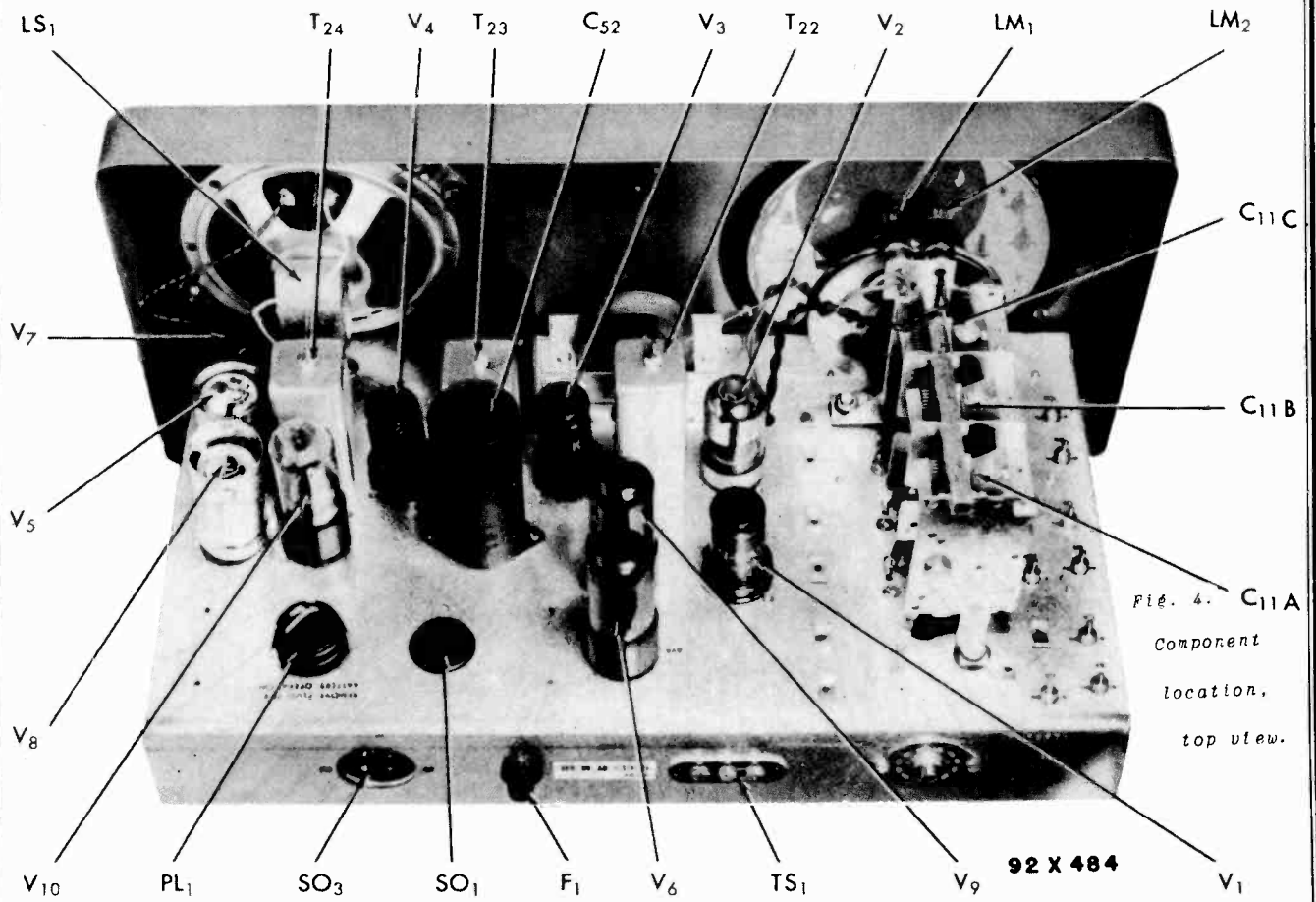


Fig. 4. Component location, top view.

92 X 484

MODEL S-51

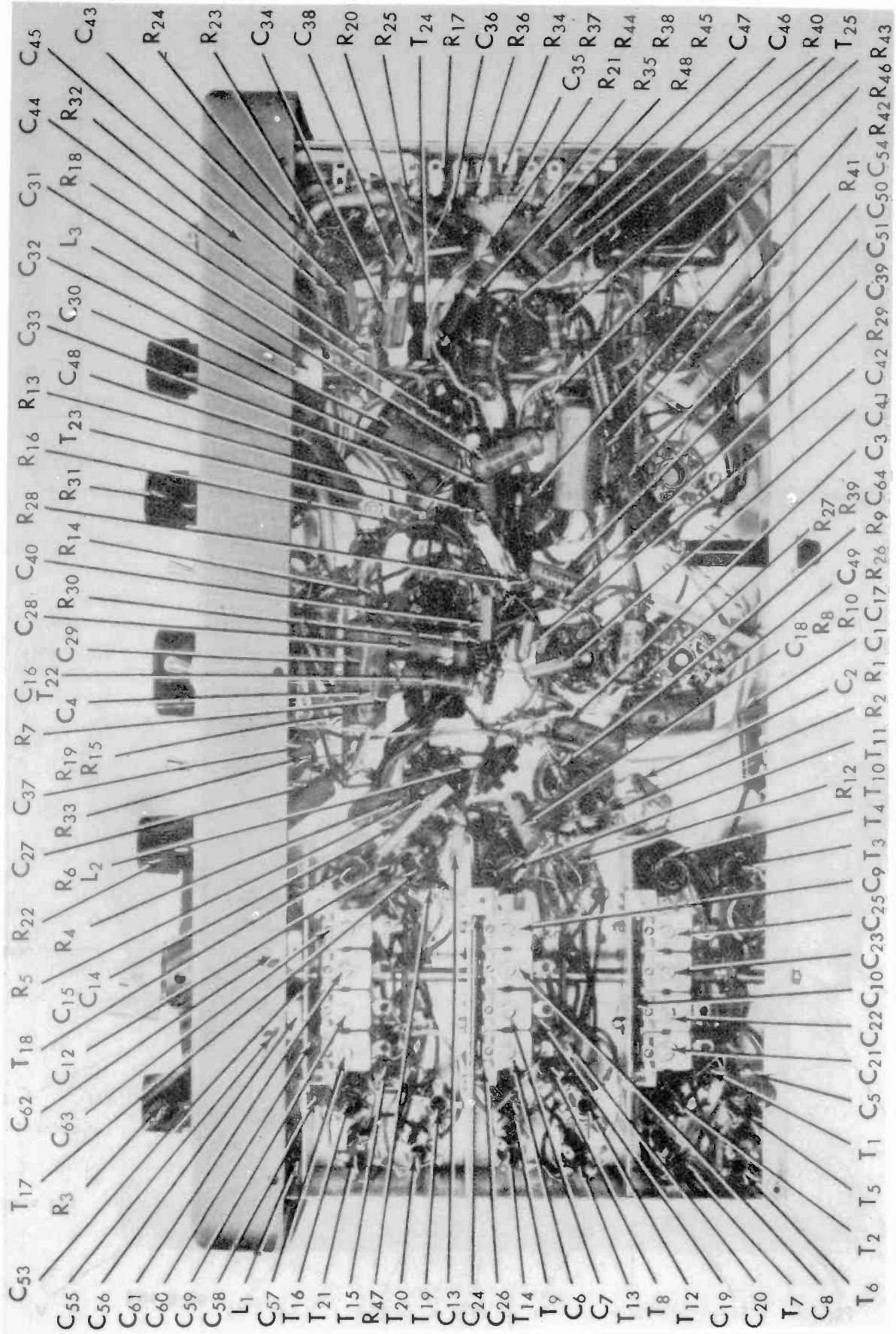


Fig. 5. Component location, bottom view.

92X485

Fig. 6.
6-volt adapter unit.

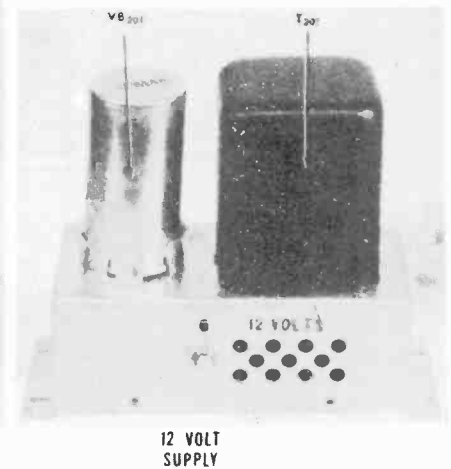
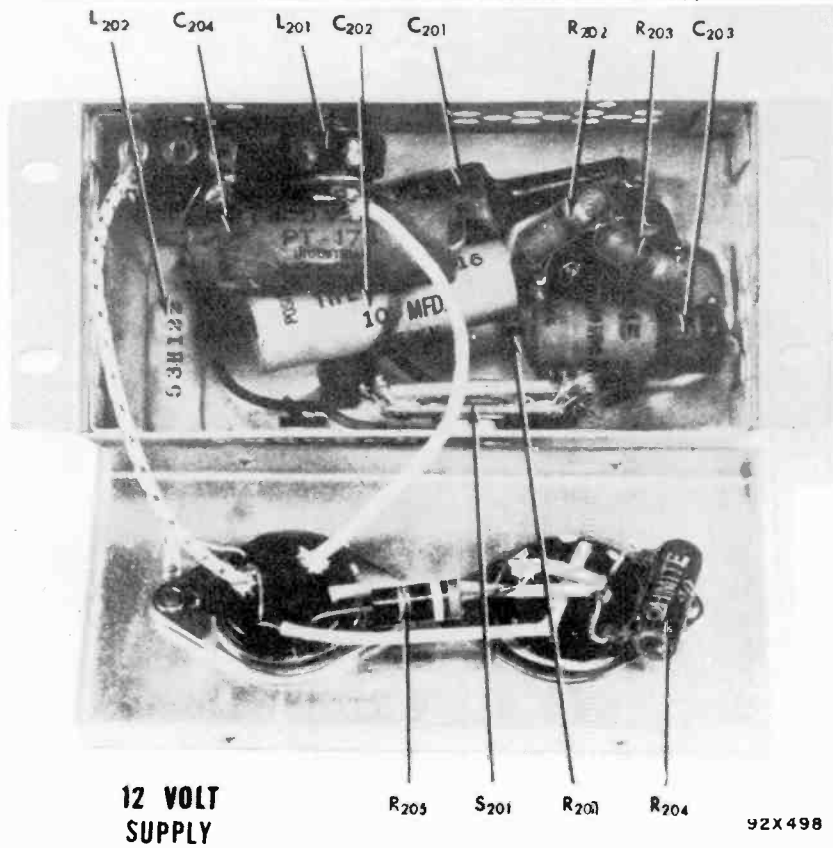
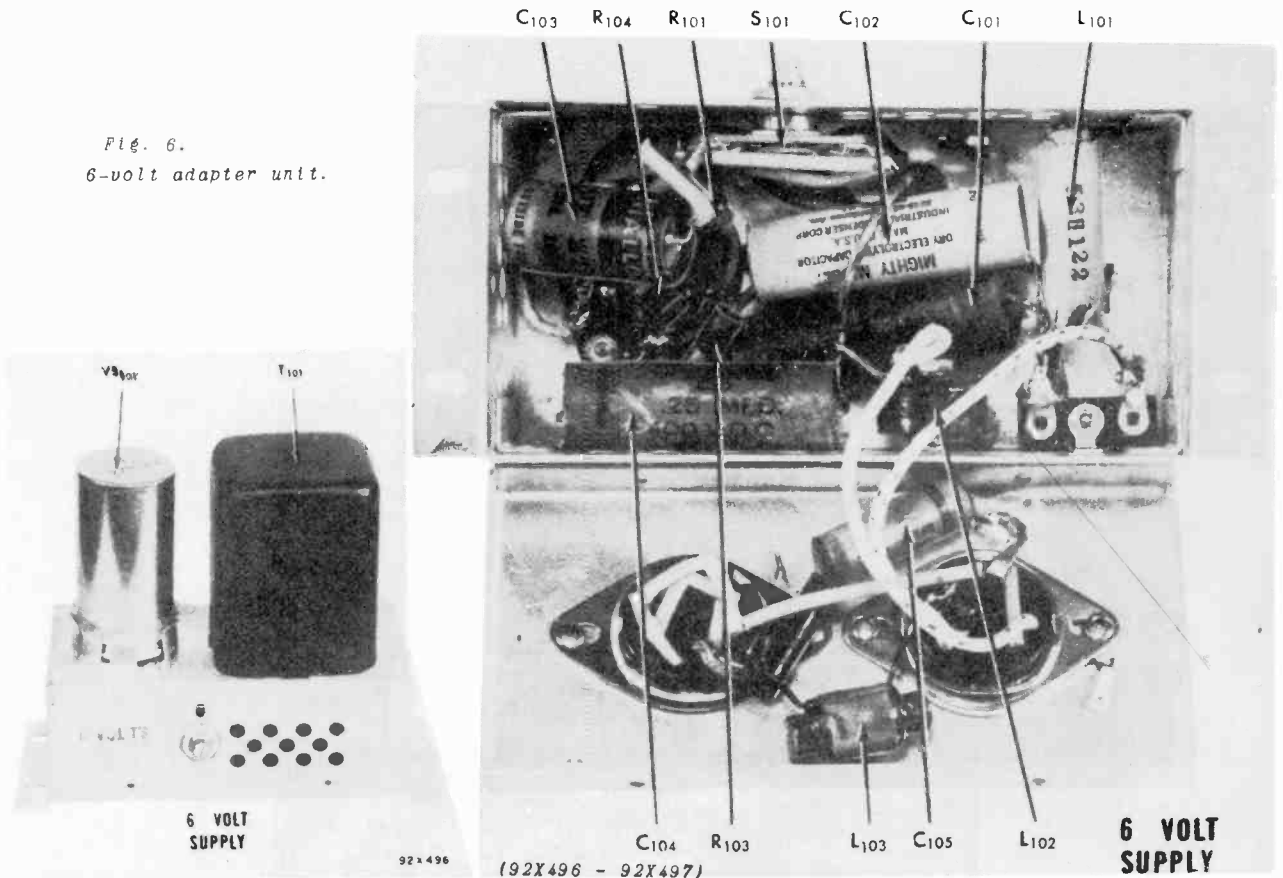


Fig. 7.
12-volt adapter unit.

MODEL S-51

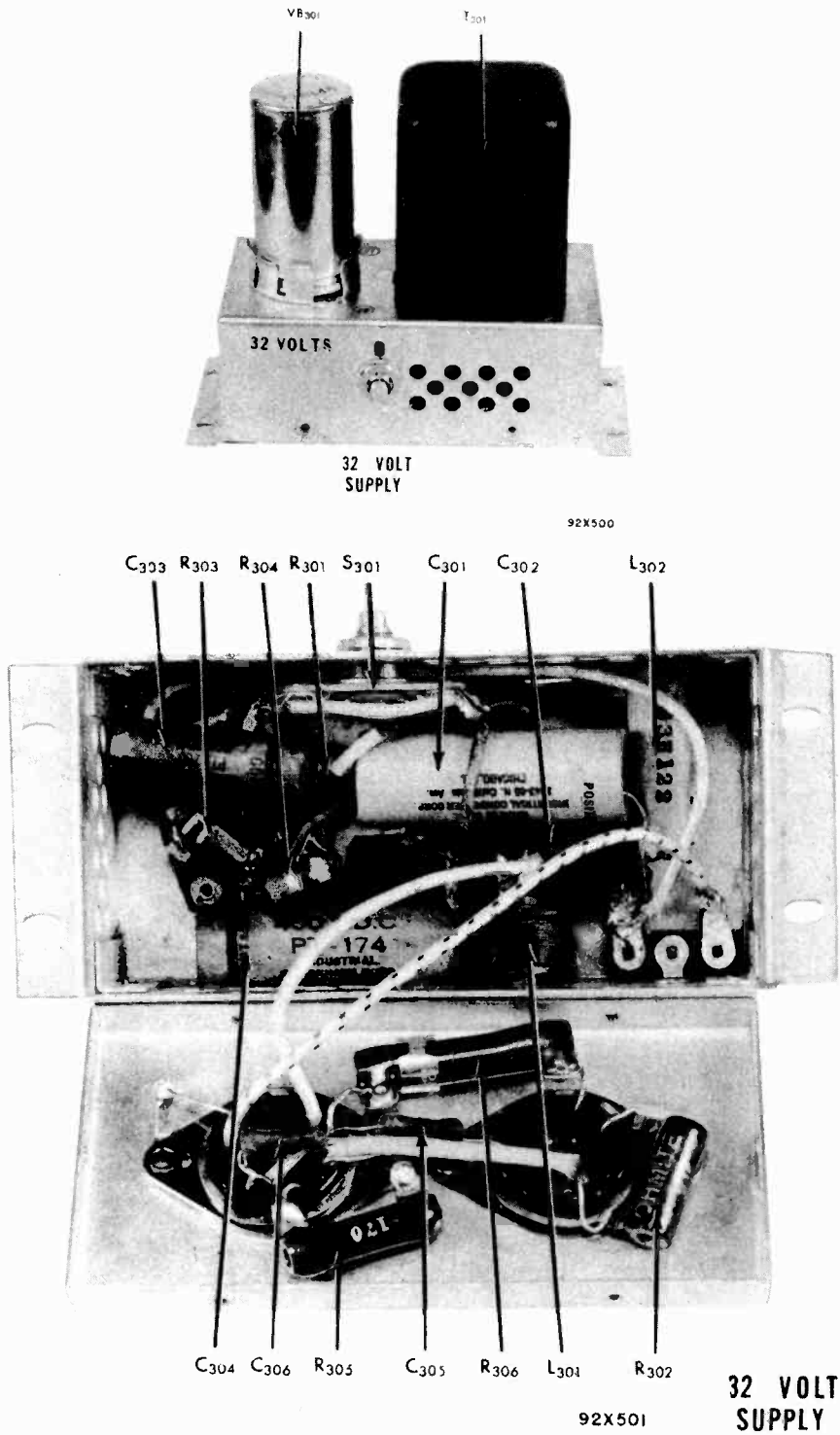


Fig. 8. Component location, 32-volt adapter unit.

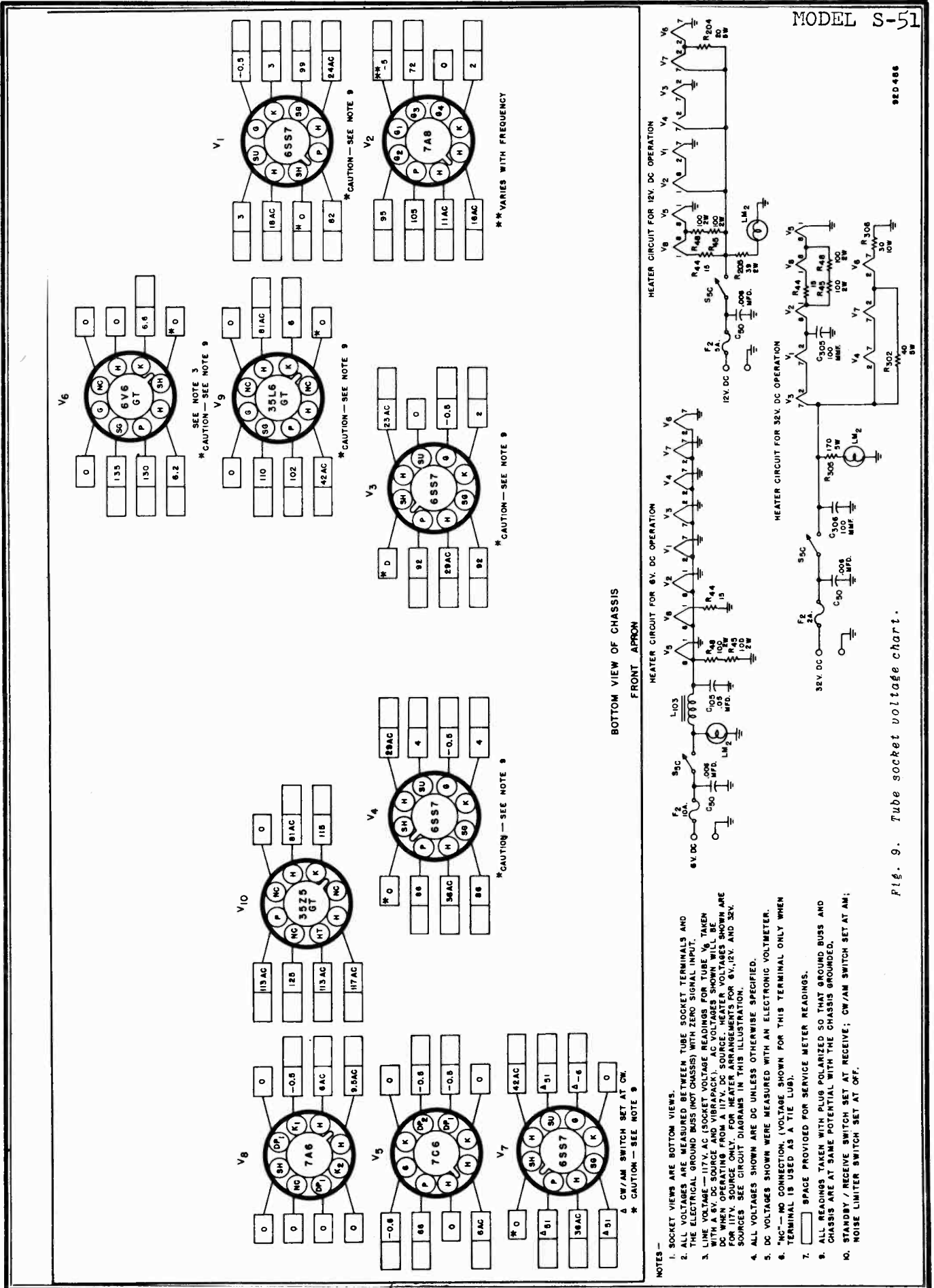


Fig. 9. Tube socket voltage chart.

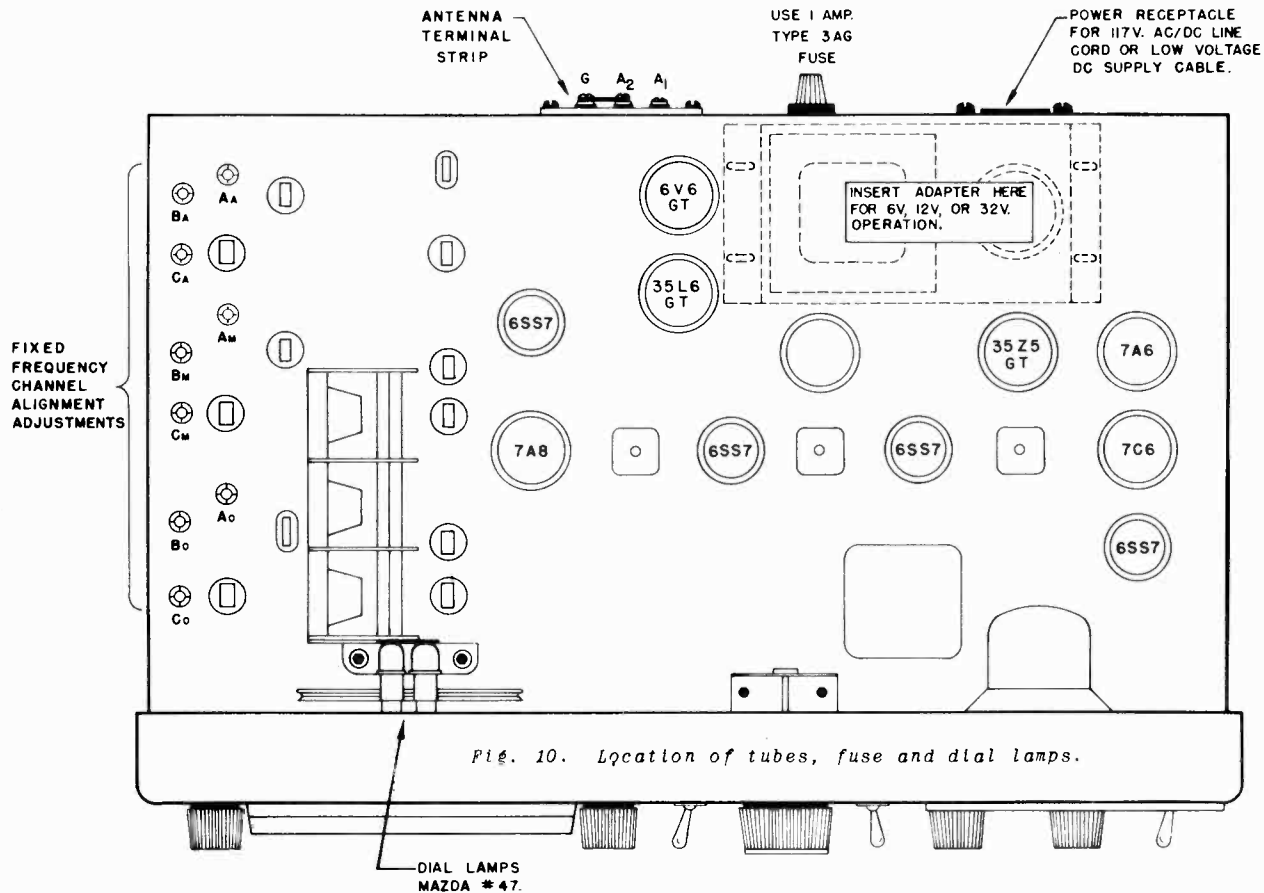


Fig. 10. Location of tubes, fuse and dial lamps.

SERVICE PARTS LIST (Cont.)

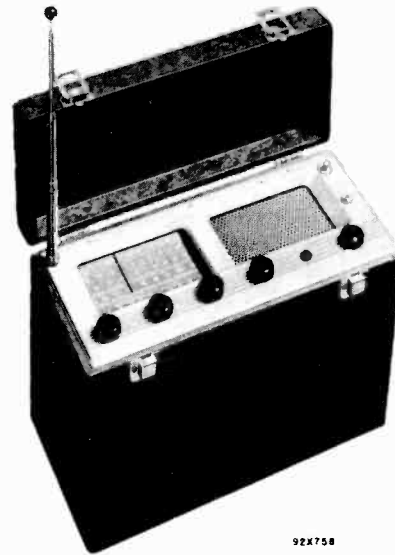
MISCELLANEOUS

TS-1	Terminal strip, antenna	88A032
	Plate, electrolytic cond. mtg.	8A749
	Clip, coil mtg.	76A326
	Shaft, bandswitch	74A239
	Shaft, tuning drive	74A242
	Flywheel, tuning drive	71A178
	Bracket, tuning drive shaft bearing	67A779
	Washer, spring (tuning drive shaft)	4A195
	"C" washer (tuning drive shaft)	4A269
	Cord, dial drive	38A019
	Spring, dial cord	75A012
	Shield, tube (V5, V8)	69B195
F-1	Fuse, 1 amp. type 3AG. (115 V. AC/DC operation)	39A306
F-2	Fuse, 10 amp. type 3AG (6V. operation)	39A309
F-2	Fuse, 5 amp. type 3AG (12 V. operation)	39A313
F-2	Fuse, 2 amp. type 3AG (32 V. operation)	39A307
	Dial scale	83C334
	Dial, escutcheon	7C033-1
	Gasket, dial escutcheon	12A040
	Window, glass	22A199
	Baffle, speaker	63C223
	Speaker assembly	85B050
	Grill, speaker	7C016-1
	Knob assembly, bandswitch	15B088-1
	Knob, TUNING	15A047
	Knob, SENSITIVITY, VOLUME	15B050
	Knob, TONE	15B049
	Knob, PITCH CONTROL	15A058
PL-2	Power cable, 117 V. AC/DC operation	87B1660
PL-3	Power cable, 6 V. operation	87B1661
PL-3	Power cable, 12 V. operation	87B1661-1
PL-3	Power cable, 32 V. operation	87B1661-2
VB-101	Vibrator unit, 6V. operation	27A143
VB-201	Vibrator unit, 12 V. operation	27A144
VB-301	Vibrator unit, 32 V. operation	27A145

MODEL S-72

GENERAL

- Tubes Eight plus selenium rectifier
 - Speaker 5-inch PM
 - Speaker V.C. Impedance 3.2 ohms (100 ohm headset tap)
 - Headset Output For 500 to 5000-ohm phones
 - Antenna Loop for band 1
Whip for bands 2, 3 and 4
Provisions for connection to an external antenna
 - Tuning Manual
- | Tuning Range | Band Selector Position | Frequency Range |
|------------------------|------------------------|------------------|
| | 1. | 550 kc - 1600 kc |
| | 2. | 1500 kc - 4.4 mc |
| | 3. | 4.5 mc - 11.5 mc |
| | 4. | 11 mc - 30 mc |
- Intermediate Frequency 455 kc.
 - Power Supply 105-125 V. DC/60 cycles AC or Battery Pack
 - Power Consumption 25 Watts



92X758

drive following the lettered sequence "A" through "E" and at position "E" stretch the tension spring and tie the cord securely. In cases where the set screw on the band spread pulley has been loosened, set the general coverage dial to the frequency of a signal generator or local short wave station and tune in the signal with the band spread drive shaft. Turn the pulley counter clockwise to the stop, tighten the set screw and attach the band spread pointer and index it at 100 on the band spread dial scale.

RESTRINGING DIAL CORD

GENERAL COVERAGE DIAL

To restring the general coverage tuning dial drive, cut a 32-inch length of 30 lb. test dial cord and tie one end to the tie-point "1" shown in Fig. 1. Follow the number sequence "1" through "12" and at position "12" stretch the tension spring and tie the cord securely. Note that the string is wrapped around the drive shaft three and a fraction times for proper traction. Close the gang capacitor and attach the pointer so that it is aligned with the index marks on the left side of the dial scales.

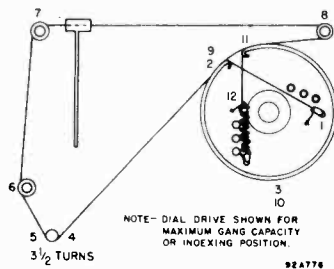


Figure 1. Dial cable stringing procedure, general coverage

BAND SPREAD DIAL

To restring the band spread tuning dial drive, cut a 24-inch length of 30 lb. test dial cord and tie one end to the tension spring in the band spread pulley at position "A" in Figure 2. Turn the pulley counter-clockwise to the stop and string up the

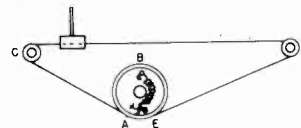


Figure 2. Dial cable stringing procedure, band spread

BATTERY REPLACEMENT

A strip of canvas webbing and a hold down screw are used to keep the battery in the cabinet. To replace the battery, disconnect the battery plug and loosen the hold down screw. Refer to Fig. 3.

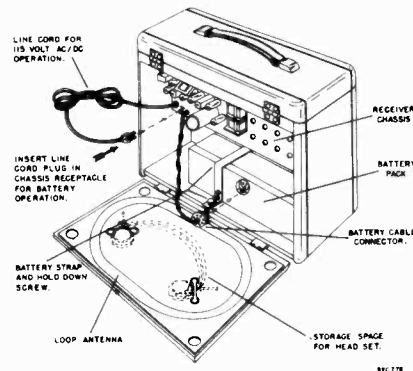


Figure 3. Battery compartment

Suitable replacement packs can be found from the list shown below.

REPLACEMENT BATTERY LIST

Manufacturer	Type No.	Manufacturer	Type No.
BRIGHT STAR	66-50	OLIN	0615 0614
BURGESS	G6M60 F6A60	RAY-O-VAC	AB878 AB994
DELCO	8760	RCA	VS018 VS019
EVERREADY	754 753	SEARS ROEBUCK	67E605
GENERAL	60BF65 60A6F65	USALITE	680
MONTGOMERY WARD	62A35M 62A33	WESTERN WIZARD	60B6F65 60A6F65
NATIONAL UNION	N808		

NOTE - Only one battery pack of the type listed above is required.

CAUTION - When the receiver is to operate on batteries it is necessary to insert the line cord plug in the chassis receptacle as shown in Fig. 3.

ALIGNMENT PROCEDURE

It will be necessary to remove the receiver chassis from the cabinet to make the I.F. alignment adjustments. To do this, first, remove all the knobs from the control panel; next, unfasten the ANL switch and phone jack from the front panel; then, unsolder the antenna connections, two for the loop antenna and one for the whip antenna; last, remove the two screws fastened to the cabinet through the angle brackets mounted on the chassis and lift out of the case.

The primaries of the I.F. transformers are adjusted from the bottom of the chassis and the secondaries are adjusted from the top of the chassis.

Before starting the alignment procedure, check the position of the general coverage dial pointer at the low frequency end of the range. The pointer should index at the maximum capacity of the tuning capacitor.

Set the following controls before alignment.

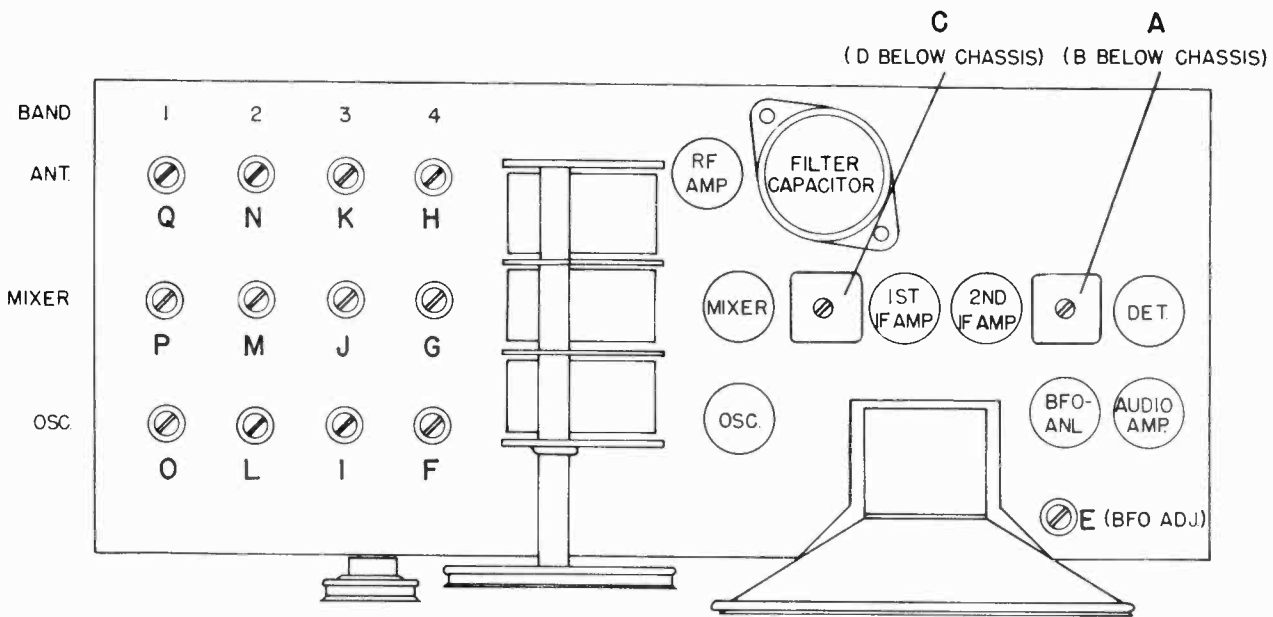
- VOLUME Set at maximum
- VOICE/CODE Set at maximum VOICE
- ANL Set at OFF
- BAND SPREAD Set at 0

ALIGNMENT CHART

Step	Dummy Antenna	Signal Generator Coupling	Signal Generator Frequency	Band Switch Setting	Receiver Dial Setting	Adjust	Remarks
1.	None	Stator plates in center section of tuning gang	455 kc	"1"	1000 kc	A,B,C,D	Maximum audio output at speaker voice coil. Use just enough signal generator output to obtain a 50 mw signal level.
2.	None	See step 1.	455 kc (No mod.)	"1"	1000 kc	E	With the VOICE/CODE switch set at CODE, adjust E for a 1000 cycle note.
3.	Just before r-f amplifier alignment, run band spread pointer to zero to check operation of the band spread compression trimmer. If the trimmer is fully tight before the pointer reaches zero, loosen the set screw on the drum dial and turn the drive shaft clockwise until the trimmer is fully compressed. Now back off the trimmer one and one-half turns and turn the pulley counter-clockwise until the pointer indicates 100. Now tighten the set screw on the shaft. This check permits the compression trimmer to work over its operating range without binding. Before proceeding to the next step, set the band spread dial at 0						
4.	10 mmf from ext. antenna lead to chassis.	Couple the generator to the ext. ant. lead thru a 15 mmf capacitor	30 mc	"4"	30 mc	F,G,H	Maximum output as in step 1.
5.	See step 4.	See step 4.	11.5 mc	"3"	11.5 mc	I,J,K	Maximum output as in step 1.
6.	See step 4.	See step 4.	4.4 mc	"2"	4.4 mc	L,M,N	Maximum output as in step 1.
*7.	See step 4.	See step 4.	1500 kc	"1"	1500 kc	O,P,Q	Maximum output as in step 1.

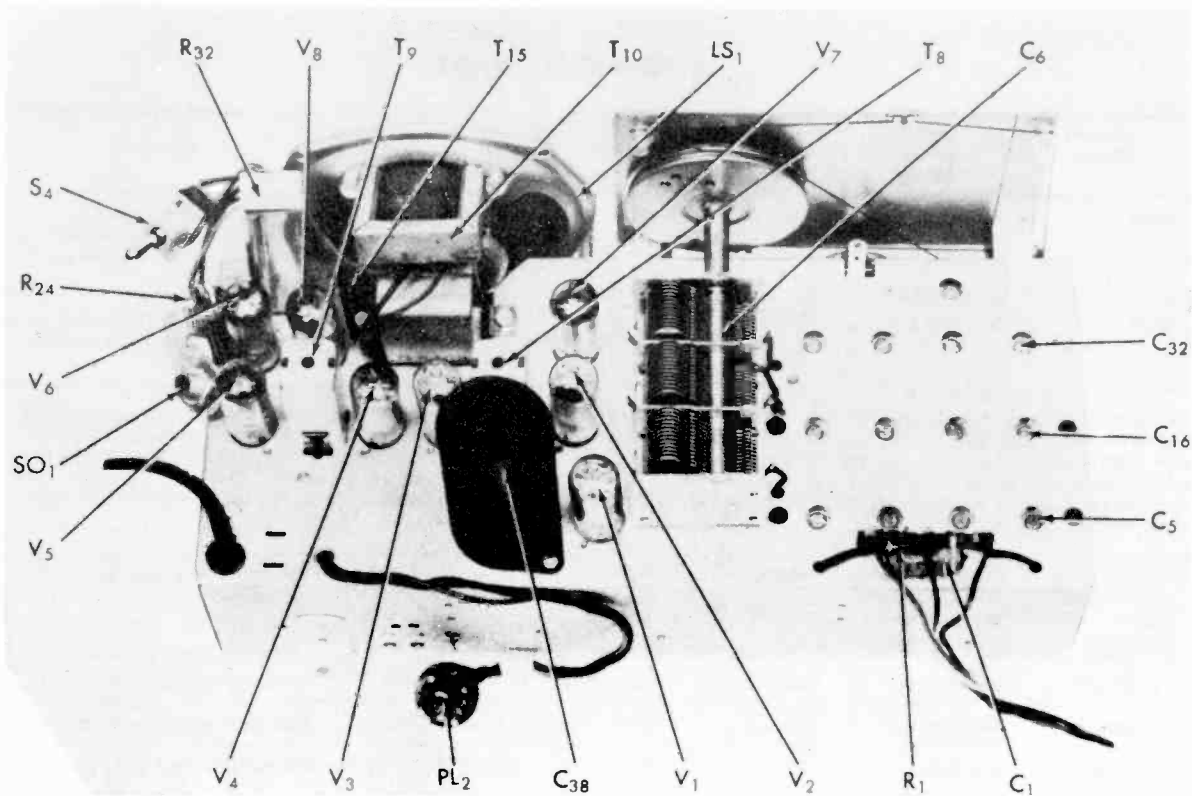
*NOTE - Loop must be reconnected for this step.

MODEL S-72



92C782-0

Figure 4. Alignment points



92X781

Figure 5. Top view, component location

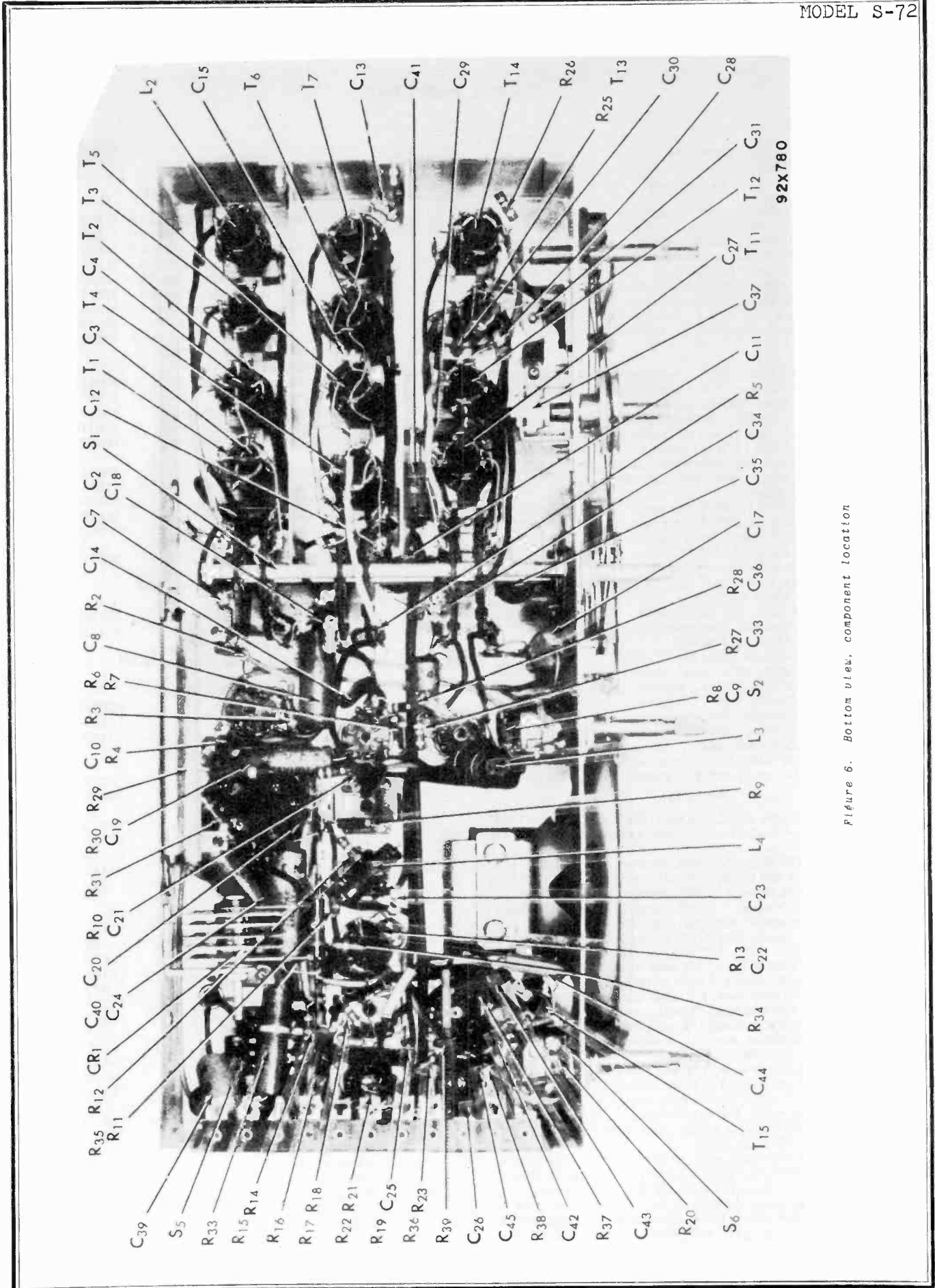
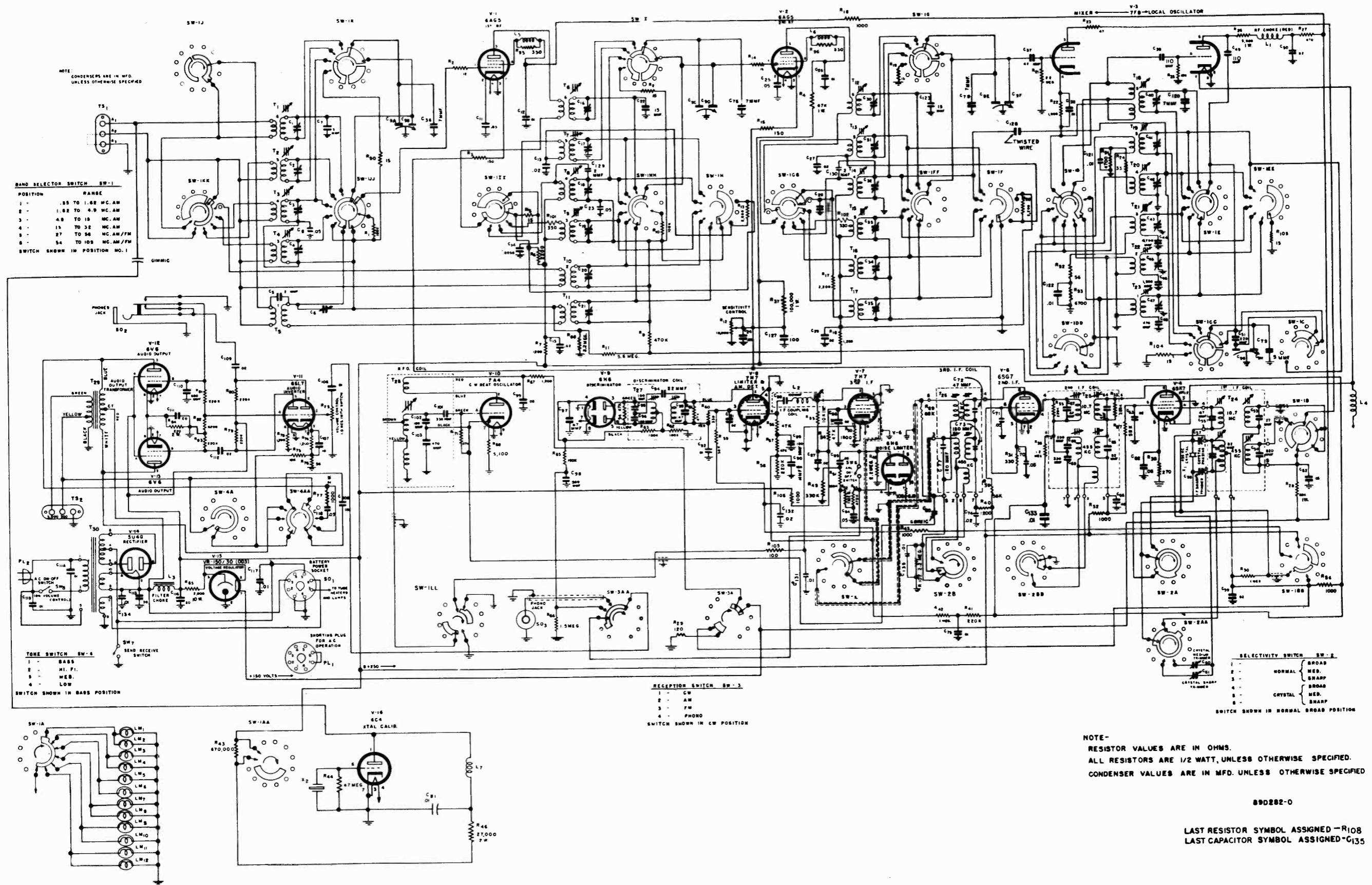


Figure 6. Bottom view, component location

SERVICE PARTS LIST

Ref. No.	Description	Hallicrafter's Part Number	Ref. No.	Description	Hallicrafter's Part Number
CAPACITORS					
C-1,33,42	.003 mfd., 600 V., tubular	46AZ302J	T-1	Transformer, antenna stage, band 4	51B1139
C-2,13,23,34	100 mmf., 500 V., ceramic	47B20101K5	T-2	Transformer, antenna stage, band 3	51B1138
C-3,4,15	15 mmf., 500 V., ceramic	47B20150K5	T-3	Transformer, antenna stage, band 2	51B1137
C-5	Trimmer, ant. assy., 4 sections (Bands 1,2,3,4)	44B374-1	T-4	Transformer, mixer stage, band 4	51B1143
C-6	Tuning capacitor, 3 section	48C221	T-5	Transformer, mixer stage, band 3	51B1142
C-7,18	68 mmf., 500 V., ceramic	47B20680K5	T-6	Transformer, mixer stage, band 2	51B1141
C-8	.05 mfd., 200 V., tubular	46AU503J	T-7	Transformer, mixer stage, band 1	51B1140
C-9,10,11,14,20,21,22,35	5000 mmf., 500 V., ceramic	47A168	T-8	Transformer, 1st I.F.	50C233
C-12	47 mmf., 500 V., ceramic	47B20470K5	T-9	Transformer, 2nd I.F.	50C234
C-16	Trimmer, mixer assy., 4 sections, (Bands 1,2,3,4)	44B374-2	T-10	Transformer, audio output (part of speaker assy. LS-1)	
C-17	Capacitor, resonant (455KC)	46A150	T-11	Transformer, osc. stage, band 4	51B1147
C-19	.01 mfd., 600 V., tubular	46AY103J	T-12	Transformer, osc. stage, band 3	51B1146
C-24	.1 mfd., 200 V., tubular	46AU104J	T-13	Transformer, osc. stage, band 2	51B1145
C-25	Capacitor, composite; .002, .005, .0001, .005 mfd, 500 V., ceramic	47A203	T-14	Transformer, osc. stage, band 1	51B1144
C-27	22 mmf., 500 V., ceramic	47B20220K5	T-15	Transformer, B.F.O. (with mtg. clip)	50B402
C-28	50 mmf., 500 V., ceramic	47B20500K5	L-1	Loop antenna	57C125
C-29	3900 mmf., 500 V., mica	47X35A392J	L-2	Coil, antenna loading (band 1)	51B1136
C-30	1400 mmf., 500 V., mica	47X30A142J	L-3	Choke, R.F.	53A008
C-31	Padder, adjustable, (Band 1)	44A376	L-4	Choke, filament	53A121
C-32	Trimmer, osc. assy., 4 sections (Band 1,2,3,4)	44B374	SWITCHES		
C-36	7 mmf., 500 V., ceramic	47X20UK070K	S-1	Switch, band (6 section assy. complete)	60C362
C-37	Capacitor, band spread, (with shaft and bracket)	44B375	S-2	Switch, VOICE/CODE, (Part of r-f gain control, R-8)	
C-38	60-20-20 mfd., 150 V., 1000 mfd., 10 V., electrolytic	45B155	S-3	Switch, TONE	60A361
C-39	.02 mfd., 600 V., moulded paper	46BR203L6	S-4	Switch, ANL, (S.P.S.T.)	60A365
C-40	.02 mfd., 200 V., tubular	46AU203J	S-6	Switch, ON-OFF (D.P.S.T. power switch, part of volume control R-20)	
C-41,44	470 mmf., 500 V., mica	47X20A471K	PLUGS AND SOCKETS		
C-43	100 mmf., 500 V., mica	47X20A101M	PL-1	Line cord	87B1683
C-45,26	1000 mmf., 500 V., ceramic	47B20102K5	PL-2	Battery plug, 6 prong	10A344
C-46	100 mfd., 25 V., electrolytic	45A116	SO-1	Jack, phone	36A036
C-47	5.6 mmf., 500 V., composition	47A160-7	TUBES AND RECTIFIERS		
RESISTORS					
R-1	10,000 ohms, 1/2 watt, carbon	23X20X103K	V-1	Type 1T4, r-f amplifier	90X1T4
R-2,6,10,13,14,15	4.7 megohms, 1/2 watt, carbon	23X20X475M	V-2,3,4	Type 1U4, mixer, 1st and 2nd i-f amplifier	90X1U4
R-3	150 ohms, 1/2 watt, carbon	23X20X151K	V-5,8	Type 1U5, detector and B.F.O.	90X1U5
R-4,37	22,000 ohms, 1/2 watt, carbon	23X20X223K	V-6	Type 3V4, audio power amplifier	90X3V4
R-5,19	470 ohms, 1/2 watt, carbon	23X20X471K	V-7	Type 1R5, oscillator	90X1R5
R-7,24	100 ohms, 1/2 watt, carbon	23X20X101K	CR-1	Rectifier, selenium	27A151
R-8	Resistor, variable, 500,000 ohms, VOICE/CODE control	25B847	MISCELLANEOUS		
R-9	2200 ohms, 1/2 watt, carbon	23X20X222K		Socket, 7 prong miniature (tube)	6A292
R-11	100,000 ohms, 1/2 watt, carbon	23X20X104K		Lock, line cord	76A397
R-12	6800 ohm, 1/2 watt, carbon	23X20X682K		Escutcheon	7D109
R-16,23,39	2.2 megohms, 1/2 watt, carbon	23X20X225M		Escutcheon, dial	22B250
R-17,27,38	47,000 ohms, 1/2 watt, carbon	23X20X473K		Plate, dial	83C355
R-18,22	470,000 ohms, 1/2 watt, carbon	23X20X474K		Knob	15B172
R-20	Resistor, variable, 2 megohm, VOLUME control	25B839		Knob (with dot)	15B177
R-21	3.3 megohms, 1/2 watt, carbon	23X20X335M		Pointer, main tuning	82A161
R-25	1000 ohms, 1/2 watt, carbon	23X20X102K		Pointer, band spread	82A161-1
R-26	680 ohms, 1/2 watt, carbon	23X20X681K		Dial cord	38A001
R-28	47 ohms, 1/2 watt, carbon	23X20X470K		Spring, general coverage dial	75A012
R-29	270 ohms, 2.3 watts; 350 ohms, 5.5 watts; W.W.	24A912		Spring, band spread dial	75A070
R-30,34	560 ohms, 1 watt, carbon	23X30X561K		Assembly, pulley, bushing and cam	41X13804
R-31	680 ohms, 1 watt, carbon	23X30X681K		Pulley, idler	28A052-7
R-32	600 ohms, 9.3 watts, W.W.	24A913		Shaft, main tuning	74A274
R-33	22 ohms, 2 watts, W.W.	24BV220E	LS-1	Antenna, whip	72A035
R-35	1200 ohms, 1/2 watt, carbon	23X20X122K		Antenna, insulator	65A533
R-36	33 ohms, 1/2 watt, carbon	23X20X330K		Speaker	85C093
				Strap, battery	76B467
				Cabinet	78F423



NOTE: CONDENSERS ARE IN MFD. UNLESS OTHERWISE SPECIFIED.

BAND SELECTOR SWITCH SW-1

POSITION	RANGE
1	.55 TO 1.62 MC./AM
2	1.62 TO 4.9 MC./AM
3	4.9 TO 18 MC./AM
4	15 TO 32 MC./AM
5	27 TO 56 MC./AM/FM
6	54 TO 108 MC./AM/FM

SWITCH SHOWN IN POSITION NO. 1

TONE SWITCH SW-4

1	BASS
2	HI. F.
3	MED.
4	LOW

SWITCH SHOWN IN BASS POSITION

RECEPTION SWITCH SW-3

1	CW
2	AM
3	FM
4	PHONO

SWITCH SHOWN IN CW POSITION

SELECTIVITY SWITCH SW-2

1	NORMAL	BROAD
2		MED. SHARP
3	CRYSTAL SHARP	BROAD
4		MED. SHARP

SWITCH SHOWN IN NORMAL BROAD POSITION

NOTE-
RESISTOR VALUES ARE IN OHMS.
ALL RESISTORS ARE 1/2 WATT, UNLESS OTHERWISE SPECIFIED.
CONDENSER VALUES ARE IN MFD. UNLESS OTHERWISE SPECIFIED

89D282-0

LAST RESISTOR SYMBOL ASSIGNED -R108
LAST CAPACITOR SYMBOL ASSIGNED -C135

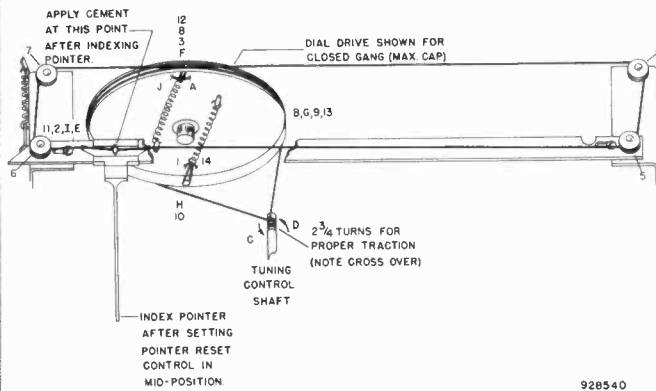
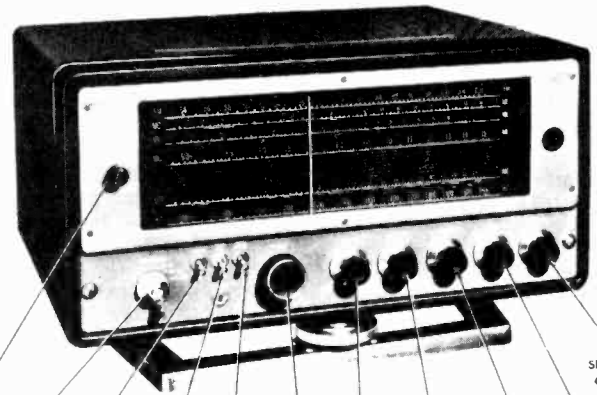


Figure 1. Dial cable stringing procedure



928540

POINTER RESET BAND SELECTOR RECEIVE STANDBY SWITCH CALIB. XTAL SWITCH NOISE LIMITER SWITCH TUNING CONTROL VOLUME CONTROL RECEPTION CONTROL SELECTIVITY CONTROL TONE CONTROL SENSITIVITY CONTROL

92 X 513

GENERAL

- Tubes Fourteen plus voltage regulator and rectifier
- Speaker Output 500/5000 ohms
- Headset Output High impedance
- Antenna Input For 50 to 600 ohm line or single wire lead-in.
- Phono Input High impedance
- External Power Connector . . . Std. octal socket
- Tuning Range

Band	Frequency Range	Type of Reception
1	550 kc - 1620 kc	AM/CW
2	1.62 mc - 4.9 mc	AM/CW
3	4.9 mc - 15 mc	AM/CW
4	15 mc - 32 mc	AM/CW
5	27 mc - 56 mc	AM/FM/CW
6	54 mc - 109 mc	AM/FM/CW

- Intermediate Frequency 455 kc/10.7 mc
- Power Supply Standard Model 105-125 V. 60 Cycles AC
 Universal Model 105-250 V. 25/60 cycles AC
- Power Consumption 120 Watts

POSITIONING CONTROL KNOBS

- BAND SELECTOR As required by flat on shaft
- VOLUME Set at 10 for full clockwise rotation
- RECEPTION As required by markings
- SELECTIVITY As required by markings
- STONE As required by markings
- SENSITIVITY Set at 10 for full clockwise rotation

RESTRINGING DIAL CORD

Restring the tuning condenser drive with a 45 - inch length of 30 lb. test dial cord. Tie one end of the cord to the tension spring at position "1" and follow the stringing sequence "1" "14" as shown. At position "14" stretch the tension spring and tie the cord securely to the spring. Note that the dial cord is wrapped around the tuning drive shaft two and three-quarters times for proper traction.

Restring the dial pointer drive with a 75 - inch length of 30 lb. test dial cord. Tie one end of the cord to the tension spring at position "A" and follow the stringing sequence "A" through "J" as illustrated. At position "J" stretch the tension spring and tie the cord securely.

Index the dial pointer by setting the tuning gang at maximum capacity, the RESET control in the middle of its range and aligning the pointer with the left hand dial index marker.

REPLACING LAMPS

Refer to Fig. 9. for the location of the twelve dial lamps used in the receiver. To gain access to defective lamps, reach in through the cabinet cover, remove the light shield (4 sheet metal screws), and unclip the dial lamp socket by compressing the side springs. The socket may then be brought out into the open to change the defective lamp. Replace defective lamps with 6-8 V. Mazda #44 (Blue bead) lamps, or equivalent.

ALIGNMENT PROCEDURE

- IF AMP. ALIGNMENT (455 kc) - Set the controls as follows:
- BAND SELECTOR 550/1620 kc range
 - RECEIVE/STANDBY switch RECEIVE
 - CALIB. XTAL switch OFF
 - NOISE LIMITER switch OFF
 - VOLUME control Near maximum
 - RECEPTION control AM
 - SELECTIVITY control NORMAL/SHARP
 - SENSITIVITY control Near maximum
- Set tuning dial pointer at approximately 1,000 kc.

MODELS SX-62

Connect high side of signal generator through an 0.1 mfd. capacitor to pin #1, of the 7F8 converter tube. With signal generator set at approximately 455 kc align slugs S-1,3,5,10,12 and 14 for maximum output.

Set RECEPTION control at CW and adjust slug S-8 for a 1,000 cycle note.

Set the SELECTIVITY control at CRYSTAL/BROAD. While slowly turning slug S-10 in one direction across the resonant setting obtained above, "rock" the signal generator tuning and observe the dip in the output meter reading as the adjustment passes through the response of the crystal filter. The correct setting of the slug S-10 is in the center of the observed dip. Set the signal generator at the weaker of the two responses obtained on either side of zero beat and adjust the crystal phasing trimmer C-57 for the null.

Set the SELECTIVITY control at CRYSTAL/SHARP and with trimmer C-61 set near minimum capacity, slowly increase its capacity while "rocking" the signal generator and adjust for maximum output. It may be necessary at this point to reduce the signal generator input and the receiver sensitivity to prevent overloading. After peaking the adjustment, turn the trimmer in until a drop in output of about 2 db. occurs. At this point the sharp crystal will have very good selectivity without sacrificing too much gain.

Tune the signal generator to exact crystal frequency and note output meter reading. Set the SELECTIVITY control at CRYSTAL/BROAD and note the drop in output, and output meter reading. Now switch to CRYSTAL/MEDIUM and with trimmer C-60 near minimum capacity, slowly increase its capacity, while "rocking" the signal generator, until the output meter indicates about midway between the output readings obtained in sharp crystal and broad crystal positions.

Set the SELECTIVITY control at CRYSTAL/SHARP and reset signal generator for the exact crystal frequency. Switch to NORMAL/SHARP and reset slugs S-1,3,5,12,14 and trimmer C-58 for maximum output.

Set the RECEPTION control at CW and adjust the BFO slug S-8 for zero beat.

- IF AMP. ALIGNMENT (10.7 mc) - Set the mc controls as follows:
- BAND SELECTOR - - - - - 27/56 mc range
 - RECEIVE/STANDBY switch - RECEIVE
 - CALIB. XTAL switch - - - - OFF
 - NOISE LIMITER switch - - - OFF
 - VOLUME - - - - - Near maximum
 - RECEPTION control - - - - AM
 - SELECTIVITY control - - - - NORMAL/SHARP
 - SENSITIVITY control - - - - Near Maximum
- Set tuning dial pointer at approx. midscale.

Connect the high side of the signal generator through an 0.1 mfd. capacitor to pin #1 of the 7F8 converter tube. Set signal generator at 10.7 mc and adjust slugs S-4, 6, 9, 13 and 15 for maximum output. Now set slugs S-2 and S-11 for maximum output, but do not readjust slugs S-4,6,9,13 and 15.

Set RECEPTION control at CW and adjust slug S-17 for zero beat.

Set RECEPTION control at FM and adjust slug S-16 for maximum output. Now set Slug S-7 for the null or minimum output as indicated on the output meter. Check the discriminator by slowly tuning the signal generator through 10.7 mc and observe the two maximum audio level readings on the output meter. If the two peaks are equal the job is done; if not, it may be necessary to reset Slug S-16 until a reasonable balance is obtained.

RF AMP ALIGNMENT

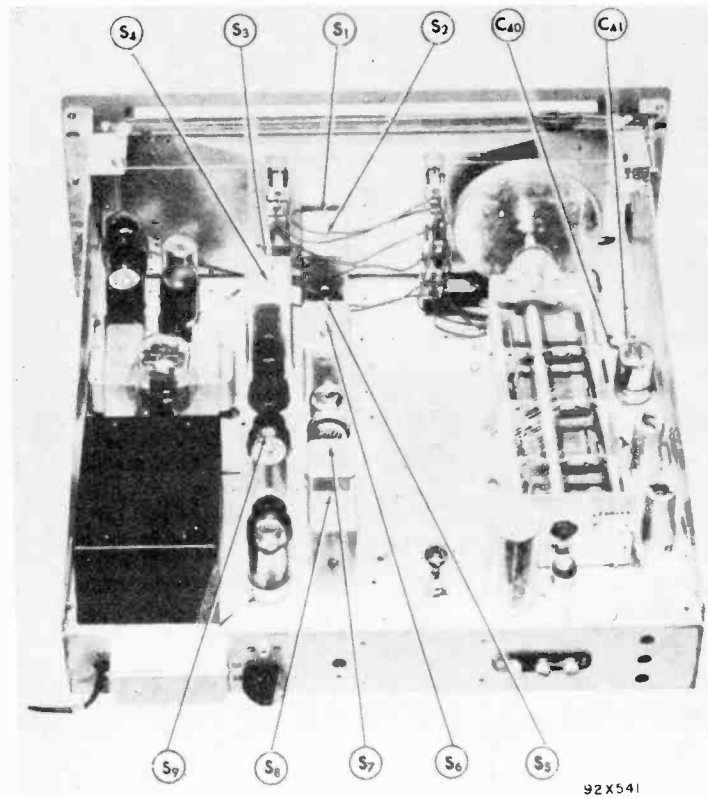
After completing the alignment of the IF amplifier stages, the RF amplifier stages may be aligned according to the following alignment chart. Connect the high side of the signal generator to terminal A-1 through the dummy antenna specified and connect a jumper between antenna terminal A-2 and GND. Use just enough signal generator output to obtain a 500 milliwatt audio output level for best results.

ALIGNMENT CHART

Dummy Antenna	Signal Generator Frequency	Band Selector Range	Radio Dial Setting	Adjust	Remarks
RMA	1500 kc 600 kc	550-1600 kc	1500 kc 600 kc	C-47*, 6, 21, 35 S-36*	Adjust for max. output
RMA	4.5 mc 2.0 mc	1.62-4.9 mc	4.5 mc 2.0 mc	C-45*, 20, 34 S-35*	Adjust for max. output
RMA	14.0 mc 7.0 mc	4.9-15 mc	14.0 mc 7.0 mc	C-43*, 4, 19, 33 S-34*, 22, 26, 30	Adjust for max. output
RMA	28 mc 18 mc	15-32 mc	28 mc 18 mc	C-42*, 3, 18, 32 S-33*, 21, 25, 29	Adjust for max. output
300-ohm non-inductive resistor	50 mc 30 mc	27-56 mc	50 mc 30 mc	C-41*, 2, 17, 31 S-32*, 20, 24, 28	Adjust for max. output
300-ohm non-inductive resistor	105 mc 60 mc	54-109 mc	105 mc 60 mc	C-40*, 1, 16, 30 S-31*, 19, 23, 27	Adjust for max. output

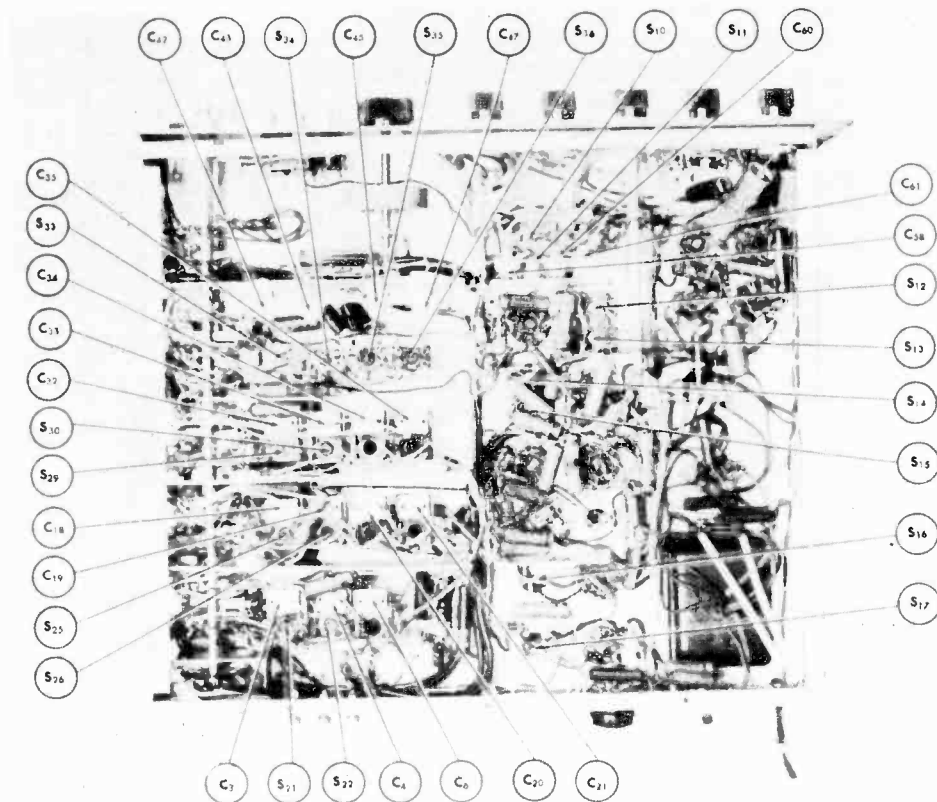
* Note - Calibration adjustment

Note - The standard RMA dummy antenna mention 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.



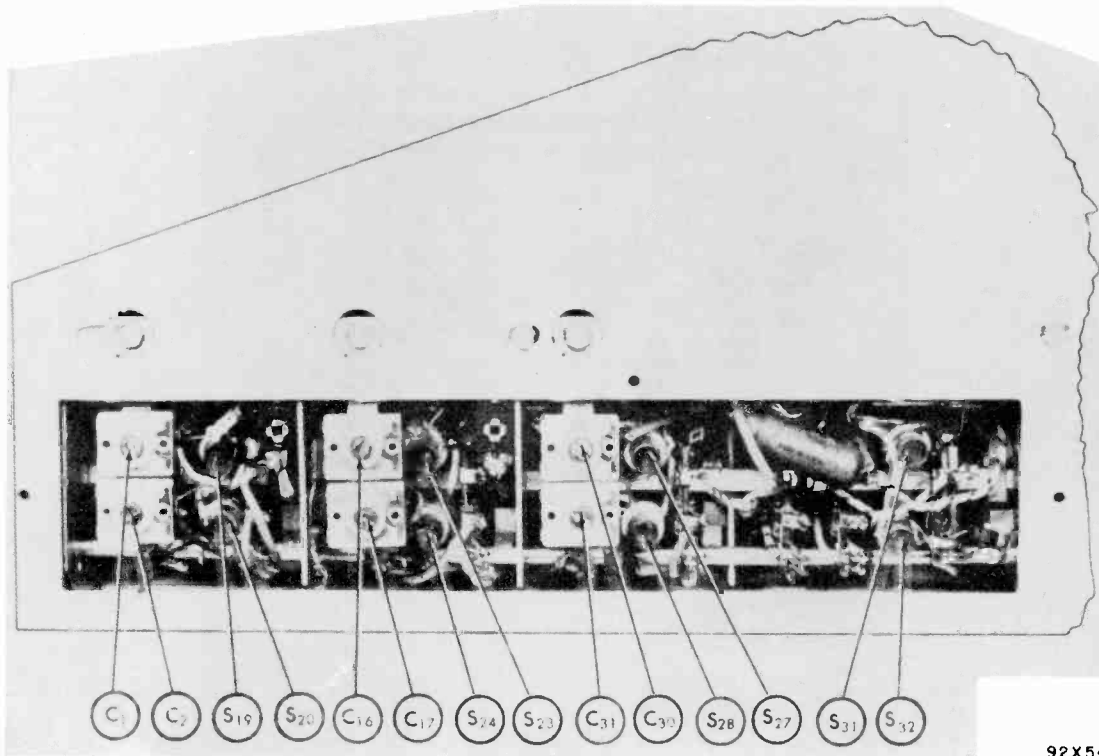
92X541

Fig. 2. Alignment adjustments, top view



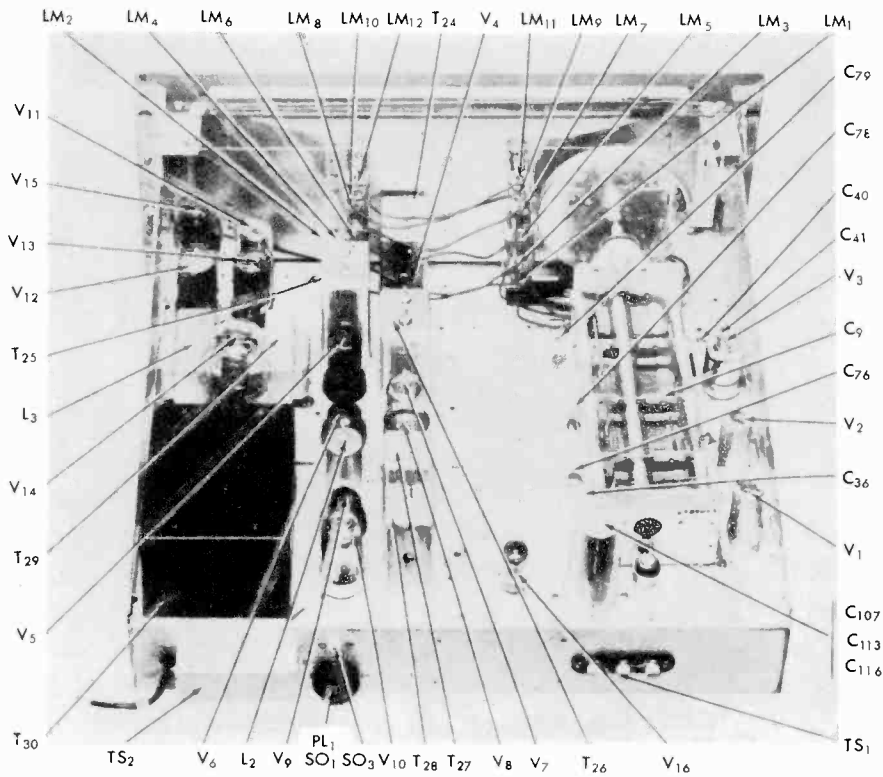
92X542

Fig. 3. Alignment adjustments, bottom view



92X543

Fig. 4. Alignment adjustments, left side view



92X544

Fig. 5. Component locations, top view

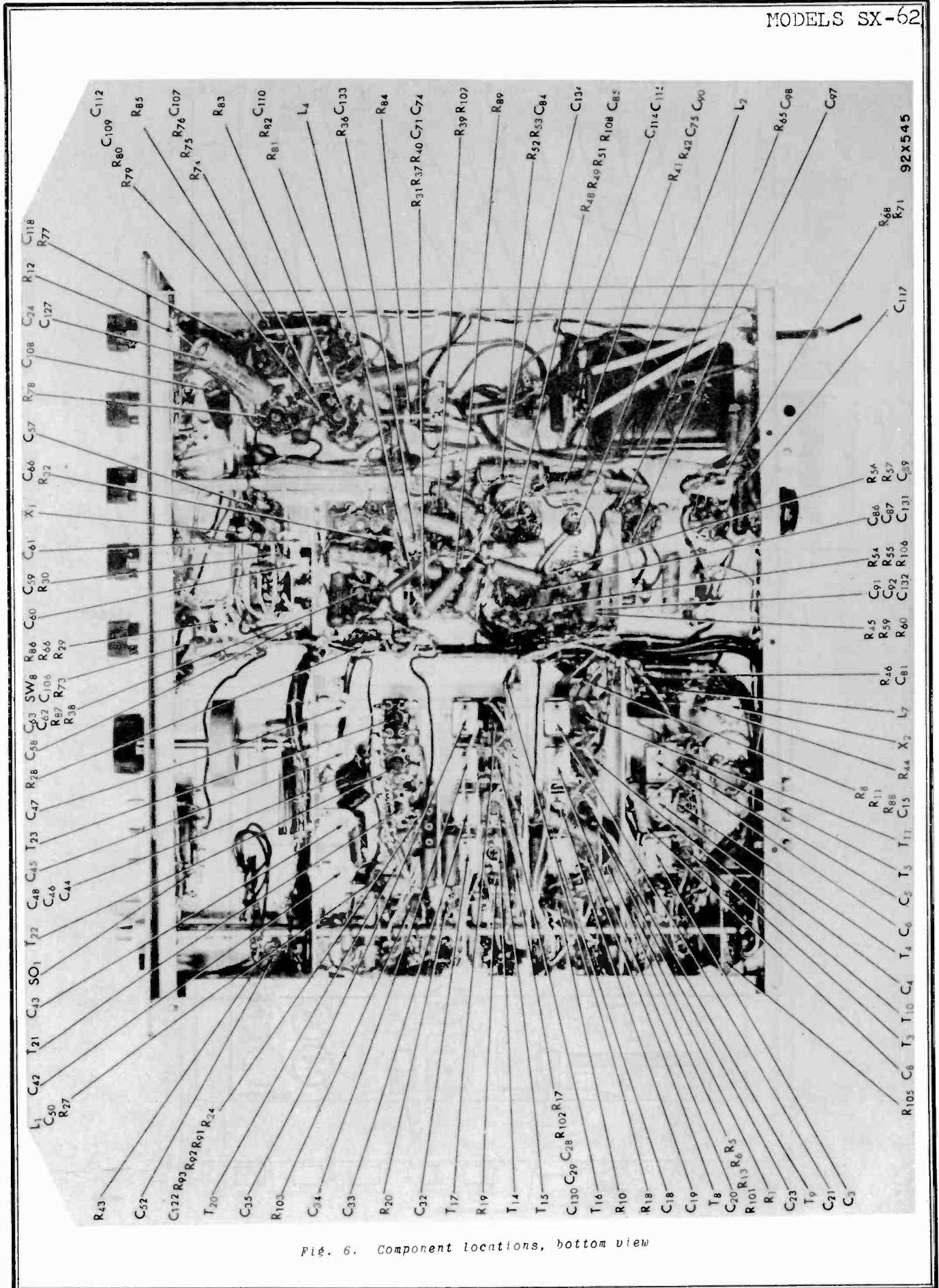
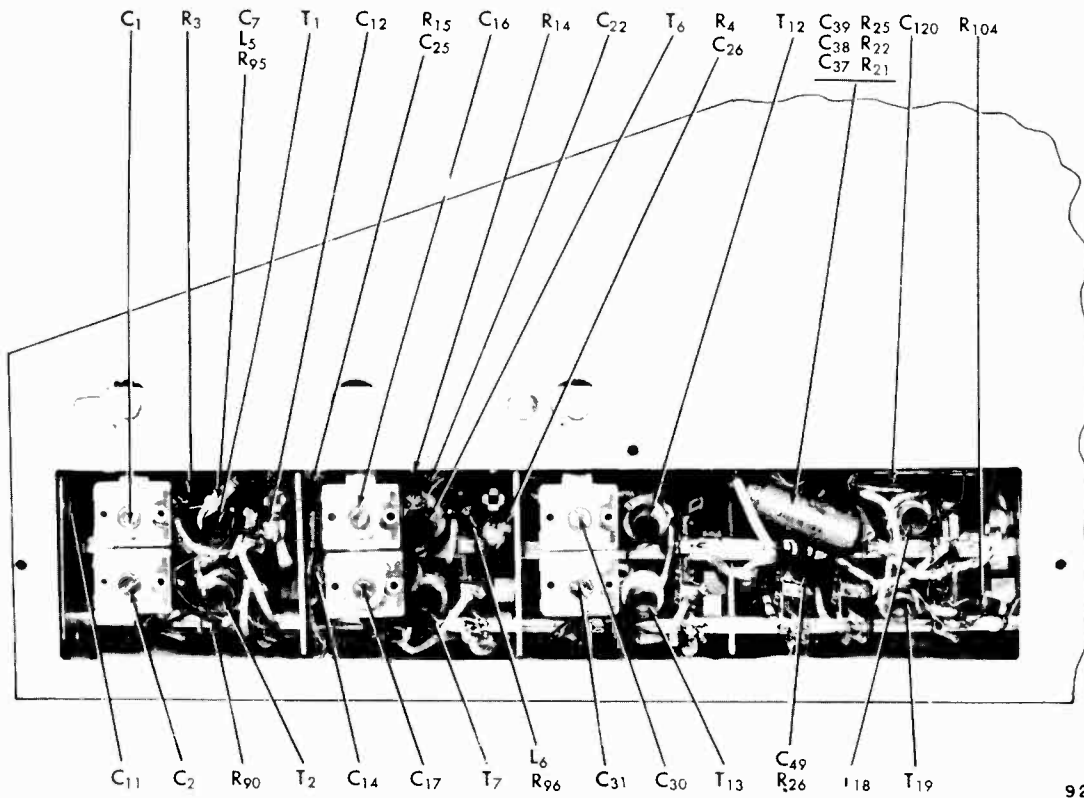


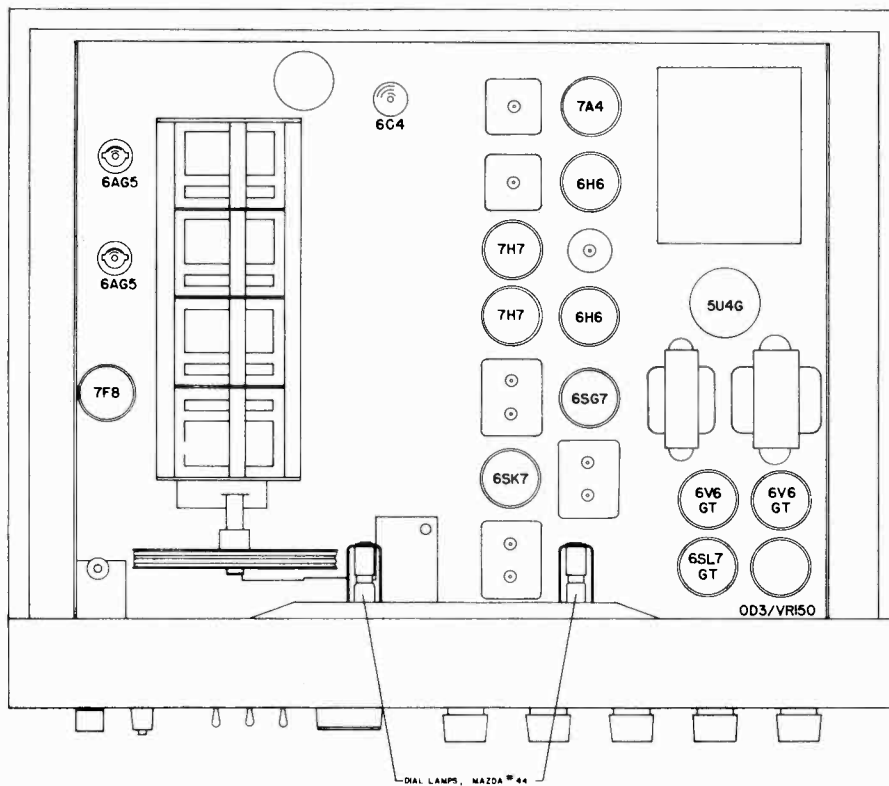
Fig. 6. Component locations, bottom view

MODELS SX-62



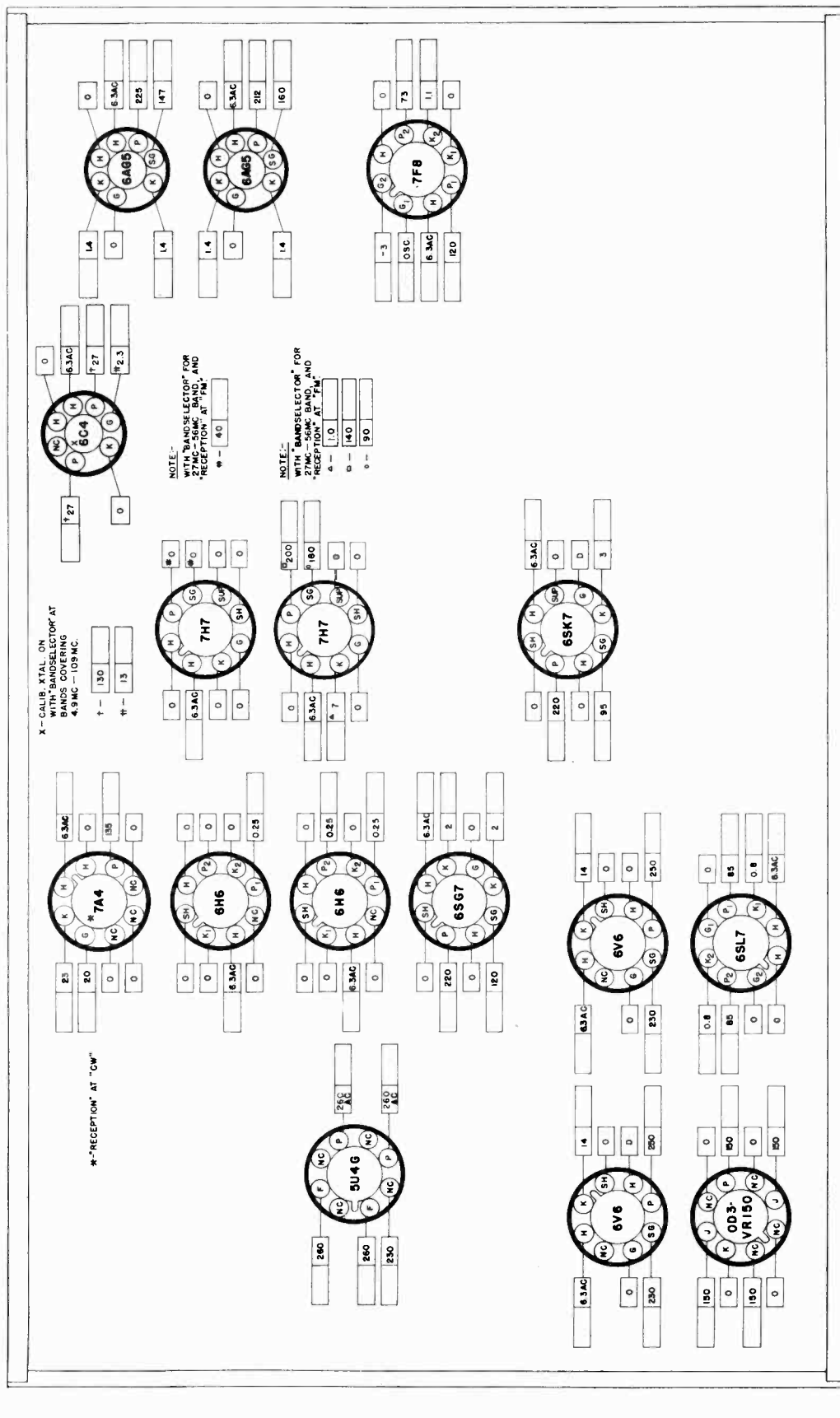
92X580

Fig. 7. Component locations, left side view.



920924-0

Fig. 8. Top view, location of tubes and dial lamps



FRONT PANEL.

NOTE—

1. SOCKET VIEWS ARE BOTTOM VIEWS.
2. ALL VOLTAGES MEASURED BETWEEN TUBE SOCKET TERMINALS AND GROUND.
3. LINE VOLTAGE—117 V. AC.
4. ALL VOLTAGES SHOWN ARE DC UNLESS OTHERWISE SPECIFIED.
5. VOLTAGES SHOWN WERE MEASURED WITH A 20,000 OHM/VOLT METER.
6. "NC"—NO CONNECTION.
7. THE BLANK SPACES ARE PROVIDED FOR THE SERVICEMAN. FILL IN THE ACTUAL READINGS AS TAKEN WITH YOUR OWN EQUIPMENT. A NORMAL OPERATING RADIO SHOULD BE USED FOR THESE MEASUREMENTS.

B. CONTROL SETTING—UNLESS SPECIFIED "BAND SELECTOR" AT BAND 1. "RECEPTION" AT "AM". "CALIB. XTAL" AT "OFF". "NOISE LIMITER" AT "OFF". "RECEIVE—STANDBY" AT "RECEIVE". "SENSITIVITY" AT MAXIMUM GAIN. "SELECTIVITY" AT "NORMAL / BOARD".

Fig. 9. Tube socket voltage chart

92D546

SERVICE PARTS LIST

Ref. No.	Description	Hallicrafters Part Number	Ref. No.	Description	Hallicrafters Part Number
CONDENSERS			RESISTORS (Cont.)		
C-1,2,16,17,30,31	Trimmers, adjustable: 2 section; antenna, RF amp. and mixer stages	44B165	R-16,22,32,45,86,106	1000 ohms 1/2 watt, carbon	RC20AE102M
C-3,4,6,18,19,20,21,32,33,34,35	Part of transformers T-3,4, respectively		R-21,48,107	2.2 megohms 1/2 watt, carbon	RC20AE225M
C-5,129,130	2 mmf. 500 V., bakelite	47A160-4	R-23	47 ohms 1/2 watt, carbon	RC20AE470M
C-7,79	5 mmf. 500 V., ceramic	CC20UK050D	R-24	33 ohms 1/2 watt, carbon	RC20AE330M
C-8,11,25	.05 mfd. 200 V., tubular	49A091	R-25,75	10,000 ohms 1/2 watt, carbon	RC20AE103K
C-9	Capacitor, main tuning	48C204	R-26	5600 ohms 1 watt, carbon	RC30AE562K
C-12,26,38,75,81,92,106,117,121,122,131,133,134,135	.01 mfd. 600 V., tubular	46AZ103J	R-27	470 ohms 1/2 watt, carbon	RC20AE471M
C-13,15,27,29,50,59,63,74,86,87,91,109,112,132	.02 mfd. 600 V., tubular	46AY203J	R-28	68,000 ohms 1 watt, carbon	RC30AE683K
C-14,28	5600 mmf. 500 V., mica	CM35A562M	R-29	120 ohms 1/2 watt, carbon	RC20AE121K
C-22,123	15 mmf. 500 V., ceramic	CC20UK150K	R-30,42,52	1 megohm 1/2 watt, carbon	RC20AE105M
C-23,62,70,84,85	.05 mfd. 200 V., tubular	46AU503J	R-31,60	330 ohms 1/2 watt, carbon	RC20AE331K
C-24	.25 mfd. 200 V., tubular	46AT254J	R-36	1.2 megohms 1/2 watt, carbon	RC20AE125K
C-36,76,78,120	7 mmf. 500 V., ceramic	CC20UK070K	R-37	100,000 ohms 1 watt, carbon	RC20AE104K
C-37,97	47 mmf. 500 V., mica	CM20A470K	R-38	270 ohms 1/2 watt, carbon	RC20AE271K
C-39,49	110 mmf. 500 V., ceramic	CC25UK111J	R-39,59,87	56,000 ohms 1/2 watt, carbon	RC20AE563
C-40,41,57	Trimmer, adjustable, oscillator section, bands 5 & 6; and crystal phasing	44A078	R-41,58,79,80,81,83	220,000 ohms 1/2 watt, carbon	RC20AE224K
C-42	Trimmer, adjustable, oscillator section, band 4	44A347	R-44	4.7 megohms 1/2 watt, carbon	RC20AE475K
C-43,45	Trimmers, adjustable, oscillator section, bands 2 & 3	44A047	R-46	27,000 ohms 2 watt, carbon	RC40AE273K
C-44	4700 mmf. 2% 500 V., silver mica	CM35C472G	R-49	330,000 ohms 1/2 watt, carbon	RC20AE334K
C-46	1500 mmf. 2% 500 V., silver mica	CM30C152G	R-50	1800 ohms 1/2 watt, carbon	RC20AE182K
C-47	Trimmer, adjustable, oscillator section, band 1	44A076	R-55	10,000 ohms 1 watt, carbon	RC30AE103K
C-48	470 mmf. 2% 500 V., mica	CM20A471G	R-56,57,71,94	47,000 ohms 1/2 watt, carbon	RC20AE473K
C-51	220 mmf. 2% 500 V., mica	CM25E221G	R-65	150,000 ohms 1/2 watt, carbon	RC20AE154K
C-52,66,71,99,108,118	.05 mfd. 600 V., tubular	46AY503J	R-66	1 megohm 1/2 watt, carbon	RC20AE155K
C-58,60,61	Trimmer, adjustable, crystal phasing	44B164	R-68	5100 ohms 5% 1/2 watt, carbon	RC20AE512J
C-89,90	180 mmf. 500 V., mica	CM20A181K	R-73	Resistor, variable, VOLUME control	25A549
C-98	560 mmf. 500 V., mica	CM25A561K	R-76,92	56 ohms 1/2 watt, carbon	RC20AE560K
C-107	10 mfd. 25 V., electrolytic	45A121	R-77	1000 ohms 2 watts, carbon	RC40AE102K
C-110	680 mmf. 500 V., mica	CM25A681K	R-82	8200 ohms 1/2 watt, carbon	RC20AE822K
C-111,113,116	20 mfd. 25 V., 30-20 mfd. 450 V., electrolytic	45A041	R-84	220 ohms 2 watts, carbon	RC40AE221K
C-114,115	.01 mfd. 600 V., moulded paper	46BR103J	R-85	2000 ohms 10 watts, WW	24BG202D
C-127	100 mfd. 25 V., electrolytic	45A116	R-88	2.2 megohms 1/2 watt, carbon	RC20AE225K
RESISTORS			R-89	68,000 ohms 1/2 watt, carbon	RC20AE683K
R-1,10,51	100,000 ohms 1/2 watt, carbon	RC20AE104M	R-91,93	4700 ohms 1/2 watt, carbon	RC20AE472K
R-2	12 ohms 1/2 watt, carbon	RC20AE120K	R-101,102	330 ohms 1/2 watt, carbon	RC20AE331M
R-3,15	150 ohms 1/2 watt, carbon	RC20AE151K	R-105	100 ohms 1/2 watt, carbon	RC20AE101K
R-4,54	47,000 ohms 1 watt, carbon	RC30AE473K	R-108	6.8 ohms 1 watt, carbon	RC30AE068K
R-5,9,14,19,90,103,104	15 ohms 1/2 watt, carbon	RC20AE150M	TRANSFORMERS AND COILS		
R-6,13,17,20	2200 ohms 1/2 watt, carbon	RC20AE222M	T-1	Transformer, antenna stage, band 6	51B829
R-7,18,40,67,74,78	1200 ohms 1/2 watt, carbon	RC20AE122K	T-2	Transformer, antenna stage, band 5	51B828
R-8,43,53	470,000 ohms 1/2 watt, carbon	RC20AE474M	T-3	Transformer, antenna stage, band 4	51B990
R-11	5.6 megohms 1/2 watt, carbon	RC20AE565K	T-4	Transformer, antenna stage, band 3	51B826
R-12	Resistor, variable, SENSITIVITY control	25A548	T-5	Transformer, antenna stage, band 1	51B823
			T-6,12	Transformer, RF and converter stages, band 6	51B833
			T-7	Transformer, RF stage, band 5	51B832
			T-8,14	Transformer, RF and converter stages, band 4	51B989
			T-9	Transformer, RF stage, band 3	51B987
			T-10	Transformer, antenna stage, band 2	51B825
			T-11	Transformer, RF stage, band 1	51B824
			T-13	Transformer, converter stage, band 5	51B844
			T-15	Transformer, converter stage, band 3	51B988
			T-16	Transformer, converter stage, band 2	51B986

Ref. No.	Description	Hallicrafters Part Number
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TRANSFORMERS AND COILS (Cont.)

T-17	Transformer, converter stage, band 1	51B985
T-18	Transformer, oscillator stage, band 6	51B839
T-19	Transformer, oscillator stage, band 5	51B838
T-20	Transformer, oscillator stage, band 4	51B991
T-21	Transformer, oscillator stage, band 3	51B836
T-22	Transformer, oscillator stage, band 2	51B835
T-23	Transformer, oscillator stage, band 1	51B834
T-24	Transformer, 1st IF amp stage	50C198
T-25	Transformer, 2nd IF amp stage	50C190
T-26	Transformer, 3rd IF amp stage	50C373
T-27	Transformer, FM detector	50C191
T-28	Transformer, BFO	54C032
T-29	Transformer, audio output	55B077
T-30	Transformer, power (115 V. 50/60 cycles)	52C141
*T-30	Transformer, power (115/230 V. 25/60 cycles)	52C131
L-1	RF choke (coded red)	53B008
L-2	IF coupling coil	53B104
L-3	Choke, filter	56B067
L-4	RF choke, filament	53A009
L-5,6	RF choke, screen (wound on R-95 & R-96)	37A117
L-7	Plate coil (Tube V-16)	53A139

SWITCHES

SW-1	Switch, BAND SELECTOR	60B329
SW-2	Switch, SELECTIVITY	60A234
SW-3	Switch, RECEPTION	60C330
SW-4	Switch, TONE	60C236
SW-5,6,7	Switch, toggle, SPST	60A138
SW-8	Switch, power (Part of volume control R-73)	

PLUGS AND SOCKETS

PL-1	Plug, octal (with jumpers)	35A003
PL-2	Plug and cord, power	87A078
SO-1	Socket, octal (BATTERY POWER and tube)	6A035
SO-2	Connector, PHONES	36B030
SO-3	Connector, PHONO	36A029
	Socket, miniature (6AG5 tube)	6A268
	Socket, miniature (6C4 tube)	6A292
	Socket, loktal (7H7 & 7A4 tube)	6A213
	Socket, loktal (7F8 tube)	6A223
	Socket, dial light	86B073

* Universal model only.

Ref. No.	Description	Hallicrafters Part Number
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TUBES, RECTIFIERS AND LAMPS

V-1,2	Type 6AG5, antenna & RF amplifier	90X6AG5
V-3	Type 7F8, oscillator/converter	90X7F8
V-4	Type 6SK7, 1st IF amplifier	90X6SK7
V-5	Type 6SG7, 2nd IF amplifier	90X6SG7
V-6,9	Type 6H6, noise limiter & discriminator	90X6H6
V-7,8	Type 7H7, 3rd IF amplifier & AM detector	90X7H7
V-10	Type 7A4, BFO	90X7A4
V-11	Type 6SL7GT, phase inverter	90X6SL7GT
V-12,13	Type 6V6GT, AF power amplifier	90X6V6GT
V-14	Type 5U4G, rectifier	90X5U4G
V-15	Type OD3/VR150, voltage regulator	90XVR150
V-16	Type 6C4, calibration oscillator	90X6C4
LM-1,2,3,4,5,6,7,8,9,10,11,12	Lamp, 6-8 V., Mazda #44 (Blue bead)	39A003

MISCELLANEOUS

TS-1,2	Terminal strip, antenna or speaker	88A567
	Screw, knurled head, for above terminal strip	3A1371
X-1	Crystal, 455 KC	19A123
X-2	Crystal, calibration, 500 KC	19A1211
	Lock, line cord	76A299
	Pulley, condenser drive	28B068
	Flywheel, dial drive	71A187
	Shaft, general coverage dial	74A252
	Dial cord	38A019
	Escutcheon	7D078
	Window, general coverage dial	22C214
	Dial scale (calibrated)	22D215
	Clip, dial scale & window mtg.	76A043
	Shaft, index control	74A013
	Washer, "C" type, index control shaft	4A333
	Spring, dial drive & pointer index	75A013
	Dial pointer	67B835
	Knob, BAND SELECTOR control	15A088-2
	Knob, RECEPTION control	15A045
	Knob, SELECTIVITY control	15A063
	Knob, TONE control	15A062
	Knob, SENSITIVITY control	15A064
	Knob, TUNING control	15A047
	Knob, POINTER RESET	15A074-1
	Knob, VOLUME	15A097
	Mounting foot, rubber	16A029

This Heathkit Frequency Modulation Tuner operates on the super regenerative principle and covers the new FM Band 88-108 Megacycles. It is 110V 60 cy power transformer operated. The tuning coils are ready assembled to the tuning condenser and the IF transformer is assembled and aligned--the tuning condenser is also aligned and set for peak performance and the trimmers are soldered to prevent misalignment during assembly. The tuner incorporates the latest type vernier slide rule dial. The dial cable is special long wearing nylon for years of service. As this unit is power transformer operated, it can safely be attached to AC-DC type receivers for amplification without danger.

The newer types of insulated resistors have a higher wattage rating. The 1/4 watt size is now rated at 1/2 watt and these are used in this kit.

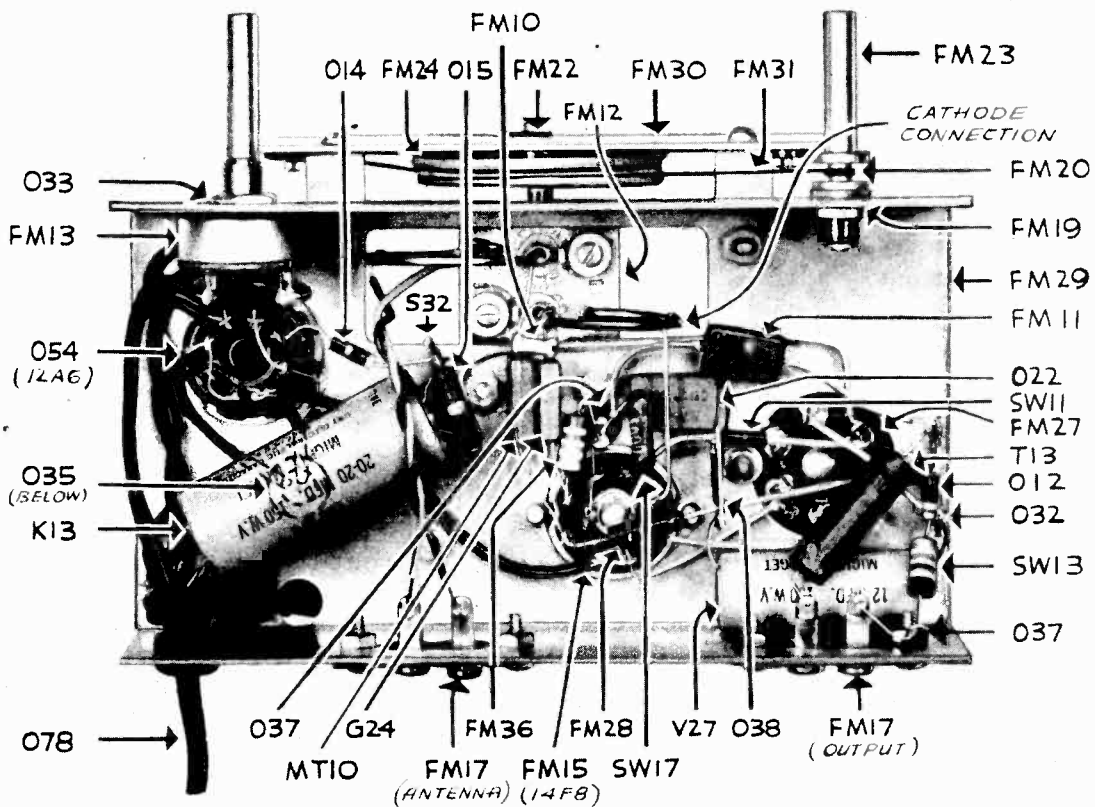
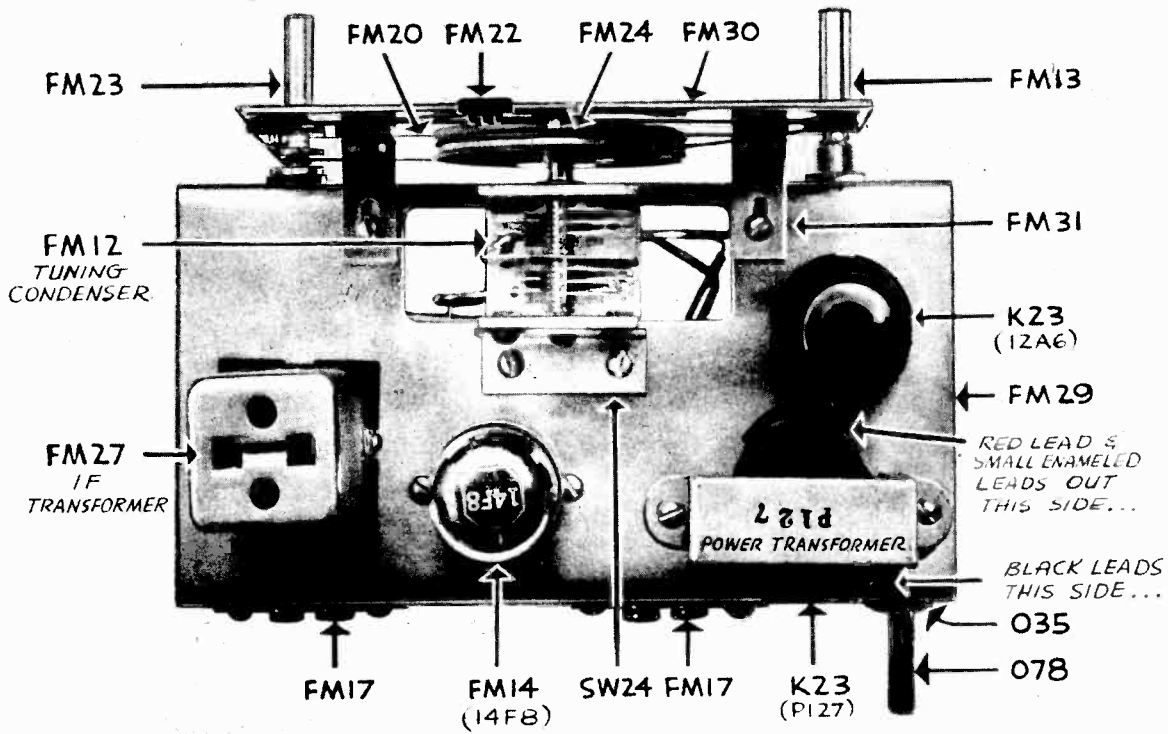
Resistors and potentiometers have a tolerance rating of plus or minus 20% unless otherwise stated. Therefore, a one megohm unit may test between 800,000 and 1,200,000 ohms. The Heathkit circuits are designed to accommodate these variations.

In connecting the tuner to an amplifier, be certain that the grounded side of the tuner is connected to the grounded side of the amplifier. The usual connecting cable is a single shielded wire and the grounded side is the shield. The tuner may be connected to the phonograph or FM connection of any radio. The connecting plug depends on the type of radio and should be obtained from the radio dealer. For local stations, a single wire approximately 3 feet long can be connected to one of the antenna terminals but for distant reception an FM dipole antenna is recommended with connections. On single wire, try each post and use one with best results.

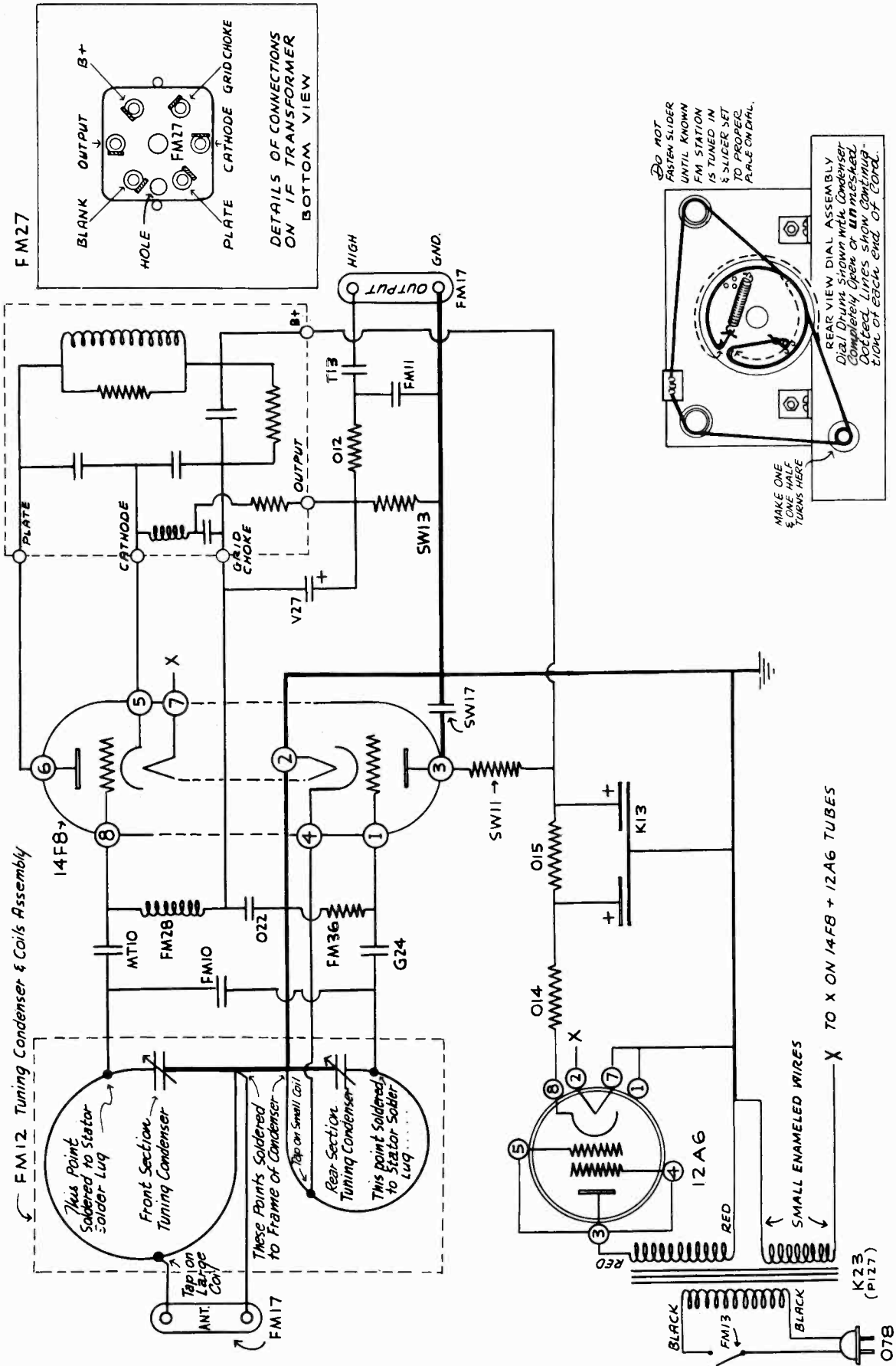
The table below lists the voltages measured between the chassis and tube socket contact. Measurements were taken with 1,000 ohms per volt voltmeter--normal variation of plus or minus 15% are to be expected due to line voltage variations.

12A6		14F8	
Pin 1	0	Pin 1	0
2	9-12VAC	2	0
3	110-150VAC	3	110-140V
4	110-150VAC	4	0
5	110-150VAC	5	40-50V
6	(used as tie point)	6	110-140V
7	0	7	9-12VAC
8	120-150V	8	3-20V

MODEL FM-1,
FM Tuner



MODEL FM-1,
FM Tuner



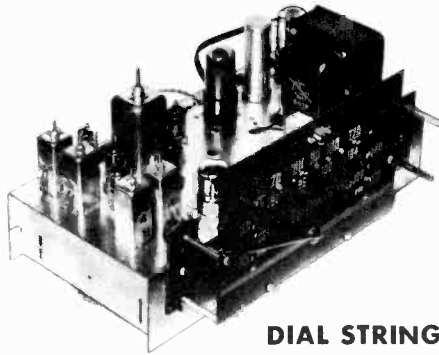
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MODEL FM-1,
FM Tuner

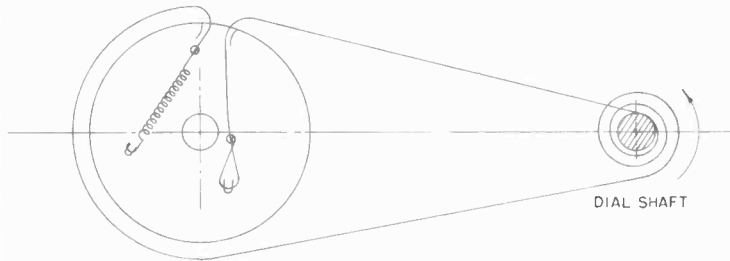
FM 1 FM TUNER PARTS LIST

Part No.	No. Parts	Description	Part No.	No. Parts	Description
SW11	1	100 Ohm Resistor	S22	16	6-32 x 1/4 Nuts
O14	1	470 Ohm Resistor	FM18	1	#8-32 Set Screw for pulley
O15	1	2000 Ohm Resistor	O33	1	Control Nut
SW13	1	22000 Ohm Resistor	FM19	1	Drive Shaft Nut
FM36	1	27000 Ohm Resistor	O35	2	3/8" Grommet
O12	1	100000 Ohm Resistor	O37	3	Soldering Lugs
FM10	1	3 MMF Ceramic Condenser	FM20	1	Pc. Dial Cable (28")
G24	1	47 MMF Mica Condenser	FM21	1	Dial Cable Spring
MT10	1	470 MMF Mica Condenser	FM22	1	Slide Pointer
FM11	1	1000 MMF Mica Condenser	FM23	1	Drive Shaft
SW17	1	1000 MMF Ceramic Condenser	FM24	1	Pulley
O22	1	.005 MFD Condenser	FM25	1	Length Hookup Wire (2 ft.)
T13	1	.01 MFD 300V Condenser	FM26	1	Length Spaghetti (4 in.)
V27	1	12 MFD 150V Electrolytic Condenser	O78	1	Line Cord
K13	1	20-20 MFD 150V Electrolytic Cond.	FM27	1	IF Transformer
FM12	1	Tuning Condenser with Coils	FM28	1	RF Choke
FM13	1	Rotary Switch SPST	K25	1	Power transformer (P127)
FM14	1	14F8 Tube	FM29	1	Chassis
K23	1	12A6 Tube	SW24	1	Condenser Mounting Bracket
FM15	1	Loctal Tube Socket	K16	3	6-32 x 3/16 Screws
O54	1	Octal Tube Socket	FM30	1	Dial Plate Assembly
O43	1	Octal Socket Ring	FM31	2	Dial Mounting Brackets
FM16	2	Brown Acorn Knobs	FM32	1	Set of Instructions
FM17	2	Screw Type Dual Terminal Strips	FM33	1	Parts List
O38	1	Single Terminal Strip	FM34	1	Schematic
S32	2	Dual Terminal Strips	FM35	1	Pictorial
O101	1	3/8" Lock washer	FM44	1	Photo Print
O31	14	6-32 x 3/8 Screws			

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DIAL STRINGING



ELECTRICAL AND MECHANICAL DATA

Frequency Range (AM) 535 KC to 1650 KC
 (FM) 88 MC to 108 MC

Intermediate Frequency (AM) 455 KC, (FM) 10.7 MC

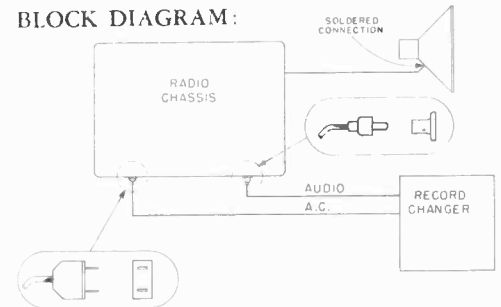
Power Supply 117 volts AC, 60 cycles

Output Impedance 3.2 ohms at 400 cycles

Power output (Undistorted) 3.5 watts

Power output (Maximum) 5 watts

BLOCK DIAGRAM:



Record Changer:

One of the following:
 78 R.P.M. Webster Model 148
 78 R.P.M. Webster Model 149
 78 and 33 1/3 R.P.M. Webster Model 246
 78 and 33 1/3 R.P.M. V.M. Corporation Model 400-D-3

TUBE COMPLEMENT

1	7F8	FM Oscillator—Converter	1	6AL5	FM Detector
1	6BE6	AM Oscillator—Converter	1	6AT6	AM Detector—AVC
1	6BA6	AM-FM 1st IF Amplifier	1	6V6GT	1st Audio (AM-FM)
1	6BA6	FM 2nd IF Amplifier	1	5Y3GT	Power Output Rectifier

SOCKET VOLTAGES

Tube	Position	1	2	3	4	5	6	7	8	Band Switch
7F8	FM Osc.—Conv.	-2*	0	230	0	4	240	6.3 AC	0	FM
6BE6	AM Osc.—Conv.	-12*	0	0	6.3 AC	230	120	0	—	AM
6BA6	FM-AM IF	-0.8*	0	0	6.3 AC	230	95	1	—	FM
6BA6	FM 2nd IF	0	0	0	6.3 AC	230	85	1	—	FM, AM
6AT6	AM Det.- 1st AF	-1.5*	0	0	6.3 AC	-2.7*	0	100	—	AM
6AL5	FM Disc.	0	-1*	0	6.3 AC	-0.5*	NC	-0.5*	—	FM
6V6GT	AF Output	0	0	280	250	0	NC	6.3 AC	14	FM, AM
5Y3GT	Rect.	—	5V AC to pin 8	NC	260 AC	NC	260 AC	NC	300	FM, AM

All voltages measured to chassis unless otherwise noted.
 DC voltages measured with 20,000 ohm/volt meter.
 All voltages DC unless otherwise noted.

All measurements made with no signal input to receiver.
 * Must be measured with VTVM with 100,000 ohm composition resistor in series with probe.

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ALIGNMENT PROCEDURE

NOTES

- 1—Before beginning alignment, the pointer must be set at the highest mark on the dial with the tuning condenser fully open.
- 2—The AM section should be completely aligned before beginning the FM alignment.
- 3—The set should be allowed to warm up 15 minutes before aligning.
- 4—An output meter should be connected across the speaker voice coil for AM alignment. Keep the volume control at maximum on AM and use as low a signal input as possible for AM and FM.
- 5—For AM and FM tracking, bend plates of the variable (RF Section) as required.
- 6—In FM alignment, care must be taken to set the receiver oscillator frequency 10.7 MC above the incoming signal frequency.
- 7—The dummy antenna for FM alignment is two 150 ohm composition resistors; one in series with each generator lead.

ALIGNMENT CHART

STEP NO.	BAND SWITCH POSITION	SIGNAL GENERATOR	CONNECTION TO RECEIVER	DUMMY ANTENNA	DIAL SETTING	ADJUST	REMARKS
1	AM	455 KC Mod.	6BE6 Conv. Grid Pin 7	0.1 mfd	1600 KC	T2 Pri., Sec., T4 Pri., Sec.	Adjust for Max. output
2	AM	1600 KC Mod.	Ext. Antenna Clip	0.1 mfd	1600 KC	C19 BC Osc. Trimmer	Adjust for Max. output
3	AM	1400 KC Mod.	Ext. Antenna Clip	0.1 mfd	1400 KC	C4 BC RF Trimmer	Adjust for Max. output
4	AM	600 KC Mod.	Ext. Antenna Clip	0.1 mfd	600 KC	See Note 5	See Note 5
5	FM	10.7 MC CW	FM Ant. Terminals	0.1 mfd	107 MC	T1 Pri. & Sec., T3 Pri. & Sec.; T5 Pri. only	Tune for Max. reading, VTVM from point A to chassis. See Ratio Detector Alignment.
6	FM	10.7 MC CW	FM Ant. Terminals	0.1 mfd	107 MC	T5 Sec.	Tune for Zero reading, VTVM from resistor junction to point C. See Ratio Detector Alignment
7	FM	107 MC CW	FM Ant. Terminals	300 ohms See Note 7	107 MC	C6 FM Osc. Trimmer	Adjust for Max. with VTVM from point A to chassis. See Note 6.
8	FM	107 MC CW	FM Ant. Terminals	300 ohms	107 MC	C9 FM RF Trimmer	Adjust for Max. with VTVM from Point A to chassis.
9	FM	98 MC CW	FM Ant. Terminals	300 ohms	98 MC	See Note 5	Adjust for Max. with VTVM from Point A to chassis.
10	FM	88 MC CW	FM Ant. Terminals	300 ohms	88 MC	See Note 5	Adjust for Max. with VTVM from Point A to chassis.

RATIO DETECTOR ALIGNMENT

(T1 and T3 should be tuned before tuning T5.)

TUNING T5 PRIMARY

Locate the ratio detector test points A, B, and C on the schematic diagram. Solder two 100,000 ohm composition resistors in series from point "A" to chassis. Connect a VTVM from point "A" to chassis and feed 10.7 MC CW into the FM antenna terminals. Adjust T5 primary (bottom slug) for maximum reading, setting the generator output to give about one volt meter reading. (An insulated aligning tool should be used for this adjustment.)

TUNING T5 SECONDARY

Connect the VTVM probe to point "C" and the VTVM common or ground lead to the junction

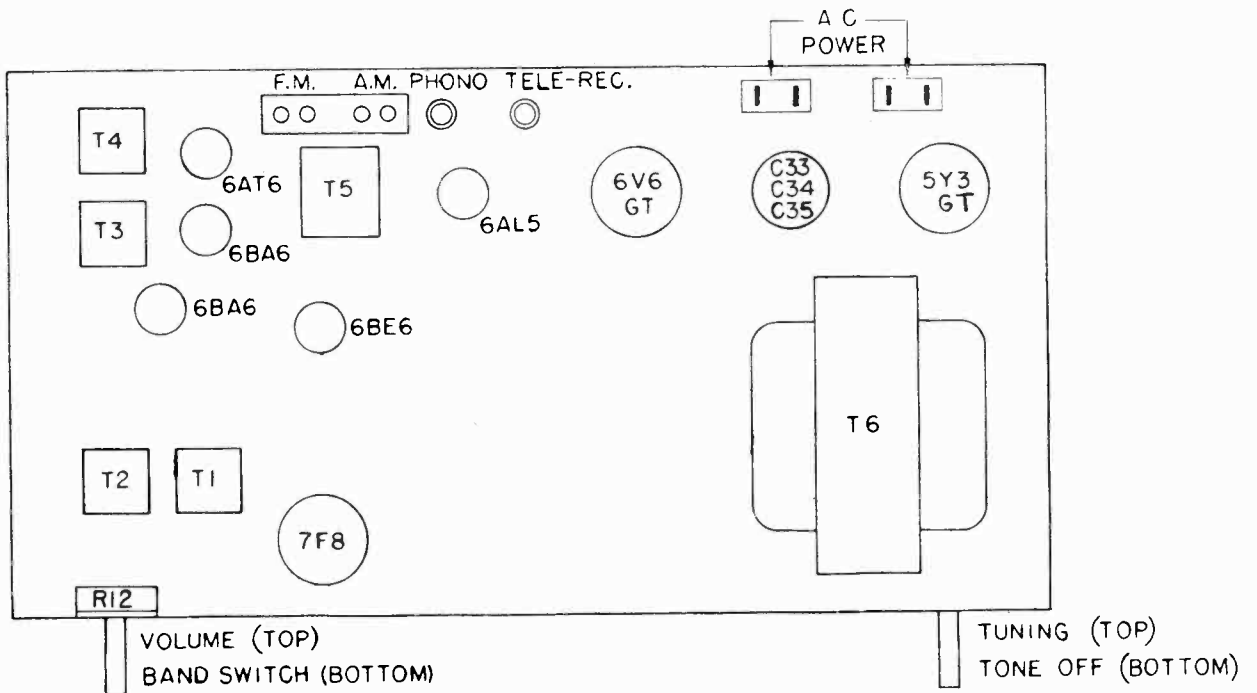
of the two 100,000 ohm resistors. Tune T5 secondary until the meter reading reverses polarity. Set the slug at this zero point.

CHECKING BAND WIDTH

Connect the signal generator to the grid of the 2nd FM IF tube. Set the generator to 100,000 microvolts at 10.7 MC CW. Shift the generator frequency above and below 10.7 MC and record the frequencies at which the maximum positive and negative meter readings are obtained. The difference between these two readings is the bandwidth of the ratio detector and should be 250 to 300 KC.

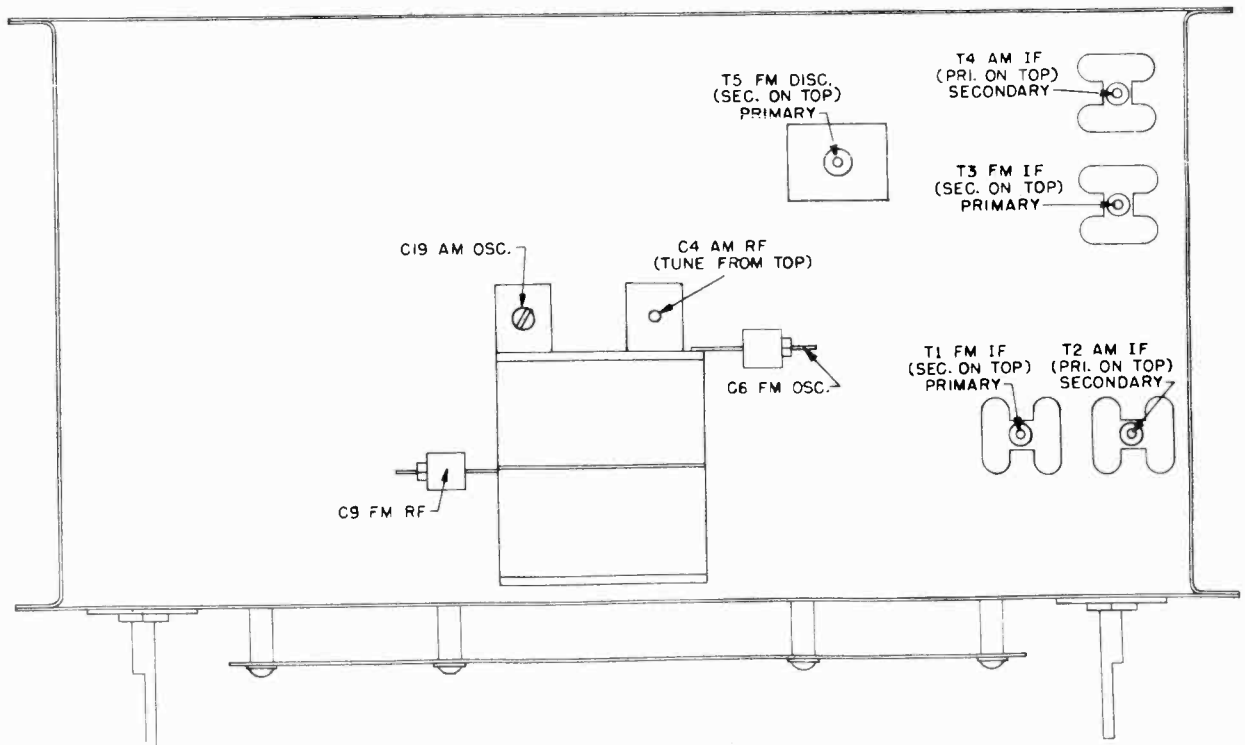
Remove the two 100,000 ohm resistors before beginning the FM RF alignment.

TUBE AND TRIMMER LOCATIONS



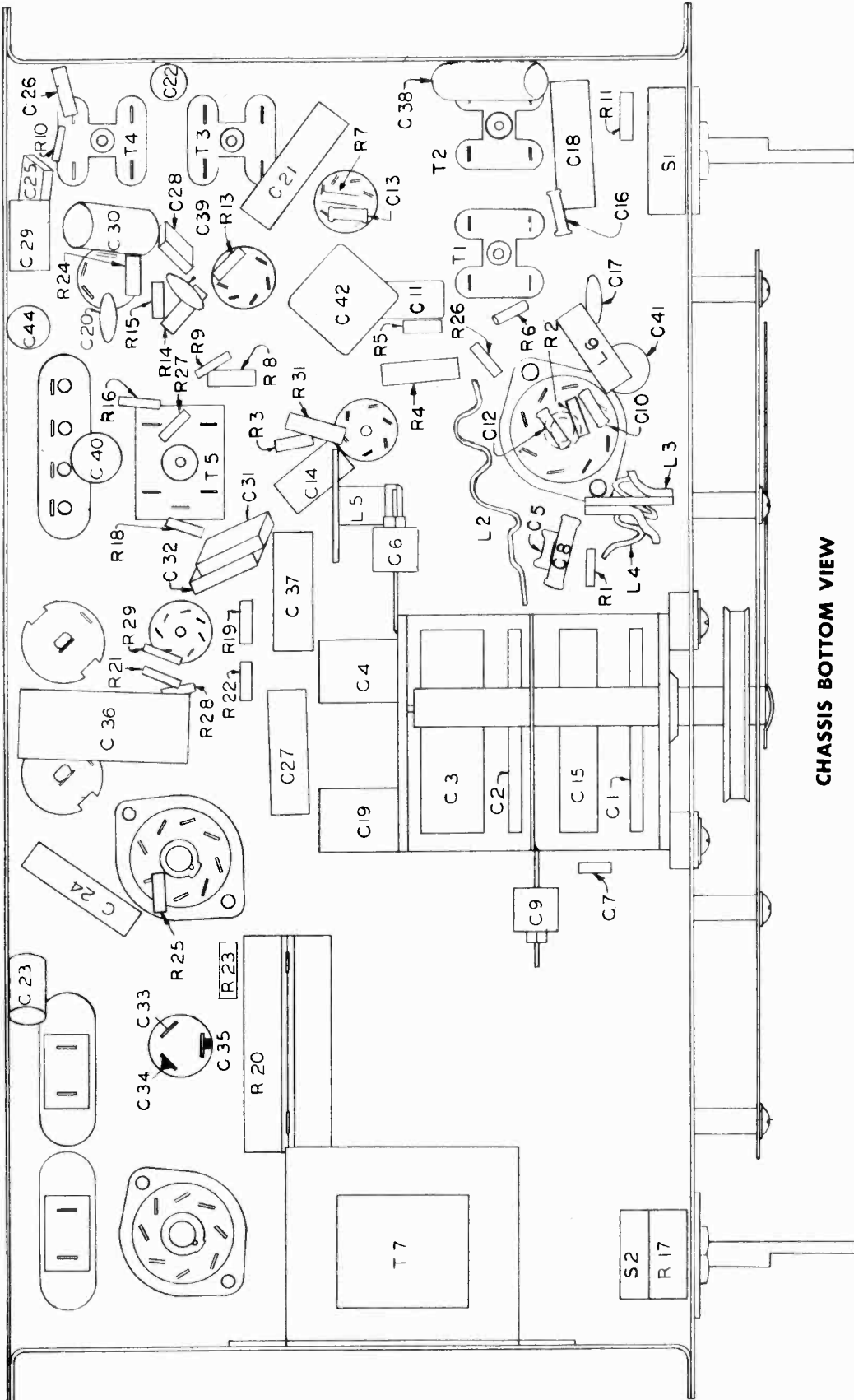
TOP VIEW OF CHASSIS

TUBE LOCATION

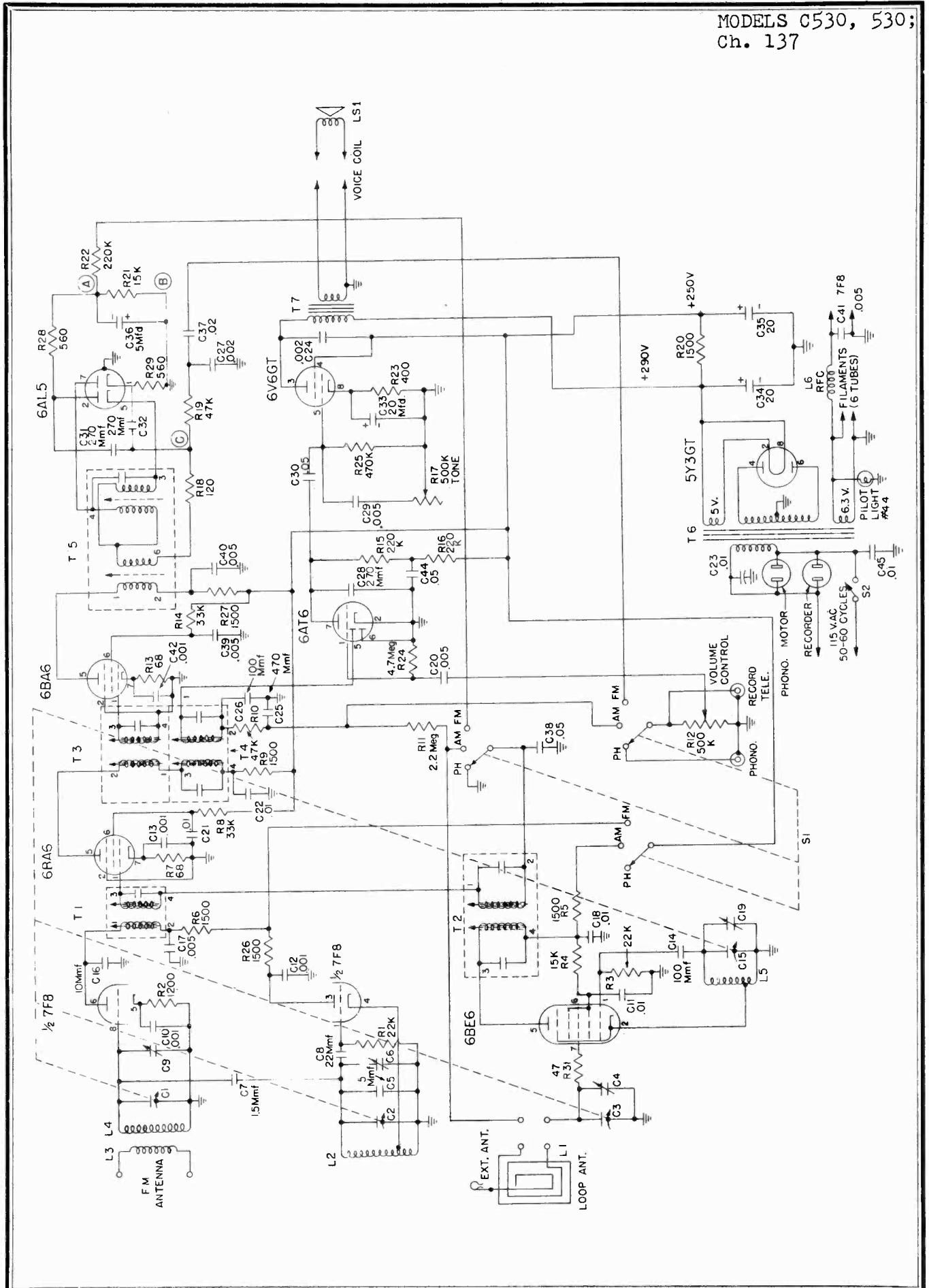


TRIMMER LOCATION—BOTTOM VIEW

MODEL S C530, 530;
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CHASSIS BOTTOM VIEW



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CHASSIS 137 PARTS LIST

Symbol	Description	Hoffman Part Nos.
C1, C2, C3, C15	4 Section Variable	4410
C4, C19	Trimmer (AM Section)	4313
C5	5 Mmf ±10% Ceramic N750	4028
C6, C9	Trimmer (FM Section)	4318
C7	1.5 Mmf ±10% Mica	4024
C8	22 Mmf ±10% Ceramic N150	4021
C10, C12, C13, C42	1000 Mmf Ceramic Hi-K	4025
C11, C18, C21, C22, C23	.01 Mfd 400V Paper	4112
C14, C26	100 Mmf ±20% Mica	4000
C16	10 Mmf ±10% Ceramic	4027
C17, C20, C39, C40, C41	5000 Mmf Ceramic Hi-K	4029
C24, C27	.002 Mfd 600V Paper	4118
C25	470 Mmf ±20% Mica	4003
C28, C31, C32	270 Mmf ±20% Mica	4001
C29	.005 Mfd 600V Paper	4102
C30, C44	.05 Mfd 400V Paper	4101
C33	20 Mfd 25V Electrolytic	4200
C34, C35	20 Mfd 450V Electrolytic	
C36	5 Mfd 50V Electrolytic	4209
C37	.02 Mfd 400V Paper	4106
C38	.05 Mfd 200V Paper	4100
R1, R3	22,000 Ohm ±20% 1/2W Carbon	4501
R2	1200 Ohm ±10% 1/2W Carbon	4553
R4	15,000 Ohm ±20% 1W Carbon	4539
R5, R6, R9, R26, R27	1500 Ohm ±20% 1/2W Carbon	4534
R7, R13	68 Ohm ±20% 1/2W Carbon	4524
R8, R14	33,000 Ohm ±20% 1W Carbon	4556
R10, R19	47,000 Ohm ±20% 1/2W Carbon	4504
R11	2.2 Meg ±20% 1/2W Carbon	4502
R12	.5 Meg Pot. (Volume Control)	4804
R15, R16, R22	.22 Meg ±20% 1/2W Carbon	4500
R17	.5 Meg Pot. W/switch (Tone Control)	4812
R18	120 Ohm ±10% 1/2W Carbon	4546
R20	1500 Ohm (W.W.) ±5% 6 1/2W	4701
R21	15,000 Ohm ±20% 1/2W Carbon	4521
R23	400 Ohm ±10% 1W Carbon	4587
R24	4.7 Meg ±20% 1/2W Carbon	4544
R25	.47 Meg ±20% 1/2W Carbon	4506
R28, R29	560 Ohm ±10% 1/2W Carbon	4507
L1	Loop Antenna (AM)	5279
L2	Oscillator Coil (FM)	5247
L3	Antenna Primary (FM)	5258
L4	Antenna Secondary (FM)	5248
L5	Oscillator Coil (AM)	5282
L6	Filament Choke	5266
T1	1st FM IF Transformer	5284
T2	1st AM IF Transformer	5286
T3	2nd FM IF Transformer	5285
T4	2nd AM IF Transformer	5287
T5	Ratio Detector Transformer	5288
T6	Power Transformer	5012
T7	Output Transformer	5122
S1	Band Switch	6002
S2	On-Off Switch (Part of R17)	
	Dial	2217A
	Knob, Indicator (Specify Color)	3514
	Knob, Plain (Specify Color)	3510
	Plug, Phono	6203
	Pointer, Dial	518
	Socket, Octal	6105
	Socket, Miniature	6118
	Socket, Octal	6103
	Socket, Phono	6121
	Socket, Pilot Lamp	6110
	Socket, AC Power	6108
	Spring, Dial Cable	9507
	Strip, Antenna Terminal	424

NOTE: In some cases the following substitutions have been made:

C24 is two .001 Mfd 600V in parallel.

C27 is two .001 Mfd 600V in parallel.

C42 is 1050 Mmf ±5% Mica.

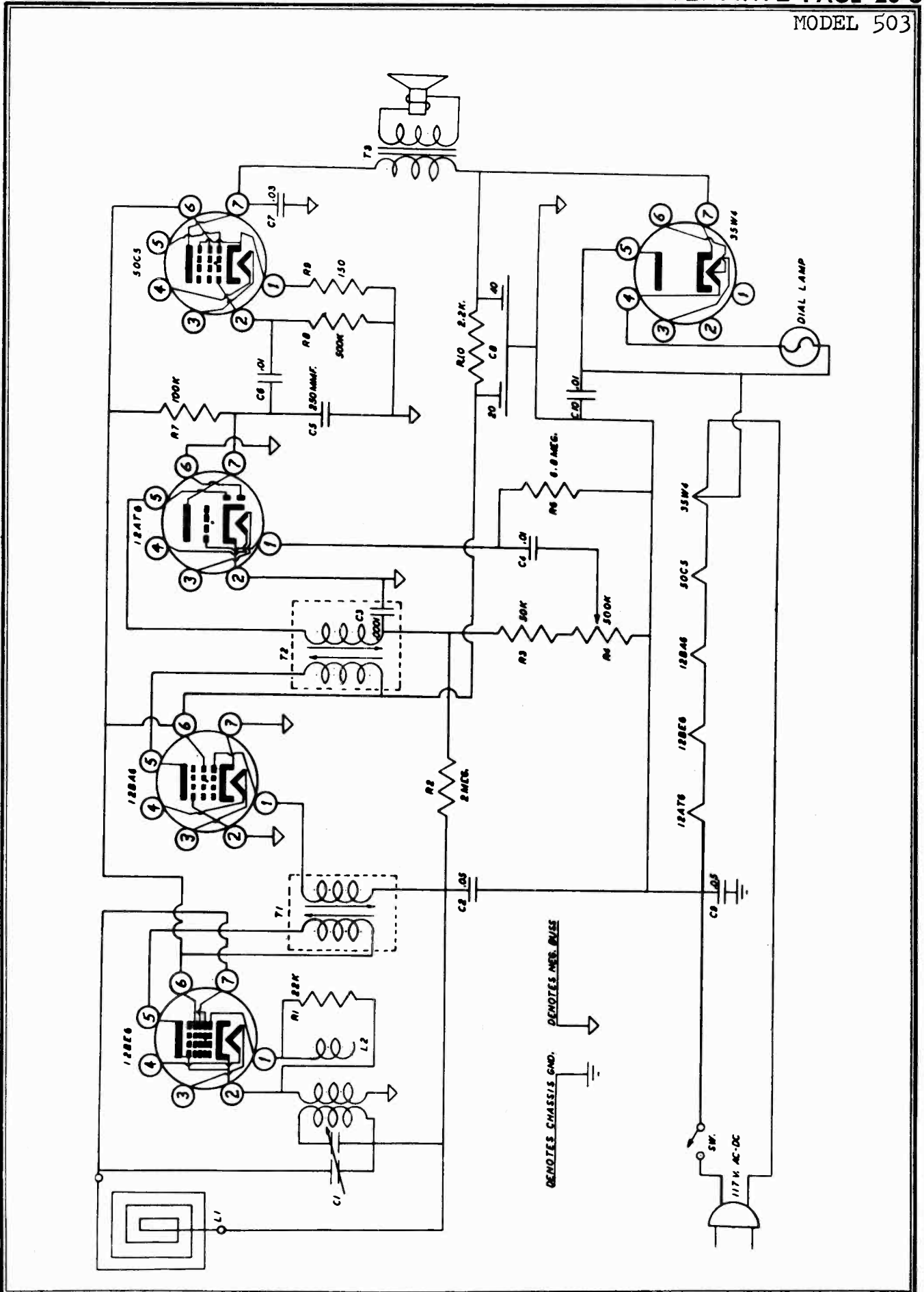
R8 and R14 are each 47,000 ohm ±20% 1 Watt.

R23 is two 820 ohm ±10% 1/2 Watt in parallel.

MODEL 501

ANTENNA	GEN. COUPLING	GEN. FREQ.	RADIO DIAL	OUTPUT METER	ADJUST
1.					
.02mfd	Hi side to front section of tuning condenser	455 kcs	closed max. cap.	across V.C.	T1 bottom slug first for max. output T1 top slug for max. output.
2.					
50mmf	Ant. coil Ant. input Remove hank	545 kcs	closed max. cap.	across V.C.	adjust osc. trimmer (front section tuning condenser) for max. output
3.					
50mmf	same as No. 2	1500 kcs.	1500 kcs.	across V.C.	adjust rear section tuning condenser trimmer for uniform output between 545kc and 1500 kc

Circuit Location	Part No.	Description
C1		Condenser, paper tubular, .001mfd., 400v
C3	29A002	Condenser, variable 2 gang
C2		Condenser, paper tubular, .01 mfd., 400v
C4		Condenser, paper tubular, .002mfd., 400v
C5		Condenser, mica, .0001mfd., 600v
C6		Condenser, paper tubular, .005 mfd., 400v
C7		Condenser, paper tubular, .03 mfd., 400v
C8	31E003	Condenser, tubular cardboard, 40X20mfd, 150v
C9		Condenser, paper tubular, .01 mfd., 400v
R1		Resistor, composition, 2 meg., 1/2 watt
R2		Resistor, composition, 22k., 1/2 watt
R3		Resistor, composition, 6.8 meg., 1/2 watt
R4	26G008	Resistor, variable, 500k ohms
R5		Resistor, composition, 100k., 1/2 watt
R6		Resistor, composition, 500k., 1/2 watt
R7		Resistor, composition, 150 ohms, 1 watt
R8		Resistor, composition, 2k., 1 watt
R9		Resistor, composition, 33 ohms, 1/2 watt
R10		Resistor, wire wound, 65 ohms, 5 watts
L1	35D004	Coil, antenna
L2	35C002	Coil, oscillator
T1	18A005	Transformer, I.F. 455 KCS.
T2	15D001	Transformer, audio output
SP'KR	19H100	Speaker, 4" P. M.
12BE6		Tube, 12BE6
12AT6		Tube, 12AT6
50C5		Tube, 50C5
35W4		Tube, 35W4
	5D004	Knob, pointer, walnut, split spline
	5D005	Knob, pointer, ivory, split spline
	5D006	Knob, walnut, split spline
	5D007	Knob, ivory, split spline
	11G007	Cover, back, chipboard
	40B011	Cabinet, model 1010 walnut
	40B010	Cabinet, model 1010 ivory



MODEL 503

ANTENNA	GEN. COUPLING	GEN. FREQ.	RADIO DIAL	OUTPUT METER	ADJUST
1. .02mfd.	Connect gen. hi side to osc. section of tuning condenser. Connect gen. gnd. to radio neg. buss.	455 kcs.	open	across V.C. min. cap.	Adjust T2 top & bottom slug for max output. Adjust T1 top and bottom slugs for max. output
2. 50mmf	Connect gen. Hi side to antenna lead. (rear section tuning condenser) Connect gen. gnd. to radio neg. buss.	1400 kcs.	1400 kcs.	Across V.C.	Tune osc. trimmer for max output.
3. 50mmf	same as No. 2.	600 kcs.	600 kcs.	across V.C.	Adjust for uniform output between 1400 kc and 600 kc.

Circuit Location	Part No.	Description
R1		Resistor, composition, 22k, 1/2 w.
R2		Resistor, composition, 2 meg., 1/2 w.
R3		Resistor, composition, 50k, 3/4 w.
R4	25G009	Resistor, variable, 500k, w/switch
R6)		
R4)	40L103	Caprister, 6.8 meg., 1/2 w. .01 mfd, 400v
R7&C5	40L101	Caprister, 100k, 1/2 w., 250mmf., 400v.
R8&C6	40L102	Caprister, 500k, 1/2 w., .01 mfd., 400v.
C1	29A003	Condenser, variable 2 gang
R9		Resistor, 150 ohms, 1 watt
R10		Resistor, composition, 2.2k., 1 watt
C5-C9		Condenser, paper tubular, .05mfd., 400v.
C3		Condenser, ceramic, 100m.f., 400v., (in T2)
C7		Condenser, paper tubular, .03mfd., 400v.
C8	31E003	Condenser, electrolytic, 40X20mfd, 150v.
C10		Condenser, paper guular, .01mfd., 400v.
L1	35D003	Loop, antenna
L2	35C001	Coil, oscillator, with capacity winding 50mmf
T1	18A005	Transformer, I.F. 455 kc.
T2	18A006	Transformer, I.F. 455 kc. with 100mmf. diode filter
T3	15L001	Transformer, audio output
SPEAKER	19H101	Speaker, 4" P.M.
Dial Lamp		Lamp, dial. miniature bayonet No. 47
Sw.		Switch, off-on, on vol. control R4
	40B008	Cabinet, plastic, walnut
	40B009	Cabinet, plastic, ivory
	2R100	Pointer, dial
	27103	Glass, dial plate with calibration
	5D008	Knob, push on, split knurl
1 23E6		12BE6
12BA6		L 12BA6
12AT6		12AT6
		50C5
50C5		35W4
35W4		
	11G006	Cover, back, chipboard